



Fapas® – Water and Environmental Report DWC131

Drinking Water Chemistry

July-August 2025

PARTICIPANT LABORATORY NUMBER

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Laboratory numbers are displayed in SecureWeb next to the download link for this report and are therefore fully confidential to each laboratory.

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SUMMARY

1. The test materials for Fapas® – Drinking Water Chemistry proficiency test Distribution DWC131 were dispatched in July 2025. Each participant received water test materials together with a spiking concentrate to be analysed for a variety of analytes in Groups 1, 2, 3, 4, 5, 12, 16, 18 and 21.
2. An assigned value (x_a) was determined for each analyte and in conjunction with the standard deviation for proficiency (σ_p) was used to calculate a z-score for each result. However, those for Lithium, Mercury, Bromide and Chlorite, are given *for information only*.
3. Results for this proficiency test are summarised as follows:

Summary Tables

Group 1

analyte	assigned value, x_a	units	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Chloride	32.3	mg/l	38	39	97
Sulphate	53.1	mg/l	40	41	98
Alkalinity	241	mg HCO_3/l	18	20	90
Total Hardness	119	mg Ca/l	27	32	84
Calcium	104	mg/l	28	31	90
Magnesium	8.01	mg/l	30	30	100
Sodium	12.8	mg/l	27	29	93
Potassium	1.66	mg/l	30	30	100
Fluoride	348	$\mu\text{g/l}$	19	29	66
Phosphorus (total)	1526	$\mu\text{g P/l}$	12	14	86

Group 2

analyte	assigned value, x_a	units	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
pH	8.18	pH units	48	51	94
Turbidity	0.149	FTU	28	30	93
Colour (filtered) HAZEN units only	1.00	Hazen	12	13	92
Conductivity (20°C)	579	$\mu\text{S}/\text{cm}$	46	47	98
Nitrate	28.6	$\text{mg NO}_3/\text{l}$	40	45	89
SR Phosphate	1044	$\mu\text{g P}/\text{l}$	15	19	79
Permanganate Index Val. (PIV oxidisability) 10 min	0.550	$\text{mg O}_2/\text{l}$	8	9	89
Total Organic Carbon (TOC)	0.560	mg/l	7	11	64
Ammonium	0.481	$\text{mg NH}_4/\text{l}$	30	36	83
Nitrite	0.378	$\text{mg NO}_2/\text{l}$	34	44	77

Group 3

analyte	assigned value, x_a $\mu\text{g}/\text{l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Chromium	39.2	31	33	94
Nickel	28.4	28	30	93
Iron	304	33	35	94
Manganese	49.5	27	32	84
Aluminium	150	27	31	87
Lead	3.88	25	32	78
Cadmium	2.99	31	36	86
Copper	449	32	34	94
Zinc	352	27	30	90

Group 4

analyte	assigned value, x_a $\mu\text{g/l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Silver	15.2	6	6	100
Barium	729	16	17	94
Boron	993	15	15	100
Arsenic	5.58	19	24	79
Selenium	6.00	13	16	81
Antimony	2.10	19	21	90
Strontium	295	9	9	100
Lithium	48.3	6	6	100
Cobalt	4.86	12	13	92
Vanadium	15.2	11	11	100
Molybdenum	24.0	11	11	100
Tin	50.4	5	6	83
Beryllium	7.18	8	8	100
Mercury	1.33	10	17	59

*italics indicate for information only**Group 5*

analyte	assigned value, x_a $\mu\text{g/l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Bromide	174	7	11	64
Bromate	20.7	9	14	64
Chlorite	71.9	7	10	70
Chlorate	380	5	8	63

italics indicate for information only

Group 12

analyte	assigned value, x_a mg/l	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Total Chlorine	1.63	14	14	100
Free Chlorine	1.55	18	19	95

Group 16

analyte	assigned value, x_a $\mu\text{g/l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Cyanide (free)	32.6	12	13	92

Group 18

analyte	assigned value, x_a $\mu\text{g/l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Chromium (VI)	3.66	10	11	91

Group 21

analyte	assigned value, x_a $\mu\text{g/l}$	number of scores, $ z \leq 2$	total number of scores	% $ z \leq 2$
Uranium	49.7	19	19	100

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1. INTRODUCTION

1.1. Proficiency Testing

Proficiency testing aims to provide an independent assessment of the competence of participating laboratories. Together with the use of validated methods, proficiency testing is an essential element of laboratory quality assurance.

Further details of the Fapas[®] – Water and Environmental proficiency tests are available in our protocols [7, 8].

2. TEST MATERIAL

2.1. Preparation

Preparation of the test materials was sub-contracted to a laboratory meeting the quality requirements of the scheme's accreditation [3].

For Groups 1 to 3 a real drinking water sample was collected, mixed and sub-sampled into (1 litre and 500 ml) PET plastic bottles. One (60 ml) spiking concentrate was also prepared for these groups.

For Group 4, two samples were prepared by spiking ultra pure water with the analytes of interest. For Sample 1, a (5 litre) bulk sample was prepared and then sub-sampled into (60 ml) plastic bottles. For Sample 2, (500 ml) samples were prepared in PET plastic bottles. One (60 ml) spiking concentrate was also prepared for this Group.

For Group 5, a (6 litre) standard solution water sample was prepared containing the analytes of interest, mixed and sub-sampled into (125 ml) plastic bottles.

For Group 12 a spiking concentrate (2 ml) of total and free Chlorine was prepared.

For Group 16 a (2 ml) spiking concentrate of Cyanide was prepared.

For Group 18 a (20 ml) spiking concentrate of Chromium (VI) was prepared.

For Group 21, a (5 litre) Uranium standard solution was prepared, mixed and sub-sampled in to (60 ml) plastic bottles.

Samples for Groups 1-5 and 21 were labelled and stored at 4°C prior to distribution.

Samples for Group 12, 16 and 18 were labelled and stored at ambient temperature prior to distribution.

2.2. Dispatch

The start date was 1 July 2025. Test materials were sent to 159 participants.

Participants were given detailed instructions on how to prepare the dispatched test materials prior to their analysis and advised that Fapas[®] cannot be held responsible for any failure arising from not following these instructions.

3. RESULTS

Results were submitted by 151 participants (95%) before the closing date for this test, 1 August 2025.

Each participant was given a laboratory number, assigned in order of receipt of results. The reported analyte concentrations are given in Tables 1-9.

Participants' comments are given in Table 10.

The analytical methods used by each participant are summarised in APPENDIX I.

4. STATISTICAL EVALUATION OF RESULTS

The results submitted by participants were statistically analysed in order to provide an assigned value for each analyte. The assigned values were then used in combination with the standard deviation for proficiency, σ_p , to calculate a z-score [9] for each result. The procedure is detailed in the relevant protocols [7, 8].

Further background on the procedure followed can be found in the IUPAC International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [10].

4.1. Calculation of the Assigned Value, x_a

The assigned value, x_a , for each analyte was derived from the consensus of the results submitted by participants.

The procedure used to derive the consensus involved:

- i) exclusion, if present, of any non numerical results i.e. qualitative or semi-quantitative results,
- ii) exclusion, if present, of any results that were approximately 10, 100 or 1000 $\times$ greater or smaller than the majority of submitted results (as these were considered to be reporting errors).

The assigned values for all analytes, together with their uncertainties are shown in Table 11. Where the assigned value has been set as the robust mean, the observed standard deviation is the robust standard deviation. Where the assigned value has been set as the median, the observed standard deviation is the standardised median absolute deviation (sMAD) [7].

4.2. Standard Deviation for Proficiency, σ_p

The standard deviation for proficiency, σ_p , was set with reference to performance requirements in Water Regulations [11], at a value that reflects best practice for the analyses in question.

Full details of how σ_p was derived are given in our Protocol [8] but in summary for all analytes, except pH, σ_p was set at either one quarter of the satisfactory range, 10% of the assigned value or half the Lower Level of Interest (LLI), see Table 11. For pH, σ_p was set at 0.20 pH units.

4.3. Individual z-Scores

Participants' z-scores were calculated as:

$$z = \frac{(x - x_a)}{\sigma_p}$$

where x = the participant's reported result,
 x_a = the assigned value, see Table 11,
 and σ_p = the standard deviation for proficiency, see Table 11.

Participants' z-scores for all analytes are given in Tables 1-9. Those for Lithium, Mercury, Bromide and Chlorite are given *for information only* due to the associated high uncertainty. It is possible for the z-scores published in this report to differ slightly from the z-score that can be calculated using the formula given above. These differences arise from the necessary rounding of the actual assigned values and standard deviations for proficiency prior to their publication in Table 11.

The number and percentage of z-scores in the range $-2 \leq z \leq 2$ for all analytes are given in Table 12.

5. INTERPRETATION OF SCORES

In normal circumstances, over time, about 95% of z-scores will lie in the range $-2 \leq z \leq 2$. Occasional scores in the range $2 < |z| < 3$ are to be expected, at a rate of 1 in 20. Whether or not such scores are of importance can only be decided by considering them in the context of the other scores obtained by that laboratory.

