Results of Proficiency Test
Hydraulic Fluid (used)
November 2010

Organised by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2003, the Institute for Interlaboratory Studies organized a proficiency test for the analysis of used Hydraulic Fluid every year. It was decided to continue this interlaboratory study during the annual program 2010/2011. In this interlaboratory study, 27 laboratories from 19 different countries have participated. See appendix 2 for a list of number of participants per country in alphabetical order. In this report, the test results of the interlaboratory study on used hydraulic fluid are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (i.i.s.) in Spijkenisse, The Netherlands, was the organiser of this proficiency test. Analysis for fit-for-use and homogeneity testing were subcontracted. It was decided to send two different samples of used oils: one sample of 1 litre used ISO VG68 Hydraulic Fluid and one sample of 0.1 litre used ISO VG68 Hydraulic Fluid especially for wear metals. Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system on ISO guide 43, ILAC-G13:2007 and ISO17043:2010. This ensures 100% confidentiality of participant’s data. Feedback from the participants on the reported data is encouraged and customer’s satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'i.i.s. Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of January 2010 (i.i.s.-protocol, version 3.2).

2.3 CONFIDENTIALITY STATEMENT

All data present in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

The necessary bulk materials for the two samples of used Hydraulic Fluid were obtained from a participating laboratory. The approximately 45 litre of the first bulk material was

homogenised in a precleaned drum. After homogenisation, 43 subsamples were transferred to 1 litre amber glass bottles, and labelled #1083. The homogeneity of the subsamples #1083 was checked by determination of Density in accordance with ASTM D4052:02e1 and Kinematic Viscosity @ 40ºC according to ASTM D445:09 on 8 stratified randomly selected samples.

	Density @ 15 °C in kg/L	*Kinematic Viscosity at 40ºC in mm²/s*
Sample #1083-1	0.87537	63.65
Sample #1083-2	0.87537	63.65
Sample #1083-3	0.87537	63.63
Sample #1083-4	0.87537	63.67
Sample #1083-5	0.87537	63.66
Sample #1083-6	0.87537	63.65
Sample #1083-7	0.87537	63.65
Sample #1083-8	0.87537	63.65

table 1: homogeneity test results of subsamples #1083

From the test results of table 1, the repeatabilities were calculated and compared with 0.3 times the corresponding target reproducibility in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	Density @15ºC in kg/L	*Kinematic Viscosity at 40°C in mm²/s*
r (Observed)	0.00000	0.032
reference method	D4052:02e1	D445:09
0.3 * R (ref. method)	0.00015	0.145

table 2: repeatabilities of subsamples #1083

The approximately 5 litre of the second bulk material, containing wear metals, was homogenised in a precleaned can. After homogenisation, 40 subsamples were transferred to 100 mL HDPE containers, labelled #1084. The homogeneity of the subsamples #1084 was checked by determination of Calcium and Magnesium in accordance with ASTM D5185:09 on 8 stratified randomly selected samples.

	Calcium in mg/kg	*Magnesium in mg/kg*
Sample #1084-1	31	19
Sample #1084-2	31	19
Sample #1084-3	33	20
Sample #1084-4	31	18
Sample #1084-5	33	19
Sample #1084-6	33	20
Sample #1084-7	33	20
Sample #1084-8	34	20

table 3: homogeneity test results of subsamples #1084

From the test results of table 3, the repeatability was calculated and compared with 0.3 times the corresponding target reproducibility in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	Calcium in mg/kg	*Magnesium in mg/kg*
r (Observed)	3	2
reference method	Horwitz	D5185:09
0.3* R (ref. method)	3	2

table 4: repeatabilities of subsamples #1084

Each calculated repeatability was equal or less than 0.3 times the corresponding reproducibility of respectively ASTM D4052:02e1, D445:09 and D5185:09. Therefore, homogeneity of the subsamples #1083 and #1084 was assumed.

To each of the participating laboratories was dispatched: One 1 litre amber glass bottle, labelled #1083 and one 100 mL HDPE container, labelled #1084 on October 22, 2010.

2.5 STABILITY OF THE SAMPLES

The stability of Hydraulic Fluid, packed in the brown glass bottles or in HDPE containers, was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYSES

The participants were asked to determine Total Acid Number, Density @ 15°C, Flash Point PMcc, Kinematic Viscosity @ 40°C and @ 100°C, Extractable Organic Halogens, Total Organic Halogens and Water on sample #1083 and 20 elements (17 wear metals and 3 additives) on sample #1084.
To get comparable results a detailed report form, on which the units were prescribed, was sent together with each set of samples. In addition, a letter of instructions and a SDS were added to the package.

3 RESULTS

During four weeks after sample despatch, the results of the individual laboratories were gathered. The original results are tabulated per determination in the appendix 1 of this report. The laboratories are presented by their codenumbers.

Directly after the deadline the available results were screened for suspect data. A result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the results. Additional or corrected data are put under 'Remarks' in the result tables in appendix 1.

Results that came in after deadline were not taken into account in the screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'i.i.s. Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of January 2010 (i.i.s.-protocol, version 3.2).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. Results reported as '<…' or '>…' were not used in the statistical evaluation. First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. After removal of outliers, this check was repeated. In case a data set does not have a normal distribution, the results of the statistical evaluation should be used with due care.

In accordance with ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test and by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test and by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of the averages and the standard deviations.

Finally, the reproduciblities were calculated from the standard deviations by multiplying these with a factor of 2.8.

3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under the X-axis.
The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle. Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 3, nr.13-14).

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM reproducibilities, the z-scores were calculated

using a target standard deviation. This results in an evaluation independent of the spread of this interlaboratory study.
The target standard deviation was calculated from the literature reproducibility by division with 2.8. The z-scores were calculated in accordance with:

$$z_{(target)} = (\text{result - average of PT}) / \text{target standard deviation}$$

Absolute values for z<2 are very common and absolute values for z>3 are very rare. The usual interpretation of z-scores is as follows:

$\lvert z \rvert < 1$	good
$1 < \lvert z \rvert < 2$	satisfactory
$2 < \lvert z \rvert < 3$	questionable
$3 < \lvert z \rvert$	unsatisfactory

4 EVALUATION

In this proficiency test, no serious problems were encountered during dispatch and execution. Only one laboratory received the samples late. Two laboratories reported the results after the final reporting date and two laboratories did not report any results at all.
The 30 reporting participants sent in 434 numerical results. Observed were 36 outlying results, which is 8.3% of the numerical results. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.
Not all original data sets proved to have a normal distribution. An anormal distribution was found for the following determination: Kinematic Viscosity @ 40°C and Silver. In this case the statistical evaluation should be used with due care.

4.1 EVALUATION PER TEST

In this section, the results are discussed per test. The methods that are used by the various laboratories are taken into account for explaining the observed differences when possible and applicable. These methods are also in the tables together with the original data. The abbreviations, used in these tables, are listed in appendix 3.

Sample #1083:

Acid Number (Total): This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D664:09.

Density @ 15°C: This determination was problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D4052:02e1.

Flash Point PMcc: This determination was not problematic. Only one statistical outlier was detected. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D93:08.

Kin.Visco.@ 40°C: This determination was very problematic. Four statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D445:09.

Kin.Visco.@ 100°C: This determination was very problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D445:09.

Extractable Organic Halogens: For this determination, no results were reported. Therefore no significant conclusions were drawn.

Total Organic Halogens: For this determination, only one numerical result was reported. Therefore no significant conclusions were drawn.

Water: This determination was not problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D6304:07. The preferred method to use is ASTM D6304:07 method C. This method is applicable for oils with difficult matrix interferences (presence of additives).

Sample #1084:

Aluminium: This determination was not problematic. One false negative result and no statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5185:09.

Barium: As the average concentration found by the group (12.35 mg/kg) is above the application range given in ASTM D5185:09 table 3 (0.5 – 4 mg/kg), it was decided to use the estimated reproducibility calculated using the Horwitz equation instead of the reproducibility of ASTM D5185:09. This determination may not be problematic. Only one statistical outlier was observed and the calculated reproducibility after rejection of the statistical outlier is in good agreement with the estimated requirements calculated using the Horwitz equation.

Calcium: As the average concentration found by the group (32.74 mg/kg) is below the application range given in ASTM D5185:09 table 3 (40-9000 mg/kg), it was decided to use the estimated reproducibility calculated using the Horwitz equation instead of the reproducibility of ASTM D5185:09. This determination was not problematic. One false negative result was observed.

However, the calculated reproducibility is in agreement with the estimated requirements, calculated using the Horwitz equation.

Chromium: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in full agreement with the requirements of ASTM D5185:09.

Copper: This determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5185:09.

Iron: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:09.

Lead: This determination was problematic for two laboratories. Two false negative results and no statistical outliers were observed. However, the calculated reproducibility is in good agreement with the requirements of ASTM D5185:09.

Lithium: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in agreement with the estimated requirements, calculated using the Horwitz equation.

Magnesium: This determination was not problematic. One false negative result and no statistical outliers were detected. The calculated reproducibility is in good agreement with the requirements of ASTM D5185:09.

Manganese: This determination was problematic. Two statistical outliers were detected. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5185:09.

Molybdenum This determination was not problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is almost in agreement with the requirements of ASTM D5185:09

Nickel: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:09.

Phosphorus: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D5185:09.

Silicon: This determination was problematic for one laboratory. One false negative result and no statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5185:09.

Silver: This determination was problematic for one laboratory. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5185:09.

Sodium: This determination was not problematic. One statistical outlier and one false negative result were observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5185:09.

Tin: This determination was problematic for one laboratory. One false negative result and no statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5185:09.

Titanium: This determination was problematic for two laboratories. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D5185:09.

Vanadium: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outlier was in good agreement with the requirements of ASTM D5185:09.

Zinc: This determination was very problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the requirements of ASTM D5185:09.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and these parameters as found for the group of participating laboratories. The average results and the calculated reproducibilities are compared in the next tables with the reproducibilities, derived from literature standards (in casu the ASTM, IP, ISO and EN standards, see tables in appendix 1).

Parameter	*Unit*	*n*	*Average*	*2.8 * sd*	*R(lit)*
Total Acid Number	mg KOH/g	18	0.473	0.184	0.208
Density @ 15 °C	kg/L	17	0.87867	0.00073	0.00050
Flash Point PMcc	^{o}C	14	204.45	8.99	10.00
Kinematic viscosity @ 40 °C	mm^2/s	20	63.532	0.555	0.483
Kinematic viscosity @ 100 °C	mm^2/s	19	10.0266	0.0936	0.0762
Organic Halogens Extractable	mg/kg	0	n.a.	n.a.	n.a.
Total Organic Halogens	mg/kg	1	n.a.	n.a.	n.a.
Water	%M/M	18	0.0099	0.0147	0.0267

table 5: reproducibilities of results of sample #1083.

Parameter	*Unit*	*n*	*average*	*2.8 * sd*	*R (lit)*
Aluminium as Al	mg/kg	16	11.40	4.58	7.15
Barium as Ba	mg/kg	15	12.35	2.71	3.79
Calcium as Ca	mg/kg	16	32.74	9.46	8.68
Chromium as Cr	mg/kg	16	11.34	3.28	3.56
Copper as Cu	mg/kg	15	12.02	3.99	2.88
Iron as Fe	mg/kg	16	12.06	3.16	3.81
Lead as Pb	mg/kg	15	11.72	3.46	7.28
Lithium as Li	mg/kg	6	10.04	2.78	3.18
Magnesium as Mg	mg/kg	15	19.29	4.31	7.03
Manganese as Mn	mg/kg	13	11.34	2.72	2.40
Molybdenum as Mo	mg/kg	15	11.25	3.93	3.57
Nickel as Ni	mg/kg	14	11.15	2.76	5.01
Phosphorus as P	mg/kg	15	523.5	119.6	98.4
Silicon as Si	mg/kg	16	12.18	3.33	7.69
Silver as Ag	mg/kg	15	11.80	3.80	4.13
Sodium as Na	mg/kg	12	12.21	3.08	6.50
Tin as Sn	mg/kg	16	10.95	3.23	9.26
Titanium as Ti	mg/kg	14	11.23	2.81	7.79
Vanadium as V	mg/kg	15	11.07	2.24	3.94
Zinc as Zn	mg/kg	16	31.08	6.87	3.64

table 6: reproducibilities of results of sample #1084 (results in brackets are compared against the estimated reproducibility calculated using the Horwitz equation)

Without further statistical calculations, it could be concluded that for many tests there is a good compliance of the group of participating laboratories with the relevant standards. The problematic tests have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2010 WITH THE PREVIOUS PTS.

	November 2010	*November 2009*	*November 2008*	*November 2007*
Number of reporting labs	30	30	25	24
Number of results reported	434	520	418	407
Statistical outliers	36	35	32	26
Percentage outliers	8.3%	6.7%	7.7%	6.4%

table 7: comparison with previous proficiency tests.

In proficiency tests, outlier percentages of 3% - 7.5% are quite normal.
The performance of the determinations of the proficiency tests was compared against the requirements of the respective standards. The conclusions are given the following table:

Determination	*November 2010*	*November 2009*	*November 2008*	*November 2007*
Total Acid Number	+	++	++	(--)
Density @ 15 °C	--	--	--	--
Flash Point PMcc	++	--	--	++
Kinematic viscosity @ 40 °C	--	--	--	--
Kinematic viscosity @ 100 °C	--	--	--	--
Organic Halogens Extractable	n.e.	n.e.	n.e	n.e.
Total Organic Halogens	n.e.	n.e.	n.e.	n.e.
Water	++	++	++	++
Aluminium as Al	++	++	++	++
Barium as Ba	(++)	(++)	(++)	(++)
Calcium as Ca	(+)	++	--	(--)
Chromium as Cr	-	-	++	++
Copper as Cu	--	++	+/-	++
Iron as Fe	++	+	++	++
Lead as Pb	++	++	++	++
Lithium as Li	++	+	(++)	++
Magnesium as Mg	++	++	++	++
Manganese as Mn	-	++	++	++
Molybdenum	--	++	n.e.	n.e.
Nickel as Ni	++	+	+/-	++
Phosphorus as P	--	++	-	--
Silicon as Si	++	++	++	++
Sodium as Na	++	++	++	++
Silver as Ag	++	++	n.e.	n.e.
Tin as Sn	++	(++)	++	++
Titanium as Ti	++	++	n.e.	n.e.
Vanadium as V	++	++	++	++
Zinc as Zn	--	+	--	(++)

table 8: comparison determinations against the standard
results between brackets to be used with care, result was lower (or above) than application range of reference method.

