Marine Water Quality in Hong Kong in 2009

Environmental Protection Department

The Government of the Hong Kong Special Administrative Region

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.

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Acknowledgements

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Introduction

The Hong Kong Special Administrative Region (HKSAR) has a land area of 1,104km^2 and 1,651km^2 area of marine waters. It has long coastlines, including 461km in Kowloon Peninsula and New Territories and 728km in Hong Kong Island, Lantau Island and other small islands. There are more than 260 islands in the territory, each with an area greater than 500m^2. Its coastal waters support a diversity of marine life. To protect the ecology and beneficial uses of Hong Kong marine waters, the Environmental Protection Department (EPD) implemented a comprehensive marine water quality monitoring programme in 1986.

The aims and objectives of the marine monitoring programme are to:

- indicate the state of coastal waters;
- assess compliance with the statutory Water Quality Objectives (WQOs);
- reveal long-term changes in water quality;
- provide a basis for planning water pollution control strategies;
- measure the benefit of water quality improvement measures.

Every month, the EPD conducts marine water quality monitoring at 76 sampling stations. The sediment quality monitoring is conducted at 45 stations twice a year. In addition, we monitor water and sediment quality of 17 typhoon shelters, marinas, and dockyard(s) across Hong Kong.

We also carry out monthly sampling of phytoplankton at 25 monitoring stations.

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

The EPD has a dedicated marine monitoring vessel *"Dr. Catherine Lam"*. It is equipped with an advanced conductivity-temperature-depth (CTD) profiler linked to a computer-controlled rosette water sampler which takes field measurements and collects water samples at the same time. Marine sediments are collected using bottom sediment grabs. The water and sediment samples are analysed by the EPD's laboratories and the Government Laboratory for over 80 physical, chemical and biological parameters.

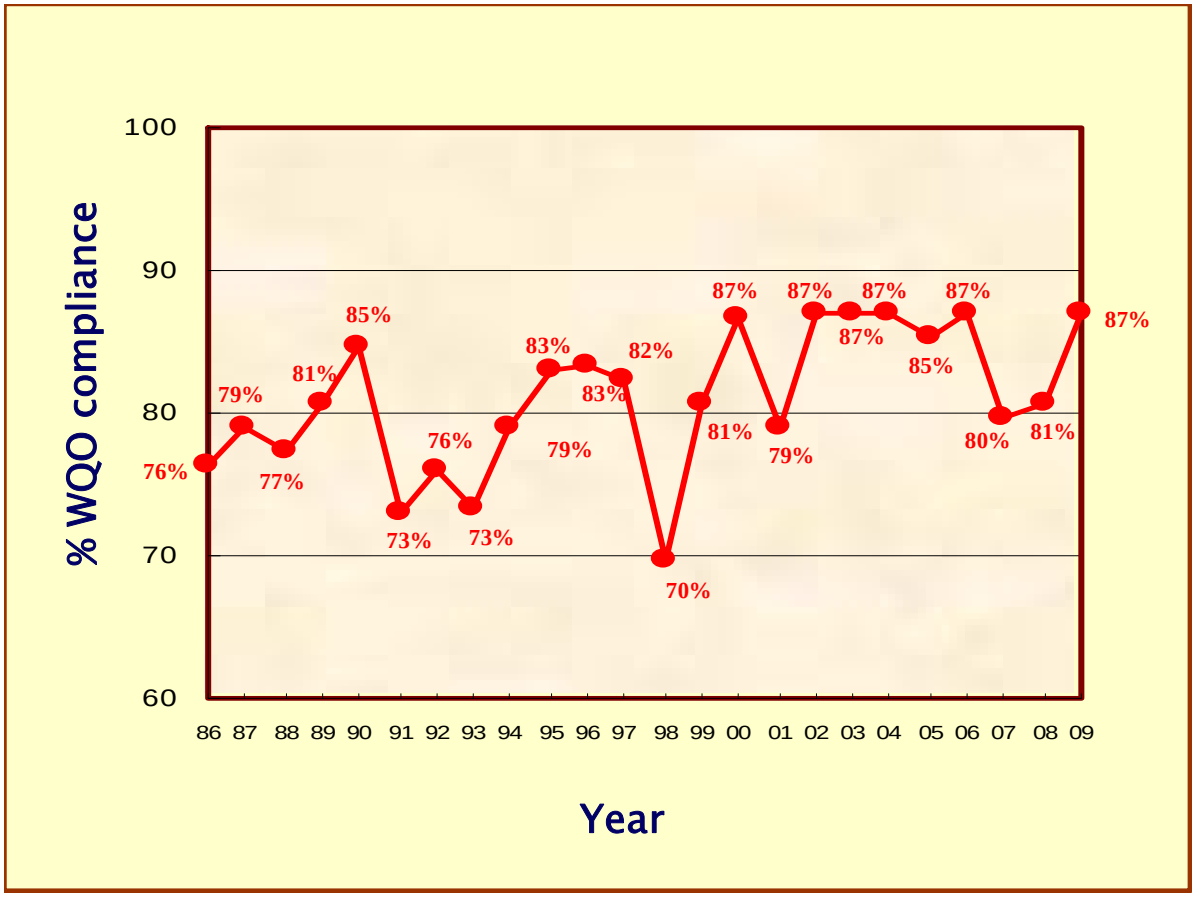
EPD's laboratory

Government Laboratory's instrument
(High-Resolution Mass Spectrometer)

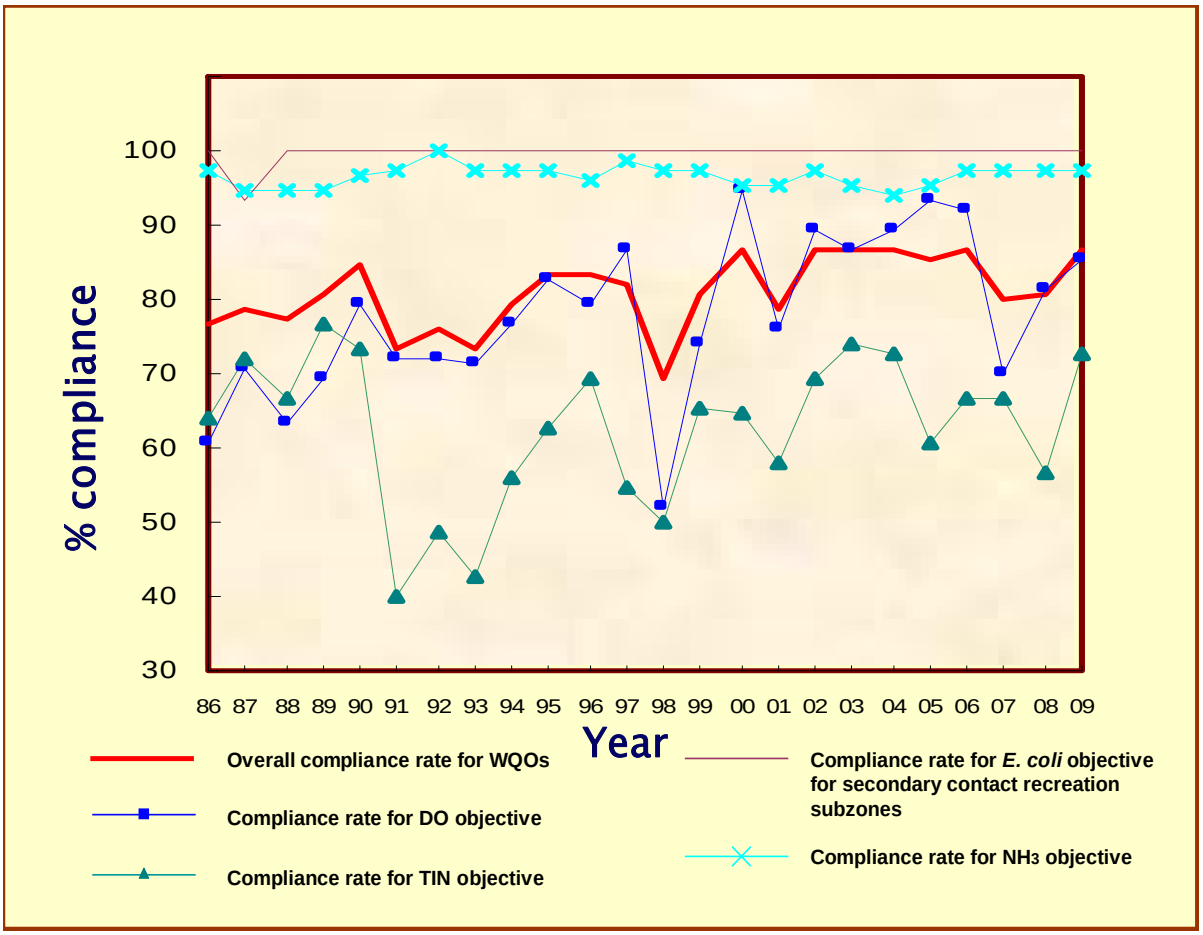
The State of Hong Kong Marine Waters in 2009

The overall WQO compliance rate of the whole territory is based on the combined individual compliance rates of all stations in the territory for the four important marine WQOs, namely Dissolved Oxygen (DO), Total Inorganic Nitrogen (TIN), Unionised Ammonia (NH_3) and *E. coli* bacteria.

The overall WQOs compliance for 2009 is 87%, higher than those in 2007 (80%) and 2008 (81%) but generally similar to that in 2002-2006 (85% and above).



Overall compliance with the marine Water Quality Objectives in Hong Kong, 1986-2009



The overall compliance rate with the WQOs and the compliance rates for the four objectives in Hong Kong, 1986-2009

The improvement of the overall WQO compliance rate in 2009 was mainly due to the increase of compliance with TIN objective from 57% in 2008 to 72% in 2009. The compliance rate with DO objective also increased from 82% in 2008 to 86% in 2009 while the compliance with NH_3 and *E. coli* remained the same in the 2 years.

The compliance rates with TIN objective in the Southern, North Western and Victoria Harbour WCZs increased from 0%, 17% and 60% in 2008 to 19%, 83% and 100% in 2009 respectively. The increase of TIN compliance of the North Western WCZ in 2009 also raised its overall compliance rate from 61% in 2008 to 94% in 2009. The lower levels of TIN recorded in Hong Kong waters could be related to the drier weather in 2009 (as well as in Guangdong area) which resulted in less pollutant being discharged into the marine water via surface runoff. According to the Hong Kong Observatory's (HKO) weather report, the year 2009 was drier than usual and the annual rainfall was 8% less than normal.

In the Victoria Harbour WCZ, the 2009 compliance rate was 93% which was the second highest

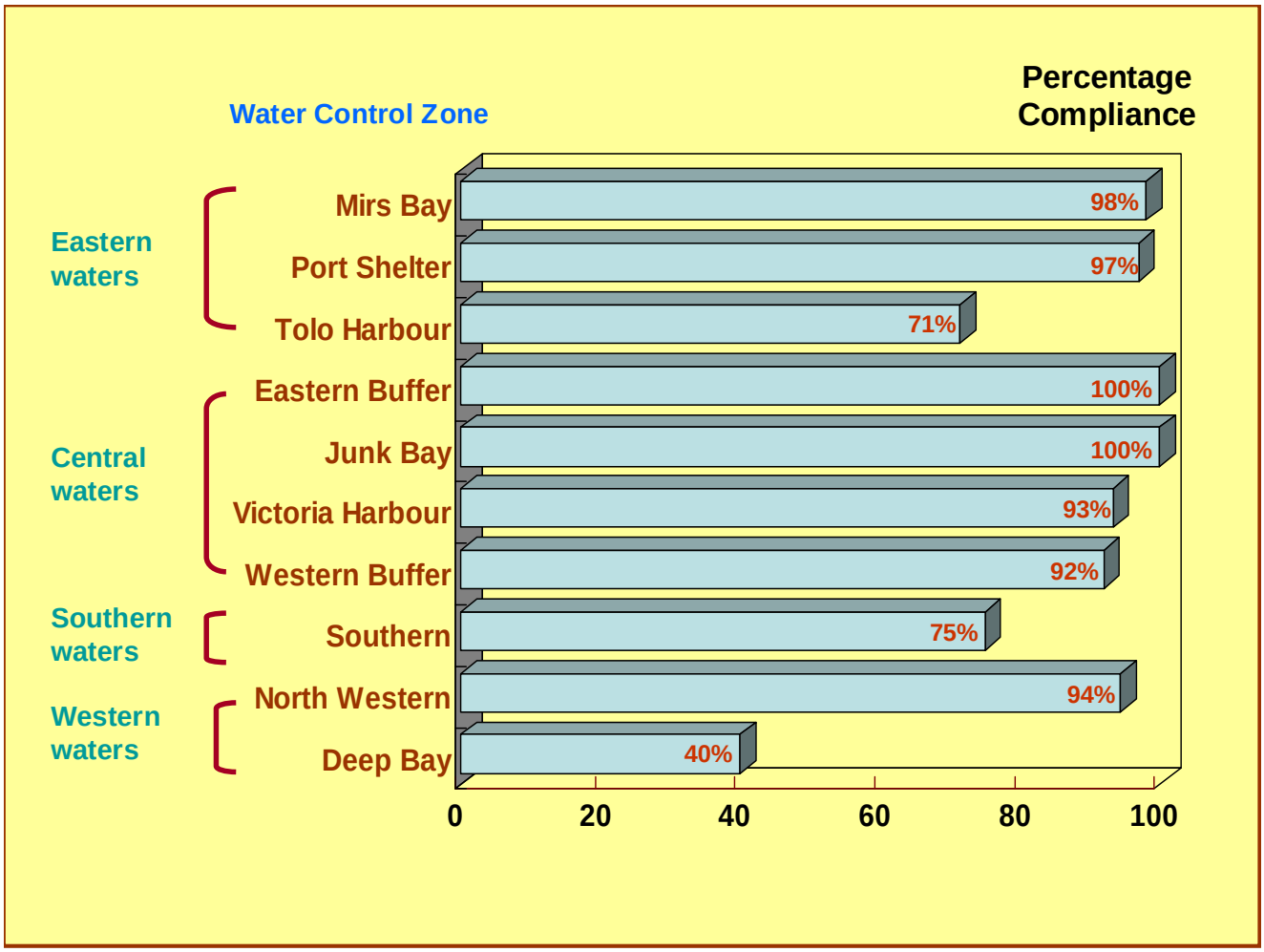
recorded since the commissioning of HATS Stage 1 in 2002, the highest (97%) was recorded in the same year. The increase of compliance was mainly due to the full compliance with TIN objective at all (10) stations in the Victoria Harbour WCZ in 2009, compared with the compliance at only six stations in 2008. The decreasing trend in *E. coli* and increasing trend in DO level in the Victoria Harbour WCZ, particularly on the eastern side, continued. While the *E. coli* levels in central and western Victoria Harbour were higher (1600-4700 cfu/100mL) compared with the eastern side, the bactercial levels in the former areas also decreased by 38% from an average of 4500 cfu/100mL in 2006 to 2800 cfu/100mL in 2009.

The overall WQO compliance rate in Deep Bay maintained at 40% in 2009, the same as in 2008. The TIN levels in Inner Deep Bay (DM1, DM2 and DM3) were similar to those in 2008 but remained high (4.8, 3.4 and 1.5 mg/L) compared with the objective (0.7 mg/L). The TIN levels in Outer Deep Bay have been largely stable at 0.7-1.3 mg/L since 2002.

The compliance rates in Port Shelter and Mirs Bay in 2009 were 97% and 98% respectively, slightly lower than their usual rates (100%). The non-compliance with DO objective was due to the lower DO levels recorded at the sea bottom in July and August when the water column was thermally stratified. This phenomenon has also been observed in the past to occur in areas which the water was calmer and deeper during the hot summer months. According to HKO's record, both July and August were quite warm in 2009, and the mean temperature of 29.4℃ for August was one 1 degree higher than its climatological normal.

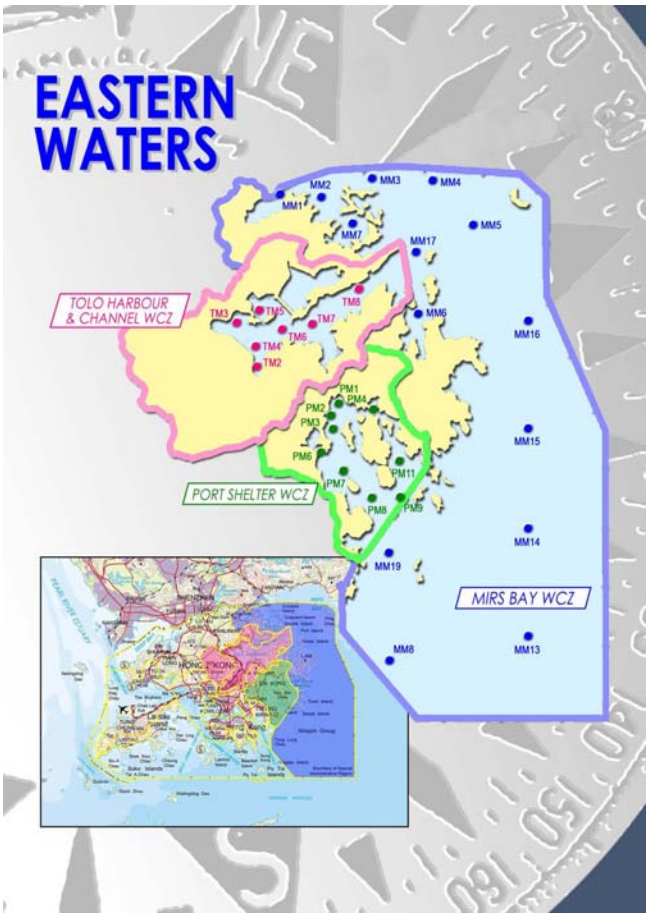
The WQO compliance rate in Tolo Harbour was 71% in 2009, compared with 64% in 2008. The improvement was due to the higher compliance with DO objective (43% in 2009 as compared with 29% in 2008). As a landlocked harbour, its bottom water often recorded relatively low DO compliance rate compared with other WCZs (60% – 100%) particularly in summer months.

The compliance rates with the TIN objective in the Southern and North Western WCZs increased from 0% and 17% in 2008 to 19% and 83% in 2009 respectively. The North Western WCZ in 2009 also raised its overall compliance rate from 61% in 2008 to 94% in 2009. It is noted that these two WCZs are under the influence of local discharges as well as the Pearl River Delta. The improvements in TIN compliance rates could be related to the reduced discharge from the Pearl River catchment because of the drier weather observed in the southern area of Guangdong in 2009.



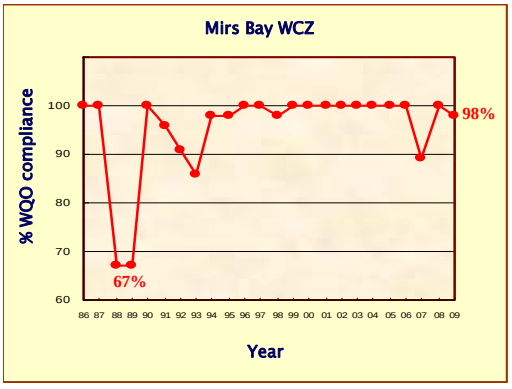
Level of compliance with the Water Quality Objectives in the ten Water Control Zones in 2009

Eastern Waters



The eastern waters cover an area of 900 km^2 which comprises Mirs Bay, Port Shelter and Tolo Harbour & Channel Water Control Zones (WCZs). These waterbodies have beautiful coastlines and good water quality in general which supports a diversity of marine life. Moreover, there are six gazetted bathing beaches (Kiu Tsui, Hap Mun Bay, Trio, Silverstrand, Clear Water Bay First and Clear Water Bay Second Beaches in Port Shelter), three marine parks (Yan Chau Tong, Hoi Ha Wan and Tung Ping Chau), 21 fish culture zones and several secondary contact recreation subzones located within these three WCZs.

Mirs Bay Water Control Zone



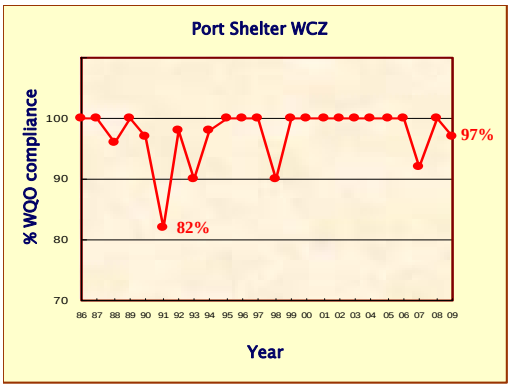
In 2009, the overall WQO compliance rate of the Mirs Bay WCZ was 98%. The non-compliance with DO objective was due to the low oxygen levels recorded at the sea bottom in July and August at station MM6 located in the relatively sheltered water in Long Harbour where the water was thermally stratified.

Other than the relatively low bottom DO level at MM6, the water quality of the Mirs Bay WCZ was generally good in 2009 with high DO at surface and mid-depth, as well as low nutrients and bacteria counts which fully met their respective WQO. The chlorophyll-*a* level in Mirs Bay remained stable in the past few years, indicating that there was little sign of excessive algal growth in the bay.

Soft coral found in Mirs Bay

Soft coral found in Mirs Bay

Port Shelter Water Control Zone

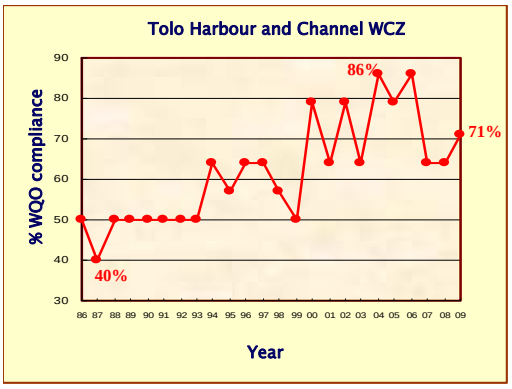


As in previous years, the water quality in the Port Shelter WCZ in 2009 was amongst the best in the territory with high DO and low levels of nutrients and *E. coli*. Similar to Mirs Bay, the 2009 WQO compliance of the Port Shelter WCZ was 97%. The non-compliance with DO objective was due to the low oxygen levels recorded at the sea bottom in July and August at station PM7 located near Shelter Island where the water was thermally stratified in the summer months. Because of its excellent water quality, Port Shelter attracts a lot of visitors who enjoy various water sport activities, including swimming, yachting, water skiing and diving every year. The six gazetted bathing beaches in Port Shelter attracted over 1.5 million visitor numbers during the 2009 bathing season.

Hap Mun Bay Beach is located in Sharp Island

Clear Water Bay Second Beach is one of the popular bathing beaches in Port Shelter

Tolo Harbour and Channel Water Control Zone



The Tolo Harbour and Channel WCZ achieved an overall WQO compliance rate of 71% in 2009, higher than that in 2008 (64%). The harbour water often experienced a lower compliance rate with the DO objective (around 43% in 2009) compared with other WCZs (60%-100%). The reason is the harbour's landlocked situation often leads to prolonged period of stratification of the water column inside Tolo Harbour particularly during the hot summer months. The stratification of the water column prevents the mixing of upper and lower water masses and leads to oxygen depletion in the deeper water. As a result, the water in the bottom layer usually experiences non-compliance with DO objective (<2 mg/L).

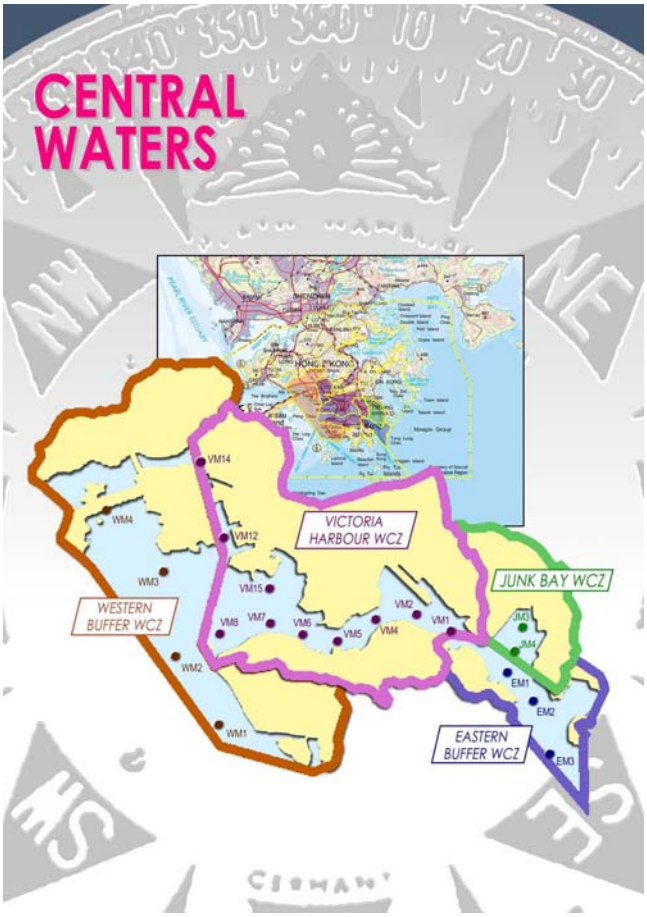
The water quality of the Tolo Harbour and Channel WCZ has improved markedly since the implementation of the Tolo Harbour Action Plan in the mid-80s. The Plan includes the control of livestock waste, improvement of sewage treatment facilities, export of treated effluent outside of the harbour to Kai Tak Nullah in Victoria Harbour and extension of village sewerage in the catchment area. As a result of Government's effort, an improvement of water quality (i.e. decrease in 5-day Biochemical Oxygen Demand (BOD_5), *E. coli*, nitrogen and orthophosphate phosphorus measurements) was observed in Tolo Harbour in the past decade.

In 2009, about 96% of marine water samples collected in the Tolo Harbour WCZ met the chlorophyll-*a* objective. The *E. coli* level (<10 cfu / 100mL) in the WCZ in 2009 also fully complied with the WQO for secondary contact recreational use (610 cfu / 100mL), which is designated for the entire WCZ.

A steady and continued recovery of water quality in Tolo Harbour since implementation of the effluent export scheme

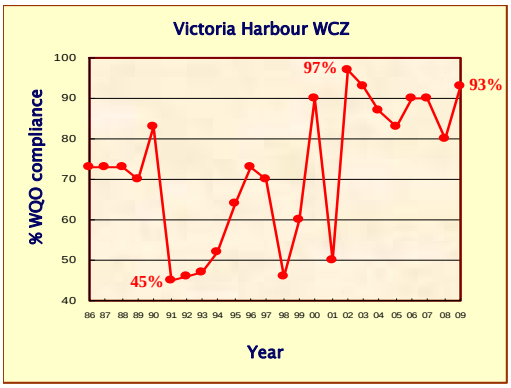
Sea birds flying in Tolo Harbour

Central Waters



The central waters of Hong Kong, including the Victoria Harbour, Eastern Buffer, Western Buffer and Junk Bay WCZs, are important navigational channels and port areas. After the commissioning of the Stonecutters Island Sewage Treatment Works under HATS Stage 1 in 2002, about 75% of the sewage around Victoria Harbour now undergoes chemically enhanced primary treatment, resulting in a 70% reduction of the pollution load (in terms of organic pollutants) into the harbour. This also leads to an improvement of water quality in the harbour which can be observed particularly in the Eastern Buffer and Junk Bay WCZs.

Victoria Harbour Water Control Zone

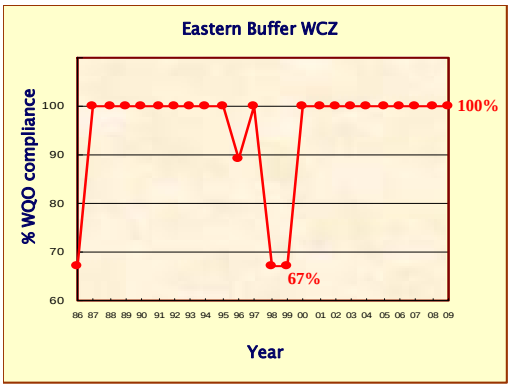


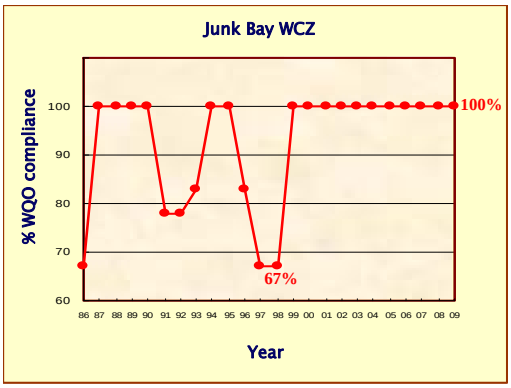
In the Victoria Harbour WCZ, the 2009 compliance rate was 93%, the second highest recorded since the commissioning of HATS Stage 1 in late 2001 (the highest of 97% was recorded in 2002). The improved compliance was mainly due to the full compliance with TIN objective at all (10) stations in Victoria Harbour in 2009, compared with the compliance at only six stations in 2008. In general, the water quality improvements (i.e. increase in DO, decreases in nutrients and *E. coli*) in eastern Victoria Harbour have largely been maintained since the commissioning of HATS Stage 1 in 2002. As the Advanced Disinfection Facilities were still under construction in 2009, the western harbour area (i.e. VM8) around the Stonecutters Island Sewage Treatment Works outfall continues to have a higher level of *E. coli* bacteria. Nevertheless, the *E. coli* level decreased from 6200 cfu/100mL in 2006 to 4000 cfu/100mL in 2009.

Monitoring vessel and Victoria Harbour

Monitoring vessel passing-by Tsim Sha Tsui seafront

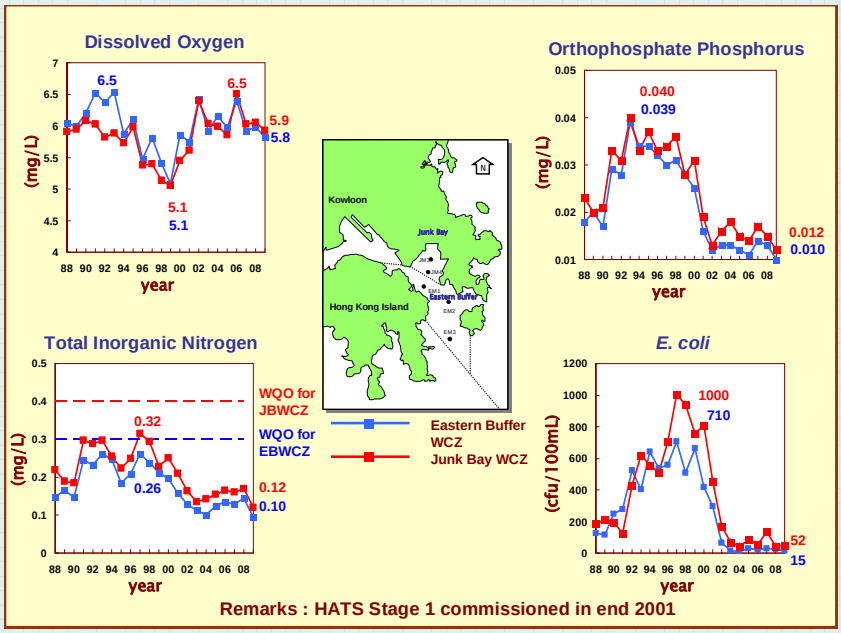
Eastern Buffer and Junk Bay Water Control Zones





Since the implementation of the HATS Stage 1 in 2002 by which all sewage generated from Junk Bay (Tseung Kwan O) and Eastern Buffer (Chai Wan) was diverted and treated at the Stonecutters Island Sewage Treatment Works, the water quality of these two WCZs has improved significantly with increasing DO levels and decreasing nutrients and *E. coli* levels. In 2009, the Eastern Buffer and Junk Bay WCZs achieved full compliance (100%) with the WQOs. The annual geometric means of *E. coli* in these waters were greatly reduced from 400-800 cfu/100mL in 2000 to below 60 cfu/100mL in 2009.

Water Quality Improvements in the Eastern Buffer and Junk Bay Water Control Zones (1988 – 2009)



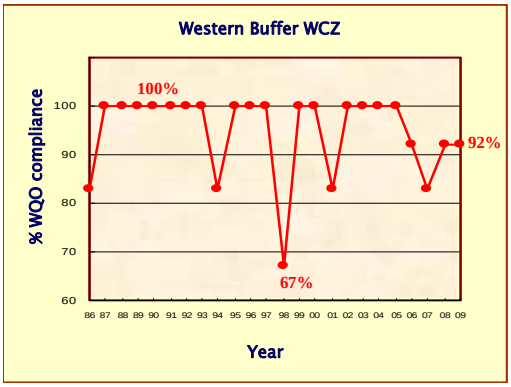
The HATS Stage 1 Work helps to improve the water quality of Victoria Harbour markedly, particularly in the Eastern Buffer and Junk Bay WCZs.

For Eastern Buffer and Junk Bay WCZs :

- Dissolved oxygen levels increased by 6 - 9%;
- Nutrient levels, in terms of total inorganic nitrogen and ortho-phosphate phosphorus decreased by more than 20%;
- *E. coli* reduced by over 80%.

Harbour Area Treatment Scheme (HATS) Stage 1

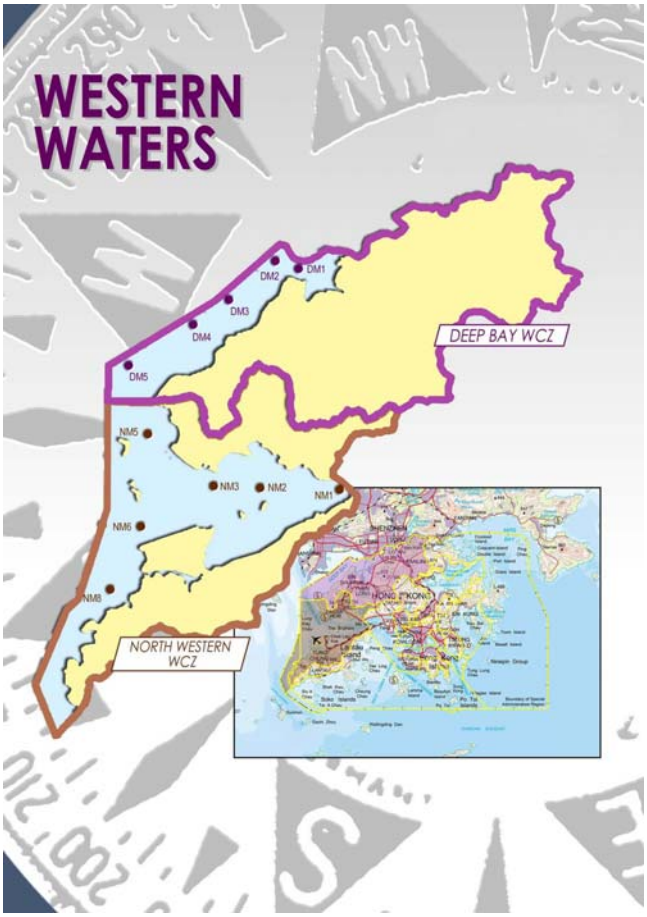
Western Buffer Water Control Zone



The Western Buffer WCZ achieved a 92% overall compliance with the WQOs in 2009, same as in 2008. The *E. coli* levels in this WCZ were high because the Advanced Disinfection Facilities at Stonecutters Island Sewage Treatment Works (SCISTW) were still under construction in 2009. The highest *E. coli* count (2600 cfu/100mL) was recorded in 2009 at WM3 which is the station closest to the submarine outfall of the SCISTW. Nevertheless, this situation has been improved since the disinfection facilities at the SCISTW under HATS Stage 2A was in operation in full scale in March 2010.

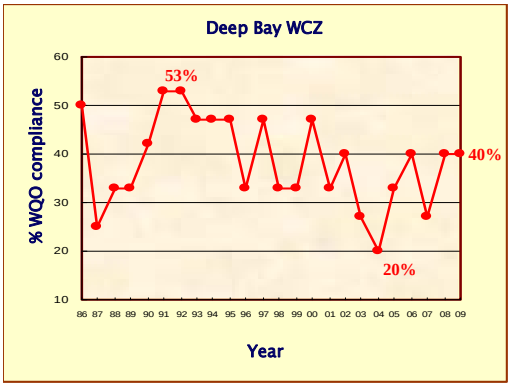
Sampling at station WM4
under the Tsing Ma Bridge

Western Waters



The Deep Bay and North Western WCZs are located to the west of Hong Kong. Deep Bay is shallow with depth varying from 2m at DM1 to 8m at DM5 and its sediment laden water body is impacted by pollution from both Hong Kong and Shenzhen. The Deep Bay WCZ includes the ecologically sensitive Mai Po and Inner Deep Bay Ramsar site, and areas of oyster culture. Both the Deep Bay and North Western WCZs are affected by the Pearl River as well as local discharges, and the North Western WCZ is the home of the Chinese white dolphins.

Deep Bay Water Control Zone

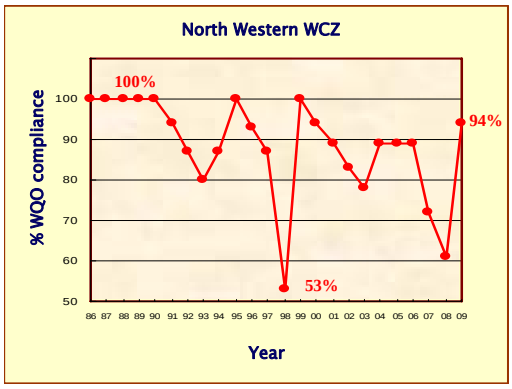


Deep Bay has the poorest water quality in the territory with high concentrations of organic and inorganic pollutants and low levels of DO. Same as in 2008, the WQO compliance in the Deep Bay WCZ in 2009 was 40%. The inner bay was seriously affected by the discharges from Shenzhen River, Kam Tin River, Yuen Long Creek and Tin Shui Wai Nullah. While three of the monitoring stations in the outer bay met the WQOs for DO and NH_3, none of the 5 stations in the Deep Bay WCZ met the TIN objective. In 2009, the nitrogen levels in inner (inner subzone) Deep Bay (1.5 – 4.8 mg/L) and outer (outer subzone) Deep Bay (0.7 – 1.0 mg/L) were much higher compared with their respective TIN objectives for inner subzone (0.7 mg/L) and outer subzone (0.5 mg/L).

Western Corridor in Deep Bay

A white egret flying in the sky of Deep Bay

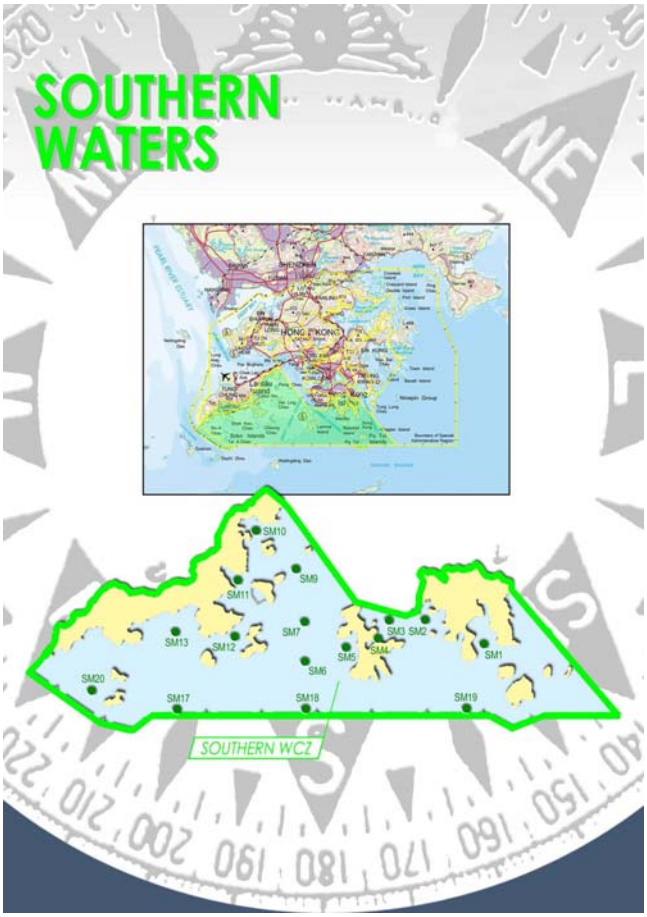
North Western Water Control Zone



The North Western WCZ in 2009 attained an overall WQO compliance rate of 94% and was markedly higher than that in 2008 (61%). The increased compliance rate in 2009 was mainly due to the improved compliance rates of DO objective from 67% in 2008 to 100% in 2009 as well as TIN objective from 17% in 2008 to 83% in 2009. All stations in the WCZ also fully complied with the NH_3 objective. The improvement of TIN compliance in the North Western WCZ in 2009 could be related to the reduced discharge from Pearl River because of the drier weather (low rainfall) in the Guangdong area (catchment of Pearl River) in 2009.

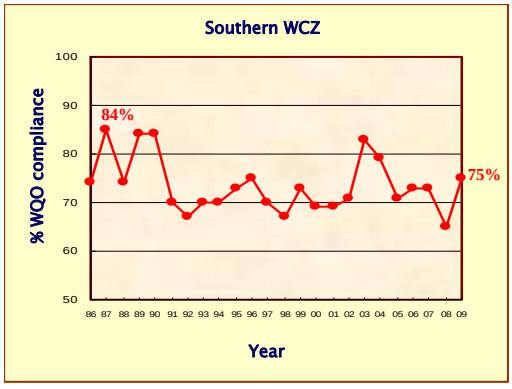
Sha Chau in the North Western WCZ

Southern Waters



The Southern WCZ stretches from Hong Kong Island south to Lantau Island and faces the South China Sea. The western part of the WCZ is impacted seasonally by the Pearl River flow and the effect diminishes towards the eastern end.

Southern Water Control Zone



In 2009, the Southern WCZ attained an overall 75% compliance with the WQOs, higher than that in 2008 (65%) and similar to that in 2007 (73%). Full compliance (100%) with the WQOs for unionised ammonia (NH_3) and *E. coli* was achieved. Compared with 2008, the compliance with DO objective had improved from 88% to 100% in 2009. In addition, 3 stations in the southeast part of the WCZ (SM1, SM18 and SM19) also met the TIN objectives this year. The increase of the overall compliance rate in the Southern WCZ in 2009 could be related to the possible reduced discharge from Pearl River, similar to the case in the North Western WCZ.

The secondary contact recreation subzones of the Southern WCZ which covers approximate 67 km^2

and is about 26% of total secondary contact recreation subzones of Hong Kong are mainly located along the coastal waters in the Southern District (Hong Kong Island) and outlying islands. In 2009, full compliance (100%) with the *E. coli* objective was attained in the secondary contact recreation subzones.

Stanley Beach in the Southern District

Wind surfing is one of the more popular water sports in Cheung Chau

Sediment Quality in Hong Kong

Collecting sediment samples

Sea bottom sediments are the ultimate sink of pollutants in the marine environment, and are also home to a wide variety of benthic organisms. The quality of marine sediments can therefore be used to reflect the health of the marine environment as a whole.

Since the implementation of the marine monitoring programme in 1986, elevated levels of selected heavy metals, in particular copper and silver could often be detected in the sediments of Victoria Harbour and Tsuen Wan Bay. This was attributed to previous industrial pollution sources in the 60s to 80s before pollution control legislation was introduced. With regard to trace organic pollutants, such as polychlorinated biphenyls (PCBs), they were generally present at low concentrations except for one station in the western Victoria Harbour (VS6). The higher levels of PCB at VS6 could be related to the discharges from industries in the past as well as contamination from the waste incineration facility in Kennedy Town, which was decommissioned in the 1990s.

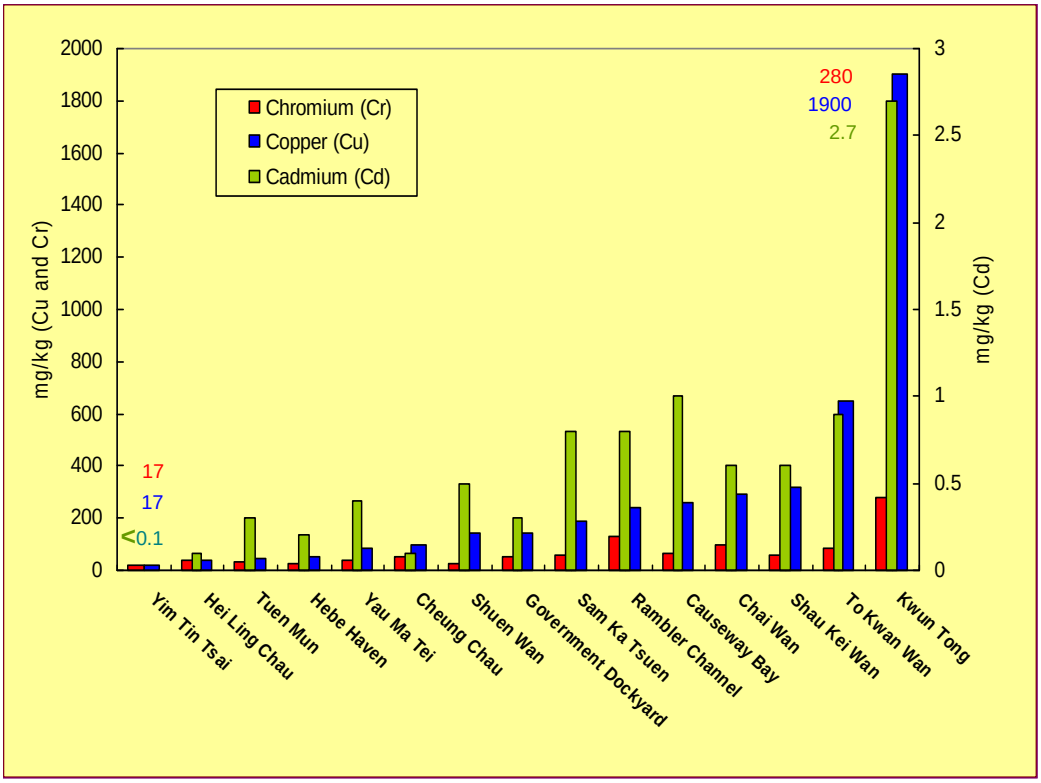
Typhoon Shelters in Hong Kong

Causeway Bay Typhoon Shelter in Hong Kong Island

Typhoon shelters in Hong Kong are used by small to medium vessels as protection against strong winds and rough sea conditions particularly during typhoon season. For this reason, typhoon shelters are often semi-enclosed water bodies and vulnerable to pollution from both land and sea. Hong Kong has 17 typhoon shelters (TSs), marinas and dockyard(s). Some of these are located besides residential and/or industrial areas, i.e. Causeway TS and Kwun Tong TS in which the water quality is fair to poor. Others are located in outlying islands or far away from urban areas, i.e. Hei Ling Chau TS and Hebe Haven TS in which the water quality is good.

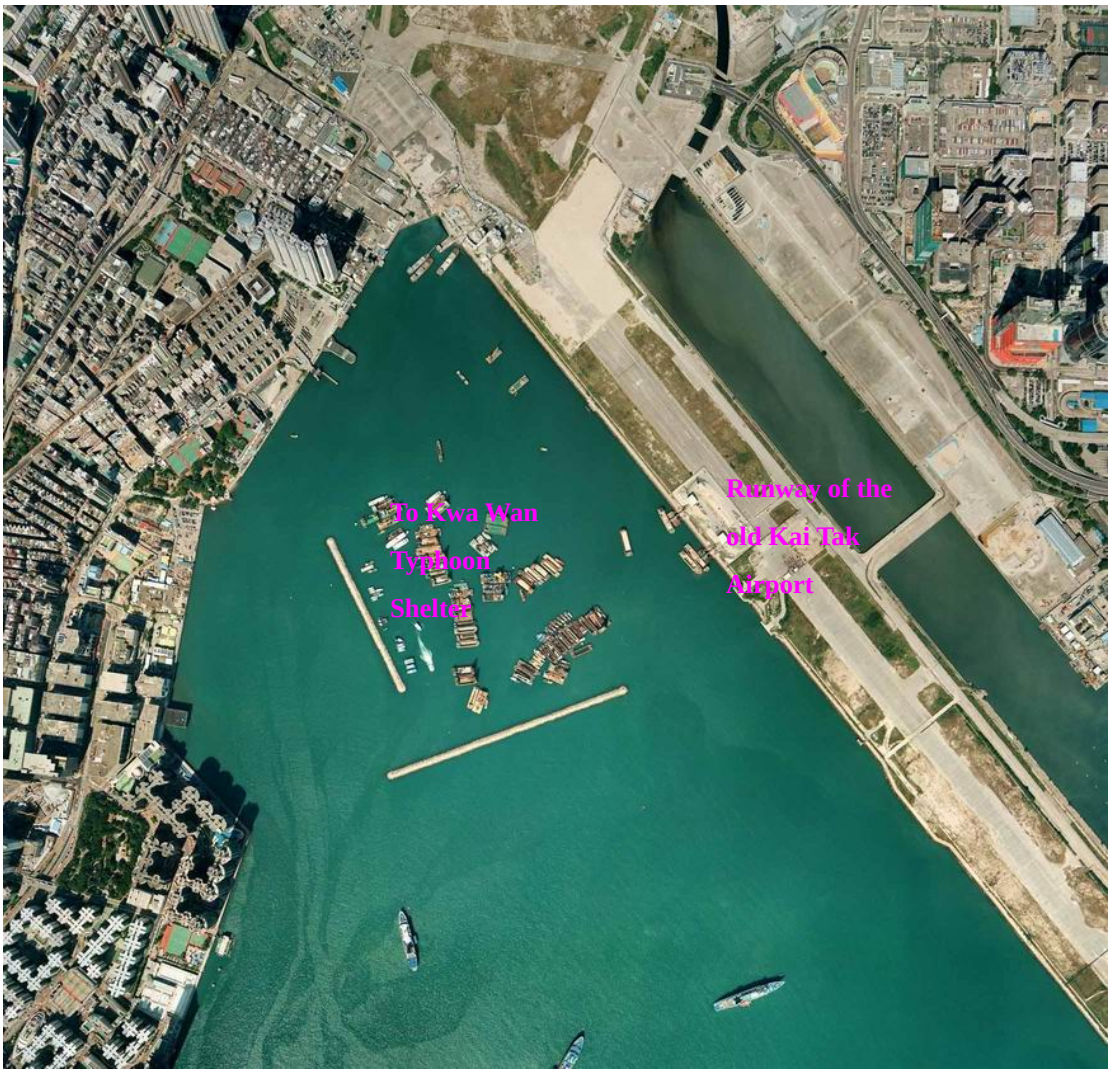
In 2009, the EPD monitored the water quality of 17 typhoon shelters (TSs), marinas and dockyard(s) around Hong Kong. Among these typhoon shelters, the three typhoon shelters, namely Yim Tin Tsai TS, Hebe Haven TS and Sai Kung TS located in Sai Kung had the lowest TIN levels (0.03 - 0.05 mg/L) and *E. coli* counts (1-7 cfu/100mL).

Yim Tin Tsai TS also had the lowest levels of heavy metals in the sediment amongst the 15 typhoon shelters sampled while the sediments in Aberdeen and Sai Kung Typhoon Shelters were removed by previous dredging have not been included for comparison. The typhoon shelters in Victoria Harbour generally had poorer water quality, and their sediments were often contaminated by heavy metals due to historical discharges from the nearby industries. During 2005-2009, the Kwun Tong TS's sediment recorded the highest levels of heavy metals (i.e. cadmium, chromium, copper, lead and nickel) amongst the typhoon shelters in Hong Kong.



Mean levels of Cadmium, Chromium and Copper in the sediments of typhoon shelters of Hong Kong in 2005-2009

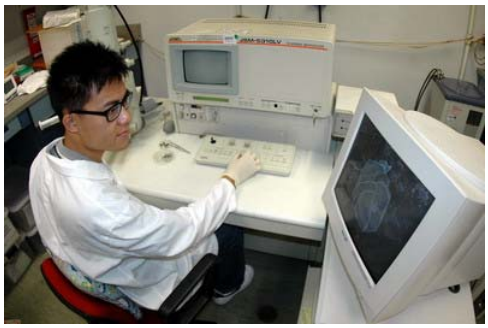
For polyaromatic hydrocarbons (PAHs), To Kwa Wan TS had the highest level compared with other typhoon shelters. The presence of PAHs in To Kwa Wan TS could be attributed to contamination from the old industrial areas in San Po Kong and perhaps the old Kai Tak Airport which ceased operation in July 1998.



To Kwa Wan Typhoon Shelter and the runway of the old Kai Tak Airport

(Aerial photo taken by the Lands Department in 2008)

Phytoplankton and Red Tides in Hong Kong

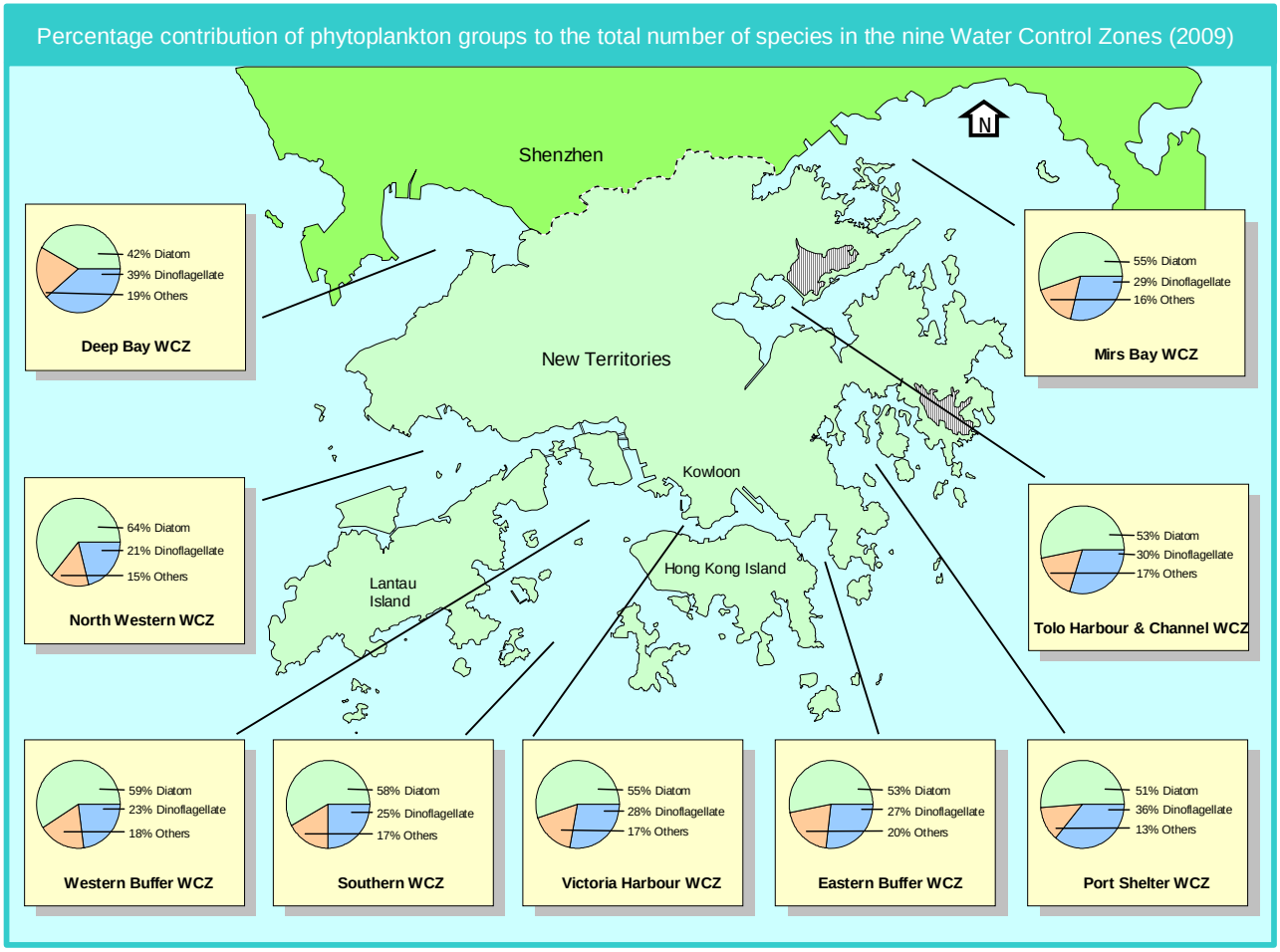


Identification of phytoplankton under an electronic microscope

Phytoplankton is a critical component of coastal ecosystems and represents the first biological response to the nutrient enrichment problem. In a water body, high concentrations of nutrients (e.g. nitrogen, phosphorus and silica) can stimulate excessive algal (e.g. phytoplankton) growth resulting in algal blooms or red tides. The enhanced algal growth may reduce dissolved oxygen in the water when dead algae decompose and cause other organisms to die (e.g. fish kills). Some phytoplankton species may also produce toxins and induce a toxic effect on marine life and cultured fish. Phytoplankton monitoring therefore forms an essential part of water quality management.

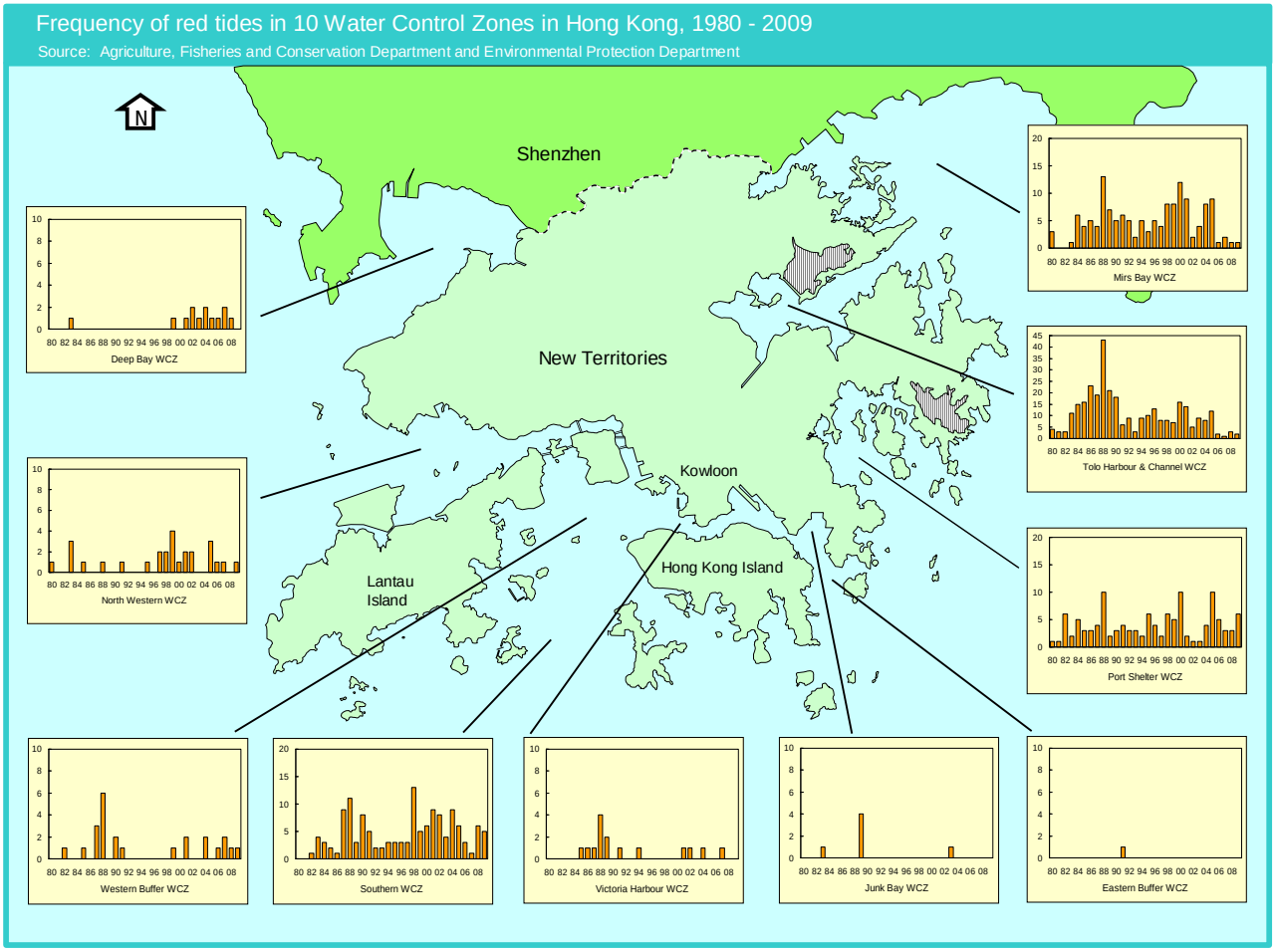
EPD conducts monitoring of phytoplankton at 25 stations covering nine Water Control Zones (WCZs) in the territory. Monthly samples are enumerated and analyzed for trends and changes in the major phytoplankton groups with regard to their composition and densities.

A total of 92 phytoplankton species was recorded in Hong Kong waters in 2009. Of these, 52 were diatoms (57%), 26 were dinoflagellates (28%) and 14 were from other minor algal groups (15%). Of the samples examined in 2009, diatoms constituted the largest component of phytoplankton in term of both species number and cell density. The most dominant diatom species was *Skeletonema costatum* which constituted 20-69% of the diatom population in the Southern, Deep Bay, Victoria Harbour, North Western and Western Buffer WCZs. The most abundant dinoflagellate species were *Gymnodinium spp.* comprising 50-69% of the dinoflagellate populations in all the WCZs. In 2009, phytoplankton densities were generally higher at some stations in Tolo Harbour & Channel and Southern Waters than those in other WCZs.



Note : Others refer to minor phytoplankton groups which mainly include Cyanophyta and Chrysophyta.

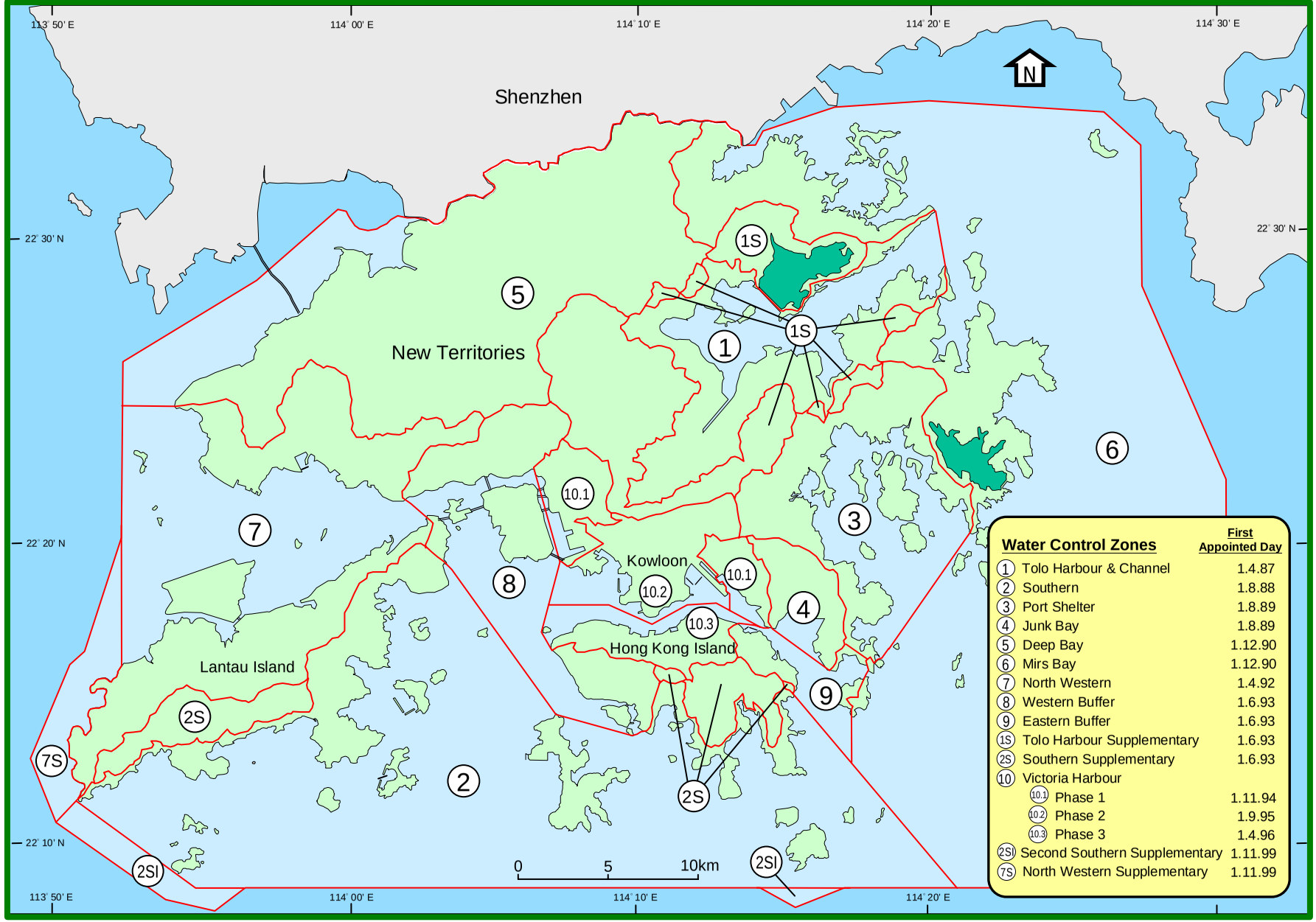
Red tides and algal blooms are phenomena which can occur in both polluted and unpolluted waters. A total of 808 red tides was recorded in Hong Kong waters between 1980 and 2009. Locally, red tides occur more frequently in the eastern (72%) and southern (17%) waters. The most common red tide species in Hong Kong waters was the dinoflagellate *Noctiluca scintillans*, which accounted for almost 29% of the reported red tides between 1980 and 2009. In 2009, a total of 16 red tides were recorded in Hong Kong waters. Of these, 2 occurred in Tolo Harbour, 5 in Southern waters and 6 in Port Shelter; whereas only one in Mirs Bay, North Western and Western Buffer WCZs, respectively. These incidents involved 12 red tide species, i.e. *Noctiluca scintillans, Heterosigma akashiwo, Plagioselmis prolonga, Karenia digitata, Skeletonema costatum, Pseudo-nitzschia sp., Phaeocytis globosa, Gonyaulax polygramma, Trichodesmium erythraeum, Karenia papilionacea, Protopolykrikos distortus* and *Mesodinium rubrum.* Among those, *Karenia papilionacea* and *Trichodesmium erythraeum* are suspected toxic species as reported by the Agriculture, Fisheries and Conservation Department of Hong Kong.

