

Government Office, Tai Kok Tsui petrol filling station at Skyway House and the factory building at Shum Mong Road.

Site investigations were conducted between Oct 2002 and Feb 2003. Ground water table was found at about 1-2m below the ground level. The locations of the collected groundwater samples are shown in **Figure 8-2**. Some of the water samples show certain degree of contamination as described in the following sections.

(a) *Groundwater Analytical Results*

Table 8-3 shows the measurement results for the groundwater samples taken from 5 drillholes. Heavy metals (including Cd, Cr, Cu, Ni, Pb, Zn, Hg, As, Ba, Co, Mo and Sn), BTEX, cyanide, PAH, Total Petroleum Hydrocarbon (TPH) and dioxin were tested.

Estimation indicates that the amount of groundwater generated during dewatering will be around 580m³ per day, which is corresponding to the flow band of 400 – 600m³ / day listed in the TM-Water.

Table 8-3 : Comparison between contaminants and TM-Water effluent discharge criteria

Parameters	Maximum Concentration ^[1] (mg/L) (unless specified)					TM-Water Effluent limit for inshore waters of VHW CZ (mg/L) 400 – 600 m ³ / day	Reporting Limit (µg/L) ^[5]
	KSD100/DHE063	KSD100/DHEPZ052	KSD100/DHEPZ113	KSD100/DHE053	KSD100/DHE120 ^[3]		
PH	7.89	8	7.4	7.2	7.7	6-9	
Temperature °C	22.4	20.4	19.1	19.8	26.9	< 40°C	
TPH C6 – C9	<0.020	<0.020	<0.020	<0.020	<0.020	---	20 –25
TPH C10–C14	<0.050	<0.050	<0.050	<0.050	<0.050	---	
TPH C15 – C28	0.115	<0.1	0.13	<0.1	0.11	---	
TPH C29 – C36	<0.050	<0.050	<0.050	<0.050	0.321	---	
Dioxin (pg/L)	0.04	---	---	---	0.019	---	10 pgL
Cd	< 0.0002	0.0013	0.0005	<0.0002	0.0005	0.001	
Cr	0.006	0.043	0.051	0.0071	0.0043	0.7	
Cu	0.4	0.230	0.330	0.340	0.055	0.7	
Ni	0.0035	0.023	0.027	0.0057	0.0081	0.7	
Pb	0.013	0.210	0.210	0.0051	0.061	0.7	
Zn	0.130	0.270	0.29	0.053	0.037	0.7	
Hg	< 0.0005	0.0016	0.0029	0.0025	<0.0005	0.001	
As	<0.010	0.021	0.015	<0.010	<0.010	0.7	
Ba	0.130	0.35	0.35	0.110	0.120	2.7	
Co	0.0045	0.016	0.017	0.0048	<0.001	---	
Mo	0.015	0.019	0.017	0.026	0.0079	---	
Sn	0.0053	0.124	0.074	0.0074	0.011	---	
Total Cyanide (µg/L)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---	
PAH ^[8] (µg/L)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	0.1 – 1 (Low molecular weight) 0.02 – 0.1 (High molecular weight)

Parameters	Maximum Concentration ^[1] (mg/L) (unless specified)					TM-Water Effluent limit for inshore waters of VHW CZ (mg/L)	Reporting Limit (µg/L) ^[5]
	KSD100/DHE063	KSD100/DHEPZ052	KSD100/DHEPZ113	KSD100/DHE053	KSD100/DHE120 ^[3]	400 – 600 m ³ / day	
Benzene (µg/L)	< 2	< 2	< 2	< 2	< 2	---	1
Ethylbenzene (µg/L)	< 2	< 2	< 2	< 2	< 2	---	
Toluene (µg/L)	< 2	< 2	< 2	< 2	< 2	---	
Meta- & Para Xylene (µg/L)	< 4	< 4	< 4	< 4	< 4	---	
Ortho Xylene (µg/L)	< 2	< 2	< 2	< 2	< 2	---	

Note [1]: Bolded letters indicate exceedance in discharge limits at flow band of 400 – 600m³ / day.

- [2]: KSD100/DHEPZ052: Fire Station in Canton Road;
 KSD100/DHE053: West Kowloon Reclamation (replaced adjacent drillhole KSD100/DHE056);
 KSD100/DHEPZ113: Petrol station in Skyway House;
 KSD100/DHE120: Former shipyard site in West Kowloon Reclamation Area;
 KSD100/DHE063: industrial activities west Canton Road

[3]: There will be no groundwater discharge from DHE120 as there will only be at-grade rail works

[4]: ProPECC Note 3/94: Contaminated Land Assessment and Remediation

[5]: According to TM-Water, the chemicals concentration for TPH, dioxin, BTEX and PAH should be below the Reporting limit. Discharges of PCB, PAHs, petroleum oil, pesticide and toxicant into foul sewers, inland waters and coastal waters are prohibited. As the presence of these chemicals is not known at this stage, the groundwater cannot be discharged to the stormwater or foul sewer directly.

It can be seen from the above table that the maximum temperature of the samples are less than 40°C and the pH of the samples are in the range of 6-9, which comply with the standards stipulated in TM-Water. In addition, the concentration of Cr, Ni, As, Cu, Pb, Zn, and Ba are well below the TM-Water limits. However, exceedances in heavy metals (Cd and Hg) contents are observed at locations KSD100 / DHEPZ052 (Fire Station in Canton Road), KSD100 / DHE053 (West Kowloon Reclamation), and KSD100/DHEPZ113 (Petrol station in Skyhouse).

(b) *Impact on health of construction workers*

The Dutch ABC Values for groundwater are based on the use of groundwater for potable supply. As this is rarely the case in Hong Kong, the Dutch B Values are not necessarily appropriate for assessing the requirement of groundwater remediation, particularly within urban areas where there may be numerous diffuse sources of historical contamination within the vicinity. Hence, the Dutch C values are used for assessment.

When comparing the groundwater with the Dutch levels, 4 groundwater samples exceed the Dutch C Levels. The analytical results exceeding the Dutch C Levels are given in Table 8-4.

Table 8-4 : Summary of groundwater samples exceeding Dutch C Level

Drillhole reference	Depth (mbgl)	Contaminant	Concentration (µg/L)	Dutch C Limit (µg/L)
KSD100/DHEPZ052	8.0m	Copper	230	200
		Lead	210	200
KSD100/DHE053 ^[1]	6.5m	Copper	340	200
		Mercury	2.5	2
KSD100/DHE063	3.0m	Copper	400	200