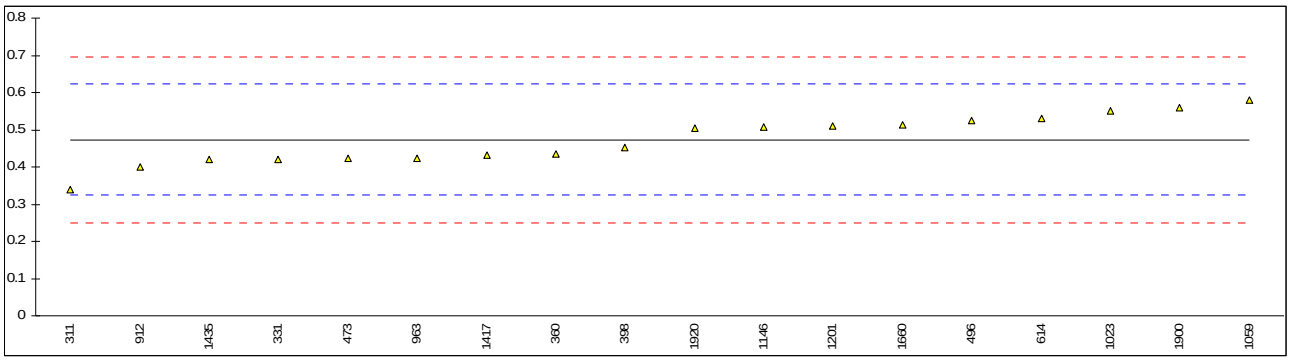
++: group performed much better than the standard
+ : group performed better than the standard
+/-: group performance equals the standard
- : group performed worse than the standard
-- : group performed much worse than the standard
n.e.: not evaluated

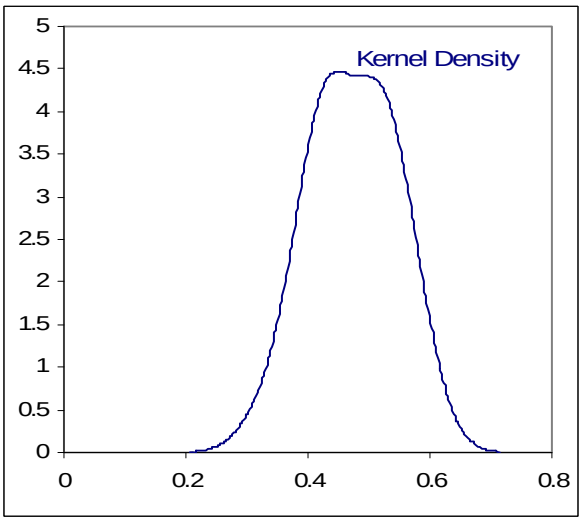
APPENDIX 1

Determination of Acid Number (Total) on sample #1083; results in mg KOH/g.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D664	0.34		-1.79	
331	D664	0.42		-0.72	
360	D664	0.435		-0.52	
398	D664	0.452		-0.29	
432		-----		-----	
451		-----		-----	
473	D664	0.4224		-0.69	
496	D664	0.524		0.68	
613		-----		-----	
614	D664	0.53		0.76	
912	D664	0.399		-1.00	
963	D974	0.424		-0.66	
1017		-----		-----	
1023	D664	0.55		1.03	
1059	ISO6619	0.58		1.43	
1113		-----		-----	
1146	D664	0.506		0.44	
1189		-----		-----	
1201	D664	0.51		0.49	
1417	In house	0.433	C	-0.54	First reported 0.713
1435	D664	0.42		-0.72	
1613		-----		-----	
1628		-----		-----	
1660	D664	0.512		0.52	
1900	D664	0.56		1.16	
1920	D664	0.505		0.42	

normality	OK
n	18
outliers	0
mean (n)	0.473
st.dev. (n)	0.0655
R(calc.)	0.184
R(D664:09)	0.208

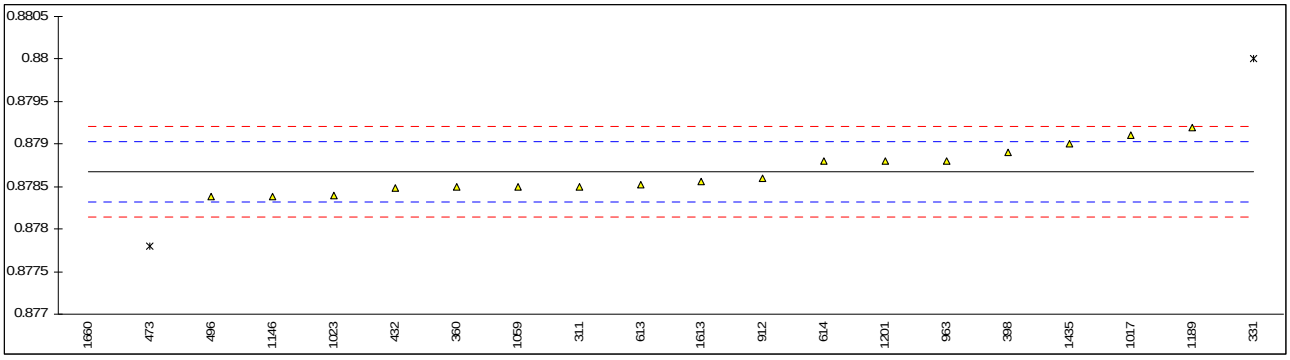


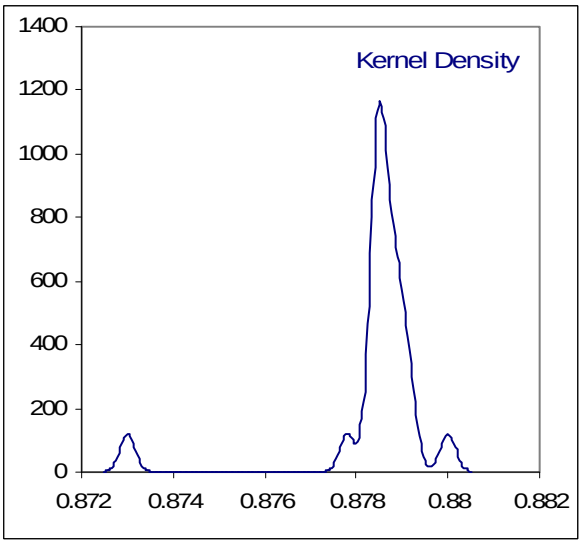


Determination of Density @ 15°C on sample #1083; results in kg/L.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D4052	0.8785		-0.96	
331	D4052	0.880	C,G(0.05)	7.44	First reported 0.875
360	D4052	0.8785		-0.96	
398	D4052	0.8789		1.28	
432	D4052	0.87848		-1.07	
451		-----		-----	
473	D445	0.8778	G(0.05)	-4.88	
496	D4052	0.87838		-1.63	
613	D4052	0.87852		-0.85	
614	D4052	0.8788		0.72	
912	D4052	0.8786	C	-0.40	First reported 878.6
963	D4052	0.8788	C	0.72	First reported 0.8793
1017	D4052	0.8791		2.40	
1023	D4052	0.8784		-1.52	
1059	D4052	0.8785		-0.96	
1113		-----		-----	
1146	D4052	0.87838		-1.63	
1189	D1298	0.8792		2.96	
1201	D4052	0.8788		0.72	
1417		-----		-----	
1435	D4052	0.879		1.84	
1613	D4052	0.87856		-0.63	
1628		-----		-----	
1660	D4052	0.8730	G(0.01)	-31.76	
1900		-----		-----	
1920		-----		-----	

normality	OK
n	17
outliers	3
mean (n)	0.87867
st.dev. (n)	0.000260
R(calc.)	0.00073
R(D4052:02e1)	0.00050

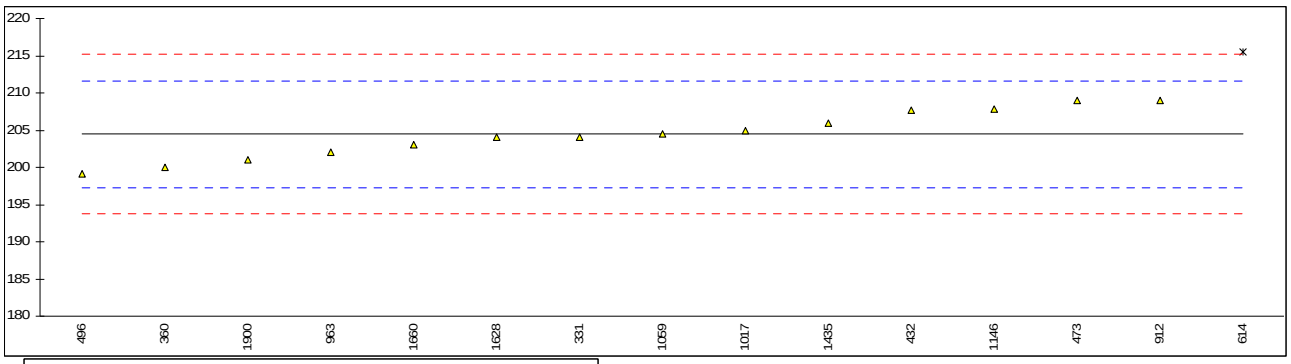


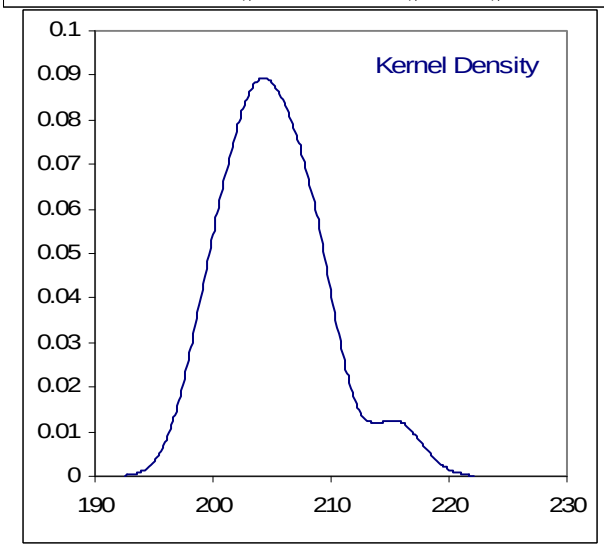


Determination of Flash Point PMcc on sample #1083; results in °C.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D93AE	204		-0.12	
360	D93AE	200.0		-1.24	
398		-----		-----	
432	D93AE	207.7		0.91	
451		-----		-----	
473	D93AE	209		1.28	
496	D93AE	199.2		-1.47	
613		-----		-----	
614	D93MF	215.5	G(0.05)	3.10	
912	D93AE	209		1.28	
963	D93A	202.0		-0.68	
1017	D93AF	205.0		0.16	
1023		-----		-----	
1059	ISO2719AE	204.5		0.02	
1113		-----		-----	
1146	In house	207.85		0.95	
1189		-----		-----	
1201	D93AE	>110		-----	
1417		-----		-----	
1435	D93AE	206		0.44	
1613		-----		-----	
1628	ISO2719AE	204.0		-0.12	
1660	D93AE	203.0		-0.40	
1900	D3828AF	201		-0.96	
1920		-----		-----	

normality	OK
n	14
outliers	1
mean (n)	204.45
st.dev. (n)	3.211
R(calc.)	8.99
R(D93:08)	10.00

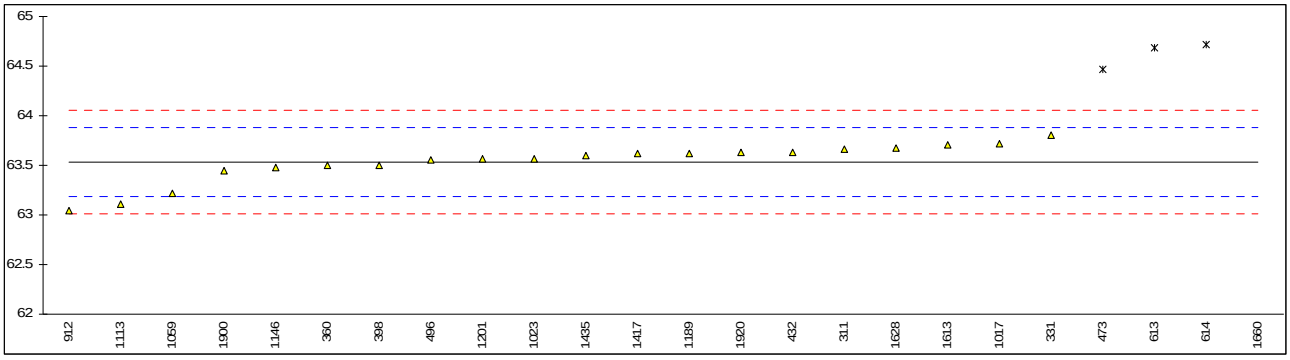


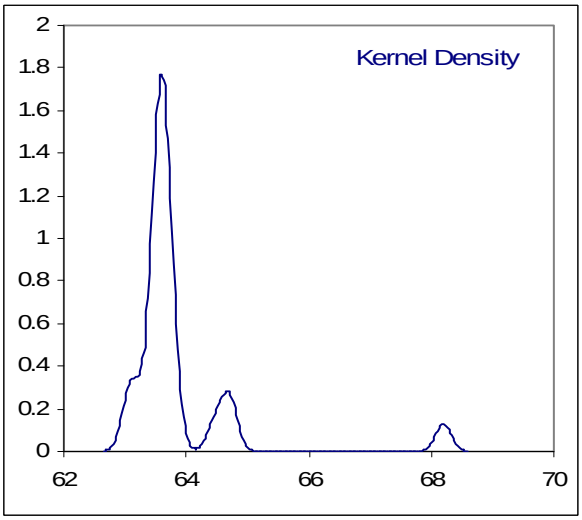


Determination of Kinematic Viscosity @ 40°C on sample #1083; results in mm/s^2.