Scores where $|z| > 3$ are to be expected at a rate of about 1 in 300. Given this rarity, such z-scores very strongly indicate that the result is not fit-for-purpose and almost certainly requires investigation.

The consideration of a set or sequence of z-scores over time provides more useful information than a single z-score. Examples of suitable methods of comparison are provided in the IUPAC International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories [10].

6. REFERENCES

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- 10 Thompson, M., Ellison, S.L.R. and Wood, R., 2006, The International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories, *Pure Appl. Chem.*, **78**, No. 1, 145–196.
- 11 Directive (EU) 2020/2184 of the European Parliament and of the Council, of 16 December 2020, on the quality of water intended for human consumption (recast).

Table 1: Results and z-Scores for Analytes in Group 1, Real Sample A

laboratory number	analyte							
	Chloride assigned value: 32.3 mg/l		Sulphate assigned value: 53.1 mg/l		Alkalinity assigned value: 241 mg HCO ₃ /l		Total Hardness assigned value: 119 mg Ca/l	
	result	z-score	result	z-score	result	z-score	result	z-score
002							165	3.8
003								
015	32.4395	0.0						
018			53.5	0.1			102.6	-1.4
020	32.00	-0.1	55.72	0.5			118.63	-0.1
022	31.840	-0.1	53.629	0.1			126.24	0.6
029	33.80	0.5	52.35	-0.2	246.0	0.2	297.44	14.9
032	31.17	-0.4	45.69	-1.4	241.36	0.0	119.6	0.0
035	32.5	0.1	52.1	-0.2	225.7	-0.6	115.2	-0.3
040	33.09	0.2	51	-0.4	268.4	1.1	118.4	-0.1
042	31.76	-0.2	49.85	-0.6	164.88	-3.2	113.1	-0.5
047	30.8	-0.5	51.7	-0.3				
048			53.59	0.1				
049			52.91	0.0				
055	33.9	0.5	55.6	0.5				
060	31.7	-0.2	52.4	-0.1	239.73	-0.1	116.8	-0.2
062	39	2.1			261.37	0.8	118	-0.1
065	38.03	1.8	51	-0.4			98.67	-1.7
069	33.67	0.4	48.40	-0.9	241.56	0.0	120	0.1
072	33.41	0.3	55.24	0.4				
075			52.0	-0.2				
076	30.57	-0.5					119	0.0
086	30.8	-0.5	52.5	-0.1	233.6	-0.3	115.3	-0.3
089	31.5	-0.3	52.0	-0.2	242	0.0	114	-0.4

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 1 (continued): Results and z-Scores for Analytes in Group 1, Real Sample A

laboratory number	analyte							
	Chloride assigned value: 32.3 mg/l		Sulphate assigned value: 53.1 mg/l		Alkalinity assigned value: 241 mg HCO ₃ /l		Total Hardness assigned value: 119 mg Ca/l	
	result	z-score	result	z-score	result	z-score	result	z-score
091	31.59	-0.2	53.12	0.0				
092	29.01	-1.0	51.19	-0.4	236.40	-0.2	114.79	-0.4
095								
098	31	-0.4	52	-0.2				
099	32.62	0.1	53	0.0			2.97	-9.8
100			54.554	0.3				
101			59.267	1.2	244.9	0.2		
102	31.80	-0.2	55	0.3			114.11	-0.4
110	31.9	-0.1	52.4	-0.1				
111							122.45	0.3
112	31.72	-0.2	53.40	0.0	234	-0.3	138	1.6
115	35	0.8	72	3.5				
116	36.8	1.4	43	-1.9	114.68	-5.2	180.80	5.2
118	34.625	0.7	56.889	0.7				
122	31.6	-0.2	55.3	0.4	248	0.3	119.8	0.0
130	31.629	-0.2	51.947	-0.2	253.76	0.5	120.0	0.1
131	30.8	-0.5	52.0	-0.2	251	0.4	117	-0.2
132	32.3	0.0	53.8	0.1				
133	33.51	0.4	51.37	-0.3			117.00	-0.2
138	31.37	-0.3	53.8	0.1	249.1	0.3	117.6	-0.1
139	32	-0.1	55	0.3	256.2	0.6	112	-0.6
143	32.32	0.0	54.27	0.2	207.00	-1.4	129.48	0.9
147	32.5	0.1	58.3	1.0			181	5.2
150	34	0.5					117	-0.2
151	27.84	-1.4	54.58	0.3			115.28	-0.3

z-scores outside |z| >2 are shown in **bold**, see Section 5

Table 1 (continued): Results and z-Scores for Analytes in Group 1, Real Sample A

laboratory number	analyte							
	Calcium assigned value: 104 mg/l		Magnesium assigned value: 8.01 mg/l		Sodium assigned value: 12.8 mg/l		Potassium assigned value: 1.66 mg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
002								
003	101.24	-0.3	7.68	-0.1	13	0.1	1.8	0.3
015								
018	102.6	-0.1	7.21	-0.3	12.8	0.0	1.54	-0.2
020	105.3	0.1	8.16	0.1	12.40	-0.3	1.513	-0.3
022	112.947	0.9	8.013	0.0	13.662	0.6	2.656	2.0
029	105.10	0.1	8.50	0.2	22.94	7.9	1.60	-0.1
032	98.0	-0.6	6.5	-0.6	11.6	-1.0	1.6	-0.1
035	107.2	0.3	6	-0.8	12.7	-0.1	2	0.7
040	102.9	-0.1	9.28	0.5				
042	100.9	-0.3	7.49	-0.2	13.29	0.4	1.55	-0.2
047								
048								
049								
055								
060	104	0.0	7.9	0.0	12.7	-0.1	1.61	-0.1
062	72	-3.1			<17.51		1.44	-0.4
065	99.47	-0.4						
069	107.63	0.3	7.60	-0.2	14.32	1.2	2.26	1.2
072	110.91	0.7	8.04	0.0	12.76	-0.1	1.59	-0.1
075								
076								
086	111.5	0.7	8.2	0.1	11.9	-0.7	1.6	-0.1
089	103	-0.1	8.34	0.1	12.2	-0.5	1.60	-0.1

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 1 (continued): Results and z-Scores for Analytes in Group 1, Real Sample A

laboratory number	analyte							
	Calcium assigned value: 104 mg/l		Magnesium assigned value: 8.01 mg/l		Sodium assigned value: 12.8 mg/l		Potassium assigned value: 1.66 mg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
091	102.5	-0.1	7.63	-0.2	13.23	0.3	1.43	-0.5
092	101.02	-0.3	8.36	0.1	14.33	1.2	1.67	0.0
095	100.41	-0.4	7.66	-0.1	12.73	-0.1	2.44	1.6
098								
099								
100	110.317	0.6	8.279	0.1	12.443	-0.3	1.596	-0.1
101								
102	101.96	-0.2						
110								
111								
112	127.1	2.2	8.6	0.2	12.54	-0.2	1.22	-0.9
115			8.33	0.1	12.4	-0.3	1.74	0.2
116	67.52	-3.5	7.39	-0.2	11.24	-1.2	1.43	-0.5
118								
122	107	0.3	7.45	-0.2	13	0.1	1.70	0.1
130			8.60	0.2	13.50	0.5	1.852	0.4
131	102	-0.2	8.09	0.0	13.1	0.2	1.71	0.1
132	106	0.2	8.54	0.2	12.6	-0.2	1.65	0.0
133	99.386	-0.4	8.235	0.1	12.739	-0.1	1.497	-0.3
138	106.3	0.2	8.23	0.1	13.45	0.5	1.73	0.1
139	97.479	-0.6	8.383	0.2	13.982	0.9	1.7	0.1
143	116	1.1	8.15	0.1	8.56	-3.3	1.44	-0.4
147								
150								
151	103.12	-0.1	7.88	-0.1	11.97	-0.7	2.59	1.9

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 1 (continued): Results and z-Scores for Analytes in Group 1, Real Sample A *Spiked*

laboratory number	analyte			
	Fluoride assigned value: 348 µg/l		Phosphorus (total) assigned value: 1526 µg P/l	
	result	z-score	result	z-score
002	100	-5.0		
003				
015				
018			1470	-0.4
020	386	0.8	1342	-1.2
022	348	0.0		
029	950.0	12.0	652.0	-5.7
032				
035	453	2.1	1743	1.4
040				
042	518	3.4	1526	0.0
047	80.7	-5.3		
048				
049				
055	370	0.4		
060	357	0.2		
062	1060	14.2		
065			1700	1.1
069	346	0.0	120	-9.2
072	303.4	-0.9	1433.31	-0.6
075				
076				
086				
089	280	-1.4		

