

WINE ROUND 16

PROFICIENCY TESTING PROGRAM

JUNE 2008

REPORT NO. 574B

ACKNOWLEDGMENTS

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CONTENTS

	Page
1. Foreword	1
2. Features of the Program	1
3. Design of Program	1
Table A: Summary Statistics	2
4. Outlier Results	3
Table B: Outlier Results	4
5. Statistical Format	5
6. PTA & Technical Adviser's Comments	6
7. Reference	8

APPENDIX A

Results, Summary Statistics and Z-Score Charts

Section 1 – Sample 1 (White Wine)

- Actual Alcohol	A1 - A2
- Total Alcohol	A3 - A4
- Free Sulfur Dioxide	A5 - A6
- Total Sulfur Dioxide	A7
- Glucose and Fructose	A8 - A9
- Residual (Reducing) Sugars	A10 - A11
- pH	A12 - A13
- Acetic Acid	A14 - A15
- Citric Acid	A16 - A17
- Malic Acid	A18 - A19
- Total Acidity	A20 - A21
- Volatile Acidity	A22 - A23
- Specific Gravity	A24 - A25
- Total Dry Extract	A26 - A27
- Copper	A28 - A29
- Iron	A30 - A31
- Calcium	A32 - A33
- Potassium	A34 - A35
- Sodium	A36 - A37

Section 2 – Sample 2 (Red Wine)

- Actual Alcohol	A38 - A39
- Total Alcohol	A40 - A41
- Free Sulfur Dioxide	A42 - A43
- Total Sulfur Dioxide	A44 - A45
- Glucose and Fructose	A46 - A47
- Residual (Reducing) Sugars	A48 - A49
- pH	A50 - A51
- Acetic Acid	A52 - A53
- Citric Acid	A54 - A55
- Malic Acid	A56 - A57
- Total Acidity	A58 - A59
- Volatile Acidity	A60 - A61
- Specific Gravity	A62 - A63
- Total Dry Extract	A64 - A65
- Copper	A66 - A67
- Iron	A68 - A69
- Calcium	A70 - A71
- Potassium	A72 - A73
- Sodium	A74 - A75

APPENDIX B

Homogeneity Testing	B1
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APPENDIX C

Instructions to Participants	C1 – C2
Results Sheet	C3 – C10

1. **FOREWORD**

This report summarises the results of a proficiency testing program on the chemical testing of wine.

The program was conducted in April 2008 by Proficiency Testing Australia. The program coordinator was Charlotte Nohra. This is the sixteenth round in a series of on-going wine proficiency testing programs.

The aim of the program was to assess laboratories' ability to competently perform the tests examined.

2. **FEATURES OF THE PROGRAM**

2.1 Results were received from 14 laboratories, with all laboratories submitting one set of results

2.2 The results, as reported by participants, are presented in Appendix A. Summary statistics are calculated from the results reported for each test. These are presented in Table A (page 2). Robust z-scores and z-score charts are presented in Appendix A. A listing of laboratories (by code number) identified as having reported outliers are presented in Table B (page 4).

2.3 Appendix B contains the results of the homogeneity testing on the samples used in the program.

2.4 Laboratories were requested to perform the tests according to the *Instructions to Participants* and to record their results on the accompanying *Results Sheet*, both of which were distributed to participants with their samples.

Copies of the *Instructions to Participants* and *Results Sheet* are given in Appendix C of this report.

2.5 Each laboratory was randomly allocated a code number for the program to allow for the confidential treatment of results. Reference to any laboratory in this report is made by its code number.

3. **DESIGN OF PROGRAM**

3.1 For this program each participant was provided with two 750 mL samples, one of white wine (sample 1) and one of red wine (sample 2).

The following tests were to be conducted on each sample:

- Actual Alcohol
- Total Alcohol
- Free Sulfur Dioxide
- Total Sulfur Dioxide
- Glucose and Fructose
- Residual (Reducing) Sugars
- pH
- Acetic Acid
- Citric Acid
- Malic Acid

- Total Acidity
- Volatile Acidity
- Specific Gravity
- Total Dry Extract
- Copper
- Iron
- Calcium
- Potassium
- Sodium

3.2 Robust statistical procedures were used to generate the z-scores and summary statistics for each sample and for each test - number of results, median, normalised interquartile range, minimum, maximum and range.

3.3 Robust z-scores were calculated based on the average of results submitted for each test. Where only one result was submitted, this result was used to determine the z-score.

TABLE A: SUMMARY STATISTICS

Analysis	Sample No.	No. of Results	Median (g/L)	Normalised IQR
Actual Alcohol	1	14	13.62	0.06
	2	14	14.21	0.06
Total Alcohol	1	12	13.80	0.12
	2	12	14.33	0.15
Free Sulfur Dioxide	1	12	27.0	1.9
	2	12	29.0	1.3
Total Sulfur Dioxide	1	14	-	-
	2	14	69.8	7.4
Glucose and Fructose	1	12	2.118	0.059
	2	12	0.518	0.098
Residual (Reducing) Sugars	1	6	3.25	0.06
	2	6	2.28	0.33
pH	1	14	3.425	0.033
	2	14	3.475	0.032
Acetic Acid	1	9	0.270	0.015
	2	9	0.430	0.015
Citric Acid	1	10	0.263	0.029
	2	9	0.090	0.030
Malic Acid	1	11	2.145	0.078
	2	9	0.075	0.030

Analysis	Sample No.	No. of Results	Median (g/L)	Normalised IQR
Total Acidity	1	13	5.65	0.15
	2	13	6.50	0.07
Volatile Acidity	1	8	0.335	0.020
	2	8	0.488	0.075
Specific Gravity	1	12	0.99130	0.00037
	2	12	0.99370	0.00035
Total Dry Extract	1	12	22.85	1.19
	2	12	31.15	1.20
Copper	1	11	0.275	0.043
	2	11	0.450	0.059
Iron	1	11	1.290	0.222
	2	11	1.435	0.297
Calcium	1	11	48.5	11.5
	2	11	48.0	12.2
Potassium	1	9	635	24
	2	9	960	63
Sodium	1	11	80.0	3.2
	2	11	18.0	2.8

Note: Summary Statistics for Total Sulfur Dioxide have not been reported due to uncertainty about the homogeneity of Sample 1 for this test (see Appendix B).

4. **OUTLIER RESULTS**

In order to achieve the program's aim of assessing laboratories' testing performance, a robust statistical approach, which uses z-scores to assess participants' performance, has been utilised. The z-score is a measure of how far the results are from the consensus value - a normalised value which gives a "score" to each result relative to the other results in the group. Therefore a z-score close to zero means that the result agrees well with those from other laboratories. An outlier is any result which has an absolute z-score value greater than three and is marked by the symbol §.

Each determination was examined for outliers with all methods pooled. Table B summarises the outliers detected.

TABLE B: OUTLIER RESULTS
(by laboratory code number)

Test	Sample 1	Sample 2
Actual Alcohol	13	13
Total Alcohol	-	-
Free Sulfur Dioxide	-	-
Total Sulfur Dioxide	N/A	10, 13
Glucose and Fructose	12	12
Residual (Reducing) Sugars	4	-
pH	3, 8	3, 8
Acetic Acid	12, 14	12, 13, 14
Citric Acid	12	-
Malic Acid	13	-
Total Acidity	10	4, 10
Volatile Acidity	9	-
Specific Gravity	12	12
Total Dry Extract	12, 13	12, 13
Copper	-	-
Iron	-	-
Calcium	-	-
Potassium	12	2, 12
Sodium	2, 4, 7	7

Note: Z-Scores for Total Sulfur Dioxide have not been reported due to uncertainty about the homogeneity of Sample 1 for this test (see Appendix B).

5. STATISTICAL FORMAT

For each test, the following information is given:

- (a) a table of results and calculated z-scores;
- (b) a list of summary statistics; and
- (c) ordered z-score charts;

(a) Table of Results and Z-Scores

Each of these tables contains the results returned by each laboratory, including the code number for the method used, and the laboratory z-scores calculated based on each laboratory's averaged results.

Note that results have been entered exactly as reported by participants. That is, laboratories which did not report results to the precision (i.e. number of significant figures) requested on the Results Sheet have **not** been rounded to the requested precision before being included in the statistical analysis.

Outliers are identified in the table by a marker (**\$**) next to the relevant z-score. Please see reference [1] for details on how these z-scores are calculated.

(b) Summary Statistics

The list of summary statistics appears at the bottom of the table of results and consists of:

- (i) the number of results for that test/sample (*No. of Results*);
- (ii) the median of laboratory's results - i.e. the middle value (*Median*);
- (iii) the normalised interquartile range of the results (*Normalised IQR*) - the interquartile range x 0.741;
- (iv) the robust coefficient of variation, expressed as a percentage (*Robust CV*) - i.e. $100 \times \text{Normalised IQR} / \text{Median}$;
- (v) the minimum and maximum laboratory results; and
- (vi) the range (*Maximum - Minimum*).

Please see reference [1] for further details on these robust summary statistics.

(c) Ordered Z-Score Charts

On these charts each laboratory's z-score is shown, in order of magnitude, and is marked with its code number. From these each laboratory can readily compare its performance relative to the other laboratories.

These charts contain solid lines at +3 and -3, so the outliers are clearly identifiable as the laboratories whose "bar" extends beyond these "cut-off" lines. In some cases the y-axis of these charts has been limited, so very large or small (negative) z-scores appear to extend beyond the chart.

6. **PTA & TECHNICAL ADVISER'S COMMENTS**

Actual Alcohol

This analysis was well performed with very low Robust CV values (0.48% and 0.46%) achieved for both samples. There was only one outlier reported for Sample 1 and 2 by Lab Code 13.

Total Alcohol

The analysis for Sample 1 and 2 was well performed, with low Robust CV values. There were no outliers reported for either sample.

Free Sulfur Dioxide

The analysis for Sample 1 and 2 was well performed, with low Robust CV values. Greater variation was seen for Sample 1. There were no outliers reported for either sample.

Total Sulfur Dioxide

Z-Scores for Total Sulfur Dioxide have not been reported due to uncertainty about the homogeneity of Sample 1 for this test (see Appendix B). Large variation was seen for Sample 2 with a Robust CV above 10%. Lab Code 10 reported an outlier for Sample 2, while Lab Code 13 reported outliers for both samples.

Glucose and Fructose

The analysis for Sample 1 was well performed, with low Robust CV values. Robust CV value for Sample 2 was above 15%, probably due to the low level of sugar in the sample. Lab code 12 reported outliers for Sample 1 and 2.

Residual (Reducing) Sugars

The analysis for Sample 1 was well performed, with low Robust CV values. Robust CV value for Sample 2 was above 10%. Lab code 4 reported an outlier for Sample 1. No laboratories reported outliers for Sample 2.

pH

The analysis was generally well performed, with low Robust CV values observed for both samples. Lab Codes 3 and 8 reported outliers for Sample 1 and 2.

Acetic Acid

The analysis for Sample 1 and 2 was well performed, with low Robust CV values. Greater variation was seen for Sample 2. Lab Codes 12 and 14 reported an outlier for Sample 1 and 2. Lab Code 13 reported an outlier for Sample 2.

Citric Acid

Robust CV values for both samples were above 10%. Greater variation was seen for Sample 2 which was over 30% due to the fact that the citric acid levels were very low. Outliers were reported for Sample 1 by Lab Code 12 only. No Laboratories reported outliers for Sample 2.

Malic Acid

The analysis for Sample 1 was well performed, with low Robust CV values. Robust CV value for Sample 2 was above 30% due to very low levels being present. Lab code 13 reported an outlier for Sample 1. No laboratories reported outliers for Sample 2.

Total Acidity

This analysis was well performed as shown by the low Robust CV values for both samples. Outliers were reported for Sample 1 by Lab Code 10 only. Sample 2 outliers were reported by Lab Codes 4 and 10.

Volatile Acidity

A wide spread of results for both samples was observed, with Robust CV values above 15% for Sample 2. Lab Code 9 reported an outlier for Sample 1. No laboratories reported outliers for Sample 2.

Specific Gravity

This analysis was well performed with very low Robust CV values achieved for both samples. Lab Code 12 reported an outlier for Sample 1 and Sample 2.

Total Dry Extract

This analysis was well performed with very low Robust CV values achieved for both samples. Lab Codes 12 and 13 reported outliers for Sample 1 and Sample 2.

Copper

A wide spread of results for both samples was observed, with Robust CV values above 10% for both samples. No Laboratories reported outliers for either Sample 1 or 2.

Iron

Robust CV values for both samples were above 15%. No Laboratories reported outliers for either Sample 1 or 2.

Calcium

A wide spread of results for both samples was observed, with Robust CV values above 20% for both samples. No Laboratories reported outliers for either Sample 1 or 2.

Potassium

The analysis was generally well performed, with low Robust CV values observed for both samples. Lab Code 12 reported outliers for Sample 1 and 2. Lab Code 2 reported an outlier for Sample 2.

Sodium

The analysis for Sample 1 was well performed, with low Robust CV values. Greater variation was seen for Sample 2 with a Robust CV above 15%. Lab Codes 2, 4 and 7 reported outliers for Sample 1. Lab Code 7 reported an outlier for Sample 2.

Conclusion

The “common” tests required for the Australian Wine and Brandy Corporation and European export certificates (alcohol, total acidity, sugars, pH, specific gravity and volatile acidity/acetic acid) were generally performed well and compare favourably with previous rounds. Analysis of metals and cations were requested for the first time in this round and some variability was observed, particularly for calcium, copper and iron. The majority of labs reported measurement uncertainty for the tests they conducted.

7. REFERENCES

[1] Guide to Proficiency Testing Australia (2008).

APPENDIX A

All Results

Summary Results

Z-Score Charts

Section 1

Sample 1 (White Wine)

A1

Actual Alcohol
0.1%v/v

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	13.6	0.2	13.6	0.2	FTIR	13.6	-0.31
2	13.5	0.12	13.5	0.12	NIR	13.5	-1.85
3	13.7	0.2	13.74	0.2	NIR	13.7	1.54
4	13.64	0.046	13.64	0.046	Alcoholizer	13.6	0.31
5	13.6	0.1	13.5		NIR/Distillation	13.6	-1.08
6	13.6	0.3	13.6	0.3	Distillation/Hydrometry	13.6	-0.31
7	13.6	0.1	13.6	0.1	NIR	13.6	-0.31
8	13.7	0.1	13.7	0.1	Inhouse Method MAL-003	13.7	1.23
9	13.7	0.2	13.7	0.2	NIR	13.7	1.23
10	13.6	0.2	13.7	0.2	QIS 12669 (GC)	13.7	0.46
11	13.6	0.12	13.6	0.12	NIR	13.6	-0.31
12	13.7	0.008	13.6		Alcoholizer	13.7	0.46
13	13.9	0.54	13.9	0.54	Gas Chromatography	13.9	4.32 §
14	13.5	0.14	13.4	0.14	FTIR	13.5	-2.62

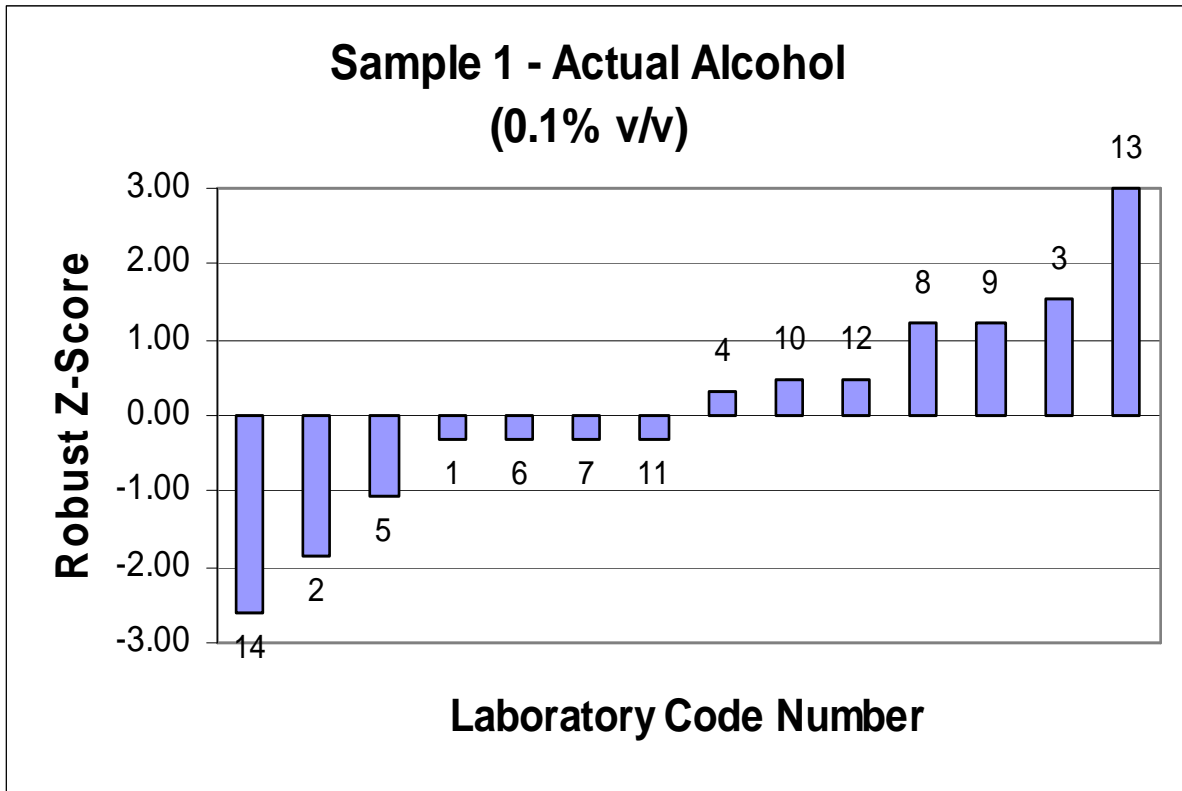
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	14
Median	13.62
NormIQR	0.06
Robust CV	0.48%
Min	13.5
Max	13.9
Range	0.5



Total Alcohol
0.1%v/v

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	13.8	0.2	13.8	0.2	Calculation	13.8	0.00
2	13.6	0.12	13.6	0.12	Calculation	13.6	-1.66
3	13.9	0.2	13.9	0.2	NIR/Titration	13.9	0.83
4	13.8		13.8			13.8	0.00
5	13.7	0.18			Calculation	13.7	-0.83
6	13.8	0.3	13.8	0.3	Distillation/Hydrometry/ Rebelien & Calculation	13.8	0.00
7	13.7	0.1	13.7	0.1	Calculation	13.7	-0.83
8							
9	13.9		13.9		Calculation	13.9	0.83
10							
11	13.7		13.7		Calculation	13.7	-0.83
12	13.9		13.8		Calculation	13.9	0.42
13	14.04	0.91	14.03	0.90	Calculation	14.0	1.95
14	13.5		13.5		Calculation	13.5	-2.49

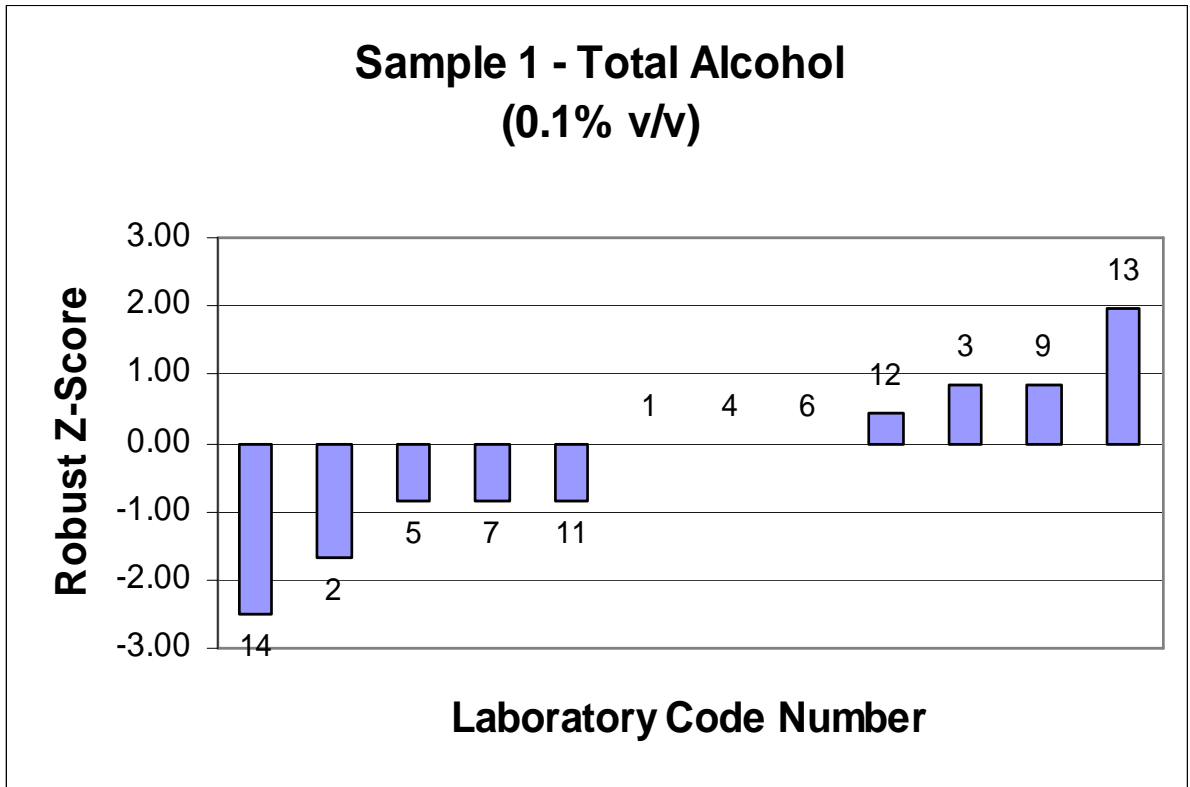
Notes:

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Summary Statistics

No. results	12
Median	13.80
NormIQR	0.12
Robust CV	0.87%
Min	13.5
Max	14.0
Range	0.5



Free Sulfur Dioxide
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	32	3	30	3	Rankin	31	2.16
2	26	3	26	3	Aspiration	26	-0.54
3	26	2	26	2	Titration/Aspiration	26	-0.54
4	30	1.56	30	1.56	Rankin	30	1.62
5	27	3			Aspiration	27	0.00
6	27	2	27	2	Titration/Aspiration	27	0.00
7	29	3	29	3	Rankine Aspiration	29	1.08
8							
9	28	3	30	3	Aspiration	29	1.08
10							
11	30	3	30	3	Aspiration	30	1.62
12	27	3			Aspiration	27	0.00
13	27	2.7	27	2.7	Aspiration	27	0.00
14	24	0	24	0	Flow Injection	24	-1.62

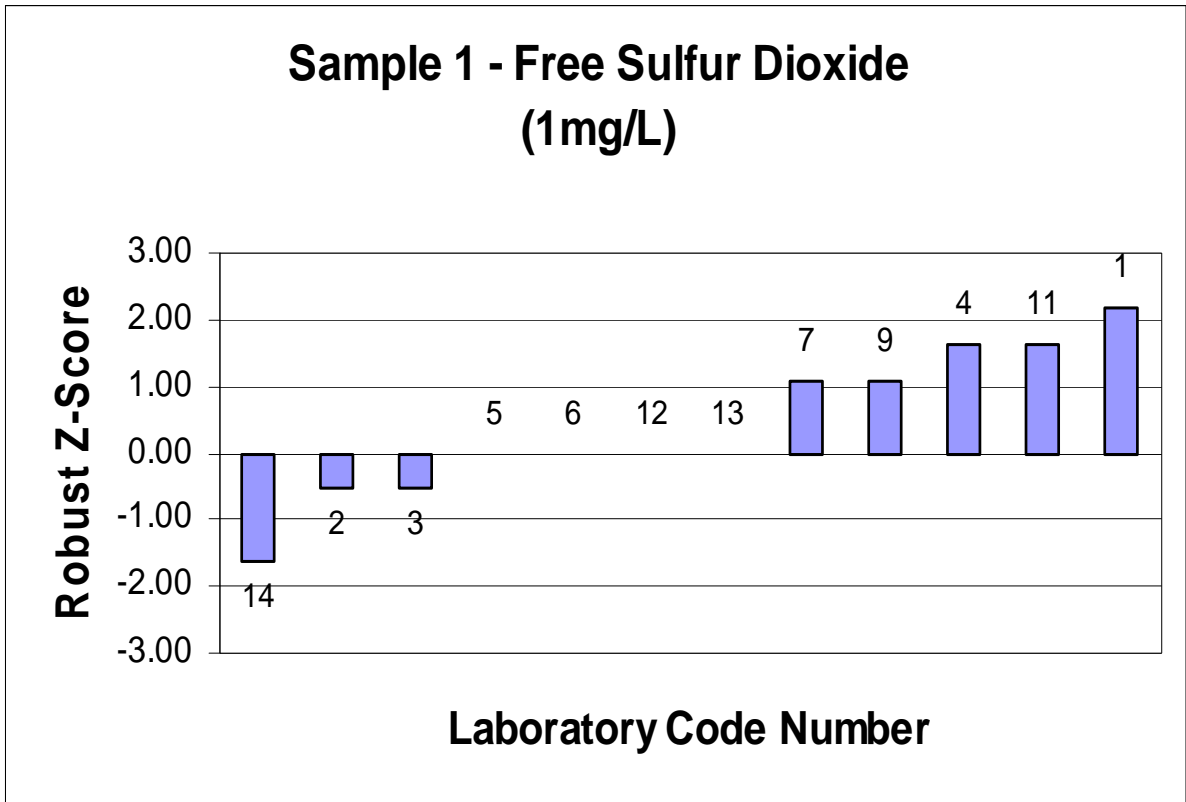
Notes:

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Summary Results

No. results	12
Median	27.0
NormIQR	1.9
Robust CV	6.86%
Min	24
Max	31
Range	7



Total Sulfur Dioxide
1mg/L

Lab Code	Result 1	MU \pm	Result 2	MU \pm	Method	Averaged Results
1	129	4	128	4	Rankin	129
2	113	3.5	113	3.5	Aspiration	113
3	113	7	113	7	Titration/Aspiration	113
4	121	6.8	120	6.8	Rankin	121
5	118	6			Aspiration	118
6	122	4	122	4	Titration/Aspiration	122
7	116	5	113	5	Rankine Aspiration	115
8	120	10	120	10	AOAC 990.28	120
9	118	5	117	5	Aspiration	118
10	119	10	119	10	Monier Williams	119
11	123	3.5	123	3.5	Aspiration	123
12	120	6			Aspiration	120
13	89	8.9	91	9.1	Aspiration	90
14	127	3	125	3	Flow Injection	126

Notes:

MU = Measurement Uncertainty

Summary Statistics and Z-Scores for Total Sulfur Dioxide have not been reported due to uncertainty about the homogeneity of Sample 1 for this test (see Appendix B).

Glucose and Fructose
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	2.00	0.5	1.98	0.5	Enzymatic	1.99	-2.15
2	2.0	0.13	2.0	0.13	HPLC	2.00	-1.98
3	2.10	0.40	2.10	0.40	Enzymatic Plate Reader	2.10	-0.30
4							
5	2.1	10%	2.2		Enzyme (automated)	2.15	0.55
6							
7	2.00	0.60	2.11	0.60	Enzymatic	2.06	-1.05
8	2.14	0.2	2.10	0.2	Inhouse Method MAL-025 /AC 268	2.12	0.04
9	2.1	5%	2.1	5%	Enzymatic	2.10	-0.30
10	2.05	0.1	2.18	0.1	QIS 12677R2 (HPLC)	2.12	-0.04
11	2.12	0.13	2.12	0.13	Enzymatic	2.12	0.04
12	3.7	0.2	3.7		HPLC	3.70	26.68 §
13	2.31	0.21	2.19	0.20	Enzyme	2.25	2.23
14	2.35	0.35	2.10	0.35	FTIR	2.23	1.81

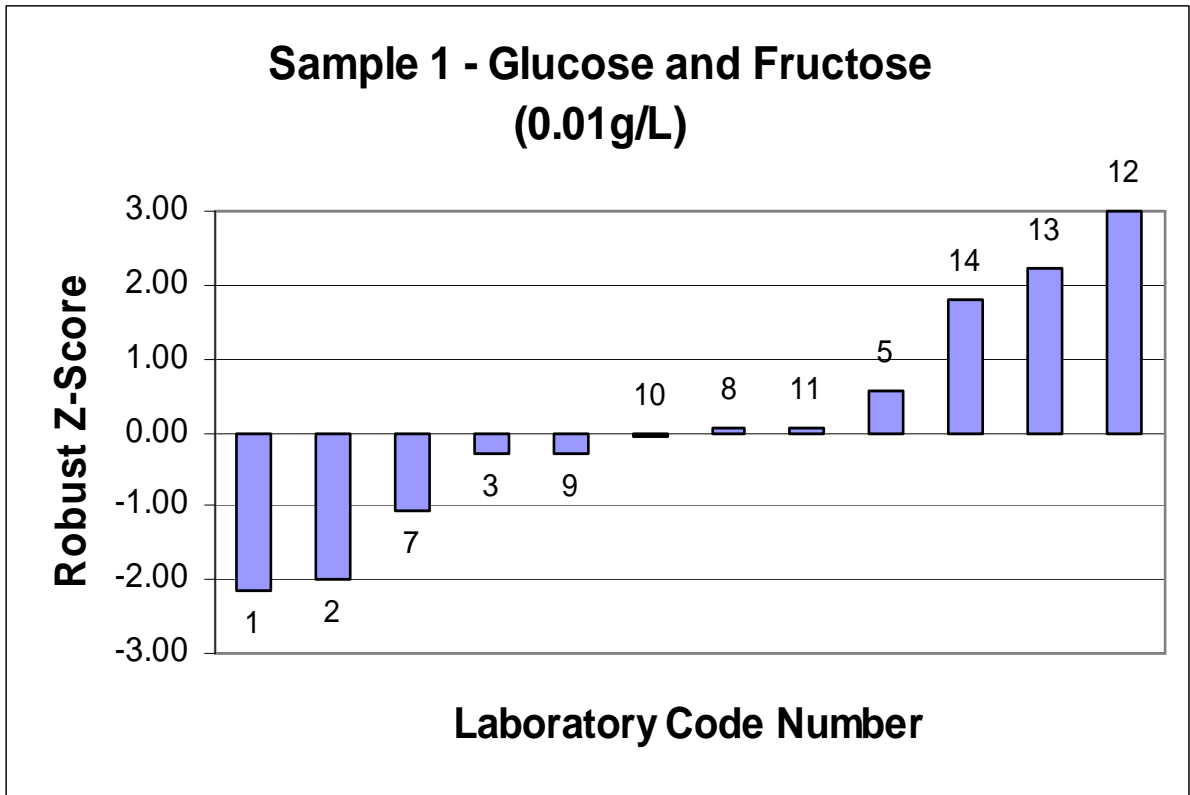
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	2.118
NormIQR	0.059
Robust CV	2.80%
Min	1.99
Max	3.70
Range	1.71



A10

Residual (Reducing) Sugars
0.1g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	3.2	0.5	3.2	0.5	HPLC	3.2	-0.90
2							
3	3.2	0.5	3.3	0.5	NIR/ Titration (Lane Eynon)	3.3	0.00
4	3.5	0.15	3.5	0.15	Rebelien	3.5	4.50 §
5							
6	3.2	0.3	3.3	0.3	Rebelien	3.3	0.00
7							
8							
9	3.3	0.5	3.3	0.5	Lane & Eynon	3.3	0.90
10							
11							
12	3.3	3.0	3.1		Rebelien	3.2	-0.90
13							
14							

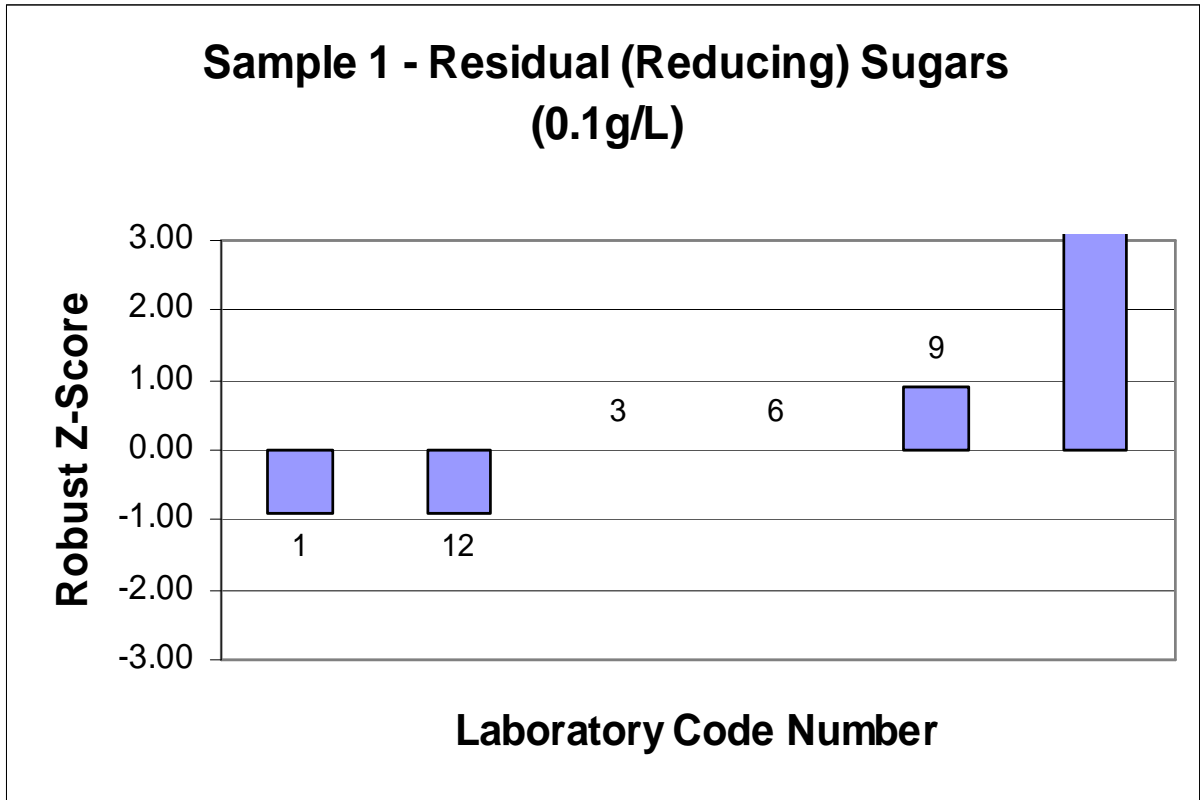
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	6
Median	3.25
NormIQR	0.06
Robust CV	1.71%
Min	3.2
Max	3.5
Range	0.3



A12

pH
0.01

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	3.48	0.05	3.48	0.05	pH Meter	3.48	1.65
2	3.45	0.02	3.45	0.02	Auto Titrator	3.45	0.75
3	3.32	0.10	3.32	0.10	pH Electrode	3.32	-3.15 §
4	3.41		3.43		pH Meter	3.42	-0.15
5	3.42	0.04				3.42	-0.15
6	3.49	0.04	3.49	0.04	pH Meter	3.49	1.95
7	3.43	0.05	3.42	0.05	Potentiometric Electrode	3.43	0.00
8	3.53	0.05	3.53	0.05	AOAC 981.12	3.53	3.15 §
9	3.42	0.05	3.43	0.05	pH Meter	3.43	0.00
10	3.43	0.05	3.42	0.05		3.43	0.00
11	3.47	0.02	3.47	0.02	pH Meter	3.47	1.35
12	3.43	0.05	3.41		Probe	3.42	-0.15
13	3.42	0.034	3.42	0.034	pH Electrode	3.42	-0.15
14	3.43	0.028	3.45	0.028	FTIR	3.44	0.45

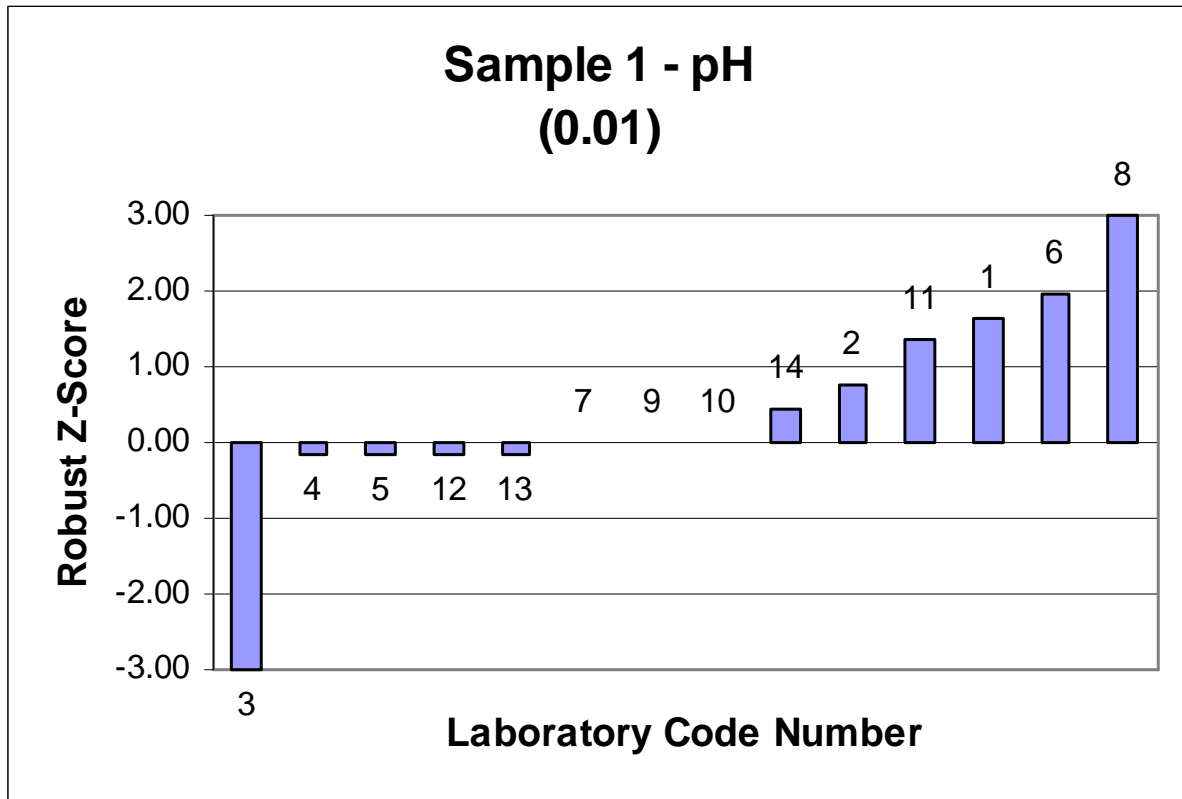
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	14
Median	3.425
NormIQR	0.033
Robust CV	0.97%
Min	3.32
Max	3.53
Range	0.21



Acetic Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.29	0.05	0.29	0.05	Enzymatic	0.29	1.35
2	0.27	0.12	0.27	0.12	HPLC	0.27	0.00
3	0.25	0.06	0.26	0.06	Enzymatic Plate Reader	0.26	-1.01
4							
5	0.27	10%			Enzyme (automated)	0.27	0.00
6							
7	0.27	0.03	0.27	0.03	Enzymatic	0.27	0.00
8							
9							
10							
11	0.27	0.12	0.27	0.12	Enzymatic	0.27	0.00
12	0.34	0.05	0.32		Still	0.33	4.05 §
13	0.23	0.011	0.25	0.012	Enzyme	0.24	-2.02
14	0.36	0.02	0.35	0.02	FTIR	0.36	5.73 §

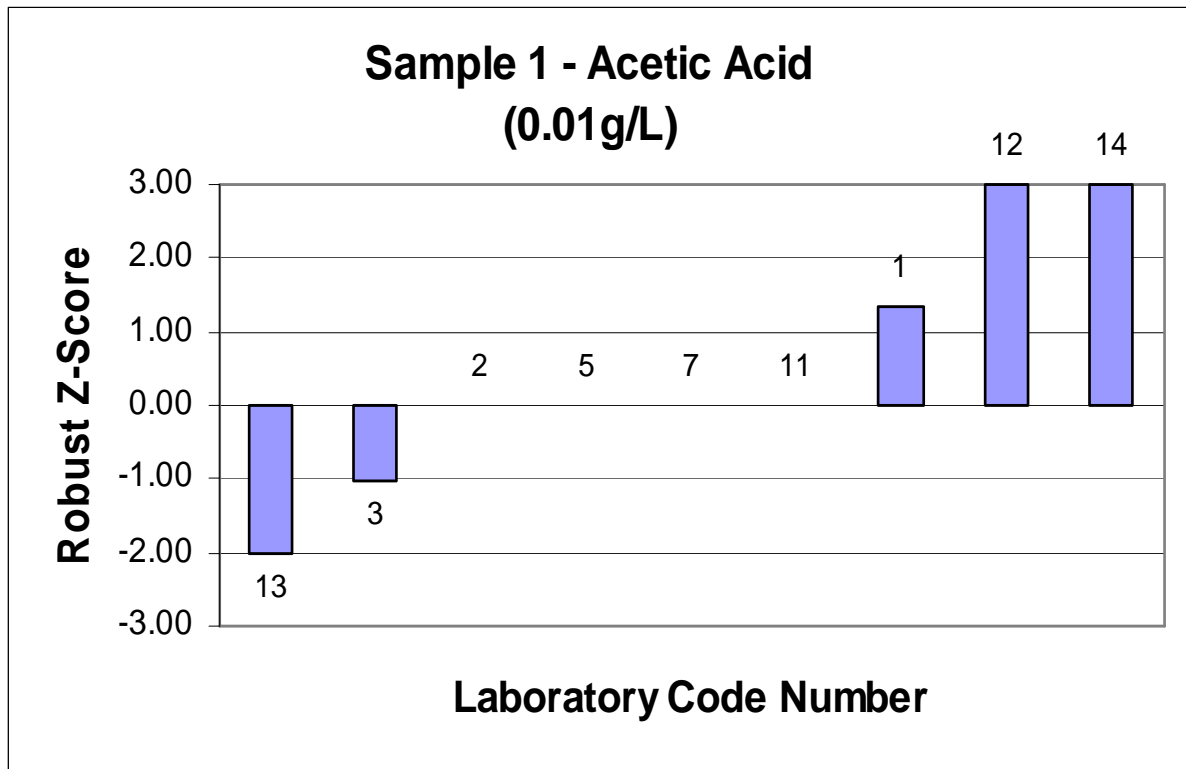
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	9
Median	0.270
NormIQR	0.015
Robust CV	5.49%
Min	0.24
Max	0.36
Range	0.12