lab	method	value	mark	z(targ)	Remarks
255		-----		-----	
311	D445	63.66		0.74	
331	D445	63.8		1.56	
360	D445	63.498		-0.20	
398	D445	63.502		-0.17	
432	D445	63.632		0.58	
451		-----		-----	
473	D445	64.467	G(0.01)	5.42	
496	D445	63.550		0.11	
613	D445	64.68	DG(0.01)	6.66	First reported 64.62
614	D445	64.72	DG(0.01)	6.89	
912	D445	63.04	C	-2.85	First reported 62.7
963		-----		-----	
1017	D445	63.7224		1.11	
1023	D445	63.56		0.16	
1059	ISO3104	63.22		-1.81	
1113	D445	63.11	C	-2.45	First reported 62.28
1146	D445	63.482		-0.29	
1189	D445	63.6205		0.51	
1201	D445	63.56	C	0.16	First reported 10.04
1417	In house	63.615		0.48	
1435	D7042	63.6		0.40	
1613	D445	63.706		1.01	
1628	ISO3104	63.678		0.85	
1660	D445	68.2	G(0.01)	27.07	
1900	D445	63.45		-0.47	
1920	D445	63.628		0.56	

normality	not OK
n	20
outliers	4
mean (n)	63.532
st.dev. (n)	0.1981
R(calc.)	0.555
R(D445:09)	0.483

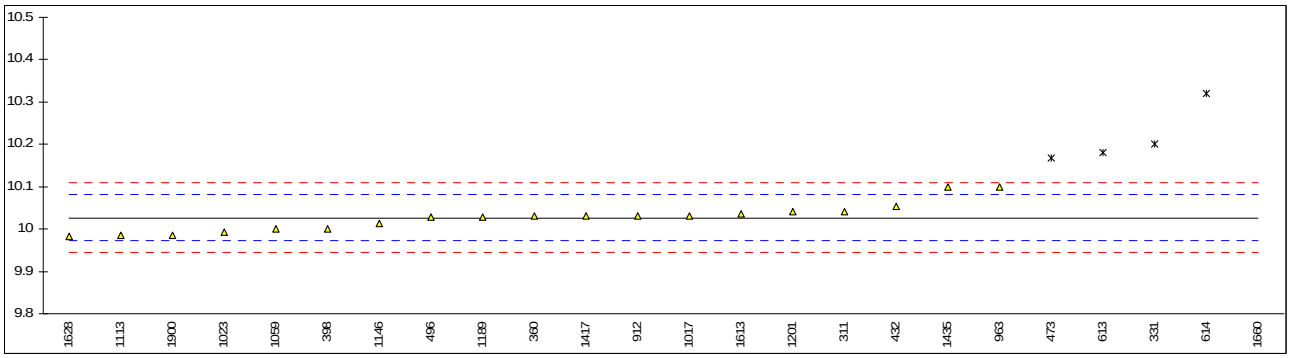


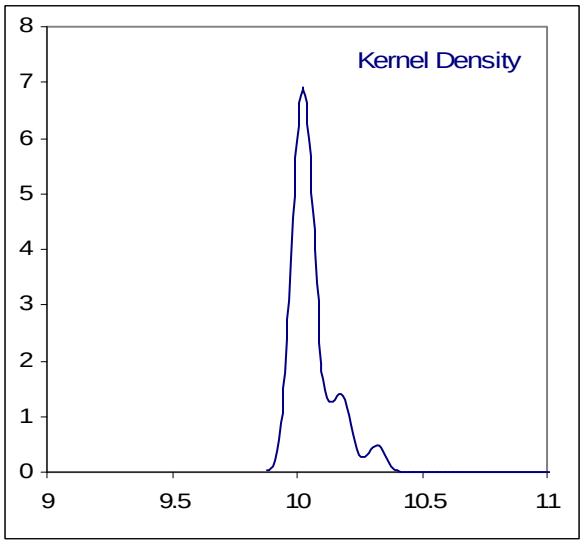


Determination of Kinematic Viscosity @ 100°C on sample #1083; results in mm/s^2

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D445	10.04		0.49	
331	D445	10.2	DG(0.05)	6.37	
360	D445	10.030		0.12	
398	D445	10.001	C	-0.94	First reported 11.001
432	D445	10.054		1.01	
451		-----		-----	
473	D445	10.168	G(0.05)	5.19	
496	D445	10.029		0.09	
613	D445	10.18	DG(0.05)	5.64	
614	D445	10.32	G(0.01)	10.78	
912	D445	10.03		0.12	
963	D445	10.10		2.70	
1017	D445	10.0303		0.13	
1023	D445	9.993		-1.24	
1059	ISO3104	10.00		-0.98	
1113	D445	9.985		-1.53	
1146	D445	10.012		-0.54	
1189	D445	10.0292		0.09	
1201	D445	10.04	C	0.49	First reported 63.56
1417	in house	10.03		0.12	
1435	D7042	10.1		2.70	
1613	D445	10.035		0.31	
1628	ISO3104	9.9817		-1.65	
1660	D445	13.8	G(0.01)	138.65	
1900	D445	9.986		-1.49	
1920		-----		-----	

normality	OK
n	19
outliers	5
mean (n)	10.0266
st.dev. (n)	0.03343
R(calc.)	0.0936
R(D445:09)	0.0762





Determination of Extractable Organic Chloride on sample #1083; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331		-----		-----	
360		-----		-----	
398		-----		-----	
432		-----		-----	
451		-----		-----	
473		-----		-----	
496		-----		-----	
613		-----		-----	
614		-----		-----	
912		-----		-----	
963		-----		-----	
1017		-----		-----	
1023		-----		-----	
1059		-----		-----	
1113		-----		-----	
1146		-----		-----	
1189		-----		-----	
1201		-----		-----	
1417		-----		-----	
1435		-----		-----	
1613		-----		-----	
1628		-----		-----	
1660		-----		-----	
1900		-----		-----	
1920		-----		-----	

normality	n.a.
n	n.a.
outliers	n.a.
mean (n)	n.a.
st.dev. (n)	n.a.
R(calc.)	n.a.
R(lit)	n.a.

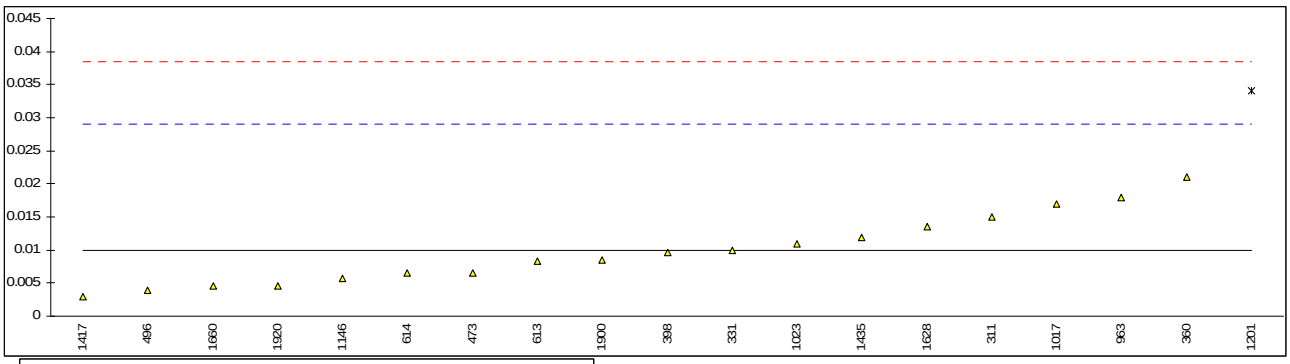
Determination of Total Organic Halogens on sample #1083; results in mg/kg.

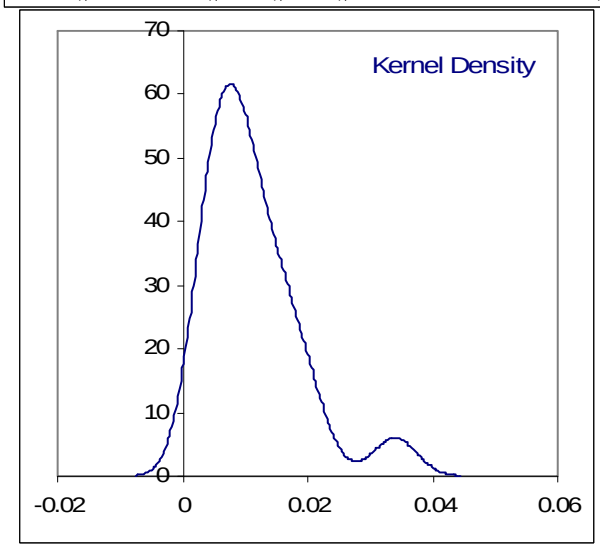
lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331		-----		-----	
360		-----		-----	
398		-----		-----	
432		-----		-----	
451		-----		-----	
473		-----		-----	
496		-----		-----	
613		-----		-----	
614		-----		-----	
912		-----		-----	
963		-----		-----	
1017		-----		-----	
1023		-----		-----	
1059		-----		-----	
1113		-----		-----	
1146	In house	4.491		-----	
1189		-----		-----	
1201		-----		-----	
1417		-----		-----	
1435		-----		-----	
1613		-----		-----	
1628		-----		-----	
1660		-----		-----	
1900		-----		-----	
1920		-----		-----	
	normality	n.a.			
	n	n.a.			
	outliers	n.a.			
	mean (n)	n.a.			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(lit)	n.a.			

Determination of Water on sample #1083; results in %M/M.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D6304A	0.015		0.53	
331	ISO12937	0.010		0.01	
360	D6304-A	0.021		1.16	
398	D6304-C	0.0097		-0.02	
432		-----		-----	
451		-----		-----	
473	D6304-A	0.0066		-0.35	
496	D6304-C	0.0039		-0.63	
613	D6304-A	0.00838		-0.16	
614	D4928	0.00655		-0.35	
912	D6304C	<0.01		<0.01	
963	D6304A	0.018		0.85	
1017	D6304A	0.0170		0.74	
1023	D6304A	0.0109		0.10	
1059	D6304	<0.0030		<-0.72	
1113		-----		-----	
1146	D6304C	0.0057		-0.44	
1189		-----		-----	
1201	D6304	0.034	G(0.01)	2.53	
1417	In house	0.00297		-0.73	
1435	D1744	0.0119		0.21	
1613		-----		-----	
1628	KF	0.0135		0.38	
1660	IEC60814	0.0046		-0.56	
1900	D6304C	0.0084		-0.16	
1920	D6304	0.00461		-0.56	

normality	OK
n	18
outliers	1
mean (n)	0.0099
st.dev. (n)	0.00525
R(calc.)	0.0147
R(D6304:07)	0.0267

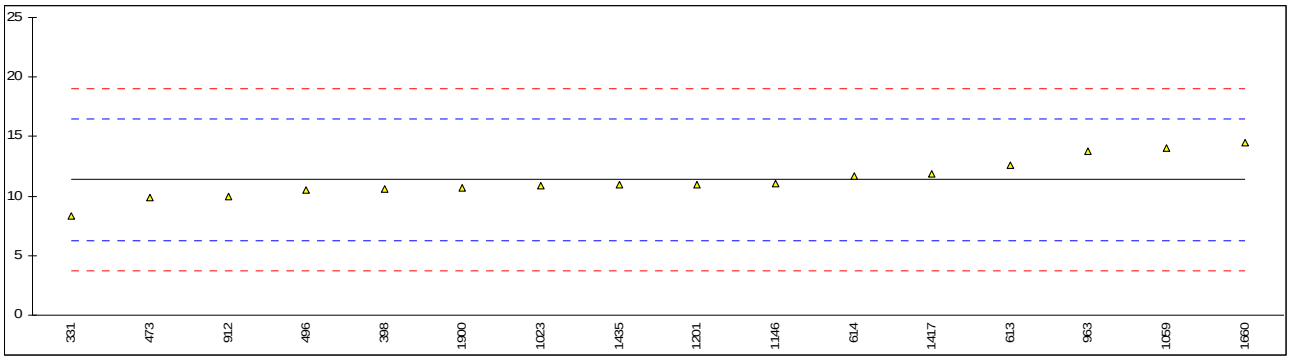


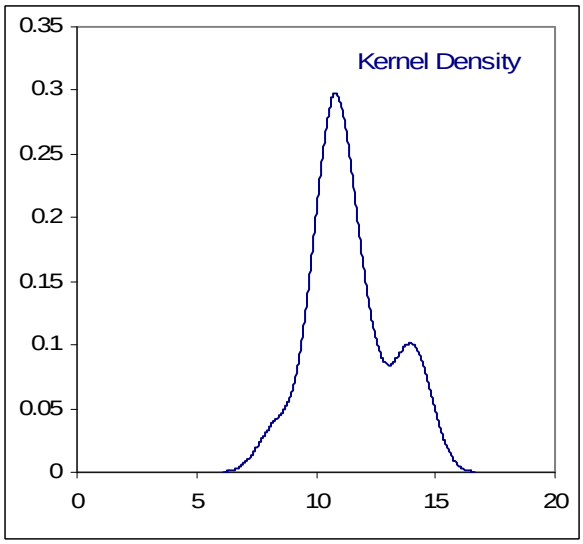


Determination of Aluminium (Al) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	8.3		-1.21	
360	D5185	<5.0		<-2.51	False negative result?
398	D6595	10.6		-0.31	
432		-----		-----	
451		-----		-----	
473	D5185	9.8921		-0.59	
496	D5185	10.5		-0.35	
613	D5185	12.58189		0.46	
614	D5185	11.70		0.12	
912	D5185	10.0	C	-0.55	First reported 1.14
963	D5185	13.8		0.94	
1017		-----		-----	
1023	D5185	10.9		-0.19	
1059	In house	14		1.02	
1113		-----		-----	
1146	D5185	11.06		-0.13	
1189		-----		-----	
1201	D5185	11		-0.16	
1417	In house	11.825		0.17	
1435	D5185	11		-0.16	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.48		1.21	
1900	D6595	10.7		-0.27	
1920		-----		-----	

normality	OK
n	16
outliers	0
mean (n)	11.40
st.dev. (n)	1.636
R(calc.)	4.58
R(D5185:09)	7.15

