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VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457 1- 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC 308

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Danish Environmental Protection Agency
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FINAL REPORT

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SUMMARY

ECN (NL)

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1. INTRODUCTION

Before standard test methods can be used in a regulatory context, standards need to be validated to be able to know what quality in terms of repeatability and reproducibility can be expected. In relation to leaching, which is the topic of this validation study, one must realize that a leaching tests alone is not sufficient to come to a conclusion on environmental properties of a material. Sampling of waste and analysis of eluates are aspects that are an integral part of a judgement of leaching test results. In this work, the CEN/TC 292 compliance leaching test, EN12457 parts 1 - 4 and the Eluate analysis methods prEN 13370 and ENV 12506 have been validated. These standards are important in view of their use in the EU landfill Directive 1999/31/EC and possibly other related regulations to be developed in the future. The compliance leaching test cannot be used alone to determine the leaching behaviour of a waste. For basic characterisation a methodology for the determination of the leaching behaviour of waste has been developed within CEN/TC 292, which is formulated in ENV 12920: 1998 "Methodology for the determination of the leaching behaviour of waste under specified conditions". Validation of standards for waste can only be validated for a selection of representative wastes from the large number of wastes and waste types relevant in Europe.

2. SAMPLE COLLECTION AND PREPARATION

As no waste materials are available as a standard reference material in sufficient quantities for validation, the study was carried out on real wastes coming from industrial processes and prepared to be representative of real laboratory samples arising from primary sampling procedures. In this manner the results can be used directly to assess performance characteristics of the leaching test described in EN 12457 Parts 1 - 4.

As justification for the selection of materials, the materials cover a wide range of final pH values, which is one of the key parameters in leaching. In addition, the materials selected all occur in bulk quantities in Europe. <u>MSWI Bottom ash</u> (MBA - EWC 19 01 11) - Municipal Solid Waste Incinerator Bottom ash is an inherently heterogeneous material with a grain size distribution extending from very fine to relatively coarse. The concentration levels encountered in bottom ash are intermediate. <u>Metalurgical slag</u> (MES - EWC 10 04 01) - metallurgical slag is selected for its potentially high metal leachability. It comes in different particle size ranges to make it suitable for a comparison of particle size classes. The main feature to be tested on this materials is therefore the performance characteristics of Part 2 and 4 of EN 12457. A specific feature of the metallurgical slag is the relative low buffer capacity. This makes the material appropriate for the evaluation of the pH-conditions of the leaching test. <u>Sand blasting material (SBW- EWC 12 01 16)</u> - This material is relatively low in leachable elements. Sand blasting material is also relatively inert. In view of analytical capabilities a material with low, but measurable leachability is necessary. <u>Sludge from chemical waste water plant (CHS - EWC 06 05 02)</u> - This industrial sludge is an example of a waste with high moisture content. It can only be tested by EN 12457 Part 2. <u>Filter cake of treated fly ash from waste incineration (FCM - EWC 19 01 05)</u> - This material has a high soluble salt loading, which has consequences for the analysis of eluates with a low concentrations of elements. <u>Sludge from municipal wastewater treatment (SEW - EWC 19 08 05) -</u> This material is particularly relevant to CEN/TC 308. This is typically a material with a high water content. Therefore, only EN 12457 Part 2 is useful. In the municipal sludge the presence of high concentrations of dissolved organic matter provide a complex matrix for the analysis of the eluates. <u>Contaminated soil (COS - EWC 17 05 03)</u> - Contaminated soil is often designated as waste and very abundant all around Europe. Contaminated soil is usually a relatively fine-grained material. In this case, the main focus is on the low L/S conditions in EN 12457 Parts 1 and 3.

The materials have been processed by different laboratories to obtain laboratory samples for homogeneity testing, ruggedness testing, characterisation and for the ultimate validation by participating European laboratories. Based on the analytical data foundry sand (FS), which was included initially, has been rejected, as the concentrations in eluates were too low, the material is only relevant for phenol. The analysis of phenol is covered through eluate analysis. Homogeneity testing has indicated for which parameters validation would be possible with the wastes sampled.

3. RUGGEDNESS TESTING

A ruggedness testing programme has been carried out to assess the sensitivity of the leaching procedures prEN 12457 part 1- 4 to variations in several test conditions. The test was performed by varying one of 7 potentially critical test conditions at a time and compare the result of 5 replicates to the results of 10 replicates carried out under “standard” conditions for each parameter. All 4 parts were tested but the most thorough testing was carried out on EN 12457-2 alone since most of the test conditions and procedures are common for all 4 parts. The test conditions addressed were: contact time, liquid to solid ratio (L/S), weight of test material, temperature, mode of agitation, diameter of the filter and size reduction of test material. A few additional test conditions, including head space and particle size, were addressed using a factorial design experiment. Four materials were tested: MSWI bottom ash (MBA), filter cake of treated MSWI fly ash (FCM), contaminated soil (COS) and sewage sludge from a municipal wastewater treatment plant (SEW). All parts of the test were performed on MBA whereas only part 2 (L/S = 10 l/kg) were performed on the other materials. The choice of analytical parameters to be addressed in the test were based mainly on the nature of the materials, the levels of concentration in the eluates and the analytical capabilities of the participants. They were: MBA (Ba, Cr, Cu, Mo, Pb, Sb, Zn, Cl^-, S/SO_4^{2-}), FCM (Ba, Cd, Cr, Mo, F^-, Cl^-, NO_2^-, Cr(VI)), COS (As, Cd, Co, Ni, Pb, Sb, Zn) and SEW (B, Ba, Cd, co, Cu, Mo, Ni, Pb, Sn, Zn, NH_4^+, SO_4^{2-}, DOC). Effects were generally evaluated at a 1% level of significance.

Contact time was tested for variations of ± 2 hours, whereas only variations of ± 0.5 hours are allowed by the draft standard. The results indicate that contact time variations within the ranges prescribed by the draft standard do not appear to have any significant influence on the test result. The results of the factorial design experiment indicate that the settling time prior to filtration (0 – 15 minutes) is not critical.

The variations of the L/S ratio in the test were ± 10 % of the designated value, whereas the variations allowed by the draft standard are only 2 %. The larger variation turned out to be critical for a number of parameters, but a subsequent further analysis of the data indicated that variations within the L/S ranges allowed by the standard are unlikely to influence the results significantly. It should be noted that solubility controlled components are most sensitive to changes in L/S when the results are reported in terms of leached amount (mg/kg), whereas availability controlled components are most sensitive when results are reported in terms of eluate concentration (mg/l).

