Marine Water Quality in Hong Kong in 2019




Environmental Protection Department
The Government of the Hong Kong Special Administrative Region

Our Mission

To conduct a comprehensive and scientific monitoring programme that helps safeguard the health of Hong Kong's marine environment and achieve the Water Quality Objectives.

Acknowledgements

We acknowledge the following parties for their contribution to this report: Government Laboratory for undertaking chemical analyses of water and sediment samples; Marine Department for managing and operating the monitoring vessel *Dr. Catherine Lam* in conducting field sampling and measurement; Agriculture, Fisheries and Conservation Department for providing photos and information on marine parks, fish culture zones and red tides; Lands Department for providing information on geography and aerial photography of Hong Kong; Ms. Hidy Yu for providing underwater photos on local corals; Mr. Kenny Lee for providing underwater photos on local fishes.

Abbreviations / 簡稱

Advance Disinfection Facilities	ADF	前期消毒設施
Ammonia Nitrogen	NH_4-N	氨氮
Chemically Enhanced Primary Treatment	CEPT	化學強化一級處理
Conductivity-temperature-depth	CTD /溫鹽深	溫度、鹽度、深度
Dissolved Oxygen	DO	溶解氧
Environmental Protection Department	EPD / 環保署	環境保護署
Escherichia coli	*E. coli*	大腸桿菌
Harbour Area Treatment Scheme	HATS	淨化海港計劃
Joint Implementation Programme	JIP	聯合實施方案
Orthophosphate phosphorus	PO_4-P	正磷酸鹽磷
Sewage Treatment Works	STW	污水處理廠
Stonecutters Island Sewage Treatment Works	SCISTW	昂船洲污水處理廠
Total Inorganic Nitrogen	TIN	總無機氮
Unionised Ammonia Nitrogen	NH_3-N	非離子化氨氮
Water Control Zone	WCZ	水質管制區
Water Quality Objective	WQO	水質指標
5-day Biochemical Oxygen Demand	BOD_5	五天生化需氧量

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1. Introduction

Hong Kong, a highly urbanised city of nearly 7.5 million people, is also blessed with a sea area of 1 648 km^2 with long and beautiful coastline extending over 1 200 km. Excluding Hong Kong Island and Lantau Island, there are 261 islands with individual area exceeding 500 m^2 in the Special Administrative Region of China. Hong Kong's marine waters support a variety of marine life and habitats, and serve as destinations of various leisure activities for local residents and tourists alike.

To protect the marine environment of Hong Kong for various beneficial uses, the Environmental Protection Department (EPD) has been implementing a comprehensive marine water quality monitoring programme since 1986. The aims and objectives of the programme are to:

- evaluate the health state of marine waters;
- monitor long-term changes in water quality;
- provide a scientific basis for planning water pollution control strategies and evaluating their effectiveness; and
- assess the compliance with statutory Water Quality Objectives (WQOs).

Every month, the EPD monitors the marine water quality at 76 monitoring stations in open waters, and collects and examines phytoplankton samples from 26 of these stations. We also monitor, at bimonthly intervals, the water quality of 18 monitoring stations located in sheltered waters including 14 typhoon shelters, three sheltered anchorages and the Government Dockyard. In addition, sediment samples are collected twice a year from 60 monitoring stations for analyses, including 45 stations in open waters and 15 in sheltered waters.

EPD's marine monitoring vessel *Dr. Catherine Lam*

The *MV Dr. Catherine Lam*, EPD's dedicated marine monitoring vessel, is equipped with an advanced conductivity-temperature-depth (CTD) profiler linked to a computer-controlled rosette water sampler which simultaneously performs depth profiling of *in situ* measurements and takes water samples at specified depths. Marine sediments are sampled and collected by using a Van Veen sediment grab sampler. The water and sediment samples are analysed by the Government Laboratory and EPD's in-house laboratory for over 80 physical, chemical and biological parameters. Details of the water quality parameters, their analytical methods as well as information of monitoring stations and WQOs are given in the Appendices.

The computer-controlled rosette water sampler.

2. The State of Hong Kong Marine Waters in 2019

2.1 Overall Compliance Rate of Marine Water Quality Objectives (WQOs)

The overall marine WQO compliance rate for Hong Kong's marine waters is calculated based on the overall average of the compliance rates for all monitoring stations for the four key marine WQO parameters including Dissolved Oxygen (DO), Total Inorganic Nitrogen (TIN), Unionised Ammonia Nitrogen (NH_3-N) as well as *E. coli* bacteria. The overall marine WQO compliance rate for Hong Kong was 89% in 2019, as compared with 88% in 2018 (Figure 1).

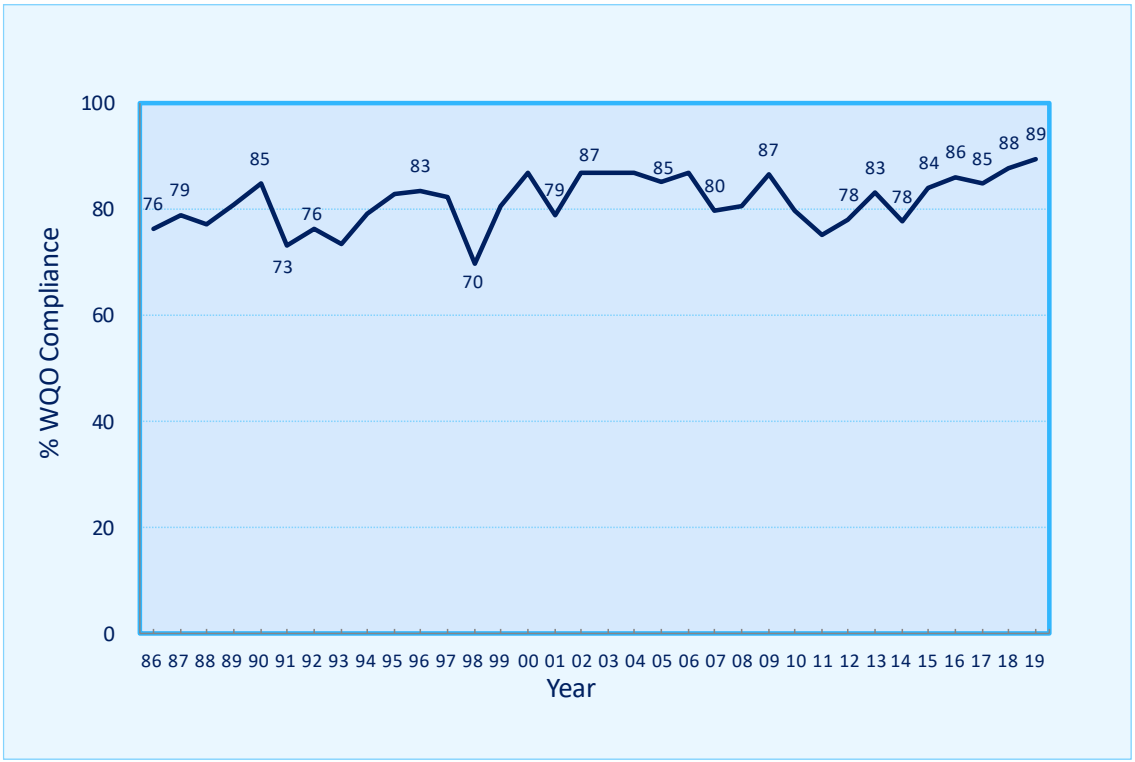


Figure 1. Overall marine WQO compliance rates, 1986-2019

The compliance rates for the four key WQO parameters and the overall WQO compliance rates for the ten water control zones (WCZs) are shown in Figures 2 and 3. Notably, full compliance with the *E. coli* and NH_3-N WQOs in all applicable WCZs have been achieved for five consecutive years since 2015. The compliance rate of the DO WQO increased slightly to 96%, as compared to 91% in 2018. The compliance rate for the TIN WQO maintained at about 68% in 2019.

For the DO WQO, the non-compliance was mainly observed in the highly land-locked waters with limited tidal exchange in the Tolo Harbour and Channel WCZ where seasonal stratification occurred. For the TIN WQO, non-compliance was observed in the Deep Bay WCZ, Southern WCZ, North Western WCZ and, to a lesser extent, in the Victoria Harbour WCZ. Details about the marine WQO compliance rates for individual WCZs are given in Chapter 3.

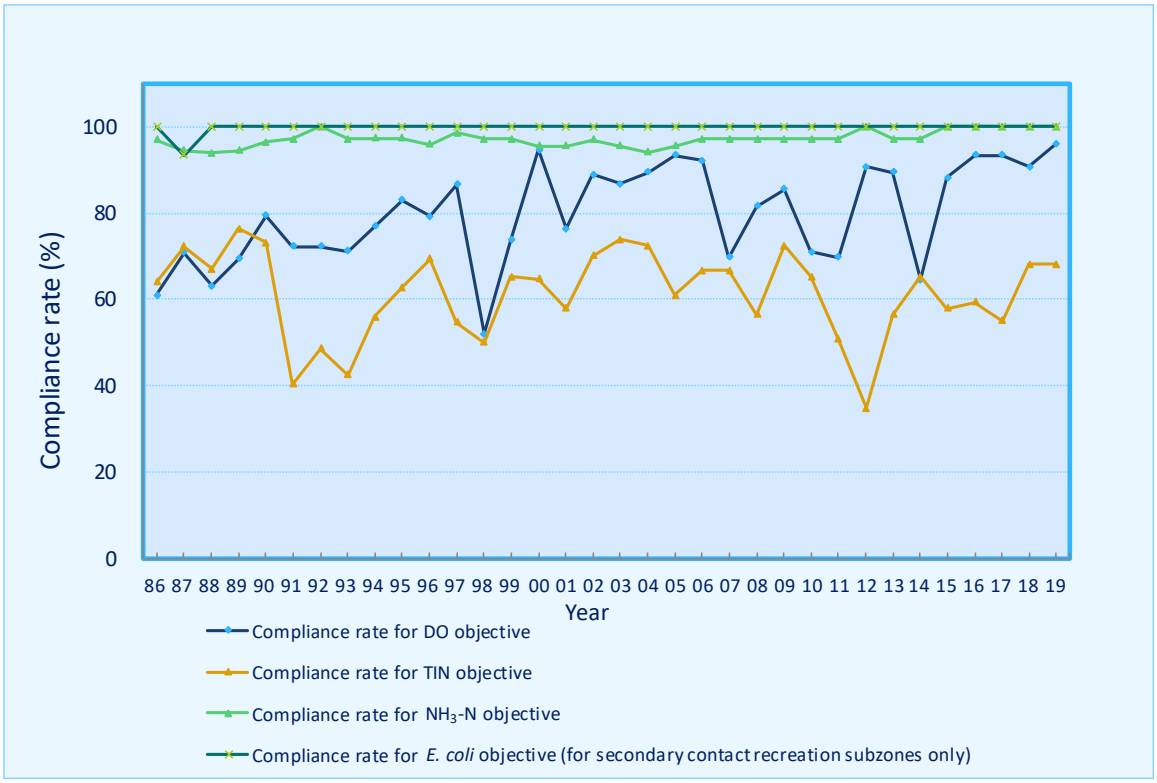


Figure 2. Compliance rates for four key marine WQOs, 1986-2019

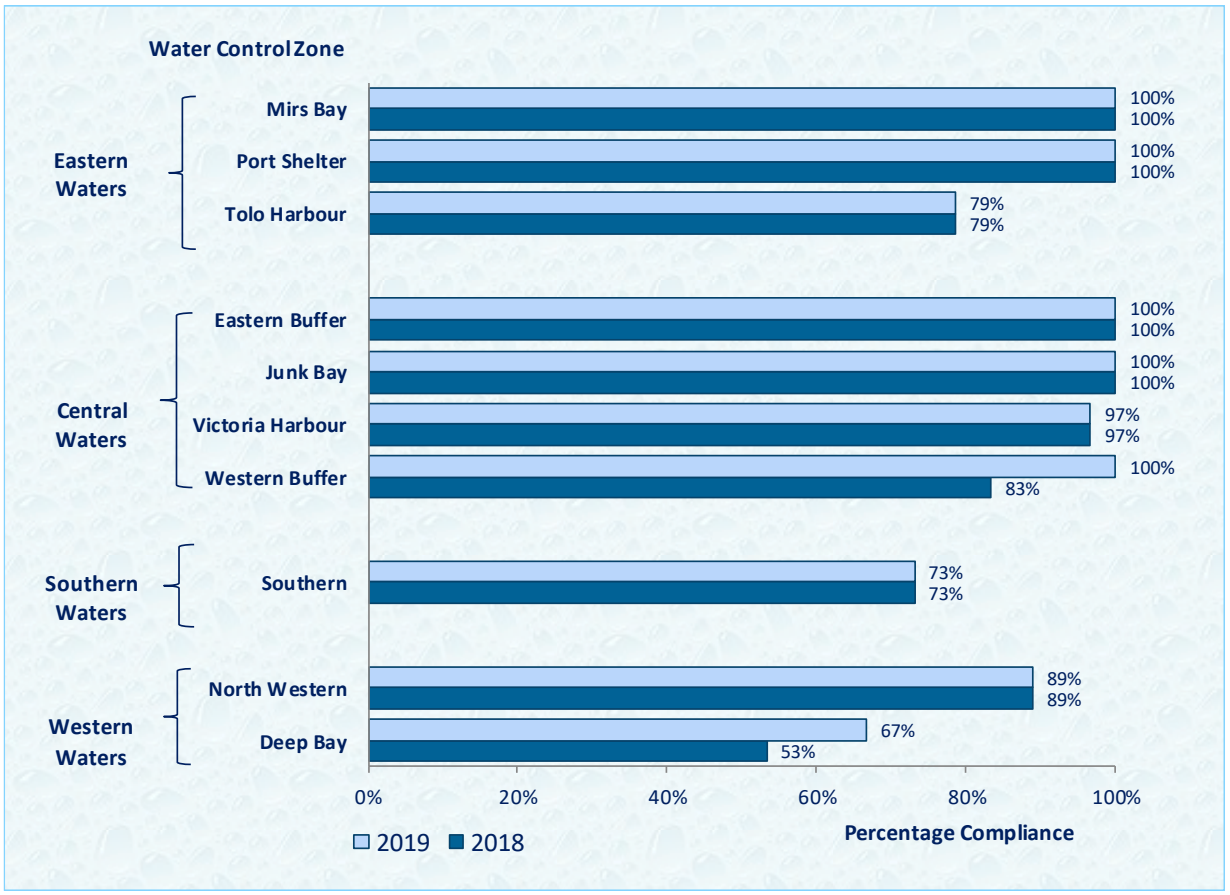


Figure 3. Marine WQO compliance rates for the ten WCZs, 2018-2019

2.2 Highlight in 2019 – Water Quality of Victoria Harbour

Through the continuous efforts of the Government in proactive planning to preempt environmental impacts, implementing sewerage projects and enforcing environmental laws, the water quality of most parts of our marine waters have been gradually improving.

The vibrant Victoria Harbour where more than half of Hong Kong's population reside, has seen significant improvement in water quality upon staged implementation of the Harbour Area Treatment Scheme (HATS) as illustrated in Figure 4. The overall geometric mean of *E. coli* and NH_3-N levels have greatly decreased to 351 counts per 100mL and 0.004 mg/L respectively, while that of DO has increased to 5.7 mg/L. For details please refer to Section 3.2.

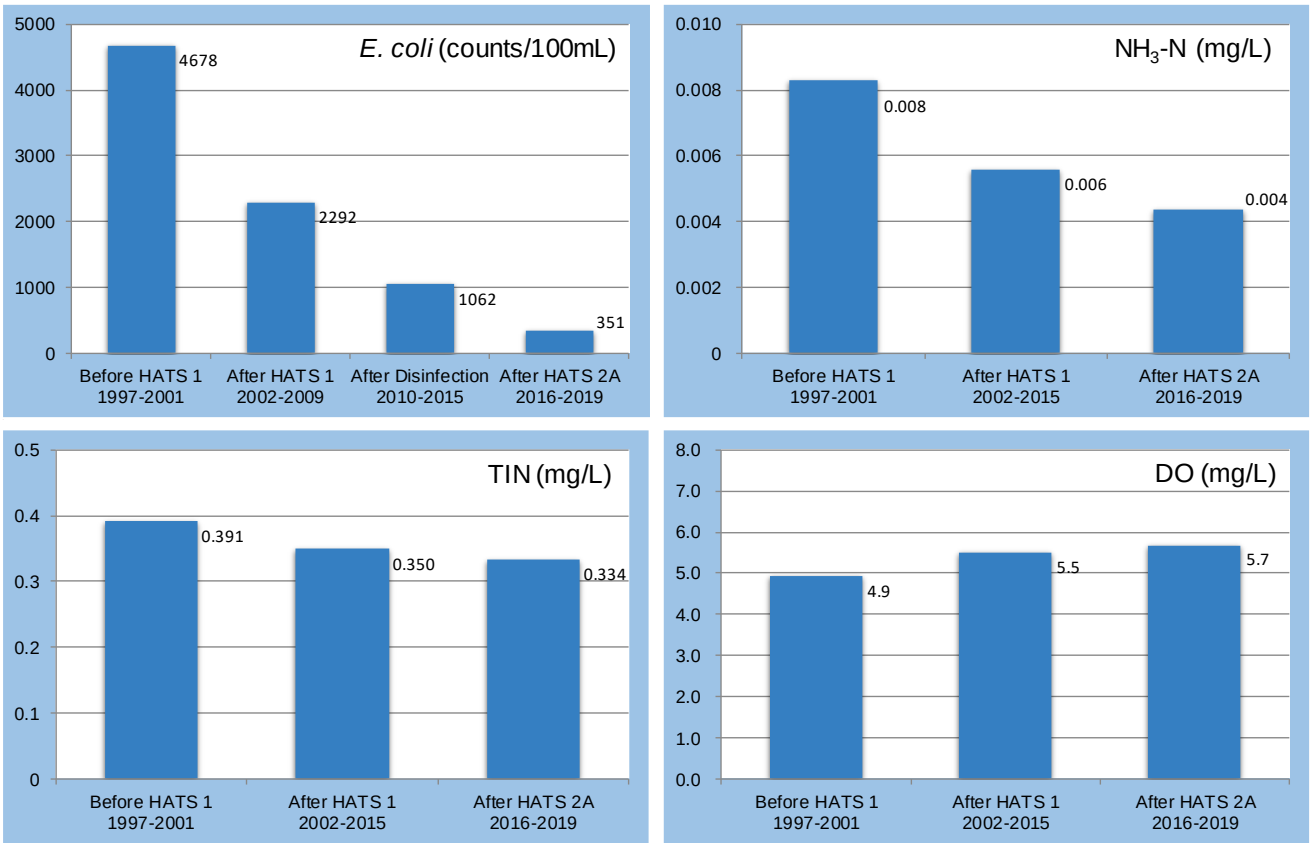
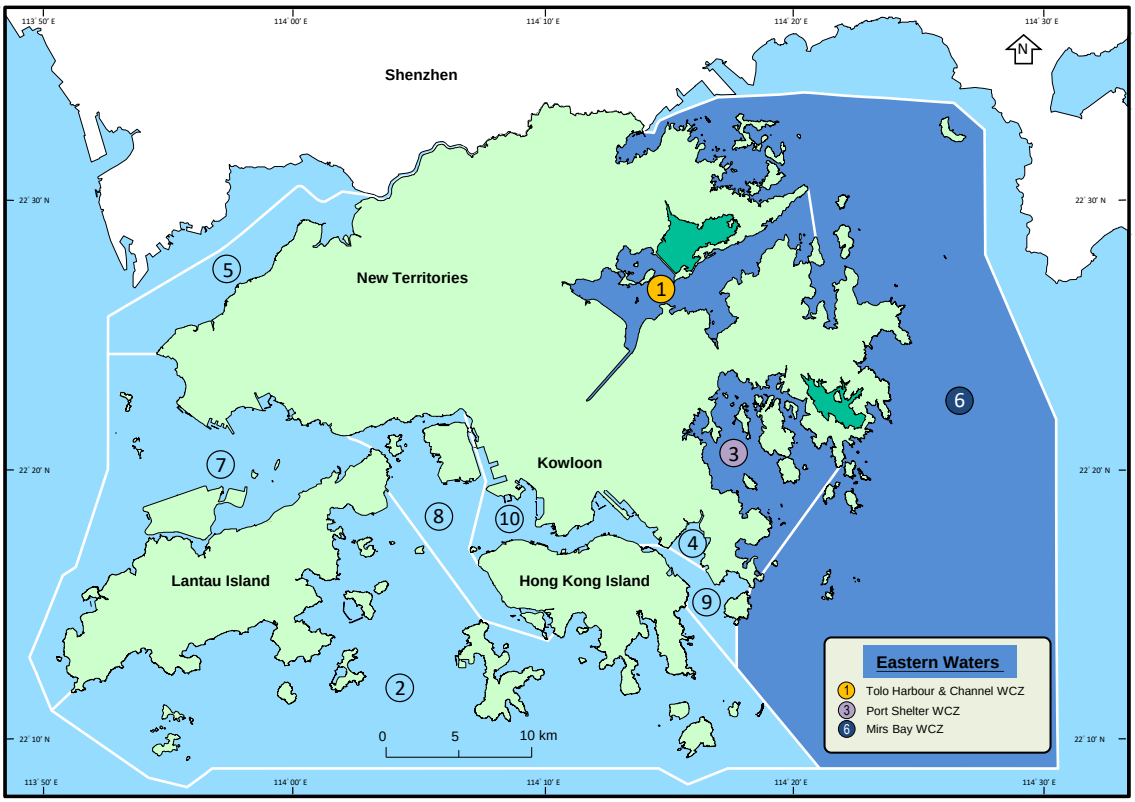


Figure 4. Water quality improvement in Victoria Harbour since the implementation of Harbour Area Treatment Scheme (HATS)

3. Water Quality of the Ten Water Control Zones (WCZs)

Based on the hydrographical conditions of Hong Kong waters and the proximity to the Pearl River Estuary, the ten WCZs are grouped into four main areas, namely Eastern, Central, Western and Southern Waters. Details of their respective water quality conditions are reported in the following sections.

3.1 Eastern Waters



The eastern waters comprise three WCZs, namely the Mirs Bay WCZ, the Port Shelter WCZ and the Tolo Harbour and Channel WCZ. These waterbodies cover 6 gazetted bathing beaches, 3 marine parks and 20 fish culture zones, and come with beautiful natural coastlines and pristine water quality that support a diversified array of marine life, fisheries and recreation activities.

Mirs Bay Water Control Zone

In 2019, Mirs Bay continued to fully achieve the marine WQOs. The water quality remained superb with high DO and low nutrient levels, and fitting secondary contact recreational uses. Figures 5 and 6 illustrate the WQO compliance rates and long-term trends for some key water quality parameters in the Mirs Bay WCZ during the past three decades.

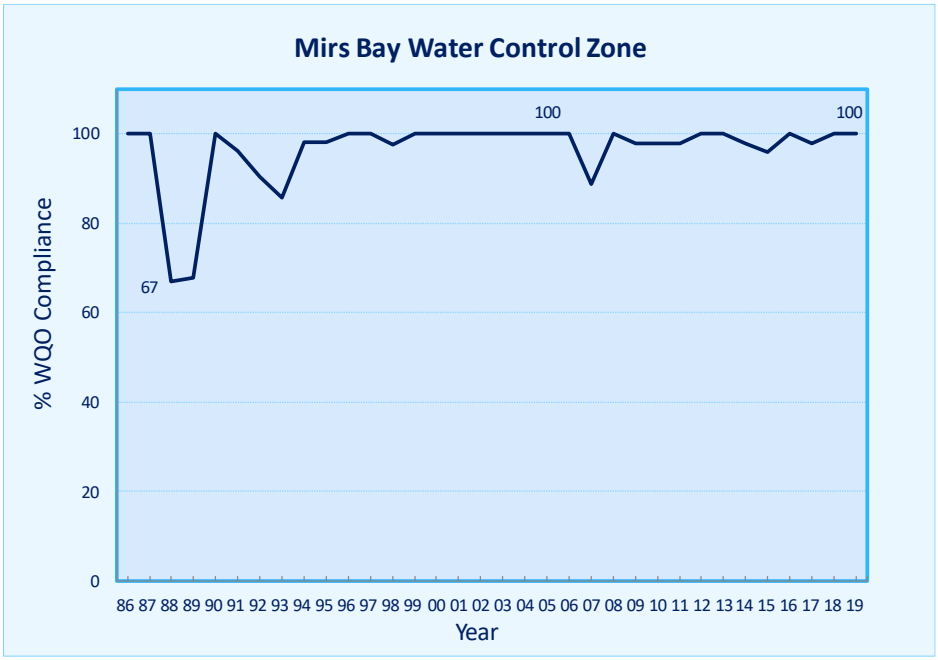


Figure 5. Overall WQO compliance rate for the Mirs Bay WCZ, 1986-2019

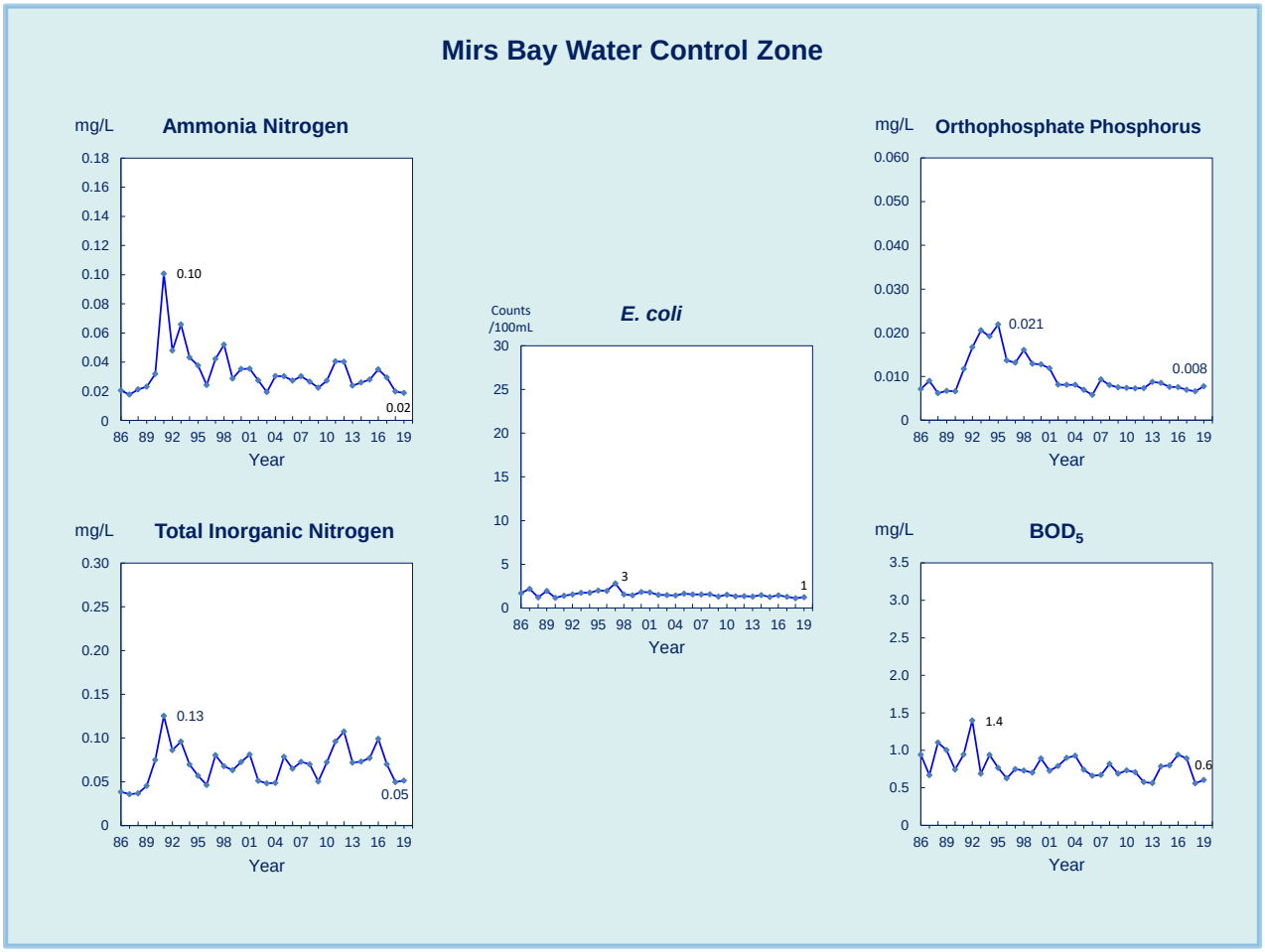


Figure 6. Long-term water quality trends in the Mirs Bay WCZ, 1986-2019

Port Shelter Water Control Zone

Port Shelter is a popular destination for various water sports activities, including leisure fishing, swimming, diving, water-skiing and yachting. In 2019, the water quality of the Port Shelter WCZ remained good, fully achieving the WQOs for five consecutive years since 2015.

The WQO compliance rates and long-term water quality trends in the Port Shelter WCZ since 1986 are illustrated in Figures 7 and 8. In general, the water quality in recent years was significantly better than that in the late 1980's. There was a steady decrease in nutrients concentrations (including ammonia nitrogen (NH_4-N) and orthophosphate phosphorus (PO_4-P)) which stood at low levels in recent years.

Sunset at the Sharp Island tombolo in the Port Shelter WCZ

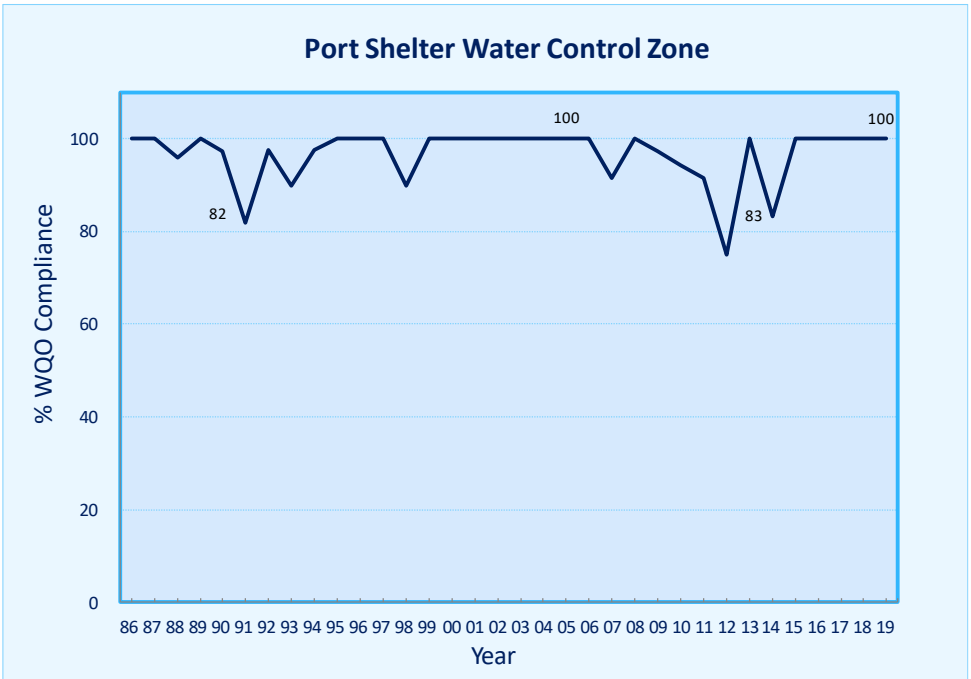


Figure 7. Overall WQO compliance rate the Port Shelter WCZ, 1986-2019

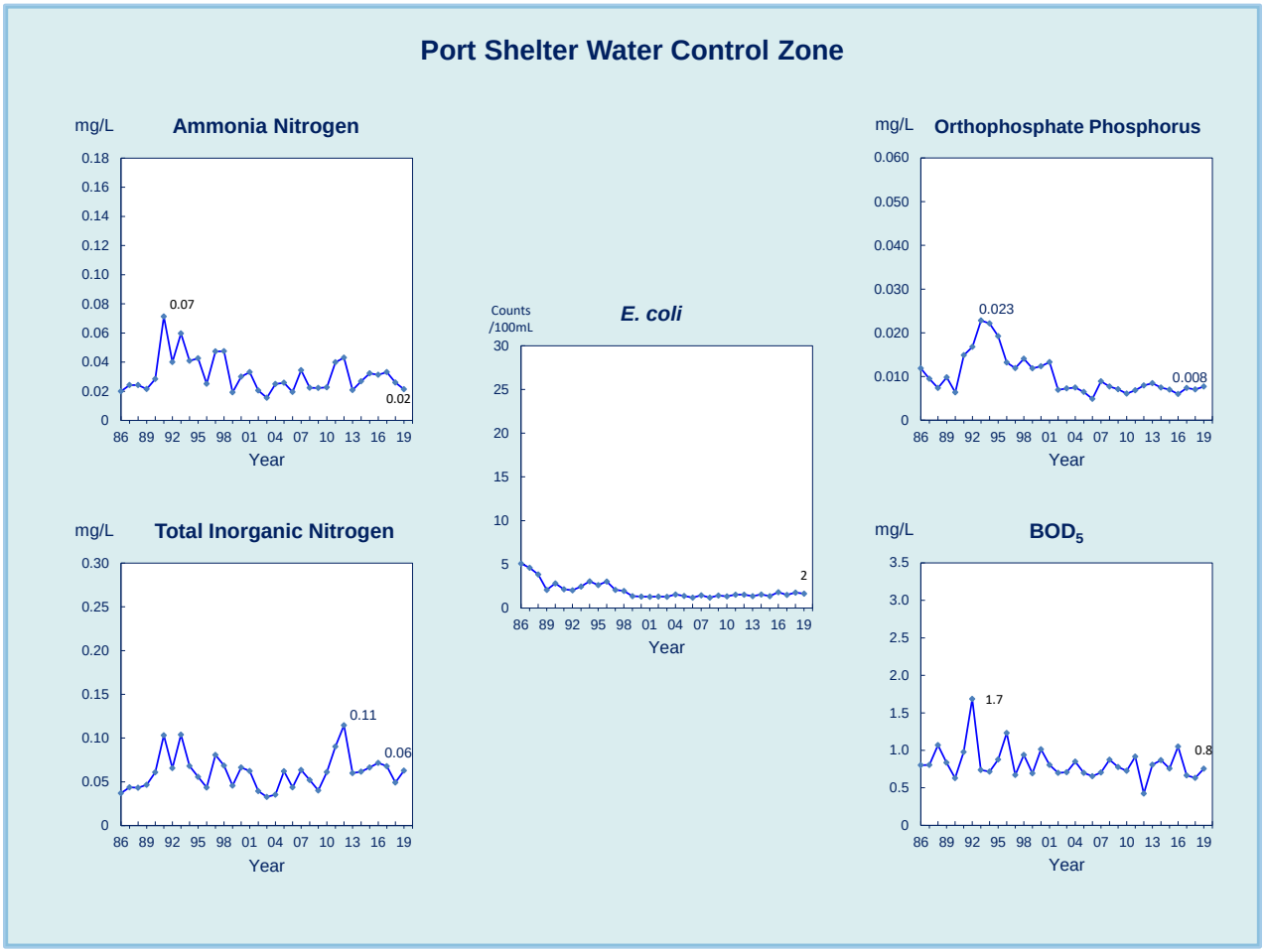


Figure 8. Long-term water quality trends in the Port Shelter WCZ, 1986-2019

Tolo Harbour and Channel Water Control Zone

The overall marine WQO compliance rate for the Tolo Harbour and Channel WCZ remained at 79% in 2019. While there was no change in the DO WQO compliance rate (about 57%) in the last three years, Tolo Harbour consistently complied with the bacteriological WQO for secondary contact recreational uses applicable to the entire marine waters of the WCZ.

Tolo Harbour is a shallow and highly land-locked water body. Such hydrological setting often leads to natural stratification of the water column and associated lower bottom DO levels due to restricted water exchange, particularly during the hot summer months with high rainfall. As such, occassional low DO levels, in particular at sea bottom of the Channel Subzone with water depths of some 10 to 20 metres, may take place in summer. This natural hydrological phenomenon was the major cause for the relatively lower DO WQO compliance rate for the WCZ.

Since the mid-1980s, with the implementation of the Tolo Harbour Action Plan which includes control of wastewater discharges, prohibition of livestock farming, provision and improvement of sewerage facilities, export of treated sewage effluent from the Sha Tin and Tai Po Sewage Treatment Works (STWs) for discharge outside of Tolo Harbour, as well as progressive extension of village sewerage in the catchment area, there has been a marked improvement in the water quality in Tolo Harbour in the past three decades, as evidenced in Figures 9 and10.

Shing Mun River merges with Tolo Harbour in the Tolo Harbour and Channel WCZ

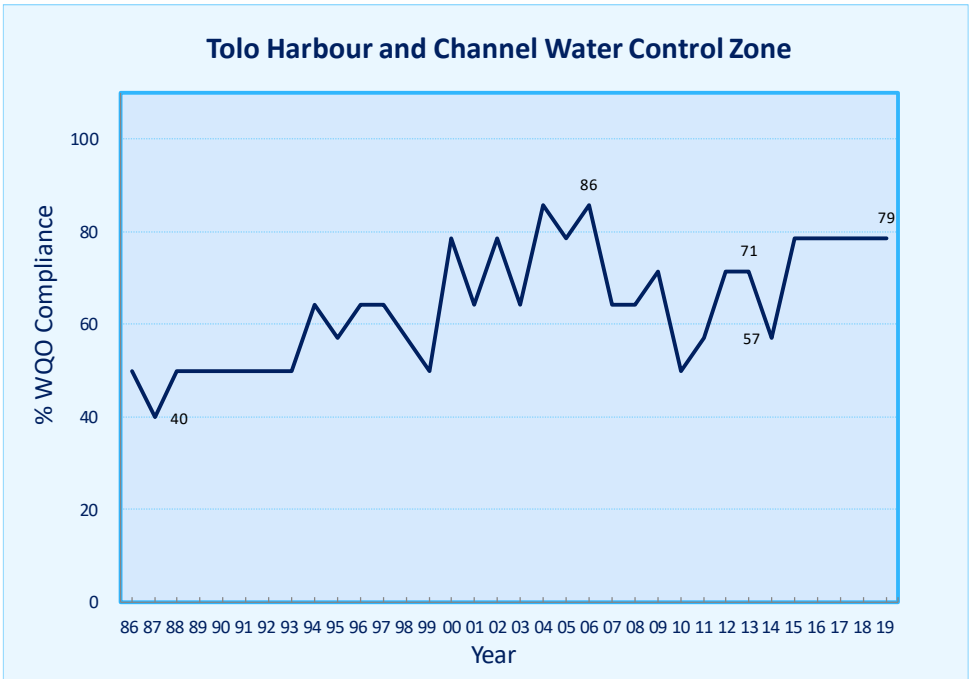


Figure 9. Overall WQO compliance rate for the Tolo Harbour and Channel WCZ, 1986-2019

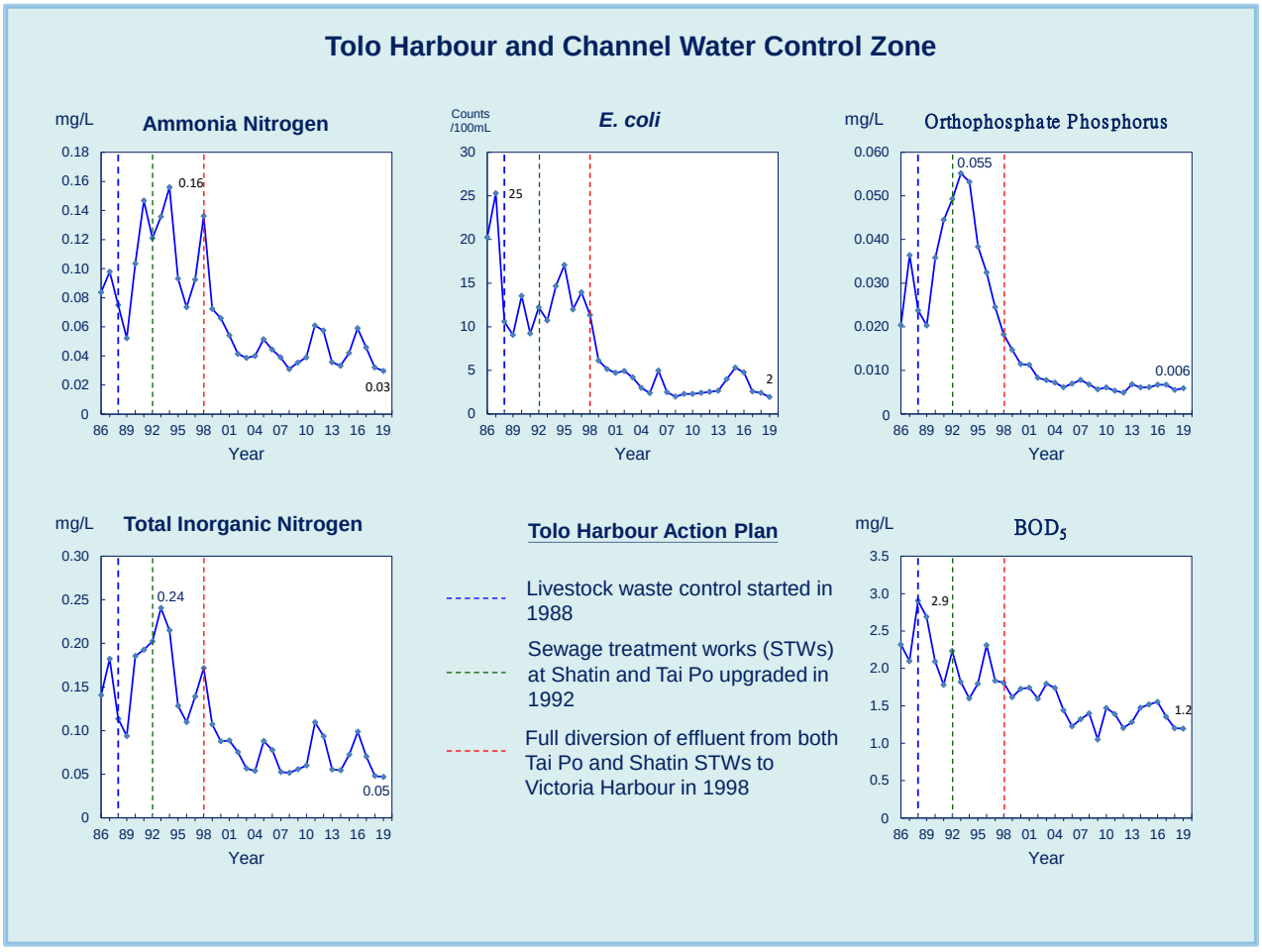
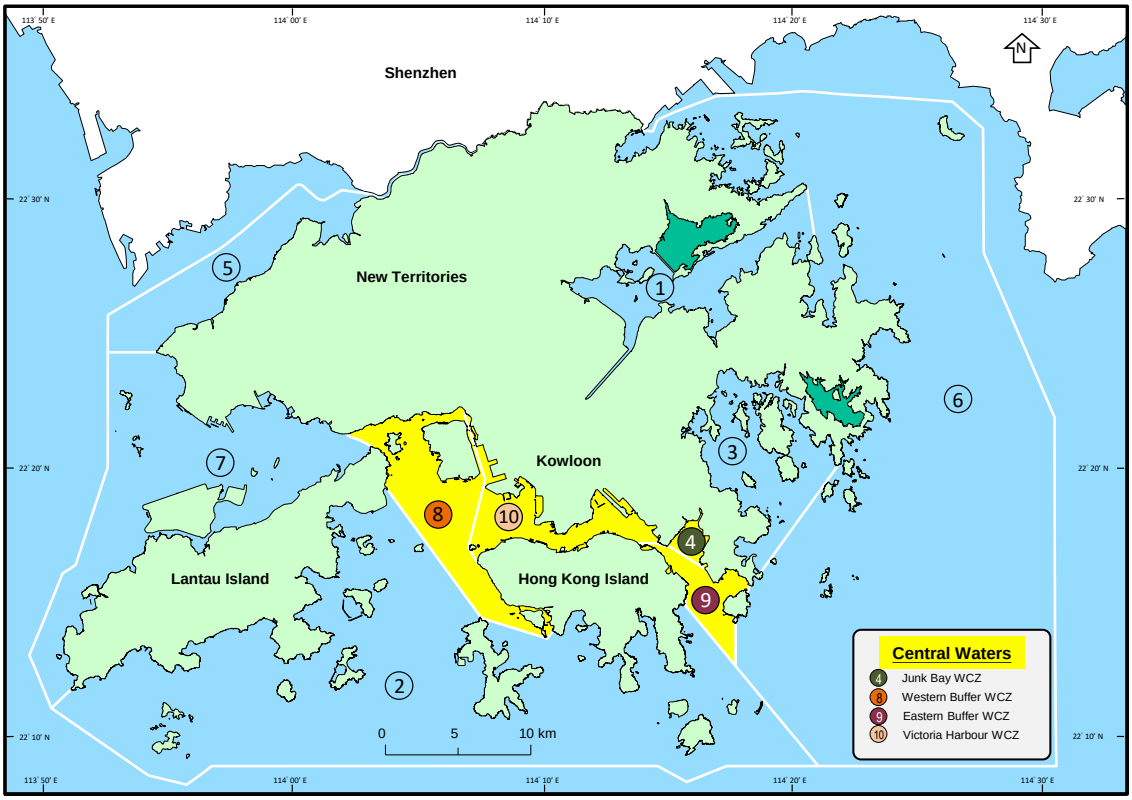


Figure 10. Long-term water quality trends in the Tolo Harbour and Channel WCZ, 1986-2019

3.2 Central Waters



The central waters of Hong Kong are important navigational channels and port areas, covering four WCZs, i.e. the Victoria Harbour WCZ, the Eastern Buffer WCZ, the Western Buffer WCZ and the Junk Bay WCZ.

Upon the commissioning of the Stonecutters Island Sewage Treatment Works (SCISTW) under the HATS Stage 1 in December 2001, about 75% of the sewage generated around Victoria Harbour receives chemically enhanced primary treatment (CEPT), resulting in a 70% reduction of the pollution load (in terms of organic pollutants) discharged into the harbour. This has improved the water quality in the harbour particularly in the Eastern Buffer and Junk Bay WCZs. With the Advance Disinfection Facilities (ADF) of the HATS Stage 2A commissioned in March 2010, the *E. coli* removal efficiency at the SCISTW has increased to over 99%. The *E. coli* level in the western harbour area has been substantially reduced since then.

Since the full commissioning of HATS Stage 2A in December 2015, all sewage generated from both sides of Victoria Harbour is collected and conveyed to the SCISTW via deep tunnels for centralised CEPT and disinfection before being discharged into the western harbour area. Overall improvement in water quality has been observed.

Victoria Harbour Water Control Zone

The overall WQO compliance rate of the Victoria Harbour WCZ in 2019 was 97%. The WQO compliance rates for DO and NH_3-N were both 100%, and 90% of the monitoring stations in the WCZ also met the TIN WQO.

The TIN WQO compliance rate fluctuates from year to year under the influence of regional TIN level in the entire Pearl River Estuary, local urban surface run-offs and SCISTW discharges. The regional influence was also observed in the monitoring data for the North Western, Southern and Western Buffer WCZs. On the other hand, BOD_5, *E. coli,* NH_3-N and PO_4-P levels showed decreasing trends over the past 30 years.

The *E. coli* level in the eastern side of Victoria Harbour has decreased markedly since the implementation of HATS Stage 1 in December 2001. The annual Cross Harbour Swim, suspended since 1979 because of poor water quality, was resumed on the eastern side of the harbour in 2011. With full commissioning of the HATS Stage 2A, the *E. coli* level of the central harbour area has been further reduced. In 2017, the race route of the event was moved back to the central harbour area.

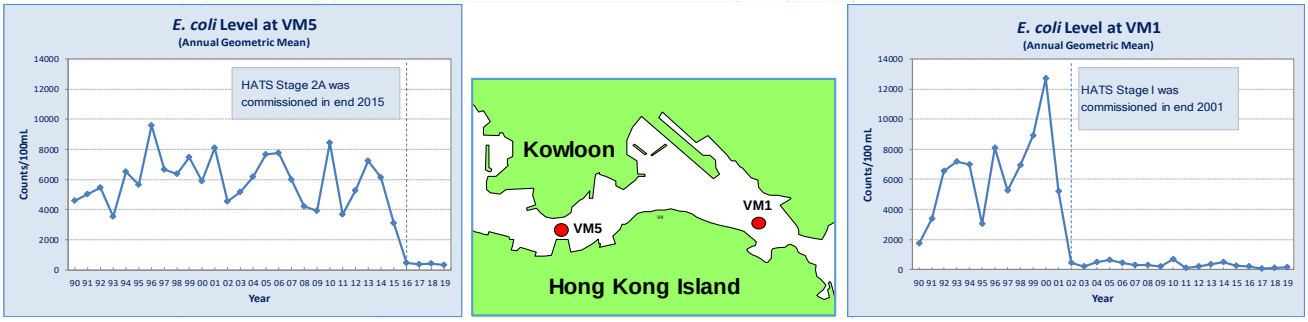


Figure 11. *E. coli* level at the central (VM5) and eastern (VM1) parts of Victoria Harbour Water Control Zone, 1990-2019

Figures 12 and 13 show the WQO compliance rates and long-term trends for key water quality parameters in the Victoria Harbour WCZ in the period of 1986 to 2019.

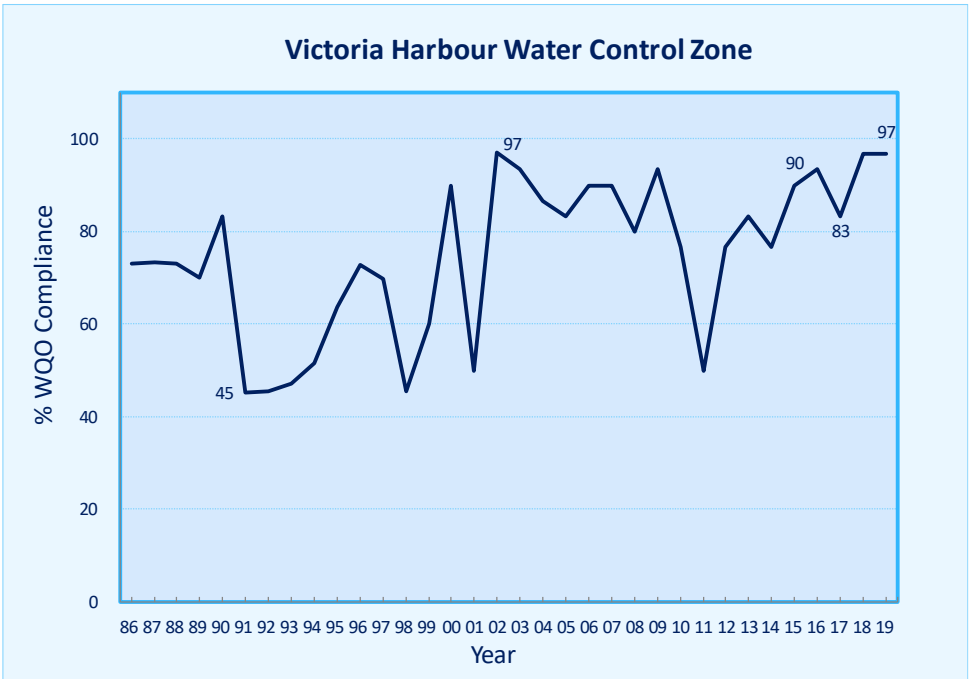


Figure 12. Overall WQO compliance rate the Victoria Harbour WCZ, 1986-2019

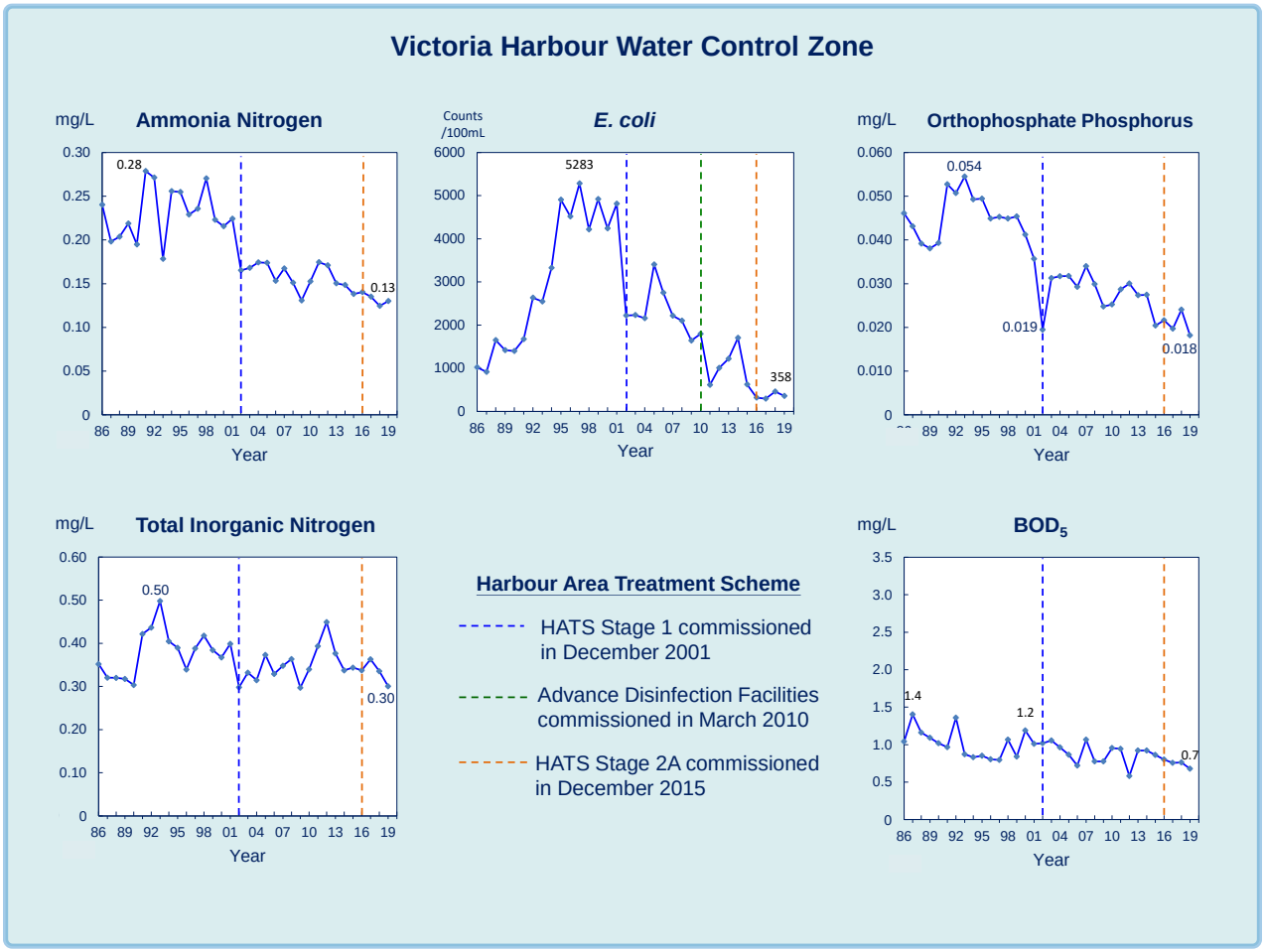


Figure 13. Long-term water quality trends in the Victoria Harbour WCZ, 1986-2019

Eastern Buffer Water Control Zone and Junk Bay Water Control Zone

Both the Eastern Buffer WCZ and the Junk Bay WCZ have achieved full compliance (100%) with the WQOs for the last 20 years. Since the implementation of the HATS Stage 1 in December 2001 by which all sewage generated from Junk Bay (Tseung Kwan O), the Kowloon Peninsula and the eastern part of Hong Kong Island (Chai Wan) has been diverted to the SCISTW for treatment, the water quality of these two WCZs has improved noticeably with increase in DO and decrease in nutrient and bacterial levels.

A view of the eastern waters outside the LOHAS Park and Tseung Kwan O Industrial Estate

Figures 14 to 17 present the WQO compliance rates and long-term water quality improving trends in the Eastern Buffer WCZ and the Junk Bay WCZ over the past three decades.

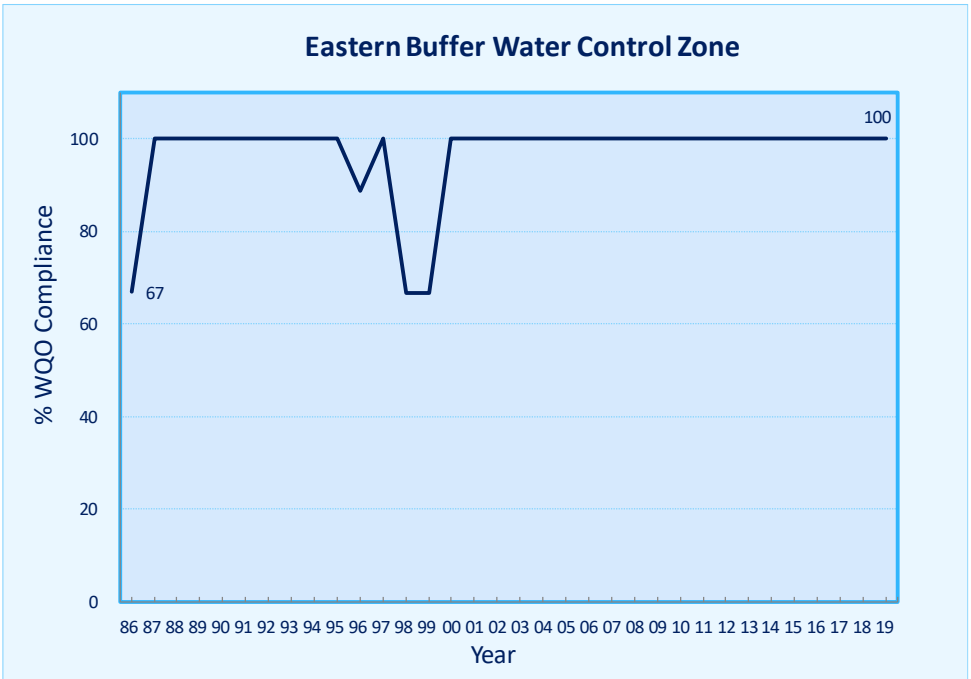


Figure 14. Overall WQO compliance rate for the Eastern Buffer WCZ, 1986-2019

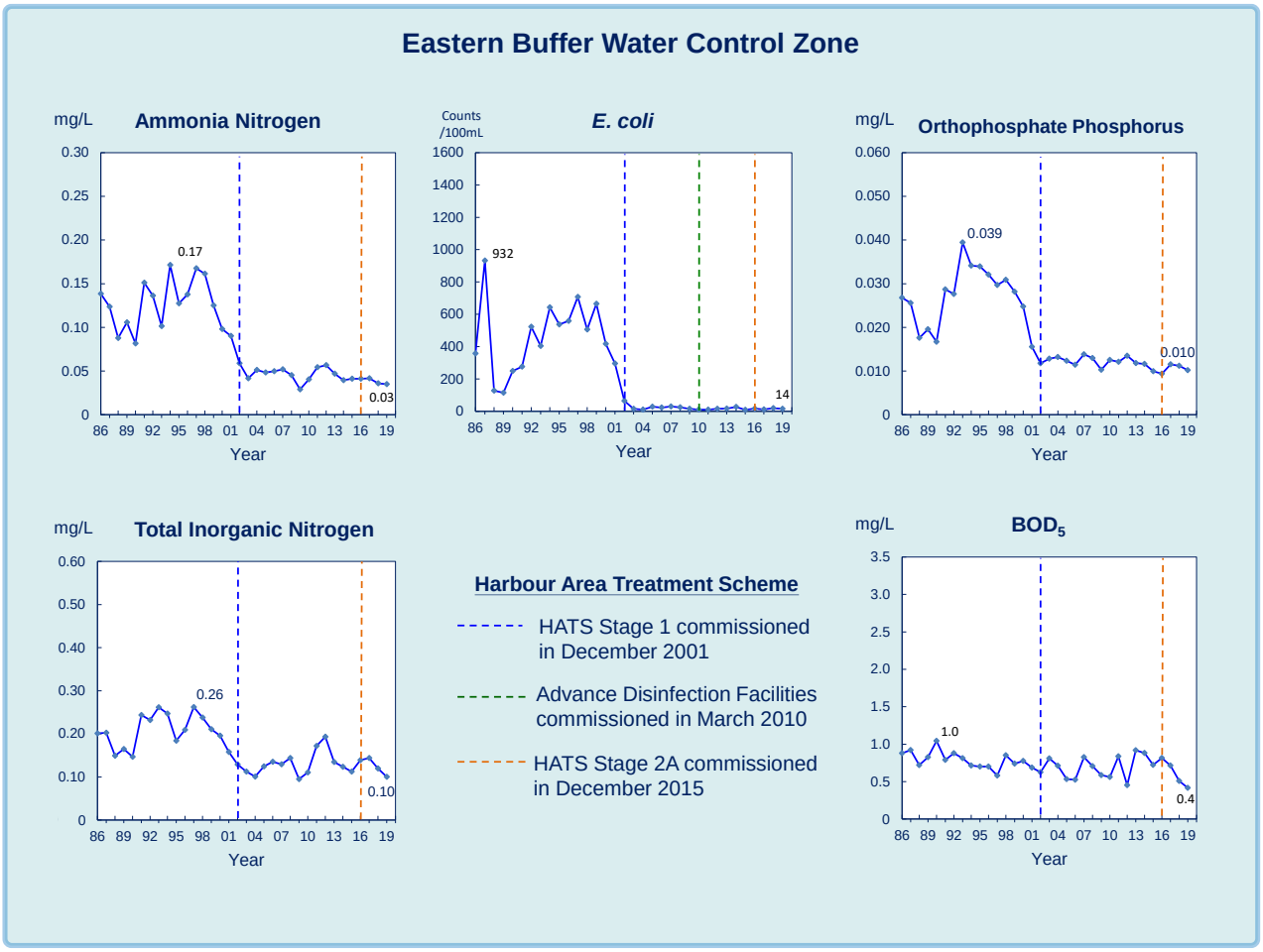


Figure 15. Long-term water quality trends in the Eastern Buffer WCZ, 1986-2019

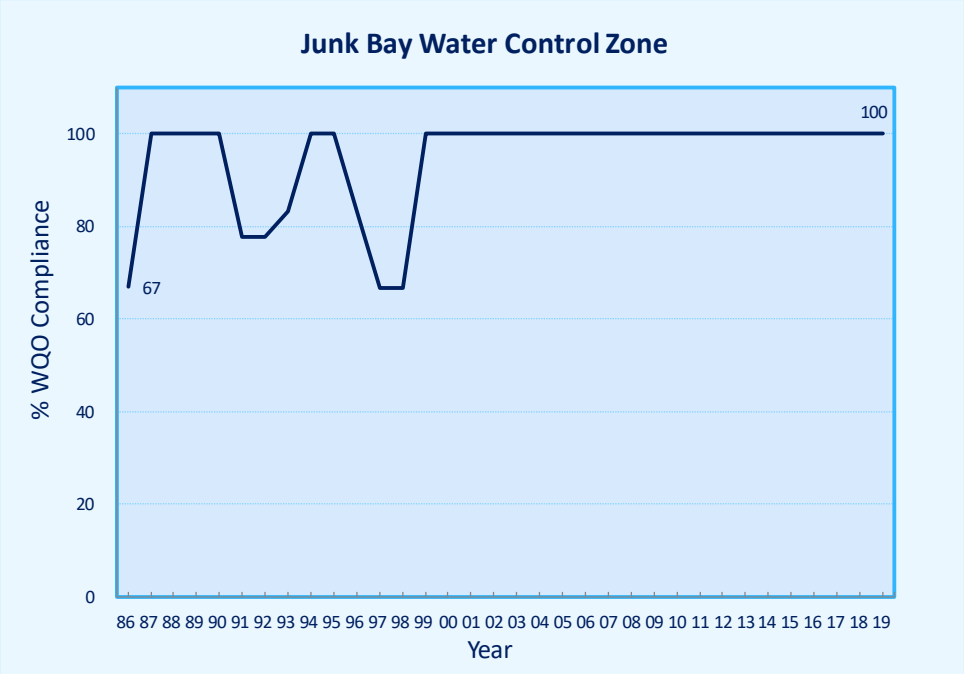


Figure 16. Overall WQO compliance rate for the Junk Bay WCZ, 1986-2019

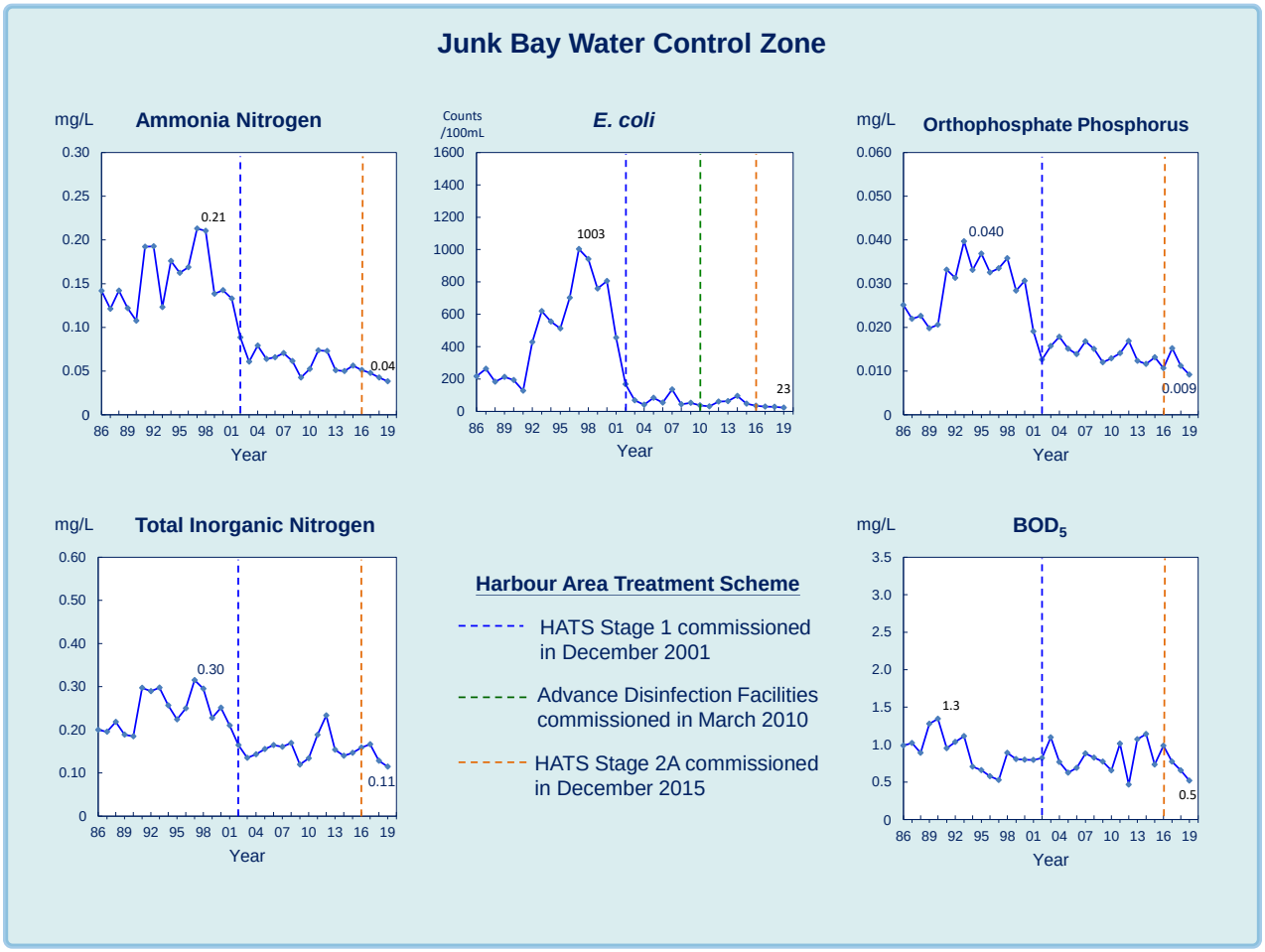
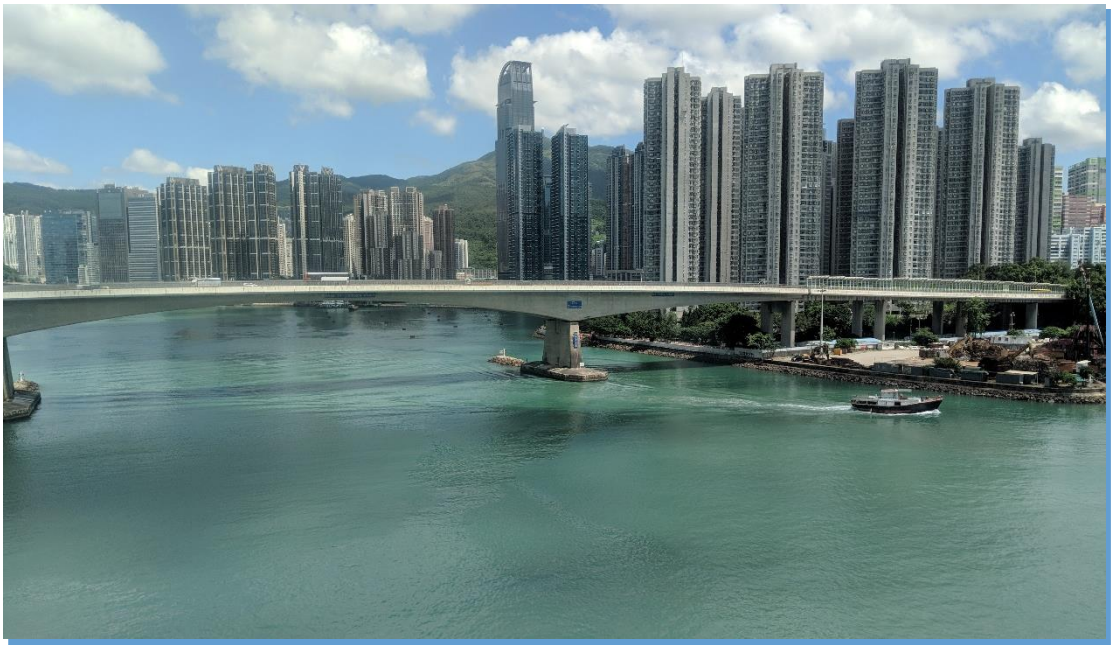


Figure 17. Long-term water quality trends in the Junk Bay WCZ, 1986-2019

Western Buffer Water Control Zone

The Western Buffer WCZ fully achieved the WQOs in 2019. Similar to the situation in the Victoria Harbour WCZ, the TIN level in the Western Buffer WCZ was influenced by the high background level in the Pearl River Estuary, as well as fluctuating urban surface run-offs and discharge from the SCISTW.

Since the commissioning of the ADF at the SCISTW in March 2010, the *E. coli* level in the WCZ decreased substantially by over 90%. In 2019, all eight gazetted beaches located in the Tsuen Wan District continued to fully meet the bacteriological WQO for bathing waters, as reported in the *2019 Beach Water Quality in Hong Kong*.



Rambler Channel across Western Buffer WCZ and Victoria Harbour WCZ

Figures 18 and 19 illustrate the WQO compliance rate and long-term trends of some important water quality parameters for the Western Buffer WCZ since 1986. Similar to other WCZs in the central waters, significant improvement of water quality in terms of *E. coli* and PO_4-P has been observed.

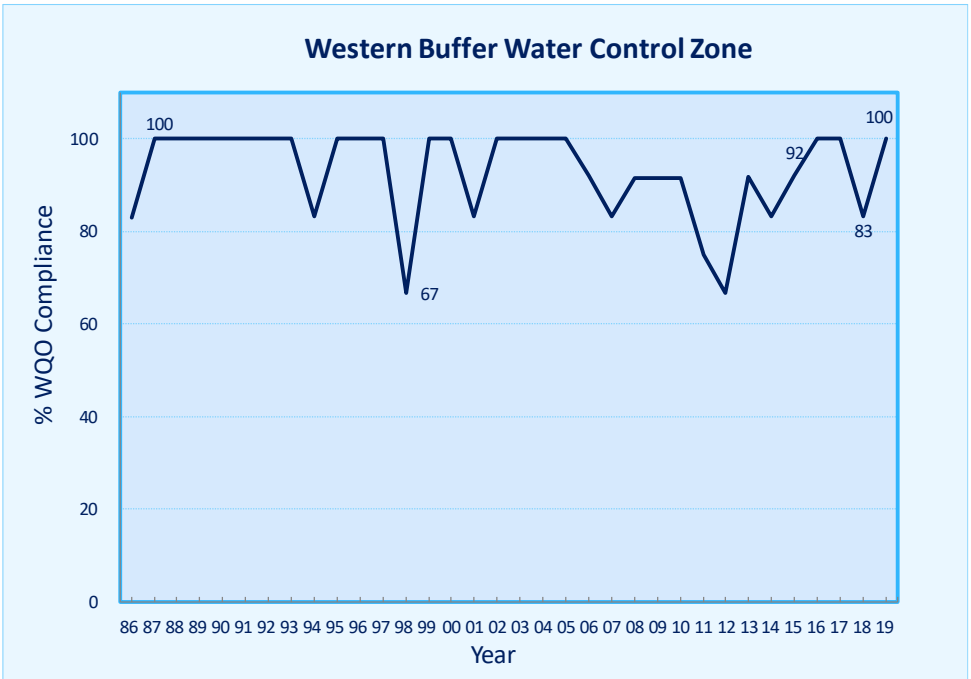


Figure 18. Overall WQO compliance in the Western Buffer WCZ, 1986-2019

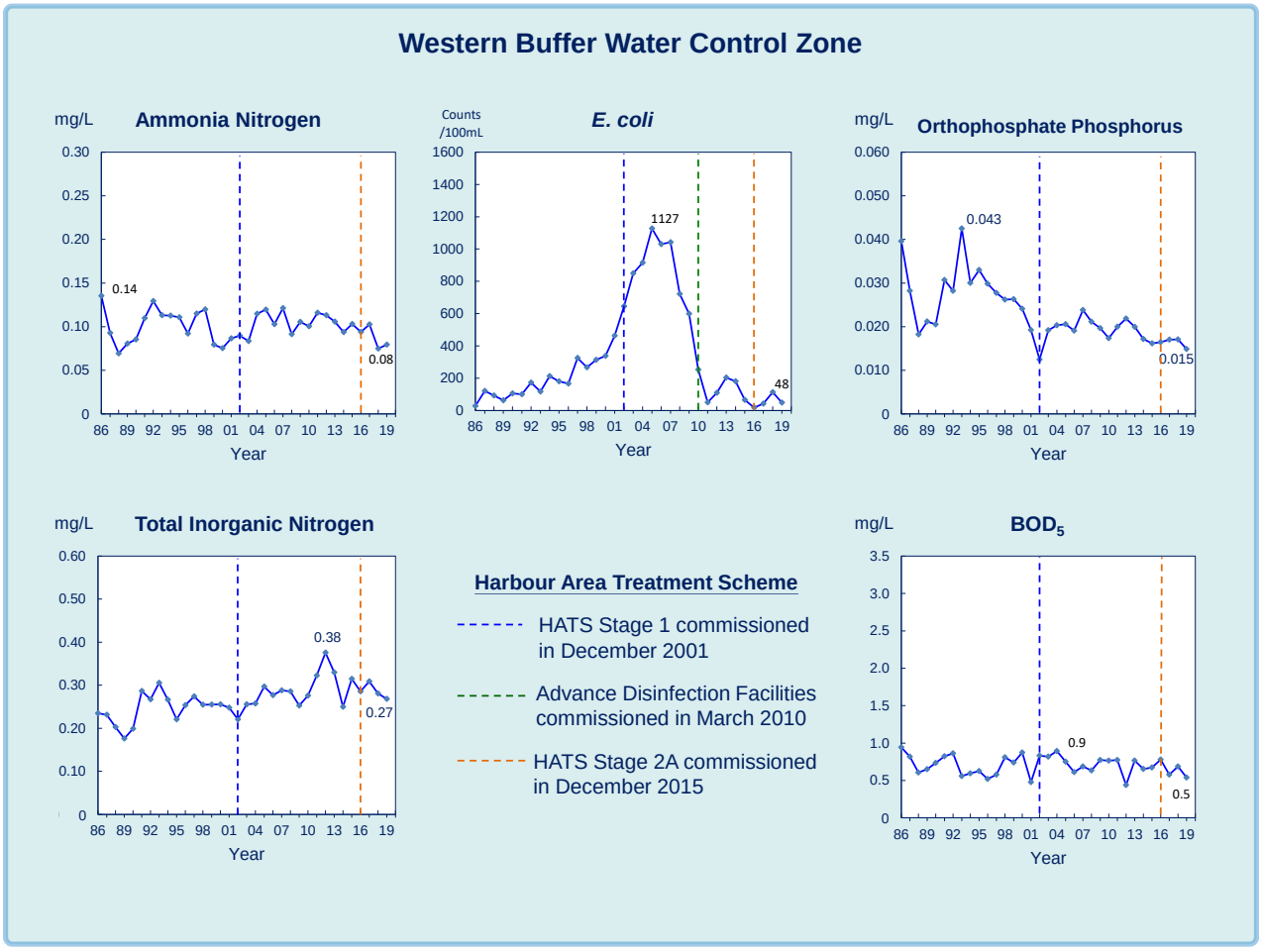
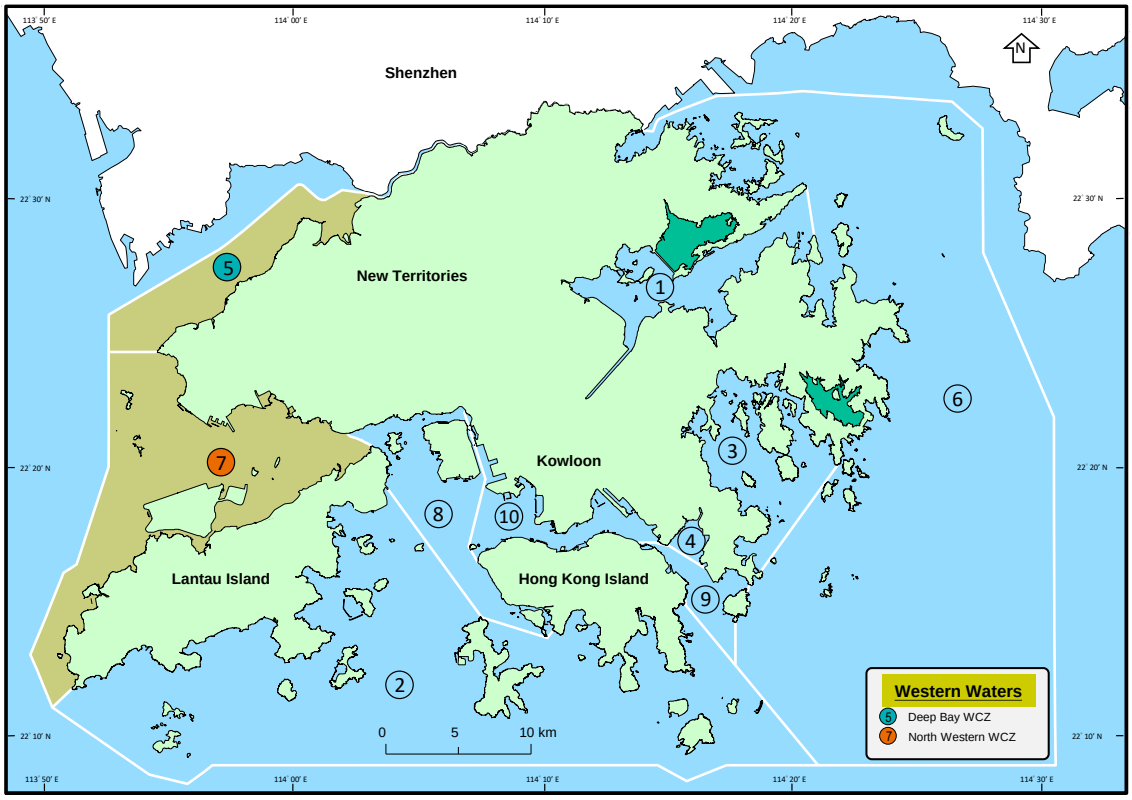


Figure 19. Long-term water quality trends in the Western Buffer WCZ, 1986-2019

3.3 Western Waters



The Deep Bay WCZ and the North Western WCZ are located in the western part of Hong Kong. Apart from local discharges, both WCZs are also affected by the discharges from Pearl River catchment, particularly during the wet season under the influence of the southwest monsoon. The Deep Bay WCZ also receives discharges from Shenzhen River.

