

4. WATER QUALITY IMPACT

4.1 Legislation, Policies, Plans, Standards and Criteria

4.1.1.1 The relevant legislation and associated guidance applicable to the present study for assessment of water quality impacts include:

- *Water Pollution Control Ordinance (WPCO) Chapter 358* (as amended by the *Water Pollution Control (Amendment) Ordinance 1990 and 1993*);
- *Water Pollution Control (General) Regulations* (as amended by the *Water Pollution Control (General) (Amendment) Regulations 1990 and 1994*);
- *Water Pollution Control (Appeal Board) Regulations*; and
- *Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)*, *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), Annexes 6 and 14*.

4.1.1.2 Under the WPCO, Water Quality Objectives (WQOs) were established to protect the beneficial uses of water quality in Water Control Zones (WCZs). Specific WQOs are applied to each WCZ. There are currently ten WCZs and four Supplementary WCZs in Hong Kong. The SEKD falls within the Victoria Harbour (Phase 2) WCZ. The appointed day for this WCZ was on 1 September 1995. **Table 4.1** summarises the WQOs for the Victoria Harbour WCZ.

4.1.1.3 The EIAO came into effect on 1 April 1998. The purpose of establishing the EIAO is to safeguard the environment by reducing and minimising adverse environmental impacts from Designated Projects. Annex 6 of the EIAO-TM issued under section 16 of EIAO sets forth general and project-specific criteria for evaluating water pollution.

4.1.1.4 Annex 14 of the EIAO-TM provides guidelines for assessing water pollution. It describes the components of an aquatic system that are subject to water pollution impacts: water quality, hydrology, bottom sediments and ecology; as well as beneficial uses sensitive to water pollution. Assessment should rely on the concept of assimilative capacity of the receiving water body and water quality objectives. Assessment methodology should include the identification of impact causing factors, determination of impact boundary, any necessary baseline study, impact prediction and assessment, recommendation of mitigation measures, and monitoring. Guidelines for assessing impacts from project-specific activities are also provided.

4.1.1.5 Discharges of effluents are subject to control under the WPCO. The Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM) sets limits for effluent discharges. Specific limits apply for different areas and are different between surface waters and sewers. The limits vary with the rate of effluent flow. Standards for effluent discharged into the inshore waters of Victoria Harbour WCZ are presented in **Table 4.2**.

Table 4.1 Water Quality Objectives for the Victoria Harbour WCZ

Parameters	Objectives	Sub-zone
Offensive odour and tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Ammonia	Annual mean not to exceed 0.021 mg/L as unionised form	Whole zone
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone
Dissolved oxygen within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters
Depth-averaged dissolved oxygen	Not less than 4.0 mg/L for 90% of samples	Marine waters
pH	To be in the range of 6.5 to 8.5, change due to human activity not to exceed 0.2	Marine waters
Suspended solids	Not to raise the ambient level by 30% caused by human	Marine waters
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth average inorganic nitrogen not to exceed 0.4 mg/L	Marine waters
Colour	Not to exceed 50 Hazen units, due to human activity	Inland waters
<i>E. coli</i>	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Inland waters
pH	Not to exceed the range of 6.0 to 9.0 due to human activity	Inland waters
Suspended solids	Annual median not to exceed 25 mg/L due to human activity	Inland waters
Dissolved oxygen	Not less than 4.0 mg/L	Inland waters
Biochemical oxygen demand	Not to exceed 5 mg/L	Inland waters
Chemical oxygen demand	Not to exceed 30 mg/L	Inland waters

Source: Statement of Water Quality Objectives - Victoria Harbour (Phases 1, 2 and 3) WCZ

Table 4.2 Standards for Effluents Discharged into the Inshore Waters of Victoria Harbour Water Control Zone

Flow rate (m ³ /day)	£10	>10 and £200	>200 and £400	>400 and £600	>600 and £800	>800 and £1000	>1000 and £1500	>1500 and £2000	>2000 and £3000	>3000 and £4000
pH (pH units)	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9	6 – 9
Temperature (°C)	40	40	40	40	40	40	40	40	40	40
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1	1	1
Suspended solids	50	30	30	30	30	30	30	30	30	30
BOD	50	20	20	20	20	20	20	20	20	20
COD	100	80	80	80	80	80	80	80	80	80
Oil & Grease	30	20	20	20	20	20	20	20	20	20
Iron	15	10	10	7	5	4	2.7	2	1.3	1
Boron	5	4	3	2.7	2	1.6	1.1	0.8	0.5	0.4
Barium	5	4	3	2.7	2	1.6	1.1	0.8	0.5	0.4
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.7	0.5	0.4	0.25	0.2	0.15	0.1
Total toxic metals	2	2	1.6	1.4	1	0.8	0.5	0.4	0.3	0.2
Cyanide	0.2	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.03	0.02
Phenols	0.5	0.5	0.5	0.3	0.25	0.2	0.13	0.1	0.1	0.1

Flow rate (m ³ /day)	£10	>10 and £200	>200 and £400	>400 and £600	>600 and £800	>800 and £1000	>1000 and £1500	>1500 and £2000	>2000 and £3000	>3000 and £4000
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1
Total residual chlorine	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	100	100	100	100	80	80	50	50
Total phosphorus	10	10	10	10	10	10	8	8	5	5
Surfactants (total)	20	15	15	15	15	15	10	10	10	10
<i>E. coli</i> (count/100 mL)	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000

Notes: 1. All units in mg/L unless otherwise stated; and
2. All figures are upper limits unless otherwise indicated.

Source: *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*, Table 9a, Environmental Protection Department.