The sensitivity to the weight of the test material was tested at 50 g and 200 g with the prescribed standard value of 100 g (with the prescribed L/S value). This is a much wider range than the ± 5 g allowed by the draft standard. The general ruggedness test indicated that the wide range of variation did have a significant effect on the results for a few components. The factorial test design experiment showed that for some of these components ( ) the effect observed could be ascribed to variations in headspace. This has led to recommendation and implementation of changes to the draft standard aimed at ensuring a constant and limited headspace in the leaching vessels. The results indicate that the use of small portions of material may affect the results due to heterogeneity effects for some parameters( ). It is therefore likely that the use of test portions smaller than those prescribed in the standard is more critical than the use of larger portions.

In the ruggedness testing the temperature was varied between 10 °C and 30 °C, whereas the range allowed by the draft standard is 15 °C – 25 °C. The tested variation did have a significant effect on the test results for several components( ). Further analysis of the data indicated that a range of variation corresponding to that prescribed by the standard would have a significant effect only for Ba. The maximum effect of this temperature variation on the amount of Ba leached was estimated to be within the order of ± 20 %. Since temperature does have an effect, a change in the temperature specifications of the standard from 15 °C – 25 °C to 20 °C ± 5 °C has been recommended and implemented. This change signals more clearly that 20 °C is the target temperature.

The effect of the mode of agitation was tested using an end over end tumbler, a roller table and a wrist shaker, respectively. The results indicated that the mode of agitation does have a significant effect on the results for several components. Based on the results it was recommended and implemented into the draft standard that only end-over-end tumbling and roller tables should used for agitation. It its further recommended that any roller table used should have eccentric motion and that only round (as opposed to square) bottles are to be used.

Filter sizes between 47 and 147 mm were tested. The filter size is not specified in the draft standard, but it was shown to have a significant effect on the results for several components( ). Due to lacking information on filtration flow rates, the results could not be evaluated in-depth. The results do, however, stress the importance of the filtration procedure and of observing the prescribed minimum flow rate (and of reporting the actual flow rate). The results of the factorial design experiment indicated that it is unimportant whether the filters are made of cellulose esters or vinyl fluoride. The results also indicated that the use of pressure filtration instead of vacuum filtration only had a significant influence of the result for Pb.

The mode of size reduction applied to the test material (jaw crusher, hammer mill and rotary disc mill) does have a significant influence on the results for several components( ). It has therefore been recommended and implemented into the draft standard that only a jaw crusher should be used for size reduction of the material.

The practical work with the draft standards prEN 12457 part 1-4 during the ruggedness testing have given rise to some additional observations and recommendations for changes: In the draft standard a filtration vacuum of 2500 Pa to 4000 Pa (25 to 40 mbars) is prescribed. This is far too little to have any influence on the filtration, and it is recommended to change the range to 30000 – 70000 Pa (300 to 700 mbars). A normal water ejection pump typically operates in the vicinity of 50000 Pa.

In the standard pre-rinsed filters are prescribed. This is probably a remnant from previous times when it was necessary to rinse the filters. Today very clean filters are available and the prescribed rinsing procedure is unnecessary and it actually makes the filters less stable. It is therefore recommended to change the wording to „Pre-rinsed or similarly clean 0.45 μm filters…“

The standards modified according to the results from the ruggedness testing have been circulated for the final validation work.

4. CHARACTERIZATION OF LEACHING BEHAVIOUR

In CEN/TC 292 Working group 6 leaching behaviour tests have been developed (PrEN 14405 and PrEN 14429), which play an important role in understanding leaching behaviour of wastes and provides a basis for long-term behaviour. Long term behaviour forms the basis for regulatory limit setting. The characterisation data presented provide a basis of reference that allow conclusions to be drawn on behaviour of materials under different exposure conditions than those tested in a leaching test. In particular, the pH dependence test data provide information on the chemical speciation of elements in the various matrices. The information also allows to identify particular sensitivity to pH differences in testing. Factors that control leachability in specific matrices can be recognised (e.g. role of DOC, control of leachability by common mineral phases).

The agreement between EN 12457 results and respectively the pH dependence leaching test and the percolation leaching test (at the corresponding pH and L/S=10 condition) is generally good (figure 1).

