

## **DRINKING WATER SAFETY ADVISORY COMMITTEE**

### **Review of the Hong Kong Drinking Water Standards Parameters and Standard Values**

#### **PURPOSE**

This paper aims to seek views from the Drinking Water Safety Advisory Committee (“the Committee”) on the parameters recommended for inclusion in the Hong Kong Drinking Water Standards (“HKDWS”) and their proposed standard values. The paper also proposes to establish a “Surveillance List” and a “Watch List” of parameters as well as the Aesthetic Guidelines for Drinking Water in Hong Kong (“Aesthetic Guidelines”) and the proposed guideline values for the parameters in the Aesthetic Guidelines.

#### **BACKGROUND**

2. At present, Hong Kong adopts the Guideline Values (“GVs”)/Provisional Guideline Values (“PGVs”) of the 92 parameters in the Guidelines for Drinking-water Quality published by World Health Organization in 2011 (“WHO Guidelines 2011”) as the HKDWS.

#### **The Stage One Study**

3. In 2016, the Water Supplies Department (“WSD”) commissioned the Water Research Centre (“WRc”) of United Kingdom (“UK”) to conduct a study to review the 12 metal parameters in the WHO Guidelines 2011 for inclusion in the HKDWS (“Stage One Study”), which was completed in 2017. Based on the recommendation of the Stage One Study and advice of the International Expert Panel on Drinking Water Safety (“IEP”), all the 12 metal parameters in the WHO Guidelines 2011 and their corresponding GV/ PGVs were adopted in the HKDWS as listed in **Annex 1**. Nonetheless, the IEP also recommended that Hong Kong should carry out a review on the standard values for these metal parameters when new information was available from revision of WHO Guidelines 2011 or when sufficient local data collected under the Enhanced Water Quality Monitoring Programme (“Enhanced Programme”) at consumers’ taps were available in 3 to 5 years.

4. Besides, pending completion of a further study to review the other parameters and their standard values (“Stage Two Study”), IEP agreed that the non-metal parameters in the WHO Guidelines 2011 and their corresponding GVs/PGVs could be adopted in the HKDWS in the interim.

### The Stage Two Study

5. In 2017, WSD commissioned WRc to conduct the Stage Two Study to review all potential relevant parameters other than the 12 metal parameters covered in the Stage One Study for inclusion in HKDWS by studying the practices/guidelines in establishing drinking water standards in two international organisations (i.e. WHO and the European Union (“EU”)) and seven overseas nations (i.e. the UK, the United States of America (“USA”), Canada, Australia, New Zealand, Singapore and Japan)

### **SELECTION OF PARAMETERS FOR HKDWS**

6. Taking into account the findings and recommendations of the Stage Two Study, we propose to set up a framework for selecting parameters for inclusion in the HKDWS, based on the likelihood<sup>1</sup> of a parameter occurring in drinking water in Hong Kong and its potential to cause adverse health effects. Under the framework, there are three lists of parameters as detailed in the ensuing paragraphs.

7. Details of the three lists of parameters, viz. the Recommended List, the Surveillance List and the Watch List, are as below:

#### (a) Recommended List

Subject to the views of the Committee, the parameters in this list are recommended for inclusion in the HKDWS. Endorsement by the Secretary for Development will then be sought for inclusion of the recommended parameters in the HKDWS. After inclusion into the

---

<sup>1</sup> For parameters that are currently monitored by WSD, the likelihood of occurrence in drinking water in Hong Kong was evaluated based on the monitoring data in the **past ten years**. For parameters that are not currently monitored by WSD, the Stage Two Study assessed the likelihood of their occurrence in the drinking water of Hong Kong based on the situations in local context such as the chemicals and processes used in water treatment in Hong Kong.

HKDWS, these parameters will be routinely monitored<sup>2</sup> by WSD. The parameters recommended for inclusion in the list shall satisfy the following criteria:

- (i) They were detected in the drinking water of Hong Kong in the past and would cause adverse health risk in case of exceedance; or
- (ii) They were at undetectable level in the drinking water of Hong Kong in the past but they have chance to occur in the drinking water of Hong Kong in the future and would cause adverse health risk in case of exceedance; or
- (iii) They are not currently monitored in Hong Kong but they have chance to occur in the drinking water of Hong Kong and would cause adverse health risk in case of exceedance.

(b) Surveillance List

The parameters in this list are proposed for monitoring at lower frequencies in general to ascertain if their concentrations in the drinking water of Hong Kong remain at undetectable or low levels. The monitoring results shall be reviewed regularly to (i) identify if any of the parameters should be included in HKDWS or the Watch List and (ii) see if adjustment of the monitoring frequency should be made, as appropriate. Any detection of abnormal change in the level of concentration of these parameters in the drinking water may trigger stepping up of the monitoring and/or study of their sources and trends as well as their potential health risk for consideration as to whether the parameters should be included in the HKDWS<sup>3</sup>. The parameters recommended for inclusion in the list shall satisfy the following criteria:

- (i) They were at undetectable level in the drinking water of Hong Kong in the past. Though their present likelihood of occurrence

---

<sup>2</sup> A further review study on the sampling location, frequency and protocol for the parameters concerned will be conducted.

<sup>3</sup> WRc is currently reviewing the practice in international organisations and overseas nations in order to recommend the monitoring frequencies and alert levels for the parameters in the Surveillance List for triggering the stepping up of the monitoring and/or the study.

is low but their presence could not be totally excluded in the future and they would cause adverse health risk in case of exceedance; or

- (ii) They were at low levels in the drinking water of Hong Kong in the past and they would not occur at such levels that would cause adverse health risk currently. However, their occurrence at levels that would cause adverse health risk could not be completely excluded in the future; or
- (iii) They are microbial parameters which serve to indicate the effectiveness of microbial control, cleanliness, integrity, presence of biofilms and sanitary problem in the water supply system, though they would not directly represent faecal contamination which would cause adverse health risk. They could be used for sanitary surveillance and detection of any abnormal change in the microbial quality of the drinking water.

(c) Watch List

The parameters in this list are proposed for regular review of the international scientific development on them such as assessment of their adverse health risk and thresholds, their inclusion in drinking water standards and guidelines of international organisations and overseas nations, etc. Snapshot and sampling test may be conducted as appropriate. Subject to the outcome of the regular review and snapshot monitoring results, these parameters may be included in the HKDWS or Surveillance List<sup>4</sup>. The parameters recommended for inclusion in the list shall satisfy the following criteria:

- (i) There are increasing concerns of their potential adverse health risk through consumption of drinking water but the risk has yet to be established scientifically; or
- (ii) They are included in the standards or guidelines in the international organisations and overseas nations but the

---

<sup>4</sup> WRc is currently reviewing the practice in international organisations and overseas nations in order to recommend the framework for regular review and snapshot monitoring of the parameter in the Watch List before selection of the parameters for inclusion in the HKDWS or Surveillance List.

information available at present does not indicate their relevance to drinking water safety in Hong Kong; or

- (iii) They are pesticides that have been approved for use in Hong Kong or the Mainland and the likelihood of their occurrence in the drinking water of Hong Kong should be kept under review.

