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Certificate of Analysis

BERG RIVER MUNICIPALITY

SAMPLE : Ten Samples of Reticulation Water

DATE SAMPLED : 5 July 2011

YOUR REF. : Tender 8/3/18 - 2010

OUR REF. : sc/017/2/1/2799
14 July 2011

LAB DATA SHEET NO. : 11/1860

Location :	S33°0.75' E18°59.66'	S33°1.25' E18°59.19'	S32°54.52' E18°45.48'	S32°47.035' E18°09.850'	SANS 241 – 2006 (Drinking Water)		
	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, ^a max.
pH (at 25°C)	7,20	7,04	6,89	7,04	5.0-9.5	4.0-10.0	No Limit ^c
Conductivity (at 25°C) (mS/m)	4,0	4,6	74,8	61,9	<150	150-370	7 years
Turbidity (NTU)	0,90	0,88	2,7	1,2	<1	1-5	No Limit ^d
Langelier Saturation Index	-3,49	-3,48	-1,50	-1,48	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	9	5	9	8	<20	20-50	No Limit ^b
CaCO ₃ Precipitation Potential	-9,6	-9,8	-21,4	-16,5	-	-	-
Total Alkalinity (as CaCO ₃)	4,0	6,0	40,0	40,8	-	-	-
Total Hardness (as CaCO ₃)	24,7	28,0	173	135	-	-	-
Calcium Hardness (as CaCO ₃)	3,0	3,0	91,5	63,3	-	-	-
Calcium (as Ca)	1,2	1,2	36,6	25,3	<150	150-300	7 years
Magnesium Hardness (as CaCO ₃)	21,7	25,0	81,6	71,8	-	-	-
Magnesium (as Mg)	5,3	6,1	19,9	17,5	<70	70-100	7 years
Sodium (as Na)	3,3	3,2	66,3	59,1	<200	200-400	7 years
Potassium (as K)	0,11	0,33	2,8	3,1	<50	50-100	7 years
Zinc (as Zn)	<0,01	<0,01	0,02	<0,01	<5.0	5.0-10.0	1 year
Chloride (as Cl)	11,3	11,3	155	128	<200	200-600	7 years
Fluoride (as F)	<0,10	<0,10	0,17	0,19	<1.0	1.0-1.5	1 year
Sulphate (as SO ₄)	<4,0	<4,0	86,0	52,0	<400	400-600	7 years

Sample Marked :	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	SANS 241 – 2006 (Drinking Water)		
					Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, ^a max.
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
Total Dissolved Solids	60	80	600	520	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<0,15	<0,15	<0,15	<1.0	1.0-2.0	No Limit ^d
Nitrate & Nitrite Nitrogen (as N)	0,39	0,11	1,6	1,8	<10	10-20	7 years
Free Chlorine	0,55	0,20	0,11	0,03	-	-	-
Total Chlorine	0,65	0,22	0,13	0,04	-	-	-
	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	
Iron (as Fe)	<10	160	<10	<10	<200	200-2 000	7 years ^b
Manganese (as Mn)	<40	<40	<40	40	<100	100-1 000	7 years
Aluminium (as Al)	<14	<14	220	<14	<300	300-500	1 year
^a	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.						
^b	The limits given are based on aesthetic aspects.						
^c	No primary health effect – low pH values can result in structural problems in the distribution system.						
^d	These values can indicate process efficiency and risks associated with pathogens.						

**MICROBIOLOGICAL REQUIREMENTS
SANS 241 - 2006 (Drinking Water)**

1	2				3	4	5
Determinand	Porterville Municipal Office	Porterville Biblioteek	Piketberg Municipal Office	Veldrif Municipal Office	Allowable Compliance Contribution ^e		
					95% of samples, min.	4% of samples, max.	1% of samples, max.
					Upper Limits		
<i>E.coli</i> ^f (count/100 ml)	Nil	Nil	Nil	Nil	Not Detected	Not Detected	1
Total Coliform Bacteria ^g (count/100 ml)	2	2	4	60	-	-	-
Heterotrophic Plate Count ^h (count/ml)	Nil	1	3	27	-	-	-
^e	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.						
^f	Definitive preferred indicator of faecal pollution.						
^g	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.						
^h	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.						