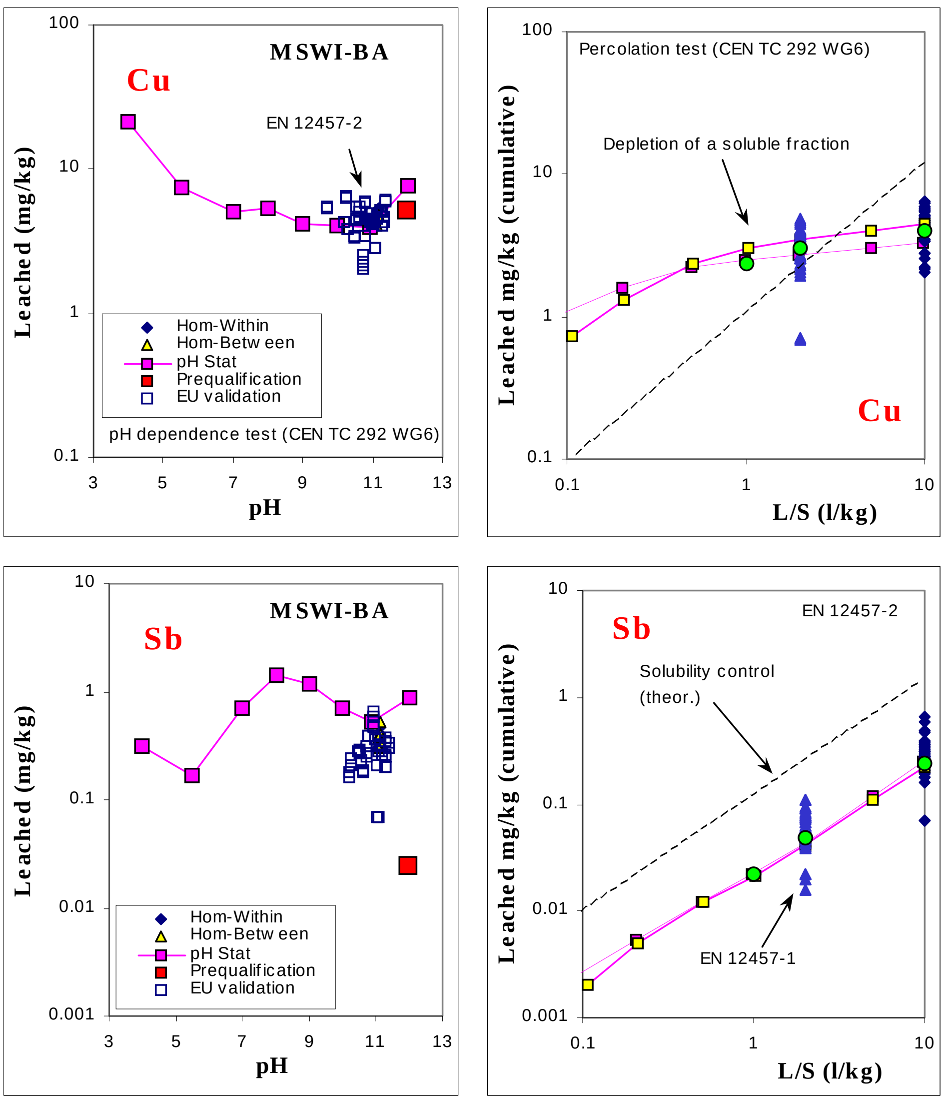


Figure 1 *Relationships between CEN TC 292 characterisation and compliance leaching tests. MSWI BA is Municipal Solid Waste Incinerator Bottom ash.*

In this figure also data from the pre-qualification to determine the sample suitability, the homogeneity testing are included. Those data fall well within the cluster of data points resulting from the EU wide validation study. The elements Cu and Sb are shown here to illustrate the difference in leaching behaviour : Cu washout of soluble species - Sb solubility control. For other elements, differences can occur in case of measurements close to the detection limit or in cases where relatively large changes in pH or other controlling parameters occur over the course of the percolation test. The relationship between compliance tests and characterisation tests is important, as characterisation tests provide the basis for long term leaching behaviour of materials, for which the compliance tests form a quick check for quality and consistency.

5. SUB-SAMPLING

In judging performance of (sub-) sampling methods, the analytical sensitivity plays an important role. Preferably this factor should be ruled out by selecting parameters with sufficient analytical sensitivity in judging sub-sampling performance.

Sub-sampling performance may be very element specific, as a material may be homogeneous for many, but not for all constituents of interest. This requires more knowledge of the material under consideration. Cone and quartering and sampling with a riffler are suitable methods for sub-sampling in the laboratory.

The results indicate that sub-sampling from 4 mm size reduced laboratory samples show the lowest relative standard deviations and may be judged therefore as is the more appropriate method. At 0-10 mm the relative standard deviation is slightly higher than for 0-4 mm. Significantly larger relative standard deviations in sub-sampling are noted for the 0-40 mm fraction.

In case of obvious sample heterogeneity, such as in MSWI bottom ash, analysis for composition may be less repeatable than analysis by leaching in spite of the higher concentration levels, which are to be measured by total chemical analysis (Table I). In case of Cu this heterogeneity can be understood from the presence of non-leachable pure metal particles such as originating from staples and electrical wire clippings.

Table I *Comparison of results of sub-sampling on leaching versus composition analysis All data in mg/kg.*

			Grab			Cone&Quarter			Riffler		
			Avg*	Std	Rstd %	Avg	Std	Rstd %	Avg	Std	Rstd %
Composition		Cu	5510	3695	67	2153	691	32	3290	2513	76
Leaching	40 mm	Cu	0.51	0.03	6.7	0.48	0.09	18	0.53	0.05	9.8
	10 mm	Cu	0.58	0.05	8.8	0.59	0.06	11	0.57	0.05	8.9
	4 mm	Cu	0.51	0.05	10	0.55	0.03	5.6	0.50	0.04	7.6
Composition		Ba	813	346	43	684	59	8.7	642	83	12.9
Leaching	40 mm	Ba	0.128	0.003	2.55	0.123	0.007	5.55	0.119	0.004	3.03
	10 mm	Ba	0.113	0.002	1.75	0.110	0.002	2.22	0.107	0.004	3.51
	4 mm	Ba	0.107	0.004	3.50	0.106	0.002	1.90	0.102	0.003	3.10

*Avg = Average; Std = standard deviation; Rstd = relative standard deviation.

Heterogeneity may appear in forms that are unrelated to environmental impact, such as in case of metals (e.g Pb, Cu, Zn) in MSWI bottom ash. The metals although presnet in relatively high content do not significantly contribute to leaching. In such cases, leaching is the preferred method of assessing environmental properties of materials.

Sub-sampling in the laboratory for testing should be carried out after size reduction to within the specified particle size range for the standard (respectively 4 and 10 mm). Under this condition the additional variability caused by sub-sampling is minimised. Separation of a test portion meeting the requirements by the standard by sieving is not allowed.

Apart from the 0-40 mm material, the relative standard deviation within a size/sub-sampling method combination does not vary very much between the size/sub-sampling method combinations. The differences are mainly between the elements analysed, which is largely related to the concentration levels measured.
For MBA the variability within sampling method/ size combinations (n=5) for the elements analysed in the EU wide validation of EN 12457-2 corresponds well with the within laboratory variability on the test method as determined in the validation of EN 12457 -2 (See part 5). This implies that the contribution of sub-sampling to the overall uncertainty in performing a leaching test is limited.
In previous work carried out in the preparation of EN 12457, the result obtained for batch tests carried out on the same material with different particle size distributions meeting the requirements of the respective standards is significantly larger than the reproducibility limit obtained for such a standard. This implies that particularly with EN 12457-4, in which a statement is given on its application to even larger particle sizes (up to 40 mm), the user must be well aware of the effects of particle size on the test result.

6. STANDARD ELUATE

For a proper evaluation of analytical performance of participating laboratories a Standard Eluate has been prepared to be analysed by all participants in the ruggedness testing, in the validation of EN 12457 and in the validation of eluate analysis methods EN 13370 and EN 12506. The Standard Eluate is composed of a mixture of a pulverised coal fly ash leachate and a MSWI fly ash leachate in a suitable mixing ratio. The eluate from coal fly ash provides oxyanions and the eluate from MSWI fly ash provides elevated metal concentrations.

