NOTES ON TREATED WATER SAMPLE ANALYSIS RESULTS, AUGUST 2022

1 INTRODUCTION

On 30th August 2022, four samples of treated water from the four water treatment works (WTW) on St Helena Island were collected from the freight forwarders in Cape Town, Zedcore, and delivered to the CSIR Laboratories in Stellenbosch. The samples had been shipped from St Helena in a cooler box with ice bricks and transported on the MV *Helena* in a reefer. When they were collected from Zedcore, the samples were being stored in a fridge and were in a cold condition. The results for the four WTW samples are largely consistent with previous results and therefore, I have no doubt that the samples were maintained in a cold condition throughout their transport. The results certificates received from the Laboratory are included in Appendix A.

2 TREATED WATER SAMPLE RESULTS

In this section, the results received are compared to the results of the four previous samples from each WTW and interpreted in terms of their suitability for domestic use, using Table 1 as a reference. In order to facilitate the interpretation of the results in terms of the fitness for domestic use, the following colour codes have been used:

No shading: water is within the guideline limits
Green: water will have slight aesthetic effects (taste, colour), but no adverse health effects;
Yellow: water will have moderate aesthetic effects, but no significant health effects;
Orange: water will have severe aesthetic effects and minor to moderate health effects;
Red: water will have very severe aesthetic effects and moderate to significant health effects.

Table 1: Range of fitness classes for domestic use

Parameter (all as mg/l except where indicated)	Within guideline limits for no adverse effects	Slight aesthetic effects; no adverse health effects	Moderate aesthetic effects; no significant health effects	Severe aesthetic effects; minor to moderate health effects	Very severe aesthetic effects; moderate to significant health effects
Sodium (Na)	<100	100 - 400	400 - 600	600 - 1,000	>1,000
Ammonia (NH_4)	<1	1 - 2	2 - 10	>10	
Sulphate (SO_4)	<200	200 - 400	400 - 600	600 – 1,000	>1,000
Chloride (Cl)	<100	100 - 200	200 - 600	600 – 1,200	>1,200
Nitrate (NO_3)	<6	-	-	6 - 20	>20
Conductivity (eC) as mS/m	<70	70 – 150	150 - 300	300 - 450	>450
pH units	6 - 9	-	-	4 – 6 9 - 11	<4 >11
Aluminium (Al)	<0.15	0.15 – 0.5	>0.5 (in presence of Fe and Mn)	>1	
Copper (Cu)	<1	1 - 3	3 - 30	30 - 200	>200
Iron (Fe)	<0.1	0.1 – 0.3	0.3 – 1.0	1 - 10	>10
Lead (Pb) as ppb	<10	-	-	10 - 100	>100
Manganese (Mn)	<0.05	0.05 – 1.0	1 - 5	5 - 14	>14
Zinc (Zn)	<3	3 - 5	5 - 10	10 - 50	>50

Note that the Feb18, Aug20, Jul21 and Jul22 samples were analysed by the same laboratory at the CSIR in Stellenbosch, while the Nov18 samples were analysed by the Hospital Lab on St Helena using new equipment.

2.1 Red Hill WTW

The results for treated water from the Red Hill WTW are shown in Table 2 below. The quality of water produced at the Red Hill WTW is consistent with previous sample results, although there has been a pleasing decrease in iron concentration (0.02 mg/l) compared to the previous year's result. This means that the water will taste less metallic. Manganese continues to be within acceptable limits.

Table 2: Red Hill WTW: treated water samples

Parameters (mg/l except where indicated)	RH23 Feb18	RH23 Nov18	RH23 Aug20	RH23 Jul21	RH Aug22
Potassium	1.4	1.4	1.8	ND	ND
Sodium	36	33.4	41	45	36
Magnesium	4.6	2.38	7.4	6.3	5.2
Calcium	3.8	0.09	6.3	7.8	3.6
Sulphate	12	8	NR	9.6	11
Chloride	49	NR	62	57	53
Nitrate	<0.1	0.3	0.06	<0.05	0.11
Phosphate	<0.05	0.34	<0.05	0.05	<0.05
Conductivity (mS/m)	23	22.4	33	30	26
pH (units)	7.4	ND	7.1	7.5	6.8
Aluminium	0.02	0.006	0.05	0.02	0.04
Copper	<0.01	0	<0.01	<0.01	0.01
Iron	0.05	0.505	0.13	0.34	0.02
Manganese	<0.01	0.5	<0.03	<0.03	<0.03
Suspended solids	ND	ND	ND	1	<1

2.2 Hutt's Gate WTW

The quality of the treated water from Hutt's Gate WTW is relatively good, with the current results being similar to those obtained previously (Table 3). The concentration of dissolved iron has decreased slightly, but there may still be a slight metallic taste to the water or some staining. This will not have any adverse impacts on health. Manganese levels are within the guideline limits.