The Deep Bay WCZ includes the ecologically sensitive Mai Po Inner Deep Bay Ramsar Site and areas of oyster culture. The mudflat and mangroves associated flora and fauna in the Ramsar Site support a great diversity of local and seasonally migrating birds, and constitutes an important feeding and resting ground for a number of globally threatened species, such as Black-faced Spoonbill, Saunders's Gull and Nordmann's Greenshank.

The North Western WCZ covers the waters around Lantau Island, Tuen Mun, Sha Chau and Lung Kwu Chau where Chinese white dolphins are commonly spotted. The Sha Chau and Lung Kwu Chau Marine Park as well as the Brothers Marine Park are located in the western waters of Hong Kong.

Deep Bay Water Control Zone

Deep Bay is a large shallow and semi-enclosed bay on the eastern side of the Pearl River Estuary with an average depth of about 3m only. Deep Bay has the largest and most important mangrove habitat in Hong Kong, with mudflats in the inner Deep Bay of high conservation value as an important feeding ground for a huge number of resident and wintering birds. The water body's shallowness, presence of wetland habitats as well as strong riverine inputs from within and outside the bay, have all contributed to its unique aquatic environment with naturally high level of turbidity and suspended solids.

The overall WQO compliance rate for the Deep Bay WCZ was 67% in 2019, as compared with a ten-year average of 47% in 2009-2018. The DO and NH_3-N WQOs were fully complied with. Although Deep Bay, as compared with other WCZs, had higher nutrient levels with annual depth-averaged TIN levels exceeding the respective TIN WQOs, a noticeable long-term decrease in TIN levels since mid-2000s has been seen. Also, there were only few reported cases of red tides in Deep Bay, likely ascribed to the presence of considerable areas of unique wetland habitats and the high background turbidity which could become a key factor limiting the photosynthesis and growth of phytoplankton in the bay despite ample local nutrients supply.

Overall speaking, there have been significant water quality improvements in Deep Bay since mid-2000s as a result of the joint efforts (e.g. provision and upgrading of sewage collection and treatment facilities) of the Hong Kong SAR and Shenzhen Governments in reducing its pollution loads. Figures 20 to 22 depict the WQO compliance rate and long-term water quality improvement in the Deep Bay WCZ.

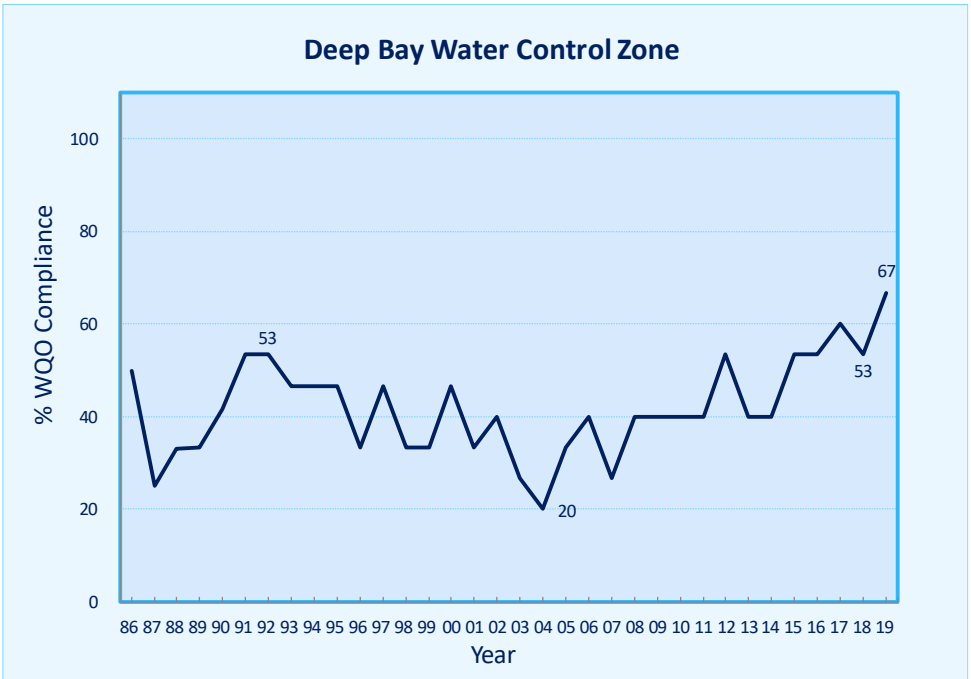


Figure 20. Overall WQO compliance for the Deep Bay WCZ, 1986-2019

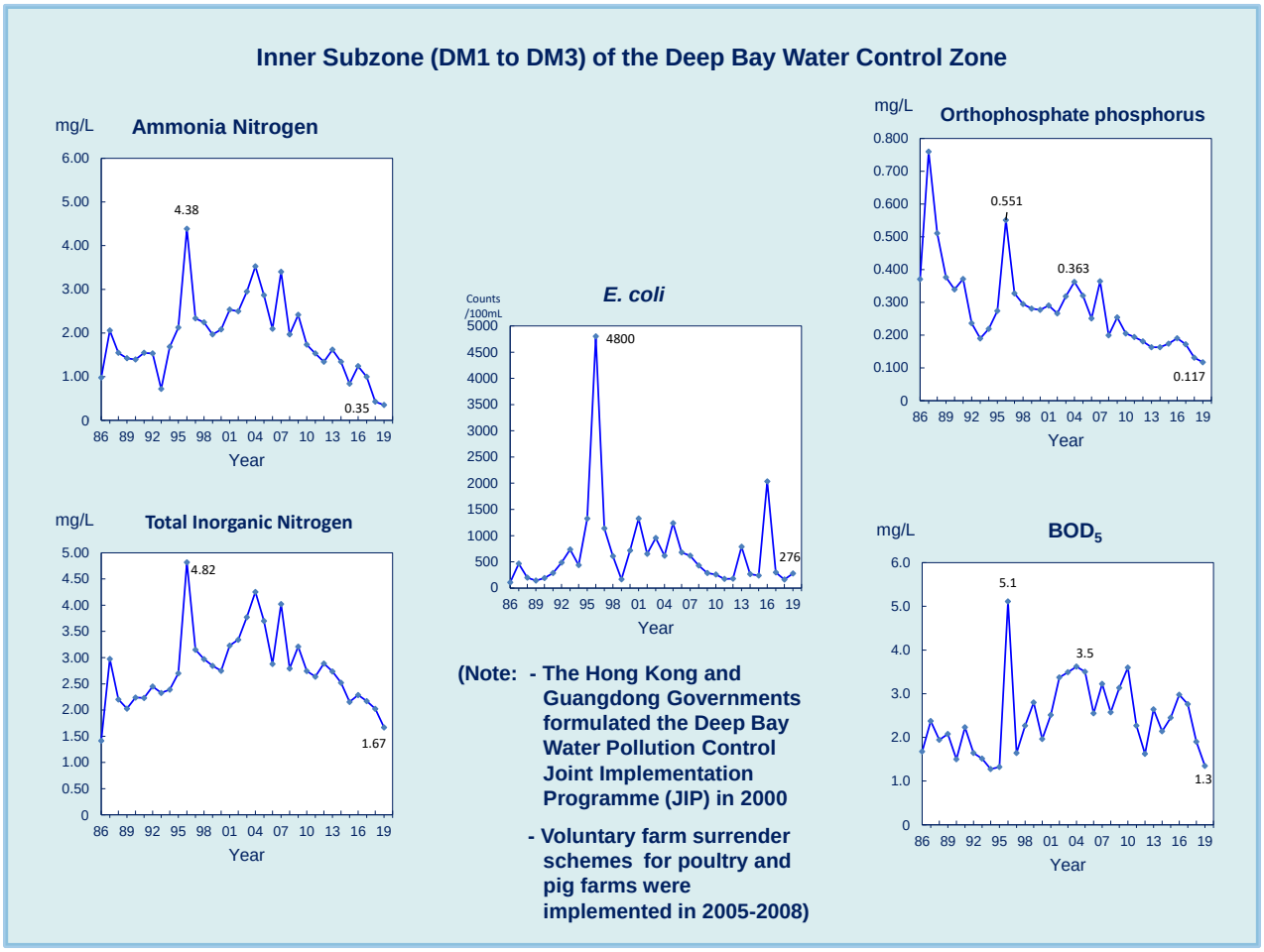


Figure 21. Long-term water quality trends in Inner Subzone of the Deep Bay WCZ, 1986-2019

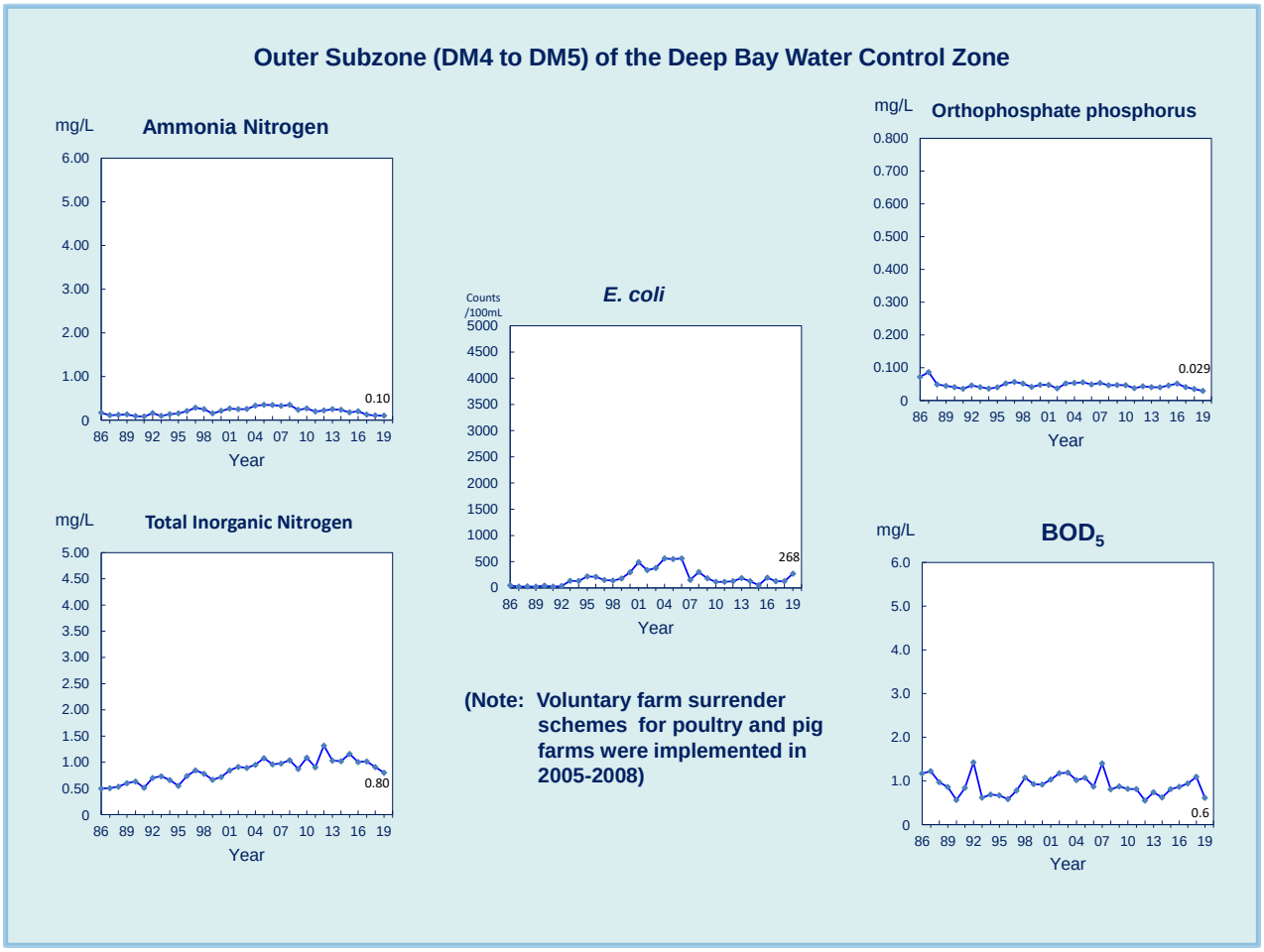


Figure 22. Long-term water quality trends Outer Subzone of the Deep Bay WCZ, 1986-2019

A view of the Shenzhen city skyline across Deep Bay

North Western Water Control Zone

In 2019, the North Western WCZ attained an overall WQO compliance rate of 89%. The compliance rates for the NH_3-N and TIN WQO were 100% and 67%, respectively. As observed in previous years, the relatively higher TIN levels in the WCZ in 2019 were likely attributed to the high background level of the Pearl River discharges, and some local discharges and surface run-offs from both the Northwest New Territories and North Lantau. Notwithstanding, the red tides occurrence in these waters remained very low even in the presence of rich nutrients, likely owing to strong tidal flushing hindering the proliferation of phytoplankton community in the area.

A view of the western waters outside Tuen Mun

The WQO compliance rate and long-term water quality trends in the North Western Water WCZ are illustrated in Figures 23 and 24.

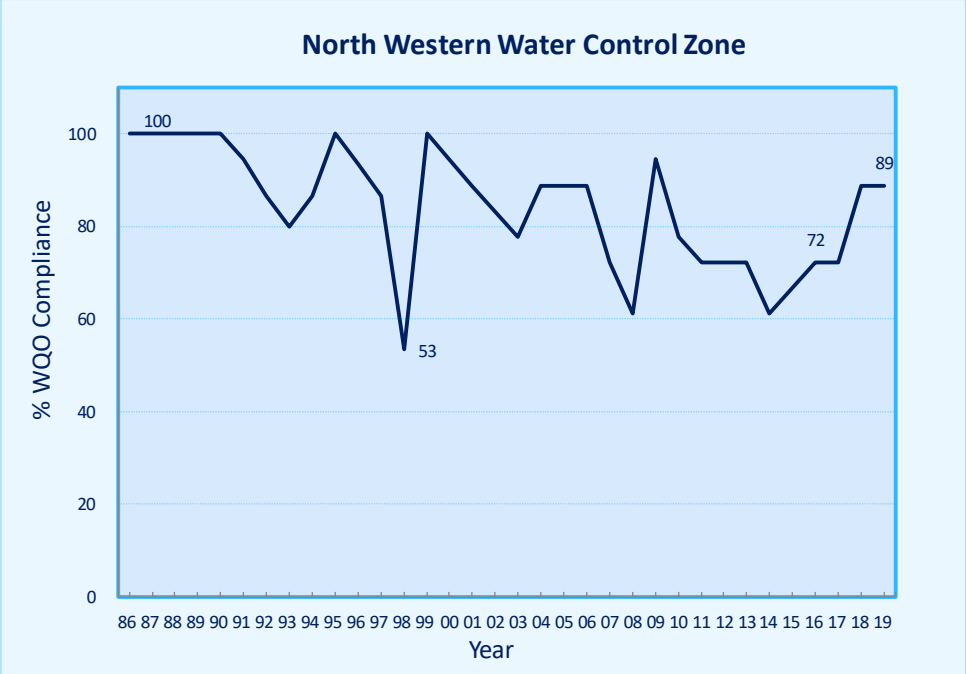


Figure 23. Overall WQO compliance for the North Western WCZ, 1986-2019

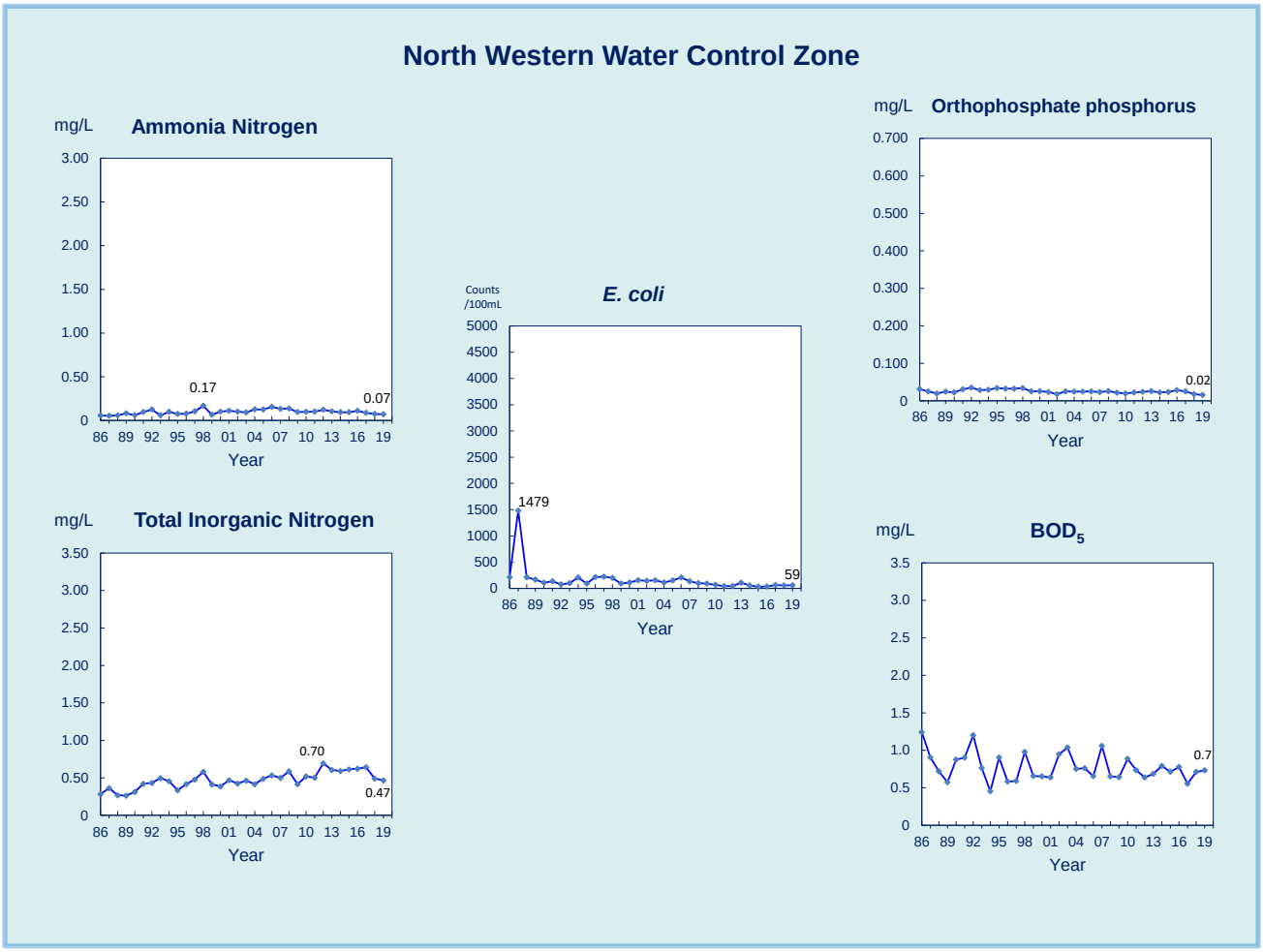
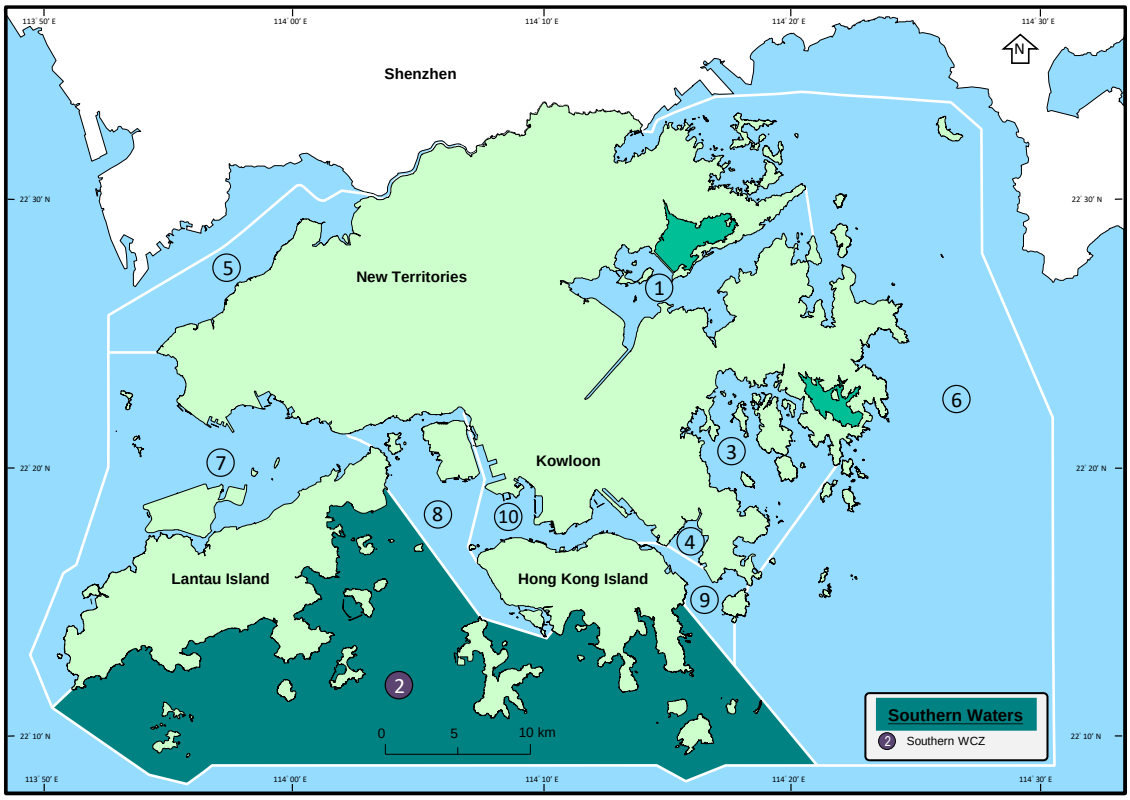


Figure 24. Long-term water quality trends in the North Western WCZ, 1986-2019

3.4 Southern Waters



The southern waters consist of only one WCZ - the Southern WCZ. It stretches from south of Hong Kong Island to Lantau Island, facing the South China Sea. The western and central parts of the WCZ are affected seasonally by the Pearl River and the effect, more prominent in wet seasons, diminishes gradually towards the east.

Southern Water Control Zone

In 2019, the Southern WCZ achieved an overall WQO compliance rate of 73%, with full attainment of the DO and NH_3-N WQOs. Owing to the cumulative effect of the high background level due to the Pearl River and local discharges, the TIN levels in the coastal waters south of the Hong Kong and the central part of the southern waters exceeded the relatively stringent TIN WQO.

Soko Islands in the Southern WCZ

The Southern WCZ also covers a number of secondary contact recreation subzones mainly located along the southern coast of Hong Kong Island and the outlying islands. In 2019, full compliance with the bacteriological WQO on *E. coli* for all these secondary contact recreation subzones was achieved. The WQO compliance rates and long-term water quality trends in the Southern WCZ are plotted in Figures 25 and 26.

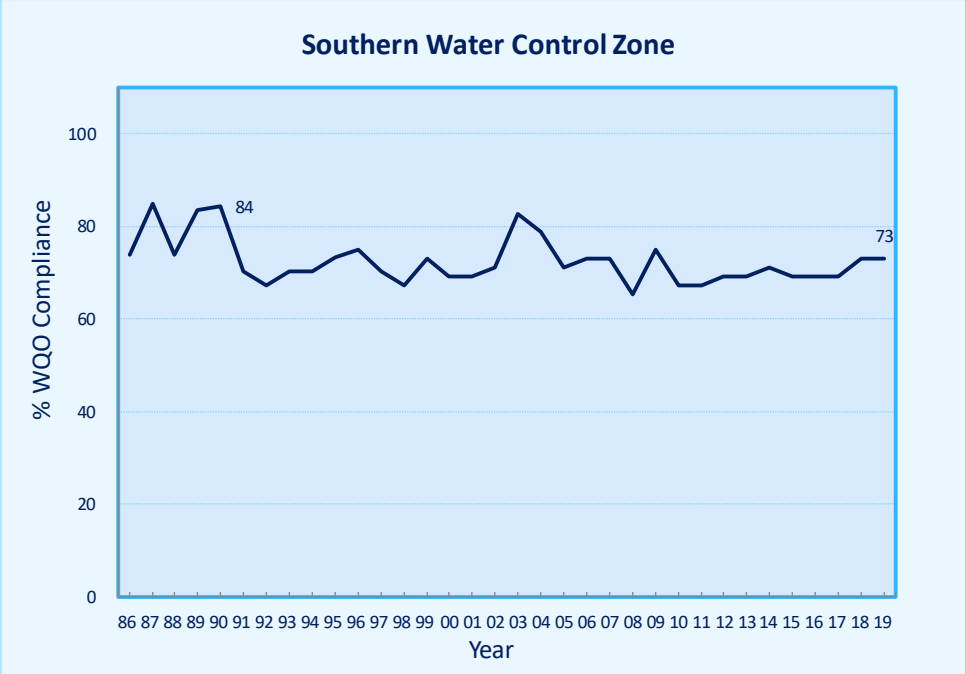


Figure 25. Overall WQO compliance in the Southern WCZ, 1986-2019

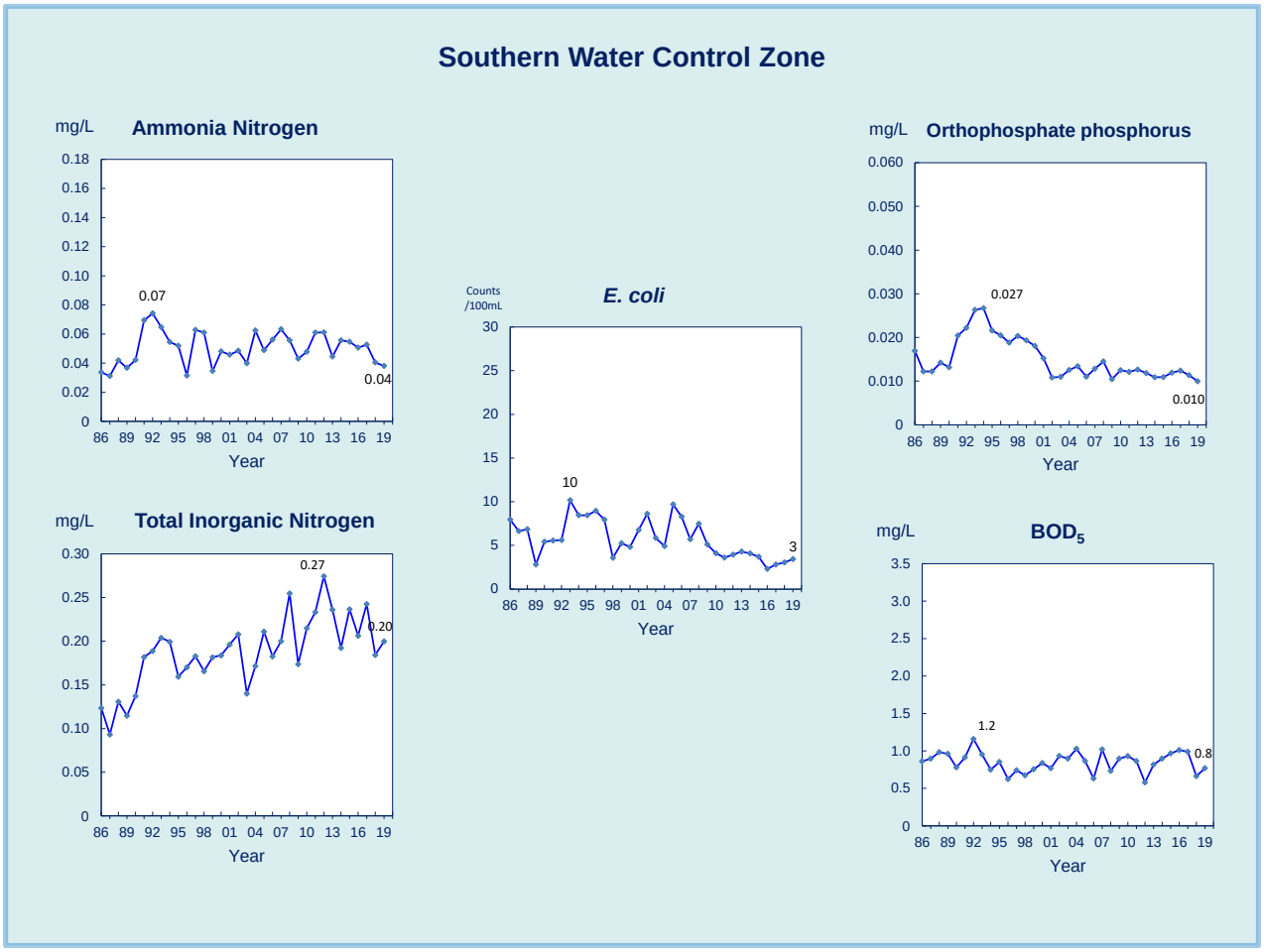


Figure 26. Long-term water quality trends in the Southern WCZ, 1986-2019

4. Marine Sediment Quality

In addition to water quality parameters, the marine environment can be assessed through the quality of sediments since they are the ultimate sink of many pollutants. The quality of marine sediments can, therefore, reflect the historical and long-term health of the marine environment.

The EPD analyses sediment samples taken in different parts of Hong Kong for over 60 physical, chemical and biological parameters. Due to industrial pollution discharges in 1960s to 1980s before systematic pollution control was introduced, elevated levels of some heavy metals, in particular copper and silver, and some trace organic pollutants, could be detected in the sediments in Victoria Harbour and Tsuen Wan Bay in the past. Through EPD's efforts over the years in enforcing relevant pollution control ordinances, i.e. the Water Pollution Control Ordinance and Waste Disposal Ordinance, and removing various industrial pollution sources, the level of these pollutants in the marine sediments had gradually decreased. As an example, Figure 27 illustrates the decreasing pattern of silver in the marine sediments of the Victoria Harbour WCZ since 1997.

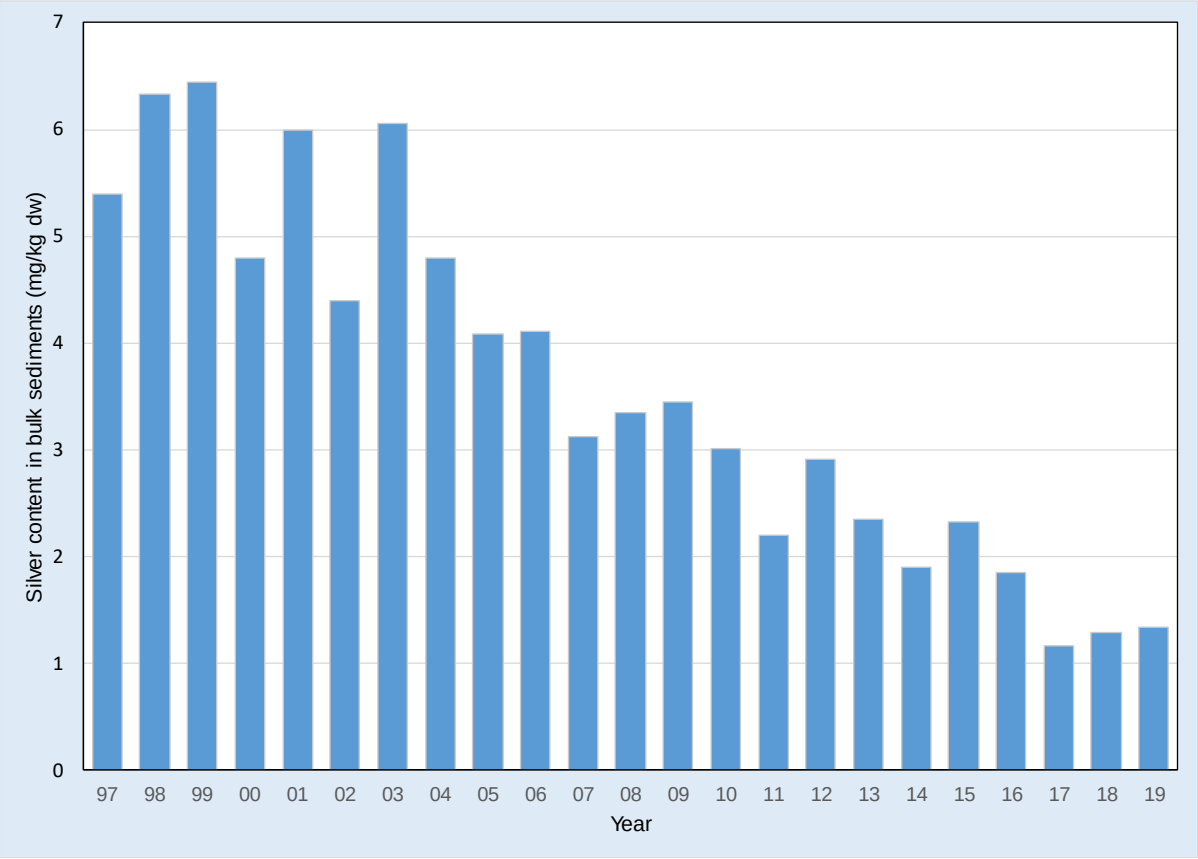


Figure 27. Annual averaged silver levels in marine sediments of the Victoria Harbour WCZ, 1997-2019

5. Typhoon Shelters

Typhoon shelters in Hong Kong provide protection for small to medium vessels against strong winds and rough sea conditions, particularly during the typhoon season. For this reason, typhoon shelters are often located in semi-enclosed water bodies. Since typhoon shelters are installed with breakwaters, the water circulation between the typhoon shelters and open waters is restricted. Consequently, the water quality of typhoon shelters is more prone to impact from urban surface runoffs and other land-based non-point sources.

The EPD monitored the water quality of 14 typhoon shelters, as well as 3 sheltered anchorages and the Government Dockyard. Some of these typhoon shelters (e.g. Causeway Bay Typhoon Shelter and Kwun Tong Typhoon Shelter) are located adjacent to populated residential, commercial and/or industrial areas. Others (e.g. Cheung Chau Typhoon Shelter and Shuen Wan Typhoon Shelter) are located in outlying islands or far away from urban areas. There is no bacteriological WQO set for typhoon shelters since their beneficial uses are mainly for vessel mooring. In 2019, the NH_3-N levels recorded in all typhoon shelters were generally low, and below the NH_3-N WQO values for respective WCZs.

Due to restricted water circulation and their proximity to densely populated areas, most typhoon shelters in urban areas, as well as a few at remote sites like Cheung Chau, Hei Ling Chau and Habe Haven generally exhibited larger fluctuations in DO levels and relatively more elevated TIN levels . Nevertheless, the water quality of all typhoon shelters in Hong Kong as a whole has been improving over the last decade. Figure 28 shows the long-term improving trend in the depth-averaged and bottom DO levels in the Kwun Tong Typhoon Shelter.

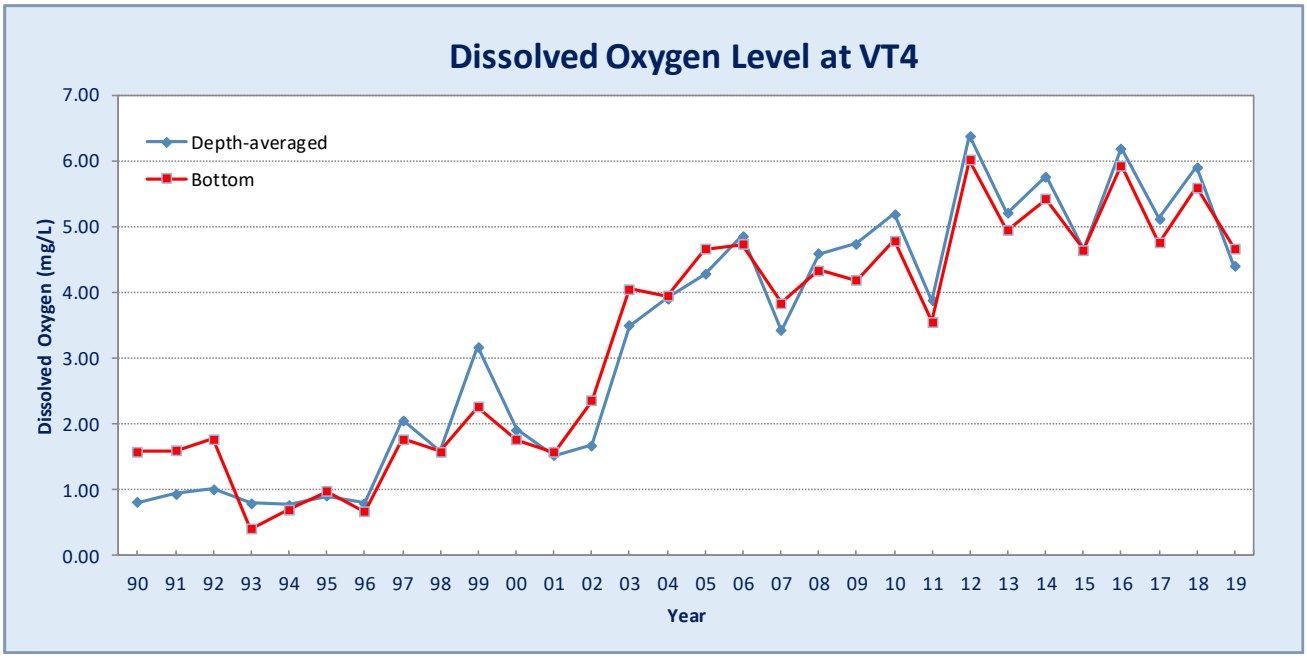


Figure 28. Long-term improvement in dissolved oxygen level in Kwun Tong Typhoon Shelter, 1990-2019

6. Phytoplankton and Red Tides

Phytoplankton are comprised of vast and highly diversified groups of tiny photosynthetic plants in the water column of aquatic environment. Like terrestrial plants, majority of them require sunlight, carbon dioxide, minerals and nutrients for growth. Phytoplankton play a very important role as a key primary producer supporting many aquatic lives ranging from tiny zooplankton to large fishes. Under favourable conditions (including nutrients supply, water temperature, sunlight, water current and wind speed), phytoplankton can reproduce quickly and bloom, resulting in overly dense population which may "colour" the waters with their photosynthetic pigments, resulting in a natural phenomenon commonly called "red tide". Most red tides have no harmful effect on the marine community, while a few may do depending on the species involved (e.g., toxic or with potential to produce toxin) and the scale of the bloom (e.g., excessive algal biomass can lower the oxygen levels in the water column during the decomposition process). Those blooms that can cause harm to aquatic animals, human or local ecology are regarded as "harmful algal blooms (HABs)".

The EPD conducts monthly monitoring of phytoplankton at 26 stations to determine the long-term changes and trends in their composition and densities in Hong Kong marine waters. In 2019, a total of 94 phytoplankton species were recorded in Hong Kong waters. Of these, 53 species were diatoms (56%), 28 were dinoflagellates (30%) and 13 were from other seven minor algal groups[1] (14%). As observed in previous years, diatoms were the dominant group found in all WCZs, both in terms of species richness (number of species) and population (cell density). In 2019, the most abundant diatoms were *Pseudo-nitzschia* which constituted 4% to 45% of the diatom population in various WCZs. The most abundant dinoflagellates were *Gymnodinium spp*., comprising 23% to 51% of the dinoflagellate populations in different WCZs. The total phytoplankton densities were generally higher at the monitoring stations in the Tolo Harbour and Channel WCZ and the Southern WCZ as compared with those in the other WCZs. The densities of diatoms, dinoflagellates and other minor phytoplankton groups followed the similar patterns as the total phytoplankton density.

In Hong Kong, red tides occur throughout the year but are relatively more frequent in the spring. They are also more common in semi-enclosed bays (e.g., Tolo Harbour) with low turbidity, less favorable water circulation and flushing capacity. In 2019, the total number of reported red

[1] Phytoplankton can be classified into 11 different groups based on their morphological characteristics, photosynthetic pigments and nutrition modes. In this report, phytoplankton other than the two major groups, i.e., diatoms and dinoflagellates, are collectively regarded as other minor phytoplankton groups to facilitate the data presentation.

tide incidents in Hong Kong waters was 12, as compared to an average of 14 incidents in the last five years (2014-2018). Of these, 7 incidents involved only 1 WCZ; 2 incidents involved 2 WCZs; 1 incident involved 3 WCZs and 2 incidents involved 5 WCZs. The 12 red tide incidents were caused by 7 red tide species, all of which are non-toxic species commonly found in Hong Kong waters. No fish kill caused by red tides was recorded in Hong Kong waters in 2019. The following table shows the details of red tide incidents in 2019.

Red Tide Incident No.	Sighting Period	Red Tide Species
1	2/1/2019 – 6/1/2019	**Mesodinium rubrum*
2	23/1/2019 – 24/1/2019	*Akashiwo sanguinea*
3	29/1/2019 – 16/2/2019	*Noctiluca scintillans*
4	8/2/2019 – 18/2/2019	*Akashiwo sanguinea*
5	13/2/2019 – 19/2/2019	*Gonyaulax polygramma* *Noctiluca scintillans*
6	21/2/2019	*Akashiwo sanguinea* *Prorocentrum triestinum* *Gonyaulax polygramma*
7	4/3/2019 – 5/3/2019	**Mesodinium rubrum*
8	10/3/2019 – 21/3/2019	*Noctiluca scintillans*
9	27/3/2019 – 3/4/2019	*Heterosigma akashiwo*
10	30/3/2019	**Mesodinium rubrum*
11	17/4/2019 – 22/4/2019	*Noctiluca scintillans*
12	21/5/2019 – 2/6/2019	*Phaeocystis globosa*

* *Mesodinium rubrum* is a phototrophic marine ciliate

Red tide incidents in Hong Kong marine waters in 2019
(Source: Agriculture, Fisheries and Conservation Department)

Historically, the land-locked Tolo Harbour had the highest occurrence of red tides. The number of red tide incidents in the harbour has, however, dropped significantly from the record high of 43 in 1988 to an annual average of about only 6 incidents in the past five years. This is ascribed to the significant improvement in water quality in the past decades following the successful implementation of the Tolo Harbour Action Plan, as clearly shown in Figure 29

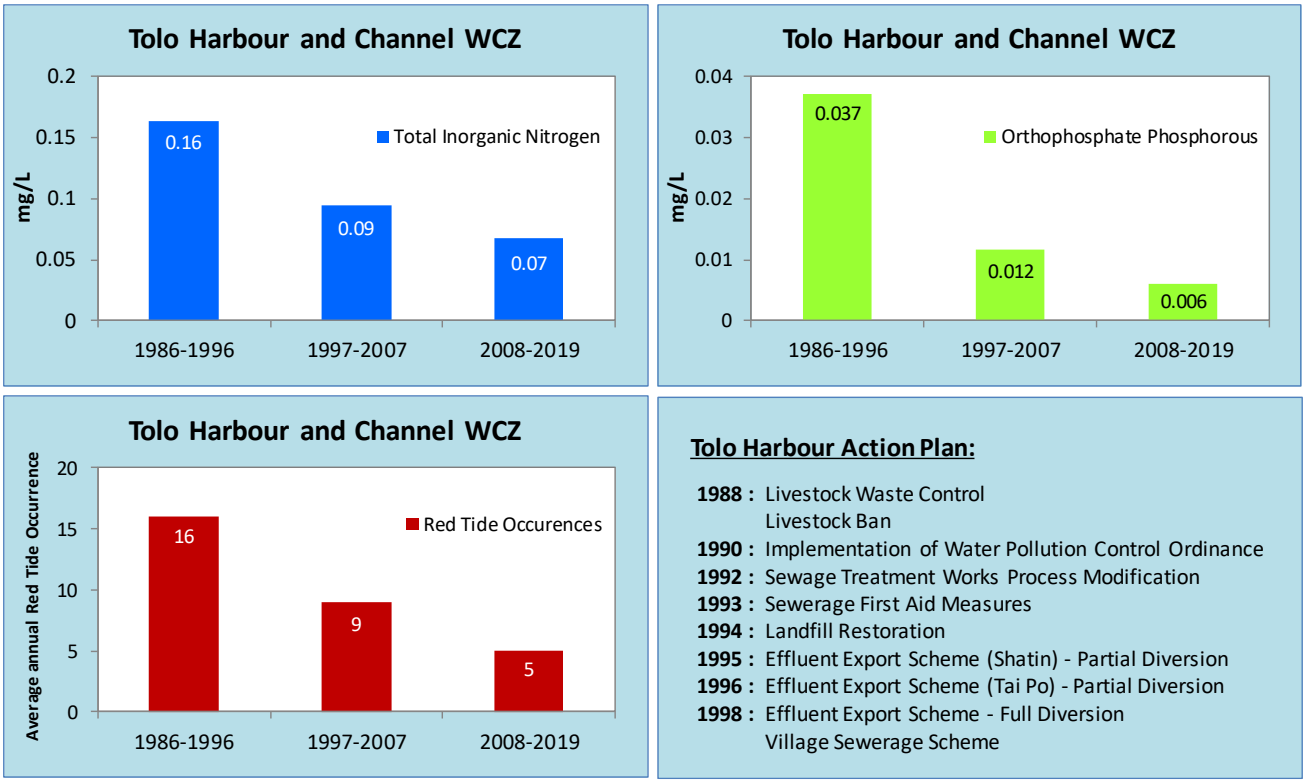
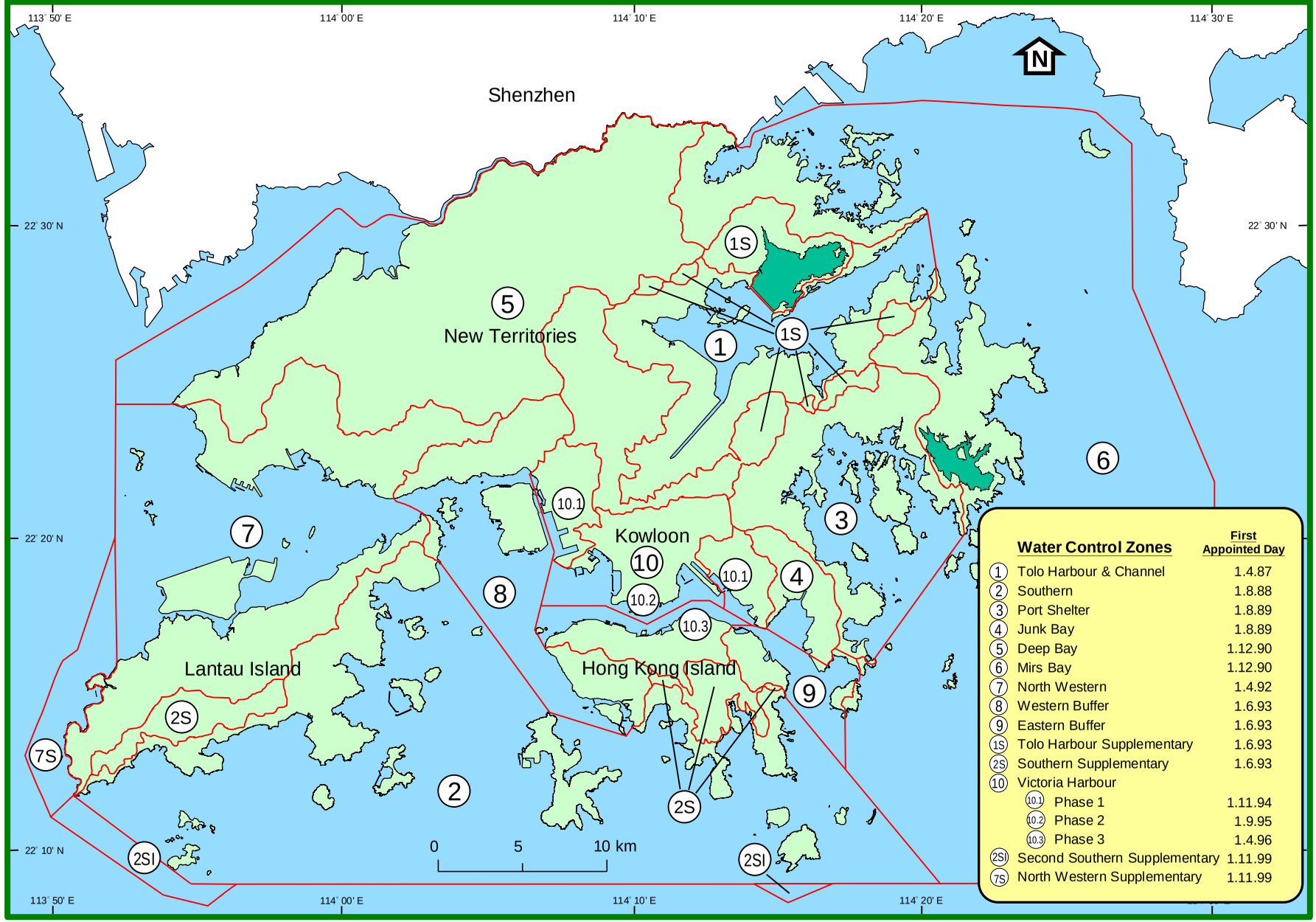


Figure 29. Reductions of nutrients levels with the average annual red tide occurrences in the Tolo Harbour and Channel WCZ, 1986-2019

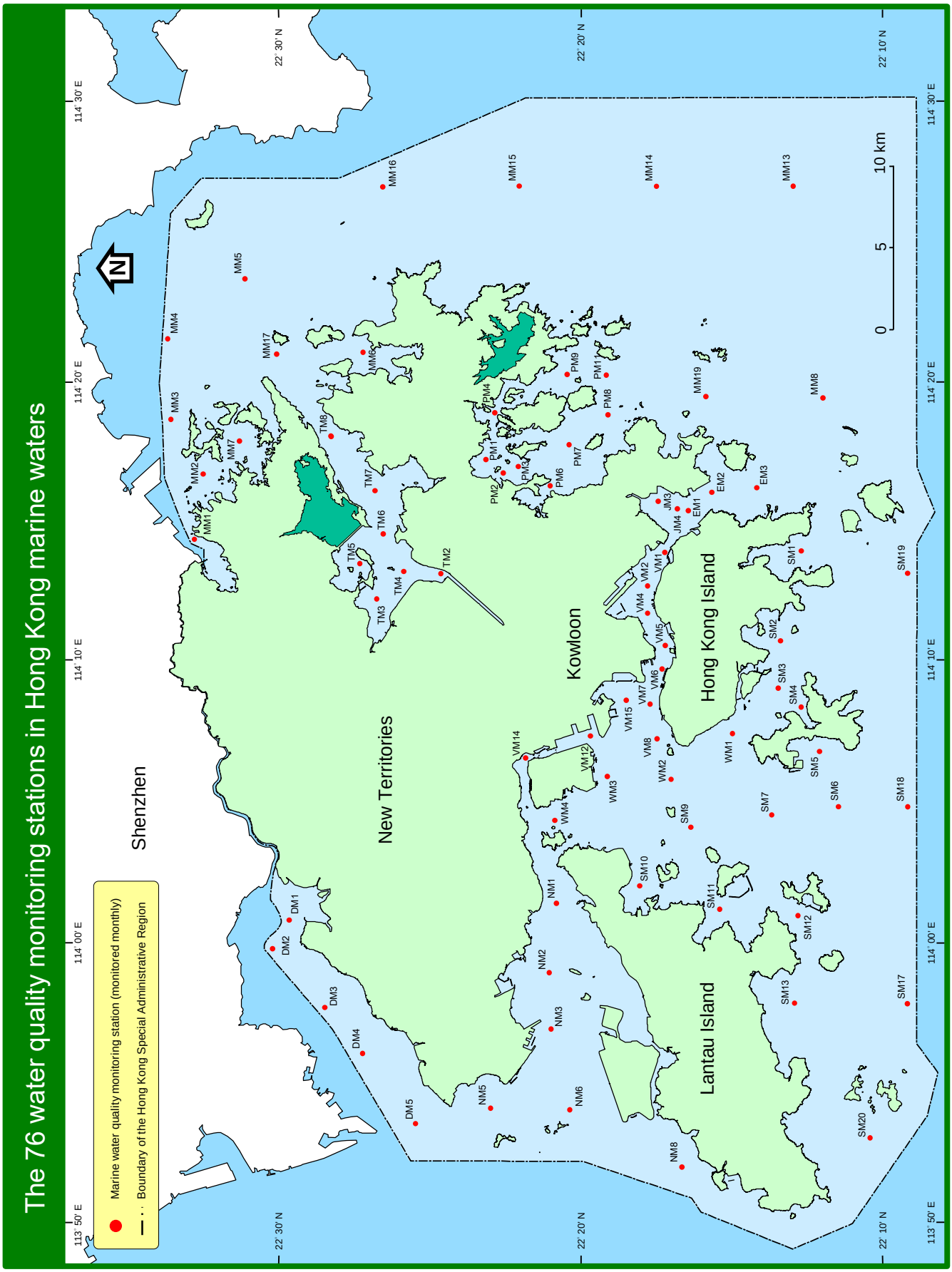
Appendices

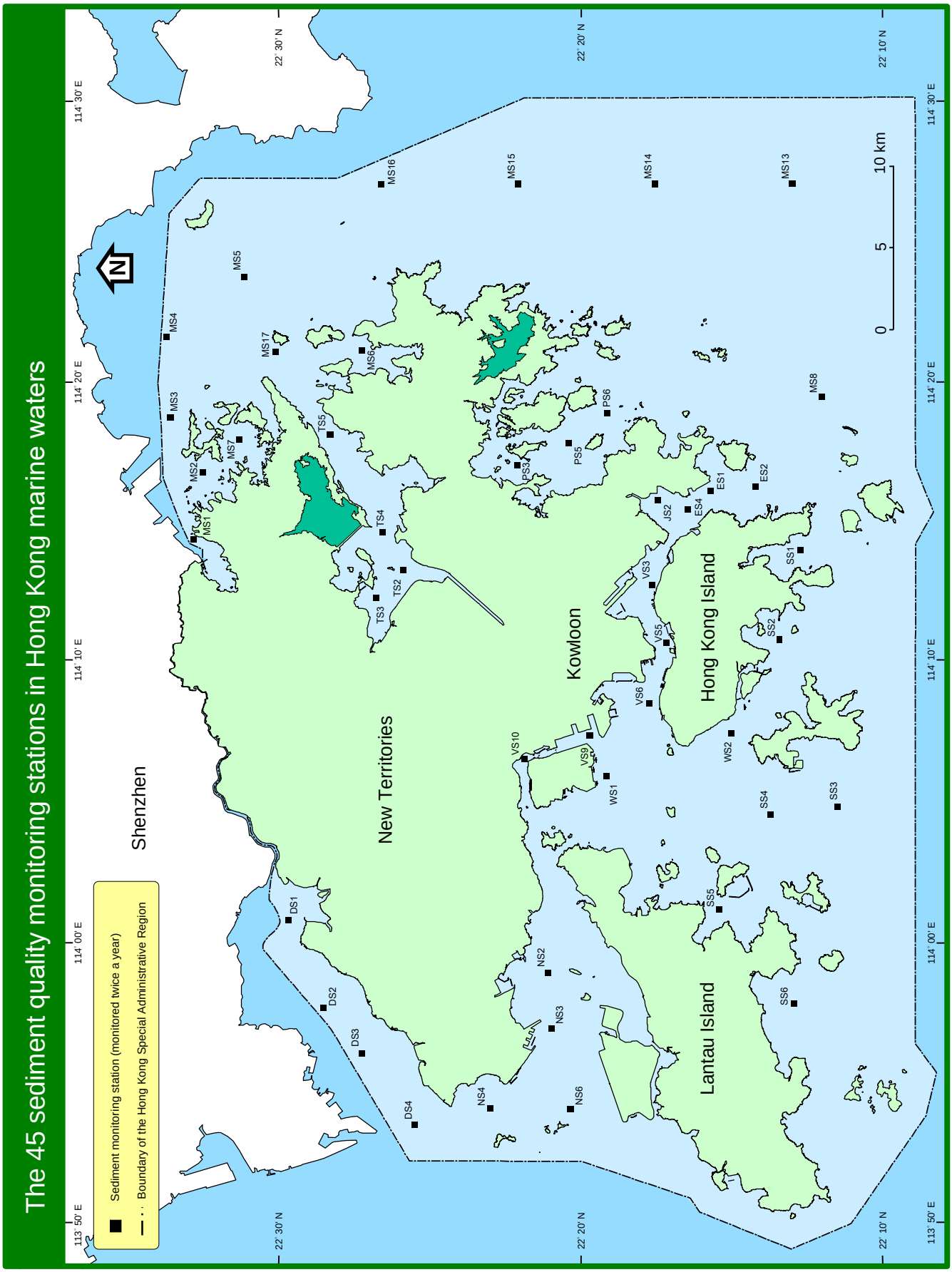
The Water Control Zones in Hong Kong

(Source: Environment Bureau– Plan No. WP/WP4/75, Oct 1999)

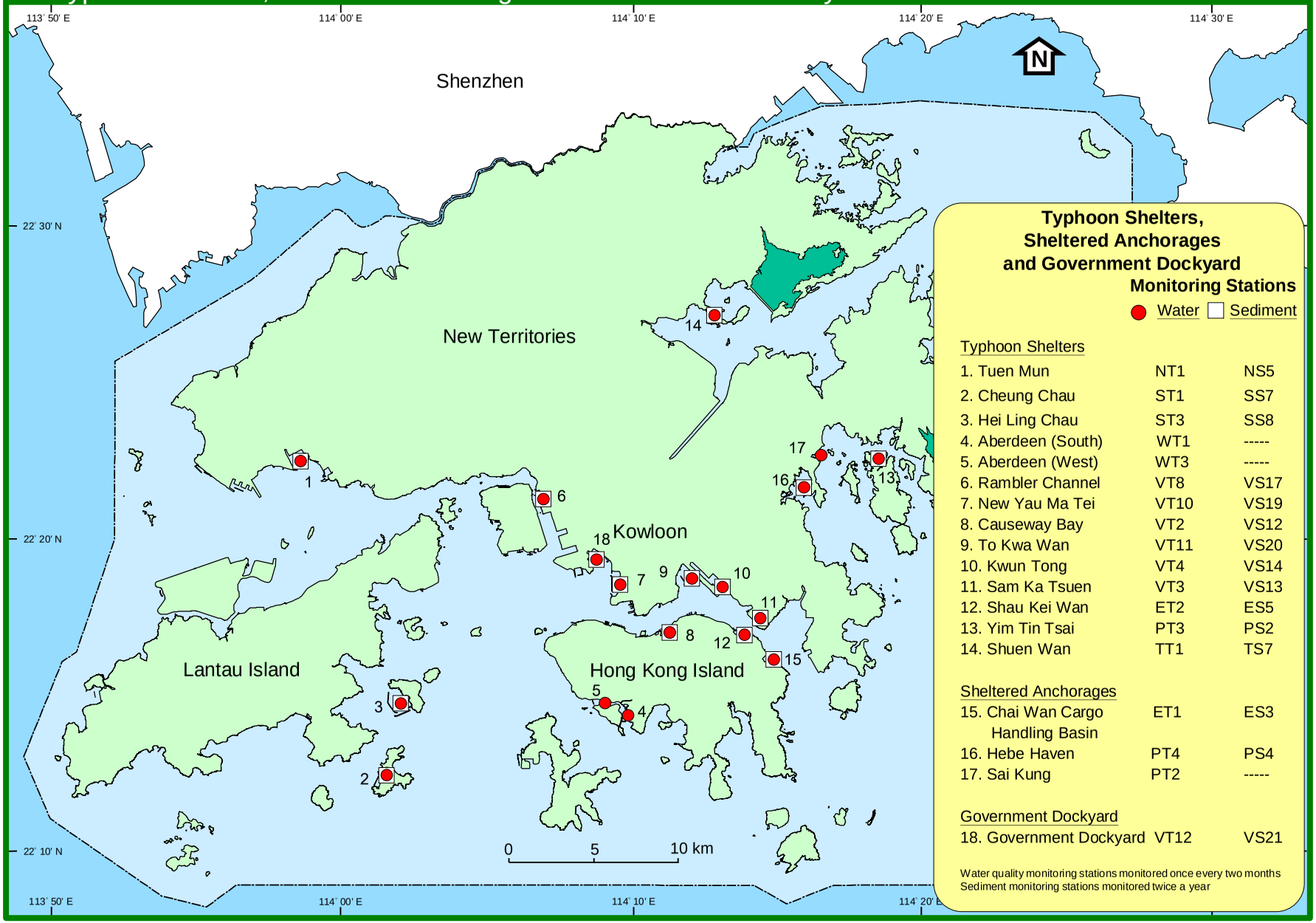


Water Control Zones		First Appointed Day
1	Tolo Harbour & Channel	1.4.87
2	Southern	1.8.88
3	Port Shelter	1.8.89
4	Junk Bay	1.8.89
5	Deep Bay	1.12.90
6	Mirs Bay	1.12.90
7	North Western	1.4.92
8	Western Buffer	1.6.93
9	Eastern Buffer	1.6.93
1S	Tolo Harbour Supplementary	1.6.93
2S	Southern Supplementary	1.6.93
10	Victoria Harbour	
10.1	Phase 1	1.11.94
10.2	Phase 2	1.9.95
10.3	Phase 3	1.4.96
2SI	Second Southern Supplementary	1.11.99
7S	North Western Supplementary	1.11.99


The 76 water quality monitoring stations in Hong Kong marine waters
Marine water quality monitoring station (monitored monthly)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
N
0
5
10 km
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N


The 45 sediment quality monitoring stations in Hong Kong marine waters
Sediment monitoring station (monitored twice a year)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
N
0
5
10 km
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
MS1
MS2
MS3
MS4
MS5
MS6
MS7
MS8
MS13
MS14
MS15
MS16
MS17
TS2
TS3
TS4
TS5
PS3
PS5
PS6
ES1
ES2
ES4
JS2
SS1
SS2
SS3
SS4
SS5
SS6
WS1
WS2
VS3
VS5
VS6
VS9
VS10
DS1
DS2
DS3
DS4
NS2
NS3
NS4
NS6

The 18 water quality monitoring stations and 15 sediment quality monitoring stations in the typhoon shelters, sheltered anchorages and Government Dockyard



Typhoon Shelters, Sheltered Anchorages and Government Dockyard Monitoring Stations

● Water ☐ Sediment

Typhoon Shelters		
1. Tuen Mun	NT1	NS5
2. Cheung Chau	ST1	SS7
3. Hei Ling Chau	ST3	SS8
4. Aberdeen (South)	WT1	-----
5. Aberdeen (West)	WT3	-----
6. Rambler Channel	VT8	VS17
7. New Yau Ma Tei	VT10	VS19
8. Causeway Bay	VT2	VS12
9. To Kwa Wan	VT11	VS20
10. Kwun Tong	VT4	VS14
11. Sam Ka Tsuen	VT3	VS13
12. Shau Kei Wan	ET2	ES5
13. Yim Tin Tsai	PT3	PS2
14. Shuen Wan	TT1	TS7
Sheltered Anchorages		
15. Chai Wan Cargo Handling Basin	ET1	ES3
16. Hebe Haven	PT4	PS4
17. Sai Kung	PT2	-----
Government Dockyard		
18. Government Dockyard	VT12	VS21

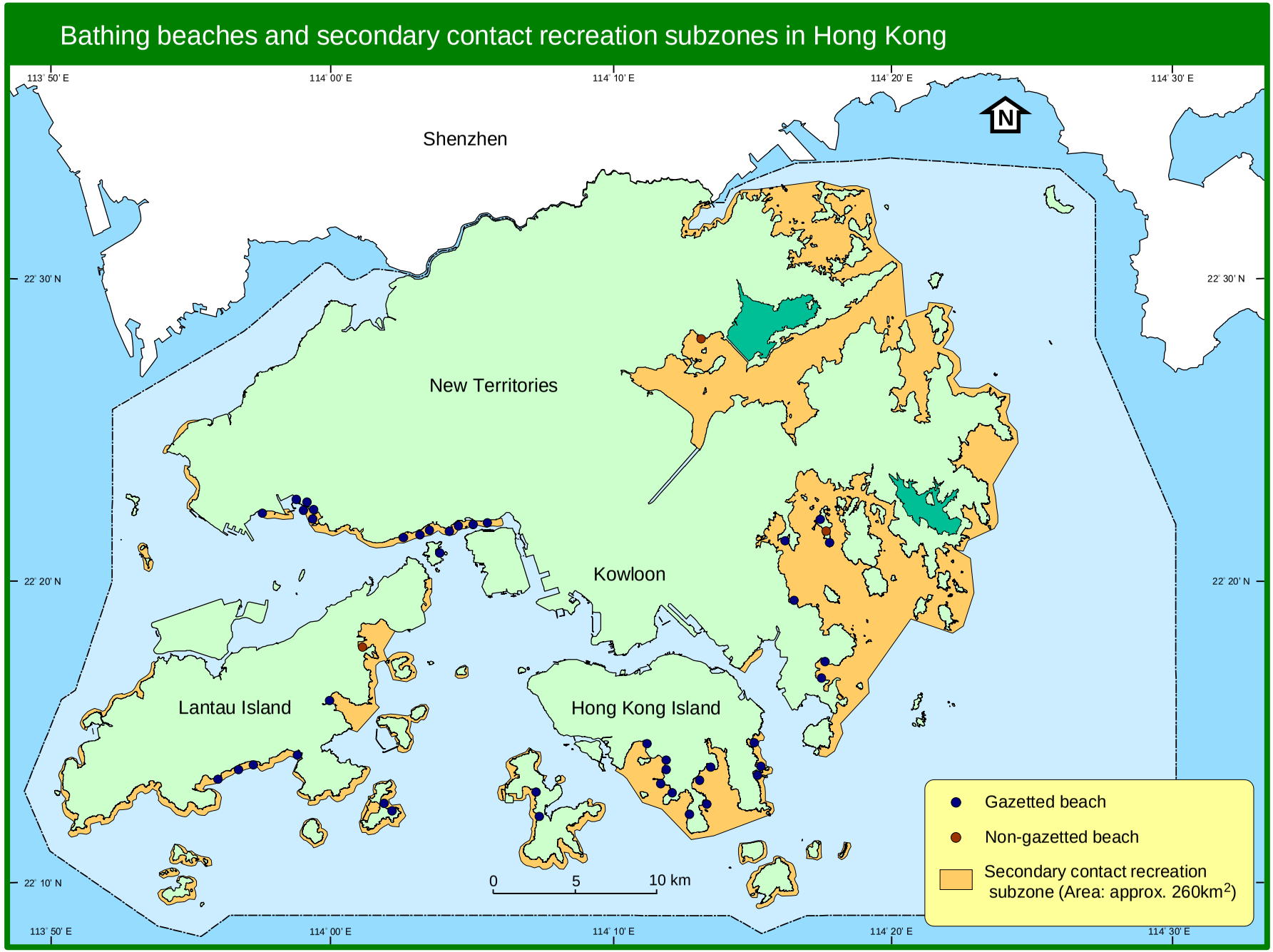
Water quality monitoring stations monitored once every two months
Sediment monitoring stations monitored twice a year

Location of marine water and sediment quality monitoring stations

Water Control Zone	Station		Location				Depth (m) approx.
	Water	Sediment	Latitude		Longitude		
Tolo Harbour and Channel	TM2		22° 24.744'	N	114° 13.085'	E	4
	TM3	TS3	22° 26.857'	N	114° 12.181'	E	7
	TM4	TS2	22° 25.964'	N	114° 13.176'	E	8
	TM5		22° 27.426'	N	114° 13.456'	E	4
	TM6	TS4	22° 26.631'	N	114° 14.506'	E	12
	TM7		22° 26.907'	N	114° 16.057'	E	11
	TM8	TS5	22° 28.392'	N	114° 18.003'	E	22
	* TT1	* TS7	22° 27.270'	N	114° 12.717'	E	6
Southern	SM1	SS1	22° 12.738'	N	114° 13.885'	E	14
	SM2	SS2	22° 13.447'	N	114° 10.691'	E	14
	SM3		22° 13.527'	N	114° 8.980'	E	33
	SM4		22° 12.758'	N	114° 8.315'	E	11
	SM5		22° 12.141'	N	114° 6.728'	E	8
	SM6	SS3	22° 11.500'	N	114° 4.743'	E	14
	SM7	SS4	22° 13.740'	N	114° 4.473'	E	8
	SM9		22° 16.420'	N	114° 4.024'	E	8
	SM10		22° 18.125'	N	114° 1.919'	E	5
	SM11	SS5	22° 15.443'	N	114° 1.078'	E	8
	SM12		22° 12.861'	N	114° 0.869'	E	7
	SM13	SS6	22° 12.957'	N	113° 57.724'	E	6
	SM17		22° 9.211'	N	113° 57.727'	E	12
	SM18		22° 9.211'	N	114° 4.746'	E	21
	SM19		22° 9.211'	N	114° 13.077'	E	24
	SM20		22° 10.448'	N	113° 52.932'	E	7
	* ST1	* SS7	22° 12.517'	N	114° 1.493'	E	6
	* ST3	* SS8	22° 14.734'	N	114° 1.928'	E	6
Port Shelter	PM1		22° 23.242'	N	114° 17.145'	E	6
	PM2		22° 22.643'	N	114° 16.687'	E	8
	PM3	PS3	22° 22.156'	N	114° 16.910'	E	13
	PM4		22° 22.940'	N	114° 18.819'	E	6
	PM6		22° 21.102'	N	114° 16.213'	E	11
	PM7	PS5	22° 20.453'	N	114° 17.703'	E	17
	PM8	PS6	22° 19.168'	N	114° 18.745'	E	20
	PM9		22° 20.529'	N	114° 20.196'	E	15
	PM11		22° 19.240'	N	114° 20.163'	E	21
	* PT2		22° 22.798'	N	114° 16.540'	E	3
	* PT3	* PS2	22° 22.790'	N	114° 18.400'	E	6
	* PT4	* PS4	22° 21.728'	N	114° 15.879'	E	5
Junk Bay	JM3	JS2	22° 17.490'	N	114° 15.657'	E	10
	JM4		22° 16.873'	N	114° 15.378'	E	16
Deep Bay	DM1	DS1	22° 29.769'	N	114° 0.644'	E	2
	DM2		22° 30.454'	N	113° 59.549'	E	2
	DM3	DS2	22° 28.600'	N	113° 57.551'	E	3
	DM4	DS3	22° 27.335'	N	113° 55.937'	E	4
	DM5	DS4	22° 25.561'	N	113° 53.388'	E	8
North Western	NM1		22° 20.877'	N	114° 1.286'	E	34
	NM2	NS2	22° 21.130'	N	113° 58.815'	E	11
	NM3	NS3	22° 20.783'	N	113° 56.783'	E	14
	NM5	NS4	22° 23.051'	N	113° 53.972'	E	20
	NM6	NS6	22° 20.366'	N	113° 53.908'	E	8
	NM8		22° 16.695'	N	113° 51.886'	E	8
	* NT1	* NS5	22° 22.475'	N	113° 58.353'	E	4
Mirs Bay	MM1	MS1	22° 32.984'	N	114° 14.271'	E	6
	MM2	MS2	22° 32.626'	N	114° 16.648'	E	11
	MM3	MS3	22° 33.714'	N	114° 18.615'	E	16
	MM4	MS4	22° 33.817'	N	114° 21.483'	E	18
	MM5	MS5	22° 31.233'	N	114° 23.633'	E	20
	MM6	MS6	22° 27.334'	N	114° 20.997'	E	12
	MM7	MS7	22° 31.409'	N	114° 17.824'	E	13
	MM8	MS8	22° 12.021'	N	114° 19.345'	E	31
	MM13	MS13	22° 13.000'	N	114° 26.920'	E	28
	MM14	MS14	22° 17.560'	N	114° 26.920'	E	25
	MM15	MS15	22° 22.120'	N	114° 26.920'	E	24
	MM16	MS16	22° 26.670'	N	114° 26.920'	E	22
	MM17	MS17	22° 30.192'	N	114° 20.960'	E	17
	MM19		22° 15.921'	N	114° 19.411'	E	28
Western Buffer	WM1	WS2	22° 15.044'	N	114° 7.363'	E	35
	WM2		22° 17.074'	N	114° 5.730'	E	13
	WM3	WS1	22° 19.203'	N	114° 5.826'	E	20
	WM4		22° 20.940'	N	114° 4.256'	E	26
	* WT1		22° 14.494'	N	114° 9.737'	E	7
	* WT3		22° 14.811'	N	114° 8.918'	E	10
Eastern Buffer	EM1	ES4	22° 16.506'	N	114° 15.335'	E	16
	EM2	ES1	22° 15.732'	N	114° 15.971'	E	21
	EM3	ES2	22° 14.237'	N	114° 16.144'	E	21
	* ET1	* ES3	22° 16.203'	N	114° 14.624'	E	6
	* ET2	* ES5	22° 17.078'	N	114° 13.783'	E	12
Victoria Harbour	VM1		22° 17.280'	N	114° 13.839'	E	38
	VM2		22° 17.862'	N	114° 12.619'	E	12
		VS3	22° 17.631'	N	114° 12.526'	E	8
	VM4		22° 17.860'	N	114° 11.654'	E	12
	VM5		22° 17.266'	N	114° 10.510'	E	11
		VS5	22° 17.077'	N	114° 10.600'	E	8
	VM6		22° 17.371'	N	114° 9.665'	E	14
	VM7	VS6	22° 17.771'	N	114° 8.416'	E	10
	VM8		22° 17.564'	N	114° 7.175'	E	11
	VM12	VS9	22° 19.757'	N	114° 7.278'	E	14
	VM14	VS10	22° 21.935'	N	114° 6.527'	E	11
	VM15		22° 18.579'	N	114° 8.539'	E	11
	* VT2	* VS12	22° 17.194'	N	114° 11.304'	E	5
	* VT3	* VS13	22° 17.448'	N	114° 14.250'	E	5
	* VT4	* VS14	22° 18.734'	N	114° 12.814'	E	6
	* VT8	* VS17	22° 21.360'	N	114° 6.867'	E	5
	* VT10	* VS19	22° 18.590'	N	114° 9.430'	E	5
	* VT11	* VS20	22° 18.981'	N	114° 11.814'	E	6
	* VT12	* VS21	22° 19.429'	N	114° 8.587'	E	5