The within laboratory variability or repeatability in the chemical analysis of the Standard Eluate is generally very good. The repeatability (s_r) is often within 4 %. As the concentration to be measured decreases the uncertainty increases, here up to about 12 %. The between laboratory variability or reproducibility (s_R) in the chemical analysis of the Standard Eluate is on average a factor 2.6 larger than the within laboratory variability, which is quite good for a European wide validation. The repeatability (s_R) is often within 10 % relative standard deviation.
A Standard Eluate such as applied here is a useful means of evaluating analytical performance in validating leaching tests, of which eluate analysis is an integral part.

In table II the performance characteristics of the Standard Eluate analyses for the individual elements are provided.

Table II *Standard Eluate Analysis Performance Data*

		Eluate Analysis Validation						Leaching Test Validation					
Element	Units	Labs	Values	Outl.	Mean	s_r %	s_R %	Labs	Values	Outl.	Mean	s_r %	s_R %
As	µg/l	3	7		10.9	112.8	130.3	13	26	2	0.93	6.7	102
Ba	µg/l	15	42	1	27.1	3.95	12.85	34	68	4	26.6	3.6	11
Be	µg/l	4	10		1.39	1.06	145.1						
B	mg/l							34	68	5	1.196	2.4	7.1
Cd	µg/l	14	42	6	365	2.01	8.09	36	72	2	357	2.1	7.1
Co	µg/l	9	27	3	5.85	7.21	9.3	25	50	3	6.00	11.4	21
Cr	µg/l	15	45	3	81.8	4.18	8.53	36	72	3	83.3	3	8.9
Cu	µg/l	10	30	5	7.66	14.98	16.75	25	50	2	6.17	11.2	26
Mo	µg/l	14	41	3	70.3	5.27	16.05	36	72	4	235	2.9	6.2
Ni	µg/l	11	32	3	13.3	6.23	17.22	29	58	2	13.2	11.9	27
P	mg/l	4	12		91.7	10.27	86.76						
Pb	µg/l	14	41	4	75.9	4.21	21.2	37	74		404	3.4	8.5
Sb	µg/l							31	62	6	6.56	20.3	30
SO_4 as S	mg/l	9	27	3	50.5	1.48	7.62	28	56	1	52.0	2.8	11
V	µg/l	12	34	4	24.9	5.71	18.5	31	62	5	15.99	8.8	23
Zn	µg/l	16	47		18600	3.31	8.9	36	72	3	18134	2.8	6.7

If the repeatability is limited to 10 % then the following overall characteristics apply:

	Median	Min.	Max.
s_r %	2.9	2	9
s_R %	7.7	6	23

These values have been used as reference for the eluate analysis in EN 12457 1-4.

7. STATISTICAL EVALUATION OF EN 12457

In a European wide validation study according to ISO 5725-5, the performance characteristics of the compliance leaching tests EN 12457 1-4 for inorganic species were established. The uncertainty in the end result of a leaching test is composed of contributions from:

- the origin of the material (variation in production processes);
- the method of sampling in the field (differences in representativeness);
- the sample pretreatment (reduction of the field sample into laboratory sample(s) and preparation of the test portion from the laboratory sample before the leaching test);
- the leaching test itself and the experimental parameter variations as allowed by the tolerances;
- the chemical analysis (uncertainty in the determination of concentration in the eluates).

In the interlaboratory exercise to establish the uncertainty of the compliance leaching test, the contributions of the first two items listed above were not included. The validation covers all aspects from the receipt of the laboratory sample from the same primary field sample, onwards.

The validation was carried out with 12 - 14 European laboratories on seven types of waste materials. One of the wastes was tested according to all parts of EN 12457. The wastes selected for the validation were chosen such as to represent as broad a range of wastes as possible, as the standard is intended for general use on waste.

In the validation study the following starting points were used:
The laboratory samples were all taken from one large batch of the different wastes. To be representative for normal practice rigorous homogenisation of wastes (i.e by size reduction and repeated mixing) was not applied. Only the normal primary sampling in the appropriate manner

and the size reduction as needed were carried out. Only in the case of metallurgical slag a separate laboratory sample was provided to assess the difference between central and individual size reduction.

The experimental plan was designed by CEN/TC 292 WG 2 on the basis of each laboratory being given two laboratory samples of each waste to be tested. This is in accordance with ISO 5725-5 section 5 dedicated to heterogeneous material (such as for instance sand or aggregate samples to be tested). However, in order to verify that the variability due to the eluate analysis is not dominant, the laboratories participating in the validation were requested to perform a single complete leaching test on each laboratory sample and to analyse the eluates in duplicate.

The wastes examined cover all the grain size classes to which the compliance leaching test applies: powdered wastes and sludges (0 µm to about 125 µm), fine-grained materials (0 mm to 4 mm) and coarse-grained materials (0 mm to greater than 4 mm) after the required size reduction.

For the choice of waste and component, it was not intended to only investigate waste – component combinations for which already much experience with the leaching test has been obtained. Also some waste-component combinations were tested for which it can be expected that one or more of the requirements would not be easily fulfilled (for example heterogeneity in metallurgical slag, biological instability of sewage sludge). Such combinations were involved in the validation to also give insight in the potentially increased uncertainty for these matrices.

In the validation of the 4 parts of EN 12457, 3 clusters of labs were formed to share the workload of carrying out the testing of 7 wastes. Standard reporting sheets in Excel were developed to facilitate data processing.

In figure 2 and 3 examples are given of the robust statistics on respectively cobalt in contaminated soil (COS) using EN 12457-1 test data and lead in metalurgical slag (MES) using EN 12457-2 test data. From the duplicate analysis of all eluates the within laboratory variability of the analysis is given ($s_{r,Anal}$). For comparison the results of the analysis of the standard eluate and the results of the eluate analysis validation are given. From the duplicate extraction, the within laboratory variability of the test is obtained ($s_{r,test}$). The overall evaluation of participating labs provides the between laboratory variability (s_R). In case of Co in COS a relatively normal Z-score curve is obtained. However, in the case of Pb the heterogeneity of the metalurgical slag is illustrated by the steep slope in the Z-score curve. Even central size reduction to < 4 mm (MESr), which implies that potentially a more homogeneous material was shipped has not resulted in better reproducibility, which implies true heterogeneity in this material for Pb. For Sb, As and B an improvement in reproducibility is noted after central size reduction as compared to individual size reduction (particle size of shipped material: 0 - 40 mm). For comparison, the results of the percolation and pH dependence leaching test on COS respectively MESr are given. In addition, the performance of the analytical measurements on eluates (Eluate analysis validation, see paragraph 10) for the constituent shown is given as well (STE = Standard Eluate).

