

**For discussion  
on 26 February 2024**

**Legislative Council  
Panel on Environmental Affairs**

**Water quality improvement in Victoria Harbour**

**PURPOSE**

This paper reports to Members on the work progress and future plans of the Government for improving the water quality and coastal odour conditions of Victoria Harbour.

**BACKGROUND**

2. The Government has all along been attaching great importance to improving the water quality of Victoria Harbour, and is adopting a multi-pronged approach in implementing various pragmatic measures, having regard to the varying environment and conditions of individual districts, to endeavour to resolve the odour problems of coastal areas. These measures include tackling the problems at source by conducting proactive and comprehensive pollution source investigations, tracing and rectifying major pollution sources in the stormwater drainage system and intercepting pollutants at source from entering the harbour; conducting various works, including pollutant interception and sewerage and sewer rehabilitation, to reduce near-shore pollution discharge; and carrying out desilting and dredging works at stormwater drainage culverts and outfalls to ameliorate odour problems caused by accumulation of sediments.

3. Since the full commissioning of the Harbour Area Treatment Scheme (HATS), the water quality of Victoria Harbour has substantially improved (see **Figure 1**). As compared to the situation before the implementation of the HATS in 2001, the dissolved oxygen level in Victoria Harbour had an overall increase by some 22% in 2023; the pollutants in seawater also reduced substantially, among which the *Escherichia coli* (*E. coli*) level had decreased by about 90% and the unionised ammonia nitrogen concentration had decreased by some 60%. The overall compliance rate of Water Quality Objectives for Victoria Harbour has reached over 90% in recent years. The annual Cross Harbour Race, which was suspended for years due to poor water quality, was resumed in 2011 and has returned to its traditional route in the central area of Victoria Harbour since 2017. With further measures taken by the Government to clear several major pollution

sources along the coastal areas of Tsim Sha Tsui and Hung Hom, many swimmers who participated in the 2023 Cross Harbour Race expressed their great enjoyment after the race with credits going to the significantly improved harbour water quality. Besides, the State Key Laboratory of Marine Pollution of the City University of Hong Kong conducted surveys of the benthic ecological systems in Victoria Harbour and its nearby waters from 2021 to 2023. The surveys discovered 35 species of corals at under these waters, as well as clusters of scallops and some iconic species, such as double-ended pipefish and festive sea slugs, in the waters near the east of Victoria Harbour. Study findings revealed that, since the commissioning of the HATS, the water quality of Victoria Harbour has improved significantly and progressively restored to pristine condition, which is conducive to the breeding and habitation of more marine organisms.

4. To further ameliorate the odour problems on both sides of Victoria Harbour, the Chief Executive has announced in the Policy Address 2022 that the Government will regularly monitor the water quality at stormwater drain outlets and rectify misconnections of sewer pipes. The target is to reduce the pollution load by half before end-2024 at highly polluted outfalls along both sides of Victoria Harbour, including Tsuen Wan, Sham Shui Po and Kowloon City.

## **MEASURES AND PROGRESS**

### Detection and Rectification of Sewer Misconnections

5. To address the near-shore odour problems along the coastal areas of Victoria Harbour, including Tsuen Wan, Kowloon City and Sham Shui Po, the Government is endeavouring to detect and rectify sewer misconnections. The Environmental Protection Department (EPD) would continue to trace major pollution sources in stormwater drainage systems and work in collaboration with other relevant government departments, such as the Buildings Department (BD) and the Drainage Services Department (DSD), etc. to rectify the misconnection cases so as to intercept pollutants at source from entering the harbour, thereby improving the near-shore environment.

6. To tackle the problems at source, the Government has conducted large-scale proactive investigations in the priority areas. The dye-tracing method is adopted in the investigations on the sources of near-shore water pollution, so as to trace from the outfalls or the downstream all the way to the upstream to ascertain the pollution sources (see **Figure 2**). We also collect water samples from the stormwater drains for analysis on need basis, including tests on organic pollutant and *E. coli* to assess the pollution load. If misconnections or leakages in the public sewers and stormwater drains are identified in the investigations, the

EPD would follow-up to rectify in collaboration with DSD. If the pollution source involves sewer misconnections in private buildings, the EPD and the BD would take appropriate enforcement actions in accordance with the Water Pollution Control Ordinance (Cap. 358) and the Buildings Ordinance (Cap. 123) respectively to curb the illegal discharge of wastewater and rectify the sewer misconnections.