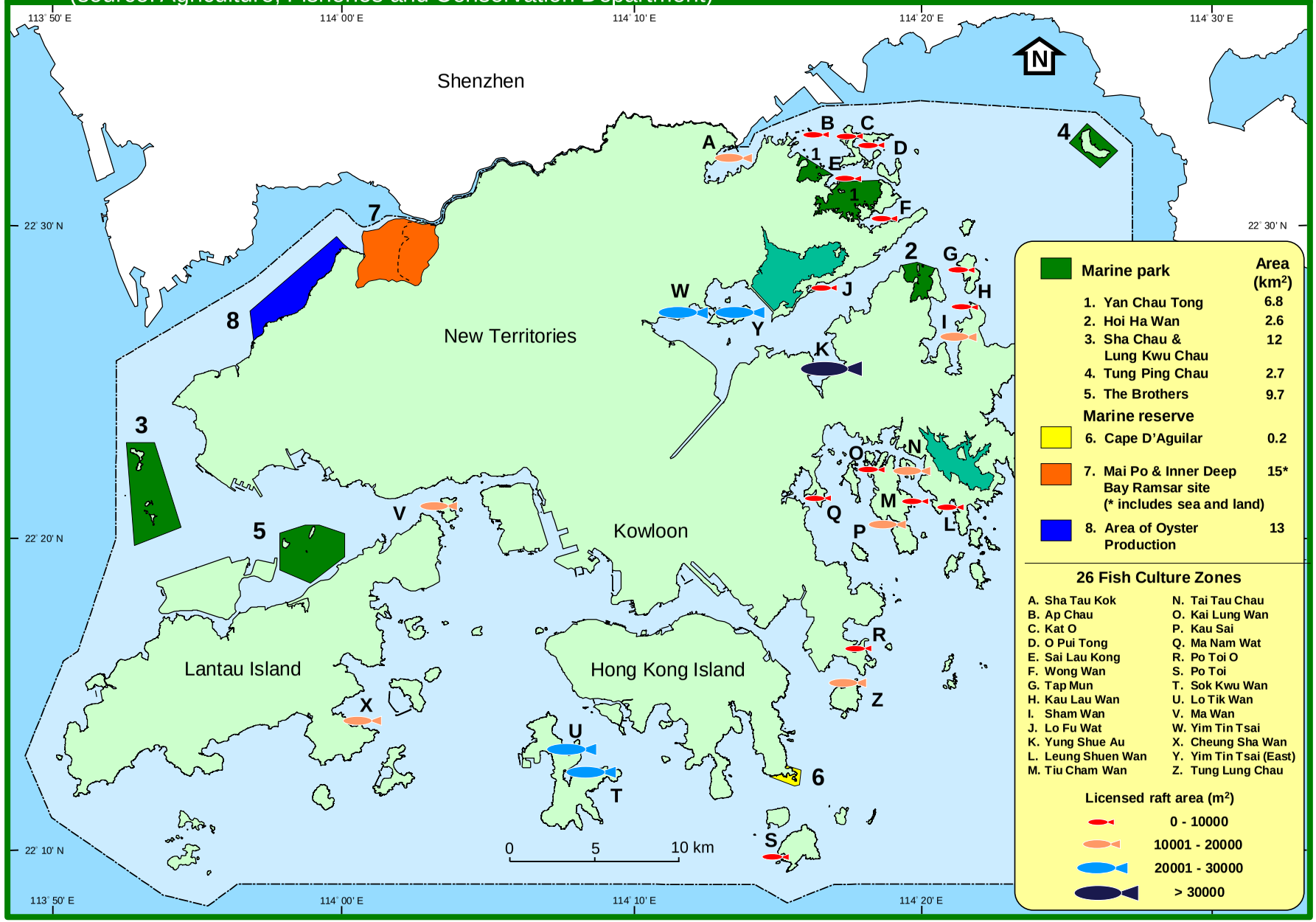
Note: 1. All locations are based on WGS84 datum

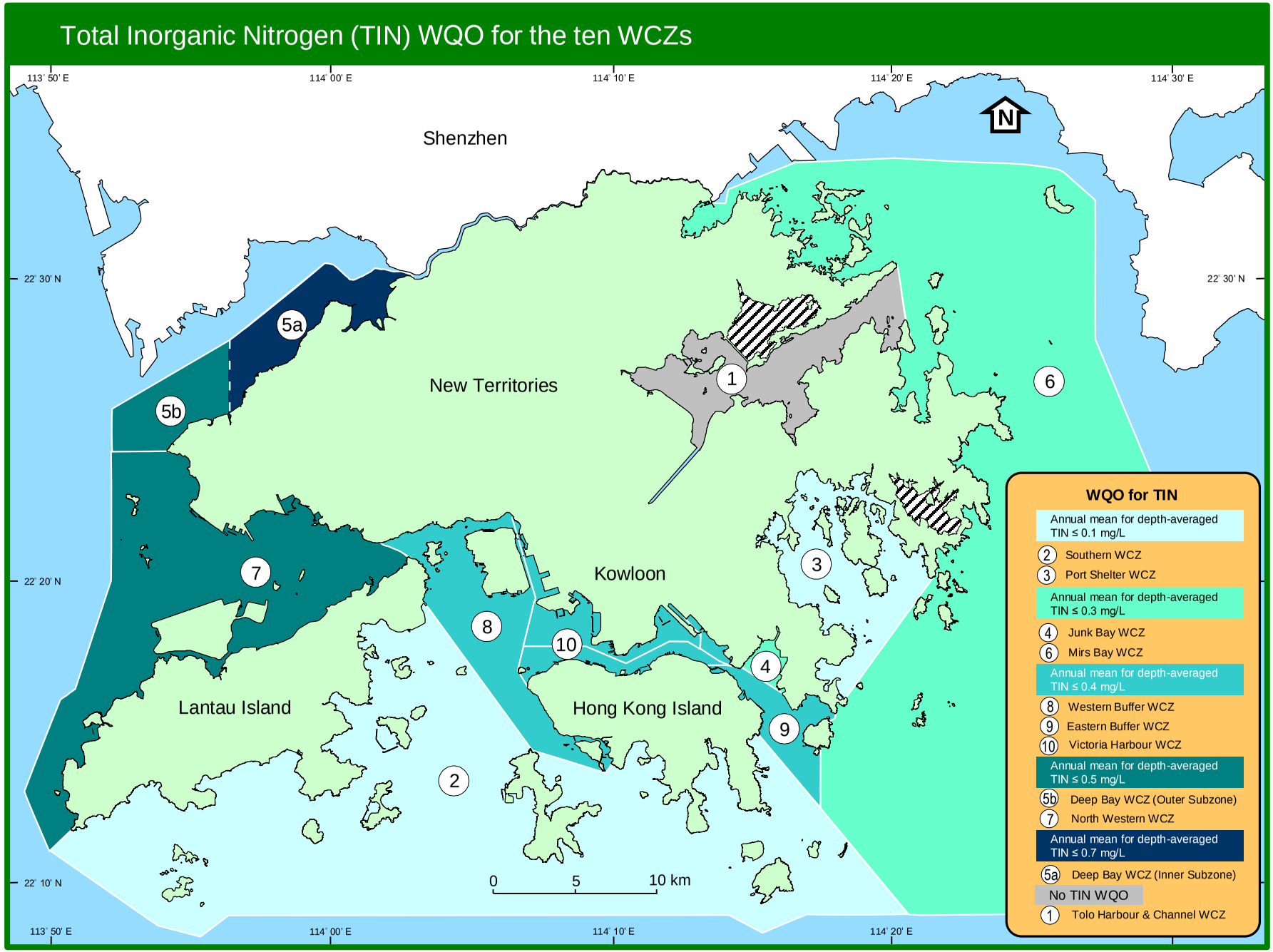
2. Water quality and sediment monitoring stations in typhoon shelters are marked with an asterisk *


Bathing beaches and secondary contact recreation subzones in Hong Kong
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
N
Shenzhen
New Territories
Kowloon
Lantau Island
Hong Kong Island
0
5
10 km
Gazetted beach
Non-gazetted beach
Secondary contact recreation subzone (Area: approx. 260km2)

Fish and shellfish culture zones and marine conservation sites in Hong Kong

(source: Agriculture, Fisheries and Conservation Department)




Total Inorganic Nitrogen (TIN) WQO for the ten WCZs
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
N
Shenzhen
New Territories
Kowloon
Lantau Island
Hong Kong Island
1
2
3
4
5a
5b
6
7
8
9
10
0
5
10 km
WQO for TIN
Annual mean for depth-averaged TIN ≤ 0.1 mg/L
2 Southern WCZ
3 Port Shelter WCZ
Annual mean for depth-averaged TIN ≤ 0.3 mg/L
4 Junk Bay WCZ
6 Mirs Bay WCZ
Annual mean for depth-averaged TIN ≤ 0.4 mg/L
8 Western Buffer WCZ
9 Eastern Buffer WCZ
10 Victoria Harbour WCZ
Annual mean for depth-averaged TIN ≤ 0.5 mg/L
5b Deep Bay WCZ (Outer Subzone)
7 North Western WCZ
Annual mean for depth-averaged TIN ≤ 0.7 mg/L
5a Deep Bay WCZ (Inner Subzone)
No TIN WQO
1 Tolo Harbour & Channel WCZ

Summary of Water Quality Objectives (WQOs) for marine waters of Hong Kong

Parameter	Water Quality Objective	Water Control Zone (WCZ) / Part(s) of zone / Subzone to which the WQO applies
Aesthetic Appearance	There should be no objectionable odours or discolouration of the water. Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substances should be absent. Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam. There should be no recognisable sewage-derived debris. Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels or cause damage to vessels should be absent. The waters should not contain substances which settle to form objectionable deposits.	All WCZs (whole zone)
Dissolved Oxygen (bottom)	Not less than 2 mg/L for 90% of samples;	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
Dissolved Oxygen (Depth-averaged)	Not less than 4 mg/L for 90% of samples;	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
Dissolved Oxygen (bottom)	Not less than 2 mg/L	Harbour Subzone in Tolo Harbour & Channel WCZ
	Not less than 3 mg/L	Buffer Subzone in Tolo Harbour & Channel WCZ
	Not less than 4 mg/L	Channel Subzone in Tolo Harbour & Channel WCZ
Dissolved Oxygen (surface to 2m above bottom)	Not less than 4 mg/L	Harbour Subzone and Buffer Subzone in Tolo Harbour & Channel WCZ
Dissloved Oxygen (all depths)	Not less than 4 mg/L	Channel Subzone in Tolo Harbour & Channel WCZ
Nutrients	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.1 mg/L	Marine waters of Southern WCZ and Port Shelter WCZ
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.3 mg/L	Marine waters of Mirs Bay WCZ, Junk Bay WCZ, North Western WCZ (Castle Peak Subzone)
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.4 mg/L	Marine waters of Eastern Buffer WCZ, Western Buffer WCZ, Victoria Harbour WCZ
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.5 mg/L	Marine waters of Deep bay WCZ (Outer Subzone) and North Western WCZ (Whole zone except Castle Peak Subzone)
	Annual mean depth-averaged total inorganic nitrogen not to exceed 0.7 mg/L	Marine waters of Deep Bay WCZ (Inner Subzone)
Unionised Ammonia	Annual mean not to exceed 0.021 mg/L	All WCZs (whole zone) except Tolo Harbour & Channel WCZ
E.coli	Annual geometric mean not to exceed 610 cfu/100mL	Secondary contact recreation subzones in Tolo Harbour & Channel WCZ, Southern WCZ, Port Shelter WCZ, Mirs Bay WCZ, Deep Bay WCZ, North Western WCZ, Western Buffer WCZ
	Annual geometric mean not to exceed 610 cfu/100mL	Fish culture subzones in Tolo Harbour & Channel WCZ, Southern WCZ, Port Shelter WCZ, Junk Bay WCZ, Mirs Bay WCZ, Deep Bay WCZ, Eastern Buffer WCZ, Western Buffer WCZ
pH	To be in the range 6.5 - 8.5, change due to waste discharge not to exceed 0.2	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.5	Harbour Subzone in Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.3	Buffer Subzone in Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 0.1	Channel Subzone in Tolo Harbour & Channel WCZ
Salinity	Change due to waste discharge not to exceed 10% of natural ambient level	All WCZs (Whole zone) except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to be greater than ± 3ppt	Tolo Harbour & Channel WCZ
Temperature	Change due to waste discharge not to exceed 2°C	All WCZs (Whole zone) except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to exceed 1°C	Tolo Harbour & Channel WCZ
Suspended Solids	Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities	Marine waters of all WCZs except Tolo Harbour & Channel WCZ
Toxicants	Not to be present at levels producing significant toxic effect	All WCZs (Whole zone)
Chlorophyll-*a*	Not to exceed 20mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Harbour Subzone in Tolo Harbour & Channel WCZ
	Not to exceed 10mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Buffer Subzone in Tolo Harbour & Channel WCZ
	Not to exceed 6mg/m^3 (µg/L) calculated as running arithmetic mean of 5 daily measurements for any location and depth	Channel Subzone in Tolo Harbor & Channel WCZ

Sediment Quality Criteria for Classification of Sediments[1]

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals (mg/kg dry weight)		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)[2]	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid (mg/kg dry weight)		
Arsenic (As)	12	42
Organic-PAHs (µg/kg dry weight)		
Low Molecular Weight PAHs[3]	550	3160
High Molecular Weight PAHs[4]	1700	9600
Organic-non-PAHs (µg/kg dry weight)		
Total PCBs	23	180
Organometallics (mg TBT/L in Interstitial water)		
Tributyltin[2]	0.15	0.15

Note:

1. The table is extracted from Appendix A of WBTC (W) No. 34/2002 Management of Dredged / Excavated Sediment (http://www.devb-wb.gov.hk).
2. When the LCEL and UCEL for a contaminant are the same, the contaminant level is considered to have exceeded UCEL if it is greater than the value shown.
3. Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.
4. High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene.
5. Total PCBs include 18 congeners: PCB 8, 18, 28, 44, 52, 66, 77, 101, 105, 118, 126, 128, 138, 153, 169, 170, 180, 187.

Summary of marine water quality parameters

Parameter		Unit	Reporting Limit	Sampling Depth	Standard Method / Techniques used [20]	Analysed by
Physical and Aggregate Properties	Temperature[1]	°C	0.1	Depth Profiling[10]	Instrumental (thermistor), SEACAT19+ CTD and Water Quality Profiler	MMT/EPD[15]
	Salinity[1,8]	---	0.1	Depth Profiling	Instrumental (electrical conductivity), SEACAT19+ CTD and Water Quality Profiler	MMT/EPD
	Dissolved Oxygen[1]	mg/L % saturation [9]	0.1 1	Depth Profiling	Instrumental (membrane elelectrode), SBE43 dissolved oxygen sensor linked to SEACAT19+ CTD and Water Quality Profiler	MMT/EPD
	Turbidity[2]	NTU	0.1	Depth Profiling	Instrumental (nephelometric / infrared back scattering), OBS-3 turbidity sensor linked to SEACAT 19+ CTD and Water Quality Profiler	MMT/EPD
	pH[1]	---	0.1	Depth Profiling	Instrumental (electrodemetric), SBE18 pH sensor linked to SEACAT19 + CTD and Water Quality Profiler	MMT/EPD
	Secchi Disc Depth[2]	m	0.1	---	Manual	MMT/EPD
	Suspended Solids[2]	mg/L	0.5	S,M,B[11]	In-house method GL-PH-23 based on APHA 22ed 2540D (weighing)	GL[18]
	Volatile Suspended Solids[3]	mg/L	0.5	S,M,B	In-house method GL-PH-23 based on APHA 22ed 2540E (weighing)	GL
Aggregate Organic Constituents	5-day Biochemical Oxygen Demand (BOD_5)[4]	mg/L	0.1	S,M,B	In-house method based on APHA 20ed 5210B	EML/EPD[16]
Nutrients and Inorganic Constituents	Ammonia Nitrogen[5]	mg/L	0.005	S,M,B	In-house method GL-IN-15 based on ASTM D3590-11 B	GL
	Unionised Ammonia[5]	mg/L	0.001	S,M,B	By calculation[12]	MMT/EPD
	Nitrite Nitrogen[5]	mg/L	0.002	S,M,B	In-house method GL-IN-18 based on APHA 22ed 4500-NO_2-B	GL
	Nitrate Nitrogen[5]	mg/L	0.002	S,M,B	In-house method GL-IN-18 based on APHA 22ed 4500-NO_3-I	GL
	Total Inorganic Nitrogen[5]	mg/L	0.01	S,M,B	By calculation[13]	MMT/EPD
	Total Kjeldahl Nitrogen[5] (soluble; soluble & particulate)	mg/L	0.05	S,M,B	In-house methods GL-IN-14 and GL-IN-15 based on ASTM D3590-11 B	GL
	Total Nitrogen[5]	mg/L	0.05	S,M,B	By calculation[13]	MMT/EPD
	Orthophosphate Phosphorus[5]	mg/L	0.002	S,M,B	In-house method GL-IN-16 based on APHA 22ed 4500-P G	GL
	Total Phosphorus[5] (soluble; soluble & particulate)	mg/L	0.02	S,M,B	In-house methods GL-IN-14 and GL-IN-16 based on ASTM D515-88 B (FIA) and APHA 22ed 4500-P G	GL
	Silica (as SiO_2) (soluble) [5]	mg/L	0.05	S,M,B	In-house method GL-IN-17 based on APHA 22ed 4500-SiO_2 F	GL
Biological and Microbiological Examination	Chlorophyll-a[6]	µg/L	0.2	S,M,B	In-house method GL-OR-34 based on APHA 20ed 10200H 2 (spectrophotometric)	GL
	Escherichia coli (*E. coli*)[7]	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid *E. coli* -coliform culture[14]	EML/EPD
	Faecal Coliforms[7]	cfu/100mL	1	S,M,B	In-house method, membrane filtration with CHROMagar Liquid *E. coli* -coliform culture[14]	EML/EPD
	Phytoplankton	cell/mL	1	S	In-house method, 10 ml settled sub-sample using plankton chamber and inverted microscope[19]	WSL/EPD[17]

Note:
1. Indicate general oceanographic conditions of marine water.
2. Low transparency and light penetration would affect aesthetic value and photosynthesis in marine water.
3. Indicate the amount of particulate organic matters in marine water.
4. Indicate the amount of organic pollutants in marine water.
5. Major nutrients (nitrogen, phosphorus, silica) promoting algal growth in marine water.
6. Indicate the amount of algal biomass in marine water.
7. Sewage bacteria indicate the extent of faecal pollution in marine water.
8. Measuring and reporting of Salinity (S) are based on the Practical Salinity Scale and International Equation of State of Seawater.
   (UNESCO Technical Papers in Marine Science No. 30 (1981) ; No. 36 (1981) and No. 45 (1985))
9. Percent saturation of dissolved oxygen is calculated from dissolved oxygen in mg/L based on Weiss R.F. (1970); The solubility of nitrogen, oxygen and argon in water and seawater.
   Deep Sea Res. Vol. 17, pp.721-735.
10. Depth profiling - continuous measurements at downcast are processed and presented at 1m intervals from 1m below the surface to 1m above the seabed.
11. If water depth is 6m or above, sampling is taken at three depths: S - 1m below water surface; M - mid-depth of water column; B - 1m above seabed.
    If water depth is 4 to 5 m, "M" is skipped; If water depth is 3m or less, "M" and "B" are skipped.
12. i) Bower C.E. and Bidwell J.P. (1978), Ionization of ammonia in seawater: Effect of temperature, pH and salinity. J. Fish. Res. Board Can. Vol.35, pp.1012-1016;
    ii) K., Russo R.C. & et. al. (1975), Aqueous ammonia equilibrium calculations: effect of pH and temperature. J. Fish. Res. Board Can. Vol.32, pp.2379-2383.
13. Total Inorganic Nitrogen = Ammonia Nitrogen + Nitrite Nitrogen + Nitrate Nitrogen ; Total Nitrogen = Total Kjeldahl Nitrogen (soluble & particulate) + Nitrite Nitrogen + Nitrate Nitrogen
14. i) DoE, DHSS & PHLS (1983); The Bacteriological Examination of Drinking Water Supplies 1982, Sec.7.8 & 7.9;
    ii) B.S.W. Ho and T.Y. Tam (1997), Enumeration of E. coli in environmental waters and wastewater using a chromogenic medium. Wat. Sci. Tech.Vol.35, No.11-12, pp.409-413;
    method adopted in 1997.
15. MMT/EPD - Marine Monitoring Team, Water Policy and Science Group, Environmental Protection Department.
16. EML/EPD - Environmental Microbiology Laboratory, Water Policy and Science Group, Environmental Protection Department.
17. WSL/EPD - Water Sciences Laboratory, Water Policy and Science Group, Environmental Protection Department.
18. GL - Government Laboratory.
19. i) Lund, J.H., Kipling, C. and Le Cren, E.D. 1958. The inverted microscope method of estimating algal numbers, and the statistical basis of estimations by counting.
    Hydrobiologia Vol. 11, pp. 143-170.
    ii) Utermohl, H. 1958. Zur Vervollkommung der Quantitativen Phytoplankton-Methodik. Mitt. Inter. Verein. Lim. Vol. 9, pp. 1-38.
20. Mention of brand names and commercial products does not constitute or imply endorsement or recommendation by the Environmental Protection Department.

Summary of marine sediment[1] quality parameters

	Parameter	Unit [2]	Reporting Limit	Standard Method / Techniques used [8]	Analysed by
Physical and Aggregate Properties	Particle Size Fractionation	% w/w	1	In-house method, sieving and weighing ; 8 fractions : >4000 µm, <4000µm, <2000µm, <1000µm, <500µm, <250µm, <125µm and <63µm	MMT/EPD [6]
	Electrochemical Potential [4]	mV	1	Instrumental, Orion Model 250A pH/Redox Meter (electrodemetric)	MMT/EPD
	Total Solids (TS) [3]	% w/w	0.1	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL [7]
	Total Volatile Solids (TVS) [3]	% TS	0.1	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL
	Dry Wet Ratio	---	0.01	In-house method GL-PH-22 based on APHA 20ed 2540G (weighing)	GL
Aggregate Organic Constituents [3]	Chemical Oxygen Demand (COD)	mg/kg	2	In-house method GL-OR-47 based on ASTM D1252-00 A (open reflux)	GL
	Total Carbon (TC)	% w/w	0.1	In-house method GL-OR-33 based on APHA 20ed 5310 B (combustion - IR)	GL
Nutrients and Inorganic Constituents [3]	Ammonia Nitrogen (NH_4-N)	mg/kg	0.05	In-house method GL-IN-19 based on ASTM D3590-11 B (FIA)	GL
	Total Kjeldahl Nitrogen (TKN)	mg/kg	0.5	In-house methods GL-IN-14 and GL-IN-15 based on ASTM D3590-11 B (FIA)	GL
	Total Phosphorus	mg/kg	0.2	In-house methods GL-IN-14 and GL-IN-16 based on ASTM D515-88 B (FIA) and APHA 22ed 4500-P G	GL
	Total Sulphide	mg/kg	0.2	In-house method GL-IN-45 based on APHA 20ed 4500-S^{2-} A&D (spectrophotometric)	GL
	Total Cyanide	mg/kg	0.1	In-house method GL-IN-44 based on APHA 20ed 4500-CN A&E (distillation and amperometric)	GL
Metals & Metalloids [5]	Aluminium (Al)	mg/kg	1	In-house method GL-TE-103 (ICP-MS)	GL
	Arsenic (As)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Barium (Ba)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Boron (B)	mg/kg	5	In-house method GL-TE-103 (ICP-MS)	GL
	Cadmium (Cd)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Chromium (Cr)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Copper (Cu)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Iron (Fe)	mg/kg	5	In-house method GL-TE-103 (ICP-MS)	GL
	Lead (Pb)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Manganese (Mn)	mg/kg	1	In-house method GL-TE-103 (ICP-MS)	GL
	Mercury (Hg)	mg/kg	0.05	In-house method GL-TE-103 (ICP-MS)	GL
	Nickel (Ni)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Silver (Ag)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
	Vanadium (V)	mg/kg	0.1	In-house method GL-TE-103 (ICP-MS)	GL
	Zinc (Zn)	mg/kg	0.2	In-house method GL-TE-103 (ICP-MS)	GL
Trace Organic Compounds	Polychlorinated Biphenyls (PCBs)				
	18 PCB congeners : PCB 8, 18, 28, 44, 52, 66, 77, 101, 105, 118, 126, 128, 138, 153, 169, 170, 180, 187	µg/kg	2	In-house method GL-OR-25 based on Reference Method for the Analysis of Polychlorinated Biphenyls, Environmental Protection Series: Report EPS 1/RM/31, March 1997, Environment Canada (GC-MS)	GL
	Polyaromatic Hydrocarbons (PAHs)				
	- Acenaphthene	µg/kg	50	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Acenaphthylene	µg/kg	50	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Naphthalene	µg/kg	60	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Fluorene	µg/kg	10	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Phenanthrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Anthracene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Fluoranthene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Pyrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*a*)anthracene	µg/kg	3	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Chrysene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*b*)fluoranthene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*k*)fluoranthene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*a*)pyrene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Dibenzo(*a,h*)anthracene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Benzo(*ghi*)perylene	µg/kg	1	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL
	- Indeno(*1,2,3-cd*)pyrene	µg/kg	5	In-house method GL-OR-15 based on USEPA method 610, 1984 (UV-FLUO)	GL

Note:
1. Birge-Ekman (0.023sq.m) grab / Van Veen (0.1sq.m) grab / Smith-McIntyre (0.1sq.m) grab is employed to collect sediment samples from the top 10cm of seabed.
2. All parameters are reported on a dry weight basis unless otherwise stated.
3. Determinants are reported on a wet weight basis.
4. Electrochemical potential (Eh) is measured "on-site" at 3cm below the surface of freshly collected sediment samples (Reference : Handbook of Techniques for Aquatic Sediment Sampling. By A. Mudrock & S.D. MacKnight, 1994, CRC Press).
5. Digestion procedure for metals and metalloids in sediment follows Government Laboratory's in-house method GL-TE-51.
6. MMT/EPD - Marine Monitoring Team, Water Policy and Science Group, Environmental Protection Department.
7. GL - Government Laboratory.
8. Mention of brand names and commercial products does not constitute or imply endorsement or recommendation by the Environmental Protection Department.

Summary of water quality statistics for the Mirs Bay WCZ in 2019

Parameter		Starling Inlet	Crooked Island		Port Island	Mirs Bay North		
		MM1	MM2	MM7	MM17	MM3	MM4	MM5
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		25.0 (18.9 - 30.8)	24.7 (18.8 - 30.5)	24.6 (18.8 - 30.3)	24.1 (18.3 - 29.6)	24.3 (18.2 - 29.7)	24.1 (18.1 - 29.7)	24.0 (18.3 - 29.7)
Salinity		31.9 (30.4 - 33.2)	32.3 (30.9 - 33.3)	32.4 (31.0 - 33.3)	32.7 (31.3 - 33.5)	32.6 (31.3 - 33.4)	32.8 (31.6 - 33.5)	32.8 (31.7 - 33.6)
Dissolved Oxygen (mg/L)		6.2 (3.7 - 7.0)	6.0 (4.5 - 7.8)	5.7 (4.4 - 7.2)	6.1 (4.4 - 7.7)	5.8 (3.6 - 7.7)	6.1 (4.3 - 7.8)	6.0 (4.2 - 7.4)
	Bottom	5.8 (2.8 - 7.4)	5.3 (2.1 - 7.8)	4.8 (2.3 - 7.5)	5.2 (2.5 - 7.8)	5.0 (2.2 - 8.0)	5.3 (2.6 - 7.9)	5.2 (2.1 - 7.6)
Dissolved Oxygen (% Saturation)		89 (57 - 101)	86 (68 - 102)	80 (55 - 95)	87 (66 - 99)	82 (54 - 101)	86 (61 - 101)	85 (58 - 97)
	Bottom	83 (42 - 101)	74 (30 - 102)	63 (14 - 98)	73 (27 - 101)	69 (21 - 105)	73 (23 - 101)	73 (28 - 98)
pH		8.1 (7.8 - 8.3)	8.1 (7.7 - 8.3)	8.0 (7.6 - 8.2)	8.0 (7.6 - 8.2)	8.1 (7.7 - 8.3)	8.1 (7.6 - 8.3)	8.1 (7.6 - 8.2)
Secchi Disc Depth (m)		2.5 (1.9 - 3.0)	3.2 (2.0 - 4.2)	3.5 (1.7 - 4.8)	3.8 (2.5 - 6.5)	3.4 (2.2 - 4.8)	4.0 (3.1 - 5.2)	3.9 (2.3 - 6.3)
Turbidity (NTU)		2.0 (0.8 - 3.6)	1.5 (0.5 - 2.8)	1.3 (0.6 - 2.9)	1.0 (0.3 - 2.3)	1.7 (0.5 - 2.6)	1.5 (0.4 - 2.5)	1.8 (0.4 - 6.2)
Suspended Solids (mg/L)		6.6 (2.1 - 9.8)	5.8 (1.7 - 9.7)	5.8 (1.5 - 9.0)	4.8 (1.2 - 8.0)	6.8 (1.8 - 15.2)	5.7 (1.8 - 10.9)	6.1 (1.5 - 13.0)
5-day Biochemical Oxygen Demand (mg/L)		0.9 (0.2 - 1.5)	0.7 (0.2 - 1.1)	0.7 (0.2 - 1.2)	0.5 (<0.1 - 0.9)	0.5 (0.2 - 1.0)	0.6 (0.2 - 1.3)	0.5 (<0.1 - 0.9)
Ammonia Nitrogen (mg/L)		0.030 (0.008 - 0.066)	0.027 (0.011 - 0.067)	0.030 (<0.005 - 0.061)	0.022 (0.005 - 0.033)	0.022 (0.010 - 0.049)	0.018 (0.007 - 0.032)	0.020 (<0.005 - 0.032)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.004)	0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.004)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.007 (<0.002 - 0.037)	0.008 (<0.002 - 0.032)	0.011 (<0.002 - 0.035)	0.006 (<0.002 - 0.025)	0.008 (<0.002 - 0.033)	0.007 (0.002 - 0.029)	0.006 (<0.002 - 0.024)
Nitrate Nitrogen (mg/L)		0.026 (<0.002 - 0.107)	0.021 (<0.002 - 0.091)	0.024 (<0.002 - 0.086)	0.020 (<0.002 - 0.103)	0.026 (<0.002 - 0.127)	0.022 (<0.002 - 0.130)	0.020 (<0.002 - 0.117)
Total Inorganic Nitrogen (mg/L)		0.06 (0.01 - 0.13)	0.06 (0.01 - 0.11)	0.06 (0.01 - 0.11)	0.05 (<0.01 - 0.12)	0.06 (0.02 - 0.14)	0.05 (0.01 - 0.14)	0.05 (<0.01 - 0.14)
Total Kjeldahl Nitrogen (mg/L)		0.34 (0.14 - 0.63)	0.29 (0.15 - 0.61)	0.30 (0.11 - 0.60)	0.25 (0.12 - 0.43)	0.25 (0.14 - 0.58)	0.25 (0.09 - 0.59)	0.24 (0.13 - 0.48)
Total Nitrogen (mg/L)		0.37 (0.16 - 0.63)	0.32 (0.17 - 0.61)	0.33 (0.18 - 0.63)	0.27 (0.12 - 0.47)	0.29 (0.14 - 0.58)	0.28 (0.10 - 0.59)	0.26 (0.14 - 0.50)
Orthophosphate Phosphorus (mg/L)		0.006 (<0.002 - 0.012)	0.007 (<0.002 - 0.011)	0.009 (<0.002 - 0.020)	0.008 (<0.002 - 0.023)	0.008 (<0.002 - 0.015)	0.007 (<0.002 - 0.017)	0.007 (<0.002 - 0.015)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.77 (0.08 - 1.40)	0.78 (0.13 - 1.53)	0.88 (0.35 - 1.48)	0.70 (0.16 - 1.24)	0.81 (0.30 - 1.44)	0.78 (0.22 - 1.33)	0.67 (0.08 - 1.27)
Chlorophyll-*a* (µg/L)		4.2 (1.6 - 8.6)	3.0 (0.7 - 7.2)	2.9 (0.5 - 6.6)	2.0 (0.2 - 3.8)	2.0 (0.2 - 4.4)	2.3 (0.2 - 5.0)	1.8 (0.2 - 5.3)
E.coli (count/100mL)		7 (1 - 100)	2 (<1 - 6)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 13)	1 (<1 - 1)
Faecal Coliforms (count/100mL)		19 (5 - 340)	2 (<1 - 16)	1 (<1 - 2)	1 (<1 - 1)	1 (<1 - 2)	1 (<1 - 23)	1 (<1 - 1)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Mirs Bay WCZ in 2019 (continued)

Parameter		Ninepin Group MM19	Waglan Isalnd MM8	Mirs Bay (South) MM13	Mirs Bay (Central) MM14	Mirs Bay (Central) MM15	Mirs Bay (Central) MM16	Long Harbour MM6
Number of samples		**12**	**12**	**12**	**12**	**12**	**12**	**12**
Temperature (°C)		23.4 (18.3 - 29.1)	23.6 (18.2 - 29.1)	23.6 (18.0 - 29.1)	23.5 (18.0 - 28.9)	23.7 (18.1 - 29.0)	23.7 (18.4 - 28.9)	24.3 (18.4 - 29.8)
Salinity		33.3 (32.0 - 33.9)	33.0 (31.8 - 34.2)	32.9 (31.4 - 34.3)	33.2 (31.8 - 34.3)	33.3 (31.9 - 34.2)	33.1 (32.2 - 33.8)	32.5 (31.1 - 33.5)
Dissolved Oxygen (mg/L)		6.2 (4.6 - 7.8)	6.2 (4.9 - 7.8)	6.3 (4.9 - 7.9)	6.3 (5.1 - 8.2)	6.3 (4.9 - 8.2)	6.3 (4.5 - 8.1)	6.2 (4.6 - 7.7)
	Bottom	6.0 (3.9 - 7.8)	6.1 (4.1 - 8.1)	6.1 (4.2 - 8.1)	6.2 (4.2 - 8.3)	6.0 (3.8 - 8.3)	6.1 (3.6 - 8.5)	5.7 (3.1 - 7.7)
Dissolved Oxygen (% Saturation)		88 (66 - 102)	87 (70 - 102)	88 (72 - 102)	90 (73 - 107)	89 (73 - 108)	90 (66 - 107)	88 (61 - 101)
	Bottom	85 (55 - 102)	85 (58 - 106)	85 (59 - 104)	87 (59 - 109)	85 (54 - 109)	86 (51 - 112)	79 (32 - 102)
pH		8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)
Secchi Disc Depth (m)		3.7 (2.6 - 5.5)	3.7 (2.5 - 6.8)	4.0 (2.5 - 6.0)	3.6 (2.9 - 4.7)	4.1 (2.7 - 5.4)	4.1 (2.9 - 5.4)	3.6 (2.4 - 5.3)
Turbidity (NTU)		2.6 (0.4 - 10.7)	3.2 (0.6 - 12.0)	3.4 (0.8 - 12.8)	2.7 (0.3 - 11.4)	2.7 (0.3 - 11.4)	2.6 (0.3 - 12.8)	1.4 (0.2 - 6.9)
Suspended Solids (mg/L)		5.4 (1.9 - 10.5)	5.8 (1.2 - 10.3)	6.2 (2.0 - 9.7)	5.4 (2.0 - 8.5)	5.1 (1.0 - 9.1)	5.3 (1.3 - 9.2)	5.2 (1.2 - 9.3)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.1 - 1.5)	0.5 (<0.1 - 1.5)	0.4 (<0.1 - 1.4)	0.6 (<0.1 - 1.5)	0.5 (<0.1 - 1.6)	0.8 (0.2 - 1.8)	0.7 (0.1 - 1.5)
Ammonia Nitrogen (mg/L)		0.013 (<0.005 - 0.024)	0.013 (<0.005 - 0.022)	0.014 (<0.005 - 0.024)	0.011 (<0.005 - 0.023)	0.011 (<0.005 - 0.026)	0.014 (<0.005 - 0.029)	0.020 (0.008 - 0.046)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.001)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.001)	0.001 (<0.001 - 0.002)	0.001 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)		0.007 (<0.002 - 0.023)	0.009 (<0.002 - 0.030)	0.009 (<0.002 - 0.034)	0.007 (<0.002 - 0.021)	0.005 (<0.002 - 0.014)	0.004 (<0.002 - 0.011)	0.007 (<0.002 - 0.024)
Nitrate Nitrogen (mg/L)		0.029 (<0.002 - 0.147)	0.034 (<0.002 - 0.163)	0.048 (<0.002 - 0.160)	0.029 (<0.002 - 0.163)	0.025 (<0.002 - 0.157)	0.015 (<0.002 - 0.124)	0.016 (<0.002 - 0.082)
Total Inorganic Nitrogen (mg/L)		0.05 (0.01 - 0.17)	0.06 (0.01 - 0.18)	0.07 (<0.01 - 0.18)	0.05 (<0.01 - 0.18)	0.04 (<0.01 - 0.17)	0.03 (0.01 - 0.14)	0.04 (0.01 - 0.10)
Total Kjeldahl Nitrogen (mg/L)		0.30 (0.14 - 0.66)	0.31 (0.12 - 0.53)	0.29 (0.12 - 0.48)	0.26 (0.10 - 0.46)	0.27 (0.09 - 0.56)	0.29 (0.13 - 0.57)	0.27 (0.13 - 0.55)
Total Nitrogen (mg/L)		0.33 (0.14 - 0.66)	0.36 (0.13 - 0.55)	0.35 (0.18 - 0.49)	0.29 (0.11 - 0.46)	0.30 (0.09 - 0.58)	0.31 (0.13 - 0.57)	0.29 (0.15 - 0.55)
Orthophosphate Phosphorus (mg/L)		0.009 (<0.002 - 0.019)	0.008 (<0.002 - 0.020)	0.010 (<0.002 - 0.020)	0.008 (<0.002 - 0.019)	0.008 (<0.002 - 0.019)	0.007 (<0.002 - 0.017)	0.006 (<0.002 - 0.011)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.14)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.13)	0.03 (<0.02 - 0.12)	0.04 (<0.02 - 0.15)	0.03 (<0.02 - 0.10)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.60 (0.16 - 1.40)	0.61 (0.18 - 1.47)	0.63 (0.10 - 1.43)	0.58 (0.17 - 1.40)	0.57 (0.19 - 1.40)	0.55 (0.16 - 1.27)	0.62 (0.18 - 1.10)
Chlorophyll-*a* (µg/L)		2.1 (0.3 - 5.9)	1.7 (0.6 - 4.7)	1.5 (0.2 - 5.0)	1.7 (0.6 - 4.0)	1.5 (0.5 - 3.4)	2.1 (0.8 - 5.1)	2.5 (0.2 - 5.0)
E.coli (count/100mL)		1 (<1 - 7)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 2)
Faecal Coliforms (count/100mL)		1 (<1 - 11)	1 (<1 - 1)	1 (<1 - 4)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 1)	1 (<1 - 3)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Port Shelter WCZ in 2019

Parameter		Inner Port Shelter PM1	PM2	PM3	PM4	Hebe Haven PM6
Number of samples		**12**	**12**	**12**	**12**	**12**
Temperature (°C)		24.9 (18.7 - 33.2)	24.8 (18.7 - 33.3)	24.4 (18.7 - 32.2)	24.7 (18.5 - 33.3)	24.4 (18.5 - 33.0)
Salinity		31.0 (19.2 - 33.3)	31.0 (19.2 - 33.3)	31.6 (22.2 - 33.4)	31.2 (19.4 - 33.4)	31.3 (21.5 - 33.7)
Dissolved Oxygen (mg/L)		6.0 (4.7 - 7.6)	6.0 (4.5 - 7.2)	5.9 (4.3 - 7.8)	5.8 (4.1 - 7.4)	5.8 (4.3 - 7.5)
	Bottom	6.0 (4.4 - 7.9)	5.8 (3.0 - 7.5)	5.0 (2.0 - 7.5)	5.6 (2.7 - 7.8)	5.3 (2.7 - 7.7)
Dissolved Oxygen (% Saturation)		86 (72 - 100)	86 (70 - 97)	84 (65 - 104)	83 (62 - 99)	82 (63 - 97)
	Bottom	85 (68 - 104)	83 (49 - 102)	70 (29 - 100)	79 (39 - 103)	74 (34 - 101)
pH		8.1 (7.7 - 9.1)	8.1 (7.8 - 9.0)	8.1 (7.7 - 8.9)	8.1 (7.7 - 9.0)	8.0 (7.6 - 8.9)
Secchi Disc Depth (m)		2.9 (2.0 - 4.3)	3.0 (2.0 - 5.3)	3.2 (2.3 - 4.5)	2.9 (1.5 - 5.0)	5.0 (2.7 - 22.0)
Turbidity (NTU)		2.6 (0.4 - 10.6)	2.6 (0.2 - 10.9)	2.4 (0.2 - 10.6)	2.8 (0.4 - 12.5)	2.6 (0.4 - 10.5)
Suspended Solids (mg/L)		6.1 (2.8 - 10.2)	5.7 (2.0 - 9.4)	5.4 (1.5 - 8.9)	6.2 (1.5 - 13.0)	6.0 (1.6 - 11.4)
5-day Biochemical Oxygen Demand (mg/L)		1.2 (0.5 - 2.7)	0.8 (0.4 - 1.6)	0.8 (0.4 - 2.1)	0.8 (0.4 - 1.3)	0.9 (0.4 - 1.8)
Ammonia Nitrogen (mg/L)		0.025 (<0.005 - 0.050)	0.024 (0.008 - 0.040)	0.022 (0.008 - 0.041)	0.024 (<0.005 - 0.047)	0.026 (0.009 - 0.038)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.009)	0.002 (<0.001 - 0.011)	0.001 (<0.001 - 0.007)	0.002 (<0.001 - 0.008)	0.002 (<0.001 - 0.014)
Nitrite Nitrogen (mg/L)		0.003 (<0.002 - 0.007)	0.004 (<0.002 - 0.007)	0.004 (<0.002 - 0.007)	0.003 (<0.002 - 0.008)	0.005 (0.002 - 0.010)
Nitrate Nitrogen (mg/L)		0.029 (<0.002 - 0.140)	0.034 (<0.002 - 0.140)	0.032 (<0.002 - 0.130)	0.031 (<0.002 - 0.140)	0.040 (<0.002 - 0.140)
Total Inorganic Nitrogen (mg/L)		0.06 (<0.01 - 0.17)	0.06 (0.01 - 0.17)	0.06 (0.01 - 0.16)	0.06 (<0.01 - 0.16)	0.07 (0.02 - 0.17)
Total Kjeldahl Nitrogen (mg/L)		0.35 (0.19 - 0.56)	0.36 (0.15 - 0.56)	0.34 (0.13 - 0.55)	0.35 (0.14 - 0.68)	0.34 (0.17 - 0.78)
Total Nitrogen (mg/L)		0.38 (0.21 - 0.57)	0.40 (0.24 - 0.57)	0.38 (0.20 - 0.56)	0.39 (0.26 - 0.68)	0.39 (0.24 - 0.79)
Orthophosphate Phosphorus (mg/L)		0.006 (<0.002 - 0.015)	0.007 (<0.002 - 0.017)	0.007 (<0.002 - 0.017)	0.007 (<0.002 - 0.016)	0.008 (<0.002 - 0.017)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.61 (0.07 - 1.33)	0.67 (0.16 - 1.33)	0.62 (0.14 - 1.33)	0.72 (0.18 - 1.33)	0.71 (0.07 - 1.43)
Chlorophyll-*a* (µg/L)		4.1 (1.1 - 14.1)	3.1 (0.7 - 9.2)	2.3 (0.5 - 8.1)	2.6 (0.6 - 11.3)	2.5 (0.5 - 6.9)
E.coli (count/100mL)		2 (<1 - 27)	5 (1 - 37)	2 (<1 - 17)	2 (<1 - 33)	2 (<1 - 29)
Faecal Coliforms (count/100mL)		4 (<1 - 110)	21 (1 - 280)	3 (<1 - 74)	3 (<1 - 180)	5 (1 - 160)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Port Shelter WCZ in 2019 (continued)

Parameter		Outer Port Shelter PM7	Outer Port Shelter PM8	Rocky Harbour PM9	Bluff Island PM11
Number of samples		**12**	**12**	**12**	**12**
Temperature (°C)		24.0 (18.4 - 31.4)	23.8 (18.4 - 30.7)	24.0 (18.2 - 31.5)	23.8 (18.2 - 30.6)
Salinity		31.9 (23.7 - 34.1)	32.2 (25.2 - 34.0)	32.1 (24.2 - 34.1)	32.3 (25.3 - 33.9)
Dissolved Oxygen (mg/L)		6.0 (4.3 - 7.7)	6.0 (4.2 - 7.6)	6.0 (4.1 - 7.7)	6.0 (4.1 - 7.6)
	Bottom	5.3 (2.1 - 7.9)	5.7 (3.3 - 7.6)	5.7 (2.7 - 7.8)	5.7 (2.1 - 7.8)
Dissolved Oxygen (% Saturation)		84 (62 - 101)	84 (55 - 97)	85 (62 - 99)	85 (57 - 98)
	Bottom	73 (31 - 104)	78 (40 - 101)	81 (39 - 101)	80 (31 - 100)
pH		8.0 (7.6 - 8.9)	8.0 (7.6 - 8.8)	8.1 (7.7 - 8.9)	8.0 (7.6 - 8.8)
Secchi Disc Depth (m)		4.1 (3.0 - 6.6)	3.9 (2.7 - 6.6)	3.7 (2.4 - 6.3)	4.0 (2.8 - 6.8)
Turbidity (NTU)		2.3 (0.2 - 11.4)	2.6 (0.4 - 12.0)	2.4 (0.3 - 12.0)	2.6 (0.4 - 11.3)
Suspended Solids (mg/L)		5.6 (1.2 - 10.6)	5.5 (1.7 - 11.6)	5.6 (1.4 - 11.2)	5.6 (1.4 - 8.9)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.3 - 1.1)	0.5 (0.2 - 0.8)	0.6 (0.3 - 1.0)	0.6 (0.3 - 1.4)
Ammonia Nitrogen (mg/L)		0.019 (0.005 - 0.035)	0.017 (0.006 - 0.025)	0.018 (0.006 - 0.031)	0.018 (0.008 - 0.028)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.005)	0.001 (<0.001 - 0.006)	0.001 (<0.001 - 0.006)	0.001 (<0.001 - 0.006)
Nitrite Nitrogen (mg/L)		0.005 (<0.002 - 0.011)	0.006 (<0.002 - 0.014)	0.006 (<0.002 - 0.013)	0.006 (<0.002 - 0.014)
Nitrate Nitrogen (mg/L)		0.040 (<0.002 - 0.143)	0.040 (<0.002 - 0.157)	0.040 (<0.002 - 0.153)	0.046 (<0.002 - 0.167)
Total Inorganic Nitrogen (mg/L)		0.06 (<0.01 - 0.17)	0.06 (<0.01 - 0.18)	0.06 (<0.01 - 0.17)	0.07 (0.01 - 0.19)
Total Kjeldahl Nitrogen (mg/L)		0.34 (0.17 - 0.70)	0.32 (0.14 - 0.64)	0.33 (0.16 - 0.62)	0.33 (0.16 - 0.50)
Total Nitrogen (mg/L)		0.38 (0.26 - 0.70)	0.37 (0.20 - 0.66)	0.37 (0.20 - 0.62)	0.38 (0.22 - 0.52)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.018)	0.008 (0.003 - 0.019)	0.008 (0.005 - 0.018)	0.009 (0.005 - 0.020)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.66 (0.25 - 1.33)	0.68 (0.26 - 1.40)	0.67 (0.13 - 1.40)	0.69 (0.13 - 1.40)
Chlorophyll-*a* (µg/L)		1.8 (0.4 - 5.3)	1.3 (0.3 - 2.9)	1.5 (0.6 - 3.1)	1.7 (0.5 - 6.1)
E.coli (count/100mL)		1 (<1 - 2)	1 (<1 - 3)	1 (<1 - 2)	1 (<1 - 1)
Faecal Coliforms (count/100mL)		1 (<1 - 6)	2 (<1 - 4)	1 (<1 - 3)	1 (<1 - 3)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Tolo Harbour WCZ in 2019

Parameter		Harbour Subzone			Buffer Subzone		Channel Subzone	
		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		25.2 (17.8 - 32.0)	25.1 (18.6 - 31.4)	25.0 (18.7 - 31.5)	25.3 (18.6 - 32.4)	24.6 (18.5 - 30.5)	24.6 (18.7 - 30.8)	24.1 (18.3 - 29.4)
Salinity		30.0 (22.2 - 32.1)	30.9 (25.4 - 32.7)	30.9 (24.9 - 32.8)	30.7 (24.7 - 32.8)	31.5 (26.0 - 33.4)	31.5 (25.9 - 33.3)	32.1 (26.8 - 33.6)
Dissolved Oxygen (mg/L)		6.4 (4.7 - 7.7)	6.3 (4.8 - 7.8)	6.3 (5.2 - 7.5)	6.0 (4.9 - 7.1)	5.9 (3.8 - 8.4)	6.0 (5.0 - 8.0)	5.3 (3.2 - 7.3)
	Bottom	6.2 (4.3 - 8.0)	6.0 (4.2 - 7.8)	5.8 (3.1 - 7.2)	5.7 (4.4 - 7.1)	4.8 (0.5 - 8.1)	5.3 (3.8 - 6.9)	4.3 (0.3 - 7.3)
Dissolved Oxygen (% Saturation)		91 (64 - 113)	91 (72 - 112)	91 (81 - 103)	87 (78 - 94)	85 (59 - 112)	86 (80 - 106)	76 (49 - 96)
	Bottom	90 (65 - 123)	86 (62 - 106)	84 (57 - 94)	83 (70 - 94)	68 (8 - 108)	77 (62 - 91)	60 (5 - 95)
pH		8.1 (7.7 - 8.7)	8.1 (7.6 - 8.6)	8.0 (7.7 - 8.7)	8.1 (7.7 - 8.8)	8.0 (7.6 - 8.6)	8.1 (7.7 - 8.7)	8.0 (7.6 - 8.6)
Secchi Disc Depth (m)		2.5 (1.5 - 3.1)	2.6 (2.0 - 3.3)	2.7 (2.1 - 3.6)	2.7 (2.0 - 3.1)	2.7 (2.0 - 3.7)	2.9 (2.0 - 3.6)	3.6 (2.2 - 6.0)
Turbidity (NTU)		3.6 (0.6 - 16.8)	2.9 (0.3 - 10.7)	3.1 (0.4 - 11.5)	2.8 (0.4 - 10.2)	2.5 (0.2 - 11.3)	2.9 (0.3 - 10.9)	3.0 (0.6 - 12.1)
Suspended Solids (mg/L)		6.1 (2.0 - 14.0)	6.1 (2.1 - 17.0)	5.4 (2.5 - 12.7)	5.8 (1.9 - 12.5)	4.9 (1.8 - 10.2)	5.5 (1.6 - 10.9)	11.6 (1.9 - 71.2)
5-day Biochemical Oxygen Demand (mg/L)		1.6 (0.2 - 2.5)	1.4 (<0.1 - 3.1)	1.2 (<0.1 - 1.9)	1.2 (<0.1 - 2.3)	1.2 (0.9 - 1.8)	1.1 (0.6 - 1.8)	0.7 (0.4 - 1.0)
Ammonia Nitrogen (mg/L)		0.042 (0.017 - 0.072)	0.030 (0.010 - 0.051)	0.031 (0.008 - 0.067)	0.024 (0.007 - 0.050)	0.027 (0.008 - 0.047)	0.027 (0.006 - 0.063)	0.025 (0.006 - 0.047)
Unionised Ammonia (mg/L)		0.004 (<0.001 - 0.020)	0.002 (<0.001 - 0.011)	0.003 (<0.001 - 0.019)	0.002 (<0.001 - 0.016)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.007)	0.001 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.004 (<0.002 - 0.013)	0.003 (<0.002 - 0.011)	0.004 (<0.002 - 0.011)	0.002 (<0.002 - 0.005)	0.005 (<0.002 - 0.012)	0.004 (<0.002 - 0.013)	0.006 (<0.002 - 0.019)
Nitrate Nitrogen (mg/L)		0.009 (<0.002 - 0.034)	0.010 (<0.002 - 0.053)	0.011 (<0.002 - 0.056)	0.007 (<0.002 - 0.034)	0.016 (<0.002 - 0.086)	0.014 (<0.002 - 0.086)	0.027 (<0.002 - 0.119)
Total Inorganic Nitrogen (mg/L)		0.06 (0.03 - 0.12)	0.04 (0.01 - 0.12)	0.05 (0.02 - 0.13)	0.03 (0.01 - 0.08)	0.05 (0.02 - 0.12)	0.05 (0.01 - 0.11)	0.06 (0.02 - 0.14)
Total Kjeldahl Nitrogen (mg/L)		0.42 (0.15 - 0.64)	0.38 (0.18 - 0.59)	0.37 (0.15 - 0.57)	0.39 (0.14 - 0.64)	0.37 (0.11 - 0.66)	0.34 (0.13 - 0.58)	0.30 (0.11 - 0.51)
Total Nitrogen (mg/L)		0.43 (0.15 - 0.64)	0.40 (0.18 - 0.61)	0.39 (0.15 - 0.57)	0.40 (0.14 - 0.64)	0.39 (0.15 - 0.67)	0.36 (0.15 - 0.58)	0.33 (0.13 - 0.56)
Orthophosphate Phosphorus (mg/L)		0.005 (<0.002 - 0.014)	0.005 (<0.002 - 0.016)	0.005 (<0.002 - 0.011)	0.004 (<0.002 - 0.006)	0.006 (<0.002 - 0.018)	0.006 (<0.002 - 0.016)	0.010 (<0.002 - 0.028)
Total Phosphorus (mg/L)		0.03 (0.02 - 0.07)	0.03 (<0.02 - 0.09)	0.04 (<0.02 - 0.15)	0.04 (<0.02 - 0.25)	0.04 (<0.02 - 0.18)	0.03 (<0.02 - 0.13)	0.03 (<0.02 - 0.05)
Silica (as SiO_2) (mg/L)		0.85 (0.30 - 1.40)	0.71 (0.33 - 1.39)	0.78 (0.31 - 1.38)	0.63 (0.09 - 1.30)	0.85 (0.52 - 1.44)	0.83 (0.36 - 1.42)	0.90 (0.24 - 1.83)
Chlorophyll-*a* (µg/L)		7.2 (2.2 - 12.0)	6.8 (1.3 - 17.4)	5.7 (1.8 - 9.8)	3.8 (1.4 - 10.5)	4.3 (1.8 - 14.2)	4.3 (1.9 - 11.7)	2.2 (1.0 - 4.8)
E.coli (count/100mL)		7 (<1 - 250)	4 (<1 - 85)	2 (<1 - 21)	1 (<1 - 14)	1 (<1 - 35)	1 (<1 - 1)	1 (<1 - 2)
Faecal Coliforms (count/100mL)		38 (1 - 520)	10 (1 - 150)	5 (<1 - 53)	3 (<1 - 17)	2 (<1 - 72)	1 (<1 - 3)	1 (<1 - 2)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2019

Parameter		Hong Kong Island (South) SM1	SM2	SM19	East Lamma Channel SM3	SM4
Number of samples		**12**	**12**	**12**	**12**	**12**
Temperature (°C)		23.9 (18.1 - 28.3)	24.1 (18.6 - 28.2)	23.9 (18.2 - 28.3)	24.3 (19.1 - 29.3)	24.4 (18.8 - 28.4)
Salinity		32.5 (29.7 - 33.9)	32.2 (28.4 - 33.7)	32.5 (29.5 - 33.8)	32.4 (31.0 - 33.5)	31.3 (25.2 - 33.5)
Dissolved Oxygen (mg/L)		6.2 (4.1 - 7.4)	6.1 (4.6 - 8.1)	6.1 (4.5 - 7.5)	6.2 (4.5 - 8.7)	6.0 (4.5 - 7.6)
	Bottom	5.8 (3.0 - 7.6)	5.6 (2.4 - 8.0)	5.8 (3.1 - 7.7)	5.9 (2.4 - 9.0)	5.9 (3.1 - 8.0)
Dissolved Oxygen (% Saturation)		89 (61 - 100)	87 (68 - 107)	87 (66 - 98)	88 (68 - 114)	86 (67 - 101)
	Bottom	82 (44 - 99)	80 (35 - 105)	82 (44 - 99)	83 (35 - 117)	84 (46 - 105)
pH		8.0 (7.6 - 8.2)	8.0 (7.6 - 8.2)	8.0 (7.6 - 8.2)	7.9 (7.6 - 8.2)	8.0 (7.6 - 8.2)
Secchi Disc Depth (m)		3.0 (2.0 - 4.1)	2.9 (2.0 - 4.3)	3.4 (2.0 - 4.6)	2.9 (1.9 - 3.8)	2.8 (1.9 - 4.4)
Turbidity (NTU)		2.6 (0.5 - 6.3)	2.8 (0.5 - 8.7)	3.6 (0.9 - 8.8)	3.3 (0.5 - 12.3)	2.3 (0.6 - 4.9)
Suspended Solids (mg/L)		6.7 (1.5 - 15.0)	7.3 (1.9 - 14.3)	7.7 (1.6 - 18.0)	6.8 (2.1 - 11.6)	6.7 (2.5 - 13.0)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.2 - 1.5)	0.7 (0.2 - 1.8)	0.6 (0.2 - 1.6)	0.6 (0.1 - 1.4)	0.7 (0.2 - 1.9)
Ammonia Nitrogen (mg/L)		0.021 (0.007 - 0.034)	0.026 (0.011 - 0.049)	0.016 (0.006 - 0.039)	0.034 (<0.005 - 0.054)	0.043 (0.011 - 0.091)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.004)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.004)	0.002 (<0.001 - 0.006)
Nitrite Nitrogen (mg/L)		0.009 (<0.002 - 0.018)	0.011 (0.002 - 0.024)	0.009 (<0.002 - 0.022)	0.023 (0.002 - 0.057)	0.019 (0.002 - 0.039)
Nitrate Nitrogen (mg/L)		0.051 (<0.002 - 0.180)	0.067 (0.004 - 0.233)	0.057 (<0.002 - 0.200)	0.076 (<0.002 - 0.177)	0.108 (0.003 - 0.327)
Total Inorganic Nitrogen (mg/L)		0.08 (0.02 - 0.22)	0.10 (0.03 - 0.28)	0.08 (0.01 - 0.23)	0.13 (0.04 - 0.27)	0.17 (0.03 - 0.38)
Total Kjeldahl Nitrogen (mg/L)		0.34 (0.13 - 0.69)	0.31 (0.16 - 0.57)	0.34 (0.15 - 0.82)	0.45 (0.14 - 1.33)	0.39 (0.22 - 0.99)
Total Nitrogen (mg/L)		0.40 (0.20 - 0.70)	0.39 (0.22 - 0.69)	0.41 (0.20 - 0.83)	0.55 (0.25 - 1.44)	0.51 (0.30 - 1.08)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.017)	0.008 (<0.002 - 0.017)	0.009 (<0.002 - 0.017)	0.008 (0.004 - 0.015)	0.010 (0.004 - 0.016)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.04)	0.03 (<0.02 - 0.07)	0.03 (<0.02 - 0.05)	0.03 (<0.02 - 0.04)	0.03 (0.02 - 0.07)
Silica (as SiO_2) (mg/L)		0.71 (0.13 - 1.80)	0.83 (0.21 - 1.87)	0.81 (0.14 - 2.10)	0.79 (0.22 - 1.43)	1.06 (0.28 - 2.97)
Chlorophyll-*a* (µg/L)		2.7 (0.5 - 13.6)	3.0 (0.3 - 11.6)	2.5 (0.2 - 9.6)	3.3 (0.4 - 10.9)	4.5 (0.7 - 17.6)
E.coli (count/100mL)		2 (<1 - 34)	3 (<1 - 81)	2 (<1 - 42)	3 (<1 - 320)	6 (1 - 200)
Faecal Coliforms (count/100mL)		4 (<1 - 47)	6 (<1 - 100)	2 (<1 - 62)	5 (1 - 370)	13 (1 - 280)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2019 (continued)

Parameter		West Lamma Channel				
		SM5	SM6	SM7	SM9	SM18
Number of samples		12	12	12	12	12
Temperature (°C)		24.6 (18.5 - 28.9)	24.3 (18.6 - 28.4)	24.5 (18.6 - 28.6)	24.8 (19.1 - 29.5)	24.2 (18.4 - 28.4)
Salinity		30.8 (22.5 - 33.6)	31.6 (25.2 - 33.6)	30.5 (23.0 - 33.5)	29.9 (25.4 - 33.4)	32.2 (28.3 - 33.9)
Dissolved Oxygen (mg/L)		6.2 (5.0 - 8.3)	6.0 (4.4 - 7.8)	6.1 (4.8 - 8.7)	6.1 (4.7 - 8.9)	6.1 (4.0 - 7.7)
	Bottom	5.9 (3.8 - 8.5)	5.5 (2.1 - 8.0)	5.9 (2.2 - 8.5)	6.0 (4.6 - 8.8)	5.6 (2.3 - 7.8)
Dissolved Oxygen (% Saturation)		89 (73 - 110)	85 (67 - 104)	87 (69 - 117)	87 (71 - 130)	87 (60 - 103)
	Bottom	86 (58 - 112)	77 (27 - 106)	84 (33 - 112)	85 (67 - 128)	79 (34 - 103)
pH		8.0 (7.7 - 8.2)	8.0 (7.6 - 8.2)	8.0 (7.6 - 8.2)	7.9 (7.7 - 8.3)	8.0 (7.6 - 8.2)
Secchi Disc Depth (m)		2.6 (1.9 - 4.0)	2.8 (2.0 - 4.0)	2.7 (2.1 - 3.7)	2.5 (1.8 - 3.6)	2.9 (2.0 - 3.8)
Turbidity (NTU)		3.2 (0.6 - 6.5)	3.9 (0.3 - 13.1)	3.4 (0.8 - 7.6)	4.8 (0.6 - 15.5)	3.9 (0.9 - 8.9)
Suspended Solids (mg/L)		7.9 (3.1 - 15.0)	9.8 (1.6 - 33.7)	9.0 (2.1 - 23.3)	9.9 (1.7 - 23.7)	9.2 (1.6 - 20.3)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.3 - 1.6)	0.7 (0.2 - 1.7)	0.7 (0.2 - 1.5)	0.7 (<0.1 - 2.2)	0.6 (0.1 - 2.1)
Ammonia Nitrogen (mg/L)		0.027 (0.005 - 0.053)	0.026 (<0.005 - 0.064)	0.046 (0.009 - 0.095)	0.093 (0.050 - 0.140)	0.020 (0.007 - 0.062)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.004)	0.001 (<0.001 - 0.005)	0.002 (<0.001 - 0.006)	0.004 (0.002 - 0.009)	0.001 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)		0.018 (0.002 - 0.039)	0.017 (0.003 - 0.040)	0.022 (0.002 - 0.039)	0.038 (0.012 - 0.102)	0.014 (<0.002 - 0.031)
Nitrate Nitrogen (mg/L)		0.110 (0.007 - 0.343)	0.097 (<0.002 - 0.320)	0.136 (0.020 - 0.347)	0.213 (0.042 - 0.380)	0.067 (<0.002 - 0.220)
Total Inorganic Nitrogen (mg/L)		0.16 (0.04 - 0.41)	0.14 (0.03 - 0.36)	0.20 (0.07 - 0.40)	0.34 (0.15 - 0.52)	0.10 (0.02 - 0.25)
Total Kjeldahl Nitrogen (mg/L)		0.33 (0.17 - 0.67)	0.35 (0.17 - 0.96)	0.35 (0.13 - 0.90)	0.51 (0.12 - 1.53)	0.35 (0.17 - 0.65)
Total Nitrogen (mg/L)		0.46 (0.24 - 0.71)	0.47 (0.25 - 0.99)	0.51 (0.29 - 0.98)	0.76 (0.22 - 1.76)	0.43 (0.20 - 0.68)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.016)	0.009 (0.003 - 0.016)	0.010 (0.004 - 0.015)	0.016 (0.006 - 0.022)	0.009 (<0.002 - 0.018)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.07)	0.03 (<0.02 - 0.09)	0.03 (0.02 - 0.07)	0.04 (0.03 - 0.05)	0.03 (<0.02 - 0.05)
Silica (as SiO_2) (mg/L)		1.06 (0.24 - 3.07)	1.04 (0.20 - 2.77)	1.20 (0.21 - 2.80)	1.27 (0.35 - 2.23)	0.87 (0.14 - 2.27)
Chlorophyll-*a* (µg/L)		4.8 (0.4 - 17.4)	3.6 (0.4 - 13.4)	4.0 (0.4 - 15.7)	5.1 (0.3 - 27.7)	3.6 (0.3 - 14.0)
E.coli (count/100mL)		2 (<1 - 65)	1 (<1 - 16)	4 (<1 - 170)	43 (3 - 700)	1 (<1 - 2)
Faecal Coliforms (count/100mL)		3 (1 - 150)	2 (1 - 37)	8 (<1 - 360)	93 (8 - 2800)	2 (<1 - 19)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Southern WCZ in 2019 (continued)

Parameter		Lantau Island (East) SM10	Lantau Island (East) SM11	Lantau Island (South) SM12	Lantau Island (South) SM13	Lantau Island (South) SM17	Soko Islands SM20
Number of samples		**12**	**12**	**12**	**12**	**12**	**12**
Temperature (°C)		25.0 (19.6 - 29.2)	24.9 (19.3 - 29.2)	24.9 (18.8 - 29.0)	25.0 (18.9 - 29.2)	24.6 (18.5 - 28.9)	24.9 (18.7 - 29.1)
Salinity		29.1 (24.5 - 33.5)	29.6 (24.7 - 33.5)	29.6 (21.9 - 33.5)	28.5 (12.0 - 33.6)	30.6 (26.5 - 33.5)	28.5 (16.4 - 33.6)
Dissolved Oxygen (mg/L)		6.2 (4.8 - 7.5)	6.5 (5.1 - 8.5)	6.5 (5.2 - 8.3)	6.4 (5.0 - 7.8)	6.2 (4.2 - 8.3)	6.4 (5.3 - 9.1)
	Bottom	6.0 (4.1 - 7.9)	6.5 (4.2 - 8.5)	6.2 (4.2 - 7.8)	5.9 (4.2 - 7.5)	5.9 (2.1 - 7.5)	6.2 (4.9 - 8.8)
Dissolved Oxygen (% Saturation)		91 (74 - 109)	98 (78 - 135)	93 (78 - 110)	90 (69 - 109)	89 (61 - 110)	91 (74 - 120)
	Bottom	88 (62 - 104)	98 (64 - 137)	90 (65 - 105)	83 (62 - 98)	84 (31 - 99)	88 (70 - 116)
pH		7.9 (7.6 - 8.2)	8.0 (7.6 - 8.2)	8.0 (7.6 - 8.2)	8.0 (7.5 - 8.2)	8.0 (7.5 - 8.2)	8.0 (7.5 - 8.2)
Secchi Disc Depth (m)		2.3 (1.5 - 3.5)	2.5 (1.8 - 3.1)	2.4 (1.7 - 3.0)	2.3 (1.8 - 3.2)	2.8 (1.8 - 3.6)	2.4 (1.7 - 3.1)
Turbidity (NTU)		3.7 (1.0 - 8.6)	3.8 (0.7 - 8.5)	3.7 (0.8 - 9.3)	3.9 (1.0 - 11.0)	3.2 (0.5 - 9.8)	3.8 (0.6 - 10.2)
Suspended Solids (mg/L)		9.5 (4.0 - 18.0)	10.3 (2.6 - 21.3)	8.7 (3.3 - 19.0)	9.1 (2.7 - 22.7)	7.9 (2.1 - 20.0)	9.0 (1.4 - 15.7)
5-day Biochemical Oxygen Demand (mg/L)		1.2 (0.3 - 2.2)	1.2 (0.3 - 2.6)	1.0 (0.3 - 2.1)	0.9 (0.4 - 2.2)	0.7 (0.1 - 1.9)	0.8 (0.3 - 2.1)
Ammonia Nitrogen (mg/L)		0.058 (0.022 - 0.130)	0.055 (0.017 - 0.137)	0.042 (0.009 - 0.130)	0.038 (0.005 - 0.098)	0.030 (<0.005 - 0.088)	0.035 (0.005 - 0.085)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.006)	0.001 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.039 (0.007 - 0.078)	0.033 (0.005 - 0.074)	0.029 (0.005 - 0.058)	0.029 (0.003 - 0.056)	0.026 (0.004 - 0.054)	0.028 (0.003 - 0.060)
Nitrate Nitrogen (mg/L)		0.240 (0.055 - 0.545)	0.195 (0.051 - 0.357)	0.190 (0.039 - 0.490)	0.235 (0.033 - 0.943)	0.166 (0.017 - 0.437)	0.218 (0.031 - 0.713)
Total Inorganic Nitrogen (mg/L)		0.34 (0.14 - 0.61)	0.28 (0.11 - 0.44)	0.26 (0.09 - 0.58)	0.30 (0.07 - 0.99)	0.22 (0.07 - 0.48)	0.28 (0.06 - 0.76)
Total Kjeldahl Nitrogen (mg/L)		0.37 (0.23 - 0.87)	0.39 (0.19 - 0.85)	0.36 (0.15 - 0.78)	0.33 (0.13 - 0.74)	0.30 (0.14 - 0.81)	0.36 (0.15 - 0.71)
Total Nitrogen (mg/L)		0.65 (0.31 - 0.98)	0.62 (0.27 - 0.96)	0.57 (0.22 - 0.87)	0.60 (0.22 - 1.11)	0.49 (0.22 - 0.87)	0.61 (0.35 - 0.90)
Orthophosphate Phosphorus (mg/L)		0.012 (<0.002 - 0.023)	0.012 (<0.002 - 0.022)	0.010 (<0.002 - 0.022)	0.010 (<0.002 - 0.019)	0.010 (<0.002 - 0.023)	0.010 (<0.002 - 0.028)
Total Phosphorus (mg/L)		0.04 (0.02 - 0.11)	0.04 (<0.02 - 0.11)	0.04 (<0.02 - 0.09)	0.04 (<0.02 - 0.11)	0.03 (<0.02 - 0.10)	0.03 (0.02 - 0.08)
Silica (as SiO_2) (mg/L)		1.51 (0.18 - 3.00)	1.31 (0.11 - 2.43)	1.19 (0.19 - 3.00)	1.36 (0.25 - 5.13)	1.17 (0.19 - 2.87)	1.35 (0.14 - 4.13)
Chlorophyll-*a* (µg/L)		11.7 (0.9 - 29.0)	11.8 (0.8 - 34.2)	7.8 (0.8 - 26.5)	5.5 (0.8 - 18.4)	4.6 (0.5 - 22.3)	5.2 (0.6 - 25.7)
E.coli (count/100mL)		4 (<1 - 44)	3 (<1 - 13)	68 (3 - 2100)	3 (<1 - 20)	1 (<1 - 5)	1 (<1 - 3)
Faecal Coliforms (count/100mL)		9 (1 - 110)	7 (1 - 34)	110 (4 - 4000)	5 (1 - 40)	2 (<1 - 11)	2 (1 - 12)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Victoria Harbour WCZ in 2019

Parameter		Victoria Harbour (East) VM1	Victoria Harbour (East) VM2	Victoria Harbour (Central) VM4	Victoria Harbour (Central) VM5	Victoria Harbour (Central) VM6
Number of samples		**12**	**12**	**12**	**12**	**12**
Temperature (°C)		24.0 (19.2 - 29.3)	24.3 (19.2 - 29.2)	24.4 (19.1 - 29.3)	24.4 (19.2 - 29.4)	24.4 (19.3 - 29.5)
Salinity		32.6 (31.0 - 33.4)	32.1 (30.1 - 33.3)	31.7 (29.9 - 33.2)	31.5 (29.5 - 33.3)	31.5 (28.8 - 33.2)
Dissolved Oxygen (mg/L)		5.9 (4.3 - 7.4)	5.8 (4.4 - 7.3)	5.8 (4.3 - 7.2)	5.7 (4.1 - 7.0)	5.6 (4.2 - 6.9)
	Bottom	5.8 (3.3 - 7.6)	5.9 (4.3 - 7.3)	5.8 (4.5 - 7.1)	5.6 (3.9 - 7.3)	5.6 (3.6 - 7.1)
Dissolved Oxygen (% Saturation)		84 (64 - 97)	83 (64 - 97)	82 (63 - 97)	81 (60 - 93)	80 (63 - 92)
	Bottom	82 (46 - 100)	84 (63 - 97)	82 (68 - 94)	80 (56 - 97)	79 (52 - 93)
pH		7.9 (7.6 - 8.1)	8.0 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.5 - 8.2)	7.9 (7.5 - 8.2)
Secchi Disc Depth (m)		2.9 (1.9 - 5.1)	2.8 (2.0 - 4.6)	2.6 (1.7 - 3.7)	2.7 (1.7 - 4.3)	2.7 (1.9 - 4.7)
Turbidity (NTU)		4.6 (0.4 - 15.9)	4.4 (0.4 - 15.3)	4.5 (0.3 - 12.8)	5.0 (0.4 - 15.5)	4.5 (0.2 - 15.0)
Suspended Solids (mg/L)		6.8 (1.4 - 15.0)	6.5 (2.7 - 13.7)	6.7 (2.3 - 11.7)	7.0 (4.0 - 12.7)	6.5 (2.6 - 13.0)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.2 - 2.5)	0.6 (0.2 - 2.0)	0.7 (0.3 - 2.3)	0.6 (0.2 - 1.8)	0.7 (0.2 - 1.8)
Ammonia Nitrogen (mg/L)		0.062 (0.018 - 0.147)	0.091 (0.017 - 0.153)	0.120 (0.032 - 0.177)	0.133 (0.033 - 0.227)	0.154 (0.072 - 0.247)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.005)	0.004 (<0.001 - 0.009)	0.005 (<0.001 - 0.011)	0.006 (0.001 - 0.015)	0.006 (0.002 - 0.016)
Nitrite Nitrogen (mg/L)		0.018 (0.004 - 0.054)	0.021 (0.008 - 0.053)	0.023 (0.009 - 0.048)	0.024 (0.010 - 0.048)	0.022 (0.011 - 0.048)
Nitrate Nitrogen (mg/L)		0.070 (0.040 - 0.140)	0.102 (0.044 - 0.143)	0.120 (0.055 - 0.230)	0.129 (0.059 - 0.227)	0.140 (0.052 - 0.257)
Total Inorganic Nitrogen (mg/L)		0.15 (0.09 - 0.31)	0.22 (0.09 - 0.33)	0.26 (0.11 - 0.43)	0.29 (0.13 - 0.49)	0.32 (0.16 - 0.54)
Total Kjeldahl Nitrogen (mg/L)		0.40 (0.12 - 1.40)	0.45 (0.19 - 1.37)	0.49 (0.26 - 1.40)	0.53 (0.30 - 1.43)	0.56 (0.30 - 1.47)
Total Nitrogen (mg/L)		0.49 (0.17 - 1.49)	0.57 (0.27 - 1.50)	0.63 (0.35 - 1.54)	0.68 (0.41 - 1.60)	0.72 (0.45 - 1.65)
Orthophosphate Phosphorus (mg/L)		0.011 (<0.002 - 0.017)	0.016 (<0.002 - 0.027)	0.018 (0.003 - 0.035)	0.018 (0.004 - 0.028)	0.019 (0.007 - 0.029)
Total Phosphorus (mg/L)		0.04 (<0.02 - 0.11)	0.04 (<0.02 - 0.06)	0.04 (0.02 - 0.07)	0.04 (0.03 - 0.06)	0.04 (0.03 - 0.06)
Silica (as SiO_2) (mg/L)		0.66 (0.28 - 1.25)	0.71 (0.35 - 1.40)	0.79 (0.25 - 1.40)	0.83 (0.40 - 1.67)	0.88 (0.43 - 1.70)
Chlorophyll-*a* (µg/L)		3.3 (0.4 - 19.9)	4.3 (0.6 - 21.0)	4.7 (0.3 - 29.7)	4.8 (0.2 - 25.7)	4.0 (0.4 - 15.7)
E.coli (count/100mL)		140 (32 - 350)	240 (56 - 470)	400 (130 - 1500)	300 (71 - 880)	560 (150 - 7000)
Faecal Coliforms (count/100mL)		330 (67 - 850)	580 (110 - 1300)	880 (270 - 4000)	780 (170 - 2400)	1400 (370 - 11000)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics of the Victoria Harbour WCZ in 2019 (continued)