8. According to the abovementioned framework, the following parameters are recommended for inclusion in the three lists and are detailed in **Annexes 2 to 4**, with rationales discussed in the ensuing paragraphs, for Members' considerations:

(a) Recommended List (**Annex 2**)

- (i) 12 metal parameters as recommended in the Stage One Study; and
- (ii) 44 non-metal chemical parameters in the WHO Guidelines 2017 which were detectable in the drinking water of Hong Kong in the past; and
- (iii) Perchlorate: It is a disinfection by-product ("DBP") potentially formed in hypochlorite solution in water disinfection process. This parameter is not currently monitored by the WSD as it is not included in the WHO Guidelines 2011 (hence the current HKDWS). It has been added to the WHO Guidelines 2017 and the DBP can be formed with the use of hypochlorite solution in Hong Kong. It is therefore recommended for inclusion in the Recommended List; and
- (iv) 2 radiological parameters: Gross alpha activity and gross beta activity are the radiological parameters in the WHO Guidelines 2017 and form the basis of the screening levels for radionuclides in drinking water<sup>5</sup>. All other international organisations and overseas nations under the review of the Stage Two Study follow the same practice to use these

---

<sup>5</sup> The first addendum of WHO Guidelines 2017 states that if the gross alpha activity and gross beta activity are below their respective screening levels, the permitted annual dose (0.1 mSv) would usually not be exceeded.

parameters for screening purpose in their standards and guidelines to demonstrate the safety of the drinking water with respect to its radiological quality. While these radiological parameters were at undetectable level in the drinking water of Hong Kong in the past, they are recommended for inclusion in the Recommended List for screening of radionuclides in the drinking water of Hong Kong; and

- (v) *Escherichia coli* (“*E. coli*”): It is universally present in faeces of humans and animals. Its presence in drinking water denotes the potential presence of recent faecal contamination or inadequate disinfection and thus possible presence of pathogens in the drinking water. It has been advocated by the WHO as an “indicator bacteria” for verification and surveillance of drinking water quality. All other organisations and overseas nations under the review adopt *E. coli* in their standards and guidelines to demonstrate the safety of the drinking water with respect to its microbial quality. *E. coli* is at undetectable level in the drinking water of Hong Kong in the past but it would give rise to adverse health risk if it is present in the drinking water.

(b) Surveillance List (**Annex 3**)

- (i) 32 chemical parameters in WHO Guidelines 2017 which were undetectable in the drinking water of Hong Kong in the past<sup>6</sup> but their occurrence in the future could not be completely excluded; and
- (ii) 5 chemical parameters not in the WHO Guidelines 2017 which were detected at low levels in the drinking water of Hong Kong in the past but their occurrence in high levels in future to cause adverse health risk could not be completely excluded; and

---

<sup>6</sup> Sodium dichloroisocyanurate is a parameter in the WHO Guidelines 2017. In addition to being undetectable in the drinking water in Hong Kong in the past, it is not used as disinfectant in the water treatment in Hong Kong. It follows that it would not be present in the drinking water in Hong Kong. It is therefore not necessary to include it in the Surveillance List.

- (iii) 4 microbial parameters, viz. total coliforms, heterotrophic plate count (“HPC”) and *Cryptosporidium* and *Giardia* (“C&G”)<sup>7</sup> : They are for sanitary surveillance and monitoring of the microbial quality of the drinking water. Total coliforms and/or HPC have been included in the routine surveillance programme for drinking water quality in nations such as UK, USA, Canada and Australia.

(c) Watch List (Annex 4)

- (i) 30 parameters of emerging contaminants currently under background monitoring in the drinking water of Hong Kong: They include 14 parameters of pharmaceuticals such as antibiotics and hormones which have been selected for background monitoring after considering the relevant information from WHO, USA, EU and the literatures on the pharmaceuticals frequently reported in rivers of the Mainland, and 16 parameters of persistent organic pollutants (“POPs”) listed in the Stockholm Convention with analytical services available<sup>8</sup>. In addition, 5 POPs listed in the Stockholm Convention with no analytical services available are also included in the Watch List; and
- (ii) 21 parameters of antibiotics which have been considered by the Department of Ecology and Environment of Guangdong Province (“GDDEE”) as having emerging concerns<sup>9</sup> as they have been found present in sewage discharges and rivers; and
- (iii) 608 parameters including 101 parameters in the standards or guidelines or potential contaminant candidates of increasing concerns in the international organisations and overseas nations under the Stage Two Study, and 507 parameters of pesticides which have been approved for use in Hong Kong or the Mainland.

---

<sup>7</sup> WSD is currently monitoring *C&G* in the source and treated water. Any detection in drinking water would trigger corresponding remedial actions according to WSD’s “Contingency Plan for *Cryptosporidium* & *Giardia* in Treated Water” in collaboration with the Department of Health.

<sup>8</sup> The Stockholm Convention has stipulated 28 POPs with 7 of them have already been covered in the Recommended List or Surveillance List.

<sup>9</sup> The GDDEE has identified 32 such parameters with 11 of them have already been covered in the emerging contaminants in the Watch List with background monitoring in sub-paragraph (i) above.

## **AESTHETIC GUIDELINES**

9. For wholesomeness of drinking water supply, it is also proposed to establish guidelines for parameters, the exceedance of which could cause objectionable aesthetic effects that may result in consumers' questioning about the quality of drinking water, although their exceedance in general will not cause health concern. As such, we propose to establish the Aesthetic Guidelines involving 10 parameters as detailed in **Annex 5**.

10. There are other aesthetic parameters proposed for future review for possible inclusion in the Aesthetic Guideline as shown in **Annex 6**. There is currently insufficient information to assess their guideline values from the aesthetic perspective (i.e. the levels that would give rise to consumers' complaints) due to their presence in low levels in the drinking water of Hong Kong. However, these parameters have already been proposed for inclusion in the Recommended List, Surveillance List or Watch List for monitoring on ground of health risk. WSD would keep in view if their concentrations in the drinking water of Hong Kong will reach a level in future that will give rise to consumers' complaints so as to determine if it is necessary to include them in the Aesthetic Guidelines.

## **METHODOLOGIES FOR DEVIATION OF THE STANDARD VALUES**

11. Taking into account the findings and recommendations of the Stage Two Study, the following methodologies are adopted for deriving the standard values for parameters in the Recommended List for inclusion in HKDWS depending on whether they would cause threshold effects<sup>10</sup> or non-threshold effects<sup>11</sup> for human exposure via drinking water.

12. For parameters that would cause threshold effects, the following steps are adopted in the derivation of their standard values:

- (a) Select the Point of Departure<sup>12</sup> based on the available toxicological data in the priority order of Benchmark Dose Level ("BMDL"), No Observed Adverse Effect Level or Lowest Observed Adverse Effect Level;

---

<sup>10</sup> A level of exposure exists (the threshold) below which adverse health effects are not anticipated.

<sup>11</sup> Any level of exposure could result in adverse health effects and there is no level at which adverse health effects are not anticipated.

<sup>12</sup> The point on a toxicological dose-response curve that corresponds to an estimated low effect level or no effect level.