Citric Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.26	0.05	0.26	0.05	Enzymatic	0.26	-0.09
2	0.27	0.02	0.27	0.02	HPLC	0.27	0.26
3	0.25	0.03	0.28	0.03	Enzymatic Plate Reader	0.27	0.09
4	0.23		0.22		Enzymatic	0.23	-1.31
5	0.24	0.1			Enzyme	0.24	-0.78
6							
7	0.25	0.05	0.25	0.05	Enzymatic	0.25	-0.44
8							
9	0.30	0.1	0.27	0.1	Enzymatic	0.29	0.78
10							
11							
12	0.5	0.2	0.5		HPLC	0.50	8.27 §
13	0.29	0.03	0.32	0.03	Enzyme	0.31	1.48
14	0.23	0	0.23	0	Enzymatic	0.23	-1.13

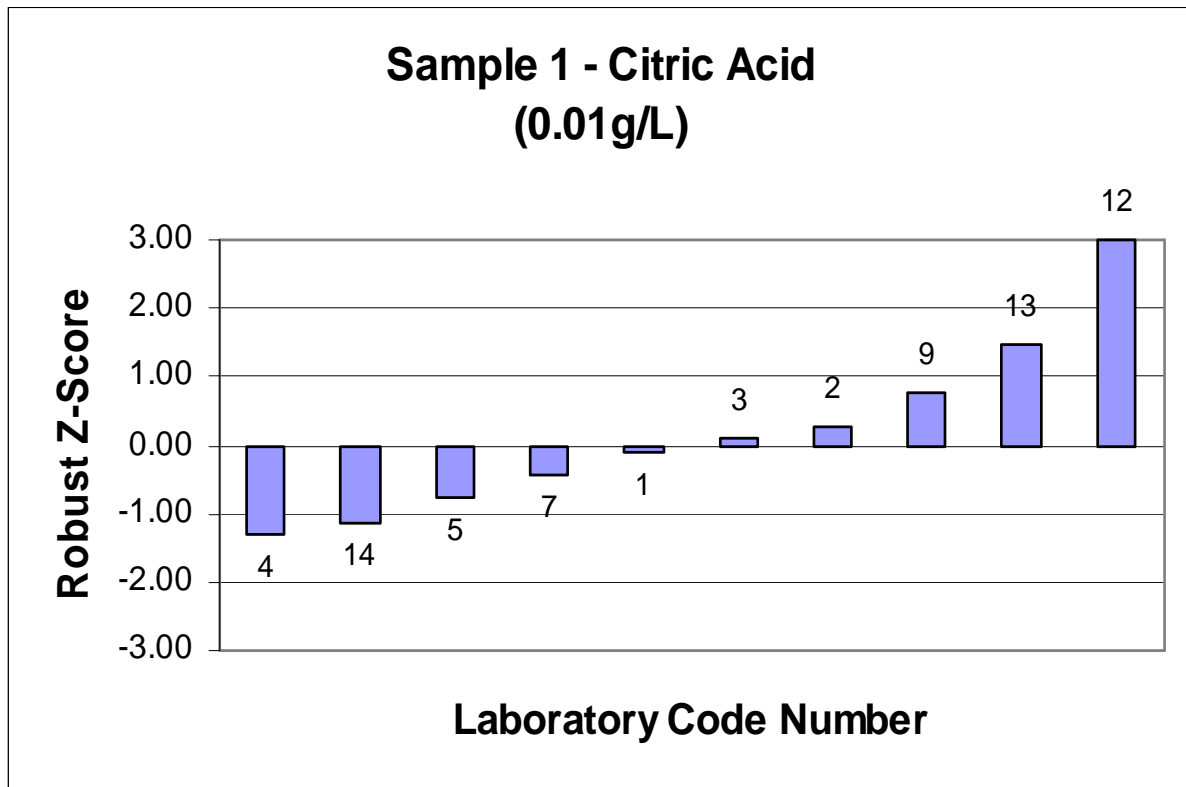
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	10
Median	0.263
NormIQR	0.029
Robust CV	10.94%
Min	0.23
Max	0.50
Range	0.28



Malic Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	2.11	0.05	2.11	0.05	Enzymatic	2.11	-0.45
2	2.06	0.24	2.10	0.24	Enzymatic	2.08	-0.84
3	2.20	0.11	2.30	0.11	Enzymatic Plate Reader	2.25	1.35
4	2.16		2.13		Enzymatic	2.15	0.00
5	2.2	10%			Enzyme (automated)	2.20	0.71
6							
7	2.01	0.07	2.02	0.07	Enzymatic	2.02	-1.67
8							
9	2.20	0.1	2.16	0.1	Enzymatic	2.18	0.45
10							
11	2.07	0.15	2.08	0.15	Enzymatic	2.08	-0.90
12	2.2	0.2	2.2		HPLC	2.20	0.71
13	2.54	0.19	2.54	0.19	Enzyme	2.54	5.07 §
14	2.14	0	2.14	0	Enzymatic	2.14	-0.06

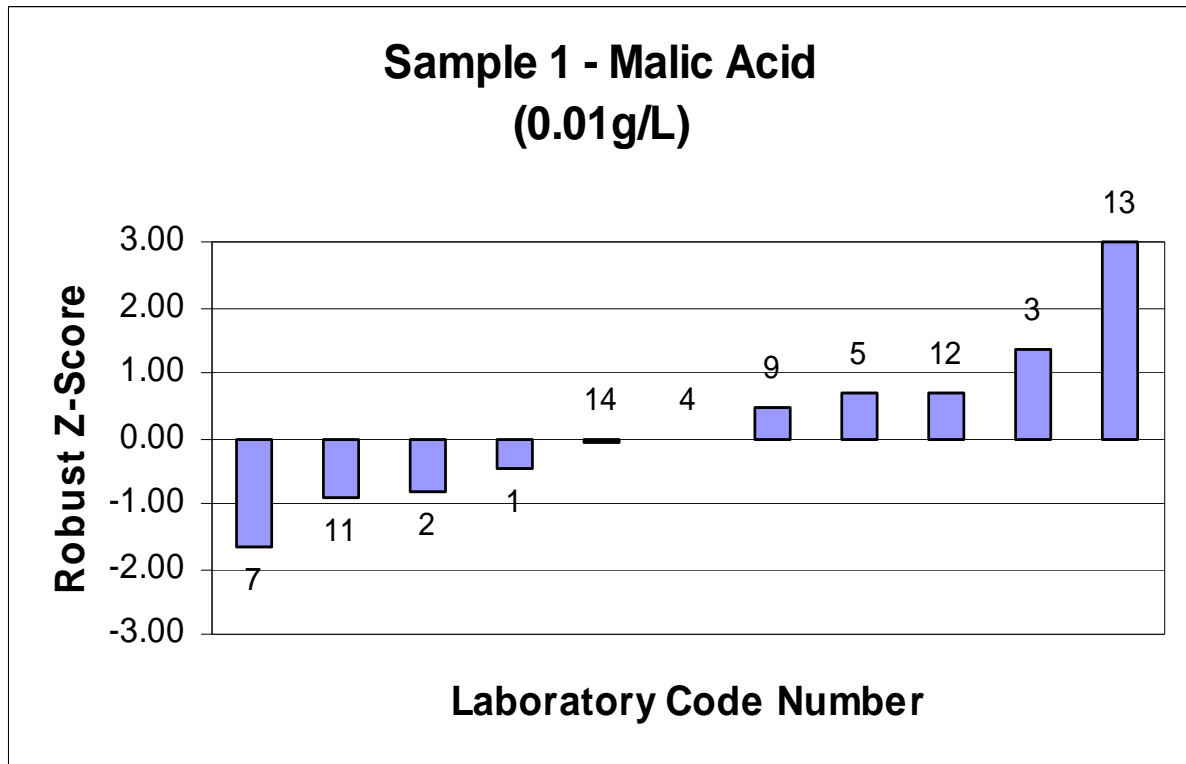
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Results

No. results	11
Median	2.145
NormIQR	0.078
Robust CV	3.63%
Min	2.02
Max	2.54
Range	0.53



Total Acidity
0.1g/L as Tartaric Acid

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	5.6	0.1	5.6	0.1	Auto-Titrator	5.6	-0.34
2	5.6	0.18	5.6	0.18	Auto-Titrator	5.6	-0.34
3	5.7	0.2	5.6	0.2	Auto-Titrator	5.7	0.00
4	5.8	0.12	5.8	0.12	Auto-Titrator	5.8	1.01
5	5.6	0.1			Potentiometric Autotitrator	5.6	-0.34
6	5.5	0.11	5.5	0.11	Potentiometric Titration	5.5	-1.01
7	5.9	0.3	5.9	0.3	Titration	5.9	1.69
8							
9	5.6	0.2	5.6	0.2	Auto-Titration	5.6	-0.34
10	7.6	0.2	8.0	0.2	AOAC 962.12 (pH 8.2)	7.8	14.50 §
11	5.6	0.18	5.6	0.18	Auto-Titrator	5.6	-0.34
12	5.7	0.1	5.6		Auto-Titrator	5.7	0.00
13	5.81	0.12	5.81	0.12	Titration	5.8	1.08
14	5.6	0.28	5.8	0.28	FTIR	5.7	0.34

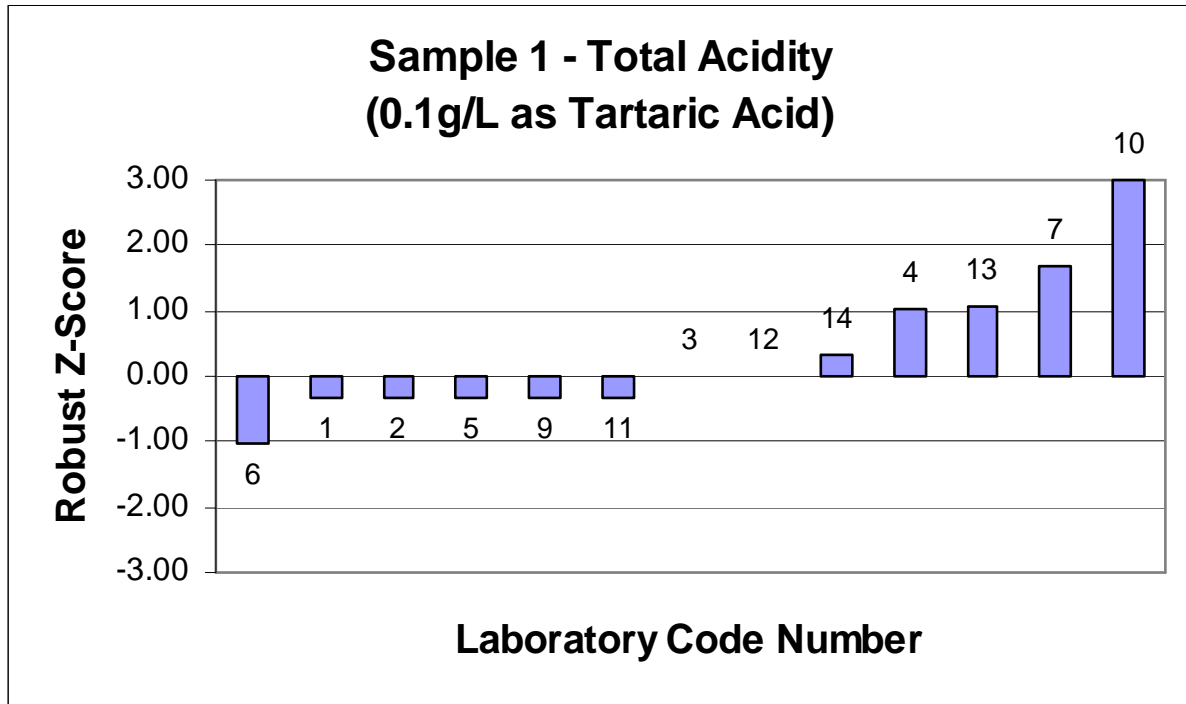
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	13
Median	5.65
NormIQR	0.15
Robust CV	2.62%
Min	5.5
Max	7.8
Range	2.3



Volatile Acidity
0.01g/L as Acetic Acid

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.36	0.05	0.37	0.05	Gibbi Still	0.37	1.96
2							
3	0.30	0.05	0.29	0.05	Steam Distillation	0.30	-1.47
4	0.32	0.065	0.32	0.065	Distillation	0.32	-0.25
5							
6	0.34	0.04	0.32	0.04	Distillation/Titration	0.33	0.25
7							
8							
9	0.24	0.05	0.23	0.05	Steam Distillation	0.24	-4.41 §
10	0.37	0.05	0.35	0.05	QIS 12675R1	0.36	1.72
11							
12							
13	0.32	0.032	0.35	0.035	Steam Distillation	0.34	0.49
14	0.32	0	0.32	0	Steam Distillation	0.32	-0.25

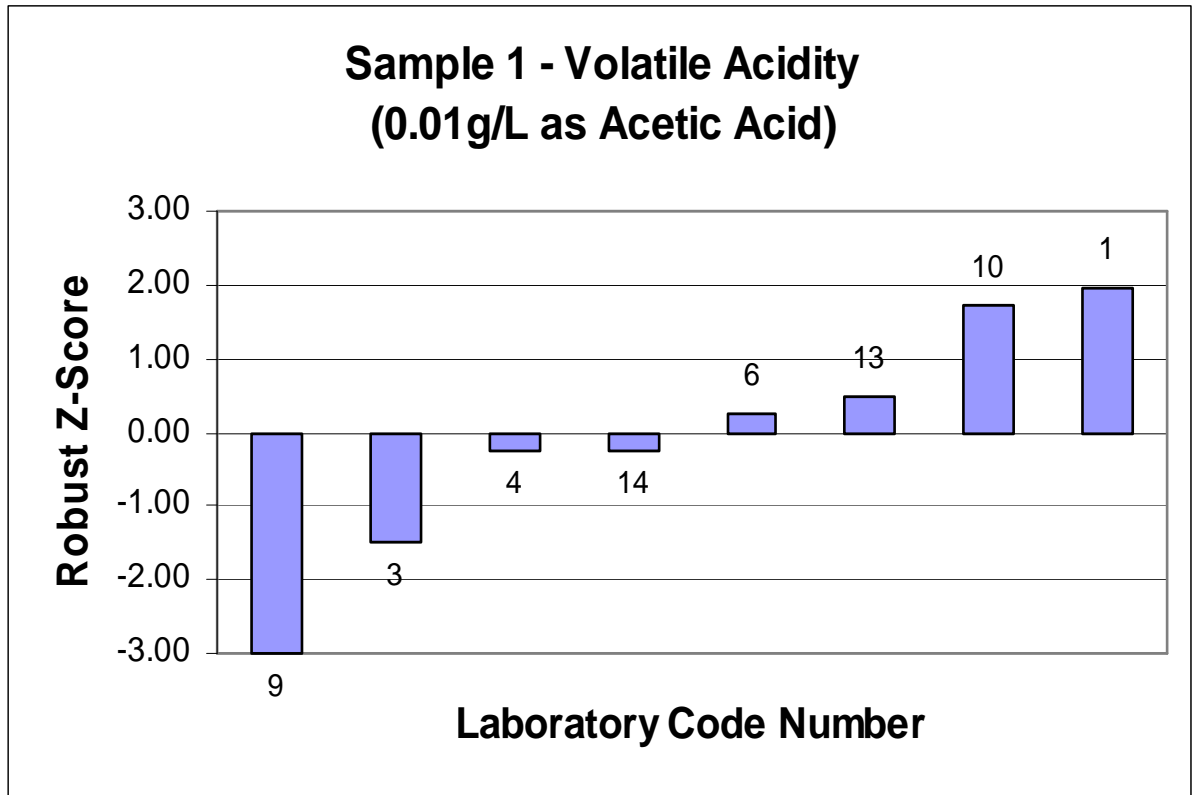
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	8
Median	0.325
NormIQR	0.020
Robust CV	6.27%
Min	0.24
Max	0.37
Range	0.13



Specific Gravity
0.0001

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.9914	0.0005	0.9914	0.0005	Calculation	0.9914	0.27
2	0.9914	0.0002	0.9915	0.0002	NIR/Densimeter	0.9915	0.40
3	0.9910	0.0003	0.9910	0.0003	Densimeter	0.9910	-0.81
4	0.9915	0.081	0.9915	0.081	Density Meter	0.9915	0.54
5	0.9914	0.0003			Frequency Oscillator (DMA)	0.9914	0.27
6	0.991	0.002	0.991	0.002	Density Meter	0.9910	-0.81
7	0.9914	0.0001	0.9914	0.0001	Oscillating U-tube density meter	0.9914	0.27
8							
9	0.9914	0.001	0.9913	0.001	Density Meter	0.9914	0.13
10							
11	0.9906	0.0002	0.9906	0.0002	Hydrometry	0.9906	-1.89
12	0.990	0.0005	0.990		Hydrometer	0.9900	-3.51 §
13	0.9905	0.001	0.9905	0.001	Hydrometer	0.9905	-2.16
14	0.9912	0.0001	0.9913	0.0001	FTIR	0.9913	-0.13

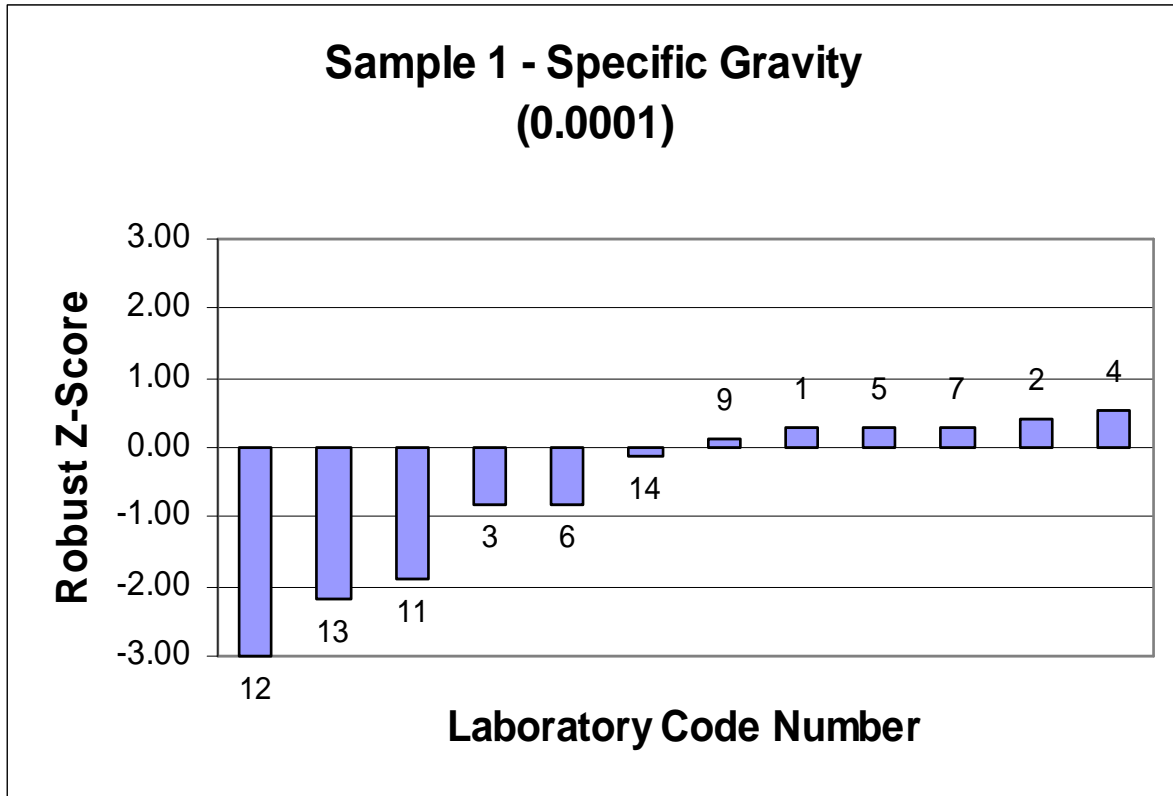
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	0.99130
NormIQR	0.00037
Robust CV	0.04%
Min	0.9900
Max	0.9915
Range	0.0015