7. The investigation process for sewer misconnections is complicated and time consuming, which is generally required to be conducted from the downstream towards the upstream progressively to trace pollution sources in the stormwater drainage system. It is even more challenging if road sections with busy traffic are involved. The EPD has deployed innovative approaches in addition to the conventional dye-tracing method. These include installing surveillance camera system inside stormwater manholes to monitor the flow in the stormwater manholes or drains for more effective identification of potential pollution sources. Furthermore, the EPD has recently been conducting a trial installation of odour monitoring equipment to support the surveillance camera system (see **Figure 3**). The EPD would immediately carry out detailed investigations to identify the pollution source if wastewater is found to be entering the stormwater drain. Other innovative methods include deploying sonar inspection boat to examine the conditions inside the drains and using Ground Penetrating Radar to scan drains at 1.5 metre depth along backlanes to help generate instant images showing the connections between underground stormwater drains and nearby sewers (see **Figure 4** for the above methods of tracing pollution sources).

8. We have completed the baseline survey for sewer misconnections in Tsuen Wan, Kowloon City and Sham Shui Po in 2023 and successfully identified the locations of major sewer misconnections in the districts. Those involving cases of misconnections from sewers in individual districts and buildings to stormwater drains have been followed-up and rectified in collaboration with the BD, the DSD and other government departments. With the effort of the BD and the DSD, as at end December 2023, 69 cases of misconnections had been rectified and the overall pollution load at the relevant stormwater outfalls had been reduced by about 49%. Amongst them, the pollution load at individual priority districts and outfalls has reduced more significantly. For example, the pollution load at the outfalls of the To Kwa Wan Typhoon Shelter (TKWTS) harbourfront had reduced by about 95%, while that of the Tsuen Wan Bay harbourfront had reduced by over 70%. According to the current timetable of investigation and works, the Government can meet the Key Performance Indicator of reducing 50% of the pollution load by end-2024 at the highly polluted stormwater outfalls in relevant districts on both sides of Victoria Harbour.

9. In addition, the EPD has arranged odour and water quality monitoring at key polluted locations. For example, monitoring instruments at the Tsuen Wan Sports Centre has been installed to monitor odour-related air pollutants in Tsuen Wan since 2022. The monitoring data at the Tsuen Wan harbourfront indicates that the concentration of odour-causing hydrogen sulphide has declined in 2023, and that the concentration of hydrogen sulphide in the fourth quarter of 2023 decreased by approximately 40% in comparison to the data in the same period in 2022. The data indicates that the odour problems at the Tsuen Wan harbourfront is improving progressively. Furthermore, the water quality monitoring data collected in the vicinity of the three stormwater outfalls in Tsuen Wan West also reveals that there has been a significant improvement in near-shore water quality, with some 25% increase in dissolved oxygen level and about 40% decrease in organic pollutant level in seawater. We have commenced odour monitoring in Kowloon City and Sham Shui Po districts in December 2023 and January 2024 respectively for one year to assess the improvement in odour conditions.

10. The DSD has been rendering full assistance to EPD in identifying and ascertaining relevant cases of sewer misconnections, as well as surveying and rectifying the misconnections. However, various constraints would be encountered during works implementation, including congested underground utilities and misconnections at narrow pathways or busy road junctions, where the space for carrying out the works is greatly limited. Besides, sewerage works largely involve working in confined space. Workers must be equipped with adequate safety and protective gear when conducting the rectification works, thereby significantly increasing the works duration and difficulty (see **Figures 5 to 7**). That being said, the DSD is committed to ensuring the successful implementation of the works through deploying appropriate measures. For example, the DSD has implemented suitable temporary traffic arrangements and scheduled the works to non-peak hours or night time, thereby minimising the traffic impact caused by the works. The DSD would also coordinate with relevant departments with on-going or planned works in the area and would maintain close liaison with them to flexibly schedule the implementation time for the relevant parts of the works, so as to further minimise the inconvenience brought to the public.

#### Dredging and Bioremediation Works

11. Apart from rectifying sewer misconnections, the Government is further improving the near-shore water quality and the environment at the priority areas through dredging and adopting bioremediation technologies. These include the dredging works by the Civil Engineering and Development Department (CEDD) at the Tsuen Wan harbourfront and the TKWTS to remove polluted and exposed

sediments. The works were completed in March and December 2023 respectively. In addition, the EPD and the CEDD will carry out bioremediation works at TKWTS with reference to the successful experience of applying bioremediation to treat the sediments and improve the environment at Shing Mun River and Kai Tak Approach Channel / Kwun Tong Typhoon Shelter. The works will soon commence and are anticipated for completion by the end of 2024, by which time the water quality and the environment in the vicinity of Kai Tak Sports Park will further improve.