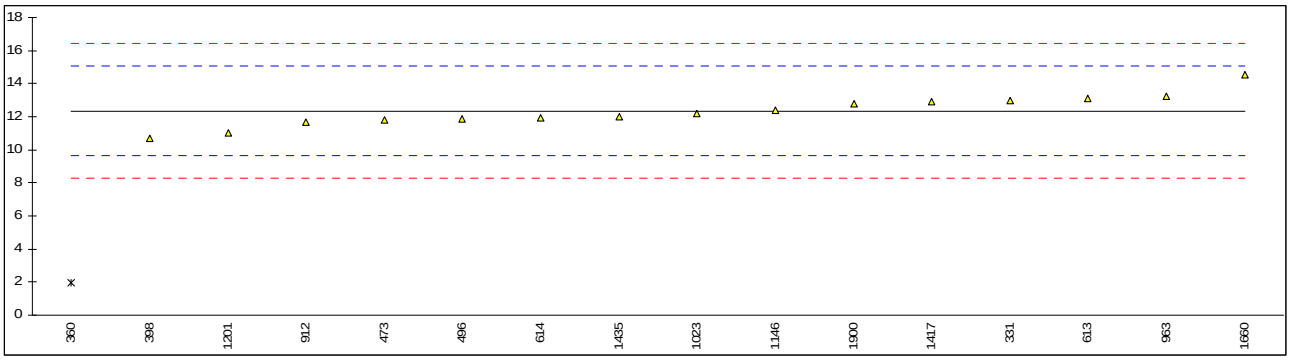


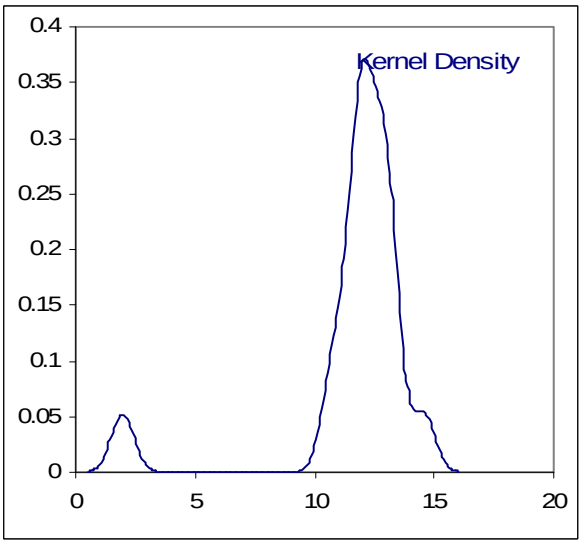


Determination of Barium (Ba) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	13.0		0.48	
360	D5185	1.97	G(0.01)	-7.67	
398	D6595	10.7		-1.22	
432		-----		-----	
451		-----		-----	
473	D5185	11.8239		-0.39	
496	D5185	11.86		-0.36	
613	D5185	13.12747		0.57	
614	D5185	11.93		-0.31	
912	D5185	11.70	C	-0.48	First reported 7.16
963	D5185	13.27		0.68	
1017		-----		-----	
1023	D5185	12.2		-0.11	
1059		-----		-----	
1113		-----		-----	
1146	D5185	12.42		0.05	
1189		-----		-----	
1201	D5185	11		-1.00	
1417	In house	12.898		0.40	
1435	D5185	12		-0.26	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.57		1.64	
1900	D6595	12.8		0.33	
1920		-----		-----	

normality	OK	
n	15	
outliers	1	
mean (n)	12.35	
st.dev. (n)	0.968	
R(calc.)	2.71	Application range = 0.5 – 4 mg/kg
R(Horwitz)	3.79	Compared with R(D5185) = 5.96

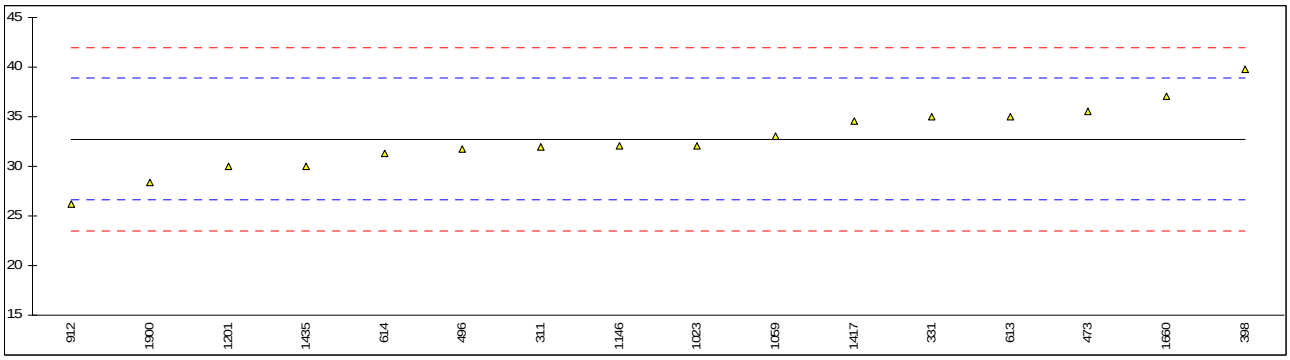


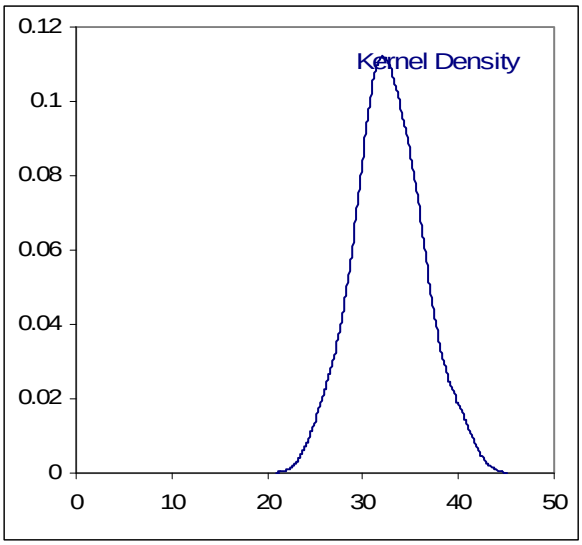


Determination of Calcium (Ca) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D5185	32		-0.24	
331	D5185	35		0.73	
360	D5185	<5.0		<-8.95	False negative result?
398	D6595	39.8		2.28	
432		-----		-----	
451		-----		-----	
473	D5185	35.5974		0.92	
496	D5185	31.71		-0.33	
613	D5185	35.04084		0.74	
614	D5185	31.30		-0.46	
912	D5185	26.2		-2.11	
963		-----		-----	
1017		-----		-----	
1023	D5185	32.1		-0.21	
1059	In house	33		0.08	
1113		-----		-----	
1146	D5185	32.10		-0.21	
1189		-----		-----	
1201	D5185	30		-0.88	
1417	In house	34.553		0.59	
1435	D5185	30		-0.88	
1613		-----		-----	
1628		-----		-----	
1660	D5185	37.03		1.38	
1900	D6595	28.4		-1.40	
1920		-----		-----	

normality	OK	
n	16	
outliers	0	
mean (n)	32.74	
st.dev. (n)	3.379	
R(calc.)	9.46	Application range D5185 = 40 – 9000 mg/kg
R(Horwitz)	8.68	Compare with R(D5185:09) = 1.40

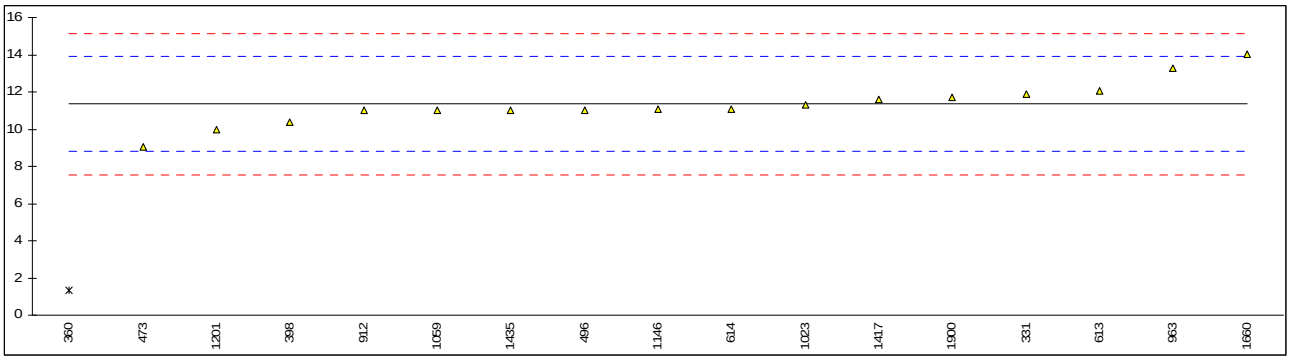


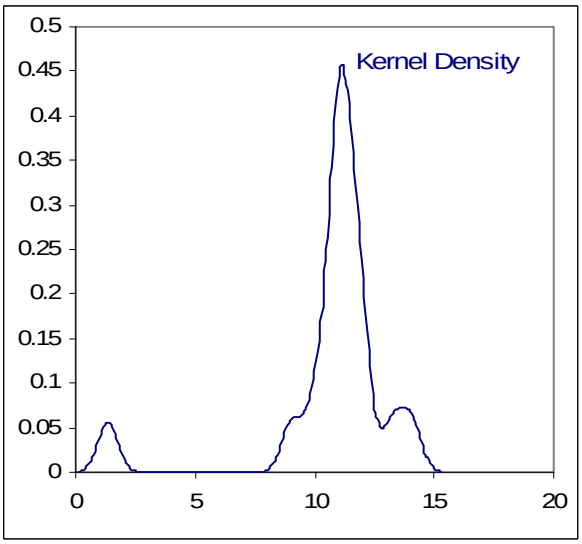


Determination of Chromium (Cr) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.9		0.44	
360	D5185	1.35	G(0.01)	-7.85	
398	D6595	10.4		-0.74	
432		-----		-----	
451		-----		-----	
473	D5185	9.0454		-1.80	
496	D5185	11.0		-0.27	
613	D5185	12.03328		0.54	
614	D5185	11.08		-0.21	
912	D5185	11	C	-0.27	First reported 6.6
963	D5185	13.27		1.52	
1017		-----		-----	
1023	D5185	11.3		-0.03	
1059	In house	11		-0.27	
1113		-----		-----	
1146	D5185	11.07		-0.21	
1189		-----		-----	
1201	D5185	10		-1.05	
1417	In house	11.606		0.21	
1435	D5185	11		-0.27	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.05		2.13	
1900	D6595	11.7		0.28	
1920		-----		-----	

normality	OK
n	16
outliers	1
mean (n)	11.34
st.dev. (n)	1.172
R(calc.)	3.28
R(D5185:09)	3.56

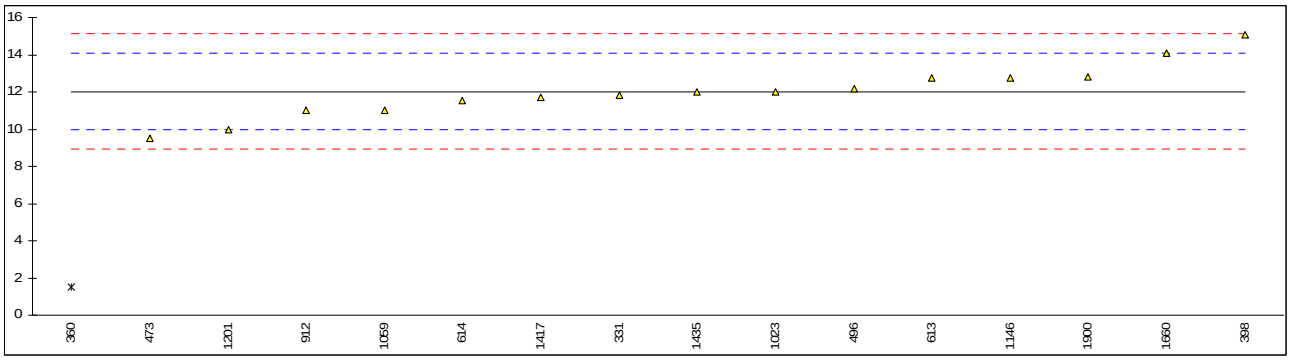


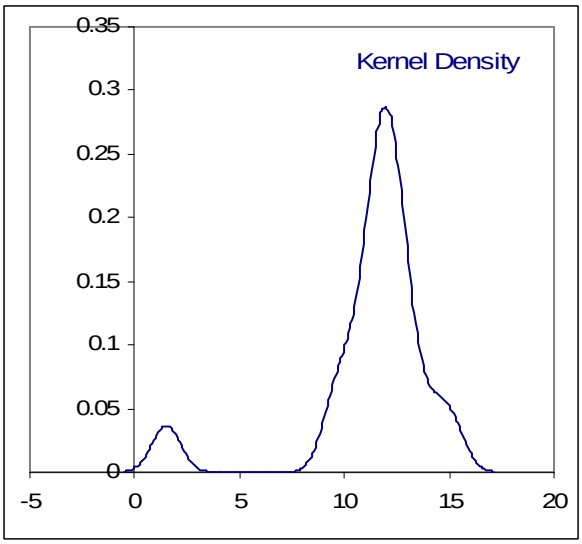


Determination of Copper (Cu) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.8		-0.21	
360	D5185	1.51	G(0.01)	-10.20	
398	D6595	15.1		2.99	
432		-----		-----	
451		-----		-----	
473	D5185	9.5253		-2.42	
496	D5185	12.2		0.17	
613	D5185	12.77565		0.73	
614	D5185	11.51		-0.50	
912	D5185	11	C	-0.99	First reported <2
963		-----		-----	
1017		-----		-----	
1023	D5185	12.0		-0.02	
1059	In house	11		-0.99	
1113		-----		-----	
1146	D5185	12.78		0.74	
1189		-----		-----	
1201	D5185	10		-1.96	
1417	In house	11.720		-0.29	
1435	D5185	12		-0.02	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.10		2.02	
1900	D6595	12.8		0.76	
1920		-----		-----	

normality	OK
n	15
outliers	1
mean (n)	12.02
st.dev. (n)	1.424
R(calc.)	3.99
R(D5185:09)	2.88