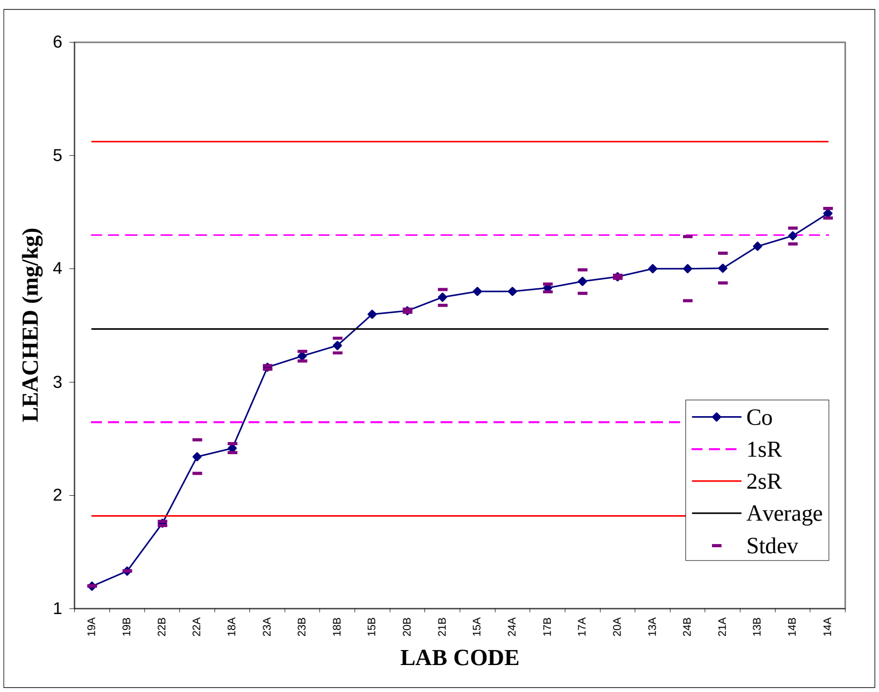
In figure 4 the within laboratory test variability ($s_{r,Test}$ %) is plotted against s_R (%). This gives two different linear relationships depending on the level of uncertainty. At within laboratory test uncertainties up to about 20 % a slope of about 2 – 2.5 is observed, which corresponds to the normal relationship between within and between lab variabilities in validation work. Beyond this point data may show a very high s_R (reproducibility) at a reasonable (low) $s_{r,Test}$ level. This is indicative of systematic errors leading to an off set in the concentration level (F in FCM, Cu in SBW). Theoretically at extreme heterogeneity the within laboratory variability and the between laboratory variability become equal. So equal and high within test and between lab variability on leaching test results in combination with low analytical uncertainty points at heterogeneity for a specific component. This type of relationship can be observed for “heterogeneous” materials. However, a waste may be homogeneous for some and heterogeneous for other constituents. It may also be heterogeneous for composition and homogeneous in leaching. For instance, Pb in MSWI bottom ash is heterogeneous in Pb composition, but it is homogeneous in Mg. Also Cu is heterogeneous in composition and much more homogeneous in leaching.

Some observations relate to specific materials properties. In case of sewage sludge the biological activity affects the results in the validation work (NH4, TOC, SO4). Already in the ruggedness evaluation sensitivity to this factor was noted. It implies that the turn-around time for testing and analysis needs to be kept as short as possible. In view of the observed gas formation (H_2) in the testing of SBW reducing the head space volume is not good. It is more important to have a constant head space. In the text of the standards a note on potential gas formation is needed to make the user aware, that under certain circumstances gas formation may occur at proper measures shall be taken to prevent too high pressure build up.

The aspect of sample hetereogeneity in waste samples is an inherent issue, which needs to be factored in when leaching data are used for decision making and judgements of acceptability.

Since the repeatability and reproducibility on a range of elements in four materials is good, the conclusion is that the leaching test as such is suitable and provides adequate results, provided the condition of sufficient level of sample homogeneity is fulfilled. To improve overall performance of the tests emphasis must be placed on means to minimize the effects of sample heterogeneity on repeatability and reproducibility. A possible option to reach this goal is to apply further size reduction and to deal with the possibly increased leachability relative to field conditions in another manner.

Sample	**COS**	Average	3.45	mg/kg	Sr Anal	0.05	mg/kg	1.5	%		%
Test	**EN 12457-1**	STD	0.83	mg/kg	Sr Test	0.21	mg/kg	6.2	%	rtest	17.4
No labs	11				SR	0.83	mg/kg	25	%	R	70.8