- (b) Apply the appropriate uncertainty factors to derive the Tolerable Daily Intake or Acceptable Daily Intake;
  - (c) Allocate the appropriate portion of the exposure contributed by drinking water. Percentage allocation recommended by WHO should be adopted unless local data or evidence is available to suggest adjustment of the percentage. The figure is then multiplied by the receptor body weight and divided by the receptor daily water consumption to give the standard value. To ensure that the standard value is protective for all individuals, the most vulnerable/sensitive population should be chosen as the receptor for the derivation of the standard value.
13. For parameters that cause non-threshold effects, such as carcinogenicity or neurotoxicity, the BMDL<sub>10</sub> is used as the starting point in general. BMDL<sub>10</sub> indicates the dose that causes an additional 10% increase in the incidence of an effect, e.g. a cancer. The BMDL<sub>10</sub> is then used to derive the standard value by extrapolation for the 10<sup>-5</sup> Excess Lifetime Cancer Risk (meaning 1 excess case of cancer per 100,000 people who drink the water with this concentration for 70-year period).
14. Details of the above methodologies in deriving the standard values are provided in **Annex 7**.

### **PROPOSED STANDARD VALUES FOR CHEMICAL, RADIOLOGICAL AND MICROBIAL PARAMETERS**

15. Based on the above methodologies and local context, the standard values of the 48 parameters in the Recommended List are proposed below:
- (a) Group 1 (33 Parameters) – The derived standard values for the parameters, which are same as the GVs/PGVs in the WHO Guidelines 2017, shall be adopted; and
  - (b) Group 2 (2 Parameters) – The derived standard values for the parameters, which are more stringent than the GVs/PGVs in the WHO Guidelines 2017, shall be adopted; and

- (c) Group 3 (5 Parameters) – For the derived standard values for the parameters which are less stringent than the GVs/PGVs in the WHO Guidelines 2017, the more stringent GVs/PGVs in the WHO Guidelines 2017 shall be adopted in order to address the likely public concerns that the drinking water quality in Hong Kong should be up to international standard. Based on the monitoring in the past, the concentrations of these parameters in the drinking water in Hong Kong are at all times lower than the GVs/PGVs in WHO Guidelines 2017 and exceedance of the GVs/PGVs is not expected in future; and
- (d) Group 4 (8 parameters) – For the derived standard values for the parameters which are more stringent than the GVs/PGVs in the WHO Guidelines 2017 but the derivations of these standard values are based on conservative data and/or assumptions, the GVs/PGVs in the WHO Guidelines 2017 shall be adopted but the international development in their standard values including the rolling revisions of WHO Guidelines and any additional scientific information available shall be kept in view to evaluate if the derived standard values shall be adopted later on.
16. The proposed standard values for the parameters in the Recommended List for inclusion in HKDWS are given in **Annex 2**.

### **GUIDELINE VALUES FOR PARAMETERS IN AESTHETIC GUIDELINES**

17. The guideline values for the 10 parameters in the Aesthetic Guidelines are derived based on information on their levels that would give rise to consumers' complaints in Hong Kong in the past. The proposed guideline values for the parameters are listed in **Annex 5**.

## **CONCLUSION**

18. The Recommended List, Surveillance List, Watch List and Aesthetic Guidelines and the proposed standard values and guideline values as listed at **Annexes 2 to 5** are summarised as follows:

RECOMMENDED LIST ( <b>Annex 2</b> )	No.
Metal Parameters recommended in Stage One Study	<b>12</b>
- Chemical parameters with standard values	<b>48</b>
• same as GVs/PGVs in WHO Guidelines 2017	42
• more stringent than GVs/PGVs in WHO Guidelines 2017	2
- New chemical parameter with standard value same as GVs/PGVs in WHO Guidelines 2017	1
- Radiological parameters with standard values same as WHO Guidelines 2017	2
- Microbial parameter with standard value same as WHO Guidelines 2017	1
SURVEILLANCE LIST ( <b>Annex 3</b> )	<b>41</b>
- chemical parameters in WHO Guidelines 2017 which were undetectable in drinking water in Hong Kong in the past	32
- chemical parameters not in the WHO Guidelines 2017 which were detected at low levels in drinking water in Hong Kong in the past	5
- Microbial parameters	4
WATCH LIST ( <b>Annex 4</b> )	<b>664</b>
- parameters of emerging contaminants under current background monitoring	30
- parameters of POPs in the Stockholm Convention with analytical service unavailable	5
- parameters of antibiotics considered by the GDDEE of emerging concerns	21
- parameters in standards or guidelines in international organisations and overseas nations or potential contaminant candidates of increasing concerns	101
- parameters of pesticides approved for use in Hong Kong or Mainland	507
AESTHETIC PARAMETERS ( <b>Annex 5</b> )	<b>10</b>

## **WAY FORWARD**

19. Subject to the views of the Committee, we will seek endorsement of the Secretary for Development for inclusion of the parameters in the Recommended List in the HKDWS. For the Committee's information, the WSD has commissioned WRc to review the water quality monitoring programme for the parameters in the HKDWS (except for the 12 metal parameters which are being monitored under the Enhanced Programme) with respect to the sampling location, frequency and protocol. As mentioned in footnote 3 above, the monitoring frequencies and alert levels will be recommended for the parameters in the Surveillance List for triggering the stepping up of the monitoring and/or study of their sources and trends as well as their potential health risk for consideration whether the parameters shall be included in HKDWS. In addition, a generic framework<sup>13</sup> will be proposed for identification of new parameters for inclusion in and existing parameters for removal from the HKDWS, Surveillance List or Watch List. It is expected that the findings and recommendations will be reported to the Committee tentatively in its next meeting in mid-2019.

## **ADVICE SOUGHT**

20. Members are invited to offer their views on the setting up of the proposed framework for selecting parameters for inclusion in the HKDWS, viz. the Recommended List, Surveillance List, Watch List, and the drawing up of the Aesthetic Guidelines, as well as the corresponding standard values and guideline values as detailed in this paper.

**Development Bureau  
Water Supplies Department  
December 2018**

---

<sup>13</sup> The framework will outline the criteria (e.g. physico-chemical properties, usage, toxicological and occurrence data, regulatory requirements etc.) to identify the parameters of health concern, surveillance requirements, methodology for evaluating the monitoring data, alert levels to trigger stepping up of the monitoring and further review etc.

**List of 12 metal parameters with  
their guideline values/provisional guideline values  
in the WHO Guidelines 2011**

<b>Metal Parameters</b>	<b>Guidelines Value / Provisional Guideline Value (µg/L)</b>
Antimony	20
Arsenic	10
Barium	700
Boron	2 400
Cadmium	3
Chromium	50
Copper	2 000
Lead	10
Mercury	6
Nickel	70
Selenium	40
Uranium	30

## RECOMMENDED LIST

Category		Parameters	WHO Guidelines 2017 (in µg/L unless otherwise specified)	Proposed HKDWS (in µg/L unless otherwise specified)	Notes on Selection of Parameters	Notes on Proposed Standard Values
Chemical Parameters	Metals (12 parameters)	Antimony	20	≤ 20	a	i
		Arsenic	10	≤ 10		
		Barium	1 300 <sup>#</sup>	≤ 1 300		
		Boron	2 400	≤ 2 400		
		Cadmium	3	≤ 3		
		Chromium	50	≤ 50		
		Copper	2 000	≤ 2 000		
		Lead	10	≤ 10		
		Mercury	6	≤ 6		
		Nickel	70	≤ 70		
		Selenium	40	≤ 40		
		Uranium	30	≤ 30		
	Disinfection By-products (15 parameters)	Bromate	10	≤ 10	b	ii
		Bromodichloromethane	60	≤ 60		
		Chlorite	700	≤ 700		
		Chloroform	300	≤ 300		
		Dibromoacetonitrile	70	≤ 70		
		Dichloroacetonitrile	20	≤ 20		
		Monochloroacetate	20	≤ 20		
		N-Nitrosodimethylamine	0.1	≤ 0.1		
		Total trihalomethanes	sum ratio ≤ 1	sum ratio ≤ 1		
		Trichloroacetate	200	≤ 200		
		Chlorate	700	≤ 300	b	iii
		Dichloroacetate	50	≤ 40		
		Dibromochloromethane	100	≤ 100	b	iv
		Bromoform	100	≤ 100	b	v