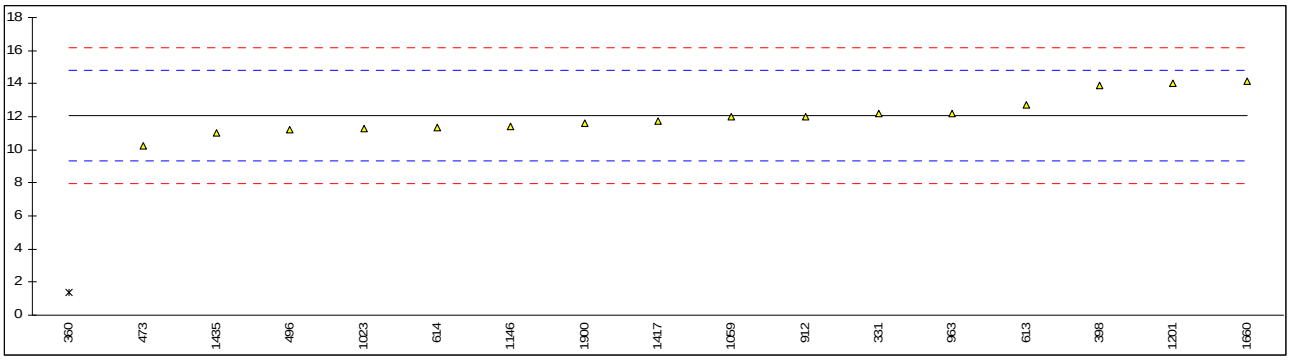


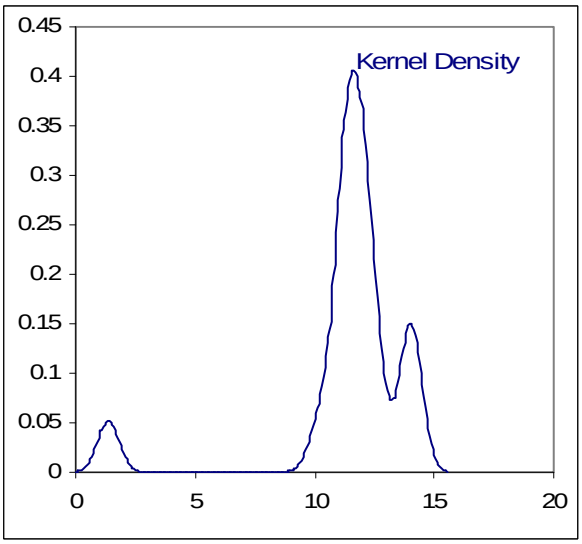


Determination of Iron (Fe) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	12.2		0.10	
360	D5185	1.37	G(0.01)	-7.85	
398	D6595	13.9		1.35	
432		-----		-----	
451		-----		-----	
473	D5185	10.2310		-1.35	
496	D5185	11.2		-0.63	
613	D5185	12.69355		0.46	
614	D5185	11.32		-0.55	
912	D5185	12.0	C	-0.05	First reported 6.9
963	D5185	12.2		0.10	
1017		-----		-----	
1023	D5185	11.3		-0.56	
1059	In house	12		-0.05	
1113		-----		-----	
1146	D5185	11.43		-0.46	
1189		-----		-----	
1201	D5185	14		1.42	
1417	In house	11.744		-0.23	
1435	D5185	11		-0.78	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.18		1.56	
1900	D6595	11.6		-0.34	
1920		-----		-----	

normality	OK
n	16
outliers	1
mean (n)	12.06
st.dev. (n)	1.129
R(calc.)	3.16
R(D5185:09)	3.81

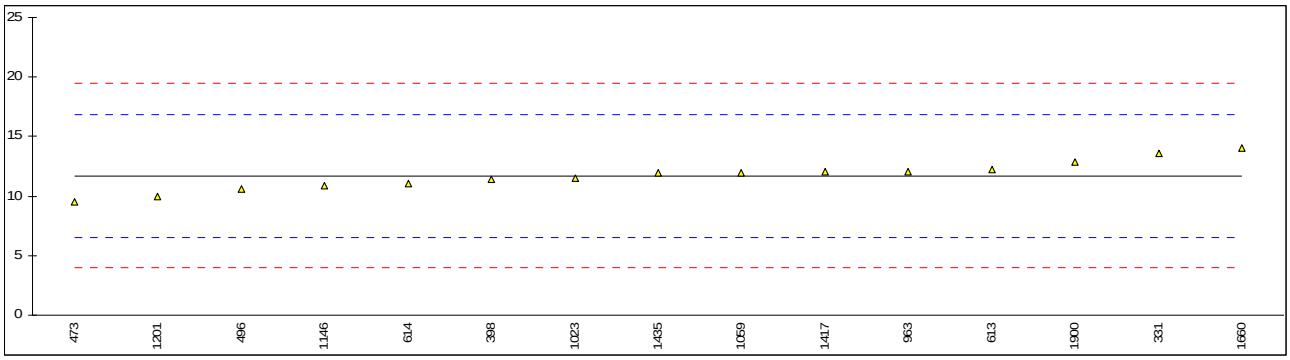


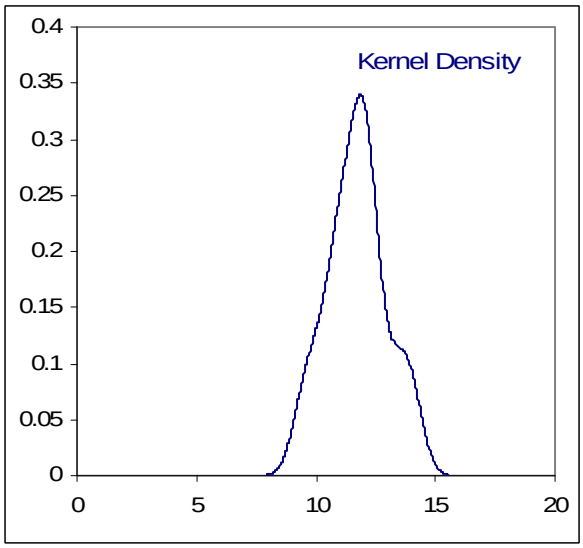


Determination of Lead (Pb) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	13.6		0.72	
360	D5185	<5.0		<-2.58	False negative result?
398	D6595	11.4		-0.12	
432		-----		-----	
451		-----		-----	
473	D5185	9.4853		-0.86	
496	D5185	10.6		-0.43	
613	D5185	12.24351		0.20	
614	D5185	11.01		-0.27	
912	D5185	<1		<-4.12	False negative result?
963	D5185	12.08		0.14	
1017		-----		-----	
1023	D5185	11.5		-0.08	
1059	In house	12		0.11	
1113		-----		-----	
1146	D5185	10.91		-0.31	
1189		-----		-----	
1201	D5185	10		-0.66	
1417	In house	12.047		0.13	
1435	D5185	12		0.11	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.02		0.89	
1900	D6595	12.9		0.45	
1920		-----		-----	

normality	OK
n	15
outliers	0
mean (n)	11.72
st.dev. (n)	1.236
R(calc.)	3.46
R(D5185:09)	7.28

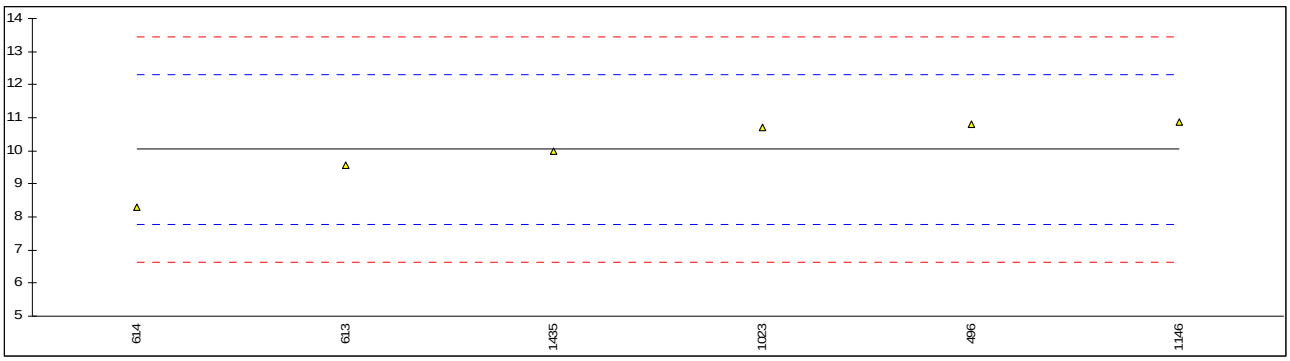




Determination of Lithium (Li) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331		-----		-----	
360		-----		-----	
398		-----		-----	
432		-----		-----	
451		-----		-----	
473		-----		-----	
496	D5185	10.8		0.67	
613	D5185	9.57822		-0.41	
614	D5185	8.30		-1.53	
912		-----		-----	
963		-----		-----	
1017		-----		-----	
1023	D5185	10.7		0.58	
1059		-----		-----	
1113		-----		-----	
1146	D5185	10.86		0.72	
1189		-----		-----	
1201		-----		-----	
1417		-----		-----	
1435	D5185	10		-0.03	
1613		-----		-----	
1628		-----		-----	
1660		-----		-----	
1900		-----		-----	
1920		-----		-----	

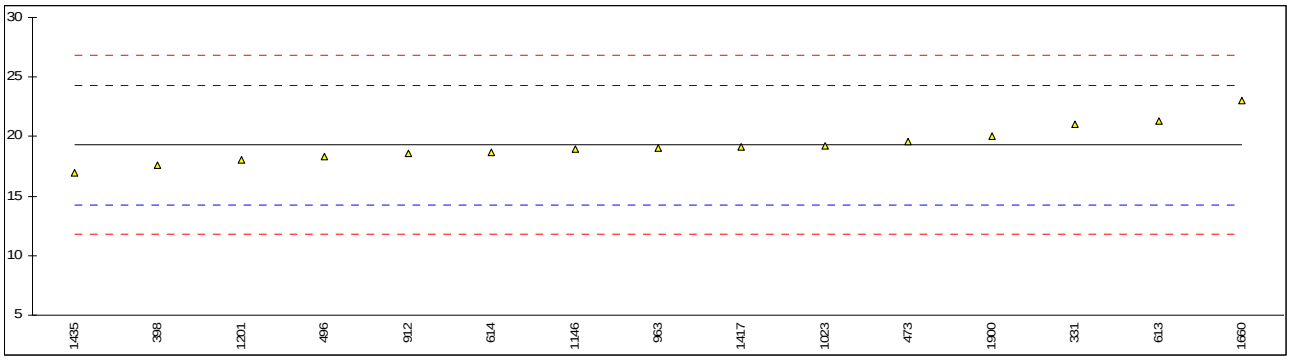
normality	OK
n	6
outliers	0
mean (n)	10.04
st.dev. (n)	0.993
R(calc.)	2.78
R(Horwitz)	3.18

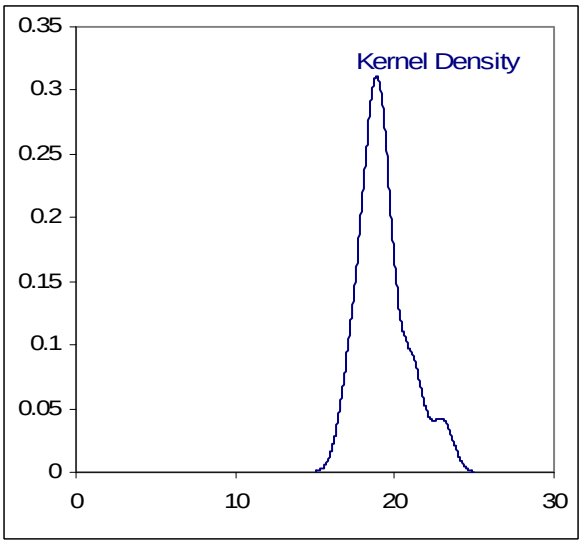


Determination of Magnesium (Mg) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	21.0		0.68	
360	D5185	<5.0		<-5.69	False negative result?
398	D6595	17.6		-0.67	
432		-----		-----	
451		-----		-----	
473	D5185	19.5436		0.10	
496	D5185	18.30		-0.40	
613	D5185	21.30517		0.80	
614	D5185	18.70		-0.24	
912	D5185	18.6	C	-0.28	First reported 13.4
963	D5185	19.05		-0.10	
1017		-----		-----	
1023	D5185	19.2		-0.04	
1059	In house	<50		-----	
1113		-----		-----	
1146	D5185	18.95		-0.14	
1189		-----		-----	
1201	D5185	18		-0.52	
1417	In house	19.138		-0.06	
1435	D5185	17		-0.91	
1613		-----		-----	
1628		-----		-----	
1660	D5185	23.02		1.48	
1900	D6595	20.0		0.28	
1920		-----		-----	

normality	OK
n	15
outliers	0
mean (n)	19.29
st.dev. (n)	1.541
R(calc.)	4.31
R(D5185:09)	7.03