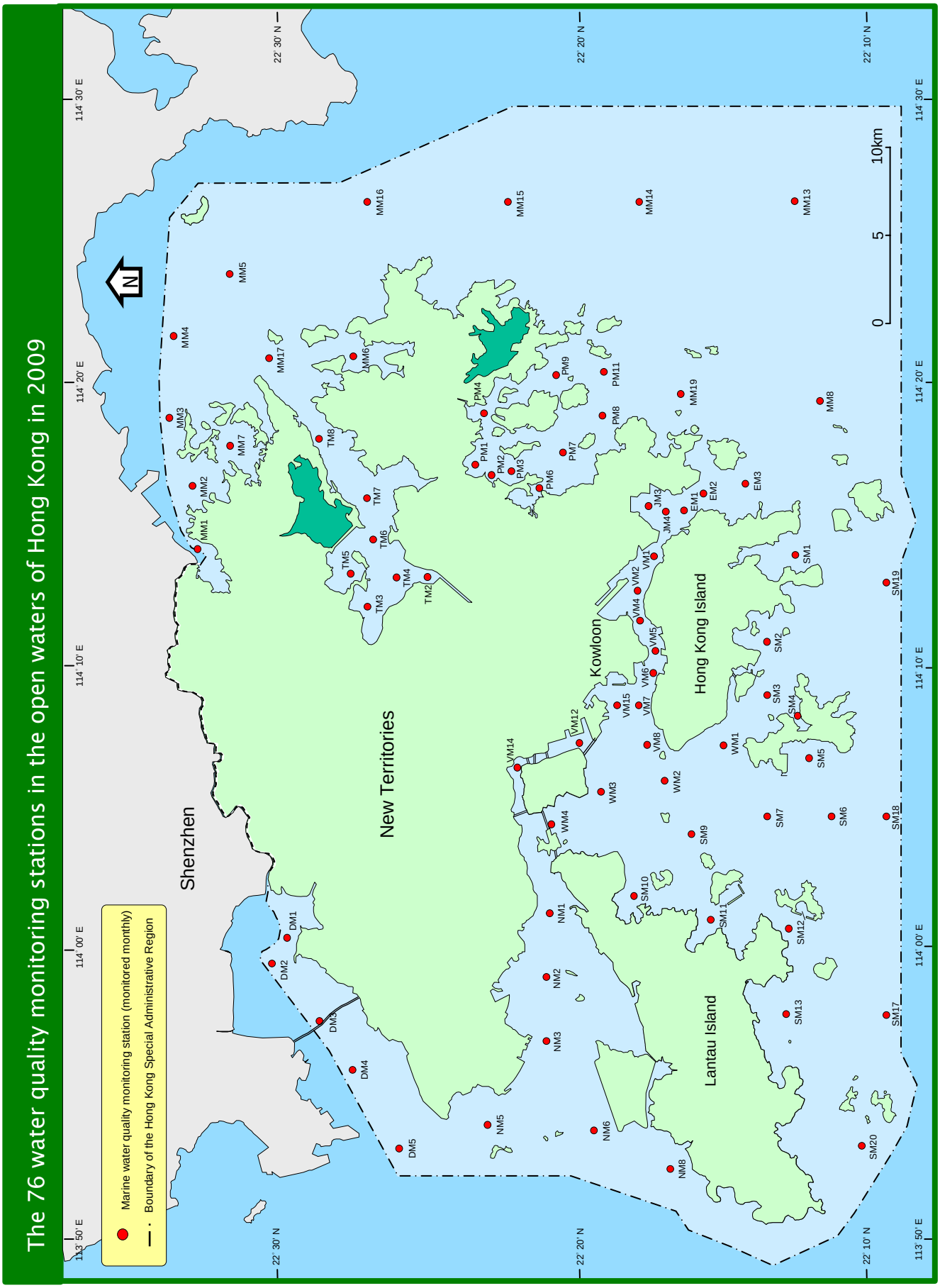


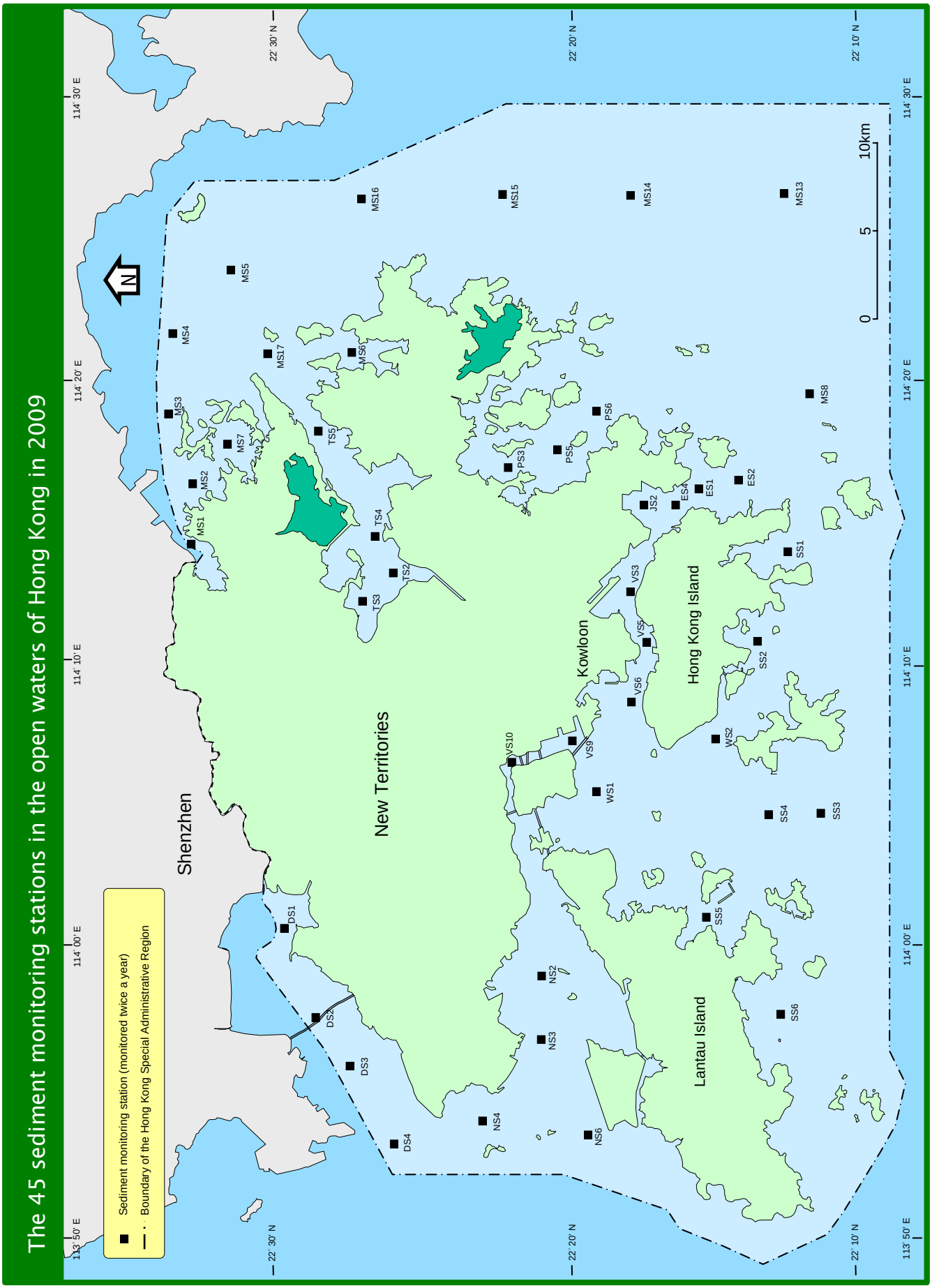
Appendices

The Water Control Zones in Hong Kong

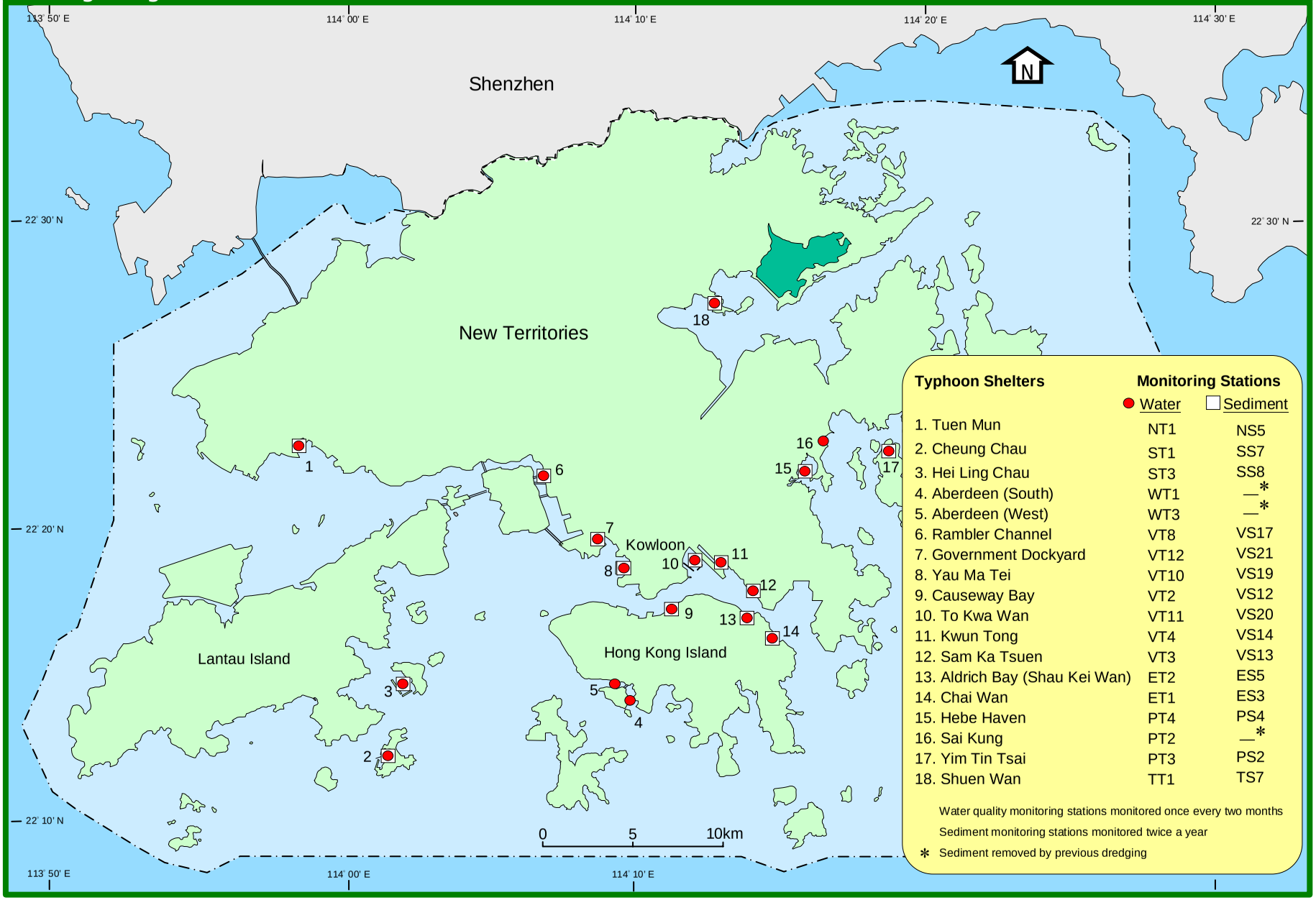
(Source: Environment Bureau– Plan No. WP/WP4/75, Nov 1999)




The 76 water quality monitoring stations in the open waters of Hong Kong in 2009
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
10km
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E


The 45 sediment monitoring stations in the open waters of Hong Kong in 2009
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
10km
MS1
MS2
MS3
MS4
MS5
MS6
MS7
MS8
MS13
MS14
MS15
MS16
MS17
TS2
TS3
TS4
TS5
PS3
PS5
PS6
JS2
ES1
ES2
ES4
SS1
SS2
SS3
SS4
SS5
SS6
VS3
VS5
VS6
VS9
VS10
WS1
WS2
DS1
DS2
DS3
DS4
NS2
NS3
NS4
NS6
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E

The 18 water quality monitoring stations and 15 sediment monitoring stations in the typhoon shelters of Hong Kong in 2009



Typhoon Shelters	Monitoring Stations	
	Water	Sediment
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. Government Dockyard	VT12	VS21
8. Yau Ma Tei	VT10	VS19
9. Causeway Bay	VT2	VS12
10. To Kwa Wan	VT11	VS20
11. Kwun Tong	VT4	VS14
12. Sam Ka Tsuen	VT3	VS13
13. Aldrich Bay (Shau Kei Wan)	ET2	ES5
14. Chai Wan	ET1	ES3
15. Hebe Haven	PT4	PS4
16. Sai Kung	PT2	—*
17. Yim Tin Tsai	PT3	PS2
18. Shuen Wan	TT1	TS7

Water quality monitoring stations monitored once every two months

Sediment monitoring stations monitored twice a year

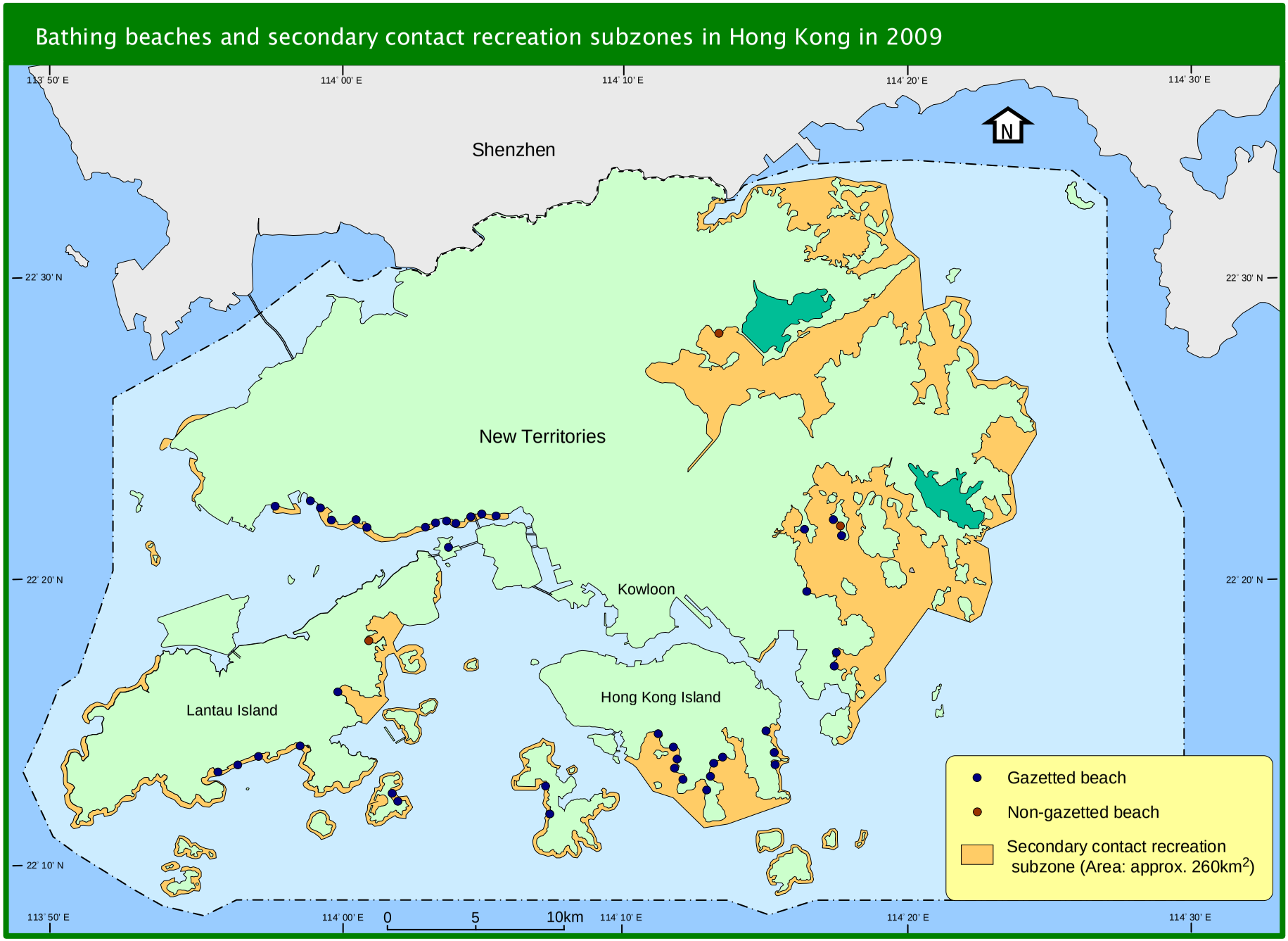
* Sediment removed by previous dredging

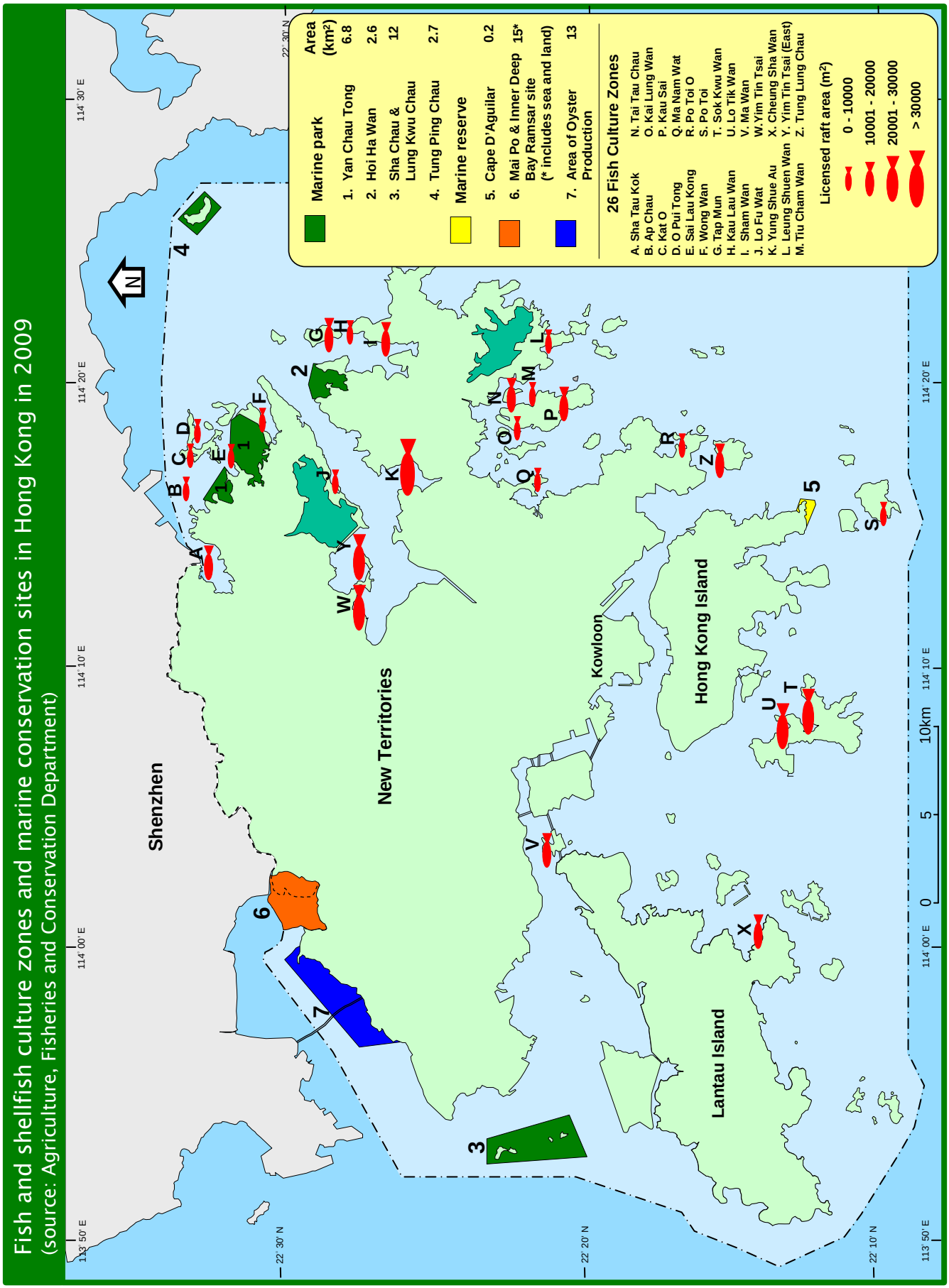
Location of marine water and sediment monitoring stations

Water Control Zone	Station		Location		Depth (m)
	Water	Sediment	Latitude	Longitude	approx.
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 Water	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	5
	*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° 21.324' N	113° 56.783' E	14
	NM5	NS4	22° 23.051' N	113° 53.972' E	20
	NM6	NS6	22° 19.281' N	113° 53.908' E	5
	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	13
	*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

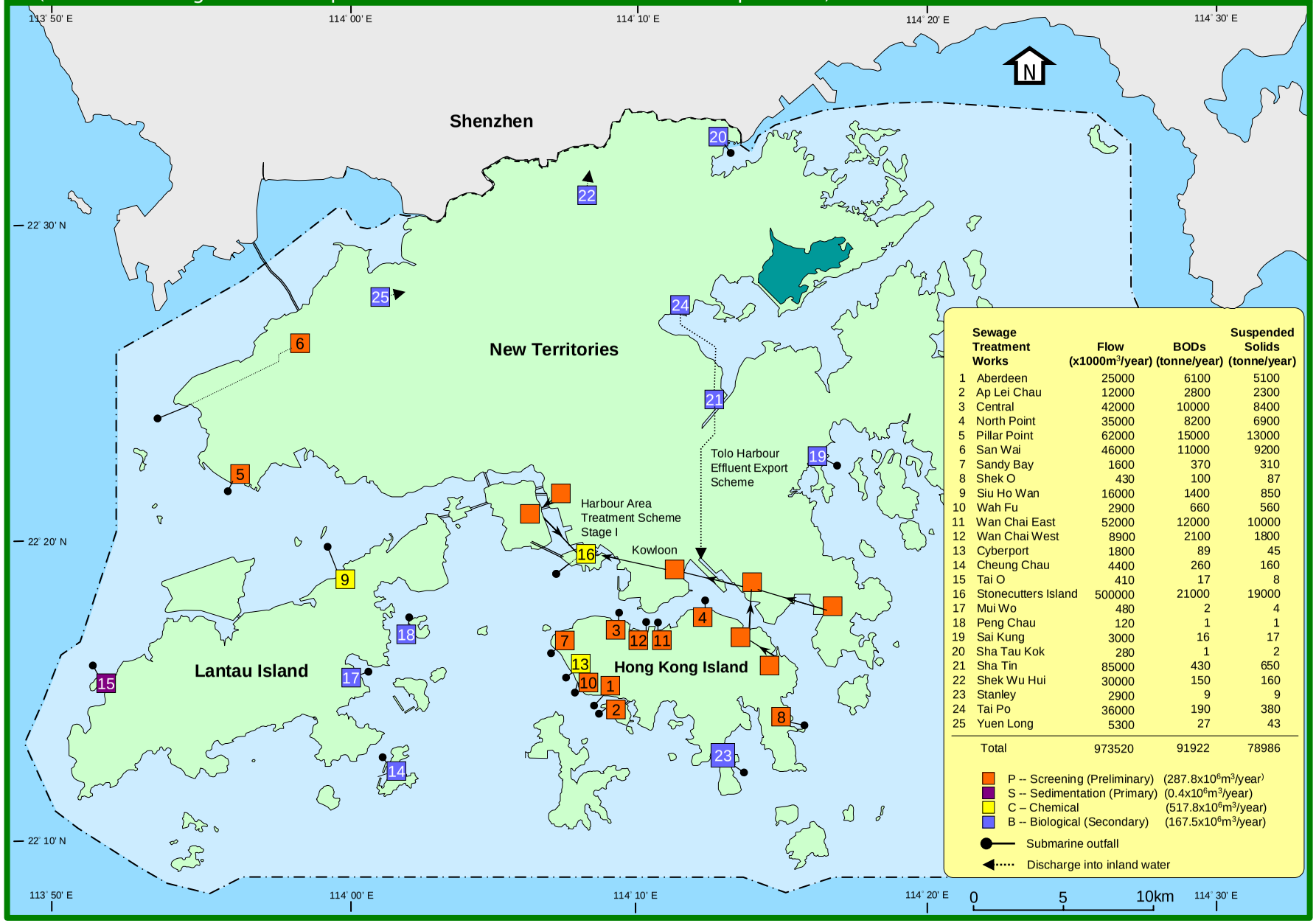
2. Water quality and sediment monitoring stations in typhoon shelters aremarked with an asterisk *


Bathing beaches and secondary contact recreation subzones in Hong Kong in 2009
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E
N
Shenzhen
22° 30' N
New Territories
22° 20' N
Kowloon
Lantau Island
Hong Kong Island
22° 10' N
0
5
10km
Gazetted beach
Non-gazetted beach
Secondary contact recreation subzone (Area: approx. 260km2)


Fish and shellfish culture zones and marine conservation sites in Hong Kong in 2009
(source: Agriculture, Fisheries and Conservation Department)
Marine park
Area (km²)
1. Yan Chau Tong 6.8
2. Hoi Ha Wan 2.6
3. Sha Chau & Lung Kwu Chau 12
4. Tung Ping Chau 2.7
Marine reserve
5. Cape D'Aguilar 0.2
6. Mai Po & Inner Deep Bay Ramsar site (* includes sea and land) 15*
7. Area of Oyster Production 13
26 Fish Culture Zones
A. Sha Tau Kok
B. Ap Chau
C. Kat O
D. O Pui Tong
E. Sai Lau Kong
F. Wong Wan
G. Tap Mun
H. Kau Lau Wan
I. Sham Wan
J. Lo Fu Wat
K. Yung Shue Au
L. Leung Shuen Wan
M. Tiu Cham Wan
N. Tai Tau Chau
O. Kai Lung Wan
P. Kau Sai
Q. Ma Nam Wat
R. Po Toi O
S. Po Toi
T. Sok Kwu Wan
U. Lo Tik Wan
V. Ma Wan
W. Yim Tin Tsai
X. Cheung Sha Wan
Y. Yim Tin Tsai (East)
Z. Tung Lung Chau
Licensed raft area (m²)
0 - 10000
10001 - 20000
20001 - 30000
> 30000
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
N
0
5
10km
114° 00' E
114° 10' E
114° 20' E
114° 30' E
113° 50' E
22° 30' N
22° 20' N
22° 10' N

Major public sewage treatment works, outfalls, and pollution load in Hong Kong in 2009

(sources: Drainage Services Department and Environmental Protection Department)



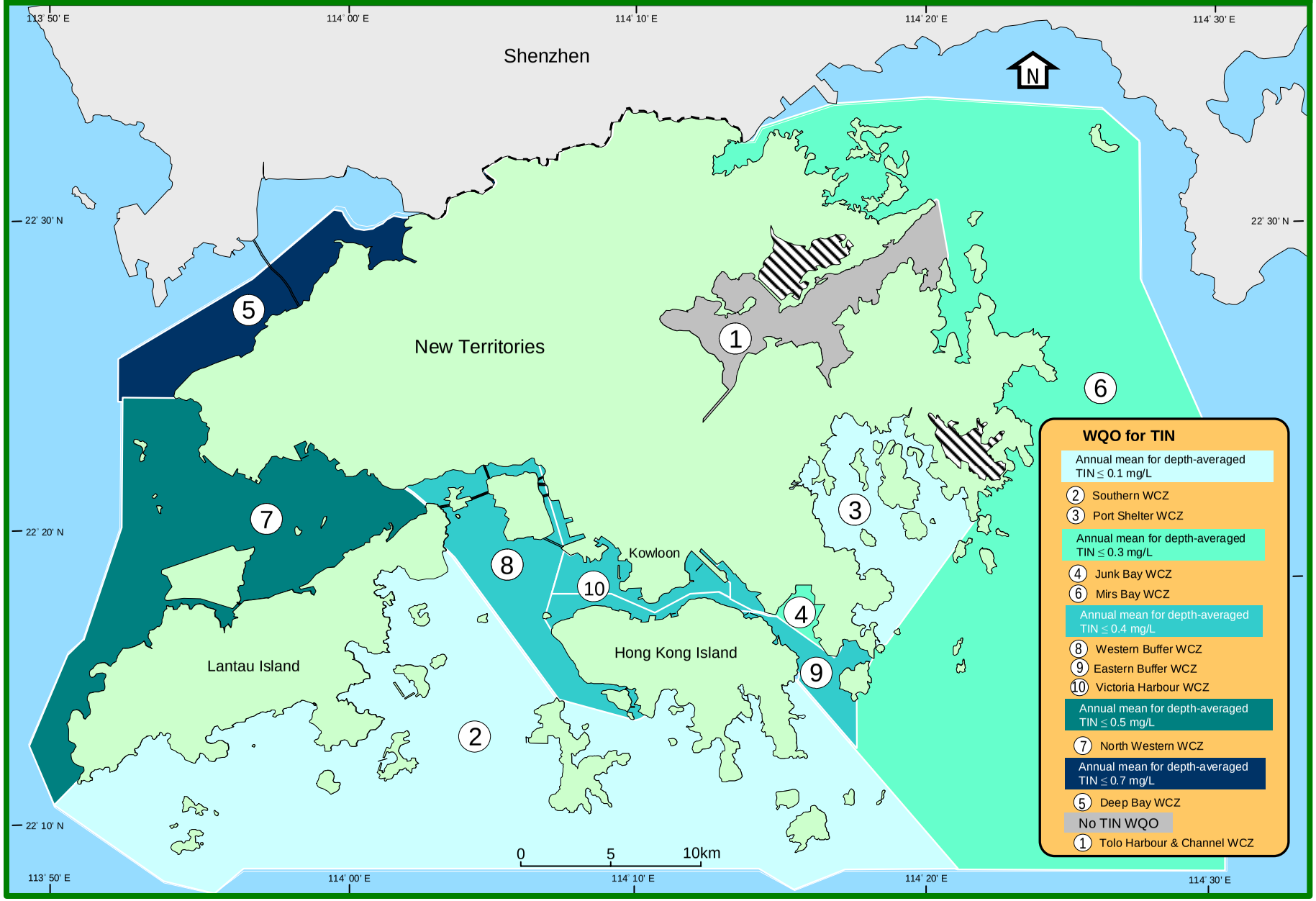
	Sewage Treatment Works	Flow (x1000m³/year)	BODs (tonne/year)	Suspended Solids (tonne/year)
1	Aberdeen	25000	6100	5100
2	Ap Lei Chau	12000	2800	2300
3	Central	42000	10000	8400
4	North Point	35000	8200	6900
5	Pillar Point	62000	15000	13000
6	San Wai	46000	11000	9200
7	Sandy Bay	1600	370	310
8	Shek O	430	100	87
9	Siu Ho Wan	16000	1400	850
10	Wah Fu	2900	660	560
11	Wan Chai East	52000	12000	10000
12	Wan Chai West	8900	2100	1800
13	Cyberport	1800	89	45
14	Cheung Chau	4400	260	160
15	Tai O	410	17	8
16	Stonecutters Island	500000	21000	19000
17	Mui Wo	480	2	4
18	Peng Chau	120	1	1
19	Sai Kung	3000	16	17
20	Sha Tau Kok	280	1	2
21	Sha Tin	85000	430	650
22	Shek Wu Hui	30000	150	160
23	Stanley	2900	9	9
24	Tai Po	36000	190	380
25	Yuen Long	5300	27	43
	Total	973520	91922	78986

P -- Screening (Preliminary) (287.8x10⁶m³/year)
S -- Sedimentation (Primary) (0.4x10⁶m³/year)
C – Chemical (517.8x10⁶m³/year)
B -- Biological (Secondary) (167.5x10⁶m³/year)

Submarine outfall

Discharge into inland water

Water Quality Objective (WQO) for Total Inorganic Nitrogen (TIN) in the ten Water Control Zones



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 2mg/L	Harbour Subzone in Tolo Harbour & Channel WCZ
	Not less than 3mg/L	Buffer Subzone in Tolo Harbour & Channel WCZ
	Not less than 4mg/L	Channel Subzone in Tolo Harbour & Channel WCZ
Dissolved Oxygen (surface to 2m above bottom)	Not less than 4mg/L	Harbour Subzone and Buffer Subzone in Tolo Harbour & Channel WCZ
Dissolved Oxygen (all depths)	Not less than 4mg/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 Habour & 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 Habour & Channel WCZ, Southern WCZ, Port Shelter WCZ, Junk Bay, 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 ±3%	Tolo Harbour & Channel WCZ
Temperature	Change due to waste discharge not to exceed 2℃	All WCZs (Whole zone) except Tolo Harbour & Channel WCZ
	Change due to waste discharge not to exceed 1℃	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 Harbour & Channel WCZ

Sediment Quality Criteria for the 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

Footnote:

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), SBE23Y 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 20ed. 2540D (weighing)	GL[18]
	Volatile Suspended Solids[3]	mg/L	0.5	S,M,B	In-house method GL-PH-23 based on APHA 20ed. 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 18ed. 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 D3590-89 B (FIA)	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 20ed. 4500-NO2- B (FIA)	GL
	Nitrate Nitrogen[5]	mg/L	0.002	S,M,B	In-house method GL-IN-18 based on APHA 20ed. 4500-NO3- F & I (FIA)	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 respectively based on ASTM D3590-89 B (FIA) and APHA 20ed 4500-N A&D (FIA)	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 ASTM D515-88 A (FIA)	GL
	Total Phosphorus[5] (soluble; soluble & particulate)	mg/L	0.02	S,M,B	In-house methods GL-IN-14 and GL-IN-16 respectively based on ASTM D515-88 B (FIA) and APHA 20ed 4500-P G (FIA)	GL
	Silica (as SiO_2) (soluble) [5]	mg/L	0.05	S,M,B	In-house method GL-IN-17 based on APHA 20ed. 4500-SiO2 C&E (FIA)	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 during upcast: 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] 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 (FIA)	GL
Nutrients and Inorganic Constituents [3]	Ammonia Nitrogen (NH_4-N)	mg/kg	0.05	In-house method GL-IN-15 based on ASTM D3590-89 B (FIA)	GL
	Total Kjeldahl Nitrogen (TKN)	mg/kg	0.5	In-house methods GL-IN-14 and GL-IN-15 respectively based on ASTM D3590-89 B (FIA) and APHA 20ed 4500-N A&D (FIA)	GL
	Total Phosphorus	mg/kg	0.2	In-house methods GL-IN-14 and GL-IN-16 respectively based on ASTM D515-88 B (FIA) and APHA 20ed 4500-P G (FIA)	GL
	Total Sulphide	mg/kg	0.2	In-house method GL-IN-45 based on APHA 20ed 4500-S^{2-} D (FIA)	GL
	Total Cyanide	mg/kg	0.1	In-house method GL-IN-44 based on APHA, 20ed., 4500 CN -A&E (distillation and colorimetric)	GL
Metals & Metalloids [5]	Aluminium (Al)	mg/kg	1	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Arsenic (As)	mg/kg	0.1	In-house methods GL-TE-64 and GL-TE-66 based on USEPA method 6020 (ICP-MS)	GL
	Barium (Ba)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Boron (B)	mg/kg	5	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Cadmium (Cd)	mg/kg	0.1	In-house method GL-TE-64 based on USEPA method 6020 (ICP-MS)	GL
	Chromium (Cr)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Copper (Cu)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Iron (Fe)	mg/kg	5	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Lead (Pb)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Manganese (Mn)	mg/kg	1	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Mercury (Hg)	mg/kg	0.05	In-house methods GL-TE-64 and GL-TE-66 based on USEPA method 6020 (ICP-MS)	GL
	Nickel (Ni)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Silver (Ag)	mg/kg	0.2	In-house method GL-TE-64 based on USEPA method 6020 (ICP-MS)	GL
	Vanadium (V)	mg/kg	0.1	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (ICP-MS)	GL
	Zinc (Zn)	mg/kg	0.2	In-house methods GL-TE-60 and GL-TE-64 respectively based on USEPA methods 6010B (ICP-AES) and 6020 (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 2009

Parameter		Starling Inlet MM1	Crooked Island MM2	Crooked Island MM7	Port Island MM17	Mirs Bay North MM3	Mirs Bay North MM4	Mirs Bay North MM5
Number of samples		12	12	12	12	12	12	12
Temperature (°C)		24.1 (16.0 - 30.3)	24 (16.1 - 29.8)	23.9 (15.9 - 29.8)	23.2 (15.8 - 29.5)	23.5 (15.9 - 29.6)	23.3 (16.1 - 29.6)	23.2 (15.9 - 29.5)
Salinity		31.7 (29.1 - 33.1)	32.2 (30.0 - 33.3)	32.3 (30.5 - 33.3)	32.7 (30.9 - 33.6)	32.6 (30.5 - 33.4)	32.9 (31.1 - 33.4)	32.9 (31.2 - 33.5)
Dissolved Oxygen (mg/L)		6.4 (4.2 - 9.1)	6.2 (4.7 - 8.1)	6.2 (3.9 - 8.1)	6.0 (3.8 - 8.2)	6.1 (4.3 - 7.9)	6.1 (4.7 - 7.5)	6.1 (4.0 - 8.0)
	Bottom	6.2 (4.2 - 9.2)	5.8 (1.5 - 7.8)	5.7 (0.9 - 8.1)	5.4 (2.0 - 8.1)	5.5 (2.3 - 8.0)	5.8 (3.3 - 7.6)	5.7 (1.9 - 7.8)
Dissolved Oxygen (% Saturation)		90 (63 - 117)	89 (67 - 111)	87 (59 - 108)	84 (58 - 102)	86 (65 - 102)	86 (71 - 100)	86 (60 - 101)
	Bottom	87 (63 - 114)	81 (21 - 105)	80 (13 - 104)	75 (28 - 101)	77 (33 - 99)	80 (47 - 100)	79 (28 - 98)
pH		8.1 (8.0 - 8.6)	8.1 (7.9 - 8.6)	8.1 (7.9 - 8.5)	8.1 (7.8 - 8.4)	8.1 (7.9 - 8.4)	8.1 (7.9 - 8.4)	8.1 (8.0 - 8.4)
Secchi Disc Depth (m)		2.2 (1.5 - 2.9)	3 (1.8 - 4.1)	3.8 (1.6 - 5.5)	4.2 (2.0 - 8.0)	3.5 (1.8 - 5.0)	4.5 (1.6 - 11.0)	5.3 (2.2 - 14.0)
Turbidity (NTU)		4.7 (1.4 - 10.0)	3.9 (0.9 - 9.7)	3.2 (0.6 - 8.9)	3.7 (0.6 - 9.2)	4.3 (0.9 - 10.5)	4.9 (0.6 - 10.4)	4.4 (0.2 - 10.5)
Suspended Solids (mg/L)		3.6 (2.1 - 5.7)	2.1 (1.1 - 3.8)	1.8 (0.8 - 4.2)	1.7 (0.6 - 2.4)	2.7 (1.3 - 4.4)	2.8 (0.8 - 5.7)	2.5 (<0.5 - 5.3)
5-day Biochemical Oxygen Demand (mg/L)		1.3 (0.4 - 2.1)	0.9 (0.3 - 1.5)	0.9 (0.3 - 1.6)	0.7 (0.1 - 1.1)	0.7 (0.3 - 1.1)	0.6 (0.3 - 1.0)	0.5 (0.1 - 1.0)
Ammonia Nitrogen (mg/L)		0.067 (0.017 - 0.190)	0.031 (0.012 - 0.113)	0.027 (0.007 - 0.078)	0.021 (0.008 - 0.043)	0.022 (0.005 - 0.063)	0.019 (<0.005 - 0.043)	0.018 (0.005 - 0.041)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.011)	0.002 (<0.001 - 0.008)	0.002 (<0.001 - 0.005)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.005)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.006 (<0.002 - 0.022)	0.005 (<0.002 - 0.023)	0.003 (<0.002 - 0.010)	0.005 (<0.002 - 0.026)	0.005 (<0.002 - 0.030)	0.006 (<0.002 - 0.030)	0.005 (<0.002 - 0.026)
Nitrate Nitrogen (mg/L)		0.045 (0.002 - 0.177)	0.020 (<0.002 - 0.054)	0.012 (<0.002 - 0.041)	0.017 (0.002 - 0.067)	0.017 (0.003 - 0.059)	0.017 (0.002 - 0.052)	0.016 (0.003 - 0.051)
Total Inorganic Nitrogen (mg/L)		0.12 (0.03 - 0.31)	0.06 (0.02 - 0.17)	0.04 (0.01 - 0.10)	0.04 (0.01 - 0.08)	0.04 (0.02 - 0.09)	0.04 (0.01 - 0.10)	0.04 (0.01 - 0.07)
Total Kjeldahl Nitrogen (mg/L)		0.23 (0.12 - 0.35)	0.16 (0.11 - 0.22)	0.15 (0.08 - 0.18)	0.13 (0.06 - 0.17)	0.13 (0.07 - 0.16)	0.13 (0.06 - 0.15)	0.12 (<0.05 - 0.17)
Total Nitrogen (mg/L)		0.28 (0.14 - 0.53)	0.19 (0.12 - 0.24)	0.16 (0.08 - 0.20)	0.15 (0.07 - 0.20)	0.15 (0.07 - 0.22)	0.15 (0.06 - 0.21)	0.14 (0.06 - 0.20)
Orthophosphate Phosphorus (mg/L)		0.009 (<0.002 - 0.024)	0.007 (0.004 - 0.014)	0.006 (0.004 - 0.009)	0.007 (0.005 - 0.011)	0.007 (0.005 - 0.009)	0.007 (0.005 - 0.010)	0.007 (0.005 - 0.010)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.65 (0.05 - 1.77)	0.56 (0.08 - 1.20)	0.50 (0.06 - 1.01)	0.56 (0.22 - 0.94)	0.59 (0.10 - 1.13)	0.54 (0.12 - 0.97)	0.51 (0.06 - 1.02)
Chlorophyll-*a* (µg/L)		6.3 (1.6 - 13.7)	2.9 (1.0 - 4.3)	2.9 (0.9 - 7.2)	2.0 (0.5 - 5.0)	2.3 (0.8 - 5.2)	1.5 (0.4 - 2.4)	1.5 (0.5 - 2.6)
E.coli (count/100mL)		11 (1 - 120)	2 (1 - 4)	1 (1 - 4)	1 (1 - 2)	1 (1 - 2)	1 (1 - 2)	1 (1 - 1)
Faecal Coliforms (count/100mL)		27 (2 - 230)	2 (1 - 7)	1 (1 - 5)	1 (1 - 3)	2 (1 - 19)	1 (1 - 3)	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 2009 (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 (18.0 - 29.1)	23.4 (17.7 - 29.0)	23.5 (17.0 - 29.0)	23.3 (17.0 - 29.0)	23.4 (17.4 - 29.1)	23.5 (17.8 - 29.5)	23.2 (15.7 - 29.4)
Salinity		33.3 (31.9 - 34.0)	33.3 (32.1 - 34.1)	33.2 (31.7 - 34.2)	33.2 (32.0 - 34.2)	33.3 (32.0 - 34.1)	33.1 (31.6 - 33.9)	32.6 (30.9 - 33.4)
Dissolved Oxygen (mg/L)		6.2 (5.0 - 7.0)	6.2 (5.0 - 7.6)	6.2 (4.4 - 7.6)	6.3 (5.1 - 7.5)	6.1 (4.4 - 7.9)	6.2 (3.8 - 7.9)	6.0 (3.7 - 8.1)
	Bottom	5.8 (4.0 - 7.4)	6.0 (4.2 - 7.5)	5.9 (4.4 - 7.6)	6.0 (4.2 - 7.5)	5.8 (4.1 - 7.8)	5.9 (4.0 - 7.9)	5.4 (0.6 - 8.1)
Dissolved Oxygen (% Saturation)		88 (74 - 102)	88 (73 - 103)	89 (64 - 107)	89 (75 - 104)	87 (64 - 107)	87 (55 - 106)	84 (56 - 103)
	Bottom	81 (56 - 100)	84 (60 - 101)	84 (62 - 102)	84 (60 - 102)	82 (58 - 105)	82 (56 - 106)	75 (9 - 102)
pH		8.1 (8.0 - 8.3)	8.1 (8.0 - 8.3)	8.1 (8.0 - 8.4)	8.1 (8.0 - 8.3)	8.1 (8.0 - 8.3)	8.1 (8.0 - 8.3)	8.1 (8.0 - 8.3)
Secchi Disc Depth (m)		4 (1.5 - 7.5)	4 (1.8 - 7.0)	4.3 (1.4 - 11.0)	4.1 (2.2 - 7.0)	4.0 (2.0 - 6.3)	4.5 (2.4 - 9.5)	4.2 (2.3 - 7.7)
Turbidity (NTU)		4.5 (0.8 - 11.1)	5.7 (1.1 - 14.1)	5.0 (1.2 - 10.0)	5.2 (0.9 - 10.8)	4.7 (1.1 - 12.4)	4.0 (0.8 - 11.5)	3.5 (0.4 - 8.7)
Suspended Solids (mg/L)		3.1 (1.3 - 5.4)	4.6 (1.6 - 9.0)	4.3 (1.3 - 13.5)	4.5 (1.3 - 12.3)	4.1 (1.1 - 16.7)	2.5 (0.8 - 4.5)	1.7 (0.6 - 3.0)
5-day Biochemical Oxygen Demand (mg/L)		0.5 (0.1 - 1.1)	0.6 (<0.1 - 1.5)	0.7 (0.1 - 1.8)	0.6 (0.1 - 1.3)	0.6 (0.2 - 1.3)	0.5 (0.3 - 0.7)	0.7 (0.3 - 1.0)
Ammonia Nitrogen (mg/L)		0.017 (<0.005 - 0.034)	0.015 (<0.005 - 0.027)	0.013 (<0.005 - 0.024)	0.016 (0.005 - 0.033)	0.014 (<0.005 - 0.024)	0.017 (<0.005 - 0.052)	0.019 (0.005 - 0.045)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.002)	<0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.007 (<0.002 - 0.014)	0.008 (<0.002 - 0.017)	0.007 (<0.002 - 0.013)	0.006 (<0.002 - 0.011)	0.006 (<0.002 - 0.012)	0.004 (<0.002 - 0.011)	0.004 (<0.002 - 0.012)
Nitrate Nitrogen (mg/L)		0.026 (0.004 - 0.068)	0.033 (0.004 - 0.090)	0.027 (0.003 - 0.099)	0.029 (0.002 - 0.100)	0.023 (0.004 - 0.081)	0.014 (0.003 - 0.049)	0.015 (0.003 - 0.060)
Total Inorganic Nitrogen (mg/L)		0.05 (0.01 - 0.11)	0.06 (0.01 - 0.12)	0.05 (0.01 - 0.13)	0.05 (0.01 - 0.13)	0.04 (0.01 - 0.12)	0.04 (0.01 - 0.08)	0.04 (0.01 - 0.08)
Total Kjeldahl Nitrogen (mg/L)		0.11 (0.06 - 0.15)	0.12 (0.06 - 0.24)	0.11 (0.05 - 0.18)	0.11 (0.05 - 0.17)	0.12 (0.06 - 0.20)	0.13 (0.06 - 0.21)	0.12 (0.06 - 0.17)
Total Nitrogen (mg/L)		0.15 (0.07 - 0.22)	0.16 (0.07 - 0.31)	0.15 (0.06 - 0.27)	0.15 (0.06 - 0.28)	0.15 (0.06 - 0.30)	0.15 (0.06 - 0.22)	0.14 (0.06 - 0.18)
Orthophosphate Phosphorus (mg/L)		0.008 (0.005 - 0.012)	0.009 (0.006 - 0.014)	0.008 (0.006 - 0.013)	0.008 (0.006 - 0.015)	0.008 (0.005 - 0.013)	0.007 (0.005 - 0.008)	0.007 (0.005 - 0.013)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	#VALUE! (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.55 (0.24 - 1.07)	0.56 (0.18 - 1.32)	0.46 (0.16 - 0.88)	0.54 (0.16 - 1.30)	0.51 (0.17 - 1.03)	0.45 (0.11 - 0.84)	0.57 (0.12 - 1.43)
Chlorophyll-*a* (µg/L)		2.2 (0.8 - 5.0)	2.6 (0.7 - 11.3)	2.8 (0.5 - 12.0)	2.5 (0.5 - 7.7)	1.6 (0.8 - 3.5)	1.7 (0.6 - 4.1)	2.4 (1.0 - 3.7)
E.coli (count/100mL)		1 (1 - 2)	1 (1 - 3)	1 (1 - 3)	1 (1 - 2)	1 (1 - 1)	1 (1 - 1)	1 (1 - 1)
Faecal Coliforms (count/100mL)		1 (1 - 3)	1 (1 - 6)	1 (1 - 5)	1 (1 - 2)	1 (1 - 1)	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 Port Shelter WCZ in 2009

Parameter		Inner Port Shelter PM1	PM2	PM3	PM4	Hebe Haven PM6
Number of samples		12	12	12	12	12
Temperature (°C)		24.9 (16.8 - 29.6)	24.9 (17.0 - 30.0)	24.5 (17.4 - 29.6)	24.6 (17.1 - 29.4)	24.6 (17.3 - 29.7)
Salinity		32.2 (28.6 - 33.8)	32.3 (29.7 - 33.7)	32.6 (30.9 - 33.7)	32.4 (29.9 - 33.8)	32.4 (30.9 - 33.6)
Dissolved Oxygen (mg/L)		6.2 (4.8 - 8.3)	6.1 (4.1 - 8.3)	6.2 (4.5 - 8.4)	5.9 (4.5 - 8.1)	6.1 (3.8 - 8.1)
	Bottom	6.2 (4.8 - 8.3)	5.9 (3.9 - 8.3)	5.7 (3.2 - 8.4)	5.7 (4.0 - 8.2)	5.7 (1.8 - 8.1)
Dissolved Oxygen (% Saturation)		90 (73 - 120)	89 (63 - 115)	90 (69 - 120)	86 (63 - 112)	88 (58 - 117)
	Bottom	89 (66 - 120)	86 (59 - 115)	82 (46 - 118)	82 (60 - 111)	81 (27 - 112)
pH		8.1 (7.9 - 8.6)	8.1 (7.9 - 8.6)	8.1 (7.9 - 8.6)	8.1 (7.9 - 8.6)	8.1 (7.9 - 8.5)
Secchi Disc Depth (m)		3.3 (2.0 - 5.8)	3.2 (1.7 - 6.2)	3.7 (1.8 - 7.5)	2.7 (1.2 - 4.2)	3.2 (2.0 - 5.5)
Turbidity (NTU)		3.9 (0.5 - 9.8)	3.8 (0.6 - 9.4)	3.5 (0.5 - 8.7)	4.2 (1.0 - 9.4)	3.8 (0.6 - 9.6)
Suspended Solids (mg/L)		2.1 (0.7 - 4.1)	1.9 (0.9 - 5.1)	1.5 (0.7 - 4.4)	2.6 (0.9 - 5.3)	1.8 (0.9 - 3.8)
5-day Biochemical Oxygen Demand (mg/L)		1.0 (0.4 - 1.6)	0.9 (0.3 - 1.8)	0.8 (0.4 - 1.6)	0.9 (0.3 - 1.3)	0.8 (0.3 - 1.4)
Ammonia Nitrogen (mg/L)		0.022 (0.008 - 0.055)	0.024 (0.009 - 0.050)	0.022 (0.007 - 0.048)	0.026 (0.009 - 0.067)	0.029 (0.009 - 0.076)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.004)	0.002 (<0.001 - 0.006)	0.001 (<0.001 - 0.004)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.002 (<0.002 - 0.006)	0.003 (<0.002 - 0.007)	0.003 (<0.002 - 0.009)	0.003 (<0.002 - 0.007)	0.003 (<0.002 - 0.012)
Nitrate Nitrogen (mg/L)		0.007 (<0.002 - 0.024)	0.011 (<0.002 - 0.031)	0.008 (<0.002 - 0.022)	0.010 (<0.002 - 0.028)	0.014 (<0.002 - 0.044)
Total Inorganic Nitrogen (mg/L)		0.03 (0.02 - 0.07)	0.04 (0.01 - 0.09)	0.03 (0.01 - 0.08)	0.04 (0.01 - 0.10)	0.05 (0.01 - 0.09)
Total Kjeldahl Nitrogen (mg/L)		0.15 (0.10 - 0.23)	0.14 (0.10 - 0.20)	0.13 (0.09 - 0.19)	0.14 (0.09 - 0.20)	0.15 (0.09 - 0.30)
Total Nitrogen (mg/L)		0.16 (0.10 - 0.23)	0.16 (0.11 - 0.21)	0.15 (0.09 - 0.20)	0.15 (0.10 - 0.21)	0.16 (0.10 - 0.32)
Orthophosphate Phosphorus (mg/L)		0.006 (<0.002 - 0.011)	0.007 (<0.002 - 0.012)	0.007 (<0.002 - 0.012)	0.006 (<0.002 - 0.011)	0.007 (0.003 - 0.015)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.52 (0.12 - 1.39)	0.51 (0.09 - 1.06)	0.47 (0.14 - 0.89)	0.56 (0.05 - 1.10)	0.49 (0.12 - 1.18)
Chlorophyll-a (µg/L)		3.4 (1.0 - 7.7)	3.1 (0.9 - 6.5)	2.4 (1.2 - 5.3)	2.6 (1.3 - 5.2)	2.7 (1.5 - 4.6)
E.coli (count/100mL)		2 (1 - 27)	4 (1 - 120)	2 (1 - 4)	1 (1 - 9)	2 (1 - 15)
Faecal Coliforms (count/100mL)		3 (1 - 170)	16 (2 - 310)	3 (1 - 20)	3 (1 - 140)	5 (1 - 110)

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 2009 (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 (17.5 - 29.5)	23.9 (17.5 - 29.6)	23.9 (17.0 - 29.6)	23.8 (17.5 - 29.5)
Salinity		32.8 (31.5 - 33.7)	32.9 (31.6 - 33.8)	32.8 (31.6 - 33.9)	32.8 (31.5 - 34.0)
Dissolved Oxygen (mg/L)		6.2 (4.2 - 8.3)	6.2 (4.6 - 8.0)	6.1 (4.6 - 8.0)	6.2 (5.1 - 7.9)
	Bottom	5.4 (1.7 - 8.3)	5.5 (2.1 - 8.0)	5.7 (2.5 - 8.1)	5.8 (3.2 - 7.9)
Dissolved Oxygen (% Saturation)		89 (64 - 121)	88 (68 - 117)	88 (70 - 117)	89 (76 - 114)
	Bottom	77 (24 - 118)	78 (31 - 121)	81 (36 - 118)	82 (46 - 119)
pH		8.1 (7.9 - 8.5)	8.1 (7.9 - 8.5)	8.1 (7.9 - 8.5)	8.1 (7.9 - 8.5)
Secchi Disc Depth (m)		4.1 (2.6 - 7.5)	4.5 (2.5 - 8.2)	4.0 (2.2 - 11.0)	4.1 (2.1 - 11.0)
Turbidity (NTU)		3.7 (0.4 - 9.0)	3.9 (0.4 - 10.8)	3.8 (0.4 - 8.8)	4.2 (0.6 - 8.6)
Suspended Solids (mg/L)		1.8 (0.5 - 5.1)	3.2 (0.5 - 15.9)	1.9 (0.5 - 5.3)	2.2 (0.8 - 5.6)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.1 - 1.1)	0.6 (0.3 - 1.2)	0.6 (0.3 - 1.4)	0.7 (0.3 - 1.5)
Ammonia Nitrogen (mg/L)		0.021 (0.005 - 0.036)	0.019 (0.005 - 0.037)	0.020 (0.006 - 0.034)	0.017 (0.007 - 0.029)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.004)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.005 (<0.002 - 0.019)	0.006 (<0.002 - 0.019)	0.004 (<0.002 - 0.011)	0.007 (<0.002 - 0.021)
Nitrate Nitrogen (mg/L)		0.017 (0.002 - 0.051)	0.020 (<0.002 - 0.052)	0.017 (0.002 - 0.048)	0.020 (0.002 - 0.051)
Total Inorganic Nitrogen (mg/L)		0.04 (0.01 - 0.07)	0.04 (0.01 - 0.08)	0.04 (0.01 - 0.08)	0.04 (0.01 - 0.09)
Total Kjeldahl Nitrogen (mg/L)		0.12 (0.07 - 0.18)	0.11 (0.06 - 0.16)	0.13 (0.06 - 0.20)	0.11 (0.06 - 0.15)
Total Nitrogen (mg/L)		0.15 (0.08 - 0.19)	0.14 (0.06 - 0.17)	0.15 (0.07 - 0.22)	0.14 (0.06 - 0.19)
Orthophosphate Phosphorus (mg/L)		0.008 (0.003 - 0.009)	0.008 (0.004 - 0.009)	0.007 (0.003 - 0.010)	0.007 (0.003 - 0.010)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.52 (0.15 - 1.00)	0.50 (0.15 - 0.82)	0.49 (0.18 - 0.79)	0.49 (0.17 - 0.83)
Chlorophyll-*a* (µg/L)		1.8 (0.7 - 3.3)	1.7 (0.6 - 4.3)	1.6 (0.5 - 4.0)	1.8 (0.9 - 4.5)
E.coli (count/100mL)		1 (1 - 1)	1 (1 - 1)	1 (1 - 1)	1 (1 - 1)
Faecal Coliforms (count/100mL)		1 (1 - 5)	1 (1 - 2)	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 2009

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)		24.5 (16.6 - 30.7)	24.4 (16.6 - 30.5)	24.2 (16.2 - 30.5)	24.6 (16.1 - 30.5)	23.8 (16.2 - 30.1)	23.8 (16.1 - 30.0)	23.4 (16.1 - 29.7)
Salinity		30.9 (28.3 - 32.6)	31.2 (27.6 - 32.7)	31.4 (29.0 - 32.6)	30.9 (28.5 - 32.8)	31.8 (30.4 - 33.1)	31.9 (30.3 - 33.1)	32.4 (31.1 - 33.3)
Dissolved Oxygen (mg/L)		6.1 (4.6 - 9.0)	5.9 (3.9 - 8.2)	6.2 (4.4 - 8.0)	6.0 (4.7 - 7.6)	5.6 (2.9 - 7.6)	5.7 (3.4 - 7.4)	5.7 (2.9 - 8.1)
	Bottom	6.0 (3.6 - 8.9)	5.3 (1.9 - 7.6)	5.5 (2.2 - 8.4)	5.9 (3.1 - 7.7)	4.9 (0.3 - 7.8)	5.1 (1.4 - 7.7)	5.0 (0.8 - 8.1)
Dissolved Oxygen (% Saturation)		87 (70 - 141)	83 (60 - 113)	88 (68 - 122)	86 (65 - 120)	80 (44 - 99)	81 (53 - 96)	80 (44 - 100)
	Bottom	86 (56 - 141)	74 (29 - 97)	77 (34 - 104)	84 (49 - 121)	69 (5 - 98)	72 (20 - 96)	69 (12 - 101)
pH		8.1 (7.8 - 8.3)	8.1 (7.8 - 8.3)	8.1 (7.8 - 8.3)	8.1 (7.8 - 8.4)	8.1 (7.9 - 8.3)	8.1 (7.9 - 8.3)	8.1 (7.9 - 8.2)
Secchi Disc Depth (m)		2.5 (1.8 - 3.2)	2.6 (1.5 - 4.2)	2.5 (1.8 - 4.2)	2.9 (2.0 - 4.2)	3.3 (1.8 - 5.5)	3.5 (2.0 - 5.1)	3.9 (2.0 - 6.2)
Turbidity (NTU)		3.6 (0.9 - 9.9)	3.6 (0.6 - 8.8)	3.5 (0.8 - 9.0)	3.5 (0.7 - 9.1)	3.5 (0.6 - 9.2)	3.3 (0.5 - 8.6)	3.9 (0.9 - 9.1)
Suspended Solids (mg/L)		2.0 (1.4 - 3.5)	2.0 (0.7 - 5.5)	1.9 (0.5 - 4.7)	1.9 (1.1 - 3.9)	1.8 (1.0 - 2.5)	1.5 (0.6 - 2.3)	2.1 (1.0 - 3.5)
5-day Biochemical Oxygen Demand (mg/L)		1.2 (0.5 - 1.9)	1.2 (0.6 - 2.2)	1.1 (0.5 - 1.8)	1.3 (0.5 - 2.3)	0.9 (0.4 - 1.5)	0.9 (0.2 - 1.3)	0.7 (0.1 - 1.0)
Ammonia Nitrogen (mg/L)		0.047 (0.015 - 0.110)	0.047 (0.016 - 0.107)	0.037 (0.006 - 0.073)	0.032 (0.007 - 0.063)	0.032 (0.007 - 0.061)	0.029 (0.008 - 0.044)	0.024 (0.006 - 0.048)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.012)	0.003 (<0.001 - 0.013)	0.002 (<0.001 - 0.007)	0.002 (<0.001 - 0.006)	0.002 (<0.001 - 0.005)	0.002 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.005 (<0.002 - 0.019)	0.006 (<0.002 - 0.026)	0.007 (<0.002 - 0.025)	0.004 (<0.002 - 0.014)	0.006 (<0.002 - 0.018)	0.006 (<0.002 - 0.021)	0.007 (<0.002 - 0.025)
Nitrate Nitrogen (mg/L)		0.019 (<0.002 - 0.042)	0.014 (<0.002 - 0.069)	0.017 (<0.002 - 0.077)	0.010 (<0.002 - 0.053)	0.014 (<0.002 - 0.061)	0.011 (<0.002 - 0.044)	0.017 (0.002 - 0.096)
Total Inorganic Nitrogen (mg/L)		0.07 (0.02 - 0.15)	0.07 (0.02 - 0.16)	0.06 (0.01 - 0.15)	0.05 (0.01 - 0.12)	0.05 (0.01 - 0.12)	0.05 (0.01 - 0.09)	0.05 (0.01 - 0.12)
Total Kjeldahl Nitrogen (mg/L)		0.22 (0.12 - 0.34)	0.22 (0.16 - 0.27)	0.19 (0.14 - 0.22)	0.18 (0.15 - 0.22)	0.18 (0.14 - 0.23)	0.17 (0.11 - 0.27)	0.15 (0.10 - 0.20)
Total Nitrogen (mg/L)		0.24 (0.12 - 0.39)	0.24 (0.16 - 0.30)	0.21 (0.15 - 0.27)	0.20 (0.15 - 0.25)	0.20 (0.16 - 0.27)	0.19 (0.12 - 0.30)	0.17 (0.11 - 0.26)
Orthophosphate Phosphorus (mg/L)		0.005 (0.003 - 0.010)	0.005 (0.002 - 0.008)	0.006 (0.002 - 0.012)	0.005 (<0.002 - 0.007)	0.006 (0.004 - 0.012)	0.005 (0.003 - 0.008)	0.007 (0.005 - 0.013)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.04)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.72 (0.13 - 1.50)	0.63 (0.06 - 1.27)	0.66 (0.08 - 1.23)	0.53 (0.11 - 1.05)	0.63 (0.06 - 1.30)	0.57 (0.07 - 1.20)	0.57 (0.07 - 1.17)
Chlorophyll-*a* (µg/L)		5.6 (1.6 - 9.6)	5.9 (1.2 - 12.3)	5.1 (1.5 - 14.2)	5.5 (0.7 - 12.3)	3.4 (1.3 - 5.2)	3.4 (0.8 - 7.0)	2.4 (0.8 - 4.9)
E.coli (count/100mL)		7 (1 - 200)	3 (1 - 10)	4 (1 - 18)	2 (1 - 18)	2 (1 - 7)	1 (1 - 2)	1 (1 - 1)
Faecal Coliforms (count/100mL)		60 (9 - 810)	18 (3 - 65)	16 (3 - 110)	21 (1 - 630)	4 (1 - 66)	2 (1 - 6)	1 (1 - 6)

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 2009

Parameter		Hong Kong Island (South) SM1	SM2	SM19	East Lamma Channel SM3	SM4
Number of samples		12	12	12	12	12
Temperature (°C)		24 (18.0 - 29.7)	24 (18.1 - 29.0)	23.9 (18.1 - 29.4)	23.7 (17.7 - 28.9)	24.1 (17.6 - 28.7)
Salinity		32.4 (29.3 - 33.9)	32.2 (28.6 - 33.8)	32.6 (30.4 - 34.0)	32.6 (31.0 - 33.7)	31.8 (28.0 - 33.5)
Dissolved Oxygen (mg/L)		6.3 (5.4 - 7.6)	5.9 (4.8 - 6.7)	5.9 (4.7 - 7.3)	5.6 (4.3 - 6.8)	5.9 (5.0 - 7.0)
	Bottom	5.8 (2.9 - 7.4)	5.5 (2.9 - 6.8)	5.5 (3.3 - 7.4)	5.3 (2.6 - 6.8)	5.7 (5.0 - 6.7)
Dissolved Oxygen (% Saturation)		90 (76 - 112)	85 (70 - 98)	84 (70 - 99)	80 (64 - 97)	84 (68 - 106)
	Bottom	82 (42 - 100)	78 (43 - 96)	78 (47 - 99)	75 (37 - 94)	82 (65 - 95)
pH		8.1 (8.0 - 8.5)	8.1 (7.9 - 8.5)	8.1 (8.0 - 8.4)	8.0 (7.9 - 8.3)	8.1 (7.9 - 8.5)
Secchi Disc Depth (m)		2.8 (1.2 - 5.5)	2.4 (1.2 - 3.5)	2.9 (1.5 - 5.7)	2.4 (1.5 - 4.1)	2.3 (1.0 - 4.0)
Turbidity (NTU)		4.6 (1.0 - 10.5)	5.3 (1.5 - 11.1)	4.6 (0.9 - 12.2)	5.3 (0.9 - 11.6)	4.5 (1.0 - 11.0)
Suspended Solids (mg/L)		4.1 (1.3 - 8.2)	5.0 (2.0 - 8.3)	3.9 (1.1 - 7.8)	4.7 (1.7 - 7.2)	3.7 (1.6 - 5.4)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.4 - 1.7)	0.8 (0.4 - 2.0)	0.7 (0.1 - 1.5)	0.8 (0.4 - 1.5)	0.9 (0.5 - 1.6)
Ammonia Nitrogen (mg/L)		0.02 (0.005 - 0.036)	0.03 (0.009 - 0.069)	0.02 (0.006 - 0.031)	0.04 (0.014 - 0.067)	0.06 (0.030 - 0.086)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.003)	0.002 (<0.001 - 0.004)	<0.001 (<0.001 - 0.002)	0.002 (0.001 - 0.003)	0.003 (0.001 - 0.007)
Nitrite Nitrogen (mg/L)		0.009 (<0.002 - 0.037)	0.017 (0.003 - 0.037)	0.011 (<0.002 - 0.032)	0.020 (0.005 - 0.057)	0.025 (0.007 - 0.080)
Nitrate Nitrogen (mg/L)		0.046 (0.003 - 0.159)	0.063 (0.011 - 0.237)	0.045 (0.002 - 0.149)	0.067 (0.014 - 0.160)	0.092 (0.022 - 0.235)
Total Inorganic Nitrogen (mg/L)		0.08 (0.02 - 0.22)	0.11 (0.03 - 0.30)	0.07 (0.01 - 0.19)	0.13 (0.06 - 0.20)	0.18 (0.10 - 0.30)
Total Kjeldahl Nitrogen (mg/L)		0.14 (0.10 - 0.18)	0.15 (0.12 - 0.20)	0.12 (0.08 - 0.20)	0.16 (0.11 - 0.22)	0.19 (0.13 - 0.24)
Total Nitrogen (mg/L)		0.20 (0.12 - 0.35)	0.23 (0.16 - 0.47)	0.18 (0.10 - 0.29)	0.25 (0.19 - 0.31)	0.31 (0.21 - 0.47)
Orthophosphate Phosphorus (mg/L)		0.007 (<0.002 - 0.011)	0.008 (0.003 - 0.015)	0.007 (<0.002 - 0.011)	0.010 (0.006 - 0.018)	0.012 (0.005 - 0.023)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.03)	0.03 (0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.49 (0.18 - 0.90)	0.52 (0.22 - 0.88)	0.53 (0.22 - 0.90)	0.65 (0.20 - 0.92)	0.63 (0.22 - 1.07)
Chlorophyll-a (µg/L)		3.6 (0.8 - 11.6)	4.3 (0.5 - 16.1)	2.9 (0.4 - 7.5)	3.1 (0.6 - 7.8)	5.0 (0.7 - 15.0)
E.coli (count/100mL)		2 (1 - 4)	30 (1 - 1100)	1 (1 - 2)	22 (3 - 100)	14 (1 - 72)
Faecal Coliforms (count/100mL)		2 (1 - 8)	58 (2 - 1900)	1 (1 - 3)	47 (5 - 220)	38 (7 - 130)

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 2009 (continued)

Parameter		West Lamma Channel				
		SM5	SM6	SM7	SM9	SM18
Number of samples		12	12	12	12	12
Temperature (°C)		24.6 (18.2 - 29.6)	24.3 (18.3 - 29.4)	24.4 (17.7 - 28.9)	24.1 (16.5 - 28.8)	24.0 (18.1 - 29.1)
Salinity		31.6 (25.6 - 33.8)	31.5 (23.4 - 33.8)	31.1 (25.0 - 33.3)	30.7 (25.7 - 33.2)	32.2 (28.3 - 34.0)
Dissolved Oxygen (mg/L)		6.5 (5.5 - 8.9)	6.3 (5.7 - 7.6)	6.1 (4.9 - 7.8)	5.7 (4.1 - 6.9)	5.8 (3.9 - 7.1)
	Bottom	6.1 (3.8 - 8.0)	5.8 (2.9 - 7.0)	5.9 (4.7 - 7.7)	5.5 (3.2 - 6.6)	5.3 (2.3 - 7.2)
Dissolved Oxygen (% Saturation)		94 (78 - 132)	91 (80 - 111)	88 (73 - 114)	80 (61 - 92)	82 (58 - 104)
	Bottom	87 (57 - 118)	83 (43 - 103)	84 (72 - 113)	77 (48 - 93)	74 (33 - 102)
pH		8.1 (7.9 - 8.5)	8.1 (7.9 - 8.5)	8.1 (7.9 - 8.3)	8 (7.8 - 8.3)	8.1 (7.9 - 8.5)
Secchi Disc Depth (m)		2.3 (0.7 - 4.7)	2.4 (0.8 - 6.0)	2.1 (1.3 - 3.0)	2.0 (0.9 - 2.9)	3.2 (0.8 - 11.0)
Turbidity (NTU)		5.7 (1.3 - 12.5)	5.8 (0.8 - 15.1)	7.4 (1.5 - 16.6)	7.2 (2.9 - 14.4)	5.9 (1.1 - 11.2)
Suspended Solids (mg/L)		5.8 (1.6 - 13.8)	5.4 (1.3 - 10.8)	7.3 (1.8 - 19.7)	7.7 (3.8 - 16.0)	5.0 (1.4 - 9.3)
5-day Biochemical Oxygen Demand (mg/L)		1.1 (0.3 - 2.7)	1.0 (0.3 - 2.3)	0.9 (0.3 - 1.8)	0.9 (0.3 - 1.6)	0.7 (<0.1 - 1.5)
Ammonia Nitrogen (mg/L)		0.025 (0.008 - 0.067)	0.027 (0.013 - 0.061)	0.079 (0.031 - 0.137)	0.101 (0.037 - 0.200)	0.020 (<0.005 - 0.049)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.004)	0.002 (<0.001 - 0.005)	0.003 (0.002 - 0.005)	0.004 (0.002 - 0.009)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.020 (<0.002 - 0.059)	0.023 (<0.002 - 0.093)	0.035 (0.012 - 0.110)	0.040 (0.014 - 0.100)	0.014 (<0.002 - 0.043)
Nitrate Nitrogen (mg/L)		0.077 (0.016 - 0.310)	0.082 (0.005 - 0.314)	0.141 (0.047 - 0.367)	0.18 (0.042 - 0.363)	0.060 (<0.002 - 0.197)
Total Inorganic Nitrogen (mg/L)		0.12 (0.03 - 0.37)	0.13 (0.02 - 0.39)	0.26 (0.16 - 0.47)	0.32 (0.11 - 0.52)	0.09 (0.01 - 0.26)
Total Kjeldahl Nitrogen (mg/L)		0.17 (0.11 - 0.32)	0.17 (0.12 - 0.23)	0.24 (0.17 - 0.29)	0.25 (0.15 - 0.34)	0.13 (0.09 - 0.17)
Total Nitrogen (mg/L)		0.27 (0.14 - 0.67)	0.27 (0.13 - 0.57)	0.41 (0.28 - 0.67)	0.47 (0.23 - 0.66)	0.20 (0.12 - 0.33)
Orthophosphate Phosphorus (mg/L)		0.008 (<0.002 - 0.019)	0.009 (0.002 - 0.025)	0.015 (0.006 - 0.035)	0.019 (0.006 - 0.036)	0.008 (0.004 - 0.011)
Total Phosphorus (mg/L)		0.02 (<0.02 - 0.03)	0.03 (0.02 - 0.04)	0.03 (0.02 - 0.05)	0.04 (0.03 - 0.06)	0.02 (<0.02 - 0.02)
Silica (as SiO_2) (mg/L)		0.56 (0.21 - 0.99)	0.64 (0.22 - 1.06)	0.84 (0.28 - 1.30)	0.93 (0.46 - 1.30)	0.64 (0.21 - 1.00)
Chlorophyll-a (µg/L)		6.5 (0.6 - 23.2)	6.4 (0.8 - 25.5)	6.7 (0.8 - 21.0)	4.8 (1.3 - 18.3)	2.8 (0.7 - 12.8)
E.coli (count/100mL)		2 (1 - 6)	2 (1 - 14)	10 (1 - 870)	150 (3 - 1100)	1 (1 - 1)
Faecal Coliforms (count/100mL)		3 (1 - 15)	3 (1 - 42)	20 (1 - 2600)	270 (3 - 2000)	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 Southern WCZ in 2009 (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)		24.5 (16.1 - 29.1)	24.3 (16.6 - 28.9)	24.3 (16.4 - 28.9)	24.4 (16.2 - 29.1)	24.2 (16.6 - 29.1)	24.1 (16.6 - 29.1)
Salinity		30.4 (25.5 - 33.3)	30.6 (26.0 - 33.3)	30.7 (25.6 - 33.3)	30.5 (25.5 - 33.2)	31.0 (24.0 - 33.9)	31.0 (26.1 - 33.7)
Dissolved Oxygen (mg/L)		6.2 (5.1 - 7.6)	6.3 (5.0 - 7.8)	6.3 (5.3 - 8.0)	6.5 (4.8 - 7.9)	6.3 (5.1 - 7.1)	5.8 (3.9 - 7.6)
	Bottom	6.3 (5.4 - 7.8)	6.0 (4.5 - 7.8)	6.2 (5.0 - 8.0)	6.5 (4.8 - 7.9)	5.9 (2.4 - 7.7)	5.7 (2.9 - 7.6)
Dissolved Oxygen (% Saturation)		89 (74 - 105)	89 (69 - 115)	90 (74 - 108)	92 (72 - 107)	90 (76 - 104)	83 (57 - 102)
	Bottom	89 (76 - 109)	85 (67 - 116)	88 (72 - 113)	92 (72 - 107)	83 (36 - 104)	80 (43 - 103)
pH		8.1 (7.9 - 8.4)	8.1 (7.9 - 8.4)	8.1 (7.9 - 8.5)	8.1 (7.9 - 8.5)	8.1 (8.0 - 8.3)	8.1 (7.8 - 8.3)
Secchi Disc Depth (m)		1.8 (0.9 - 2.6)	2.1 (1.2 - 3.7)	2.0 (1.0 - 3.3)	2.3 (1.2 - 3.9)	2.7 (1.4 - 6.4)	2.0 (1.1 - 3.0)
Turbidity (NTU)		8.0 (2.1 - 13.4)	6.9 (1.6 - 13.1)	9.7 (1.7 - 23.5)	9.0 (1.9 - 20.8)	7.6 (1.4 - 18.8)	9.8 (3.2 - 25.0)
Suspended Solids (mg/L)		8.3 (4.0 - 12.0)	7.3 (2.0 - 15.7)	13.1 (2.3 - 36.0)	9.1 (2.5 - 27.7)	7.5 (1.2 - 23.3)	11.0 (3.2 - 33.0)
5-day Biochemical Oxygen Demand (mg/L)		1.2 (0.2 - 2.6)	1.1 (0.2 - 1.9)	1.0 (0.3 - 2.2)	1.1 (0.3 - 2.3)	0.7 (0.2 - 1.0)	0.7 (0.2 - 1.5)
Ammonia Nitrogen (mg/L)		0.065 (0.017 - 0.130)	0.068 (0.030 - 0.113)	0.049 (0.020 - 0.120)	0.034 (0.007 - 0.110)	0.023 (0.005 - 0.065)	0.028 (0.008 - 0.062)
Unionised Ammonia (mg/L)		0.003 (0.001 - 0.007)	0.004 (0.001 - 0.011)	0.003 (0.001 - 0.007)	0.002 (<0.001 - 0.005)	0.001 (<0.001 - 0.004)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.037 (0.017 - 0.110)	0.033 (0.014 - 0.110)	0.033 (0.013 - 0.120)	0.029 (0.009 - 0.081)	0.027 (<0.002 - 0.091)	0.031 (0.005 - 0.113)
Nitrate Nitrogen (mg/L)		0.174 (0.053 - 0.345)	0.150 (0.050 - 0.293)	0.140 (0.052 - 0.303)	0.130 (0.045 - 0.300)	0.106 (0.004 - 0.277)	0.135 (0.037 - 0.367)
Total Inorganic Nitrogen (mg/L)		0.28 (0.13 - 0.42)	0.25 (0.12 - 0.40)	0.22 (0.13 - 0.36)	0.19 (0.10 - 0.41)	0.16 (0.01 - 0.38)	0.19 (0.07 - 0.43)
Total Kjeldahl Nitrogen (mg/L)		0.24 (0.15 - 0.31)	0.23 (0.17 - 0.35)	0.21 (0.13 - 0.28)	0.20 (0.12 - 0.30)	0.16 (0.12 - 0.22)	0.16 (0.12 - 0.23)
Total Nitrogen (mg/L)		0.45 (0.26 - 0.62)	0.42 (0.25 - 0.57)	0.38 (0.26 - 0.55)	0.36 (0.25 - 0.54)	0.29 (0.13 - 0.55)	0.32 (0.20 - 0.56)
Orthophosphate Phosphorus (mg/L)		0.014 (<0.002 - 0.025)	0.013 (0.004 - 0.026)	0.011 (<0.002 - 0.026)	0.009 (<0.002 - 0.018)	0.008 (0.003 - 0.016)	0.009 (0.004 - 0.014)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.05)	0.04 (0.02 - 0.05)	0.03 (<0.02 - 0.05)	0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.04)	0.03 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.89 (0.30 - 1.50)	0.92 (0.58 - 1.63)	0.81 (0.15 - 1.50)	0.76 (0.15 - 1.40)	0.75 (0.17 - 1.30)	0.90 (0.17 - 1.53)
Chlorophyll-a (µg/L)		6.4 (2.3 - 16.0)	5.9 (1.9 - 16.7)	5.3 (1.6 - 17.3)	6.2 (1.8 - 20.0)	2.5 (1.0 - 5.6)	3.3 (1.3 - 7.5)
E.coli (count/100mL)		11 (1 - 87)	3 (1 - 18)	36 (1 - 2600)	2 (1 - 21)	1 (1 - 8)	1 (1 - 1)
Faecal Coliforms (count/100mL)		25 (1 - 150)	6 (1 - 61)	79 (3 - 3500)	3 (1 - 35)	2 (1 - 12)	2 (1 - 23)