### Malodour Control Hydrogel and Desilting Works

12. The Government has since March 2021 started applying Malodour Control Hydrogel on a regular basis extensively at stormwater outfalls with odour problems and their vicinity at the coastal areas of Victoria Harbour to mitigate coastal odour problems. Malodour Control Hydrogel is a new technology jointly developed by the DSD and the Hong Kong University of Science and Technology, and is proven to be effective in reducing odour in drains through on-site tests.

13. Moreover, the Government has been continuously implementing other sewerage improvement works, including regular inspection of public sewerage and stormwater drainage systems and maintenance and desilting works according to needs. These not only can prevent flooding and keep the drains clear, but also help mitigate odour problem caused by silting.

### Other Sewerage and Pollution Control Works

14. To prevent leakage of sewers from affecting the water quality of Victoria Harbour, the Government has been carrying out replacement and rehabilitation works for ageing underground sewers. As of December 2023, there are about 1 940 kilometres (km) of underground sewers in Hong Kong. Currently, about 40 km of rising mains are under replacement and rehabilitation, of which 5 km are within the Victoria Harbour Water Control Zone (VHWCZ). In addition, about 90 km of rising mains are at the investigation and planning stage, of which 4 km are within the VHWCZ. As for gravity sewers, currently about 140 km are undergoing replacement and rehabilitation, of which 90 km are within the VHWCZ. In addition, about 370 km of gravity mains are at the investigation and planning stage, of which 210 km are within the VHWCZ. The Government will conduct regular review on all high-risk gravity sewers for timely planning of subsequent rehabilitation works.

15. The pollution interception works at Tsuen Wan and Kwai Chung rural areas, Kowloon East and Kowloon West have been completed by phases since 2022, with full completion anticipated within 2024. To cater for population growth, development needs and proper handling of sewage, the upgrading of the Kwun Tong Preliminary Treatment Works was completed in 2022; the enhancement works for the Kwun Tong Sewage Pumping Station was completed in the first quarter of 2023; and the construction of the sewerage system for Ma Yau Tong Village is anticipated for completion in the fourth quarter of 2024.

16. The Government briefed the Members of the Legislative Council Panel on Environmental Affairs last year on the implementation of dry weather flow interceptor (DWFI) projects at some coastal areas (including Hung Hom, Causeway Bay and Tsuen Wan) as one of the measures for enhancing the near-shore water quality. During the meeting, although Members generally expressed support, they also expressed concerns on the construction cost, recurrent expenditure and cost-effectiveness of the proposed projects, as well as the potential nuisance and inconvenience to the local residents caused by the construction and operation of the DWFIs. In this regard, the EPD and the DSD are critically assessing the recommendations received with a view to comprehensively reviewing the effectiveness that can be achieved timely by the various measures above. As mentioned above, the initial data have demonstrated remarkable effectiveness in improving the near-shore water quality of Victoria Harbour through intercepting discharge of pollutants at source from entering the harbour. In addition to successful reduction in pollution load in a short period of time, intercepting pollutants discharge at source is also more cost-effective than DWFIs. We will continue to implement the above-mentioned measures to trace pollution sources and enhance pollution interception at source, as well as holistically review the need of DWFI installations.

## **FUTURE PLANS**

17. The EPD will continue to closely monitor the water quality of Victoria Harbour and trace the pollution source, including testing of water samples from outfalls and public stormwater manholes in the district to assess the pollution load and installing surveillance camera system inside stormwater manholes to monitor sewage flow, thereby enabling more effective planning for pollution source investigations. As for the on-going cases of sewer misconnections, different government departments will continue to work closely and proceed with the rectification works progressively, so as to achieve the target as stipulated in the 2022 Policy Address.

18. In conclusion, the Government will continue to monitor and evaluate the effectiveness of the various measures above, and adopting a multi-pronged approach in implementing pragmatic and cost effective measures having regard to the varying environment and conditions of the individual districts, thereby ensuring the sustained improvement of the coastal water quality and odour problems of Victoria Harbour.