Location :	S32°46.956' E18°10.141'	S32°40.176' E18°16.405'	S32°41.098' E18°53.053'	S32°28.621' E18°32.235'	SANS 241 – 2006 (Drinking Water)		
Sample Marked :	Veldrif SDR	Dwarskersbos Water Toring	Eendekuil Kaap Agri.	Redelinghuys Municipal Office	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, ^a max.
pH (at 25°C)	7,65	7,62	8,90	8,11	5.0-9.5	4.0-10.0	No Limit ^c
Conductivity (at 25°C) (mS/m)	74,7	63,7	8,4	97,4	<150	150-370	7 years
Turbidity (NTU)	0,56	0,57	1,1	2,5	<1	1-5	No Limit ^d
Langelier Saturation Index	-0,80	-0,92	-0,51	-0,34	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	31	10	1	76	<20	20-50	No Limit ^b
CaCO ₃ Precipitation Potential	-5,0	-5,1	-3,94	-2,13	-	-	-
Total Alkalinity (as CaCO ₃)	46,0	40,0	20,8	52,0	-	-	-
Total Hardness (as CaCO ₃)	163	140	34,8	205	-	-	-
Calcium Hardness (as CaCO ₃)	69,0	62,5	11,8	65,8	-	-	-
Calcium (as Ca)	27,6	25,0	4,7	26,3	<150	150-300	7 years
Magnesium Hardness (as CaCO ₃)	94,3	77,5	23	139	-	-	-
Magnesium (as Mg)	23,0	18,9	5,6	34	<70	70-100	7 years
Sodium (as Na)	74,5	61,1	4,2	109	<200	200-400	7 years
Potassium (as K)	4,0	4,1	0,22	5,3	<50	50-100	7 years
Zinc (as Zn)	<0,01	<0,01	<0,01	<0,01	<5.0	5.0-10.0	1 year
Chloride (as Cl)	151	128	15,1	204	<200	200-600	7 years
Fluoride (as F)	0,24	0,25	<0,10	0,19	<1.0	1.0-1.5	1 year
Sulphate (as SO ₄)	54,0	53,0	<4,0	69	<400	400-600	7 years
Total Dissolved Solids	600	540	120	840	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<0,15	<0,15	0,20	<1.0	1.0-2.0	No Limit ^d
Nitrate & Nitrite Nitrogen (as N)	2,4	2,1	0,07	3,1	<10	10-20	7 years
Free Chlorine	0,02	0,03	0,45	0,08	-	-	-
Total Chlorine	0,07	0,13	0,48	0,16	-	-	-
	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	
Iron (as Fe)	<10	<10	<10	40	<200	200-2 000	7 years ^b
Manganese (as Mn)	<40	<40	<40	<40	<100	100-1 000	7 years
Aluminium (as Al)	<14	<14	40	40	<300	300-500	1 year
^a	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.						
^b	The limits given are based on aesthetic aspects.						
^c	No primary health effect – low pH values can result in structural problems in the distribution system.						
^d	These values can indicate process efficiency and risks associated with pathogens.						

**MICROBIOLOGICAL REQUIREMENTS
SANS 241 - 2006 (Drinking Water)**

1	2				3	4	5
Determinand	Veldrif SDR	Dwarskersbos Water Toring	Eendekuil Kaap Agri.	Redelinghuys Municipal Office	Allowable Compliance Contribution ^e		
					95% of samples, min.	4% of samples, max.	1% of samples, max.
					Upper Limits		
<i>E.coli</i>^f (count/100 ml)	Nil	Nil	Nil	Nil	Not Detected	Not Detected	1
Total Coliform Bacteria^g (count/100 ml)	80	30	14	89	-	-	-
Heterotrophic Plate Count^h (count/ml)	48	45	2	30	-	-	-
^e	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.						
^f	Definitive preferred indicator of faecal pollution.						
^g	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.						
^h	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.						