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 2009

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)		23.6 (18.6 - 28.4)	23.8 (18.7 - 28.5)	23.8 (18.6 - 28.6)	24.0 (18.7 - 28.6)	24.0 (18.7 - 28.6)
Salinity		32.3 (27.0 - 33.6)	31.7 (22.5 - 33.5)	31.8 (24.9 - 33.6)	31.2 (21.4 - 33.4)	31.4 (23.6 - 33.3)
Dissolved Oxygen (mg/L)		5.5 (3.5 - 7.0)	5.6 (4.1 - 7.0)	5.3 (4.1 - 6.7)	5.2 (4.5 - 6.8)	5.1 (4.5 - 6.3)
	Bottom	5.4 (3.3 - 7.1)	5.5 (4.2 - 7.0)	5.1 (2.6 - 6.8)	5.2 (4.4 - 6.8)	5.0 (3.4 - 6.6)
Dissolved Oxygen (% Saturation)		78 (53 - 102)	79 (61 - 102)	76 (60 - 98)	74 (64 - 100)	73 (65 - 92)
	Bottom	76 (48 - 102)	78 (61 - 102)	72 (39 - 100)	74 (64 - 99)	71 (49 - 96)
pH		8.0 (7.8 - 8.3)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.4)	7.9 (7.6 - 8.3)	7.9 (7.6 - 8.4)
Secchi Disc Depth (m)		2.5 (1.5 - 3.4)	2.3 (1.5 - 3.2)	2.4 (1.6 - 3.0)	2.2 (1.2 - 3.0)	2.4 (1.1 - 3.1)
Turbidity (NTU)		5.6 (2.6 - 11.3)	4.9 (2.2 - 9.9)	5.1 (2.5 - 10.0)	5.4 (2.3 - 10.2)	5.3 (2.5 - 11.9)
Suspended Solids (mg/L)		7.2 (3.5 - 17.9)	5.2 (2.7 - 8.3)	5.8 (3.5 - 7.5)	5.7 (3.3 - 9.1)	6.0 (3.2 - 10.7)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.2 - 1.0)	0.7 (<0.1 - 1.2)	0.7 (0.2 - 1.2)	0.8 (0.3 - 1.5)	0.8 (0.1 - 1.7)
Ammonia Nitrogen (mg/L)		0.06 (0.029 - 0.190)	0.08 (0.041 - 0.200)	0.10 (0.049 - 0.203)	0.12 (0.062 - 0.203)	0.14 (0.069 - 0.227)
Unionised Ammonia (mg/L)		0.002 (0.001 - 0.005)	0.003 (0.002 - 0.006)	0.004 (0.001 - 0.007)	0.005 (0.002 - 0.011)	0.005 (0.001 - 0.009)
Nitrite Nitrogen (mg/L)		0.021 (0.004 - 0.102)	0.027 (0.004 - 0.154)	0.029 (0.005 - 0.152)	0.036 (0.008 - 0.197)	0.035 (0.011 - 0.171)
Nitrate Nitrogen (mg/L)		0.076 (0.022 - 0.201)	0.097 (0.020 - 0.313)	0.112 (0.026 - 0.360)	0.134 (0.043 - 0.370)	0.142 (0.054 - 0.360)
Total Inorganic Nitrogen (mg/L)		0.16 (0.07 - 0.34)	0.21 (0.07 - 0.60)	0.24 (0.08 - 0.57)	0.29 (0.12 - 0.63)	0.32 (0.15 - 0.60)
Total Kjeldahl Nitrogen (mg/L)		0.19 (0.09 - 0.33)	0.21 (0.10 - 0.35)	0.24 (0.15 - 0.38)	0.28 (0.17 - 0.37)	0.29 (0.17 - 0.43)
Total Nitrogen (mg/L)		0.29 (0.19 - 0.48)	0.33 (0.18 - 0.75)	0.38 (0.22 - 0.69)	0.45 (0.29 - 0.79)	0.47 (0.32 - 0.75)
Orthophosphate Phosphorus (mg/L)		0.016 (0.008 - 0.030)	0.019 (0.008 - 0.041)	0.021 (0.011 - 0.032)	0.025 (0.014 - 0.037)	0.028 (0.014 - 0.041)
Total Phosphorus (mg/L)		0.03 (0.02 - 0.05)	0.03 (0.02 - 0.06)	0.04 (0.02 - 0.05)	0.04 (0.03 - 0.05)	0.05 (0.04 - 0.06)
Silica (as SiO_2) (mg/L)		0.65 (0.18 - 1.80)	0.72 (0.21 - 2.60)	0.74 (0.20 - 2.47)	0.85 (0.19 - 3.30)	0.84 (0.21 - 2.83)
Chlorophyll-a (µg/L)		2.8 (0.4 - 7.3)	3.1 (0.7 - 9.1)	3.3 (0.7 - 8.3)	3.9 (0.7 - 10.1)	3.7 (0.8 - 11.4)
E.coli (count/100mL)		210 (53 - 950)	710 (100 - 9400)	2000 (510 - 8700)	3900 (160 - 19000)	2500 (200 - 11000)
Faecal Coliforms (count/100mL)		490 (69 - 3400)	1400 (150 - 21000)	4000 (760 - 12000)	8900 (360 - 46000)	6300 (680 - 30000)

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 2009 (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)		23.5 (17.1 - 29.5)	23.5 (17.0 - 29.1)	24.1 (19.0 - 28.7)	23.5 (16.9 - 29.2)	23.6 (17.0 - 29.1)
Salinity		31.4 (26.6 - 33.6)	31.4 (26.1 - 33.4)	31.1 (21.1 - 33.2)	31.4 (27.9 - 33.1)	30.4 (20.7 - 33.0)
Dissolved Oxygen (mg/L)		5.1 (3.5 - 6.7)	5.5 (3.9 - 6.3)	5.1 (4.4 - 6.3)	5.0 (3.9 - 6.2)	5.4 (4.2 - 6.6)
	Bottom	4.9 (3.0 - 6.4)	5.5 (3.9 - 6.4)	5.1 (4.2 - 6.1)	4.8 (3.0 - 6.3)	5.2 (3.6 - 6.2)
Dissolved Oxygen (% Saturation)		72 (52 - 97)	77 (59 - 90)	73 (64 - 93)	70 (57 - 82)	75 (62 - 94)
	Bottom	68 (43 - 93)	77 (58 - 91)	72 (62 - 89)	68 (44 - 84)	73 (53 - 86)
pH		8.0 (7.7 - 8.4)	8.0 (7.8 - 8.5)	7.9 (7.6 - 8.3)	8.0 (7.8 - 8.4)	8.0 (7.8 - 8.4)
Secchi Disc Depth (m)		2.3 (1.4 - 3.1)	2.2 (0.8 - 3.5)	2.0 (1.0 - 2.6)	2.0 (1.5 - 2.6)	2.0 (1.6 - 2.8)
Turbidity (NTU)		5.6 (2.1 - 11.3)	7.3 (2.4 - 21.5)	7.2 (3.1 - 14.0)	12.3 (5.0 - 27.0)	7.2 (3.6 - 14.6)
Suspended Solids (mg/L)		5.7 (3.4 - 10.5)	7.2 (3.3 - 13.7)	7.9 (3.3 - 12.4)	17.8 (6.0 - 51.0)	7.9 (4.2 - 13.3)
5-day Biochemical Oxygen Demand (mg/L)		1.0 (0.4 - 1.6)	1.0 (0.3 - 1.5)	0.7 (0.1 - 1.6)	0.8 (0.5 - 1.2)	0.7 (0.3 - 1.7)
Ammonia Nitrogen (mg/L)		0.187 (0.081 - 0.307)	0.178 (0.049 - 0.370)	0.150 (0.037 - 0.253)	0.180 (0.082 - 0.277)	0.118 (0.043 - 0.187)
Unionised Ammonia (mg/L)		0.007 (0.002 - 0.017)	0.007 (0.002 - 0.012)	0.005 (<0.001 - 0.010)	0.007 (0.003 - 0.015)	0.005 (0.002 - 0.013)
Nitrite Nitrogen (mg/L)		0.026 (0.010 - 0.049)	0.030 (0.008 - 0.089)	0.038 (0.011 - 0.190)	0.034 (0.010 - 0.107)	0.042 (0.010 - 0.120)
Nitrate Nitrogen (mg/L)		0.138 (0.062 - 0.437)	0.135 (0.046 - 0.457)	0.147 (0.072 - 0.413)	0.153 (0.069 - 0.353)	0.214 (0.070 - 0.730)
Total Inorganic Nitrogen (mg/L)		0.35 (0.15 - 0.55)	0.34 (0.12 - 0.56)	0.34 (0.20 - 0.64)	0.37 (0.25 - 0.51)	0.37 (0.23 - 0.82)
Total Kjeldahl Nitrogen (mg/L)		0.36 (0.17 - 0.50)	0.33 (0.18 - 0.55)	0.30 (0.17 - 0.42)	0.33 (0.15 - 0.50)	0.27 (0.13 - 0.36)
Total Nitrogen (mg/L)		0.52 (0.33 - 0.69)	0.50 (0.25 - 0.69)	0.49 (0.36 - 0.80)	0.52 (0.38 - 0.66)	0.52 (0.38 - 1.00)
Orthophosphate Phosphorus (mg/L)		0.031 (0.009 - 0.048)	0.026 (0.005 - 0.046)	0.029 (0.018 - 0.043)	0.030 (0.014 - 0.042)	0.023 (0.006 - 0.035)
Total Phosphorus (mg/L)		0.05 (0.03 - 0.07)	0.04 (0.02 - 0.06)	0.05 (0.04 - 0.06)	0.05 (0.03 - 0.07)	0.04 (0.03 - 0.05)
Silica (as SiO_2) (mg/L)		0.87 (0.33 - 1.17)	0.83 (0.24 - 1.20)	0.88 (0.19 - 3.10)	0.98 (0.20 - 1.50)	0.95 (0.11 - 1.67)
Chlorophyll-a (µg/L)		2.9 (0.6 - 10.8)	3.6 (0.5 - 14.0)	4.2 (0.7 - 12.0)	2.2 (0.6 - 7.3)	4.6 (0.5 - 21.7)
E.coli (count/100mL)		4700 (750 - 29000)	4000 (780 - 29000)	1600 (450 - 8500)	2300 (380 - 11000)	670 (56 - 2800)
Faecal Coliforms (count/100mL)		11000 (1100 - 42000)	10000 (1300 - 73000)	4300 (990 - 17000)	5900 (760 - 28000)	1500 (150 - 6600)

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 2009

Parameter		Chai Wan	Tathong Channel	
		EM1	EM2	EM3
Number of samples		12	12	12
Temperature (°C)		23.2 (17.4 - 28.5)	23.4 (17.5 - 28.5)	23.3 (17.7 - 28.4)
Salinity		32.7 (30.8 - 33.9)	32.2 (25.7 - 33.9)	32.7 (30.1 - 33.9)
Dissolved Oxygen (mg/L)		5.6 (3.7 - 7.1)	5.8 (4.5 - 7.3)	6.0 (4.1 - 7.4)
	Bottom	5.3 (2.7 - 7.1)	5.4 (3.1 - 7.2)	5.5 (2.6 - 7.4)
Dissolved Oxygen (% Saturation)		79 (53 - 103)	82 (66 - 106)	85 (60 - 103)
	Bottom	75 (38 - 102)	76 (44 - 102)	77 (38 - 102)
pH		8.0 (7.6 - 8.2)	8.0 (7.6 - 8.3)	8.0 (7.6 - 8.3)
Secchi Disc Depth (m)		2.6 (2.0 - 3.2)	2.7 (1.8 - 4.0)	3.1 (1.8 - 6.1)
Turbidity (NTU)		4.4 (2.0 - 9.9)	4.4 (2.3 - 9.3)	4.6 (1.4 - 8.9)
Suspended Solids (mg/L)		4.5 (2.8 - 6.9)	4.0 (2.8 - 6.6)	4.6 (1.2 - 11.2)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (<0.1 - 1.6)	0.6 (<0.1 - 1.6)	0.5 (0.1 - 1.1)
Ammonia Nitrogen (mg/L)		0.039 (0.014 - 0.063)	0.029 (0.008 - 0.055)	0.020 (0.005 - 0.037)
Unionised Ammonia (mg/L)		0.001 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)	<0.001 (<0.001 - 0.002)
Nitrite Nitrogen (mg/L)		0.016 (0.003 - 0.073)	0.015 (<0.002 - 0.087)	0.009 (<0.002 - 0.045)
Nitrate Nitrogen (mg/L)		0.062 (0.019 - 0.197)	0.055 (0.009 - 0.217)	0.042 (0.006 - 0.167)
Total Inorganic Nitrogen (mg/L)		0.12 (0.04 - 0.30)	0.10 (0.02 - 0.34)	0.07 (0.02 - 0.23)
Total Kjeldahl Nitrogen (mg/L)		0.15 (0.11 - 0.23)	0.15 (0.09 - 0.20)	0.13 (0.09 - 0.20)
Total Nitrogen (mg/L)		0.23 (0.14 - 0.40)	0.22 (0.11 - 0.47)	0.18 (0.10 - 0.34)
Orthophosphate Phosphorus (mg/L)		0.012 (0.008 - 0.018)	0.010 (0.005 - 0.019)	0.009 (0.006 - 0.014)
Total Phosphorus (mg/L)		0.03 (0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.62 (0.23 - 1.76)	0.58 (0.20 - 1.87)	0.56 (0.24 - 1.36)
Chlorophyll-*a* (µg/L)		3.5 (0.8 - 8.6)	3.4 (0.6 - 10.7)	2.4 (0.7 - 4.9)
E.coli (count/100mL)		65 (6 - 470)	19 (3 - 240)	3 (1 - 52)
Faecal Coliforms (count/100mL)		140 (7 - 1400)	46 (5 - 970)	6 (1 - 140)

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 2009

Parameter		Hong Kong Island (West) WM1	WM2	Tsing Yi (South) WM3	Tsing Yi (West) WM4
Number of samples		12	12	12	12
Temperature (°C)		23.4 (17.0 - 29.2)	23.4 (16.9 - 29.1)	23.4 (16.9 - 29.0)	23.3 (16.8 - 29.1)
Salinity		32.3 (28.7 - 33.6)	31.6 (27.6 - 33.2)	31.8 (29.3 - 33.1)	31.6 (28.4 - 33.2)
Dissolved Oxygen (mg/L)		5.7 (3.0 - 6.8)	5.5 (3.8 - 6.5)	5.3 (4.0 - 6.3)	5.2 (3.4 - 6.6)
	Bottom	5.5 (1.8 - 6.9)	5.5 (3.4 - 6.6)	5.1 (2.3 - 6.5)	4.9 (2.2 - 6.5)
Dissolved Oxygen (% Saturation)		80 (44 - 93)	78 (56 - 93)	74 (59 - 87)	73 (50 - 91)
	Bottom	77 (26 - 93)	77 (49 - 93)	72 (33 - 90)	69 (32 - 91)
pH		8.1 (7.9 - 8.5)	8.0 (7.9 - 8.5)	8.0 (7.9 - 8.5)	8.0 (7.9 - 8.4)
Secchi Disc Depth (m)		2.5 (1.7 - 3.3)	2.3 (1.5 - 3.1)	2.2 (1.2 - 3.1)	1.9 (1.2 - 2.9)
Turbidity (NTU)		6.2 (2.2 - 11.7)	6.9 (2.6 - 11.1)	7.4 (3.5 - 13.5)	8.2 (2.9 - 18.8)
Suspended Solids (mg/L)		6.1 (3.0 - 12.0)	7.3 (3.5 - 13.6)	7.6 (4.5 - 11.7)	8.9 (3.3 - 20.2)
5-day Biochemical Oxygen Demand (mg/L)		0.7 (0.2 - 2.3)	0.8 (0.3 - 3.3)	0.9 (0.3 - 2.0)	0.7 (0.2 - 1.4)
Ammonia Nitrogen (mg/L)		0.052 (0.007 - 0.107)	0.120 (0.006 - 0.223)	0.151 (0.011 - 0.387)	0.100 (0.028 - 0.177)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.006)	0.005 (<0.001 - 0.010)	0.006 (<0.001 - 0.011)	0.004 (0.001 - 0.012)
Nitrite Nitrogen (mg/L)		0.019 (<0.002 - 0.055)	0.032 (0.008 - 0.123)	0.033 (0.009 - 0.147)	0.035 (0.010 - 0.127)
Nitrate Nitrogen (mg/L)		0.070 (0.014 - 0.186)	0.127 (0.031 - 0.370)	0.121 (0.050 - 0.293)	0.152 (0.045 - 0.333)
Total Inorganic Nitrogen (mg/L)		0.14 (0.04 - 0.25)	0.28 (0.06 - 0.49)	0.31 (0.16 - 0.47)	0.29 (0.11 - 0.45)
Total Kjeldahl Nitrogen (mg/L)		0.17 (0.12 - 0.20)	0.26 (0.14 - 0.38)	0.29 (0.16 - 0.62)	0.23 (0.13 - 0.33)
Total Nitrogen (mg/L)		0.26 (0.18 - 0.38)	0.42 (0.21 - 0.61)	0.45 (0.29 - 0.71)	0.42 (0.24 - 0.58)
Orthophosphate Phosphorus (mg/L)		0.013 (0.006 - 0.022)	0.021 (0.010 - 0.033)	0.025 (0.009 - 0.043)	0.021 (0.012 - 0.032)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.03)	0.04 (0.02 - 0.04)	0.04 (0.02 - 0.07)	0.04 (0.02 - 0.05)
Silica (as SiO_2) (mg/L)		0.71 (0.10 - 1.12)	0.87 (0.11 - 1.60)	0.86 (0.15 - 1.30)	0.88 (0.18 - 1.50)
Chlorophyll-*a* (µg/L)		2.5 (0.7 - 7.7)	2.7 (0.6 - 10.7)	2.3 (0.6 - 6.5)	3.0 (0.6 - 9.0)
E.coli (count/100mL)		100 (15 - 560)	860 (39 - 10000)	2600 (340 - 33000)	560 (41 - 4400)
Faecal Coliforms (count/100mL)		200 (31 - 1300)	1800 (89 - 19000)	6900 (840 - 74000)	1300 (82 - 7900)

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 2009

Parameter		Junk Bay JM3	Junk Bay JM4
Number of samples		12	12
Temperature (°C)		23.5 (16.8 - 28.4)	23.3 (17.0 - 28.4)
Salinity		32.1 (27.7 - 33.6)	32.5 (29.5 - 33.8)
Dissolved Oxygen (mg/L)		6.0 (4.9 - 7.3)	5.8 (4.8 - 7.0)
	Bottom	5.6 (3.5 - 7.0)	5.3 (2.7 - 7.1)
Dissolved Oxygen (% Saturation)		86 (71 - 112)	83 (69 - 102)
	Bottom	79 (50 - 100)	74 (39 - 101)
pH		8 (7.7 - 8.3)	8.0 (7.7 - 8.3)
Secchi Disc Depth (m)		2.7 (1.8 - 3.5)	2.8 (1.8 - 3.5)
Turbidity (NTU)		4.0 (1.2 - 9.1)	4.6 (2.0 - 9.9)
Suspended Solids (mg/L)		4.3 (2.2 - 7.9)	5.0 (2.5 - 8.6)
5-day Biochemical Oxygen Demand (mg/L)		0.8 (0.2 - 1.7)	0.8 (<0.1 - 1.8)
Ammonia Nitrogen (mg/L)		0.05 (0.017 - 0.089)	0.04 (0.021 - 0.068)
Unionised Ammonia (mg/L)		0.002 (<0.001 - 0.003)	0.001 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.019 (0.003 - 0.091)	0.015 (0.002 - 0.057)
Nitrate Nitrogen (mg/L)		0.064 (0.029 - 0.174)	0.056 (0.020 - 0.147)
Total Inorganic Nitrogen (mg/L)		0.13 (0.05 - 0.29)	0.11 (0.05 - 0.24)
Total Kjeldahl Nitrogen (mg/L)		0.18 (0.08 - 0.29)	0.15 (0.06 - 0.22)
Total Nitrogen (mg/L)		0.26 (0.14 - 0.41)	0.23 (0.11 - 0.33)
Orthophosphate Phosphorus (mg/L)		0.013 (0.004 - 0.022)	0.012 (0.007 - 0.018)
Total Phosphorus (mg/L)		0.03 (<0.02 - 0.04)	0.03 (0.02 - 0.03)
Silica (as SiO_2) (mg/L)		0.60 (0.09 - 1.77)	0.59 (0.15 - 1.40)
Chlorophyll-a (µg/L)		4.4 (0.8 - 11.5)	4.0 (0.6 - 13.0)
E.coli (count/100mL)		49 (11 - 430)	55 (11 - 150)
Faecal Coliforms (count/100mL)		140 (59 - 770)	140 (18 - 380)

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 2009

Parameter		Inner Deep Bay DM1	Inner Deep Bay DM2	Inner Deep Bay DM3	Outer Deep Bay DM4	Outer Deep Bay DM5
Number of samples		12	12	12	12	12
Temperature (°C)		24.7 (13.8 - 33.2)	24.6 (13.9 - 31.3)	24.6 (14.8 - 30.9)	24.7 (16.6 - 30.2)	24.7 (17.2 - 30.0)
Salinity		17.5 (8.2 - 23.3)	19.5 (10.6 - 24.7)	22.9 (13.8 - 30.1)	24.2 (14.6 - 31.0)	26.9 (16.5 - 33.0)
Dissolved Oxygen (mg/L)		4.1 (1.0 - 6.0)	5.0 (2.2 - 8.5)	6.2 (4.9 - 7.9)	6.3 (5.0 - 8.6)	6.4 (5.1 - 8.8)
	Bottom	NM	NM	NM	6.0 (4.7 - 8.5)	6.1 (4.6 - 8.4)
Dissolved Oxygen (% Saturation)		55 (13 - 77)	67 (29 - 105)	85 (70 - 102)	86 (73 - 108)	89 (74 - 112)
	Bottom	NM	NM	NM	83 (66 - 106)	85 (66 - 107)
pH		7.4 (6.9 - 7.9)	7.5 (7.0 - 7.8)	7.7 (7.5 - 8.0)	7.8 (7.6 - 8.0)	7.9 (7.7 - 8.1)
Secchi Disc Depth (m)		0.4 (0.1 - 0.8)	0.4 (0.1 - 0.9)	0.6 (0.1 - 1.0)	0.7 (0.1 - 1.3)	1.0 (0.5 - 1.4)
Turbidity (NTU)		43.3 (14.4 - 104.0)	37.7 (15.5 - 97.0)	22.6 (10.7 - 45.5)	21.4 (10.6 - 45.9)	15.6 (11.0 - 23.8)
Suspended Solids (mg/L)		58.8 (12.0 - 220.0)	38.4 (9.5 - 130.0)	23.2 (3.8 - 73.0)	18.9 (4.9 - 41.5)	10.7 (4.8 - 24.3)
5-day Biochemical Oxygen Demand (mg/L)		4.1 (1.8 - 13.0)	3.7 (1.1 - 12.0)	1.6 (0.2 - 4.5)	0.9 (<0.1 - 1.7)	0.8 (<0.1 - 1.5)
Ammonia Nitrogen (mg/L)		4.04 (1.200 - 8.300)	2.63 (0.460 - 4.400)	0.57 (0.200 - 1.200)	0.30 (0.130 - 0.465)	0.17 (0.088 - 0.303)
Unionised Ammonia (mg/L)		0.050 (0.012 - 0.108)	0.046 (0.008 - 0.095)	0.015 (0.004 - 0.024)	0.009 (0.005 - 0.020)	0.007 (0.003 - 0.017)
Nitrite Nitrogen (mg/L)		0.254 (0.170 - 0.340)	0.280 (0.170 - 0.350)	0.202 (0.084 - 0.350)	0.158 (0.060 - 0.295)	0.113 (0.029 - 0.210)
Nitrate Nitrogen (mg/L)		0.470 (0.150 - 0.940)	0.505 (0.210 - 0.890)	0.678 (0.340 - 1.000)	0.564 (0.230 - 0.820)	0.438 (0.099 - 0.773)
Total Inorganic Nitrogen (mg/L)		4.77 (2.36 - 8.74)	3.42 (1.52 - 4.96)	1.45 (0.98 - 1.95)	1.03 (0.68 - 1.32)	0.72 (0.27 - 1.22)
Total Kjeldahl Nitrogen (mg/L)		4.86 (1.50 - 11.00)	3.09 (0.76 - 5.20)	0.81 (0.48 - 1.30)	0.53 (0.27 - 0.73)	0.36 (0.19 - 0.62)
Total Nitrogen (mg/L)		5.58 (2.66 - 11.40)	3.87 (1.82 - 5.76)	1.69 (1.15 - 2.05)	1.25 (0.92 - 1.56)	0.91 (0.48 - 1.54)
Orthophosphate Phosphorus (mg/L)		0.372 (0.190 - 0.650)	0.283 (0.150 - 0.410)	0.109 (0.031 - 0.190)	0.057 (0.012 - 0.094)	0.038 (0.009 - 0.066)
Total Phosphorus (mg/L)		0.55 (0.25 - 0.94)	0.38 (0.18 - 0.56)	0.16 (0.06 - 0.23)	0.09 (0.07 - 0.13)	0.06 (0.04 - 0.10)
Silica (as SiO_2) (mg/L)		5.94 (3.00 - 8.50)	4.75 (0.94 - 8.70)	2.78 (0.49 - 5.70)	2.49 (0.26 - 4.75)	1.92 (0.27 - 4.13)
Chlorophyll-a (µg/L)		36.0 (1.7 - 190.0)	30.2 (0.5 - 160.0)	5.0 (0.5 - 12.0)	3.2 (0.8 - 6.9)	2.9 (0.5 - 7.2)
E.coli (count/100mL)		1500 (66 - 35000)	470 (7 - 4700)	32 (1 - 210)	150 (48 - 990)	220 (45 - 640)
Faecal Coliforms (count/100mL)		2600 (100 - 55000)	770 (16 - 6600)	72 (5 - 450)	280 (95 - 1700)	500 (130 - 1400)

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. N.M. – not measured.

Summary of water quality statistics for the North Western WCZ in 2009

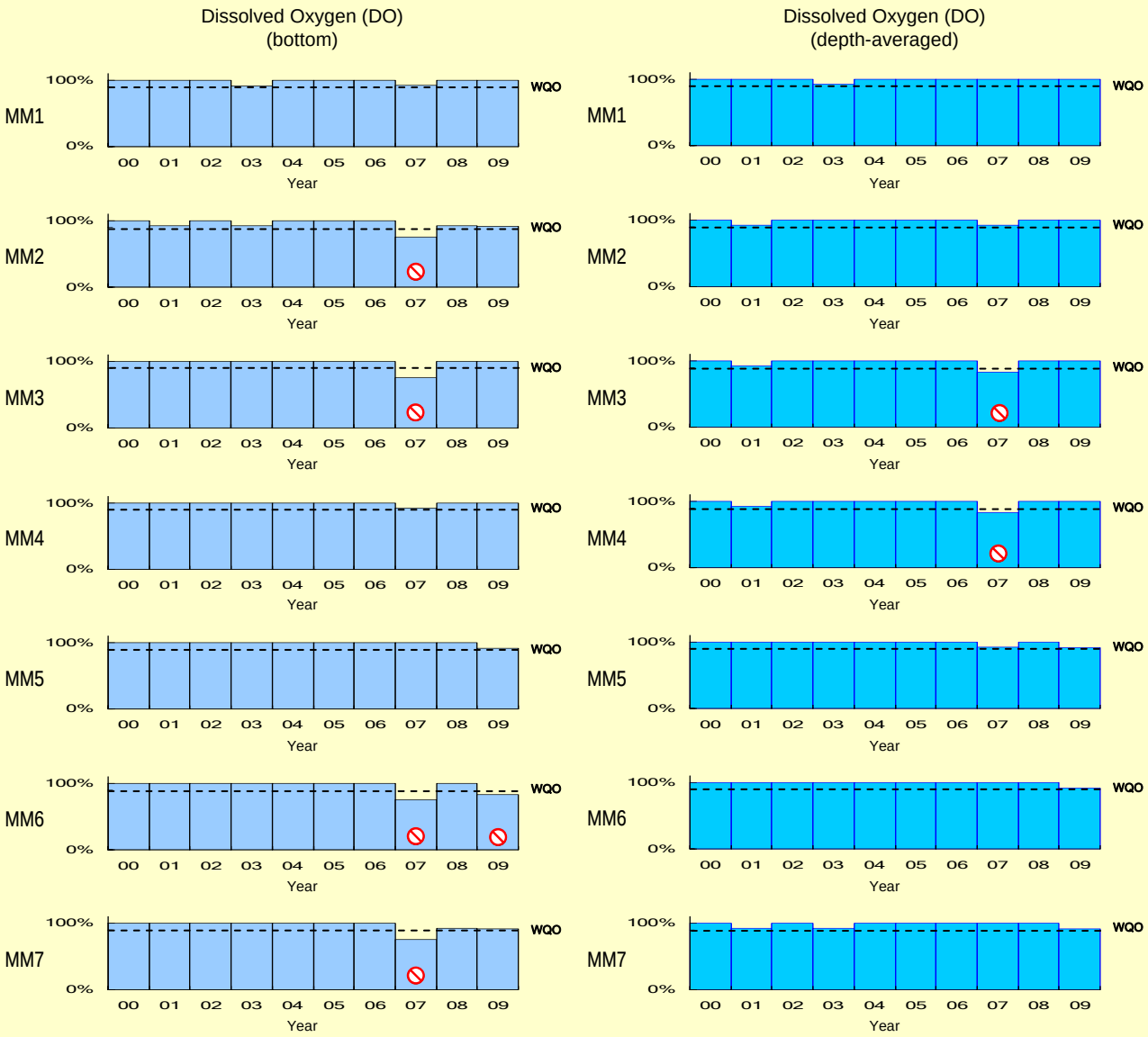
Parameter		Lantau Island (North) NM1	Pearl Island NM2	Pillar Point NM3	Urmston Road NM5	Chek Lap Kok (North) NM6	Chek Lap Kok (West) NM8
Number of samples		12	12	12	12	12	12
Temperature (°C)		23.7 (17.1 - 29.0)	24.0 (17.4 - 29.2)	24.1 (17.2 - 29.6)	24.1 (17.7 - 29.7)	24.1 (16.7 - 29.8)	24.0 (16.9 - 29.7)
Salinity		30.9 (26.2 - 33.1)	29.2 (19.9 - 33.2)	29.1 (20.9 - 33.2)	28.3 (22.0 - 33.1)	27.9 (16.1 - 33.0)	29.6 (20.0 - 33.4)
Dissolved Oxygen (mg/L)		5.2 (3.9 - 6.7)	5.6 (4.6 - 6.9)	5.6 (4.2 - 7.2)	5.5 (4.1 - 6.7)	6.2 (5.0 - 7.6)	6.2 (4.1 - 10.0)
	Bottom	5.0 (2.7 - 6.9)	5.4 (3.9 - 6.9)	5.4 (3.8 - 7.1)	5.2 (2.9 - 7.2)	6.1 (4.8 - 8.0)	6.0 (3.5 - 10.1)
Dissolved Oxygen (% Saturation)		73 (58 - 98)	79 (66 - 101)	79 (59 - 105)	77 (58 - 97)	87 (71 - 107)	87 (60 - 127)
	Bottom	70 (39 - 97)	76 (57 - 100)	77 (55 - 104)	73 (42 - 98)	85 (69 - 102)	84 (52 - 127)
pH		7.9 (7.8 - 8.1)	7.9 (7.8 - 8.1)	7.9 (7.8 - 8.1)	7.9 (7.8 - 8.0)	8.0 (7.8 - 8.1)	8.0 (7.9 - 8.2)
Secchi Disc Depth (m)		1.8 (0.9 - 2.3)	1.8 (1.5 - 2.1)	1.8 (1.0 - 2.5)	1.7 (0.8 - 2.0)	1.6 (0.7 - 2.7)	1.7 (0.8 - 2.2)
Turbidity (NTU)		10.4 (2.9 - 19.6)	9.3 (3.0 - 19.5)	11.1 (4.9 - 32.4)	14 (5.2 - 27.9)	13.2 (6.9 - 38.1)	16.7 (6.2 - 43.3)
Suspended Solids (mg/L)		11.4 (3.4 - 27.3)	9.3 (3.1 - 22.0)	11.3 (4.5 - 30.7)	14.1 (6.3 - 26.7)	13.4 (5.2 - 41.3)	20.6 (6.6 - 59.3)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.2 - 1.3)	0.6 (0.1 - 1.7)	0.7 (0.2 - 1.2)	0.7 (0.2 - 1.3)	0.7 (0.2 - 1.4)	0.7 (<0.1 - 1.5)
Ammonia Nitrogen (mg/L)		0.106 (0.010 - 0.167)	0.108 (0.013 - 0.160)	0.108 (0.012 - 0.170)	0.137 (0.032 - 0.253)	0.081 (0.033 - 0.143)	0.040 (0.013 - 0.079)
Unionised Ammonia (mg/L)		0.003 (<0.001 - 0.006)	0.004 (<0.001 - 0.006)	0.004 (<0.001 - 0.006)	0.004 (0.001 - 0.006)	0.003 (0.001 - 0.005)	0.002 (<0.001 - 0.003)
Nitrite Nitrogen (mg/L)		0.040 (0.011 - 0.143)	0.053 (0.011 - 0.157)	0.058 (0.015 - 0.167)	0.072 (0.026 - 0.183)	0.069 (0.021 - 0.200)	0.038 (0.009 - 0.088)
Nitrate Nitrogen (mg/L)		0.172 (0.065 - 0.380)	0.255 (0.059 - 0.670)	0.272 (0.058 - 0.637)	0.33 (0.095 - 0.700)	0.347 (0.101 - 0.857)	0.215 (0.030 - 0.790)
Total Inorganic Nitrogen (mg/L)		0.32 (0.15 - 0.49)	0.42 (0.12 - 0.88)	0.44 (0.11 - 0.86)	0.54 (0.25 - 0.92)	0.50 (0.20 - 1.05)	0.29 (0.07 - 0.89)
Total Kjeldahl Nitrogen (mg/L)		0.26 (0.18 - 0.35)	0.26 (0.12 - 0.33)	0.27 (0.19 - 0.35)	0.30 (0.19 - 0.40)	0.26 (0.17 - 0.41)	0.21 (0.15 - 0.28)
Total Nitrogen (mg/L)		0.47 (0.38 - 0.61)	0.57 (0.30 - 1.05)	0.60 (0.31 - 1.06)	0.70 (0.43 - 1.10)	0.67 (0.31 - 1.23)	0.46 (0.22 - 1.04)
Orthophosphate Phosphorus (mg/L)		0.022 (0.013 - 0.030)	0.023 (0.012 - 0.036)	0.024 (0.010 - 0.037)	0.028 (0.020 - 0.042)	0.020 (0.007 - 0.041)	0.013 (0.005 - 0.027)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.06)	0.04 (0.03 - 0.05)	0.04 (0.03 - 0.05)	0.05 (0.03 - 0.07)	0.04 (0.03 - 0.06)	0.03 (0.02 - 0.05)
Silica (as SiO_2) (mg/L)		1.00 (0.30 - 1.97)	1.24 (0.30 - 2.70)	1.29 (0.29 - 2.87)	1.45 (0.40 - 2.97)	1.53 (0.40 - 4.23)	1.24 (0.45 - 4.33)
Chlorophyll-a (µg/L)		2.4 (0.8 - 6.0)	2.6 (0.7 - 7.1)	3.4 (1.0 - 12.0)	3.8 (0.5 - 13.0)	5.6 (0.7 - 19.7)	4.8 (0.9 - 21.3)
E.coli (count/100mL)		480 (50 - 2600)	290 (42 - 1300)	320 (100 - 820)	390 (92 - 940)	19 (1 - 170)	2 (1 - 4)
Faecal Coliforms (count/100mL)		1200 (130 - 6800)	710 (120 - 3800)	850 (200 - 3000)	930 (220 - 2300)	38 (1 - 300)	4 (1 - 16)

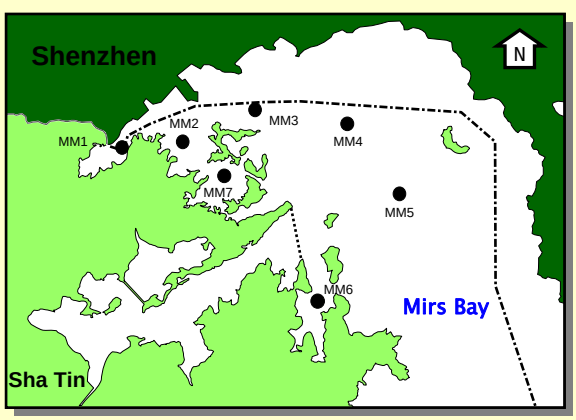
Note : 1. Unless otherwise specified, data presented are depth-averaged (A) values calculated by taking the means of three depths: Surface (S), Mid-depth (M), Bottom (B).

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.

Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ



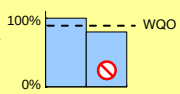


Dissolved Oxygen (DO)

1. Bottom

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

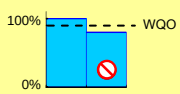
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

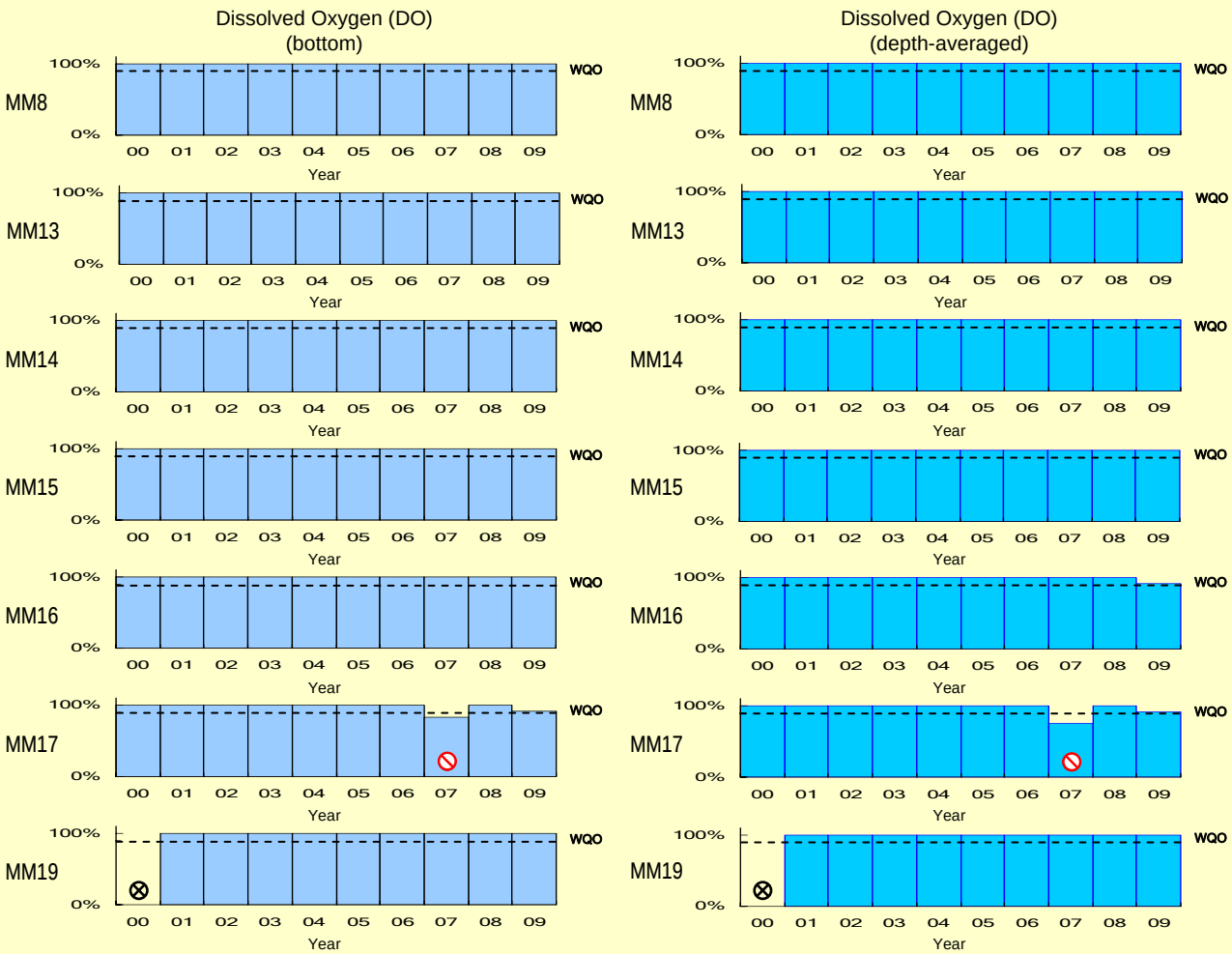
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

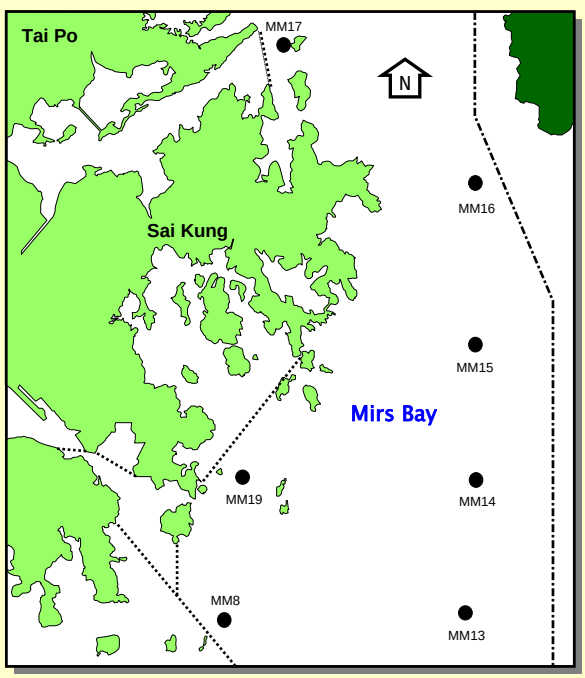
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

Levels of compliance with key Water Quality Objectives in 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

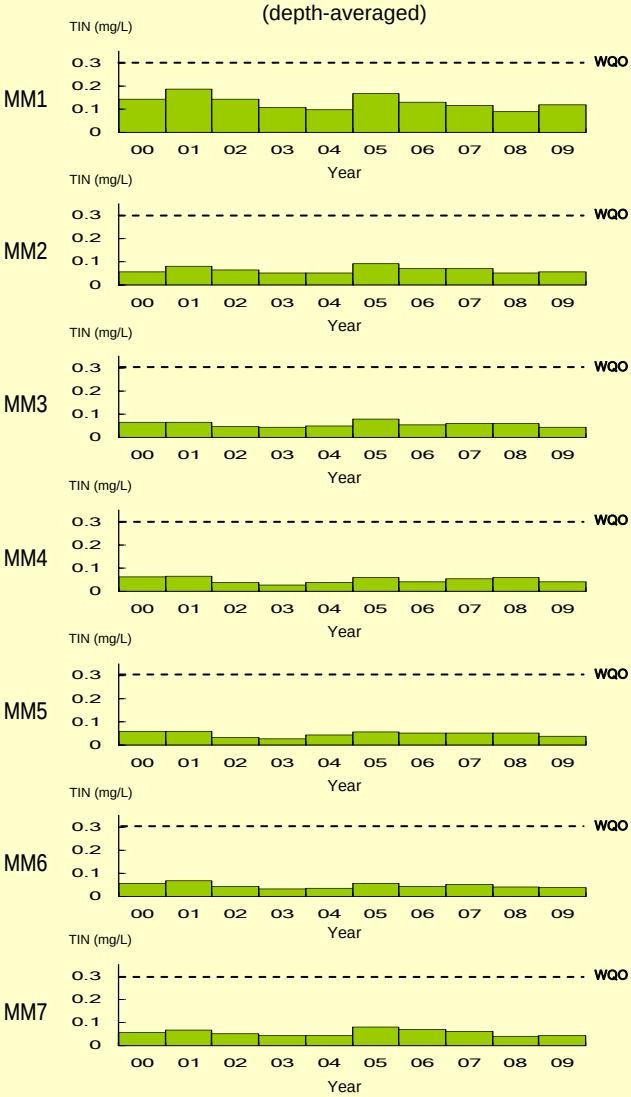
% sample with depth-averaged DO ≥ 4 mg/L

Non-compliance

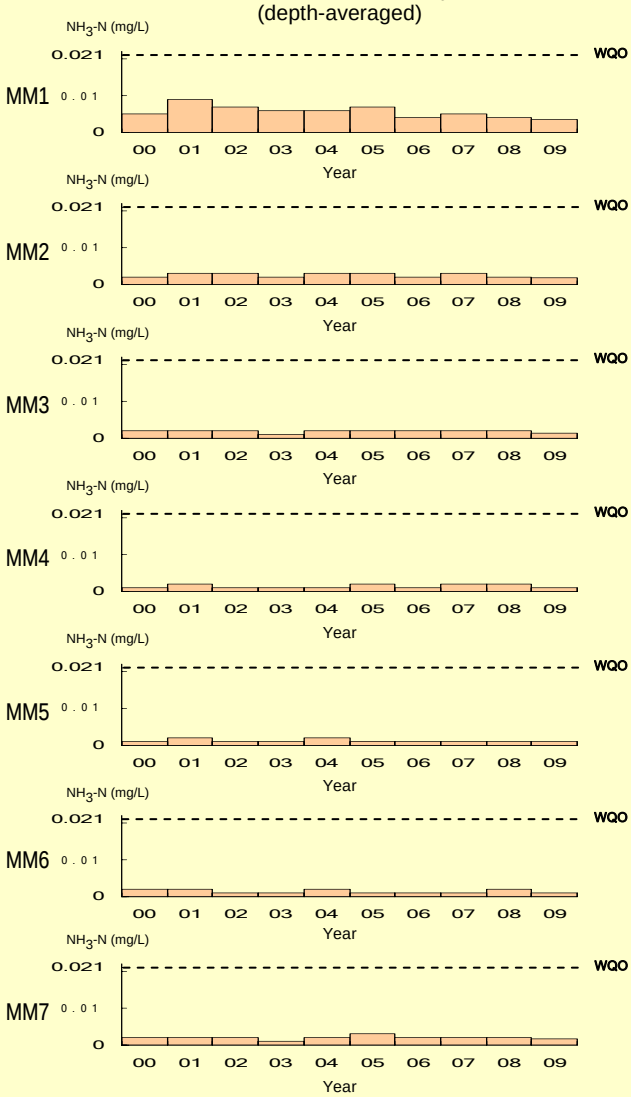
No data ; monitoring has not started

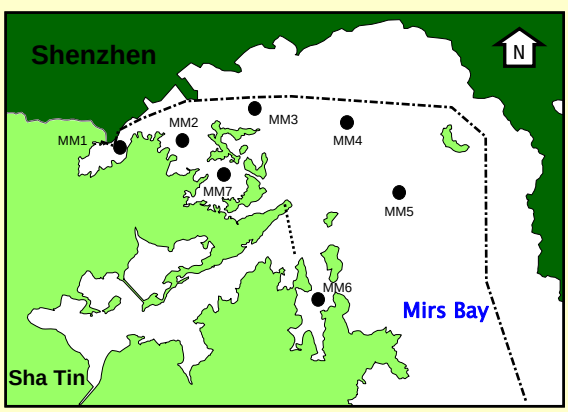
Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)



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





Total Inorganic Nitrogen (TIN)

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

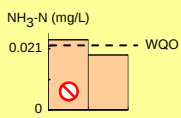
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

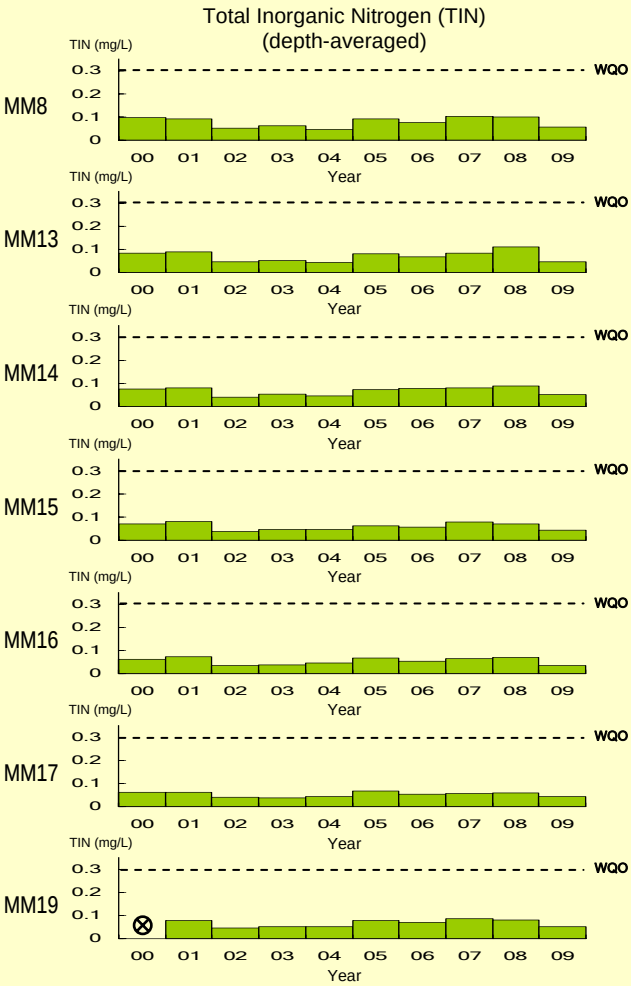
WQO : annual mean for depth-averaged NH_3-N ≤ 0.021 mg/L

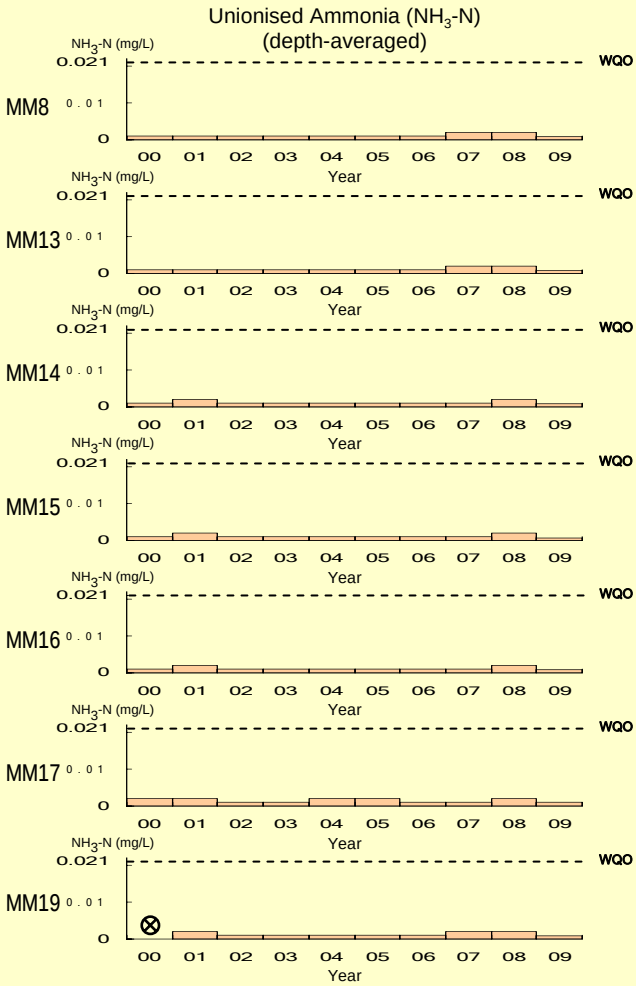
annual mean for depth-averaged NH_3-N

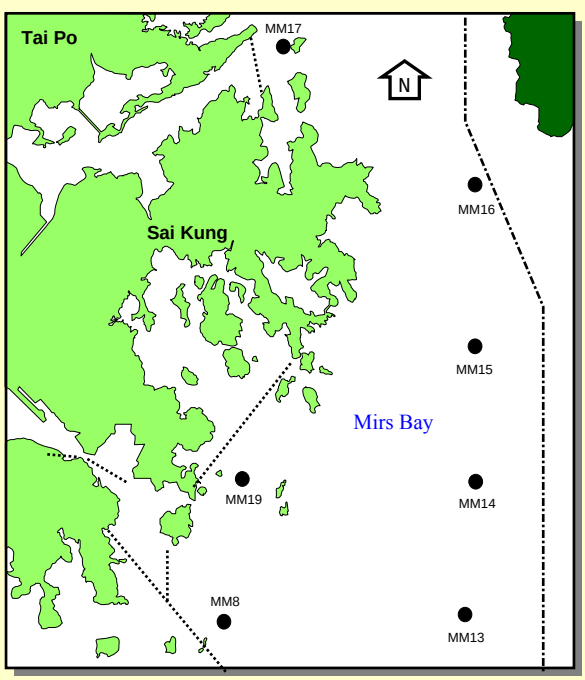
Non-compliance



Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)



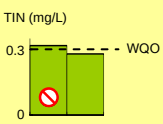




Total Inorganic Nitrogen (TIN)

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

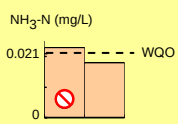
annual mean for depth-averaged TIN



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

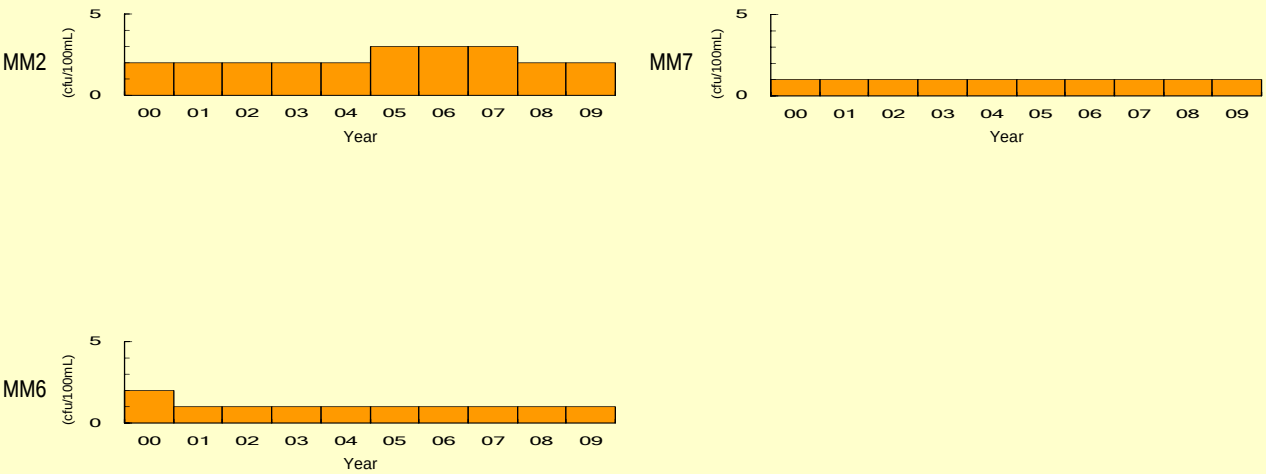


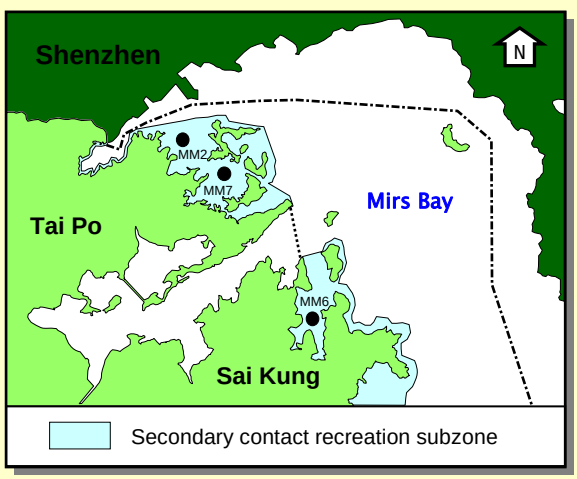
Non-compliance

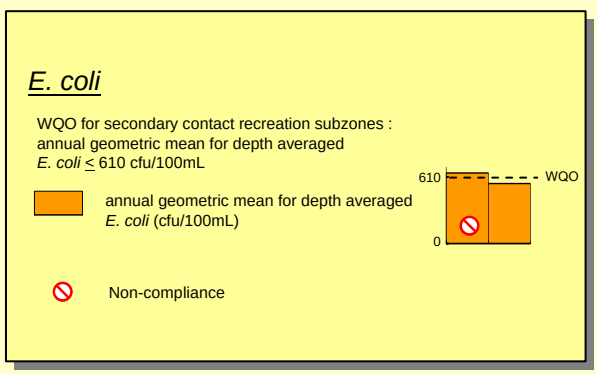
No data ; monitoring has not started

Levels of compliance with key Water Quality Objectives in the Mirs Bay WCZ (continued)

E. coli
(annual geometric mean)

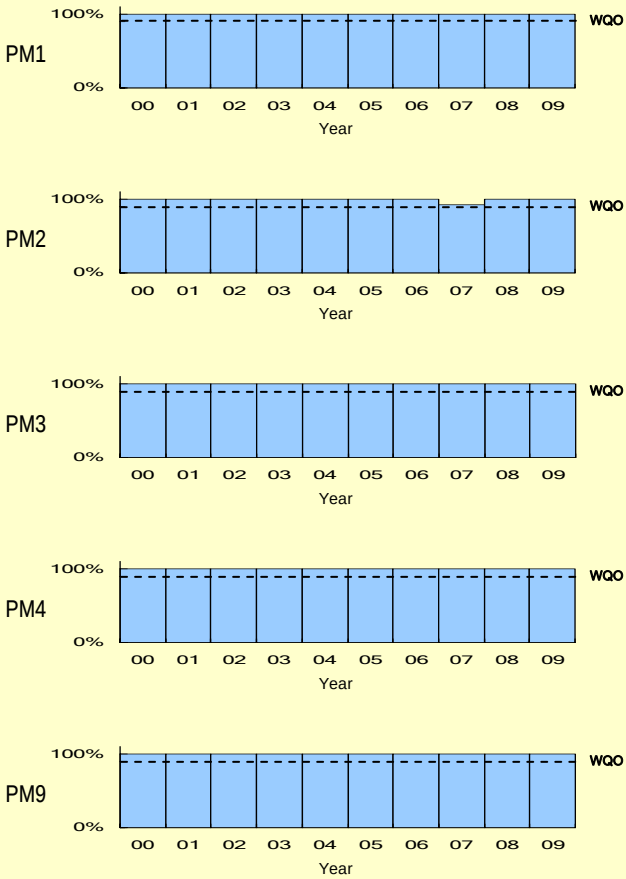




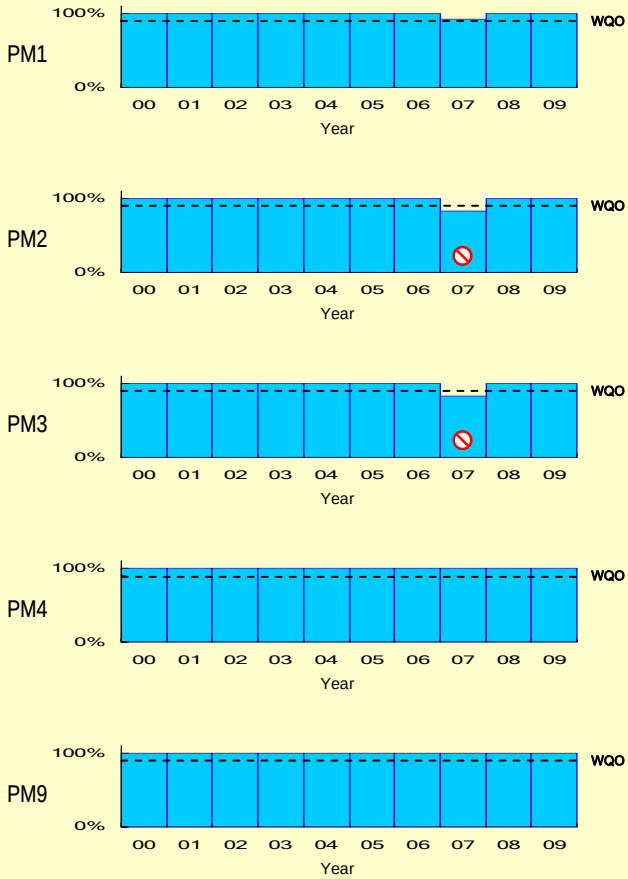


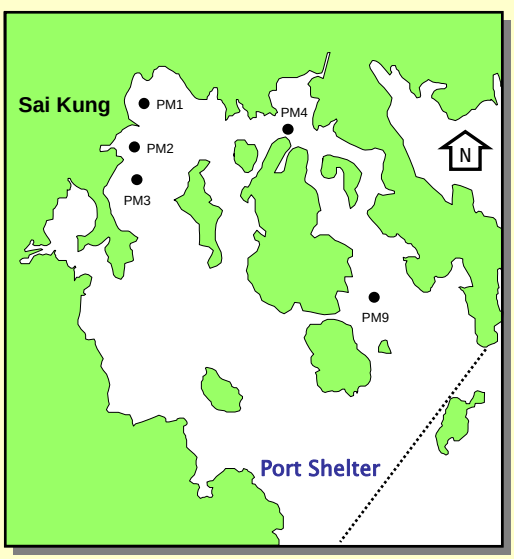
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



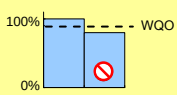


Dissolved Oxygen (DO)

1. Bottom

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

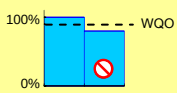
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

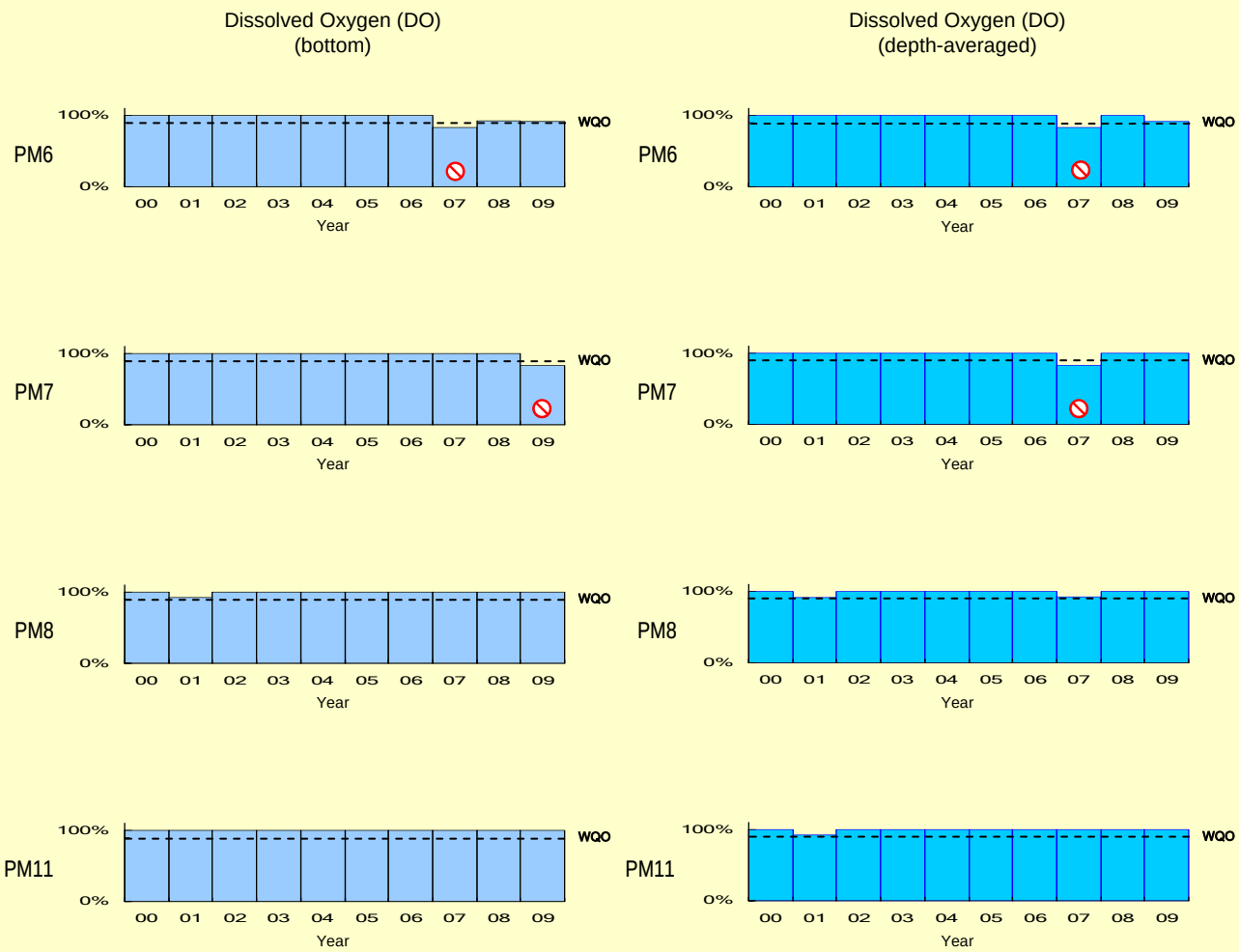
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

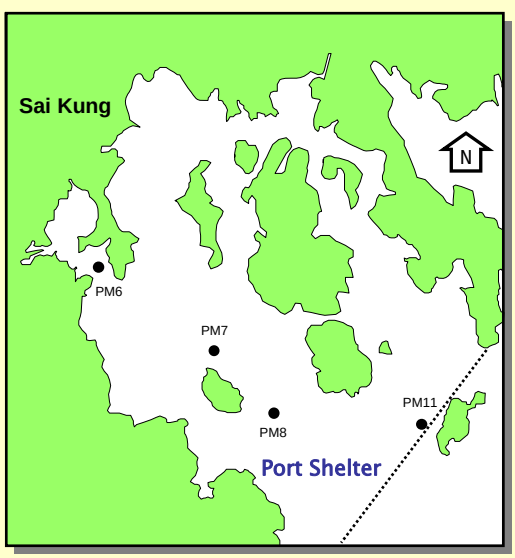
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

Levels of compliance with key Water Quality Objectives in the Port Shelter 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

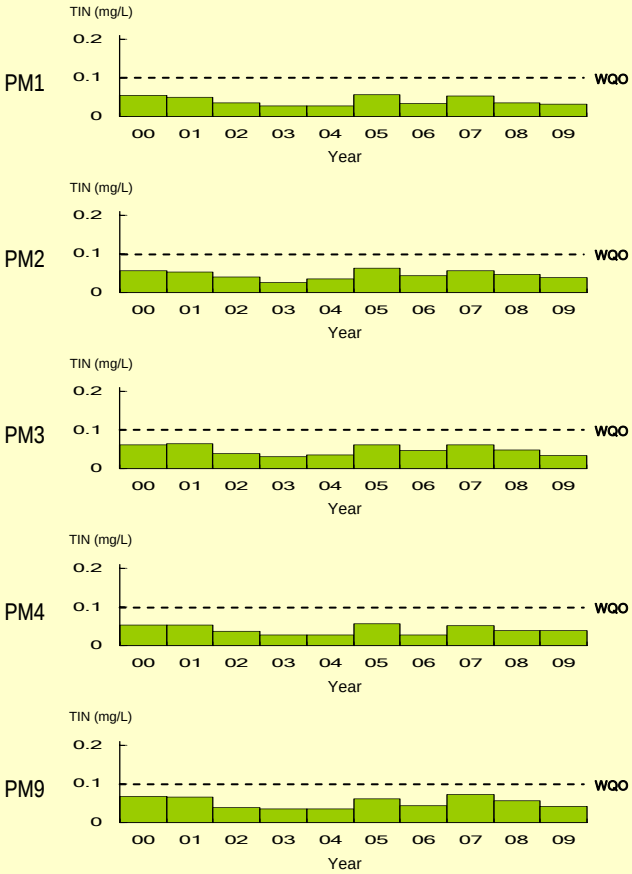
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

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

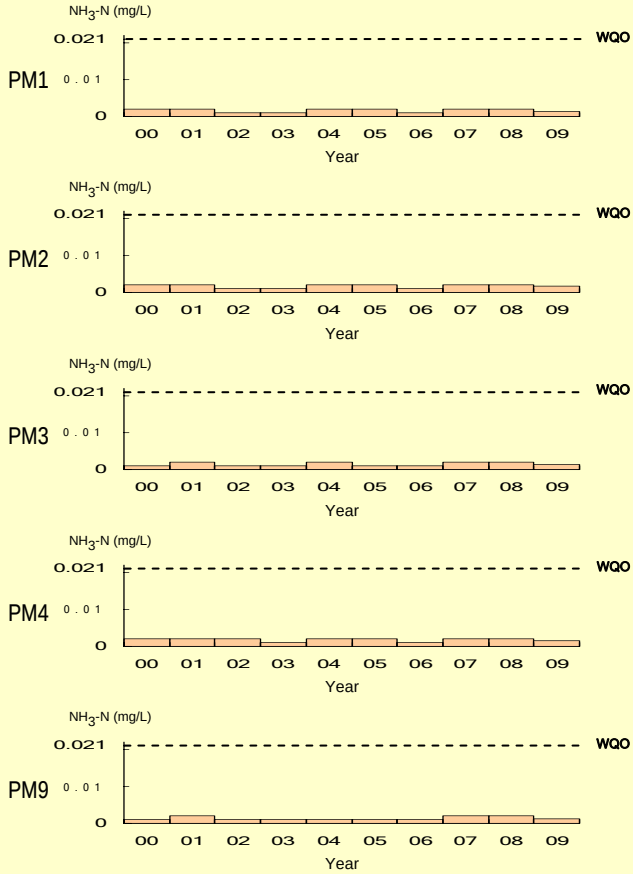
Non-compliance

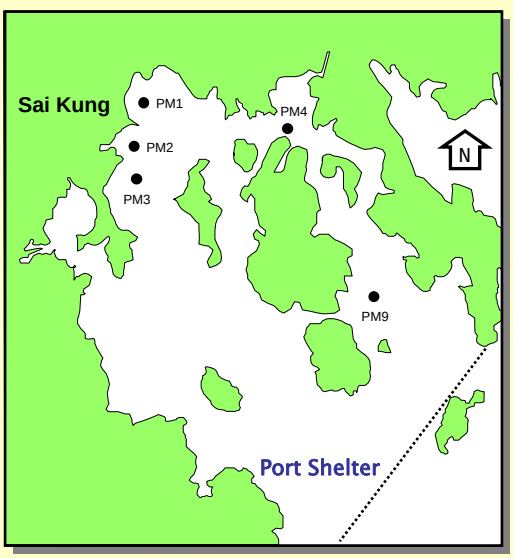
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