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 1 (continued): Results and z-Scores for Analytes in Group 1, Real Sample A *Spiked*

laboratory number	analyte			
	Fluoride assigned value: 348 µg/l		Phosphorus (total) assigned value: 1526 µg P/l	
	result	z-score	result	z-score
091	0.3	-7.0		
092	418	1.4	1609.79	0.5
095				
098	0.28	-7.0		
099	110	-4.8		
100	346	0.0		
101				
102				
110	346	0.0		
111				
112	342	-0.1		
115	500	3.0		
116	410	1.2	1692	1.1
118	350.900	0.1		
122				
130				
131	324	-0.5	1542.8	0.1
132	314	-0.7		
133	355.5	0.2		
138			1508	-0.1
139	300	-1.0	1533.61	0.0
143	307	-0.8		
147				
150			1470	-0.4
151	374.47	0.5		

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2: Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	pH		Turbidity		Colour (filtered) HAZEN units only		Conductivity (20°C)	
	assigned value: 8.18 pH units		assigned value: 0.149 FTU		assigned value: 1.00 Hazen		assigned value: 579 µS/cm	
	result	z-score	result	z-score	result	z-score	result	z-score
002	8.322	0.7	0.07	-0.4	0	-1.0	607	0.5
007	8.2	0.1	0.053	-0.5	<0.6		535	-0.8
008								
011			0.078	-0.4				
015	8.19	0.1	0.0837	-0.3			593.51	0.3
016	8.25	0.4	<0.2				563.47	-0.3
017	8.46	1.4					626	0.8
018	8.2	0.1					556	-0.4
019	8.41	1.2					670	1.6
020	8.19	0.1					571	-0.1
022	8.3	0.6					552	-0.5
028	8.06	-0.6	0.10	-0.2	<7		590	0.2
035	8.34	0.8	0.12	-0.1			554	-0.4
036	8.17	0.0	0.1	-0.2	1.0	0.0	449	-2.2
039	8.22	0.2	0.1 NTU				550	-0.5
040	8.11	-0.3					577.0	0.0
047								
048								
051								
054	8.10	-0.4					680	1.8
055	8.21	0.2					553	-0.4

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	pH		Turbidity		Colour (filtered) HAZEN units only		Conductivity (20°C)	
	assigned value: 8.18 pH units		assigned value: 0.149 FTU		assigned value: 1.00 Hazen		assigned value: 579 µS/cm	
	result	z-score	result	z-score	result	z-score	result	z-score
058	7.8	-1.9	0.25	0.5			550	-0.5
060	8.03	-0.7	<0.2		<5		541	-0.6
063	8.3	0.6	0.2	0.3			550	-0.5
065	7.89	-1.4					619	0.7
066	8.23	0.3	0.2	0.3	0	-1.0	557	-0.4
067	8.03	-0.7	0.24	0.5			582.34	0.1
069	5.60	-12.9	1.10	4.8			581.0	0.0
070	7.60	-2.9	3.64	17.5	9	8.0		
072	8.08	-0.5	0.21	0.3			573.7	-0.1
077	8.251	0.4	<0.1		2	1.0	629	0.9
079			0.07	-0.4				
086	8.25	0.4	0.033	-0.6	0.165	-0.8	563	-0.3
087	8.18	0.0	0.14	0.0	0.62	-0.4	628.75	0.9
089	8.10	-0.4	0.090	-0.3			617	0.7
090	8.31	0.7						
091								
092	8.24	0.3	0.10	-0.2	1.35	0.4	539.6	-0.7
094	8.23	0.3	0.44	1.5			616	0.6
098	8.15	-0.1					573	-0.1
101	8.18	0.0	0.08	-0.3			609.9	0.5
102	7.51	-3.3						

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	pH		Turbidity		Colour (filtered) HAZEN units only		Conductivity (20°C)	
	assigned value: 8.18 pH units		assigned value: 0.149 FTU		assigned value: 1.00 Hazen		assigned value: 579 µS/cm	
	result	z-score	result	z-score	result	z-score	result	z-score
105	8.2	0.1					581	0.0
112	7.78	-2.0	0.42	1.4	3	2.0	606	0.5
115	8.208	0.1					618	0.7
116	8.34	0.8	0.2	0.3	1	0.0	550	-0.5
118								
120	8.01	-0.8			1.081	0.1		
122	8.24	0.3	0.06	-0.4	0.3	-0.7	568	-0.2
123								
125								
126	8.19	0.1	<0.250		<5.0		543	-0.6
129							557.33	-0.4
130	8.24	0.3	0.15	0.0	<2		550.0	-0.5
131	8.25	0.4	0.13	-0.1	<5		578	0.0
133	8.25	0.4	0.08	-0.3	0.64	-0.4		
135	8.20	0.1	<1				558	-0.4
138	8.2	0.1	0.23	0.4			562	-0.3
139	8.1	-0.4					620	0.7
143	8.22	0.2	0.2	0.3	<1		617.55	0.7
148	8.2	0.1	0.2	0.3	<5		563	-0.3
151	8.12	-0.3					572.60	-0.1

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	Nitrate		SR Phosphate		Permanganate Index Val. (PIV oxidisability) 10 min		Total Organic Carbon (TOC)	
	assigned value: 28.6 mg NO ₃ /l		assigned value: 1044 µg P/l		assigned value: 0.550 mg O ₂ /l		assigned value: 0.560 mg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
002	42.50	4.8						
007	28.2	-0.2	1050	0.1			1.12	2.2
008	30.5661	0.7						
011								
015	30.2566	0.6			0.5504	0.0		
016								
017								
018								
019	25	-1.3						
020	28.53	0.0			0.51	-0.2		
022	28.789	0.1			0.726	0.7		
028	30	0.5	971	-0.7	0.61	0.2	0.53	-0.1
035	29.4	0.3	1100	0.5			0.755	0.8
036					0.8	1.0		
039	6.98	-7.6			0.38	-0.7		
040								
047	27.5	-0.4						
048								
051							3.7	12.6
054	30.999	0.8						
055	32.1	1.2						

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	Nitrate		SR Phosphate		Permanganate Index Val. (PIV oxidisability) 10 min assigned value: 0.550 mg O ₂ /l		Total Organic Carbon (TOC) assigned value: 0.560 mg/l	
	assigned value: 28.6 mg NO ₃ /l		assigned value: 1044 µg P/l					
	result	z-score	result	z-score	result	z-score	result	z-score
058	28.93	0.1			1.64	4.4		
060	29.3	0.2			<1			
063	28	-0.2	980	-0.6				
065	29.53	0.3	1100	0.5				
066	29.19919	0.2					0.36666	-0.8
067	29.05	0.1			0.35	-0.8		
069	26.92	-0.6	2724	16.1			1.44	3.5
070							0.5900	0.1
072	30.35	0.6	1007.04	-0.4				
077	29.3	0.2			<0.5			
079								
086	29.5	0.3	994.8	-0.5				
087	29.4	0.3	3175.00	20.4	0.08	-1.9		
089	27.3	-0.5						
090								
091	29	0.1						
092	26.59	-0.7	1126	0.8				
094	21	-2.7						
098	28	-0.2						
101								
102								

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A

laboratory number	analyte							
	Nitrate		SR Phosphate		Permanganate Index Val. (PIV oxidisability) 10 min assigned value: 0.550 mg O ₂ /l		Total Organic Carbon (TOC) assigned value: 0.560 mg/l	
	assigned value: 28.6 mg NO ₃ /l		assigned value: 1044 µg P/l					
	result	z-score	result	z-score	result	z-score	result	z-score
105								
112	28.5	0.0						
115	21.6	-2.5						
116	26.8	-0.6	2650	15.4				
118	29.688	0.4						
120	27.2	-0.5	910	-1.3				
122	30.8	0.8	1017	-0.3				
123							0.44	-0.5
125							0.186	-1.5
126	29.5	0.3	1050	0.1	<0.50		<1.00	
129								
130	25.445	-1.1					0.4219	-0.6
131	27.5	-0.4						
133	30.45	0.6						
135	28.5	0.0	3001	18.7				
138	28.13	-0.2	1043	0.0				
139	29	0.1	1044.16	0.0			<2.0	
143	5.82	-8.0					8.3	31.0
148	29.5	0.3	916.9	-1.2				
151	29.84	0.4	1007.82	-0.3				

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A *Spiked*

laboratory number	analyte			
	Ammonium assigned value: 0.481 mg NH ₄ /l		Nitrite assigned value: 0.378 mg NO ₂ /l	
	result	z-score	result	z-score
002			0.36	-0.5
007	0.489	0.2	0.394	0.4
008	0.5	0.4	0.4009	0.6
011				
015	0.43487	-1.0	0.3818	0.1
016				
017				
018				
019				
020	0.524	0.9	0.367	-0.3
022	0.470	-0.2	0.374	-0.1
028	0.49	0.2	0.35	-0.7
035	0.452	-0.6	0.434	1.5
036	0.497	0.3	0.378	0.0
039	0.4	-1.7	0.109	-7.1
040				
047			< 0.01	
048			0.12	-6.8
051				
054	0.504	0.5	0.367	-0.3
055	0.503	0.5	0.439	1.6