Location :	S32°42.482 E18°29.105'	S32°46.437 E18°09.962'	SANS 241 – 2006 (Drinking Water)		
Sample Marked :	Aurora Municipal Office	Noordhoek Saal	Class I (Recomm. Operation. Limit)	Class II (Maximum Allowable for Limited Duration)	Class II Water Consump. Period, ^a max.
pH (at 25°C)	7,75	7,77	5.0-9.5	4.0-10.0	No Limit ^c
Conductivity (at 25°C) (mS/m)	167	66,3	<150	150-370	7 years
Turbidity (NTU)	1,2	1	<1	1-5	No Limit ^d
Langelier Saturation Index	-1,5	-0,76	-	-	-
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	
Colour (as Pt)	<1	10	<20	20-50	No Limit ^b
CaCO ₃ Precipitation Potential	-5,38	-3,81	-	-	-
Total Alkalinity (as CaCO ₃)	12,8	40	-	-	-
Total Hardness (as CaCO ₃)	295	146	-	-	-
Calcium Hardness (as CaCO ₃)	50	65	-	-	-
Calcium (as Ca)	20	26	<150	150-300	7 years
Magnesium Hardness (as CaCO ₃)	245	81,2	-	-	-
Magnesium (as Mg)	59,8	19,8	<70	70-100	7 years
Sodium (as Na)	218	61,3	<200	200-400	7 years
Potassium (as K)	1,7	3,9	<50	50-100	7 years
Zinc (as Zn)	<0,01	<0,01	<5.0	5.0-10.0	1 year
Chloride (as Cl)	442	132	<200	200-600	7 years
Fluoride (as F)	0,17	0,21	<1.0	1.0-1.5	1 year
Sulphate (as SO ₄)	27	44	<400	400-600	7 years
Total Dissolved Solids	1180	560	<1000	1000-2400	7 years
Ammonia Nitrogen (as N)	<0,15	<0,15	<1.0	1.0-2.0	No Limit ^d
Nitrate & Nitrite Nitrogen (as N)	0,89	1,9	<10	10-20	7 years
Free Chlorine	0,14	0,07	-	-	-
Total Chlorine	0,17	0,09	-	-	-
	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	<u>µg/l</u>	
Iron (as Fe)	<10	<10	<200	200-2 000	7 years ^b
Manganese (as Mn)	280	<40	<100	100-1 000	7 years
Aluminium (as Al)	100	20	<300	300-500	1 year
^a	The limits for the consumption of Class II water are based on the consumption of 2 litres of water per day by a person of mass 70 kg over a period of 70 years.				
^b	The limits given are based on aesthetic aspects.				
^c	No primary health effect – low pH values can result in structural problems in the distribution system.				
^d	These values can indicate process efficiency and risks associated with pathogens.				

**MICROBIOLOGICAL REQUIREMENTS
SANS 241 - 2006 (Drinking Water)**

1	2		3	4	5
Determinand	Aurora Municipal Office	Noordhoek Saal	Allowable Compliance Contribution ^e		
			95% of samples, min.	4% of samples, max.	1% of samples, max.
			Upper Limits		
<i>E.coli</i> ^f (count/100 ml)	Nil	Nil	Not Detected	Not Detected	1
Total Coliform Bacteria ^g (count/100 ml)	Nil	30	-	-	-
Heterotrophic Plate Count ^h (count/ml)	Nil	40	-	-	-
^e	The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1% respectively, to the limits indicated in column 4 and column 5. The objective of disinfection should, nevertheless be to attain 100% compliance to the limits indicated in column 3.				
^f	Definitive preferred indicator of faecal pollution.				
^g	Only used as an alert indicator of possible problems. Alert level 10 organisms per 100 ml.				
^h	Only used as an alert indicator of possible problems. Alert level 5 000 organisms per ml.				

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**N. VAN BINSBERGEN Pr.Sci.Nat.
 DIRECTOR**

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Att. : MR JACO BREUNISSEN (breunissenj@bergmun.org.za)

TERMS AND CONDITIONS OF BUSINESS

All work is undertaken by A.L. Abbott and Associates (Pty) Ltd, (hereinafter called “the Company”) on the following conditions :