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

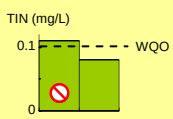




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

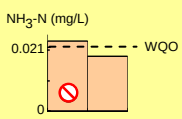


Unionised Ammonia (NH_3-N)

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

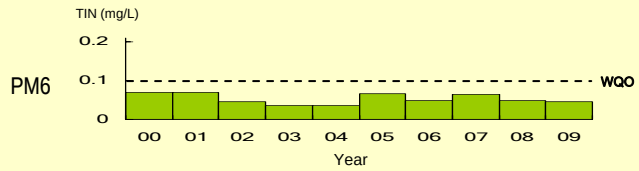
annual mean for depth-averaged NH_3-N

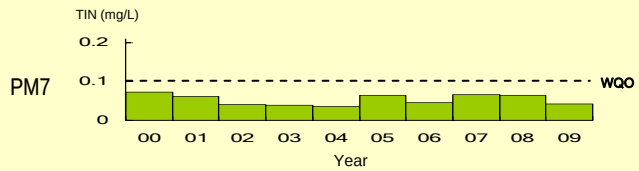
Non-compliance

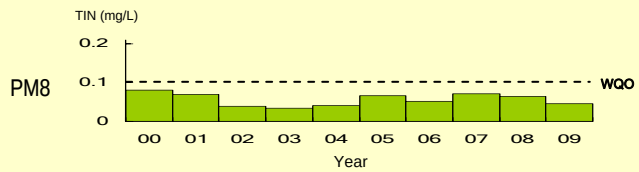


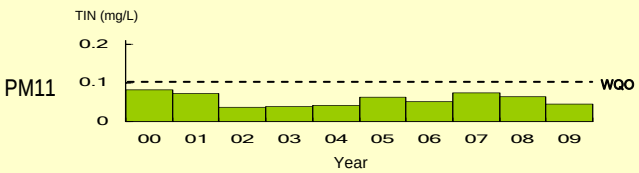
Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)

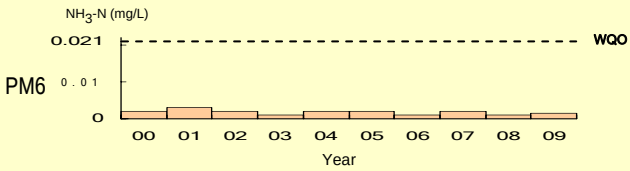


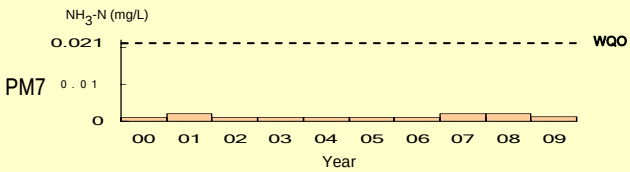


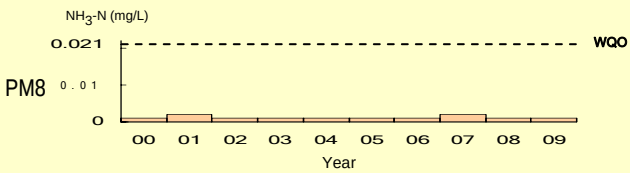


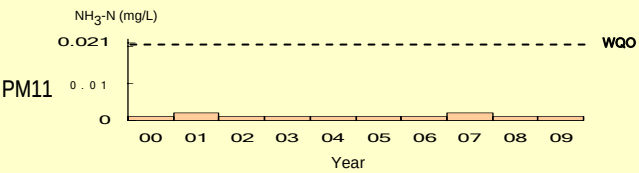


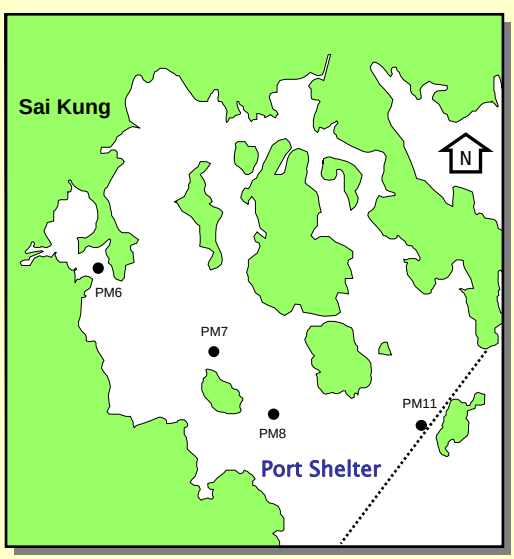
Unionised Ammonia (NH_3-N)
(depth-averaged)







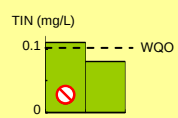




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

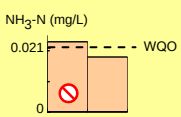


Unionised Ammonia (NH_3-N)

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

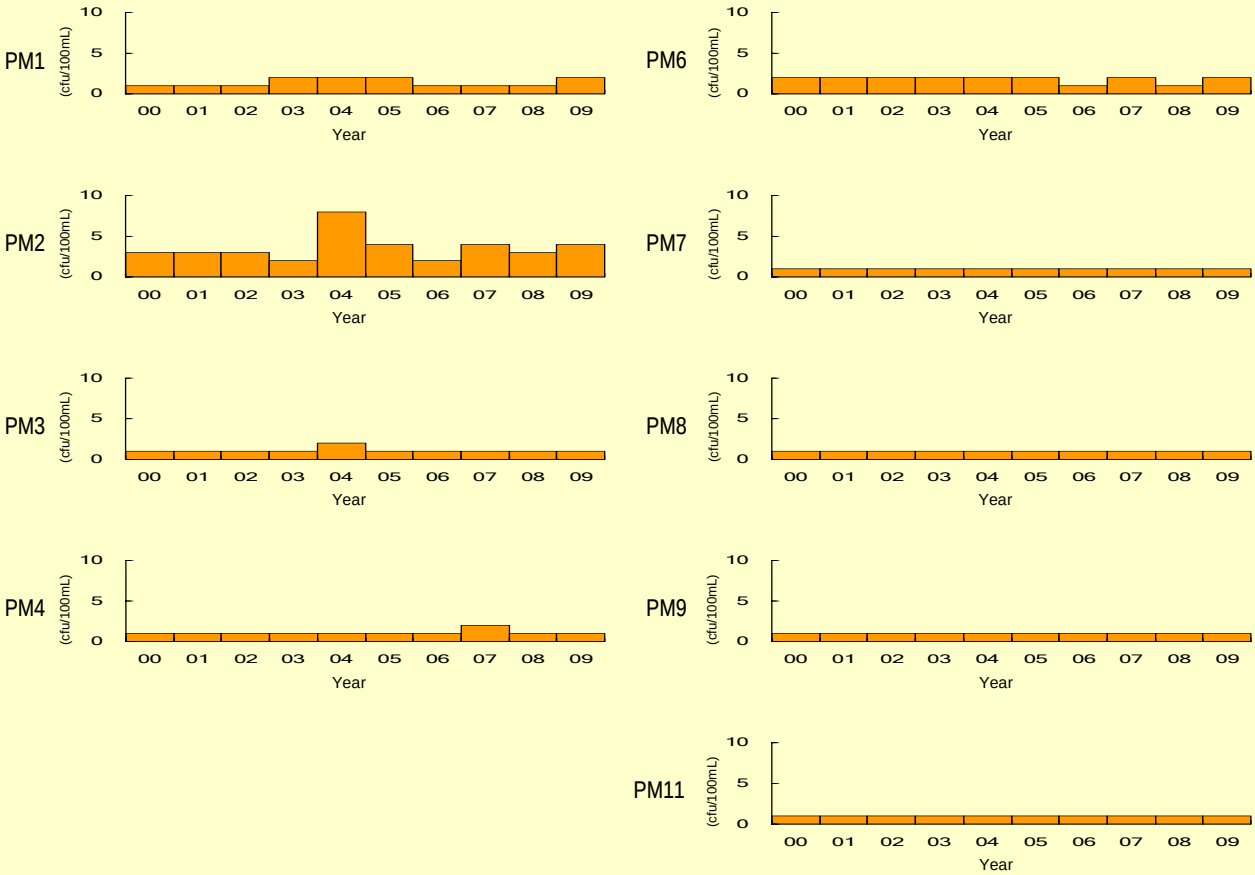
annual mean for depth-averaged NH_3-N

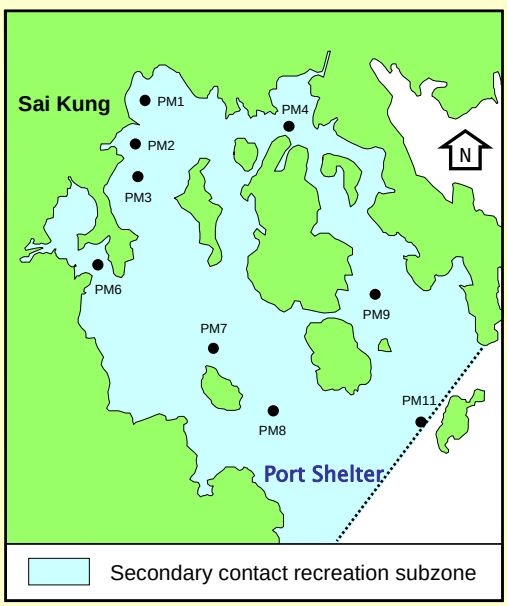
Non-compliance



Levels of compliance with key Water Quality Objectives in the Port Shelter WCZ (continued)

E. coli
(annual geometric mean)

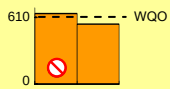




E. coli

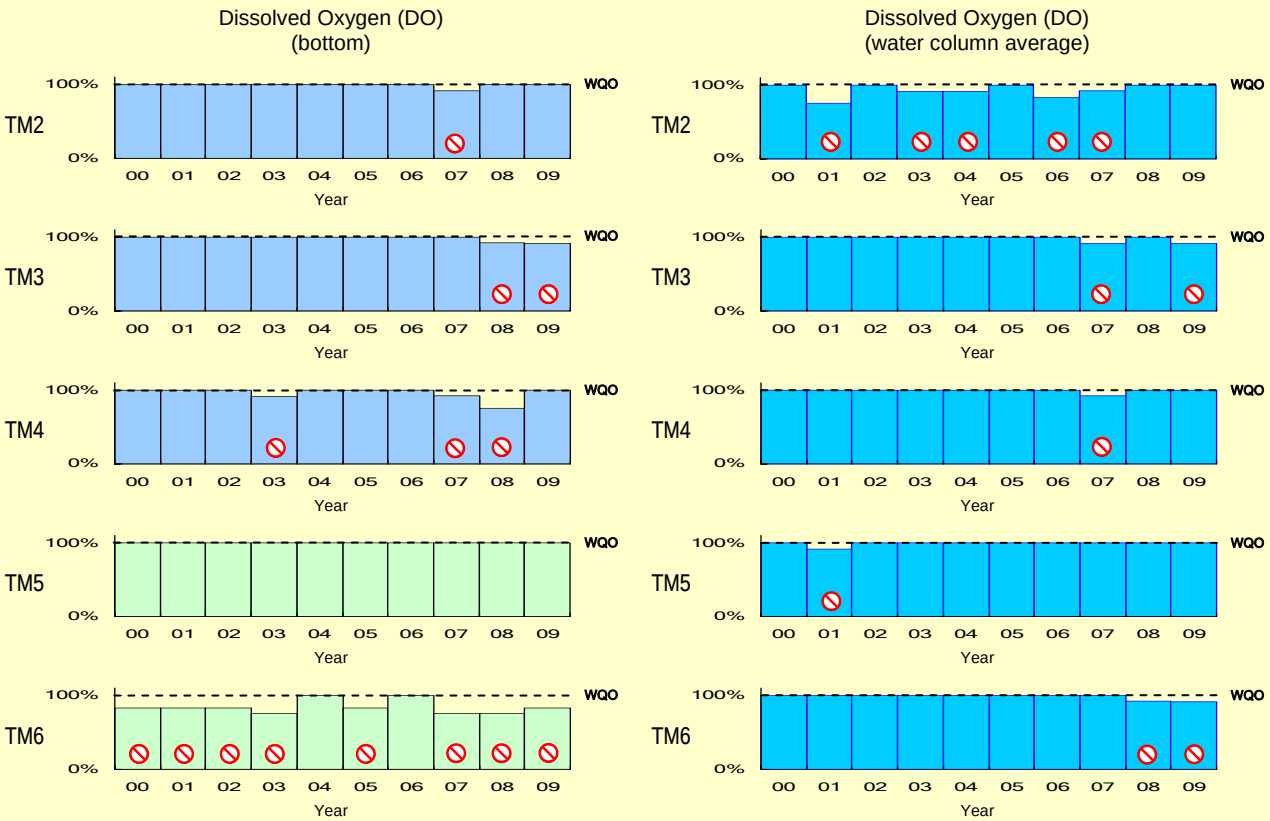
WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

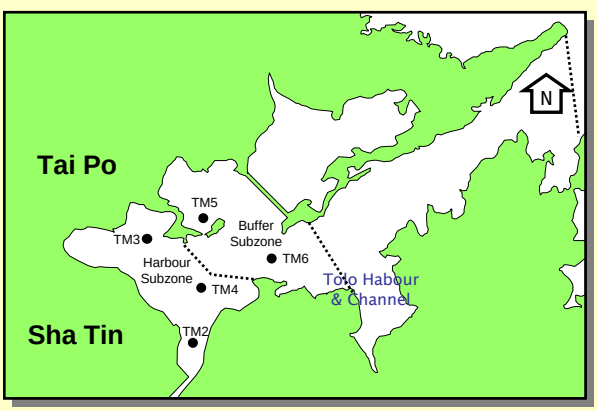
annual geometric mean for depth averaged *E. coli* (cfu/100mL)



Non-compliance

Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ





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)

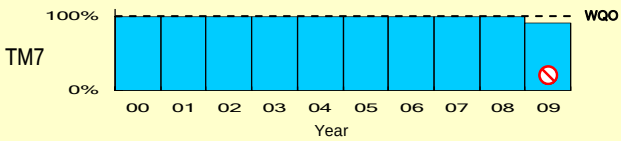
WQO : 100% sample with water column average DO ≥ 4 mg/L

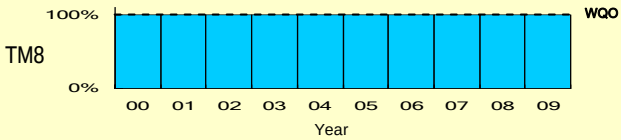
% sample with water column average DO ≥ 4 mg/L

Non-compliance

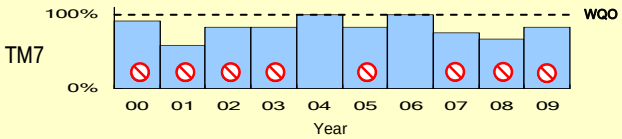
Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ (continued)

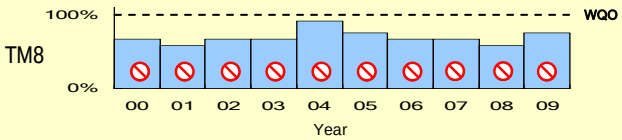
Dissolved Oxygen (DO)
(surface)



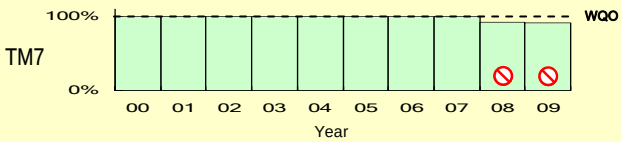


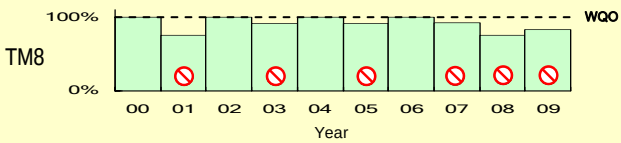
Dissolved Oxygen (DO)
(bottom)

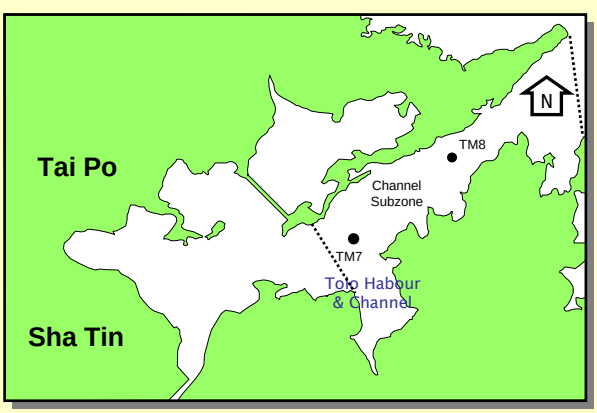




Dissolved Oxygen (DO)
(middle)







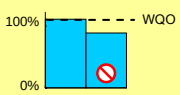
Dissolved Oxygen (DO)

Channel Subzone (TM7 - TM8)

1. Surface

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

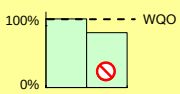
% sample with surface DO ≥ 4 mg/L



2. Middle

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

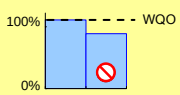
% sample with middle DO ≥ 4 mg/L



3. Bottom

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

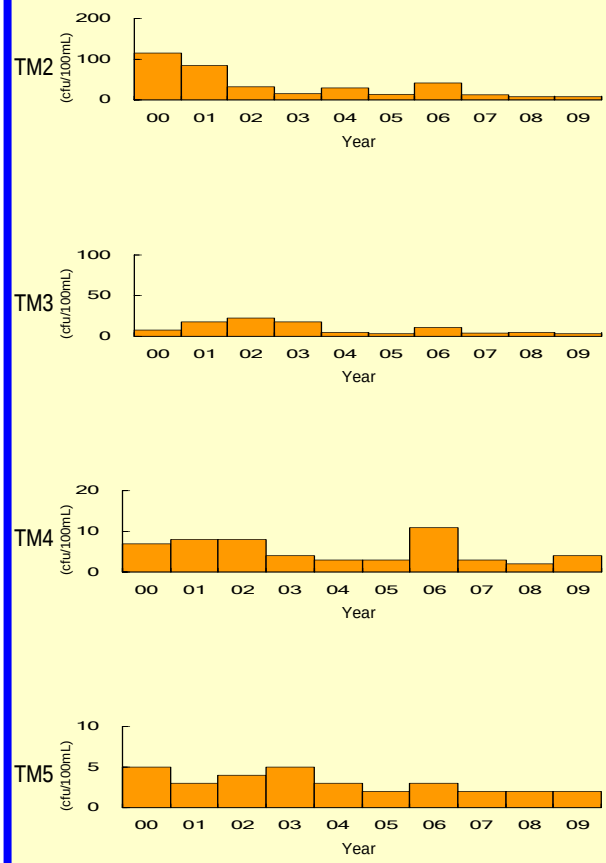
% sample with bottom DO ≥ 4 mg/L

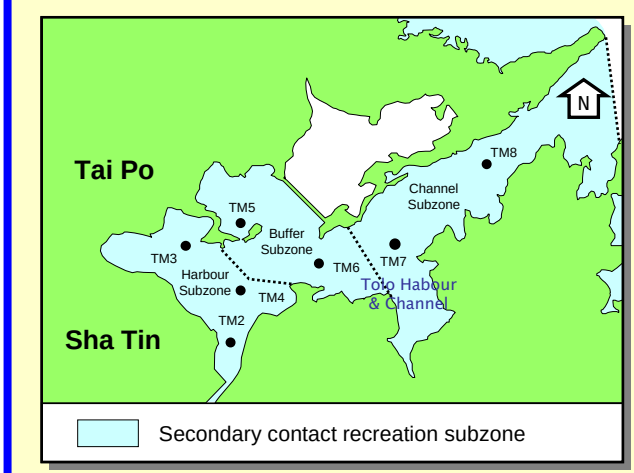


Non-compliance

Levels of compliance with key Water Quality Objectives in the Tolo Harbour and Channel WCZ (continued)

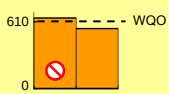
E. coli
(annual geometric mean)





E. coli

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



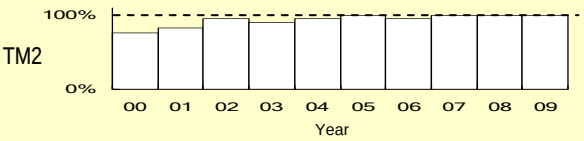
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

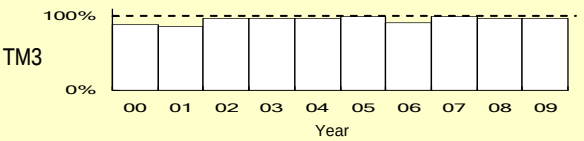
Non-compliance

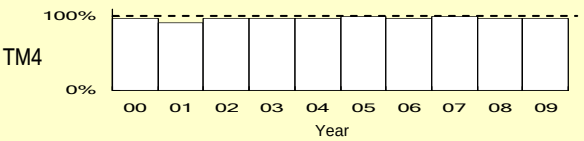
Levels of chlorophyll-*a* in the Tolo Harbour and Channel WCZ

Chlorophyll-*a*

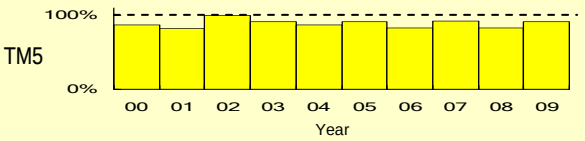
1. Harbour Subzone

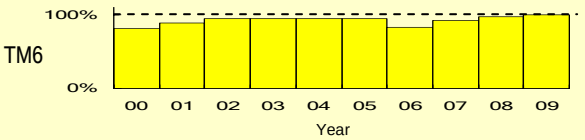




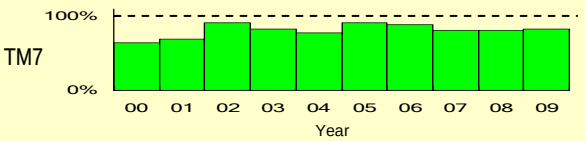


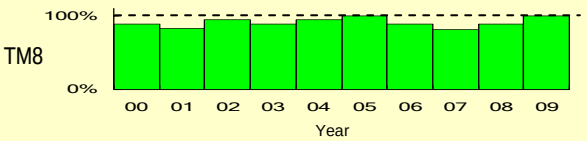
2. Buffer Subzone

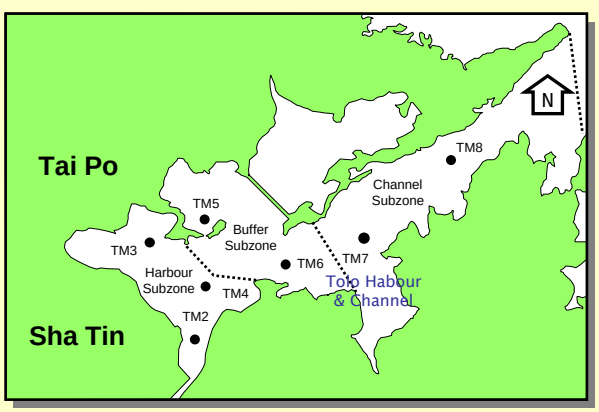




3. Channel Subzone







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

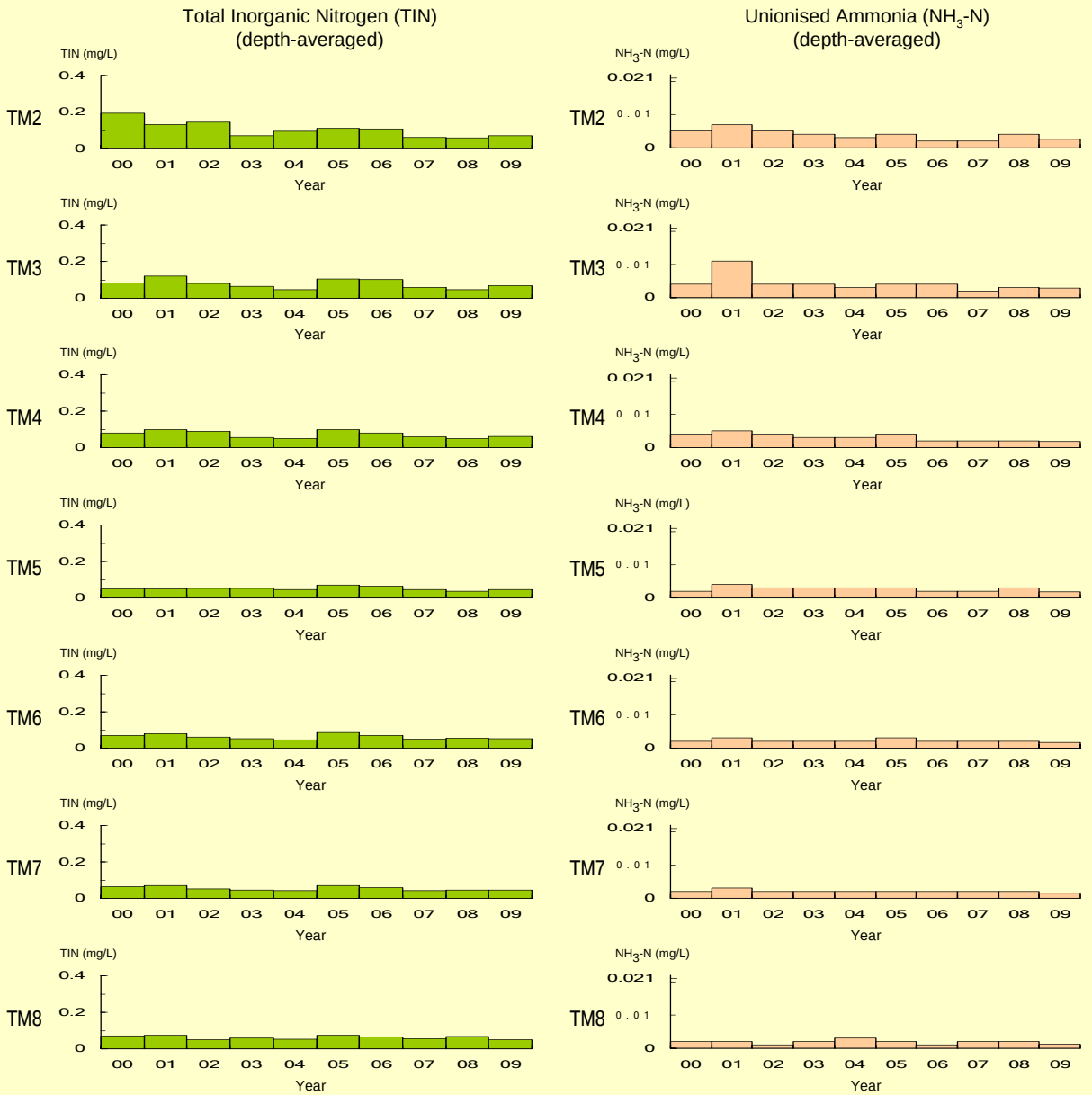
WQO : Chlorophyll-*a* ≤ 10 μg/L

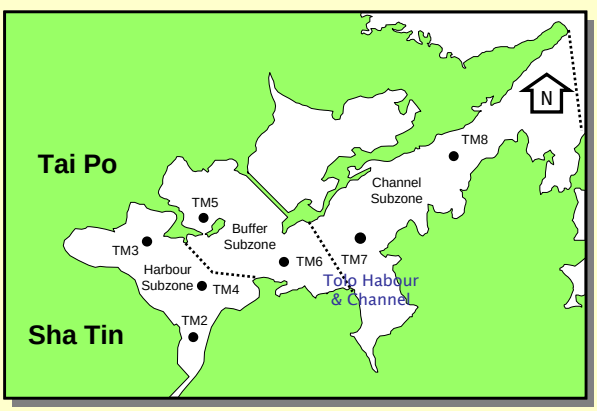
3. Channel Subzone

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

WQO : Chlorophyll-*a* ≤ 6 μg/L

Levels of total inorganic nitrogen and unionised ammonia in the Tolo Harbour and Channel WCZ





Total Inorganic Nitrogen (TIN)

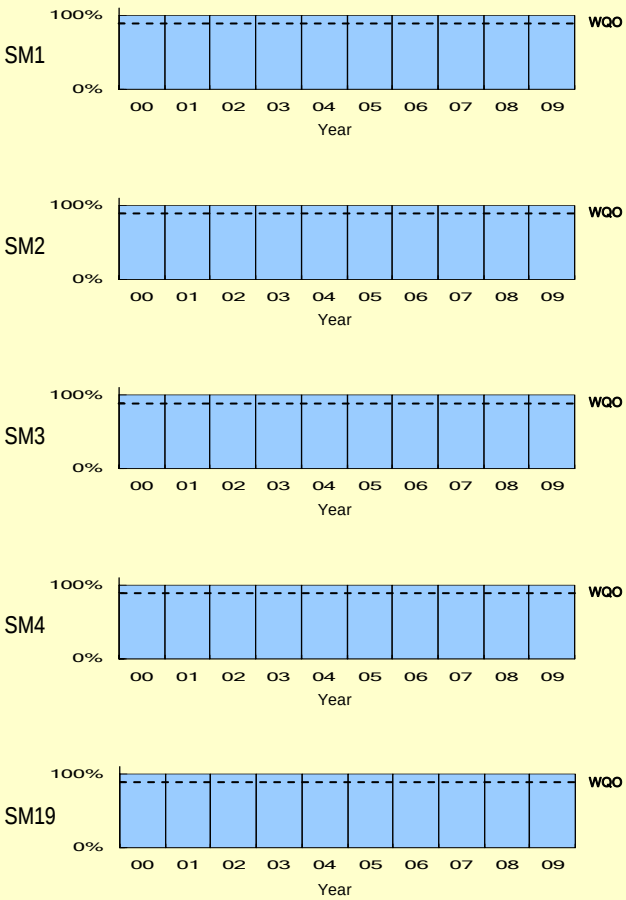
annual mean for depth-averaged TIN (mg/L)

Unionised Ammonia (NH_3-N)

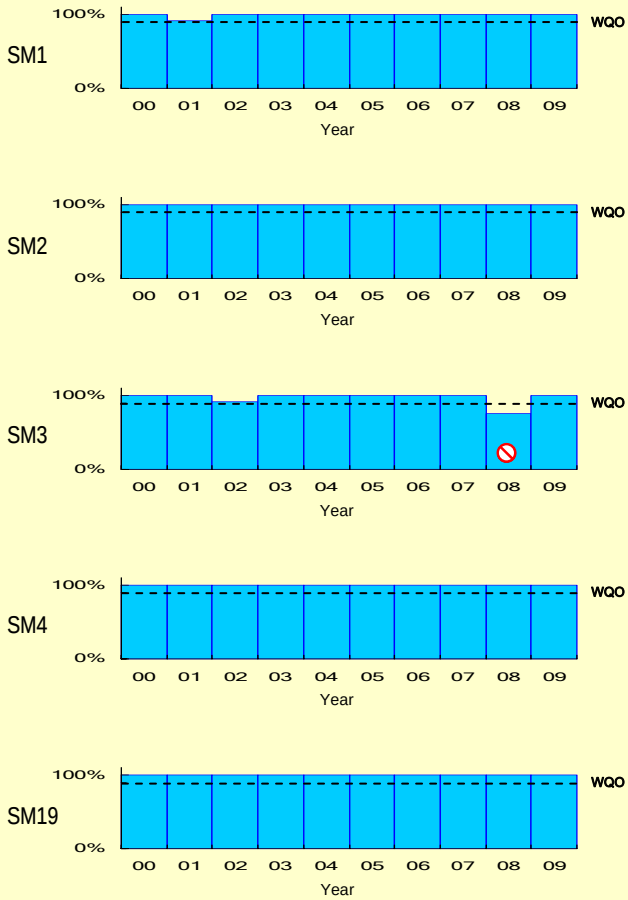
annual mean for depth-averaged NH_3-N (mg/L)

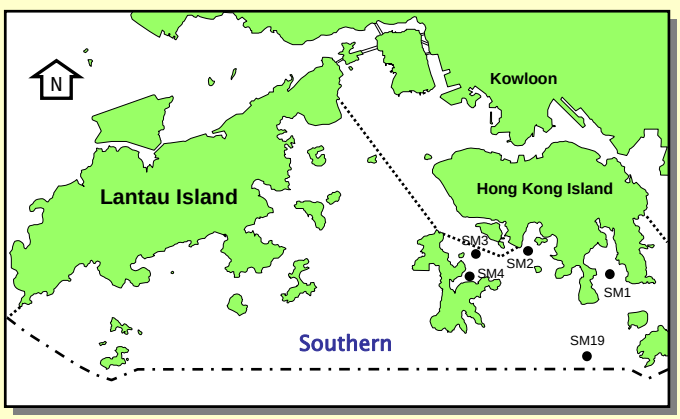
Levels of compliance with key Water Quality Objectives in the Southern WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



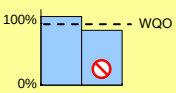


Dissolved Oxygen (DO)

1. Bottom

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

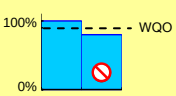
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

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

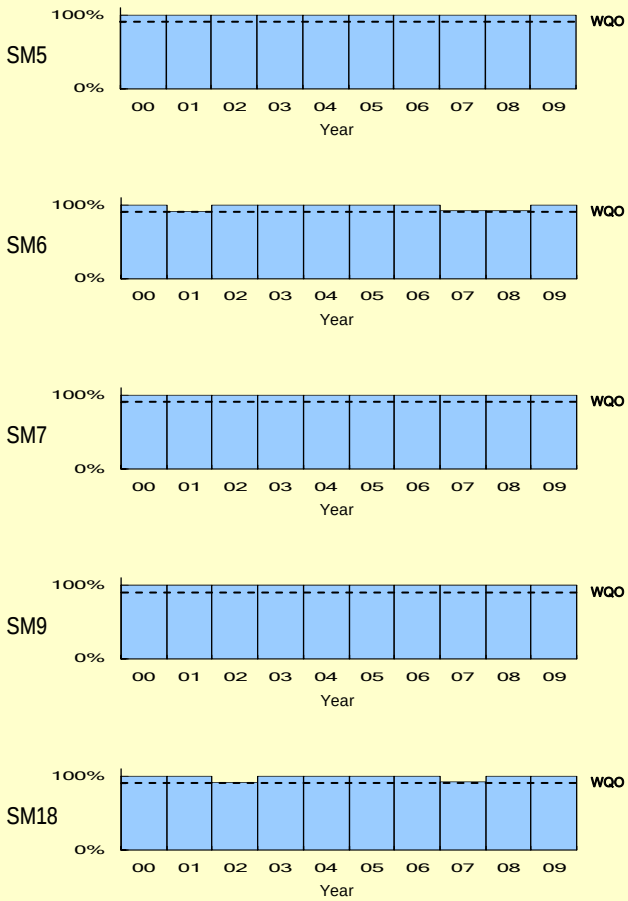
% sample with depth-averaged DO ≥ 4 mg/L



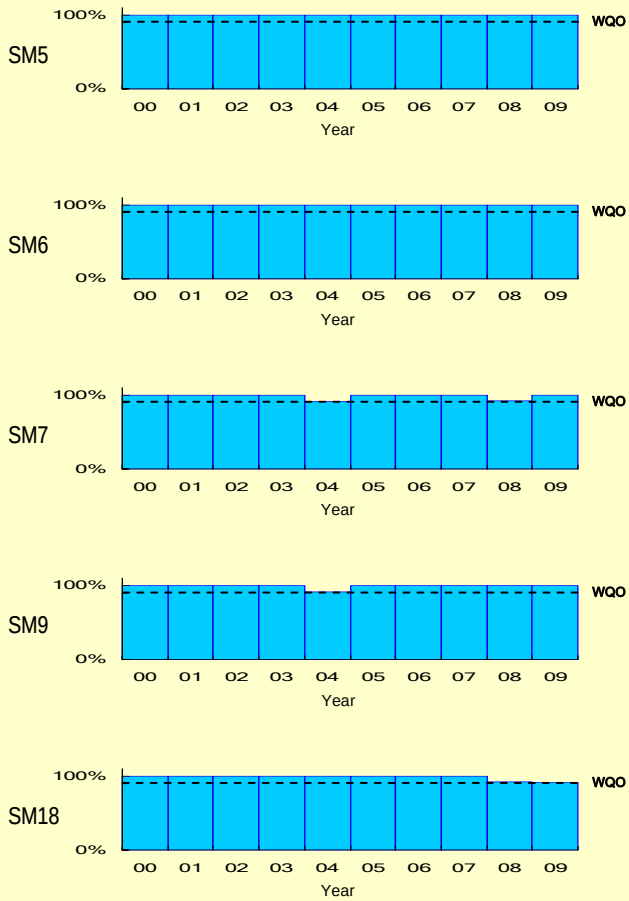
Non-compliance

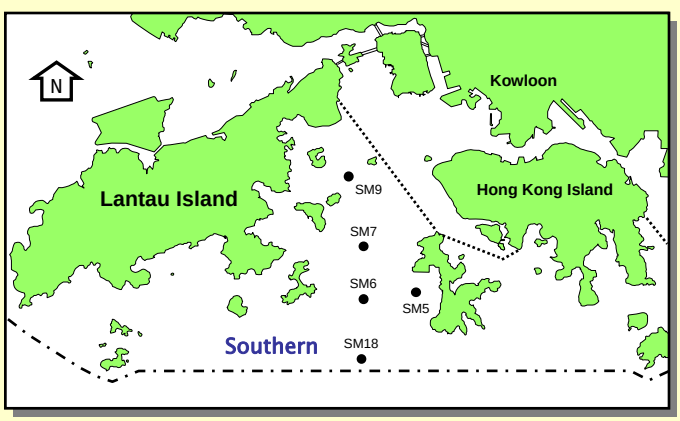
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



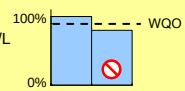


Dissolved Oxygen (DO)

1. Bottom

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

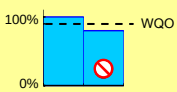
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

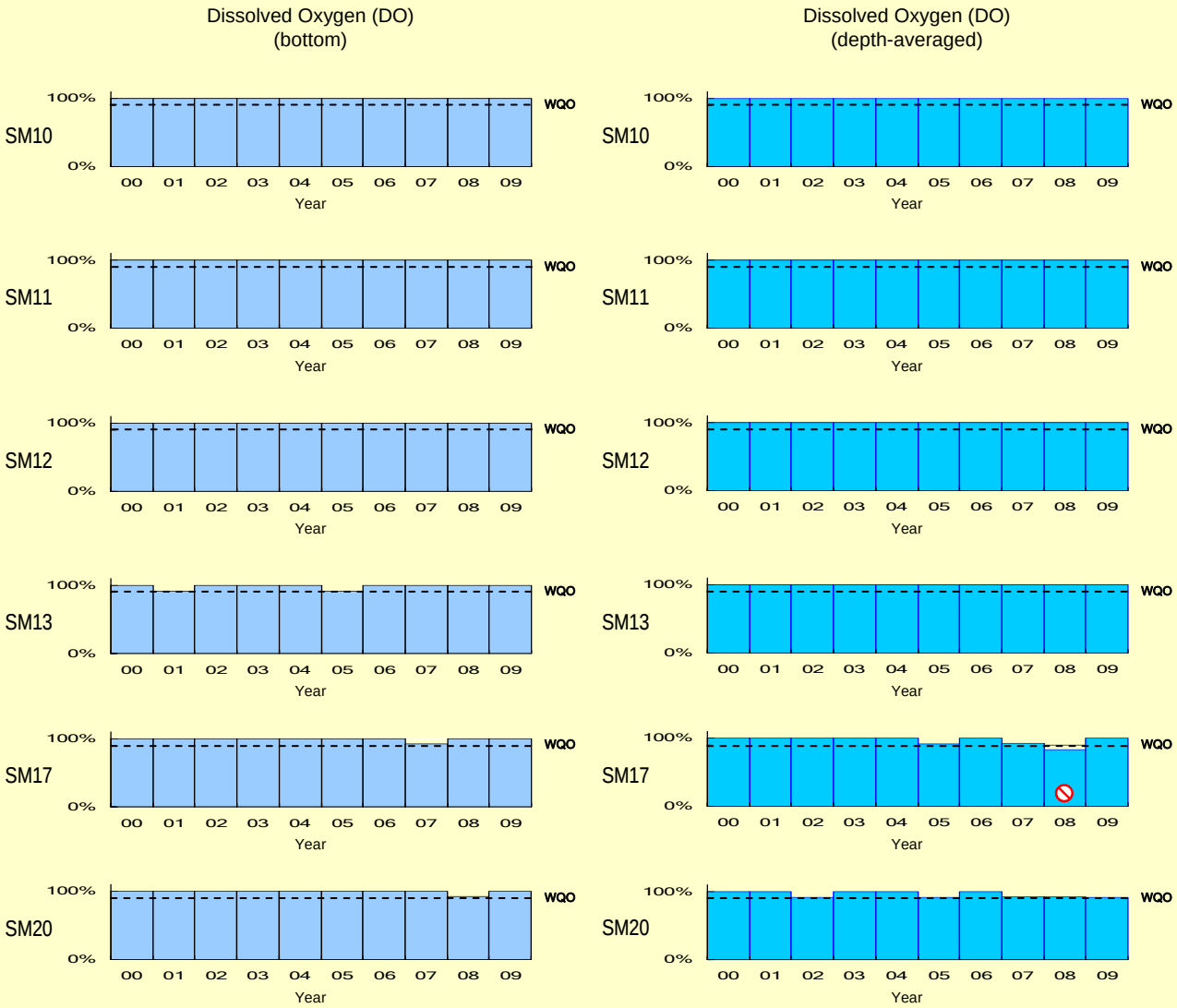
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

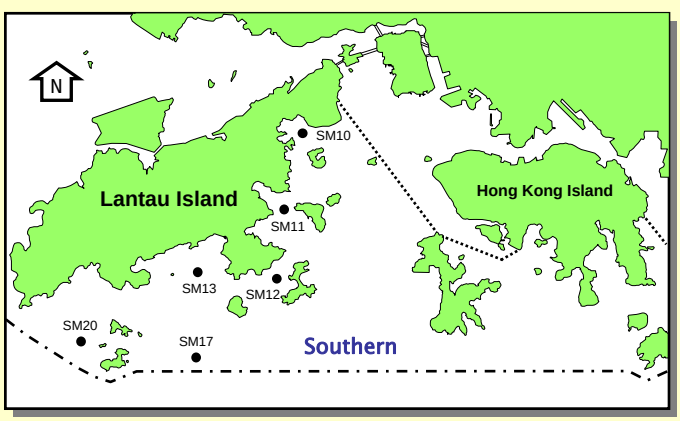
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

Levels of compliance with key Water Quality Objectives in the Southern 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

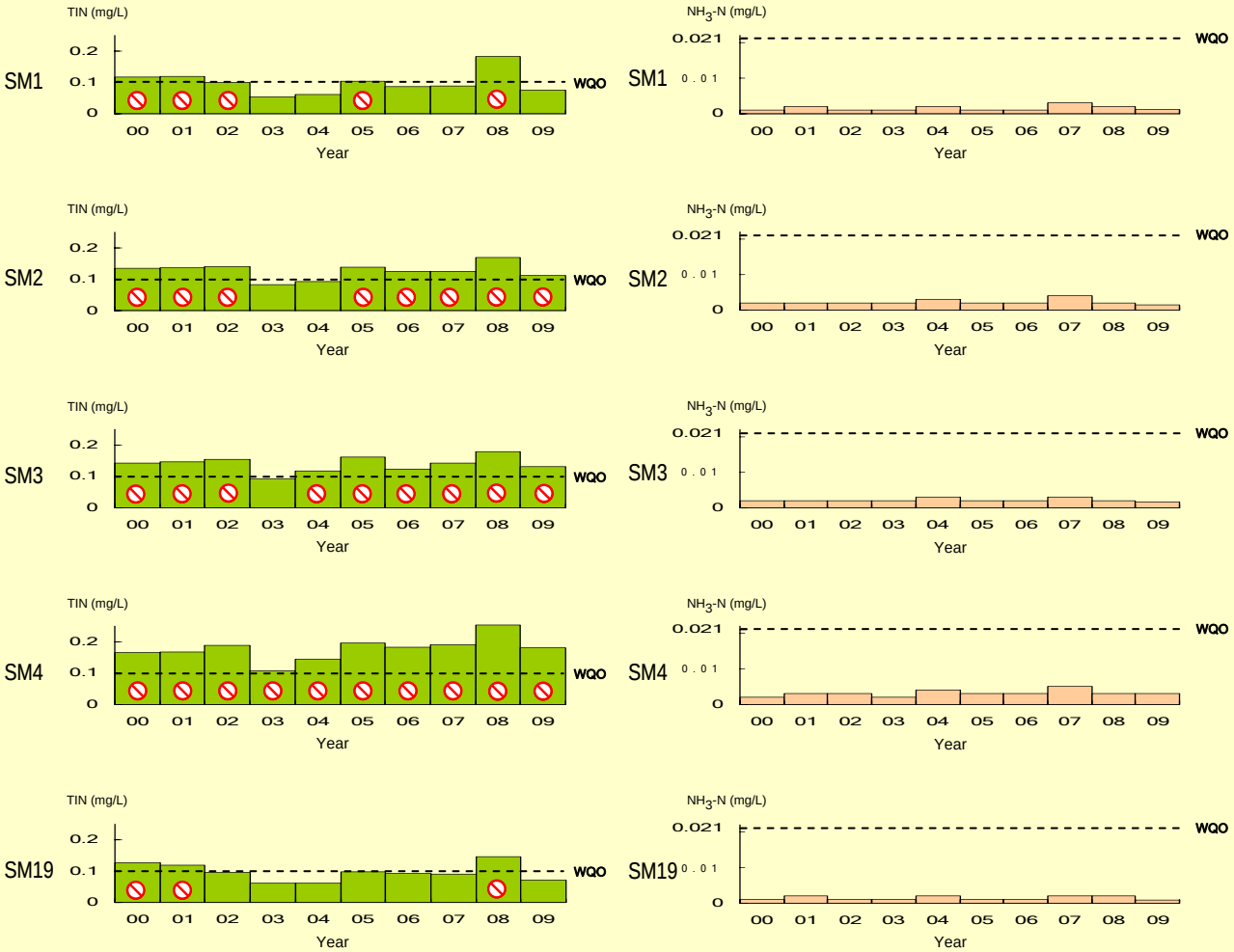
% sample with depth-averaged DO ≥ 4 mg/L

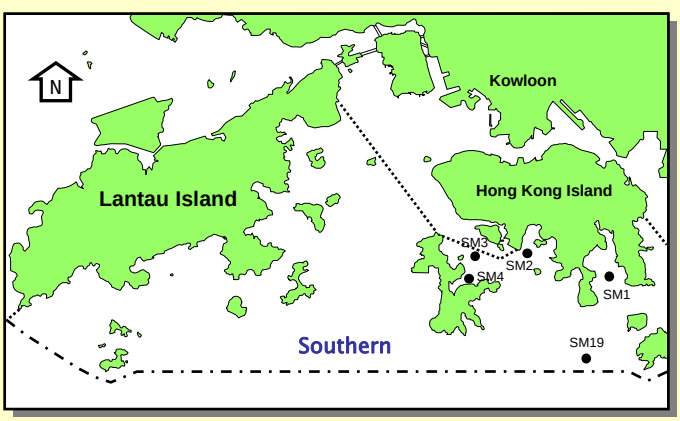
Non-compliance

Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

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

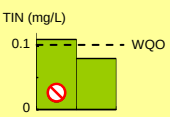




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

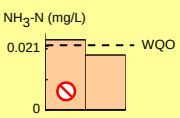


Unionised Ammonia (NH_3-N)

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

annual mean for depth-averaged NH_3-N

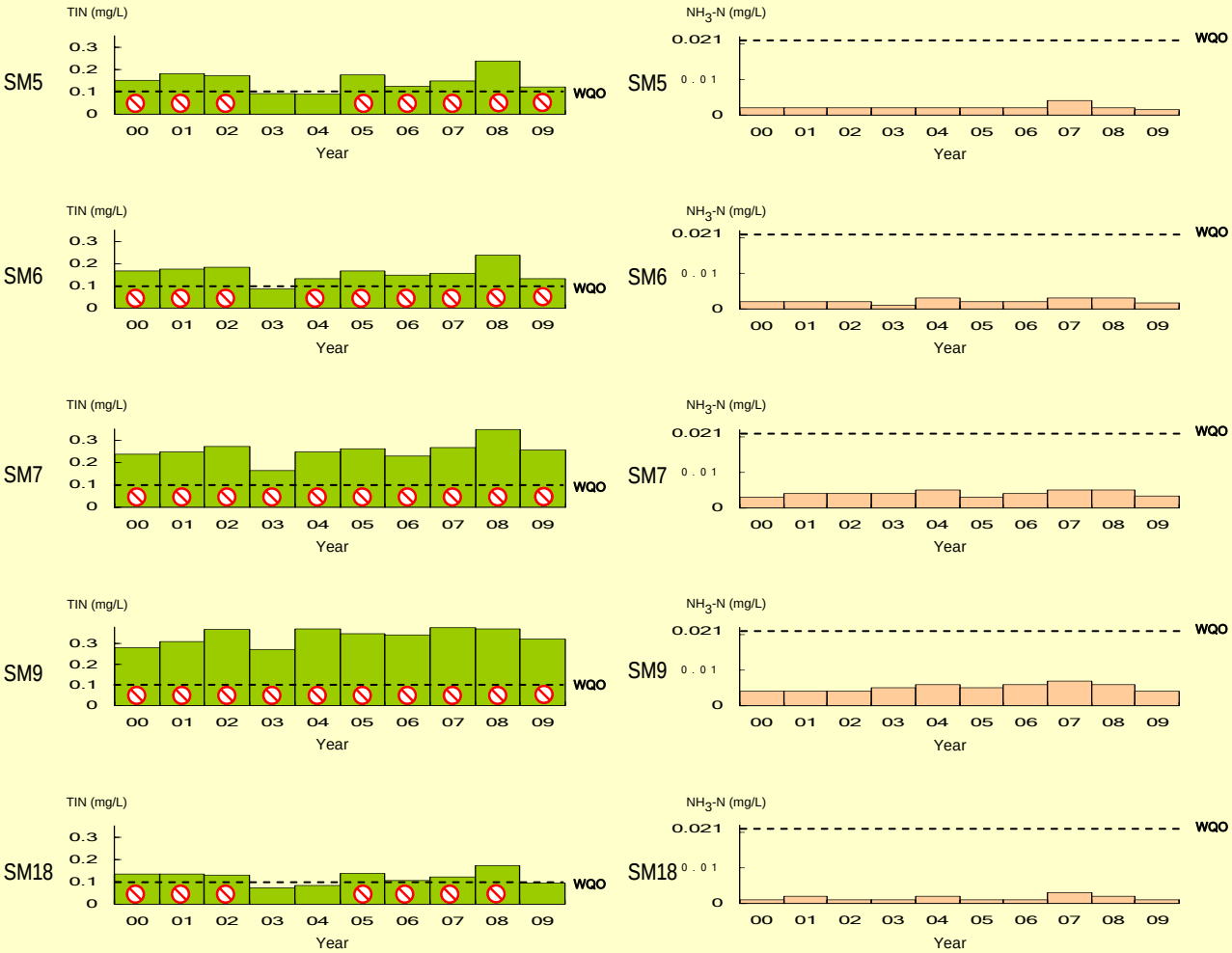
Non-compliance

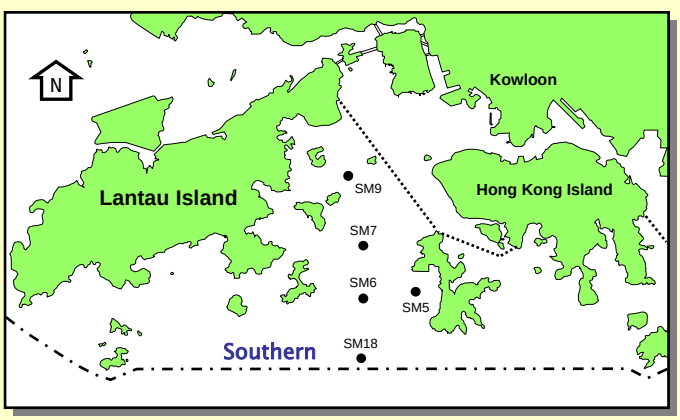


Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)

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

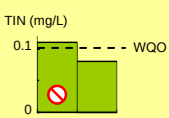




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

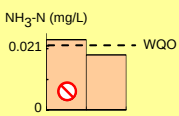


Unionised Ammonia (NH_3-N)

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

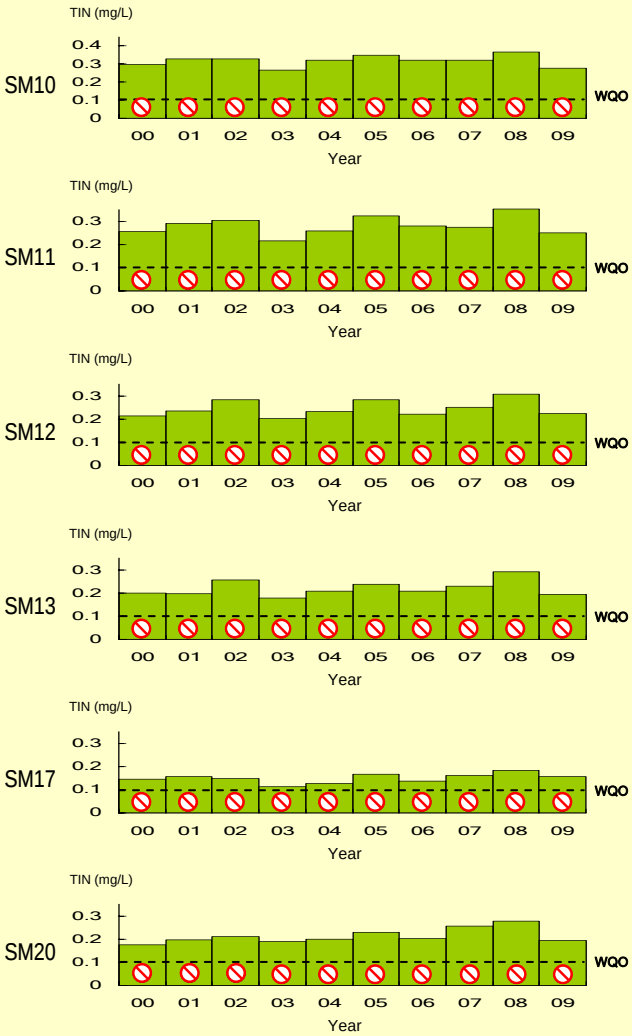
annual mean for depth-averaged NH_3-N

Non-compliance

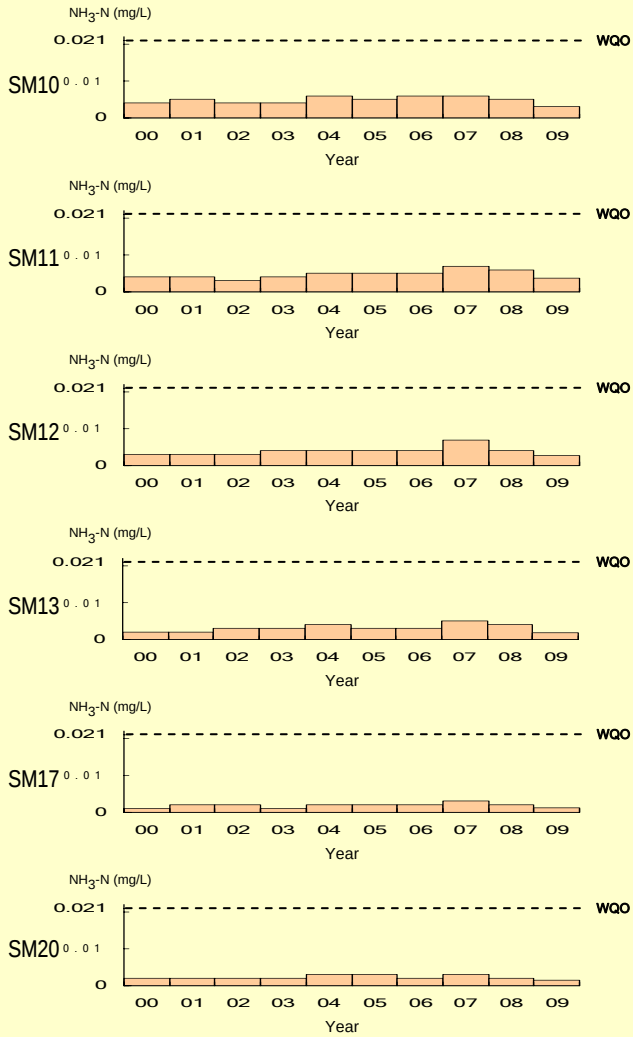


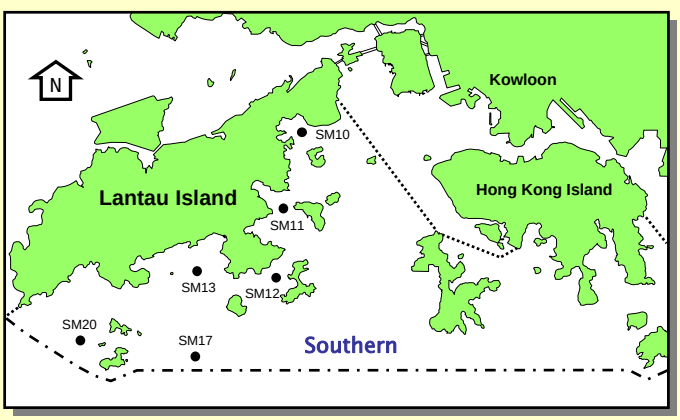
Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

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

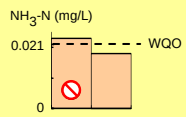
annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

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

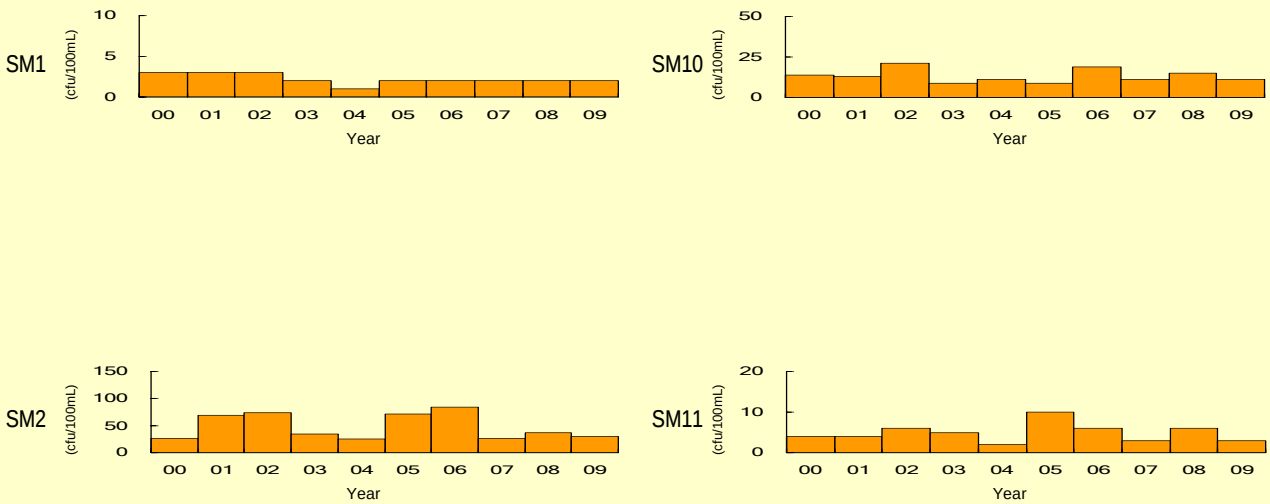
annual mean for depth-averaged NH_3-N

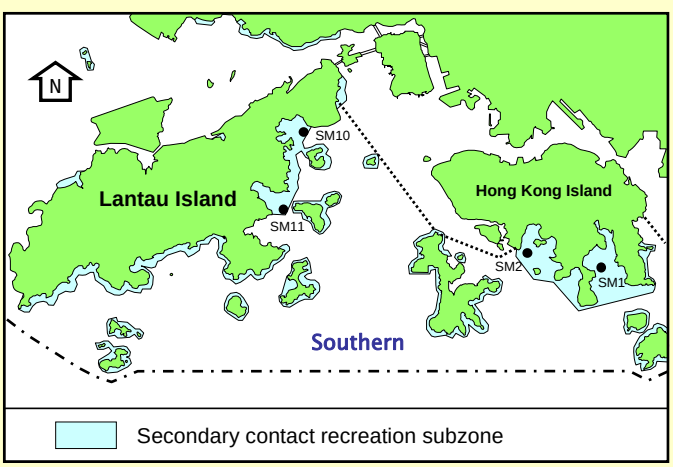
Non-compliance



Levels of compliance with key Water Quality Objectives in the Southern WCZ (continued)

E. coli
(annual geometric mean)



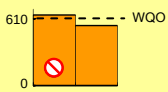


E. coli

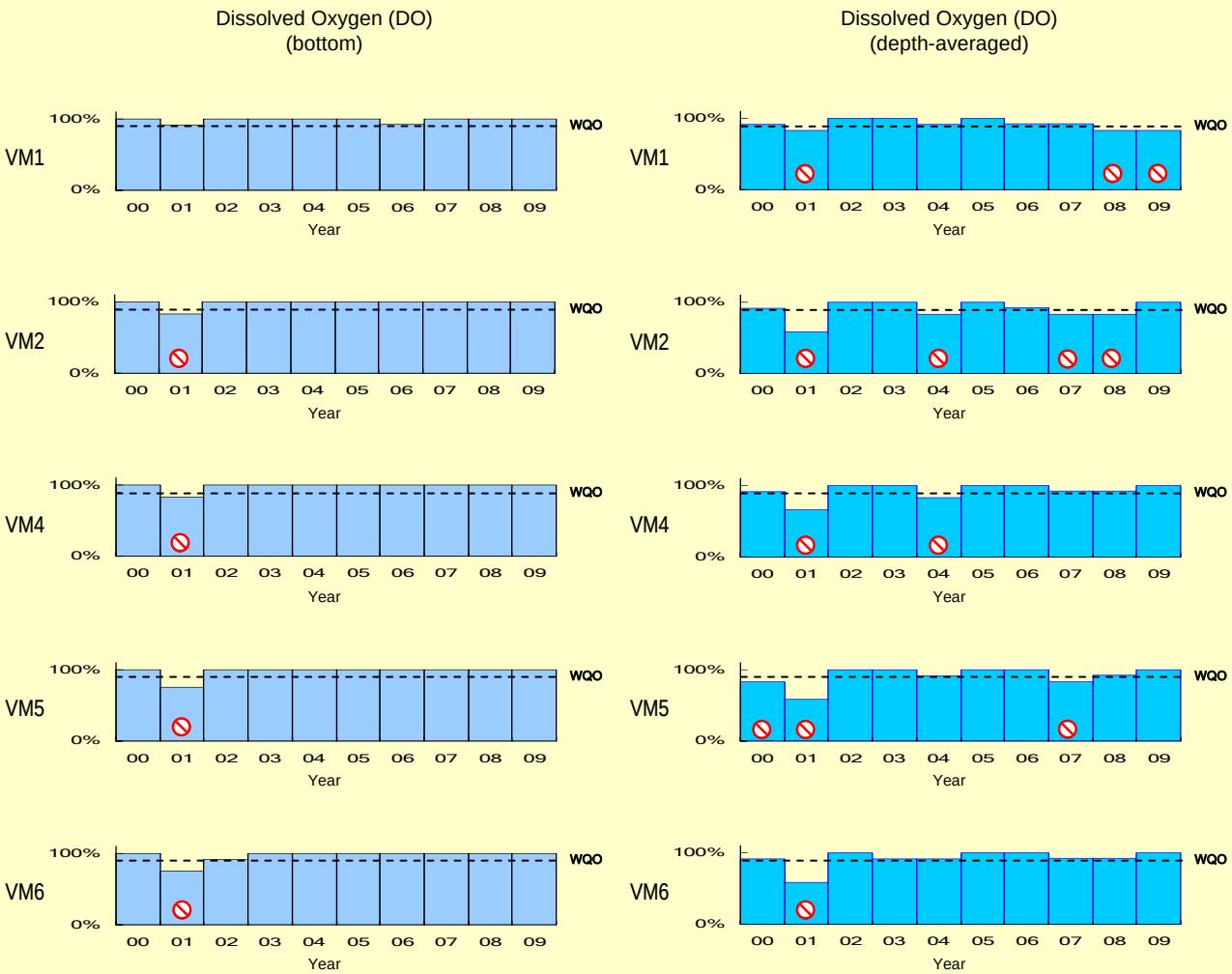
WQO for secondary contact recreation subzones :
annual geometric mean for depth averaged
E. coli ≤ 610 cfu/100mL

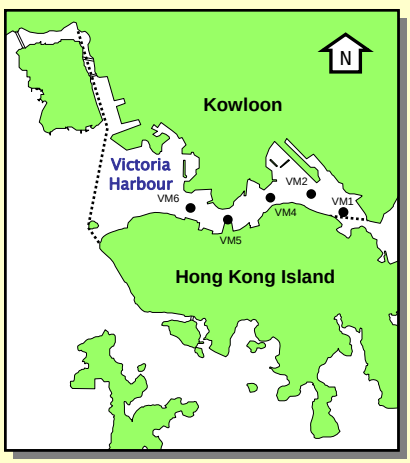
annual geometric mean for depth averaged *E. coli* (cfu/100mL)

Non-compliance



Levels of compliance with key Water Quality Objectives in the Victoria Harbour 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

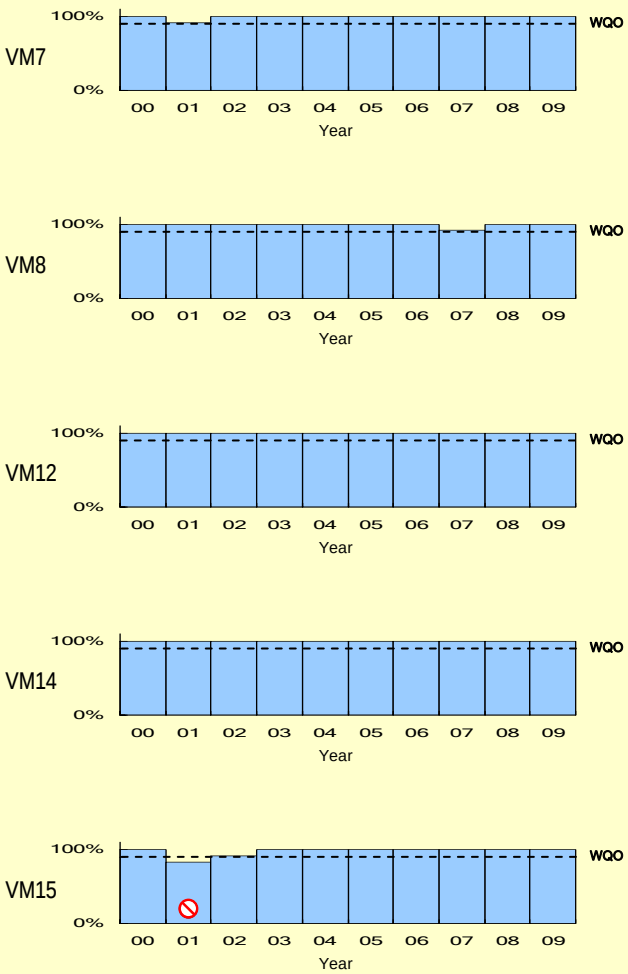
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

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

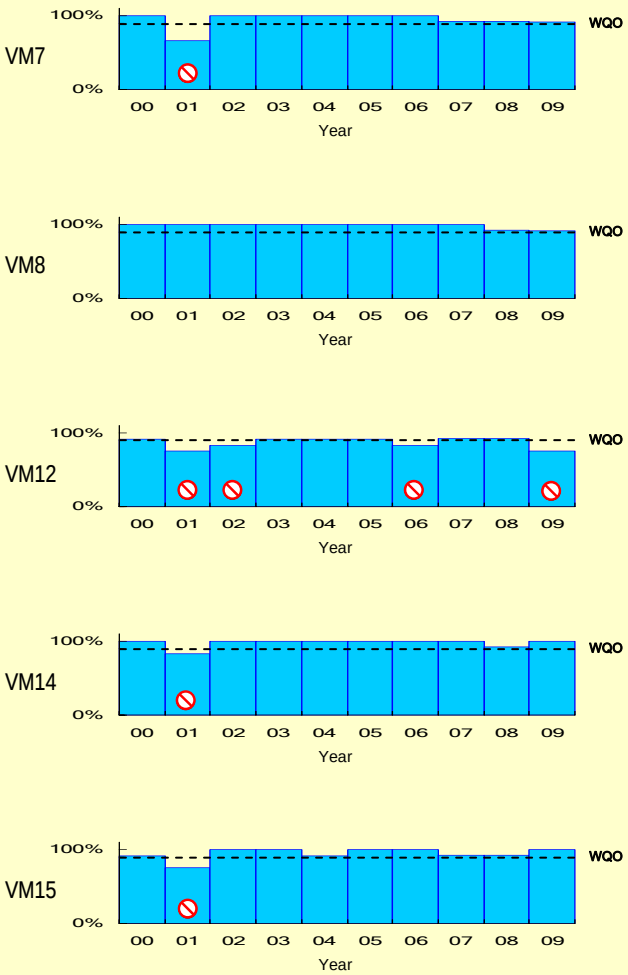
Non-compliance

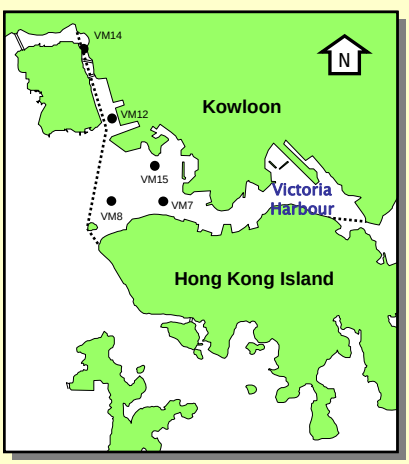
Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ (continued)

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



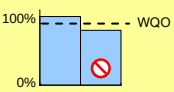


Dissolved Oxygen (DO)

1. Bottom

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

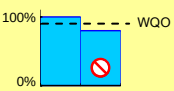
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