Category		Parameters	WHO Guidelines 2017 (in µg/L unless otherwise specified)	Proposed HKDWS (in µg/L unless otherwise specified)	Notes on Selection of Parameters	Notes on Proposed Standard Values
		Perchlorate	70	≤ 70	c	ii
	Inorganic Chemicals (3 parameter)	Nitrite	3 000	≤ 3 000	b	ii
		Fluoride	1 500	≤ 1 500	b	v
		Nitrate	50 000	≤ 50 000		
	Disinfectants (1 parameter)	Chlorine	5 000	≤ 5 000	b	ii
	Organic Chemicals (14 parameters)	1,2-Dichloroethane	30	≤ 30	b	ii
		1,4-Dichlorobenzene	300	≤ 300		
		1,4-Dioxane	50	≤ 50		
		Benzene	10	≤ 10		
		Ethylbenzene	300	≤ 300		
		Hexachlorobutadiene	0.6	≤ 0.6		
		Tetrachloroethene	40	≤ 40		
		Toluene	700	≤ 700		
		Xylenes	500	≤ 500		
		Di(2-ethylhexyl)phthalate	8	≤ 8	b	iv
		Styrene	20	≤ 20		
		Dichloromethane	20	≤ 20		
		Benzo[a]pyrene	0.7	≤ 0.7	b	v
		Carbon tetrachloride	4	≤ 4		
	Cyanobacterial toxins (1 parameter)	Microcystin-LR	1	≤ 1	b	ii

Category		Parameters	WHO Guidelines 2017 (in µg/L unless otherwise specified)	Proposed HKDWS (in µg/L unless otherwise specified)	Notes on Selection of Parameters	Notes on Proposed Standard Values
	Pesticides (11 parameter)	1,2-Dibromo-3-chloropropane	1	≤ 1	b	ii
		Aldrin & dieldrin	0.03	≤ 0.03		
		Chlordane	0.2	≤ 0.2		
		Endrin	0.6	≤ 0.6		
		Lindane	2	≤ 2		
		Molinate	6	≤ 6		
		Simazine	2	≤ 2		
		Terbuthylazine	7	≤ 7		iv
		1,2-Dibromoethane	0.4	≤ 0.4		v
		Metalochlor	10	≤ 10		
		Trifluralin	20	≤ 20		
Radiological parameters (2 parameters)		Gross alpha (α) activity	0.5 Bq/L	≤ 0.5 Bq/L	d	ii
		Gross beta (β) activity	1.0 Bq/L	≤ 1.0 Bq/L		
Microbial parameter (1 parameter)		<i>E. coli</i>	0 cfu*/100 mL	0 cfu*/100 mL	d	ii

# The Guideline Value for barium has been revised from 700 µg/L (based on NOAEL) in the WHO Guidelines 2011 to 1300 µg/L (based on BMDL<sub>05</sub>) in the WHO Guidelines 2017

\* cfu: colony forming unit

#### Notes on Selection of Parameters

- 12 metal parameters recommended in the Stage One Study.
- Non-metal chemical parameters in the WHO Guidelines 2017 which were detectable in drinking water in Hong Kong in the past.
- Chemical parameter which is in the WHO Guidelines 2017 and currently not monitored in Hong Kong but may occur in drinking water in Hong Kong and would cause adverse health risk in case of exceedance.
- Radiological and microbial parameters in the WHO Guidelines 2017 which were at undetectable level in drinking water in Hong Kong in the past but may occur in drinking water in Hong Kong and would cause adverse health risk in case of exceedance.

#### Notes on proposed standard values



- i. The GVs/PGVs in the WHO Guidelines 2017 shall be adopted and will be reviewed when new information is available from revision of WHO Guidelines or when sufficient local data from the Enhanced Programme at consumers' taps are available in 3 to 5 years.
- ii. The derived standard values are same as the GVs/PGVs in the WHO Guidelines 2017.
- iii. The derived standard values are more stringent than the GVs/PGVs in the WHO Guidelines 2017.
- iv. The derived standard values are less stringent than the GVs/PGVs in the WHO Guidelines 2017, but the more stringent GVs/PGVs in the WHO Guidelines 2017 shall be adopted in order to address the likely public concerns that the drinking water quality in Hong Kong should be up to international standard.
- v. The derived standard values are more stringent than the GVs/PGVs in the WHO Guidelines 2017 but the derivations are based on conservative data and assumptions, the GVs/PGVs in the WHO Guidelines 2017 shall be adopted but the international development in their standard values including the rolling revisions of WHO Guidelines and any additional scientific information available shall be kept in view to determining if the derived standard values shall be adopted later on.

## SURVEILLANCE LIST

Category		Parameters	Notes on Selection of Parameters
Chemicals	Disinfection By-products (1 parameter)	<ul style="list-style-type: none"> <li>2,4,6-Trichlorophenol</li> </ul>	a
	Disinfectant (1 parameters)	<ul style="list-style-type: none"> <li>Monochloramine</li> </ul>	
	Organic Chemicals (9 parameters)	<ul style="list-style-type: none"> <li>1,2-Dichlorobenzene</li> <li>1,2-Dichloroethene</li> <li>Acrylamide</li> <li>Edetic acid</li> <li>Epichlorohydrin</li> <li>Nitrilotriacetic acid</li> <li>Pentachlorophenol</li> <li>Trichloroethene</li> <li>Vinyl chloride</li> </ul>	
	Pesticides (21 parameters)	<ul style="list-style-type: none"> <li>1,2-Dichloropropane</li> <li>1,3-Dichloropropene</li> <li>2,4-Dichlorophenoxyacetic acid</li> <li>2,4-Dichlorophenoxybutyric acid</li> <li>2,4,5-Trichlorophenoxyacetic acid</li> <li>Alachlor</li> <li>Aldicarb</li> <li>Atrazine and its chloro-s-triazine metabolites</li> <li>Carbofuran</li> <li>Chlorotoluron</li> <li>Chlorpyrifos</li> <li>Cyanazine</li> <li>DDT and metabolites</li> <li>Dichlorprop</li> <li>Dimethoate</li> <li>Fenoprop</li> <li>Hydroxyatrazine</li> <li>Isoproturon</li> <li>Mecoprop</li> <li>Methoxychlor</li> <li>Pendimethalin</li> </ul>	

Category		Parameters	Notes on Selection of Parameters
Chemicals	Pesticides (1 parameters)	<ul style="list-style-type: none"> <li>• Permethrin</li> </ul>	b
	Disinfectant By-products (4 parameters)	<ul style="list-style-type: none"> <li>• Formaldehyde</li> <li>• Trichloroacetonitrile</li> <li>• Chloral hydrate</li> <li>• Total haloacetic acids (sum ratio)</li> </ul>	
Microbial parameters (4 parameters)		<ul style="list-style-type: none"> <li>• Cryptosporidium</li> <li>• Giardia</li> <li>• Coliform</li> <li>• Heterotrophic Plate Count</li> </ul>	c

#### Notes on Selection of Parameters

- Chemical parameters which are in the WHO Guidelines 2017 and were at undetectable level in drinking water in Hong Kong in the past but their occurrence in future could not be completely excluded.
- Chemical parameters which are not in the WHO Guidelines 2017 and were detected at low levels in drinking water in Hong Kong in the past but their occurrence in high levels in future to cause adverse health risk could not be completely excluded.
- Microbial parameters for sanitary surveillance and monitoring for detection of any abnormal change in the microbial quality of the drinking water in Hong Kong.