A26

Total Dry Extract
0.1g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	23.6	0.2	23.6	0.2	Calculation	23.6	0.63
2	23	2.0	24.0	2.0	NIR	23.5	0.55
3	22.3	3.2	22.3	3.2	Calculation	22.3	-0.46
4	25.0		25.0			25.0	1.81
5	23.7					23.7	0.72
6	22.7	0.3	22.7	0.3	Distillation/Hydrometry/ Density Meter & Calculation	22.7	-0.13
7	23.0	0.5	23.0	0.5	Calculation	23.0	0.13
8							
9	23.7		23.5		Calculation	23.6	0.63
10							
11	22	2.0	22	2.0	Nomograph	22.0	-0.72
12	2.1		2.1		Calculation	2.1	-17.49 §
13	17.8	0.53	17.9	0.54	Oven Drying	17.9	-4.22 §
14	22		22		Calculation	22.0	-0.72

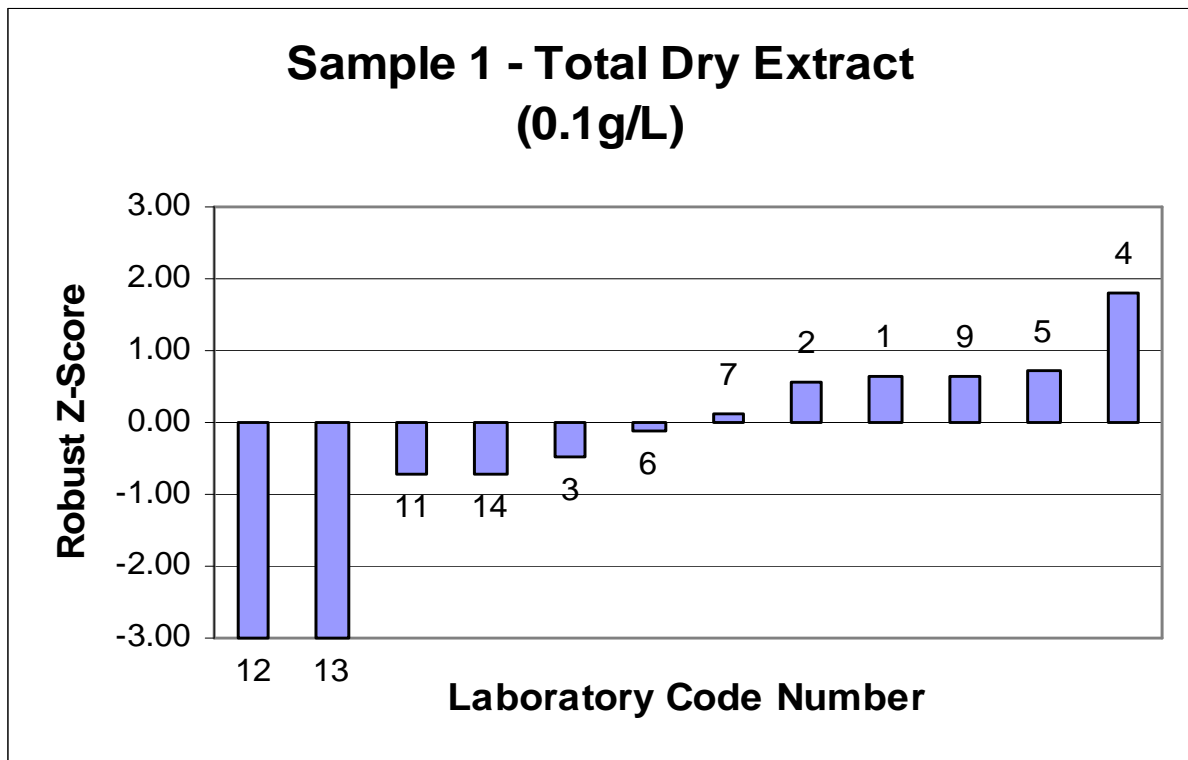
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	22.85
NormIQR	1.19
Robust CV	5.19%
Min	2.1
Max	25.0
Range	22.9



Copper
0.01mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.30	10	0.29	10	AAS	0.30	0.47
2	0.19	0.04	0.19	0.04	ICP	0.19	-1.99
3	0.24	0.07	0.25	0.07	AAS	0.25	-0.70
4	0.28		0.27		AAS	0.28	0.00
5	0.26	0.04			Flame AAS @324.7nm	0.26	-0.35
6							
7	0.29	0.05	0.28	0.05	Flame AAS	0.29	0.23
8							
9	0.21	10%	0.20	10%	Flame AAS	0.21	-1.64
10	0.40	0.2	0.30	0.2	ICP	0.35	1.76
11							
12	0.15	0.09	0.18		AAS	0.17	-2.58
13	0.28	0.028	0.28	0.028	ICP	0.28	0.12
14	0.28	0	0.28	0	AA	0.28	0.12

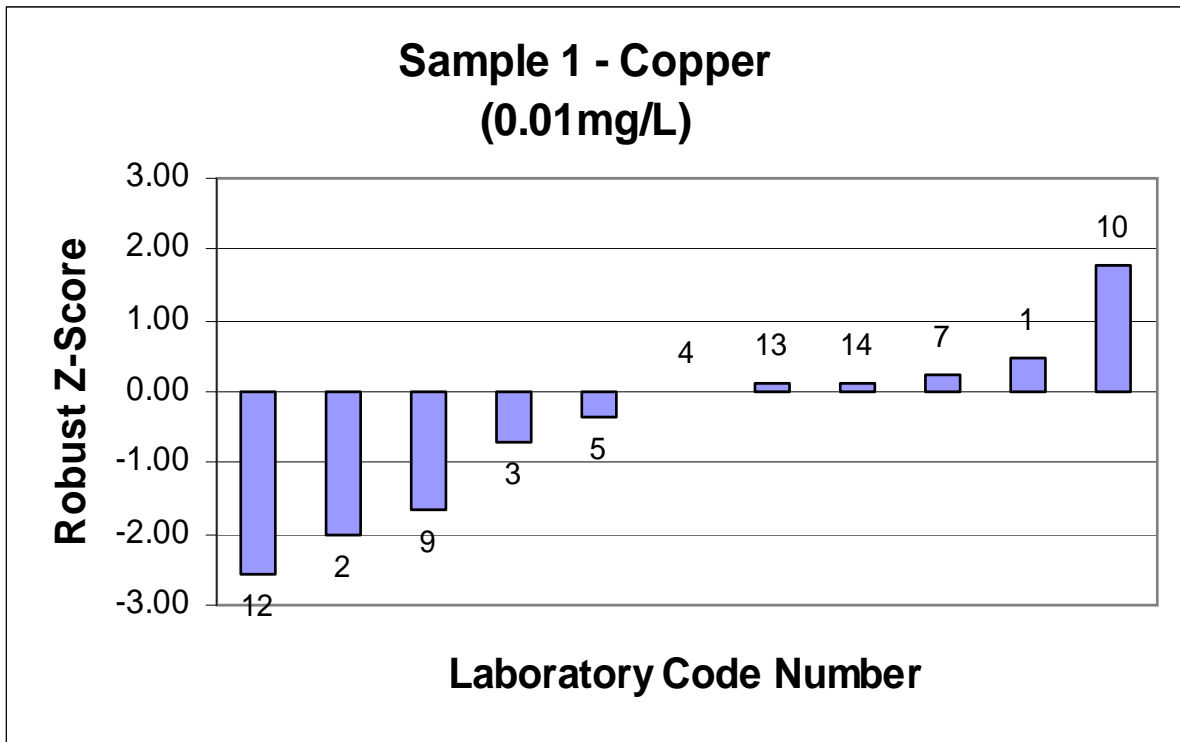
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	0.275
NormIQR	0.043
Robust CV	15.50%
Min	0.17
Max	0.35
Range	0.19



A30

Iron
0.01mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	1.36	7.5	1.28	7.5	AAS	1.32	0.13
2	0.80	0.08	0.80	0.08	ICP	0.80	-2.20
3	1.40	0.35	1.40	0.35	AAS	1.40	0.49
4	1.0		1.0		AAS	1.00	-1.30
5	1.29	0.25			Flame AAS @372.0nm	1.29	0.00
6							
7	1.39	0.35	1.44	0.35	Flame AAS	1.42	0.56
8							
9	1.00	10%	1.10	10%	Flame AAS	1.05	-1.08
10	1.17	0.1	1.17	0.1	ICP	1.17	-0.54
11							
12	1.1	0.20	1.2		AAS	1.15	-0.63
13	1.78	0.178	1.79	0.179	ICP	1.79	2.23
14	1.40	0	1.40	0	AA	1.40	0.49

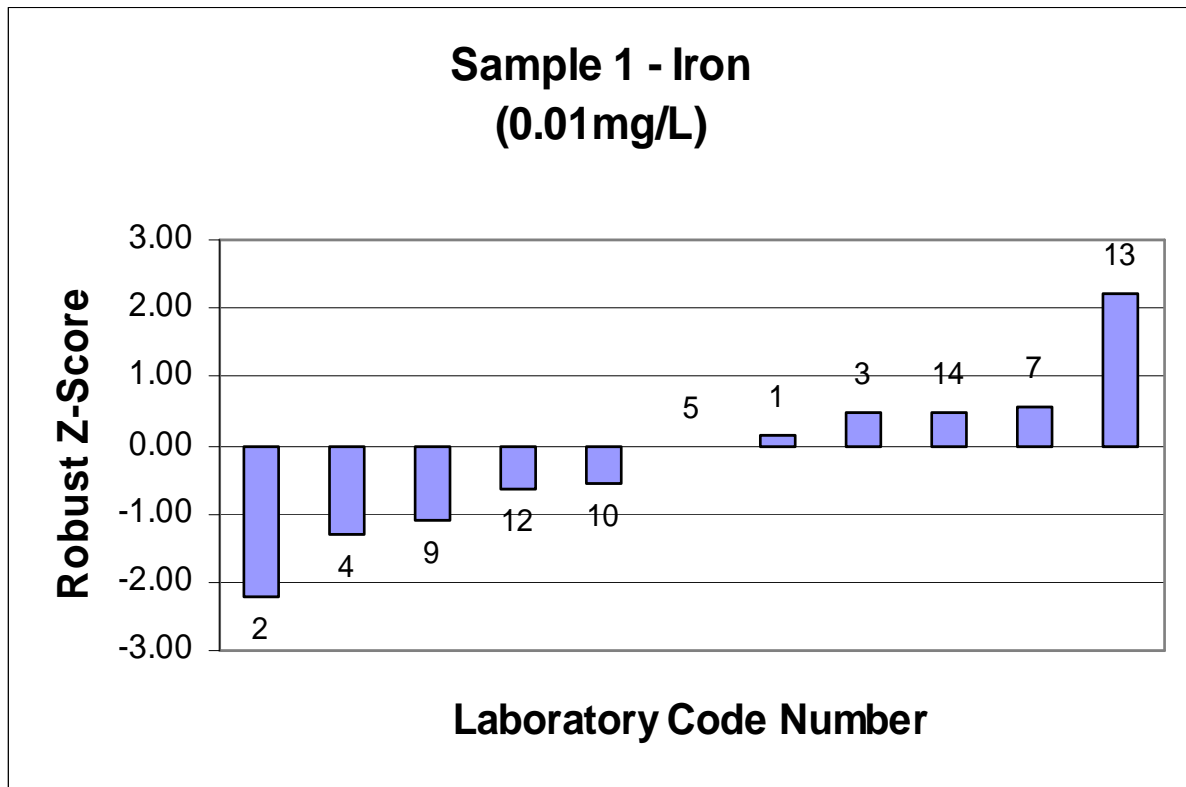
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	1.290
NormIQR	0.222
Robust CV	17.24%
Min	0.80
Max	1.79
Range	0.99



Calcium
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	39	8	38	8	AAS	39	-0.87
2	24	2	25	2	ICP	25	-2.09
3	50	24	50	24	AAS	50	0.13
4	38		39		AAS	39	-0.87
5	54	6			Flame AAS @422.7nm	54	0.48
6							
7	48	5	49	5	Flame AAS	49	0.00
8							
9	55	10%	55	10%	Flame AAS	55	0.57
10	53	1	53	1	ICP	53	0.39
11							
12	25	10.0	19		AAS	22	-2.31
13	56	5.6	56	5.6	ICP	56	0.65
14	38	2	37	2	AA	38	-0.96

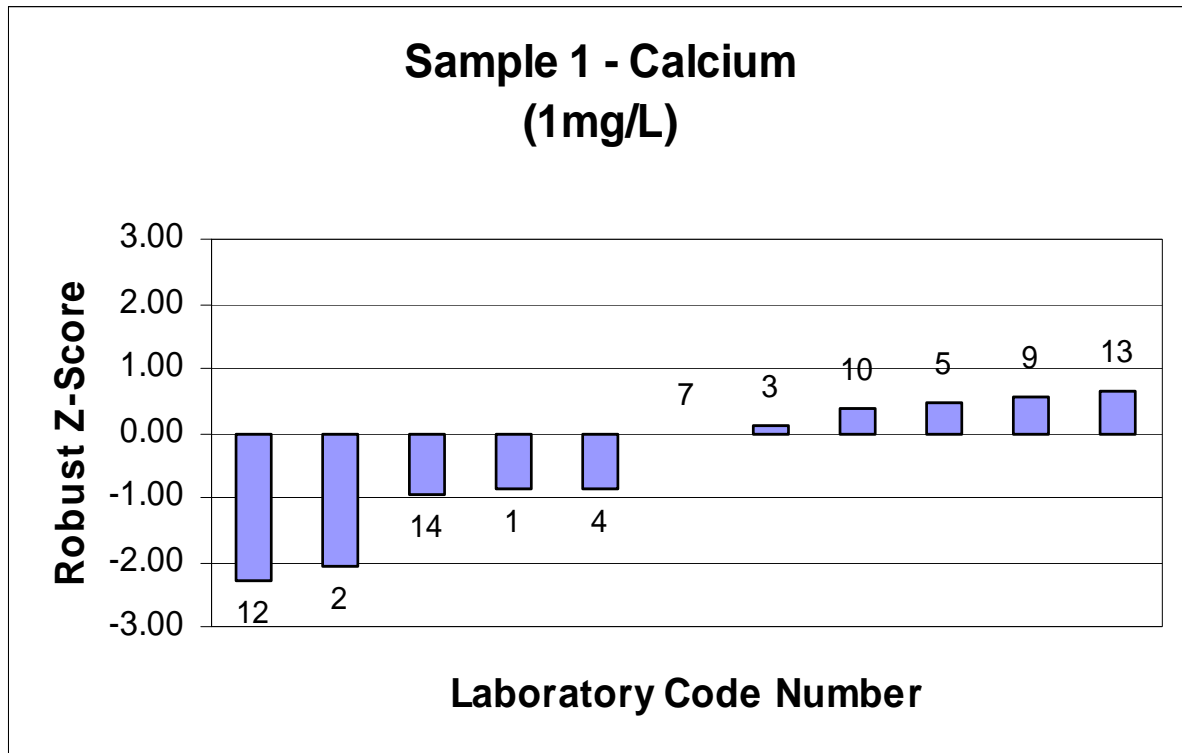
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Results

No. results	11
Median	48.5
NormIQR	11.5
Robust CV	23.69%
Min	22
Max	56
Range	34



Potassium
10mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	635	5	640	5	AAS	638	0.10
2	570	31	570	31	ICP	570	-2.70
3	640	80	630	80	AAS	635	0.00
4							
5	585	8%			Flame AAS @404.4nm	585	-2.08
6							
7	710	20	698	20	Flame AAS	704	2.86
8							
9							
10	640	10	630	10	ICP	635	0.00
11							
12	832	100	836		AAS	834	8.26 §
13	620	62	620	62	ICP	620	-0.62
14	600	14	610	14	AA	605	-1.25

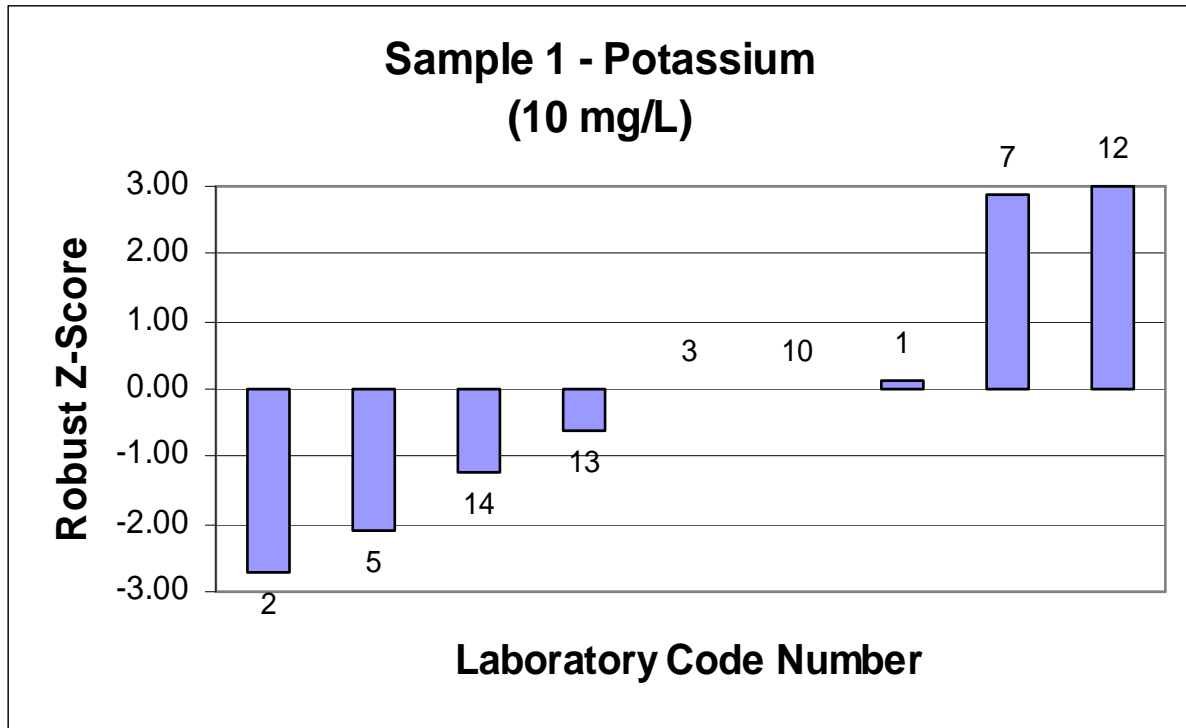
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	9
Median	635
NormIQR	24
Robust CV	3.79%
Min	570
Max	834
Range	264



Sodium
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	84	5	82	5	AAS	83	0.95
2	66	2	66	2	ICP	66	-4.44 §
3	83	10	83	10	AAS	83	0.95
4	65		64		AAS	65	-4.92 §
5	80	10%			Flame AAS @330.2nm	80	0.00
6							
7	95	8	101	8	Flame AAS	98	5.71 §
8							
9	80	10%	80	10%	Flame AAS	80	0.00
10	78	5	78	5	ICP	78	-0.63
11							
12	81	10.0	81		AAS	81	0.32
13	81	8.1	82	8.2	ICP	82	0.48
14	79	3.0	77	3.0	AA	78	-0.63

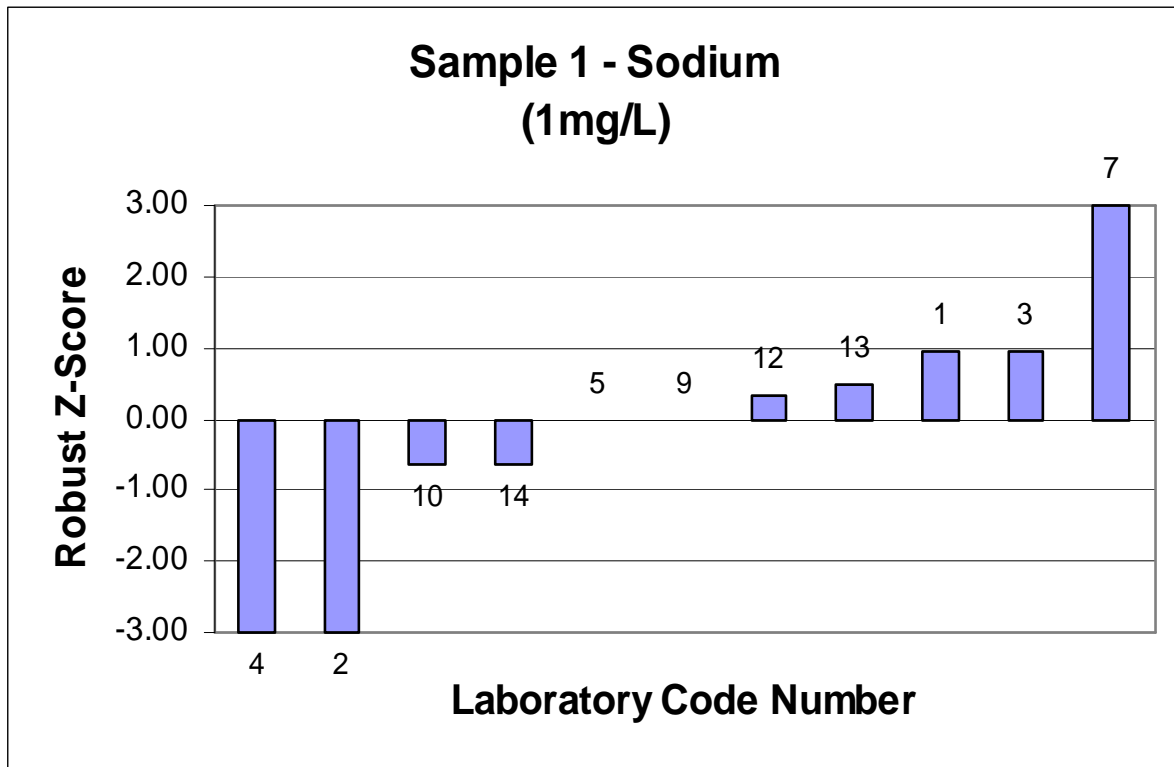
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	80.0
NormIQR	3.2
Robust CV	3.94%
Min	65
Max	98
Range	34



