

Table 2.1: Comparison of water quality standards and recommendations for Bahrain

Parameter	Units	WHO Guidelines for Drinking- water Quality (4th Edition)	EU Directive 98/83/EC	UK Water Supply (Water Quality) Reg 2000	GSO GS/ 149/2008	Qatar		Oman Oman Standard Nr 8/2006	UAE		Bahrain	
						Kahrama a Standard	Kahrama a Standard		Abu Dhabi Water Quality Regs 2014	Hidd IWPP	Umm Al Qura IWPP	Bahrain
Colour	Pt-Co Scale	-	Acceptable	20	15	0-15	15	15	15	15	15	<1.0
Turbidity	NTU	-	Acceptable	4 (at tap) 1 (at works)	5	0-5	5	5	2 (max)	2 (max)	2 (max)	<0.2
Taste	No Parameter	-	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Odour	No Parameter	-	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Temperature	°C	-	-	-	-	Acceptable	Acceptable	Acceptable	Unobjectionable	Unobjectionable	Unobjectionable	<40
pH	-	-	6.5-9.5	6.5-9.5	6.5-8.0	6.5-8.5	9	9	7.0-9.2	7.0-9.2	6.5-8.5	7.0 - 8.0
Total dissolved solids	mg/L	-	-	-	100-1,000	125-250	1,000	1,000	100-1,000	100-1,000	200-500	200-500
Electrical Conductivity	µS/cm	-	<2,500	<2,500	-	150-400	500	500	160-1,600	160-1,600	440-1,100	250-500
Total Hardness	mg/L as CaCO3	-	-	-	-	-	-	-	300	300	100-300	-
Calcium	mg/L as Ca	-	-	-	-	65-150	-	-	200	200	-	70-200*
Magnesium	mg/L as Mg	-	-	-	-	10	150	150	30	30	-	<30
Alkalinity	mg/L as CaCO3	-	-	-	-	65-150	-	-	-	-	-	70-200
Sodium	mg/L as Na	-	200	200	200	20	400	400	150	150	150	<50
Chloride	mg/L as Cl	-	250	250	250	50	600	600	250	250	250	<100
Aluminium	mg/L as Al	-	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	<0.2
Iron	mg/L as Fe	-	0.2	0.2	0.2	0.1	1.0	1.0	0.2	0.2	0.2	<0.1
Copper	mg/L as Cu	-	2.0	2.0	1.0	0.05	2.0	2.0	1.0	1.0	1.0	<0.05
Zinc	mg/L as Zn	-	-	-	-	0.05	3	3	5.0	5.0	3.0	<0.1
Manganese	mg/L as Mn	-	0.5	0.5	0.4	0.1	0.4	0.4	0.4	0.4	0.05	<0.05
Boron	mg/L as B	2.4	1.0	1.0	0.5	-	2.4	2.4	2.4	2.4	1.0	<1.0
Residual Chlorine	mg/L as Cl2	0.2 - 5	-	-	<5.0 0.2-0.5 (after 30 mins)	0.2-1.0	<5.0	<5.0	0.2-0.5	0.2-0.5	0.5 - 0.6	0.4-0.6
Bromate	mg/l	0.01	0.01	0.01	0.01	-	-	-	-	-	0.01	0.01
Langelier Saturation Index	Not set	-	-	-	-	-	-	-	0.0-0.5	0.0-0.5	-	+0.1 - +0.3

Source: See References Section.

*Value in brackets indicates turbidity limit after powdered chemical addition such as lime or soda ash. Desalinated water limit must remain at <1.0.

need to be imposed for chlorate, chlorite, mono-chloramine, di-chloramine, and tri-chloramines. However, changing the disinfection process is not recommended in this report.

Table 2.2: Key Water Quality Parameters (Maximum permitted values)

S. No	Parameters	Unit	Desalination Plant Delivery Point	Distribution Network	
				Operation Target	Allowed Limits
1	Colour	Pt/Co scale	<1	<5	15
2	Turbidity	NTU	<0.2	< 1	< 5
3	Taste		Unobjectionable	Unobjectionable	Unobjectionable
4	Odour		Unobjectionable	Unobjectionable	Unobjectionable
5	Temperature (max)	OC	40	-	-
6	pH	pH value	7.0-8.0	7.0-8.0	6.5-8.5
7	Total Dissolved Solids	mg/l	100-300	100-500	100-1000
8	Electrical Conductivity	$\mu\text{S/cm}$	200-500	200-900	200-1800
9	Total Hardness (max)	mg/l as CaCO_3	250	500	500
10	Calcium (min)	mg/l as Ca	25	25	25
11	Magnesium (max.)	mg/l as Mg	5	10	30
12	Alkalinity (min)	mg/l as CaCO_3	70	70	50
13	Sodium (max)	mg/l as Na	50	100	200
14	Chloride (max)	mg/l as Cl	100	125	250
15	Aluminium (max)	mg/l as Al	0.2	0.2	0.2
16	Iron (max)	mg/l as Fe	0.1	0.2	0.2
17	Copper (max)	mg/l as Cu	0.05	0.2	1.0
18	Zinc (max)	mg/l as Zn	0.1	0.2	0.5
19	Manganese (max)	mg/l as Mn	0.05	0.1	0.4
20	Boron (max)	mg/l as B	1.0	1.5	2.0
21	Residual Chlorine	mg/l as Cl_2	0.4-0.6	0.3-0.5	0.2-0.7
22	Bromate (max)	$\mu\text{g BrO}_3/\text{l}$	2	5	10
23	Langelier Saturation Index		0.0 to +0.30	0.0 to +0.30	0.0 to +0.30
24	Total Organic Carbon	mg/l	<0.5	<1.0	<1.0