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

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

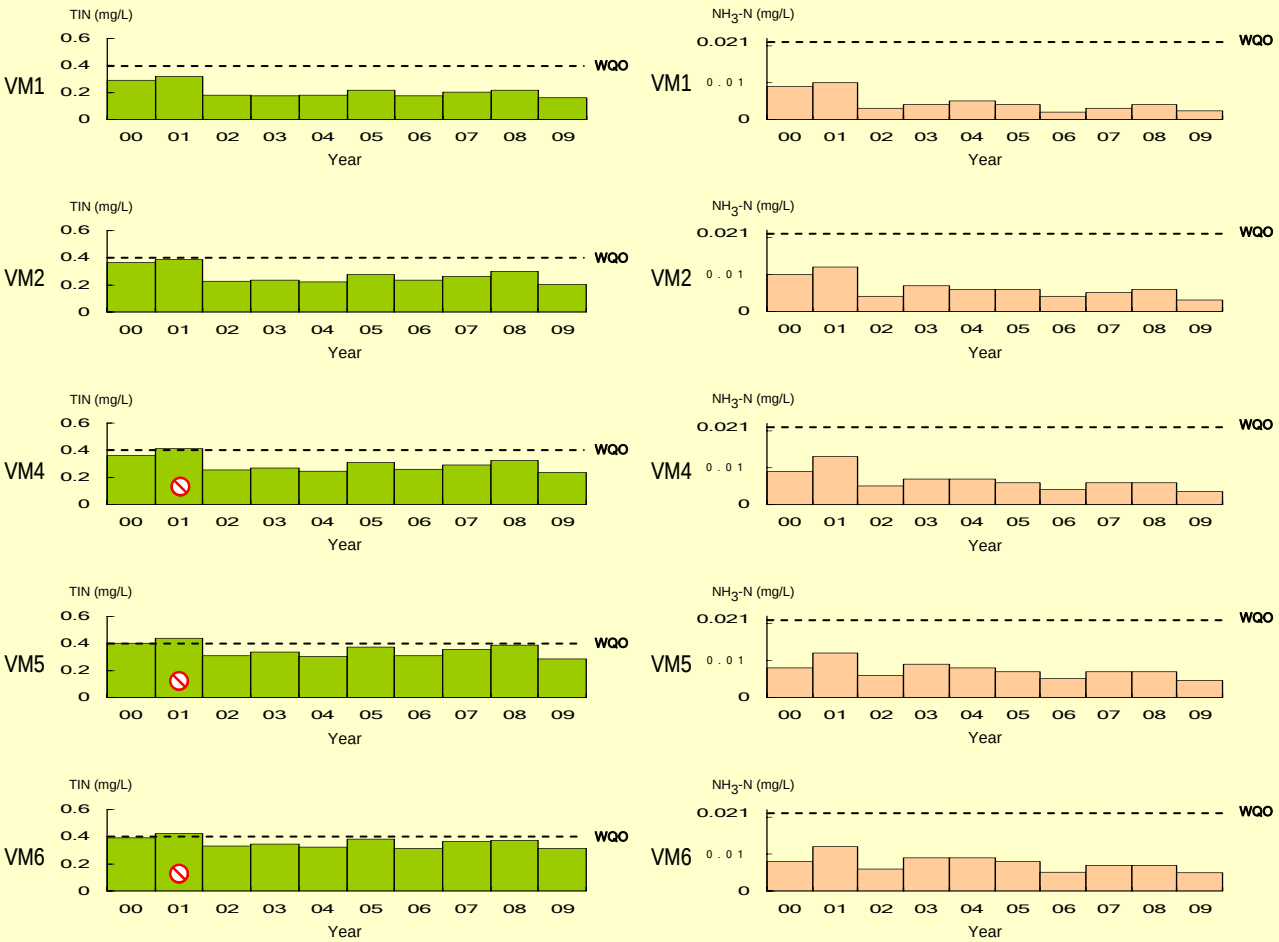


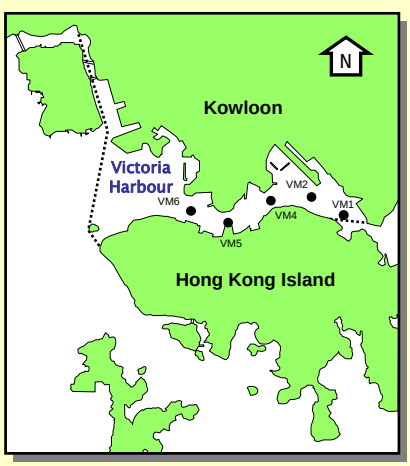
Non-compliance

Levels of compliance with key Water Quality Objectives in 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

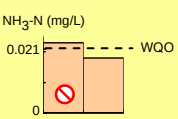
annual mean for depth-averaged TIN

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

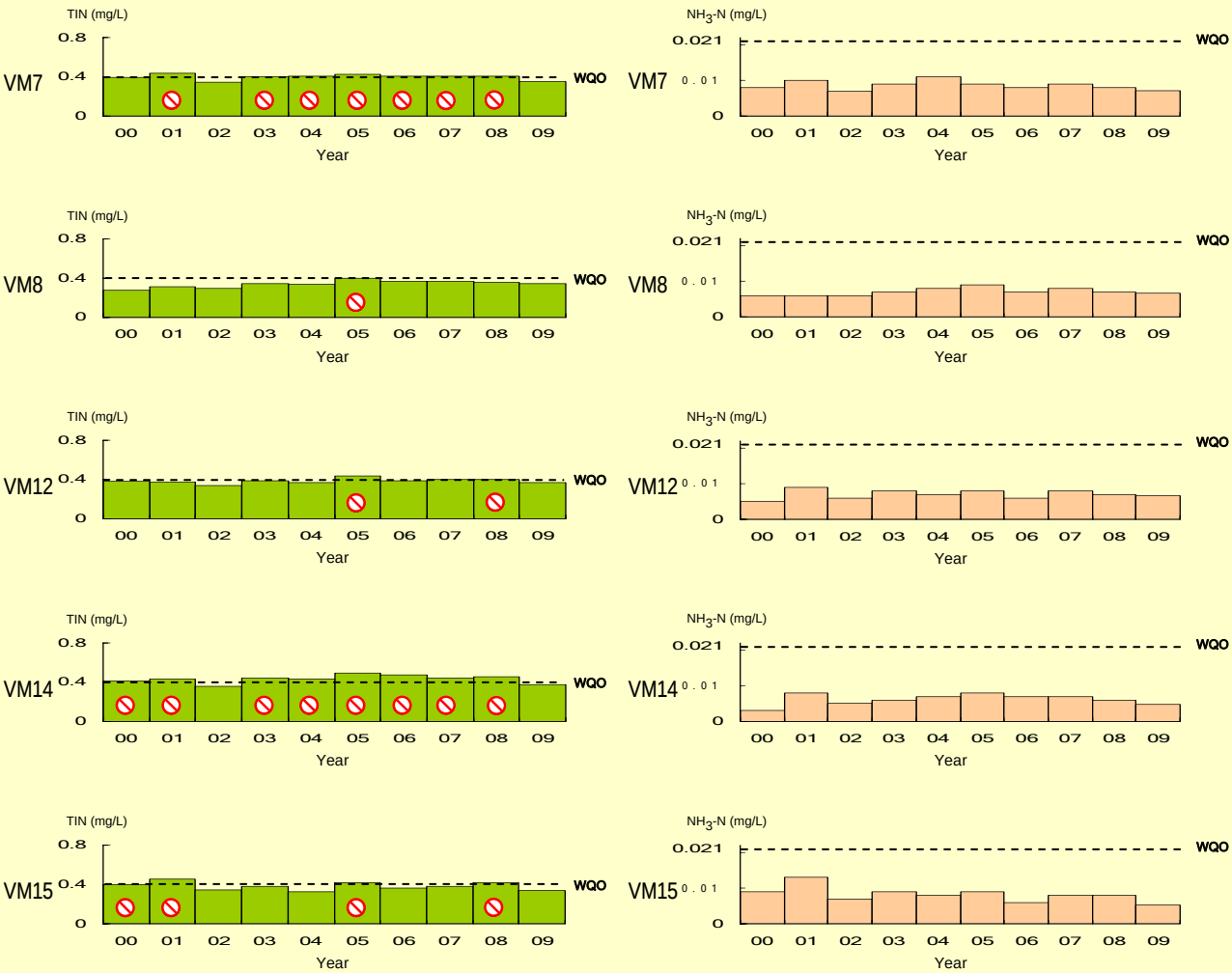
Non-compliance

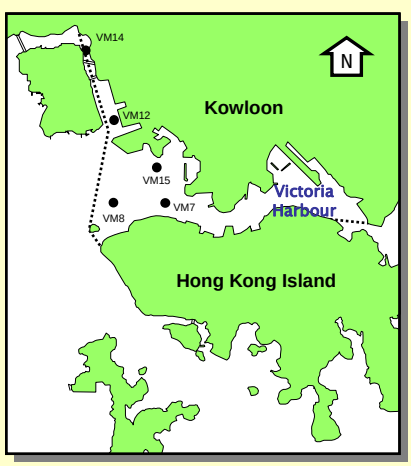


Levels of compliance with key Water Quality Objectives in the Victoria Harbour WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)

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

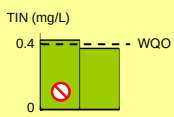




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

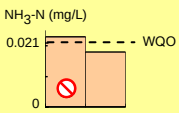


Unionised Ammonia (NH_3-N)

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

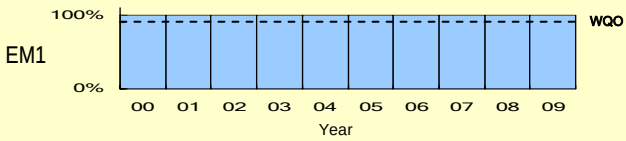
annual mean for depth-averaged NH_3-N

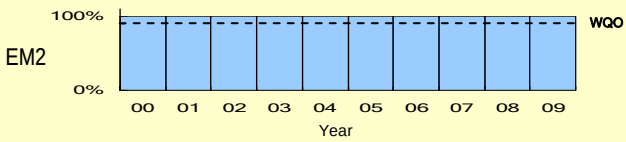
Non-compliance

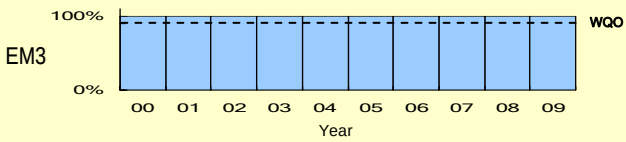


Levels of compliance with key Water Quality Objectives in the Eastern Buffer WCZ

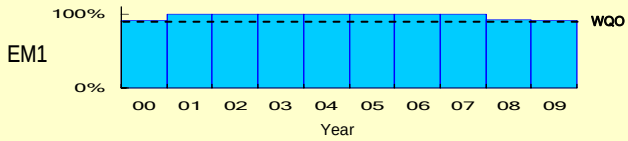
Dissolved Oxygen (DO)
(bottom)

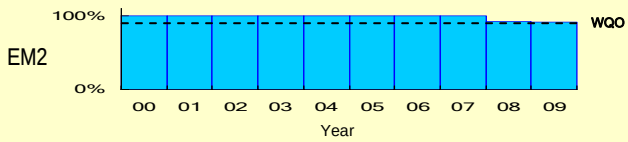


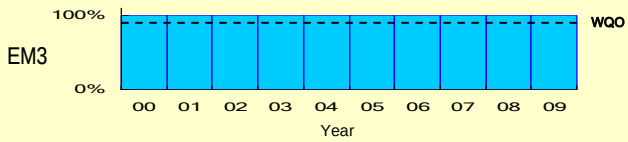


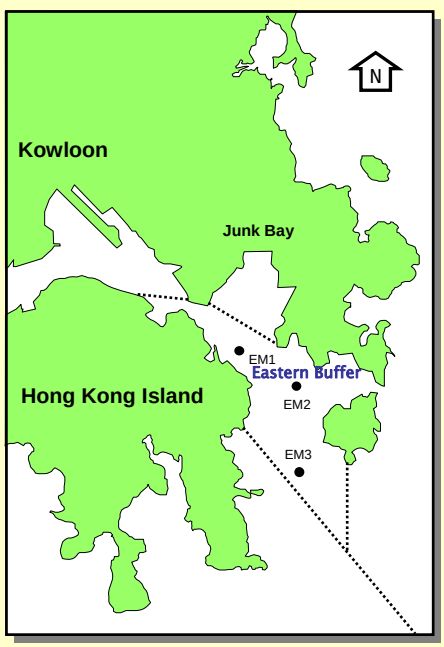


Dissolved Oxygen (DO)
(depth-averaged)







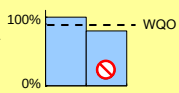


Dissolved Oxygen (DO)

1. Bottom

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

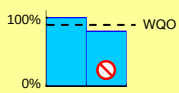
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

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

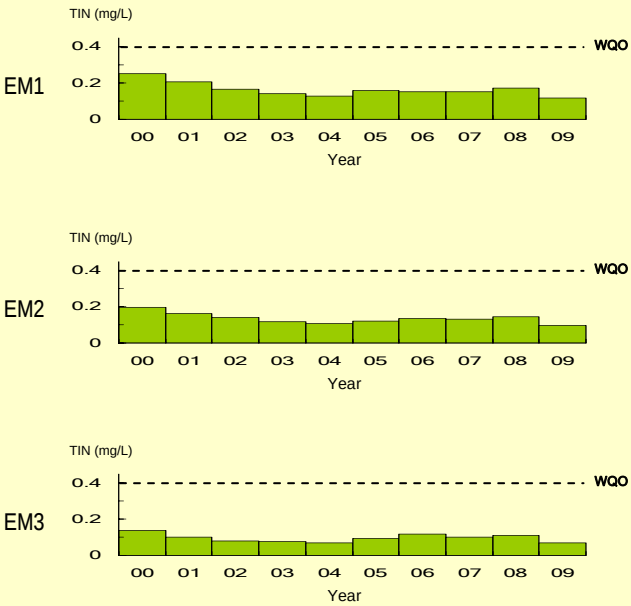
% sample with depth-averaged DO ≥ 4 mg/L



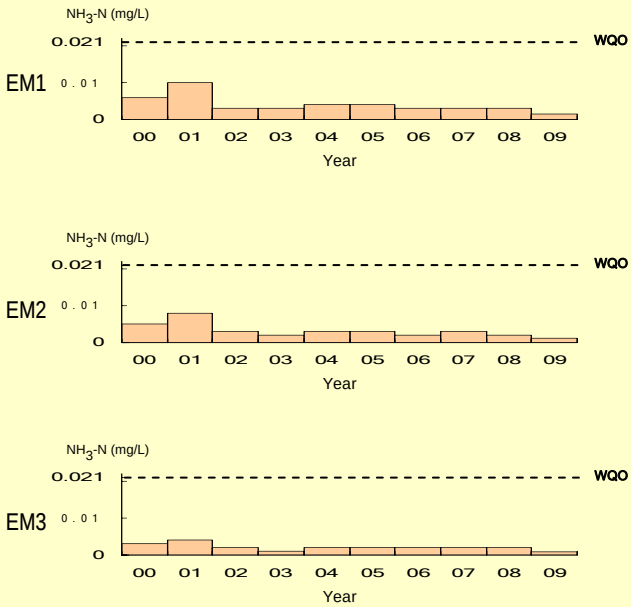
Non-compliance

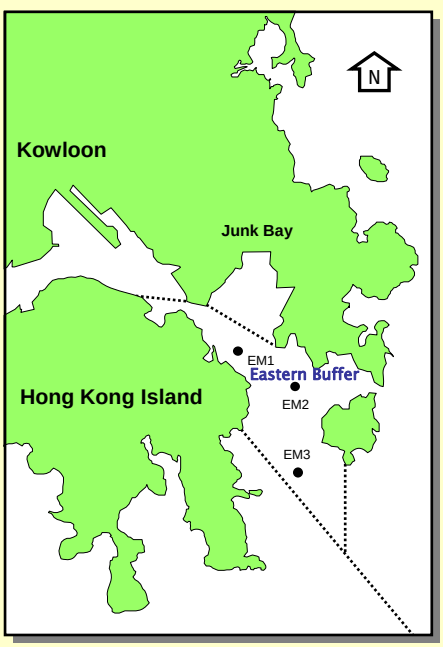
Levels of compliance with key Water Quality Objectives in the Eastern Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



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

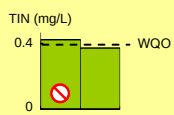




Total Inorganic Nitrogen (TIN)

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

annual mean for depth-averaged TIN

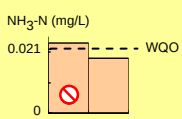


Unionised Ammonia (NH_3-N)

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

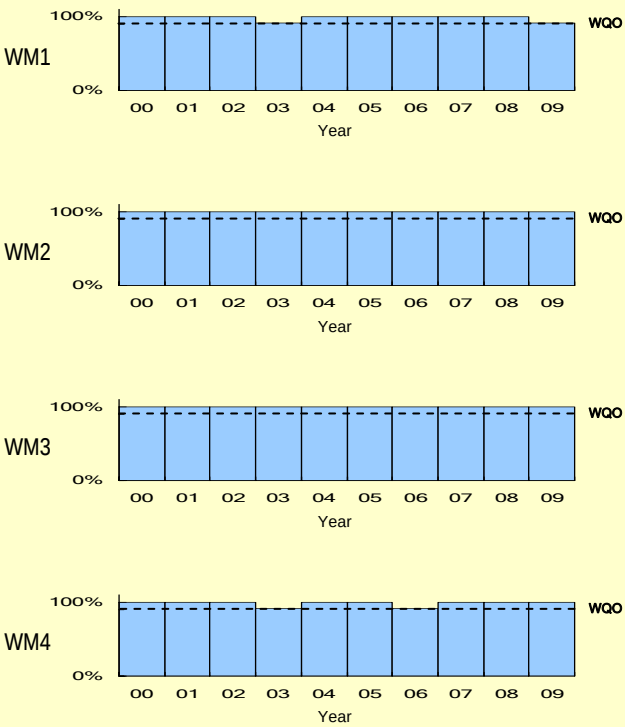
annual mean for depth-averaged NH_3-N

Non-compliance

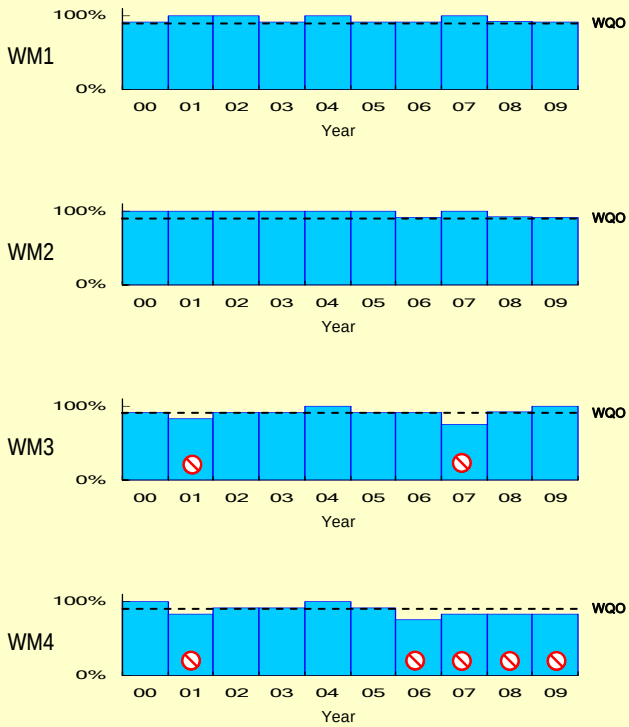


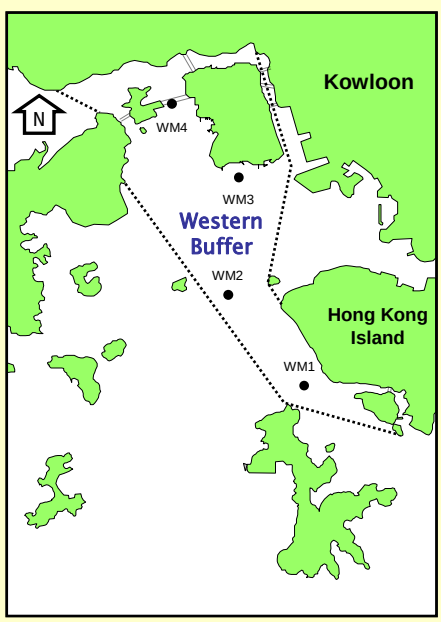
Levels of compliance with key Water Quality Objectives in the Western Buffer WCZ

Dissolved Oxygen (DO)
(bottom)



Dissolved Oxygen (DO)
(depth-averaged)



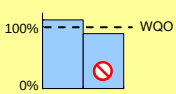


Dissolved Oxygen (DO)

1. Bottom

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

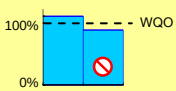
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

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

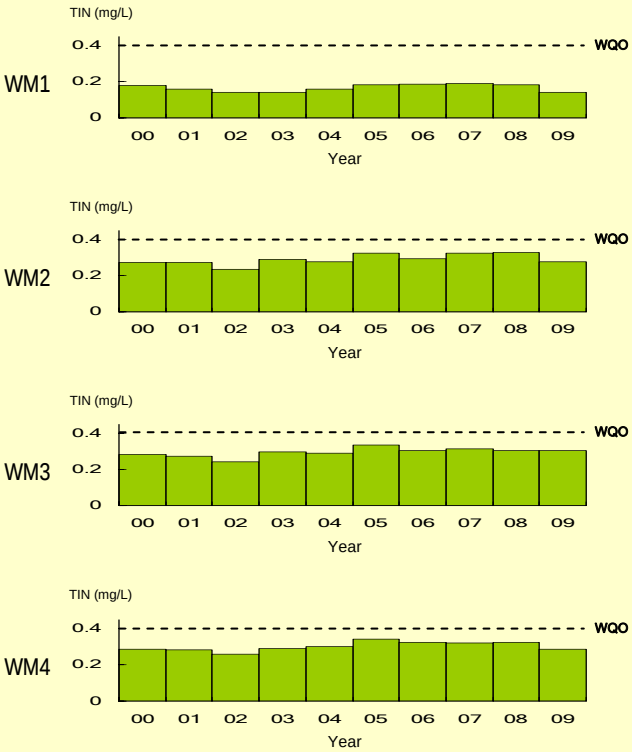
% sample with depth-averaged DO ≥ 4 mg/L



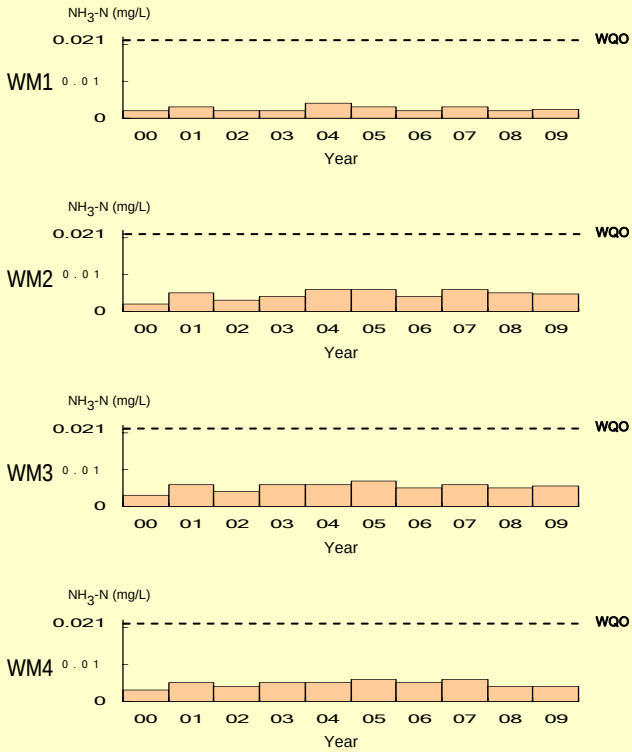
Non-compliance

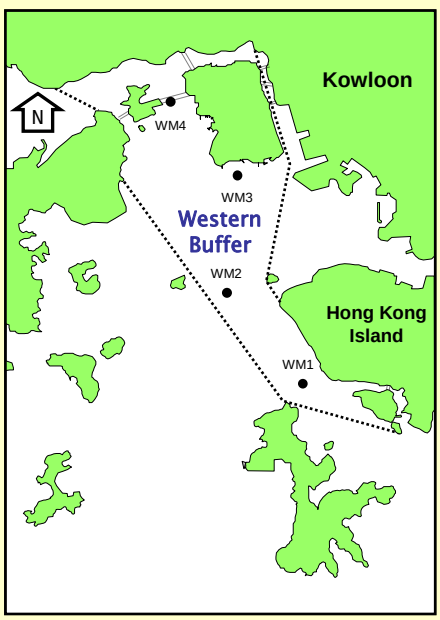
Levels of compliance with key Water Quality Objectives in the Western Buffer WCZ (continued)

Total Inorganic Nitrogen (TIN)
(depth-averaged)



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





Total Inorganic Nitrogen (TIN)

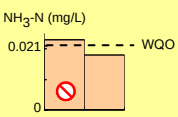
WQO : annual mean for depth-averaged TIN ≤ 0.4 mg/L

annual mean for depth-averaged TIN

Unionised Ammonia (NH_3-N)

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

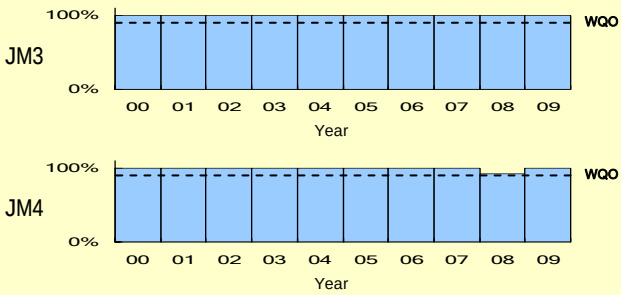
annual mean for depth-averaged NH_3-N



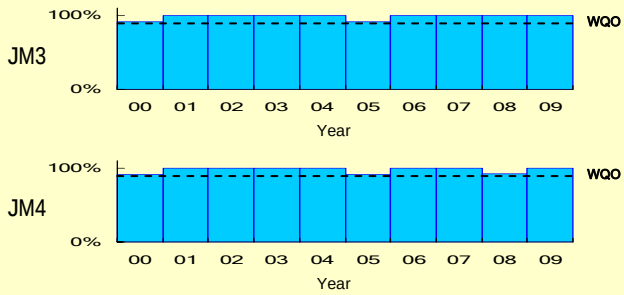
Non-compliance

Levels of compliance with key Water Quality Objectives in the Junk Bay WCZ

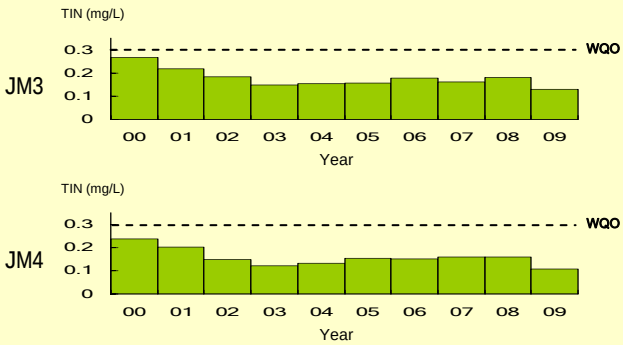
Dissolved Oxygen (DO)
(bottom)



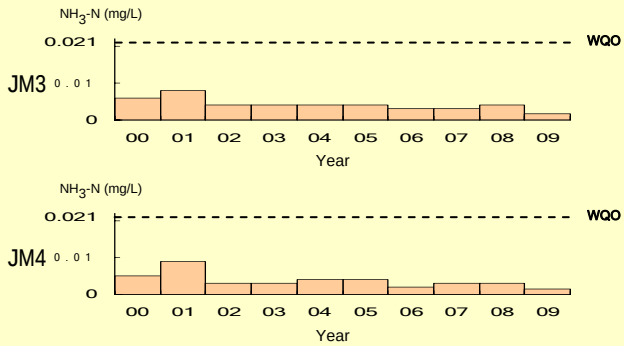
Dissolved Oxygen (DO)
(depth-averaged)

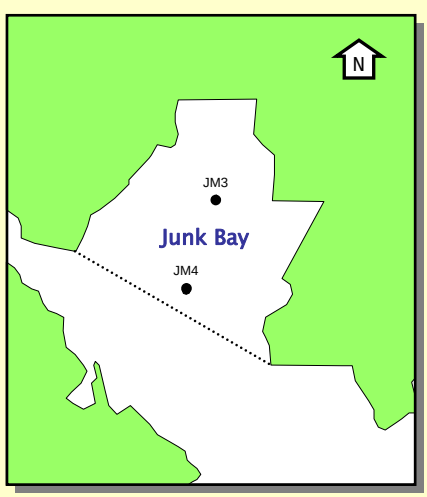


Total Inorganic Nitrogen (TIN)
(depth-averaged)



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



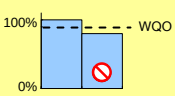


Dissolved Oxygen (DO)

1. Bottom

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

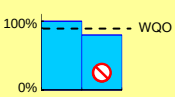
% sample with bottom DO ≥ 2 mg/L



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)

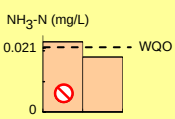
WQO : annual mean for depth-averaged TIN ≤ 0.3 mg/L

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

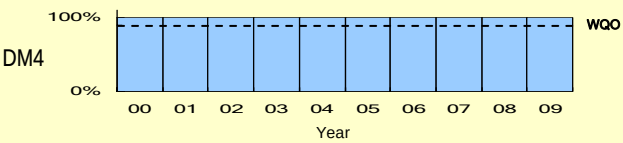
Levels of compliance with key Water Quality Objectives in the Deep Bay WCZ

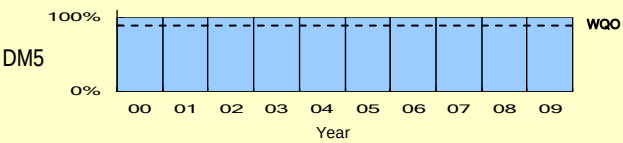
Dissolved Oxygen (DO)
(bottom)

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

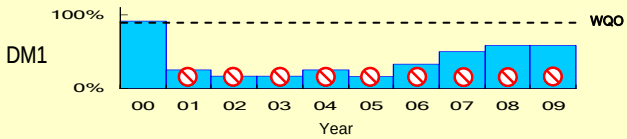
DM2 DO (bottom) not measured, water depth ≤ 3m

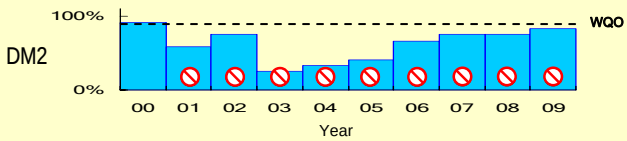
DM3 DO (bottom) not measured, water depth ≤ 3m

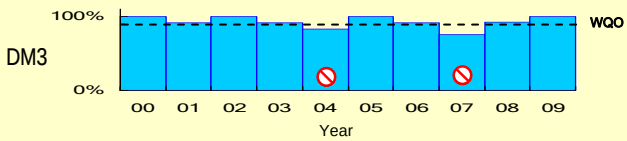


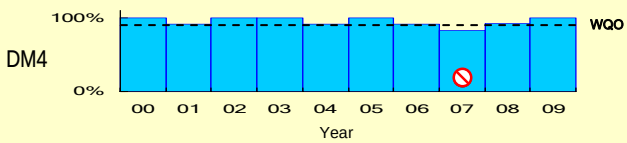


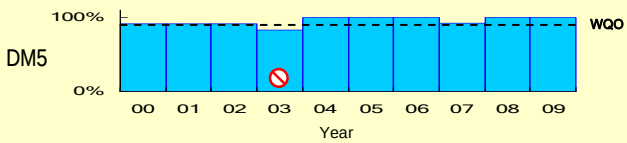
Dissolved Oxygen (DO)
(depth-averaged)

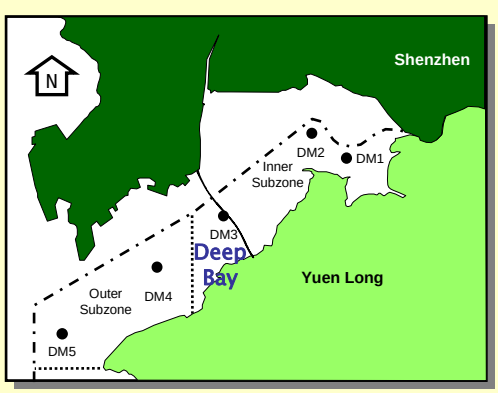










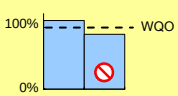


Dissolved Oxygen (DO)

1. Bottom

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

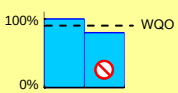
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

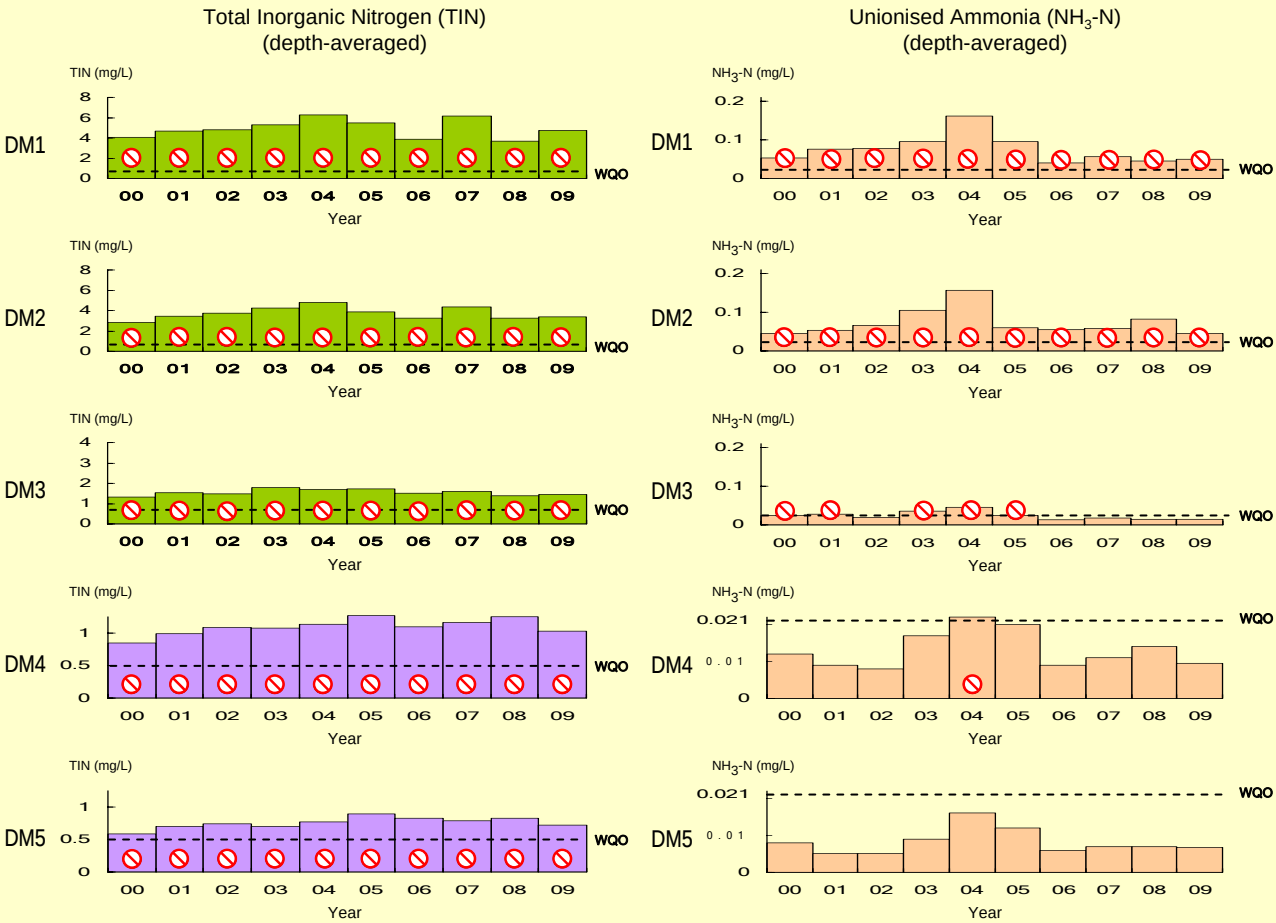
WQO : 90% sample with depth-averaged DO ≥ 4 mg/L

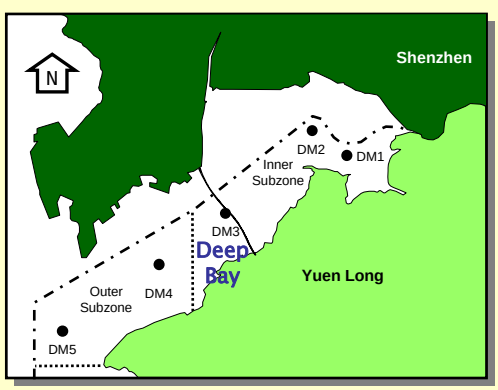
% sample with depth-averaged DO ≥ 4 mg/L



Non-compliance

Levels of compliance with key Water Quality Objectives in the Deep Bay WCZ (continued)



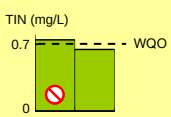


Total Inorganic Nitrogen (TIN)

Inner Subzone (DM1 - DM3)

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

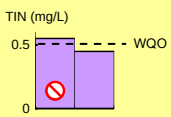
annual mean for depth-averaged TIN



Outer Subzone (DM4 - DM5)

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

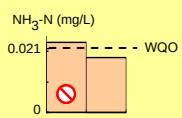
annual mean for depth-averaged TIN



Unionised Ammonia (NH_3-N)

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

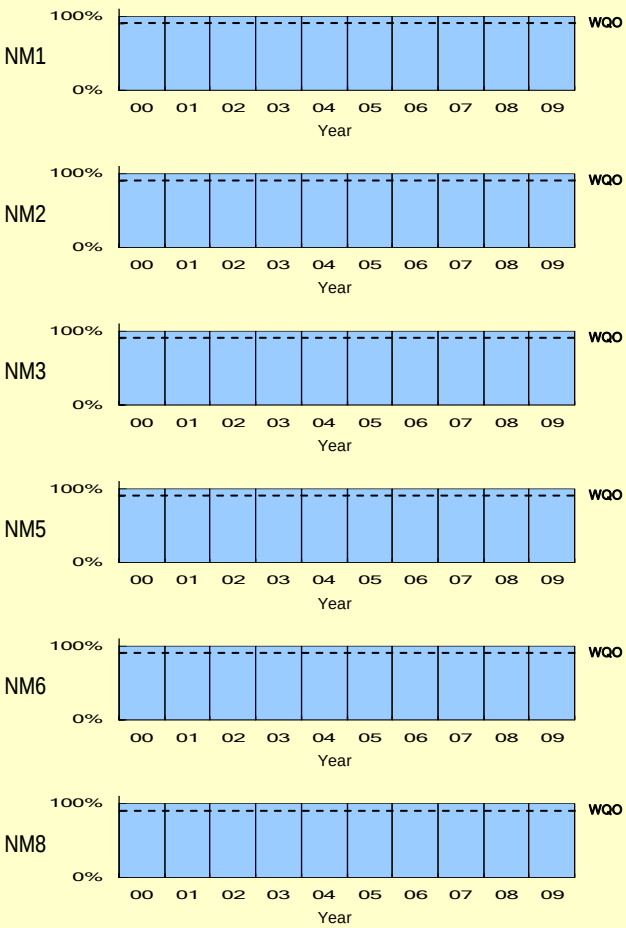
annual mean for depth-averaged NH_3-N



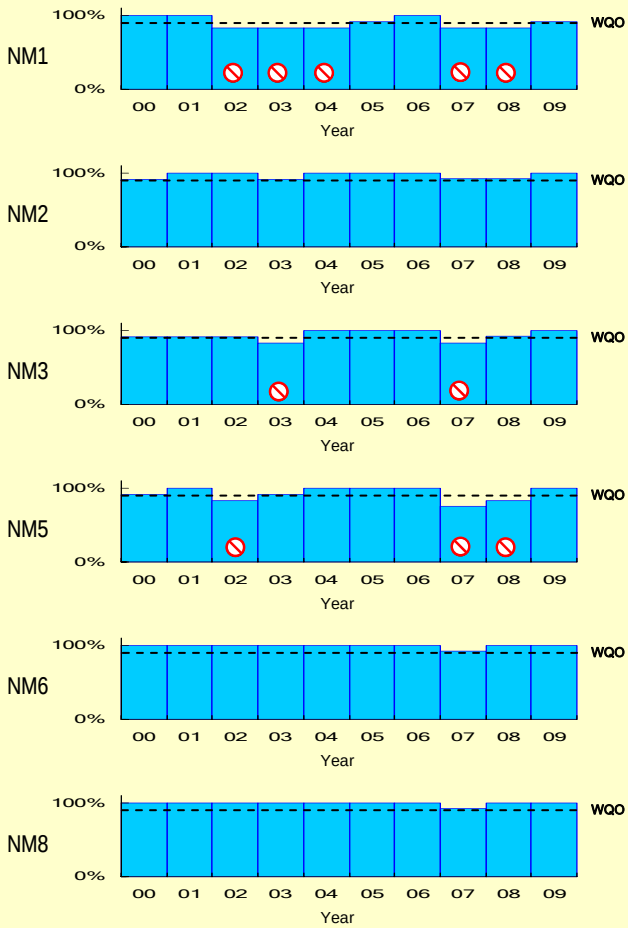
Non-compliance

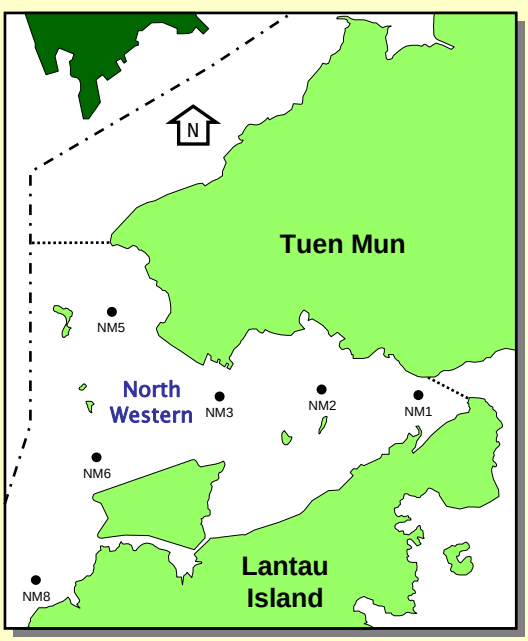
Levels of compliance with key Water Quality Objectives in the North Western WCZ

Dissolved Oxygen (DO) (bottom)



Dissolved Oxygen (DO) (depth-averaged)



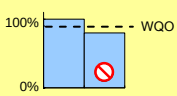


Dissolved Oxygen (DO)

1. Bottom

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

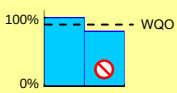
% sample with bottom DO ≥ 2 mg/L



2. Depth-averaged

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

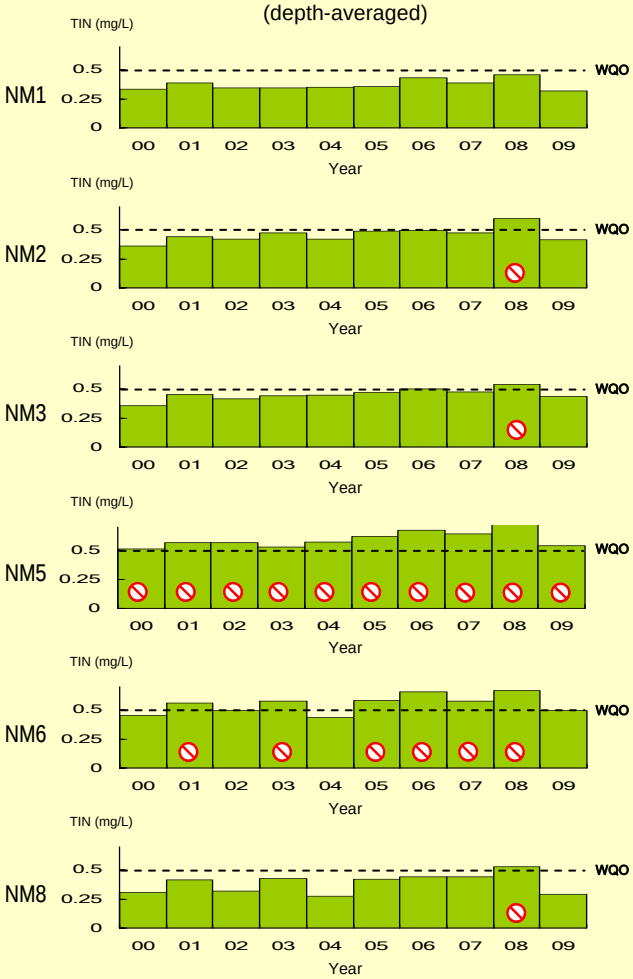
% sample with depth-averaged DO ≥ 4 mg/L



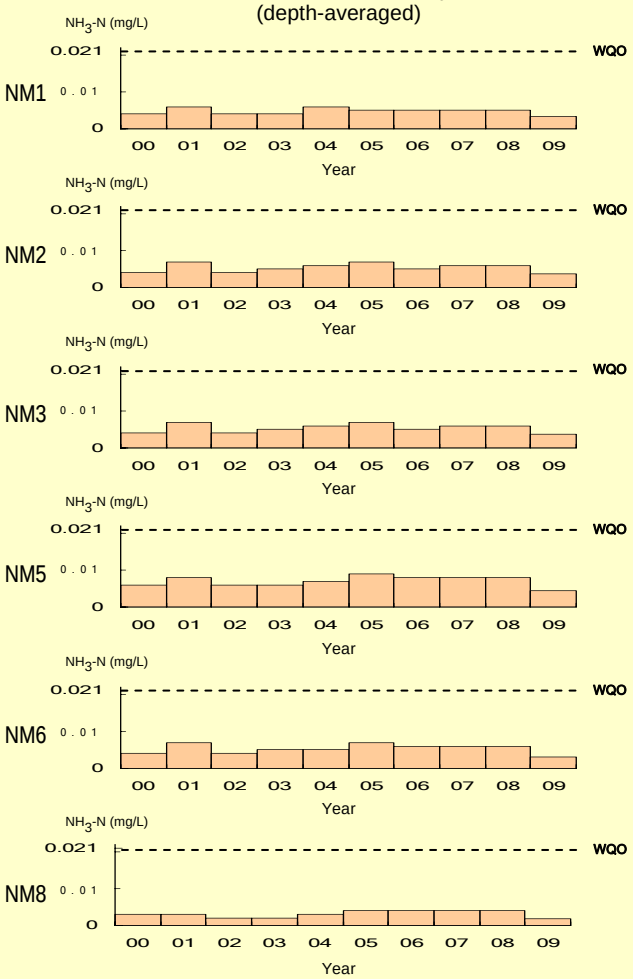
Non-compliance

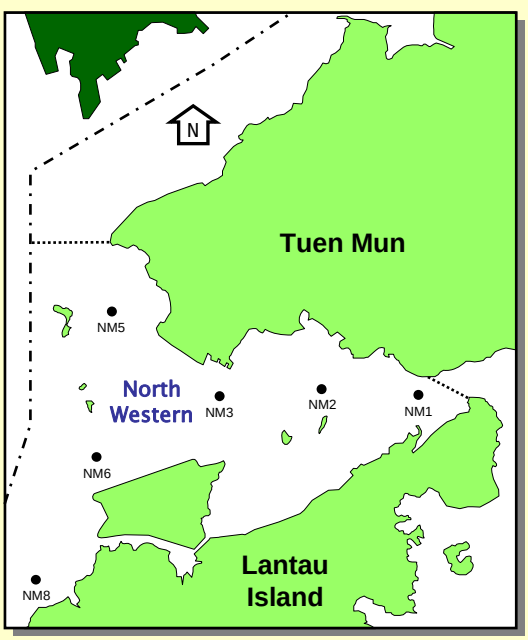
Levels of compliance with key Water Quality Objectives in the North Western WCZ (continued)

Total Inorganic Nitrogen (TIN) (depth-averaged)



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

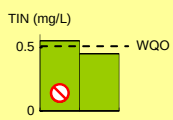




Total Inorganic Nitrogen (TIN)

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

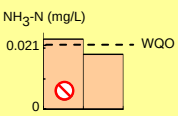
annual mean for depth-averaged TIN



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

Results of the Seasonal Kendall Test for water quality trends in the Mirs Bay WCZ, 1991 – 2009

Monitoring Station		MM1	MM2	MM3	MM4	MM5	MM6	MM7
Monitoring Period		1991 I 2009	1991 I 2009	1991 I 2009	1991 I 2009	1991 I 2009	1991 I 2009	1991 I 2009
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	-	↗	↗	-	↗	-	↗
Volatile suspended 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	↘	-	-	-	-	↘	-
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

Results of the Seasonal Kendall Test for water quality trends in the Mirs Bay WCZ, 1986 – 2009 (continued)

Monitoring Station		MM8	MM13	MM14	MM15	MM16	MM17
Monitoring Period		1991 I 2009	1991 I 2009	1994 I 2009	1994 I 2009	1994 I 2009	1986 I 2009
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	↗	-	-	-	-	↘
Volatile suspended 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	-	-	-	-	-	-
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. MM19 has nine years' data only, which are insufficient to perform Seasonal Kendall Test
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in the Port Shelter WCZ, 1986 – 2009

Monitoring Station		PM1	PM2	PM3	PM4	PM6	PM7	PM8	PM9	PM11
Monitoring Period		1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1993 I 2009
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	↘	↘	↘	↘	↘	-	-	-	-
Volatile suspended 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	-	-	-	-	↘	-	-	-	-
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

Results of the Seasonal Kendall Test for water quality trends in the Tolo Habour and Channel WCZ, 1986 – 2009

Monitoring Station		TM2	TM3	TM4	TM5	TM6	TM7	TM8
Monitoring Period		1986 I 2009	1986 I 2009	1986 I 2009	1988 I 2009	1986 I 2009	1988 I 2009	1986 I 2009
Parameter	Water Depth							
Temperature (°C)	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	↘	-	↘	-	↘	↘	-
Volatile suspended 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	↘	↘	↘	↘	↘	↘	-
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

Results of the Seasonal Kendall Test for water quality trends in the Southern WCZ, 1986 – 2009

Monitoring Station		SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM9
Monitoring Period		1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1988 I 2009
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	-	-	-	-	-	-	-	-
Volatile suspended 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	-	-	-	-	-	-	-	↗
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

Results of the Seasonal Kendall Test for water quality trends in the Southern WCZ, 1986 – 2009 (continued)

Monitoring Station		SM10	SM11	SM12	SM13	SM17	SM18	SM19	SM20
Monitoring Period		1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1989 I 2009	1989 I 2009	1989 I 2009	1999 I 2009
Parameter	Water Depth								
Temperature (°C)	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	-	-	-	↗	-	-	-	-
Volatile suspended 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	-	↗↗	-	-	-	-	-	-
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

Results of the Seasonal Kendall Test for water quality trends in the Victoria Harbour WCZ, 1986 – 2009

Monitoring Station		VM1	VM2	VM4	VM5	VM6
Monitoring Period		1988 – 2009	1988 – 2009	1988 – 2009	1986 – 2009	1988 – 2009
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	-	↘	↘	↘	↘
Volatile suspended 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	↘	↘	↘	↘	↘
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

Results of the Seasonal Kendall Test for water quality trends in the Victoria Harbour WCZ, 1986 – 2009 (continued)

Monitoring Station		VM7	VM8	VM12	VM14	VM15
Monitoring Period		1986 – 2009	1986 – 2009	1986 – 2009	1986 – 2009	1993 – 2009
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	↘	↘	-	-	↘
Volatile suspended 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	↘	↗	↘	↘	↘
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

Results of the Seasonal Kendall Test for water quality trends in the Eastern Buffer WCZ, 1986 – 2009

Monitoring Station		EM1	EM2	EM3
Monitoring Period		1986 I 2009	1986 I 2009	1988 I 2009
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	↘	-	-
Volatile suspended 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	↘	↘	↘
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

Results of the Seasonal Kendall Test for water quality trends in the Western Buffer WCZ, 1986 – 2009

Monitoring Station		WM1	WM2	WM3	WM4
Monitoring Period		1988 I 2009	1988 I 2009	1986 I 2009	1986 I 2009
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	-	-	-	-
Volatile suspended 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	-	↗	-	-
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

Results of the Seasonal Kendall Test for water quality trends in the Junk Bay WCZ, 1986 – 2009

Monitoring Station		JM3	JM4
Monitoring Period		1986 I 2009	1986 I 2009
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	-	-
Volatile suspended 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	↘	↘
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

Results of the Seasonal Kendall Test for water quality trends in the Deep Bay WCZ, 1986 – 2009

Monitoring Station		DM1	DM2	DM3	DM4	DM5
Monitoring Period		1986 I 2009	1986 I 2009	1986 I 2009	1986 I 2009	1991 I 2009
Parameter	Water Depth					
Temperature (°C)	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	-	-	-	-	↘
Volatile suspended 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	↗	↗	↗	↗	↗
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

Results of the Seasonal Kendall Test for water quality trends in the North Western WCZ, 1986 – 2009

Monitoring Station		NM1	NM2	NM3	NM5	NM6	NM8
Monitoring Period		1988 I 2009	1986 I 2009	1986 I 2009	1988 I 2009	1991 I 2009	1999 I 2009
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	-	-	-	-	-	-
Volatile suspended 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	↗	↗	↗	↗	-	-
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 bottom sediment quality in the Tolo Harbour and Channel and Southern WCZs, 2005 - 2009

	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)	72 (58 - 88)	80 (65 - 90)	69 (53 - 80)	88 (80 - 93)	73 (59 - 93)	83 (62 - 97)	78 (66 - 92)	79 (62 - 91)
Electrochemical Potential (mV)	-317 ((-361) - (-249))	-315 ((-352) - (-281))	-319 ((-359) - (-258))	-342 ((-380) - (-307))	-165 ((-263) - (-91))	-180 ((-279) - (-107))	-181 ((-265) - (-116))	-173 ((-246) - (-95))
Total Solids (%w/w)	36 (32 - 38)	33 (25 - 43)	36 (28 - 42)	31 (28 - 35)	58 (47 - 63)	49 (44 - 60)	50 (41 - 54)	48 (42 - 55)
Total Volatile Soilds (%w/w)	9.3 (7.8 - 11.0)	9.5 (7.2 - 12.0)	9.4 (7.4 - 12.0)	10.2 (8.4 - 12.0)	6 (4.9 - 9.6)	7.5 (5.4 - 14.0)	7 (5.8 - 8.7)	7.4 (4.9 - 16.0)
Chemical Oxygen Demand (mg/kg)	23000 (18000 - 27000)	22000 (19000 - 25000)	21000 (16000 - 23000)	20000 (16000 - 24000)	10000 (9100 - 12000)	13000 (10000 - 14000)	16000 (14000 - 18000)	16000 (14000 - 23000)
Total Carbon (%w/w)	0.8 (0.7 - 1.0)	0.7 (0.6 - 0.8)	1 (0.8 - 1.3)	0.8 (0.7 - 0.9)	0.9 (0.7 - 1.0)	0.7 (0.6 - 0.9)	0.8 (0.6 - 1.0)	0.8 (0.5 - 1.3)
Ammonical Nitrogen (mg/kg)	6.91 (0.05 - 13.00)	3.37 (<0.05 - 7.20)	8.82 (3.20 - 15.00)	11.42 (7.60 - 21.00)	6.05 (2.30 - 15.00)	4.75 (2.60 - 6.80)	5.22 (1.80 - 11.00)	3.05 (0.97 - 6.50)
Total Kjeldahl Nitrogen (mg/kg)	580 (420 - 700)	530 (350 - 630)	650 (400 - 810)	770 (590 - 870)	360 (210 - 440)	440 (290 - 510)	400 (330 - 470)	430 (260 - 710)
Total Phosphorus (mg/kg)	170 (140 - 200)	160 (140 - 180)	170 (130 - 200)	210 (160 - 230)	210 (110 - 250)	210 (160 - 230)	210 (180 - 230)	210 (150 - 290)
Total Sulphide (mg/kg)	98 (7.5 - 250.0)	98 (9.8 - 240.0)	110 (11.0 - 310.0)	110 (21.0 - 430.0)	12 (4.7 - 22.0)	28 (1.2 - 86.0)	16 (3.3 - 49.0)	17 (1.9 - 53.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	8.4 (5.9 - 10.0)	9.3 (7.4 - 11.0)	7.4 (5.7 - 9.2)	6 (5.3 - 6.8)	6.7 (6.2 - 7.9)	8.3 (7.8 - 9.1)	7.1 (5.8 - 7.9)	7.4 (6.1 - 8.9)
Cadmium (mg/kg)	0.6 (0.2 - 0.8)	0.6 (0.5 - 0.7)	0.5 (0.3 - 0.6)	0.3 (0.2 - 0.3)	<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)	25 (19 - 29)	24 (20 - 27)	24 (19 - 33)	33 (30 - 36)	24 (20 - 28)	33 (27 - 38)	32 (28 - 37)	35 (29 - 47)
Copper (mg/kg)	36 (15 - 50)	40 (26 - 59)	24 (19 - 36)	21 (17 - 25)	10 (7 - 13)	21 (17 - 23)	18 (15 - 21)	27 (18 - 38)
Lead (mg/kg)	80 (66 - 96)	92 (77 - 100)	65 (52 - 80)	50 (44 - 57)	26 (22 - 31)	35 (30 - 41)	34 (28 - 38)	38 (31 - 44)
Mercury (mg/kg)	0.08 (<0.05 - 0.12)	0.07 (<0.05 - 0.11)	0.06 (<0.05 - 0.10)	0.06 (<0.05 - 0.09)	0.05 (<0.05 - 0.06)	0.09 (0.07 - 0.13)	0.1 (0.07 - 0.15)	0.12 (0.08 - 0.20)
Nickel (mg/kg)	16 (12 - 22)	15 (12 - 20)	16 (11 - 24)	25 (19 - 31)	17 (14 - 21)	23 (19 - 26)	22 (19 - 25)	22 (19 - 26)
Silver (mg/kg)	0.4 (0.2 - 0.6)	0.5 (0.4 - 0.7)	0.3 (0.2 - 0.3)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)	0.3 (0.2 - 0.3)	0.2 (<0.2 - 0.2)	0.3 (<0.2 - 0.4)
Zinc (mg/kg)	230 (130 - 320)	270 (220 - 380)	160 (130 - 200)	130 (120 - 150)	70 (55 - 81)	100 (77 - 110)	91 (74 - 100)	110 (78 - 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]	90 (90 - 90)	90 (90 - 90)	90 (90 - 90)	90 (90 - 90)	90 (90 - 95)	91 (90 - 95)	93 (90 - 110)	93 (90 - 110)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	44 (24 - 58)	47 (26 - 85)	45 (27 - 87)	52 (28 - 72)	39 (26 - 55)	86 (34 - 210)	59 (25 - 120)	88 (40 - 160)

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 bottom sediment quality in the Southern, Junk Bay and Deep Bay WCZs, 2005 – 2009

	Lantau Island		Junk Bay	Inner Deep Bay		Outer Deep Bay	
Parameter	(East) SS5	(South) SS6	JS2	DS1	DS2	DS3	DS4
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	93 (85 - 99)	65 (51 - 87)	85 (68 - 96)	68 (18 - 94)	66 (17 - 90)	76 (44 - 95)	62 (39 - 88)
Electrochemical Potential (mV)	-207 ((-258) - (-110))	-151 ((-270) - (-62))	-198 ((-310) - (-115))	-243 ((-311) - (-143))	-181 ((-267) - (-34))	-201 ((-350) - (-88))	-193 ((-334) - (-136))
Total Solids (%w/w)	39 (37 - 41)	63 (55 - 66)	45 (40 - 51)	50 (37 - 59)	48 (41 - 53)	49 (42 - 67)	57 (47 - 67)
Total Volatile Soilds (%w/w)	7.7 (6.8 - 9.9)	4.0 (3.2 - 4.6)	6.9 (5.6 - 9.5)	6.2 (4.3 - 8.8)	6.3 (5.0 - 8.5)	6.6 (3.2 - 9.8)	5.8 (4.0 - 8.1)
Chemical Oxygen Demand (mg/kg)	15000 (13000 - 17000)	9200 (7800 - 11000)	17000 (13000 - 19000)	22000 (17000 - 29000)	19000 (15000 - 22000)	15000 (9900 - 18000)	14000 (10000 - 18000)
Total Carbon (%w/w)	0.6 (0.5 - 0.6)	0.5 (0.4 - 0.6)	0.7 (0.6 - 0.8)	0.7 (0.4 - 1.2)	0.7 (0.6 - 0.8)	0.5 (0.4 - 0.7)	0.6 (0.4 - 0.9)
Ammonical Nitrogen (mg/kg)	8.1 (1.20 - 15.00)	5.2 (1.20 - 10.00)	3.7 (0.22 - 8.60)	120.4 (14.00 - 600.00)	14.6 (<0.05 - 53.00)	2.3 (<0.05 - 7.90)	6.1 (<0.05 - 15.00)
Total Kjeldahl Nitrogen (mg/kg)	480 (300 - 570)	290 (190 - 360)	450 (320 - 520)	550 (230 - 1700)	450 (260 - 700)	290 (160 - 450)	250 (100 - 410)
Total Phosphorus (mg/kg)	180 (130 - 220)	190 (130 - 220)	190 (150 - 210)	280 (110 - 530)	300 (120 - 490)	190 (100 - 280)	160 (70 - 240)
Total Sulphide (mg/kg)	45 (2.2 - 150.0)	4 (0.5 - 13.0)	48 (1.6 - 200.0)	330 (0.5 - 960.0)	140 (1.2 - 570.0)	30 (0.2 - 120.0)	7 (1.1 - 22.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.2)	0.3 (<0.1 - 0.5)	0.2 (<0.1 - 0.4)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	7.6 (6.6 - 8.6)	5.3 (4.4 - 5.9)	7.4 (6.7 - 8.5)	9.7 (7.1 - 13.0)	11.9 (9.5 - 14.0)	11.6 (5.5 - 15.0)	12.2 (8.8 - 15.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.2 (0.1 - 0.2)	0.4 (0.1 - 0.7)	0.3 (0.1 - 0.6)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)
Chromium (mg/kg)	42 (40 - 45)	21 (17 - 23)	46 (39 - 52)	44 (33 - 66)	44 (22 - 79)	39 (22 - 53)	34 (16 - 49)
Copper (mg/kg)	38 (33 - 42)	10 (8 - 13)	96 (73 - 120)	78 (21 - 210)	64 (26 - 100)	68 (12 - 230)	28 (9 - 65)
Lead (mg/kg)	51 (42 - 56)	23 (20 - 28)	50 (41 - 54)	57 (45 - 84)	52 (30 - 84)	45 (32 - 61)	40 (27 - 58)
Mercury (mg/kg)	0.16 (0.14 - 0.20)	0.07 (<0.05 - 0.18)	0.26 (0.17 - 0.41)	0.18 (<0.05 - 0.40)	0.15 (0.06 - 0.26)	0.11 (<0.05 - 0.16)	0.08 (<0.05 - 0.14)
Nickel (mg/kg)	27 (24 - 32)	13 (11 - 17)	24 (19 - 31)	38 (22 - 140)	27 (14 - 37)	25 (12 - 35)	21 (15 - 31)
Silver (mg/kg)	0.5 (0.5 - 0.6)	<0.2 (<0.2 - <0.2)	2.0 (1.6 - 3.0)	1 (0.3 - 2.9)	0.7 (0.2 - 1.6)	0.4 (<0.2 - 0.7)	0.3 (<0.2 - 0.5)
Zinc (mg/kg)	140 (120 - 160)	59 (44 - 73)	150 (110 - 160)	240 (110 - 560)	200 (91 - 420)	130 (65 - 200)	97 (63 - 140)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	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]	90 (90 - 94)	90 (90 - 90)	97 (90 - 110)	150 (90 - 470)	94 (90 - 110)	92 (90 - 98)	91 (90 - 95)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	74 (59 - 100)	23 (20 - 29)	250 (90 - 420)	240 (26 - 880)	140 (75 - 330)	98 (29 - 280)	44 (16 - 82)

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 bottom sediment quality in the Port Shelter and Mirs Bay WCZs, 2005 - 2009

Parameter	Inner Port Shelter	Outer Port Shelter		Starling Inlet	Crooked Island		Port Island	Mirs Bay (North)
	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)	87 (58 - 96)	58 (34 - 92)	79 (66 - 91)	86 (64 - 95)	84 (21 - 99)	92 (83 - 99)	89 (77 - 98)	88 (82 - 96)
Electrochemical Potential (mV)	-240 ((-308) - (-180))	-148 ((-240) - (-94))	-175 ((-252) - (-73))	-278 ((-372) - (-215))	-332 ((-368) - (-298))	-342 ((-368) - (-306))	-243 ((-295) - (-184))	-237 ((-327) - (-117))
Total Solids (%w/w)	36 (33 - 41)	53 (38 - 63)	49 (46 - 53)	40 (36 - 44)	32 (31 - 35)	30 (27 - 33)	35 (33 - 41)	42 (31 - 54)
Total Volatile Soilds (%w/w)	11.6 (8.5 - 14.0)	7.8 (4.7 - 10.0)	8.4 (7.2 - 11.0)	7.5 (6.4 - 11.0)	9.2 (7.5 - 15.0)	10.3 (8.9 - 15.0)	9.2 (7.6 - 15.0)	8.4 (5.1 - 12.0)
Chemical Oxygen Demand (mg/kg)	18000 (14000 - 20000)	12000 (9900 - 14000)	13000 (11000 - 15000)	18000 (14000 - 23000)	17000 (13000 - 20000)	18000 (16000 - 20000)	17000 (15000 - 20000)	16000 (11000 - 19000)
Total Carbon (%w/w)	1.2 (1.0 - 1.4)	1.8 (0.9 - 3.0)	1.3 (1.1 - 1.4)	0.7 (0.6 - 0.8)	0.6 (0.5 - 0.7)	0.7 (0.6 - 0.9)	0.8 (0.7 - 1.0)	0.8 (0.5 - 1.1)
Ammonical Nitrogen (mg/kg)	6.36 (0.10 - 14.00)	5.14 (1.30 - 11.00)	6.5 (2.40 - 9.10)	8.82 (2.60 - 18.00)	13.54 (7.10 - 20.00)	9.0 (4.80 - 14.00)	5.47 (0.75 - 10.00)	4.96 (<0.05 - 10.00)
Total Kjeldahl Nitrogen (mg/kg)	550 (280 - 680)	370 (210 - 570)	420 (210 - 580)	450 (290 - 600)	600 (520 - 670)	630 (340 - 730)	660 (590 - 770)	440 (290 - 660)
Total Phosphorus (mg/kg)	170 (87 - 210)	150 (83 - 200)	170 (89 - 230)	160 (95 - 250)	180 (170 - 180)	190 (140 - 210)	210 (180 - 250)	160 (110 - 220)
Total Sulphide (mg/kg)	44 (4.1 - 270.0)	6.6 (0.7 - 15.0)	12 (0.5 - 36.0)	74 (11.0 - 170.0)	70 (8.0 - 190.0)	24 (1.8 - 82.0)	36 (1.1 - 180.0)	11 (1.9 - 25.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)	0.2 (<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)	5.8 (4.8 - 6.5)	3.8 (0.2 - 5.2)	5.9 (5.2 - 6.6)	8.4 (6.9 - 9.3)	6.8 (5.7 - 7.9)	6.4 (5.8 - 7.6)	6.2 (4.4 - 7.3)	6.2 (5.0 - 7.1)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.3 (0.2 - 0.5)	0.3 (0.1 - 0.3)	0.2 (0.1 - 0.4)	0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	27 (20 - 34)	22 (13 - 31)	26 (22 - 30)	30 (26 - 35)	36 (33 - 39)	34 (31 - 39)	33 (25 - 38)	29 (19 - 33)
Copper (mg/kg)	22 (18 - 29)	10 (6 - 16)	12 (10 - 14)	34 (23 - 42)	21 (14 - 23)	20 (16 - 22)	16 (12 - 19)	12 (10 - 15)
Lead (mg/kg)	36 (30 - 40)	26 (15 - 38)	31 (26 - 35)	49 (41 - 56)	46 (39 - 51)	43 (38 - 51)	44 (28 - 50)	35 (24 - 39)
Mercury (mg/kg)	0.09 (0.07 - 0.11)	0.05 (<0.05 - 0.05)	<0.05 (<0.05 - <0.05)	0.08 (0.06 - 0.10)	0.06 (<0.05 - 0.06)	0.07 (0.06 - 0.09)	0.06 (<0.05 - 0.07)	0.06 (<0.05 - 0.13)
Nickel (mg/kg)	19 (15 - 23)	16 (9 - 24)	20 (16 - 24)	19 (16 - 24)	24 (21 - 27)	24 (22 - 27)	25 (18 - 30)	21 (13 - 25)
Silver (mg/kg)	0.2 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	<0.2 (<0.2 - <0.2)	1.2 (0.6 - 1.4)	0.3 (<0.2 - 0.5)	0.2 (<0.2 - 0.3)	0.2 (<0.2 - 0.2)	<0.2 (<0.2 - <0.2)
Zinc (mg/kg)	100 (73 - 130)	67 (29 - 93)	77 (53 - 90)	110 (92 - 140)	110 (92 - 120)	100 (82 - 120)	100 (77 - 120)	80 (51 - 96)
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]	90 (90 - 90)	90 (90 - 90)	90 (90 - 90)	91 (90 - 100)	90 (90 - 90)	90 (90 - 94)	90 (90 - 90)	91 (90 - 97)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	53 (24 - 77)	26 (17 - 34)	27 (20 - 40)	52 (28 - 190)	35 (24 - 51)	49 (28 - 71)	38 (29 - 54)	31 (20 - 67)

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 bottom sediment quality in the Mirs Bay WCZ, 2005 - 2009