Section 2

Sample 2 (Red Wine)

Actual Alcohol
0.1%v/v

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	14.2	0.2	14.2	0.2	FTIR	14.2	-0.15
2	14.1	0.12	14.1	0.12	NIR	14.1	-1.70
3	14.3	0.2	14.3	0.2	NIR	14.3	1.39
4	14.22	0.046	14.22	0.046	Alcoholizer	14.2	0.15
5	14.2	0.1	14.2		NIR/Distillation	14.2	-0.15
6	14.3	0.3	14.2	0.3	Distillation/Hydrometry	14.3	0.62
7	14.2	0.1	14.2	0.1	NIR	14.2	-0.15
8	14.3	0.1	14.3	0.1	Inhouse Method MAL-003	14.3	1.39
9	14.3	0.2	14.3	0.2	NIR	14.3	1.39
10	14.2	0.2	14.2	0.2	QIS 12669 (GC)	14.2	-0.15
11	14.2	0.12	14.2	0.12	NIR	14.2	-0.15
12	14.3	0.008	14.2		Alcoholizer	14.3	0.62
13	14.5	0.57	14.5	0.57	Gas Chromatography	14.5	4.47 §
14	14.2	0	14.2	0	FTIR	14.2	-0.15

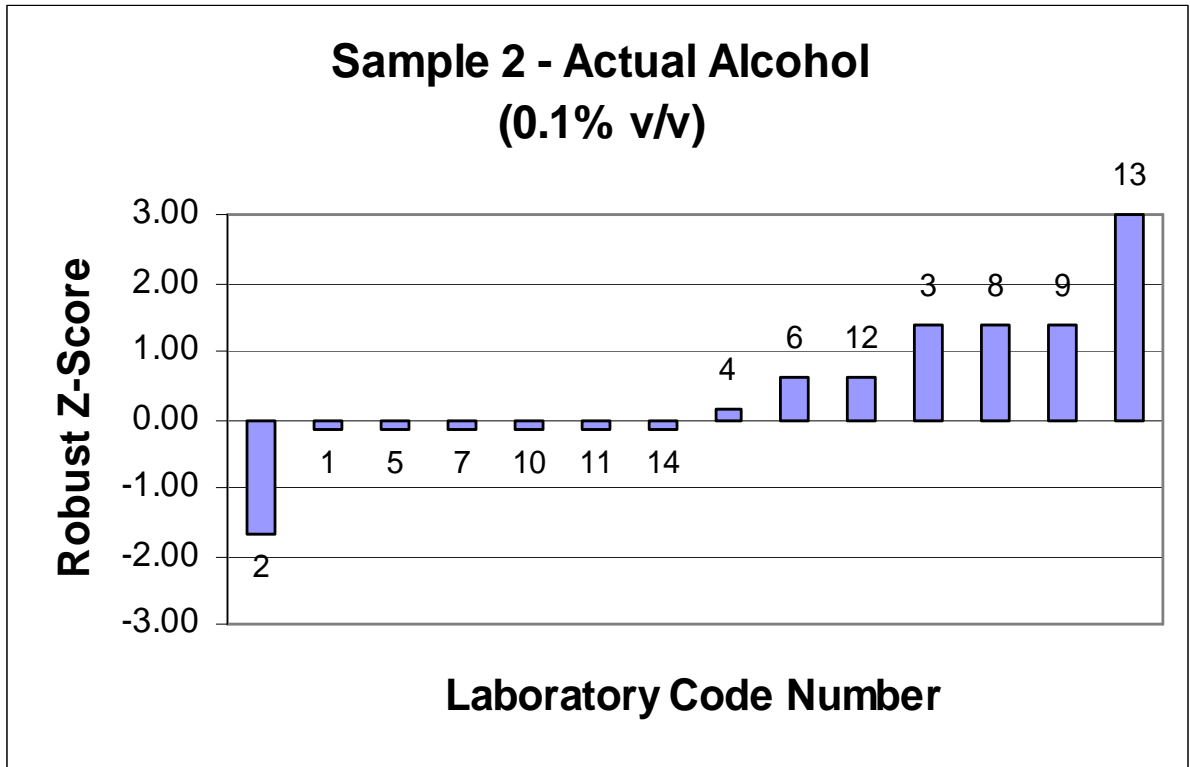
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	14
Median	14.21
NormIQR	0.06
Robust CV	0.46%
Min	14.1
Max	14.5
Range	0.4



Total Alcohol
0.1%v/v

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	14.4	0.2	14.4	0.2	Calculation	14.4	0.51
2	14.1	0.12	14.1	0.12	Calculation	14.1	-1.52
3	14.4	0.2	14.4	0.2	NIR/Titration	14.4	0.51
4	14.3		14.3			14.3	-0.17
5	14.2	0.18			Calculation	14.2	-0.84
6	14.4	0.3	14.3	0.3	Distillation/Hydrometry/ Rebelien & Calculation	14.4	0.17
7	14.2	0.1	14.2	0.1	Calculation	14.2	-0.84
8							
9	14.5		14.5		Calculation	14.5	1.18
10							
11	14.2		14.2		Calculation	14.2	-0.84
12	14.4		14.3		Calculation	14.4	0.17
13	14.53	0.94	14.54	0.94	Calculation	14.5	1.42
14	14.2		14.2		Calculation	14.2	-0.84

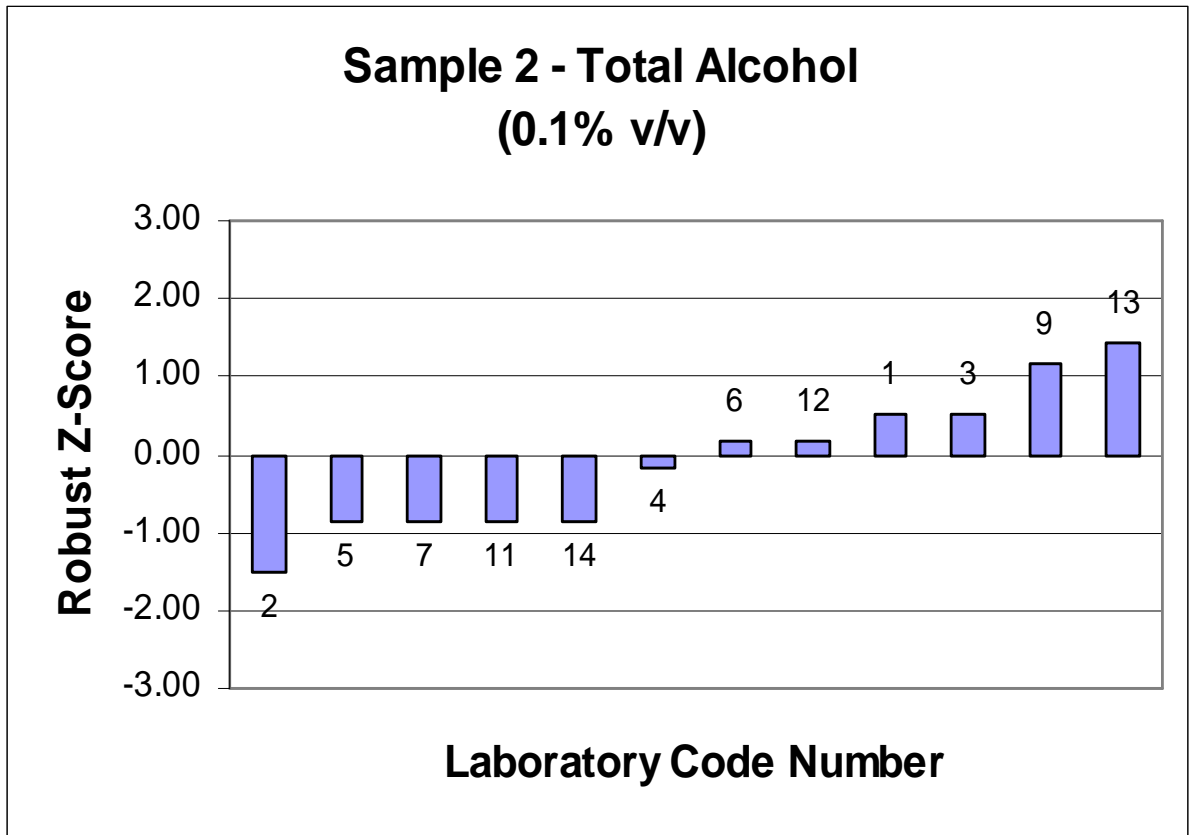
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	14.33
NormIQR	0.15
Robust CV	1.03%
Min	14.1
Max	14.5
Range	0.4



Free Sulfur Dioxide
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	30	3	30	3	Rankin	30	0.77
2	28	3	27	3	Aspiration	28	-1.16
3	29	2	30	2	Titration/Aspiration	30	0.39
4	26	1.56	28	1.56	Rankine	27	-1.54
5	29	3			Aspiration	29	0.00
6	29	2	29	2	Titration/Aspiration	29	0.00
7	26	3	26	3	Rankine Aspiration	26	-2.31
8							
9	28	3	28	3	Aspiration	28	-0.77
10							
11	30	3	30	3	Aspiration	30	0.77
12	29	3			Aspiration	29	0.00
13	29	2.9	29	2.9	Aspiration	29	0.00
14	27	0	27	0	Flow Injection	27	-1.54

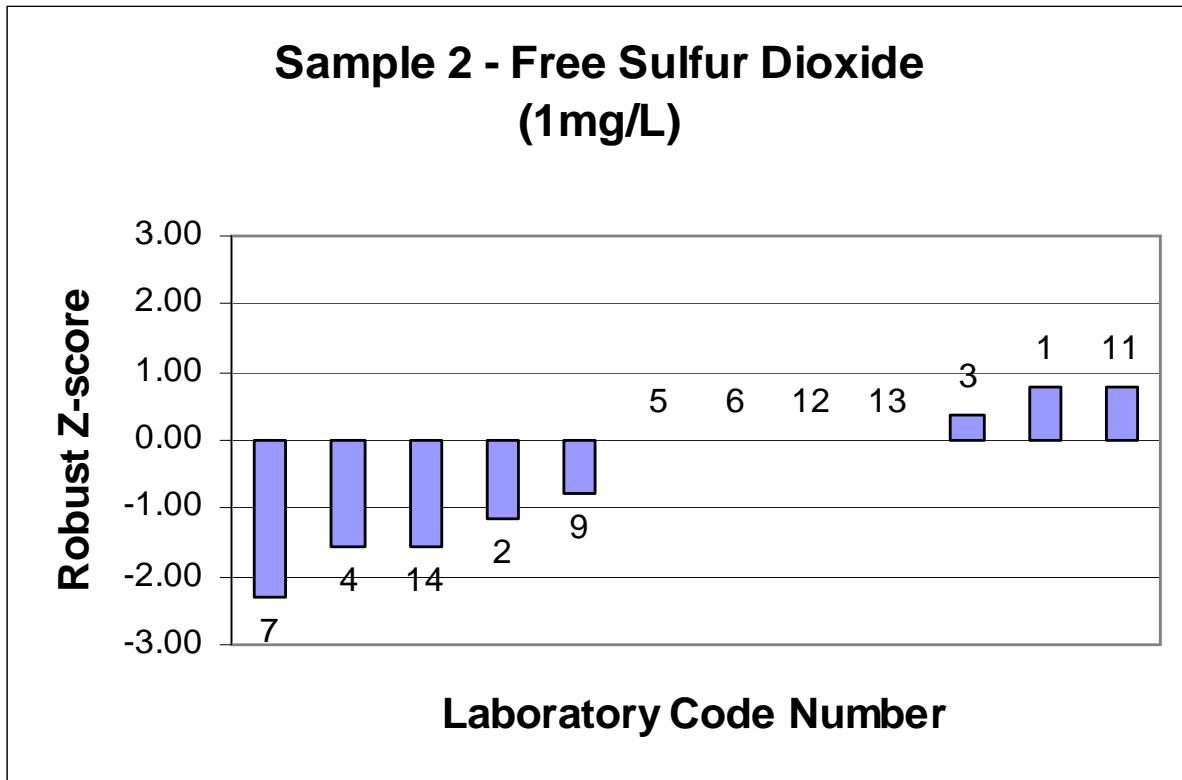
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Results

No. results	12
Median	29.0
NormIQR	1.3
Robust CV	4.47%
Min	26
Max	30
Range	4



Total Sulfur Dioxide
1mg/L

Lab Code	Result 1	MU \pm	Result 2	MU \pm	Method	Averaged Results	Robust Z-Score
1	78	4	78	4	Rankin	78	1.11
2	65	3.5	65	3.5	Aspiration	65	-0.64
3	64	7	65	7	Titration/Aspiration	65	-0.71
4	69	6.8	70	6.8	Rankine	70	-0.03
5	69	6			Aspiration	69	-0.10
6	76	4	76	4	Titration/Aspiration	76	0.84
7	59	5	62	5	Rankine Aspiration	61	-1.25
8	79	5	76	5	AOAC 990.28	78	1.05
9	65	5	67	5	Aspiration	66	-0.51
10	94	10	92	10	Monier Williams	93	3.14 §
11	70	3.5	70	3.5	Aspiration	70	0.03
12	70	6			Aspiration	70	0.03
13	37	3.7	38	3.8	Aspiration	38	-4.35 §
14	73	0	73	0	Flow Injection	73	0.44

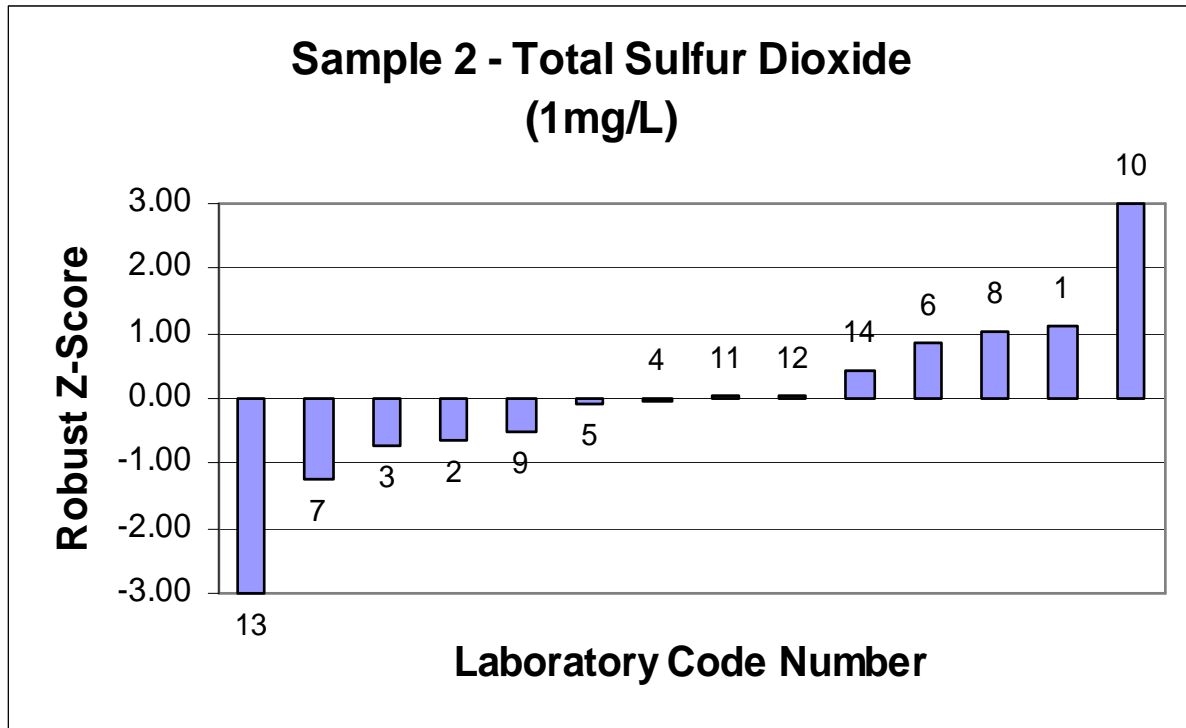
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	14
Median	69.8
NormIQR	7.4
Robust CV	10.63%
Min	38
Max	93
Range	56



Glucose and Fructose
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.54	0.5	0.54	0.5	Enzymatic	0.54	0.23
2	0.29	0.13	0.29	0.13	HPLC	0.29	-2.32
3	0.50	0.40	0.50	0.40	Enzymatic Plate Reader	0.50	-0.18
4							
5	0.54	10%	0.53		Enzyme (automated)	0.54	0.18
6							
7	0.42	0.12	0.43	0.12	Enzymatic	0.43	-0.94
8	0.46	0.05	0.42	0.05		0.44	-0.79
9	0.50	5%	0.50	5%	Enzymatic	0.50	-0.18
10	0.76	0.1	0.69	0.1	QIS 12677R2 (HPLC)	0.73	2.11
11	0.58	0.13	0.59	0.13	Enzymatic	0.59	0.69
12	1.1	0.20	1.2		HPLC	1.15	6.44 §
13	0.59	0.053	0.60	0.054	Enzyme	0.60	0.79
14	0.52	0.17	0.40	0.17	FTIR	0.46	-0.59

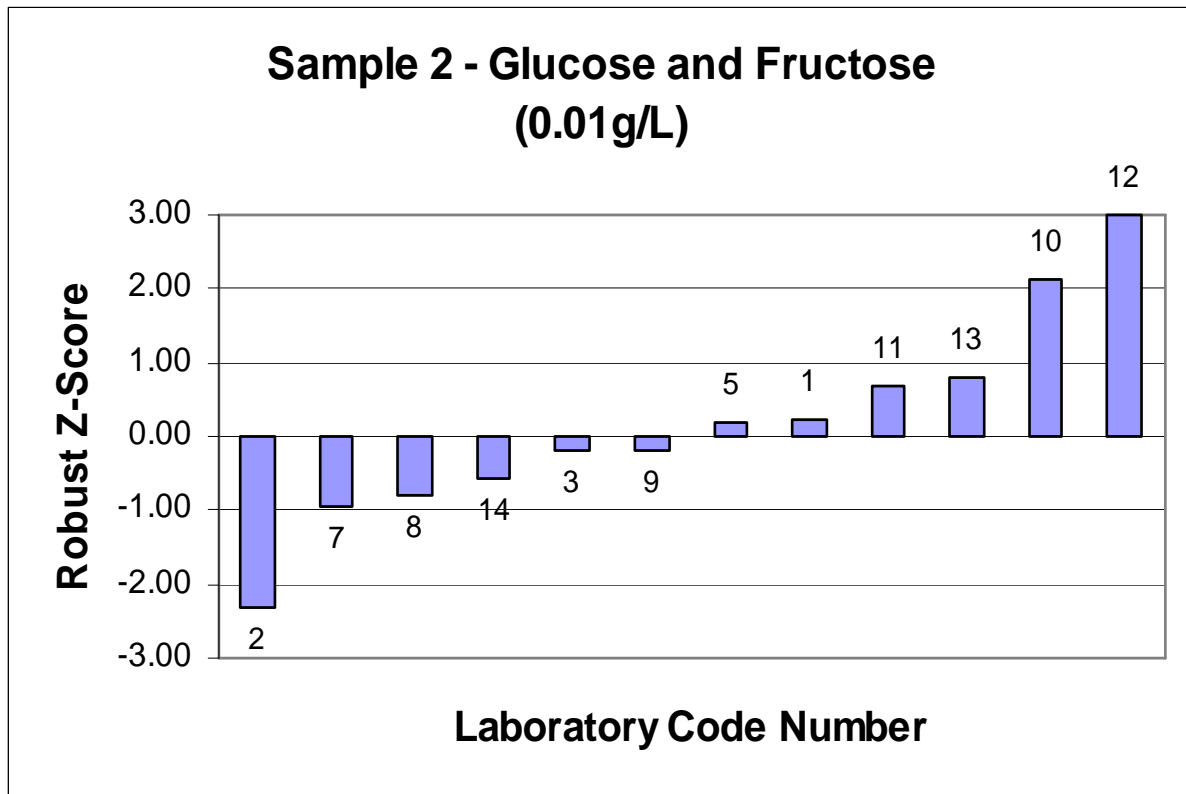
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	0.518
NormIQR	0.098
Robust CV	18.98%
Min	0.29
Max	1.15
Range	0.86