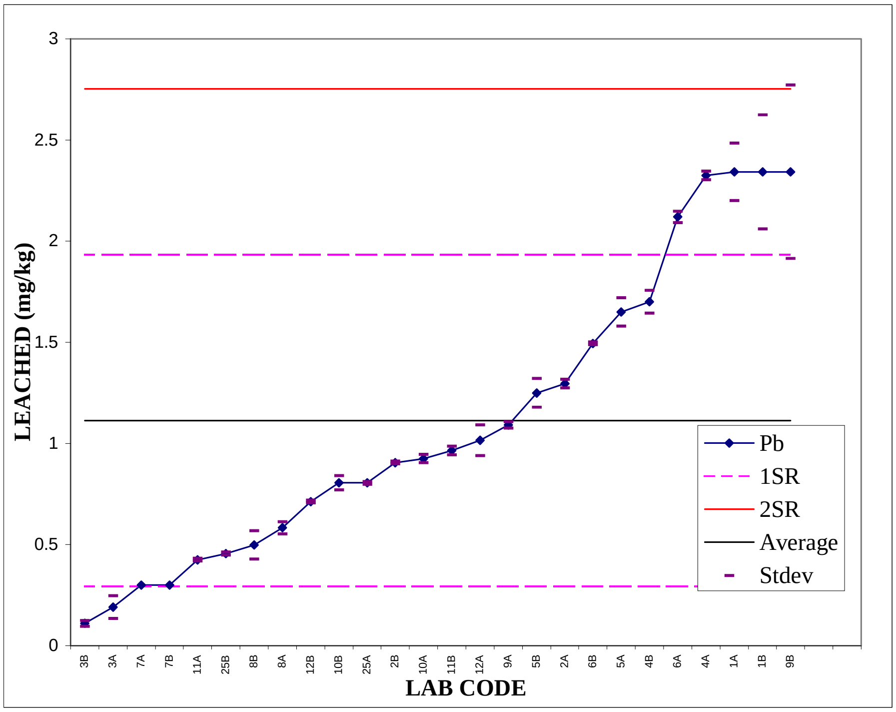
Percolation test
mg/kg
L/S=1 3.7

STE
Conc. (mg/l) 0.006
Sr Anal(%) 11.4
SR Anal(%) 22

Eluate analysis val.
Conc. (mg/l) 0.0744
Sr Anal(%) 1.9
Conc. (mg/l) 5.85
Sr Anal(%) 7.21

Figure 2 Robust statistics applied on Co leaching from contaminated soil (COS) using EN 12457-1.

Sample	MESr	Average	1.20	mg/kg	Sr Anal	0.049	mg/kg	4.4	%		%
Test	EN 12457-2	STD	0.82	mg/kg	Sr Test	0.37	mg/kg	31.1	%	rtest	87
No labs	13				SR	0.97	mg/kg	81	%	R	227



Percolation test

	mg/kg
L/S=10	0.16

pH stat (own pH)

L/S=10	mg/kg
pH 8.5	0.054

STE

Conc. (mg/l)	0.404
Sr Anal(%)	3.4
SR Anal(%)	8

Figure 3 Robust statistics applied on Pb leaching from metalurgical slag (MES size reduced) using EN 12457-2

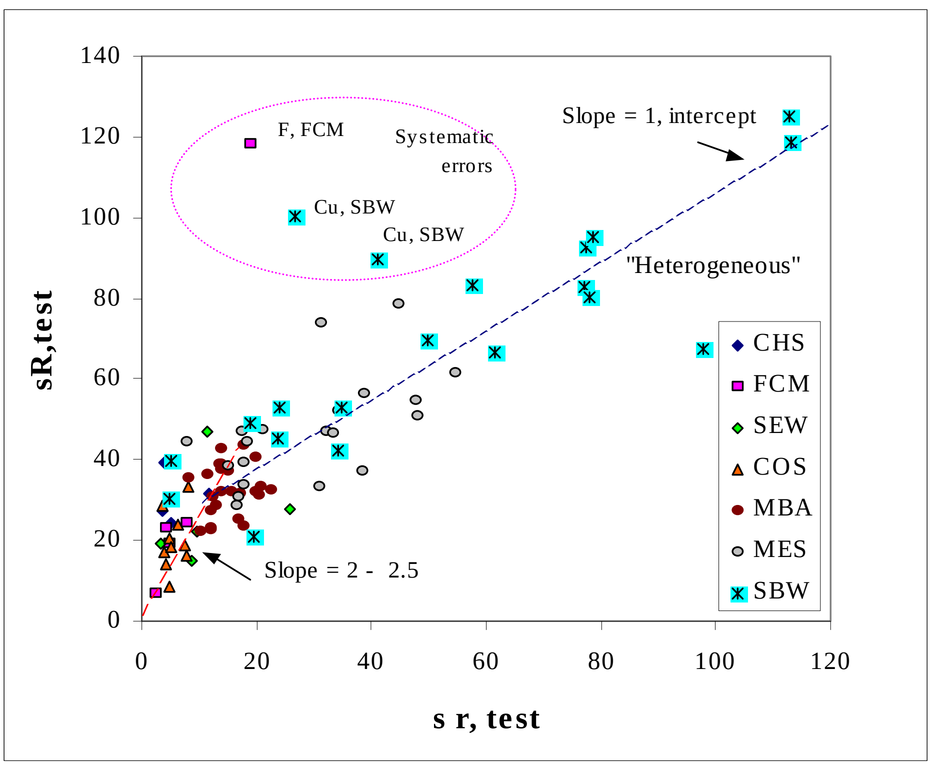


Figure 4. Plot of the within laboratory test variability ($s_{r,test}$) against the between laboratory variability (s_R).

8. ANALYTICAL PERFORMANCE EVALUATION

For the wide range of solutions analysed by any analytical laboratory it is very difficult to assess matrix interferences on individual eluates. The manner of data presentation as shown in figure 5 based on incidental duplicate analysis in the regular performance of analysis on a wide range of solutions allows to generate an instrument performance characteristic. This allows interferences to be identified fairly easily and also allows a better assessment of realistic limits of determination and limits of detection. Any point well to the right or above the cluster of data points is suspect of either sample heterogeneity or interferences. When concern arises that heterogeneity or interferences may play a role a duplicate analysis plotted in a graph like this can provide information on the occurence of such an increased uncertainty in the analytical determination. Data points well outside the curve are suspect. Further evaluation of this type of data seems useful for internal laboratory quality control.