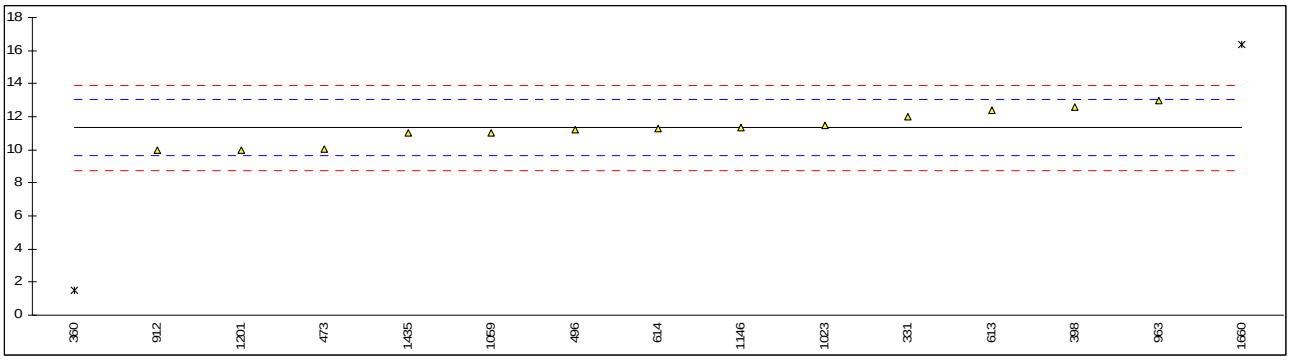


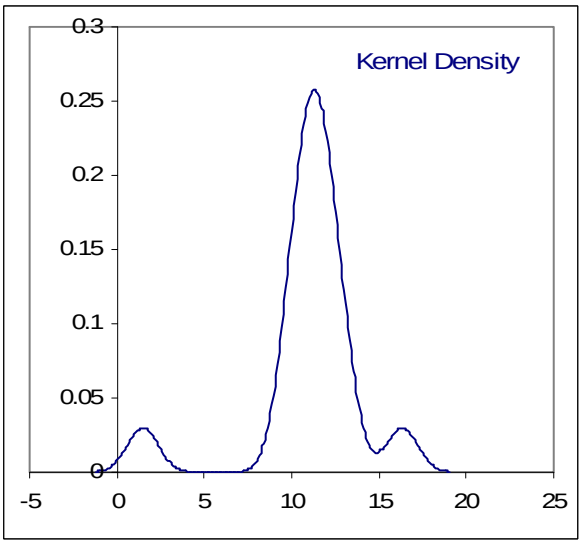


Determination of Manganese (Mn) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	12.0		0.77	
360	D5185	1.48	G(0.01)	-11.52	
398	D6595	12.6		1.48	
432		-----		-----	
451		-----		-----	
473	D5185	10.0632		-1.49	
496	D5185	11.2		-0.16	
613	D5185	12.36063		1.20	
614	D5185	11.30		-0.04	
912	D5185	10	C	-1.56	First reported 7.5
963	D5185	13		1.94	
1017		-----		-----	
1023	D5185	11.5		0.19	
1059	In house	11		-0.39	
1113		-----		-----	
1146	D5185	11.36		0.03	
1189		-----		-----	
1201	D5185	10		-1.56	
1417		-----		-----	
1435	D5185	11		-0.39	
1613		-----		-----	
1628		-----		-----	
1660	D5185	16.34	G(0.01)	5.85	
1900		-----		-----	
1920		-----		-----	

normality	OK
n	13
outliers	2
mean (n)	11.34
st.dev. (n)	0.971
R(calc.)	2.72
R(D5185:09)	2.40

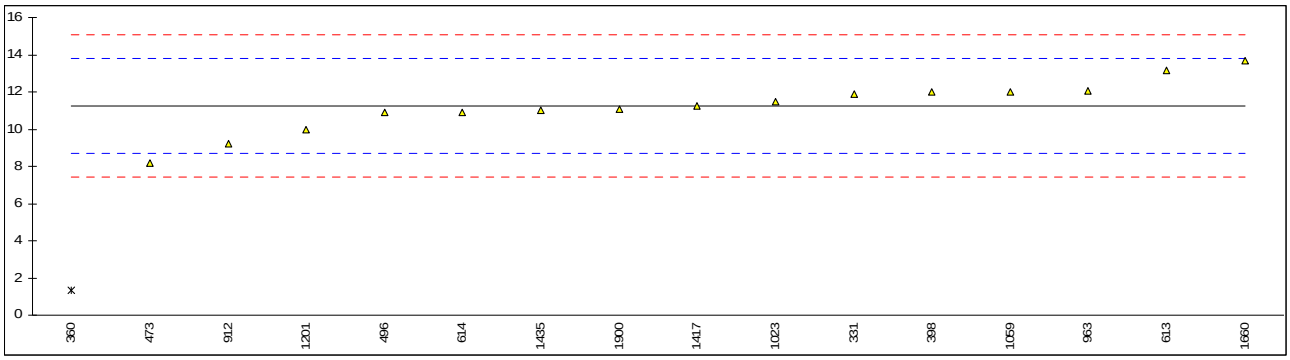


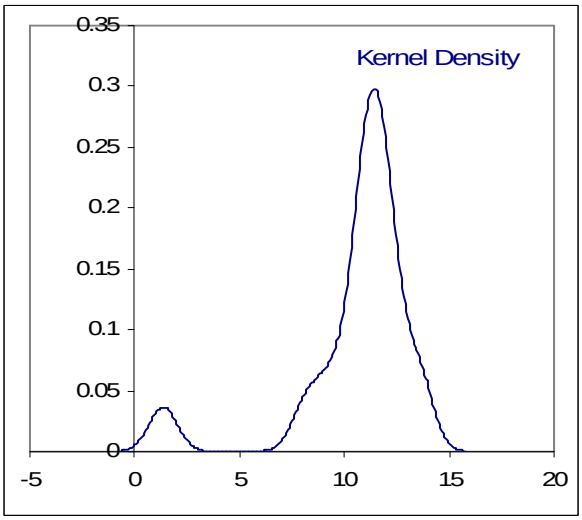


Determination of Molybdenum (Mo) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.9		0.51	
360	D5185	1.35	G(0.01)	-7.77	
398	D6595	12.0		0.58	
432		-----		-----	
451		-----		-----	
473	D5185	8.1483		-2.44	
496	D5185	10.9		-0.28	
613	D5185	13.16167		1.50	
614	D5185	10.92		-0.26	
912	D5185	9.2		-1.61	
963	D5185	12.06		0.63	
1017		-----		-----	
1023	D5185	11.5		0.19	
1059	In house	12		0.58	
1113		-----		-----	
1146		-----		-----	
1189		-----		-----	
1201	D5185	10		-0.98	
1417	In house	11.230		-0.02	
1435	D5185	11		-0.20	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.70		1.92	
1900	D6595	11.1		-0.12	
1920		-----		-----	

normality	OK
n	15
outliers	1
mean (n)	11.25
st.dev. (n)	1.405
R(calc.)	3.93
R(D5185:09)	3.57

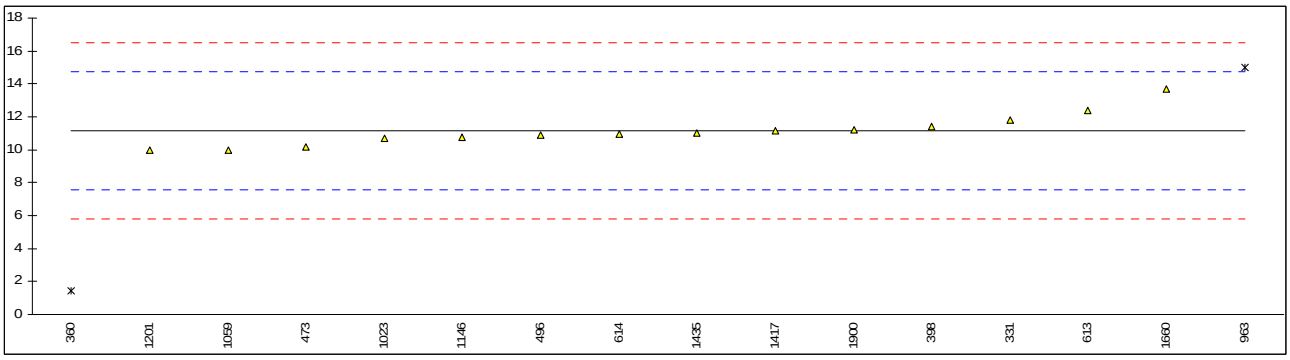


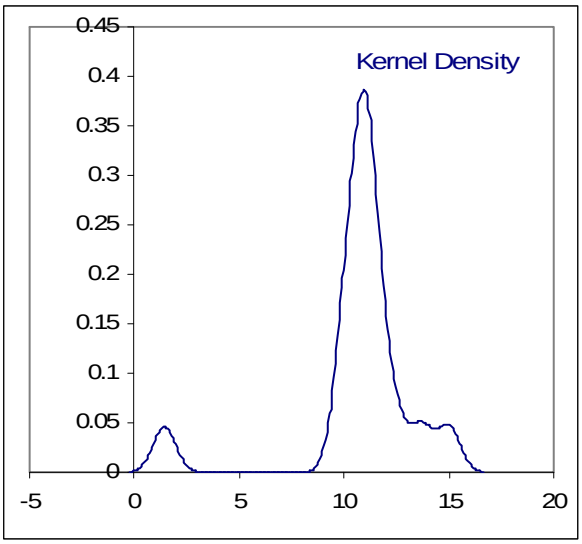


Determination of Nickel (Ni) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.8		0.36	
360	D5185	1.43	G(0.01)	-5.44	
398	D6595	11.4		0.14	
432		-----		-----	
451		-----		-----	
473	D5185	10.1465		-0.56	
496	D5185	10.9		-0.14	
613	D5185	12.41477		0.70	
614	D5185	10.97		-0.10	
912		-----		-----	
963	D5185	15	G(0.05)	2.15	
1017		-----		-----	
1023	D5185	10.7		-0.25	
1059	In house	10		-0.65	
1113		-----		-----	
1146	D5185	10.78		-0.21	
1189		-----		-----	
1201	D5185	10		-0.65	
1417	In house	11.172		0.01	
1435	D5185	11		-0.09	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.68		1.41	
1900	D6595	11.2		0.03	
1920		-----		-----	

normality	OK
n	14
outliers	2
mean (n)	11.15
st.dev. (n)	0.984
R(calc.)	2.76
R(D5185:09)	5.01

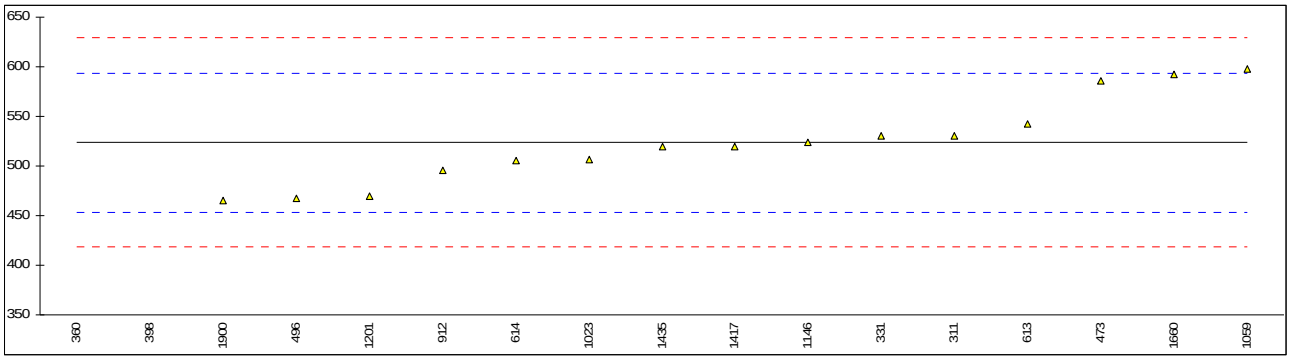


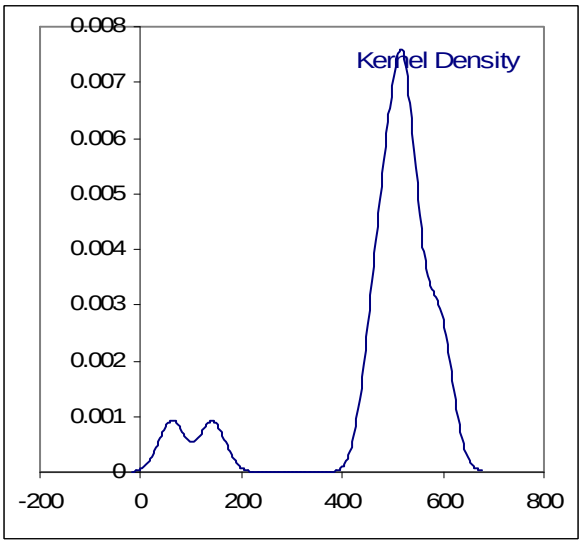


Determination of Phosphorus (P) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D5185	530		0.18	
331	D5185	530		0.18	
360	D5185	61.5	G(0.05)	-13.15	
398	D6595	141.9	G(0.01)	-10.86	
432		-----		-----	
451		-----		-----	
473	D5185	586.009		1.78	
496	D5185	466.9		-1.61	
613	D5185	542.7564		0.55	
614	D5185	505.2		-0.52	
912	D5185	496		-0.78	
963		-----		-----	
1017		-----		-----	
1023	D5185	506		-0.50	
1059	In house	598		2.12	
1113		-----		-----	
1146	D5185	524.40		0.03	
1189		-----		-----	
1201	D5185	470		-1.52	
1417	In house	520.068		-0.10	
1435	D5185	520		-0.10	
1613		-----		-----	
1628		-----		-----	
1660	D5185	592.3		1.96	
1900	D6595	465		-1.67	
1920		-----		-----	

normality	OK
n	15
outliers	2
mean (n)	523.51
st.dev. (n)	42.726
R(calc.)	119.63
R(D5185:09)	98.39