## WATCH LIST

Category		Parameters	Notes on Selection of Parameters
Pharmaceuticals	Antibiotics (11 parameters)	<ul style="list-style-type: none"> <li>Ciprofloxacin</li> <li>Norfloxacin</li> <li>Ofloxacin</li> <li>Roxithromycin</li> <li>Sulfadiazine</li> <li>Sulfamerazine</li> <li>Sulfamethoxazole</li> <li>Sulfamethazine</li> <li>Tetracycline</li> <li>Oxytetracycline</li> <li>Chlortetracycline</li> </ul>	a
	Hormones (3 parameters)	<ul style="list-style-type: none"> <li>17-alpha-ethinylestradiol (EE2)</li> <li>17-beta-estradiol (E2)</li> <li>Estrone (E1)</li> </ul>	
Environmental Pollutants	Persistent Organic Pollutants ("POPs") (21 parameters)	<ul style="list-style-type: none"> <li>Heptachlor</li> <li>Hexachlorobenzene (HCB)</li> <li>Polychlorinated biphenyls (PCB)</li> <li>Polychlorinated dibenzo-<i>p</i>-dioxins (PCDD)</li> <li>Polychlorinated dibenzofurans (PCDF)</li> <li>Mirex</li> <li>Toxaphene</li> <li>Alpha hexachlorocyclohexane</li> <li>Beta hexachlorocyclohexane</li> <li>Pentachlorobenzene</li> <li>Chlordecone</li> <li>Hexabromodiphenyl ether and heptabromodiphenyl ether</li> <li>Tetrabromodiphenyl ether and pentabromodiphenyl ether</li> <li>Hexabromobiphenyl</li> <li>Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)</li> <li>Technical endosulfan and its related isomers</li> </ul>	b
		<ul style="list-style-type: none"> <li>Hexabromocyclododecane (HBCD)</li> <li>Pentachlorophenol and its salts and esters</li> </ul>	c

Category		Parameters	Notes on Selection of Parameters
		<ul style="list-style-type: none"> <li>Polychlorinated naphthalenes</li> <li>Decabromodiphenyl ether (commercial mixture, c-DecaBDE)</li> <li>Short-chain chlorinated paraffins</li> </ul>	
Pharmaceuticals	Antibiotics (21 parameters)	<ul style="list-style-type: none"> <li>Sulfachloropyridazine</li> <li>Sulfadimethoxine</li> <li>Sulfameter</li> <li>Sulfamonomethoxine</li> <li>Sulfapyridine</li> <li>Sulfaquinoxaline</li> <li>Carbadox</li> <li>Difloxacin</li> <li>Enrofloxacin</li> <li>Fleroxacin</li> <li>Lomefloxacin</li> <li>Marbofloxacin</li> <li>Sarafloxacin</li> <li>Clarithromycin</li> <li>Erythromycin-H<sub>2</sub>O</li> <li>Leucomycin</li> <li>Oleandomycin</li> <li>Tylosin</li> <li>Doxycycline</li> <li>Lincomycin</li> <li>Trimethoprim</li> </ul>	d

Category	Parameters	Notes on Selection
Organic Chemicals	1,1,1,2-Tetrachloroethane	e
	1,1,2-Trichloroethane	
	1,2,3-Trichlorobenzene	
	1,2,3-Trichloropropane	
	1,2,4-Trichlorobenzene	
	1,2,4-Trimethylbenzene	
	1,3,5-Trichlorobenzene	
	1,3,5-Trimethylbenzene	
	1,3-Dinitrobenzene	
	1,4-Dithiane	
	2,3,4,6-Tetrachlorophenol	
	2,3,7,8-TCDD	
	2,4,6-Trinitrotoluene	
	2,4-Dinitrotoluene	
	2,6-Dinitrotoluene	
	Acenaphthene	
	Acrylonitrile	
	Anthracene	
	Benz[a]anthracene	
	Benzo[b]fluoranthene	
	Benzo[g,h,i]perylene	
	Benzo[k]fluoranthene	
	Bis-2-chloroisopropyl ether	
	Bromobenzene	
	Butyl benzyl phthalate	
	Chlorobenzene (Phenyl chloride)	
	<i>ortho</i> -Chlorotoluene	
	<i>para</i> -Chlorotoluene	
	Chrysene	
	Dibutyl phthalate	
	Diethyl phthalate	
	Diisopropyl methylphosphonate	
	Dimethyl methylphosphonate	
	Dimethyl phthalate	
	EPTC (dipropylthiocarbamic acid S-ethyl ester)	
	Ethylene glycol	
	Fluorene	
	Geosmin	
	Hexachlorocyclopentadiene	
	Hexachloroethane	
	HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocaine)	
	Indeno[1,2,3,-c,d]pyrene	
	Isophorone	
	Isopropyl methylphosphonate	

Category	Parameters	Notes on Selection
Organic Chemicals	Isopropylbenzene (cumene)	e
	Lignin	
	Methyl ethyl ketone	
	Monochlorobenzene	
	Naphthalene	
	n-Hexane	
	Nicarbazin	
	Nitrocellulose	
	Nitroguanidine	
	Perfluorooctanoic acid (PFOA)	
	Phenanthrene	
	Phenol	
	Phthalic acid esters (PAE)	
	<i>p</i> -Nitrophenol	
	Polihexanide	
	Pyrene	
	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	
	Tannin	
	Trinitroglycerol	
Inorganic Chemicals	Cyanide	
	Iodide	
	White phosphorus	
Disinfection By-Products	Bromoacetic acid	
	Bromochloromethane	
	Chlorinated furanones	
	Chloroketones	
	Chloromethane	
	Cyanogen chloride	
	Dibromoacetic acid	
	Dichlorodifluoromethane	
	Haloacetic acids - Total (HAAs)	
	Haloacetonitriles	
	Tetrachloromethane	
	Trichlorofluoromethane	
Disinfectants	Chloramines	
Pesticides	Bentazone	
	Heptachlor/Heptachlor epoxide	
	(2-methyl-4-chlorophenoxy)acetic acid	
	Propanil	
	Pyridate	
	Pyriproxyfen	
Metals	Cobalt	
	Lanthanum	
	Strontium	
	Thallium	
	Vanadium	
Radiological	Radon	