4.1.1.6 The Practice Note for Professional Persons (ProPECC Note PN1/94) on Construction Site Drainage provides guidelines for the handling and disposal of construction discharges. This note is applicable to this study for control of site runoff and wastewater generated during the construction phase of the SEKD. The types of discharges from construction sites outlined in the note include:

- Surface run-off;
- Groundwater;
- Boring and drilling water;
- Wastewater from concrete batching and precast concrete casting;
- Wheel washing water;
- Bentonite slurries;
- Water for testing and sterilization of water retaining structures and water pipes;
- Wastewater from building construction;
- Acid cleaning, etching and pickling wastewater; and
- Wastewater from site facilities.

4.1.1.7 The water quality condition in the vicinity of seawater intakes determines the flushing water quality. The criteria for assessing the water quality impacts on the Water Supplies Department's seawater intakes are based on the Water Quality Objectives of Sea Water for Flushing Supply (at intake point) issued by the Water Supplies Department (WSD). Table 4.3 provides the details.

Table 4.3 Water Quality Objectives of Sea Water for Flushing Supply (at intake point)

Parameters	Target
Colour (H.U.)	< 20
Turbidity (N.T.U.)	< 10
Threshold Odour No.	< 100
Ammonical Nitrogen (mg/L)	< 1
Suspended Solids (mg/L)	< 10
Dissolved Oxygen (mg/L)	> 2
Biochemical Oxygen Demand (mg/L)	< 10
Synthetic Detergents (mg/L)	< 5
<i>E. coli</i> (count per 100 mL)	< 20,000

Source: Water Supplies Department, Hong Kong

4.1.1.8 It is the government policy to use inert construction and demolition material in an efficient and an environmentally friendly way. Work Bureau Technical Circular (WBTC) No. 4/98 and WBTC No. 4/98A specify that project proponents should consider using public fill for the

Works if the imported fill requirement is 300,000m³ or more. The proposed reclamation areas in the SEKD would be reclaimed using public fill. These technical circulars are considered relevant to the present study.

4.2 Description of the Environment

4.2.1 General

4.2.1.1 The revised scheme of SEKD covers the disused Kai Tak Airport apron and runway, reclamation in Hoi Sham, reclamation in the Kai Tak Approach Channel (KTAC)/Kwun Tong Typhoon Shelter (KTTS), and other areas. According to the Study Brief, the “Assessment Area” for inland water quality impact assessment includes all areas within and 300m beyond the boundary. The Assessment Area for marine water quality has been expanded to include the Victoria Harbour WCZ and its adjacent WCZs including the Western Buffer and Eastern Buffer WCZs.

4.2.2 Water Quality in the WCZs

4.2.2.1 The proposed SEKD is located within the Victoria Harbour (Phase 2) WCZ. The areas covered by this WCZ include Sham Shui Po, Yau Ma Tei, Tsim Sha Tsui, Mong Kok, Kowloon City and Wong Tai Sin. There are in total 10 EPD’s water quality sampling stations (VM1, VM2, VM4 to VM8, VM14 and VM15) in the whole Victoria Harbour WCZ. **Drawing No. 22936/EN/190** shows the locations of the stations. The 1999 monitoring results indicated that the dissolved oxygen WQO compliance rate in the Victoria Harbour WCZ was low (30%) and the concentration was decreased by about 10% at all these stations. While the total inorganic nitrogen WQO compliance rate increased to 50% when compared to the compliance rate in 1998. No exceedance of the unionised ammonia level was recorded. However, increasing trends of *E. coli* and temperature were recorded in the waters. **Table 4.4** summarises the water quality parameters measured at selected EPD’s water sampling stations. The long-term monitoring results of dissolved oxygen, total inorganic nitrogen, *E. coli* and temperature at these stations are presented graphically in **Drawing No. 22936/EN/013** to **Drawing No. 22936/EN/016** respectively.

Table 4.4 Selected Water Quality Parameters Measured in Victoria Harbour WCZ in 1999

Determinant	Monitoring Stations							
	VM1	VM2	VM4	VM5	VM6	VM7	VM14	VM15
Temperature (°C)	23.1	23.3	23.2	23.3	23.5	23.6	23.6	23.5
Salinity (ppt)	32.1	31.8	31.8	31.5	31.3	31.3	29.2	31.3
Dissolved Oxygen (mg/L)	4.7 (4.8)	4.4 (4.5)	4.1 (4.1)	4.1 (4.0)	4.3 (4.2)	4.5 (4.3)	5.2 (4.9)	4.4 (4.2)
pH (pH value)	8.0	8.0	7.9	7.9	7.9	7.9	8.0	7.9
Suspended Solids (mg/L)	5.8	4.7	5.5	4.9	5.5	6.3	8.7	8.0
5-day Biochemical Oxygen Demand (mg/L)	0.7	0.9	0.8	1.1	0.8	0.7	1.1	0.6
Ammoniacal Nitrogen (mg/L)	0.19	0.23	0.24	0.27	0.26	0.25	0.18	0.26
Total Inorganic Nitrogen (mg/L)	0.30	0.35	0.37	0.41	0.42	0.42	0.45	0.42
Total Kjeldahl Nitrogen (mg/L)	0.48	0.53	0.54	0.58	0.57	0.54	0.41	0.54
Total Nitrogen (mg/L)	0.59	0.65	0.67	0.72	0.72	0.71	0.68	0.70
Chlorophyll-a (µg/L)	2.6	2.3	2.1	1.9	2.0	1.9	3.1	2.3
<i>E. coli</i> (cfu/100mL)	8900	11000	6200	7500	4800	3500	3000	3500
No. of Samples	12	12	12	12	12	12	12	12