Residual (Reducing) Sugars
0.1g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	3.2	0.5	3.1	0.5	HPLC	3.2	2.62
2							
3	2.4	0.5	2.3	0.5	Titration Lane Eynon	2.4	0.22
4	2.0	0.15	2.0	0.15	Rebelien	2.0	-0.82
5							
6	2.2	0.3	2.2	0.3	Rebelien	2.2	-0.22
7							
8							
9	2.7	0.5	2.7	0.5	Lane & Eynon	2.7	1.27
10							
11							
12	2.3	3.0	2.0		Rebelien	2.2	-0.37
13							
14							

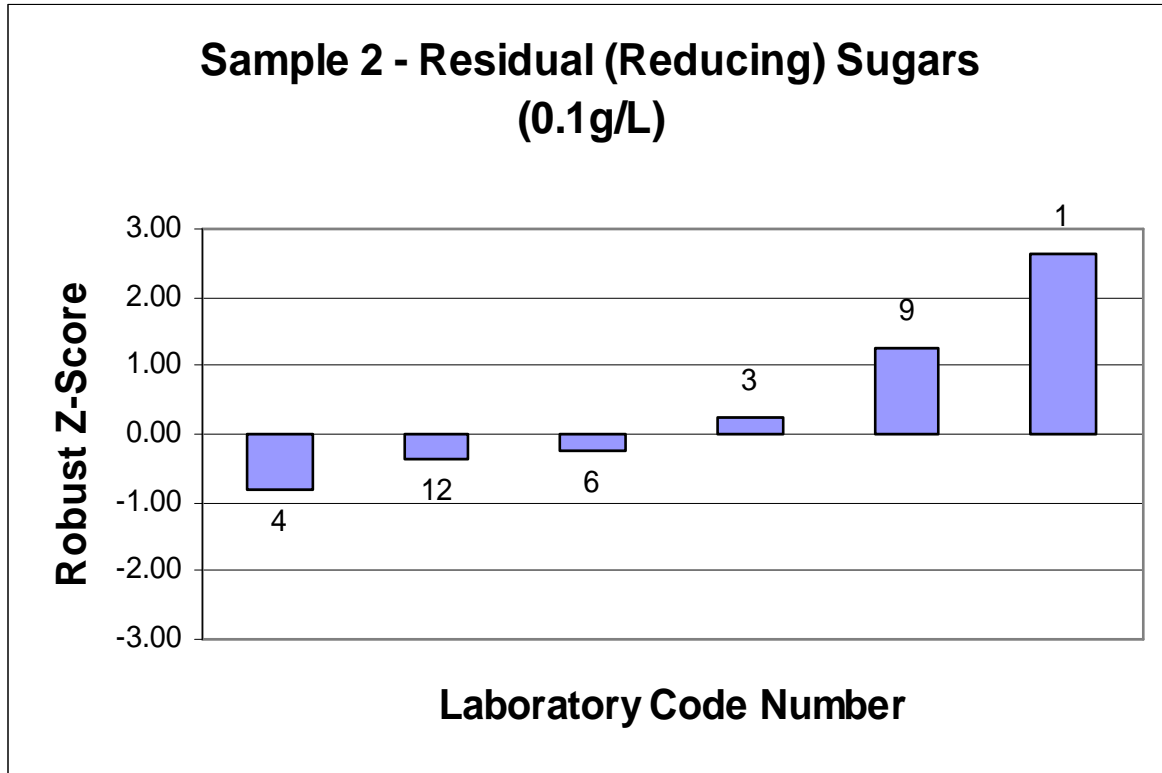
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	6
Median	2.28
NormIQR	0.33
Robust CV	14.66%
Min	2.0
Max	3.2
Range	0.1



A50

pH
0.01

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	3.53	0.05	3.53	0.05	pH Meter	3.53	1.75
2	3.49	0.02	3.49	0.02	Auto Titrator	3.49	0.48
3	3.36	0.10	3.36	0.10	pH Electrode	3.36	-3.65 §
4	3.48		3.47		pH Meter	3.48	0.00
5	3.47	0.04				3.47	-0.16
6	3.53	0.04	3.54	0.04	pH Meter	3.54	1.90
7	3.46	0.05	3.46	0.05	Potentiometric Electrode	3.46	-0.48
8	3.57	0.05	3.58	0.05		3.58	3.17 §
9	3.47	0.05	3.48	0.05	pH Meter	3.48	0.00
10	3.45	0.05	3.46	0.05		3.46	-0.63
11	3.51	0.02	3.50	0.02	pH Meter	3.51	0.95
12	3.48	0.05	3.45		pH Probe	3.47	-0.32
13	3.47	0.035	3.47	0.035	pH Electrode	3.47	-0.16
14	3.51	0	3.51	0	FTIR	3.51	1.11

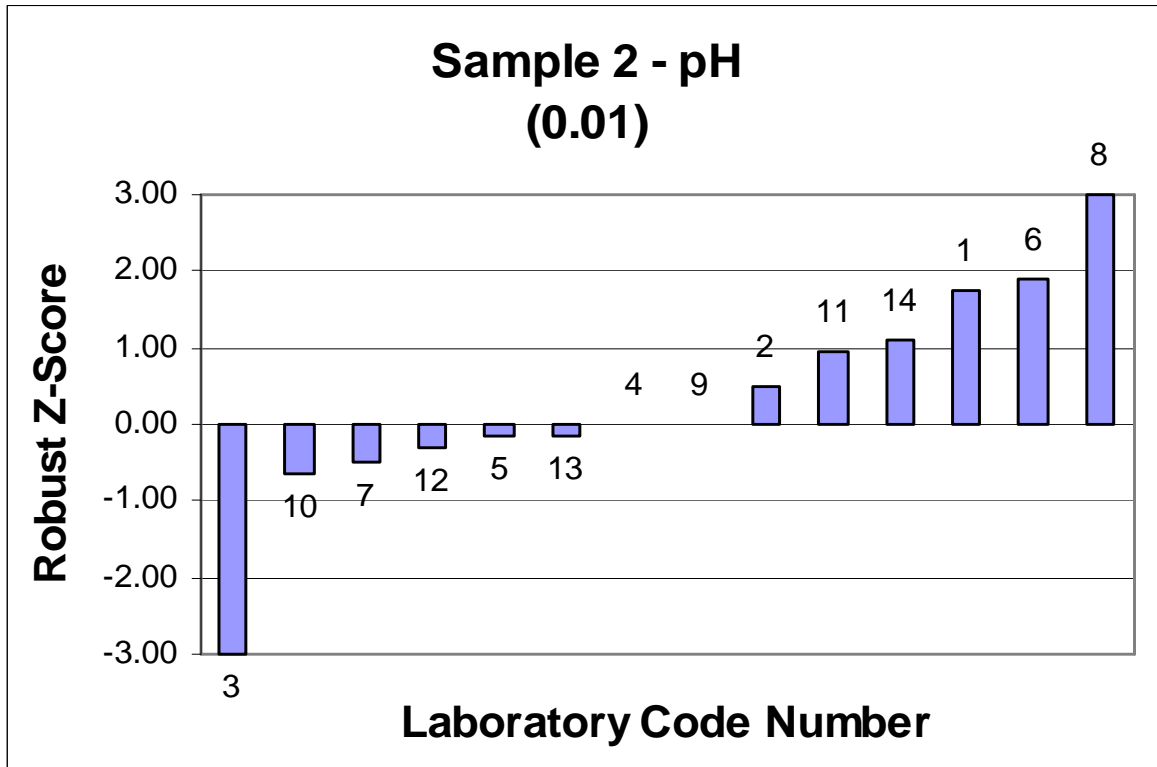
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	14
Median	3.475
NormIQR	0.032
Robust CV	0.91%
Min	3.36
Max	3.58
Range	0.22



Acetic Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.42	0.05	0.41	0.05	Enzymatic	0.42	-1.01
2	0.43	0.12	0.43	0.12	HPLC	0.43	0.00
3	0.43	0.06	0.43	0.06	Enzymatic Plate Reader	0.43	0.00
4							
5	0.43	10%			Enzyme (automated)	0.43	0.00
6							
7	0.45	0.03	0.45	0.03	Enzymatic	0.45	1.35
8							
9							
10							
11	0.43	0.12	0.44	0.12	Enzymatic	0.44	0.34
12	0.55	0.05	0.59		Still	0.57	9.44 §
13	0.36	0.018	0.38	0.019	Enzyme	0.37	-4.05 §
14	0.52	0.06	0.56	0.06	FTIR	0.54	7.42 §

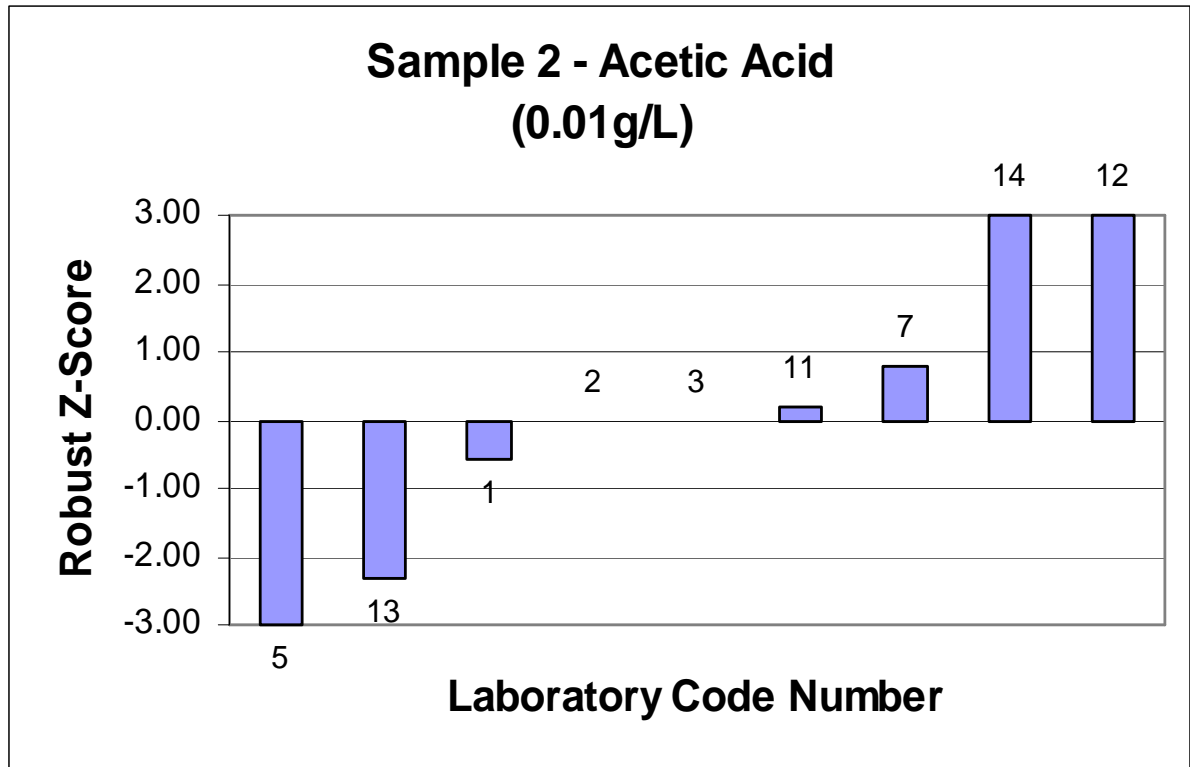
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	9
Median	0.430
NormIQR	0.015
Robust CV	6.03%
Min	0.22
Max	0.57
Range	0.36



Citric Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.09	0.05	0.09	0.05	Enzymatic	0.09	0.00
2	0.07	0.02	0.08	0.02	HPLC	0.08	-0.51
3	0.11	0.03	0.12	0.03	Enzymatic Plate Reader	0.12	0.84
4	0.06		0.06		Enzymatic	0.06	-1.01
5	0.11	0.1			Enzyme	0.11	0.67
6							
7	0.08	0.05	0.08	0.05	Enzymatic	0.08	-0.34
8							
9	0.12	0.1	0.12	0.1	Enzymatic	0.12	1.01
10							
11							
12	Not Detected	0.2	Not Detected		HPLC		
13	0.14	0.013	0.16	0.014	Enzyme	0.15	2.02
14	0.026	0.04	0.001	0.04	Enzymatic	0.01	-2.58

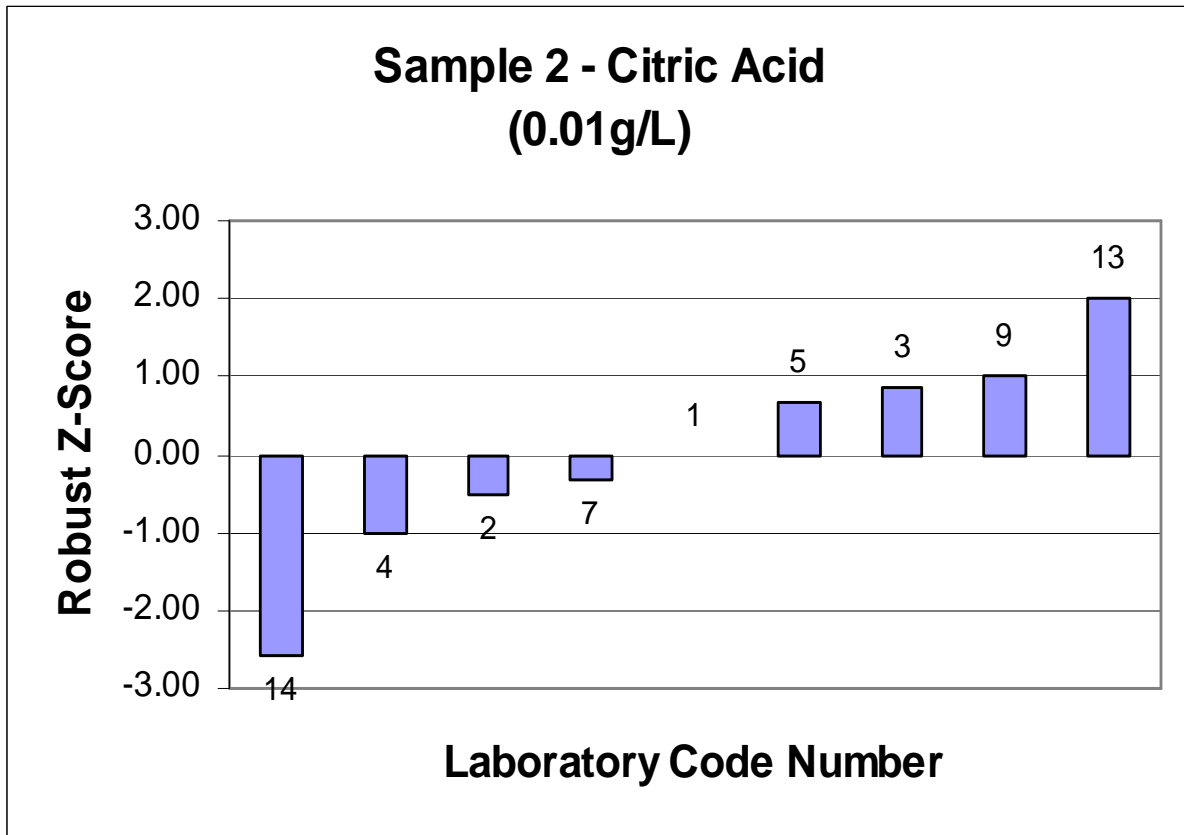
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	9
Median	0.090
NormIQR	0.030
Robust CV	32.95%
Min	0.01
Max	0.15
Range	0.14



Malic Acid
0.01g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.08	0.05	0.09	0.05	Enzymatic	0.09	0.34
2	0.06	0.10	0.06	0.10	Enzymatic	0.06	-0.51
3	0.10	0.11	0.10	0.11	Enzymatic Plate Reader	0.10	0.84
4	0.09		0.13		Enzymatic	0.11	1.18
5	0.06	10%			Enzyme (automated)	0.06	-0.51
6							
7	Not Detected	0.07	Not Detected	0.07	Enzymatic		
8							
9	0.08	0.1	0.07	0.1	Enzymatic	0.08	0.00
10							
11	0.05	0.02	0.05	0.02	Enzymatic	0.05	-0.84
12	Not Detected	0.2	Not Detected		HPLC		
13	0.10	0.007	0.11	0.008	Enzyme	0.11	1.01
14	0.051	0	0.051	0	Enzymatic	0.05	-0.81

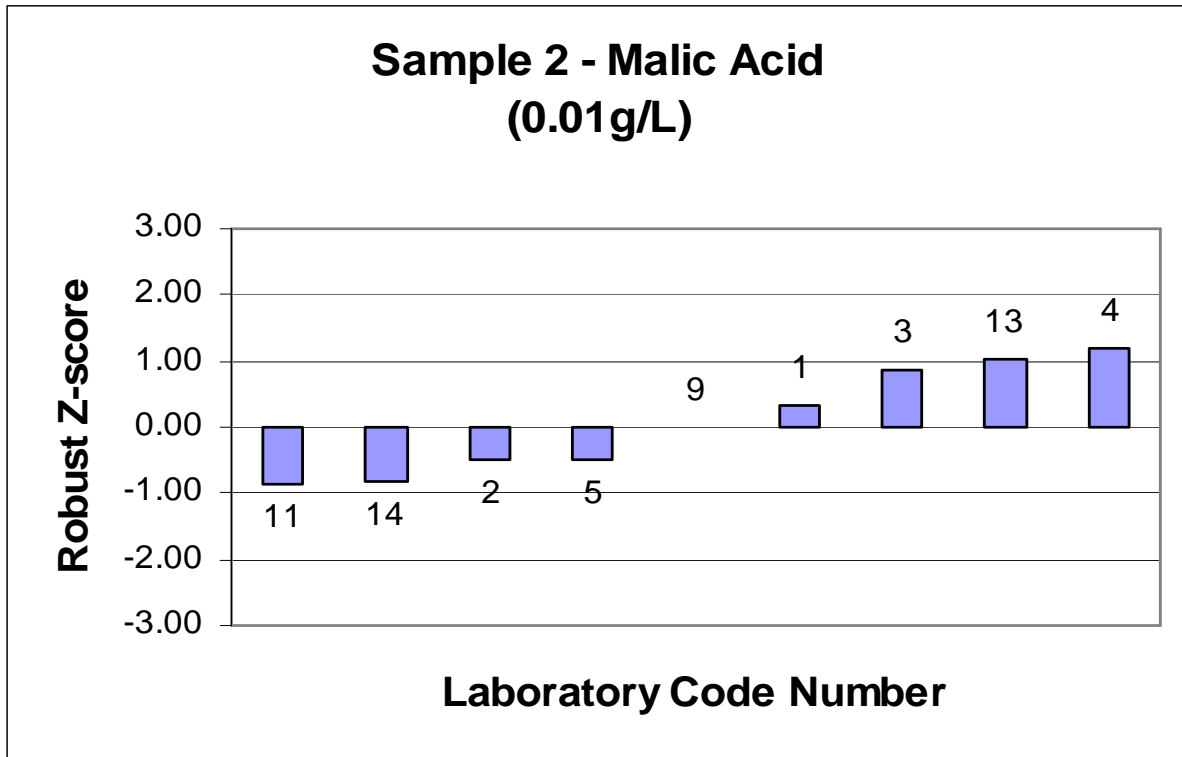
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Results

No. results	9
Median	0.075
NormIQR	0.030
Robust CV	39.54%
Min	0.05
Max	0.11
Range	0.06



Total Acidity
0.1g/L as Tartaric Acid

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	6.5	0.1	6.5	0.1	Auto-Titrator	6.5	0.00
2	6.5	0.18	6.5	0.18	Auto-Titrator	6.5	0.00
3	6.6	0.2	6.6	0.2	Auto-Titrator	6.6	1.35
4	6.9	0.12	6.9	0.12	Auto-Titrator	6.9	5.40 §
5	6.5	0.1			Potentiometric Titration	6.5	0.00
6	6.5	0.11	6.5	0.11	Potentiometric Autotitrator	6.5	0.00
7	6.6	0.3	6.6	0.3	Titration	6.6	1.35
8							
9	6.5	0.2	6.5	0.2	Auto-Titrator	6.5	0.00
10	8.6	0.2	8.9	0.2	AOAC 962.12 (pH 8.2)	8.8	30.35 §
11	6.5	0.18	6.5	0.18	Auto-Titrator	6.5	0.00
12	6.4	0.1	6.5		HPLC	6.5	-0.67
13	6.66	0.133	6.66	0.133	Titration	6.7	2.16
14	6.6	0.14	6.5	0.14	FTIR	6.6	0.67