Category	Parameters	Notes on Selection
<b>Cyanobacterial Toxins</b>	Anatoxin-a	e
	Cylindrospermopsin	
	Homoanatoxin-a	
	Nodularin	
	Saxitoxins	
<b>Chemicals from industries and dwelling</b>	Cellulose/Microplastics	
	Foaming agents	
	Non-ionic surface active agent	
	Resin acids	
	Anionic surface active agent	
<b>Pesticides</b>	1-Naphthylacetic acid and sodium 1-naphthalacitic acid	f
	2-Phenylphenol	
	2,4-Dichlorophenoxyacetic acid and 2,4-dichlorophenoxyacetic acid sodium salt (2,4-D and 2,4-D sodium)	
	2,4-Dichlorophenoxyacetic acid butylate (2,4-D butylate)	
	3-Iodo-2-propynyl butyl carbamate	
	4-Indol-3-yl-butyric acid	
	4,5-Dichloro-2-octyl-2H-isothiazol-3-one (DCOIT)	
	Abamectin	
	S-Abscisic acid	
	Acephate	
	Acetamiprid	
	Acetochlor	
	Acifluorfen	
	Allethrin and d-allethrin	
	Allicin	
	Aluminium phosphide	
	Ametryn	
	Amidosulphuron	
	Aminopyralid	
	Amitraz	
	Amitrole	
	Amobam	
	Amorphous silicon dioxide	
	Anilazine	
	Azadirachtin	
	Azamethiphos	
	Azinphos methyl	
	Azocyclotin	
	Azoxystrobin	
	Benalaxyl	
	Benazolin ethyl	
	Bendiocarb	
	Benfluralin	
	Benfuracarb	
	Benodanil	



Category	Parameters	Notes on Selection
Pesticides	Benomyl	f
	Bensulphuron methyl	
	Benzalkonium chloride	
	Benzoximate	
	Benzoylprop-ethyl	
	Bifenazate	
	Bifenox	
	Bifenthrin	
	Bioallethrin and S-Bioallethrin	
	Bioresmethrin	
	Bistrifluron	
	Bisultap thiosultap disodium	
	Bitertanol	
	Blasticidin S	
	Borax	
	Boric acid	
	Boscalid	
	Brassinolide	
	Brodifacoum	
	Bromadiolone	
	Bromophos	
	Bromopropylate	
	Bromothalonil	
	Bromoxynil	
	Buprofezin	
	Butachlor	
	Butoxycarboxim	
	Butralin	
	Cadusafos	
	Camphechlor	
	Camphor	
	Canamide	
	Capsaicin	
	Captan	
	Carbaryl	
	Carbendazim	
	Carbosulphan	
	Carboxin	
	Carfentrazone ethyl	
	Cartap	
	Celastrus alkaloids	
	Chlorantraniliprole	
	Chlorbenzuron	
	Chlordimeform	
	Chlorfenapyr	
	Chlorfluazuron	

Category	Parameters	Notes on Selection
Pesticides	Chloridazon	f
	Chlorimuron ethyl	
	Chlormequat	
	Chlorophacinone	
	Chloropicrin	
	Chlorothalonil	
	Chloroxilenol	
	Chlorpropham	
	Chlorpyrifos-methyl	
	Chlorsulphuron	
	Chlorthal-dimethyl	
	Chlortoluron	
	Cholecalciferol	
	Cinosulphuron	
	Citronella oil	
	Clethodim	
	Clodinafop propargyl	
	Clofentezine	
	Clomazone	
	Clopyralid	
	Cnidiadin	
	Consan triple action 20	
	Copper (I) oxide	
	Copper (I) thiocyanate	
	Copper (II) hydroxide	
	Copper oxychloride	
	Copper pyrrithione	
	Copper-triethanolamine complex	
	Coumaphos	
	Coumatetralyl	
	Coumoxystrobin	
	Cue-lure	
	Cyantraniliprole	
	Cyazofamid	
	Cyclosulphamuron	
	Cyfluthrin and beta-cyfluthrin	
	Cyhalofop-butyl	
	Cyhalothrin and lambda-cyhalothrin	
	Cyhexatin	
	Cymoxanil isocarbophos	
	Cypermethrin, alpha-cypermethrin and beta-cypermethrin	
	Cyphenothrin and d,d-trans-cyphenothrin	
	Cyproconazole	
	Cyprodinil	
	Cyromazine	
	Dalapon	

Category	Parameters	Notes on Selection
Pesticides	Dazomet	f
	Deltamethrin	
	Demeton	
	Desmedipham	
	Diafenthiuron	
	Diamondback moth pheromone	
	Diazinon	
	Dicamba	
	Dichlofluanid	
	Dichlone	
	Dichlorophen	
	Diclofop-methyl	
	Dicloran	
	Diethofencarb	
	Diethyl aminoethyl hexanoate	
	Diethyltoluamide	
	Difenoconazole	
	Difenzoquat	
	Difethialone	
	Diiflubenzuron	
	Diiflufenican	
	Diiodomethyl 4-tolyl sulphone	
	Dimefluthrin	
	Dimepiperate	
	Dimethametryn	
	Dimethenamid-P	
	Dimethipin	
	Dimethomorph	
	Diniconazole	
	Dinocap	
	Dinotefuran	
	Dioxabenzofos	
	Dioxacarb	
	Diphacinone	
	Diphenamid	
	Diphenylamine	
	Disodium methyl arsenate (DSMA)	
	Disodium octaborate	
	Disodium octaborate tetrahydrate	
	Disparlure	
	Disulphoton	
	Dithianon	
	Diuron	
	Dodemorph	
	Dodine	
	Edifenphos	

Category	Parameters	Notes on Selection
Pesticides	Eamectin benzoate	f
	Empenthrin	
	Endosulphan	
	Epoxiconazole	
	Esbiothrin	
	Esfenvalerate	
	Ethametsulphuron	
	Ethephon	
	Ethion	
	Ethiprole	
	Ethirimol	
	Ethoprophos	
	Ethoxyquin	
	Ethoxysulphuron	
	Ethylicin	
	Etofenprox	
	Ettoxazole	
	Etridiazole	
	Etrimfos	
	Eucalyptus oil	
	Famoxadone	
	Fenaminosulph	
	Fenamiphos	
	Fenarimol	
	Fenazaquin	
	Fenbuconazole	
	Fenbutatin oxide	
	Fenchlorphos	
	Fenfluthrin	
	Fenhexamid	
	Fenitrothion	
	Fenobucarb	
	Fenothiocarb	
	Fenoxanil	
	Fenoxycarb and fenoxaprop-P ethyl	
	Fenpropathrin	
	Fenpropidin	
	Fenpropimorph	
	Fenpyroximate	
	Fenthion	
	Fentin hydroxide	
	Fenvalerate	
	Ferrolure+	
	Fipronil	
	Flocoumafen	
	Flonicamid	