Parameter	Mirs Bay (North) MS4	Mirs Bay (North) MS5	Long Harbour MS6	Waglan Island MS8	Mirs Bay (South) MS13	Mirs Bay (Central) MS14	Mirs Bay (Central) MS15	Mirs Bay (Central) MS16
Number of samples	10	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	91 (76 - 97)	87 (79 - 95)	92 (81 - 98)	94 (90 - 97)	92 (82 - 99)	92 (84 - 96)	90 (82 - 97)	85 (76 - 96)
Electrochemical Potential (mV)	-194 ((-274) - (-82))	-194 ((-255) - (-95))	-242 ((-308) - (-91))	-176 ((-249) - (-139))	-172 ((-208) - (-104))	-172 ((-250) - (-122))	-154 ((-260) - (-108))	-162 ((-267) - (-98))
Total Solids (%w/w)	38 (33 - 41)	42 (36 - 47)	34 (33 - 39)	46 (44 - 49)	50 (42 - 54)	50 (46 - 56)	51 (43 - 57)	56 (49 - 60)
Total Volatile Soilds (%w/w)	8.5 (6.3 - 13.0)	7.9 (6.6 - 12.0)	10.7 (9.0 - 16.0)	6.6 (5.6 - 8.9)	6.2 (5.5 - 8.4)	6.1 (4.9 - 8.7)	6.2 (5.5 - 8.8)	5.9 (5.2 - 8.0)
Chemical Oxygen Demand (mg/kg)	16000 (12000 - 18000)	14000 (10000 - 17000)	18000 (15000 - 21000)	12000 (9800 - 18000)	11000 (8100 - 18000)	11000 (8700 - 18000)	11000 (8100 - 21000)	12000 (7900 - 27000)
Total Carbon (%w/w)	0.7 (0.6 - 0.8)	0.7 (0.6 - 0.8)	0.9 (0.7 - 1.0)	0.5 (0.5 - 0.6)	0.6 (0.5 - 0.6)	0.5 (0.5 - 0.6)	0.6 (0.5 - 0.6)	0.6 (0.6 - 0.7)
Ammonical Nitrogen (mg/kg)	5.38 (0.85 - 14.00)	7.85 (0.15 - 23.00)	7.75 (4.70 - 11.00)	1.85 (0.35 - 3.70)	1.95 (0.70 - 4.90)	2.11 (0.56 - 4.00)	2.66 (0.19 - 4.30)	2.5 (0.86 - 4.60)
Total Kjeldahl Nitrogen (mg/kg)	550 (430 - 670)	550 (390 - 650)	700 (580 - 800)	430 (270 - 480)	370 (200 - 530)	400 (200 - 510)	430 (310 - 500)	400 (300 - 540)
Total Phosphorus (mg/kg)	190 (160 - 210)	200 (160 - 230)	220 (180 - 240)	210 (150 - 240)	200 (98 - 260)	210 (130 - 250)	230 (180 - 250)	220 (170 - 260)
Total Sulphide (mg/kg)	16 (1.3 - 67.0)	13 (0.6 - 34.0)	28 (1.7 - 98.0)	7.6 (0.6 - 25.0)	42 (0.4 - 390.0)	4.9 (0.6 - 18.0)	7.9 (0.8 - 20.0)	4.9 (0.6 - 12.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.3)	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)	0.1 (<0.1 - 0.1)
Arsenic (mg/kg)	6.3 (5.5 - 7.0)	6.3 (5.4 - 7.0)	5.9 (5.4 - 6.9)	6.5 (5.4 - 7.7)	7.6 (5.7 - 15.0)	7.1 (5.7 - 8.3)	6.1 (5.2 - 6.8)	6.3 (4.9 - 7.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<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 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	36 (31 - 39)	30 (25 - 35)	33 (30 - 39)	31 (25 - 37)	34 (27 - 60)	31 (28 - 34)	28 (24 - 32)	27 (21 - 33)
Copper (mg/kg)	16 (14 - 17)	13 (10 - 15)	18 (16 - 19)	12 (8 - 16)	13 (10 - 22)	11 (9 - 13)	10 (8 - 12)	10 (7 - 12)
Lead (mg/kg)	40 (34 - 45)	40 (31 - 47)	44 (39 - 49)	33 (29 - 42)	34 (27 - 53)	33 (30 - 36)	30 (23 - 33)	31 (27 - 35)
Mercury (mg/kg)	0.05 (<0.05 - 0.07)	0.05 (<0.05 - 0.06)	0.07 (<0.05 - 0.11)	0.05 (<0.05 - 0.06)	0.06 (<0.05 - 0.08)	0.05 (<0.05 - 0.05)	0.05 (<0.05 - 0.05)	<0.05 (<0.05 - <0.05)
Nickel (mg/kg)	26 (22 - 32)	23 (18 - 27)	24 (21 - 27)	24 (18 - 29)	26 (20 - 45)	24 (19 - 27)	22 (17 - 28)	21 (19 - 24)
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)	97 (77 - 110)	89 (64 - 100)	110 (89 - 150)	85 (64 - 100)	91 (76 - 160)	84 (74 - 92)	76 (64 - 95)	75 (65 - 84)
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]	90 (90 - 90)	90 (90 - 90)	90 (90 - 90)	90 (90 - 90)	90 (90 - 95)	90 (90 - 90)	90 (90 - 90)	91 (90 - 97)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	37 (29 - 57)	33 (19 - 63)	54 (41 - 74)	32 (17 - 67)	32 (19 - 59)	22 (18 - 32)	26 (19 - 51)	30 (17 - 91)

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 bottom sediment quality in the North Western and Western Buffer WCZs, 2005 - 2009

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)	59 (35 - 88)	71 (34 - 96)	44 (14 - 66)	45 (17 - 64)	67 (39 - 91)	84 (68 - 93)
Electrochemical Potential (mV)	-191 ((-338) - (-129))	-204 ((-340) - (-86))	-232 ((-403) - (-161))	-190 ((-320) - (-58))	-204 ((-289) - (-114))	-173 ((-233) - (-92))
Total Solids (%w/w)	55 (45 - 64)	54 (44 - 70)	61 (49 - 68)	64 (51 - 76)	50 (43 - 63)	46 (43 - 49)
Total Volatile Soilds (%w/w)	6.1 (5.4 - 7.5)	6.1 (3.1 - 7.5)	5.1 (4.4 - 5.9)	4.3 (2.2 - 7.0)	6.4 (4.6 - 7.7)	6.6 (5.1 - 8.4)
Chemical Oxygen Demand (mg/kg)	14000 (11000 - 15000)	15000 (9700 - 23000)	15000 (11000 - 19000)	12000 (7500 - 15000)	18000 (13000 - 20000)	15000 (13000 - 21000)
Total Carbon (%w/w)	0.9 (0.6 - 1.2)	0.7 (0.5 - 1.0)	0.7 (0.6 - 0.9)	0.5 (0.3 - 0.8)	0.8 (0.7 - 1.1)	0.6 (0.5 - 0.7)
Ammonical Nitrogen (mg/kg)	2.87 (0.16 - 9.30)	5.85 (<0.05 - 21.00)	12.71 (1.00 - 28.00)	2.63 (<0.05 - 10.00)	7.7 (4.80 - 18.00)	4.9 (<0.05 - 30.00)
Total Kjeldahl Nitrogen (mg/kg)	320 (120 - 520)	340 (170 - 430)	290 (110 - 390)	250 (130 - 400)	410 (290 - 480)	400 (260 - 540)
Total Phosphorus (mg/kg)	180 (84 - 290)	200 (130 - 250)	170 (77 - 230)	140 (110 - 230)	190 (130 - 260)	180 (140 - 200)
Total Sulphide (mg/kg)	11 (0.7 - 38.0)	29 (1.9 - 110.0)	27 (6.7 - 62.0)	9.1 (0.7 - 47.0)	77 (9.1 - 200.0)	29 (3.3 - 130.0)
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 - 0.2)	0.1 (<0.1 - 0.2)
Arsenic (mg/kg)	8.1 (6.8 - 9.6)	11.4 (8.3 - 14.0)	10 (8.8 - 12.0)	9.7 (7.1 - 14.0)	7.7 (3.8 - 9.4)	9 (6.9 - 12.0)
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 - 0.1)	0.1 (<0.1 - 0.2)	<0.1 (<0.1 - <0.1)
Chromium (mg/kg)	29 (24 - 34)	32 (20 - 42)	28 (22 - 34)	26 (16 - 37)	34 (17 - 41)	35 (32 - 40)
Copper (mg/kg)	32 (26 - 37)	30 (18 - 48)	26 (12 - 40)	16 (9 - 27)	50 (13 - 68)	25 (17 - 29)
Lead (mg/kg)	35 (31 - 40)	38 (27 - 47)	35 (31 - 40)	28 (16 - 36)	40 (24 - 53)	37 (30 - 43)
Mercury (mg/kg)	0.09 (0.08 - 0.13)	0.11 (0.06 - 0.16)	0.09 (0.06 - 0.23)	0.06 (<0.05 - 0.09)	0.13 (0.06 - 0.17)	0.09 (0.05 - 0.14)
Nickel (mg/kg)	18 (15 - 22)	20 (11 - 26)	17 (13 - 21)	17 (8 - 24)	20 (9 - 24)	23 (19 - 26)
Silver (mg/kg)	0.4 (0.3 - 0.5)	0.3 (<0.2 - 0.5)	0.3 (<0.2 - 0.3)	<0.2 (<0.2 - <0.2)	1.1 (0.2 - 1.7)	0.4 (0.2 - 0.5)
Zinc (mg/kg)	97 (88 - 110)	96 (62 - 120)	100 (93 - 110)	71 (32 - 100)	110 (53 - 130)	100 (77 - 110)
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)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4]	91 (90 - 95)	92 (90 - 95)	93 (90 - 99)	90 (90 - 94)	95 (90 - 100)	91 (90 - 94)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	63 (26 - 120)	62 (24 - 93)	65 (24 - 120)	27 (17 - 49)	190 (77 - 420)	54 (38 - 70)

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

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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 bottom sediment quality in the Eastern Buffer and Victoria Harbour WCZs, 2005 - 2009

	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)	39 (21 - 62)	79 (55 - 98)	53 (24 - 91)	70 (20 - 89)	83 (51 - 95)	53 (25 - 77)	74 (53 - 88)	73 (18 - 94)
Electrochemical Potential (mV)	-179 ((-272) - (-65))	-171 ((-286) - (-120))	-185 ((-271) - (-134))	-281 ((-365) - (-183))	-351 ((-406) - (-244))	-302 ((-381) - (-169))	-187 ((-277) - (-80))	-231 ((-327) - (-121))
Total Solids (%w/w)	67 (62 - 71)	54 (38 - 66)	60 (45 - 70)	43 (35 - 63)	40 (37 - 50)	53 (37 - 64)	51 (47 - 54)	45 (37 - 66)
Total Volatile Soilds (%w/w)	4.4 (3.7 - 5.3)	5.8 (3.5 - 7.9)	5.1 (3.7 - 7.3)	6.8 (4.1 - 9.6)	8.2 (6.3 - 10.0)	7.6 (5.1 - 12.0)	6 (5.3 - 6.9)	6.9 (4.1 - 8.6)
Chemical Oxygen Demand (mg/kg)	10000 (8700 - 12000)	12000 (6700 - 15000)	13000 (11000 - 18000)	22000 (16000 - 26000)	26000 (20000 - 30000)	23000 (16000 - 32000)	15000 (11000 - 17000)	19000 (15000 - 24000)
Total Carbon (%w/w)	1.3 (0.9 - 1.6)	0.7 (0.6 - 0.9)	0.9 (0.7 - 1.3)	0.7 (0.6 - 0.8)	0.9 (0.7 - 1.4)	1.1 (0.7 - 1.5)	0.8 (0.6 - 1.3)	0.8 (0.5 - 1.5)
Ammonical Nitrogen (mg/kg)	4.93 (2.20 - 9.30)	10.13 (0.45 - 67.00)	4.38 (0.30 - 8.50)	9.79 (<0.05 - 20.00)	22.88 (7.20 - 41.00)	10.03 (2.50 - 28.00)	5.18 (<0.05 - 15.00)	4.47 (<0.05 - 16.00)
Total Kjeldahl Nitrogen (mg/kg)	270 (190 - 350)	390 (210 - 590)	360 (200 - 530)	560 (350 - 1200)	620 (430 - 940)	400 (170 - 560)	290 (130 - 410)	420 (300 - 550)
Total Phosphorus (mg/kg)	140 (96 - 200)	180 (140 - 220)	150 (88 - 230)	210 (130 - 430)	200 (160 - 240)	210 (110 - 260)	140 (65 - 190)	180 (140 - 220)
Total Sulphide (mg/kg)	15 (1.0 - 43.0)	29 (0.6 - 180.0)	22 (0.9 - 88.0)	130 (2.1 - 440.0)	220 (7.5 - 650.0)	140 (11.0 - 320.0)	10 (0.6 - 48.0)	140 (0.7 - 750.0)
Total Cyanide (mg/kg)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.6)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.4)
Arsenic (mg/kg)	4.3 (3.6 - 5.2)	6.3 (4.4 - 8.9)	4.5 (3.4 - 6.3)	7.6 (5.3 - 9.0)	7.9 (6.5 - 10.0)	9.1 (5.5 - 16.0)	4.9 (3.0 - 7.1)	8 (4.6 - 10.0)
Cadmium (mg/kg)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	0.1 (<0.1 - 0.1)	0.4 (0.2 - 0.6)	0.7 (0.4 - 0.8)	0.4 (0.2 - 0.6)	0.1 (<0.1 - 0.2)	0.5 (0.1 - 1.0)
Chromium (mg/kg)	19 (13 - 23)	28 (18 - 41)	27 (21 - 38)	46 (18 - 59)	57 (42 - 68)	35 (17 - 49)	34 (27 - 43)	70 (27 - 91)
Copper (mg/kg)	25 (18 - 30)	22 (9 - 38)	49 (32 - 75)	130 (57 - 190)	170 (120 - 220)	94 (55 - 120)	54 (8 - 230)	170 (65 - 240)
Lead (mg/kg)	26 (18 - 48)	31 (19 - 50)	31 (23 - 41)	57 (43 - 66)	66 (55 - 79)	84 (50 - 140)	28 (21 - 40)	57 (38 - 83)
Mercury (mg/kg)	0.09 (0.06 - 0.12)	0.08 (<0.05 - 0.12)	0.15 (0.10 - 0.36)	0.47 (0.30 - 0.99)	0.48 (0.35 - 0.63)	0.59 (0.26 - 1.20)	0.1 (<0.05 - 0.20)	0.22 (0.13 - 0.30)
Nickel (mg/kg)	12 (9 - 15)	19 (12 - 27)	15 (11 - 21)	21 (10 - 27)	25 (19 - 29)	17 (10 - 25)	22 (19 - 28)	31 (12 - 38)
Silver (mg/kg)	0.5 (0.4 - 0.7)	0.3 (<0.2 - 0.6)	1.1 (0.9 - 2.0)	4.4 (1.7 - 6.0)	6.5 (3.6 - 9.0)	2.7 (1.1 - 4.0)	0.7 (<0.2 - 1.4)	3.9 (1.3 - 5.1)
Zinc (mg/kg)	61 (42 - 72)	79 (45 - 120)	85 (72 - 110)	190 (93 - 250)	260 (190 - 300)	200 (140 - 250)	90 (66 - 130)	180 (90 - 260)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)	19 (18 - 22)	20 (18 - 23)	27 (18 - 49)	18 (18 - 18)	19 (18 - 20)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4]	91 (90 - 93)	93 (90 - 110)	100 (90 - 170)	110 (90 - 140)	120 (100 - 210)	220 (110 - 410)	91 (90 - 100)	96 (90 - 140)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	81 (45 - 150)	67 (24 - 190)	320 (62 - 1700)	480 (90 - 930)	620 (350 - 1000)	2100 (360 - 6200)	60 (18 - 200)	260 (52 - 1400)

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.

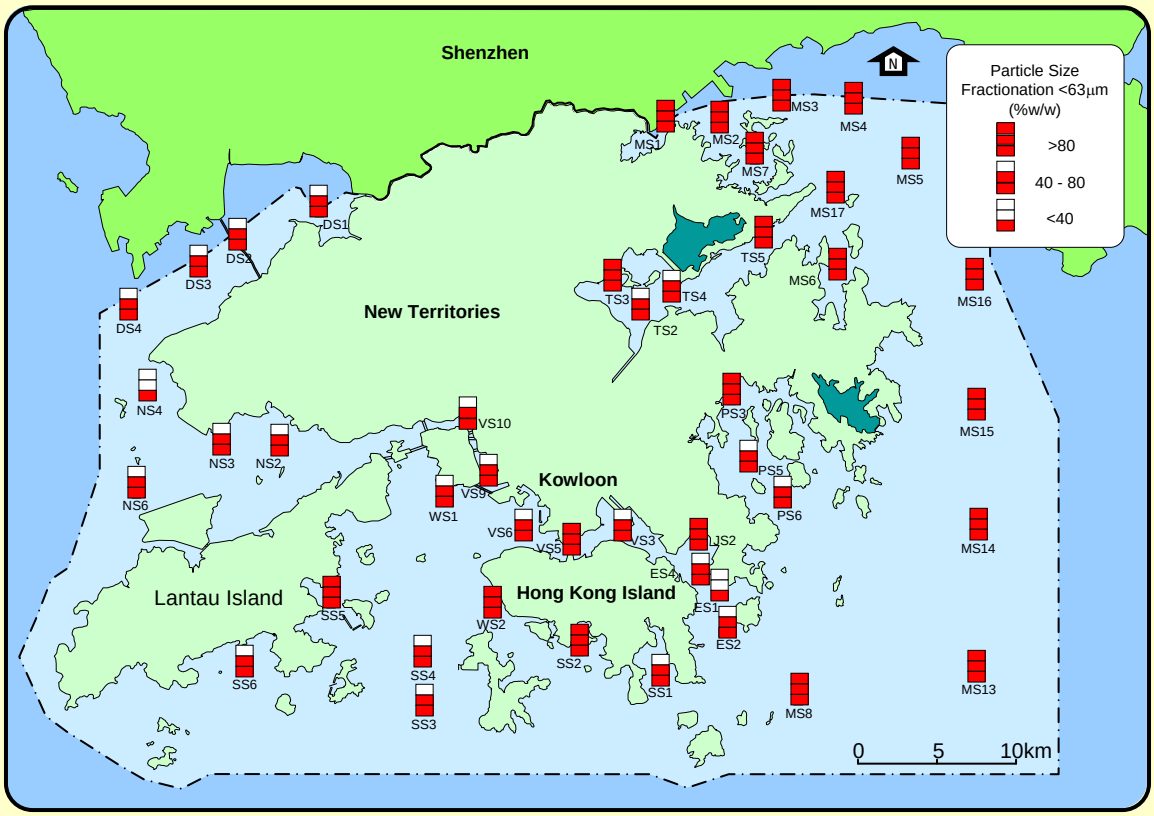
3 Total PCBs results are derived from the summation of 18 congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

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

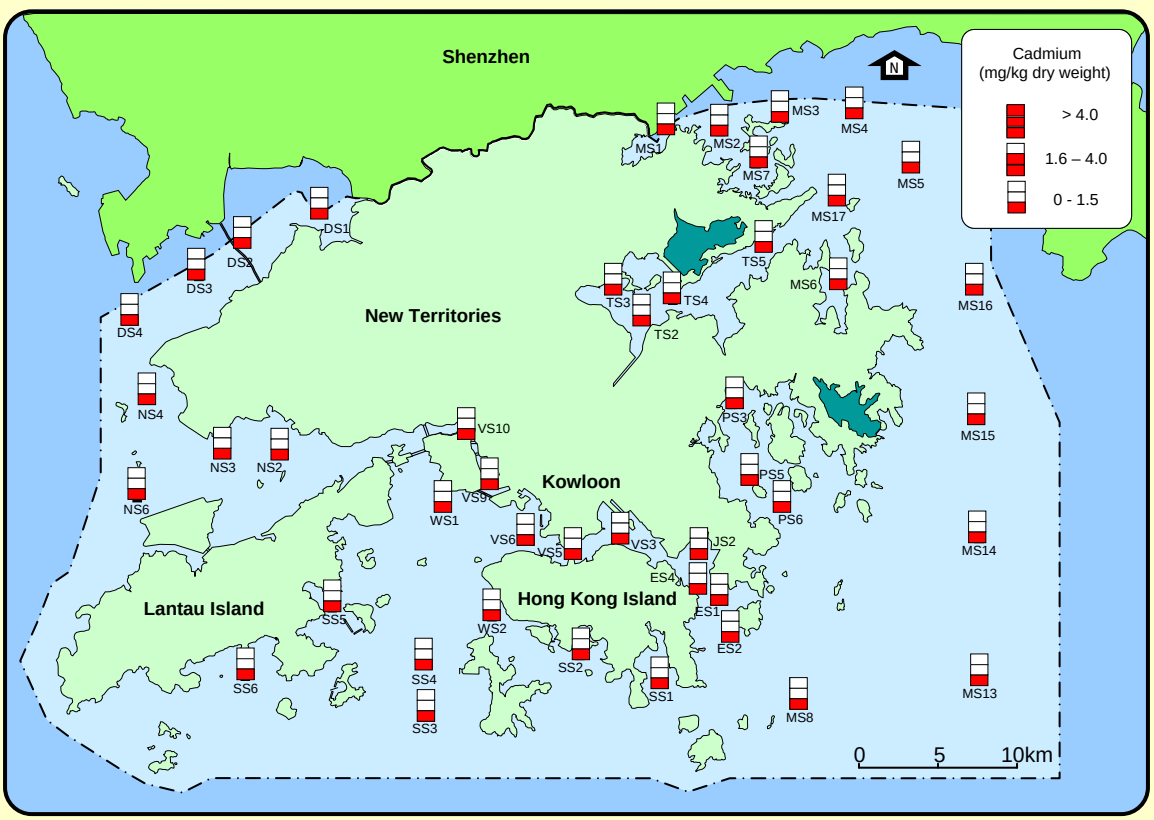
5 High molecular weight polyaromatic hydrocarbons (PAHs) include 10 congeners of molecular weight above 200, namely : Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene.

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.

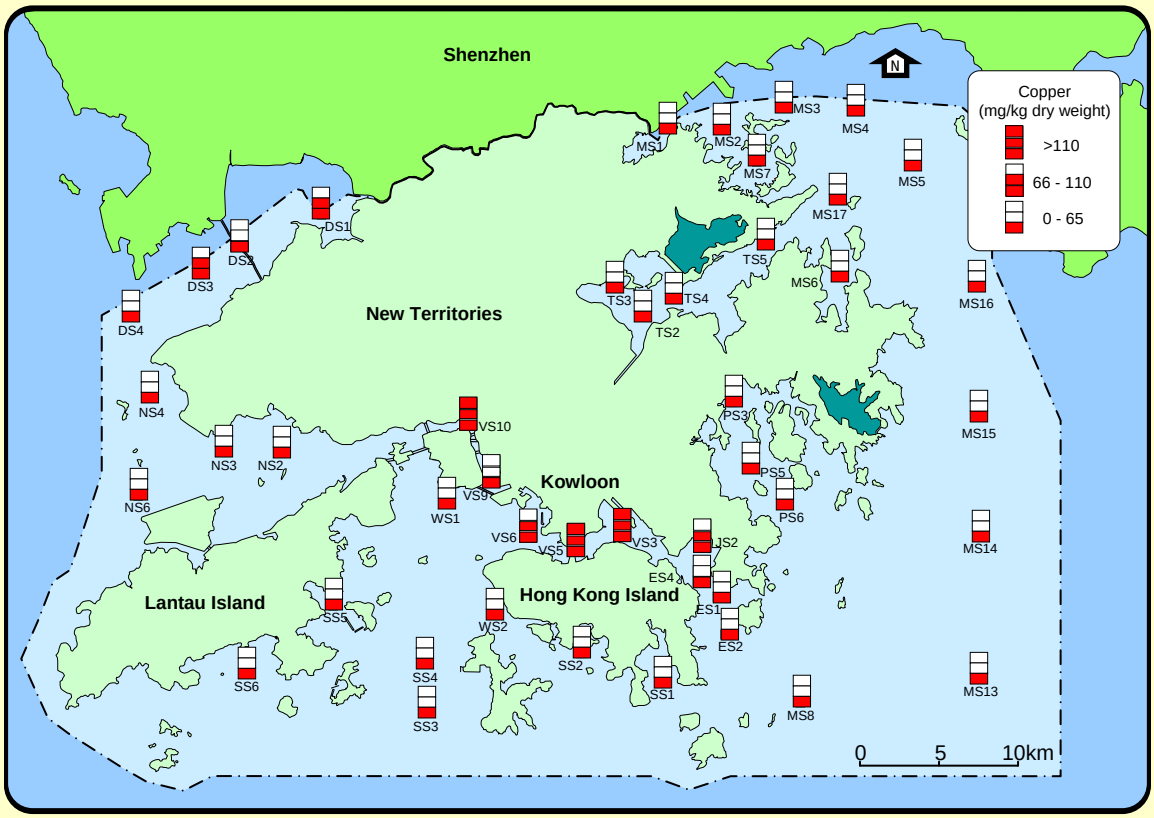
Particle Size Fractionation <63 µm in marine sediments in Hong Kong, 2005 – 2009



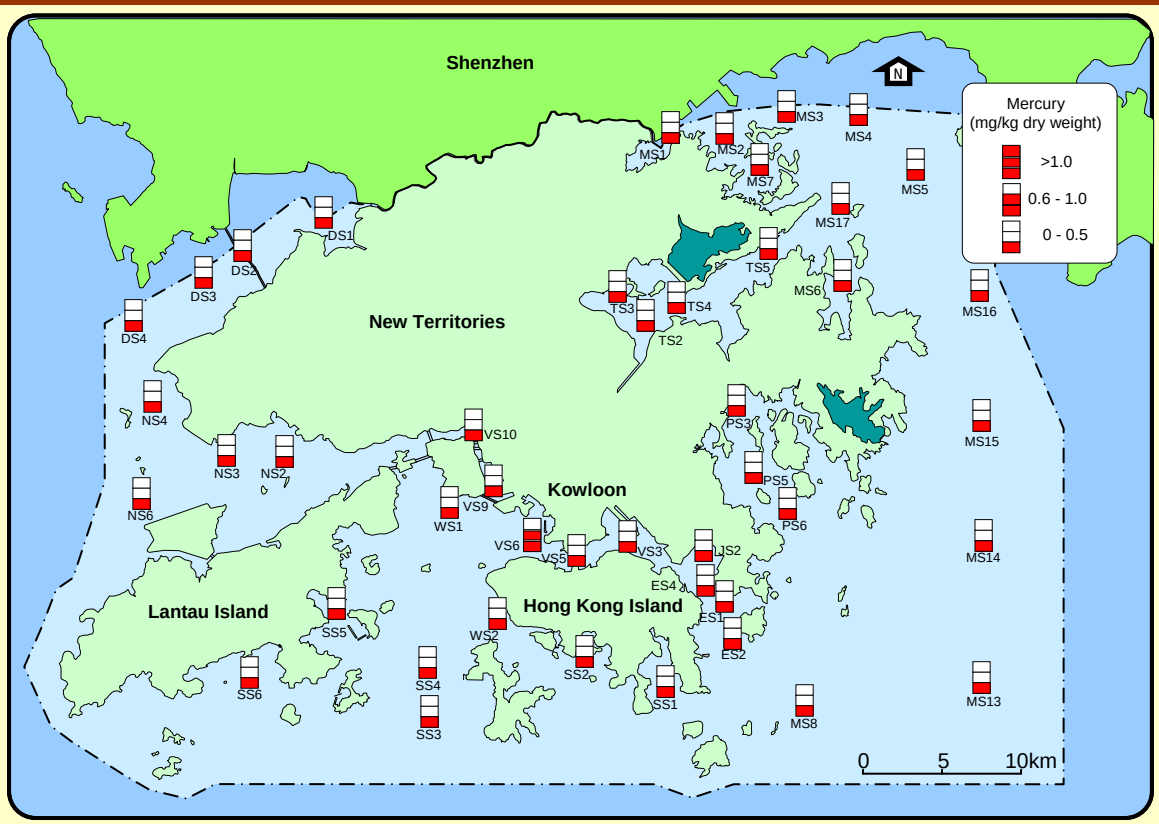
Cadmium in marine sediments in Hong Kong, 2005 – 2009



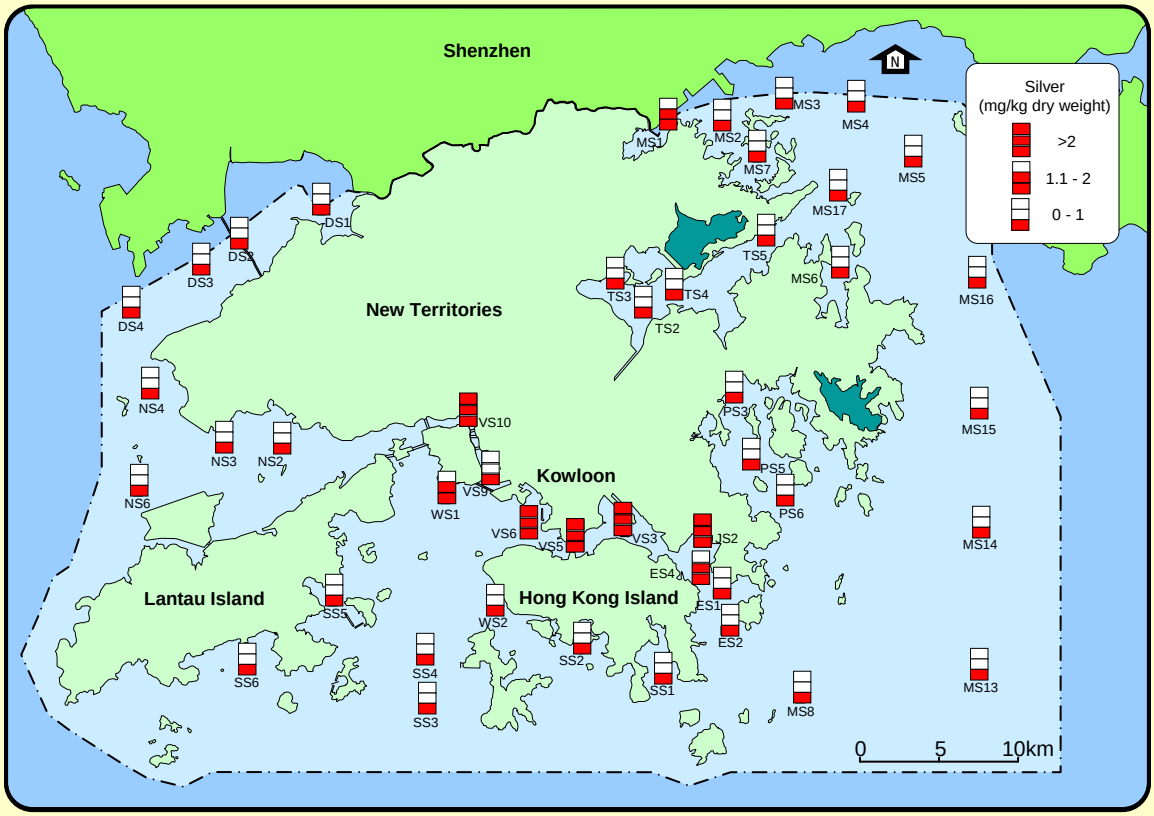
Copper in marine sediments in Hong Kong, 2005 – 2009



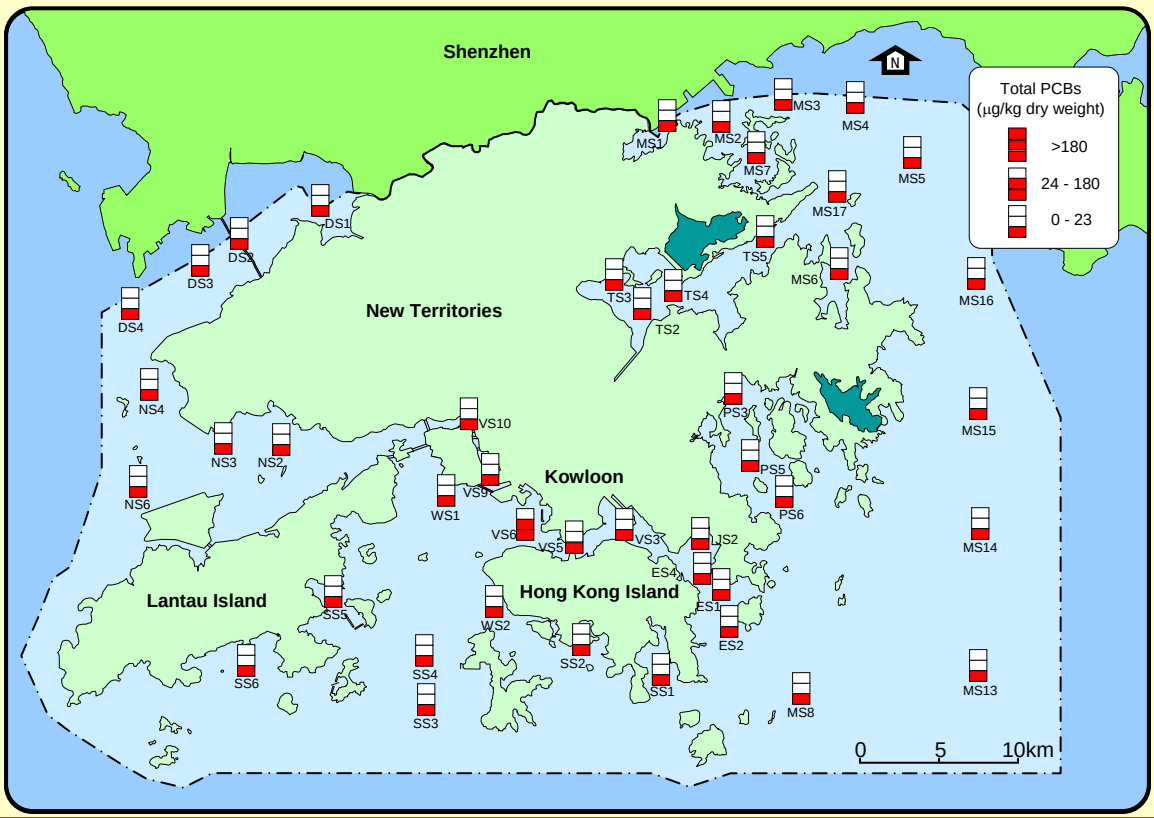
Mercury in marine sediments in Hong Kong, 2005 – 2009



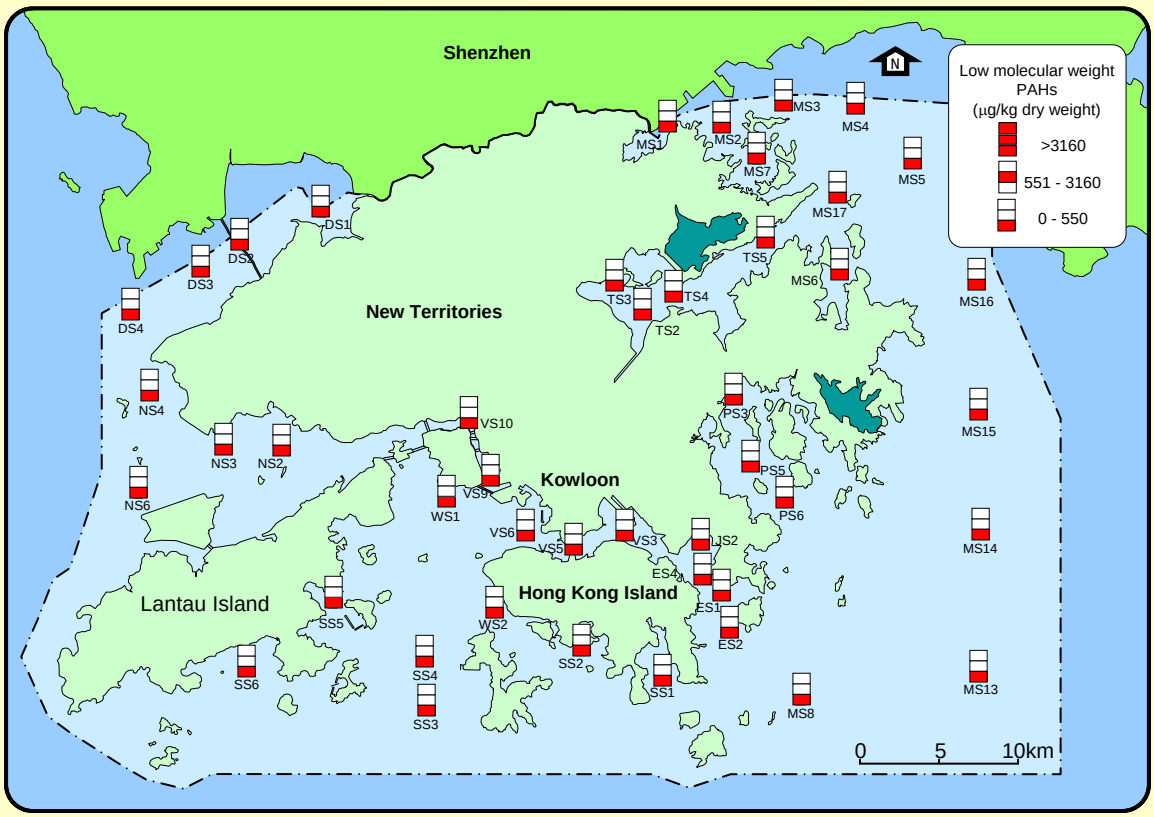
Silver in marine sediments in Hong Kong, 2005 – 2009



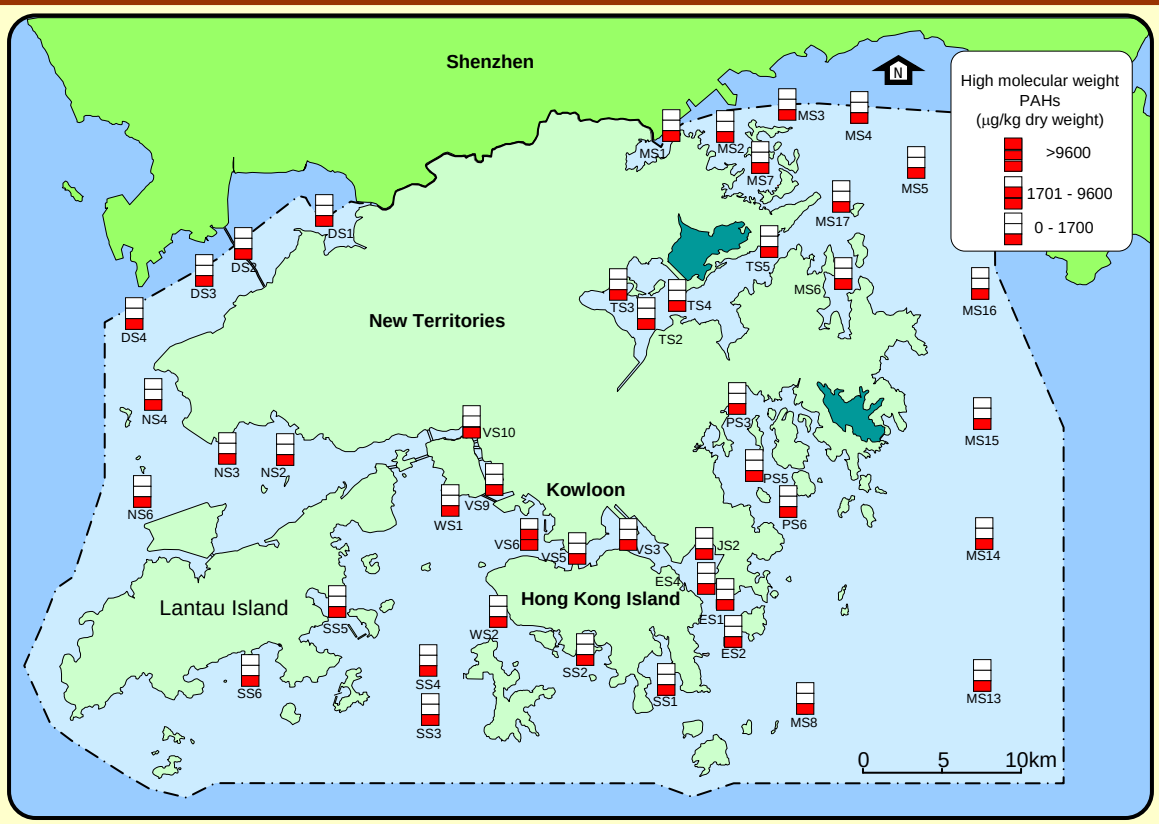
Total polychlorinated biphenyls (PCBs) in marine sediments in Hong Kong, 2005 – 2009



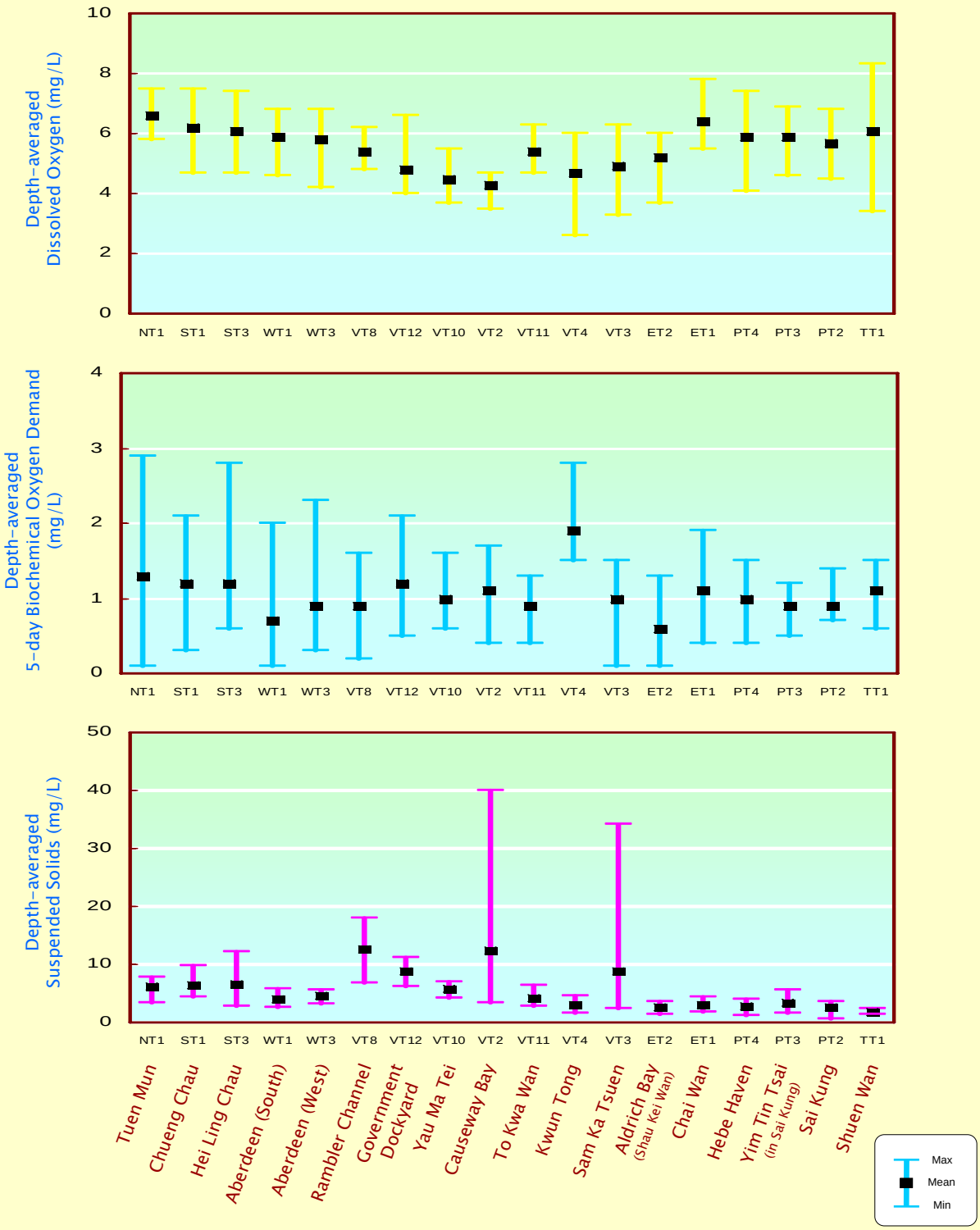
Low molecular weight polycyclic aromatic hydrocarbons (PAHs) in marine sediments in Hong Kong, 2005 – 2009



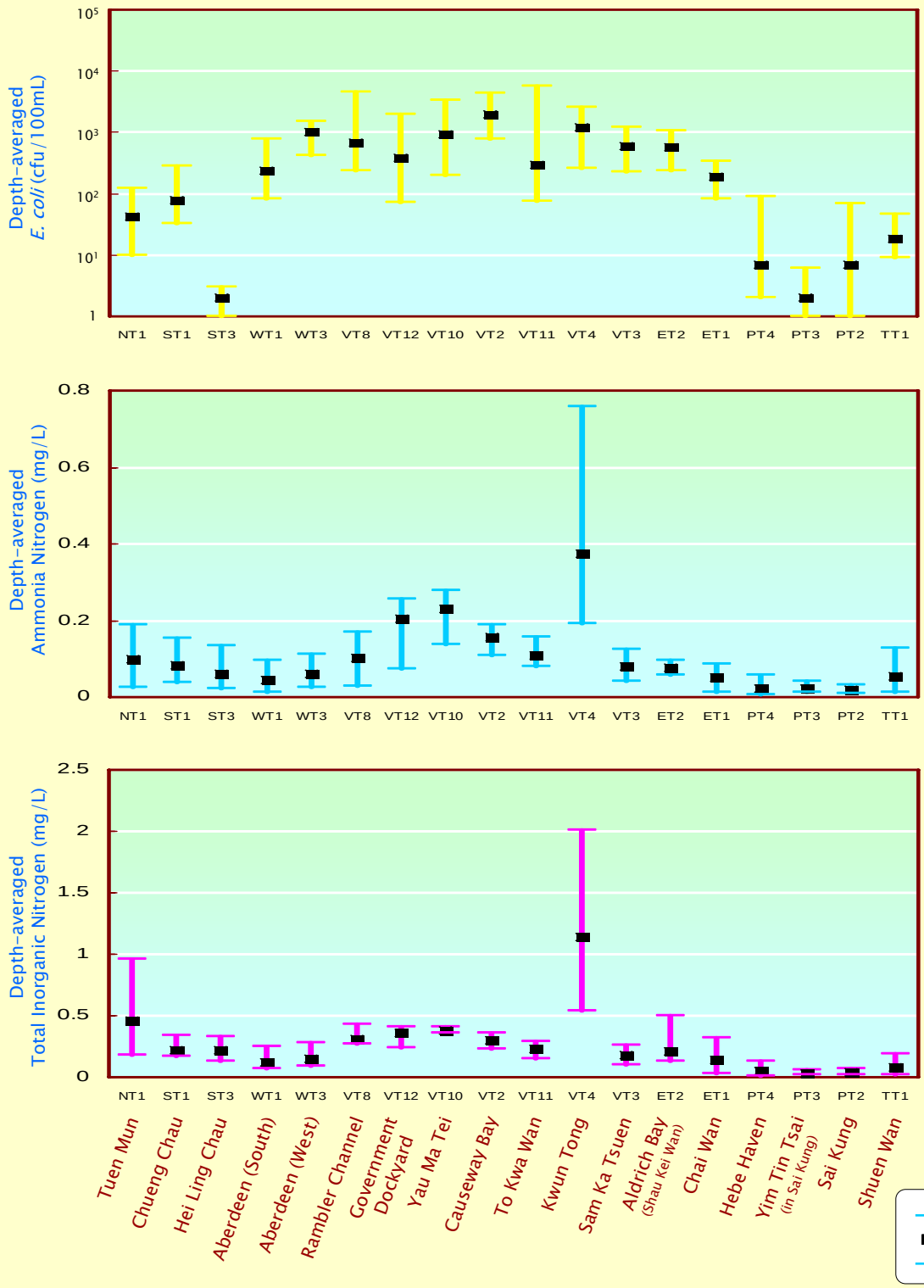
High molecular weight polycyclic aromatic hydrocarbons (PAHs) in marine sediments in Hong Kong, 2005 – 2009



Water quality of typhoon shelters in Hong Kong in 2009



Water quality of typhoon shelters in Hong Kong in 2009 (continued)



Results of the Seasonal Kendall Test for water quality trends in typhoon shelters, 1986 – 2009

Monitoring Station		NT1	ST1	ST3	WT3	WT1	VT8	VT10	VT2	VT11
Monitoring Period		1986 – 2009	1986 – 2009	2000 – 2009	1986 – 2009	1986 – 2009	1986 – 2009	1993 – 2009	1986 – 2009	1994 – 2009
Parameter	Water Depth									
Temperature (°C)	Surface	–	↗	–	–	↗	↗	–	↗	–
	Middle	NA	–	–	–	–	↗	↗	NA	–
	Bottom	NA	↗	–	–	–	↗	–	–	–
	Average	↗	↗	–	–	–	↗	–	↗	–
Salinity	Surface	–	–	–	–	–	–	–	–	–
	Middle	NA	–	–	–	↗	–	–	NA	–
	Bottom	NA	–	–	↗	–	–	–	–	–
	Average	–	–	–	↗	–	–	–	–	–
Dissolved Oxygen (mg/L)	Surface	↗	–	–	–	–	↗	–	↗	↗
	Middle	NA	–	–	–	–	↗	↗	NA	↗
	Bottom	NA	–	–	–	↗	↗	↗	↗	↗
	Average	↗	–	–	–	–	↗	↗	↗	↗
Dissolved Oxygen (%)	Surface	↗	–	–	–	↗	↗	–	↗	↗
	Middle	NA	–	–	–	↗	↗	↗	NA	↗
	Bottom	NA	↗	–	–	↗	↗	↗	↗	↗
	Average	↗	–	–	–	↗	↗	↗	↗	↗
pH	Surface	–	–	–	↘	–	–	–	–	–
	Middle	NA	–	–	↘	–	–	–	NA	–
	Bottom	NA	–	–	↘	↘	–	–	–	–
	Average	–	–	–	↘	–	–	–	–	–
Secchi disc depth (m)		↗	–	–	↗	↗	↗	↗	↗	–
Turbidity (NTU)	Surface	–	–	–	–	–	↗	–	↗	↗
	Middle	NA	–	–	–	–	↗	–	NA	↗
	Bottom	NA	–	–	–	–	↗	–	↗	↗
	Average	–	–	–	–	–	↗	–	↗	↗
Suspended Solids (mg/L)	Surface	↘	–	–	–	–	–	↘	–	–
	Middle	NA	–	–	–	–	–	↘	NA	↘
	Bottom	NA	–	–	–	–	–	↘	–	–
	Average	↘	–	–	–	–	–	↘	–	–
Volatile suspended solids (mg/L)	Surface	–	–	↗	↘	–	–	–	–	–
	Middle	NA	–	↗	–	↘	–	–	NA	–
	Bottom	NA	–	↗	–	–	–	–	–	–
	Average	–	–	↗	↘	–	–	–	–	–
5-day Biochemical Oxygen Demand (mg/L)	Surface	–	–	–	–	↘	↘	–	↘	–
	Middle	NA	–	–	–	↘	↘	–	NA	–
	Bottom	NA	–	–	–	–	↘	–	↘	–
	Average	–	–	–	–	↘	↘	–	↘	–
Ammonia nitrogen (mg/L)	Surface	↘	–	–	–	–	↘	↘	↘	↘
	Middle	NA	–	–	–	–	↘	↘	NA	↘
	Bottom	NA	–	–	–	–	↘	↘	↘	↘
	Average	↘	–	–	–	–	↘	↘	↘	↘
Nitrite nitrogen (mg/L)	Surface	↗	–	–	–	–	–	–	–	–
	Middle	NA	–	–	–	–	↗	–	NA	–
	Bottom	NA	–	–	–	–	↗	–	–	–
	Average	↗	–	–	–	–	–	–	–	–
Nitrate nitrogen (mg/L)	Surface	↗	–	–	–	–	↗	–	↗	↗
	Middle	NA	–	–	–	–	↗	↗	NA	–
	Bottom	NA	–	–	–	–	↗	↗	↗	–
	Average	↗	–	–	–	–	↗	–	↗	↗
Total inorganic nitrogen (mg/L)	Surface	–	–	–	–	–	–	↘	↘	↘
	Middle	NA	–	–	–	–	–	↘	NA	↘
	Bottom	NA	–	–	–	–	–	↘	↘	↘
	Average	–	–	–	–	–	–	↘	↘	↘
Total Kjeldahl nitrogen (mg/L)	Surface	↘	–	–	–	–	↘	↘	↘	↘
	Middle	NA	–	–	–	–	↘	↘	NA	↘
	Bottom	NA	–	–	–	–	↘	↘	↘	↘
	Average	↘	–	–	–	–	↘	↘	↘	↘
Total nitrogen (mg/L)	Surface	↘	–	–	–	–	↘	↘	↘	↘
	Middle	NA	–	–	–	–	↘	↘	NA	↘
	Bottom	NA	–	–	–	–	↘	↘	↘	↘
	Average	↘	–	–	–	–	↘	↘	↘	↘
Orthophosphate phosphorus (mg/L)	Surface	↘	–	–	–	–	↘	↘	↘	↘
	Middle	NA	–	–	–	–	↘	↘	NA	↘
	Bottom	NA	–	–	–	–	↘	↘	↘	↘
	Average	↘	–	↘	–	–	↘	↘	↘	↘
Total phosphorus (mg/L)	Surface	↘	–	–	–	–	↘	↘	↘	↘
	Middle	NA	–	–	–	↘	↘	↘	NA	↘
	Bottom	NA	–	–	–	–	↘	↘	↘	↘
	Average	↘	–	–	–	–	↘	↘	↘	↘
Silica (mg/L)	Surface	↘	–	–	–	–	–	↘	↘	↘
	Middle	NA	–	–	–	–	–	↘	NA	↘
	Bottom	NA	–	–	–	–	–	↘	–	↘
	Average	↘	–	–	–	–	–	↘	↘	↘
Chlorophyll-*a* (µg/L)	Surface	↗	–	–	–	–	↗	↗	↗	–
	Middle	NA	–	–	–	–	↗	↗	NA	–
	Bottom	NA	–	–	↗	–	↗	↗	–	–
	Average	↗	–	↗	–	–	↗	↗	–	–
E. coli (cfu/100mL)	Surface	↘	–	–	–	↘	–	↘	↘	↘
	Middle	NA	–	–	–	↘	–	↘	NA	↘
	Bottom	NA	–	–	–	–	–	↘	↘	↘
	Average	↘	–	–	–	↘	–	↘	↘	↘
Faecal coliforms (cfu/100mL)	Surface	–	–	–	–	–	–	–	↘	–
	Middle	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 wate
4. ↗ significant increase
5. ↘ significant decrease

Results of the Seasonal Kendall Test for water quality trends in typhoon shelters, 1986 – 2009 (continued)

Monitoring Station		VT12	VT4	VT3	ET2	ET1	PT4	PT2	PT3	TT1
Monitoring Period		2000 – 2009	1987 – 2009	1986 – 2009	1993 – 2009	1986 – 2009	1986 – 2009	1986 – 2009	1986 – 2009	1986 – 2009
Parameter	Water Depth									
Temperature (°C)	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	-	↘	↘	↘	-	-	-	-	↘
Volatile suspended 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	↘	↘	↘	↘	-	↘	↘	-	↘
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 wate
4. ↗ significant increase
5. ↘ significant decrease

Summary of water quality statistics for typhoon shelters in 2009

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)		24.6 (17.5 - 30.0)	23.8 (16.1 - 29.4)	23.9 (16.6 - 29.2)	23.6 (19.0 - 29.4)	23.5 (19.0 - 29.2)	23.6 (17.0 - 27.6)
Salinity		27.6 (13.6 - 32.6)	30.7 (27.0 - 33.3)	30.5 (26.5 - 33.3)	32.2 (28.4 - 33.5)	32.0 (27.6 - 33.4)	31.0 (26.5 - 33.2)
Dissolved Oxygen (mg/L)		6.6 (5.8 - 7.5)	6.2 (4.7 - 7.5)	6.1 (4.7 - 7.4)	5.9 (4.6 - 6.8)	5.8 (4.2 - 6.8)	5.4 (4.8 - 6.2)
	Bottom	N.M	6.3 (4.6 - 7.4)	6.2 (4.8 - 7.2)	5.9 (4.6 - 6.8)	5.8 (4.0 - 6.6)	5.7 (5.1 - 6.5)
Dissolved Oxygen (% Saturation)		94 (81 - 116)	88 (72 - 114)	86 (70 - 100)	83 (64 - 92)	82 (65 - 101)	76 (62 - 92)
	Bottom	N.M	89 (71 - 112)	86 (71 - 97)	83 (65 - 92)	81 (62 - 98)	81 (75 - 96)
pH		8.0 (7.9 - 8.2)	8.1 (7.9 - 8.4)	8.1 (7.9 - 8.4)	8.1 (7.9 - 8.5)	8.1 (7.9 - 8.4)	8.0 (7.9 - 8.1)
Secchi Disc Depth (m)		1.7 (1.2 - 2.3)	2.0 (1.0 - 2.5)	2.1 (0.6 - 3.2)	2.6 (1.7 - 3.4)	2.4 (1.4 - 2.9)	1.7 (0.6 - 2.2)
Turbidity (NTU)		8.1 (3.3 - 12.1)	7.2 (3.3 - 10.9)	7.5 (1.4 - 11.4)	5.2 (2.4 - 9.3)	6.4 (3.5 - 12.9)	12.4 (6.5 - 29.9)
Suspended Solids (mg/L)		6.3 (3.4 - 7.9)	6.5 (4.4 - 9.9)	6.6 (2.8 - 12.3)	4.0 (2.7 - 5.9)	4.7 (3.2 - 5.6)	12.7 (6.9 - 18.0)
5-day Biochemical Oxygen Demand (mg/L)		1.3 (0.1 - 2.9)	1.2 (0.3 - 2.1)	1.2 (0.6 - 2.8)	0.7 (0.1 - 2.0)	0.9 (0.3 - 2.3)	0.9 (0.2 - 1.6)
Ammonia Nitrogen (mg/L)		0.10 (0.027 - 0.190)	0.08 (0.039 - 0.153)	0.06 (0.023 - 0.133)	0.05 (0.014 - 0.096)	0.06 (0.026 - 0.113)	0.10 (0.030 - 0.170)
Unionised Ammonia (mg/L)		0.004 (0.003 - 0.005)	0.004 (0.002 - 0.008)	0.003 (0.002 - 0.006)	0.003 (<0.001 - 0.005)	0.003 (0.001 - 0.006)	0.003 (0.002 - 0.004)
Nitrite Nitrogen (mg/L)		0.044 (0.017 - 0.092)	0.017 (0.010 - 0.034)	0.022 (0.013 - 0.032)	0.013 (0.002 - 0.026)	0.015 (0.002 - 0.025)	0.034 (0.010 - 0.057)
Nitrate Nitrogen (mg/L)		0.313 (0.088 - 0.840)	0.124 (0.065 - 0.280)	0.141 (0.059 - 0.280)	0.065 (0.029 - 0.173)	0.072 (0.031 - 0.203)	0.172 (0.088 - 0.347)
Total Inorganic Nitrogen (mg/L)		0.46 (0.18 - 0.96)	0.22 (0.17 - 0.34)	0.22 (0.13 - 0.33)	0.13 (0.07 - 0.25)	0.15 (0.09 - 0.28)	0.31 (0.27 - 0.43)
Total Kjeldahl Nitrogen (mg/L)		0.25 (0.16 - 0.32)	0.23 (0.13 - 0.31)	0.19 (0.12 - 0.25)	0.16 (0.13 - 0.18)	0.19 (0.14 - 0.26)	0.26 (0.20 - 0.34)
Total Nitrogen (mg/L)		0.61 (0.35 - 1.09)	0.37 (0.28 - 0.55)	0.36 (0.21 - 0.54)	0.24 (0.17 - 0.33)	0.27 (0.20 - 0.37)	0.46 (0.41 - 0.59)
Orthophosphate Phosphorus (mg/L)		0.017 (0.006 - 0.031)	0.014 (<0.002 - 0.022)	0.012 (<0.002 - 0.022)	0.010 (0.004 - 0.013)	0.011 (<0.002 - 0.015)	0.018 (0.006 - 0.028)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.04)	0.03 (0.02 - 0.04)	0.03 (<0.02 - 0.04)	0.02 (<0.02 - 0.02)	0.02 (0.02 - 0.03)	0.04 (0.02 - 0.05)
Silica (as SiO_2) (mg/L)		1.21 (0.08 - 4.10)	0.76 (0.09 - 1.37)	0.75 (0.09 - 1.40)	0.64 (0.26 - 1.01)	0.64 (0.23 - 0.97)	0.72 (0.10 - 1.40)
Chlorophyll-a (µg/L)		9.6 (0.7 - 26.0)	5.5 (1.9 - 12.5)	4.9 (2.5 - 9.4)	2.4 (1.0 - 6.6)	2.9 (0.6 - 9.2)	7.1 (0.6 - 14.3)
E.coli (count/100mL)		42 (10 - 120)	80 (32 - 290)	2 (1 - 3)	240 (84 - 800)	1000 (420 - 1500)	680 (240 - 4600)
Faecal Coliforms (count/100mL)		270 (47 - 1300)	210 (50 - 1000)	3 (1 - 10)	480 (200 - 2900)	2100 (780 - 3800)	1800 (720 - 13000)

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. N.M. - not measured

Summary of water quality statistics for typhoon shelters in 2009

Parameter		Government Dockyard VT12	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)		23.8 (17.1 - 28.2)	23.5 (17.0 - 27.9)	23.4 (16.6 - 28.4)	23.5 (16.8 - 28.9)	23.6 (17.4 - 28.4)	23.5 (16.4 - 29.1)
Salinity		31.5 (29.6 - 32.7)	31.7 (29.6 - 32.7)	31.7 (29.2 - 33.0)	32.1 (30.0 - 33.2)	29.3 (25.3 - 31.2)	32.0 (30.0 - 33.1)
Dissolved Oxygen (mg/L)		4.8 (4.1 - 6.6)	4.5 (3.7 - 5.5)	4.3 (3.6 - 4.7)	5.4 (4.7 - 6.3)	4.7 (2.6 - 6.0)	4.9 (3.3 - 6.3)
	Bottom	4.9 (4.1 - 6.7)	4.5 (3.4 - 5.5)	4.3 (3.1 - 4.8)	5.3 (4.7 - 6.2)	4.2 (2.8 - 5.5)	5.1 (3.4 - 6.3)
Dissolved Oxygen (% Saturation)		69 (53 - 99)	63 (53 - 82)	60 (50 - 70)	77 (62 - 94)	67 (32 - 88)	70 (41 - 94)
	Bottom	70 (59 - 100)	64 (52 - 82)	61 (48 - 71)	76 (62 - 92)	59 (36 - 72)	73 (42 - 94)
pH		7.8 (7.6 - 8.1)	7.8 (7.7 - 8.0)	7.8 (7.6 - 8.0)	8.0 (7.9 - 8.0)	7.8 (7.6 - 8.1)	8.0 (7.9 - 8.1)
Secchi Disc Depth (m)		1.8 (1.0 - 2.1)	2.2 (1.0 - 2.9)	2.2 (1.4 - 2.8)	2.4 (1.5 - 3.5)	1.5 (0.1 - 2.3)	2.8 (1.5 - 3.8)
Turbidity (NTU)		8.4 (4.3 - 12.3)	6.0 (2.5 - 10.6)	8.2 (4.0 - 13.0)	5.3 (2.0 - 10.1)	4.4 (1.5 - 9.5)	6.8 (2.1 - 12.0)
Suspended Solids (mg/L)		8.8 (6.3 - 11.2)	5.8 (4.2 - 7.1)	12.4 (3.4 - 40.0)	4.2 (2.8 - 6.5)	3.1 (1.6 - 4.7)	8.9 (2.4 - 34.2)
5-day Biochemical Oxygen Demand (mg/L)		1.2 (0.5 - 2.1)	1.0 (0.6 - 1.6)	1.1 (0.4 - 1.7)	0.9 (0.4 - 1.3)	1.9 (1.5 - 2.8)	1.0 (0.1 - 1.5)
Ammonia Nitrogen (mg/L)		0.20 (0.074 - 0.255)	0.23 (0.137 - 0.277)	0.16 (0.110 - 0.190)	0.11 (0.079 - 0.157)	0.37 (0.193 - 0.757)	0.08 (0.043 - 0.125)
Unionised Ammonia (mg/L)		0.005 (0.003 - 0.009)	0.006 (0.004 - 0.010)	0.005 (0.002 - 0.007)	0.004 (0.003 - 0.005)	0.010 (0.004 - 0.016)	0.003 (0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.025 (0.017 - 0.040)	0.025 (0.016 - 0.038)	0.021 (0.010 - 0.036)	0.018 (0.008 - 0.030)	0.153 (0.063 - 0.396)	0.014 (0.005 - 0.027)
Nitrate Nitrogen (mg/L)		0.135 (0.120 - 0.170)	0.131 (0.097 - 0.193)	0.122 (0.078 - 0.205)	0.100 (0.057 - 0.163)	0.617 (0.283 - 0.853)	0.084 (0.050 - 0.135)
Total Inorganic Nitrogen (mg/L)		0.36 (0.24 - 0.42)	0.39 (0.36 - 0.41)	0.30 (0.23 - 0.36)	0.23 (0.15 - 0.29)	1.14 (0.54 - 2.01)	0.18 (0.10 - 0.26)
Total Kjeldahl Nitrogen (mg/L)		0.41 (0.29 - 0.50)	0.42 (0.33 - 0.50)	0.35 (0.27 - 0.46)	0.27 (0.24 - 0.35)	0.63 (0.38 - 1.18)	0.23 (0.19 - 0.31)
Total Nitrogen (mg/L)		0.57 (0.46 - 0.65)	0.57 (0.54 - 0.64)	0.50 (0.37 - 0.61)	0.39 (0.31 - 0.49)	1.40 (0.73 - 2.43)	0.33 (0.24 - 0.44)
Orthophosphate Phosphorus (mg/L)		0.037 (0.011 - 0.049)	0.033 (0.015 - 0.041)	0.027 (0.013 - 0.036)	0.022 (0.011 - 0.031)	0.176 (0.104 - 0.233)	0.016 (0.006 - 0.029)
Total Phosphorus (mg/L)		0.06 (0.03 - 0.08)	0.06 (0.04 - 0.06)	0.05 (0.03 - 0.07)	0.04 (0.03 - 0.05)	0.21 (0.14 - 0.27)	0.04 (0.03 - 0.06)
Silica (as SiO_2) (mg/L)		0.59 (0.22 - 1.20)	0.64 (0.23 - 1.20)	0.74 (0.36 - 1.15)	0.56 (0.16 - 1.07)	1.29 (0.54 - 2.37)	0.52 (0.25 - 1.10)
Chlorophyll-*a* (µg/L)		8.5 (0.7 - 16.0)	6.1 (0.8 - 11.3)	4.3 (0.6 - 8.9)	4.9 (0.8 - 11.0)	13.0 (1.2 - 30.3)	4.6 (0.5 - 11.1)
E.coli (count/100mL)		390 (72 - 2000)	930 (200 - 3300)	2000 (780 - 4300)	290 (74 - 5700)	1200 (260 - 2600)	610 (230 - 1200)
Faecal Coliforms (count/100mL)		980 (120 - 3400)	2800 (670 - 7500)	6600 (1800 - 20000)	890 (270 - 9100)	3800 (1100 - 6500)	1700 (850 - 4900)

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 in 2009

Parameter		Aldrich Bay (Shau Kei Wan) ET2	Chai Wan 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)		23.4 (19.2 - 27.9)	23.5 (18.8 - 28.3)	24.8 (17.2 - 29.8)	24.8 (16.9 - 29.5)	24.9 (17.1 - 29.7)	24.0 (16.3 - 31.1)
Salinity		31.2 (22.9 - 33.4)	32.0 (28.9 - 33.4)	31.8 (28.1 - 33.1)	32.5 (30.1 - 33.8)	32.0 (27.7 - 33.5)	31.1 (29.3 - 32.6)
Dissolved Oxygen (mg/L)		5.2 (3.8 - 6.0)	6.4 (5.5 - 7.8)	5.9 (4.1 - 7.4)	5.9 (4.6 - 6.9)	5.7 (4.5 - 6.8)	6.1 (3.4 - 8.4)
	Bottom	4.8 (2.0 - 6.3)	6.3 (5.3 - 7.0)	5.8 (4.0 - 7.2)	5.7 (4.3 - 6.6)	5.8 (4.4 - 6.8)	5.7 (1.5 - 8.3)
Dissolved Oxygen (% Saturation)		74 (53 - 87)	91 (80 - 120)	85 (63 - 116)	85 (71 - 108)	83 (60 - 104)	87 (53 - 133)
	Bottom	67 (29 - 92)	89 (78 - 106)	84 (62 - 113)	82 (67 - 103)	84 (59 - 104)	81 (23 - 132)
pH		7.8 (7.6 - 8.0)	8.0 (7.7 - 8.1)	8.0 (7.9 - 8.2)	8.1 (7.9 - 8.2)	8.1 (7.9 - 8.3)	8.1 (7.7 - 8.2)
Secchi Disc Depth (m)		3.0 (2.0 - 3.8)	2.7 (2.3 - 3.1)	2.2 (1.5 - 3.0)	2.4 (1.4 - 3.8)	2.3 (1.5 - 3.5)	2.6 (1.5 - 3.3)
Turbidity (NTU)		2.9 (1.4 - 8.8)	3.0 (1.6 - 8.1)	4.8 (1.3 - 9.5)	5.4 (2.1 - 9.9)	4.9 (0.8 - 9.8)	4.6 (0.7 - 9.3)
Suspended Solids (mg/L)		2.7 (1.4 - 3.7)	3.1 (1.8 - 4.5)	2.9 (1.2 - 4.0)	3.5 (1.6 - 5.6)	2.6 (0.7 - 3.6)	1.9 (1.4 - 2.5)
5-day Biochemical Oxygen Demand (mg/L)		0.6 (0.1 - 1.3)	1.1 (0.4 - 1.9)	1.0 (0.4 - 1.5)	0.9 (0.5 - 1.2)	0.9 (0.7 - 1.4)	1.1 (0.6 - 1.5)
Ammonia Nitrogen (mg/L)		0.08 (0.059 - 0.097)	0.05 (0.012 - 0.087)	0.02 (0.007 - 0.059)	0.02 (0.012 - 0.043)	0.02 (0.011 - 0.032)	0.06 (0.013 - 0.127)
Unionised Ammonia (mg/L)		0.002 (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)	0.002 (<0.001 - 0.004)
Nitrite Nitrogen (mg/L)		0.033 (0.006 - 0.143)	0.021 (0.002 - 0.087)	0.003 (<0.002 - 0.005)	0.002 (<0.002 - 0.003)	0.003 (<0.002 - 0.006)	0.004 (<0.002 - 0.009)
Nitrate Nitrogen (mg/L)		0.099 (0.041 - 0.297)	0.069 (0.019 - 0.187)	0.021 (<0.002 - 0.062)	0.009 (<0.002 - 0.032)	0.016 (<0.002 - 0.043)	0.022 (<0.002 - 0.059)
Total Inorganic Nitrogen (mg/L)		0.21 (0.13 - 0.50)	0.14 (0.03 - 0.33)	0.05 (0.01 - 0.13)	0.03 (0.02 - 0.06)	0.04 (0.02 - 0.07)	0.08 (0.02 - 0.19)
Total Kjeldahl Nitrogen (mg/L)		0.23 (0.17 - 0.27)	0.20 (0.11 - 0.26)	0.16 (0.14 - 0.18)	0.13 (0.10 - 0.16)	0.13 (0.11 - 0.17)	0.22 (0.18 - 0.26)
Total Nitrogen (mg/L)		0.37 (0.23 - 0.64)	0.29 (0.13 - 0.47)	0.18 (0.15 - 0.25)	0.14 (0.10 - 0.17)	0.15 (0.11 - 0.18)	0.24 (0.19 - 0.28)
Orthophosphate Phosphorus (mg/L)		0.021 (0.011 - 0.028)	0.013 (0.004 - 0.023)	0.007 (0.004 - 0.014)	0.006 (<0.002 - 0.008)	0.006 (<0.002 - 0.009)	0.008 (0.003 - 0.014)
Total Phosphorus (mg/L)		0.04 (0.03 - 0.05)	0.03 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.03)	0.02 (<0.02 - 0.02)	0.02 (<0.02 - 0.04)
Silica (as SiO_2) (mg/L)		0.88 (0.29 - 2.57)	0.64 (0.18 - 1.77)	0.65 (0.08 - 1.59)	0.60 (0.08 - 1.10)	0.69 (0.14 - 1.50)	0.83 (0.13 - 1.33)
Chlorophyll-*a* (µg/L)		4.1 (0.7 - 12.2)	8.6 (1.1 - 14.0)	3.3 (1.9 - 5.5)	2.9 (1.1 - 4.6)	3.0 (1.5 - 5.1)	6.0 (3.2 - 9.2)
E.coli (count/100mL)		570 (240 - 1000)	190 (82 - 340)	7 (2 - 91)	2 (1 - 7)	7 (1 - 70)	18 (9 - 46)
Faecal Coliforms (count/100mL)		1200 (680 - 2100)	420 (210 - 940)	25 (5 - 540)	3 (1 - 76)	48 (4 - 580)	40 (17 - 93)

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 statistics of bottom sediment quality of typhoon shelters, 2005- 2009