Parameter		Victoria Harbour (West) VM7	Victoria Harbour (West) VM8	Stonecutters Island VM15	Rambler Channel VM12	Rambler Channel VM14
Number of samples		**12**	**12**	**12**	**12**	**12**
Temperature (°C)		24.6 (19.4 - 29.5)	24.5 (19.4 - 29.5)	24.7 (19.2 - 29.6)	24.7 (19.5 - 29.6)	24.9 (19.4 - 29.7)
Salinity		31.0 (27.6 - 33.2)	31.0 (28.2 - 33.2)	31.0 (28.4 - 33.3)	30.7 (28.3 - 33.1)	29.3 (24.9 - 33.2)
Dissolved Oxygen (mg/L)		5.7 (4.5 - 7.3)	5.8 (4.4 - 7.3)	5.6 (4.3 - 7.2)	5.4 (4.2 - 6.9)	5.5 (4.3 - 8.1)
	Bottom	5.3 (2.9 - 7.2)	5.8 (4.1 - 7.7)	5.1 (2.5 - 7.2)	5.2 (2.8 - 7.1)	5.4 (3.8 - 8.1)
Dissolved Oxygen (% Saturation)		81 (67 - 97)	83 (66 - 102)	80 (66 - 101)	77 (61 - 91)	78 (61 - 106)
	Bottom	75 (43 - 96)	82 (59 - 101)	73 (37 - 95)	74 (40 - 93)	76 (58 - 106)
pH		7.9 (7.6 - 8.2)	8.0 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.5 - 8.3)
Secchi Disc Depth (m)		2.8 (1.9 - 4.5)	2.7 (2.0 - 4.7)	2.7 (2.0 - 4.5)	2.4 (1.8 - 3.0)	2.4 (2.0 - 4.0)
Turbidity (NTU)		4.9 (0.4 - 13.2)	4.7 (0.7 - 15.0)	5.8 (0.5 - 17.1)	6.1 (1.1 - 15.1)	4.7 (0.9 - 22.0)
Suspended Solids (mg/L)		6.6 (4.3 - 10.4)	7.2 (3.1 - 13.0)	7.0 (2.5 - 12.6)	8.2 (3.1 - 14.7)	7.7 (3.9 - 14.0)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.3 - 2.2)	0.9 (<0.1 - 2.3)	0.9 (0.3 - 2.2)	0.5 (0.1 - 1.5)	0.5 (0.1 - 1.4)
Ammonia Nitrogen (mg/L)		0.175 (0.070 - 0.260)	0.165 (0.064 - 0.250)	0.161 (0.050 - 0.250)	0.132 (0.050 - 0.210)	0.106 (0.041 - 0.190)
Unionised Ammonia (mg/L)		0.007 (0.002 - 0.017)	0.007 (0.003 - 0.020)	0.006 (0.002 - 0.016)	0.005 (0.003 - 0.010)	0.004 (<0.001 - 0.008)
Nitrite Nitrogen (mg/L)		0.024 (0.008 - 0.059)	0.024 (0.007 - 0.062)	0.026 (0.010 - 0.061)	0.033 (0.010 - 0.073)	0.043 (0.015 - 0.113)
Nitrate Nitrogen (mg/L)		0.145 (0.031 - 0.300)	0.140 (0.019 - 0.247)	0.153 (0.071 - 0.247)	0.183 (0.063 - 0.313)	0.261 (0.054 - 0.400)
Total Inorganic Nitrogen (mg/L)		0.34 (0.17 - 0.60)	0.33 (0.16 - 0.46)	0.34 (0.15 - 0.53)	0.35 (0.23 - 0.53)	0.41 (0.21 - 0.56)
Total Kjeldahl Nitrogen (mg/L)		0.61 (0.31 - 1.39)	0.56 (0.26 - 1.53)	0.55 (0.29 - 1.27)	0.51 (0.26 - 1.30)	0.47 (0.24 - 0.91)
Total Nitrogen (mg/L)		0.78 (0.45 - 1.55)	0.72 (0.52 - 1.69)	0.73 (0.38 - 1.42)	0.72 (0.37 - 1.50)	0.77 (0.44 - 1.17)
Orthophosphate Phosphorus (mg/L)		0.021 (0.006 - 0.029)	0.017 (0.003 - 0.030)	0.022 (0.003 - 0.034)	0.021 (0.007 - 0.029)	0.020 (0.006 - 0.029)
Total Phosphorus (mg/L)		0.05 (0.03 - 0.06)	0.04 (0.03 - 0.07)	0.05 (0.03 - 0.06)	0.04 (0.03 - 0.06)	0.04 (0.03 - 0.05)
Silica (as SiO_2) (mg/L)		0.95 (0.32 - 1.97)	0.88 (0.24 - 1.87)	1.03 (0.34 - 1.87)	1.16 (0.25 - 1.93)	1.51 (0.36 - 2.57)
Chlorophyll-*a* (µg/L)		5.1 (0.4 - 24.7)	6.1 (0.3 - 34.7)	4.9 (0.5 - 28.0)	3.9 (0.3 - 23.0)	3.1 (0.4 - 12.4)
E.coli (count/100mL)		600 (92 - 4700)	430 (16 - 15000)	290 (78 - 2300)	610 (82 - 3100)	320 (120 - 1000)
Faecal Coliforms (count/100mL)		1500 (260 - 11000)	990 (30 - 33000)	720 (200 - 3400)	1600 (200 - 8100)	850 (320 - 3100)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Eastern Buffer WCZ in 2019

Parameter	Chai Wan EM1	Tathong Channel EM2	Tathong Channel EM3
Number of samples	**12**	**12**	**12**
Temperature (°C)	24.4 (18.5 - 29.0)	24.3 (18.3 - 28.8)	24.3 (18.4 - 28.8)
Salinity	31.9 (25.2 - 33.6)	32.1 (25.6 - 33.7)	32.3 (26.7 - 33.6)
Dissolved Oxygen (mg/L)	6.1 (4.2 - 7.9)	6.2 (4.0 - 8.0)	6.2 (4.1 - 8.0)
Bottom	6.1 (3.6 - 7.9)	6.0 (2.4 - 7.9)	6.1 (3.6 - 7.9)
Dissolved Oxygen (% Saturation)	86 (62 - 105)	88 (60 - 106)	89 (62 - 106)
Bottom	86 (53 - 104)	85 (36 - 105)	87 (53 - 104)
pH	8.1 (7.7 - 8.6)	8.1 (7.8 - 8.6)	8.1 (7.8 - 8.6)
Secchi Disc Depth (m)	3.0 (1.9 - 5.4)	3.2 (2.2 - 6.5)	3.4 (1.8 - 5.4)
Turbidity (NTU)	3.9 (0.2 - 14.2)	3.6 (0.2 - 16.7)	3.5 (0.4 - 12.8)
Suspended Solids (mg/L)	6.6 (1.7 - 11.3)	6.5 (1.3 - 12.9)	7.6 (1.7 - 23.7)
5-day Biochemical Oxygen Demand (mg/L)	0.5 (0.1 - 1.2)	0.4 (<0.1 - 1.1)	0.4 (0.1 - 0.9)
Ammonia Nitrogen (mg/L)	0.044 (0.013 - 0.120)	0.033 (0.009 - 0.054)	0.028 (0.011 - 0.053)
Unionised Ammonia (mg/L)	0.002 (<0.001 - 0.007)	0.002 (<0.001 - 0.007)	0.002 (<0.001 - 0.005)
Nitrite Nitrogen (mg/L)	0.013 (<0.002 - 0.025)	0.013 (<0.002 - 0.027)	0.010 (0.002 - 0.021)
Nitrate Nitrogen (mg/L)	0.061 (0.006 - 0.140)	0.058 (0.018 - 0.187)	0.041 (0.009 - 0.140)
Total Inorganic Nitrogen (mg/L)	0.12 (0.02 - 0.19)	0.10 (0.04 - 0.25)	0.08 (0.04 - 0.16)
Total Kjeldahl Nitrogen (mg/L)	0.36 (0.08 - 1.00)	0.40 (0.07 - 1.40)	0.40 (0.08 - 1.23)
Total Nitrogen (mg/L)	0.44 (0.13 - 1.10)	0.47 (0.21 - 1.46)	0.45 (0.15 - 1.25)
Orthophosphate Phosphorus (mg/L)	0.011 (<0.002 - 0.032)	0.010 (<0.002 - 0.020)	0.010 (<0.002 - 0.020)
Total Phosphorus (mg/L)	0.03 (<0.02 - 0.07)	0.03 (<0.02 - 0.07)	0.03 (<0.02 - 0.06)
Silica (as SiO_2) (mg/L)	0.68 (0.16 - 1.70)	0.64 (0.18 - 1.83)	0.56 (0.18 - 1.43)
Chlorophyll-*a* (µg/L)	2.4 (0.6 - 9.7)	2.2 (0.6 - 6.7)	1.6 (0.4 - 3.5)
E.coli (count/100mL)	43 (1 - 230)	15 (1 - 140)	5 (1 - 44)
Faecal Coliforms (count/100mL)	81 (1 - 480)	36 (3 - 370)	9 (1 - 91)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Western Buffer WCZ in 2019

Parameter		Hong Kong Island (West) WM1	Hong Kong Island (West) WM2	Tsing Yi (South) WM3	Tsing Yi (West) WM4
Number of samples		**12**	**12**	**12**	**12**
Temperature (°C)		24.3 (19.0 - 29.3)	24.6 (19.1 - 29.6)	24.5 (19.2 - 29.5)	24.6 (19.2 - 29.5)
Salinity		32.3 (30.6 - 33.6)	30.8 (28.1 - 33.5)	31.3 (28.6 - 33.4)	31.0 (27.9 - 33.4)
Dissolved Oxygen (mg/L)		6.0 (4.3 - 8.5)	5.8 (4.6 - 8.2)	5.7 (4.1 - 8.2)	5.7 (4.0 - 8.0)
	Bottom	5.6 (2.3 - 8.9)	5.7 (3.3 - 8.4)	5.5 (2.2 - 8.4)	5.5 (2.3 - 8.2)
Dissolved Oxygen (% Saturation)		85 (64 - 110)	83 (69 - 108)	81 (60 - 107)	82 (58 - 105)
	Bottom	79 (33 - 115)	81 (48 - 110)	79 (32 - 109)	78 (33 - 107)
pH		7.9 (7.6 - 8.2)	7.9 (7.6 - 8.2)	7.9 (7.5 - 8.2)	7.9 (7.5 - 8.2)
Secchi Disc Depth (m)		3.1 (2.3 - 4.2)	2.7 (1.9 - 3.6)	2.6 (1.2 - 3.8)	2.9 (2.0 - 5.0)
Turbidity (NTU)		3.9 (1.3 - 14.4)	4.7 (1.2 - 15.1)	4.8 (0.6 - 16.5)	4.5 (1.4 - 16.4)
Suspended Solids (mg/L)		7.8 (2.6 - 12.9)	7.7 (2.9 - 12.9)	7.2 (2.8 - 12.8)	7.8 (3.6 - 14.1)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (<0.1 - 1.6)	0.6 (0.1 - 1.6)	0.6 (0.1 - 1.4)	0.5 (0.1 - 1.4)
Ammonia Nitrogen (mg/L)		0.039 (0.008 - 0.057)	0.084 (0.058 - 0.125)	0.099 (0.067 - 0.149)	0.095 (0.018 - 0.147)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.004)	0.003 (0.001 - 0.008)	0.004 (<0.001 - 0.011)	0.003 (<0.001 - 0.009)
Nitrite Nitrogen (mg/L)		0.026 (0.004 - 0.065)	0.035 (0.009 - 0.090)	0.035 (0.008 - 0.088)	0.038 (0.011 - 0.099)
Nitrate Nitrogen (mg/L)		0.084 (0.013 - 0.156)	0.188 (0.029 - 0.410)	0.163 (0.029 - 0.267)	0.185 (0.034 - 0.286)
Total Inorganic Nitrogen (mg/L)		0.15 (0.06 - 0.22)	0.31 (0.16 - 0.50)	0.30 (0.18 - 0.42)	0.32 (0.16 - 0.49)
Total Kjeldahl Nitrogen (mg/L)		0.37 (0.06 - 1.04)	0.51 (0.15 - 1.70)	0.50 (0.20 - 1.73)	0.48 (0.16 - 1.40)
Total Nitrogen (mg/L)		0.48 (0.09 - 1.16)	0.73 (0.20 - 1.84)	0.70 (0.24 - 1.88)	0.70 (0.21 - 1.55)
Orthophosphate Phosphorus (mg/L)		0.011 (0.006 - 0.015)	0.014 (0.004 - 0.023)	0.017 (0.011 - 0.024)	0.018 (0.008 - 0.024)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.08)	0.04 (0.03 - 0.10)	0.04 (0.03 - 0.10)	0.04 (0.03 - 0.09)
Silica (as SiO_2) (mg/L)		0.89 (0.34 - 1.43)	1.15 (0.37 - 1.93)	1.15 (0.35 - 2.10)	1.27 (0.38 - 2.13)
Chlorophyll-*a* (µg/L)		3.2 (0.5 - 11.2)	3.9 (0.4 - 21.3)	3.0 (0.5 - 11.0)	2.4 (0.3 - 6.8)
E.coli (count/100mL)		5 (1 - 190)	89 (7 - 15000)	120 (17 - 1900)	94 (10 - 1600)
Faecal Coliforms (count/100mL)		12 (2 - 220)	180 (25 - 25000)	270 (41 - 3400)	210 (27 - 2100)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Junk Bay WCZ in 2019

Parameter	Junk Bay JM3	Junk Bay JM4
Number of samples	**12**	**12**
Temperature (°C)	24.6 (18.6 - 29.5)	24.4 (18.5 - 28.8)
Salinity	31.9 (25.0 - 33.6)	32.1 (26.3 - 33.6)
Dissolved Oxygen (mg/L)	6.0 (4.4 - 7.3)	6.0 (4.3 - 7.8)
Bottom	6.0 (4.3 - 7.9)	6.0 (3.7 - 7.9)
Dissolved Oxygen (% Saturation)	86 (60 - 104)	86 (64 - 104)
Bottom	86 (59 - 104)	85 (54 - 105)
pH	8.0 (7.6 - 8.6)	8.0 (7.6 - 8.6)
Secchi Disc Depth (m)	3.3 (2.2 - 5.4)	3.3 (2.0 - 5.5)
Turbidity (NTU)	3.5 (0.2 - 12.8)	3.5 (0.3 - 12.4)
Suspended Solids (mg/L)	7.3 (1.5 - 12.7)	7.4 (3.0 - 13.3)
5-day Biochemical Oxygen Demand (mg/L)	0.5 (0.2 - 1.0)	0.5 (0.1 - 0.8)
Ammonia Nitrogen (mg/L)	0.041 (0.018 - 0.089)	0.036 (0.014 - 0.064)
Unionised Ammonia (mg/L)	0.002 (<0.001 - 0.007)	0.002 (<0.001 - 0.007)
Nitrite Nitrogen (mg/L)	0.015 (0.002 - 0.052)	0.016 (0.002 - 0.054)
Nitrate Nitrogen (mg/L)	0.063 (0.017 - 0.160)	0.059 (0.020 - 0.160)
Total Inorganic Nitrogen (mg/L)	0.12 (0.05 - 0.20)	0.11 (0.04 - 0.22)
Total Kjeldahl Nitrogen (mg/L)	0.39 (0.09 - 1.37)	0.39 (0.06 - 1.23)
Total Nitrogen (mg/L)	0.47 (0.12 - 1.41)	0.46 (0.10 - 1.28)
Orthophosphate Phosphorus (mg/L)	0.009 (<0.002 - 0.022)	0.009 (<0.002 - 0.021)
Total Phosphorus (mg/L)	0.03 (<0.02 - 0.08)	0.03 (<0.02 - 0.08)
Silica (as SiO_2) (mg/L)	0.68 (0.14 - 1.67)	0.68 (0.17 - 1.77)
Chlorophyll-*a* (µg/L)	2.6 (0.6 - 8.6)	2.7 (0.5 - 8.6)
E.coli (count/100mL)	28 (1 - 210)	19 (1 - 86)
Faecal Coliforms (count/100mL)	73 (17 - 380)	47 (2 - 220)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for the Deep Bay WCZ in 2019

Parameter	Inner Deep Bay DM1	DM2	DM3	Outer Deep Bay DM4	DM5
Number of samples	**12**	**12**	**12**	**12**	**12**
Temperature (°C)	25.7 (18.9 - 32.6)	25.7 (18.6 - 32.6)	25.5 (18.4 - 31.1)	25.3 (18.7 - 31.0)	25.0 (18.7 - 30.0)
Salinity	13.4 (4.3 - 21.7)	15.5 (5.5 - 27.5)	19.6 (8.0 - 29.5)	21.5 (7.4 - 31.2)	24.3 (12.6 - 31.7)
Dissolved Oxygen (mg/L)	5.5 (4.2 - 7.7)	5.8 (4.4 - 8.4)	5.9 (4.7 - 7.9)	5.9 (4.8 - 7.5)	6.1 (4.4 - 7.9)
Bottom	N/A	N/A	N/A	6.0 (4.8 - 7.9)	5.9 (4.0 - 8.0)
Dissolved Oxygen (% Saturation)	72 (55 - 95)	78 (56 - 117)	81 (69 - 113)	81 (68 - 109)	84 (62 - 114)
Bottom	N/A	N/A	N/A	82 (68 - 114)	82 (58 - 117)
pH	7.5 (7.3 - 7.8)	7.7 (7.3 - 8.0)	7.8 (7.5 - 8.2)	7.9 (7.7 - 8.2)	7.9 (7.7 - 8.2)
Secchi Disc Depth (m)	1.0 (0.7 - 1.3)	1.0 (0.9 - 1.3)	1.4 (1.0 - 1.7)	1.7 (1.5 - 2.0)	2.1 (1.7 - 2.3)
Turbidity (NTU)	36.4 (14.0 - 134.4)	26.5 (4.3 - 59.5)	7.9 (4.3 - 11.9)	5.7 (3.1 - 9.1)	4.2 (1.6 - 8.1)
Suspended Solids (mg/L)	69.3 (17.0 - 360.0)	43.4 (9.4 - 110.0)	15.8 (7.0 - 23.0)	10.1 (5.0 - 17.5)	8.1 (2.9 - 15.0)
5-day Biochemical Oxygen Demand (mg/L)	1.9 (0.6 - 3.8)	1.5 (0.9 - 2.7)	0.6 (0.2 - 1.2)	0.6 (0.3 - 1.4)	0.6 (0.2 - 1.2)
Ammonia Nitrogen (mg/L)	0.497 (0.058 - 1.100)	0.422 (<0.005 - 1.600)	0.129 (<0.005 - 0.370)	0.113 (0.020 - 0.270)	0.090 (0.028 - 0.200)
Unionised Ammonia (mg/L)	0.009 (0.004 - 0.025)	0.009 (<0.001 - 0.032)	0.004 (<0.001 - 0.012)	0.004 (<0.001 - 0.008)	0.004 (0.001 - 0.009)
Nitrite Nitrogen (mg/L)	0.217 (0.085 - 0.670)	0.155 (0.046 - 0.670)	0.092 (0.029 - 0.380)	0.066 (0.030 - 0.130)	0.059 (0.020 - 0.130)
Nitrate Nitrogen (mg/L)	1.446 (0.770 - 2.700)	1.170 (0.630 - 1.800)	0.878 (0.300 - 1.700)	0.713 (0.145 - 1.550)	0.564 (0.122 - 1.300)
Total Inorganic Nitrogen (mg/L)	2.16 (1.38 - 3.42)	1.75 (0.69 - 2.50)	1.10 (0.38 - 2.09)	0.89 (0.23 - 1.95)	0.71 (0.19 - 1.59)
Total Kjeldahl Nitrogen (mg/L)	1.09 (0.55 - 2.00)	0.90 (0.41 - 2.00)	0.49 (0.30 - 0.63)	0.40 (0.25 - 0.64)	0.36 (0.23 - 0.52)
Total Nitrogen (mg/L)	2.75 (1.68 - 4.03)	2.23 (1.17 - 3.03)	1.45 (0.97 - 2.43)	1.18 (0.44 - 2.24)	0.98 (0.51 - 1.83)
Orthophosphate Phosphorus (mg/L)	0.154 (0.110 - 0.230)	0.126 (0.064 - 0.230)	0.071 (0.018 - 0.120)	0.035 (0.007 - 0.067)	0.024 (0.003 - 0.053)
Total Phosphorus (mg/L)	0.28 (0.15 - 0.74)	0.19 (0.09 - 0.31)	0.10 (0.06 - 0.22)	0.06 (0.04 - 0.08)	0.04 (0.03 - 0.06)
Silica (as SiO_2) (mg/L)	6.45 (1.60 - 13.00)	5.25 (1.10 - 13.00)	4.28 (0.60 - 10.00)	3.45 (0.40 - 8.00)	2.74 (0.38 - 6.33)
Chlorophyll-*a* (µg/L)	4.4 (1.1 - 9.9)	5.5 (0.9 - 14.0)	3.4 (0.9 - 8.9)	2.6 (0.7 - 11.5)	2.6 (0.4 - 12.0)
E.coli (count/100mL)	760 (78 - 59000)	490 (31 - 23000)	56 (6 - 2500)	210 (29 - 1800)	350 (110 - 1800)
Faecal Coliforms (count/100mL)	1800 (250 - 130000)	1100 (72 - 56000)	140 (13 - 8600)	530 (47 - 5500)	730 (280 - 5200)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

4. NA (Not Applicable) indicates the measurement was not made due to shallow water.

Summary of water quality statistics for the North Western WCZ in 2019

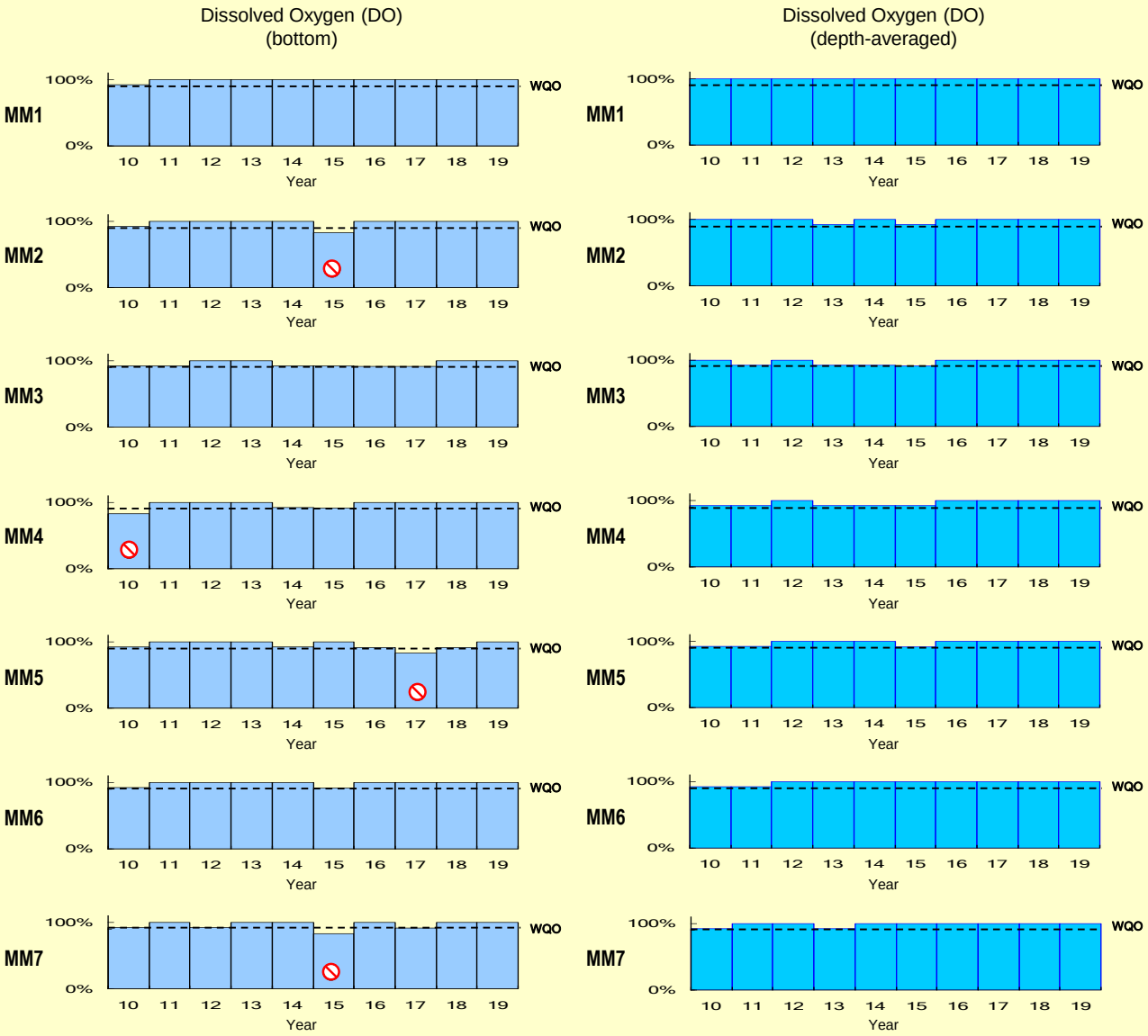
Parameter		Lantau Island (North) NM1	Pearl Island NM2	Pillar Point NM3	Urmston Road NM5	Chek Lap Kok (North) NM6	Chek Lap Kok (West) NM8
Number of samples		**12**	**12**	**12**	**12**	**12**	**12**
Temperature (°C)		24.6 (18.6 - 30.8)	24.9 (18.6 - 31.7)	24.9 (18.6 - 31.5)	24.9 (18.5 - 31.5)	25.1 (18.1 - 32.1)	24.9 (18.0 - 32.2)
Salinity		29.3 (22.2 - 33.4)	27.7 (18.4 - 33.4)	27.2 (19.9 - 33.0)	26.7 (19.6 - 32.7)	24.5 (15.7 - 32.8)	27.2 (17.9 - 32.8)
Dissolved Oxygen (mg/L)		5.8 (4.1 - 7.9)	5.9 (4.4 - 7.9)	6.0 (4.2 - 8.3)	6.0 (4.2 - 7.2)	6.2 (4.7 - 8.5)	6.5 (4.2 - 8.8)
	Bottom	5.5 (3.0 - 7.5)	5.8 (3.5 - 7.6)	5.7 (3.1 - 8.1)	5.6 (3.1 - 7.4)	6.3 (4.2 - 8.6)	6.2 (2.8 - 8.6)
Dissolved Oxygen (% Saturation)		82 (60 - 105)	82 (64 - 105)	84 (63 - 109)	84 (64 - 102)	86 (66 - 117)	91 (62 - 123)
	Bottom	77 (44 - 100)	81 (52 - 103)	79 (48 - 108)	78 (46 - 106)	88 (63 - 119)	88 (43 - 122)
pH		8.0 (7.6 - 8.6)	8.0 (7.6 - 8.7)	8.0 (7.5 - 8.6)	8.0 (7.5 - 8.6)	8.0 (7.5 - 8.7)	8.1 (7.7 - 8.8)
Secchi Disc Depth (m)		2.5 (1.8 - 4.4)	2.3 (1.7 - 4.3)	2.2 (1.5 - 3.5)	2.3 (1.8 - 3.3)	2.1 (1.5 - 2.9)	2.0 (1.6 - 3.1)
Turbidity (NTU)		5.8 (0.9 - 15.3)	5.0 (0.6 - 15.3)	6.0 (0.9 - 12.3)	7.1 (1.0 - 15.5)	7.2 (1.8 - 17.2)	8.1 (2.0 - 18.6)
Suspended Solids (mg/L)		11.9 (2.3 - 22.3)	11.6 (4.1 - 21.0)	12.4 (3.1 - 24.7)	14.1 (3.0 - 36.3)	13.9 (3.5 - 30.3)	15.7 (5.8 - 33.0)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.3 - 1.4)	0.7 (0.3 - 1.3)	0.7 (0.3 - 1.3)	0.7 (0.2 - 1.2)	0.7 (0.2 - 2.2)	1.0 (0.3 - 2.1)
Ammonia Nitrogen (mg/L)		0.095 (0.035 - 0.207)	0.070 (0.031 - 0.130)	0.074 (0.028 - 0.143)	0.079 (0.032 - 0.153)	0.068 (0.023 - 0.142)	0.035 (0.013 - 0.064)
Unionised Ammonia (mg/L)		0.004 (0.001 - 0.013)	0.003 (0.001 - 0.009)	0.003 (0.001 - 0.014)	0.003 (0.001 - 0.012)	0.004 (0.001 - 0.015)	0.002 (<0.001 - 0.008)
Nitrite Nitrogen (mg/L)		0.042 (0.011 - 0.119)	0.050 (0.012 - 0.133)	0.056 (0.015 - 0.143)	0.057 (0.022 - 0.140)	0.064 (0.023 - 0.197)	0.042 (0.013 - 0.105)
Nitrate Nitrogen (mg/L)		0.227 (0.057 - 0.377)	0.298 (0.058 - 0.483)	0.351 (0.063 - 0.670)	0.404 (0.087 - 0.780)	0.492 (0.064 - 0.867)	0.295 (0.068 - 0.450)
Total Inorganic Nitrogen (mg/L)		0.36 (0.17 - 0.54)	0.42 (0.13 - 0.61)	0.48 (0.13 - 0.84)	0.54 (0.16 - 0.92)	0.62 (0.12 - 1.04)	0.37 (0.12 - 0.55)
Total Kjeldahl Nitrogen (mg/L)		0.45 (0.20 - 0.73)	0.39 (0.09 - 0.75)	0.38 (0.15 - 0.73)	0.39 (0.21 - 0.68)	0.37 (0.21 - 0.57)	0.40 (0.12 - 0.64)
Total Nitrogen (mg/L)		0.71 (0.41 - 1.01)	0.74 (0.44 - 1.05)	0.79 (0.38 - 1.28)	0.85 (0.48 - 1.25)	0.93 (0.35 - 1.47)	0.74 (0.49 - 1.06)
Orthophosphate Phosphorus (mg/L)		0.016 (0.009 - 0.032)	0.016 (0.007 - 0.032)	0.017 (0.009 - 0.034)	0.017 (0.008 - 0.033)	0.017 (0.007 - 0.041)	0.010 (0.003 - 0.022)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.07)	0.04 (0.02 - 0.07)	0.04 (0.03 - 0.06)	0.04 (0.02 - 0.06)	0.04 (0.02 - 0.08)	0.04 (<0.02 - 0.08)
Silica (as SiO_2) (mg/L)		1.37 (0.19 - 2.37)	1.66 (0.23 - 3.33)	1.84 (0.51 - 4.17)	2.04 (0.70 - 4.97)	2.30 (0.60 - 5.37)	1.58 (0.39 - 3.20)
Chlorophyll-*a* (µg/L)		3.7 (0.4 - 12.0)	4.5 (0.4 - 11.1)	4.6 (0.5 - 17.7)	4.5 (0.5 - 11.0)	5.2 (0.3 - 12.3)	6.5 (0.7 - 13.8)
E.coli (count/100mL)		110 (15 - 1600)	41 (2 - 420)	110 (15 - 1400)	280 (51 - 880)	65 (3 - 290)	5 (1 - 65)
Faecal Coliforms (count/100mL)		230 (21 - 3200)	85 (8 - 760)	240 (33 - 2400)	590 (76 - 1500)	130 (6 - 1000)	9 (1 - 99)

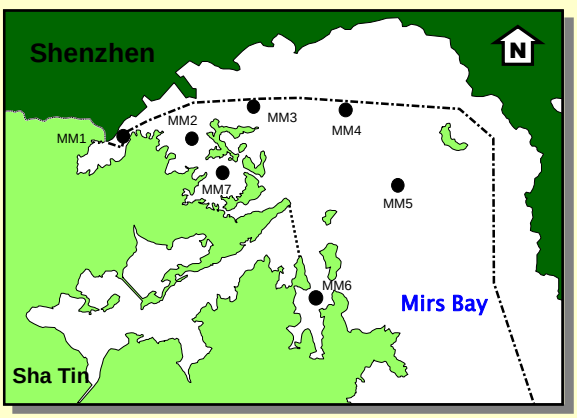
Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

WQO compliance rates for the Mirs Bay WCZ





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

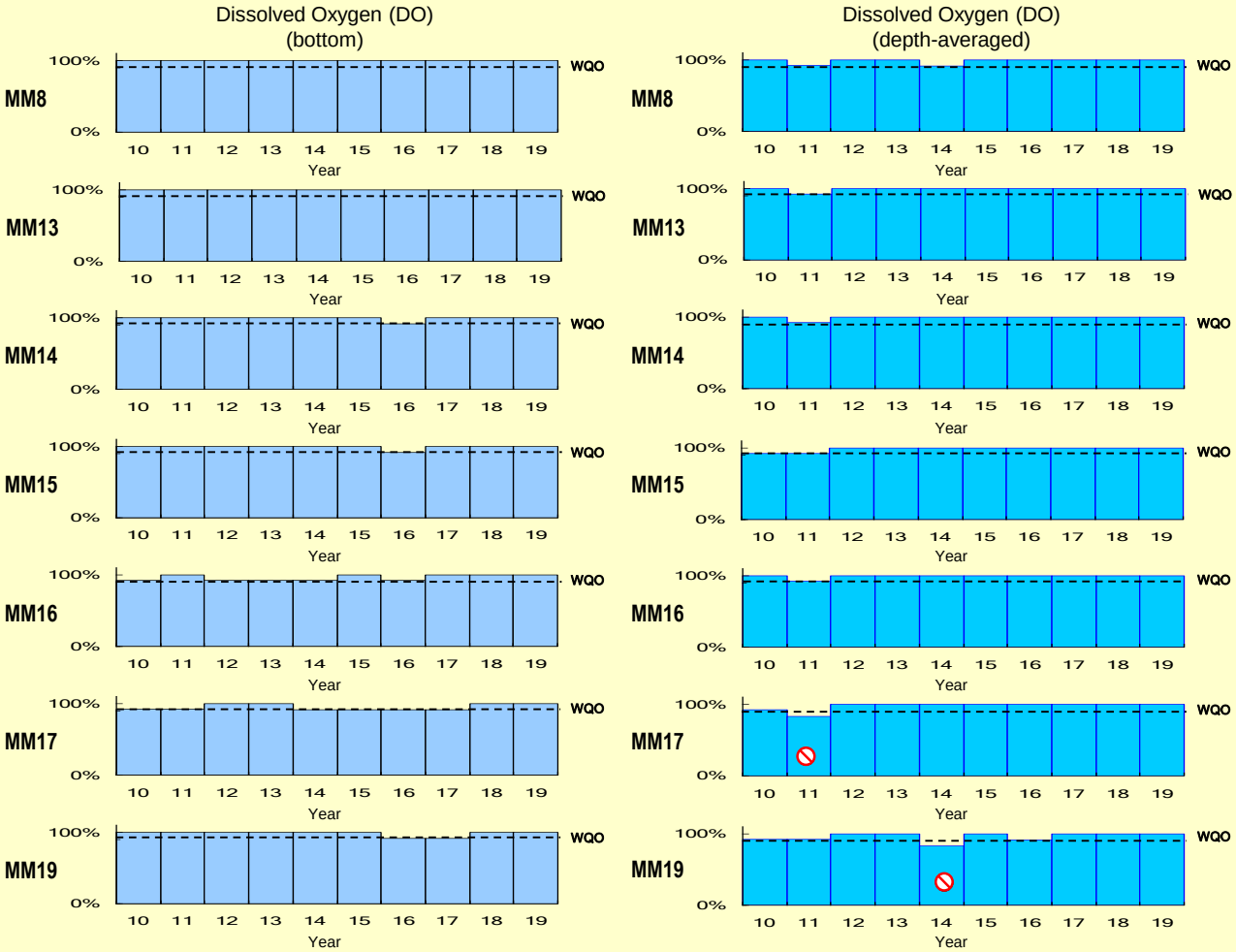
2. Depth-averaged

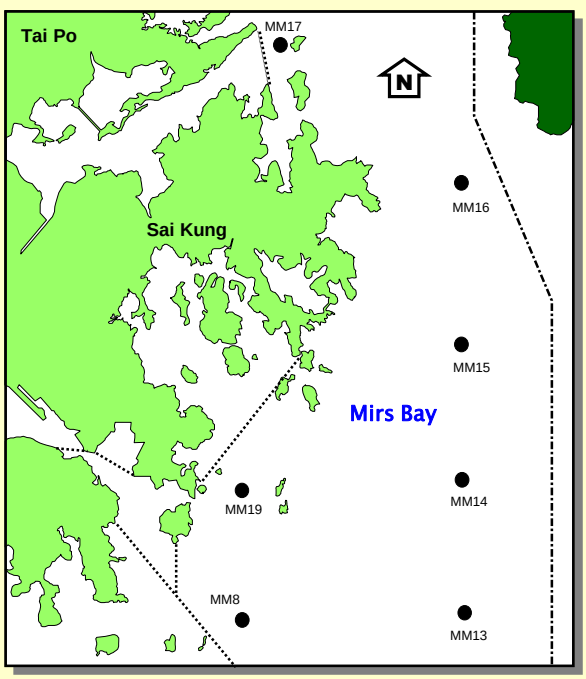
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

Non-compliance

WQO compliance rates for the Mirs Bay WCZ (continued)





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Depth-averaged

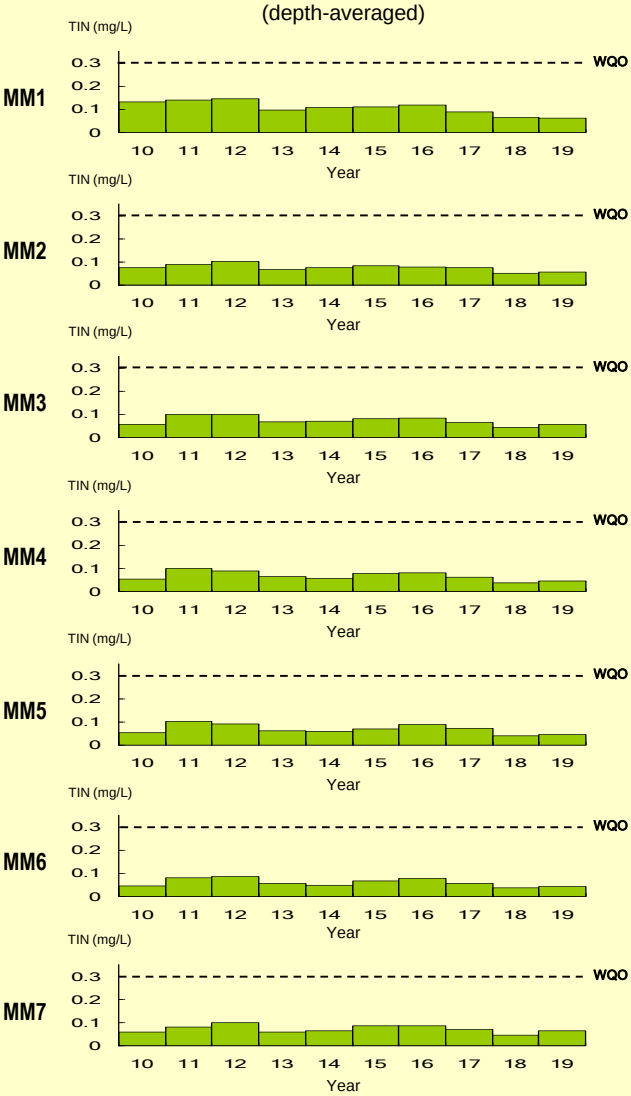
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

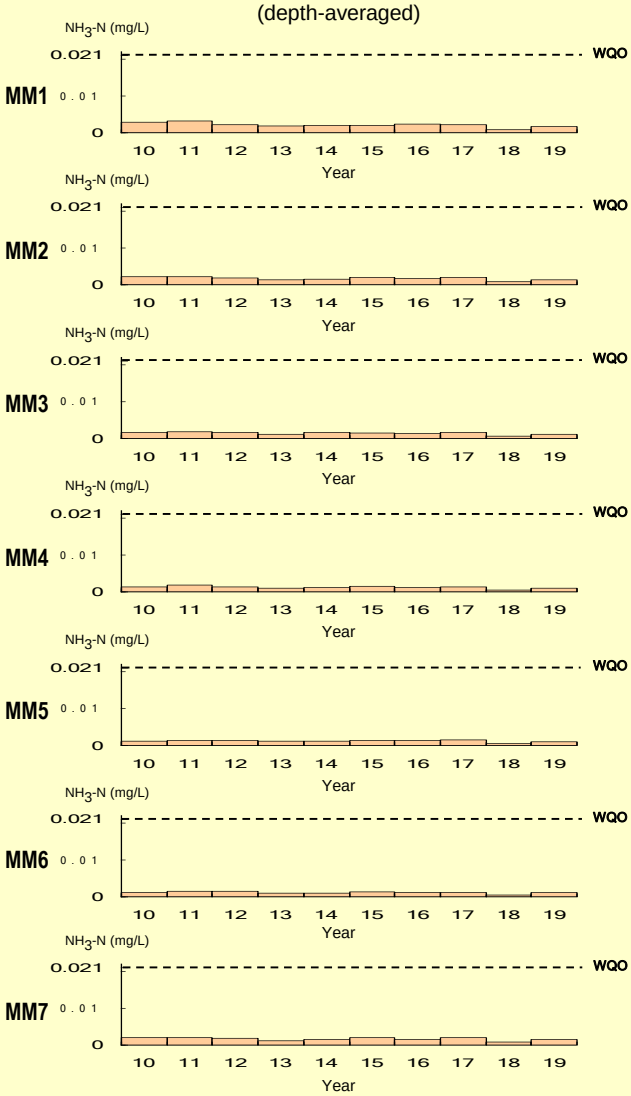
Non-compliance

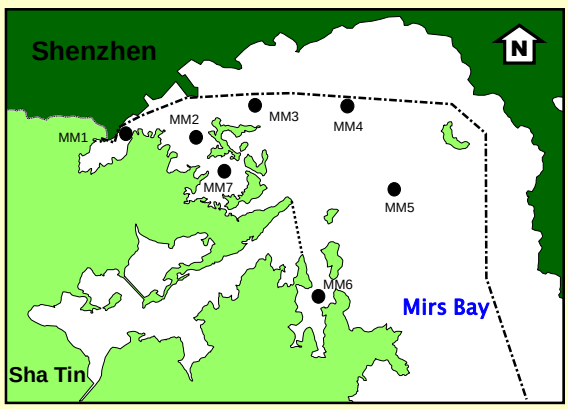
WQO compliance rates for the Mirs Bay WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

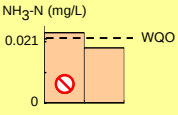
WQO : annual mean for depth-averaged TIN $\leq$ 0.3 mg/L

annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

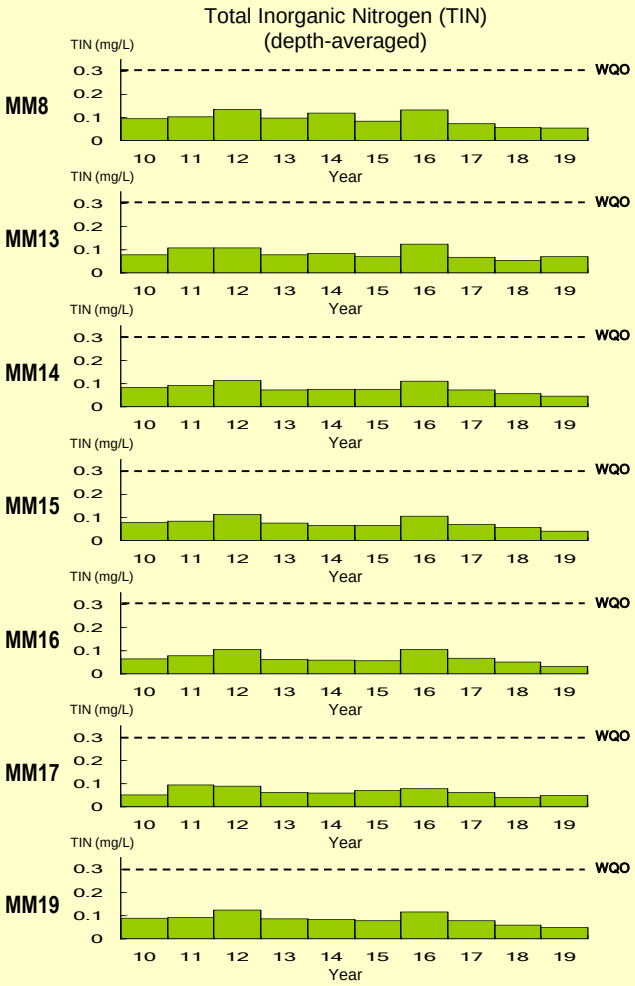
WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

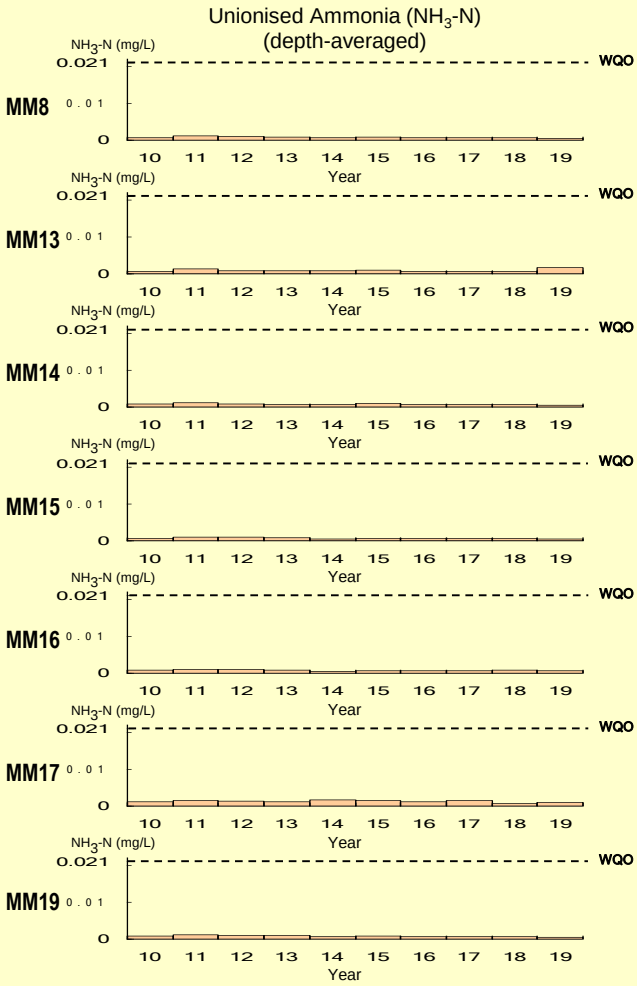
annual mean for depth-averaged NH_3-N

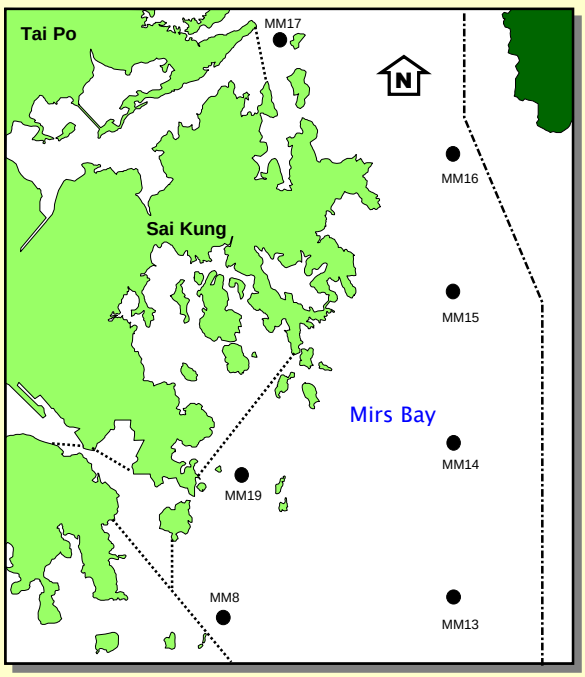


Non-compliance

WQO compliance rates for the Mirs Bay WCZ (continued)



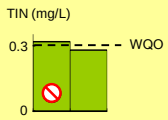




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

annual mean for depth-averaged TIN

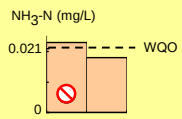


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

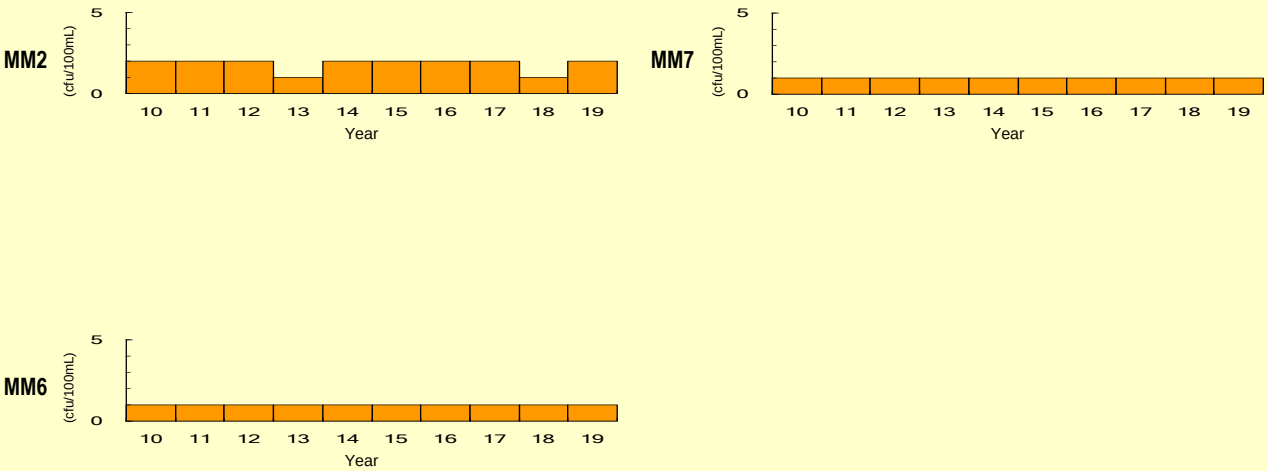
annual mean for depth-averaged NH_3-N

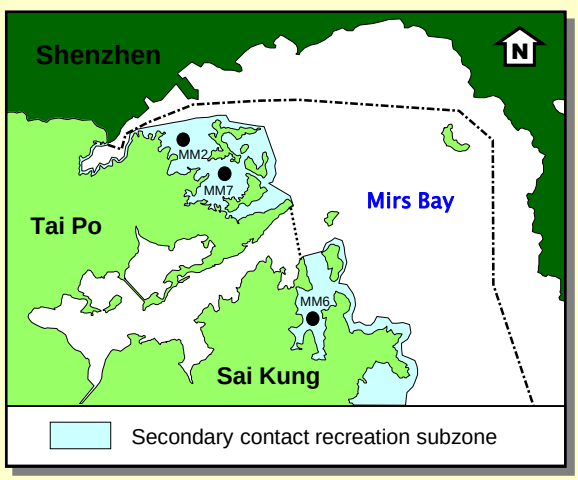
Non-compliance



WQO compliance rates for the Mirs Bay WCZ (continued)

E. coli
(annual geometric mean)





E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

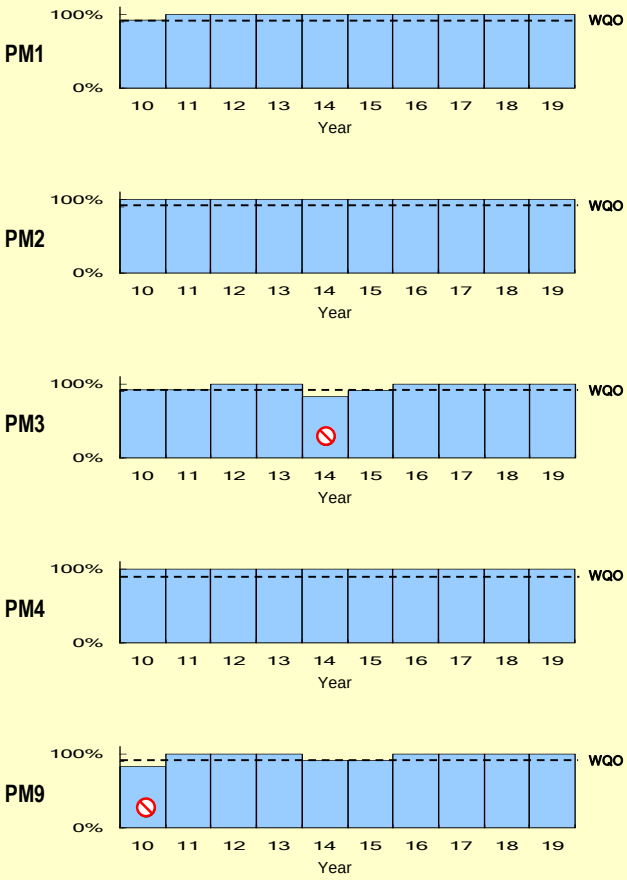
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

610 WQO
0

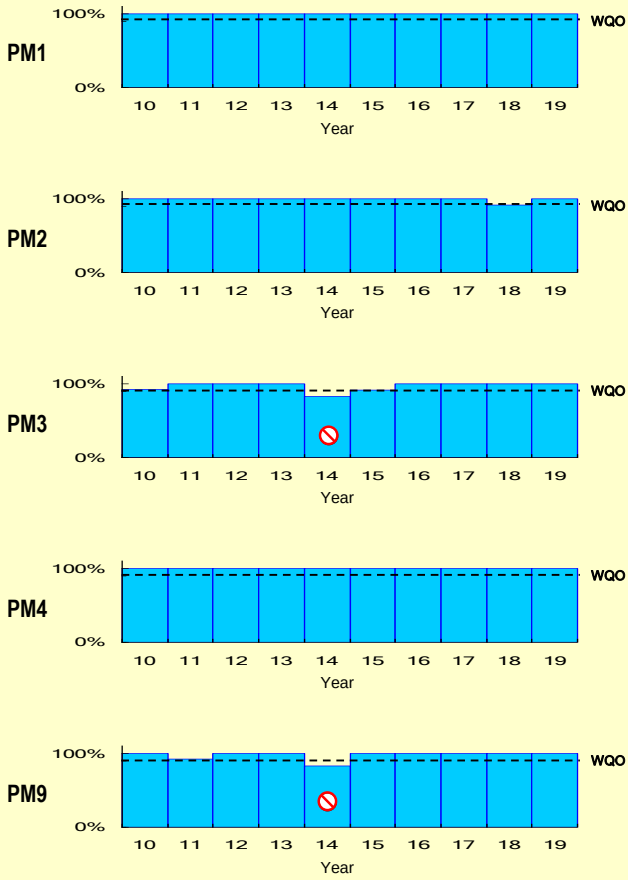
Non-compliance

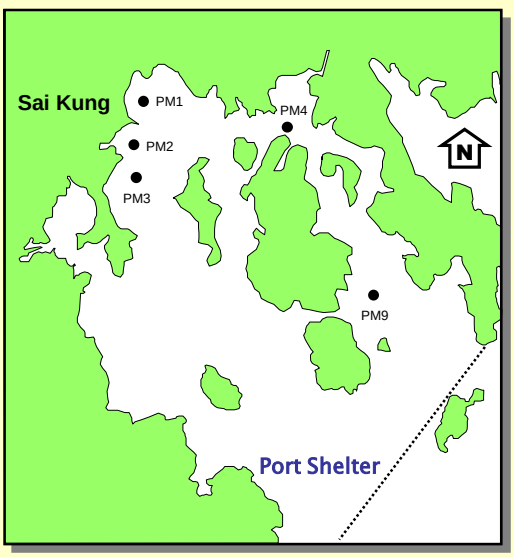
WQO compliance rates for the Port Shelter WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



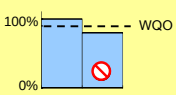


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

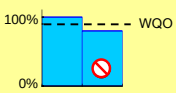
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

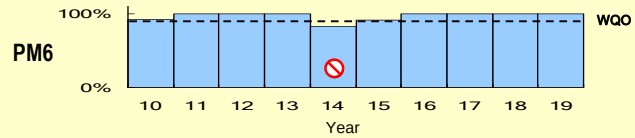
% sample with depth-averaged DO ≥ 4 mg/L

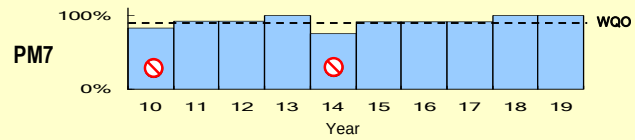


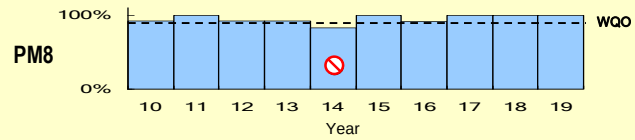
Non-compliance

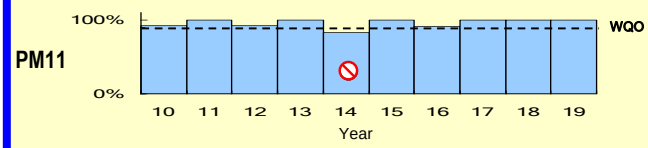
WQO compliance rates for the Port Shelter WCZ (continued)

Dissolved Oxygen (DO)
(bottom)

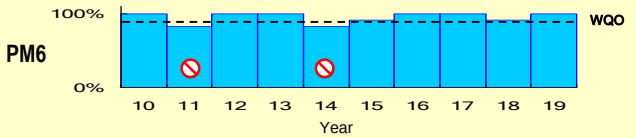


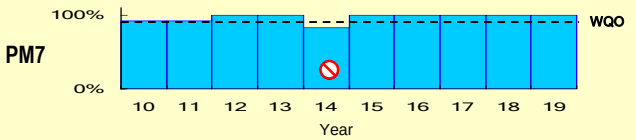


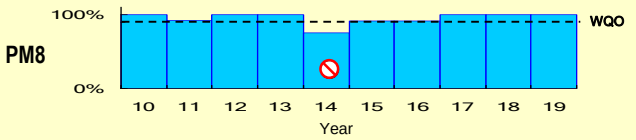


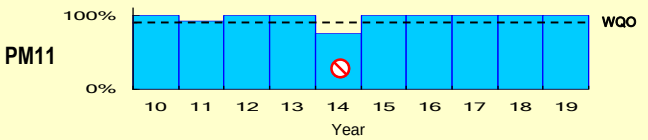


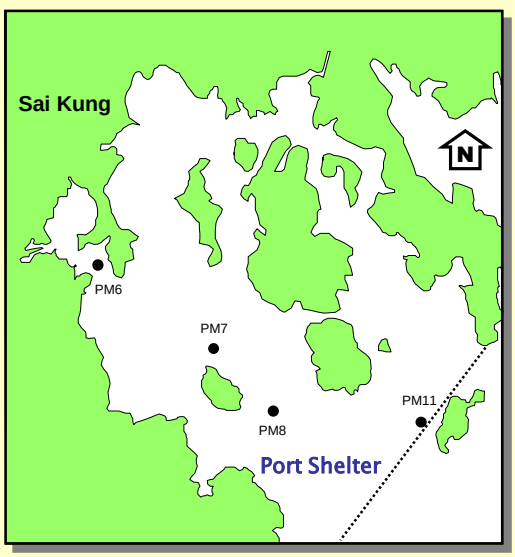
Dissolved Oxygen (DO)
(depth-averaged)









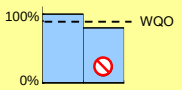


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

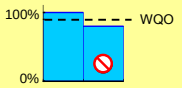
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

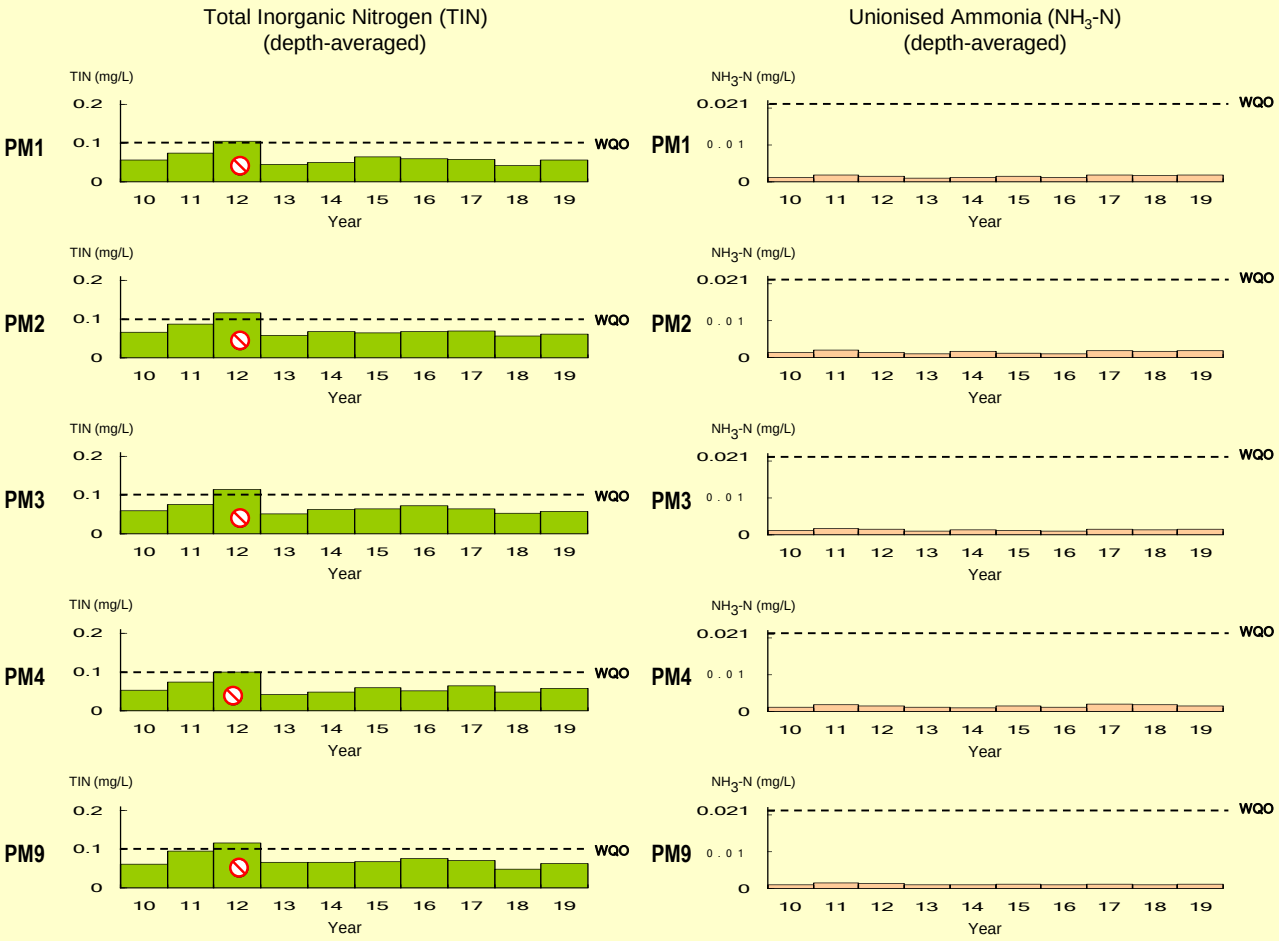
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

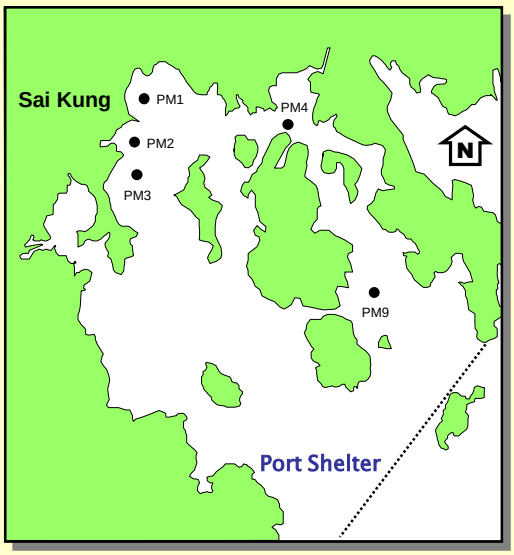
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

WQO compliance rates for the Port Shelter WCZ (continued)

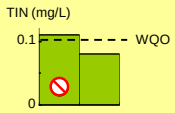




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN $\leq$ 0.1 mg/L

annual mean for depth-averaged TIN

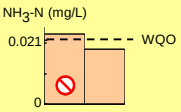


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

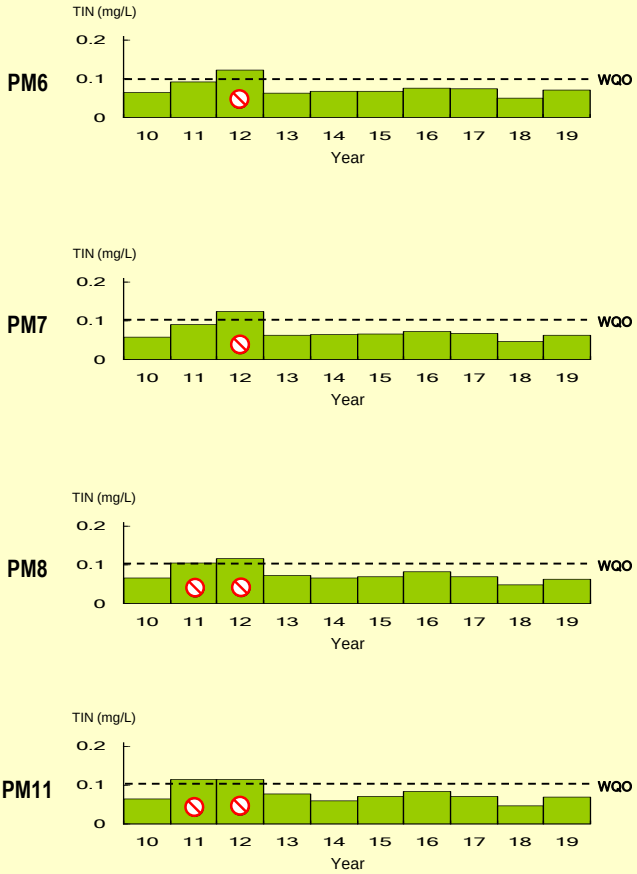
annual mean for depth-averaged NH_3-N

Non-compliance

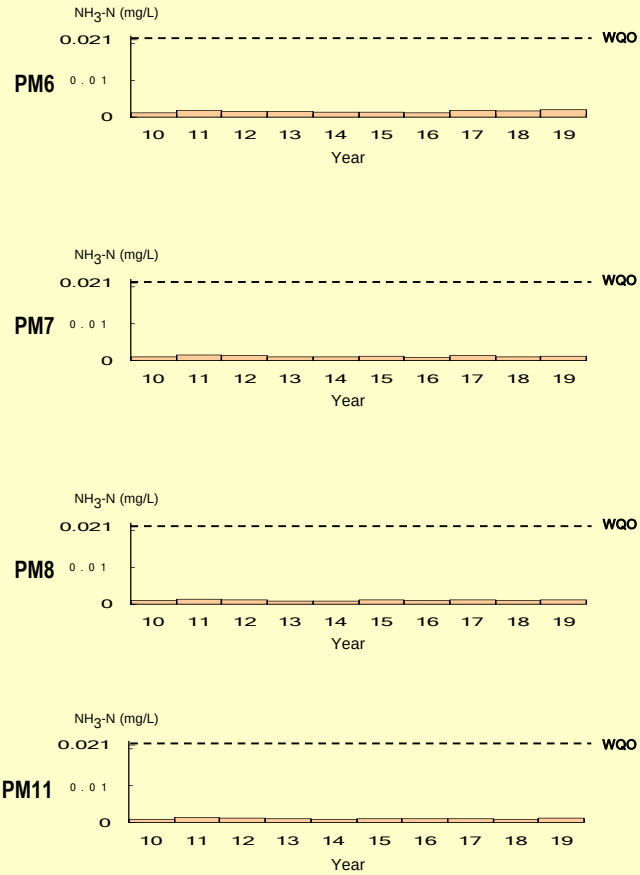


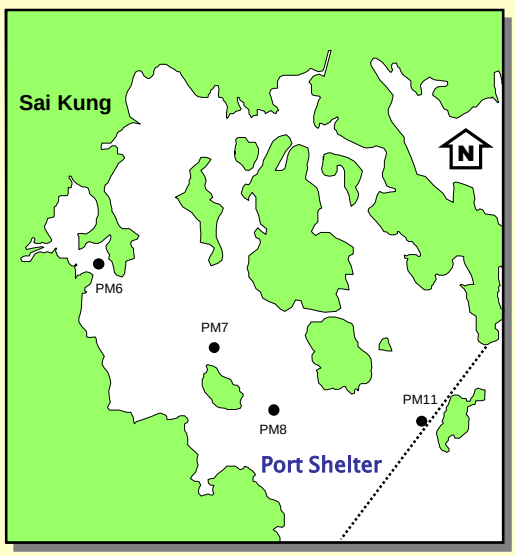
WQO compliance rates for the Port Shelter WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

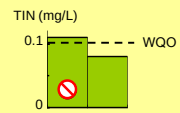




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

annual mean for depth-averaged TIN

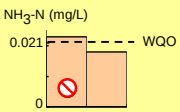


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

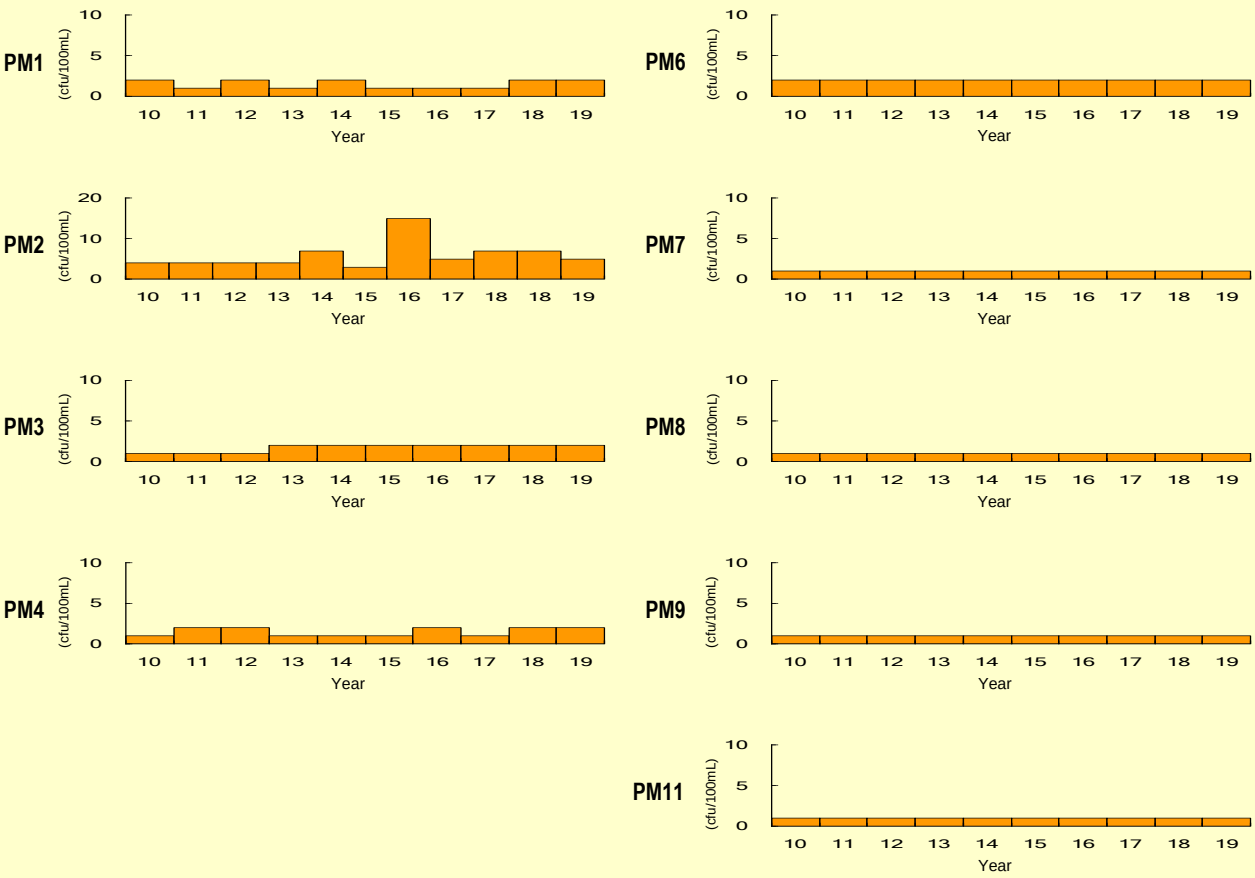
annual mean for depth-averaged NH_3-N

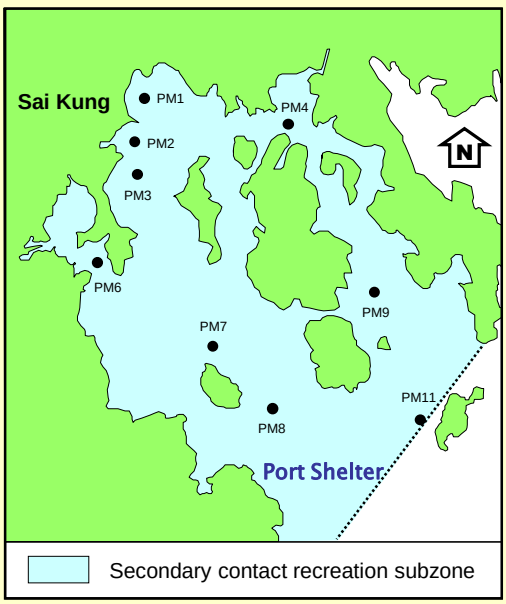
Non-compliance



WQO compliance rates for the Port Shelter WCZ (continued)

E. coli
(annual geometric mean)





E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli < 610 cfu/100mL

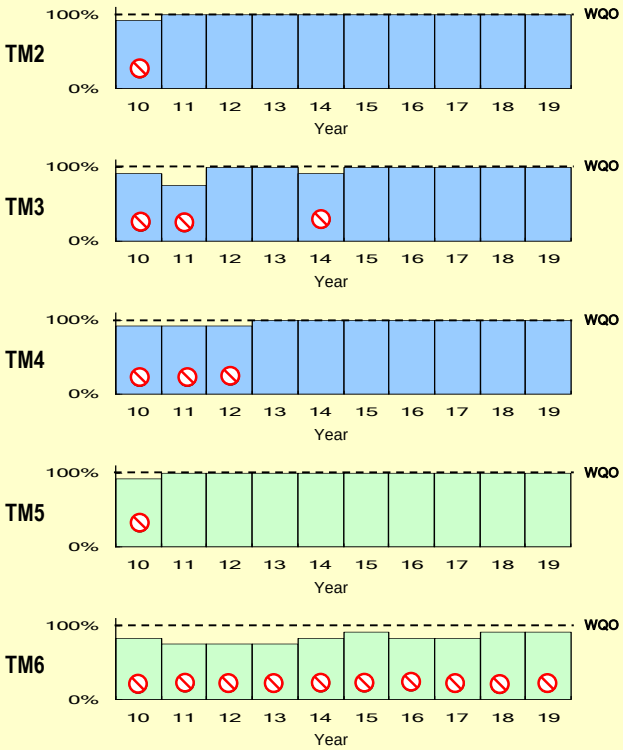
annual geometric mean for depth averaged
E. coli (cfu/100mL)

610 WQO
0

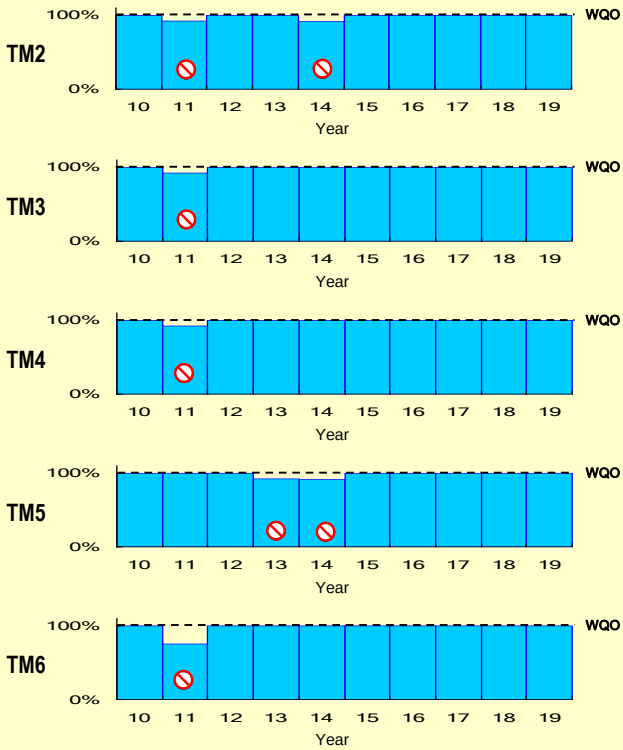
Non-compliance

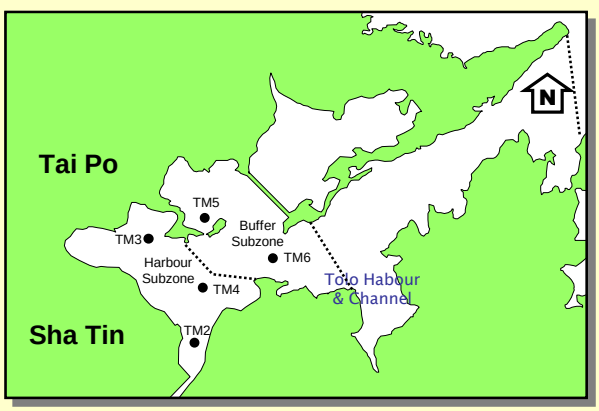
WQO compliance rates for the Tolo Harbour and Channel WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(water column average)





Dissolved Oxygen (DO)

Harbour Subzone (TM2 - TM4)

1. Bottom

WQO : 100% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Water column average (surface to 2m above bottom)

WQO : 100% sample with water column average DO ≥ 4 mg/L

% sample with water column average DO ≥ 4 mg/L

Buffer Subzone (TM5 - TM6)