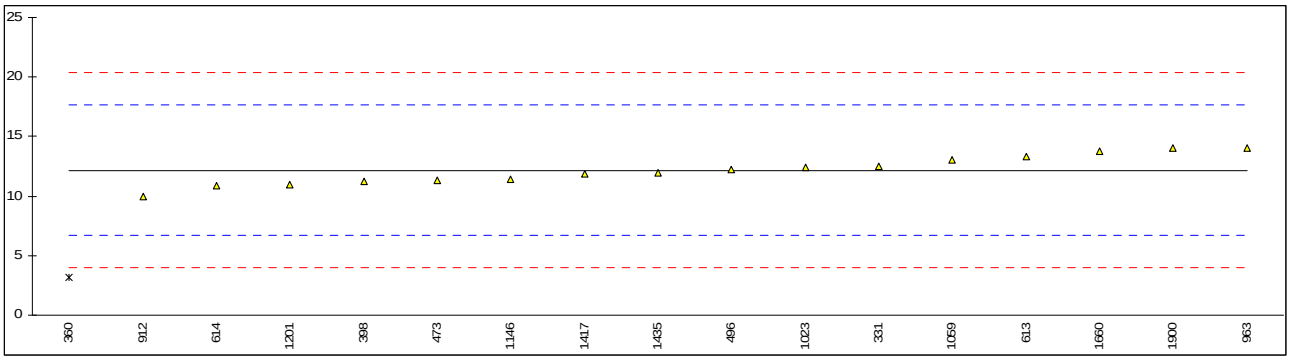


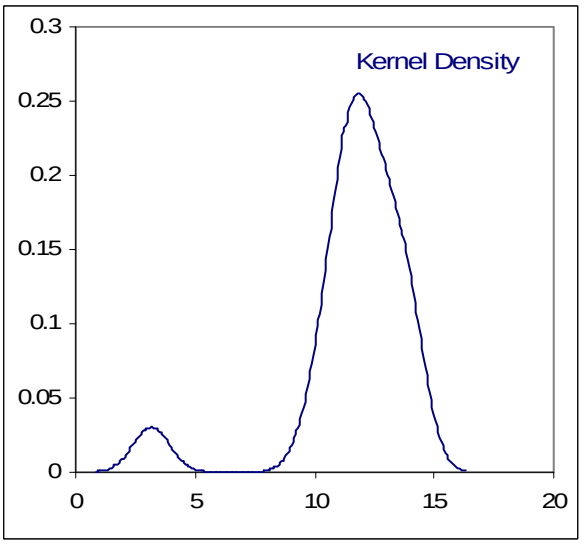


Determination of Silicon (Si) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	12.5		0.12	
360	D5185	3.17	G(0.01)	-3.28	
398	D6595	11.2		-0.36	
432		-----		-----	
451		-----		-----	
473	D5185	11.3462		-0.30	
496	D5185	12.2		0.01	
613	D5185	13.27931		0.40	
614	D5185	10.89		-0.47	
912	D5185	10		-0.79	
963	D5185	14		0.66	
1017		-----		-----	
1023	D5185	12.4		0.08	
1059	In house	13.0	C	0.30	First reported 24
1113		-----		-----	
1146	D5185	11.44		-0.27	
1189		-----		-----	
1201	D5185	11		-0.43	
1417	In house	11.868		-0.11	
1435	D5185	12		-0.07	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.75		0.57	
1900	D6595	14.0		0.66	
1920		-----		-----	

normality	OK
n	16
outliers	1
mean (n)	12.18
st.dev. (n)	1.191
R(calc.)	3.33
R(D5185:09)	7.69

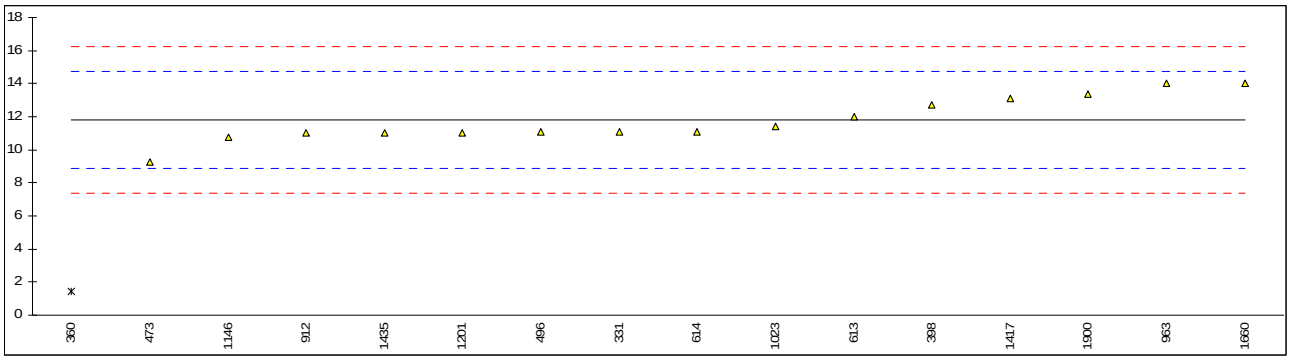


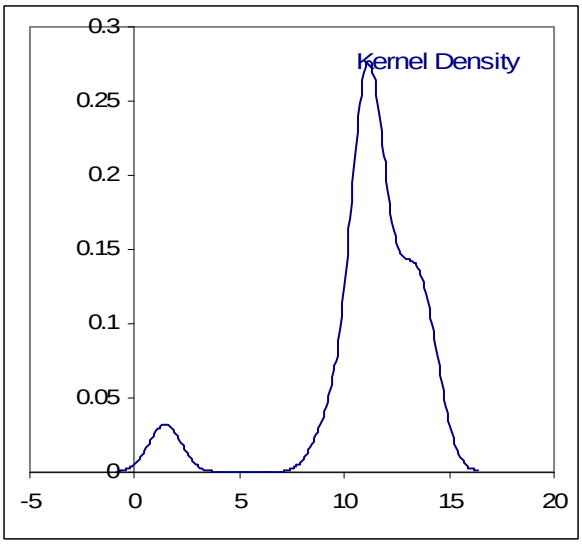


Determination of Silver (Ag) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.1		-0.47	
360	D5185	1.45	G(0.01)	-7.02	
398	D6595	12.7		0.61	
432		-----		-----	
451		-----		-----	
473	D5185	9.2931		-1.70	
496	D5185	11.1		-0.47	
613	D5185	11.97646		0.12	
614	D5185	11.1		-0.47	
912	D5185	11	C	-0.54	First reported <0.5
963	D5185	14		1.49	
1017		-----		-----	
1023	D5185	11.4		-0.27	
1059		-----		-----	
1113		-----		-----	
1146	D5185	10.78		-0.69	
1189		-----		-----	
1201	D5185	11		-0.54	
1417	In house	13.105		0.89	
1435	D5185	11		-0.54	
1613		-----		-----	
1628		-----		-----	
1660	D5185	14.02		1.51	
1900	D6595	13.4		1.09	
1920		-----		-----	

normality	not OK
n	15
outliers	1
mean (n)	11.80
st.dev. (n)	1.356
R(calc.)	3.80
R(D5185:09)	4.13

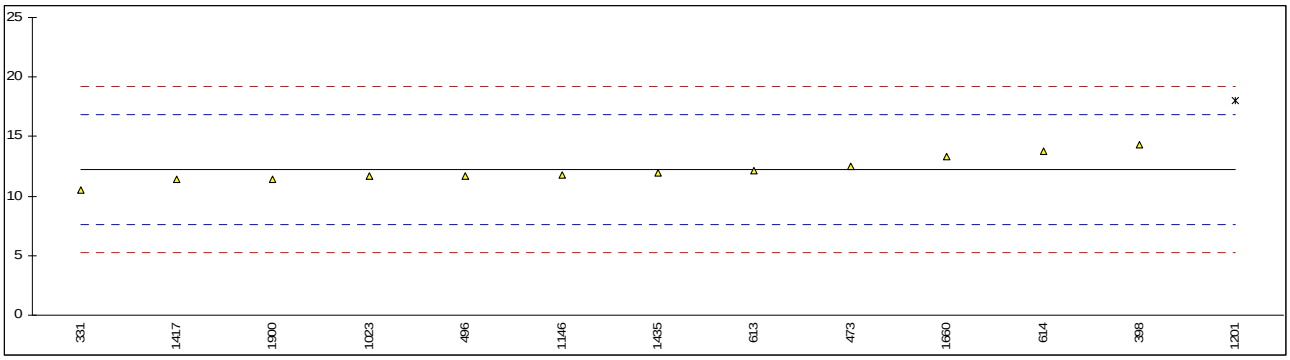


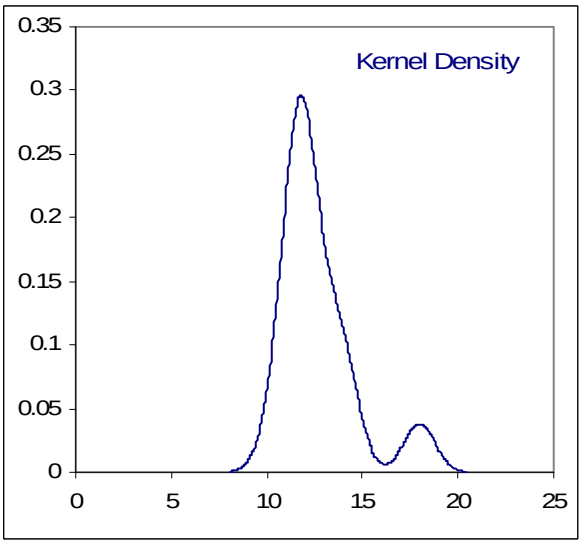


Determination of Sodium (Na) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	10.5		-0.74	
360	D5185	<7.0		<-2.24	False negative result?
398	D6595	14.3		0.90	
432		-----		-----	
451		-----		-----	
473	D5185	12.5367		0.14	
496	D5185	11.7		-0.22	
613	D5185	12.13925		-0.03	
614	D5185	13.8		0.68	
912		-----		-----	
963		-----		-----	
1017		-----		-----	
1023	D5185	11.7		-0.22	
1059		-----		-----	
1113		-----		-----	
1146	D5185	11.76		-0.19	
1189		-----		-----	
1201	D5185	18	G(0.01)	2.49	
1417	In house	11.377		-0.36	
1435	D5185	12		-0.09	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.32		0.48	
1900	D6595	11.4		-0.35	
1920		-----		-----	

normality	OK
n	12
outliers	1
mean (n)	12.21
st.dev. (n)	1.099
R(calc.)	3.08
R(D5185:09)	6.50

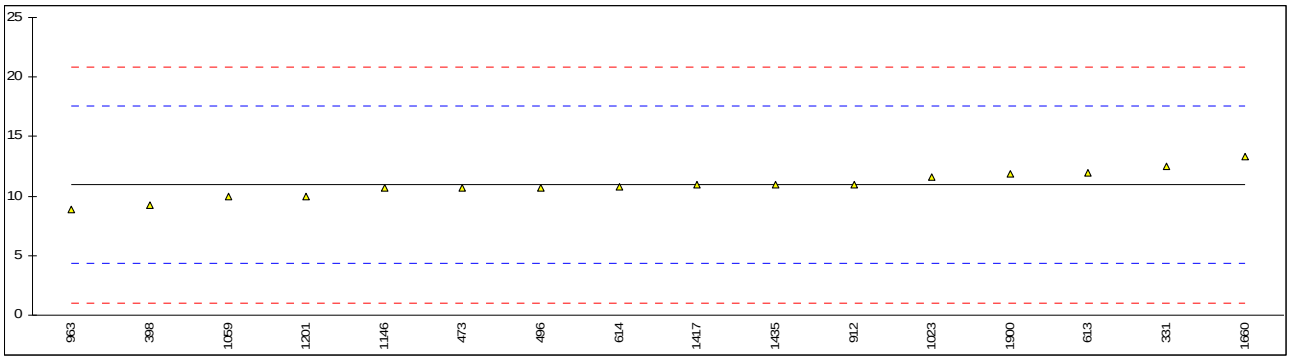


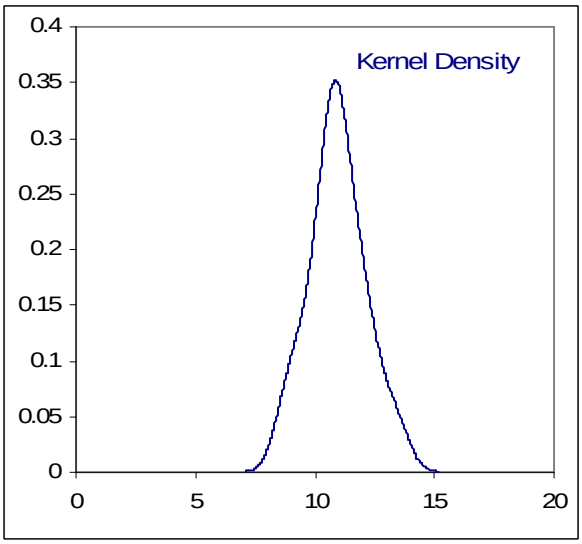


Determination of Tin (Sn) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	12.5		0.47	
360	D5185	<5.0		<-1.80	False negative result?
398	D6595	9.2		-0.53	
432		-----		-----	
451		-----		-----	
473	D5185	10.6957		-0.08	
496	D5185	10.7		-0.08	
613	D5185	11.96285		0.31	
614	D5185	10.79		-0.05	
912	D5185	11		0.01	
963	D5185	8.88		-0.63	
1017		-----		-----	
1023	D5185	11.6		0.20	
1059	In house	10		-0.29	
1113		-----		-----	
1146	D5185	10.67		-0.09	
1189		-----		-----	
1201	D5185	10		-0.29	
1417	In house	10.978		0.01	
1435	D5185	11		0.01	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.36		0.73	
1900	D6595	11.9		0.29	
1920		-----		-----	

normality	OK
n	16
outliers	0
mean (n)	10.95
st.dev. (n)	1.153
R(calc.)	3.23
R(D5185:09)	9.26