Parameter	Tuen Mun NS5	Cheung Chau SS7	Hei Ling Chau SS8	Rambler Channel VS17	Government Dockyard VS21	Yau Ma Tei VS19	Causeway Bay VS12
Number of samples	10	10	10	10	10	10	10
Particle Size Fractionation <63µm (%w/w)	70 (48 - 94)	85 (66 - 95)	95 (91 - 98)	70 (47 - 88)	95 (85 - 99)	76 (60 - 95)	84 (65 - 97)
Electrochemical Potential (mV)	-261 ((-353) - (-173))	-237 ((-310) - (-150))	-216 ((-287) - (-81))	-281 ((-371) - (-208))	-299 ((-350) - (-246))	-349 ((-397) - (-278))	-354 ((-407) - (-251))
Total Solids (%w/w)	47 (36 - 56)	42 (38 - 50)	36 (30 - 40)	46 (36 - 57)	38 (35 - 46)	48 (40 - 52)	38 (33 - 43)
Total Volatile Soilds (%w/w)	6.8 (6.2 - 9.2)	6.5 (5.4 - 8.8)	7.9 (6.7 - 11.0)	6.9 (4.6 - 8.3)	7 (6.0 - 9.6)	6.5 (5.6 - 8.6)	8.9 (7.9 - 11.0)
Chemical Oxygen Demand (mg/kg)	20000 (17000 - 25000)	17000 (12000 - 23000)	13000 (10000 - 15000)	24000 (16000 - 33000)	16000 (11000 - 19000)	18000 (14000 - 24000)	30000 (25000 - 36000)
Total Carbon (%w/w)	0.8 (0.6 - 1.0)	0.7 (0.5 - 1.1)	0.5 (0.5 - 0.5)	0.9 (0.8 - 1.3)	0.5 (0.5 - 0.6)	0.9 (0.7 - 1.0)	0.9 (0.8 - 1.1)
Ammonical Nitrogen (mg/kg)	6.9 (0.30 - 21.00)	9.5 (3.30 - 21.00)	6.79 (2.30 - 13.00)	9.8 (0.24 - 20.00)	5.51 (3.00 - 8.70)	26.14 (5.40 - 47.00)	27.99 (8.90 - 45.00)
Total Kjeldahl Nitrogen (mg/kg)	400 (230 - 620)	450 (330 - 550)	500 (300 - 1000)	450 (330 - 520)	350 (290 - 400)	440 (210 - 600)	660 (550 - 780)
Total Phosphorus (mg/kg)	210 (150 - 300)	250 (170 - 440)	180 (140 - 340)	190 (150 - 230)	190 (150 - 210)	200 (110 - 240)	220 (190 - 260)
Total Sulphide (mg/kg)	140 (19.0 - 750.0)	79 (14.0 - 250.0)	48 (2.3 - 150.0)	260 (23.0 - 750.0)	38 (2.8 - 100.0)	170 (18.0 - 380.0)	190 (23.0 - 480.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.4)	0.3 (<0.1 - 0.5)	0.2 (<0.1 - 0.5)	0.1 (<0.1 - 0.2)	0.2 (<0.1 - 0.3)
Arsenic (mg/kg)	9.7 (5.8 - 28.0)	7.8 (6.2 - 8.9)	7.3 (6.7 - 8.4)	8.6 (7.2 - 9.8)	8.1 (7.0 - 9.1)	5.5 (4.5 - 6.7)	8.4 (7.5 - 9.2)
Cadmium (mg/kg)	0.3 (0.2 - 0.7)	0.1 (<0.1 - 0.2)	0.1 (<0.1 - 0.1)	0.8 (0.5 - 1.1)	0.3 (0.1 - 0.4)	0.4 (0.2 - 0.6)	1.0 (0.7 - 1.2)
Chromium (mg/kg)	34 (22 - 53)	53 (43 - 61)	42 (36 - 48)	130 (85 - 180)	48 (43 - 53)	37 (27 - 44)	67 (56 - 76)
Copper (mg/kg)	48 (25 - 72)	95 (57 - 130)	37 (31 - 43)	240 (150 - 320)	140 (24 - 170)	83 (46 - 130)	260 (200 - 310)
Lead (mg/kg)	54 (35 - 85)	49 (35 - 57)	51 (43 - 58)	84 (65 - 140)	50 (28 - 57)	53 (31 - 110)	83 (63 - 110)
Mercury (mg/kg)	0.08 (0.05 - 0.12)	0.19 (0.12 - 0.28)	0.14 (0.11 - 0.18)	0.25 (0.14 - 0.49)	0.17 (<0.05 - 0.23)	0.22 (0.09 - 0.44)	0.78 (0.54 - 1.30)
Nickel (mg/kg)	21 (14 - 47)	21 (13 - 24)	27 (23 - 32)	49 (31 - 74)	29 (25 - 36)	23 (17 - 28)	28 (24 - 34)
Silver (mg/kg)	2.4 (0.3 - 11.0)	0.4 (0.2 - 0.4)	0.6 (0.4 - 0.7)	4.9 (2.9 - 8.2)	1.7 (0.3 - 2.1)	1.6 (0.8 - 2.5)	7.0 (4.8 - 10.0)
Zinc (mg/kg)	170 (120 - 300)	150 (110 - 230)	140 (110 - 160)	280 (200 - 350)	220 (110 - 240)	180 (120 - 320)	340 (260 - 450)
Total Polychlorinated Biphenyls (PCBs) (µg/kg) [3]	18 (18 - 18)	18 (18 - 22)	18 (18 - 18)	52 (28 - 92)	20 (18 - 24)	19 (18 - 22)	46 (27 - 82)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [4] [6]	96 (90 - 110)	94 (90 - 110)	91 (90 - 95)	230 (100 - 1100)	93 (90 - 100)	110 (90 - 140)	130 (110 - 170)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (µg/kg) [5] [6]	250 (22 - 530)	200 (62 - 590)	71 (62 - 86)	1300 (480 - 5600)	160 (21 - 280)	420 (190 - 940)	760 (640 - 1000)

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 bottom sediment quality of typhoon shelters, 2005- 2009 (continued)

Parameter	To Kwa Wan VS20	Kwun Tong VS14	Sam Ka Tsuen VS13	Aldrich Bay (Shau Kei Wan) ES5	Chai Wan ES3	Hebe Haven PS4	Yim Tin Tsai PS2	Shuen Wan TS7
Number of samples	9	10	10	10	10	10	10	10
Particle Size Fractionation <63μm (%w/w)	67 (45 - 87)	70 (50 - 92)	85 (76 - 90)	91 (85 - 97)	90 (80 - 96)	90 (81 - 97)	81 (28 - 93)	67 (54 - 90)
Electrochemical Potential (mV)	-327 ((-378) - (-173))	-377 ((-415) - (-305))	-222 ((-377) - (-56))	-385 ((-413) - (-345))	-322 ((-380) - (-266))	-235 ((-313) - (-161))	-212 ((-326) - (-129))	-338 ((-375) - (-260))
Total Solids (%w/w)	49 ((45 - 54))	38 ((27 - 45))	41 ((37 - 43))	31 ((27 - 35))	42 ((36 - 49))	39 ((36 - 43))	49 ((34 - 65))	35 ((23 - 50))
Total Volatile Soilds (%w/w)	7.4 (5.2 - 11.0)	9.6 (7.0 - 11.0)	9.5 (8.6 - 12.0)	9.8 (8.4 - 11.0)	8.1 (5.7 - 8.9)	9.4 (7.8 - 13.0)	10 (5.5 - 15.0)	8.8 (6.8 - 12.0)
Chemical Oxygen Demand (mg/kg)	32000 (18000 - 44000)	34000 (25000 - 44000)	26000 (21000 - 30000)	24000 (17000 - 31000)	26000 (18000 - 30000)	23000 (17000 - 26000)	18000 (11000 - 22000)	26000 (23000 - 30000)
Total Carbon (%w/w)	1.2 (0.9 - 2.0)	1.1 (0.7 - 1.5)	0.9 (0.8 - 1.0)	0.8 (0.7 - 1.1)	0.8 (0.7 - 0.9)	0.8 (0.7 - 1.1)	2 (0.9 - 4.3)	0.8 (0.7 - 1.2)
Ammonical Nitrogen (mg/kg)	17.9 (6.70 - 34.00)	33.5 (11.00 - 76.00)	11.0 (0.51 - 28.00)	27.5 (4.20 - 37.00)	3.1 (0.31 - 8.20)	4.7 (1.50 - 7.50)	8.9 (1.70 - 22.00)	7.1 (2.50 - 12.00)
Total Kjeldahl Nitrogen (mg/kg)	500 (420 - 630)	650 (410 - 890)	590 (530 - 700)	620 (480 - 730)	500 (400 - 630)	550 (290 - 670)	460 (250 - 850)	680 (550 - 890)
Total Phosphorus (mg/kg)	210 (170 - 250)	210 (160 - 310)	260 (210 - 340)	210 (170 - 280)	250 (180 - 400)	180 (120 - 220)	140 (72 - 200)	230 (170 - 430)
Total Sulphide (mg/kg)	140 (12.0 - 360.0)	610 (25.0 - 1300.0)	57 (4.6 - 290.0)	640 (59.0 - 1200.0)	120 (18.0 - 300.0)	33 (1.9 - 94.0)	34 (0.6 - 110.0)	260 (53.0 - 1300.0)
Total Cyanide (mg/kg)	0.2 (<0.1 - 0.2)	0.3 (<0.1 - 0.5)	0.3 (<0.1 - 0.5)	0.1 (<0.1 - 0.3)	0.2 (<0.1 - 0.3)	0.2 (<0.1 - 0.3)	0.1 (<0.1 - 0.1)	0.2 (<0.1 - 0.4)
Arsenic (mg/kg)	7.7 (6.0 - 8.7)	6.5 (5.4 - 8.4)	7.5 (6.4 - 8.5)	7.9 (6.1 - 10.0)	9.3 (8.0 - 11.0)	8.2 (7.3 - 9.2)	4 (2.6 - 5.6)	9.4 (6.6 - 12.0)
Cadmium (mg/kg)	0.9 (0.4 - 1.5)	2.7 (1.4 - 5.0)	0.8 (0.7 - 0.9)	0.6 (0.4 - 1.1)	0.6 (0.3 - 0.8)	0.2 (0.1 - 0.3)	<0.1 (<0.1 - <0.1)	0.5 (0.3 - 0.8)
Chromium (mg/kg)	85 (53 - 110)	280 (100 - 570)	56 (44 - 88)	61 (55 - 77)	100 (75 - 130)	28 (23 - 33)	17 (8 - 23)	24 (18 - 33)
Copper (mg/kg)	650 (240 - 960)	1900 (720 - 4200)	190 (150 - 240)	320 (210 - 430)	290 (220 - 390)	51 (37 - 61)	17 (7 - 27)	140 (81 - 240)
Lead (mg/kg)	110 (61 - 220)	140 (75 - 400)	100 (85 - 120)	79 (68 - 110)	84 (68 - 110)	39 (36 - 41)	32 (13 - 39)	100 (77 - 120)
Mercury (mg/kg)	1.2 (0.50 - 2.20)	0.78 (0.41 - 1.40)	0.77 (0.61 - 1.20)	0.37 (0.25 - 0.69)	0.52 (0.38 - 0.65)	0.13 (0.11 - 0.16)	0.06 (<0.05 - 0.07)	0.17 (0.08 - 0.27)
Nickel (mg/kg)	35 (19 - 45)	81 (31 - 170)	20 (16 - 25)	27 (24 - 30)	31 (22 - 40)	9 (7 - 11)	12 (6 - 18)	13 (8 - 20)
Silver (mg/kg)	4.7 (3.1 - 5.8)	8.6 (4.8 - 13.0)	2.7 (2.2 - 3.3)	7.2 (4.2 - 9.0)	17.5 (5.2 - 30.0)	0.3 (0.3 - 0.4)	0.2 (<0.2 - 0.2)	0.5 (0.3 - 0.7)
Zinc (mg/kg)	260 (150 - 380)	440 (290 - 620)	340 (280 - 380)	380 (320 - 550)	330 (250 - 430)	160 (140 - 170)	78 (28 - 110)	350 (260 - 470)
Total Polychlorinated Biphenyls (PCBs) (μg/kg) [3]	86 (31 - 140)	210 (67 - 470)	55 (40 - 110)	23 (18 - 29)	49 (29 - 71)	18 (18 - 18)	18 (18 - 18)	18 (18 - 18)
Low Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [4] [6]	16000 (580 - 42000)	130 (98 - 200)	130 (100 - 180)	110 (94 - 130)	120 (100 - 140)	90 (90 - 90)	90 (90 - 90)	91 (90 - 96)
High Molecular Weight Polycylic Aromatic Hydrocarbons (PAHs) (μg/kg) [5] [6]	130000 (7700 - 290000)	1100 (560 - 1900)	720 (410 - 1500)	780 (370 - 1500)	500 (270 - 750)	67 (37 - 100)	37 (21 - 52)	130 (61 - 200)

Note:
1. Data presented are arithmetic means ; data in brackets indicate ranges.
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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.
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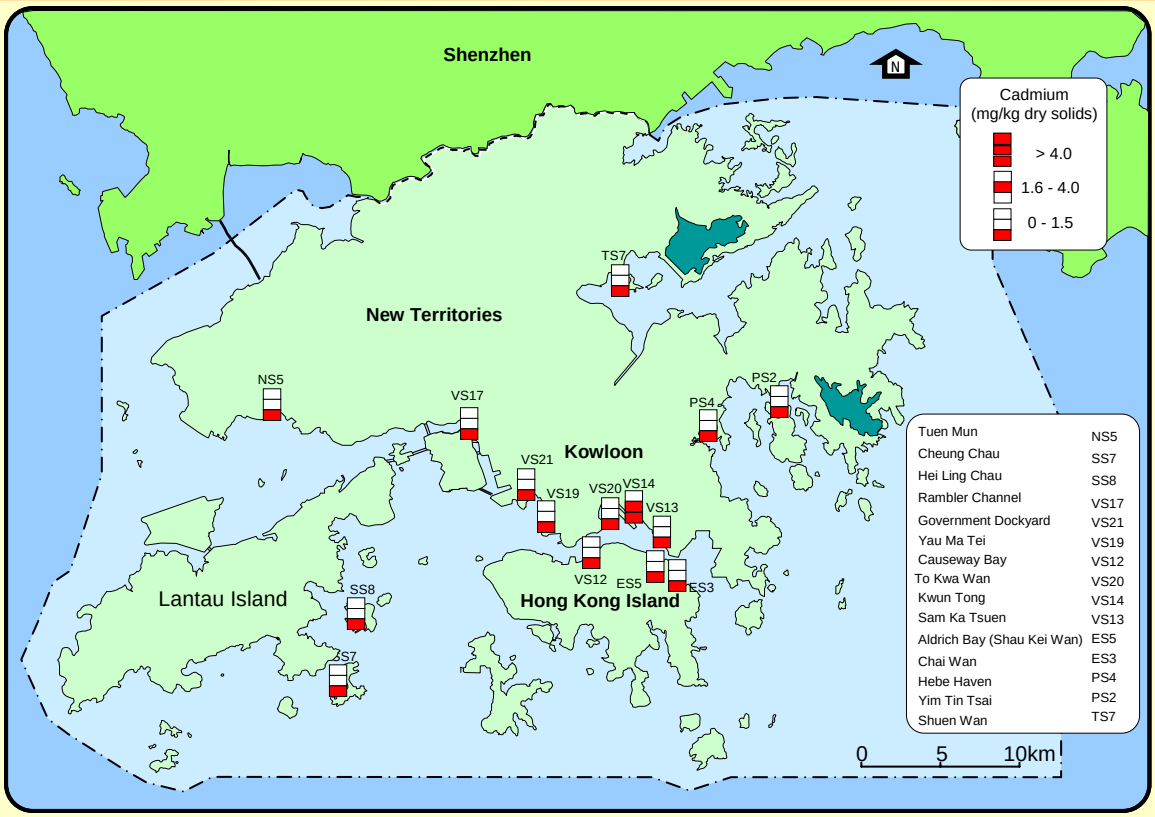
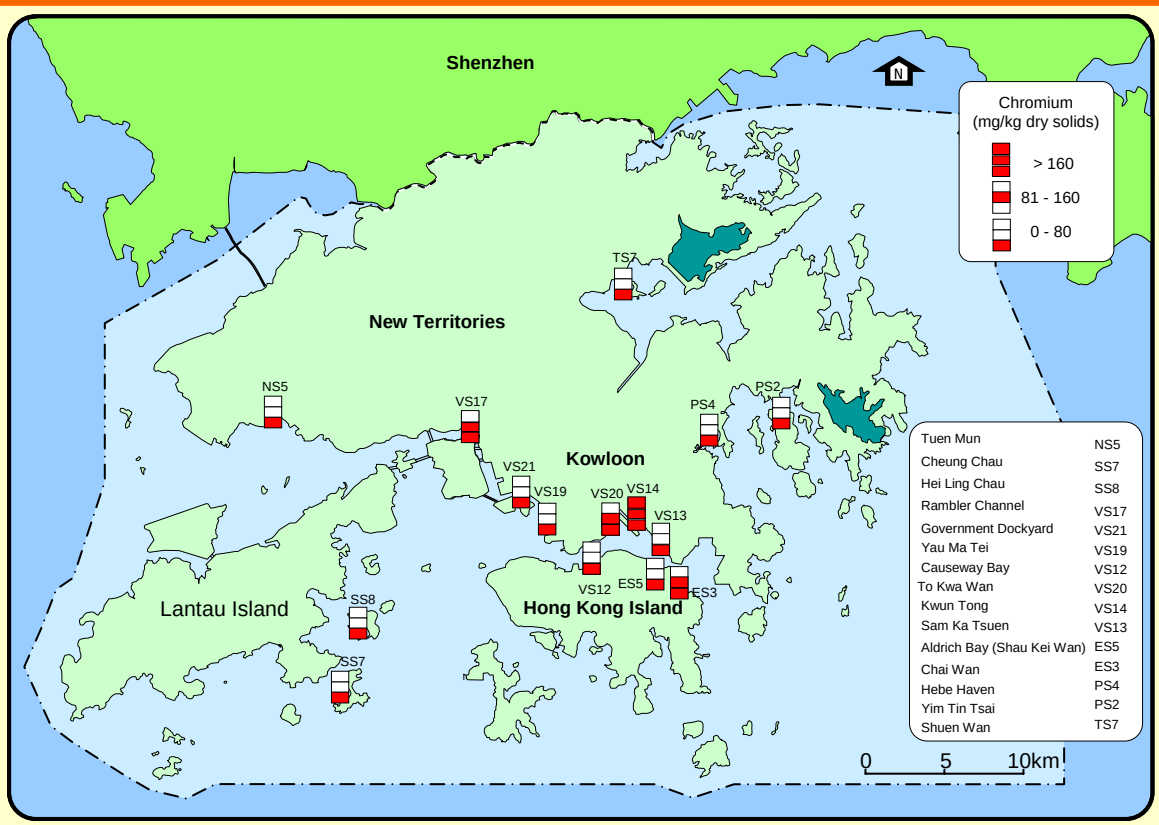
6. Low and high molecular weight PAHs results are derived from the summation of the corresponding congeners. If the concentration of a congener is below report limit (RL), the result will be taken as 0.5xRL in the calculation.

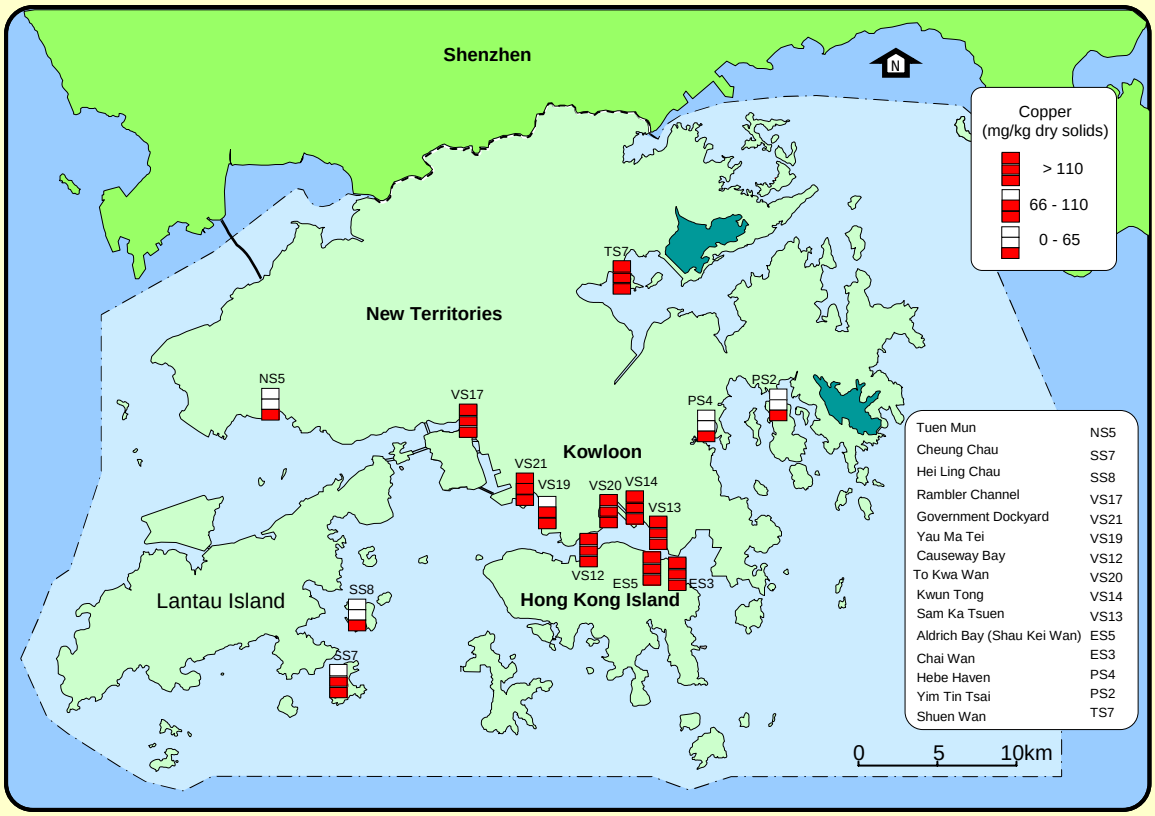
Cadmium in typhoon shelter sediments in Hong Kong, 2005 – 2009



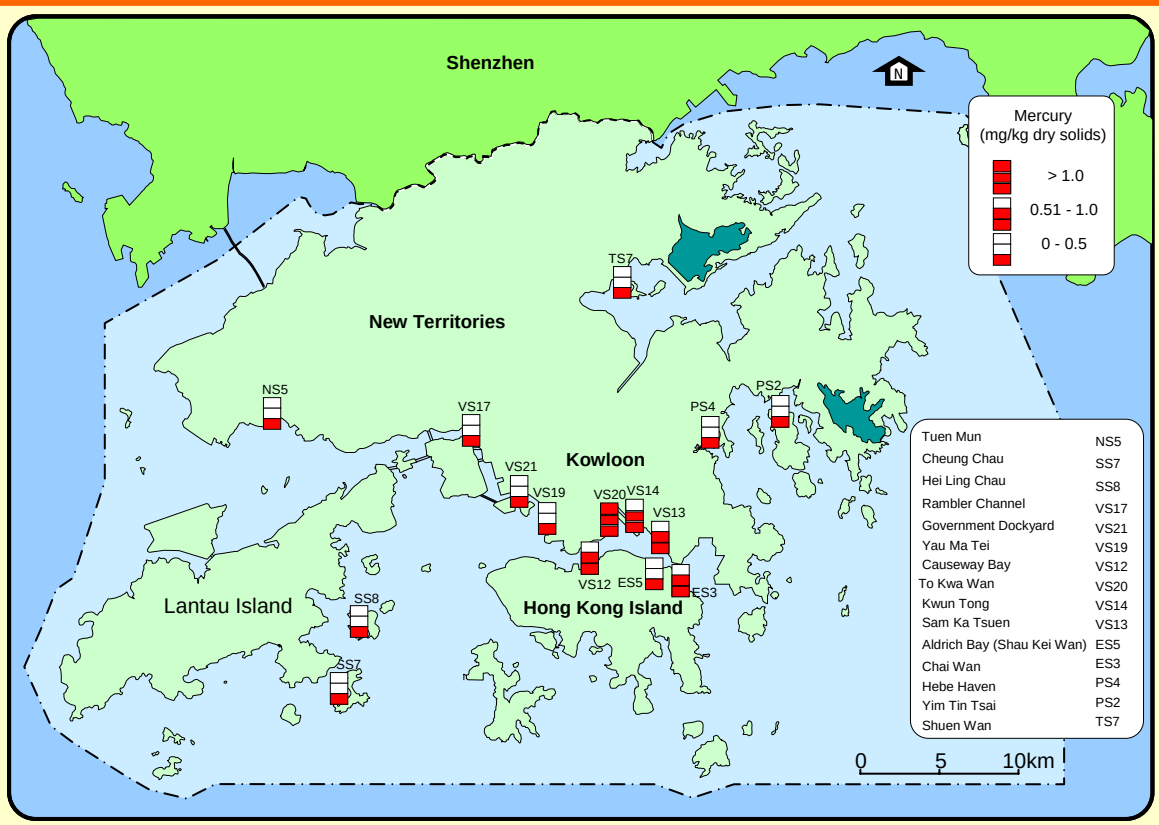
Chromium in typhoon shelter sediments in Hong Kong, 2005 – 2009



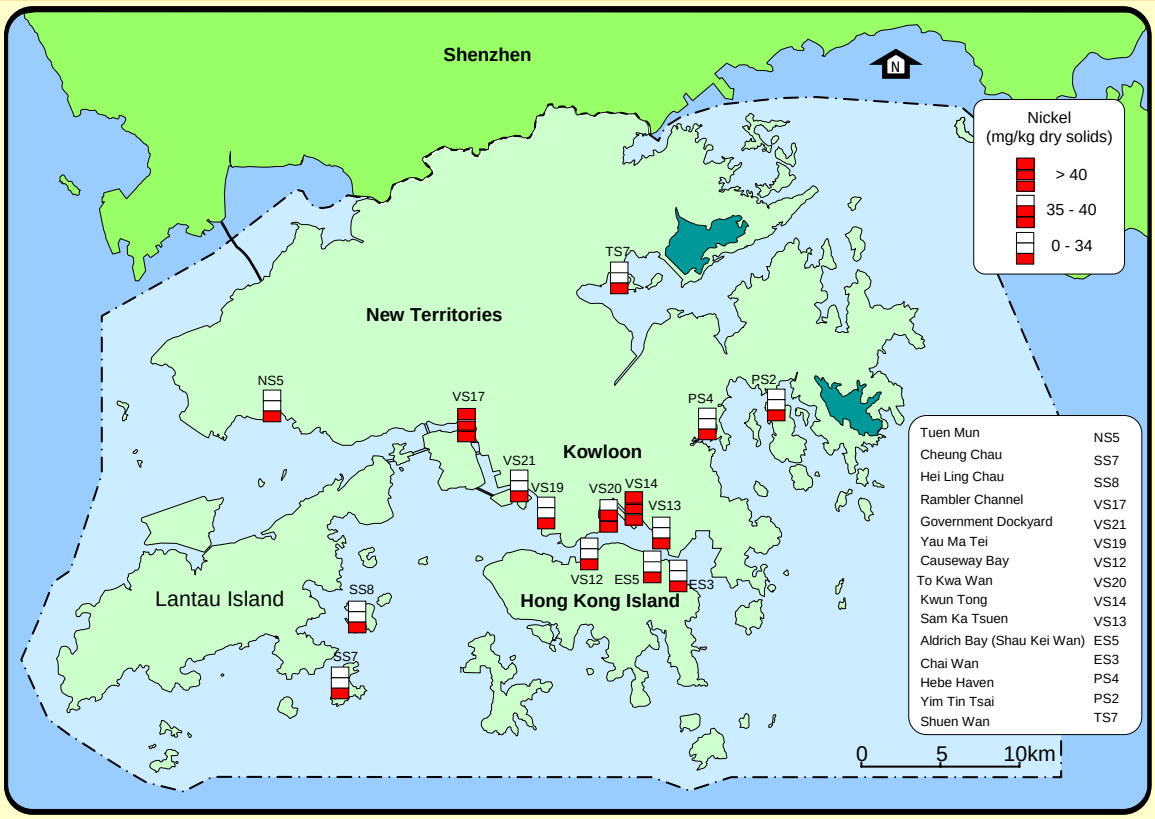
Copper in typhoon shelter sediments in Hong Kong, 2005 – 2009



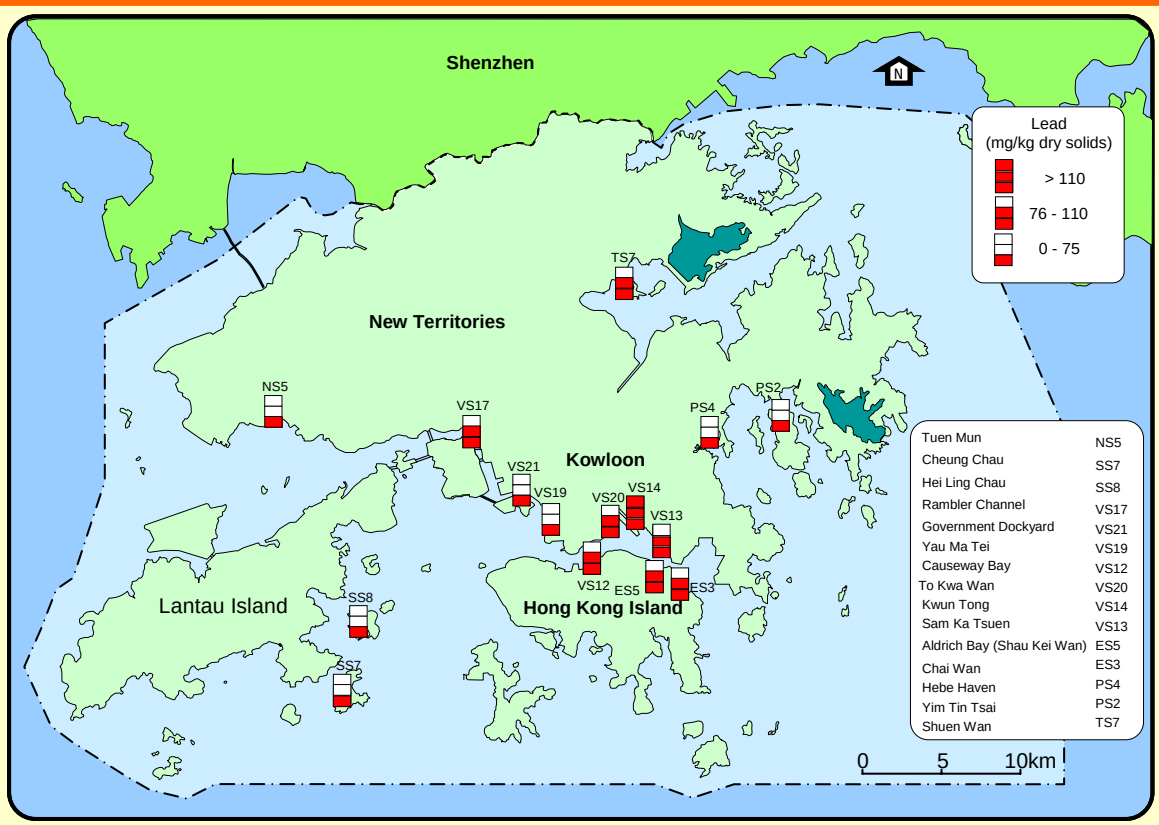
Mercury in typhoon shelter sediments in Hong Kong, 2005 – 2009



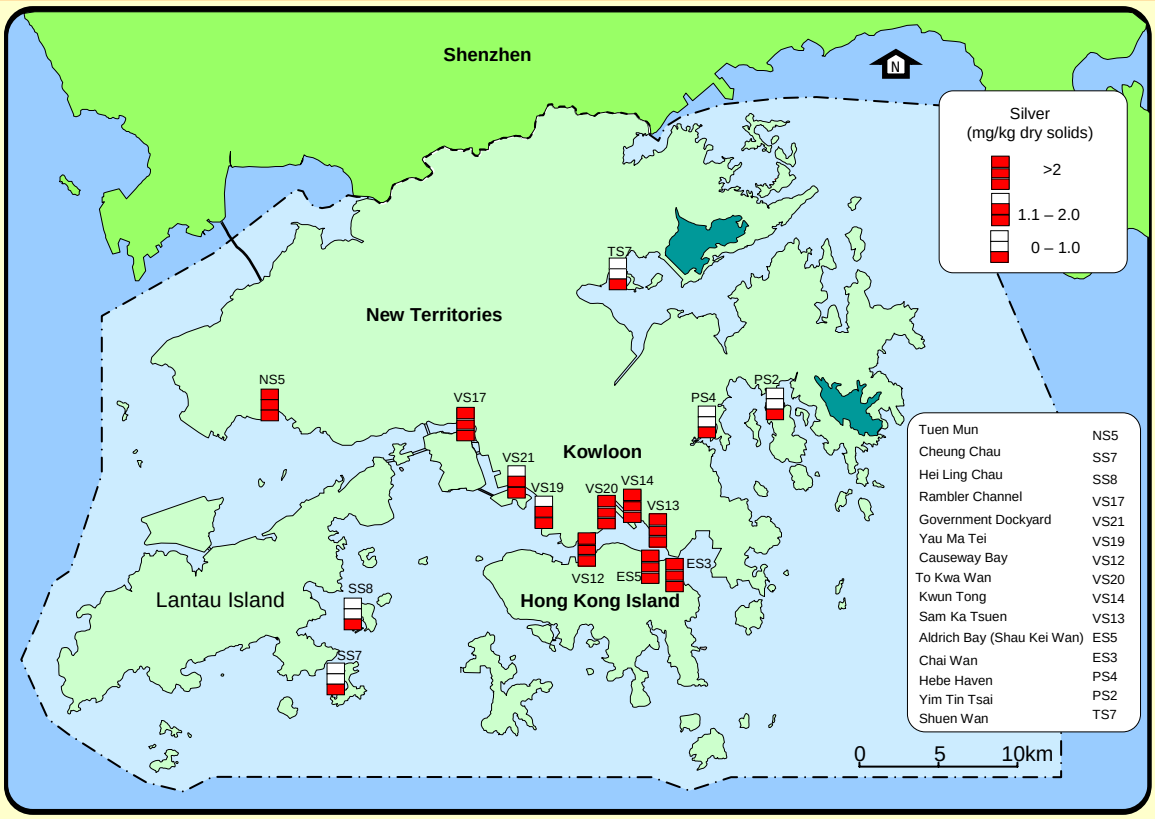
Nickel in typhoon shelter sediments in Hong Kong, 2005 – 2009



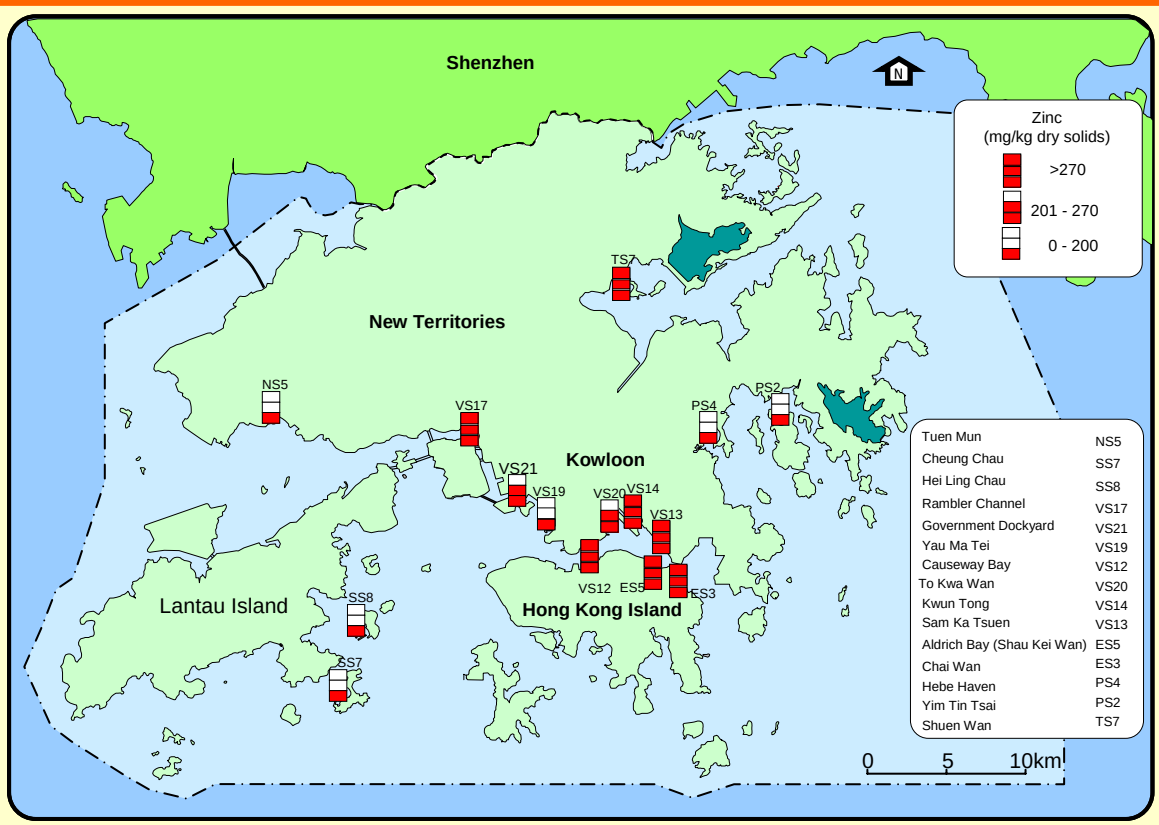
Lead in typhoon shelter sediments in Hong Kong, 2005 – 2009



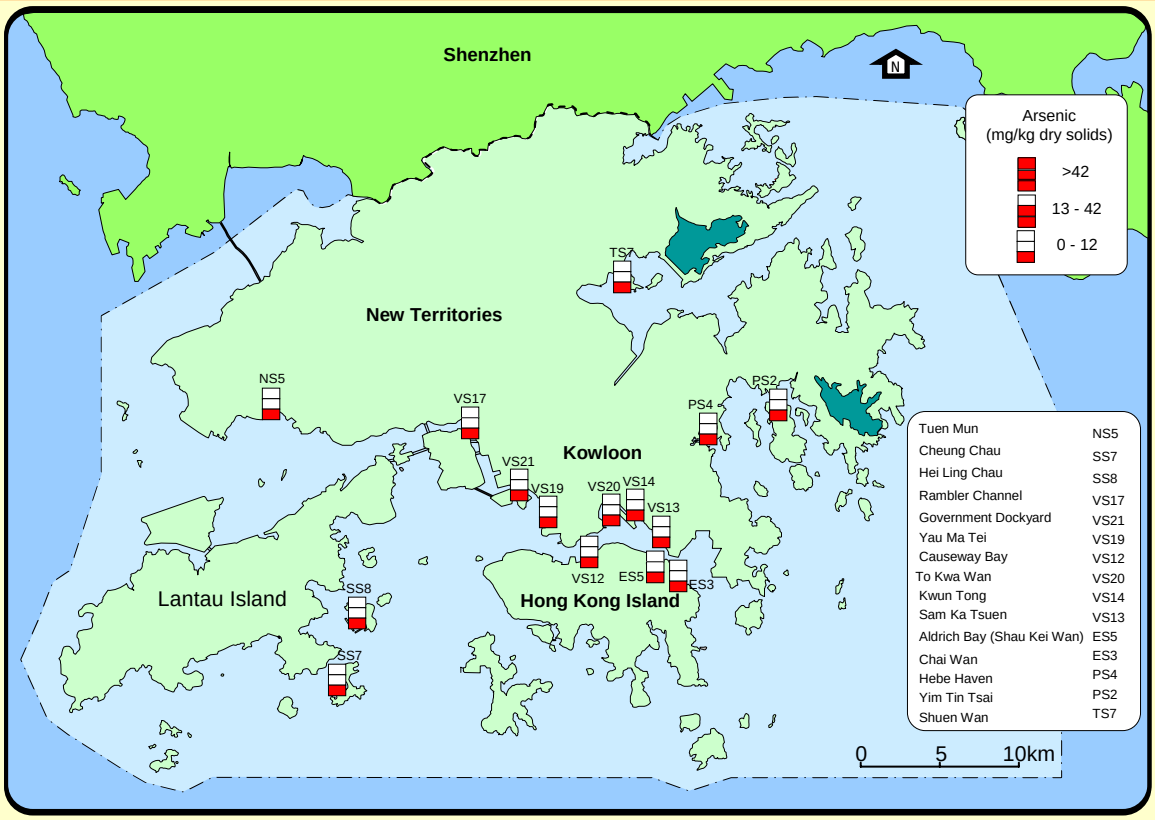
Silver in typhoon shelter sediments in Hong Kong, 2005 – 2009



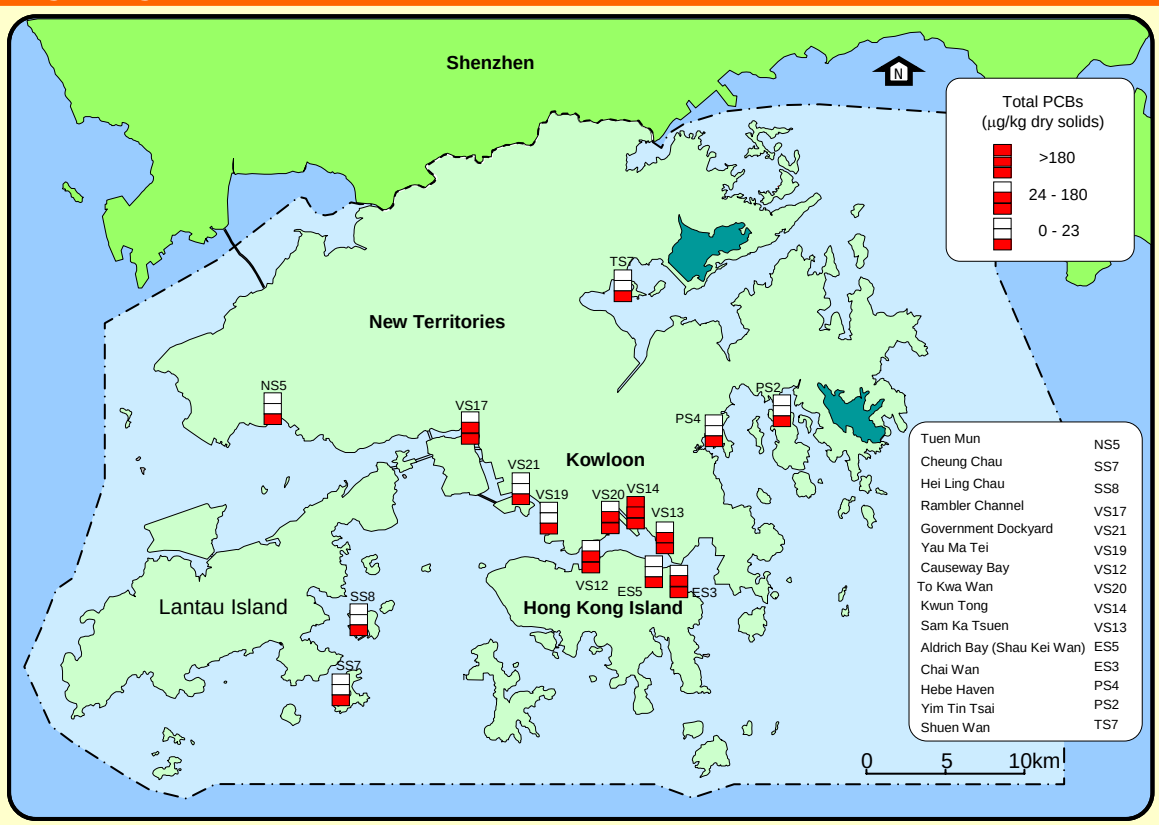
Zinc in typhoon shelter sediments in Hong Kong, 2005 – 2009



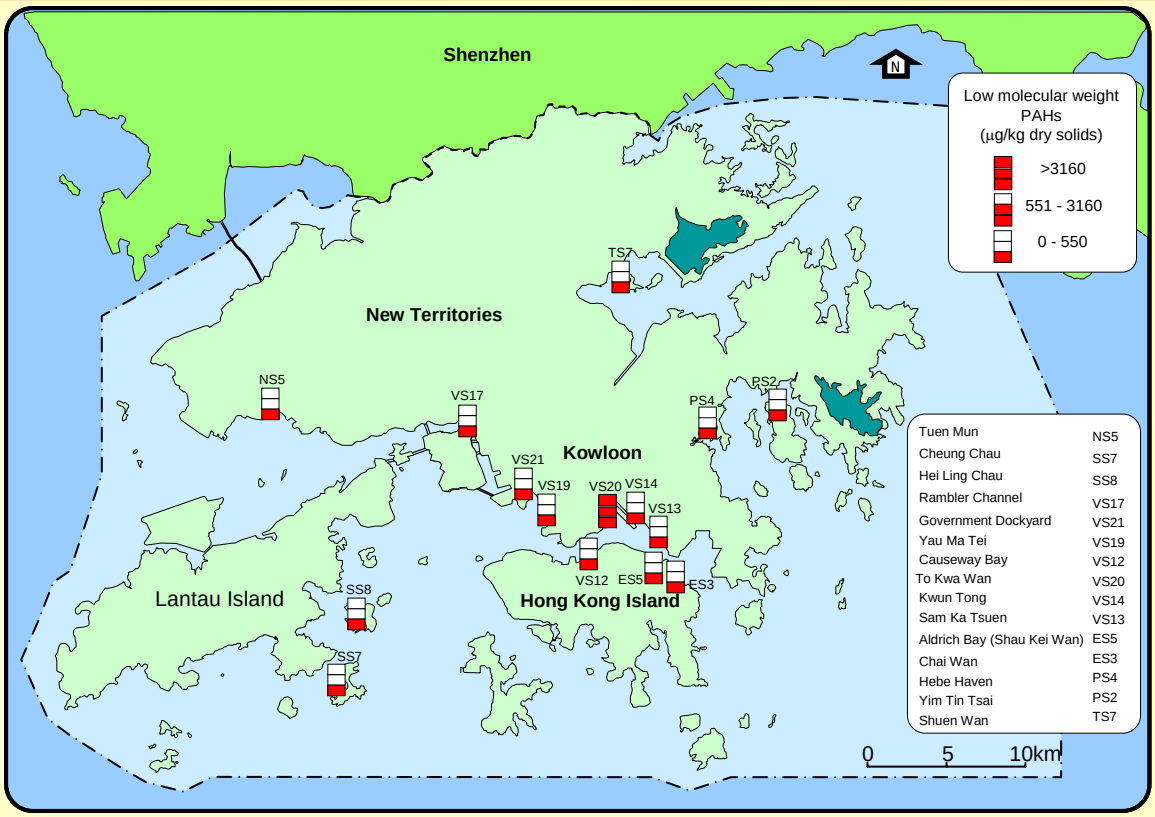
Arsenic in typhoon shelter sediments in Hong Kong, 2005 – 2009



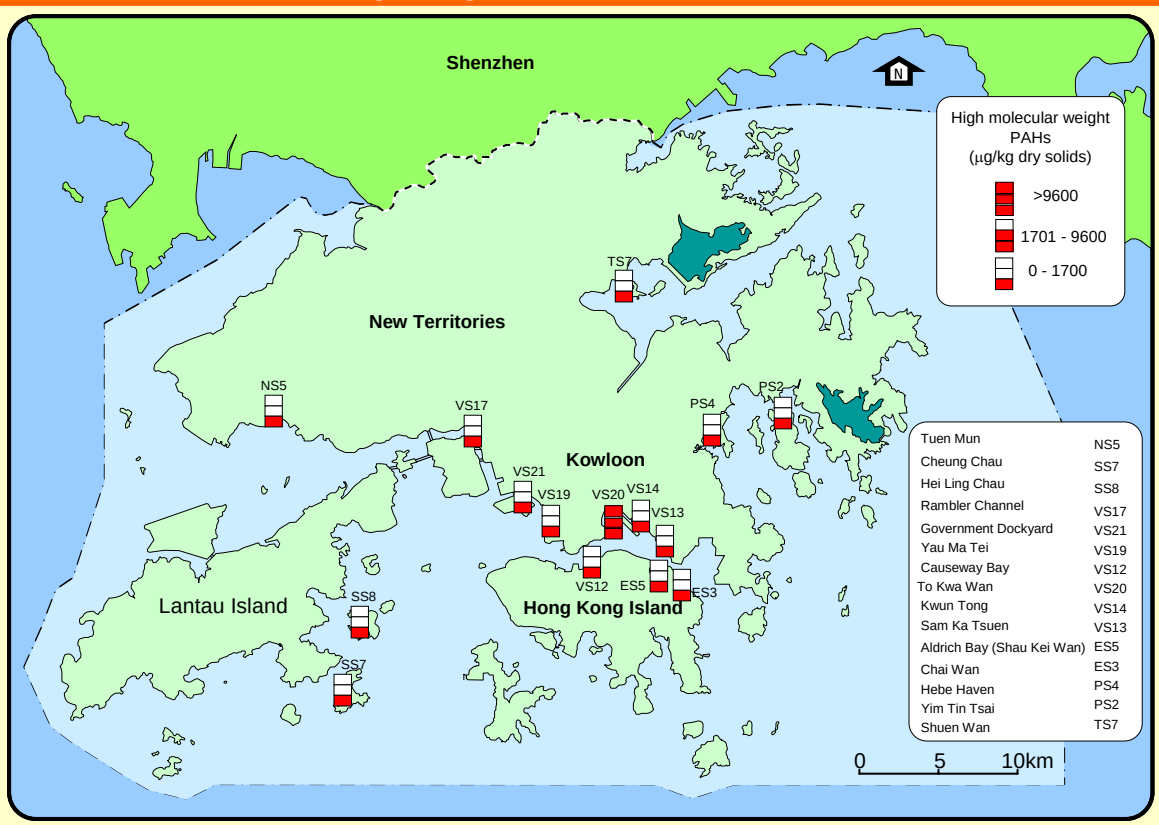
Total polychlorinated biphenyls (PCBs) in typhoon shelter sediments in Hong Kong, 2005 – 2009



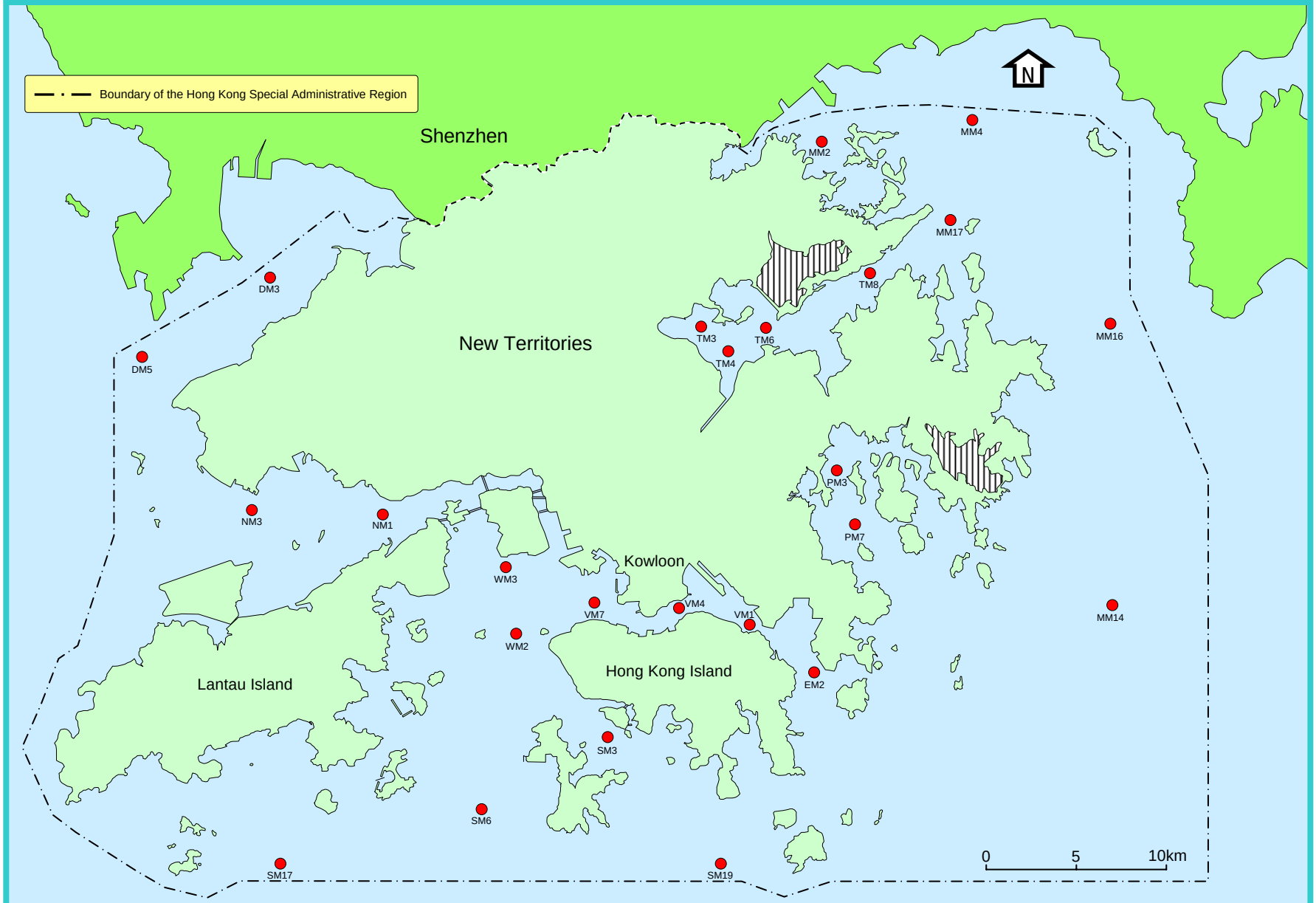
Low molecular weight polycyclic aromatic hydrocarbons (PAHs) in typhoon shelter sediments in Hong Kong, 2005 – 2009



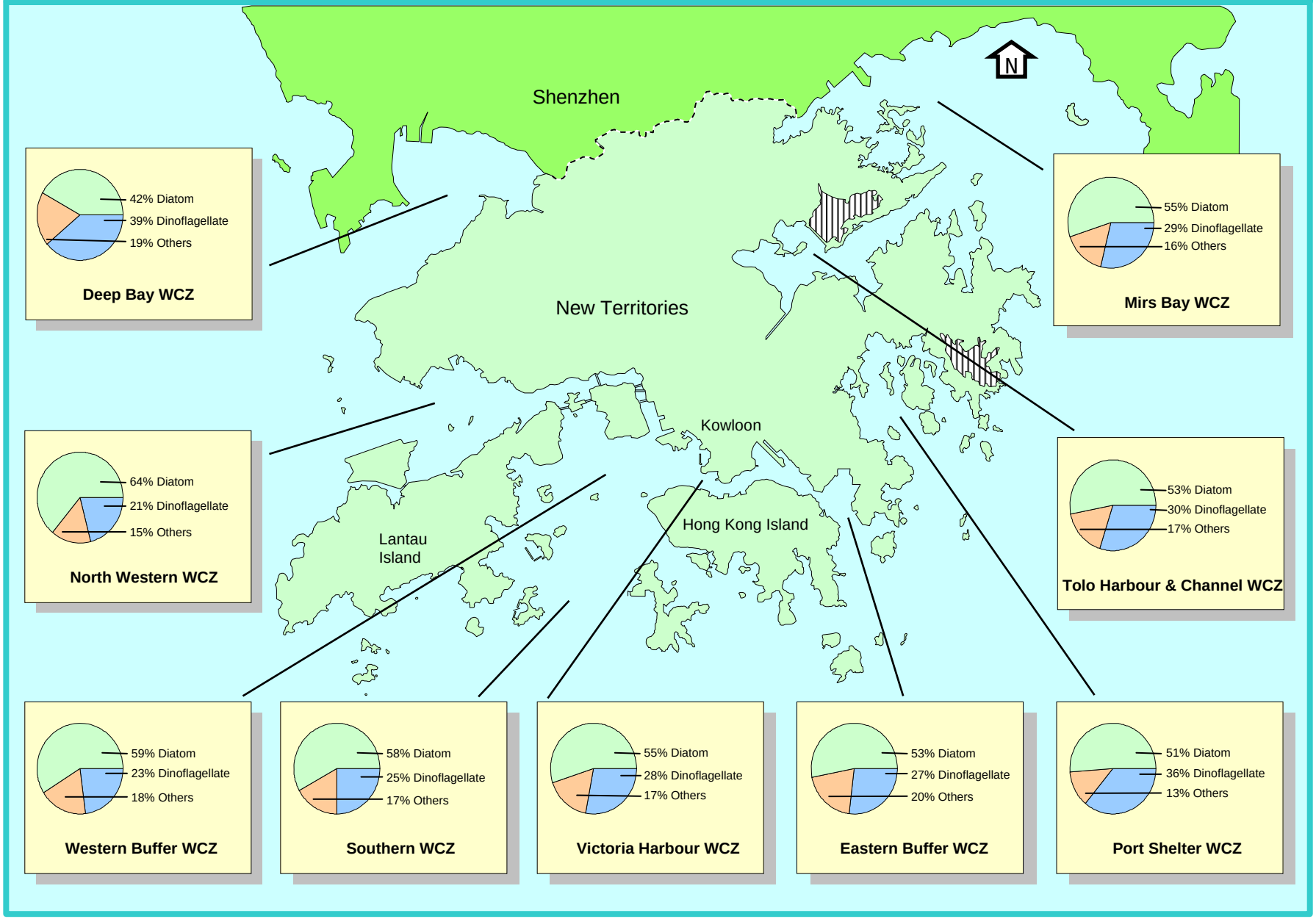
High molecular weight polycyclic aromatic hydrocarbons (PAHs) in typhoon shelter sediments in Hong Kong, 2005 – 2009



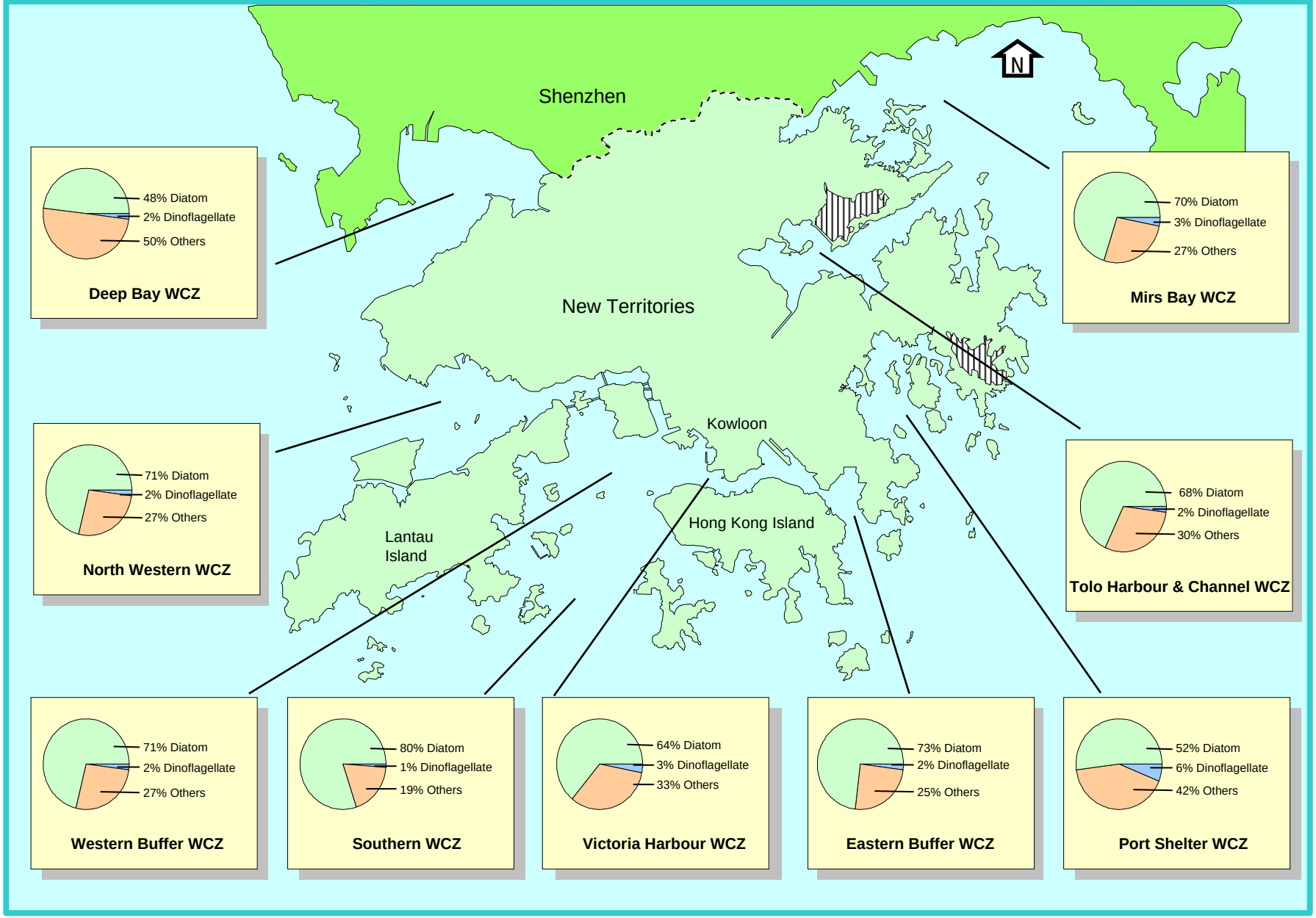
Phytoplankton monitoring stations in Hong Kong waters in 2009



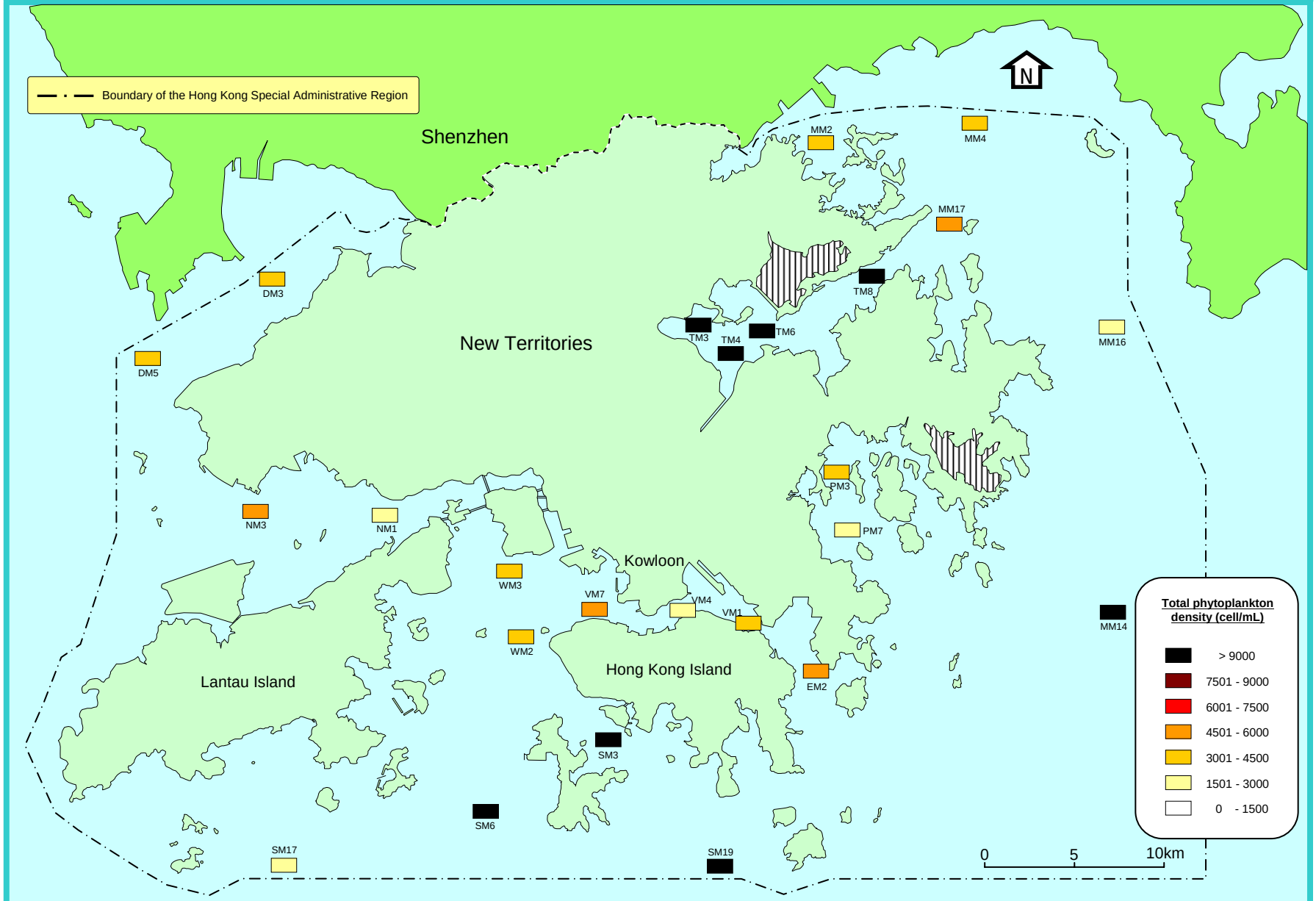
Percentage contribution of phytoplankton groups to the total number of species in the nine Water Control Zones (2009)



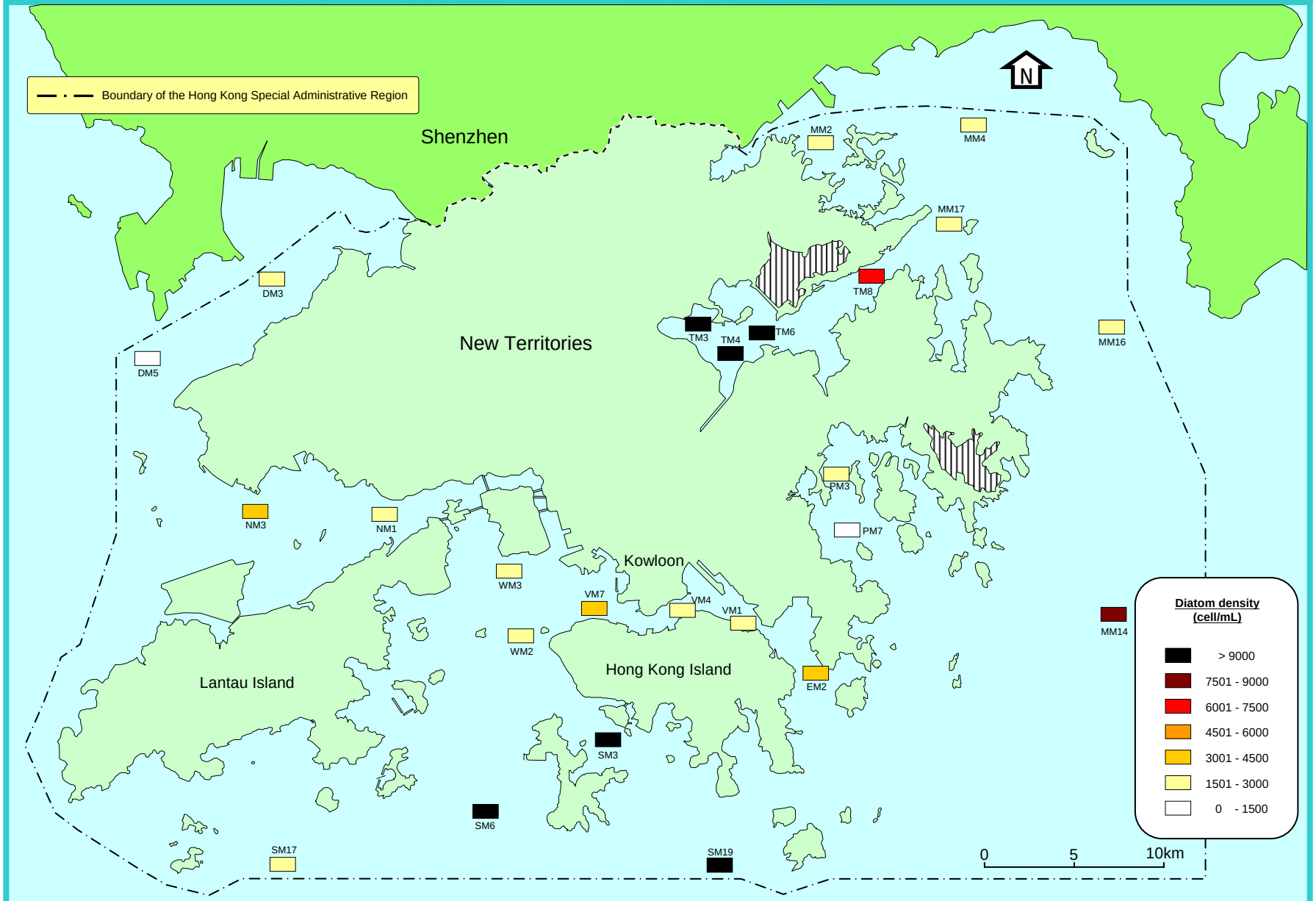
Percentage contribution of phytoplankton groups to the total density in the nine Water Control Zones (2009)



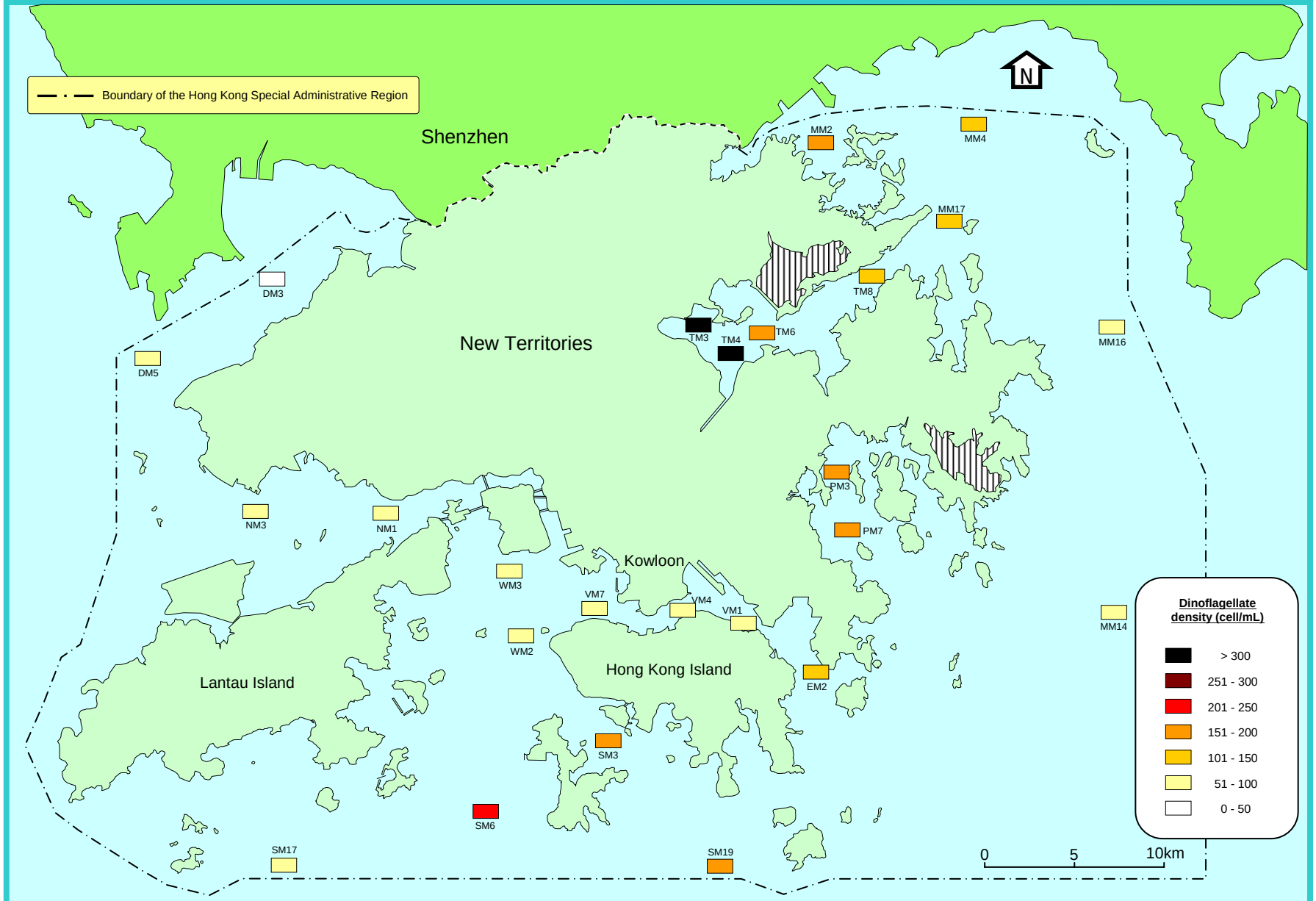
Annual mean densities (cell/mL) of total phytoplankton at 25 monitoring stations in Hong Kong waters in 2009