1. Bottom

WQO : 100% sample with bottom DO ≥ 3 mg/L

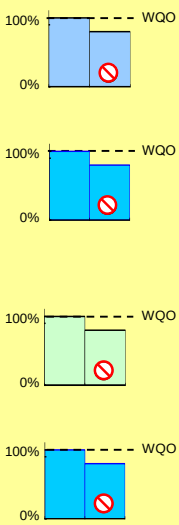
% sample with bottom DO ≥ 3 mg/L

2. Water column average (surface to 2m above bottom)

WQO : 100% sample with water column average DO ≥ 4 mg/L

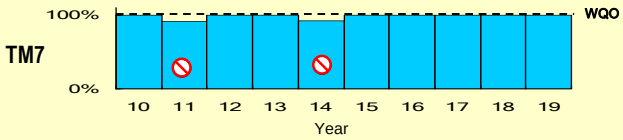
% sample with water column average DO ≥ 4 mg/L

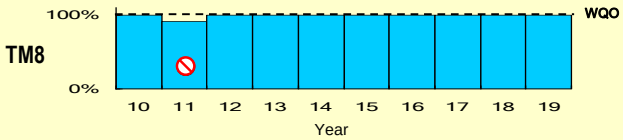
Non-compliance



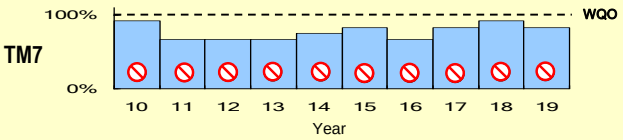
WQO compliance rates for the Tolo Harbour and Channel WCZ (continued)

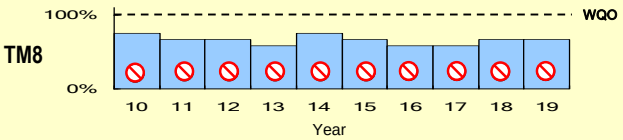
Dissolved Oxygen (DO)
(surface)



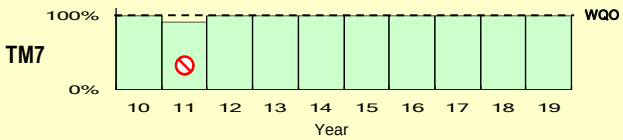


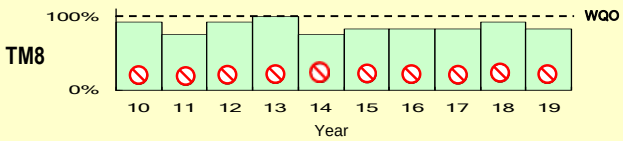
Dissolved Oxygen (DO)
(bottom)





Dissolved Oxygen (DO)
(middle)





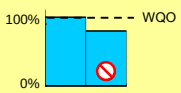
Dissolved Oxygen (DO)

Channel Subzone (TM7 - TM8)

1. Surface

WQO : 100% sample with surface DO ≥ 4 mg/L

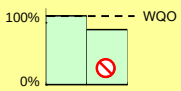
% sample with surface DO ≥ 4 mg/L



2. Middle

WQO : 100% sample with middle DO ≥ 4 mg/L

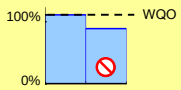
% sample with middle DO ≥ 4 mg/L



3. Bottom

WQO : 100% sample with bottom DO ≥ 4 mg/L

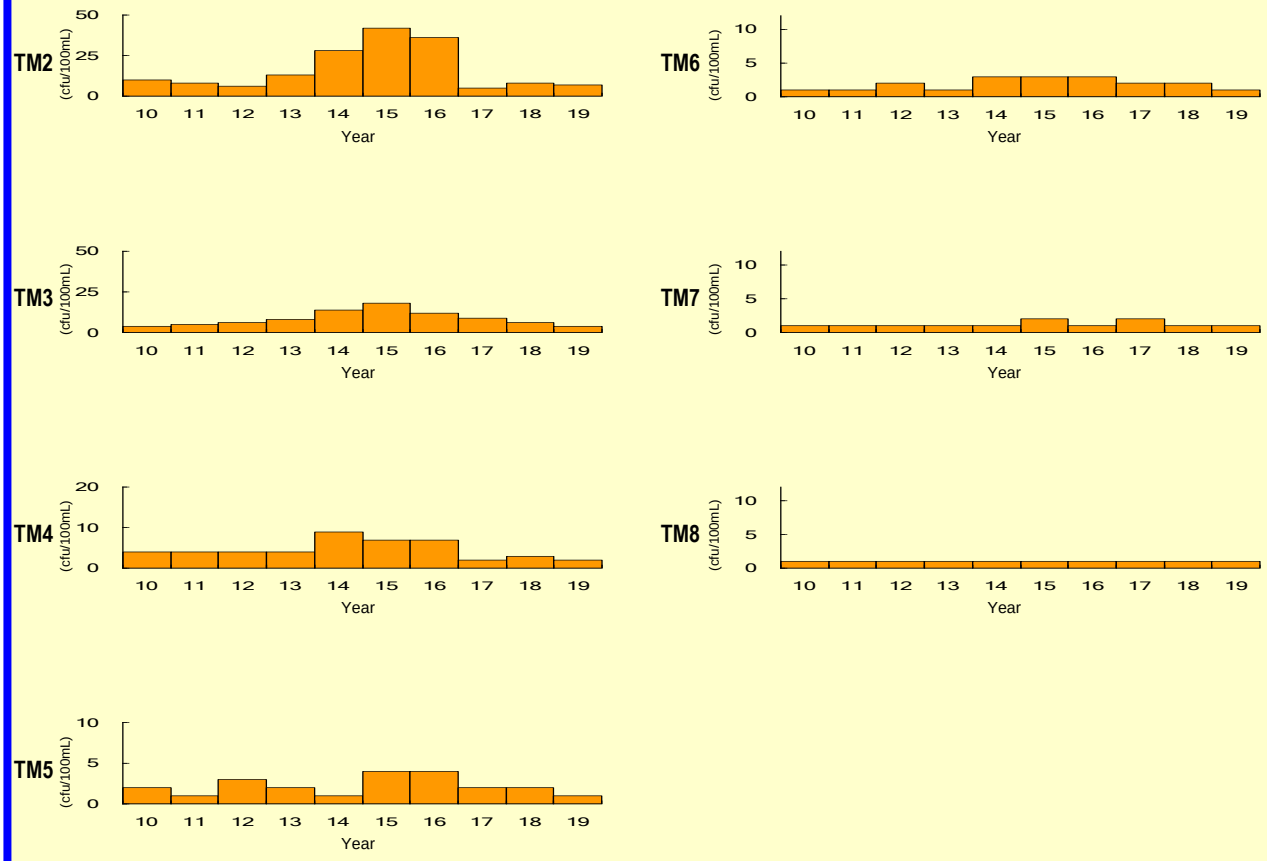
% sample with bottom DO ≥ 4 mg/L

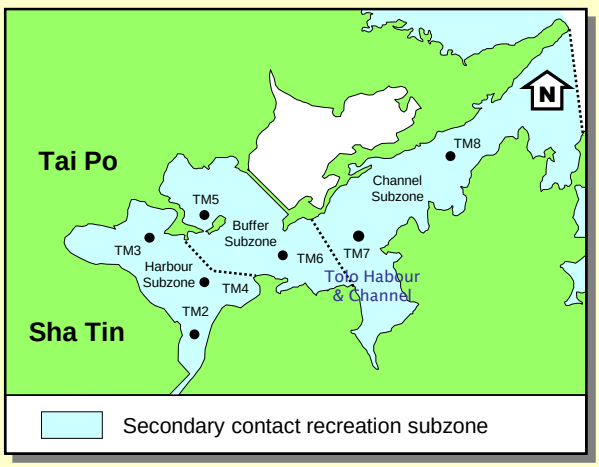


Non-compliance

WQO compliance rates for the Tolo Harbour and Channel WCZ (continued)

E. coli
(annual geometric mean)



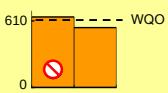


E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

annual geometric mean for depth averaged *E. coli* (cfu/100mL)

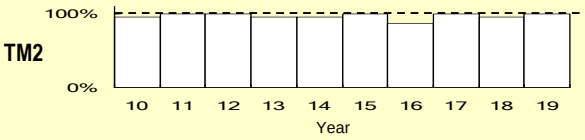
Non-compliance

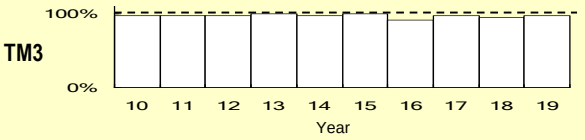


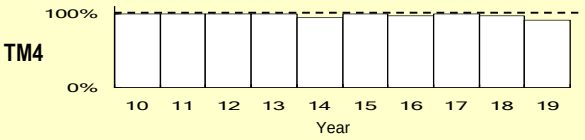
Chlorophyll-*a* lelvels in the Tolo Harbour and Channel WCZ

Chlorophyll-*a*

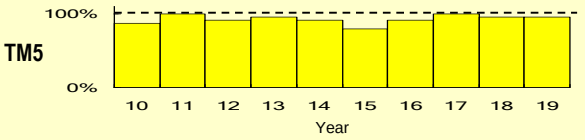
1. Harbour Subzone

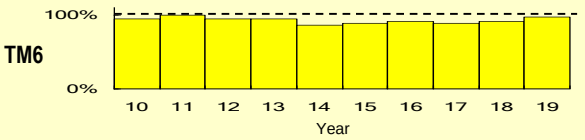




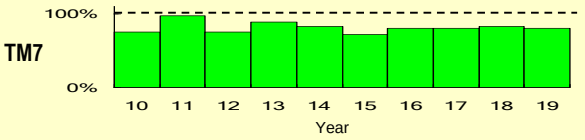


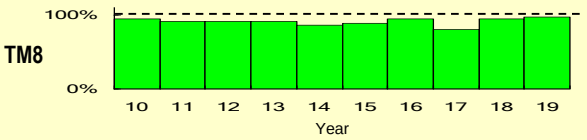
2. Buffer Subzone

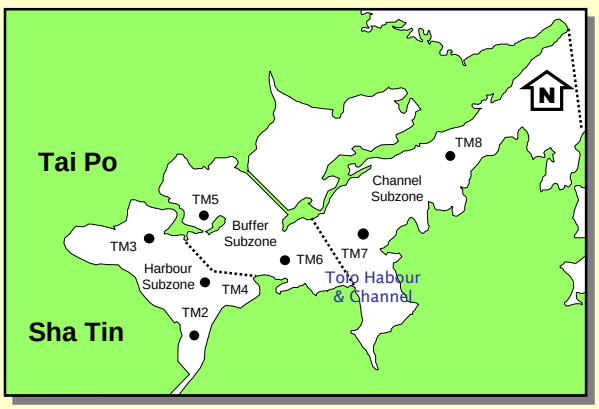




3. Channel Subzone







Chlorophyll-*a*

1. Harbour Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 20 μg/L

WQO : Chlorophyll-*a* ≤ 20 μg/L

2. Buffer Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 10 μg/L

WQO : Chlorophyll-*a* ≤ 10 μg/L

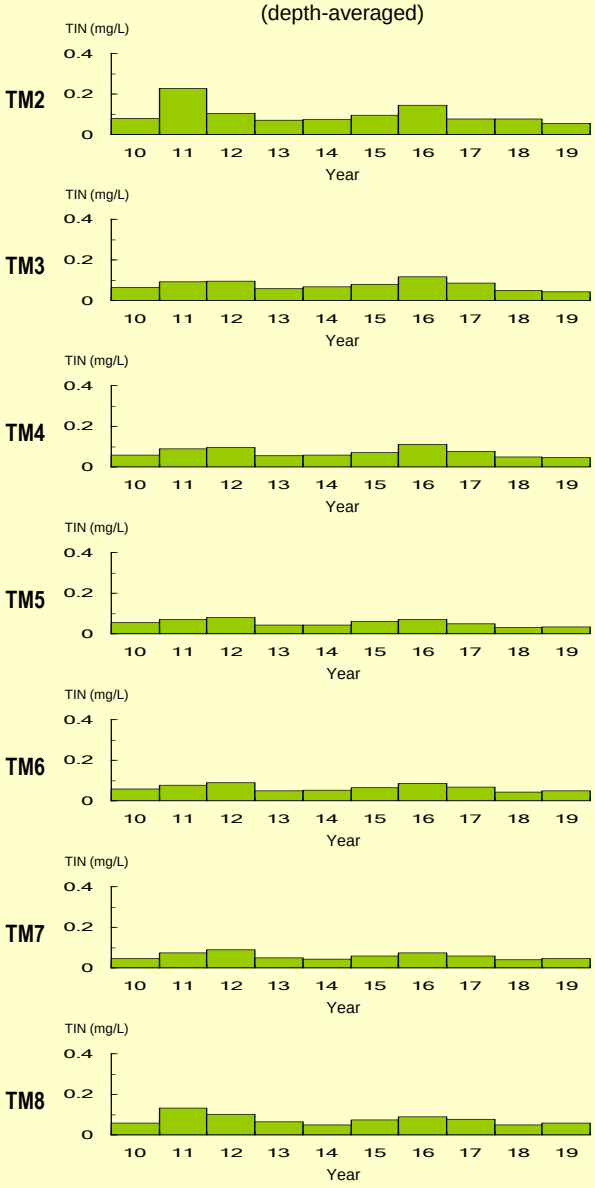
3. Channel Subzone

% sample (S, M, B) with Chlorophyll-*a* ≤ 6 μg/L

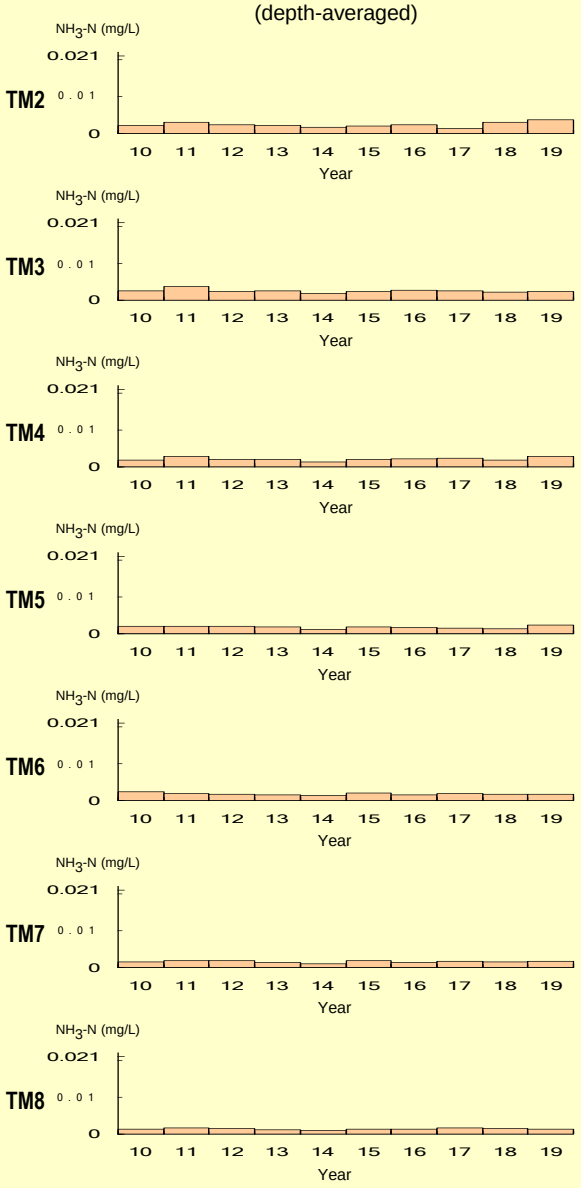
WQO : Chlorophyll-*a* ≤ 6 μg/L

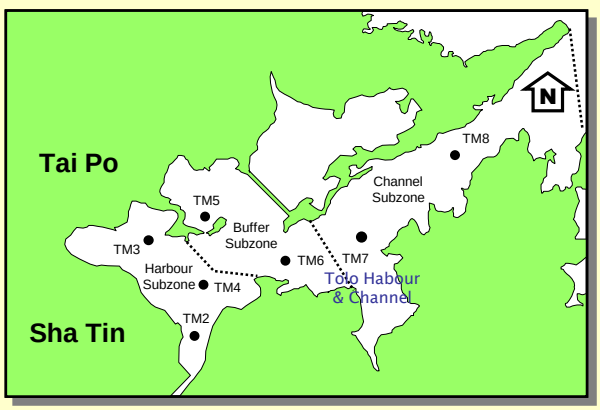
Total inorganic nitrogen and unionised ammonia levels in the Tolo Harbour and Channel WCZ

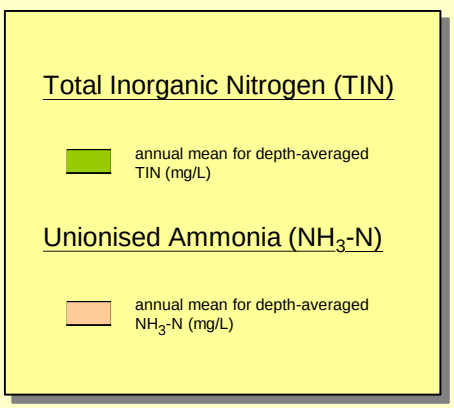
Total Inorganic Nitrogen (TIN)
(depth-averaged)



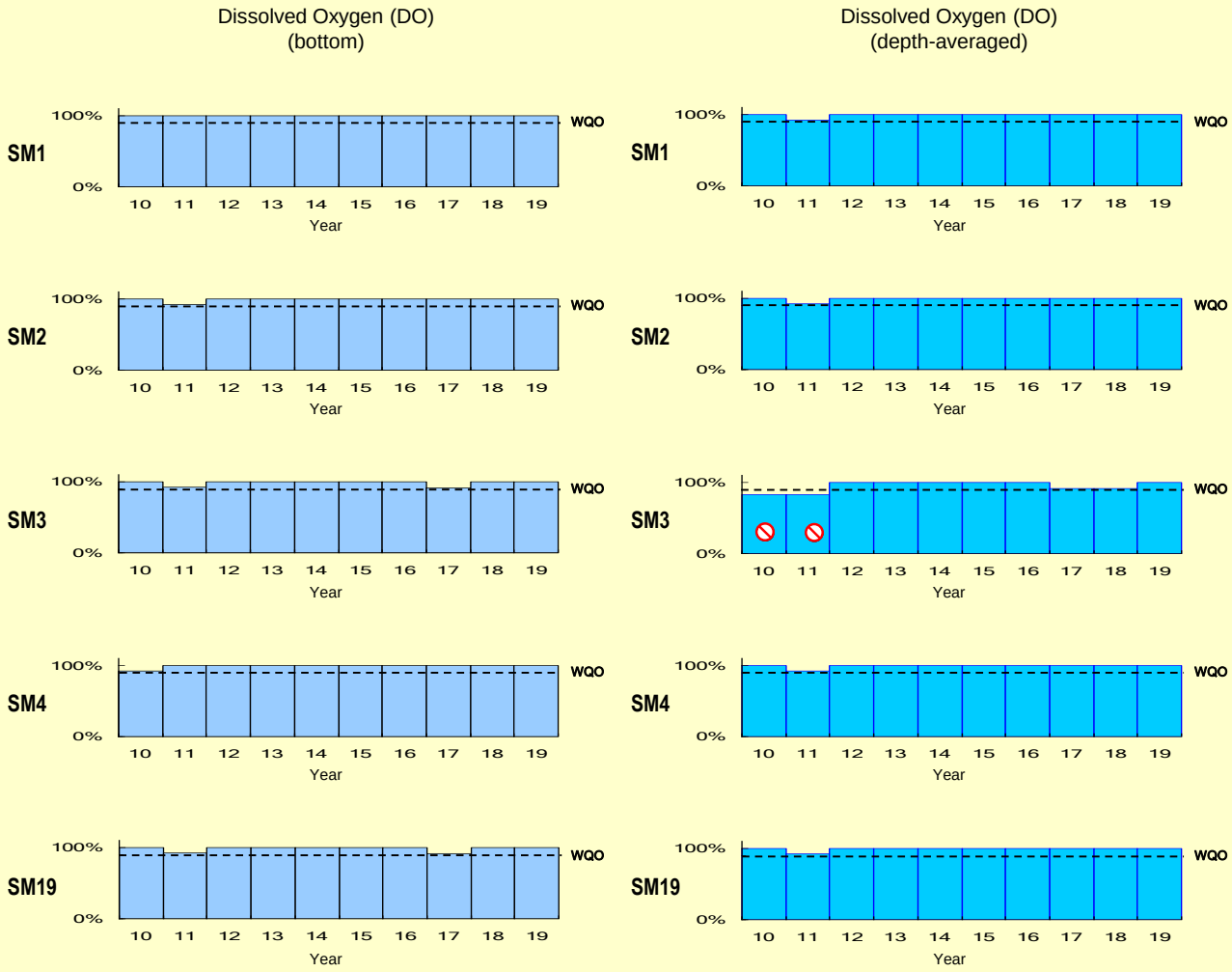
Unionised Ammonia (NH_3-N)
(depth-averaged)

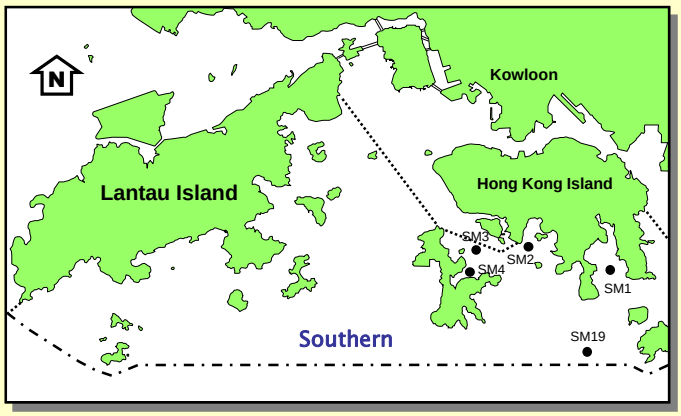






WQO compliance rates for the Southern WCZ





Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

% sample with bottom DO ≥ 2 mg/L

2. Depth-averaged

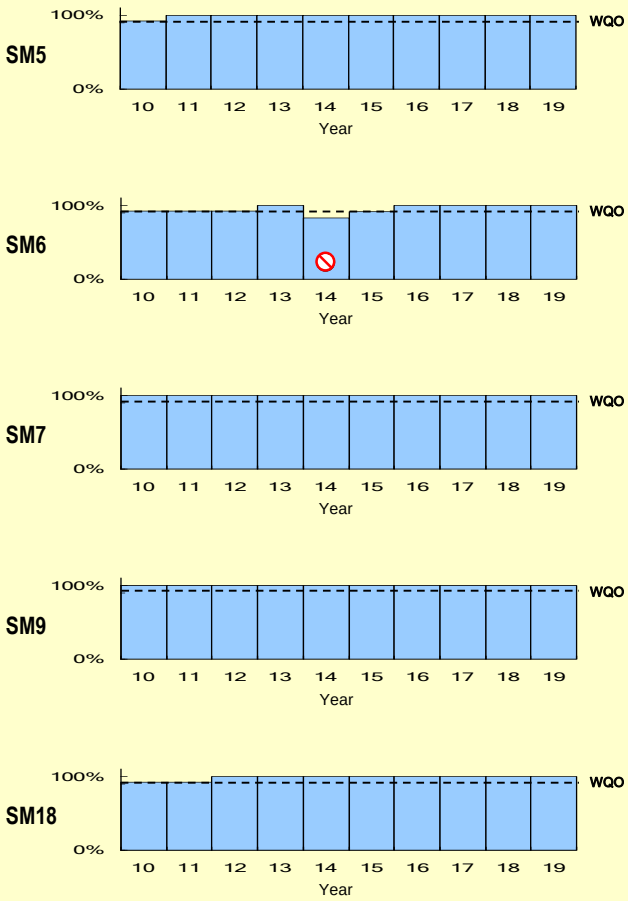
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

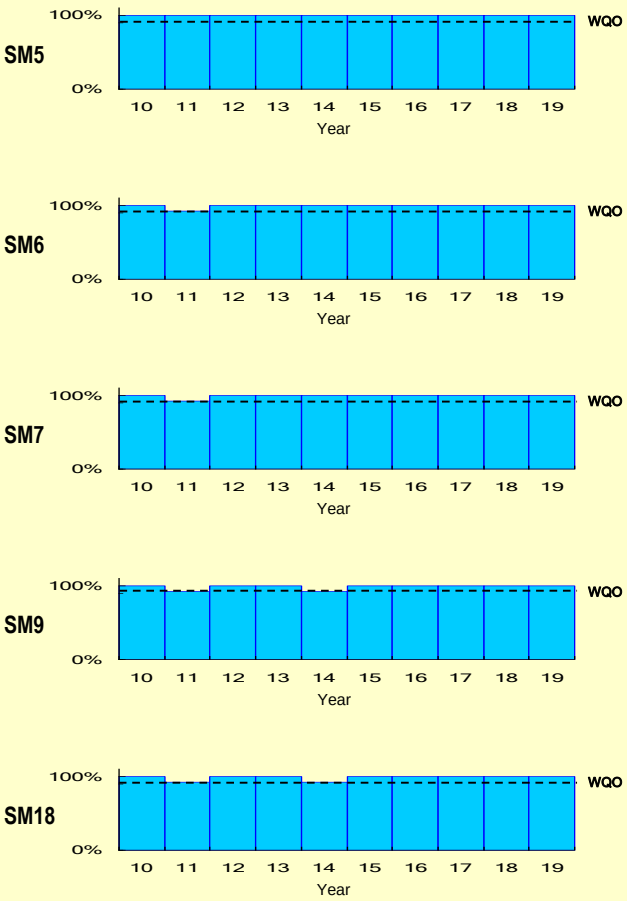
Non-compliance

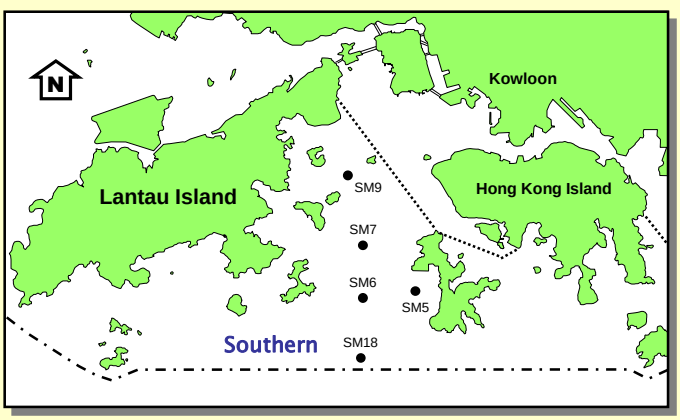
WQO compliance rates for the Southern WCZ (continued)

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



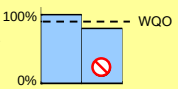


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

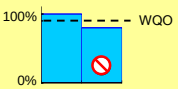
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

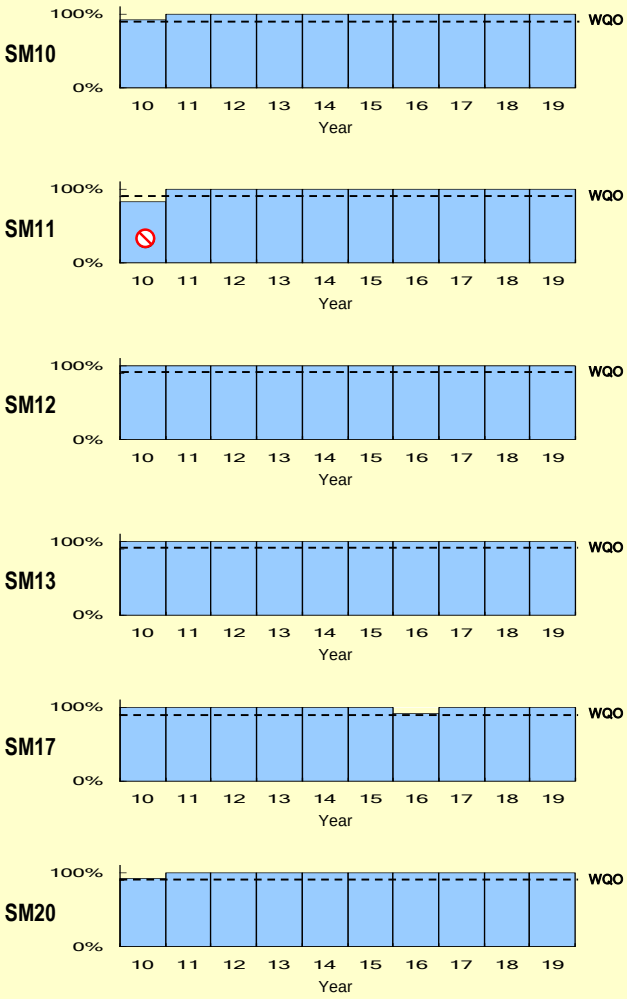
% sample with depth-averaged DO ≥ 4 mg/L



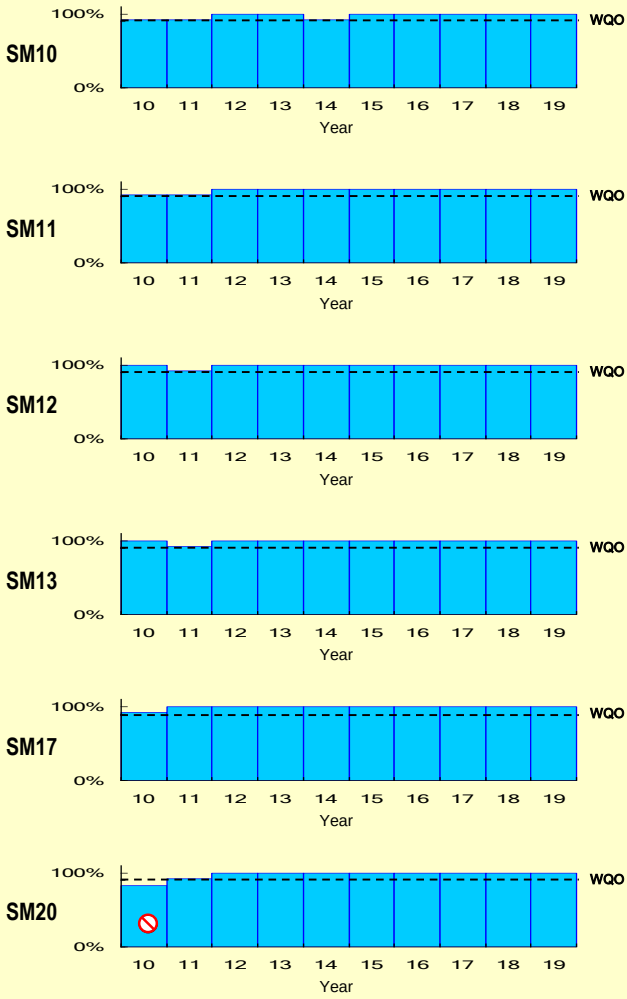
Non-compliance

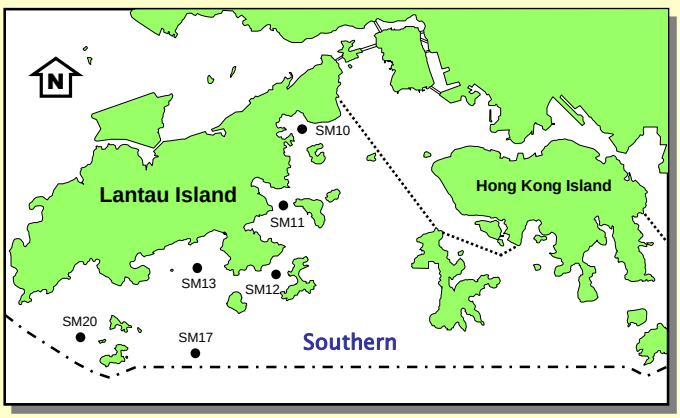
WQO compliance rates for the Southern WCZ (continued)

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



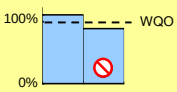


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

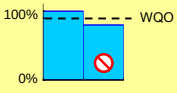
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

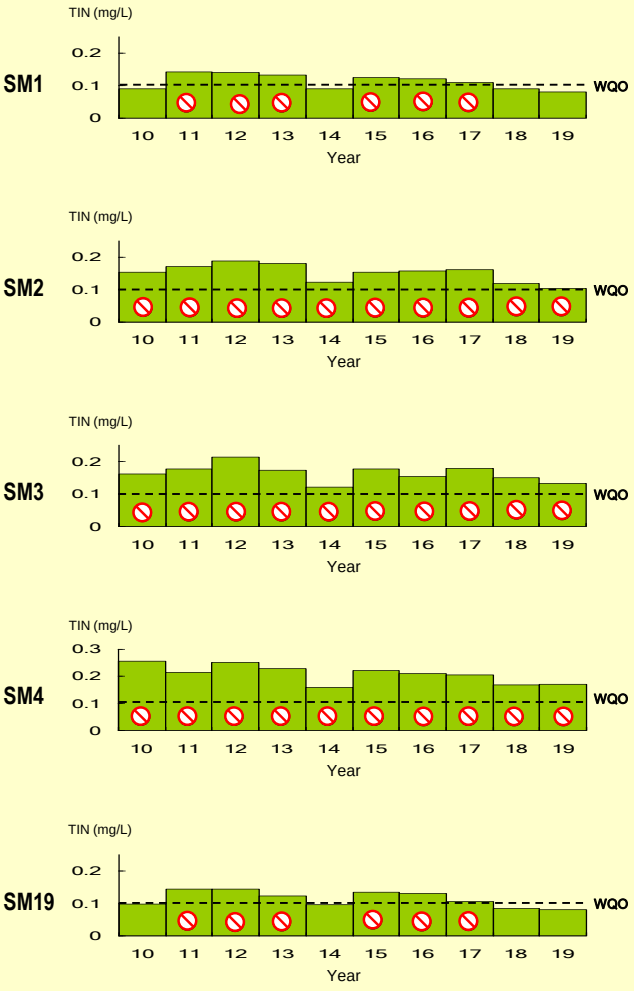
% sample with depth-averaged DO ≥ 4 mg/L



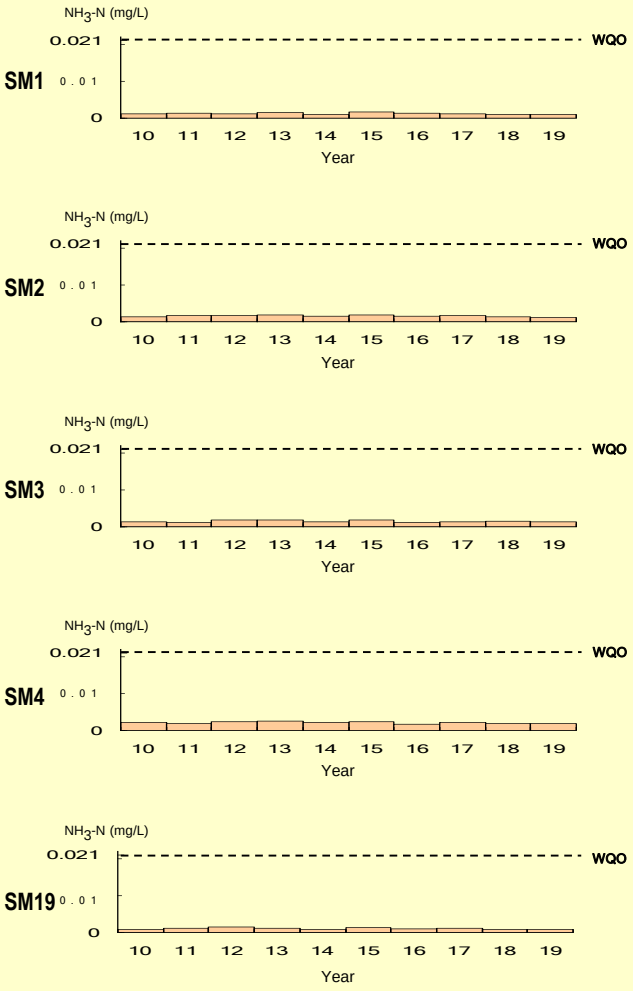
Non-compliance

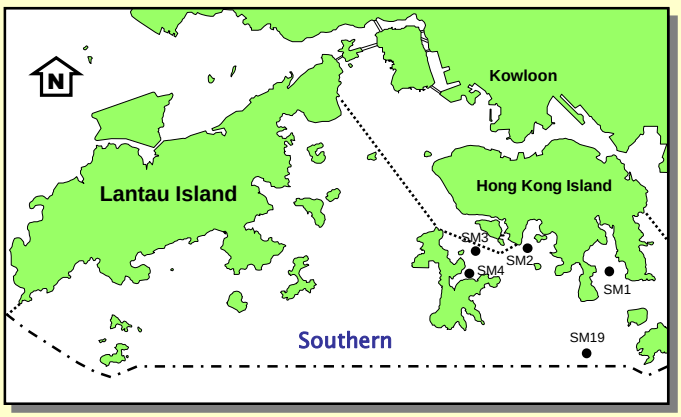
WQO compliance rates for the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN $\leq$ 0.1 mg/L

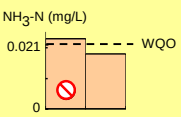
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

annual mean for depth-averaged NH_3-N

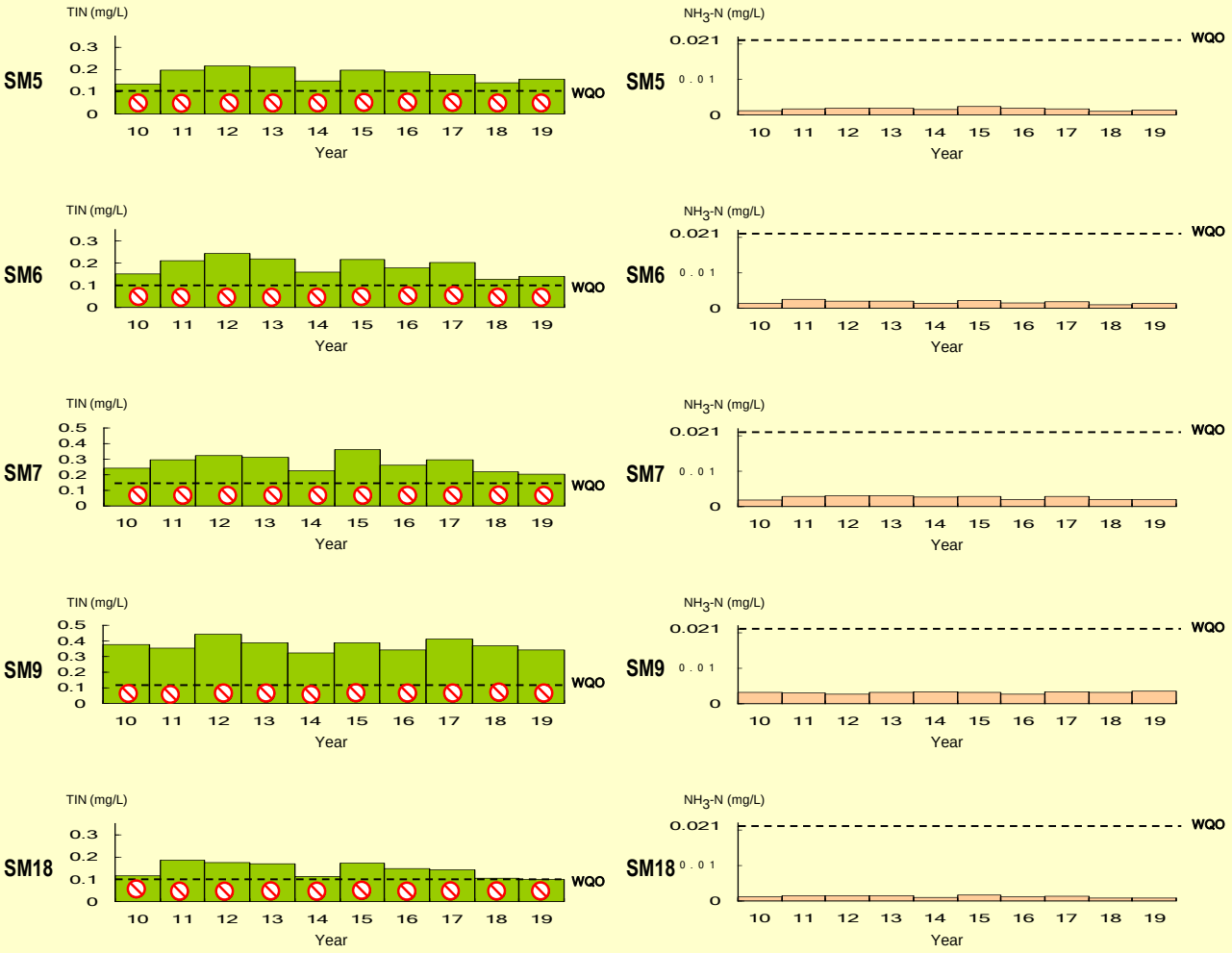
Non-compliance

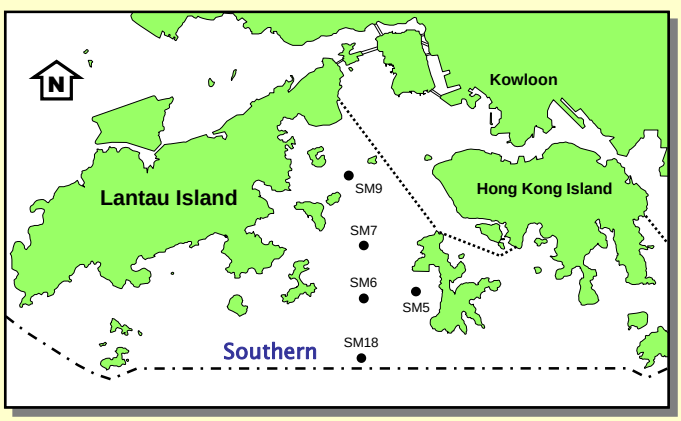


WQO compliance rates for the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)

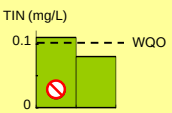




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

annual mean for depth-averaged TIN

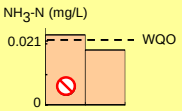


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N

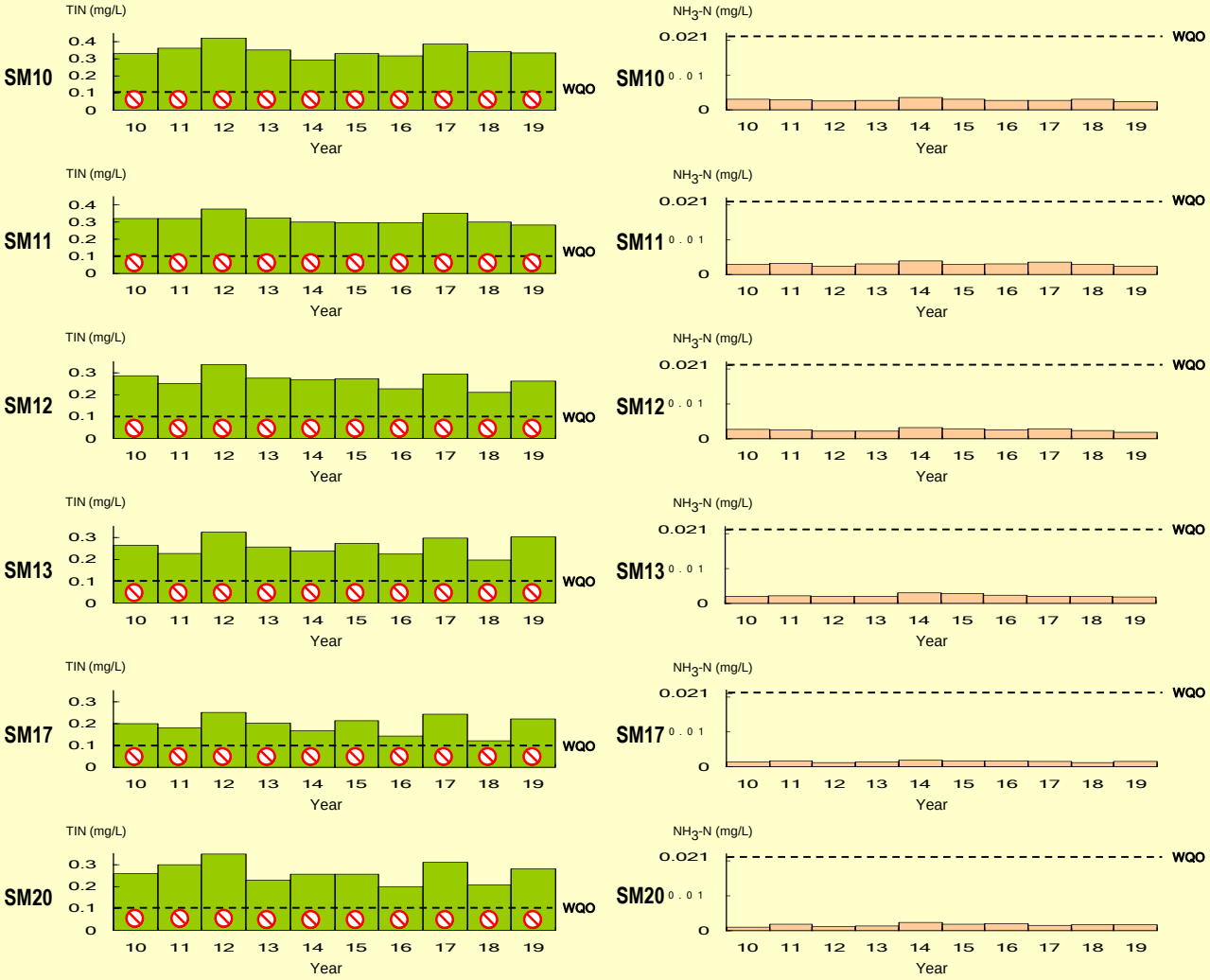
Non-compliance

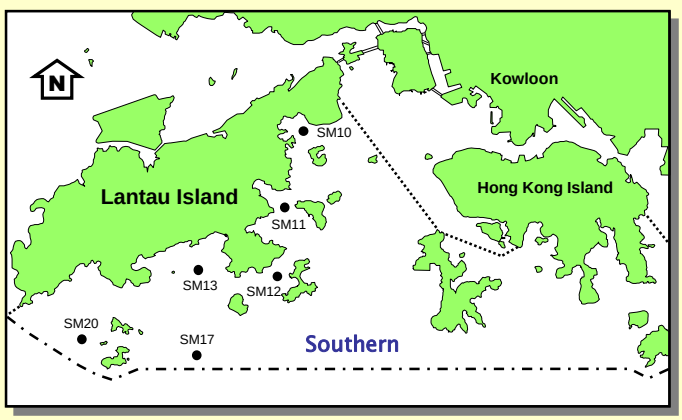


WQO compliance rates for the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.1 mg/L

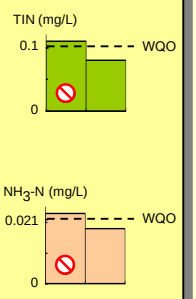
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

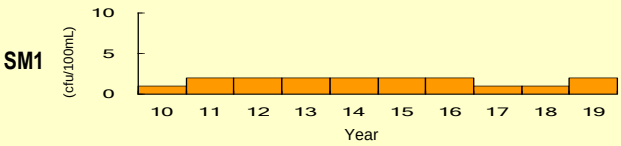
annual mean for depth-averaged NH_3-N

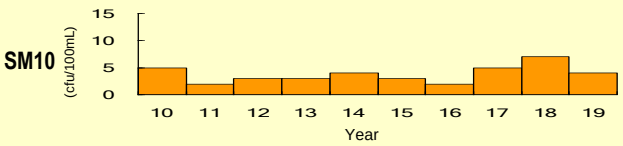
Non-compliance

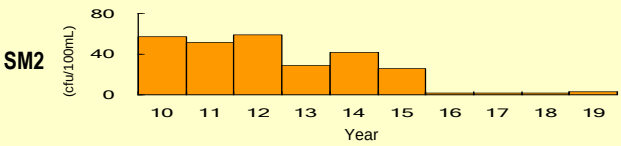


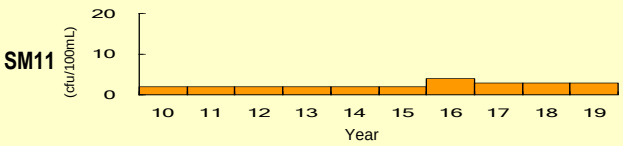
WQO compliance rates for the Southern WCZ (continued)

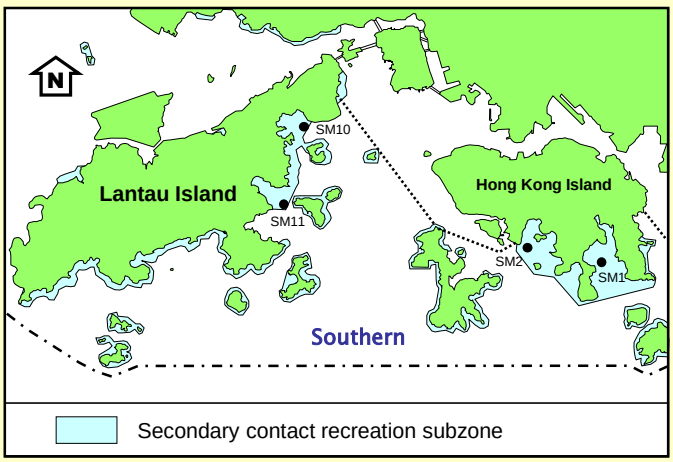
E. coli
(annual geometric mean)





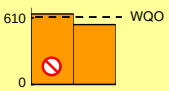






E. coli

WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

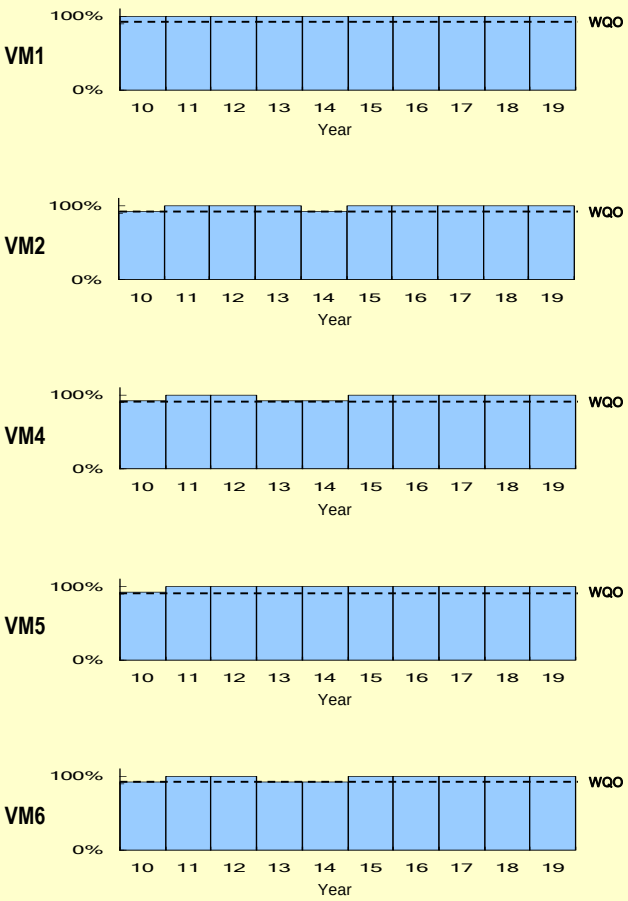


annual geometric mean for depth averaged
E. coli (cfu/100mL)

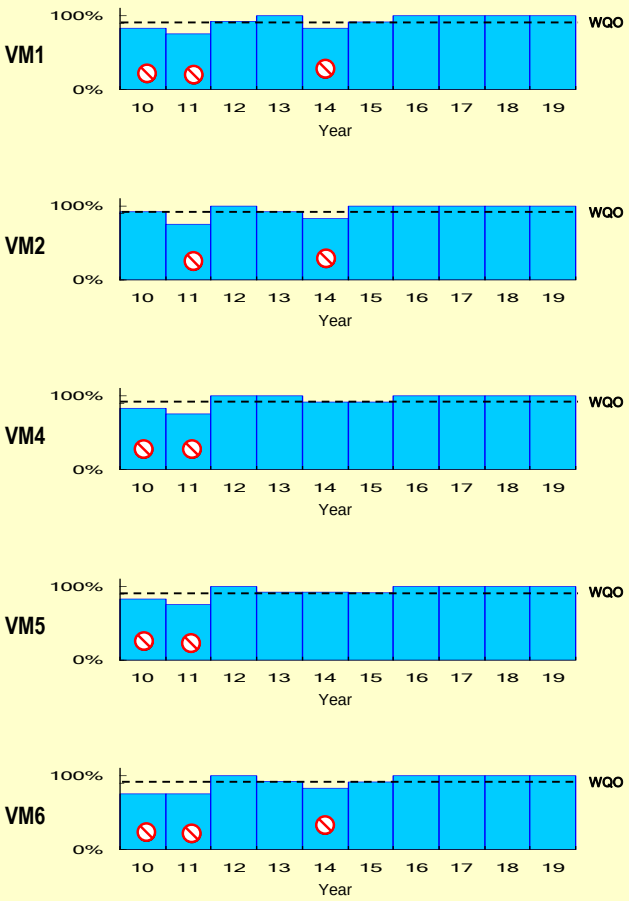
Non-compliance

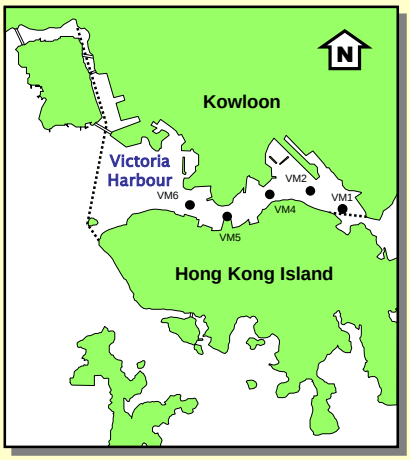
WQO compliance rates for the Victoria Harbour WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



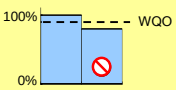


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

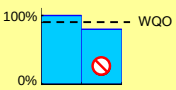
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

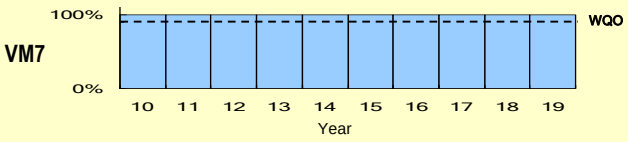
% sample with depth-averaged DO ≥ 4 mg/L

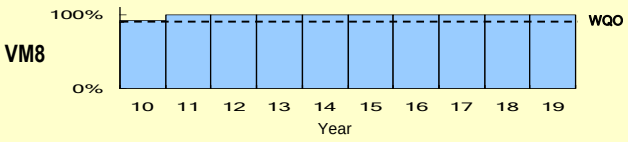


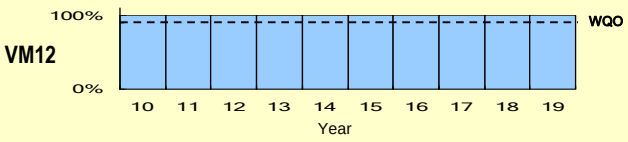
Non-compliance

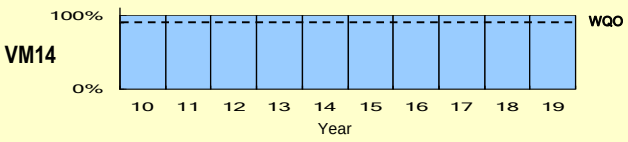
WQO compliance rates for the Victoria Harbour WCZ (continued)

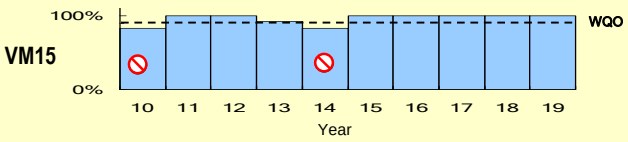
Dissolved Oxygen (DO)
(bottom)



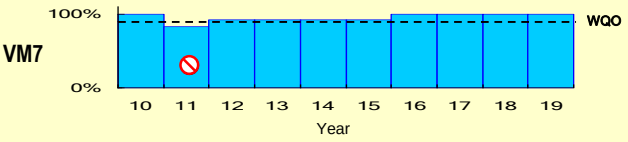


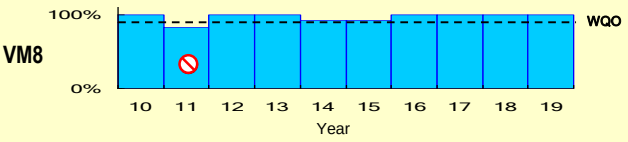


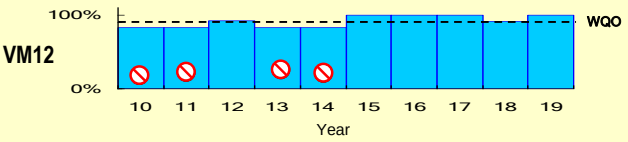


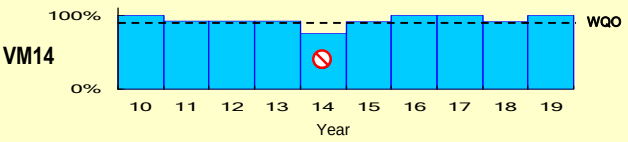


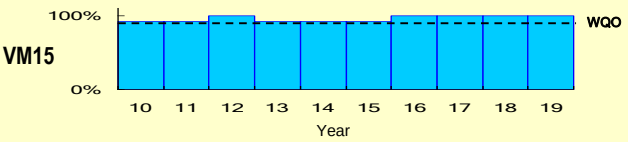
Dissolved Oxygen (DO)
(depth-averaged)

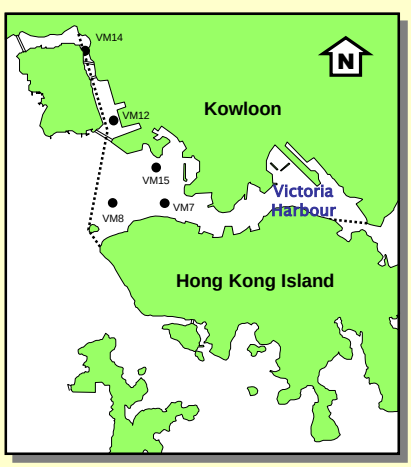










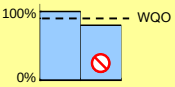


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

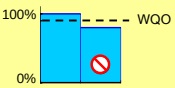
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

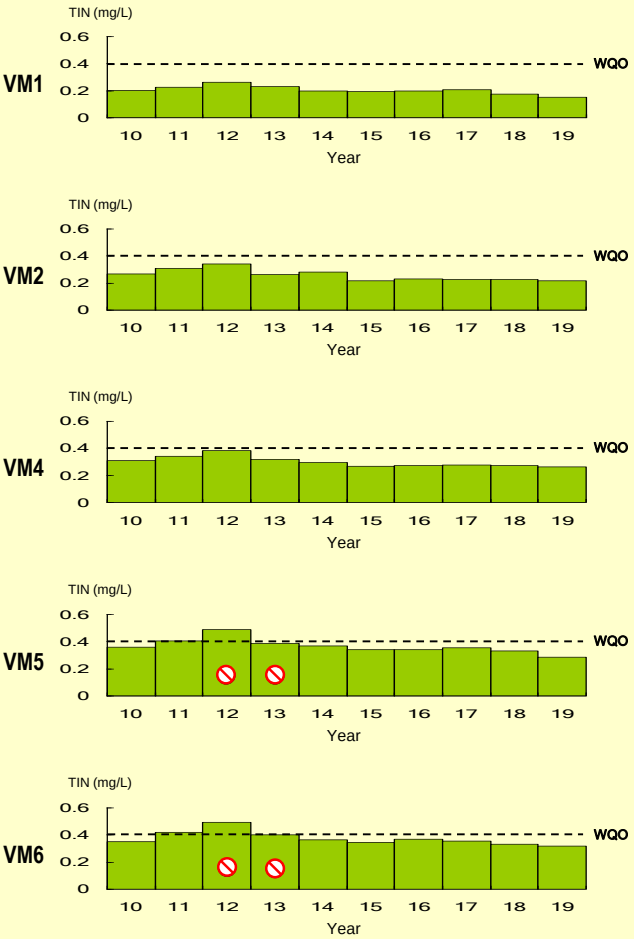
% sample with depth-averaged DO ≥ 4 mg/L



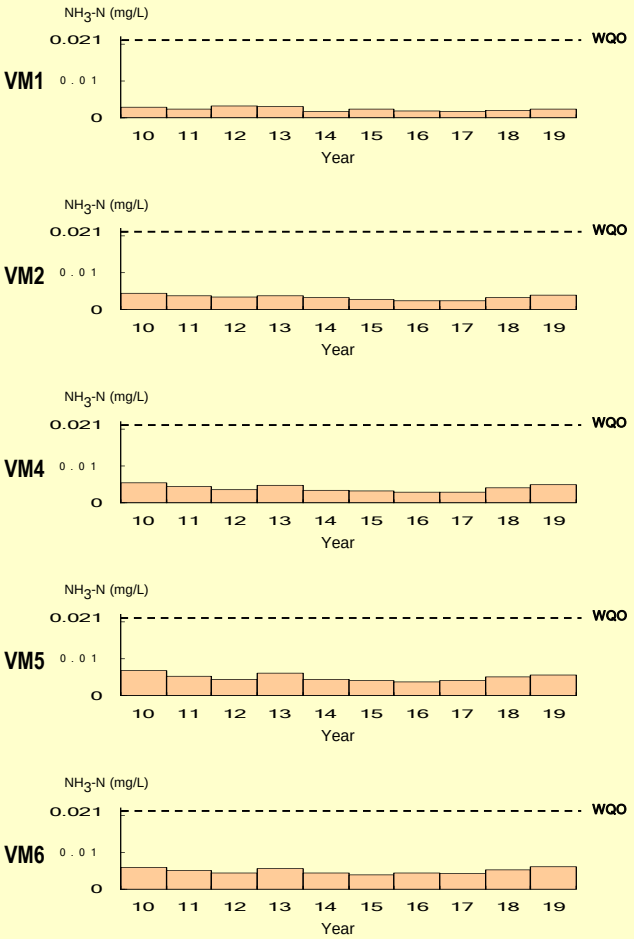
Non-compliance

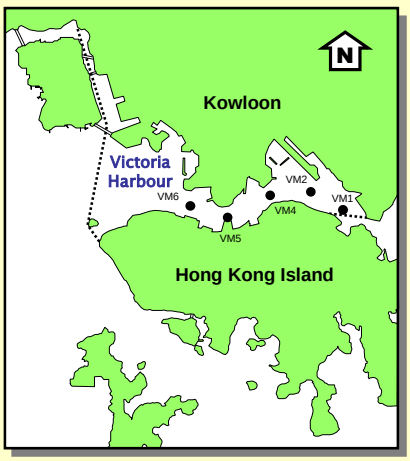
WQO compliance rates for the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

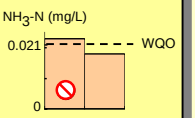
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N

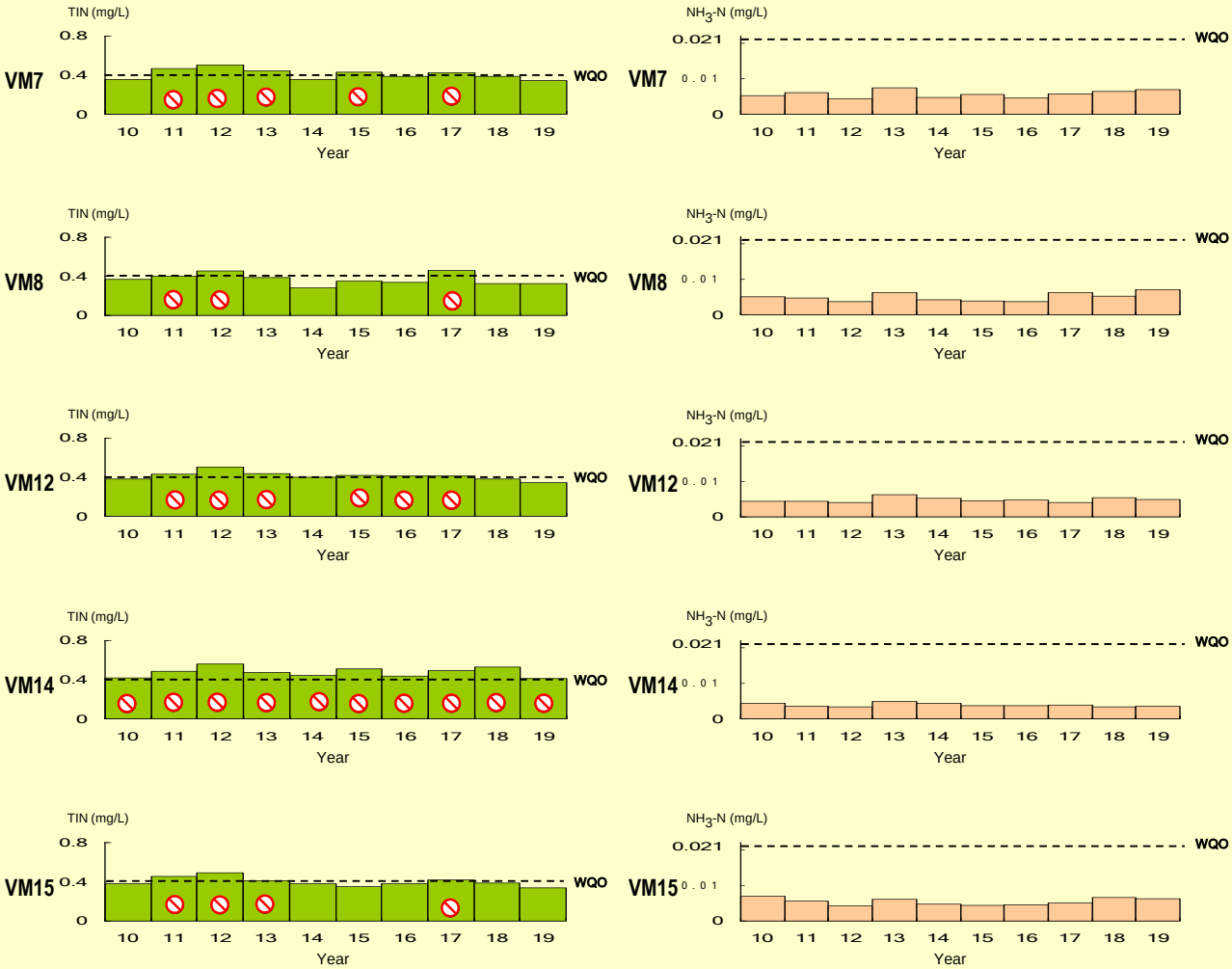
Non-compliance

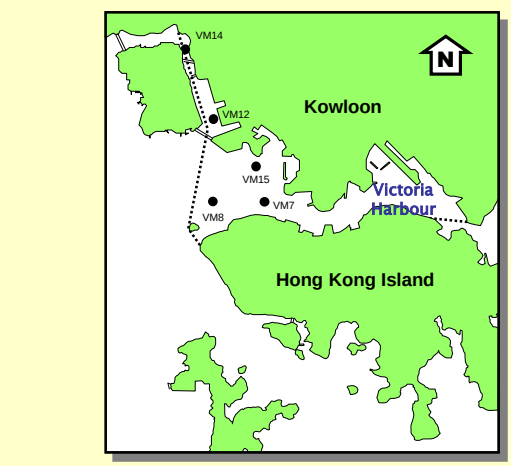


WQO compliance rates for the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)

Unionised Ammonia (NH_3-N)
(depth-averaged)





Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

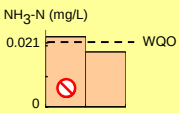
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

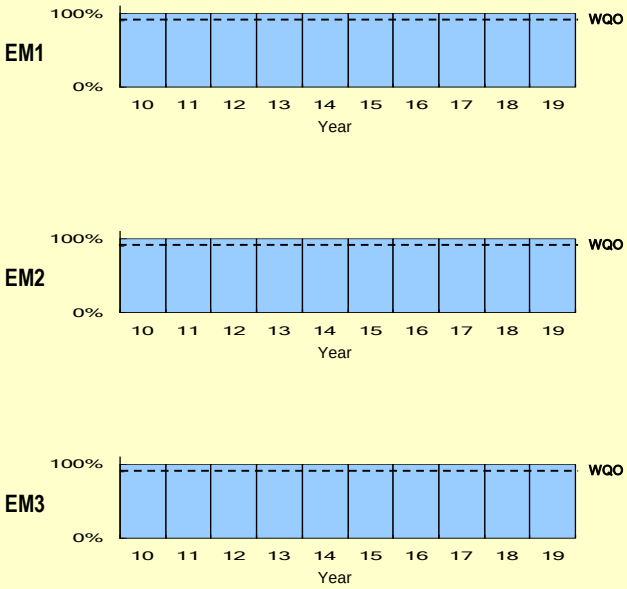
annual mean for depth-averaged NH_3-N

Non-compliance

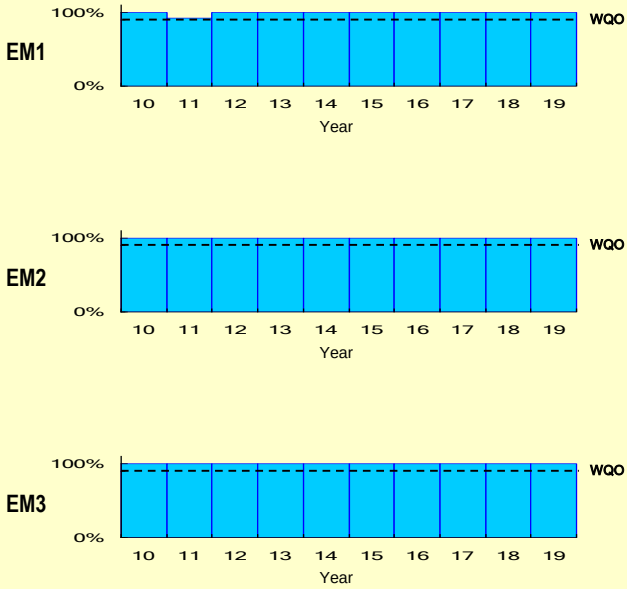


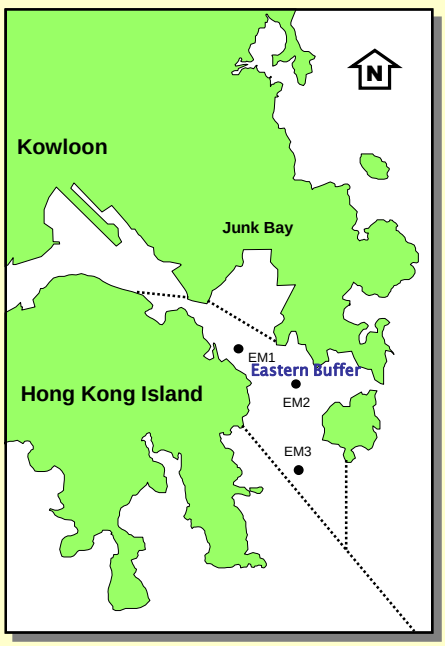
WQO compliance rates for the Eastern Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



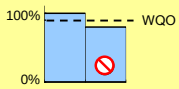


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

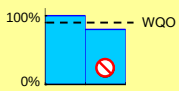
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

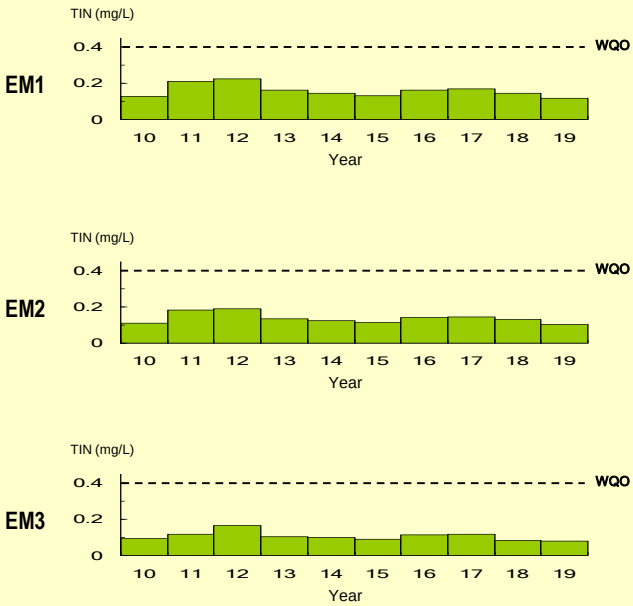
% sample with depth-averaged DO ≥ 4 mg/L



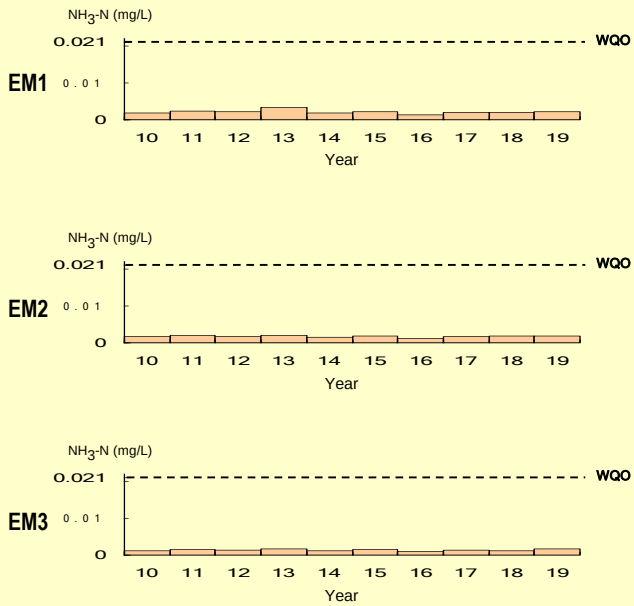
Non-compliance

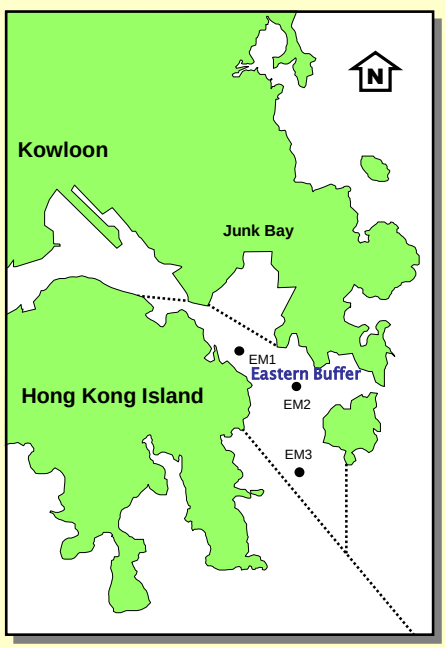
WQO compliance rates for the Eastern Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)

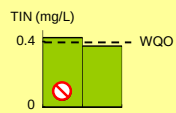




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN $\leq$ 0.4 mg/L

annual mean for depth-averaged TIN

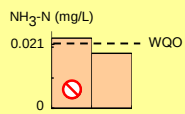


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N $\leq$ 0.021 mg/L

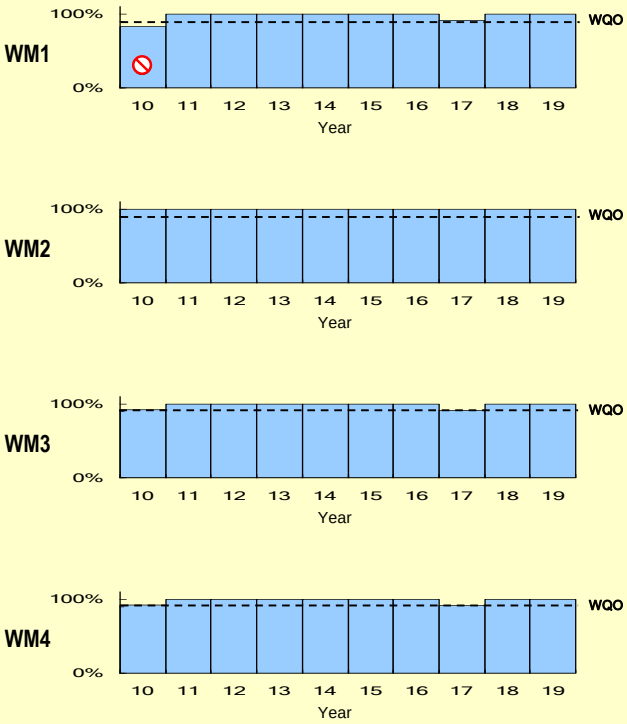
annual mean for depth-averaged NH_3-N

Non-compliance

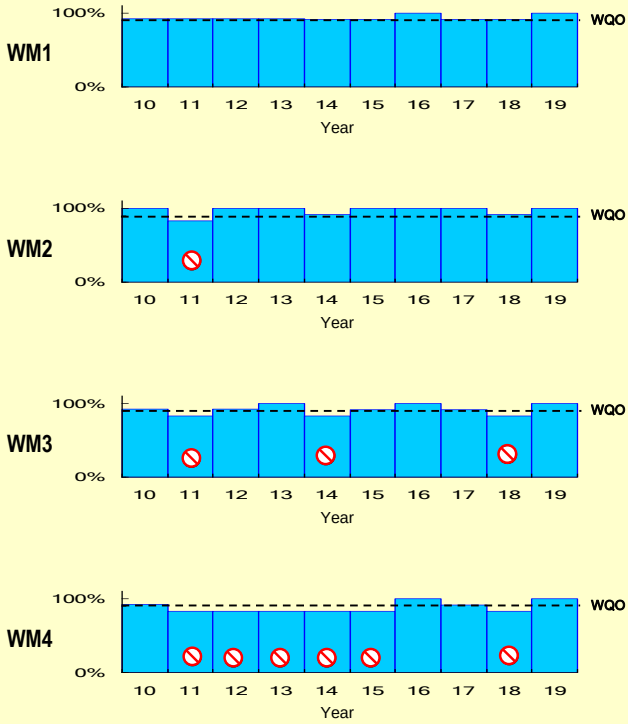


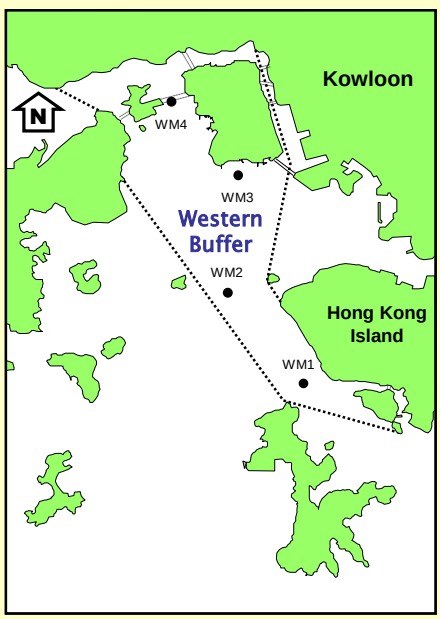
WQO compliance rates for the Western Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