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A *Spiked*

laboratory number	analyte			
	Ammonium assigned value: 0.481 mg NH ₄ /l		Nitrite assigned value: 0.378 mg NO ₂ /l	
	result	z-score	result	z-score
058	0.46	-0.4	0.42	1.1
060	0.415	-1.4	0.368	-0.3
063	0.363	-2.4	6.3	156.7
065	<0.6		0.405	0.7
066			0.38132	0.1
067	0.509	0.6	0.381	0.1
069	0.14	-7.1	0.41	0.8
070				
072			0.30	-2.1
077	1.03	11.4	390	10306.8
079				
086	0.509	0.6	0.381	0.1
087	0.50	0.4	0.430	1.4
089	0.517	0.8	0.380	0.1
090				
091	0.5193	0.8	0.365	-0.3
092	0.495	0.3	0.386	0.2
094	0.34	-2.9	0.43	1.4
098			0.35	-0.7
101				
102				

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 2 (continued): Results and z-Scores for Analytes in Group 2, Real Sample A *Spiked*

laboratory number	analyte			
	Ammonium assigned value: 0.481 mg NH ₄ /l		Nitrite assigned value: 0.378 mg NO ₂ /l	
	result	z-score	result	z-score
105				
112	0.45	-0.6	0.425	1.2
115			0.372	-0.2
116	0.61	2.7	0.10	-7.4
118	0.4626	-0.4	0.299	-2.1
120	0.48	0.0	0.40	0.6
122	0.53	1.0	0.384	0.2
123				
125				
126	0.504	0.5	0.391	0.3
129				
130	0.4398	-0.9	0.5407	4.3
131			0.388	0.3
133				
135	0.56	1.6	0.4067	0.8
138	0.477	-0.1	0.361	-0.5
139	0.49	0.2	0.38	0.1
143	0.325	-3.2	0.11	-7.1
148	0.49	0.2	0.38	0.1
151	0.50	0.4	0.29	-2.3

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3: Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte							
	Chromium assigned value: 39.2 µg/l		Nickel assigned value: 28.4 µg/l		Iron assigned value: 304 µg/l		Manganese assigned value: 49.5 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
013	41.50	0.6	28.60	0.1	320	0.5	51.50	0.4
018	39.6	0.1	29.0	0.2	301	-0.1	50.8	0.3
022	40.5	0.3	28.7	0.1	328	0.8	51.2	0.3
025	32	-1.8	2	-9.3	345	1.4	52	0.5
026	40.3	0.3	28.2	-0.1	306	0.1	52.2	0.5
029	21.70	-4.5	12.60	-5.6	271.0	-1.1	21.80	-5.5
036					345	1.4		
039					340	1.2		
040					235	-2.3		
050	43.0	1.0	28.53	0.1	273.0	-1.0	52.0	0.5
053	38.06	-0.3	-		305.04	0.0	45.42	-0.8

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte							
	Chromium assigned value: 39.2 µg/l		Nickel assigned value: 28.4 µg/l		Iron assigned value: 304 µg/l		Manganese assigned value: 49.5 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
055								
056								
063	39	0.0	29	0.2	300	-0.1	48	-0.3
069	40.20	0.3	29.62	0.4	296.39	-0.2	46.90	-0.5
073	41.0	0.5	29.9	0.5	321.6	0.6	52.5	0.6
080								
084	38.8	-0.1	28.5	0.0	299	-0.2	49.4	0.0
085								
089	40.2	0.3	26.5	-0.7	298	-0.2	51.7	0.4
091	34	-1.3	23	-1.9			35	-2.9
092	36.10	-0.8	25.69	-0.9	285.55	-0.6	45.86	-0.7

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte							
	Chromium assigned value: 39.2 µg/l		Nickel assigned value: 28.4 µg/l		Iron assigned value: 304 µg/l		Manganese assigned value: 49.5 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
093	40.9	0.4						
100	40.652	0.4	25.585	-1.0	348.55	1.5	54.643	1.0
104	39.45	0.1	31.11	1.0	307.25	0.1	49.44	0.0
106	40.500	0.3	30.316	0.7	320.000	0.5	49.904	0.1
108	34.7	-1.1	26.2	-0.8	263	-1.3	45.7	-0.8
109								
112	37	-0.6	28	-0.1	315	0.4	48	-0.3
115	40.4	0.3	30.1	0.6	292	-0.4	48.2	-0.3
116	20.20	-4.8	27.23	-0.4	300.20	-0.1	49.31	0.0
127							73.2	4.7
130	42.0	0.7	30.0	0.6	296.0	-0.3	52.0	0.5

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte							
	Chromium assigned value: 39.2 µg/l		Nickel assigned value: 28.4 µg/l		Iron assigned value: 304 µg/l		Manganese assigned value: 49.5 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
131	39.4	0.1	27.7	-0.2	309	0.2	52.7	0.6
133	40.6	0.4	28.0	-0.1	320	0.5	49.5	0.0
138					305.36	0.0		
139	39.428	0.1	29.022	0.2	290.035	-0.5	51.561	0.4
140	37.34	-0.5	29.70	0.5	232.29	-2.4	33.30	-3.2
142								
143	43.5	1.1	33	1.6	355	1.7	49.8	0.1
144	38.83	-0.1	28.28	0.0	298.98	-0.2	47.97	-0.3
145	35.68	-0.9	25.53	-1.0	260.00	-1.4	45.00	-0.9
146					316	0.4	65.3	3.2
149	44.8	1.4	31.8	1.2				
150	42	0.7			290	-0.5		

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte									
	Aluminium assigned value: 150 µg/l		Lead assigned value: 3.88 µg/l		Cadmium assigned value: 2.99 µg/l		Copper assigned value: 449 µg/l		Zinc assigned value: 352 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score	result	z-score
013	152.16	0.1	3.72	-0.3	2.85	-0.5	416	-0.7	344.24	-0.2
018	152	0.1	3.86	0.0	2.97	-0.1	448	0.0	353	0.0
022	144	-0.4	3.99	0.2	2.48	-1.7	479	0.7	369	0.5
025	155	0.3					528	1.8	391	1.1
026	152	0.1	2.00	-3.8	4.50	5.1	448	0.0	337	-0.4
029	72.30	-5.2	3.20	-1.4	2.20	-2.6	208.30	-5.4	157.50	-5.5
036							400	-1.1		
039	140	-0.7								
040										
050	152.0	0.1	3.70	-0.4	2.92	-0.2	469.0	0.5	436.0	2.4
053	140.37	-0.6	4.09	0.4	2.91	-0.3	480	0.7	-	

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte									
	Aluminium assigned value: 150 µg/l		Lead assigned value: 3.88 µg/l		Cadmium assigned value: 2.99 µg/l		Copper assigned value: 449 µg/l		Zinc assigned value: 352 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score	result	z-score
055										
056			6.0	4.2	3.777	2.6				
063	180	2.0	<10		<5		470	0.5	350	0.0
069	150.45	0.0	4.23	0.7	3.02	0.1	428.07	-0.5	344.40	-0.2
073	161.7	0.8	4.1	0.4	2.9	-0.3	446.0	-0.1	342.4	-0.3
080			4.15	0.5	3.36	1.2				
084	148	-0.1	4.06	0.4	2.86	-0.4	443	-0.1	346	-0.2
085			3.73	-0.3	3.02	0.1				
089	157	0.5	3.74	-0.3	3.04	0.2	434	-0.3	344	-0.2
091			3.3	-1.2	2.6	-1.3	346	-2.3		
092	125.47	-1.6	3.76	-0.2	2.68	-1.0	427.02	-0.5	329.63	-0.6

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte									
	Aluminium assigned value: 150 µg/l		Lead assigned value: 3.88 µg/l		Cadmium assigned value: 2.99 µg/l		Copper assigned value: 449 µg/l		Zinc assigned value: 352 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score	result	z-score
093					2.8	-0.6	390	-1.3		
100			0	-7.8	3.037	0.2	445	-0.1	335.67	-0.5
104	149.08	-0.1	4.18	0.6	3.08	0.3	452.57	0.1	374.22	0.6
106	139.333	-0.7			2.885	-0.3	471.667	0.5	349.667	-0.1
108	153.5	0.2	2.4	-3.0	2.6	-1.3	458	0.2	348	-0.1
109			3.7	-0.4	3.2	0.7				
112	160	0.7	9	10.2	3.85	2.9	431	-0.4	331	-0.6
115			2.84	-2.1	2.74	-0.8	436	-0.3	318	-1.0
116	130.60	-1.3	21.31	34.9	5.05	6.9	440.20	-0.2	331	-0.6
127	240	6.0								
130					3.00	0.0	475.0	0.6	370.0	0.5