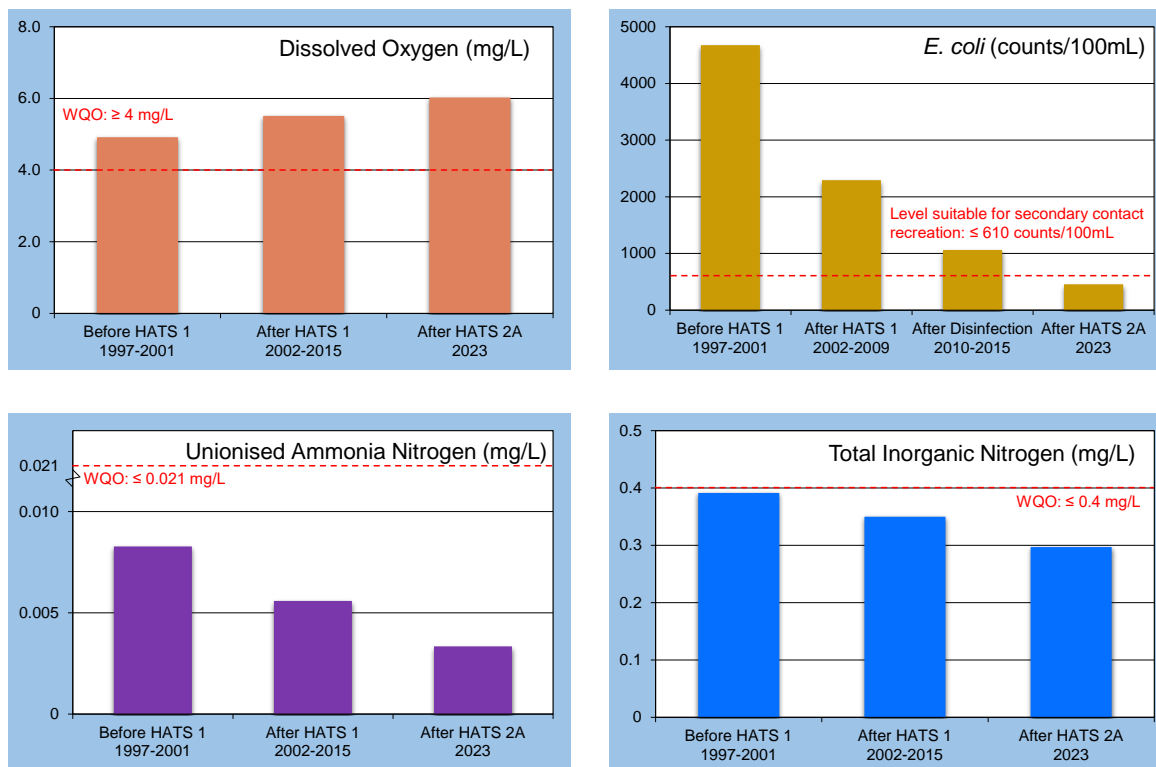
### **ADVICE SOUGHT**

19. Members are invited to note and give views on the Government's work progress made in enhancing the quality of coastal waters of Victoria Harbour.

**Environment and Ecology Bureau  
Environmental Protection Department  
Drainage Services Department  
February 2024**

Figure 1

## Water Quality Improvement in Victoria Harbour after Implementation of the Harbour Area Treatment Scheme

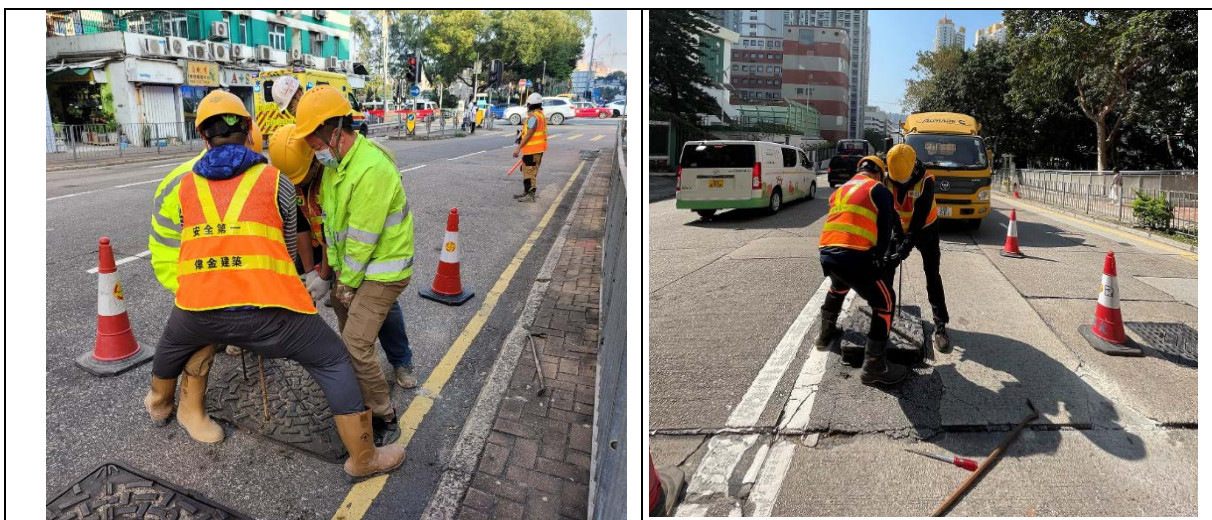


\* (Note: (i) The above diagrams show the overall average water quality data collected from 10 monitoring stations in the Victoria Harbour Water Control Zone. (ii) WQO: Water Quality Objective.)