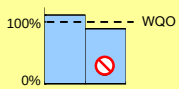


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

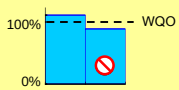
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L

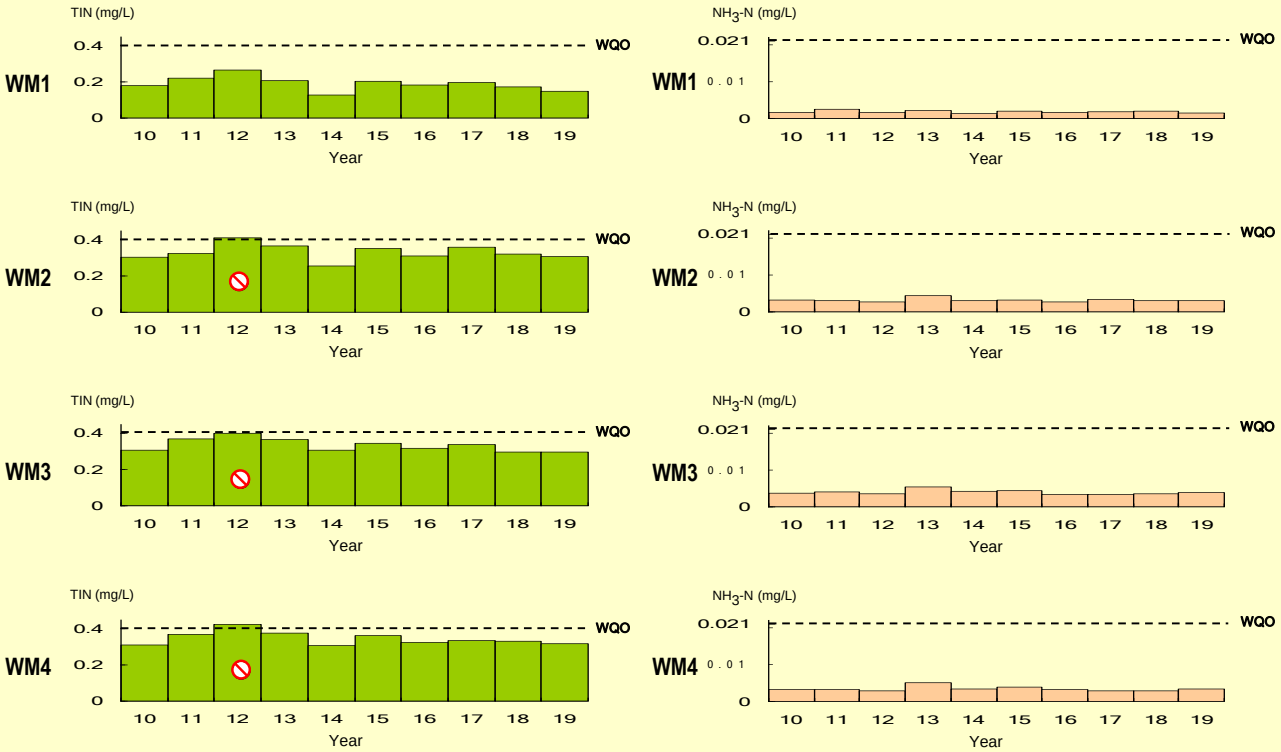


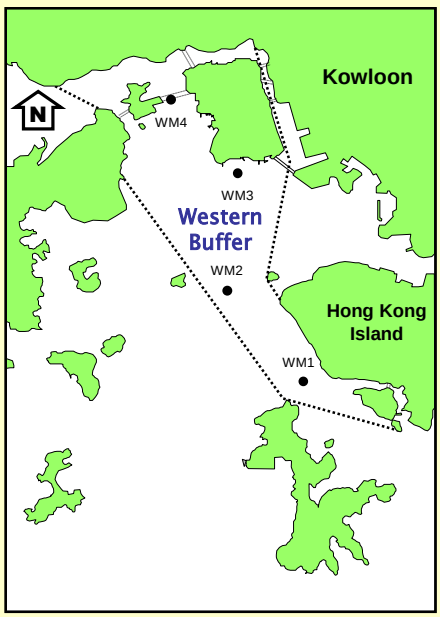
Non-compliance

WQO compliance rates for the Western Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

Unionised Ammonia (NH_3-N) (depth-averaged)

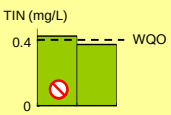




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

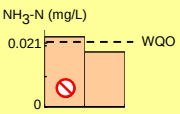


Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

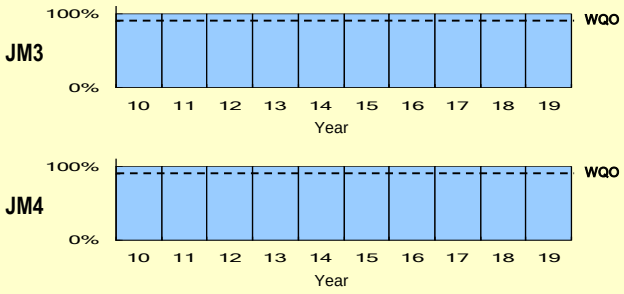
annual mean for depth-averaged NH_3-N

Non-compliance

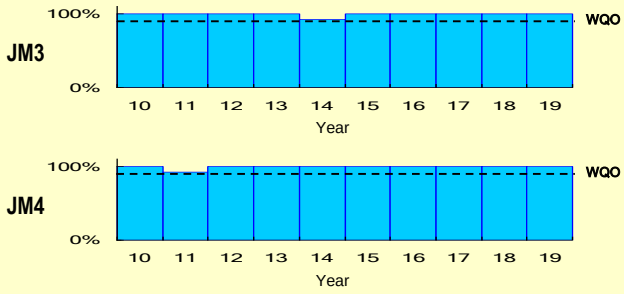


WQO compliance rates for the Junk Bay WCZ

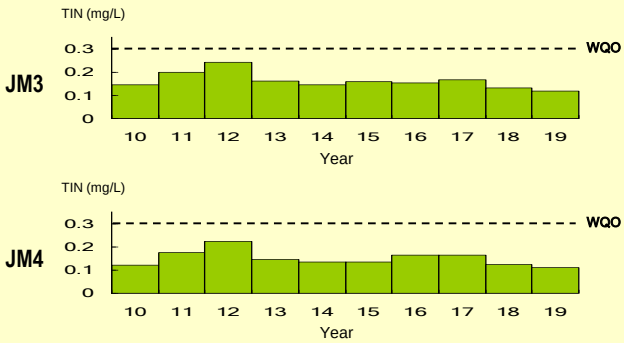
Dissolved Oxygen (DO)
(bottom)



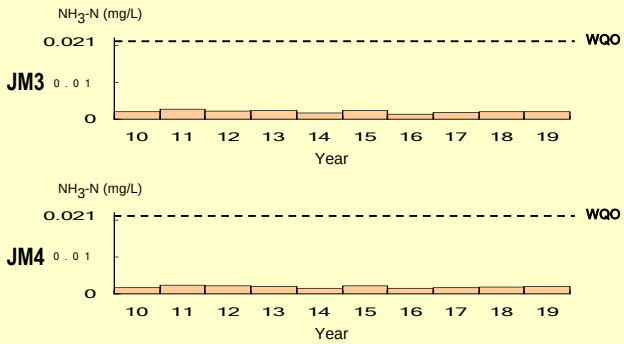
Dissolved Oxygen (DO)
(depth-averaged)

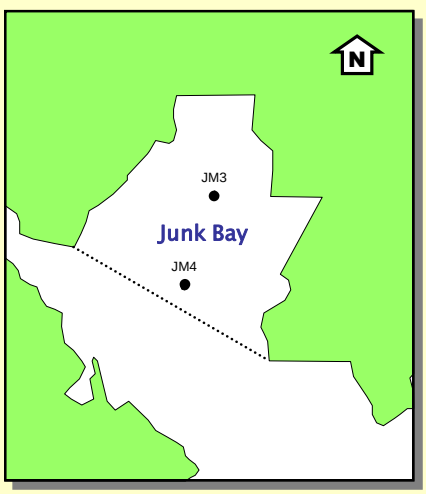


Total Inorganic Nitrogen (TIN)
(depth-averaged)



Unionised Ammonia (NH_3-N)
(depth-averaged)



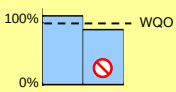


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

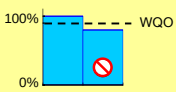
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

% sample with depth-averaged DO ≥ 4 mg/L



Total Inorganic Nitrogen (TIN)

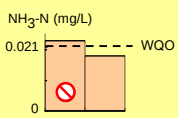
WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N



Non-compliance

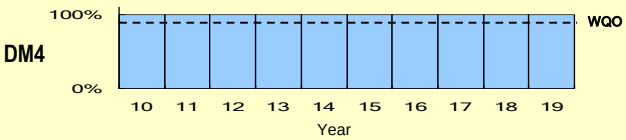
WQO compliance rates for the Deep Bay WCZ

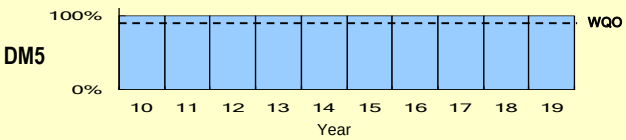
Dissolved Oxygen (DO)
(bottom)

DM1 DO (bottom) not measured, water depth ≤ 3m

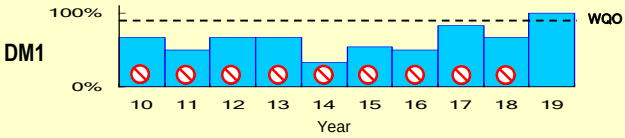
DM2 DO (bottom) not measured, water depth ≤ 3m

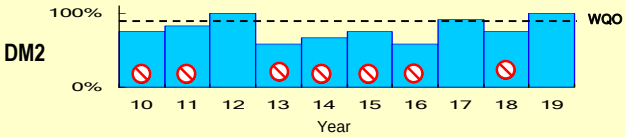
DM3 DO (bottom) not measured, water depth ≤ 3m

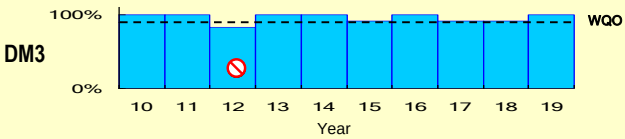


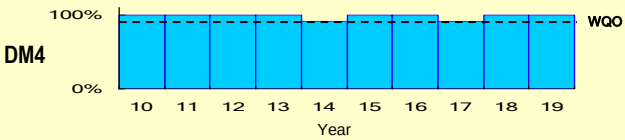


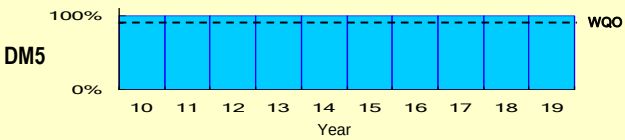
Dissolved Oxygen (DO)
(depth-averaged)

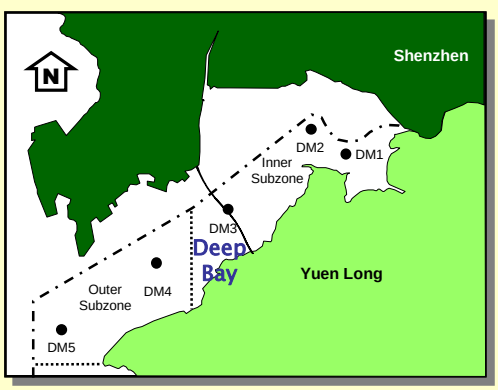










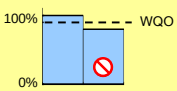


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

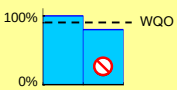
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

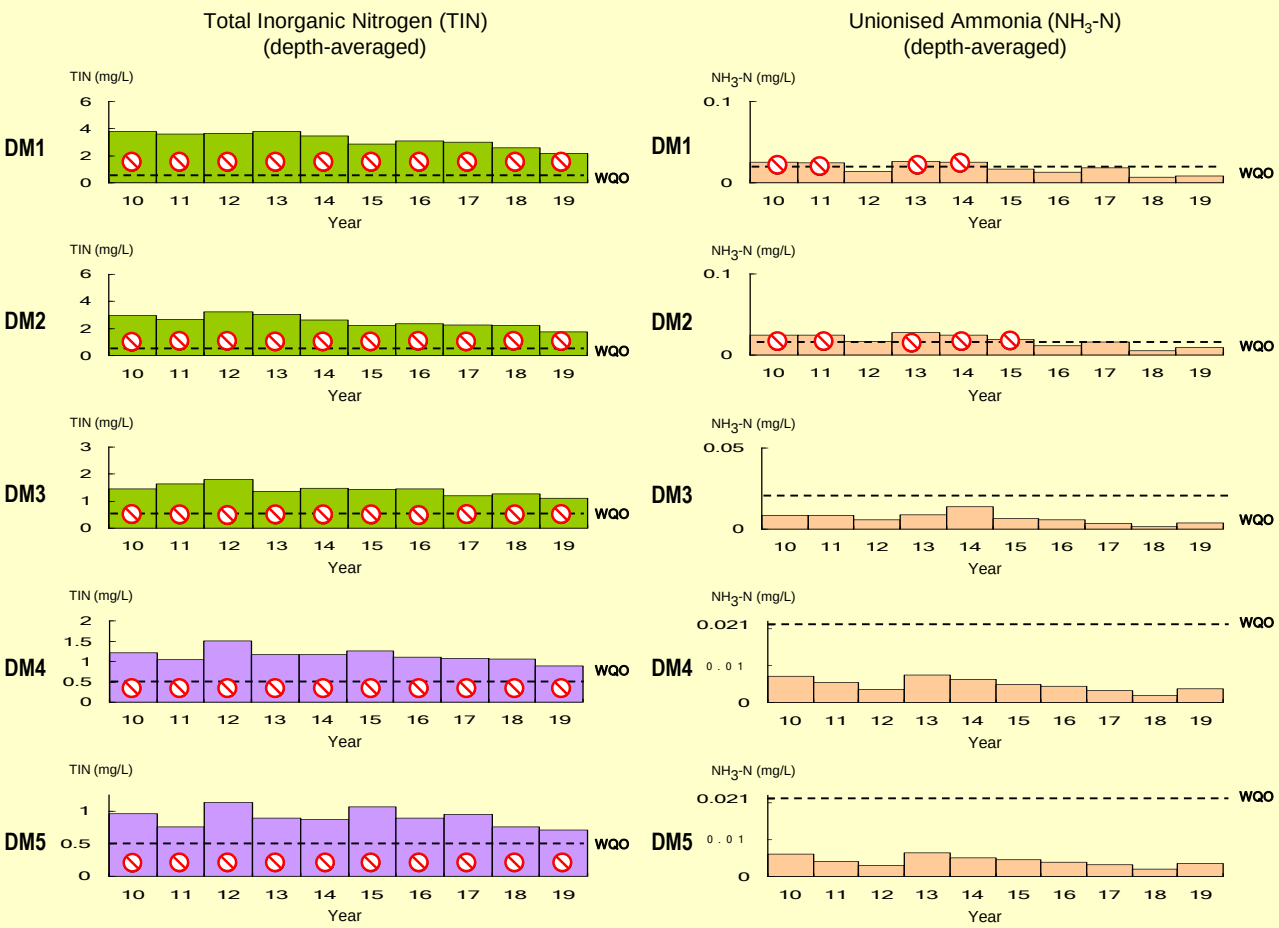
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

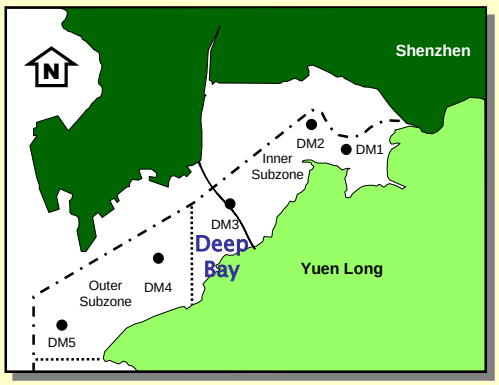
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

WQO compliance rates for the Deep Bay WCZ (continued)





Total Inorganic Nitrogen (TIN)

Inner Subzone (DM1 - DM3)

WQO : annual mean for depth-averaged TIN ≤ 0.7 mg/L

annual mean for depth-averaged TIN

Outer Subzone (DM4 - DM5)

WQO : annual mean for depth-averaged TIN ≤ 0.5 mg/L

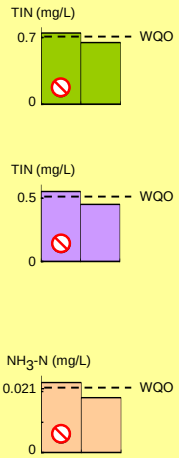
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

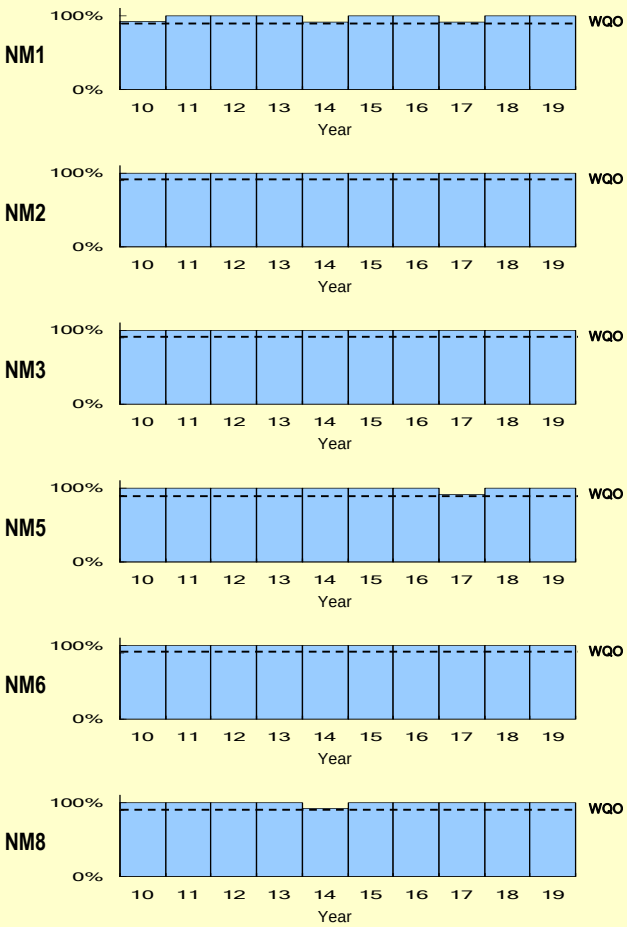
annual mean for depth-averaged NH_3-N

Non-compliance

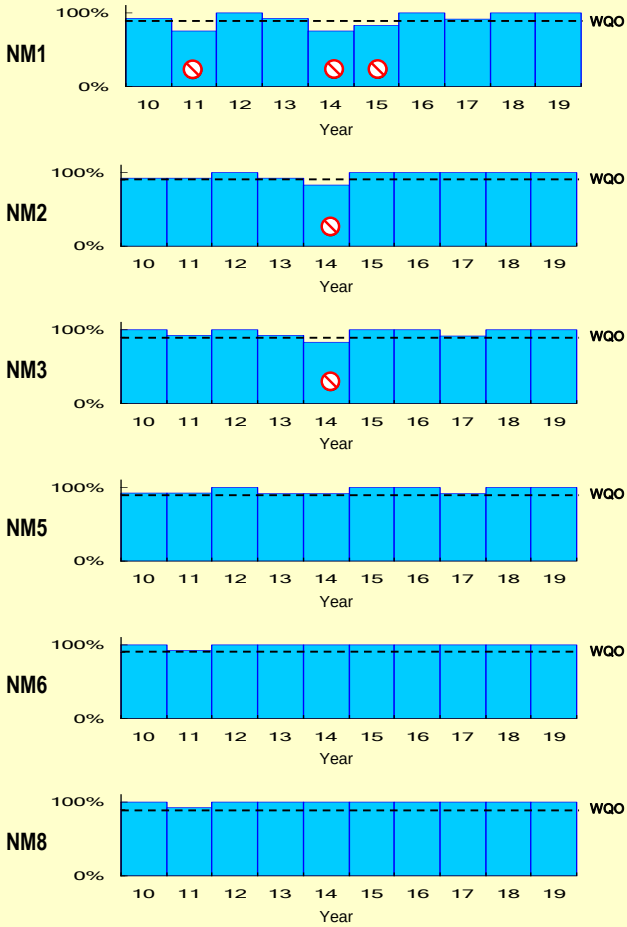


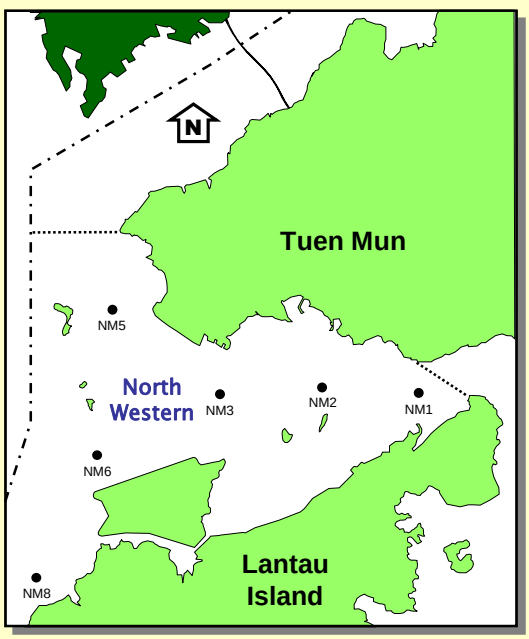
WQO compliance rates for the North Western WCZ

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



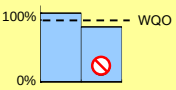


Dissolved Oxygen (DO)

1. Bottom

WQO : 90% sample with bottom DO ≥ 2 mg/L

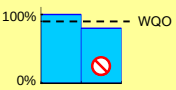
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

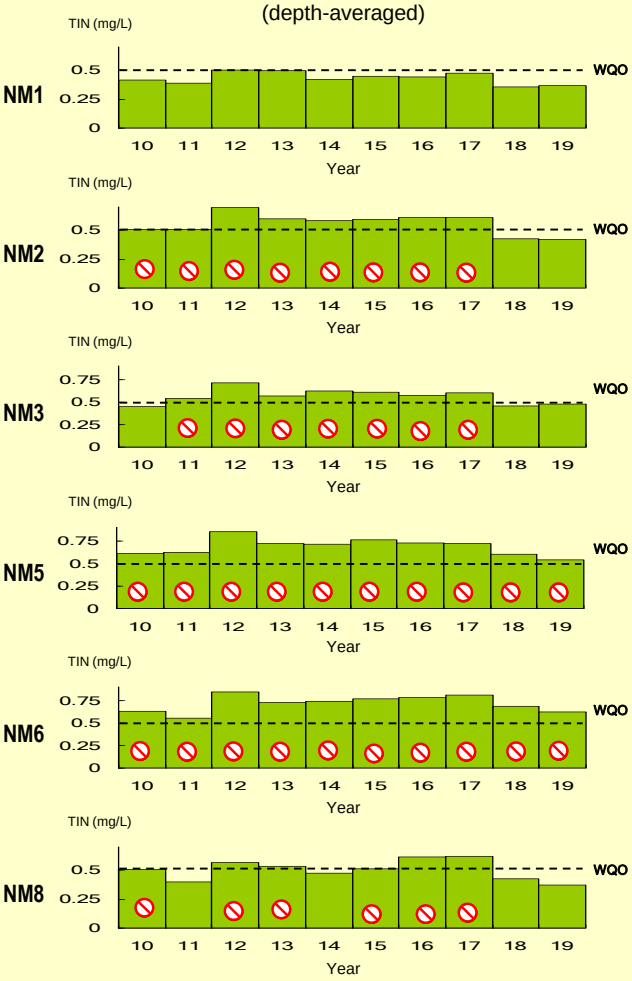
% sample with depth-averaged DO ≥ 4 mg/L



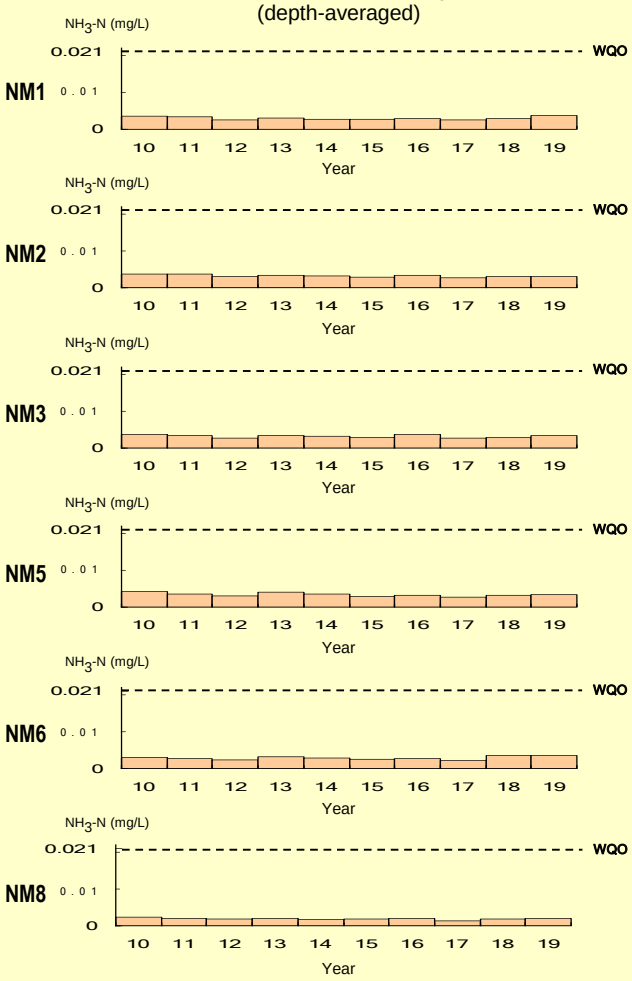
Non-compliance

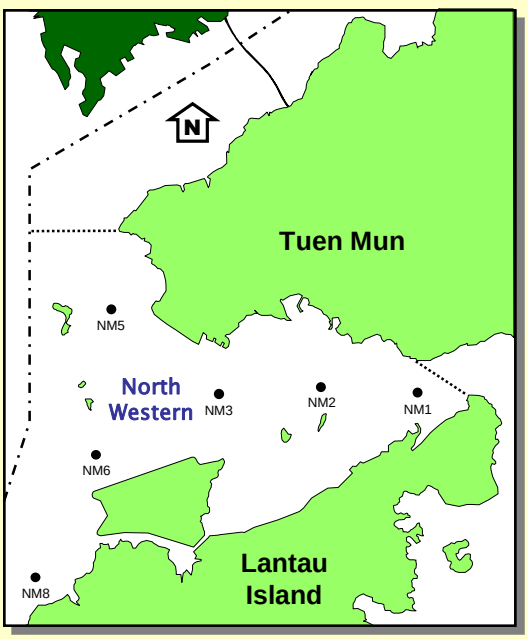
WQO compliance rates for the North Western WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)



Unionised Ammonia (NH_3-N) (depth-averaged)

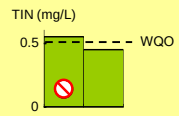




Total Inorganic Nitrogen (TIN)

WQO : annual mean for depth-averaged TIN ≤ 0.5 mg/L

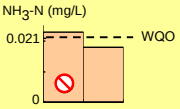
annual mean for depth-averaged TIN



Unionised Ammonia (NH_3-N)

WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

annual mean for depth-averaged NH_3-N



Non-compliance

Long-term water quality trend analyses in the Mirs Bay WCZ, 1991-2019

Monitoring Station		MM1	MM2	MM3	MM4	MM5	MM6	MM7
Monitoring Period		1991 I 2019	1991 I 2019	1991 I 2019	1991 I 2019	1991 I 2019	1991 I 2019	1991 I 2019
Parameter	Water Depth							
Temperature (℃)	Surface	-	-	-	-	-	-	-
	Middle	-	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗
	Average	-	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	-	-	-	-	↘	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	↘	↘	-	-
	Average	-	-	-	-	↘	-	-
Dissolved Oxygen (%)	Surface	↘	-	-	-	-	↘	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	↘	-	-
	Average	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	-	↘	↘	↘	-	-
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	↘	-
	Bottom	↘	↘	-	-	-	↘	-
	Average	↘	-	-	-	-	↘	-
Suspended Solids (mg/L)	Surface	-	↗	↗	↗	↗	↗	↗
	Middle	-	↗	↗	↗	↗	↗	↗
	Bottom	-	↗	↗	↗	↗	-	↗
	Average	-	↗	↗	↗	↗	-	↗
Total volatile solids (mg/L)	Surface	-	↗	↗	↗	↗	↗	↗
	Middle	-	↗	↗	↗	↗	↗	↗
	Bottom	-	↗	↗	↗	↗	↗	↗
	Average	-	↗	↗	↗	↗	↗	↗
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-	-	-	↘	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	-
	Bottom	↘	-	-	↘	-	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Nitrite nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	↗	-	↗	-	-
Nitrate nitrogen (mg/L)	Surface	↗	-	-	-	-	-	-
	Middle	↗	↗	-	-	-	-	-
	Bottom	↗	↗	-	-	-	-	↗
	Average	↗	↗	↗	-	-	-	-
Total inorganic nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Total Kjeldahl nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Total nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	↘	-	-	-	-	-
Silica (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	↘	↗	-	↗	↗	-	↗
	Middle	-	-	↗	-	↗	-	↗
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	↗	-	-	↗
E. coli (cfu/100mL)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Mirs Bay WCZ, 1986-2019

Monitoring Station		MM8	MM13	MM14	MM15	MM16	MM17	MM19
Monitoring Period		1991 I 2019	1991 I 2019	1994 I 2019	1994 I 2019	1994 I 2019	1986 I 2019	2001 I 2019
Parameter	Water Depth							
Temperature (℃)	Surface	↗	↗	-	-	-	↗	-
	Middle	↗	↗	-	-	↗	↗	-
	Bottom	↗	↗	-	-	↗	↗	-
	Average	↗	↗	-	-	-	↗	-
Salinity	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	-	-	-	-	↘	-
	Middle	↘	-	-	-	-	-	-
	Bottom	↘	-	-	-	↘	-	-
	Average	↘	-	-	-	-	-	-
Dissolved Oxygen (%)	Surface	-	-	-	-	-	↘	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	↗	-	-	-	-	-
	Average	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		-	-	-	↘	↘	↘	-
Turbidity (NTU)	Surface	-	-	-	-	-	-	↘
	Middle	-	-	↘	↘	↘	-	↘
	Bottom	-	-	↘	↘	↘	-	↘
	Average	-	-	↘	↘	↘	-	↘
Suspended Solids (mg/L)	Surface	-	↗	↗	↗	↗	-	↗
	Middle	-	-	↗	↗	↗	-	-
	Bottom	↗	↗	-	-	-	-	-
	Average	↗	↗	-	↗	↗	-	-
Total volatile solids (mg/L)	Surface	↗	↗	↗	↗	↗	-	↗
	Middle	-	-	-	↗	↗	-	↗
	Bottom	↗	↗	↗	-	-	-	-
	Average	↗	↗	↗	↗	↗	-	↗
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	↘	-	-	-	-	↘
	Bottom	↘	↘	↘	-	-	↘	↘
	Average	↘	↘	-	-	-	-	↘
Ammonia nitrogen (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	↘	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↗	↗	↗	-	-	-	-
Nitrate nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Total inorganic nitrogen (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	-
	Average	-	-	-	-	-	-	-
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	↗	↗	↗	-	↗
	Middle	-	-	↗	↗	↗	-	↗
	Bottom	-	-	↗	↗	↗	-	↗
	Average	-	-	↗	↗	↗	-	↗
Total nitrogen (mg/L)	Surface	-	-	↗	↗	↗	-	↗
	Middle	-	-	↗	↗	↗	-	↗
	Bottom	-	-	↗	-	↗	-	↗
	Average	-	-	↗	↗	↗	-	↗
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	-
	Middle	↘	↘	↘	↘	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	-	-
	Average	↘	↘	↘	↘	↘	↘	-
Total phosphorus (mg/L)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	↘	-
	Middle	-	-	-	-	-	↘	-
	Bottom	-	-	-	-	-	-	↗
	Average	-	-	-	-	-	↘	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-	↗	-
	Middle	-	-	↘	↘	-	↗	↘
	Bottom	-	-	↘	↘	↘	-	↘
	Average	-	-	-	↘	-	↗	↘
E. coli (cfu/100mL)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Port Shelter WCZ, 1986-2019

Monitoring Station		PM1	PM2	PM3	PM4	PM6	PM7	PM8	PM9	PM11
Monitoring Period		1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1993 – 2019
Parameter	Water Depth									
Temperature (℃)	Surface	↗	-	-	-	↗	↗	↗	↗	-
	Middle	↗	↗	↗	↗	↗	↗	↗	↗	-
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗	-
	Average	↗	↗	↗	↗	↗	↗	↗	↗	-
Salinity	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	↗	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Dissolved Oxygen (%)	Surface	-	↘	↘	↘	↘	↘	-	↘	-
	Middle	-	-	-	-	-	↗	-	-	-
	Bottom	↗	↗	-	↗	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	-	-	↗	-	↘	-	-
Turbidity (NTU)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-	-	-
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	↗	-	↗
	Average	-	-	-	-	-	-	-	-	-
Total volatile solids (mg/L)	Surface	↗	-	-	-	-	-	-	-	-
	Middle	↗	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	↗
	Average	-	-	-	-	-	-	-	-	↗
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↘	↘	-	↘	-	-	-	-
	Middle	-	↘	-	-	↘	-	↘	-	-
	Bottom	-	↘	↘	-	↘	↘	↘	↘	↘
	Average	-	↘	-	-	↘	↘	↘	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	-	-	↘	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	↗	↗	↗
	Average	-	-	-	-	-	↗	↗	↗	↗
Nitrate nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	↗	↗	-
	Bottom	-	-	-	-	-	↗	↗	↗	↗
	Average	-	-	-	-	-	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	↗	↗	-
	Average	-	-	-	-	-	-	-	↗	-
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Total nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	-	↘	-	-	↘	-	-	-	-
	Middle	-	-	-	-	↘	-	-	-	-
	Bottom	-	-	-	-	↘	-	-	-	-
	Average	↘	↘	↘	↘	↘	↘	↘	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	-	↘	-	-
	Middle	↘	-	↘	-	-	↘	-	↘	-
	Bottom	↘	-	-	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	↗	-	↗	↗	-	↗	↗	-	-
	Middle	↗	-	↗	↗	-	↗	-	-	-
	Bottom	↗	↗	↗	↗	-	-	-	-	↘
	Average	↗	-	↗	↗	-	↗	-	-	-
E. coli (cfu/100mL)	Surface	-	↘	-	-	↘	-	-	-	-
	Middle	-	↘	-	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-	-	-	-
	Average	-	↘	-	-	↘	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	-	↘	-	-	-	-
	Middle	-	-	-	-	↘	-	-	-	-
	Bottom	-	↘	-	-	-	-	-	-	-
	Average	-	-	-	-	↘	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. - indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Tolo Harbour and Channel WCZ, 1986-2019

Monitoring Station		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Monitoring Period		1986 I 2019	1986 I 2019	1986 I 2019	1988 I 2019	1986 I 2019	1988 I 2019	1986 I 2019
Parameter	Water Depth							
Temperature (℃)	Surface	↗	↗	↗	↗	↗	↗	↗
	Middle	NA	↗	↗	NA	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	NA	-	-	-
	Bottom	↗	↗	↗	-	-	-	-
	Average	↗	-	-	-	-	-	↘
Dissolved Oxygen (%)	Surface	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	NA	↗	-	-
	Bottom	↗	↗	↗	-	↗	↗	-
	Average	↗	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗	-
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	↘	-	-	↘	-	-	-
	Average	↘	-	-	-	-	-	-
Suspended Solids (mg/L)	Surface	↘	-	↘	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
Total volatile solids (mg/L)	Surface	↘	-	-	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Ammonia nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	↘	↘	-	-	-	-	-
	Middle	NA	↘	-	NA	-	-	-
	Bottom	↘	↘	↘	-	-	-	-
	Average	↘	↘	↘	-	↘	↘	-
Nitrate nitrogen (mg/L)	Surface	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Total inorganic nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	-
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Total Kjeldahl nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	-	-
	Average	↘	↘	↘	↘	↘	↘	↘
Total nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	NA	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	↗	↗	-	-	-	-
	Middle	NA	-	-	NA	-	-	-
	Bottom	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	↘	↘	↘	-	↘	↘	-
	Middle	NA	↘	↘	NA	-	-	-
	Bottom	↘	-	-	↘	-	-	↗
	Average	↘	↘	↘	↘	↘	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘	↘	↘	-	-
	Middle	NA	↘	↘	NA	-	-	-
	Bottom	↘	↘	↘	↘	-	-	-
	Average	↘	↘	↘	↘	↘	-	-
Faecal coliforms (cfu/100mL)	Surface	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	NA	↘	-	-
	Bottom	↘	↘	↘	-	↘	-	-
	Average	↘	↘	↘	-	↘	↘	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Long-term water quality trend analyses in the Southern WCZ, 1986-2019

Monitoring Station		SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM9
Monitoring Period		1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1988 – 2019
Parameter	Water Depth								
Temperature (℃)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	-	↘
	Bottom	-	-	-	-	-	-	-	↘
	Average	-	-	-	-	-	-	-	↘
Dissolved Oxygen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	↘	-	-	-	-	-
Dissolved Oxygen (%)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	↘	↘
	Bottom	↘	-	↘	-	-	-	↘	↘
	Average	-	-	-	-	-	-	↘	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	-	↘
	Average	-	-	-	-	-	-	-	↘
Total volatile solids (mg/L)	Surface	-	-	-	-	-	↗	↗	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	↗	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↘	-	-
	Average	-	-	-	-	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	↗	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	-	↘	-	-	-	↘
	Middle	↘	↘	↘	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	↘
	Average	↘	↘	↘	↘	↘	↘	-	↘
Nitrite nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	-	↗
	Middle	↗	↗	↗	↗	↗	↗	-	↗
	Bottom	-	-	-	↗	↗	↗	-	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	-	↗	↗
	Bottom	-	-	-	↗	↗	-	↗	↗
	Average	↗	↗	↗	↗	↗	-	↗	↗
Total inorganic nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	-	↗	↗
	Middle	-	↗	-	↗	-	-	↗	↗
	Bottom	-	-	-	↗	-	-	↗	↗
	Average	-	↗	↗	↗	↗	-	↗	↗
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Total nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	-	-	-	-	-	-	-	↘
	Middle	-	-	-	-	-	-	↘	↘
	Bottom	-	-	-	-	-	-	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	-	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	-	-	↗	-	↗	-	↗	↗
	Middle	-	-	-	-	-	-	-	↗
	Bottom	-	-	-	↗	-	-	-	↗
	Average	-	-	-	-	↗	-	↗	↗
E. coli (cfu/100mL)	Surface	-	↘	-	-	-	-	-	-
	Middle	-	↘	-	-	-	-	-	-
	Bottom	-	↘	↘	-	-	-	-	-
	Average	↘	↘	↘	-	-	-	↘	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	-	-	-	-	-
	Middle	-	↘	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-	-	-
	Average	↘	-	-	-	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Southern WCZ, 1986-2019

Monitoring Station		SM10	SM11	SM12	SM13	SM17	SM18	SM19	SM20
Monitoring Period		1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1989 – 2019	1989 – 2019	1989 – 2019	1999 – 2019
Parameter	Water Depth								
Temperature (℃)	Surface	↗	↗	↗	↗	↗	↗	↗	↗
	Middle	NA	↗	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	↘	-	-	↘
	Bottom	↘	-	↘	↘	-	-	-	↘
	Average	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	-	-	↘	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Dissolved Oxygen (%)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘	↘	↘
	Middle	NA	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	↘	-	-	-	-	-	-	↘
	Middle	NA	↘	-	-	↘	↘	-	↘
	Bottom	↘	-	-	↘	↘	↘	↘	↘
	Average	↘	↘	-	-	↘	-	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	-	-	-	-	↗	↗	↘
	Average	-	-	-	-	-	-	↗	-
Total volatile solids (mg/L)	Surface	-	-	-	-	↗	↗	↗	-
	Middle	NA	-	-	-	-	↗	↗	-
	Bottom	-	-	-	-	-	-	↗	-
	Average	-	-	-	-	-	↗	↗	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	↘	-	-
	Bottom	-	-	-	-	-	↘	↘	-
	Average	-	-	-	-	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	-	↗	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	-	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗	-	-
	Middle	NA	↗	↗	↗	↗	-	↗	-
	Bottom	↗	↗	↗	↗	-	↗	↗	-
	Average	↗	↗	↗	↗	↗	-	-	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	-	-	-
	Middle	NA	↗	↗	↗	↗	-	-	↗
	Bottom	↗	↗	↗	↗	↗	-	-	-
	Average	↗	↗	↗	↗	↗	-	-	↗
Total inorganic nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	-	-	↗
	Middle	NA	↗	↗	↗	↗	-	-	↗
	Bottom	↗	↗	↗	↗	-	-	-	-
	Average	↗	↗	↗	↗	↗	-	-	↗
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	-	-	-	-	-	↗
	Middle	NA	-	-	-	-	-	-	↗
	Bottom	-	-	-	-	-	-	-	↗
	Average	-	-	-	-	-	-	-	↗
Total nitrogen (mg/L)	Surface	-	↗	-	↗	-	-	-	↗
	Middle	NA	↗	-	↗	-	-	-	↗
	Bottom	-	-	-	-	-	-	-	↗
	Average	-	↗	-	↗	-	-	-	↗
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘	↘	↘	-
	Middle	NA	↘	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	↘	↘	-
Total phosphorus (mg/L)	Surface	↘	↘	-	-	-	-	-	-
	Middle	NA	-	↘	-	-	-	-	-
	Bottom	↘	-	↘	↘	-	-	-	-
	Average	↘	↘	↘	↘	↘	↘	-	-
Silica (mg/L)	Surface	-	↗	-	-	-	-	-	-
	Middle	NA	-	-	-	-	-	-	-
	Bottom	↗	↗	-	-	-	-	-	-
	Average	-	↗	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	↗	↗	↗	↗	↗	-	-	-
	Middle	NA	↗	↗	↗	↗	-	-	-
	Bottom	↗	-	-	-	↗	-	-	-
	Average	↗	↗	↗	↗	↗	-	-	-
E. coli (cfu/100mL)	Surface	↘	-	-	-	-	-	-	-
	Middle	NA	-	↗	-	-	-	-	-
	Bottom	↘	↘	↗	-	-	-	-	-
	Average	↘	↘	-	-	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	↘	↘	↗	-	-	-	-	-
	Middle	NA	↘	↗	-	-	-	-	-
	Bottom	↘	↘	↗	-	-	-	-	-
	Average	↘	↘	↗	↗	-	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Long-term water quality trend analyses in the Victoria Harbour WCZ, 1986-2019

Monitoring Station		VM1	VM2	VM4	VM5	VM6
Monitoring Period		1988 – 2019	1988 – 2019	1988 – 2019	1986 – 2019	1988 – 2019
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	↗	-	-	-	-
	Average	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Dissolved Oxygen (%)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
pH	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	↘	↘	↘	↘
	Average	-	↘	↘	-	↘
Suspended Solids (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	-	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total volatile solids (mg/L)	Surface	↘	↘	↘	-	↘
	Middle	↘	↘	↘	-	↘
	Bottom	-	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	↘
	Bottom	↘	↘	↘	-	↘
	Average	↘	↘	↘	-	↘
Ammonia nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	↘	-	-	-	-
	Average	-	-	-	-	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	-	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	-
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	-	-
Total Kjeldahl nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total nitrogen (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	↘	-	-	-
	Average	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-
	Middle	-	-	↗	↗	-
	Bottom	-	↗	↗	-	-
	Average	-	↗	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘	-	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Faecal coliforms (cfu/100mL)	Surface	↘	↘	↘	-	-
	Middle	↘	↘	↘	-	-
	Bottom	↘	↘	↘	-	-
	Average	↘	↘	↘	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Victoria Harbour WCZ, 1986-2019

Monitoring Station		VM7	VM8	VM12	VM14	VM15
Monitoring Period		1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1993 – 2019
Parameter	Water Depth					
Temperature (°C)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	-	-	-	-	-
	Middle	-	-	-	↘	-
	Bottom	-	-	-	↘	-
	Average	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	↗	-	↗
	Middle	↗	-	↗	↗	↗
	Bottom	↗	-	↗	↗	↗
	Average	↗	-	↗	↗	↗
Dissolved Oxygen (%)	Surface	↗	-	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	-	↗	↗	↗
pH	Surface	↘	↘	↘	↘	-
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	-
Secchi disc depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	-	↘	-	-	↘
	Bottom	↘	↘	↘	-	↘
	Average	-	↘	-	-	↘
Suspended Solids (mg/L)	Surface	↘	↘	-	↘	↘
	Middle	↘	↘	-	↘	↘
	Bottom	↘	↘	↘	-	↘
	Average	↘	↘	-	↘	↘
Total volatile solids (mg/L)	Surface	↘	↘	↘	↘	-
	Middle	-	↘	-	↘	-
	Bottom	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	↘	↘	-
	Middle	-	-	↘	↘	-
	Bottom	-	-	↘	↘	↘
	Average	-	-	↘	↘	-
Ammonia nitrogen (mg/L)	Surface	↘	↗	↘	↘	↘
	Middle	↘	↗	↘	↘	↘
	Bottom	↘	-	↘	↘	↘
	Average	↘	↗	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	-	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	↗	↗	↗	-
	Middle	-	↗	↗	↗	-
	Bottom	-	-	-	↗	-
	Average	-	↗	↗	↗	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	-	↗	-	-	-
	Middle	-	↗	-	↗	↘
	Bottom	-	↗	-	↗	↘
	Average	-	↗	-	-	↘
Total Kjeldahl nitrogen (mg/L)	Surface	↘	-	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	-	↘	↘	↘
	Average	↘	-	↘	↘	↘
Total nitrogen (mg/L)	Surface	↘	-	↘	↘	-
	Middle	↘	-	↘	-	-
	Bottom	↘	-	↘	-	-
	Average	↘	-	↘	↘	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-
	Middle	-	-	-	-	-
	Bottom	-	-	-	-	-
	Average	-	-	-	-	-
E. coli (cfu/100mL)	Surface	-	-	↘	↘	↘
	Middle	-	-	-	↘	↘
	Bottom	-	-	-	↘	↘
	Average	-	-	-	↘	↘
Faecal coliforms (cfu/100mL)	Surface	-	↗	-	↘	↘
	Middle	-	-	-	↘	↘
	Bottom	-	↗	-	-	↘
	Average	-	↗	-	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Eastern Buffer WCZ, 1986-2019

Monitoring Station		EM1	EM2	EM3
Monitoring Period		1986 I 2019	1986 I 2019	1988 I 2019
Parameter	Water Depth			
Temperature (℃)	Surface	↗	↗	↗
	Middle	↗	↗	↗
	Bottom	↗	↗	↗
	Average	↗	↗	↗
Salinity	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	-
	Middle	↗	↗	-
	Bottom	↗	-	-
	Average	↗	-	-
Dissolved Oxygen (%)	Surface	↗	↗	-
	Middle	↗	↗	↗
	Bottom	↗	↗	-
	Average	↗	↗	-
pH	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Secchi disc depth (m)		↗	↗	-
Turbidity (NTU)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Suspended Solids (mg/L)	Surface	-	-	-
	Middle	↘	-	-
	Bottom	↘	-	-
	Average	↘	-	-
Total volatile solids (mg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	↘	-	-
	Average	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	-	-
	Middle	↘	↘	-
	Bottom	↘	↘	↘
	Average	↘	↘	-
Ammonia nitrogen (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	-	-
	Middle	↘	↘	-
	Bottom	↘	-	-
	Average	↘	↘	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Total inorganic nitrogen (mg/L)	Surface	↘	↘	-
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	↘	-
Total Kjeldahl nitrogen (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	↘	-
Total nitrogen (mg/L)	Surface	↘	↘	-
	Middle	↘	↘	-
	Bottom	↘	↘	-
	Average	↘	↘	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Silica (mg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
Chlorophyll-*a* (μg/L)	Surface	-	-	-
	Middle	-	-	-
	Bottom	-	-	-
	Average	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘
Faecal coliforms (cfu/100mL)	Surface	↘	↘	↘
	Middle	↘	↘	↘
	Bottom	↘	↘	↘
	Average	↘	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Western Buffer WCZ, 1986-2019

Monitoring Station		WM1	WM2	WM3	WM4
Monitoring Period		1988 I 2019	1988 I 2019	1986 I 2019	1986 I 2019
Parameter	Water Depth				
Temperature (℃)	Surface	↗	↗	↗	↗
	Middle	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗
	Average	↗	↗	↗	↗
Salinity	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↘	↘	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Dissolved Oxygen (%)	Surface	-	-	-	-
	Middle	-	-	↗	-
	Bottom	-	↗	↗	-
	Average	-	-	-	-
pH	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-
	Middle	-	-	↘	-
	Bottom	-	↘	↘	-
	Average	-	-	↘	-
Suspended Solids (mg/L)	Surface	-	↘	↘	↘
	Middle	-	-	↘	-
	Bottom	↗	-	-	-
	Average	-	-	↘	-
Total volatile solids (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	↗	-	-	-
	Average	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	↗	-	-
	Middle	↘	-	-	-
	Bottom	↘	-	-	-
	Average	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	-	-
	Average	↗	↗	↗	↗
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	↗	↗
	Average	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	↗	↗	↗	↗
	Middle	-	↗	↗	↗
	Bottom	-	↗	-	↗
	Average	-	↗	↗	↗
Total Kjeldahl nitrogen (mg/L)	Surface	-	↘	↘	↘
	Middle	↘	-	↘	-
	Bottom	↘	-	-	↘
	Average	-	-	-	-
Total nitrogen (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	↘	-	-	-
	Average	-	-	-	-
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘	↘	↘
	Middle	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘
	Average	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-
	Middle	-	-	-	-
	Bottom	-	-	-	-
	Average	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	-	-	-	-
	Middle	-	↗	-	-
	Bottom	-	↗	-	-
	Average	-	-	-	-
E. coli (cfu/100mL)	Surface	↘	-	-	-
	Middle	↘	-	-	-
	Bottom	↘	-	-	-
	Average	↘	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	-
	Middle	↘	-	-	-
	Bottom	↘	-	-	-
	Average	↘	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Junk Bay WCZ, 1986-2019

Monitoring Station		JM3	JM4
Monitoring Period		1986 I 2019	1986 I 2019
Parameter	Water Depth		
Temperature (℃)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Salinity	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Dissolved Oxygen (mg/L)	Surface	-	-
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
Dissolved Oxygen (%)	Surface	↗	↗
	Middle	↗	↗
	Bottom	↗	↗
	Average	↗	↗
pH	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Secchi disc depth (m)		↗	↗
Turbidity (NTU)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Suspended Solids (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Total volatile solids (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	-	↘
Ammonia nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Unionised Ammonia (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	↘	↘
	Average	-	-
Nitrate nitrogen (mg/L)	Surface	-	↗
	Middle	↗	↗
	Bottom	-	-
	Average	-	↗
Total inorganic nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total Kjeldahl nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total nitrogen (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Orthophosphate phosphorus (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Total phosphorus (mg/L)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Silica (mg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
Chlorophyll-*a* (μg/L)	Surface	-	-
	Middle	-	-
	Bottom	-	-
	Average	-	-
E. coli (cfu/100mL)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘
Faecal coliforms (cfu/100mL)	Surface	↘	↘
	Middle	↘	↘
	Bottom	↘	↘
	Average	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Long-term water quality trend analyses in the Deep Bay WCZ, 1986-2019

Monitoring Station		DM1	DM2	DM3	DM4	DM5
Monitoring Period		1986 – 2019	1986 – 2019	1986 – 2019	1986 – 2019	1991 – 2019
Parameter	Water Depth					
Temperature (℃)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Salinity	Surface	↘	↘	↘	-	-
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Dissolved Oxygen (mg/L)	Surface	-	-	↘	↘	↘
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↘	-
	Average	-	-	↘	↘	-
Dissolved Oxygen (%)	Surface	-	-	↘	↘	↘
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↘	-
	Average	-	-	↘	↘	-
pH	Surface	↘	↘	↘	↘	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	-	-	-	-	-
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	-	-	-	-	↘
Suspended Solids (mg/L)	Surface	-	-	-	-	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	-	-	-	↘	↘
Total volatile solids (mg/L)	Surface	-	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	↗	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	↗	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	↘	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	↘	↘	↘	-	↘
Nitrite nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	-	-	↗	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	-	-	↗	↗	↗
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	↘	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	↘	-	-
Total nitrogen (mg/L)	Surface	-	-	-	↗	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	↗	↗
	Average	-	-	-	↗	↗
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	↘	↘	-	-	-
Total phosphorus (mg/L)	Surface	↘	↘	↘	-	↘
	Middle	NA	NA	NA	NA	↘
	Bottom	NA	NA	NA	↘	↘
	Average	↘	↘	↘	↘	↘
Silica (mg/L)	Surface	↗	↗	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↗	↗
	Average	↗	↗	-	-	-
Chlorophyll-*a* (μg/L)	Surface	↗	↗	-	-	↗
	Middle	NA	NA	NA	NA	↗
	Bottom	NA	NA	NA	-	↗
	Average	↗	↗	-	-	↗
E. coli (cfu/100mL)	Surface	-	-	-	-	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	-	-
	Average	-	-	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	-	-	↗	-
	Middle	NA	NA	NA	NA	-
	Bottom	NA	NA	NA	↗	-
	Average	-	-	-	↗	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$

2. – indicates no significant trend

3. NA (Not Applicable) indicates the measurement was not made due to shallow water

4. ↗ significant increase

5. ↘ significant decrease

Long-term water quality trend analyses in the North Western WCZ, 1986-2019

Monitoring Station		NM1	NM2	NM3	NM5	NM6	NM8
Monitoring Period		1988 I 2019	1986 I 2019	1986 I 2019	1988 I 2019	1991 I 2019	1999 I 2019
Parameter	Water Depth						
Temperature (℃)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	-	↗	↗	↗	↗
	Average	↗	-	↗	↗	↗	↗
Salinity	Surface	-	-	↘	-	-	-
	Middle	-	↘	↘	↘	↘	↘
	Bottom	-	-	↘	-	↘	↘
	Average	-	-	↘	-	-	↘
Dissolved Oxygen (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	↘	-	-	-	-
	Average	-	↘	-	↘	-	-
Dissolved Oxygen (%)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-
	Average	-	-	-	-	-	-
pH	Surface	↘	↘	↘	↘	↘	↘
	Middle	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	↘	↘	-	-	-	↘
	Middle	↘	↘	↘	↘	↘	↘
	Bottom	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘
Suspended Solids (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-
	Average	-	-	-	-	-	-
Total volatile solids (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-
	Average	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	-	-	-	-	-	-
	Average	-	↘	-	-	-	-
Ammonia nitrogen (mg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	-	-
	Bottom	↗	-	↗	-	-	-
	Average	-	-	-	-	-	-
Unionised Ammonia (mg/L)	Surface	↘	↘	-	-	-	↘
	Middle	↘	↘	-	↘	↘	-
	Bottom	↘	↘	-	-	↘	-
	Average	↘	↘	-	↘	-	↘
Nitrite nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	-
	Bottom	-	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	↗	↗	↗	↗	↗	↗
	Bottom	↗	↗	↗	↗	↗	↗
	Average	↗	↗	↗	↗	↗	↗
Total Kjeldahl nitrogen (mg/L)	Surface	-	-	-	↘	-	-
	Middle	-	-	-	-	-	↗
	Bottom	-	-	-	-	-	↗
	Average	-	-	-	-	-	↗
Total nitrogen (mg/L)	Surface	↗	↗	↗	↗	↗	↗
	Middle	-	↗	-	↗	↗	↗
	Bottom	-	-	-	-	↗	↗
	Average	-	-	↗	↗	↗	↗
Orthophosphate phosphorus (mg/L)	Surface	↘	↘	-	-	-	-
	Middle	↘	-	-	↘	↘	-
	Bottom	↘	↘	-	↘	↘	-
	Average	↘	↘	-	↘	↘	-
Total phosphorus (mg/L)	Surface	-	-	-	-	↘	-
	Middle	-	-	-	↘	-	-
	Bottom	↘	↘	↘	↘	↘	-
	Average	↘	↘	↘	↘	↘	-
Silica (mg/L)	Surface	-	-	-	-	-	↗
	Middle	-	↗	-	-	-	↗
	Bottom	-	-	-	-	-	↗
	Average	-	-	-	-	-	↗
Chlorophyll-*a* (µg/L)	Surface	-	-	-	-	-	-
	Middle	-	-	-	-	↗	-
	Bottom	-	-	↗	-	↗	-
	Average	-	-	-	-	-	-
E. coli (cfu/100mL)	Surface	-	↘	↘	-	-	-
	Middle	-	↘	↘	-	-	-
	Bottom	-	↘	↘	-	-	-
	Average	-	↘	↘	-	-	-
Faecal coliforms (cfu/100mL)	Surface	-	↘	↘	-	-	-
	Middle	-	↘	↘	-	-	-
	Bottom	-	↘	↘	-	-	-
	Average	-	↘	↘	-	-	-

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. ↗ significant increase
4. ↘ significant decrease

Summary statistics for marine sediment quality in the Tolo Harbour and Channel and Southern WCZs, 2015 - 2019

	Tolo Harbour and Channel				Hong Kong Island (South)		West Lamma Channel	
	Harbour Subzone		Buffer Subzone	Channel Subzone				
Parameter	TS2	TS3	TS4	TS5	SS1	SS2	SS3	SS4
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63μm (%w/w)	81 (57 - 94)	89 (70 - 97)	77 (57 - 98)	96 (90 - 99)	54 (25 - 90)	81 (58 - 91)	82 (70 - 99)	85 (67 - 96)
Electrochemical Potential (mV)	-328 (-408 - -231)	-329 (-418 - -188)	-341 (-419 - -226)	-353 (-444 - -316)	-187 (-358 - -98)	-195 (-356 - -71)	-159 (-331 - -40)	-190 (-319 - -84)
Total Solids (%w/w)	38 (29 - 45)	35 (29 - 44)	33 (23 - 50)	31 (29 - 34)	60 (53 - 65)	49 (42 - 53)	49 (40 - 54)	46 (42 - 50)
Total Volatile Soilds (%TS)	9.9 (5.9 - 12.0)	10.0 (7.9 - 11.0)	11.2 (9.0 - 13.0)	11.0 (9.0 - 12.0)	5.5 (4.8 - 6.5)	7.2 (6.8 - 8.0)	7.1 (6.4 - 8.5)	7.1 (6.6 - 7.5)
Chemical Oxygen Demand (mg/kg)	20500 (17000 - 24000)	21500 (18000 - 27000)	18900 (16000 - 25000)	18200 (15000 - 22000)	9550 (7800 - 11000)	12240 (9400 - 16000)	12800 (10000 - 16000)	12070 (9700 - 14000)
Total Carbon (%w/w)	0.9 (0.6 - 1.2)	0.7 (0.6 - 0.8)	1.0 (0.5 - 1.5)	0.8 (0.7 - 0.9)	1.0 (0.8 - 1.1)	0.7 (0.6 - 0.9)	0.8 (0.6 - 0.9)	0.6 (0.5 - 0.8)
Ammonical Nitrogen (mg/kg)	5.63 (2.40 - 9.50)	4.30 (0.99 - 9.20)	13.67 (3.50 - 27.00)	11.99 (8.80 - 17.00)	4.83 (0.26 - 10.00)	8.57 (1.30 - 43.00)	4.50 (0.05 - 10.00)	4.51 (0.27 - 13.00)
Total Kjeldahl Nitrogen (mg/kg)	640 (500 - 750)	620 (500 - 780)	730 (520 - 1300)	730 (500 - 860)	430 (330 - 610)	550 (460 - 600)	500 (420 - 580)	540 (480 - 670)
Total Phosphorus (mg/kg)	180 (150 - 250)	170 (160 - 190)	190 (140 - 230)	200 (160 - 230)	210 (160 - 260)	240 (220 - 260)	240 (210 - 260)	230 (210 - 250)
Total Sulphide (mg/kg)	96.1 (0.8 - 260.0)	86.6 (31.0 - 160.0)	163.3 (42.0 - 310.0)	133.9 (42.0 - 230.0)	14.1 (2.5 - 41.0)	23.8 (3.7 - 64.0)	24.8 (9.3 - 54.0)	34.2 (6.8 - 100.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)
Arsenic (mg/kg)	11.6 (7.4 - 15.0)	12.0 (9.6 - 15.0)	10.1 (7.9 - 13.0)	7.6 (3.6 - 12.0)	6.9 (5.2 - 11.0)	8.9 (6.6 - 11.0)	7.9 (6.0 - 9.9)	8.4 (6.7 - 12.0)
Cadmium (mg/kg)	0.6 (0.4 - 0.8)	0.6 (0.4 - 0.8)	0.5 (0.4 - 0.6)	0.3 (0.2 - 0.7)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	24 (14 - 32)	25 (20 - 29)	26 (21 - 34)	33 (26 - 39)	19 (15 - 24)	29 (25 - 32)	29 (21 - 36)	31 (25 - 39)
Copper (mg/kg)	41 (21 - 92)	39 (26 - 59)	38 (21 - 150)	23 (18 - 34)	9 (7 - 11)	18 (15 - 21)	17 (13 - 21)	26 (21 - 34)
Lead (mg/kg)	88 (60 - 110)	91 (67 - 110)	71 (61 - 100)	55 (47 - 86)	26 (21 - 32)	34 (30 - 38)	35 (30 - 39)	39 (36 - 42)
Mercury (mg/kg)	0.07 (<0.05 - 0.10)	0.07 (<0.05 - 0.09)	0.07 (<0.05 - 0.12)	0.06 (<0.05 - 0.07)	0.06 (<0.05 - 0.07)	0.10 (0.06 - 0.18)	0.16 (0.07 - 0.80)	0.13 (0.10 - 0.17)
Nickel (mg/kg)	16 (5 - 38)	14 (5 - 18)	18 (12 - 24)	24 (20 - 29)	14 (11 - 17)	20 (17 - 23)	20 (15 - 25)	20 (17 - 25)
Silver (mg/kg)	0.4 (0.2 - 0.5)	0.4 (0.2 - 0.8)	0.3 (<0.2 - 0.4)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	0.2 (<0.2 - 0.2)
Zinc (mg/kg)	270 (170 - 410)	290 (170 - 360)	200 (140 - 410)	150 (120 - 220)	62 (50 - 74)	96 (80 - 130)	92 (69 - 110)	120 (100 - 140)
Total Polychlorinated Biphenyls (PCBs) (μg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [4] [6]	150 (90 - 430)	140 (90 - 410)	170 (90 - 670)	130 (90 - 220)	110 (90 - 180)	110 (90 - 190)	120 (90 - 230)	130 (90 - 270)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [5] [6]	60 (34 - 100)	53 (28 - 93)	70 (25 - 160)	71 (33 - 110)	36 (19 - 50)	87 (21 - 270)	51 (26 - 91)	75 (26 - 120)

Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for marine sediment quality in the Southern, Junk Bay and Deep Bay WCZs, 2015 - 2019

	Lantau Island (East)	Lantau Island (South)	Junk Bay	Inner Deep Bay		Outer Deep Bay	
Parameter	SS5	SS6	JS2	DS1	DS2	DS3	DS4
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	97 (88 - 99)	65 (50 - 76)	90 (69 - 99)	74 (47 - 98)	75 (33 - 93)	84 (54 - 99)	64 (34 - 92)
Electrochemical Potential (mV)	-203 (-346 - -68)	-202 (-379 - -102)	-236 (-382 - -130)	-291 (-458 - -93)	-276 (-455 - -94)	-272 (-454 - -90)	-264 (-450 - -90)
Total Solids (%w/w)	38 (36 - 43)	64 (59 - 68)	50 (39 - 73)	45 (36 - 54)	50 (45 - 53)	50 (40 - 57)	55 (45 - 68)
Total Volatile Soilds (%TS)	8.1 (7.2 - 8.6)	4.0 (2.9 - 5.9)	7.0 (3.2 - 8.6)	7.4 (4.2 - 9.1)	7.0 (5.7 - 8.0)	7.0 (4.9 - 8.1)	6.0 (4.0 - 7.4)
Chemical Oxygen Demand (mg/kg)	13400 (11000 - 15000)	8130 (3600 - 9700)	13950 (8500 - 17000)	19000 (15000 - 24000)	13700 (10000 - 16000)	11510 (8200 - 14000)	11700 (10000 - 14000)
Total Carbon (%w/w)	0.5 (0.5 - 0.6)	0.5 (0.4 - 1.1)	0.7 (0.6 - 0.9)	0.7 (0.4 - 1.2)	0.6 (0.5 - 0.9)	0.5 (0.3 - 0.5)	0.7 (0.4 - 1.3)
Ammonical Nitrogen (mg/kg)	7.54 (<0.05 - 13.00)	7.62 (<0.05 - 20.00)	3.71 (0.16 - 8.40)	28.84 (0.67 - 96.00)	1.47 (<0.05 - 8.30)	1.16 (<0.05 - 4.40)	1.52 (0.11 - 5.50)
Total Kjeldahl Nitrogen (mg/kg)	580 (490 - 650)	320 (190 - 460)	560 (480 - 660)	640 (450 - 1000)	440 (340 - 550)	440 (380 - 540)	380 (270 - 530)
Total Phosphorus (mg/kg)	200 (180 - 220)	190 (170 - 230)	200 (100 - 230)	400 (240 - 630)	280 (200 - 330)	240 (220 - 260)	210 (160 - 250)
Total Sulphide (mg/kg)	30.5 (6.4 - 67.0)	9.4 (1.5 - 21.0)	25.7 (<0.2 - 77.0)	278.4 (44.0 - 660.0)	12.3 (1.2 - 44.0)	7.2 (0.5 - 21.0)	11.0 (1.0 - 36.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	8.7 (6.5 - 11.0)	5.7 (4.7 - 8.8)	7.5 (4.1 - 10.0)	13.1 (5.3 - 19.0)	14.7 (6.3 - 19.0)	13.1 (9.4 - 16.0)	11.7 (6.6 - 17.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)	0.5 (0.2 - 0.8)	0.3 (0.1 - 0.7)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Chromium (mg/kg)	40 (32 - 47)	18 (13 - 24)	36 (12 - 46)	48 (21 - 64)	39 (22 - 45)	38 (27 - 50)	28 (17 - 40)
Copper (mg/kg)	37 (30 - 56)	8 (3 - 13)	58 (19 - 85)	70 (31 - 110)	44 (24 - 56)	46 (34 - 65)	29 (15 - 44)
Lead (mg/kg)	48 (41 - 53)	22 (17 - 28)	44 (24 - 54)	55 (31 - 82)	48 (24 - 56)	47 (34 - 57)	39 (23 - 53)
Mercury (mg/kg)	0.15 (0.10 - 0.25)	0.06 (<0.05 - 0.08)	0.25 (0.10 - 0.64)	0.22 (0.07 - 0.43)	0.14 (0.06 - 0.18)	0.11 (0.10 - 0.13)	0.08 (<0.05 - 0.10)
Nickel (mg/kg)	25 (21 - 30)	11 (7 - 16)	18 (6 - 25)	28 (15 - 41)	22 (13 - 27)	24 (16 - 32)	18 (11 - 26)
Silver (mg/kg)	0.3 (0.2 - 0.4)	<0.2 (<0.2 - <0.2)	0.8 (0.2 - 1.1)	0.7 (0.3 - 1.1)	0.3 (<0.2 - 0.5)	0.3 (0.3 - 0.4)	0.2 (<0.2 - 0.3)
Zinc (mg/kg)	140 (120 - 170)	59 (43 - 88)	130 (52 - 170)	290 (170 - 410)	170 (97 - 210)	140 (110 - 160)	110 (64 - 140)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	19 (18 - 26)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	110 (90 - 190)	100 (90 - 190)	130 (90 - 350)	240 (90 - 830)	130 (90 - 260)	110 (90 - 260)	110 (90 - 180)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	80 (46 - 130)	31 (19 - 120)	210 (54 - 330)	380 (75 - 1600)	93 (59 - 130)	78 (39 - 140)	60 (22 - 90)

Note:
1 Data presented are arithmetic means ; data in brackets indicate ranges.
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for marine sediment quality in the Port Shelter and Mirs Bay WCZs, 2015 - 2019

	Inner Port Shelter	Outer Port Shelter		Starling Inlet	Crooked Island		Port Island	Mirs Bay (North)
Parameter	PS3	PS5	PS6	MS1	MS2	MS7	MS17	MS3
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63μm (%w/w)	94 (83 - 97)	61 (42 - 87)	77 (60 - 90)	93 (60 - 99)	97 (88 - 99)	88 (38 - 99)	94 (87 - 99)	84 (73 - 94)
Electrochemical Potential (mV)	-317 (-395 - -253)	-249 (-387 - -88)	-258 (-399 - -126)	-279 (-383 - -178)	-350 (-401 - -303)	-362 (-415 - -329)	-278 (-383 - -80)	-290 (-386 - -130)
Total Solids (%w/w)	35 (30 - 39)	51 (40 - 64)	50 (45 - 54)	41 (37 - 46)	33 (30 - 38)	31 (27 - 36)	35 (31 - 39)	43 (38 - 49)
Total Volatile Soilds (%TS)	12.3 (11.0 - 13.0)	8.9 (6.4 - 12.0)	8.8 (7.6 - 10.0)	7.6 (6.7 - 8.1)	9.5 (8.6 - 10.0)	11.1 (10.0 - 12.0)	10.2 (9.4 - 11.0)	7.9 (6.4 - 9.0)
Chemical Oxygen Demand (mg/kg)	15600 (11000 - 19000)	13100 (10000 - 17000)	12900 (11000 - 15000)	14000 (12000 - 16000)	16200 (13000 - 21000)	16700 (13000 - 21000)	15400 (12000 - 18000)	13230 (8300 - 20000)
Total Carbon (%w/w)	1.1 (0.8 - 1.3)	1.7 (1.1 - 2.4)	1.4 (1.0 - 1.8)	0.5 (0.1 - 0.8)	0.6 (0.5 - 0.8)	0.8 (0.6 - 1.0)	0.7 (0.5 - 0.9)	0.7 (0.4 - 0.9)
Ammonical Nitrogen (mg/kg)	7.86 (1.10 - 12.00)	4.21 (0.57 - 6.90)	4.88 (0.92 - 8.90)	8.73 (6.00 - 19.00)	10.39 (8.60 - 17.00)	10.68 (7.20 - 18.00)	8.24 (7.00 - 9.90)	8.88 (2.20 - 18.00)
Total Kjeldahl Nitrogen (mg/kg)	740 (630 - 1000)	580 (440 - 730)	640 (570 - 770)	510 (390 - 640)	630 (450 - 720)	690 (520 - 770)	680 (590 - 770)	520 (400 - 780)
Total Phosphorus (mg/kg)	210 (190 - 230)	210 (190 - 240)	240 (190 - 270)	190 (170 - 230)	190 (150 - 220)	200 (170 - 240)	210 (180 - 250)	200 (150 - 310)
Total Sulphide (mg/kg)	42.8 (12.0 - 65.0)	17.2 (2.1 - 43.0)	29.0 (3.5 - 54.0)	38.6 (9.0 - 170.0)	66.3 (26.0 - 140.0)	70.9 (24.0 - 100.0)	25.3 (5.7 - 55.0)	40.4 (3.2 - 130.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.3)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.3)
Arsenic (mg/kg)	6.6 (4.8 - 8.0)	5.5 (4.3 - 8.2)	6.6 (5.2 - 9.4)	10.0 (7.7 - 13.0)	8.9 (6.4 - 11.0)	7.5 (4.0 - 9.7)	7.7 (6.1 - 9.6)	7.4 (5.6 - 9.8)
Cadmium (mg/kg)	0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	0.3 (0.2 - 0.4)	0.3 (0.2 - 0.5)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)
Chromium (mg/kg)	27 (23 - 29)	21 (14 - 31)	24 (21 - 30)	33 (31 - 36)	36 (30 - 41)	32 (25 - 40)	33 (26 - 37)	28 (22 - 34)
Copper (mg/kg)	23 (19 - 32)	11 (7 - 17)	11 (9 - 16)	21 (14 - 25)	24 (21 - 29)	22 (18 - 28)	17 (15 - 19)	13 (10 - 17)
Lead (mg/kg)	40 (37 - 44)	29 (22 - 38)	33 (28 - 38)	43 (31 - 50)	47 (36 - 54)	44 (39 - 51)	43 (40 - 45)	31 (26 - 38)
Mercury (mg/kg)	0.10 (0.07 - 0.12)	0.05 (<0.05 - 0.06)	0.05 (<0.05 - 0.07)	0.05 (<0.05 - 0.07)	0.06 (<0.05 - 0.09)	0.07 (<0.05 - 0.11)	0.06 (<0.05 - 0.10)	0.05 (<0.05 - 0.06)
Nickel (mg/kg)	18 (16 - 19)	15 (10 - 21)	17 (15 - 22)	20 (18 - 22)	23 (20 - 27)	22 (17 - 28)	23 (19 - 26)	18 (13 - 24)
Silver (mg/kg)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	0.3 (<0.2 - 0.5)	0.3 (<0.2 - 0.3)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	110 (97 - 130)	80 (46 - 110)	80 (71 - 94)	110 (82 - 130)	120 (110 - 140)	110 (94 - 140)	110 (94 - 120)	79 (64 - 95)
Total Polychlorinated Biphenyls (PCBs) (μg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [4] [6]	120 (90 - 230)	110 (90 - 150)	130 (90 - 330)	120 (90 - 210)	150 (90 - 350)	140 (90 - 320)	99 (90 - 180)	120 (90 - 340)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [5] [6]	61 (37 - 95)	31 (18 - 47)	37 (20 - 75)	46 (22 - 89)	45 (26 - 88)	81 (41 - 270)	51 (22 - 140)	36 (18 - 66)

Note:
1. Data presented are arithmetic means ; data in brackets indicate ranges.
2. All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3. Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4. Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5. High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6. Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for marine sediment quality in the Mirs Bay WCZ, 2015 - 2019

	Mirs Bay (North)		Long Harbour	Waglan Island	Mirs Bay (South)		Mirs Bay (Central)	
Parameter	MS4	MS5	MS6	MS8	MS13	MS14	MS15	MS16
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	84 (18 - 99)	95 (87 - 99)	90 (40 - 98)	89 (65 - 96)	84 (44 - 96)	94 (87 - 99)	91 (83 - 99)	76 (59 - 91)
Electrochemical Potential (mV)	-296 (-385 - -198)	-275 (-379 - -203)	-275 (-394 - -145)	-210 (-327 - -124)	-216 (-330 - -117)	-217 (-329 - -135)	-212 (-355 - -102)	-193 (-346 - -99)
Total Solids (%w/w)	42 (33 - 57)	37 (32 - 44)	34 (30 - 46)	49 (36 - 65)	53 (46 - 65)	51 (48 - 54)	52 (44 - 58)	55 (44 - 62)
Total Volatile Soilds (%TS)	8.0 (3.8 - 9.6)	8.9 (7.2 - 11.0)	11.3 (9.6 - 13.0)	6.9 (5.3 - 8.9)	6.0 (4.8 - 6.6)	6.6 (5.4 - 7.4)	6.7 (5.9 - 8.3)	6.2 (5.1 - 7.6)
Chemical Oxygen Demand (mg/kg)	13300 (10000 - 17000)	13800 (13000 - 15000)	15300 (11000 - 18000)	10360 (8500 - 12000)	8680 (6400 - 12000)	9770 (7300 - 13000)	9970 (8200 - 11000)	9930 (8000 - 12000)
Total Carbon (%w/w)	0.8 (0.6 - 1.1)	0.6 (0.5 - 0.8)	1.0 (0.8 - 2.0)	0.7 (0.4 - 1.3)	0.6 (0.5 - 0.8)	0.6 (0.5 - 0.6)	0.6 (0.5 - 0.7)	0.6 (0.5 - 0.7)
Ammonical Nitrogen (mg/kg)	8.26 (4.80 - 13.00)	5.16 (0.60 - 8.30)	6.47 (0.78 - 9.90)	2.39 (0.08 - 3.60)	3.25 (1.40 - 6.80)	2.68 (0.74 - 4.10)	3.74 (0.08 - 10.00)	4.24 (0.33 - 8.70)
Total Kjeldahl Nitrogen (mg/kg)	640 (490 - 720)	640 (550 - 730)	710 (610 - 780)	490 (340 - 680)	450 (310 - 520)	510 (400 - 620)	520 (450 - 650)	510 (400 - 730)
Total Phosphorus (mg/kg)	210 (180 - 220)	200 (180 - 220)	210 (170 - 230)	220 (150 - 240)	240 (180 - 360)	240 (230 - 270)	250 (230 - 270)	260 (220 - 320)
Total Sulphide (mg/kg)	35.1 (11.0 - 85.0)	20.5 (3.5 - 35.0)	34.6 (3.0 - 78.0)	13.6 (2.0 - 41.0)	17.0 (4.9 - 35.0)	11.1 (1.7 - 21.0)	12.1 (0.8 - 27.0)	14.5 (3.2 - 37.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.1)
Arsenic (mg/kg)	7.2 (5.0 - 9.7)	7.9 (6.0 - 10.0)	6.7 (3.5 - 10.0)	7.7 (5.2 - 11.0)	8.3 (5.7 - 10.0)	7.9 (6.1 - 9.9)	7.4 (5.9 - 9.9)	7.1 (6.3 - 8.4)
Cadmium (mg/kg)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	31 (17 - 39)	33 (27 - 39)	29 (22 - 35)	29 (16 - 35)	28 (19 - 33)	29 (26 - 34)	28 (22 - 36)	24 (22 - 30)
Copper (mg/kg)	16 (7 - 29)	16 (12 - 20)	15 (7 - 19)	14 (11 - 15)	12 (8 - 15)	30 (9 - 200)	11 (9 - 16)	91 (7 - 830)
Lead (mg/kg)	37 (31 - 44)	42 (36 - 46)	41 (33 - 45)	33 (21 - 38)	31 (23 - 37)	31 (26 - 35)	31 (28 - 37)	28 (24 - 35)
Mercury (mg/kg)	0.05 (<0.05 - 0.06)	0.05 (<0.05 - 0.06)	0.06 (<0.05 - 0.07)	0.06 (<0.05 - 0.10)	0.05 (<0.05 - 0.05)	<0.05 (<0.05 - <0.05)	0.05 (<0.05 - 0.06)	<0.05 (<0.05 - <0.05)
Nickel (mg/kg)	21 (12 - 27)	23 (19 - 28)	21 (15 - 26)	21 (11 - 25)	21 (13 - 24)	21 (18 - 24)	20 (16 - 27)	20 (16 - 38)
Silver (mg/kg)	<0.2 (<0.2 - <0.2)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	89 (47 - 110)	99 (85 - 120)	100 (74 - 120)	83 (51 - 97)	79 (50 - 94)	110 (71 - 400)	75 (63 - 100)	100 (56 - 420)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 20)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	130 (90 - 300)	130 (90 - 260)	120 (90 - 220)	98 (90 - 140)	100 (90 - 170)	99 (90 - 140)	120 (90 - 300)	120 (90 - 200)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	57 (19 - 160)	50 (22 - 170)	61 (30 - 160)	72 (21 - 200)	34 (18 - 84)	37 (21 - 85)	34 (18 - 69)	31 (18 - 62)

Note:
1. Data presented are arithmetic means ; data in brackets indicate ranges.
2. All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3. Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4. Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5. High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6. Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for marine sediment quality in the North Western and Western Buffer WCZs, 2015 - 2019

Parameter	Pearl Island NS2	Pillar Point NS3	Urmston Road NS4	Chek Lap Kok (North) NS6	Tsing Yi (South) WS1	Hong Kong Island (West) WS2
Number of samples	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	63 (34 - 97)	64 (41 - 96)	52 (30 - 72)	72 (33 - 99)	80 (72 - 94)	81 (65 - 91)
Electrochemical Potential (mV)	-162 (-298 - -59)	-203 (-382 - -125)	-196 (-388 - -118)	-184 (-377 - -118)	-231 (-350 - -109)	-202 (-347 - -102)
Total Solids (%w/w)	54 (39 - 65)	51 (44 - 63)	58 (50 - 65)	56 (47 - 70)	47 (40 - 52)	48 (44 - 54)
Total Volatile Soilds (%TS)	6.4 (4.8 - 7.8)	6.9 (5.0 - 8.5)	5.8 (4.7 - 7.5)	6.2 (3.0 - 8.2)	7.4 (6.2 - 9.1)	7.4 (6.1 - 9.8)
Chemical Oxygen Demand (mg/kg)	11310 (6900 - 15000)	13100 (11000 - 15000)	13400 (11000 - 17000)	11040 (8700 - 15000)	15500 (12000 - 21000)	13400 (11000 - 16000)
Total Carbon (%w/w)	0.8 (0.5 - 1.2)	0.7 (0.6 - 0.9)	0.6 (<0.1 - 0.8)	0.7 (0.4 - 1.2)	0.8 (0.5 - 1.1)	0.7 (0.6 - 1.2)
Ammonical Nitrogen (mg/kg)	5.25 (<0.05 - 13.00)	8.61 (0.07 - 31.00)	4.75 (0.17 - 24.00)	13.31 (<0.05 - 76.00)	11.18 (1.40 - 27.00)	5.57 (0.65 - 12.00)
Total Kjeldahl Nitrogen (mg/kg)	400 (280 - 540)	460 (400 - 530)	450 (330 - 740)	420 (340 - 570)	560 (500 - 770)	490 (370 - 600)
Total Phosphorus (mg/kg)	220 (170 - 280)	230 (210 - 260)	220 (190 - 250)	220 (160 - 310)	240 (210 - 270)	220 (170 - 250)
Total Sulphide (mg/kg)	28.7 (0.9 - 100.0)	54.6 (1.6 - 230.0)	20.0 (4.3 - 51.0)	9.2 (<0.2 - 35.0)	121.3 (52.0 - 320.0)	18.5 (<0.2 - 46.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	10.9 (7.0 - 23.0)	11.9 (7.7 - 16.0)	10.7 (7.8 - 13.0)	15.2 (7.1 - 22.0)	9.1 (7.5 - 11.0)	9.0 (7.1 - 13.0)
Cadmium (mg/kg)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.1)	0.1 (0.1 - 0.2)	0.1 (<0.1 - 0.1)
Chromium (mg/kg)	32 (20 - 48)	29 (22 - 45)	26 (20 - 32)	31 (21 - 38)	34 (26 - 46)	31 (25 - 34)
Copper (mg/kg)	31 (17 - 48)	27 (17 - 51)	27 (17 - 44)	22 (13 - 34)	49 (26 - 100)	25 (18 - 33)
Lead (mg/kg)	45 (29 - 90)	38 (28 - 53)	34 (30 - 39)	39 (25 - 51)	38 (33 - 52)	35 (30 - 42)
Mercury (mg/kg)	0.09 (0.06 - 0.12)	0.10 (0.06 - 0.14)	0.08 (0.06 - 0.11)	0.09 (0.05 - 0.13)	0.17 (0.10 - 0.25)	0.10 (0.07 - 0.14)
Nickel (mg/kg)	19 (12 - 30)	17 (12 - 27)	16 (12 - 26)	19 (12 - 25)	20 (16 - 26)	20 (18 - 22)
Silver (mg/kg)	0.2 (<0.2 - 0.4)	0.2 (<0.2 - 0.4)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	0.6 (0.3 - 1.7)	0.3 (<0.2 - 0.5)
Zinc (mg/kg)	140 (79 - 220)	110 (83 - 160)	110 (90 - 150)	100 (61 - 180)	150 (94 - 300)	110 (86 - 170)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	18 (18 - 19)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	110 (90 - 150)	110 (90 - 220)	100 (90 - 140)	110 (90 - 200)	130 (90 - 320)	120 (90 - 220)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	59 (36 - 100)	69 (30 - 120)	100 (28 - 230)	57 (24 - 130)	170 (91 - 400)	360 (29 - 1500)

Note:

1 Data presented are arithmetic means ; data in brackets indicate ranges.

2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.