- (i) That the total liability of the Company, its officers, servants, agents or sub-contractors for any loss or damage caused by or resulting from improper or negligent performance, purported performance or non-performance of such work shall not exceed the sum equal to fifteen times the fee payable by the client or R6000, whichever is the lesser sum.
- (ii) That the person with whom the Company shall have contracted to have performed the said work will indemnify the Company, its said officers, servants, agents and sub-contractors against all claims made by the third parties consequent upon the performance, purported performance or non-performance of such work to the extent to which the aggregate of such claims exceeds the maximum liability specified in paragraph (i) above.
- (iii) Without the prejudice to the foregoing every person who is or becomes an officer, servant, agent or sub-contractor of the Company shall have the benefit of the limitation of liability and indemnity contained in these conditions as if they were expressly made for his benefit and so far as relates to such conditions any contract entered into by the Company is entered into not only on its own benefit but also as agent and trustee for every such person as aforesaid.
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APPENDIX 1 : Specific Methods used for the Analysis of Parameters indicated in this report.

Parameter	Method	Estimated Uncertainty (%)
pH (at 25 °C) - Lab	SABS 11 : (1990 – 3 rd Revision)	0,019
pH (at 25 °C) – Field*	SABS 11 : (1990 – 3 rd Revision)	-
Langelier Saturation Index (at 25 °C)*	Calculation	-
Conductivity (mS/m) (at 25 °C)	STD Method 2501 A (1992)	2,15
Turbidity (NTU)	Hach 8237	1,81
Colour (mg/l as Pt)*	Hach 8025	-
Total Alkalinity (mg/l as CaCO ₃)*	STD Methods 2320 (1992)	-
Total Hardness (mg/l as CaCO ₃)	SABS SM 1265 (2000)	0,09
Calcium (mg/l as CaCO ₃)	SABS SM 1265 (2000)	0,09
Magnesium (mg/l as CaCO ₃)	SABS SM 1265 (2000)	0,08
Chloride (mg/l as Cl)	SABS 202 (2 nd Revision)	0,08
Fluoride (mg/l as F)	Hach 8029	0,19
Iron (µg/l as Fe)	SANS 5207 (2004)	0,09
Manganese (µg/l as Mn)	SANS 5209 (2005)	0,09
Aluminium (µg/l as Al)	SANS 6169 (2005)	0,14
Calcium Carbonate Precipitation Potential*	Calculation	-
Free Chlorine (mg/l)*	Lovibond Method 3	-
Sodium (mg/l as Na)	SANS 6050 (2004)	0,08
Potassium (mg/l as K)	STD Method 3111 B (1992)	0,07
Zinc (mg/l as Zn)	SANS 5214 (2005)	0,08
Nitrate Nitrogen (mg/l as N)	Hach 8150	0,12
Nitrate Nitrogen (mg/l as N)	Lovibond Method using Brucine	0,057
Nitrite Nitrogen (mg/l as N)	Lovibond Method	0,08
Nitrate & Nitrite Nitrogen (mg/l as N)	Hach 8150	-
Ammonia (mg/l as N)	STD Method 4500-NH ₃ :C (1992)	0,07
Sulphate (mg/l as SO ₄)	Hach 8051	0,17
Total Dissolved Solids*	STD Method 2501 A (1992)	1,63
E.coli (organisms per 100 ml)	SABS 221 (2002)	-
Coliforms (organisms per 100 ml)	SABS 221 (2002)	-
Total Plate Count (organisms per ml)	Petrifilm TM	-
Faecal coliforms (organisms per 100 ml)	SABS SM 221 (2002)	-
Settleable Solids (ml/l)*	STD Method 2540 F (1992)	-
Chemical Oxygen Demand (mg/l)	SANS 6048 (2005)	0,08
Total Kjeldahl Nitrogen (mg/l)*	Hach 8075	-
Dissolved Oxygen (mg/l)*	STD Method 4500 O-G	-
Total Suspended Solids (mg/l)*	STD Method 2540 D (1992)	-
Volatile Suspended Solids (mg/l)*	STD Method 2540 E (1992)	-
Total Phosphate (mg/l as P)*	STD Method 4500-PB (1992) / Hach 8114	-
Ortho Phosphate (mg/l as P)*	Hach 8114	-
Copper (µg/l as Cu)	SANS 5203 (2005)	0,13

* Tests marked “Not SANAS Accredited” in this report are not included in the SANAS Schedule of Accreditation for this laboratory.