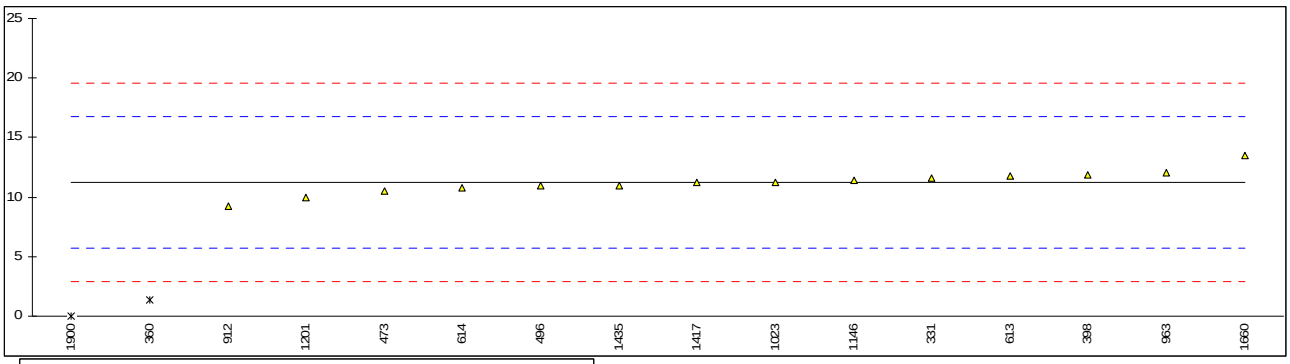


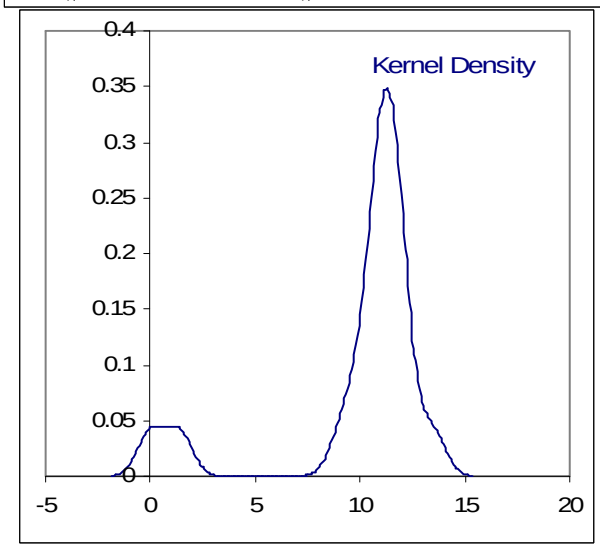


Determination of Titanium (Ti) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.6		0.13	
360	D5185	1.37	G(0.01)	-3.54	
398	D6595	11.9		0.24	
432		-----		-----	
451		-----		-----	
473	D5185	10.5139		-0.26	
496	D5185	11.0		-0.08	
613	D5185	11.80999		0.21	
614	D5185	10.80		-0.15	
912	D5185	9.2		-0.73	
963	D5185	12.06		0.30	
1017		-----		-----	
1023	D5185	11.2		-0.01	
1059		-----		-----	
1113		-----		-----	
1146	D5185	11.43		0.07	
1189		-----		-----	
1201	D5185	10		-0.44	
1417	In house	11.188		-0.01	
1435	D5185	11		-0.08	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.46		0.80	
1900	D6595	0.0	G(0.05)	-4.03	
1920		-----		-----	

normality	OK
n	14
outliers	2
mean (n)	11.23
st.dev. (n)	1.002
R(calc.)	2.81
R(D5185:09)	7.79

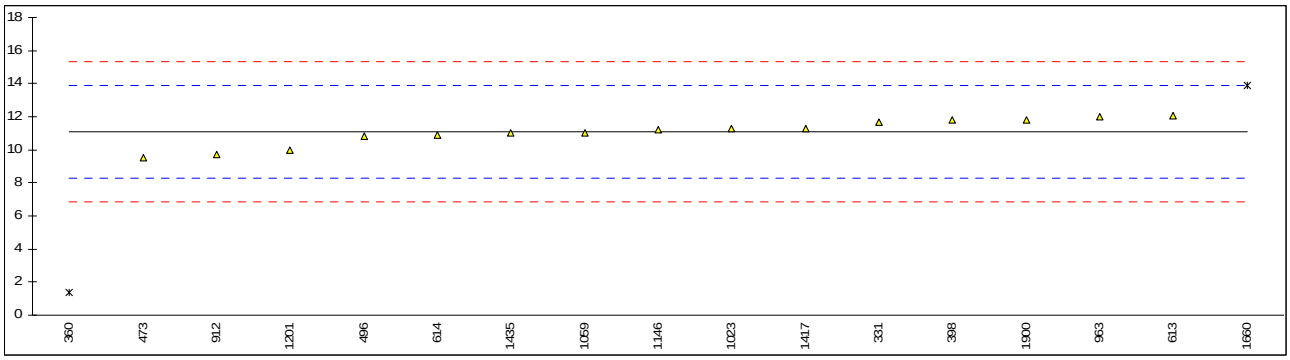


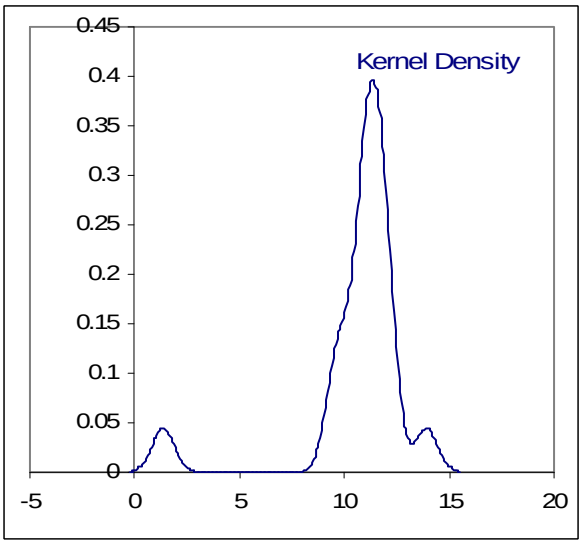


Determination of Vanadium (V) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311		-----		-----	
331	D5185	11.7		0.44	
360	D5185	1.36	G(0.01)	-6.90	
398	D6595	11.8		0.51	
432		-----		-----	
451		-----		-----	
473	D5185	9.5389		-1.09	
496	D5185	10.8		-0.20	
613	D5185	12.06419		0.70	
614	D5185	10.90		-0.12	
912	D5185	9.7		-0.98	
963	D5185	12		0.66	
1017		-----		-----	
1023	D5185	11.3		0.16	
1059	In house	11		-0.05	
1113		-----		-----	
1146	D5185	11.21		0.10	
1189		-----		-----	
1201	D5185	10		-0.76	
1417	In house	11.310		0.17	
1435	D5185	11		-0.05	
1613		-----		-----	
1628		-----		-----	
1660	D5185	13.92	G(0.05)	2.02	
1900	D6595	11.8		0.51	
1920		-----		-----	

normality	OK
n	15
outliers	2
mean (n)	11.07
st.dev. (n)	0.798
R(calc.)	2.24
R(D5185:09)	3.94

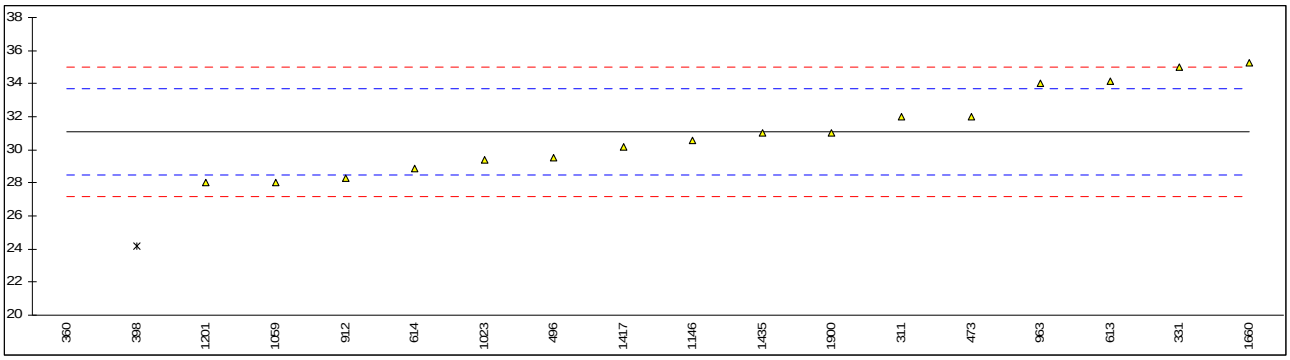


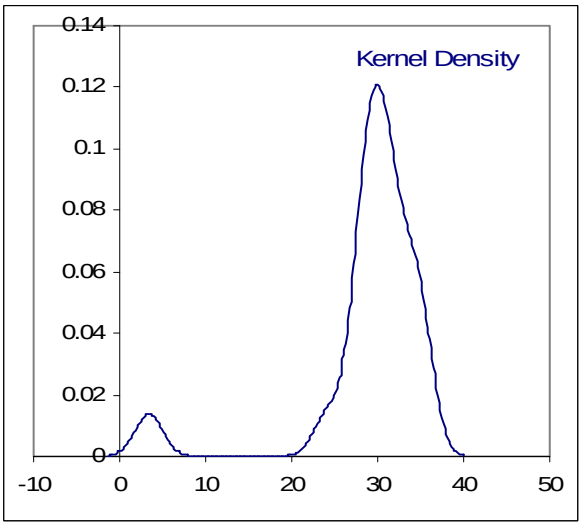


Determination of Zinc (Zn) on sample #1084; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
255		-----		-----	
311	D5185	32		0.71	
331	D5185	35		3.02	
360	D5185	3.42	G(0.01)	-21.29	
398	D6595	24.2	G(0.05)	-5.30	
432		-----		-----	
451		-----		-----	
473	D5185	32.0094		0.71	
496	D5185	29.53		-1.19	
613	D5185	34.15362		2.36	
614	D5185	28.9		-1.68	
912	D5185	28.3		-2.14	
963	D5185	34.0		2.25	
1017		-----		-----	
1023	D5185	29.4		-1.29	
1059	In house	28		-2.37	
1113		-----		-----	
1146	D5185	30.57		-0.39	
1189		-----		-----	
1201	D5185	28		-2.37	
1417	In house	30.190		-0.69	
1435	D5185	31		-0.06	
1613		-----		-----	
1628		-----		-----	
1660	D5185	35.25		3.21	
1900	D6595	31.0		-0.06	
1920		-----		-----	

normality	OK
n	16
outliers	2
mean (n)	31.08
st.dev. (n)	2.452
R(calc.)	6.87
R(D5185:09)	3.64





APPENDIX 2

Number of participants per country

2 laboratories in	AUSTRALIA
1 laboratory in	AUSTRIA
2 laboratories in	BELGIUM
1 laboratory in	BULGARIA
1 laboratory in	ESTONIA
1 laboratory in	FRANCE
1 laboratory in	GERMANY
1 laboratory in	INDIA
2 laboratories in	ITALY
1 laboratory in	JORDAN
1 laboratory in	KOREA
3 laboratories in	NORWAY
1 laboratory in	SAUDI ARABIA
1 laboratory in	SLOVENIA
1 laboratory in	SWEDEN
1 laboratory in	TANZANIA
3 laboratories in	THE NETHERLANDS
1 laboratory in	TURKEY
2 laboratories in	UNITED KINGDOM

APPENDIX 3

Abbreviations:

C	= final result after checking of first reported suspect result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
ex	= excluded from calculations
n.a.	= not applicable
W	= withdrawn result on request of participant
SDS	= Safety Data Sheet

Literature:

1 iis Interlaboratory Studies, Protocol for the Organization, Statistics and Evaluation, January 2010
2 ASTM E178-89
3 ASTM E1301-89
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7 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
8 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
9 IP 367/84
10 DIN 38402 T41/42
11 P.L. Davies, First reported Z. Anal. Chem, 331, 513, (1988)
12 J.N. Miller, Analyst, 118, 455, (1993)
13 Analytical Methods Committee Technical Brief, No4 January 2001
14 The Royal Society of Chemistry 2002, Analyst 2002, 127 page1359-1364, P.J. Lowthian and M. Thompson.