3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics for marine sediment quality in the Eastern Buffer and Victoria Harbour WCZs, 2015 - 2019

	Eastern Buffer			Victoria Harbour			Rambler Channel	
	Chai Wan	Tathong Channel		(East)	(Central)	(West)		
Parameter	ES1	ES2	ES4	VS3	VS5	VS6	VS9	VS10
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63μm (%w/w)	61 (34 - 99)	70 (36 - 94)	74 (43 - 95)	54 (16 - 94)	85 (72 - 97)	64 (11 - 96)	86 (59 - 97)	80 (37 - 98)
Electrochemical Potential (mV)	-224 (-361 - -105)	-223 (-366 - -127)	-247 (-357 - -115)	-247 (-390 - -104)	-333 (-438 - -168)	-262 (-430 - -65)	-273 (-387 - -194)	-266 (-342 - -147)
Total Solids (%w/w)	57 (42 - 69)	55 (41 - 73)	52 (35 - 64)	48 (36 - 70)	46 (35 - 73)	47 (33 - 60)	43 (35 - 56)	41 (33 - 52)
Total Volatile Soilds (%TS)	6.1 (4.3 - 8.6)	6.5 (3.9 - 8.4)	6.9 (5.1 - 9.3)	7.1 (3.7 - 8.7)	8.5 (7.6 - 9.6)	8.1 (5.7 - 11.0)	7.7 (5.3 - 10.0)	7.9 (6.2 - 8.8)
Chemical Oxygen Demand (mg/kg)	10910 (7200 - 15000)	10550 (6400 - 13000)	14400 (10000 - 21000)	17200 (13000 - 22000)	18900 (11000 - 24000)	17300 (11000 - 24000)	14770 (9700 - 18000)	16400 (11000 - 21000)
Total Carbon (%w/w)	1.1 (0.7 - 1.3)	1.0 (0.6 - 2.5)	1.0 (0.6 - 1.9)	0.7 (0.4 - 1.3)	0.9 (0.6 - 1.4)	0.8 (0.6 - 1.2)	0.7 (0.5 - 0.9)	0.7 (0.5 - 0.9)
Ammonical Nitrogen (mg/kg)	3.42 (0.15 - 11.00)	3.54 (0.09 - 9.40)	5.58 (0.15 - 17.00)	10.38 (<0.05 - 58.00)	18.33 (<0.05 - 44.00)	14.01 (0.15 - 46.00)	14.89 (0.28 - 34.00)	5.99 (0.95 - 17.00)
Total Kjeldahl Nitrogen (mg/kg)	450 (280 - 730)	480 (280 - 700)	500 (380 - 620)	530 (270 - 680)	690 (490 - 1200)	600 (400 - 770)	510 (400 - 780)	510 (370 - 670)
Total Phosphorus (mg/kg)	200 (130 - 250)	200 (140 - 230)	200 (180 - 230)	190 (140 - 210)	210 (160 - 240)	240 (200 - 290)	200 (170 - 220)	210 (170 - 250)
Total Sulphide (mg/kg)	19.2 (4.6 - 44.0)	31.1 (<0.2 - 78.0)	36.9 (2.3 - 70.0)	122.0 (14.0 - 400.0)	205.8 (11.0 - 450.0)	153.6 (15.0 - 530.0)	125.2 (40.0 - 210.0)	85.3 (2.1 - 500.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.4)
Arsenic (mg/kg)	5.9 (4.7 - 8.7)	5.9 (3.6 - 9.4)	7.0 (4.1 - 10.0)	7.6 (2.8 - 11.0)	8.4 (6.1 - 11.0)	9.2 (6.5 - 12.0)	9.0 (5.4 - 12.0)	10.4 (6.8 - 15.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.2)	0.3 (<0.1 - 0.5)	0.5 (0.2 - 0.8)	0.3 (0.2 - 0.5)	0.3 (0.2 - 0.5)	0.3 (0.2 - 0.8)
Chromium (mg/kg)	22 (15 - 36)	24 (8 - 39)	33 (19 - 42)	36 (16 - 50)	46 (20 - 55)	37 (21 - 47)	41 (28 - 58)	58 (42 - 120)
Copper (mg/kg)	24 (14 - 38)	17 (5 - 32)	50 (28 - 85)	86 (33 - 160)	120 (42 - 210)	72 (33 - 110)	70 (41 - 140)	130 (77 - 220)
Lead (mg/kg)	29 (21 - 43)	31 (15 - 42)	42 (25 - 66)	47 (33 - 56)	59 (41 - 72)	65 (44 - 110)	38 (27 - 49)	56 (44 - 79)
Mercury (mg/kg)	0.12 (<0.05 - 0.31)	0.08 (<0.05 - 0.13)	0.20 (0.11 - 0.38)	0.29 (0.13 - 0.43)	0.44 (0.18 - 0.81)	0.40 (0.25 - 0.70)	0.15 (0.09 - 0.22)	0.19 (0.13 - 0.27)
Nickel (mg/kg)	14 (10 - 21)	16 (6 - 24)	18 (10 - 25)	17 (7 - 24)	21 (10 - 25)	17 (12 - 23)	22 (14 - 28)	26 (18 - 43)
Silver (mg/kg)	0.3 (<0.2 - 0.5)	0.2 (<0.2 - 0.4)	0.9 (0.4 - 2.8)	1.7 (0.7 - 4.1)	2.3 (0.7 - 4.6)	1.2 (0.5 - 1.7)	1.1 (0.7 - 2.9)	1.8 (1.0 - 2.9)
Zinc (mg/kg)	74 (53 - 120)	72 (30 - 110)	120 (71 - 160)	160 (58 - 200)	230 (120 - 320)	190 (160 - 250)	140 (110 - 180)	220 (130 - 360)
Total Polychlorinated Biphenyls (PCBs) (μg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	19 (18 - 25)	19 (18 - 23)	23 (18 - 51)	18 (18 - 18)	20 (18 - 33)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [4] [6]	110 (90 - 220)	100 (90 - 180)	150 (90 - 340)	190 (90 - 430)	170 (110 - 300)	170 (90 - 340)	120 (90 - 250)	110 (90 - 160)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [5] [6]	170 (52 - 440)	72 (21 - 180)	180 (65 - 410)	1100 (87 - 3300)	580 (340 - 960)	830 (51 - 3200)	150 (100 - 240)	360 (94 - 1100)

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4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

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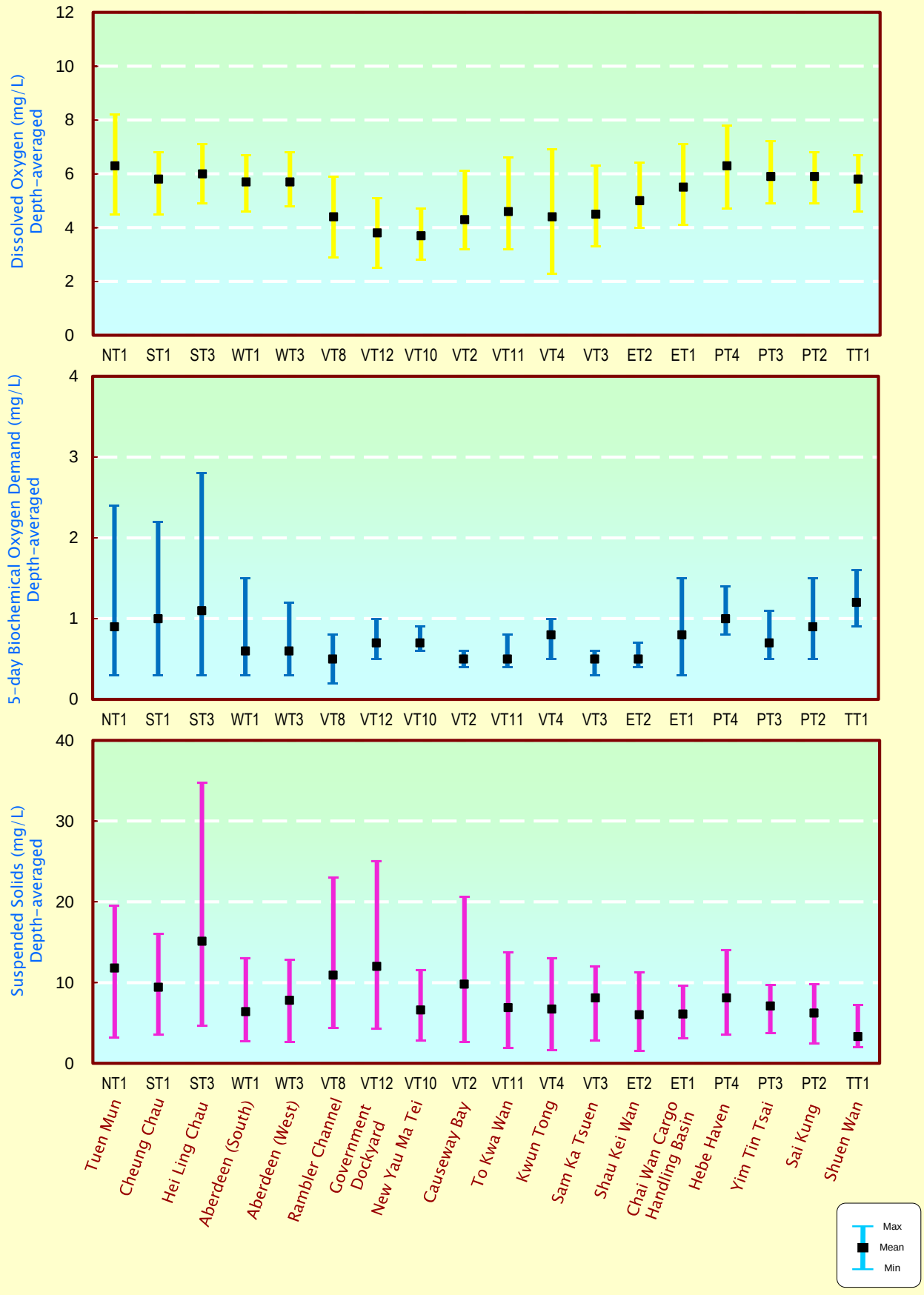
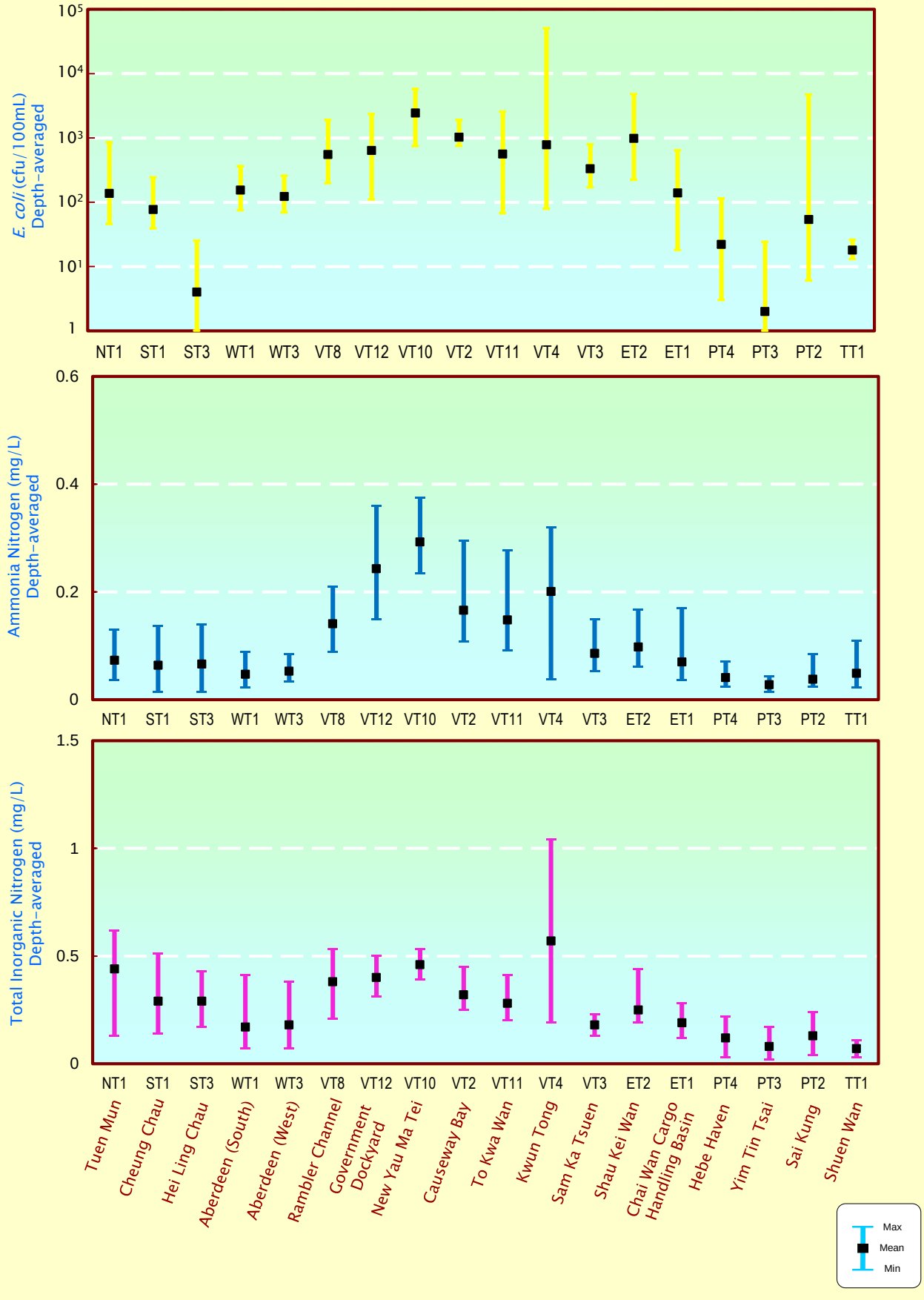
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Water quality in typhoon shelters, sheltered anchorages and Government Dockyard in 2019



Water quality in typhoon shelters, sheltered anchorages and Government Dockyard 2019 (continued)



Long-term water quality trend analyses in typhoon shelters, sheltered anchorages and Government Dockyard, 1986-2019

Monitoring Station		NT1	ST1	ST3	WT3	WT1	VT8	VT10	VT2	VT11
Monitoring Period		1986 I 2019	1986 I 2019	2000 I 2019	1986 I 2019	1986 I 2019	1986 I 2019	1993 I 2019	1986 I 2019	1994 I 2019
Parameter	Water Depth									
Temperature (℃)	Surface	↗	↗	-	-	-	↗	↗	↗	↗
	Middle	NA	-	-	-	-	NA	NA	NA	↗
	Bottom	↗	↗	-	-	-	↗	↗	↗	↗
	Average	↗	↗	-	-	-	↗	↗	↗	↗
Salinity	Surface	-	-	↘	-	-	-	-	-	-
	Middle	NA	-	↘	-	-	NA	NA	NA	-
	Bottom	-	↘	↘	-	-	-	-	-	-
	Average	-	-	↘	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	Surface	↗	-	-	-	-	↗	-	↗	-
	Middle	NA	-	-	-	-	NA	NA	NA	↗
	Bottom	↗	-	-	-	↗	↗	↗	↗	↗
	Average	↗	-	-	-	-	↗	↗	↗	↗
Dissolved Oxygen (%)	Surface	↗	-	-	-	-	↗	-	↗	↗
	Middle	NA	-	-	-	-	NA	NA	NA	↗
	Bottom	↗	-	-	↗	↗	↗	↗	↗	↗
	Average	↗	-	-	-	-	↗	↗	↗	↗
pH	Surface	↘	↘	↘	↘	↘	↘	-	-	-
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	-
	Bottom	-	↘	↘	↘	↘	↘	-	-	-
	Average	↘	↘	↘	↘	↘	↘	-	-	-
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗	↗	↗	↗
Turbidity (NTU)	Surface	↘	↘	↘	↘	↘	-	↘	-	-
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	-
	Bottom	↘	↘	↘	↘	↘	-	↘	-	↘
	Average	↘	↘	↘	↘	↘	-	↘	-	-
Suspended Solids (mg/L)	Surface	↘	-	-	-	-	↘	↘	-	-
	Middle	NA	-	↗	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	↘	-	-
	Average	↘	-	-	-	-	↘	↘	-	-
Total volatile solids (mg/L)	Surface	↘	-	↗	-	-	↘	-	-	-
	Middle	NA	-	↗	-	-	NA	NA	NA	-
	Bottom	-	-	↗	-	-	↘	-	-	-
	Average	↘	-	↗	-	-	↘	↘	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	↘	↘	-	-	-	↘	-	↘	↘
	Middle	NA	-	-	↘	-	NA	NA	NA	↘
	Bottom	-	-	-	↘	-	↘	-	↘	↘
	Average	↘	↘	-	↘	-	↘	-	↘	↘
Ammonia nitrogen (mg/L)	Surface	↘	-	-	-	-	↘	↘	↘	↘
	Middle	NA	-	-	-	↘	NA	NA	NA	↘
	Bottom	↘	-	↘	↘	-	↘	↘	↘	↘
	Average	↘	-	-	↘	↘	↘	↘	↘	↘
Unionised Ammonia(mg/L)	Surface	↘	↘	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	↘	↘	↘	NA	NA	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	↘	↘
	Average	↘	↘	↘	↘	↘	↘	-	↘	↘
Nitrite nitrogen (mg/L)	Surface	↗	-	-	-	-	↗	-	-	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	↗	-	-	-
	Average	↗	-	-	-	-	↗	-	-	-
Nitrate nitrogen (mg/L)	Surface	↗	↗	↗	-	-	↗	↗	↗	↗
	Middle	NA	-	↗	-	-	NA	NA	NA	↗
	Bottom	↗	↗	↗	-	-	↗	↗	↗	↗
	Average	↗	↗	↗	-	-	↗	↗	↗	↗
Total inorganic nitrogen (mg/L)	Surface	↗	-	↗	-	-	-	↘	↘	-
	Middle	NA	-	-	-	-	NA	NA	NA	↘
	Bottom	-	-	-	-	-	-	↘	↘	↘
	Average	↗	-	↗	-	-	-	↘	↘	↘
Total Kjeldahl nitrogen (mg/L)	Surface	↘	-	↗	-	-	↘	↘	↘	↘
	Middle	NA	-	↗	-	↗	NA	NA	NA	↘
	Bottom	-	-	↗	↗	↗	↘	↘	↘	↘
	Average	↘	-	↗	↗	↗	↘	↘	↘	↘
Total nitrogen (mg/L)	Surface	-	↗	↗	-	↗	↘	↘	↘	-
	Middle	NA	↗	↗	↗	↗	NA	NA	NA	-
	Bottom	-	↗	↗	↗	↗	↘	↘	↘	-
	Average	-	↗	↗	↗	↗	↘	↘	↘	-
Orthophosphate phosphorus (mg/L)	Surface	↘	-	-	-	-	↘	↘	↘	↘
	Middle	NA	↘	-	↘	↘	NA	NA	NA	↘
	Bottom	↘	↘	-	↘	↘	↘	↘	↘	↘
	Average	↘	↘	-	↘	↘	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	-	-	-	-	↘	↘	↘	↘
	Middle	NA	-	-	-	-	NA	NA	NA	↘
	Bottom	↘	-	-	-	-	↘	↘	↘	↘
	Average	↘	-	-	-	-	↘	↘	↘	↘
Silica (mg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	-	-	-	-	-	-	-	-	-
	Middle	NA	-	-	-	-	NA	NA	NA	-
	Bottom	-	-	-	-	-	-	-	-	-
	Average	-	-	-	-	-	-	-	-	-
E. coli (cfu/100mL)	Surface	↘	↘	-	↘	↘	↘	↘	↘	↘
	Middle	NA	-	-	↘	↘	NA	NA	NA	↘
	Bottom	↘	↘	-	↘	↘	↘	↘	↘	↘
	Average	↘	↘	-	↘	↘	↘	↘	↘	↘
Faecal coliforms (cfu/100mL)	Surface	↘	↘	-	↘	↘	-	↘	↘	↘
	Middle	NA	↘	-	↘	↘	NA	NA	NA	-
	Bottom	-	-	-	↘	-	-	↘	↘	↘
	Average	↘	-	-	↘	↘	-	↘	↘	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Long-term water quality trend analyses in typhoon shelters, sheltered anchorages and Government Dockyard, 1986-2019

Monitoring Station		VT12	VT4	VT3	ET2	ET1	PT4	PT3	PT2	TT1
Monitoring Period		2000 I 2019	1987 I 2019	1986 I 2019	1993 I 2019	1986 I 2019	1986 I 2019	1986 I 2019	1986 I 2019	1986 I 2019
Parameter	Water Depth									
Temperature (℃)	Surface	↗	↗	↗	-	↗	↗	↗	↗	↗
	Middle	NA	↗	NA	-	↗	NA	↗	NA	↗
	Bottom	↗	↗	↗	-	↗	↗	↗	NA	↗
	Average	↗	↗	↗	-	↗	↗	↗	↗	↗
Salinity	Surface	-	↘	-	-	-	-	↘	-	-
	Middle	NA	-	NA	-	-	NA	↘	NA	-
	Bottom	-	-	-	-	-	-	↘	NA	-
	Average	-	-	-	-	-	-	↘	-	-
Dissolved Oxygen (mg/L)	Surface	-	↗	↗	↗	-	↘	-	-	↘
	Middle	NA	↗	NA	↗	-	NA	-	NA	↘
	Bottom	-	↗	↗	↗	↗	-	-	NA	-
	Average	-	↗	↗	↗	-	-	-	-	↘
Dissolved Oxygen (%)	Surface	-	↗	↗	↗	-	-	-	-	↘
	Middle	NA	↗	NA	↗	↗	NA	-	NA	↘
	Bottom	-	↗	↗	↗	↗	↗	-	NA	-
	Average	-	↗	↗	↗	↗	-	-	-	-
pH	Surface	-	↗	↘	-	-	↘	↘	↘	↘
	Middle	NA	↗	NA	↘	-	NA	↘	NA	↘
	Bottom	-	-	↘	-	↘	↘	↘	NA	↘
	Average	-	-	↘	↘	-	↘	↘	↘	↘
Secchi disc depth (m)		↗	↗	↗	↗	↗	↗	-	-	↗
Turbidity (NTU)	Surface	↘	↘	-	-	↘	-	↘	↘	-
	Middle	NA	↘	NA	-	↘	NA	↘	NA	-
	Bottom	↘	↘	-	-	↘	-	↘	NA	-
	Average	↘	↘	-	-	↘	-	↘	↘	-
Suspended Solids (mg/L)	Surface	-	-	↘	↘	-	-	-	-	-
	Middle	NA	-	NA	-	-	NA	↗	NA	-
	Bottom	-	-	-	-	-	-	-	NA	-
	Average	-	↘	↘	-	-	-	-	-	-
Total volatile solids (mg/L)	Surface	-	-	-	-	-	-	-	-	↘
	Middle	NA	↘	NA	-	-	NA	↗	NA	-
	Bottom	-	-	-	-	-	-	-	NA	-
	Average	-	-	-	-	-	-	-	-	-
5-day Biochemical Oxygen Demand (mg/L)	Surface	-	↘	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	↘	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	↘	↘
Ammonia nitrogen (mg/L)	Surface	-	↘	↘	↘	↘	-	-	-	↘
	Middle	NA	↘	NA	↘	↘	NA	↗	NA	↘
	Bottom	-	↘	↘	↘	↘	-	-	NA	↘
	Average	-	↘	↘	↘	↘	-	-	-	↘
Unionised Ammonia(mg/L)	Surface	↘	↘	↘	↘	↘	↘	-	↘	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	NA	↘
	Average	↘	↘	↘	↘	↘	↘	-	↘	↘
Nitrite nitrogen (mg/L)	Surface	-	↗	-	-	-	-	-	-	-
	Middle	NA	↗	NA	-	-	NA	-	NA	-
	Bottom	-	↗	-	-	-	-	-	NA	-
	Average	-	↗	-	-	-	-	-	-	-
Nitrate nitrogen (mg/L)	Surface	-	↗	↗	↗	-	-	-	-	-
	Middle	NA	↗	NA	-	-	NA	-	NA	-
	Bottom	-	↗	↗	-	-	-	-	NA	-
	Average	-	↗	↗	-	-	-	-	-	-
Total inorganic nitrogen (mg/L)	Surface	-	↘	↘	↘	-	-	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	↘
	Bottom	-	↘	↘	↘	-	-	-	NA	↘
	Average	-	↘	↘	↘	-	-	-	-	↘
Total Kjeldahl nitrogen (mg/L)	Surface	-	↘	↘	↘	-	↘	↗	↗	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	-
	Bottom	-	↘	↘	↘	-	-	↗	NA	-
	Average	-	↘	↘	↘	-	-	↗	↗	↘
Total nitrogen (mg/L)	Surface	-	↘	↘	↘	-	-	↗	↗	↘
	Middle	NA	↘	NA	↘	-	NA	↗	NA	-
	Bottom	-	↘	↘	↘	-	-	↗	NA	↘
	Average	-	↘	↘	↘	-	-	↗	↗	↘
Orthophosphate phosphorus (mg/L)	Surface	↘	-	↘	↘	↘	↘	-	-	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	↘	NA	↘
	Average	↘	-	↘	↘	↘	↘	-	↘	↘
Total phosphorus (mg/L)	Surface	-	-	↘	↘	↘	↘	-	-	↘
	Middle	NA	↘	NA	↘	↘	NA	-	NA	↘
	Bottom	↘	↘	↘	↘	↘	↘	-	NA	↘
	Average	-	↘	↘	↘	↘	↘	-	-	↘
Silica (mg/L)	Surface	-	-	-	↘	-	↗	-	-	-
	Middle	NA	↘	NA	↘	-	NA	-	NA	-
	Bottom	-	-	-	-	-	-	-	NA	-
	Average	-	-	-	↘	-	-	-	-	-
Chlorophyll-*a* (μg/L)	Surface	-	↗	-	-	-	-	-	-	↘
	Middle	NA	↗	NA	-	-	NA	-	NA	↘
	Bottom	-	↗	-	-	-	-	-	NA	-
	Average	-	↗	-	-	-	-	-	-	↘
E. coli (cfu/100mL)	Surface	-	↘	↘	↘	-	↘	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	↘	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	-	↘
Faecal coliforms (cfu/100mL)	Surface	-	↘	↘	↘	-	↘	-	-	↘
	Middle	NA	↘	NA	↘	-	NA	-	NA	↘
	Bottom	-	↘	↘	↘	-	-	-	NA	↘
	Average	-	↘	↘	↘	-	↘	-	-	↘

Note: 1. Results of the Seasonal Kendall Test statistically significant at $p < 0.05$
2. – indicates no significant trend
3. NA (Not Applicable) indicates the measurement was not made due to shallow water
4. ↗ significant increase
5. ↘ significant decrease

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2019

Parameter		Tuen Mun NT1	Cheung Chau ST1	Hei Ling Chau ST3	Aberdeen (South) WT1	Aberdeen (West) WT3	Rambler Channel VT8
Number of samples		6	6	6	6	6	6
Temperature (°C)		25.3 (18.5 - 31.9)	24.9 (19.2 - 29.1)	25.0 (19.3 - 29.1)	24.2 (18.8 - 27.9)	24.1 (19.0 - 27.6)	24.7 (19.4 - 29.3)
Salinity		26.2 (17.0 - 32.3)	29.2 (21.2 - 32.8)	29.5 (23.4 - 33.0)	30.9 (23.7 - 33.3)	31.5 (27.1 - 33.2)	29.9 (25.8 - 33.1)
Dissolved Oxygen (mg/L)		6.3 (4.5 - 8.2)	5.8 (4.5 - 6.8)	6.0 (4.9 - 7.1)	5.7 (4.6 - 6.7)	5.7 (4.8 - 6.8)	4.4 (2.9 - 5.9)
	Bottom	6.2 (4.2 - 8.1)	5.8 (4.3 - 7.2)	6.1 (4.9 - 7.2)	5.6 (4.3 - 7.2)	5.6 (4.5 - 7.0)	4.6 (2.5 - 6.2)
Dissolved Oxygen (% saturation)		89 (67 - 116)	86 (67 - 102)	92 (73 - 119)	81 (66 - 91)	80 (69 - 89)	63 (41 - 84)
	Bottom	87 (63 - 114)	87 (69 - 100)	97 (73 - 131)	79 (63 - 94)	79 (68 - 91)	65 (37 - 87)
pH		8.1 (7.9 - 8.7)	7.9 (7.7 - 8.0)	8.0 (7.8 - 8.0)	7.9 (7.7 - 8.1)	7.9 (7.6 - 8.1)	7.8 (7.4 - 8.1)
Secchi Disc Depth (m)		2.3 (1.8 - 3.4)	2.1 (2.0 - 2.4)	2.5 (1.7 - 3.5)	3.0 (2.2 - 4.1)	2.8 (2.2 - 3.6)	2.2 (1.5 - 2.7)
Turbidity (NTU)		7.7 (1.3 - 22.7)	4.4 (1.2 - 7.8)	4.8 (0.8 - 8.1)	2.4 (0.7 - 3.7)	3.2 (1.7 - 4.4)	4.4 (1.5 - 8.3)
Suspended Solids (mg/L)		11.8 (3.2 - 19.5)	9.4 (3.5 - 16.0)	15.1 (4.6 - 34.7)	6.4 (2.7 - 13.0)	7.8 (2.6 - 12.8)	10.9 (4.4 - 23.0)
5-day Biochemical Oxygen Demand (mg/L)		0.9 (0.3 - 2.4)	1.0 (0.3 - 2.2)	1.1 (0.3 - 2.8)	0.6 (0.3 - 1.5)	0.6 (0.3 - 1.2)	0.5 (0.2 - 0.8)
Ammonia Nitrogen (mg/L)		0.073 (0.036 - 0.130)	0.064 (0.015 - 0.137)	0.066 (0.014 - 0.140)	0.047 (0.022 - 0.089)	0.053 (0.034 - 0.085)	0.141 (0.089 - 0.210)
Unionised Ammonia (mg/L)		0.006 (0.001 - 0.020)	0.003 (<0.001 - 0.006)	0.003 (<0.001 - 0.005)	0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.006)	0.005 (0.001 - 0.012)
Nitrite Nitrogen (mg/L)		0.047 (0.017 - 0.135)	0.028 (0.008 - 0.048)	0.032 (0.009 - 0.057)	0.014 (0.003 - 0.029)	0.014 (0.003 - 0.028)	0.028 (0.012 - 0.051)
Nitrate Nitrogen (mg/L)		0.318 (0.057 - 0.420)	0.197 (0.054 - 0.413)	0.196 (0.087 - 0.323)	0.114 (0.024 - 0.343)	0.110 (0.015 - 0.317)	0.212 (0.049 - 0.330)
Total Inorganic Nitrogen (mg/L)		0.44 (0.13 - 0.62)	0.29 (0.14 - 0.51)	0.29 (0.17 - 0.43)	0.17 (0.07 - 0.41)	0.18 (0.07 - 0.38)	0.38 (0.21 - 0.53)
Total Kjeldahl Nitrogen (mg/L)		0.48 (0.25 - 0.68)	0.36 (0.18 - 0.61)	0.35 (0.15 - 0.53)	0.28 (0.17 - 0.46)	0.32 (0.13 - 0.71)	0.41 (0.26 - 0.67)
Total Nitrogen (mg/L)		0.85 (0.70 - 1.01)	0.59 (0.40 - 0.87)	0.58 (0.44 - 0.87)	0.41 (0.27 - 0.55)	0.45 (0.31 - 0.81)	0.65 (0.33 - 0.99)
Orthophosphate Phosphorus (mg/L)		0.016 (0.004 - 0.034)	0.015 (0.003 - 0.026)	0.016 (0.002 - 0.028)	0.012 (0.006 - 0.018)	0.012 (0.008 - 0.019)	0.019 (0.007 - 0.031)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.06)	0.03 (<0.02 - 0.05)	0.04 (<0.02 - 0.06)	0.03 (<0.02 - 0.04)	0.03 (0.02 - 0.05)	0.04 (0.04 - 0.06)
Silica (as SiO_2) (mg/L)		1.14 (0.25 - 1.90)	1.24 (0.35 - 2.47)	1.43 (0.22 - 3.67)	1.01 (0.36 - 2.37)	1.01 (0.38 - 2.50)	1.35 (0.43 - 2.00)
Chlorophyll-*a* (µg/L)		7.8 (0.8 - 22.0)	6.5 (0.9 - 22.7)	8.2 (0.8 - 32.4)	2.7 (0.3 - 11.9)	2.7 (0.3 - 11.6)	1.6 (0.5 - 3.7)
E.coli (cfu/100mL)		140 (46 - 850)	77 (39 - 240)	4 (1 - 25)	160 (75 - 360)	120 (69 - 260)	550 (200 - 1900)
Faecal Coliforms (cfu/100mL)		410 (120 - 3400)	190 (79 - 590)	7 (2 - 44)	720 (400 - 2000)	400 (170 - 970)	1800 (610 - 6200)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2019 (continued)

Parameter		Government Dockyard VT12	New Yau Ma Tei VT10	Causeway Bay VT2	To Kwa Wan VT11	Kwun Tong VT4	Sam Ka Tsuen VT3
Number of samples		6	6	6	6	6	6
Temperature (°C)		24.7 (19.6 - 29.4)	24.6 (19.4 - 29.5)	24.3 (19.0 - 29.2)	24.2 (19.0 - 29.3)	24.4 (18.7 - 29.5)	24.1 (18.8 - 29.5)
Salinity		31.2 (29.6 - 32.6)	31.3 (29.5 - 32.8)	31.7 (30.4 - 32.8)	32.1 (31.1 - 33.0)	29.6 (24.8 - 32.7)	32.4 (31.2 - 33.0)
Dissolved Oxygen (mg/L)		3.8 (2.5 - 5.1)	3.7 (2.8 - 4.7)	4.3 (3.2 - 6.1)	4.6 (3.2 - 6.6)	4.4 (2.3 - 6.9)	4.5 (3.3 - 6.3)
	Bottom	3.7 (2.6 - 5.1)	3.7 (2.2 - 4.8)	4.3 (2.6 - 6.3)	4.6 (2.6 - 6.7)	4.7 (2.1 - 7.2)	4.5 (3.1 - 6.6)
Dissolved Oxygen (% saturation)		55 (35 - 67)	52 (38 - 68)	61 (46 - 80)	65 (46 - 86)	62 (33 - 90)	63 (46 - 85)
	Bottom	53 (37 - 68)	53 (32 - 70)	62 (38 - 84)	66 (38 - 89)	66 (30 - 94)	62 (44 - 90)
pH		7.7 (7.5 - 8.0)	7.7 (7.4 - 8.0)	7.8 (7.4 - 8.1)	7.8 (7.4 - 8.1)	7.8 (7.5 - 8.1)	7.8 (7.5 - 8.2)
Secchi Disc Depth (m)		2.2 (1.5 - 2.5)	2.5 (1.9 - 3.0)	2.6 (2.2 - 3.1)	2.9 (2.0 - 4.0)	2.4 (1.9 - 3.0)	2.9 (2.3 - 3.8)
Turbidity (NTU)		4.0 (1.9 - 5.9)	2.0 (0.8 - 3.5)	3.8 (1.1 - 12.4)	2.4 (0.8 - 3.6)	2.1 (0.7 - 4.9)	2.4 (1.1 - 4.8)
Suspended Solids (mg/L)		12 (4.3 - 25.0)	6.6 (2.8 - 11.5)	9.8 (2.6 - 20.6)	6.9 (1.9 - 13.7)	6.7 (1.6 - 13.0)	8.1 (2.8 - 12.0)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.5 - 1.0)	0.7 (0.6 - 0.9)	0.5 (0.4 - 0.6)	0.5 (0.4 - 0.8)	0.8 (0.5 - 1.0)	0.5 (0.3 - 0.6)
Ammonia Nitrogen (mg/L)		0.243 (0.150 - 0.360)	0.293 (0.235 - 0.375)	0.166 (0.108 - 0.295)	0.148 (0.091 - 0.277)	0.201 (0.038 - 0.320)	0.086 (0.053 - 0.150)
Unionised Ammonia (mg/L)		0.006 (0.002 - 0.015)	0.008 (0.003 - 0.018)	0.005 (0.002 - 0.012)	0.005 (0.001 - 0.011)	0.006 (<0.001 - 0.019)	0.003 (<0.001 - 0.007)
Nitrite Nitrogen (mg/L)		0.021 (0.017 - 0.027)	0.023 (0.017 - 0.038)	0.017 (0.014 - 0.028)	0.018 (0.012 - 0.023)	0.081 (0.018 - 0.192)	0.013 (0.011 - 0.018)
Nitrate Nitrogen (mg/L)		0.132 (0.083 - 0.210)	0.141 (0.081 - 0.195)	0.140 (0.077 - 0.205)	0.112 (0.063 - 0.147)	0.290 (0.130 - 0.530)	0.083 (0.045 - 0.130)
Total Inorganic Nitrogen (mg/L)		0.4 (0.31 - 0.50)	0.46 (0.39 - 0.53)	0.32 (0.25 - 0.45)	0.28 (0.20 - 0.41)	0.57 (0.19 - 1.04)	0.18 (0.13 - 0.23)
Total Kjeldahl Nitrogen (mg/L)		0.65 (0.45 - 0.99)	0.64 (0.44 - 0.75)	0.49 (0.25 - 0.78)	0.46 (0.25 - 0.76)	0.58 (0.26 - 0.95)	0.40 (0.21 - 0.69)
Total Nitrogen (mg/L)		0.81 (0.55 - 1.14)	0.81 (0.53 - 0.92)	0.65 (0.34 - 0.95)	0.59 (0.32 - 0.88)	0.95 (0.41 - 1.45)	0.49 (0.32 - 0.77)
Orthophosphate Phosphorus (mg/L)		0.032 (0.012 - 0.060)	0.032 (0.015 - 0.047)	0.021 (0.012 - 0.040)	0.021 (0.010 - 0.040)	0.078 (0.020 - 0.136)	0.014 (0.006 - 0.026)
Total Phosphorus (mg/L)		0.07 (0.06 - 0.08)	0.06 (0.06 - 0.07)	0.05 (0.04 - 0.06)	0.05 (0.03 - 0.10)	0.11 (0.04 - 0.17)	0.04 (0.02 - 0.05)
Silica (as SiO_2) (mg/L)		1.18 (0.75 - 2.05)	1.11 (0.56 - 2.10)	1.07 (0.53 - 2.10)	0.93 (0.50 - 1.60)	1.29 (0.60 - 2.43)	0.77 (0.41 - 1.30)
Chlorophyll-*a* (µg/L)		4.1 (1.1 - 14.5)	2.7 (0.3 - 10.8)	2.2 (0.6 - 8.2)	1.7 (0.5 - 5.8)	3.7 (0.5 - 11.2)	1.7 (0.6 - 4.3)
E.coli (cfu/100mL)		640 (110 - 2300)	2400 (740 - 5700)	1000 (750 - 1900)	560 (67 - 2500)	780 (79 - 50000)	330 (170 - 790)
Faecal Coliforms (cfu/100mL)		1700 (260 - 5100)	6800 (1700 - 26000)	2400 (1500 - 7000)	1400 (270 - 3600)	1900 (130 - 160000)	690 (300 - 1200)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

Summary of water quality statistics for typhoon shelters, sheltered anchorages and Government Dockyard in 2019 (continued)

Parameter		Shau Kei Wan ET2	Chai Wan Cargo Handling Basin ET1	Hebe Haven PT4	Yim Tin Tsai PT3	Sai Kung PT2	Shuen Wan TT1
Number of samples		6	6	6	6	6	6
Temperature (°C)		24.9 (19.0 - 30.4)	25.1 (18.8 - 30.4)	25.3 (18.7 - 32.8)	25.4 (18.5 - 33.1)	25.6 (18.7 - 33.1)	25.4 (18.5 - 31.8)
Salinity		30.7 (22.6 - 32.9)	30.7 (23.2 - 33.0)	28.9 (17.9 - 32.9)	29.8 (19.4 - 33.3)	29.2 (18.4 - 33.3)	30.1 (25.2 - 32.6)
Dissolved Oxygen (mg/L)		5.0 (4.0 - 6.4)	5.5 (4.1 - 7.1)	6.3 (4.7 - 7.8)	5.9 (4.9 - 7.2)	5.9 (4.9 - 6.8)	5.8 (4.6 - 6.7)
	Bottom	4.8 (2.4 - 6.7)	5.4 (3.8 - 7.0)	6.0 (4.3 - 7.9)	6.0 (4.8 - 7.5)	NA	5.5 (4.1 - 6.7)
Dissolved Oxygen (% saturation)		70 (53 - 85)	80 (58 - 111)	89 (71 - 102)	84 (76 - 94)	85 (76 - 88)	83 (71 - 98)
	Bottom	68 (35 - 87)	77 (58 - 92)	85 (67 - 103)	86 (70 - 98)	NA	78 (63 - 87)
pH		8.0 (7.7 - 8.5)	8.1 (7.8 - 8.6)	8.1 (7.7 - 9.0)	8.2 (7.8 - 9.0)	8.2 (7.8 - 9.0)	8.1 (7.7 - 8.7)
Secchi Disc Depth (m)		3.1 (2.0 - 3.9)	2.9 (2.0 - 4.0)	2.4 (1.5 - 3.4)	2.7 (1.8 - 4.0)	2.2 (1.8 - 2.6)	2.7 (2.3 - 3.0)
Turbidity (NTU)		2.1 (0.7 - 6.2)	3.0 (0.5 - 11.3)	3.1 (0.7 - 10.0)	2.6 (0.5 - 8.2)	2.5 (0.4 - 6.1)	3.2 (0.5 - 11.8)
Suspended Solids (mg/L)		6.0 (1.5 - 11.2)	6.1 (3.1 - 9.6)	8.1 (3.5 - 14.0)	7.1 (3.7 - 9.7)	6.2 (2.4 - 9.8)	3.3 (2.0 - 7.2)
5-day Biochemical Oxygen Demand (mg/L)		0.5 (0.4 - 0.7)	0.8 (0.3 - 1.5)	1.0 (0.8 - 1.4)	0.7 (0.5 - 1.1)	0.9 (0.5 - 1.5)	1.2 (0.9 - 1.6)
Ammonia Nitrogen (mg/L)		0.098 (0.061 - 0.167)	0.070 (0.037 - 0.170)	0.041 (0.024 - 0.071)	0.028 (0.014 - 0.043)	0.038 (0.024 - 0.085)	0.049 (0.023 - 0.109)
Unionised Ammonia (mg/L)		0.005 (0.002 - 0.012)	0.004 (<0.001 - 0.008)	0.004 (<0.001 - 0.017)	0.002 (<0.001 - 0.009)	0.004 (<0.001 - 0.013)	0.006 (<0.001 - 0.017)
Nitrite Nitrogen (mg/L)		0.022 (0.010 - 0.048)	0.016 (0.010 - 0.034)	0.004 (<0.002 - 0.006)	0.003 (<0.002 - 0.007)	0.005 (<0.002 - 0.009)	0.004 (<0.002 - 0.012)
Nitrate Nitrogen (mg/L)		0.135 (0.056 - 0.327)	0.106 (0.046 - 0.213)	0.077 (<0.002 - 0.180)	0.053 (<0.002 - 0.140)	0.084 (<0.002 - 0.200)	0.013 (<0.002 - 0.024)
Total Inorganic Nitrogen (mg/L)		0.25 (0.19 - 0.44)	0.19 (0.12 - 0.28)	0.12 (0.03 - 0.22)	0.08 (0.02 - 0.17)	0.13 (0.04 - 0.24)	0.07 (0.03 - 0.11)
Total Kjeldahl Nitrogen (mg/L)		0.50 (0.11 - 1.23)	0.51 (0.06 - 1.40)	0.56 (0.19 - 1.45)	0.46 (0.16 - 1.23)	0.48 (0.12 - 1.50)	0.36 (0.17 - 0.58)
Total Nitrogen (mg/L)		0.65 (0.48 - 1.35)	0.63 (0.31 - 1.47)	0.64 (0.27 - 1.46)	0.52 (0.24 - 1.24)	0.57 (0.12 - 1.52)	0.38 (0.20 - 0.58)
Orthophosphate Phosphorus (mg/L)		0.019 (0.007 - 0.034)	0.014 (<0.002 - 0.028)	0.009 (<0.002 - 0.015)	0.009 (<0.002 - 0.017)	0.010 (<0.002 - 0.018)	0.006 (<0.002 - 0.017)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.05)	0.03 (0.02 - 0.04)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.03 (<0.02 - 0.05)
Silica (as SiO_2) (mg/L)		1.02 (0.47 - 2.43)	0.79 (0.25 - 1.93)	0.71 (0.25 - 1.30)	0.69 (0.22 - 1.30)	0.83 (0.25 - 1.30)	0.69 (0.46 - 1.32)
Chlorophyll-*a* (µg/L)		1.9 (0.2 - 6.8)	4.3 (0.6 - 13.2)	3.8 (1.9 - 7.9)	1.5 (0.8 - 2.9)	2.3 (0.7 - 5.1)	5.1 (2.7 - 9.3)
E.coli (cfu/100mL)		990 (220 - 4800)	140 (18 - 640)	22 (3 - 110)	2 (<1 - 24)	54 (6 - 4700)	18 (13 - 26)
Faecal Coliforms (cfu/100mL)		2200 (470 - 12000)	540 (140 - 1800)	75 (20 - 460)	5 (<1 - 140)	290 (26 - 17000)	46 (30 - 75)

Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

2. Data presented are annual arithmetic means of the depth-averaged results except for *E. coli* and faecal coliforms which are annual geometric means.

3. Data in brackets indicate the ranges.

4. NA (Not Applicable) indicates the measurement was not made due to shallow water.

Summary statistics of marine sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2015- 2019

Parameter	Tuen Mun NS5	Cheung Chau SS7	Hei Ling Chau SS8	Rambler Channel VS17	Government Dockyard VS21	New Yau Ma Tei VS19	Causeway Bay VS12
Number of samples	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Particle Size Fractionation <63µm (% w/w)	79 (37 - 95)	85 (27 - 99)	97 (90 - 99)	66 (23 - 87)	87 (3 - 99)	80 (43 - 97)	71 (26 - 99)
Electrochemical Potential (mV)	-202 (-386 - -122)	-270 (-368 - -118)	-251 (-355 - -160)	-297 (-395 - -208)	-338 (-402 - -230)	-356 (-412 - -156)	-328 (-405 - -214)
Total Solids (% w/w)	46 (35 - 55)	39 (30 - 48)	34 (31 - 37)	45 (36 - 70)	35 (28 - 46)	46 (37 - 61)	48 (35 - 64)
Total Volatile Soilds (% TS)	7.3 (6.3 - 9.0)	7.7 (6.6 - 8.9)	8.0 (7.2 - 8.7)	8.1 (4.1 - 12.0)	8.2 (6.4 - 9.9)	7.7 (5.8 - 9.1)	7.6 (5.0 - 10.0)
Chemical Oxygen Demand (mg/kg)	15100 (13000 - 20000)	15200 (12000 - 18000)	12580 (9800 - 17000)	20200 (15000 - 26000)	16900 (14000 - 20000)	18700 (14000 - 23000)	19260 (9600 - 33000)
Total Carbon (% w/w)	0.7 (0.5 - 1.2)	0.6 (0.5 - 0.9)	0.5 (0.4 - 0.6)	1.1 (0.7 - 1.9)	0.5 (0.5 - 0.7)	0.8 (0.6 - 1.1)	1.0 (0.4 - 2.0)
Ammonical Nitrogen (mg/kg)	7.61 (0.13 - 14.00)	11.26 (<0.05 - 27.00)	7.46 (<0.05 - 17.00)	5.17 (0.23 - 9.10)	12.23 (3.60 - 41.00)	20.67 (6.10 - 35.00)	12.07 (0.92 - 65.00)
Total Kjeldahl Nitrogen (mg/kg)	480 (330 - 750)	520 (410 - 660)	520 (410 - 560)	570 (200 - 1000)	450 (370 - 610)	550 (420 - 670)	480 (300 - 670)
Total Phosphorus (mg/kg)	220 (190 - 270)	240 (180 - 340)	170 (160 - 200)	200 (120 - 240)	180 (160 - 260)	250 (180 - 360)	190 (120 - 240)
Total Sulphide (mg/kg)	51.6 (6.7 - 130.0)	101.4 (0.9 - 360.0)	43.0 (0.5 - 80.0)	149.2 (23.0 - 280.0)	81.2 (6.7 - 240.0)	130.7 (20.0 - 340.0)	147.8 (11.0 - 360.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (0.1 - 0.3)	0.1 (<0.1 - 0.1)	0.1 (0.1 - 0.2)	0.2 (0.1 - 0.2)
Arsenic (mg/kg)	9.9 (7.8 - 14.0)	9.6 (7.0 - 14.0)	8.3 (6.2 - 11.0)	10.7 (6.4 - 15.0)	9.4 (4.3 - 12.0)	7.4 (4.9 - 11.0)	8.9 (4.6 - 16.0)
Cadmium (mg/kg)	0.2 (<0.1 - 0.6)	0.1 (0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.6 (0.2 - 0.9)	0.4 (0.3 - 0.6)	0.5 (0.2 - 0.7)	0.4 (0.2 - 0.9)
Chromium (mg/kg)	35 (26 - 43)	48 (40 - 60)	37 (32 - 43)	98 (28 - 130)	46 (36 - 62)	34 (23 - 45)	39 (18 - 59)
Copper (mg/kg)	42 (26 - 64)	100 (72 - 130)	34 (27 - 43)	170 (33 - 220)	160 (100 - 220)	88 (37 - 120)	120 (40 - 210)
Lead (mg/kg)	49 (31 - 68)	68 (44 - 230)	45 (38 - 51)	83 (59 - 120)	52 (44 - 63)	50 (35 - 120)	70 (42 - 120)
Mercury (mg/kg)	0.09 (0.05 - 0.12)	0.19 (0.14 - 0.30)	0.13 (0.10 - 0.23)	0.25 (0.07 - 0.62)	0.24 (0.16 - 0.59)	0.29 (0.16 - 0.77)	0.53 (0.12 - 0.94)
Nickel (mg/kg)	19 (14 - 24)	22 (15 - 30)	24 (20 - 29)	32 (12 - 43)	23 (19 - 27)	19 (13 - 26)	19 (8 - 28)
Silver (mg/kg)	1.5 (0.3 - 9.7)	0.3 (<0.2 - 0.4)	0.3 (0.2 - 0.4)	2.2 (0.4 - 3.3)	1.3 (1.0 - 1.9)	1.2 (0.5 - 1.8)	1.7 (0.7 - 4.1)
Zinc (mg/kg)	160 (98 - 260)	180 (150 - 230)	140 (110 - 220)	280 (110 - 380)	250 (130 - 340)	240 (100 - 330)	240 (99 - 510)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) (3)	18 (18 - 18)	18 (18 - 19)	18 (18 - 18)	28 (18 - 40)	21 (18 - 29)	18 (18 - 19)	63 (18 - 400)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) (4) (6)	180 (90 - 340)	110 (90 - 230)	120 (90 - 360)	140 (96 - 190)	120 (95 - 250)	140 (90 - 390)	140 (94 - 270)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) (5) (6)	110 (35 - 200)	210 (86 - 650)	220 (40 - 1500)	820 (260 - 2100)	260 (110 - 360)	360 (37 - 1500)	670 (140 - 2100)

Note:
1. Data presented are arithmetic means ; data in brackets indicate ranges.
2. All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.
3. Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.
4. Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.
5. High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.
6. Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

Summary statistics of marine sediment quality of typhoon shelters, sheltered anchorages and Government Dockyard, 2015- 2019 (continued)

Parameter	To Kwa Wan VS20	Kwun Tong VS14	Sam Ka Tsuen VS13	Shau Kei Wan ES5	Chai Wan Cargo Handling Basin ES3	Hebe Haven PS4	Yim Tin Tsai PS2	Shuen Wan TS7
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (% w/w)	81 (30 - 98)	85 (52 - 98)	80 (25 - 96)	97 (87 - 100)	88 (81 - 93)	92 (78 - 97)	80 (33 - 92)	80 (71 - 91)
Electrochemical Potential (mV)	-354 (-402 - -295)	-290 (-405 - -132)	-279 (-457 - -141)	-360 (-411 - -291)	-301 (-372 - -223)	-271 (-358 - -164)	-282 (-392 - -186)	-334 (-451 - -239)
Total Solids (% w/w)	45 (35 - 72)	33 (27 - 41)	40 (29 - 55)	28 (26 - 31)	41 (36 - 50)	45 (38 - 52)	49 (37 - 72)	37 (29 - 50)
Total Volatile Soilds (% TS)	9.2 (2.9 - 20.0)	10.6 (8.5 - 12.0)	9.8 (7.4 - 11.0)	10.1 (8.8 - 11.0)	8.6 (8.0 - 9.0)	10.0 (9.5 - 11.0)	10.1 (5.8 - 12.0)	9.5 (6.8 - 12.0)
Chemical Oxygen Demand (mg/kg)	22200 (16000 - 26000)	20400 (18000 - 24000)	22100 (18000 - 27000)	16000 (12000 - 21000)	22600 (18000 - 30000)	21600 (13000 - 25000)	16740 (9400 - 22000)	24100 (19000 - 29000)
Total Carbon (% w/w)	1.1 (0.5 - 3.7)	0.9 (0.7 - 1.1)	1.0 (0.7 - 1.3)	0.6 (0.5 - 0.7)	0.9 (0.8 - 1.0)	1.2 (1.0 - 1.3)	2.1 (0.9 - 6.0)	0.8 (0.7 - 1.0)
Ammonical Nitrogen (mg/kg)	12.35 (1.90 - 24.00)	19.48 (5.80 - 34.00)	16.87 (0.42 - 74.00)	31.50 (23.00 - 41.00)	4.20 (0.19 - 10.00)	5.75 (2.90 - 10.00)	9.99 (4.10 - 23.00)	6.13 (0.46 - 13.00)
Total Kjeldahl Nitrogen (mg/kg)	520 (310 - 640)	690 (540 - 930)	660 (540 - 780)	540 (410 - 720)	540 (400 - 680)	790 (610 - 1000)	750 (310 - 1300)	700 (430 - 1100)
Total Phosphorus (mg/kg)	220 (140 - 310)	240 (190 - 320)	300 (190 - 360)	180 (140 - 310)	230 (190 - 290)	210 (180 - 240)	200 (79 - 240)	210 (160 - 240)
Total Sulphide (mg/kg)	120.0 (28.0 - 270.0)	89.8 (<0.2 - 350.0)	254.0 (120.0 - 380.0)	412.0 (200.0 - 620.0)	167.6 (56.0 - 350.0)	56.2 (4.9 - 140.0)	35.1 (7.9 - 81.0)	86.6 (18.0 - 150.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.3)	0.2 (0.1 - 0.4)	0.2 (0.1 - 0.3)	0.1 (0.1 - 0.2)	0.2 (0.1 - 0.2)	0.1 (0.1 - 0.2)	0.1 (0.1 - 0.2)	0.2 (0.1 - 0.4)
Arsenic (mg/kg)	9.0 (5.8 - 11.0)	9.0 (6.2 - 13.0)	9.5 (6.7 - 13.0)	8.6 (7.0 - 11.0)	10.2 (7.5 - 11.0)	9.3 (7.7 - 13.0)	5.7 (3.8 - 7.6)	10.9 (6.4 - 15.0)
Cadmium (mg/kg)	0.8 (0.3 - 1.5)	1.7 (0.9 - 3.2)	0.8 (0.3 - 1.0)	0.4 (0.3 - 0.5)	0.5 (0.4 - 0.8)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.4 (0.2 - 0.7)
Chromium (mg/kg)	79 (37 - 110)	180 (58 - 310)	70 (39 - 140)	50 (46 - 59)	84 (58 - 170)	24 (19 - 28)	18 (13 - 22)	23 (15 - 33)
Copper (mg/kg)	470 (150 - 980)	1200 (220 - 3500)	250 (80 - 1000)	160 (110 - 300)	250 (140 - 550)	51 (35 - 71)	16 (11 - 18)	85 (15 - 150)
Lead (mg/kg)	98 (47 - 160)	120 (84 - 160)	90 (62 - 110)	64 (57 - 80)	83 (63 - 100)	42 (36 - 45)	36 (29 - 41)	96 (44 - 110)
Mercury (mg/kg)	1.14 (0.31 - 2.70)	0.83 (0.43 - 1.30)	1.05 (0.46 - 1.60)	0.29 (0.23 - 0.45)	0.42 (0.34 - 0.52)	0.13 (0.11 - 0.19)	0.07 (<0.05 - 0.10)	0.11 (<0.05 - 0.16)
Nickel (mg/kg)	28 (15 - 46)	55 (18 - 160)	23 (16 - 40)	24 (21 - 26)	26 (17 - 49)	9 (7 - 10)	12 (6 - 21)	13 (7 - 23)
Silver (mg/kg)	3.5 (1.8 - 5.5)	6.7 (1.7 - 23.0)	2.0 (0.8 - 3.5)	2.6 (1.1 - 9.2)	10.6 (5.7 - 23.0)	0.3 (0.2 - 0.4)	0.2 (<0.2 - 0.3)	0.3 (<0.2 - 0.5)
Zinc (mg/kg)	260 (130 - 370)	410 (300 - 820)	340 (250 - 410)	280 (220 - 370)	360 (280 - 490)	180 (110 - 250)	100 (65 - 250)	290 (110 - 450)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) (3)	70 (18 - 150)	160 (44 - 300)	39 (25 - 58)	18 (18 - 19)	33 (23 - 53)	18 (18 - 19)	18 (18 - 18)	46 (18 - 290)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) (4) (6)	14000 (760 - 52000)	350 (110 - 1400)	220 (110 - 550)	200 (94 - 520)	220 (110 - 580)	150 (90 - 390)	120 (90 - 350)	140 (90 - 290)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) (5) (6)	160000 (5400 - 670000)	990 (450 - 1700)	760 (380 - 1200)	420 (260 - 710)	590 (350 - 950)	91 (53 - 140)	49 (21 - 95)	130 (38 - 210)

Note: 1 Data presented are arithmetic means ; data in brackets indicate ranges.

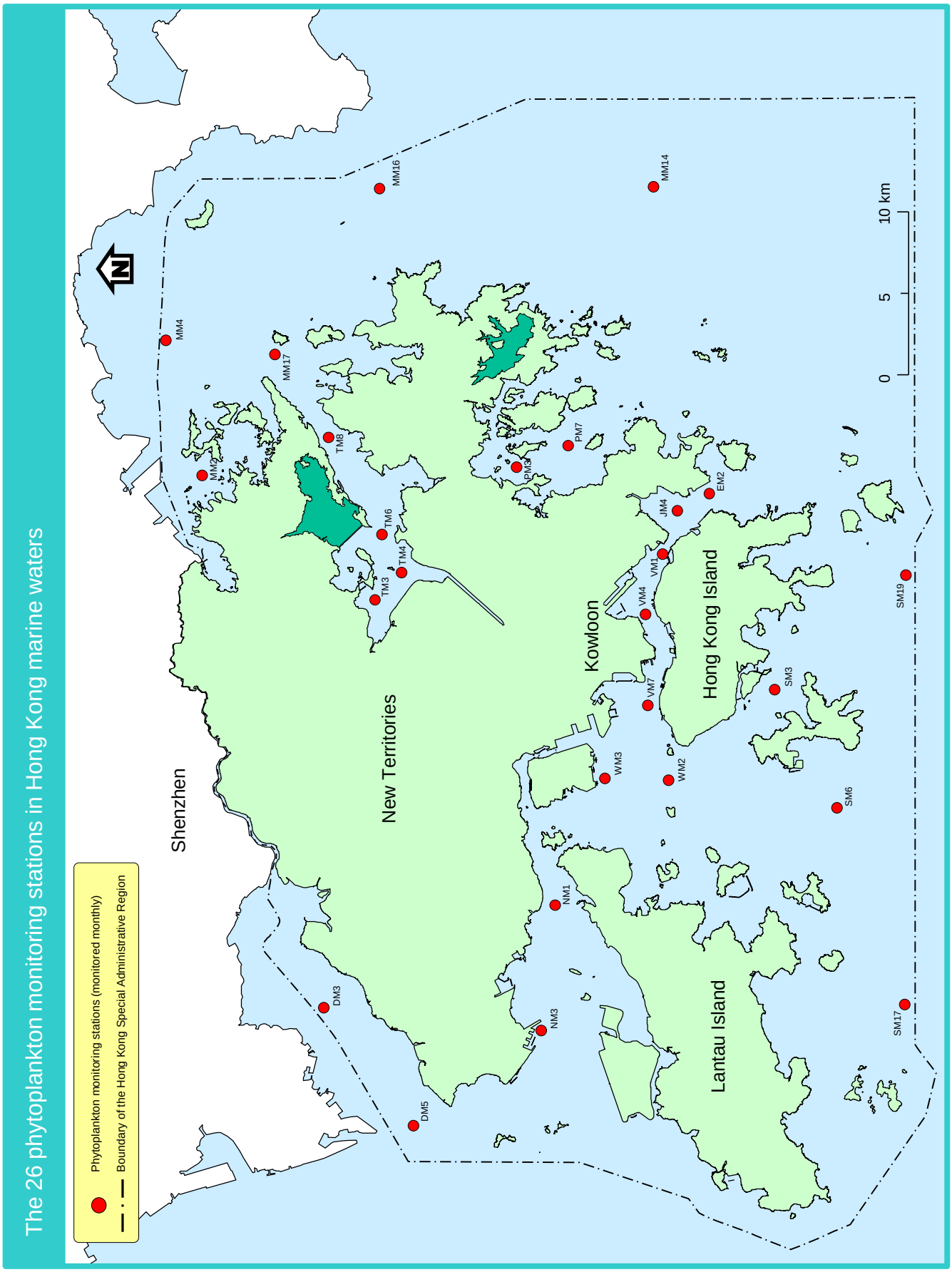
2 All data are based on the analyses of bulk (unsieved) sediment and are reported on a dry weight basis unless stated otherwise.

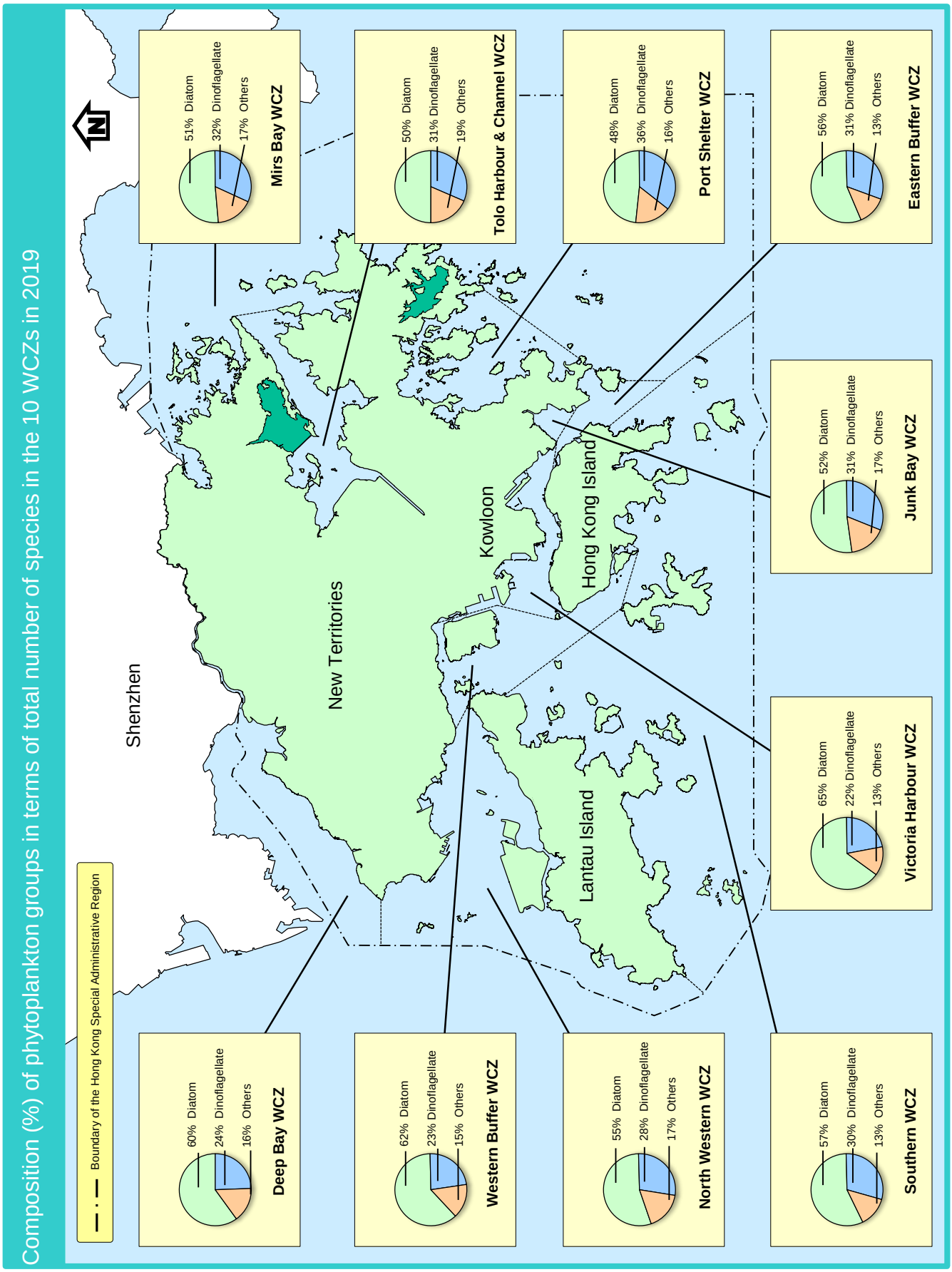
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

4 Low molecular weight polyaromatic hydrocarbons (PAHs) include 6 congeners of molecular weight below 200, namely : Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene and Phenanthrene.