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 3 (continued): Results and z-Scores for Analytes in Group 3, Real Sample M

laboratory number	analyte									
	Aluminium assigned value: 150 µg/l		Lead assigned value: 3.88 µg/l		Cadmium assigned value: 2.99 µg/l		Copper assigned value: 449 µg/l		Zinc assigned value: 352 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score	result	z-score
131	157	0.5	3.83	-0.1	3.04	0.2	480	0.7	392	1.1
133	167	1.1	4.5	1.2	2.9	-0.3	461.4	0.3	365.9	0.4
138	146.56	-0.2					460.61	0.3	357.96	0.2
139	151.143	0.1	3.975	0.2	2.935	-0.2	464.903	0.4	362.2	0.3
140	172.53	1.5	3.94	0.1	3.24	0.8	540.50	2.0	327.90	-0.7
142			4.27	0.8	3.05	0.2				
143	146	-0.3	3.5	-0.8	3.5	1.7	470	0.5	469	3.3
144	140.31	-0.6	4.33	0.9	3.04	0.2	455.76	0.2	360	0.2
145	132.00	-1.2	BLQ		2.96	-0.1	395.00	-1.2	320.00	-0.9
146	259	7.3								
149			3.73	-0.3	2.94	-0.2	463	0.3	372	0.6
150	114	-2.4	3.3	-1.2	2.8	-0.6				

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 4: Results and z-Scores for Analytes in Group 4, Sample 1

laboratory number	analyte	
	Silver assigned value: 15.2 µg/l	
	result	z-score
013		
018	14.75	-0.3
022		
031		
044		
048		
060		
063	15	-0.1
072		
073		
084	15.3	0.1
085		
089		
091		
092		
100		
106		
108		
112		
115		
116	16.39	0.8
117		
130		
133	18.2	2.0
138		
139	12.362	-1.8
142		

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 4 (continued): Results and z-Scores for Analytes in Group 4, Sample 2

laboratory number	analyte							
	Barium assigned value: 729 µg/l		Boron assigned value: 993 µg/l		Arsenic assigned value: 5.58 µg/l		Selenium assigned value: 6.00 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
013	725.8	0.0	1000	0.1	5.64	0.1	6.20	0.3
018	745	0.2	948	-0.5	6.0	0.8	5.6	-0.7
022					5.27	-0.6	6.03	0.1
031								
044					5.5806	0.0		
048					6.86	2.3		
060	723	-0.1	944	-0.5	5.2	-0.7	5.9	-0.2
063	760	0.4	1100	1.1	6	0.8	6.1	0.2
072					5.32	-0.5		
073			993.0	0.0	5.6	0.0	5.7	-0.5
084	751	0.3			5.72	0.2	5.70	-0.5
085					5.21	-0.7		
089	718	-0.1	946	-0.5	5.68	0.2	6.99	1.7
091	643	-1.2	823	-1.7	4.0	-2.8	4.2	-3.0
092	706.39	-0.3	1010.00	0.2	5.79	0.4	6.19	0.3
100	741.133	0.2	903.044	-0.9	6.452	1.6	6.019	0.0
106	809.040	1.1	1028.676	0.4	5.432	-0.3		
108	728.7	0.0	1019.8	0.3				
112	705	-0.3	853	-1.4	8	4.3	8.5	4.2
115	671	-0.8			4.93	-1.2	4.82	-2.0
116	533.30	-2.7	997.20	0.0	0.045	-9.9		
117					5.14	-0.8		
130	817.0	1.2	1010.0	0.2	7.0	2.5	6.0	0.0
133	747.2	0.3			5.5	-0.1	6.0	0.0
138								
139	745.453	0.2	967.297	-0.3	4.938	-1.2	4.283	-2.9
142					5.36	-0.4		

z-scores outside |z| >2 are shown in **bold**, see Section 5

Table 4 (continued): Results and z-Scores for Analytes in Group 4, Sample 2

laboratory number	analyte							
	Antimony assigned value: 2.10 µg/l		Strontium assigned value: 295 µg/l		Lithium assigned value: 48.3 µg/l		Cobalt assigned value: 4.86 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
013	2.05	-0.1					28.60	23.7
018	2.2	0.2	300	0.2			4.98	0.1
022	1.75	-0.7					4.73	-0.1
031								
044								
048								
060	1.95	-0.3						
063	2.1	0.0	310	0.5	54	<i>1.1</i>	5.2	0.3
072								
073	2.1	0.0						
084	2.10	0.0	302	0.3			4.86	0.0
085	2.00	-0.2						
089	1.09	-2.0	280	-0.5	53.8	<i>1.1</i>	4.73	-0.1
091	1.8	-0.6						
092	1.96	-0.3	288.61	-0.2	51.64	<i>0.7</i>	4.48	-0.4
100	2.350	0.5						
106								
108	2.4	0.6	289	-0.2			4.3	-0.6
112	4.5	4.8			45	<i>-0.7</i>		
115	4.08	4.0					4.83	0.0
116	2.37	0.5	299.60	0.2	44.68	<i>-0.7</i>	3.616	-1.2
117	2.02	-0.2						
130	3.00	1.8	294.5	0.0	40.08	<i>-1.6</i>	5.234	0.4
133	2.2	0.2					5.3	0.4
138								
139	2.01	-0.2	279.966	-0.5			5.081	0.2
142	2.00	-0.2						

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5
italics indicate for information only

Table 4 (continued): Results and z-Scores for Analytes in Group 4, Sample 2

laboratory number	analyte							
	Vanadium assigned value: 15.2 µg/l		Molybdenum assigned value: 24.0 µg/l		Tin assigned value: 50.4 µg/l		Beryllium assigned value: 7.18 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
013	15.80	0.4					7.20	0.0
018	14.7	-0.3	23.9	0.0			6.63	-0.5
022	14.6	-0.4						
031								
044								
048								
060								
063	16	0.5	26	0.8	50	-0.1	7.4	0.2
072								
073			25.1	0.5				
084	15.1	-0.1			49.8	-0.1	7.02	-0.2
085								
089	15.2	0.0	26.3	1.0			7.15	0.0
091								
092	16.28	0.7	22.22	-0.7			7.31	0.1
100								
106			26.095	0.9				
108	13.9	-0.9	25.2	0.5	50.8	0.1		
112			24	0.0				
115								
116	16.39	0.8	22.44	-0.6				
117								
130	15.61	0.3	22.32	-0.7	53.74	0.7	7.564	0.4
133					63.0	2.5		
138								
139	14.297	-0.6	20.437	-1.5	43.148	-1.4	6.818	-0.4
142								

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 4 (continued): Results and z-Scores for Analytes in Group 4, Sample 2 *Spiked*

laboratory number	analyte	
	Mercury assigned value: 1.33 µg/l	
	result	z-score
013	1	-2.5
018	1.332	0.0
022		
031	1.31	-0.2
044	1.1639	-1.3
048		
060	1.40	0.5
063	2.2	6.5
072	1.246	-0.6
073		
084	1.441	0.8
085	1.70	2.8
089		
091	3.4	15.5
092		
100	1.115	-1.6
106	2.772	10.8
108		
112		
115	1.01	-2.4
116		
117	1.86	4.0
130		
133	1.28	-0.4
138		
139	1.209	-0.9
142	1.38	0.4

italics indicate for information only

Table 5: Results and z-Scores for Analytes in Group 5, *Spiked*

laboratory number	analyte							
	Bromide assigned value: 174 µg/l		Bromate assigned value: 20.7 µg/l		Chlorite assigned value: 71.9 µg/l		Chlorate assigned value: 380 µg/l	
	result	z-score	result	z-score	result	z-score	result	z-score
006			13.79	-3.3	76.7	0.7		
014			19.948	-0.4				
020	205	1.8						
047								
057			20.682	0.0				
058			14.1	-3.2	71.9	0.0		
060	180	0.3	24.9	2.0	72	0.0	43.9	-8.8
061	174.1	0.0					384.8	0.1
068			20.36	-0.2				
072	131.30	-2.5	21.60	0.4				
078	160	-0.8	<5		60	-1.7	380	0.0
088			21.22	0.3	65.78	-0.9		
098			0.027	-10.0	0.0637	-10.0	0.355	-10.0
112	210	2.1	22	0.6	98	3.6	298	-2.2
120	165	-0.5						
131	174	0.0	20.2	-0.2	53.7	-2.5	386	0.2
134	554	21.8	21.19	0.2	86	2.0	427.85	1.3
136	154.50	-1.1	28.30	3.7	70.30	-0.2	376.20	-0.1
141	116	-3.3	7.40	-6.4				

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5
italics indicate for information only

Table 6: Results and z-Scores for Analytes in Group 12

laboratory number	analyte			
	Total Chlorine assigned value: 1.63 mg/l		Free Chlorine assigned value: 1.55 mg/l	
	result	z-score	result	z-score
004	1.67	0.2	1.65	0.6
005	1.58	-0.3	1.55	0.0
010	1.69	0.4	1.72	1.1
023	1.51	-0.7	1.47	-0.5
024			1.47	-0.5
027			1.65	0.6
036	1.65	0.1	1.59	0.3
039			1.47	-0.5
042	1.52	-0.7	1.39	-1.0
045	1.62	-0.1	1.52	-0.2
074	1.50	-0.8	1.48	-0.5
077			1.55	0.0
087	1.51	-0.7	1.34	-1.4
092	1.73	0.6	1.73	1.2
094	1.74	0.7	1.68	0.8
101	1.912	1.7		
112			3.5	12.6
122	1.64	0.1	1.63	0.5
124	1.60	-0.2	1.49	-0.4
143			1.749	1.3