Table 2.3: Additional Parameters (Maximum permitted values)

S. No	Parameters	Unit	Desalination Plant Delivery Point	Distribution Network	
				Operation Target	Allowed Limits
25	Sulphate	mg SO ₄ /l	50	50	50
26	Potassium	mg K/l	10	10	10
27	Nitrate	mg NO ₃ /l	2	2	2
28	Nitrite	mg NO ₂ /l	0.1	0.1	0.1
29	Ammonium (ammonia and ammonium ions)	mg NH ₄ /l	0.5	0.5	0.5
30	Dissolved or emulsified hydrocarbons; mineral oil	mg/l	0.01	0.01	0.01
31	Phosphorus	mg P/l	2.2	2.2	2.2
32	Arsenic	µg As/l	50	50	50
33	Cadmium	µg Cd/l	5	5	5
34	Cyanides	µg CN/l	50	50	50
35	Chromium	µg Cr/l	50	50	50
36	Mercury	µg Hg/l	1	1	1
37	Lead	µg Pb/l	10	10	10
38	Antimony	µg Sb/l	5	5	5
39	Selenium	µg Se/l	10	10	10
40	Barium	µg Ba/l	700	700	700

Table 2.4: Organic Chemicals (Maximum permitted values)

S. No	Parameters	Unit	Desalination Plant Delivery Point	Distribution Network	
				Operation Target	Allowed Limits
41	Endrine	µg/l	0.2	0.2	0.2
42	Lindane	µg/l	2	2	2
43	Methoxychlor	µg/l	10	10	10
44	2,4 dichlorophexy acetic acid	µg/l	10	10	10
45	2,4,5 trichlorophenoxy propionic acid	µg/l	10	10	10
46	Phenols	µg/l	0.5	0.5	0.5
47	Heptachlor	µg/l	0.03	0.03	0.03
48	Aldrin	µg/l	0.03	0.03	0.03
49	DDT	µg/l	2	2	2
50	Chlordane	µg/l	0.2	0.2	0.2
51	Dieldrin	µg/l	0.03	0.03	0.03
52	Heptachlor epoxide	µg/l	0.03	0.03	0.03
53	Trichloroethene	µg/l	10	10	10
54	Tetrachlormethane	µg/l	3	3	3
55	Tetrachloroethene	µg/l	10	10	10
56	Chloroform	µg/l	10	10	10
57	Polycyclic aromatic Hydrocarbons	µg/l	0.2	0.2	0.2
58	Trihalomethanes	µg/l	50	50	50
59	1,2 Dichloroethane	µg/l	3	3	3
60	Benzene	µg/l	1	1	1
61	Benzo (a) pyrene	µg/l	0.01	0.01	0.01
62	Bromoform	µg/l	30	30	30
63	Dichloromethane	µg/l	5	5	5
64	Bromodichloromethane	µg/l	10	10	10
65	Chlorobenzene	µg/l	10	10	10

Table 2.5: Micro-biological Parameters (Maximum permitted values)

S. No	Parameters	Unit	Desalination Plant Delivery Point	Distribution Network	
				Operation Target	Allowed Limits
66	Total coliforms	Number/100 ml	0	0	0
67	E. coli or thermotolerant Faecal coliform bacteria	Number/100 ml	0	0	0
68	Enterococci	Number/100 ml	0	0	0
69	Total Bacterial Count	Number/ ml at 22°C or 37°C	10 at 37°C	10 at 37°C	10 at 37°C

2.4 Summary

Bahrain currently adopts the Gulf Standards Organisation (GSO) Standard for Unbottled Drinking Water (GS/149/2008) which only contains a limited number of parameters compared to those adopted by other GCC states (Oman, Qatar and Abu Dhabi).

Various recommendations have been made as to proposed revisions to the water quality standards which were presented in revision A of this report. These have discussed with representatives from EWA. Following these discussions EWA provided a table setting out a new set of potable water quality standards that they prefer to work to. These have been compiled into Tables 2.2, Table 2.3, Table 2.4 and Table 2.5. These parameters have prepared based the standards included in the Hidd and Al Dur Power and Water Purchase Agreements and consideration of the World Health Organization Guidelines for Drinking-water Quality (Fourth Edition), standards adopted in other countries and existing practices at comparable treatment plants.