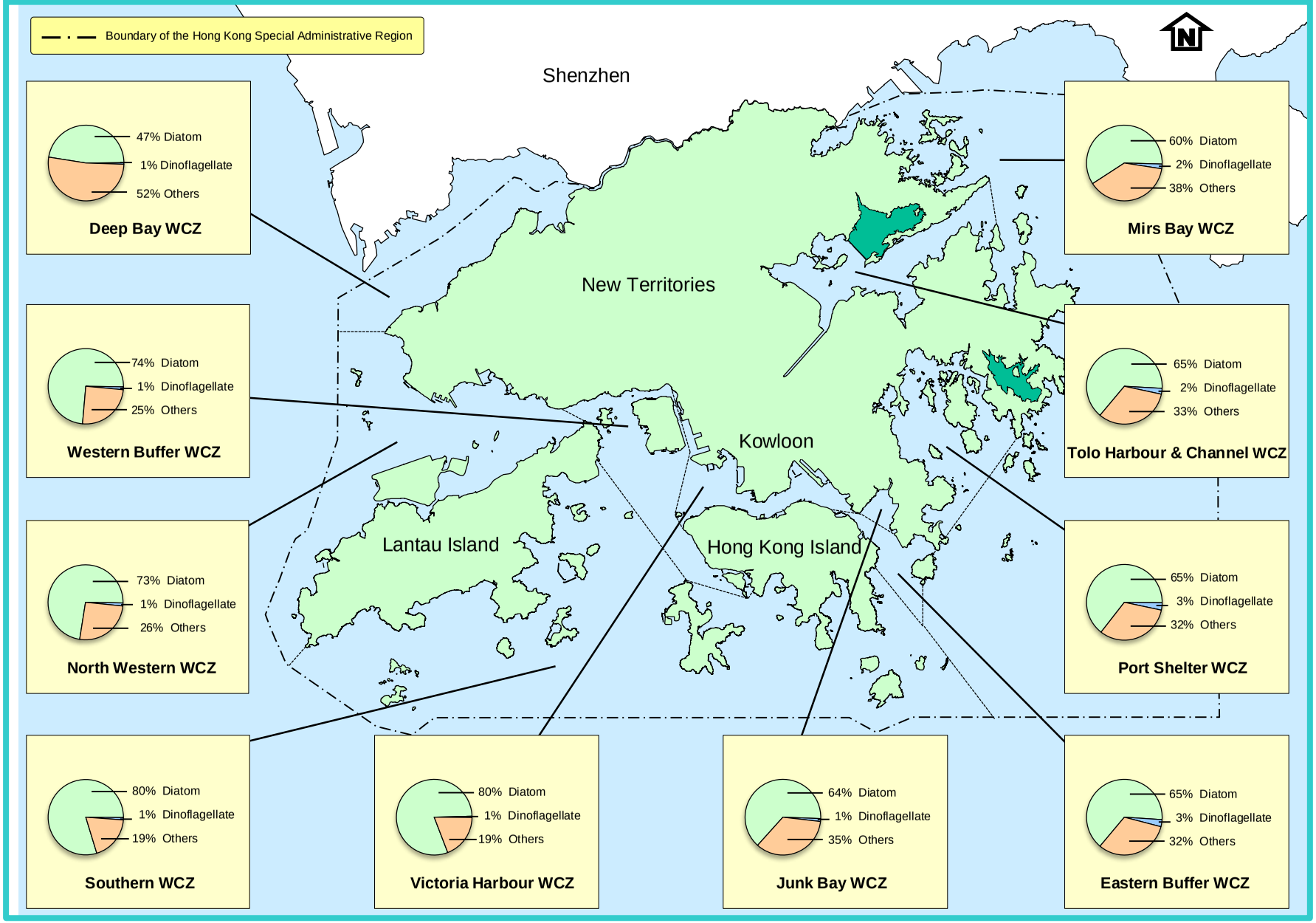
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

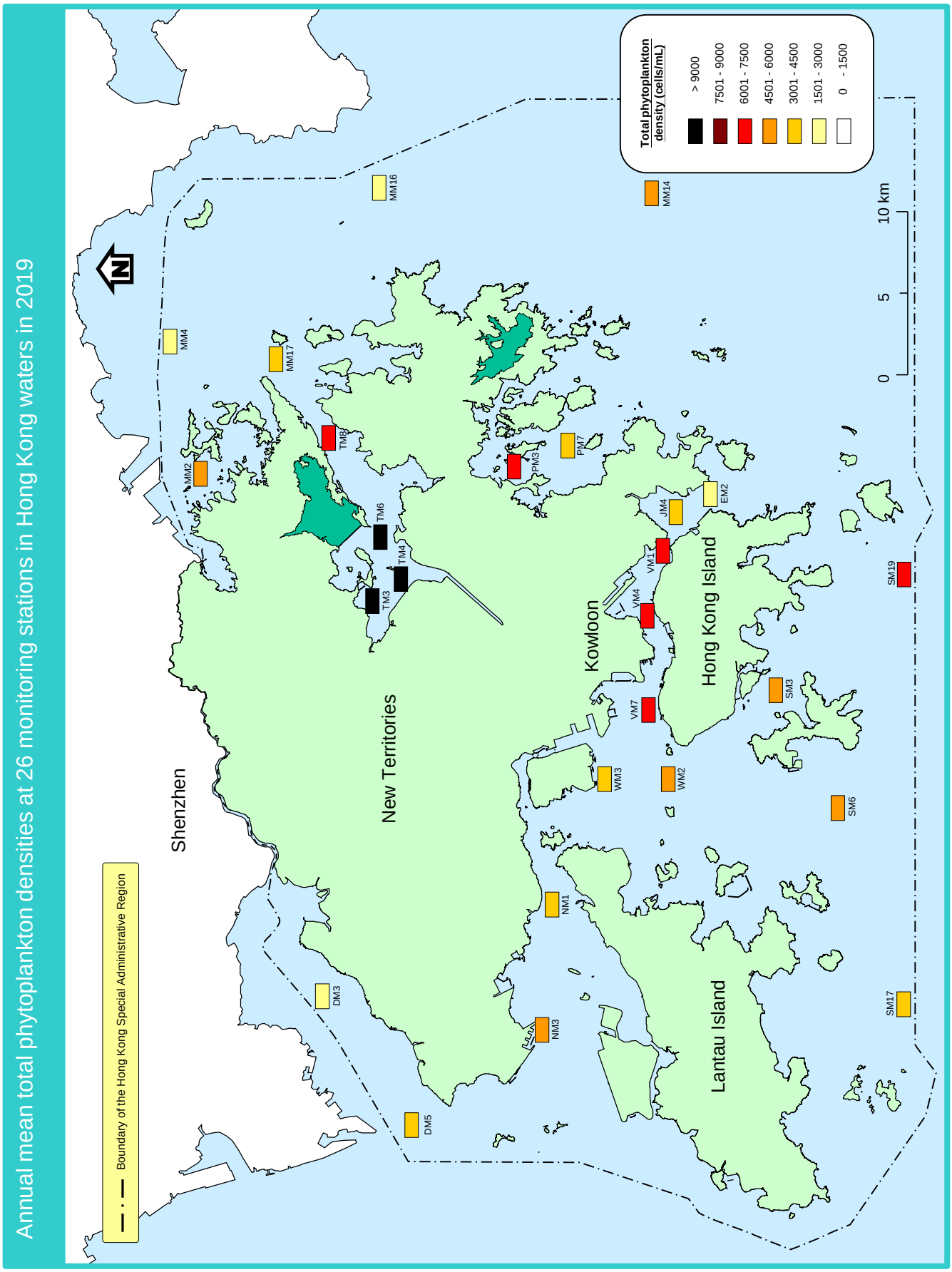
6 Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

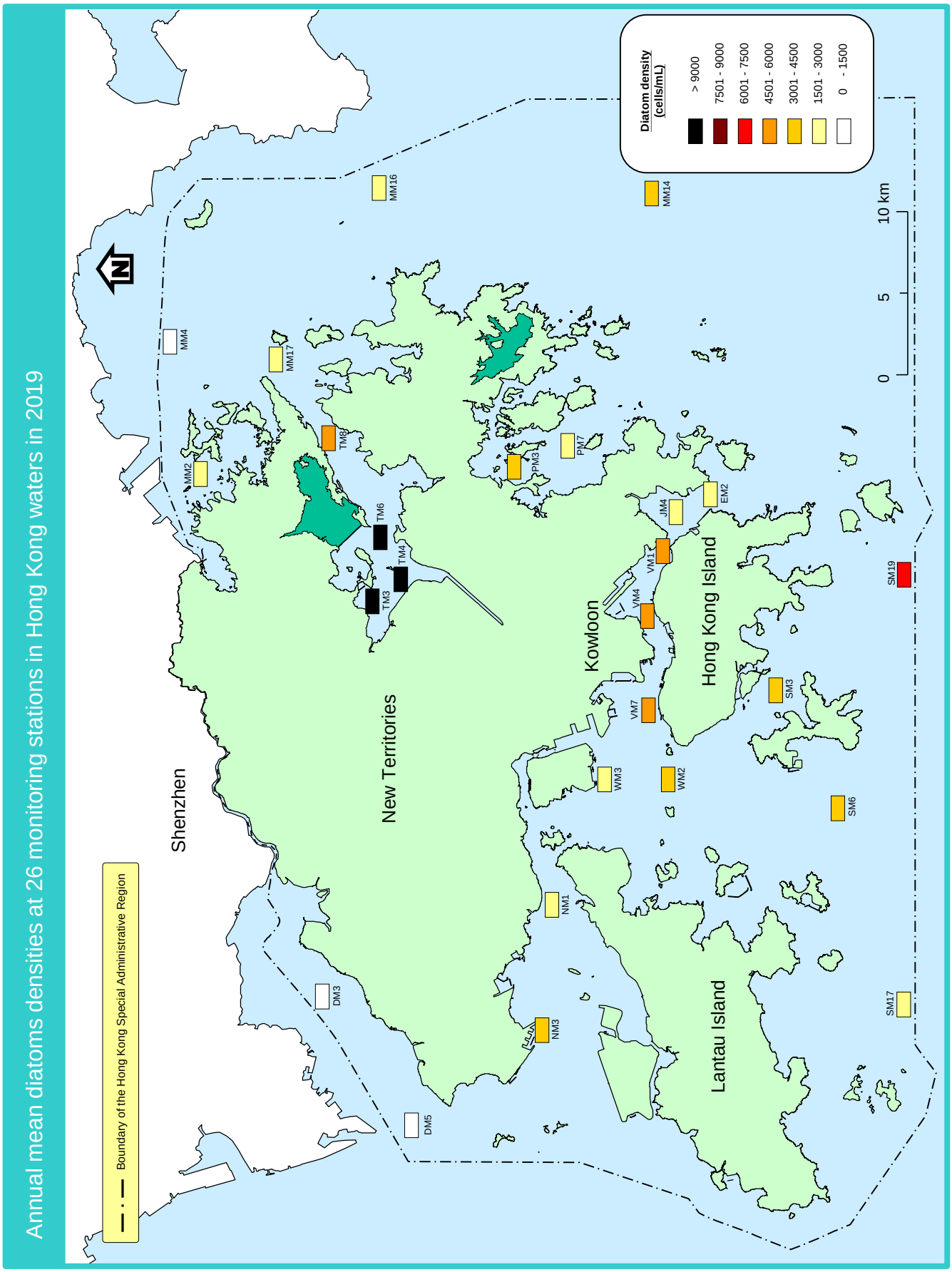

The 26 phytoplankton monitoring stations in Hong Kong marine waters
Phytoplankton monitoring stations (monitored monthly)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM4
MM17
MM2
TM8
TM6
TM4
TM3
MM16
MM14
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
WM3
WM2
SM6
NM1
NM3
DM3
DM5
SM17
0
5
10 km

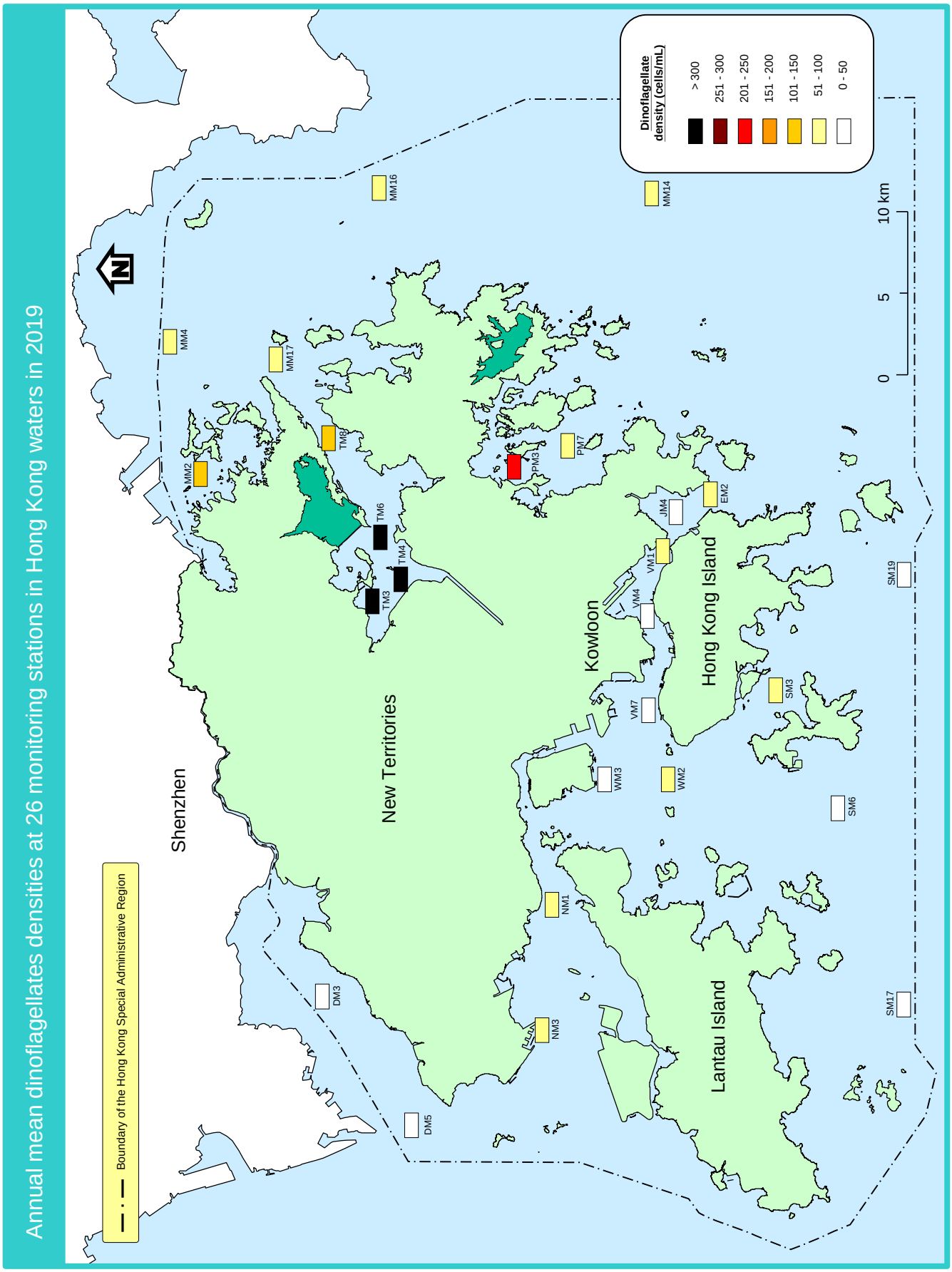

Composition (%) of phytoplankton groups in terms of total number of species in the 10 WCZs in 2019
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
Mirs Bay WCZ
51% Diatom
32% Dinoflagellate
17% Others
Tolo Harbour & Channel WCZ
50% Diatom
31% Dinoflagellate
19% Others
Port Shelter WCZ
48% Diatom
36% Dinoflagellate
16% Others
Eastern Buffer WCZ
56% Diatom
31% Dinoflagellate
13% Others
Junk Bay WCZ
52% Diatom
31% Dinoflagellate
17% Others
Victoria Harbour WCZ
65% Diatom
22% Dinoflagellate
13% Others
Southern WCZ
57% Diatom
30% Dinoflagellate
13% Others
North Western WCZ
55% Diatom
28% Dinoflagellate
17% Others
Western Buffer WCZ
62% Diatom
23% Dinoflagellate
15% Others
Deep Bay WCZ
60% Diatom
24% Dinoflagellate
16% Others

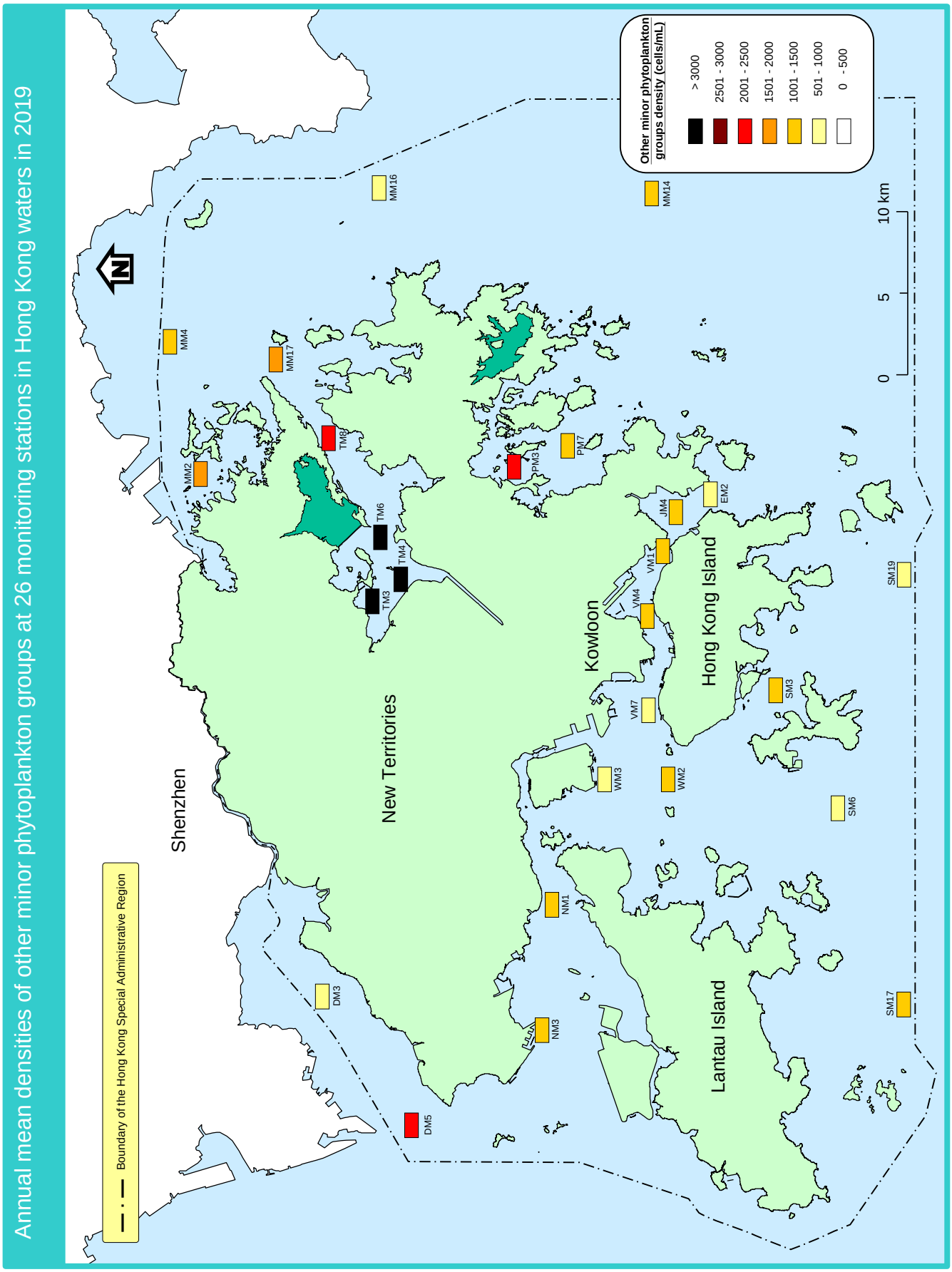
Composition (%) of phytoplankton groups in terms of total density in the 10 WCZs in 2019

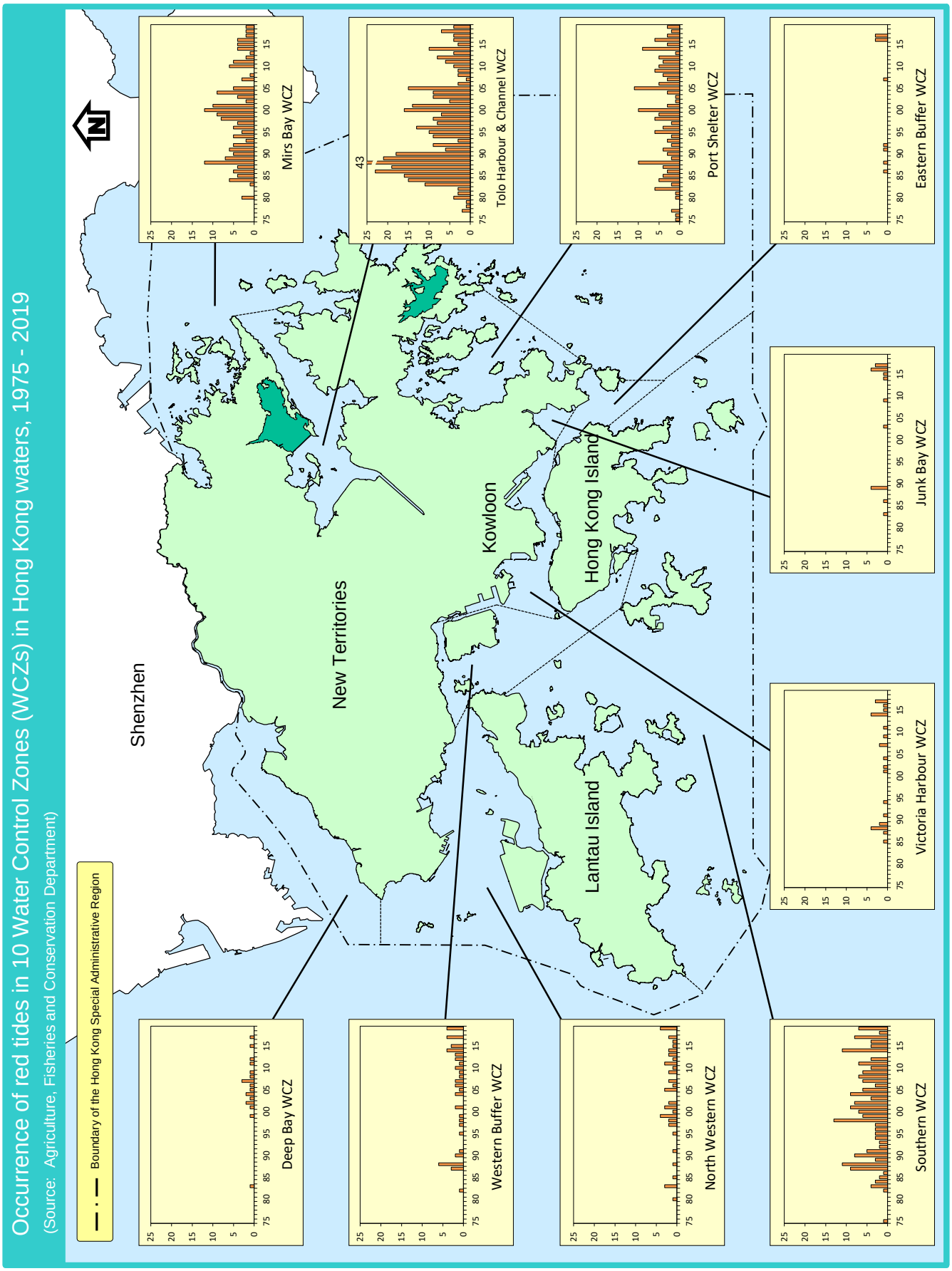



Annual mean total phytoplankton densities at 26 monitoring stations in Hong Kong waters in 2019
Boundary of the Hong Kong Special Administrative Region
Total phytoplankton density (cells/mL)
> 9000
7501 - 9000
6001 - 7500
4501 - 6000
3001 - 4500
1501 - 3000
0 - 1500
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM14
MM16
MM4
MM17
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
WM3
WM2
SM6
NM1
NM3
DM3
DM5
SM17


Annual mean diatoms densities at 26 monitoring stations in Hong Kong waters in 2019
Boundary of the Hong Kong Special Administrative Region
Diatom density (cells/mL)
> 9000
7501 - 9000
6001 - 7500
4501 - 6000
3001 - 4500
1501 - 3000
0 - 1500
0
5
10 km
N
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM14
MM16
MM4
MM17
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
WM3
WM2
SM6
NM1
NM3
DM3
DM5
SM17


Annual mean dinoflagellates densities at 26 monitoring stations in Hong Kong waters in 2019
Boundary of the Hong Kong Special Administrative Region
Dinoflagellate density (cells/mL)
> 300
251 - 300
201 - 250
151 - 200
101 - 150
51 - 100
0 - 50
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM14
MM16
MM17
MM4
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
WM3
WM2
SM3
SM6
SM19
SM17
NM1
NM3
DM3
DM5

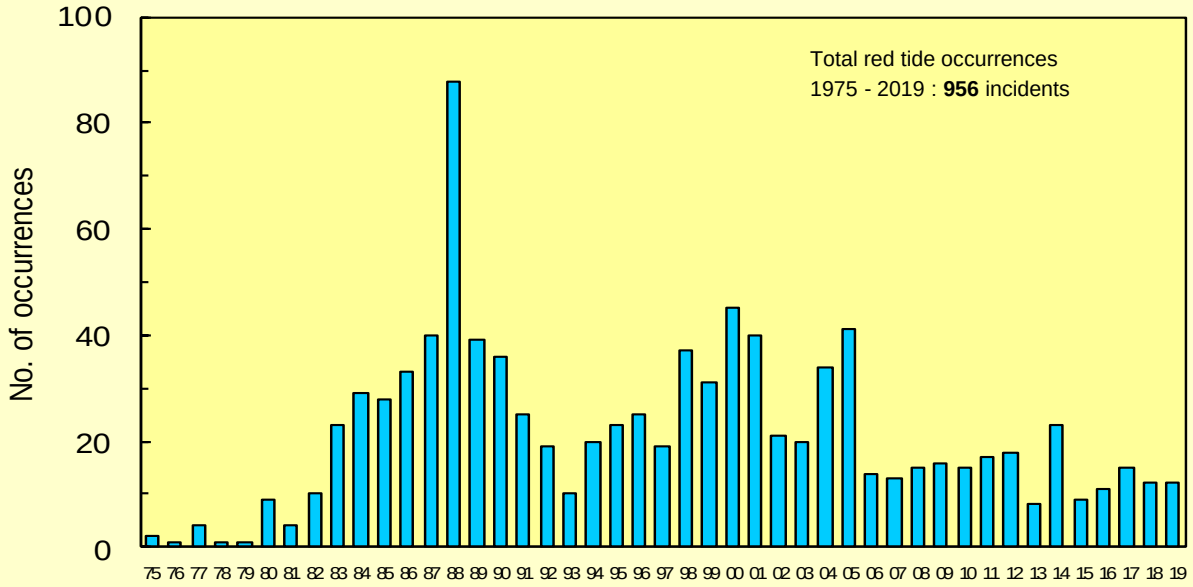

Annual mean densities of other minor phytoplankton groups at 26 monitoring stations in Hong Kong waters in 2019
Other minor phytoplankton groups density (cells/mL)
> 3000
2501 - 3000
2001 - 2500
1501 - 2000
1001 - 1500
501 - 1000
0 - 500
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
0
5
10 km
MM14
MM16
MM4
MM17
MM2
TM8
TM6
TM4
TM3
PM7
PM3
JM4
EM2
VM1
VM4
VM7
SM19
SM3
WM3
WM2
SM6
NM1
NM3
DM3
DM5
SM17


Occurrence of red tides in 10 Water Control Zones (WCZs) in Hong Kong waters, 1975 - 2019
(Source: Agriculture, Fisheries and Conservation Department)
Boundary of the Hong Kong Special Administrative Region
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
Mirs Bay WCZ
Tolo Harbour & Channel WCZ
Port Shelter WCZ
Eastern Buffer WCZ
Junk Bay WCZ
Victoria Harbour WCZ
Southern WCZ
North Western WCZ
Western Buffer WCZ
Deep Bay WCZ
43

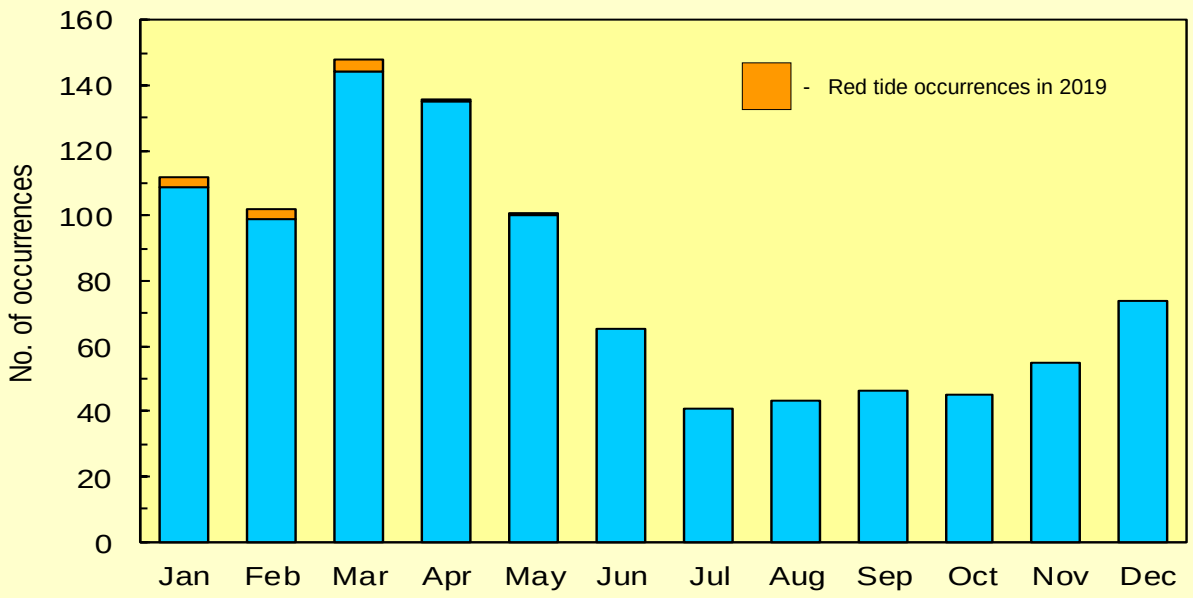
Occurrence of red tides in Hong Kong waters, 1975-2019

(Source: Agriculture, Fisheries and Conservation Department)

Yearly Distribution

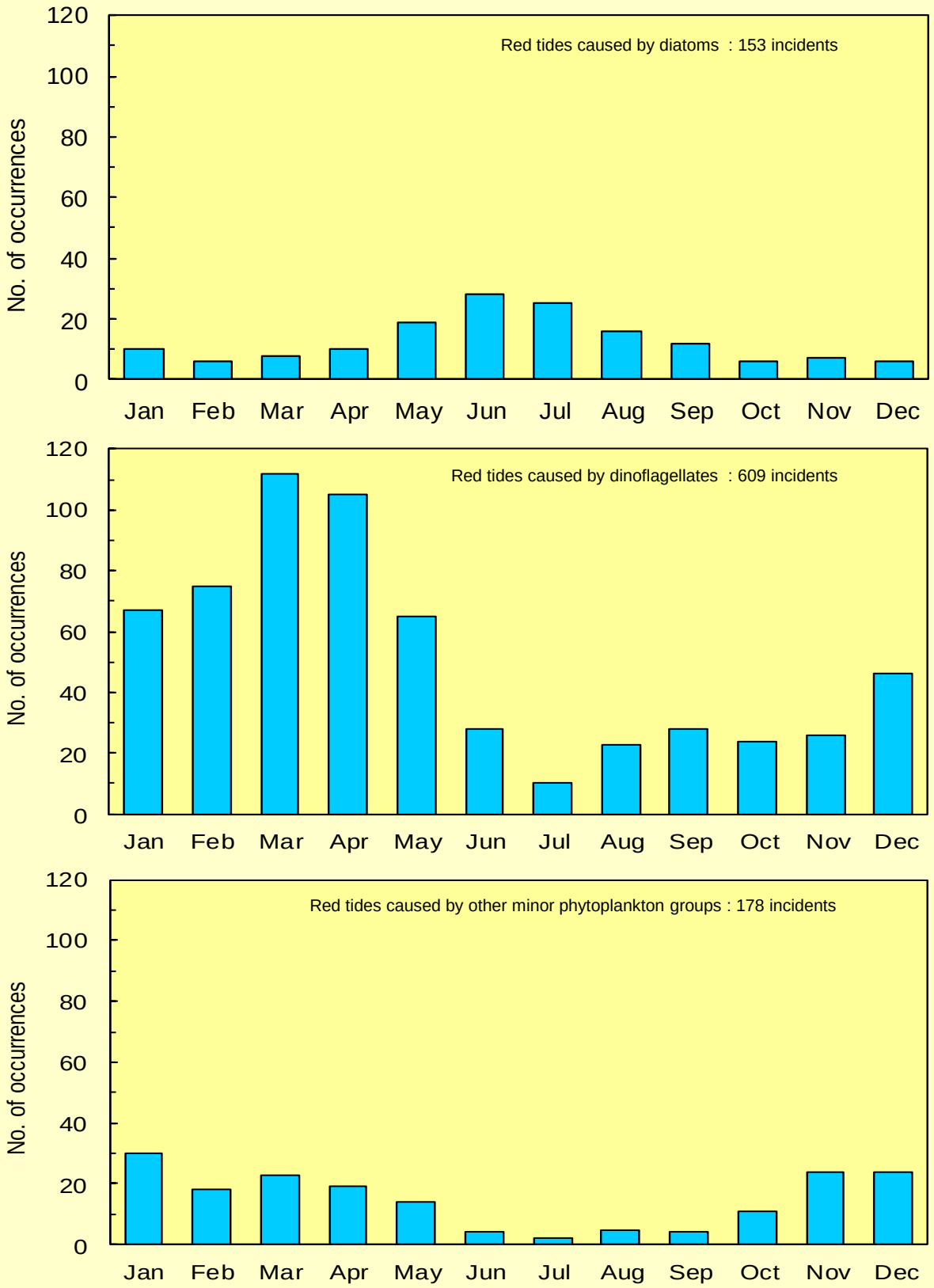


Seasonal Distribution



Seasonal distribution of red tides caused by different phytoplankton groups in Hong Kong, 1975-2019

(Source: Agriculture, Fisheries and Conservation Department)



Abundance and frequency of dominant phytoplankton species in different Water Control Zones (WCZs) in 2019

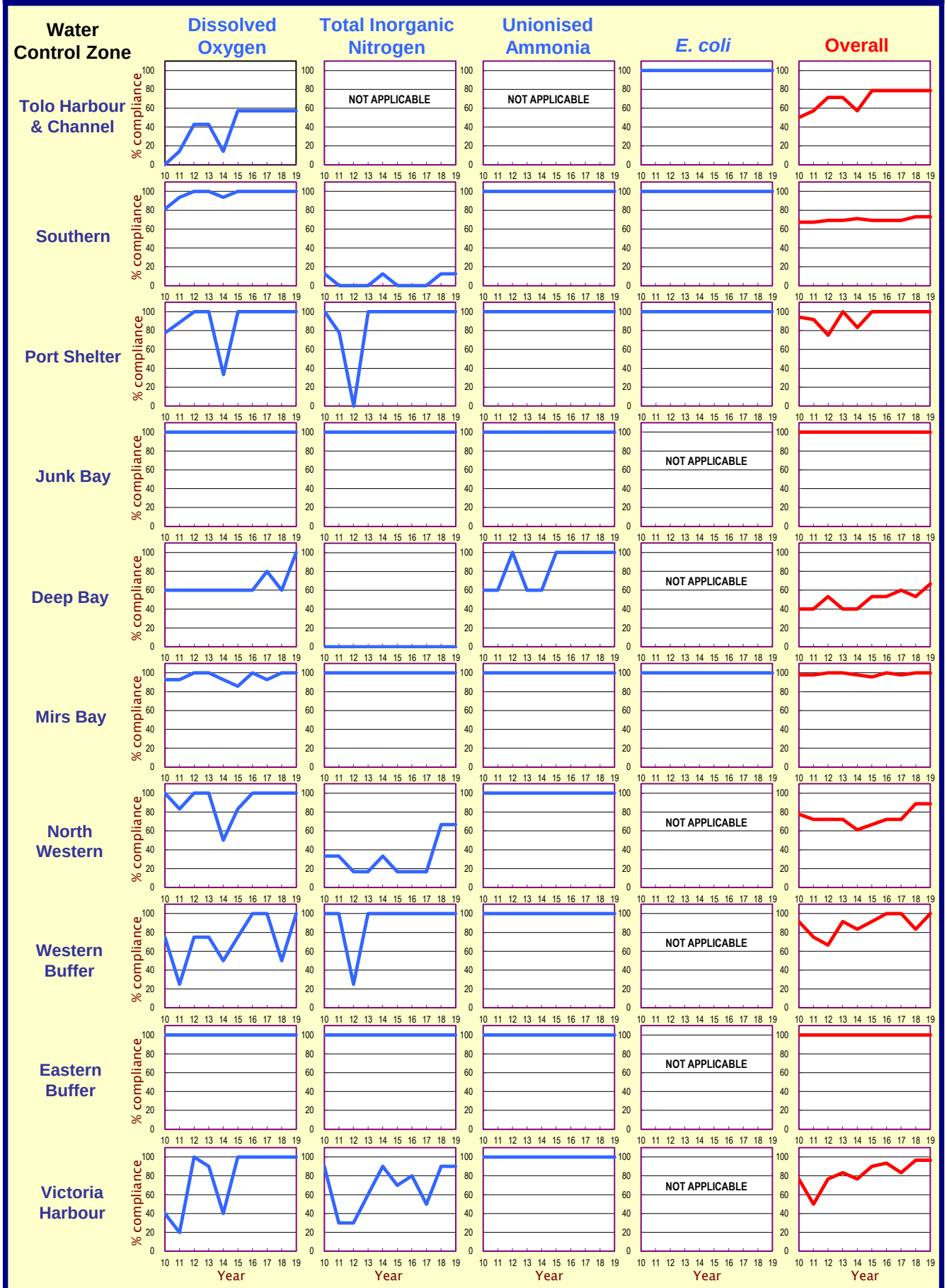
Species	% Abundance[1]	Frequency[2]	Species	% Abundance	Frequency
Deep Bay WCZ			**Mirs Bay WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	50.72	12	*Pseudo-nitzschia* spp.	45.47	12
Skeletonema costatum	23.46	12	*Dactyliosolen fragilissimus*	19.99	8
Chaetoceros spp.	5.39	8	*Cerataulina pelagica*	10.41	10
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	42.00	8	*Gymnodinium* spp.	31.42	12
Gyrodinium spp.	15.75	5	*Amphidinium* spp.	18.42	10
Amphidinium spp.	14.56	4	*Gonyaulax* spp.	12.48	4
Others[3]			Others		
small flagellates	82.30	12	small flagellates	81.37	12
Teleaulax acuta	12.58	12	*Plagioselmis prolonga*	8.92	12
Plagioselmis prolonga	4.21	12	*Teleaulax acuta*	5.14	11
Western Buffer WCZ			**Tolo Harbour & Channel WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	29.34	12	*Dactyliosolen fragilissimus*	28.12	7
Pseudo-nitzschia spp.	26.74	12	*Pseudo-nitzschia* spp.	26.33	12
Skeletonema costatum	20.88	8	*Cerataulina pelagica*	18.80	10
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	50.67	11	*Prorocentrum cordatum*	45.89	8
Amphidinium spp.	21.12	8	*Gymnodinium* spp.	23.05	12
Gyrodinium spp.	12.51	7	*Prorocentrum gracile*	6.84	4
Others			Others		
small flagellates	78.72	12	small flagellates	79.38	12
Teleaulax acuta	14.38	12	*Plagioselmis prolonga*	7.69	12
Plagioselmis prolonga	6.46	11	*Teleaulax acuta*	6.26	12
North Western WCZ			**Port Shelter WCZ**		
Diatoms			Diatoms		
Thalassiosira spp.	59.03	12	*Pseudo-nitzschia* spp.	40.41	12
Skeletonema costatum	22.19	11	*Ceratoneis closterium*	24.88	8
Pseudo-nitzschia spp.	4.83	10	*Thalassiosira* spp.	13.03	12
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	44.11	10	*Akashiwo sanguinea*	27.04	3
Amphidinium spp.	20.17	4	*Gymnodinium* spp.	24.95	9
Gyrodinium spp.	11.55	6	*Amphidinium* spp.	14.77	9
Others			Others		
small flagellates	79.61	12	small flagellates	82.91	12
Teleaulax acuta	12.50	12	*Plagioselmis prolonga*	8.49	12
Plagioselmis prolonga	6.32	11	*Teleaulax acuta*	6.70	10
Southern WCZ			**Eastern Buffer WCZ**		
Diatoms			Diatoms		
Pseudo-nitzschia spp.	27.76	12	*Thalassiosira* spp.	33.69	12
Thalassiosira spp.	22.03	12	*Skeletonema costatum*	29.05	7
Chaetoceros spp.	17.51	11	*Pseudo-nitzschia* spp.	18.11	11
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	36.18	12	*Gonyaulax* spp.	30.72	2
Protoperidinium spp.	13.00	6	*Gymnodinium* spp.	24.58	10
Gyrodinium spp.	10.81	7	*Gyrodinium* spp.	10.49	4
Others			Others		
small flagellates	85.08	12	small flagellates	73.65	12
Teleaulax acuta	7.68	12	*Plagioselmis prolonga*	13.34	11
Plagioselmis prolonga	6.28	12	*Teleaulax acuta*	12.48	10
Victoria Harbour WCZ			**Junk Bay WCZ**		
Diatoms			Diatoms		
Skeletonema costatum	42.98	12	*Thalassiosira* spp.	42.63	11
Pseudo-nitzschia spp.	20.81	11	*Skeletonema costatum*	17.92	7
Chaetoceros spp.	17.67	12	*Pseudo-nitzschia* spp.	14.16	10
Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	46.46	11	*Gymnodinium* spp.	25.21	8
Gyrodinium spp.	20.75	7	*Akashiwo sanguinea*	16.98	2
Amphidinium spp.	10.09	5	*Gonyaulax* spp.	14.58	1
Others			Others		
small flagellates	80.37	12	small flagellates	76.64	12
Teleaulax acuta	12.28	12	*Teleaulax acuta*	11.52	12
Plagioselmis prolonga	6.83	11	*Plagioselmis prolonga*	7.15	12

Note: 1 The % abundance of dominant species of diatoms, dinoflagellates and other minor phytoplankton groups in different WCZs.

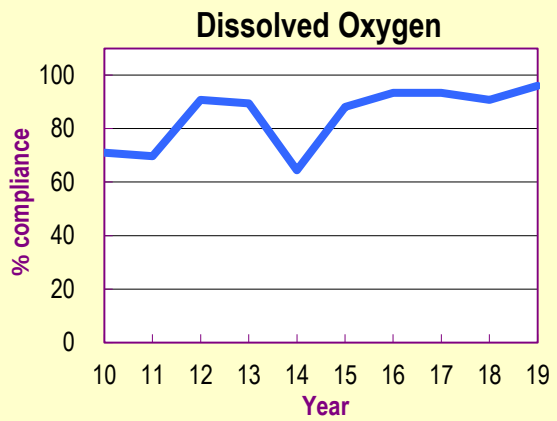
2 Number of occurrences out of 12 sampling occasions.

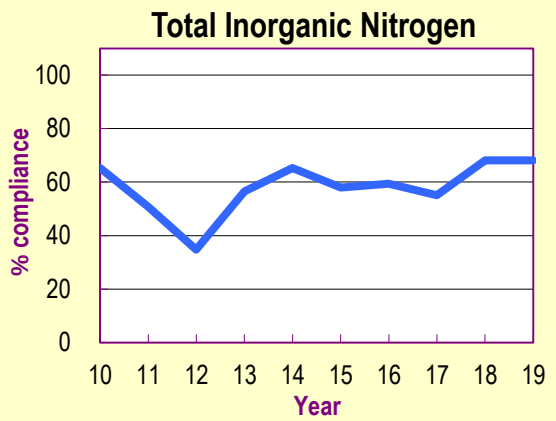
3 Other minor phytoplankton groups.

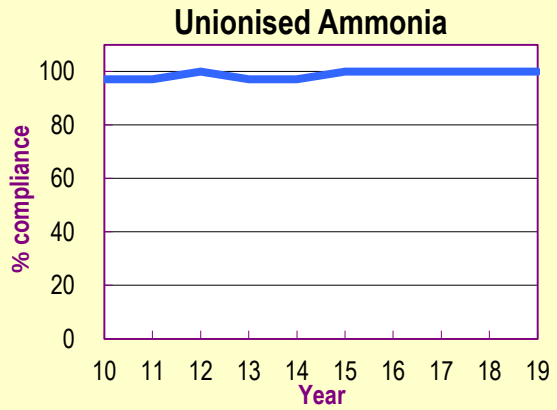
Marine WQO compliance rates for 10 Water Control Zones in Hong Kong, 2010 - 2019

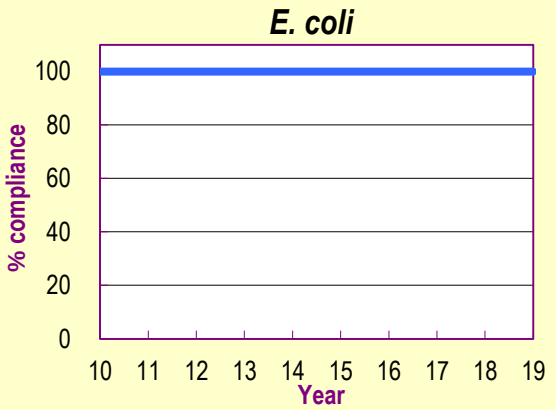


Compliance rates for key marine WQOs, 2010 - 2019

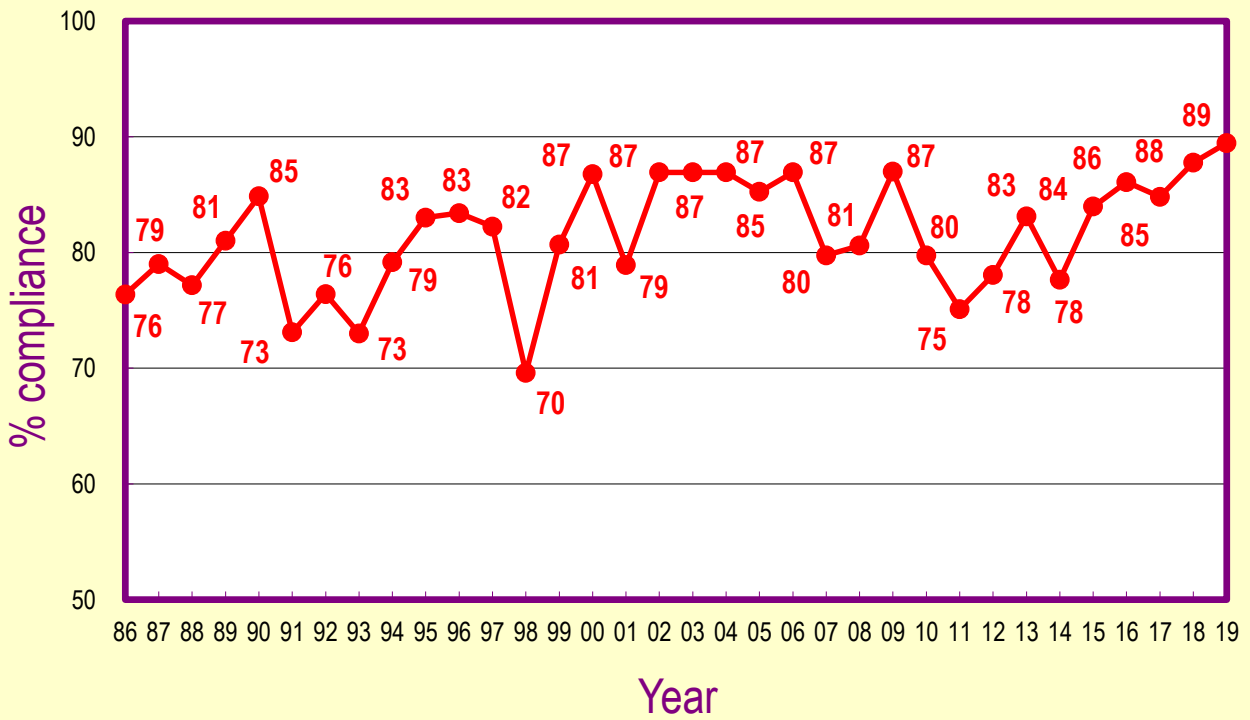




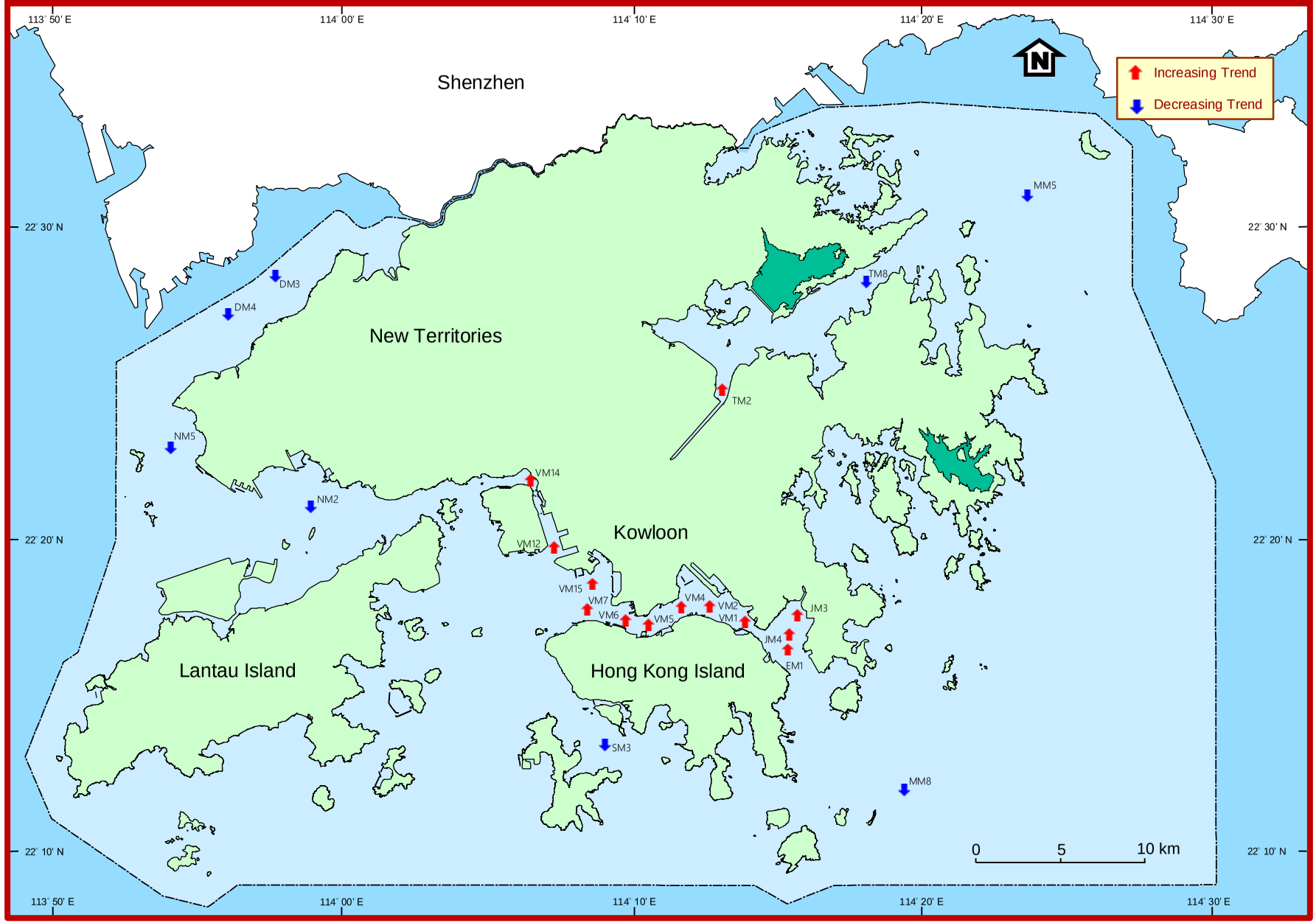


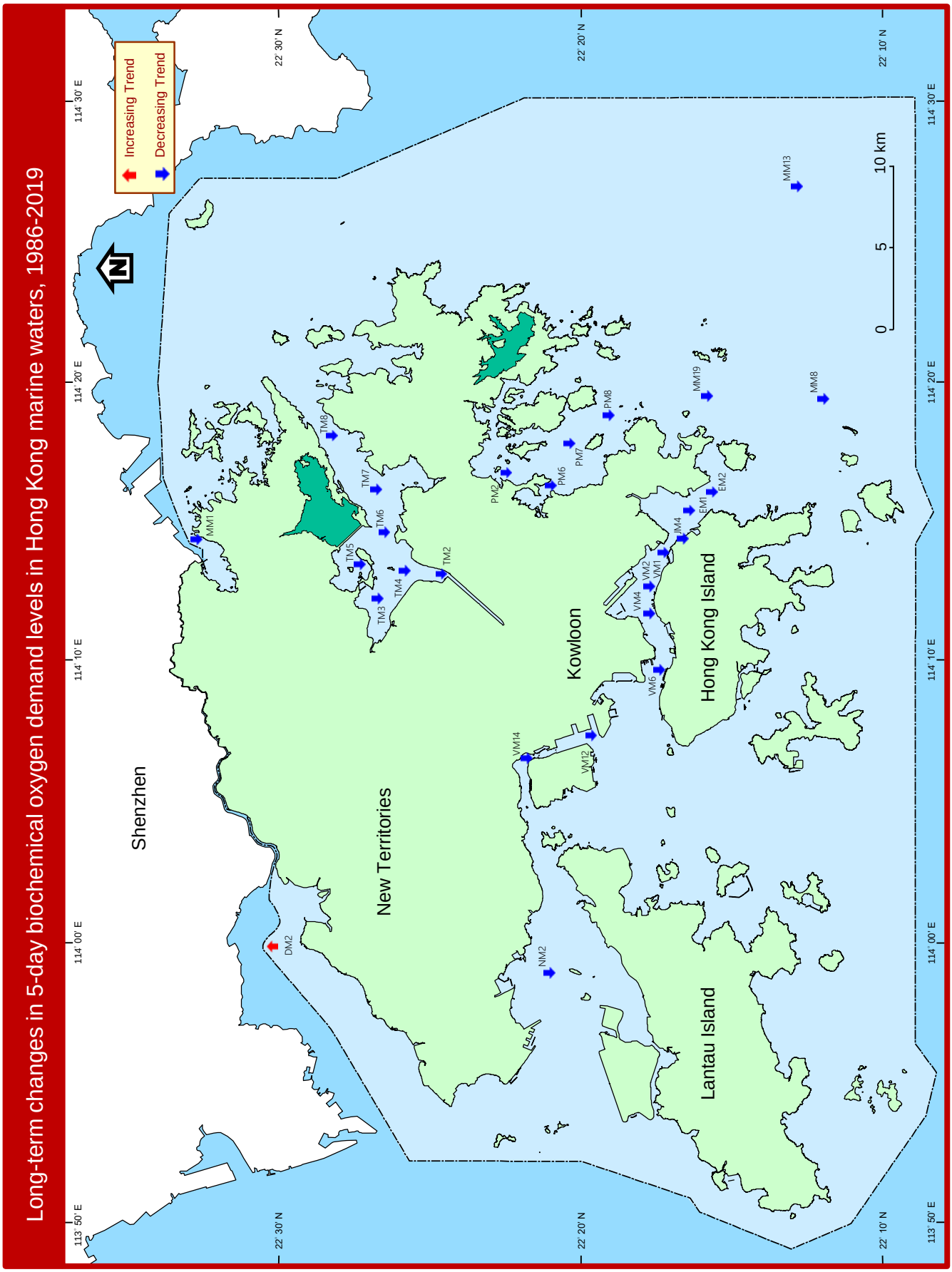


Overall compliance rates for key marine WQOs, 1986 - 2019

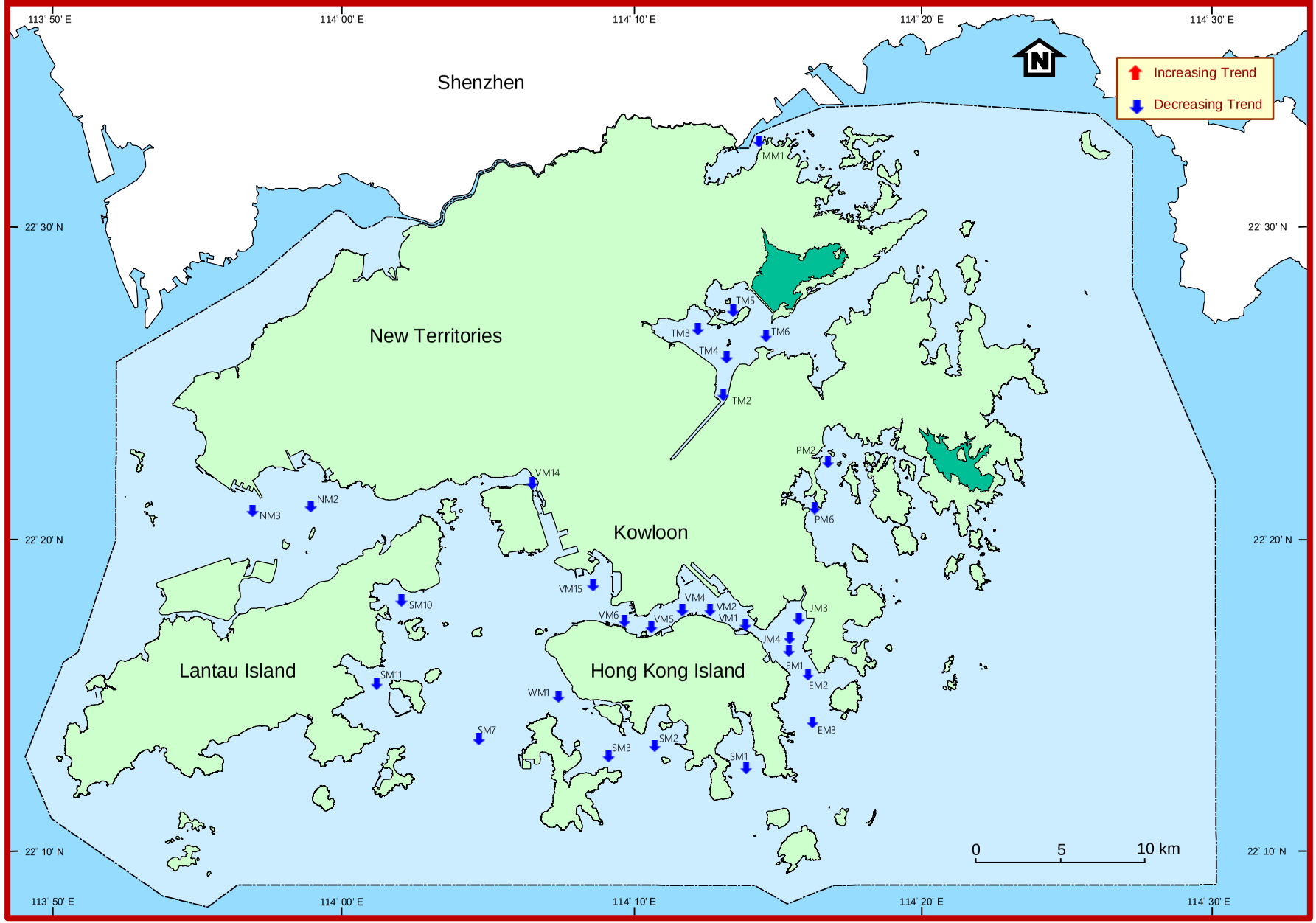


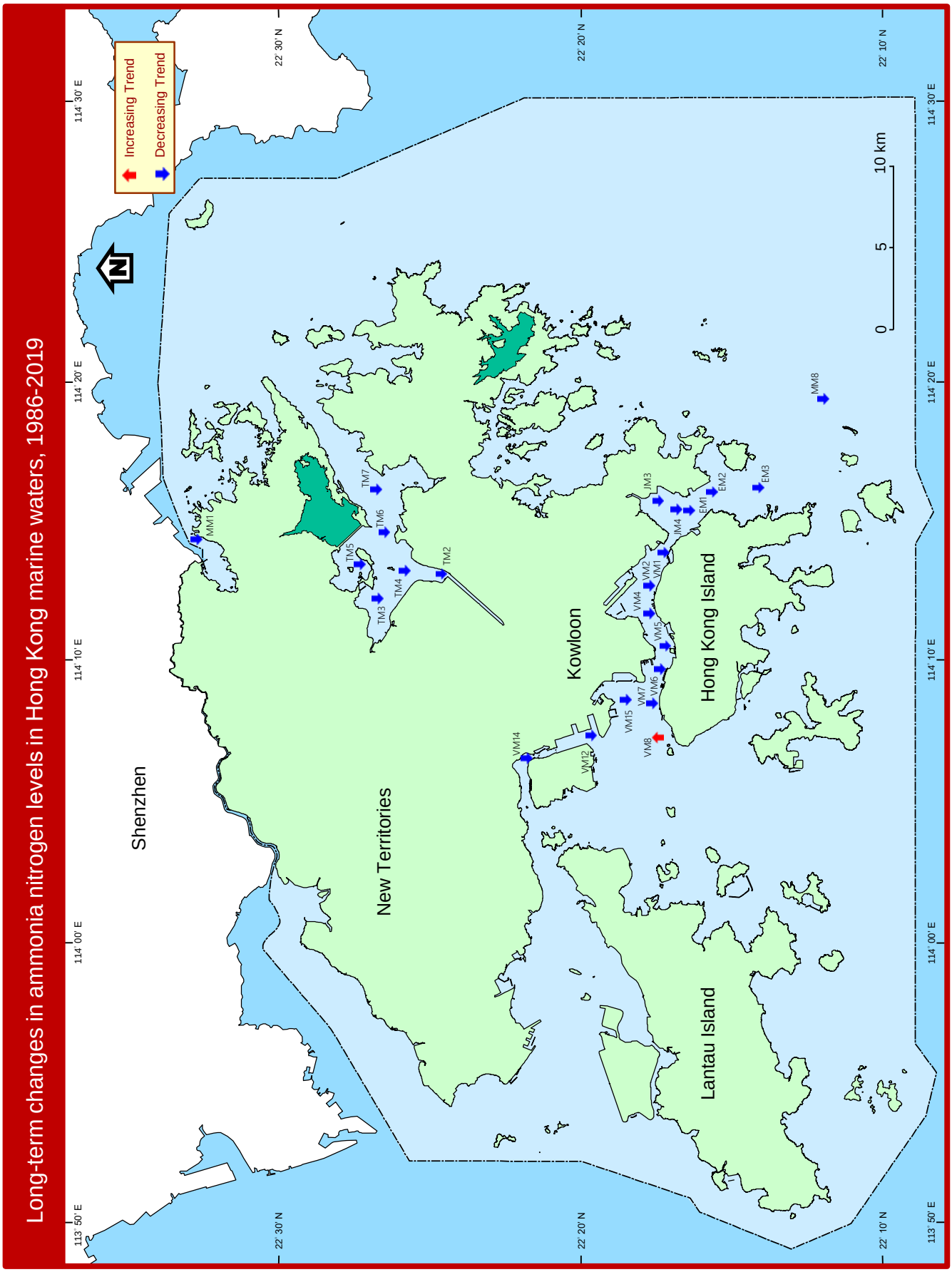
Long-term changes in dissolved oxygen levels in Hong Kong marine waters, 1986-2019

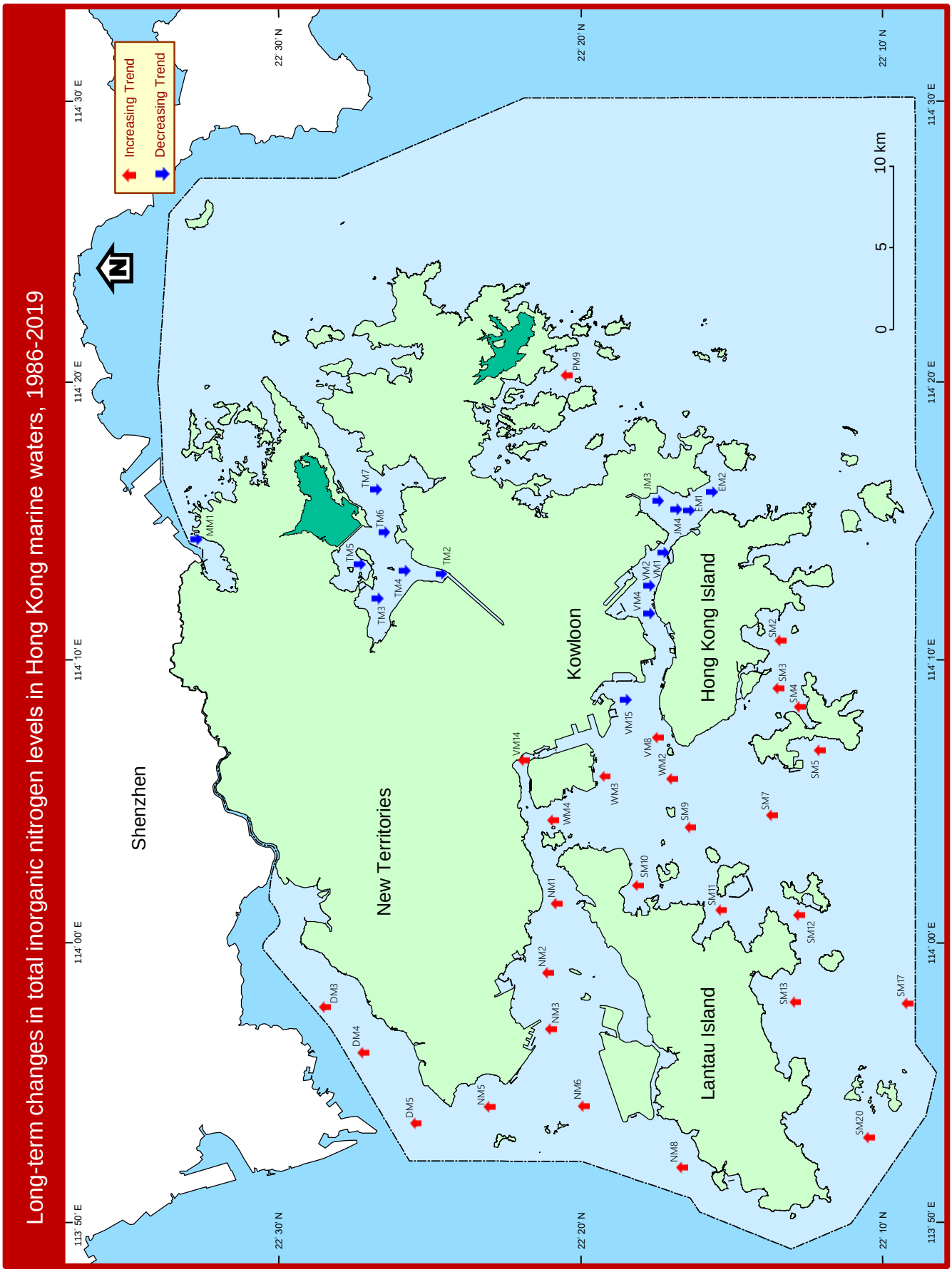


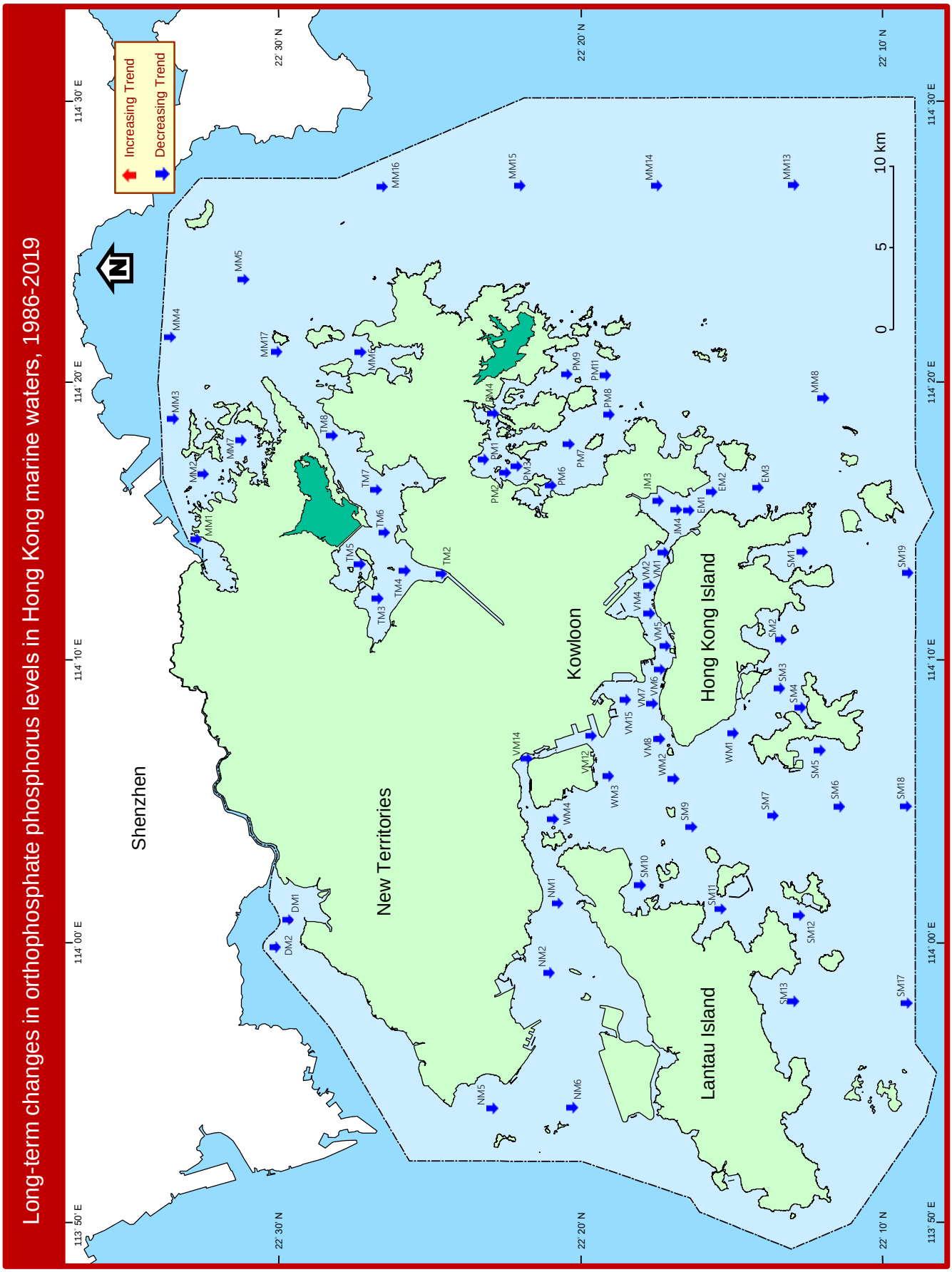

Long-term changes in 5-day biochemical oxygen demand levels in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
DM2
NM2
MM1
MM8
MM13
MM19
TM2
TM3
TM4
TM5
TM6
TM7
TM8
PM2
PM6
PM7
PM8
EM1
EM2
VM1
VM2
VM4
VM6
VM12
VM14

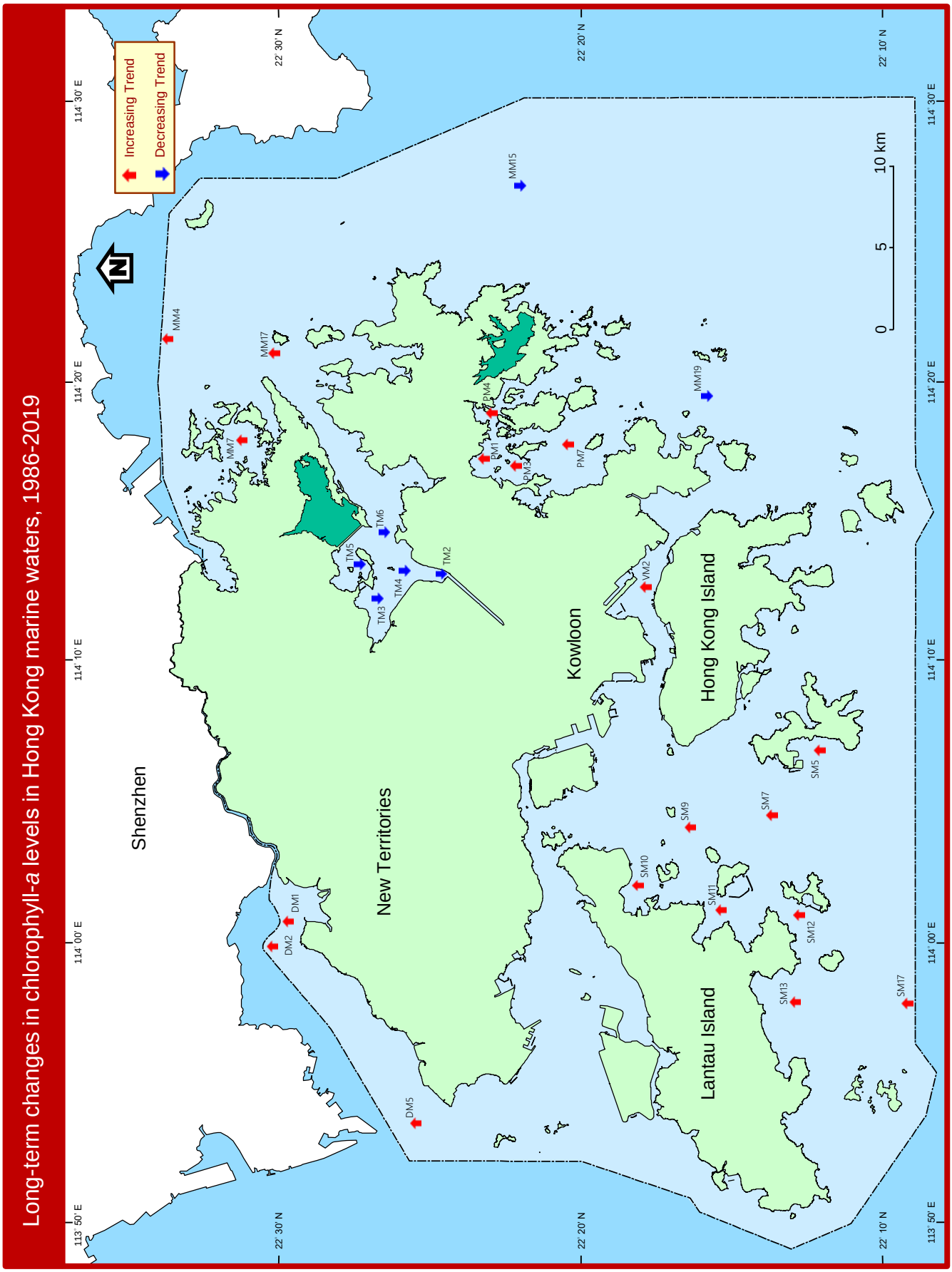
Long-term changes in *E.coli* levels in Hong Kong marine water, 1986-2019

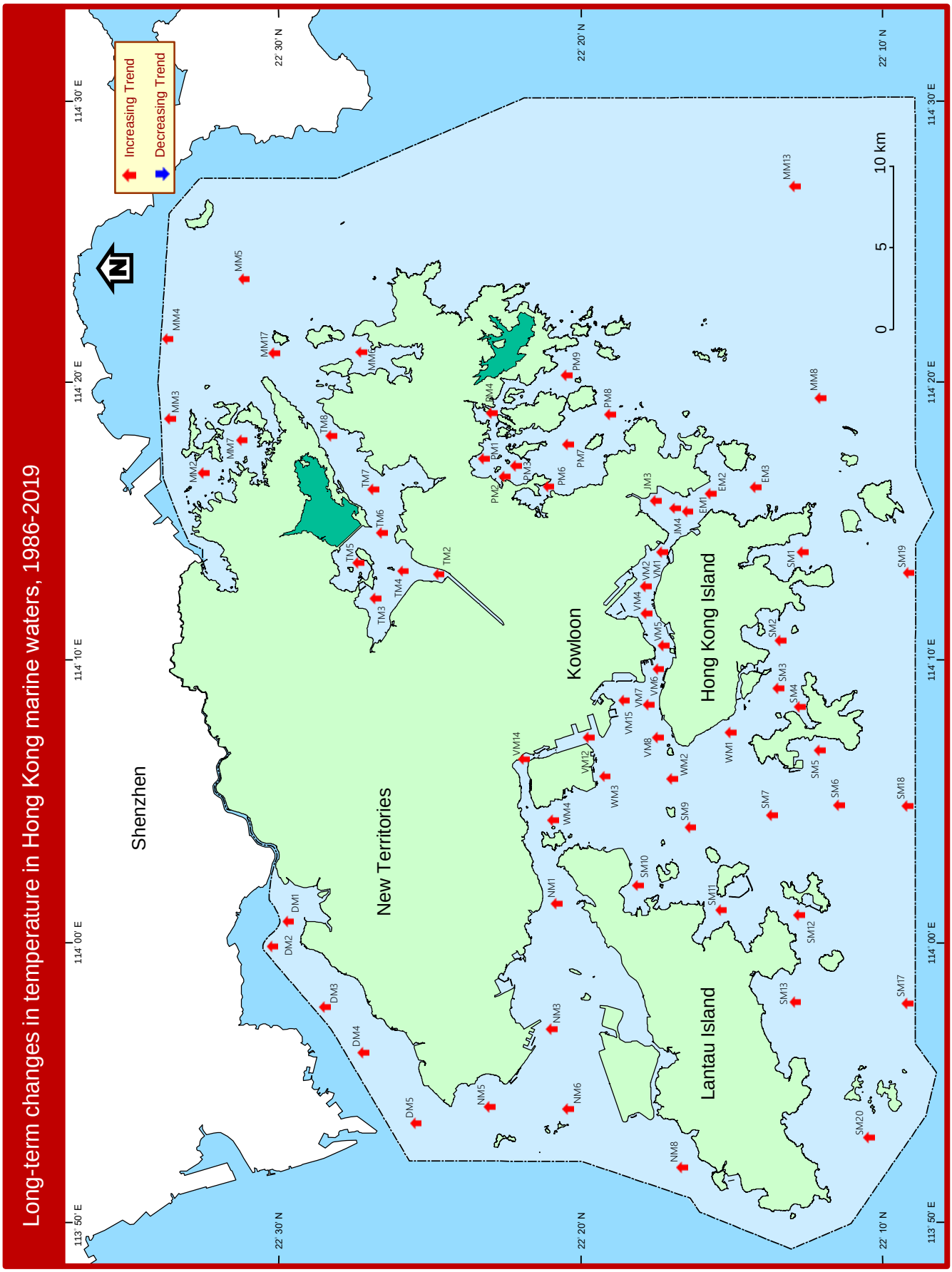



Long-term changes in ammonia nitrogen levels in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM1
MM8
TM2
TM3
TM4
TM5
TM6
TM7
JM3
JM4
EM1
EM2
EM3
VM1
VM2
VM4
VM5
VM6
VM7
VM8
VM12
VM14
VM15
114° 30' E
114° 20' E
114° 10' E
114° 00' E
113° 50' E
22° 30' N
22° 20' N
22° 10' N


Long-term changes in total inorganic nitrogen levels in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N
MM1
TM2
TM3
TM4
TM5
TM6
TM7
PM9
JM3
JM4
EM1
EM2
VM1
VM2
VM4
VM8
VM14
VM15
WM2
WM3
WM4
SM2
SM3
SM4
SM5
SM7
SM9
SM10
SM11
SM12
SM13
SM17
SM20
NM1
NM2
NM3
NM5
NM6
NM8
DM3
DM4
DM5


Long-term changes in orthophosphate phosphorus levels in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N


Long-term changes in chlorophyll-a levels in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM4
MM17
MM7
MM15
MM19
PM4
PM1
PM3
PM7
TM6
TM5
TM4
TM3
TM2
VM2
SM5
SM7
SM9
SM10
SM11
SM12
SM13
SM17
DM1
DM2
DM5
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N


Long-term changes in temperature in Hong Kong marine waters, 1986-2019
Increasing Trend
Decreasing Trend
N
0
5
10 km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
22° 30' N
22° 20' N
22° 10' N