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 7: Results and z-Scores for Analytes in Group 16

laboratory number	analyte	
	Cyanide (free) assigned value: 32.6 µg/l	
	result	z-score
003	32	-0.2
006	32.09	-0.2
009	32	-0.2
012	32.050	-0.2
033	35.6	0.9
042	0.8	-9.8
046	33.2	0.2
052	34	0.4
059	31.2	-0.4
060	34.8	0.7
089	30.6	-0.6
107	34.00	0.4
113	39.27	2.0

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 8: Results and z-Scores for Analytes in Group 18

laboratory number	analyte	
	Chromium (VI) assigned value: 3.66 µg/l	
	result	z-score
001	2.65	-0.4
022	3.659	0.0
027	6.18	1.0
038	3.708	0.0
078	3	-0.3
081	2.65	-0.4
082	2.90	-0.3
083	44.5	16.4
096	4.20	0.2
108	0.0	-1.5
137	<20	
150	3.7	0.0

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 9: Results and z-Scores for Analytes in Group 21

laboratory number	analyte	
	Uranium assigned value: 49.7 µg/l	
	result	z-score
003	49.5	0.0
021	53.2	0.7
030	47.2	-0.5
034	46.9	-0.6
037	52.7	0.6
041	49.43	0.0
043	50.8	0.2
046	55.25	1.1
050	51.0	0.3
064	45.75	-0.8
071	49.7	0.0
097	51.7	0.4
103	51.5	0.4
104	50.62	0.2
114	46.45	-0.6
119	49.50	0.0
121	48.70	-0.2
128	45.57	-0.8
137	49.5	0.0

z-scores outside $|z| > 2$ are shown in **bold**, see Section 5

Table 10: Participants' Comments*Group 1*

laboratory number	comments
002	Converted results for Total hardness as CaCO ₃ to Ca (mg Ca/L), and fluoride from mg/L to ug/L
069	METHOD ANION-APHA 4110B METHOD CATION-IN HOUSE METHOD HARDNESS-APHA2340 B&IN HOUSE METHOD ALKALINITY- HACH METHOD 8221, 9TH EDITION METHOD TOTAL PHOSPHORUS-HACH METHOD 8190, 10TH EDITION
115	Environmental Laboratory

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 2

laboratory number	comments
002	Sample was delivered on Tuesday, 08/07/2025 15:19
066	We used Mexican standards. The method used in the colour test was visual
120	IC TS ISO EN 14911/10304 SM 4500 -HB. SM2120C

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 3

laboratory number	comments
013	icp-ms
069	sample prep with digestion
108	The lead result is below the LOQ, but reported as part of reverification process
144	IS 3025 part 65 by ICP-MS
145	Limit of Quantification for Lead- 10 µg/l
149	444

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 4

laboratory number	comments
031	Atomiv fluorescence spectrophotometry
100	Antimony - LOQ 3 ug/l
108	The Co and Sb result is below the LOQ, but reported as part of reverification process

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 5

laboratory number	comments
120	IC TS ISO EN 10304
136	Test by Ion Chromatography

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 16

laboratory number	comments
107	Standard methods for the examination of water and wastewater. American Public Health Association (APHA) - American Water Work Association (AWWA) - Water Environment Federation (WEF), 4500CN-E, colorimetric method, Washington, DC., 24th Edition, 2022.

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 18

laboratory number	comments
038	Bestimmung nach Verdünnung
083	APHA 3500-Cr D method used. Instrument HACH DR6000. Uncertainty is 9.3 ug/L
096	method: 1,5-Diphenylcarbohydrazide spectrophotometric method(GB/T 5750.6-2023) wavelength: 540nm Sample preparation:1.Adjust the sample temperature to 22(oC) 2.Add 900mL reagent-grade water to a 1 litre volumetric flask 3.Using a pipette, transfer 10.00mL from the sample into the volumetric flask 4.Fill the flask to volume with reagent-grade water, stopper and invert to mix Curve:A=0.0022C-0.0003 (linear range:0.00-200 µg/l r=0.9999)
108	The result is below the LOQ

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Group 21

laboratory number	comments
021	ICP MS UNI EN ISO 17294-2:2024 TIZMEL
037	Method accredited for Cu and Zn.
103	PN-EN ISO 17294-2:2024-04

comments are as submitted by participants but some may have been edited to maintain participant anonymity

Table 11: Assigned Values and Standard Deviations for Proficiency*Group 1*

analyte	data points, n	assigned value, x_a	units	observed sd	uncertainty, u	standard deviation for proficiency, σ_p	
Chloride	39	32.3 (rm)	mg/l	1.49 (sh)	0.2	10% AV	3.23
Sulphate	41	53.1 (rm)	mg/l	2.20 (sh)	0.3	10% AV	5.31
Alkalinity	20	241 (rm)	mg HCO ₃ /l	15.6 (sh)	3	10% AV	24.1
Total Hardness	31	119 (rm)	mg Ca/l	7.3 (sh)	1	10% AV	11.9
Calcium	31	104 (rm)	mg/l	5.5 (sh)	1	10% AV	10.4
Magnesium	30	8.01 (rm)	mg/l	0.508 (sh)	0.09	half LLI	2.500
Sodium	29	12.8 (rm)	mg/l	0.85 (sh)	0.2	10% AV	1.28
Potassium	30	1.66 (rm)	mg/l	0.203 (sh)	0.04	half LLI	0.500
Fluoride	27	348 (m)	µg/l	60.8 (sm)	12	half LLI	50.0
Phosphorus (total)	13	1526 (m)	µg P/l	124.2 (sm)	34	10% AV	152.6
<i>rm = robust mean</i>		<i>m = median</i>		<i>sh = robust sd</i>		<i>sm = sMAD</i>	

Group 2

analyte	data points, n	assigned value, x_a	units	observed sd	uncertainty, u	standard deviation for proficiency, σ_p	
pH	51	8.18 (rm)	pH units	0.119 (sh)	0.02	fixed sd	0.200
Turbidity	29	0.149 (rm)	FTU	0.0876 (sh)	0.016	¼ sat. range	0.1990
Colour (filtered) HAZEN units only	11	1.00 (m)	Hazen	0.563 (sm)	0.17	¼ sat. range	0.995
Conductivity (20°C)	47	579 (rm)	µS/cm	34.6 (sh)	5	10% AV	57.9
Nitrate	45	28.6 (rm)	mg NO ₃ /l	1.78 (sh)	0.3	10% AV	2.86
SR Phosphate	19	1044 (m)	µg P/l	82.8 (sm)	19	10% AV	104.4
Permanganate Index Val. (PIV oxidisability) 10 min	9	0.550 (m)	mg O ₂ /l	0.2603 (sm)	0.087	half LLI	0.2500
Total Organic Carbon (TOC)	10	0.560 (m)	mg/l	0.2879 (sm)	0.091	half LLI	0.2500
Ammonium	36	0.481 (rm)	mg NH ₄ /l	0.0498 (sh)	0.008	10% AV	0.0481
Nitrite	42	0.378 (rm)	mg NO ₂ /l	0.0409 (sh)	0.006	10% AV	0.0378
<i>rm = robust mean</i>		<i>m = median</i>		<i>sh = robust sd</i>		<i>sm = sMAD</i>	

Group 3

analyte	data points, <i>n</i>	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Chromium	33	39.2 (rm)	3.03 (sh)	0.5	10% AV	3.92
Nickel	29	28.4 (rm)	2.12 (sh)	0.4	10% AV	2.84
Iron	35	304 (rm)	27.5 (sh)	5	10% AV	30.4
Manganese	32	49.5 (rm)	3.62 (sh)	0.6	half LLI	5.00
Aluminium	31	150 (rm)	15.5 (sh)	3	10% AV	15.0
Lead	31	3.88 (rm)	0.517 (sh)	0.09	half LLI	0.500
Cadmium	36	2.99 (rm)	0.276 (sh)	0.05	10% AV	0.299
Copper	34	449 (rm)	30.3 (sh)	5	10% AV	44.9
Zinc	30	352 (rm)	24.5 (sh)	4	10% AV	35.2