Table 3: Hutt's Gate WTW: treated water samples

Parameters (mg/l except where indicated)	HG22 Feb18	HG22 Nov18	HG22 Aug20	HG22 Jul21	HG Aug22
Potassium	1.6	1.1	1.4	ND	ND
Sodium	45	31.1	30	49	27
Magnesium	7.7	3.29	3.5	5.6	3.3
Calcium	8.3	ND	3.9	8.4	3.4
Sulphate	9.2	6	ND	13	6.1
Chloride	66	ND	48	63	42

Parameters (mg/l except where indicated)	HG22 Feb18	HG22 Nov18	HG22 Aug20	HG22 Jul21	HG Aug22
Nitrate	0.1	0.4	<0.05	<0.05	<0.05
Phosphate	0.05	0.45	0.05	0.08	<0.05
Conductivity (mS/m)	32	23.9	22	32	22
pH (units)	7.7	ND	7.2	7.2	7.3
Aluminium	0.03	0.008	0.04	0.05	<0.02
Copper	<0.01	0	<0.01	<0.01	<0.01
Iron	0.12	0.019	0.38	0.15	0.14
Manganese	<0.01	0.7	<0.03	<0.03	<0.03
Suspended solids	ND	ND	ND	<1	<1

2.3 Levelwood WTW

The results from the latest sample are consistent with previous results (Table 4). The quality of the water is good and aluminium and manganese are within the guideline limits, while the result for iron exceeds the 'no effects' threshold of 0.1 mg/l and as a consequence, the water may have a slight metallic taste.

Table 4: Levelwood WTW: treated water samples

Parameters (mg/l except where indicated)	LW20 Feb18	LW20 Nov18	LW20 Aug20	LW20 Jul21	LW Aug22
Potassium	1.8	1.5	2.0	ND	ND
Sodium	26	25.8	43	42	40
Magnesium	4.9	15.82	4.1	5.7	4.3
Calcium	6.4	2.16	4.5	5.1	4.6
Sulphate	8.1	6	NR	26	7.9
Chloride	55	NR	66	53	60
Nitrate	<0.1	0.6	<0.05	<0.05	<0.05
Orthophosphate	0.1	0.45	0.07	0.05	0.07
Conductivity (mS/m)	21	19.58	29	28	28
pH (units)	7.5	ND	7.0	7.1	7.2
Aluminium	0.07	0.04	0.19	0.02	0.13
Copper	<0.01	0.45	<0.01	<0.01	<0.01
Iron	0.15	0.136	0.37	0.17	0.27
Manganese	<0.01	0.4	<0.03	<0.03	<0.03
Suspended solids	ND	ND	ND	2	<1

2.4 Jamestown WTW

The latest results **are all generally much lower** than the two previous results, indicating **decreased salinity**, as reflected in the fact that sodium and chloride are now both within the guideline limits. Iron concentrations are slightly elevated at 0.13 mg/l as opposed to the 'no effects' limit of 0.1mg/l and so the water may taste slightly metallic to sensitive users.

The water may also have a slight discolouration due to a small amount of suspended sediment. Suspended matter in water consists of a mixture of inorganic matter such clay and soil particles, and organic matter. Consumption of water with elevated turbidity *per se* does not have any direct health effects; however, micro-organisms can attach themselves to particles and thus pose the potential for the transmission of disease. According to Connect, turbidity has been a problem at the Jamestown WTW since about May and as a result, they have been mixing the water normally supplying the WTW with water from Red Hill WTW (pers. comm. L Muranganwa). This therefore accounts for the noticeable drop in salinity noted above.

Table 5: Jamestown WTW: treated water samples

Parameters (mg/l except where indicated)	JT21 Feb18	JT21 Nov18	JT21 Aug20	JT21 Jul21	JT Aug22
Potassium	2.5	2.9	2.9	ND	ND
Sodium	92	74.7	88	100	56
Magnesium	14	1.64	10	14	5.9
Calcium	11	<0.05	8.7	15	5.2
Sulphate	30	27	ND	32	14
Chloride	114	ND	107	116	77
Nitrate	0.3	0.8	0.13	0.54	0.09
Orthophosphate	0.14	0.72	0.12	0.16	<0.05
Conductivity (mS/m)	58	55	54	64	37
pH (units)	7.9	ND	7.4	7.9	7.4
Aluminium	0.08	0.007	0.64	0.05	0.09
Copper	<0.01	0.01	<0.01	<0.01	<0.01
Iron	0.16	0.47	0.44	0.05	0.13
Manganese	<0.01	0.5	<0.03	<0.03	<0.03
Suspended solids	ND	ND	ND	1	3

2.5 Summary

All samples are fit for human consumption from a health perspective, based on the inorganic results received from the August 2022 set of samples. The samples were not analysed for microbiological constituents due to the lag time between sample collection in St Helena and sample analysis in South Africa, which is too long for microbiological analyses. The following points summarise the situation:

- The results are consistent with previous results and within the normal range of variability;
- The quality of water from the Jamestown treatment works has shown a significant improvement in salinity levels compared to all previous samples. This will contribute to better tasting water.
- There is a marked improvement in the iron concentrations at Red Hill compared to previous results, but iron is still present at slightly elevated levels in the Hutt's Gate, Levelwood and

Jamestown treated water. These concentrations do not present a health hazard, but will make the water taste slightly metallic and may cause some discolouration;
- All samples are within the recommended threshold limits for manganese and aluminium.

3 RECOMMENDATIONS

There is only one recommendation: attention needs to be paid to reducing the suspended sediment from the treated water at Jamestown WTW to minimise any potential for microbial contamination.

Otherwise, the water quality results are consistent with previous results and therefore, there is no need for any other corrective actions or follow-up testing.

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APPENDIX A: RESULTS CERTIFICATE