Category	Parameters	Notes on Selection
Pesticides	Florasulam	f
	Flour beetle, khapra beetle and tobacco beetle pheromone mixture	
	Fluazifop and fluazifop-P butyl	
	Fluazinam	
	Flubendiamide	
	Flucarbazone sodium	
	Flucetosulphuron	
	Flucythrinate	
	Fludioxonil	
	Flufenoxuron	
	Flufiprole	
	Flumetralin	
	Flumetsulam	
	Flumiclorac	
	Flumioxazin	
	Flumorph	
	Fluopicolide	
	Fluoroglycofen ethyl	
	Fluroxypyr and fluroxypyr methyl	
	Flusilazole	
	Flutolanil	
	Flutriafol	
	Folpet	
	Fomesafen	
	Fonofos	
	Forchlorfenuron	
	Formothion	
	Fosetyl-aluminium	
	Fosthiazate	
	Freside S	
	Fthalide phthalide	
	d-trans-Furamethrin	
	Gaozhimo	
	Garlic	
	Geraniol	
	Gibberellic acid	
	Glufosinate-ammonium	
	Glutaraldehyde	
	Glyphosate	
	Glyphosine	
	Halosulphuron methyl	
	Haloxypop	
	Haloxypop methyl and haloxypop-P methyl	
	Henziotiazolinone	
	Heptenophos	
	Hexaconazole	

Category	Parameters	Notes on Selection
Pesticides	Hexaflumuron	f
	Hexazinone	
	Hexythiazox	
	Hydramethylnon	
	Hydrogen phosphide	
	S-Hydroprene	
	Hymexazol	
	Imazalil	
	Imazamox	
	Imazapic	
	Imazaquin	
	Imazethapyr	
	Imibenconazole	
	Imidacloprid	
	Imidaclothiz	
	Iminoctadine tris(albesilate)	
	Imiprothrin	
	Indoxacarb	
	Iodofenphos	
	Iodosulphuron methyl sodium	
	Iprobenfos	
	Iprodione	
	Irgarol 1051	
	Isazofos	
	Iso-alcohol ethoxylate (MMF)	
	Isobornyl thiocynoacetate	
	Isofenphos methyl	
	Isoprocarb	
	Isoprothiolane	
	Ivermectin	
	Kadethrin	
	Kasugamycin	
	Kinetin	
	Kresoxim methyl	
	Lactofen	
	Larvicidal oil	
	D-Limonene	
	Linalool	
	Linuron	
	Lvdingjunzhi (Triclopyricarb)	
	Magnesium phosphide	
	Malathion	
	Maleic hydrazide	
	Mancozeb	
	Mandipropamid	
	Maneb	

Category	Parameters	Notes on Selection
Pesticides	Mathuralure	f
	Matrine	
	Mefenacet	
	Menthol	
	Mepronil	
	Mesosulphuron methyl	
	Mesotrione	
	Metalaxyl and metalaxyl-M	
	Metaldehyde	
	Metam and metam sodium	
	Methamidophos	
	Methidathion	
	Methiocarb	
	Methomyl	
	Methoprene and S-methoprene	
	Methothrin	
	Methoxyfenozide	
	Methyl anthranilate	
	Methyl bromide	
	Methyl eugenol	
	Methyl neodecanamide	
	Methyl nonyl ketone	
	Metofluthrin	
	Metoxadiazone	
	Metriam	
	Metribuzin	
	Metsulphuron methyl	
	Monocrotophos	
	Monosodium methyl arsenate (MSMA)	
	Monosulphuron	
	Monuron	
	Muscalure	
	Myclobutanil	
	Naled	
	Naphthalene	
	Napropamide	
	Neem	
	Nicosulphuron	
	Nicotine	
	Ningnanmycin	
	Nitenpyram	
	Novaluron	
	Noviflumuron	
	Octachlorodipropyl ether	
	Octenol	

Category	Parameters	Notes on Selection
Pesticides	N-Octyl bicycloheptene dicarboximide (MGK 264)	f
	Omethoate	
	Ooxydemeton methyl	
	Oxadiargyl	
	Oxadiazon	
	Oxadixyl	
	Oxamyl	
	Oxaziclomefone	
	Oxine copper	
	Oxine sulphate	
	Oxyfluorfen	
	Oxymatrine	
	Paclobutrazol	
	Paraquat	
	Parathion and parathion methyl	
	Penconazole	
	Petroleum oils	
	Phenmedipham	
	d-Phenothrin	
	Phenthoate	
	Phenyl salicylate	
	Phorate	
	Phosalone	
	Phosfolan and phosfolan methyl	
	Phosmet	
	Phosphamidon	
	Phoxim	
	Phyiscion	
	Picloram	
	Picoxystrobin	
	Piperonyl	
	Piperonyl butoxide	
	Piperophos	
	Pirimicarb	
	Pirimiphos-methyl	
	Polydimethylsiloxane	
	Potassium bicarbonate	
	Prallethrin	
	Pretilachlor	
	Prochloraz and prochloraz manganese chloride complex	
	Procymidone	
	Prodiamine	
	Profenofos	
	Propamocarb and propamocarb hydrochloride	
	Propamocarb hydrochloride	
	Propargite	



Category	Parameters	Notes on Selection
Pesticides	Propiconazole	f
	Propineb	
	Propisochlor	
	Propoxur	
	Prothioconazole	
	Prothiofos	
	Psoralen	
	Pymetrozine	
	Pyraclostrobin	
	Pyraflufen ethyl	
	Pyraoxystrobin	
	Pyrazophos	
	Pyrazosulphuron ethyl	
	Pyrethrins	
	Pyridaben	
	Pyridine-triphenylborane	
	Pyriftalid	
	Pyrimethanil	
	Quaternary ammonium chloride	
	Quaternary ammonium chlorides (mixture of n-alkyl dimethyl benzyl)	
	Quinalphos	
	Quinclorac	
	Quinoxifen	
	Quintozene	
	Quizalofop and quizalofop-P ethyl	
	Resmethrin and d-resmethrin	
	Rhyncolure	
	Rimsulphuron	
	Rotenone	
	Ryania alkaloids	
	Sabadilla alkaloids	
	Saponins	
	Semiamitraz and semiamitraz chloride	
	Serricornin	
	Sethoxydim	
	Simetryn	
	Sodium fluoride	
	Spinetoram	
	Spinosad	
	Spirodiclofen	
	Spirotetramat	
	Spodoptera litura Nuclear Polyhedrosis Virus (NPV)	
	Sulcotrione	
	ortho-Sulphamuron	
	Sulphometuron-methyl	

Category	Parameters	Notes on Selection
Pesticides	Sulphotep	f
	Sulphoxaflor	
	Sulphoxide	
	Sulphuryl fluoride	
	Taufluvalinate	
	Tebuconazole	
	Tebufenozide	
	Tecnazene	
	Teflubenzuron	
	Temephos	
	Terbufos	
	Tetrachlorvinphos	
	Tetradifon	
	Tetramethrin and d-Tetramethrin	
	Thiabendazole	
	Thiacloprid	
	Thiamethoxam	
	Thidiazuron	
	Thifensulphuron methyl	
	Thifluzamide	
	Thiobencarb	
	Thiocyclam	
	Thiodicarb	
	Thiophanate-methyl	
	Thiosultap monosodium	
	Thiram	
	Thymol	
	Tolclofos methyl	
	Tolfenpyrad	
	Tolylfluanid	
	Transfluthrin	
	Triadimefon	
	Triadimenol	
	Triallate	
	Triazophos	
	Tribenuron methyl	
	Trichlorfon	
	Trichoderma harzianum	
	Triclopyr	
	Tricyclazole	
	Tridemorph	
	Trifloxystrobin	
	Trifloxysulphuron sodium	
	Triflumuron	
	Triforine	
	Trimedlure	

Category	Parameters	Notes on Selection
Pesticides	Trinexapac-ethyl	f
	Ttriflumizole	
	Validamycin A	
	Vamidothion	
	Vinclozolin	
	Warfarin	
	White oils	
	Xiwojunan (Fenaminstrobin)	
	Zeatin	
	Zinc pyriithione	
	Zinc thiazole	
	Zineb	
	Ziram	
	Zoxamide	

#### Notes on Selection of Parameters

- Pharmaceuticals under current background monitoring.
- Persistent organic pollutants listed in the Stockholm Convention with available analytical services and under current background monitoring.
- Persistent organic pollutants listed in the Stockholm Convention with analytical services unavailable.
- Antibiotics of emerging concerns to be present in the sewage discharges and rivers in Guangdong Province.
- Parameters in the standards or guidelines or potential contaminant candidates of increasing concerns in the international organisations and overseas nations.
- Pesticides approved for use in Hong Kong or Mainland.