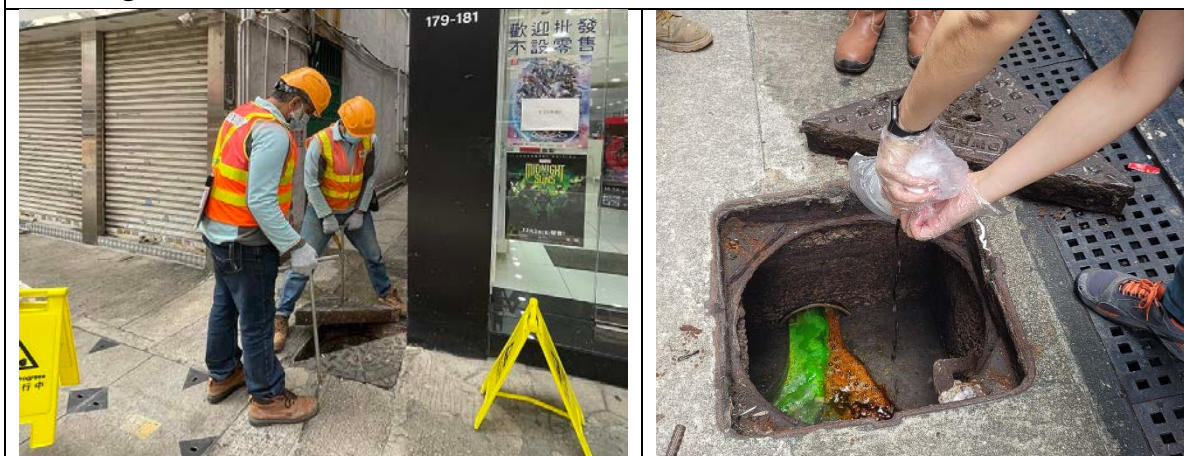


Figure 2

Investigation of Near-shore Water Pollution Sources at Priority Areas by the Government



Investigation on sewer misconnections at roads.



Investigation on sewer misconnections at backlanes by adding dye to trace pollution sources.



Collection of water samples at stormwater drains for pollution load analysis.



**Figure 3**

**Trial Installation of Odour Monitoring Equipment to Support Surveillance Camera System by the Government**



Trial installation of odour monitoring equipment at stormwater manholes to support the surveillance cameras system.

Figure 4

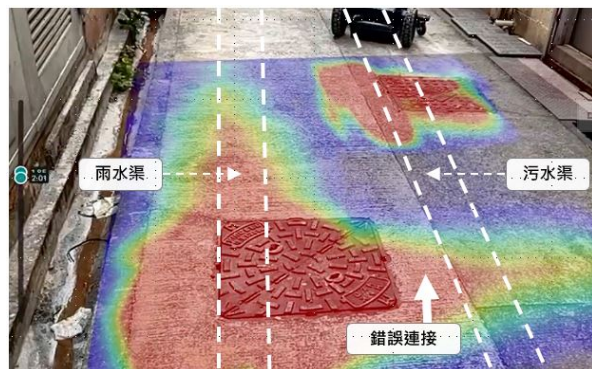
Government's Innovative Approaches for Tracing Pollution Sources



Installing surveillance cameras inside stormwater manholes to monitor the flow in the manholes or drains to expedite the identification of potential pollution sources.



Deploying sonar inspection boat to examine the situations inside drains.



Using Ground Penetrating Radar to scan drains at 1.5 metre depth along backlanes. Instant images showing the underground situations are generated when radar waves are emitted into the ground and reflected from other materials back to the equipment. The findings reveal misconnections between underground stormwater drains and nearby sewers.



Figure 5

Challenges Faced by the Government during Rectification of Sewer Misconnections (1)



Congested underground utilities and narrow footpath

Figure 6

Challenges Faced by the Government during Rectification of Sewer Misconnections (2)



Traffic diversion or road closure at busy road junction



**Figure 7**

**Challenges Faced by the Government during Rectification of Sewer Misconnections (3)**