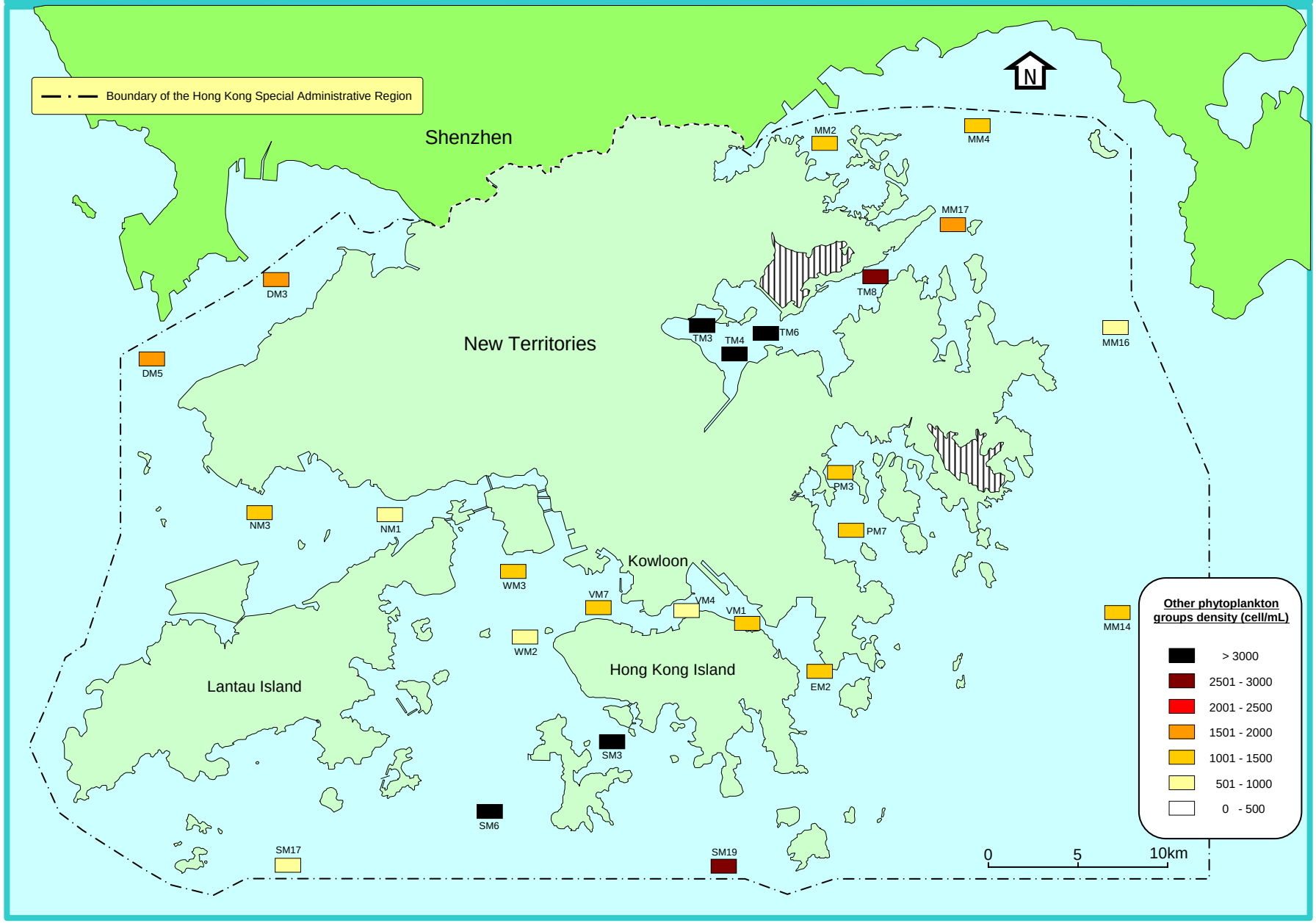
Annual mean densities (cell/mL) of diatoms at 25 monitoring stations in Hong Kong waters in 2009



Annual mean densities (cell/mL) of dinoflagellates at 25 monitoring stations in Hong Kong waters in 2009

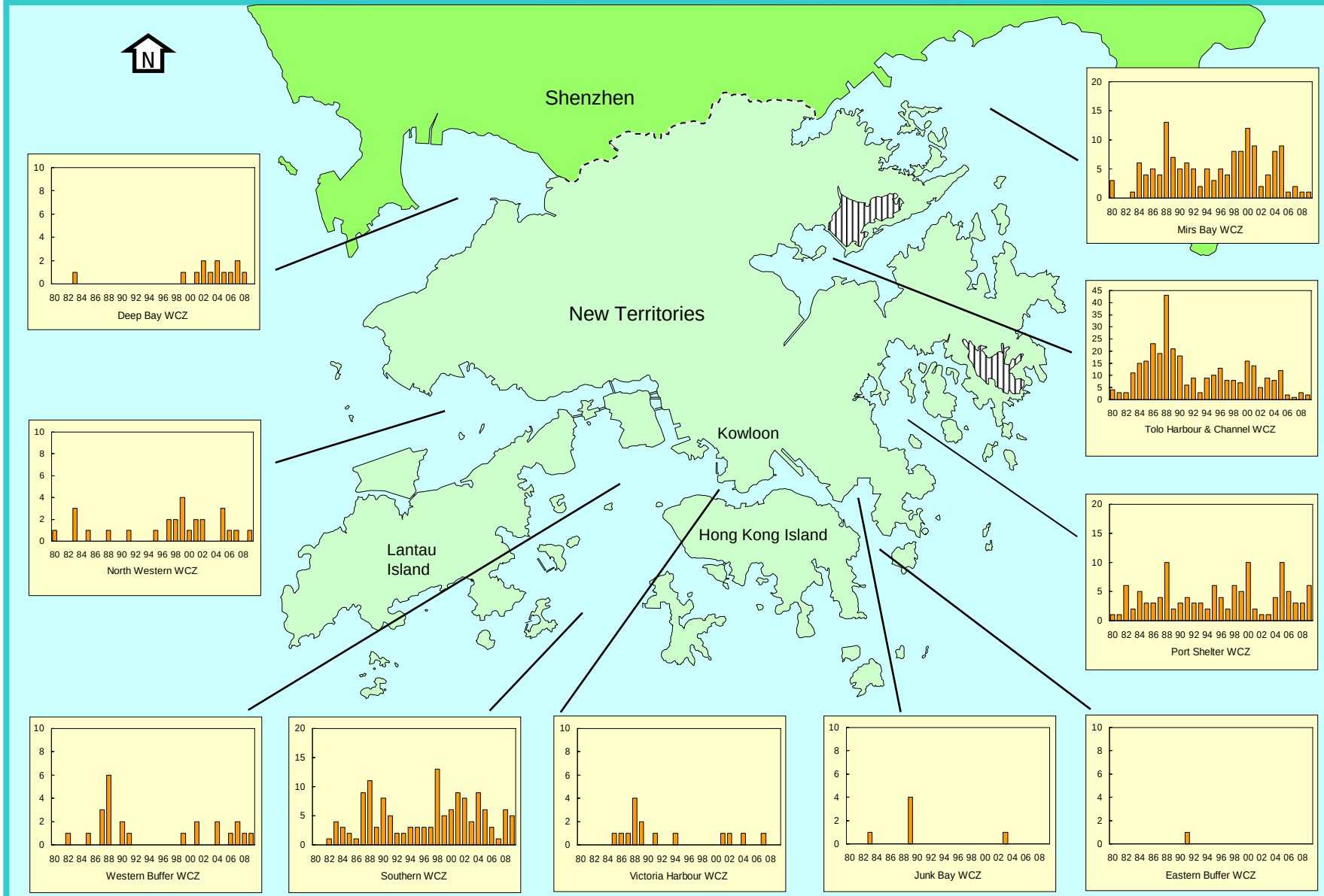


Annual mean densities (cell/mL) of other phytoplankton groups at 25 monitoring stations in Hong Kong waters in 2009



Frequency of red tides in 10 Water Control Zones in Hong Kong, 1980 - 2009

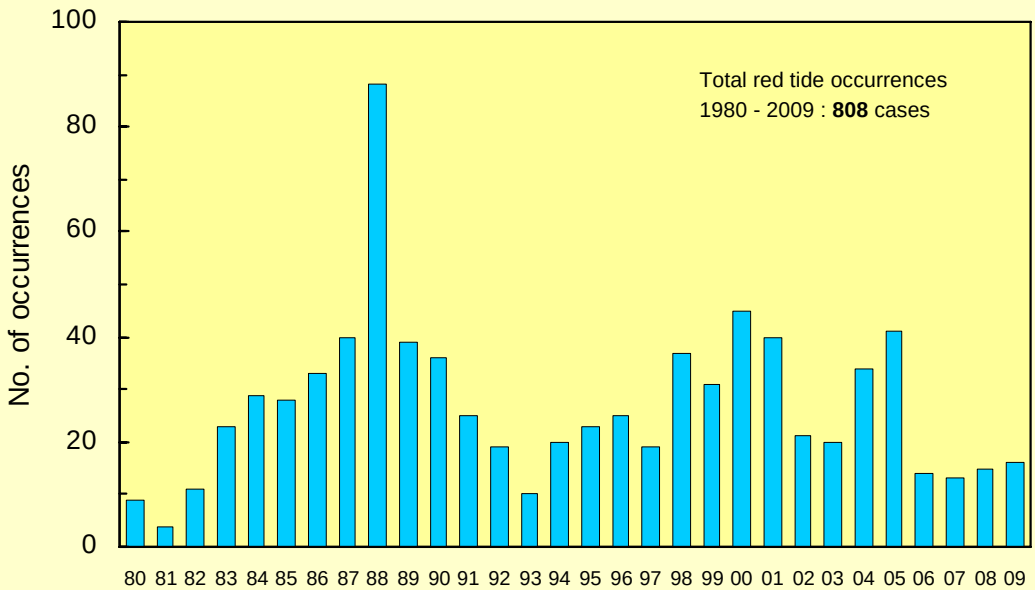
Source: Agriculture, Fisheries and Conservation Department and Environmental Protection Department



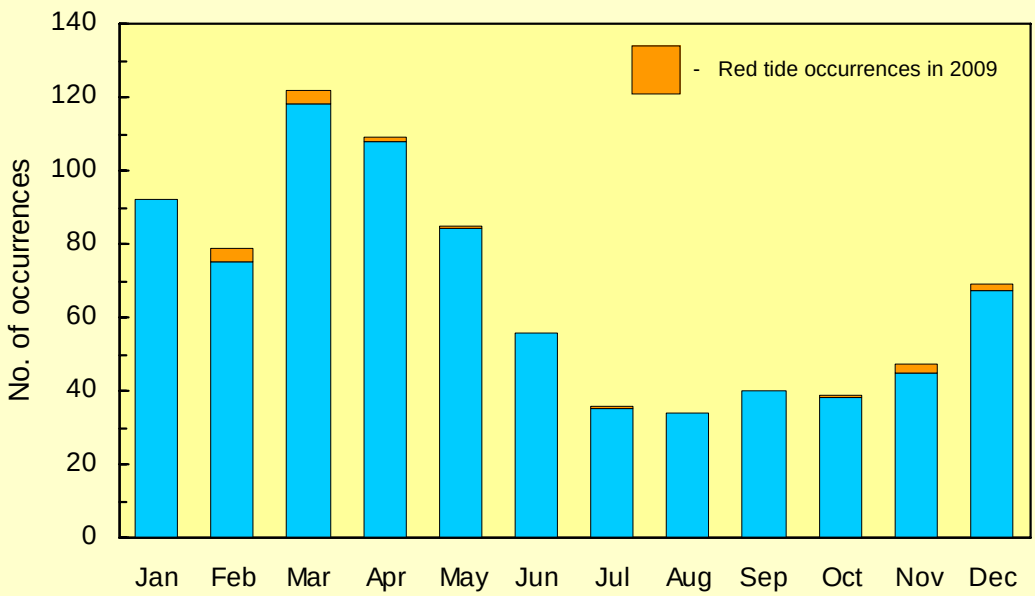
Occurrence of red tides in Hong Kong waters, 1980 – 2009

(Sources: Agriculture, Fisheries and Conservation Department and Environmental Protection Department)

Yearly Distribution

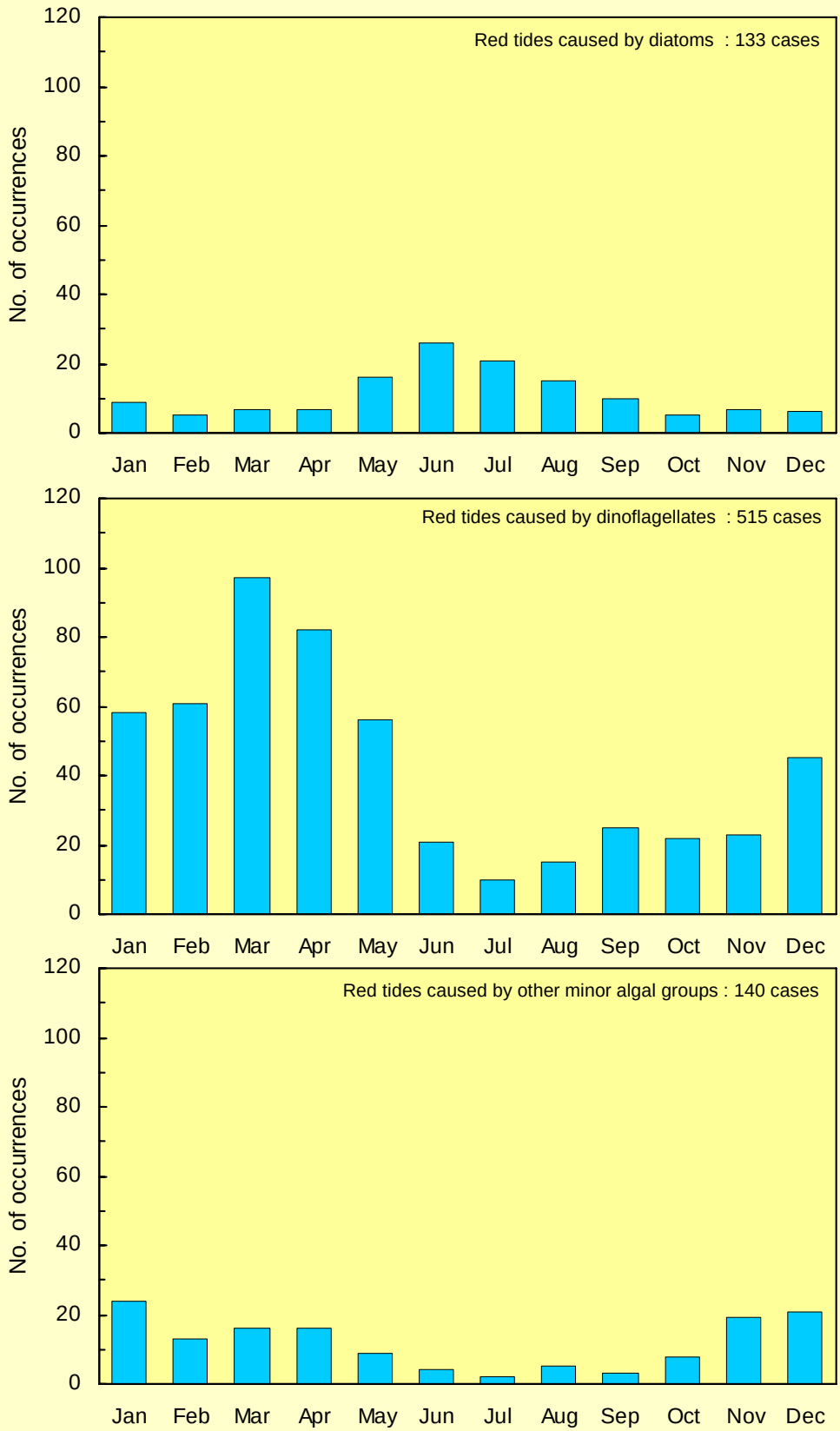


Monthly Distribution



Seasonal occurrence of red tides caused by different phytoplankton groups in Hong Kong, 1980 – 2009

(Sources: Agriculture, Fisheries and Conservation Department and Environmental Protection Department)



Abundance and frequency of the dominant phytoplankton species in different Water Control Zones (WCZs) in 2009.

Species	% Abundance[1]	Frequency[2]	Species	% Abundance[1]	Frequency[2]	Species	% Abundance[1]	Frequency[2]
Tolo Harbour & Channel			**Port Shelter**			**North Western**		
Diatoms			Diatoms			Diatoms		
Pseudo-nitzschia spp.	25.1	11	Dactyliosolen fragilissimus	21.8	7	*Skeletonema costatum*	67.3	12
Chaetoceros spp.	18.8	12	Thalassiosira spp.	17.7	12	*Thalassiosira spp.*	11.1	12
Thalassiosira spp.	16.8	12	Chaetoceros spp.	15.1	12	*Chaetoceros spp.*	9.3	10
Dinoflagellates			Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	56.9	12	*Gymnodinium spp.*	58.1	12	*Gymnodinium spp.*	69.4	12
Prorocentrum minimum	8.3	8	*Amphidinium spp.*	9.1	10	*Amphidinium spp.*	11.2	9
Scrippsiella spp.	8.2	10	*Scrippsiella spp.*	7.8	11	*Scrippsiella spp.*	6.6	4
Others			Others			Others		
small flagellates	80.4	12	*small flagellates*	83.1	12	*small flagellates*	67.3	12
Plagioselmis prolonga	12.2	12	*Plagioselmis prolonga*	14.0	11	*Plagioselmis prolonga*	20.9	12
Teleaulax acuta	2.6	12	*Teleaulax acuta*	2.1	9	*Teleaulax acuta*	10.1	12
Mirs Bay			**Victoria Harbour**			**Western Buffer**		
Diatoms			Diatoms			Diatoms		
Pseudo-nitzschia spp.	35.4	12	*Skeletonema costatum*	56.3	12	*Skeletonema costatum*	68.5	10
Dactyliosolen fragilissimus	22.9	10	*Thalassiosira spp.*	13.5	12	*Pseudo-nitzschia spp.*	11.3	10
Thalassiosira spp.	12.5	12	*Chaetoceros spp.*	11.5	11	*Chaetoceros spp.*	10.8	8
Dinoflagellates			Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	54.4	12	*Gymnodinium spp.*	49.8	12	*Gymnodinium spp.*	58.0	12
Amphidinium spp.	10.4	11	Gyrodinium fusiforme	20.7	12	*Scrippsiella spp.*	11.0	9
Scrippsiella spp.	9.7	12	*Amphidinium spp.*	8.4	10	*Gyrodinium fusiforme*	10.9	8
Others			Others			Others		
small flagellates	78.7	12	*small flagellates*	76.1	12	*small flagellates*	79.7	12
Plagioselmis prolonga	15.8	12	*Plagioselmis prolonga*	16.6	12	*Plagioselmis prolonga*	16.3	12
Teleaulax acuta	4.0	12	*Teleaulax acuta*	6.4	11	*Teleaulax acuta*	2.9	12
Eastern Buffer			**Southern**			**Deep Bay**		
Diatoms			Diatoms			Diatoms		
Chaetoceros spp.	48.6	9	*Pseudo-nitzschia spp.*	63.6	12	*Thalassiosira spp.*	59.7	12
Thalassiosira spp.	18.8	11	*Skeletonema costatum*	19.7	12	*Skeletonema costatum*	30.6	12
Pseudo-nitzschia spp.	13.9	12	*Chaetoceros spp.*	6.6	12	*Chaetoceros spp.*	5.2	9
Dinoflagellates			Dinoflagellates			Dinoflagellates		
Gymnodinium spp.	57.3	12	*Gymnodinium spp.*	69.3	12	*Gymnodinium spp.*	59.7	11
Amphidinium spp.	14.1	8	*Gyrodinium fusiforme*	9.6	11	*Amphidinium spp.*	17.6	8
Scrippsiella spp.	11.9	9	*Amphidinium spp.*	8.2	12	*Gyrodinium fusiforme*	9.0	7
Others			Others			Others		
small flagellates	80.6	12	*small flagellates*	89.1	12	*small flagellates*	63.1	12
Plagioselmis prolonga	12.0	12	*Plagioselmis prolonga*	8.3	12	*Plagioselmis prolonga*	20.9	12
Heterosigma akashiwo	4.8	1	*Teleaulax acuta*	1.8	12	*Teleaulax acuta*	9.0	12

[1] % of species/group in diatoms, dinoflagellates and other phytoplankton
[2] Number of occurrences out of 12 sampling occasions.

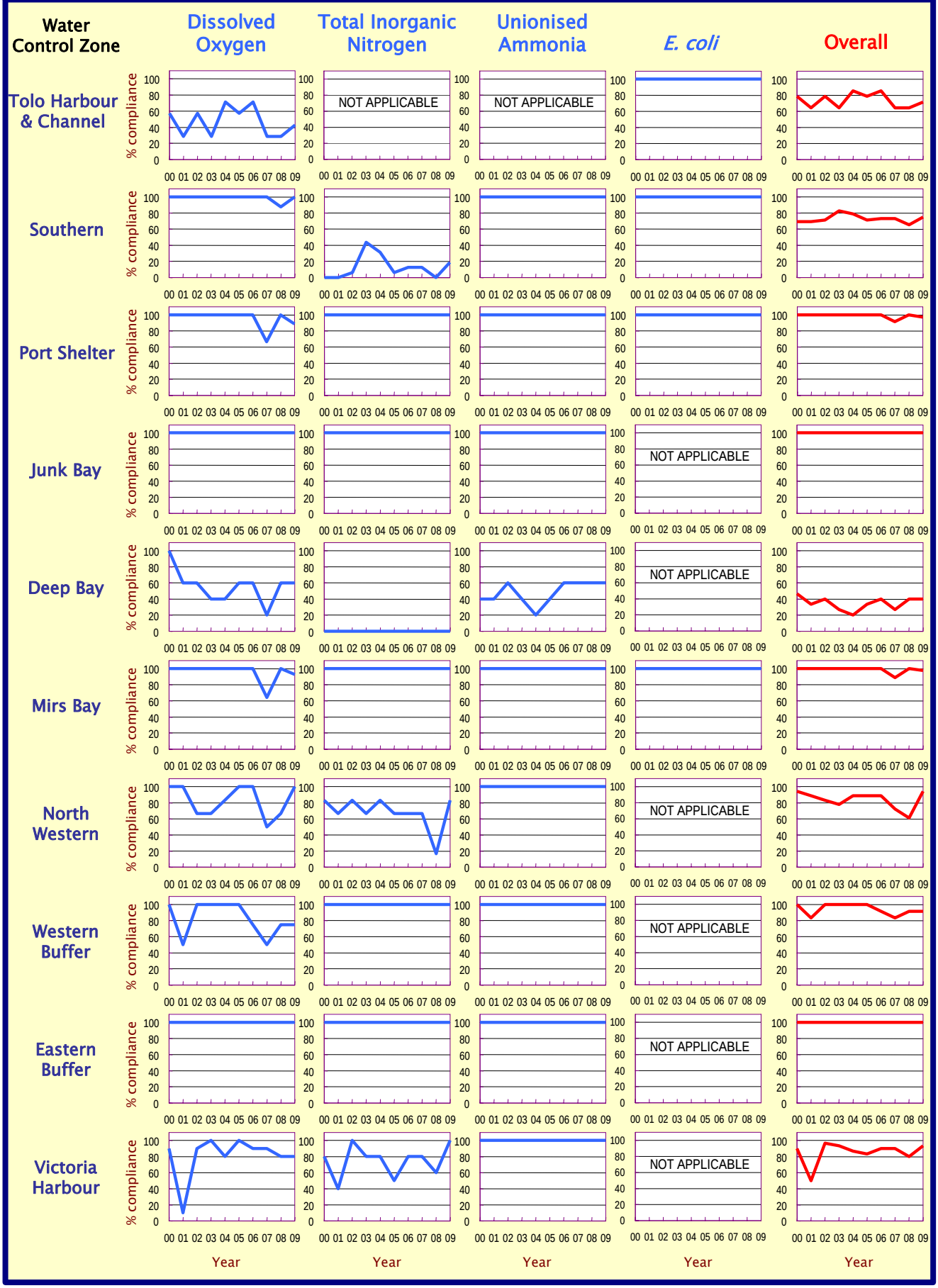
Occurrence and distribution of red tide species in different Water Control Zones (WCZs), 1980 -2009

Species	Number of occurrences										
	Tolo Harbour & Channel WCZ	Mirs Bay WCZ	Eastern Buffer WCZ	Port Shelter WCZ	Junk Bay WCZ	Victoria Harbour WCZ	Southern Waters WCZ	North Western WCZ	Western Buffer WCZ	Deep Bay WCZ	Total
Noctiluca scintillans	61	67		55			55	5	7		250
Skeletonema costatum	23	3		1	3	9	12	3	9	2	65
Mesodinium rubrum	8	8		9	1		17	6	2	2	53
Gonyaulax polygramma	21	8		14			6	1			50
Prorocentrum minimum	44	1									45
Ceratium furca	15	7		13							35
Prorocentrum triestinum	33										33
Scrippsiella trochoidea	15	4		2			1				22
Heterosigma akashiwo	15	2						3		1	21
Heterocapsa circularisquama	13	3									16
Prorocentrum sigmoides	14	1		1							16
Prorocentrum dentatum	8	4		1			1				14
Trichodesmium erythraeum		6		5			3				14
Thalassiosira nordenskioeldii	2	3				1	4		2		12
Prorocentrum micans	4	4		1		1	1				11
Karenia mikimotoi	6	1		3							10
Leptocylindrus minimus	10										10
Phaeocystis globosa		1					7			1	9
Cryptomonas spp.	8										8
Dactyliosolen fragilissimus	6	1		1							8
Karenia digitata	1	3		2			2				8
Thalassiosira mala	6						2				8
Akashiwo sanguinea	2	2						2		1	7
Chaetoceros spp.	6			1							7
Plagioselmis prolonga	7										7
Thalassiosira proschkinae	6	1									7
Cochlodinium spp.	2							2	1	1	6
Gyrodinium instriatum						1	1	2	1	1	6
Dictyocha speculum		2		2			1				5
Thalassiosira spp.	2				1		2				5
Eutreptiella spp.	4										4
Haematococcus pluvialis	4										4
Leptocylindrus danicus	3	1									4
Pseudo-nitzschia pseudodelicatissima	1						2		1		4
Chaetoceros curvisetus			1		1		1				3
Chattonella marina	2	1									3
Chattonella ovata		2		1							3
Gymnodinium simplex	3										3
Karenia longicanalis	1	1					1				3
Prorocentrum balticum	1	1		1							3
Pseudo-nitzschia seriata	1					2					3
Teleaulax acuta	3										3
Trichodesmium spp.		1		1			1				3
Alexandrium tamarense				2							2
Cerataulina pelagica	2										2
Chaetoceros socialis							2				2
Chattonella spp.	1						1				2
Cochlodinium polykrikoides							2				2
Eucampia zodiacus							1	1			2
Fibrocapsa japonica				1			1				2
Gymnodinium spp. X				2							2
Heterocapsa rotundata	2										2
Nitzschia longissima	1						1				2
Prorocentrum spp.	1	1									2
Pseudo-nitzschia spp.							2				2
Thalassiosira weissflogii										2	2
Alexandrium catenella					1						1
Chaetoceros pseudocrinitus	1										1
Chaetoceros pseudocurvisetus							1				1
Chaetoceros spp.0105	1										1
Chaetoceros tenuissimus		1									1
Chlamydomonas spp.	1										1
Chlamydomonas uva-maris	1										1
Cyclotella caspia	1										1
Cyclotella spp.	1										1
Cylindrotheca closterium	1										1
Cyttarocylis spp.				1							1
Guinardia delicatula	1										1
Guinardia striata	1										1
Gymnodinium spp.		1									1
Gyrodinium spirale							1				1
Hermesinum adriaticum		1									1
Karenia papilionacea				1							1
Karlodinium micrum		1									1
Katodinium rotundatum								1			1
Leptocylindrus spp.							1				1
Navicula spp.										1	1
Odontella mobiliensis	1										1
Odontella sinensis	1										1
Pedinomonadaceae spp.	1										1
Protoperidinium quinquecorne	1										1
Protopolykrokos distortus								1			1
Thalassiosira tealata							1				1
Thalassomonas spp.	1										1
Trichodesmium thiebautii							1				1
Total : 85 species	**382**	**144**	**1**	**121**	**7**	**14**	**135**	**27**	**23**	**12**	**866**

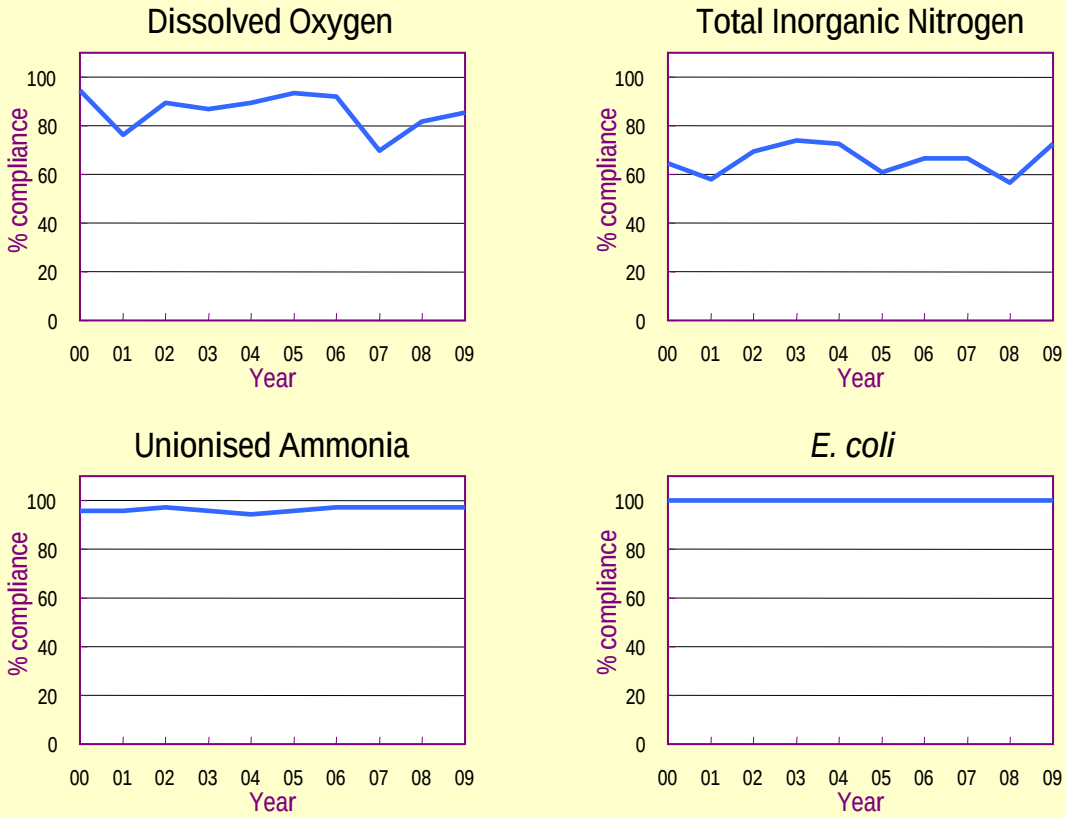
Note: a red tide incident may involve more than one causative species.

Source: Agriculture, Fisheries and Conservation Department and Environmental Protection Department

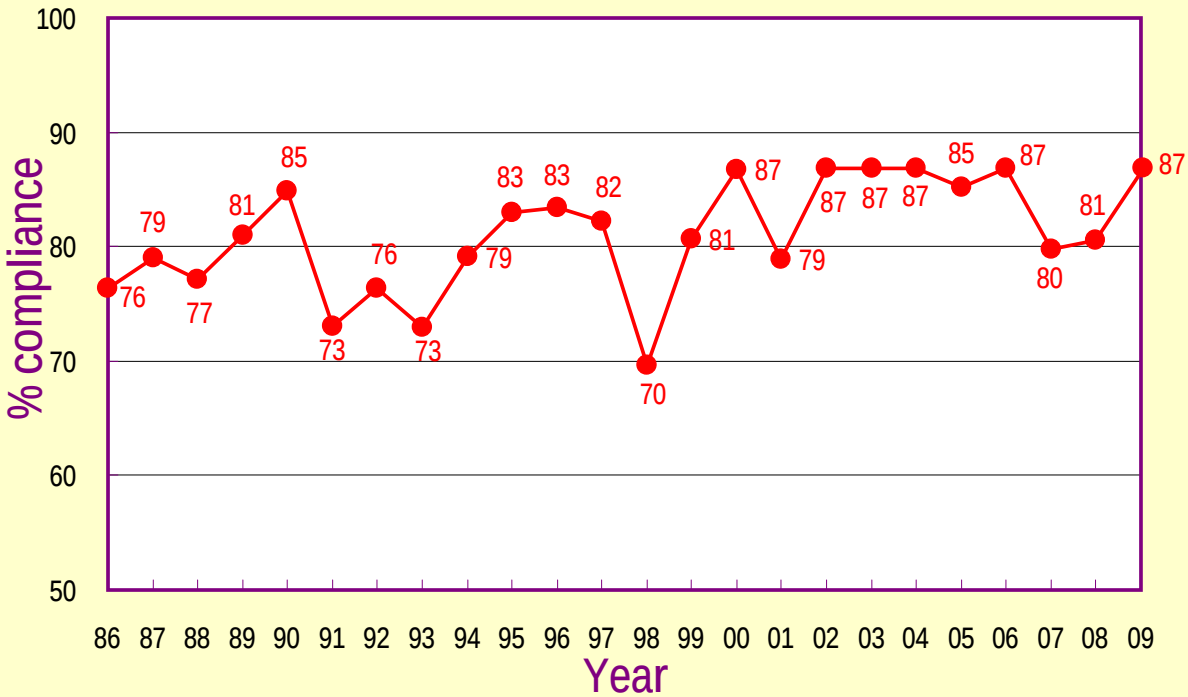
Level of compliance with key marine Water Quality Objectives for 10 Water Control Zones in Hong Kong, 2000 – 2009

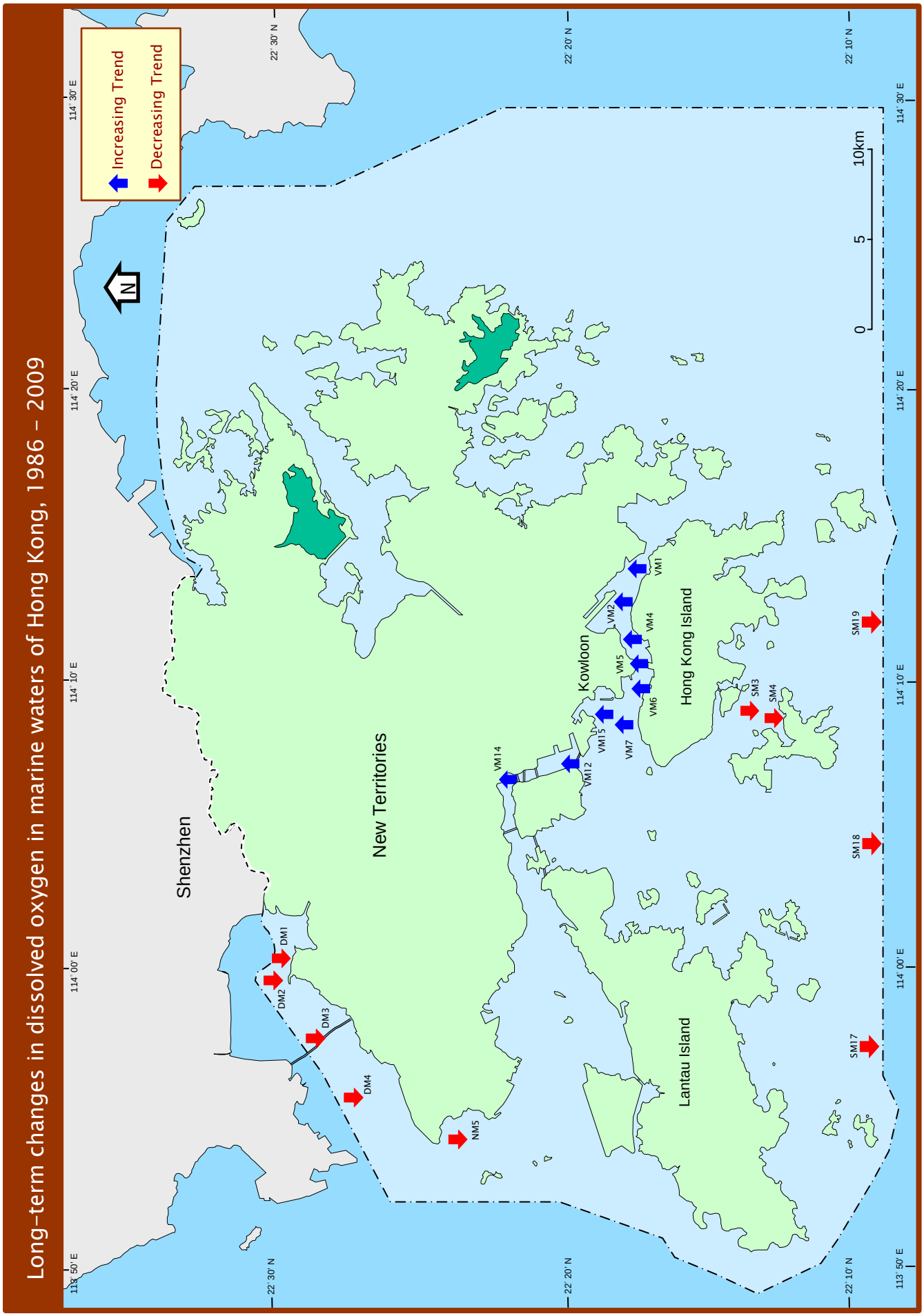


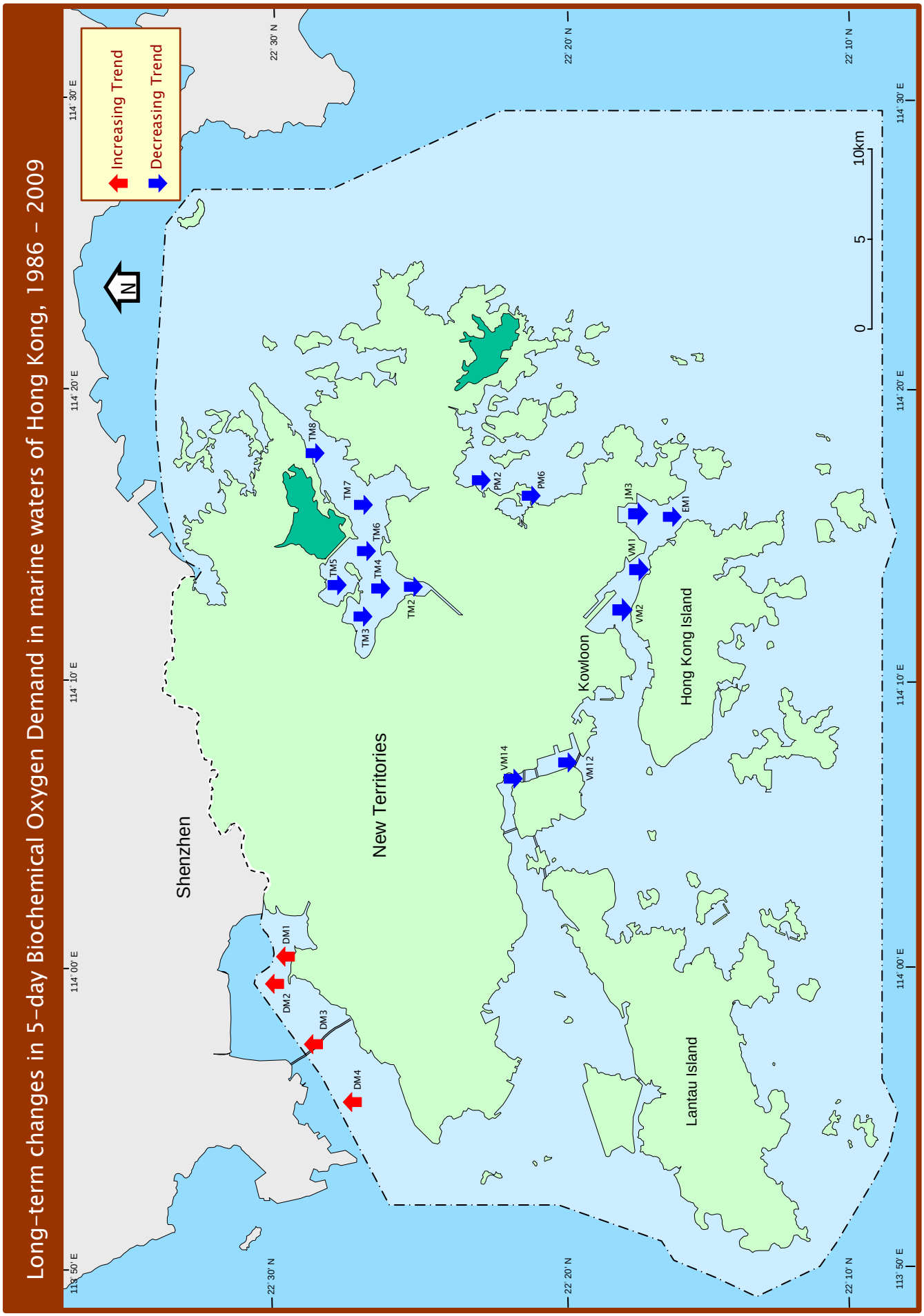
Level of compliance with key marine Water Quality Objectives in Hong Kong, 2000 – 2009



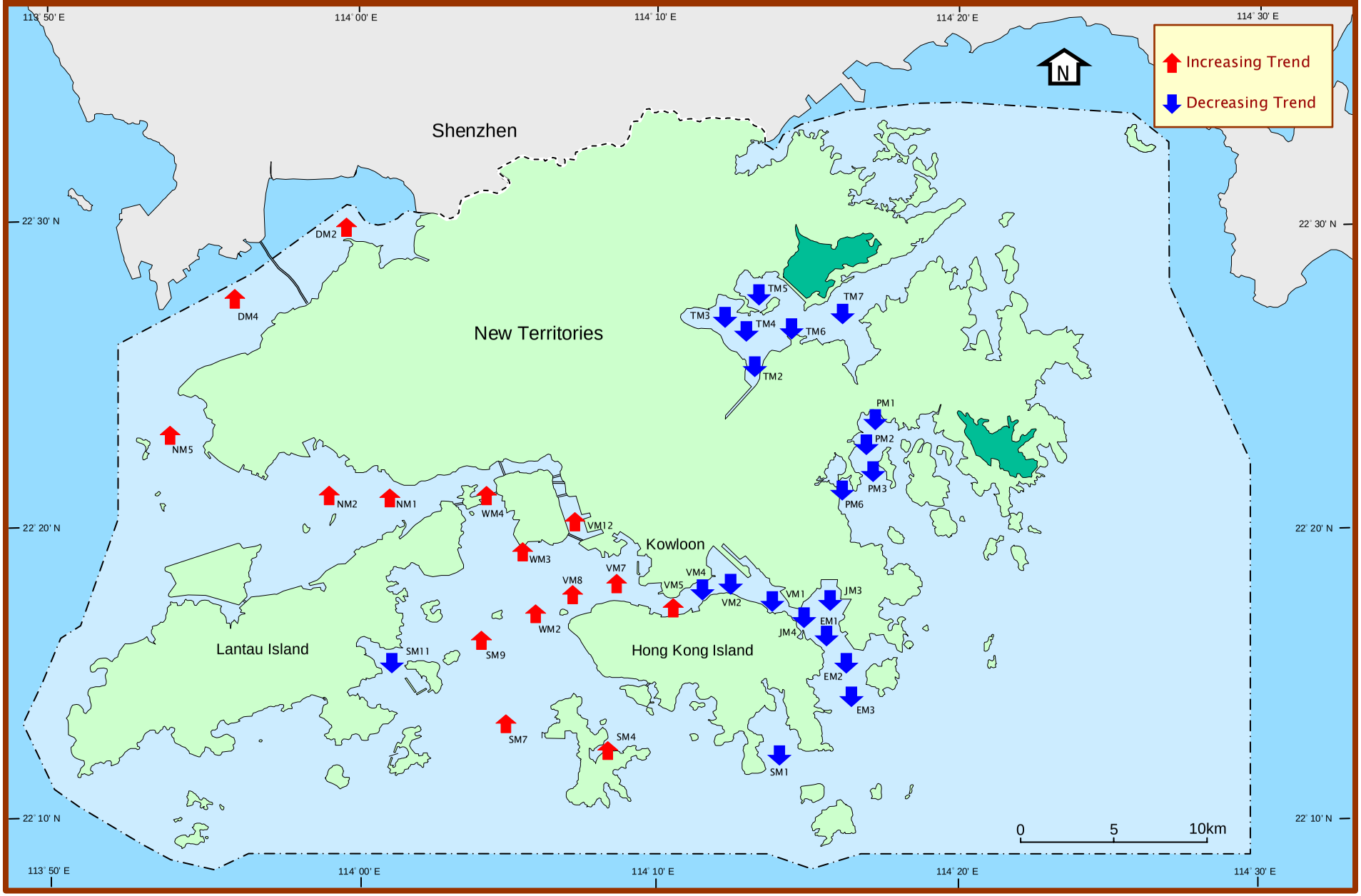
Overall level of compliance with key marine Water Quality Objectives in Hong Kong, 1986 – 2009

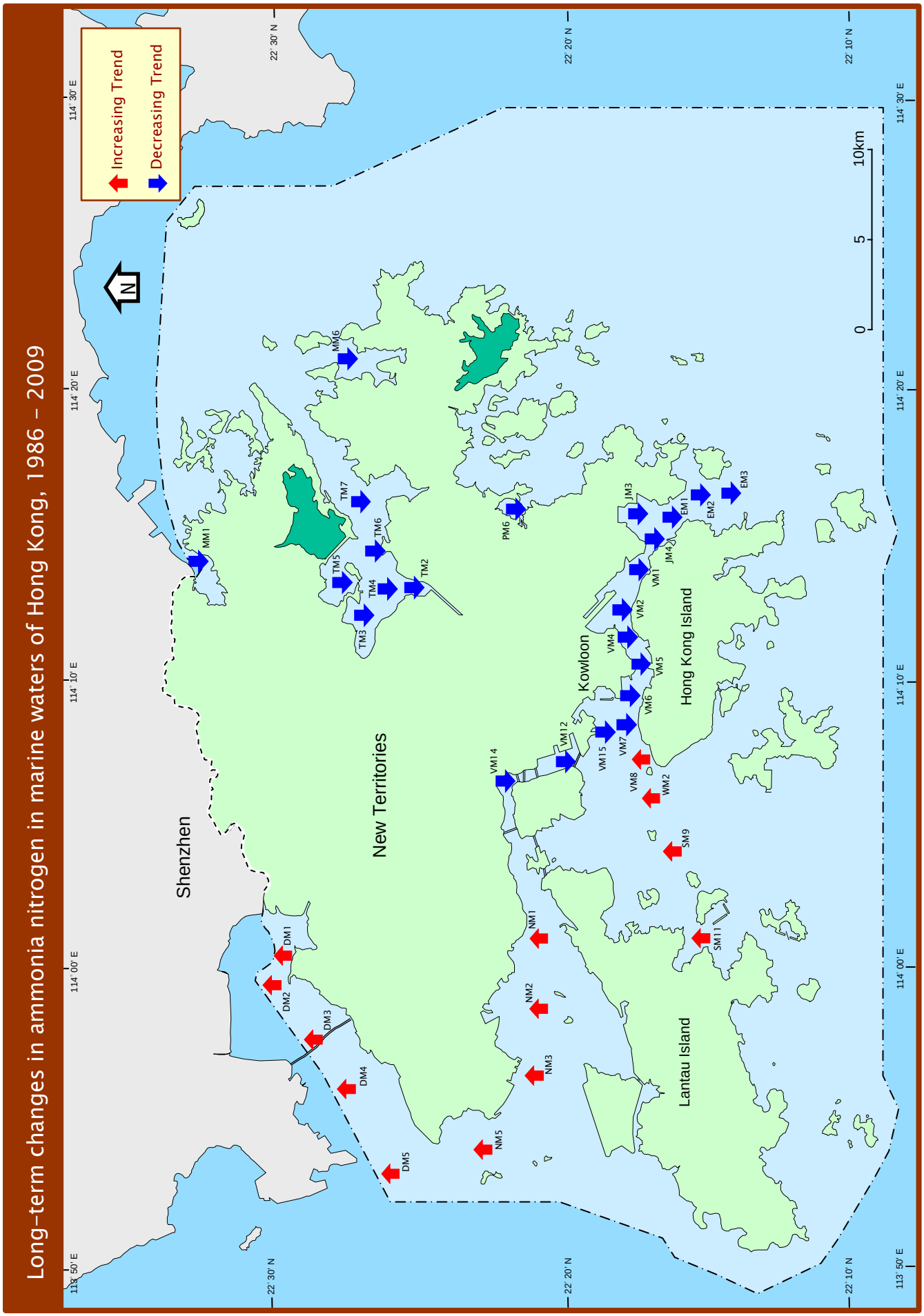


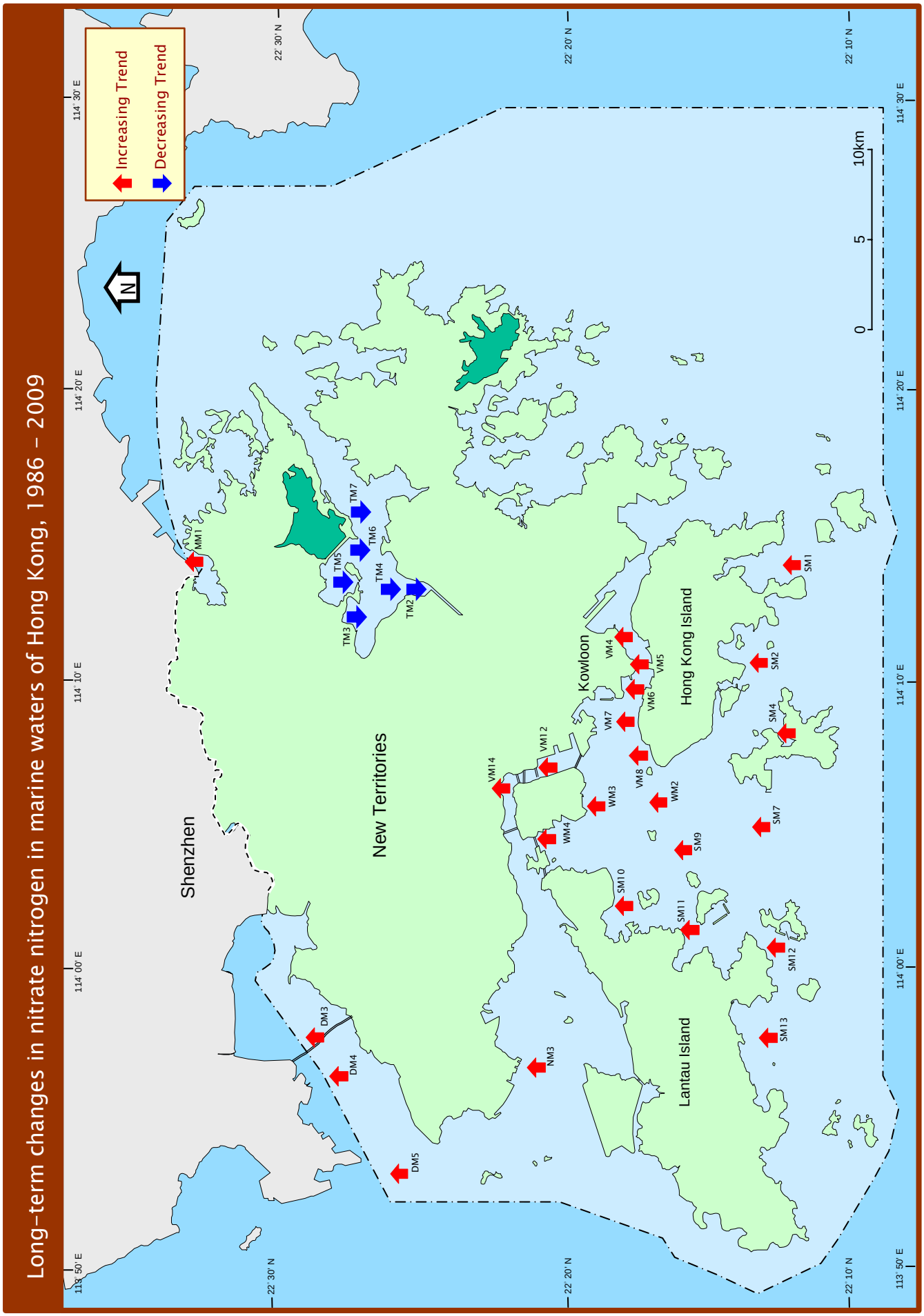

Long-term changes in dissolved oxygen in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
DM1
DM2
DM3
DM4
NM5
VM1
VM2
VM4
VM5
VM6
VM7
VM12
VM14
VM15
SM3
SM4
SM17
SM18
SM19
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E

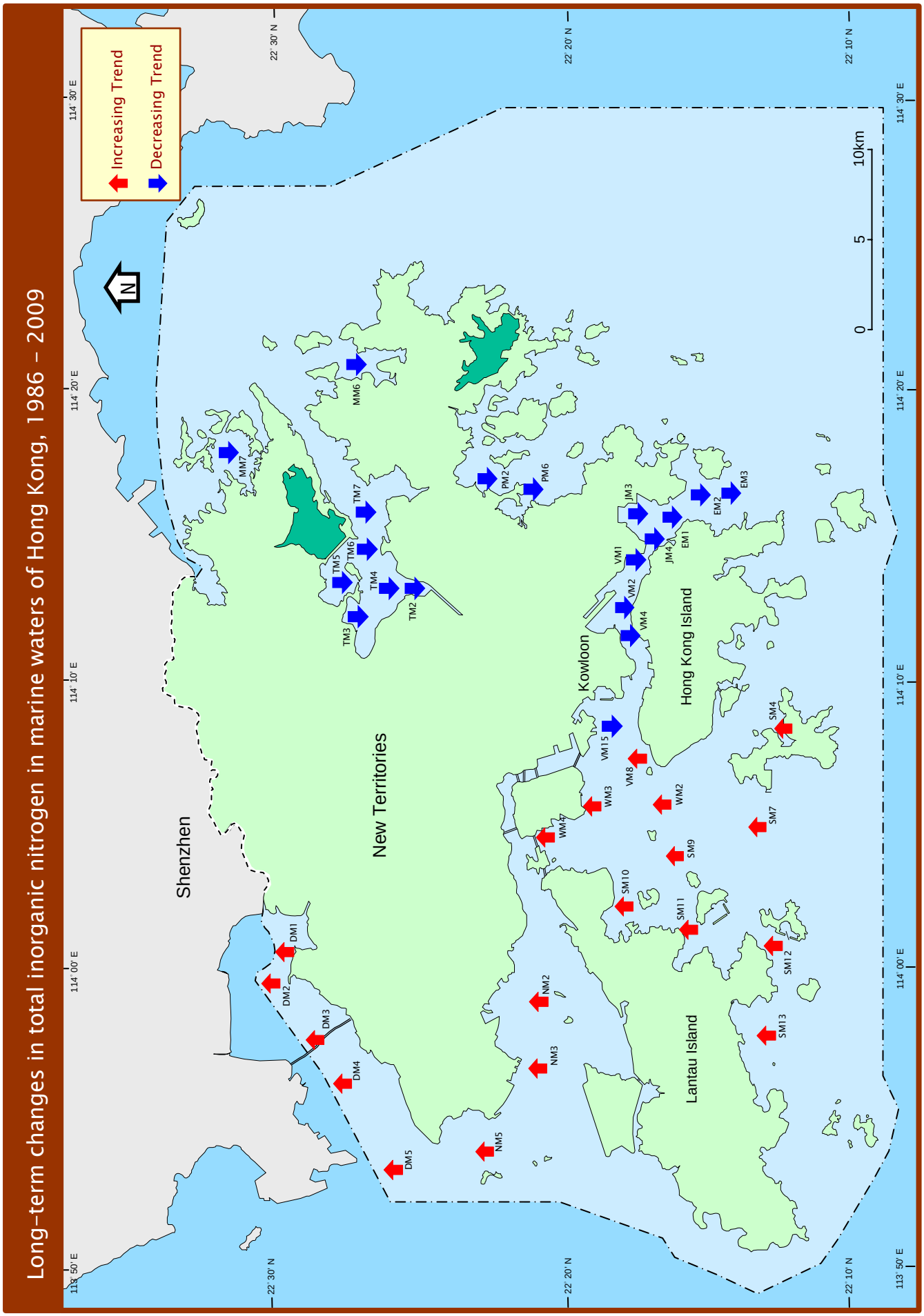

Long-term changes in 5-day Biochemical Oxygen Demand in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
TM8
TM7
TM6
TM5
TM4
TM3
TM2
PM2
PM6
JM3
EM1
VM1
VM2
VM14
VM12
DM1
DM2
DM3
DM4
114° 30' E
114° 20' E
114° 10' E
114° 00' E
113° 50' E
22° 30' N
22° 20' N
22° 10' N

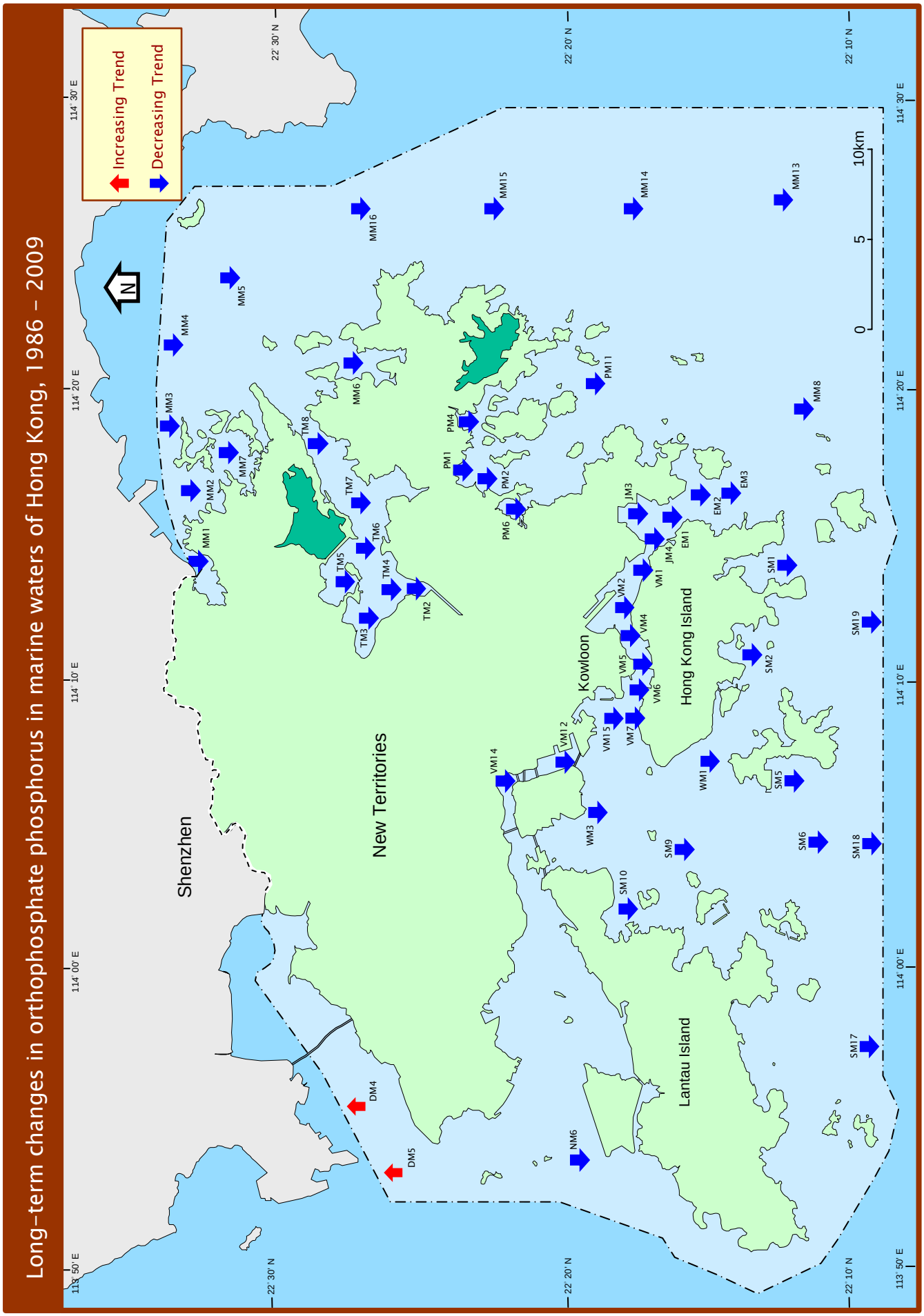
Long-term changes in *E. coli* in marine waters of Hong Kong, 1986 – 2009

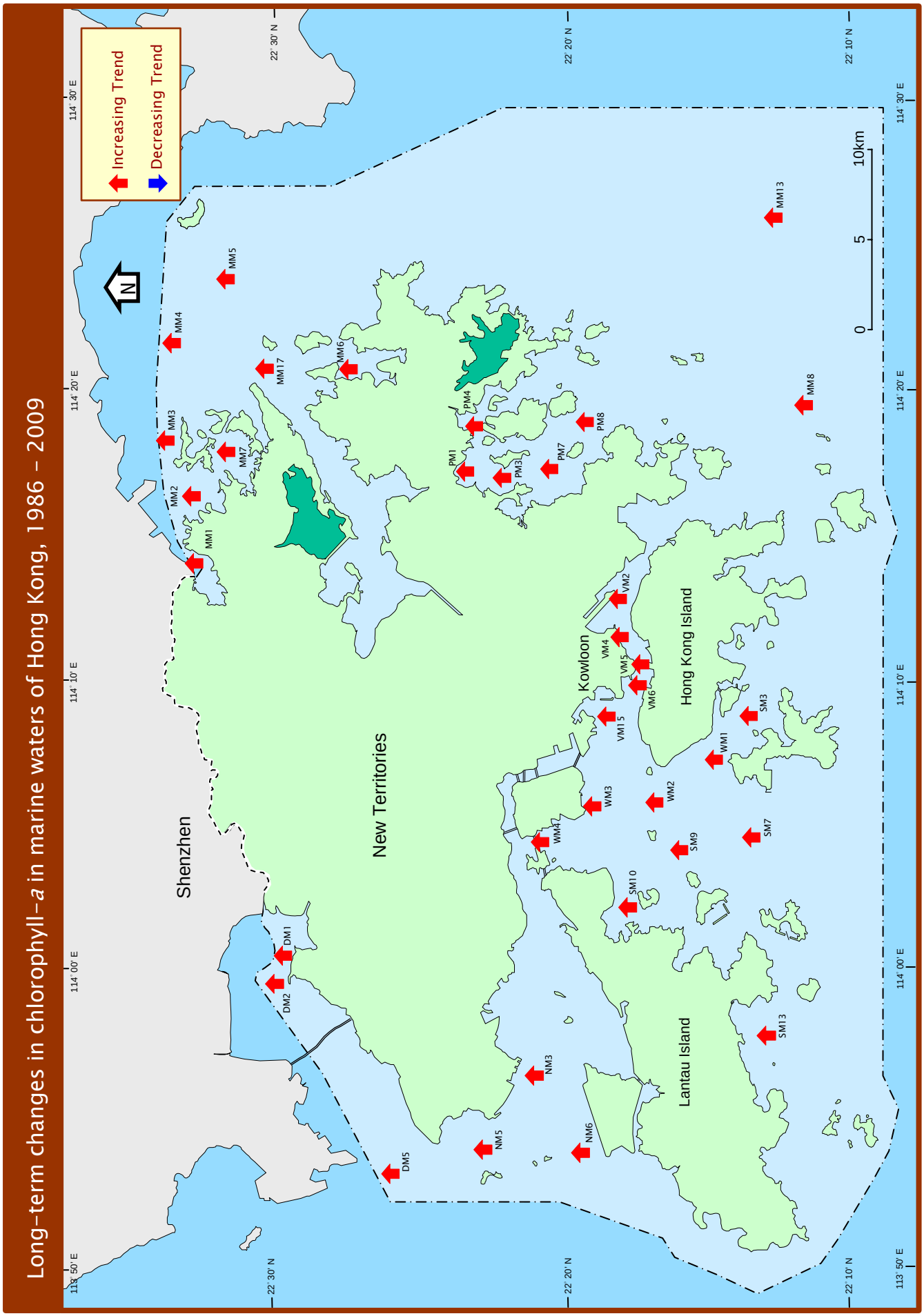



Long-term changes in ammonia nitrogen in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM1
MM6
TM2
TM3
TM4
TM5
TM6
TM7
PM6
JM3
JM4
EM1
EM2
EM3
VM1
VM2
VM4
VM5
VM6
VM7
VM8
VM12
VM14
VM15
WM2
SM9
SM11
NM1
NM2
NM3
NM5
DM1
DM2
DM3
DM4
DM5
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E


Long-term changes in nitrate nitrogen in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM1
TM2
TM3
TM4
TM5
TM6
TM7
DM3
DM4
DM5
NM3
VM2
VM3
VM4
VM5
VM6
VM7
VM8
VM12
VM14
WM2
WM3
WM4
SM1
SM2
SM4
SM7
SM9
SM10
SM11
SM12
SM13
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E


Long-term changes in total inorganic nitrogen in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM6
MM7
TM7
TM6
TM5
TM4
TM3
TM2
PM2
PM6
JM3
JM4
EM1
EM2
EM3
VM1
VM2
VM4
VM15
VM8
WM3
WM2
WM4
SM4
SM7
SM9
SM10
SM11
SM12
SM13
DM1
DM2
DM3
DM4
DM5
NM2
NM3
NM5
22° 30' N
22° 20' N
22° 10' N
113° 50' E
114° 00' E
114° 10' E
114° 20' E
114° 30' E


Long-term changes in orthophosphate phosphorus in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
114° 30' E
114° 20' E
114° 10' E
114° 00' E
113° 50' E
22° 30' N
22° 20' N
22° 10' N
MM1
MM2
MM3
MM4
MM5
MM6
MM7
MM8
MM13
MM14
MM15
MM16
TM2
TM3
TM4
TM5
TM6
TM7
TM8
PM1
PM2
PM4
PM6
PM11
JM3
JM4
EM1
EM2
EM3
VM1
VM2
VM4
VM5
VM6
VM7
VM12
VM14
VM15
WM1
WM3
SM1
SM2
SM5
SM6
SM9
SM10
SM17
SM18
SM19
DM4
DM5
NM6


Long-term changes in chlorophyll-a in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
Shenzhen
New Territories
Kowloon
Hong Kong Island
Lantau Island
MM1
MM2
MM3
MM4
MM5
MM6
MM7
MM8
MM13
MM17
PM1
PM3
PM4
PM7
PM8
VM2
VM4
VM5
VM6
VM15
WM1
WM2
WM3
WM4
SM3
SM7
SM9
SM10
SM13
DM1
DM2
DM5
NM3
NM5
NM6
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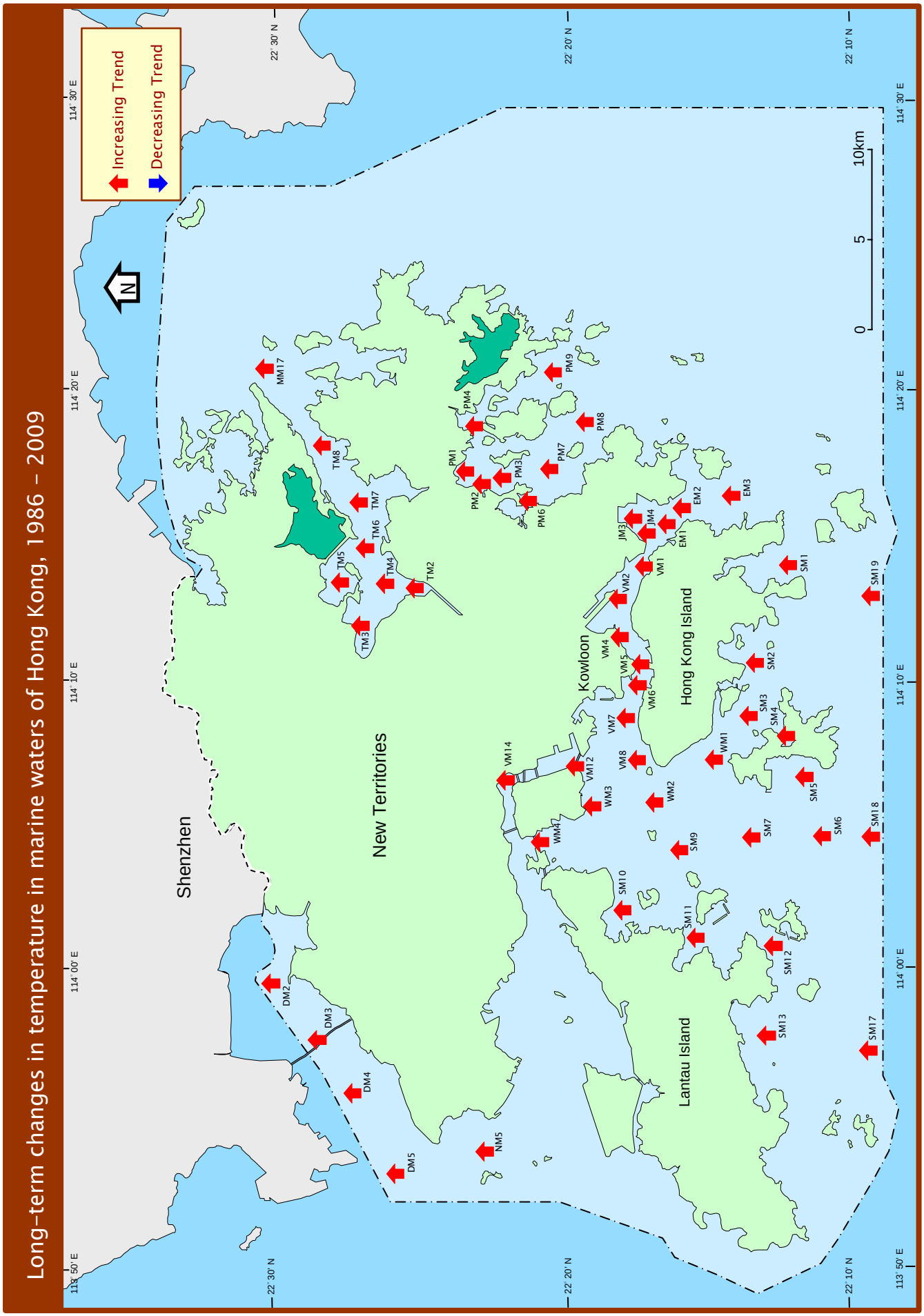
114° 20' E
114° 10' E
114° 00' E
113° 50' E
22° 30' N
22° 20' N
22° 10' N


Long-term changes in temperature in marine waters of Hong Kong, 1986 – 2009
Increasing Trend
Decreasing Trend
N
0
5
10km
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
DM3
DM4
DM5
NM5
MM17
TM8
TM7
TM6
TM5
TM4
TM3
TM2
PM9
PM8
PM7
PM6
PM4
PM3
PM2
PM1
JM4
JM3
EM3
EM2
EM1
VM14
VM12
VM8
VM7
VM6
VM5
VM4
VM2
VM1
WM4
WM3
WM2
WM1
SM19
SM18
SM17
SM13
SM12
SM11
SM10
SM9
SM7
SM6
SM5
SM4
SM3
SM2
SM1