*rm = robust mean**sh = robust sd**Group 4*

analyte	data points, <i>n</i>	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Silver	6	15.2 (m)	1.22 (sm)	0.5	10% AV	1.52
Barium	17	729 (m)	33.1 (sm)	8	10% AV	72.9
Boron	15	993 (m)	52.9 (sm)	14	10% AV	99.3
Arsenic	23	5.58 (m)	0.549 (sm)	0.11	10% AV	0.558
Selenium	16	6.00 (m)	0.371 (sm)	0.09	10% AV	0.600
Antimony	21	2.10 (m)	0.208 (sm)	0.05	half LLI	0.500
Strontium	9	295 (m)	8.7 (sm)	3	10% AV	29.5
Lithium	6	48.3 (m)	6.76 (sm)	2.8	half LLI	5.00
Cobalt	13	4.86 (m)	0.504 (sm)	0.14	half LLI	1.000
Vanadium	11	15.2 (m)	0.89 (sm)	0.3	10% AV	1.52
Molybdenum	11	24.0 (m)	2.49 (sm)	0.8	10% AV	2.40
Tin	6	50.4 (m)	2.92 (sm)	1.2	10% AV	5.04
Beryllium	8	7.18 (m)	0.282 (sm)	0.10	half LLI	1.000
Mercury	17	1.33 (m)	0.249 (sm)	0.06	10% AV	0.133

*m = median**sm = sMAD**italics indicate for information only*

Group 5

analyte	data points, <i>n</i>	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Bromide	11	174 (<i>m</i>)	28.9 (<i>sm</i>)	9	10% AV	17.4
Bromate	13	20.7 (<i>m</i>)	1.36 (<i>sm</i>)	0.4	10% AV	2.07
Chlorite	9	71.9 (<i>m</i>)	9.07 (<i>sm</i>)	3.0	10% AV	7.19
Chlorate	7	380 (<i>m</i>)	8.9 (<i>sm</i>)	3	10% AV	38.0
<i>m = median</i>		<i>sm = sMAD</i>	<i>italics indicate for information only</i>			

Group 12

analyte	data points, <i>n</i>	assigned value, x_a mg/l	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Total Chlorine	14	1.63 (<i>m</i>)	0.119 (<i>sm</i>)	0.03	10% AV	0.163
Free Chlorine	19	1.55 (<i>m</i>)	0.119 (<i>sm</i>)	0.03	10% AV	0.155
<i>m = median</i>		<i>sm = sMAD</i>				

Group 16

analyte	data points, <i>n</i>	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Cyanide (free)	12	32.6 (<i>m</i>)	2.01 (<i>sm</i>)	0.6	10% AV	3.26
<i>m = median</i>		<i>sm = sMAD</i>				

Group 18

analyte	data points, <i>n</i>	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, <i>u</i>	standard deviation for proficiency, σ_p	
Chromium (VI)	9	3.66 (<i>m</i>)	0.977 (<i>sm</i>)	0.33	¼ sat. range	2.488
<i>m = median</i>		<i>sm = sMAD</i>				

Group 21

analyte	data points, n	assigned value, x_a $\mu\text{g/l}$	observed sd	uncertainty, u	standard deviation for proficiency, σ_p	
Uranium	19	49.7 (rm)	2.77 (sh)	0.6	10% AV	4.97
<i>rm = robust mean</i>		<i>sh = robust sd</i>				

Table 12: Number and Percentage of z-Scores where $|z| \leq 2$ *Group 1*

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Chloride	38	39	97
Sulphate	40	41	98
Alkalinity	18	20	90
Total Hardness	27	32	84
Calcium	28	31	90
Magnesium	30	30	100
Sodium	27	29	93
Potassium	30	30	100
Fluoride	19	29	66
Phosphorus (total)	12	14	86

Group 2

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
pH	48	51	94
Turbidity	28	30	93
Colour (filtered) HAZEN units only	12	13	92
Conductivity (20°C)	46	47	98
Nitrate	40	45	89
SR Phosphate	15	19	79
Permanganate Index Val. (PIV oxidisability) 10 min	8	9	89
Total Organic Carbon (TOC)	7	11	64
Ammonium	30	36	83
Nitrite	34	44	77

Group 3

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Chromium	31	33	94
Nickel	28	30	93
Iron	33	35	94
Manganese	27	32	84
Aluminium	27	31	87
Lead	25	32	78
Cadmium	31	36	86
Copper	32	34	94
Zinc	27	30	90

Group 4

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Silver	6	6	100
Barium	16	17	94
Boron	15	15	100
Arsenic	19	24	79
Selenium	13	16	81
Antimony	19	21	90
Strontium	9	9	100
Lithium	6	6	100
Cobalt	12	13	92
Vanadium	11	11	100
Molybdenum	11	11	100
Tin	5	6	83
Beryllium	8	8	100
Mercury	10	17	59

italics indicate for information only

Group 5

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Bromide	7	11	64
Bromate	9	14	64
Chlorite	7	10	70
Chlorate	5	8	63

*italics indicate for information only**Group 12*

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Total Chlorine	14	14	100
Free Chlorine	18	19	95

Group 16

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Cyanide (free)	12	13	92

Group 18

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Chromium (VI)	10	11	91

Group 21

analyte	number of scores where $ z \leq 2$	total number of scores	% $ z \leq 2$
Uranium	19	19	100

APPENDIX I: Analytical Methods Used by Participants

Methods are tabulated according to the information supplied by participants, but some responses may have been combined or edited for clarity. Text that appears as unreadable symbols are derived from entries made using non-Western characters.

DW131c01

Method of Analysis Used for Sodium (Group 1)	laboratory number
AAS	003 029 062 100
ICP-OES	032 047 089 116 130 132 138
ICP-MS	086 095 110 115 133
Colorimetric/Spectrophotometric (manual)	065
Ion Chromatography (IC)	020 022 035 060 069 091 112

Method of Analysis Used for Potassium (Group 1)	laboratory number
AAS	003 029 062 100
ICP-MS	086 095 115 133
ICP-OES	032 089 110 116 130 132 138
Ion Chromatography (IC)	020 022 035 060 069 091 112

Method of Analysis Used for Chloride (Group 1)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	086 089
Colorimetric/Spectrophotometric (manual)	065 116
Ion Chromatography (IC)	020 022 035 047 060 069 091 098 110 112 118 130 132 138 147
Titrimetric	015 029 032 040 062 076 099 102 115 133 150

Method of Analysis Used for Calcium (Group1)	laboratory number
AAS	100
ICP-MS	003 086 095 110 115 133
ICP-OES	032 089 116 130 132 138
Ion Chromatography (IC)	020 022 060 069 091 112
Titrimetric	029 035 040 062 102

Method of Analysis Used for Magnesium (Group 1)	laboratory number
AAS	100
ICP-MS	003 086 095 110 115 133
ICP-OES	032 089 116 130 132 138
Ion Chromatography (IC)	020 022 035 060 069 091 112
Titrimetric	029 040
Method of Analysis Used for Alkalinity (Group 1)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	086
Colorimetric/Spectrophotometric (manual)	060 069
Titrimetric	029 032 035 040 062 089 101 110 112 116 130 138
Method of Analysis Used for Total Hardness (Group 1)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	086
Colorimetric/Spectrophotometric (manual)	002 060 065
ICP-OES	089 116
Titrimetric	029 032 035 040 062 069 076 099 102 110 112 130 133 138 147 150
Method of Analysis Used for Total Phosphorus (Group 1)	laboratory number
Colorimetric/Spectrophotometric (manual)	029 035 060 065 069 150
ICP-OES	110 116 130 138
Method of Analysis Used for Fluoride (Group 1)	laboratory number
Colorimetric/Spectrophotometric (manual)	002 062 089 099 115 116
Ion Chromatography (IC)	020 022 035 047 060 069 091 098 110 112 118 130 132
Ion Selective Electrode (ISE)	029 100 133

Method of Analysis Used for Sulphate (Group 1)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	086 089 100 101
Colorimetric/Spectrophotometric (manual)	029 040 065 099 102 115 116
Gravimetric	032 133
Ion Chromatography (IC)	020 022 035 047 048 060 069 075 091 098 110 112 118 130 132 138 147

DW131c02

Method of Analysis Used for Nitrite (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	007 008 028 055 086 087 089 116 126 135
Colorimetric/Spectrophotometric (manual)	002 015 020 036 039 048 054 065 066 067 077 094 115 148
Ion Chromatography (IC)	022 035 047 058 060 063 069 091 098 112 118 120 130 138

Method of Analysis Used for Nitrate (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	007 008 019 028 055 086 087 089 116 135
Colorimetric/Spectrophotometric (manual)	002 015 039 054 065 066 067 077 094 115 126 133
Ion Chromatography (IC)	020 022 035 047 058 060 063 069 091 098 112 118 120 130 138
Ion Selective Electrode (ISE)	148

Method of Analysis Used for Ammonium (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	007 008 028 055 086 089 116 126 135
Colorimetric/Spectrophotometric (manual)	015 036 039 054 063 065 067 077 087 094 112
Ion Chromatography (IC)	020 022 035 058 060 069 091 118 120 130 138
Ion Selective Electrode (ISE)	148