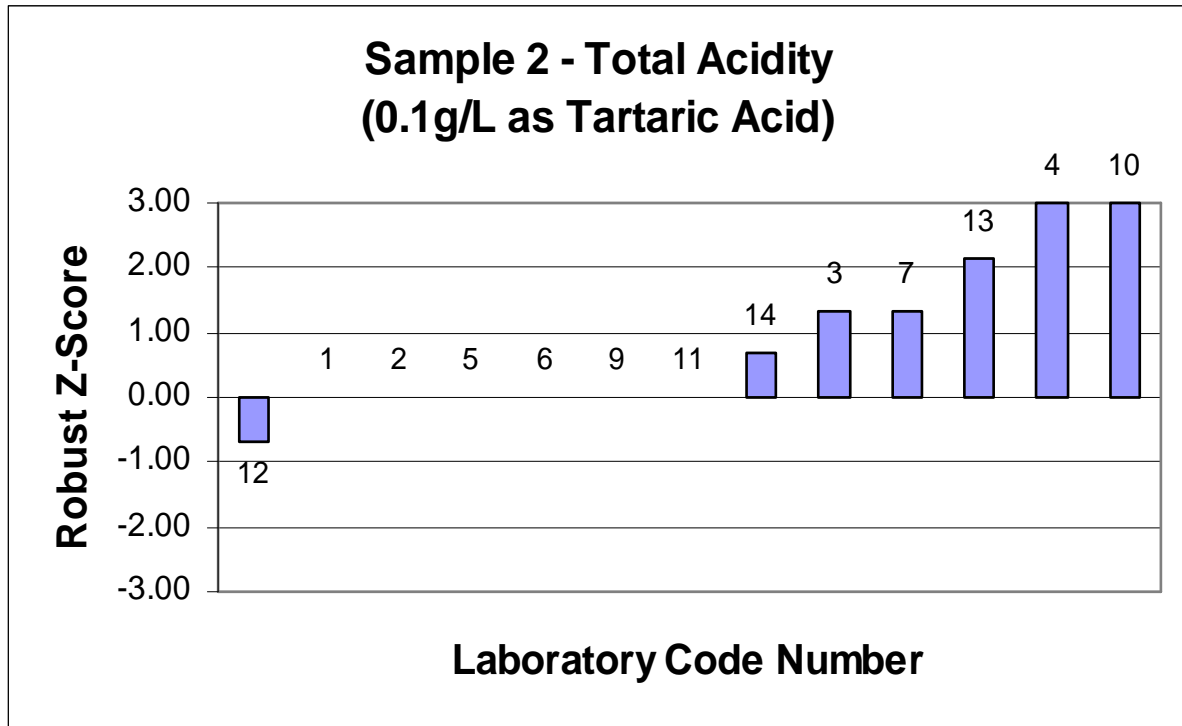
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	13
Median	6.50
NormIQR	0.07
Robust CV	1.14%
Min	6.5
Max	8.8
Range	2.3



Volatile Acidity
0.01g/L as Acetic Acid

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.53	0.05	0.54	0.05	Gibbi Still	0.54	0.63
2							
3	0.51	0.05	0.52	0.05	Steam Distillation	0.52	0.37
4	0.46	0.065	0.46	0.065	Distillation	0.46	-0.37
5							
6	0.54	0.04	0.53	0.04	Distillation/Titration	0.54	0.63
7							
8							
9	0.40	0.05	0.38	0.05	Steam Distillation	0.39	-1.30
10	0.39	0.05	0.41	0.05	QIS 12675R1	0.40	-1.17
11							
12							
13	0.44	0.044	0.44	0.044	Steam Distillation	0.44	-0.63
14	0.53	0	0.53	0	Steam Distillation	0.53	0.57

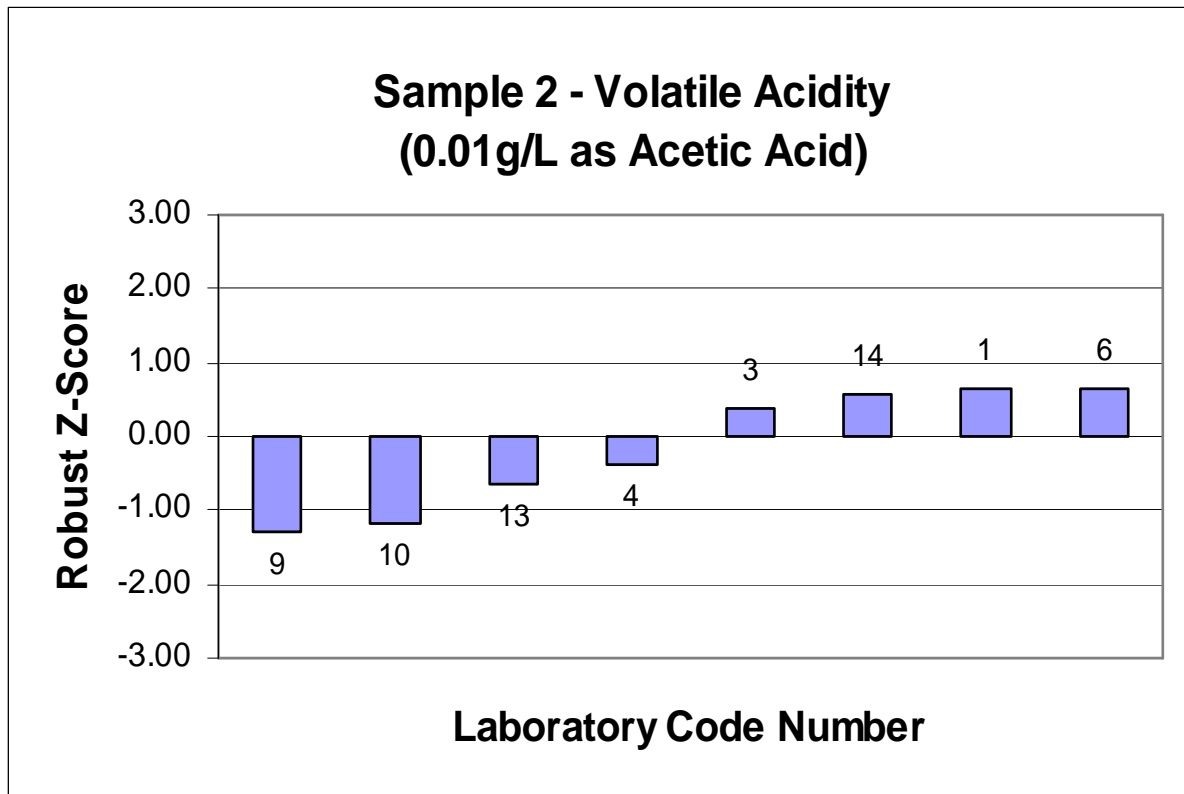
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	8
Median	0.488
NormIQR	0.075
Robust CV	15.40%
Min	0.39
Max	0.54
Range	0.15



Specific Gravity
0.0001

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.9937	0.0005	0.9937	0.0005	Calculation	0.9937	0.00
2	0.9938	0.0002	0.9938	0.0002	NIR/Densimeter	0.9938	0.28
3	0.9940	0.0003	0.9940	0.0003	Densimeter	0.9940	0.85
4	0.9940	0.081	0.9940	0.081	Density Meter	0.9940	0.85
5	0.9937	0.0003			Frequency Oscillator (DMA)	0.9937	0.00
6	0.993	0.002	0.993	0.002	Density Meter	0.9930	-1.99
7	0.9937	0.0001	0.9937	0.0001	Oscillating U-tube density meter	0.9937	0.00
8							
9	0.9937	0.001	0.9937	0.001	Density Meter	0.9937	0.00
10							
11	0.9929	0.0002	0.9929	0.0002	Hydrometry	0.9929	-2.27
12	0.991	0.0005	0.990		Hydrometer	0.9905	-9.09 §
13	0.9935	0.00099	0.9935	0.00099	Hydrometer	0.9935	-0.57
14	0.9945	0.0000	0.9945	0	FTIR	0.9945	2.27

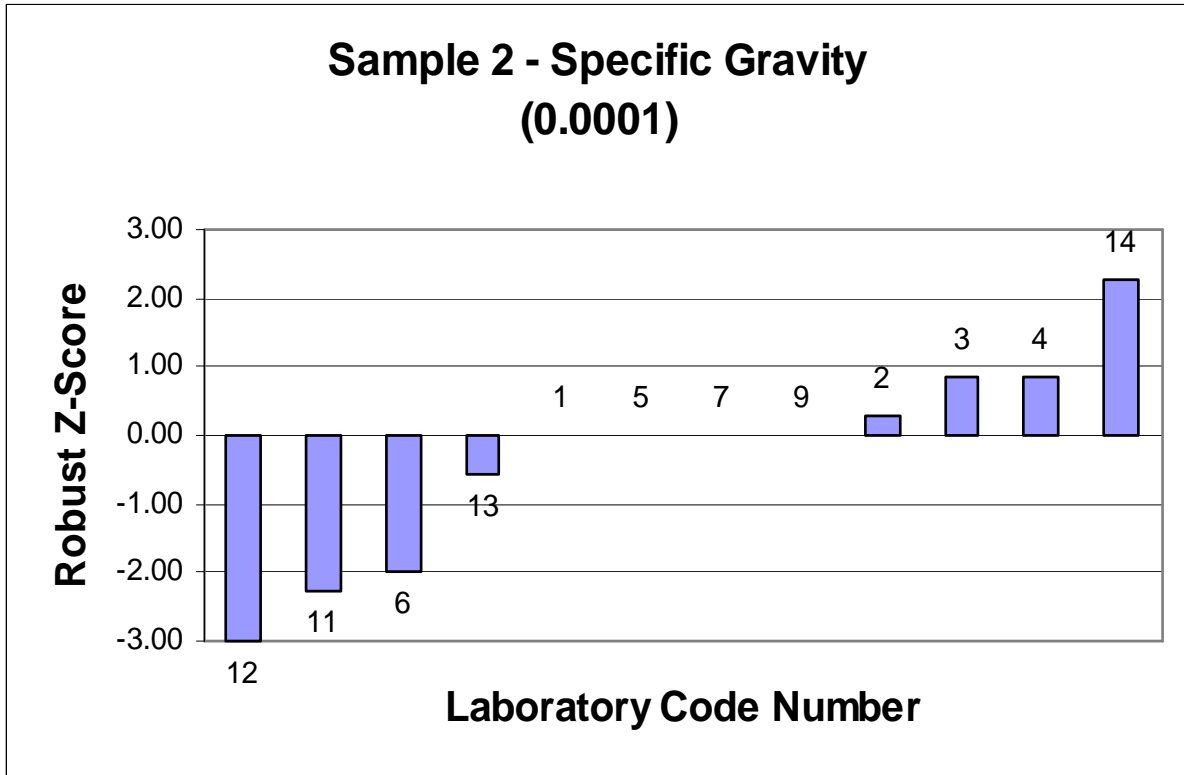
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	0.99370
NormIQR	0.00035
Robust CV	0.04%
Min	0.9905
Max	0.9945
Range	0.1300



A64

Total Dry Extract
0.1g/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	31.3	0.2	31.3	0.2	Calculation	31.3	0.13
2	31	2.0	31	2.0	NIR	31.0	-0.13
3	31.8	3.2	31.8	3.2	Calculation	31.8	0.54
4	34.6		34.6			34.6	2.89
5	31.3				Calculation	31.3	0.13
6	29.7	0.3	30.0	0.3	Distillation/Hydrometry/ Density Meter & Calculation	29.9	-1.09
7	30.8	0.5	30.8	0.5	Calculation	30.8	-0.29
8							
9	31.5		31.5		Calculation	31.5	0.29
10							
11	30	2.0	30	2.0	Nomograph	30.0	-0.96
12	2.5		2.3		Calculation	2.4	-24.05 §
13	26.8	0.80	25.6	0.77	Oven Drying	26.2	-4.14 §
14	33		33		Calculation	33.0	1.55

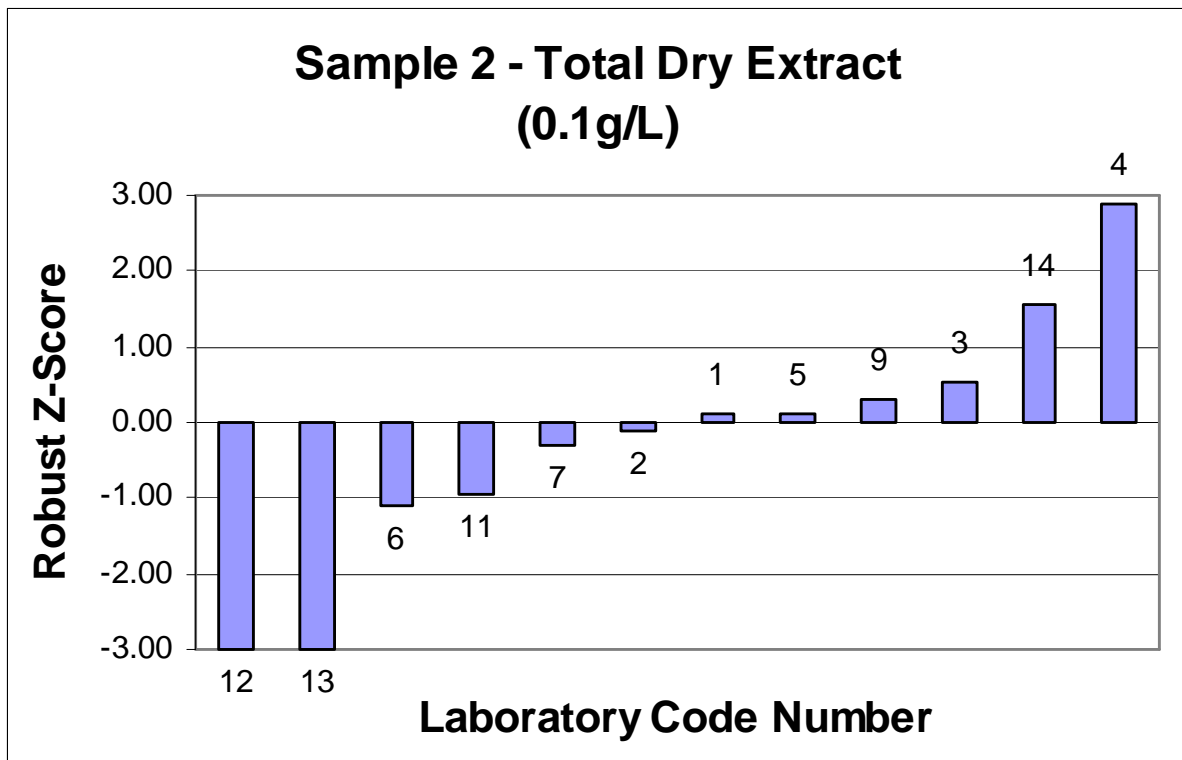
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	12
Median	31.15
NormIQR	1.20
Robust CV	3.84%
Min	2.4
Max	34.6
Range	32.2



Copper
0.01mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	0.46	10	0.45	10	AAS	0.46	0.08
2	0.40	0.04	0.40	0.04	ICP	0.40	-0.84
3	0.42	0.07	0.40	0.07	AAS	0.41	-0.67
4	0.43		0.43		AAS	0.43	-0.34
5	0.49	0.04			Flame AAS @324.7nm	0.49	0.67
6							
7	0.51	0.05	0.51	0.05	Flame AAS	0.51	1.01
8							
9	0.35	10%	0.35	10%	Flame AAS	0.35	-1.69
10	0.4	0.2	0.5	0.2	ICP	0.45	0.00
11							
12	0.25	0.09	0.30		AAS	0.28	-2.95
13	0.48	0.048	0.48	0.048	ICP	0.48	0.51
14	0.49	0	0.49	0	AA	0.49	0.67

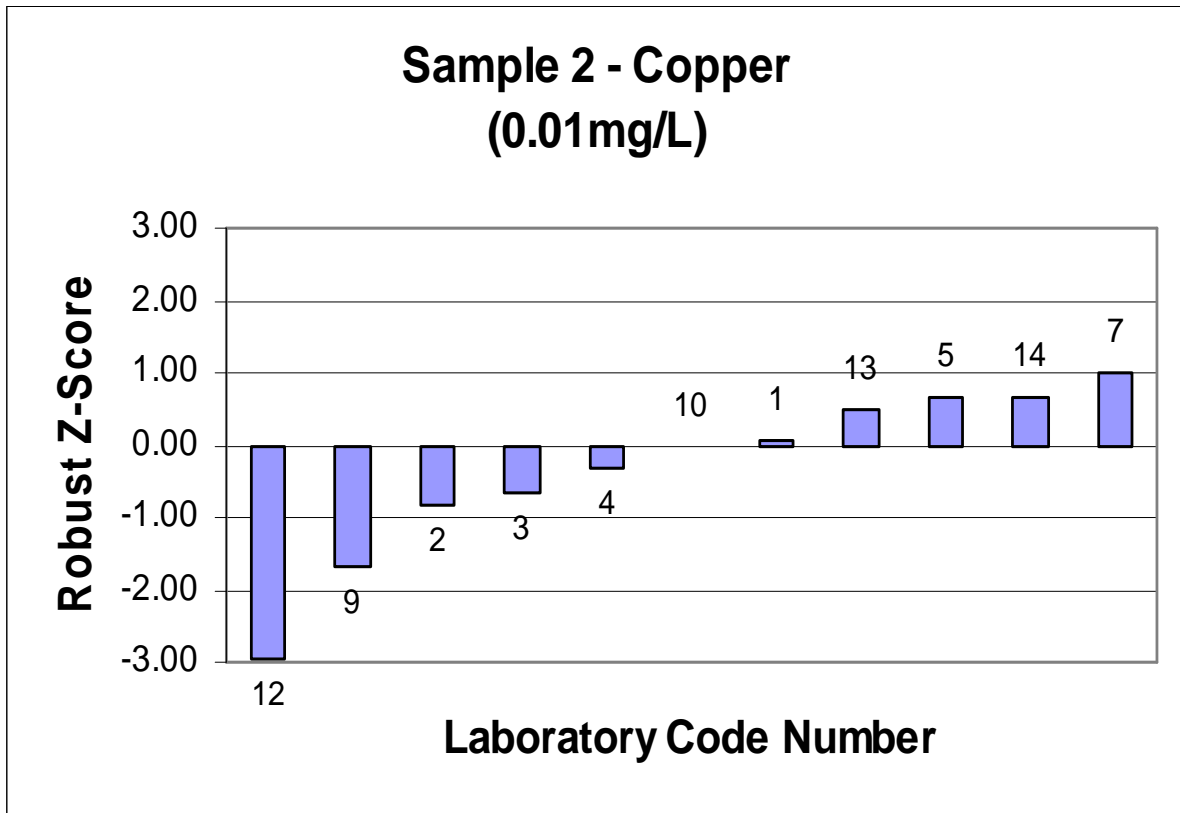
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	0.450
NormIQR	0.059
Robust CV	13.18%
Min	0.28
Max	0.51
Range	0.24



A68

Iron
0.01mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	1.42	7.5	1.42	7.5	AAS	1.42	-0.05
2	1.2	0.08	1.1	0.08	ICP	1.15	-0.96
3	1.60	0.35	1.60	0.35	AAS	1.60	0.56
4	1.2		1.1		AAS	1.15	-0.96
5	1.54	0.25			Flame AAS @372.0nm	1.54	0.35
6							
7	2.02	0.35	2.03	0.35	Flame AAS	2.03	1.99
8							
9	1.10	10%	1.10	10%	Flame AAS	1.10	-1.13
10	1.41	0.1	1.46	0.1	ICP	1.44	0.00
11							
12	1.2	0.2	1.3		AAS	1.25	-0.62
13	1.64	0.164	1.65	0.165	ICP	1.65	0.71
14	1.60	0	1.60	0	AA	1.60	0.56