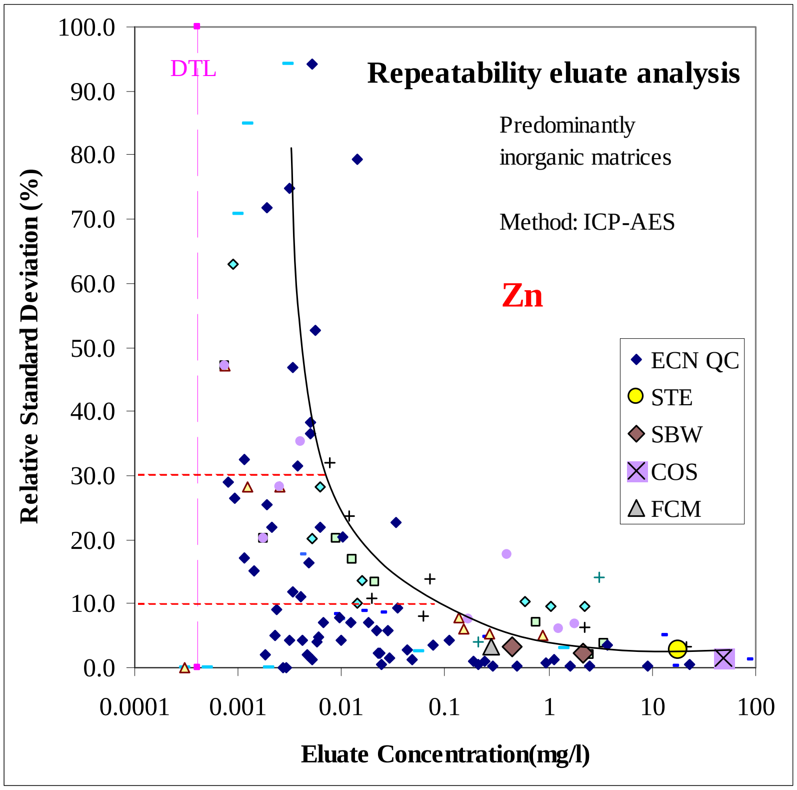


Figure 5. Analytical performance data for ICP based on duplicate analysis of Zn in eluates. (STE=standard eluate; SBW, COS and FCM are codes for the wastes studied; 5 year ECN QC data from wide range of eluates included for comparison).

9. EN 12457 1- 4 PERFORMANCE CHARACTERISTICS

Based on the outcome of the validation, performance characteristics for the parts of EN 12457 1- 4 have been derived. The statistical evaluation was conducted according to ISO 5725-5 section 6 providing "robust methods for data analysis": The average values, the repeatability standard deviation ($s_{r\ test}$) and the reproducibility standard deviation (s_R) were obtained. In order to compare and contrast the contribution of the analysis of the eluate to the overall uncertainty in the leaching test, Table III lists the repeatability standard deviation for the eluate analysis $s_{r,anal}$ as obtained in the validation study.

The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions: the tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures. The repeatability limit was calculated using the relationship: $r_{test} = f\sqrt{2} * s_{r,test}$ with the critical range factor f = 2. For instance, for the first line of table III, the repeatability limit around a measurement result of 4,69 mg As/kg is ± 0,49 mg As/kg (i.e. ±10,4 % of 4,69).

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program.
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important.

However in the case of heterogeneous materials, the concept of a distinction between “poor” and “good” laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results.

Table III. Example results of the validation studies of EN 12457-2

EN 12457-2			Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	Average						
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % 3)
COS	As	4.69	3.7	29.3	10.4	82.0	11	3.4
COS	Pb	33.19	4.9	7.4	13.7	20.7	11	3.4
COS	Cd	19.71	3.9	16.6	10.9	46.5	11	4.1
COS	Ni	4.70	4.1	14.7	11.5	41.2	11	3.1
COS	Co	4.31	5.0	19.0	14.0	53.2	11	4.1
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % 3)
MBA	Mo	0.48	17.7	26.7	50	75	12	7.3
MBA	Sb	0.29	19.1	36.0	53	101	12	5.5
MBA	SO_4	1517	15.6	39.6	44	111	14	3.9
MBA	Ba	1.62	11.9	37.0	33	104	13	2.6
MBA	Cu	4.57	18.3	22.8	51	64	14	1.8
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % 3)
MESr 1,2,4)	As	0.047	38.4	39.7	108	111	10	10
MESr 2)	Sb	0.76	30.9	34.9	87	98	13	2.2
MESr	Ba	6.20	8.4	26.1	24	73	13	1.9
MESr	B	1.96	15.3	31.0	43	87	12	3.6
MESr 2)	Pb	1.20	31.1	81.2	87	227	13	4.4

1) Too poor analytical data 2) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) 3) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study. 4) MESr – sample size reduced centrally by the sample dispatching laboratory as opposed to size reduction by participating laboratories according to the standard.

Based on the overall evaluation table IV gives the resulting typical values for repeatability and reproducibility limits as well as their observed ranges. The typical value is derived from the data in table III by taking the median value and eliminating data as indicated in table III and rounding the numbers.

Table IV *Typical values and observed ranges of the repeatability and reproducibility limits*

Results of the validation of the compliance leaching test EN 12457- 2	Typical value	Observed range
r repeatability limit	24 %	7 % - 100 %
R reproducibility limit	72 %	20 % - 160 %

In figure 6 the analytical repeatability ($s_{r,anal}$), and test repeatability ($s_{r,test}$) are shown in relation to the test reproducibility (s_R) for all materials tested using EN 12457 Part 2. This illustrates the relative contribution of the individual steps.

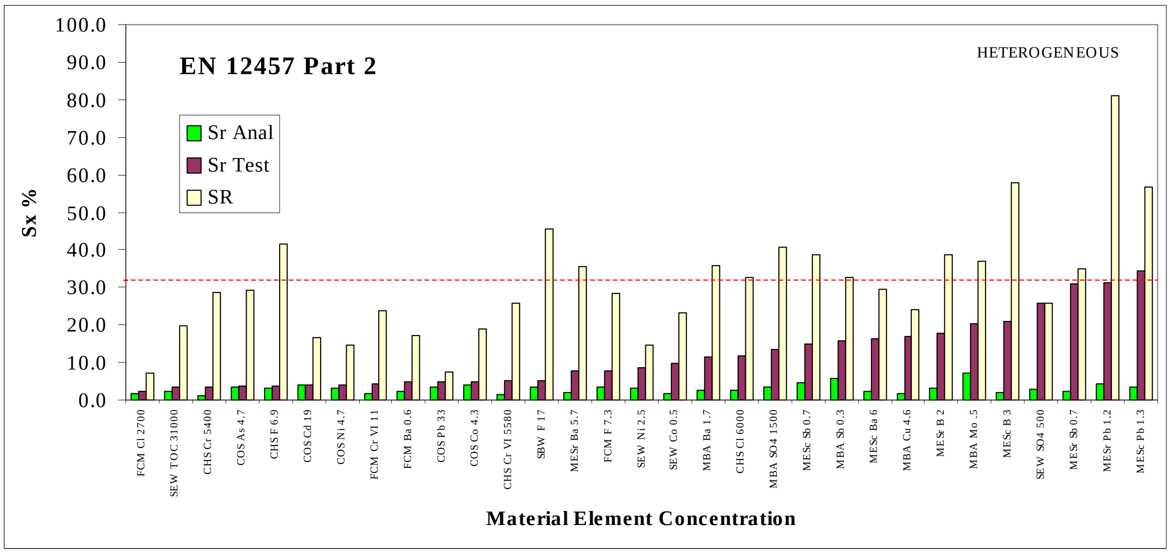


Figure 6. Analytical repeatability, test repeatability and reproducibility of EN 12457 Part 2. (Labels reflect Material code – element - leached amount; dotted line reflects the average reproducibility standard deviation).