Method of Analysis Used for TOC (Group 2)	laboratory number
High Temperature UV Persulphate with NDIR	028 035 051
Low Temperature Membrane Conductometric	125
Combustion oxidation method	070
Combustion with NDIR	126
FEUM 13.0 MGA 0146	066
Method of Analysis Used for PI (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	116
Colorimetric/Spectrophotometric (manual)	020 087
Titrimetric	015 028 036 039 058 060 067 077 126
Method of Analysis Used for Colour (Filtered) (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	028
Colorimetric/Spectrophotometric (manual)	002 007 036 055 060 063 066 070 077 086 087 094 112 116 120 126 130 133 148
Method of Analysis Used for SR Phosphate (Group 2)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	028 055 086 135
Colorimetric/Spectrophotometric (manual)	035 060 063 087 120 126 138 148
ICP-OES	116
Method of Analysis Used for pH (Group 2)	laboratory number
pH Electrode (discrete/cont. flow)	016 022 028 055 101 105
pH Electrode (manual)	002 007 015 019 020 035 036 039 040 054 058 060 063 065 066 067 069 070 077 086 087 089 090 094 098 102 112 115 116 120 126 130 133 135 138 148

**Method of Analysis Used for Turbidity
(Group 2)****laboratory number**

Nephelometry (discrete/cont. flow)

016 069 079 101

Nephelometry (manual)

002 007 011 015 028 035 039 055 058 060 063
066 067 070 077 086 087 089 094 112 116 126
130 133 135 138 148**Method of Analysis Used for Conductivity
(Group 2)****laboratory number**

Electrode (discrete/cont. flow)

016 022 028 055 101 105

Electrode (manual)

002 007 015 019 020 035 036 039 040 054 058
060 063 066 067 069 077 086 087 089 094 098
112 115 116 126 129 130 135 138 148**DW131c03****Method of Analysis Used for Cadmium
(Group 3)****laboratory number**

AAS

093

ETA-AAS

089 100 140 150

cold vapour / hydride generation ICP-MS

053

ICP-MS

013 022 069 073 084 085 091 104 109 112 115
133 142 145 149

ICP-OES

026 029 063 108 116 130

**Method of Analysis Used for Lead
(Group 3)****laboratory number**

ETA-AAS

089 100 140 150

ICP-MS

013 022 053 069 073 084 085 091 104 109 112
115 133 142 145 149

ICP-OES

026 029 063 108 116 130

Method of Analysis Used for Iron (Group 3)	laboratory number
AAS	140
Colorimetric/Spectrophotometric (manual)	036 039 040 146 150
ETA-AAS	100
cold vapour / hydride generation ICP-MS	022
ICP-MS	013 053 069 073 084 104 112 115 133 145
ICP-OES	026 029 063 089 108 116 130 138

Method of Analysis Used for Manganese (Group 3)	laboratory number
AAS	127 140
Colorimetric/Spectrophotometric (manual)	146
ETA-AAS	100
ICP-MS	013 022 053 069 073 084 091 104 112 115 133 145
ICP-OES	026 029 063 089 108 116 130

Method of Analysis Used for Aluminium (Group 3)	laboratory number
Colorimetric/Spectrophotometric (manual)	039 127 146 150
ETA-AAS	140
ICP-MS	013 022 053 069 073 084 104 112 115 133 145
ICP-OES	026 029 063 089 108 116 130 138

Method of Analysis Used for Copper (Group 3)	laboratory number
AAS	093 100 140
ICP-MS	013 022 053 069 073 084 091 104 112 115 133 145 149
ICP-OES	026 029 063 089 108 116 130 138

**Method of Analysis Used for Zinc
(Group 3)****laboratory number**

AAS	100 140
ICP-MS	013 022 053 069 073 084 104 112 115 133 145 149
ICP-OES	026 029 063 089 108 116 130 138

**Method of Analysis Used for Nickel
(Group 3)****laboratory number**

ETA-AAS	100 140
ICP-MS	013 022 053 069 073 084 091 104 112 115 133 145 149
ICP-OES	026 029 063 089 108 116 130

**Method of Analysis Used for Chromium
(Group 3)****laboratory number**

AAS	093
ETA-AAS	100 140 150
ICP-MS	013 022 053 069 073 084 091 104 112 115 133 145 149
ICP-OES	026 029 063 089 108 116 130

DW131c04**Method of Analysis Used for Mercury
(Group 4)****laboratory number**

hydride generation AAS	100
hydride generation AFS	031 060
cold vapour / hydride generation ICP-OES	108
ICP-MS	013 044 063 073 084 085 091 112 115 117 133 142

**Method of Analysis Used for Barium
(Group 4)****laboratory number**

ETA-AAS	100
ICP-MS	013 060 063 073 084 091 112 115 133
ICP-OES	089 108 116 130

**Method of Analysis Used for Boron
(Group 4)****laboratory number**

ICP-MS	013 060 073 091 112 115
ICP-OES	063 089 108 116 130

**Method of Analysis Used for Arsenic
(Group 4)****laboratory number**

ETA-AAS	089 100
hydride generation AFS	048
cold vapour / hydride generation ICP-OES	108
ICP-MS	013 022 044 060 063 073 084 085 091 112 115 117 133 142
ICP-OES	116 130

**Method of Analysis Used for Selenium
(Group 4)****laboratory number**

ETA-AAS	100
cold vapour / hydride generation ICP-OES	108
ICP-MS	013 022 063 073 084 091 112 115 133
ICP-OES	089 116 130

**Method of Analysis Used for Antimony
(Group 4)****laboratory number**

ETA-AAS	100
cold vapour / hydride generation ICP-OES	108
ICP-MS	013 022 060 063 073 084 085 091 112 115 117 133 142
ICP-OES	089 116 130

**Method of Analysis Used for Silver
(Group 4)****laboratory number**

ICP-MS	013 063 073 084 112 133
ICP-OES	116

Method of Analysis Used for Strontium (Group 4)	laboratory number
ICP-MS	013 073 084
ICP-OES	063 089 108 116 130
Method of Analysis Used for Lithium (Group 4)	laboratory number
ICP-MS	013 063 073 112
ICP-OES	089 116 130
Method of Analysis Used for Cobalt (Group 4)	laboratory number
ICP-MS	013 022 063 073 084 112 115 133
ICP-OES	108 116 130
Method of Analysis Used for Vanadium (Group 4)	laboratory number
ICP-MS	013 022 063 073 084
ICP-OES	089 108 116 130
Method of Analysis Used for Molybdenum (Group 4)	laboratory number
ICP-MS	013 063 073 112 115
ICP-OES	089 108 116 130
Method of Analysis Used for Tin (Group 4)	laboratory number
ICP-MS	013 063 073 084 133
ICP-OES	108 130
Method of Analysis Used for Beryllium (Group 4)	laboratory number
ICP-MS	013 063 073 084
ICP-OES	089 130

DW131c05

Was Ion Chromatography Used for Bromide (Group 5)	laboratory number
no	014 057 068 088
yes	020 047 060 061 078 098 112 120 134 136 141

Was Ion Chromatography Used for Bromate (Group 5)	laboratory number
no	061 134
yes	006 014 047 057 058 060 068 078 088 098 112 136 141

Was Ion Chromatography Used for Chlorite (Group 5)	laboratory number
no	014 057 061 068 141
yes	006 047 058 060 078 088 098 112 134 136

Was Ion Chromatography Used for Chlorate (Group 5)	laboratory number
no	014 057 068 088 134 141
yes	047 060 061 078 098 112 136

DW131c12

Method of Analysis Used for Total and Free Chlorine (Group 12)	laboratory number
Colorimetric/Spectrophotometric (manual)	004 005 023 027 039 077 087 094 112
Colorimetric/Spectrophotometric (discrete/cont. flow)	042 101
Colorimetric/Titration	036

DW131c16

Method of Analysis Used for Total Cyanide (Group 16)	laboratory number
Colorimetric/Spectrophotometric (discrete/cont. flow)	006 012 033 042 060 089
Colorimetric/Spectrophotometric (manual)	003 046 059 107 113

DW131c18

Method of Analysis Used for Chromium (VI) (Group 18)	laboratory number
Colorimetric/Spectrophotometric (manual)	022 027 078 081 150
Ion Chromatography (IC)	001 038
ICP-MS	082

DW131c21

Method of Analysis Used for Uranium (Group 21)	laboratory number
ICP-MS	003 034 037 041 043 046 064 097 103 104 114 119 121

APPENDIX II: Fapas® SecureWeb, Protocol and Contact Details

1. Fapas® SECUREWEB

Access to the secure area of our website is only available to participants in our proficiency tests. Please contact us if you require a UserID and Password. Fapas® SecureWeb allows participants to:

- Obtain their laboratory numbers for the proficiency tests in which they have participated.
- View the results they submitted in past and current proficiency tests.
- Submit their results and methods for current tests.
- Review future tests they have ordered.
- Order proficiency tests, reference materials and quality control materials.
- Freely download copies of reports (PDF file), of proficiency tests in which they have participated.
- View charts of their z-scores obtained in previous Fapas® – Water Chemistry proficiency tests.

2. PROTOCOL

The Protocols [7, 8] set out how Fapas® – Water & Environmental is organised. Copies can be downloaded from our website.

3. CONTACT DETAILS

This report was prepared and authorised on behalf of Fapas® by Simon Hunter (Round Coordinator). Participants with any comments or concerns about this proficiency test should contact:

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