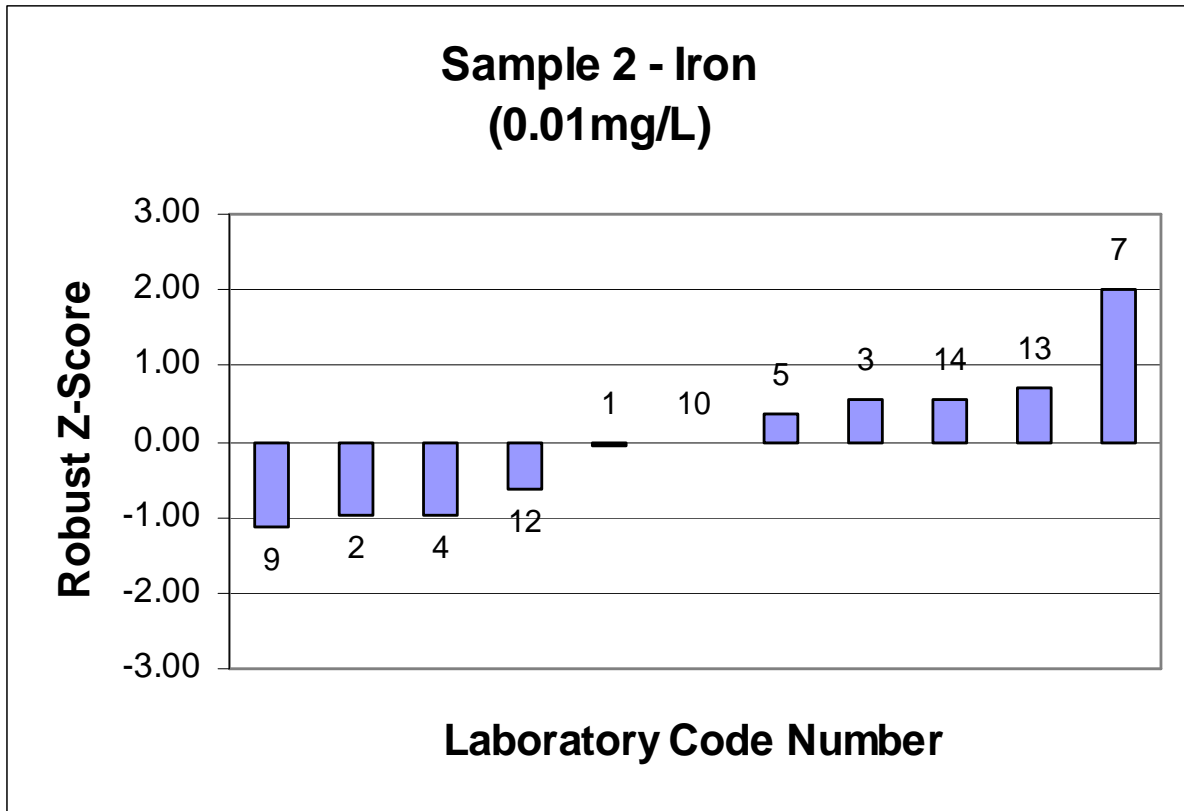
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	1.435
NormIQR	0.297
Robust CV	20.66%
Min	1.10
Max	2.03
Range	0.93



A70

Calcium
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	42	8	42	8	AAS	42.0	-0.49
2	37	2	39	2	ICP	38.0	-0.82
3	50	24	50	24	AAS	50.0	0.16
4	36		36		AAS	36.0	-0.98
5	54	6			Flame AAS @422.7nm	54.0	0.49
6							
7	48	5	48	5	Flame AAS	48.0	0.00
8							
9	60	10%	60	10%	Flame AAS	60.0	0.98
10	58	1	58	1	ICP	58.0	0.82
11							
12	33	10.0	25		AAS	29.0	-1.55
13	61	6.1	61	6.1	ICP	61.0	1.06
14	41	0	41	0	AA	41.0	-0.57

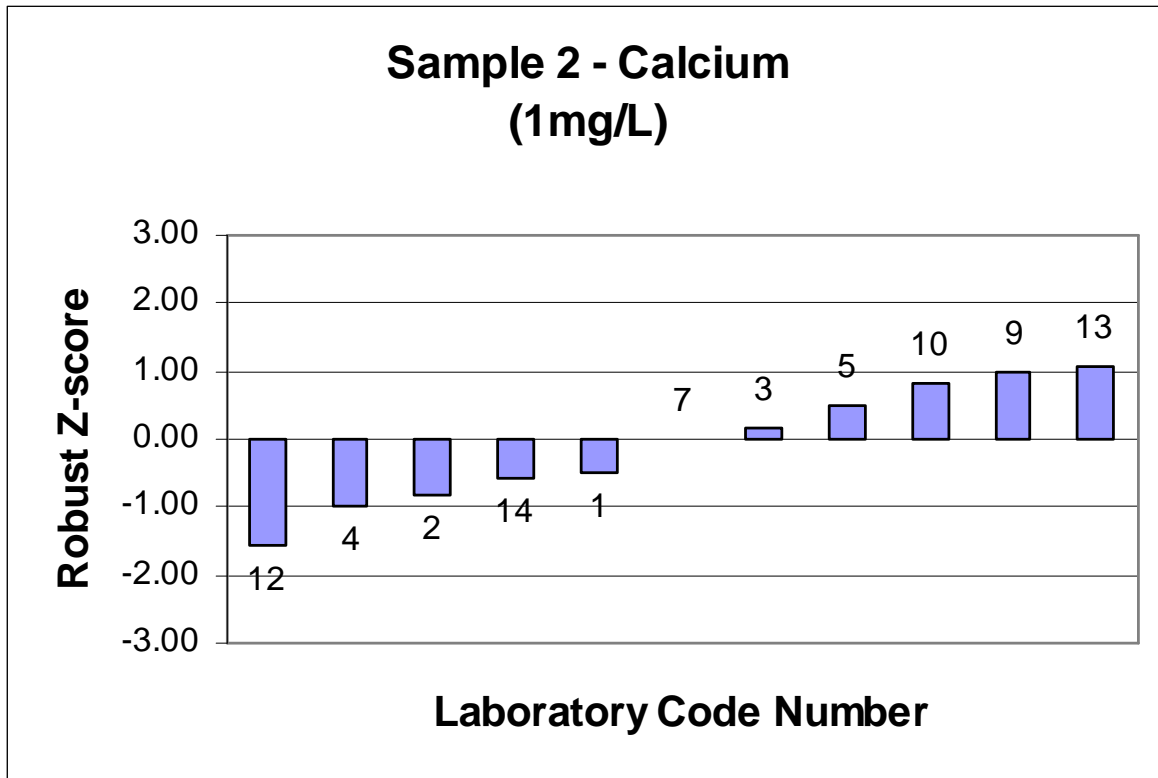
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Results

No. results	11
Median	48.0
NormIQR	12.2
Robust CV	25.48%
Min	29
Max	61
Range	32



Potassium
10mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	960	5	950	5	AAS	955	-0.08
2	740	31	780	31	ICP	760	-3.17 §
3	990	80	930	80	AAS	960	0.00
4							
5	853	8%			Flame AAS @404.4nm	853	-1.70
6							
7	1049	20	1047	20	Flame AAS	1048	1.40
8							
9							
10	970	10	950	10	ICP	960	0.00
11							
12	1252	100.0	1203		AAS	1228	4.25 §
13	960	96	950	95	ICP	955	-0.08
14	1040	0	1040	0	AA	1040	1.27

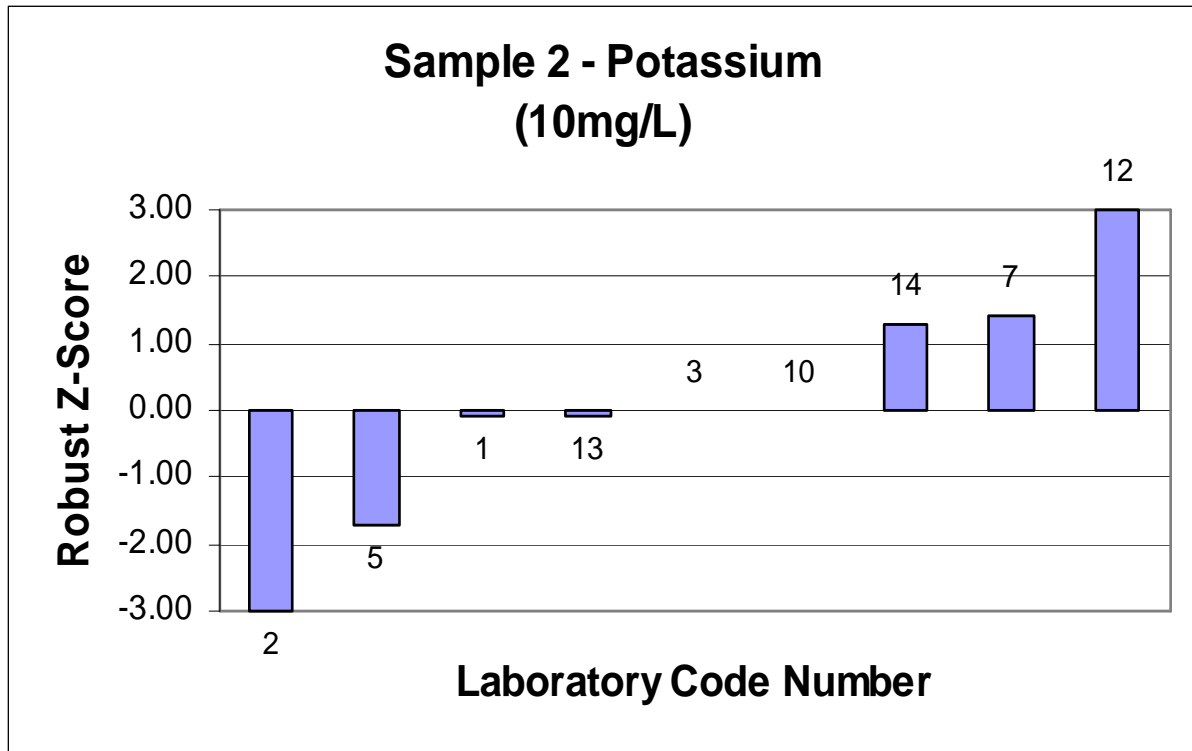
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	9
Median	960
NormIQR	63
Robust CV	6.56%
Min	760
Max	1228
Range	468



Sodium
1mg/L

Lab Code	Result 1	MU±	Result 2	MU±	Method	Averaged Results	Robust Z-Score
1	17	5	17	5	AAS	17	-0.36
2	12	2	13	2	ICP	13	-1.98
3	19	10	19	10	AAS	19	0.36
4	14		15		AAS	15	-1.26
5	16	10%			Flame AAS @330.2nm	16	-0.72
6							
7	30	8	30	8	Flame AAS	30	4.32 §
8							
9	19	10%	18	10%	Flame AAS	19	0.18
10	18	5	18	5	ICP	18	0.00
11							
12	25	10.0	21		AAS	23	1.80
13	19	1.9	19	1.9	ICP	19	0.36
14	12	0	12	0	AA	12	-2.16

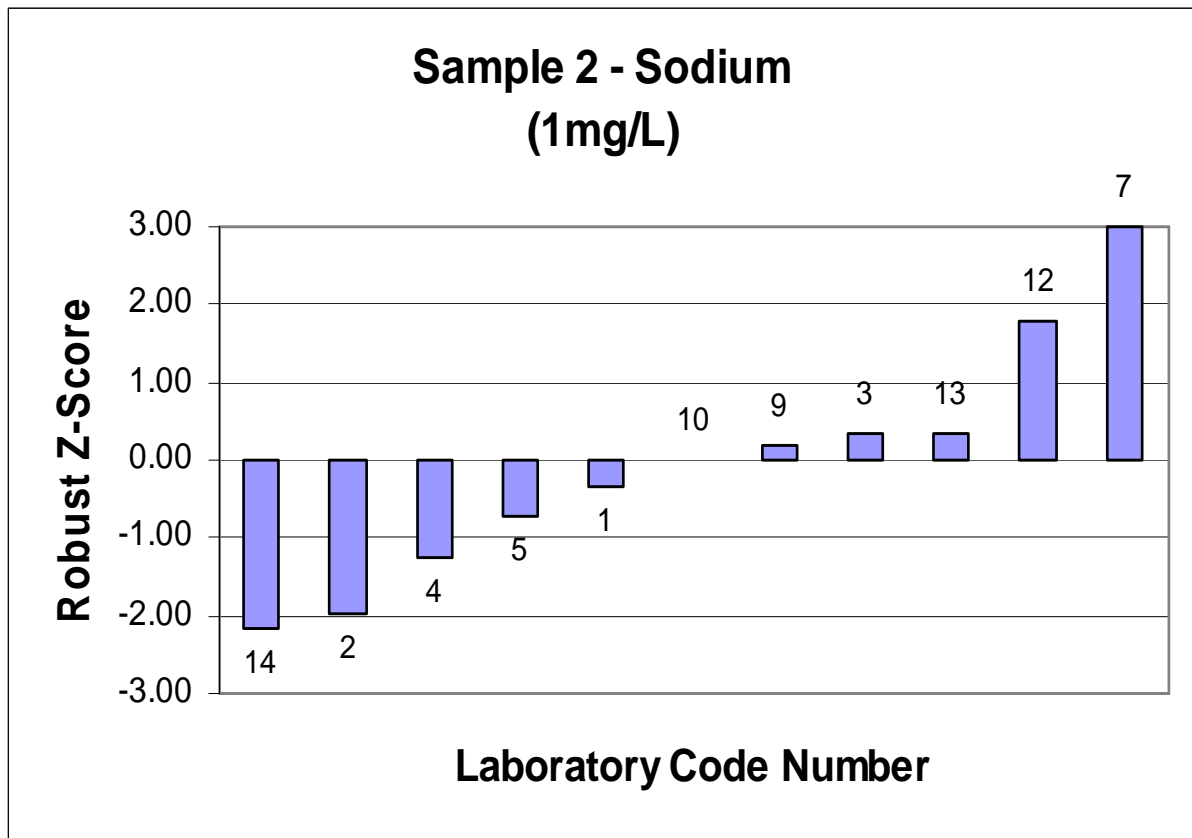
Notes:

MU = Measurement Uncertainty

§ denotes an outlier

Summary Statistics

No. results	11
Median	18.0
NormIQR	2.8
Robust CV	15.44%
Min	12
Max	30
Range	18



APPENDIX B

Homogeneity Testing

HOMOGENEITY TESTING

As mentioned in the introduction of this report, a number of samples were selected for preliminary testing analyses to monitor the homogeneity of the samples.

For this, 10 of each sample type were randomly selected and tested under repeatability conditions (i.e. same operator, same method etc). The results are given below. Statistical analysis indicated that there was no significant difference between the samples except for Total Sulfur Dioxide in the White Wine Sample.

White Wine Sample

Sample	Free SO ₂ (mg/L)	Total SO ₂ (mg/L)	pH	Titrateable Acidity (g/L)	Specific Gravity	Alcohol - NIR (% v/v)
1	34	123	3.40	5.6	0.9914	13.6
2	36	127	3.40	5.6	0.9913	13.6
3	36	128	3.40	5.6	0.9914	13.6
4	35	131	3.40	5.6	0.9914	13.6
5	34	125	3.40	5.6	0.9913	13.6
6	34	124	3.40	5.6	0.9914	13.6
7	36	93*	3.40	5.6	0.9914	13.6
8	34	133	3.39	5.6	0.9914	13.6
9	35	132	3.39	5.6	0.9914	13.6
10	34	121	3.40	5.6	0.9914	13.6

* - This result was reported as a transcription error for the following reasons:

1. If the result was incorrect due to bottle oxidation or other production errors it would be expected that Free SO₂ and Total SO₂ for this sample would both be reported low.
2. Samples 1 and 7 were re-analysed for Free SO₂ and Total SO₂ 17 days after initial analysis. The Free SO₂ to Total SO₂ ratio for samples 1 and 7 were 9:80 and 7:80 respectively. This demonstrates that both wine samples degraded similarly in relation to the Total SO₂. If the result for sample 7 was correct there would have been a much larger drop in Total SO₂ over this time frame in comparison to sample 1.

Red Wine Sample

Sample	Free SO ₂ (mg/L)	Total SO ₂ (mg/L)	pH	Titrateable Acidity (g/L)	Specific Gravity	Alcohol - NIR (% v/v)
1	37	80	3.44	6.5	0.9937	14.2
2	39	78	3.44	6.5	0.9937	14.2
3	37	78	3.44	6.5	0.9937	14.2
4	36	75	3.44	6.5	0.9937	14.2
5	37	71	3.45	6.5	0.9937	14.2
6	36	79	3.44	6.5	0.9937	14.2
7	39	74	3.44	6.5	0.9937	14.2
8	37	80	3.44	6.5	0.9937	14.2
9	34	76	3.45	6.5	0.9937	14.2
10	36	79	3.45	6.5	0.9937	14.2

APPENDIX C

Instructions to Participants

and

Results Sheet

**PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM – APRIL 2008
ROUND 16
INSTRUCTIONS TO PARTICIPANTS**

Please read instructions carefully BEFORE commencing testing.

To ensure that the results of this program can be analysed properly participants are asked to note carefully the following:

1. For this program each participant is provided with two samples, one of white wine and one of red wine labelled sample 1 and sample 2.

2. The following tests are to be conducted in duplicate on both samples:

Acetic Acid
Alcohol - Actual
Alcohol -Total (expressed as the sum of Actual and Potential Alcohol)
Calcium
Citric Acid
Copper
Glucose + Fructose
Iron
Malic Acid
pH
Potassium
Reducing Sugars
Sodium
Specific Gravity
Sulfur Dioxide – Free
Sulfur Dioxide – Total
Total Dry Extract
Total (Titratable) Acidity (as Tartaric Acid)
Volatile Acidity (as Acetic Acid)

Laboratories should perform these tests by their usual methods.

All results are to be reported on the attached Results Sheet. Please ensure that the method used is entered on the Results Sheet for each set of analyses. If the method is not a standard method, please provide a precise description.

3. For Total Acidity, participants should titrate to end point pH 8.2. It is recognised that some methods for total acidity (e.g. EEC Regulation 000/90; Method 13, page 81) prescribe an end point at pH 7.0. However, for the purpose of this program it is necessary that all values be obtained at the same end point, namely pH 8.2.
4. Laboratories are also requested to calculate and report an estimate of uncertainty of measurement for each reported measurement result. All estimates of uncertainty of measurement must be given as a 95% confidence interval (coverage factor $k \approx 2$)

5. All tests may be conducted as soon as the samples are received. Results should be forwarded to:

Ms Charlotte Nohra
Scientific Officer
Proficiency Testing Australia
PO Box 7507
SILVERWATER NSW 2128
ph: (02) 9736 8397
fax: (02) 9743 6664
e-mail: charlotte.nohra@pta.asn.au
please no later than **FRIDAY 9 MAY 2008**.

6. For this program your laboratory has been allocated a code number which will allow for confidential treatment of your results in any reports prepared for this round of testing.

Your code number for this round of testing is

C3
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16– APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 1 – WHITE WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Actual Alcohol	0.1%v/v					
Total Alcohol	0.1%v/v					
Free Sulfur Dioxide	1mg/L					
Total Sulfur Dioxide	1mg/L					
Glucose and Fructose	0.01g/L					
Residual Sugars	0.1g/L					
pH	0.01					

C4
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16- APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 1 – WHITE WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Acetic Acid	0.01 g/L					
Citric Acid	0.01g/L					
Malic Acid	0.01g/L					
Total Acidity	0.1 g/L as Tartaric Acid					
Volatile Acidity	0.01g/L as Acetic Acid					
Specific Gravity	0.0001					
Total Dry Extract	0.1 g/L					

C5
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16- APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 1 – WHITE WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Copper	0.01 mg/L					
Iron	0.01 mg/L					
Calcium	1 mg/L					
Potassium	10 mg/L					
Sodium	1 mg/L					

Date(s) of Tests(s): _____

Signature: _____

C6
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16– APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 2 – RED WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Actual Alcohol	0.1%v/v					
Total Alcohol	0.1%v/v					
Free Sulfur Dioxide	1mg/L					
Total Sulfur Dioxide	1mg/L					
Glucose and Fructose	0.01g/L					
Residual Sugars	0.1g/L					
pH	0.01					

C7
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16– APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 2 – RED WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Acetic Acid	0.01 g/L					
Citric Acid	0.01g/L					
Malic Acid	0.01g/L					
Total Acidity	0.1 g/L as Tartaric Acid					
Volatile Acidity	0.01g/L as Acetic Acid					
Specific Gravity	0.0001					
Total Dry Extract	0.1 g/L					

C8
PROFICIENCY TESTING AUSTRALIA
WINE PROFICIENCY PROGRAM ROUND 16– APRIL 2008
RESULTS SHEET

Laboratory Code

SAMPLE 2 – RED WINE						
Test	Report To Nearest	Result 1	Measurement Uncertainty	Result 2	Measurement Uncertainty	Method
Copper	0.01 mg/L					
Iron	0.01 mg/L					
Calcium	1 mg/L					
Potassium	10 mg/L					
Sodium	1 mg/L					

Date(s) of Tests(s): _____

Signature: _____

C9

PTA WINE PROFICIENCY TESTING PROGRAM – ROUND 16

MEASUREMENT UNCERTAINTY COMMENTS

Laboratory Code

Please use the space below to briefly describe the methods used to determine the measurement uncertainty for each reported measurement results.

Please return results no later than **FRIDAY 9 MAY 2008** to:

Ms Charlotte Nohra
Scientific Officer
Proficiency Testing Australia
PO Box 7507
SILVERWATER NSW 2128
ph: (02) 9736 8397 fax: (02) 9743 6664
e-mail: charlotte.nohra@pta.asn.au

C10

PTA WINE PROFICIENCY TESTING PROGRAM – ROUND 16

MEASUREMENT UNCERTAINTY COMMENTS

Laboratory Code

Please use the space below to briefly describe the methods used to determine the measurement uncertainty for each reported measurement results.

Please return results no later than **FRIDAY 9 MAY 2008** to:

Ms Charlotte Nohra
Scientific Officer
Proficiency Testing Australia
PO Box 7507
SILVERWATER NSW 2128
ph: (02) 9736 8397 fax: (02) 9743 6664
e-mail: charlotte.nohra@pta.asn.au

-- End of Report --