**AESTHETIC GUIDELINES**

<b>Parameters</b>	<b>Guideline Values</b>
2-Methyl-isoborneol (MIB)	$\leq 50$ ng/L
Aluminium	$\leq 0.2$ mg/L
Iron	$\leq 0.3$ mg/L
Manganese	$\leq 0.1$ mg/L
Zinc	$\leq 1.5$ mg/L
Colour	$\leq 15$ Hazen Unit
Odour	Acceptable to consumers
pH	6.5 to 9.5
Taste	Acceptable to consumers
Turbidity	$\leq 3$ NTU

**List of other aesthetic parameters for future review**

Chlorine
Monochloramine
2,4,6-Trichlorophenol
1,2-Dichlorobenzene
1,4-Dichlorobenzene
Styrene
Toluene
Xylenes
Geosmin

**Methodology of Derivation of the Standard Values****(A) Chemicals with Threshold Effects**

The following methodology is adopted for deriving the standard values for parameters with threshold effect:

- If different toxicological studies/data for the parameter are available from literature, it is preferable to choose the threshold value as the Point of Departure (“PoD”) in descending order of priority of Benchmark Dose Limit<sup>14</sup> (“BMDL<sub>10</sub>”), No Observed Adverse Effect Level<sup>15</sup> (“NOAEL”) and Lowest Observed Adverse Effect Level<sup>16</sup> (“LOAEL”).
- In converting the PoD into the Tolerable Daily Intake (“TDI”) (for natural occurring substances) or Acceptable Daily Intake (“ADI”) (for artificial additive substances e.g. pesticides), the following generic Uncertainty Factors (“UF”) as recommended by the WHO could be adopted:
  - Inter-species variation: 1-10;
  - Intra-species variation: 1-10;
  - Use of LOAEL as the PoD: 1-10;
  - Adequacy of study or dataset: 1-10.

UF of 2, 5, 10 are generally applicable to cases with low uncertainty, medium uncertainty and high uncertainty respectively.

$$\text{TDI or ADI} = \frac{\text{BMDL or NOAEL or LOAEL}}{\text{UF}}$$

- In order to derive an appropriate standard value, it is necessary to consider the potential exposure to chemicals via other sources in addition to drinking water, such as food or occupational exposure.

---

<sup>14</sup> Benchmark Dose (“BMD<sub>10</sub>”) is the dose that causes an increase in the incidence of an effect compared to controls. It is usually expressed in BMDL<sub>10</sub> which is 95% lower confidence limit of the BMD corresponding to an additional 10% increase in the incidence of an effect compared to controls. The BMD is now considered to be the more robust value as it is based on the whole dose response curve rather than individual dose points.

<sup>15</sup> NOAEL is the dose level below which no adverse effect occurs.

<sup>16</sup> LOAEL is the lowest dose level of which adverse effect occurs. If all doses tested in experimental study caused health effects, the LOAEL should be determined.

Therefore, an allocation of the TDI/ADI to drinking water is assigned. Percentage allocation of TDI/ADI to drinking water recommended by WHO for individual parameters should be adopted unless local data are available. The default % allocation is 20% unless the chemical parameter is pesticide, industrial chemical or disinfection by-product, then other percentage allocations shall be considered, i.e. 1, 10 or 80% respectively as recommended by WHO<sup>17</sup>.

- To determine a standard value, it is necessary to take into account of water consumed daily. Water consumption of 2, 1 and 0.75 litres for adults, children and infants respectively are used for the derivation of standard values in Hong Kong.
- Most countries base their standards or guideline values on the adult as the receptor. However, there is some variability in the weight used for the average adult. People in Asia, on average, have a body mass of 57.7 kg<sup>18</sup>. Therefore, the derivation of standard values in Hong Kong should be based on the use of a default 60 kg adult (based on 57.7 kg rounded), unless children or infants show particular sensitivity or if specific sensitive populations are identified by the toxicological/epidemiological data. The body weights of 10 and 5 kg as recommended by WHO, should then be used for Hong Kong children and infants respectively.
- Once the receptor, the receptor's consumption of water per day, and the percentage of allocation of the TDI/ADI to drinking water are determined, these are applied to the TDI/ADI to determine the standard values using the equation below:

Standard value (mg/L)

$$= \frac{TDI \text{ or } ADI \text{ (mg/kg bw/day)} \times \text{Allocation (\%)} \times \text{Receptor body weight (kg)}}{\text{Receptor daily water consumption (L)}}$$

## Chemicals with Non-threshold Effects

<sup>17</sup> According to WHO document "Policies and Procedures used in updating the WHO Guidelines for Drinking-water Quality" in 2009, allocation for pesticides for which exposure from food is high may be as low as 1%. Allocation for disinfection by-products for which exposure from food is low may be as high as 80%.

<sup>18</sup> Walpole, S.C., Prieto-Merino, D., Edwards, P., Cleland, J., Stevens, G. and Roberts, I. (2012). The weight of nations: an estimation of adult human biomass. BMC Public Health, 12, 439.

The following methodology is adopted for deriving the standard values for parameters with non-threshold effect:

- BMDL<sub>10</sub> should be used as the starting point to derive the corresponding standard value by extrapolation for 10<sup>-5</sup> Excess Lifetime Cancer Risk<sup>19</sup> (“ELCR”).
- If BMDL<sub>10</sub> is not available, existing ELCR data may be used to derive the standard value corresponding to 10<sup>-5</sup> ELCR.
- Default 60 kg, 10 kg and 5 kg as body weight of adult, children and infants should be used.
- Default water consumption of 2, 1, and 0.75 litres for adult, children and infants should be used.
- Once the ELCR has been selected, the standard value can be derived using the slope factor (gradient of the linear model) and assuming a 60 kg adult drinks 2 litres of water per day, using the equation below:

$$\text{Standard value (mg/L)} = \left( \frac{0.00001}{\text{slope factor}} \right) \times \left( \frac{60 \text{ kg}}{2 \text{ litres}} \right)$$

Methodology of derivation of the standard value is summarised in the flowchart as shown in **Figure 1**.

---

<sup>19</sup> ELCR is the excess case of cancer in a population ingesting drinking water at the concentration daily over a 70-year period. A 10<sup>-5</sup> ELCR corresponds to 1 excess case of cancer per 100,000 people consuming drinking water containing the substance at the standard value for 70 years.



**Figure 1 - Flowchart of the derivation of the standard value**