10. ELUATE ANALYSIS METHODS VALIDATION

Within the European standardisation committee CEN/TC292 "Characterisation of Waste" two standards were developed for the analysis of waste eluates on the basis of existing international and European standards for the determination of the corresponding parameters in water: prEN 13370: Determination of Ammonium-N, AOX, conductivity, Hg, phenol index, TOC, CN- easy liberatable, F- and ENV 12506: Determination of pH, As, Cd, Cr(VI), Cu, Ni, Pb, Zn, Cl-, NO2-, SO4-. These standards are urgently needed as important tools for controlling limit values in waste eluates as regulated by the European Landfill Directive. For this purpose they need to be validated. After some difficulty sufficient laboratories were found who were willing to take part in the validation exercise.

The overall statistics of the interlaboratory study on validation of methods for eluate analysis, (prEN 13370/ENV 12506) for a selection of parameters out of the range of eluates prepared (COS, FFC, SEW, SBW, SYN1, SYN2, SYN3), are given in table V. More than 90% of the calculated relative repeatabilities are below 10%, whereas about 75% of the reproducibilities are below 40%. These results indicate that most of the tested analytical procedures can be used with adequate precision for the determination of relevant parameters in waste eluates. Bad reproducibilities were probably caused by concentration levels near the determination limit (e.g. NO3-, Ion Chromatography, ISO 10304, FFC, SEW), high concentrations of interfering substances in the eluates (e.g. CN-, Photometry, ISO 6703, SEW) or insufficient quality of some of the participating laboratories in performing the analysis (e.g. Pb, AAS, ISO 8288, SYN1, SYN2).

Table V *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – Contaminated Soil Eluate (COS), Filtercake Eluate (FCM), Sand blasting waste eluate (SBW) and Synthetic eluate (Syn3.)*

Parameter	Material Code	Standard	Units	Number of			Mean	s_r	s_R
				Labs	Values	Outliers		[%]	[%]
As - ICP	COS	ISO 11885	µg/l	11	33	3	20.6	4.76	28.1
As - Hydride AAS	COS	EN 11969	µg/l	13	39	-	17.4	5.32	33.9
As - Hydride AAS	SEW	EN 11969	µg/l	12	36	6	15.2	5.2	51.4
As - ICP	SEW	ISO 11885	µg/l	11	33	6	139	7.66	19.4
As - ICP	Syn3	ISO 11885	µg/l	3	7	-	10.9	113	130
F - Electrode	FCM	ISO 10359	mg/l	7	21	6	0.71	3.25	12.2
F – IC	FCM	ISO 10304	mg/l	7	20	4	0.63	1.35	19.5
F - Electrode	SBW	ISO 10359	mg/l	10	30	-	7.66	0.78	12.9
F - IC	SBW	ISO 10304	mg/l	11	33	-	7.42	2.06	16.6

Figures 7, 8 and 9 contain examples of the graphical presentation of the results of the the interlaboratory study on validation of methods for eluate analysis as cited in prEN 13370 and ENV 12506. The figures allow the evaluation of the reproducibilities of the analytical procedures in the investigated real waste and synthetic eluates (Figure 5 and 6) and a comparison of the performance of different methods for the same parameter (figure 7). Here As and F are shown. In case of As, a significant difference is noted for ICP versus the generally more sensitive hydride AAS method. This is attributed to the complex eluate of sewage sludge leachate, where ICP due to the high flame temperature leads to additional destruction of the sample during analysis, which is lacking in the hydride method.

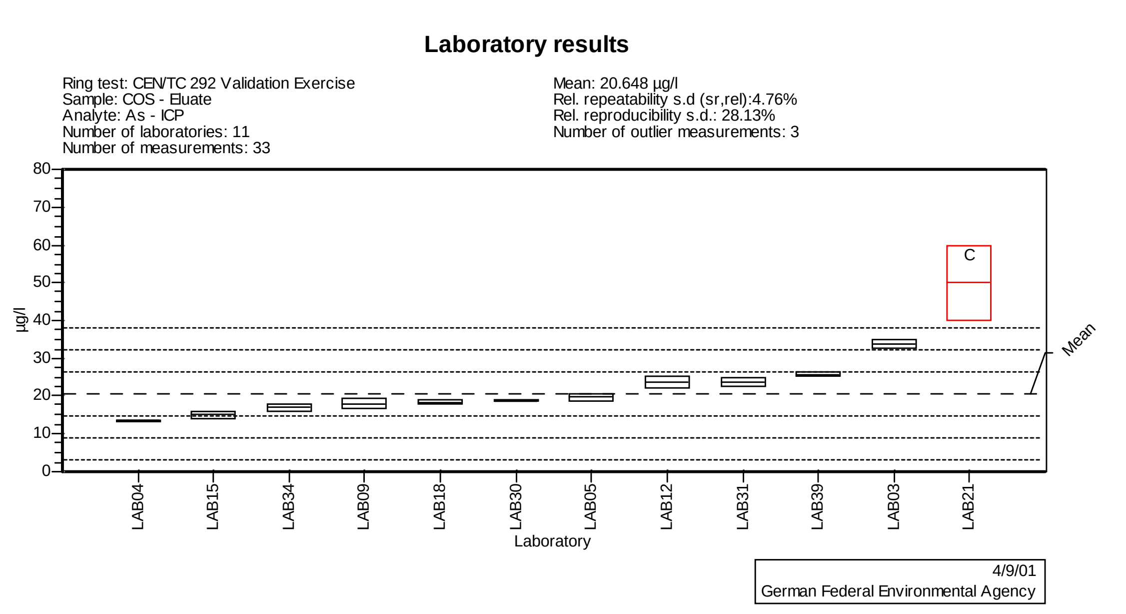


Figure 7. Evaluation of the repeatability and reproducibilities of the analytical procedures of As by ICP in COS eluate. (C means rejected based on too large within lab variability)

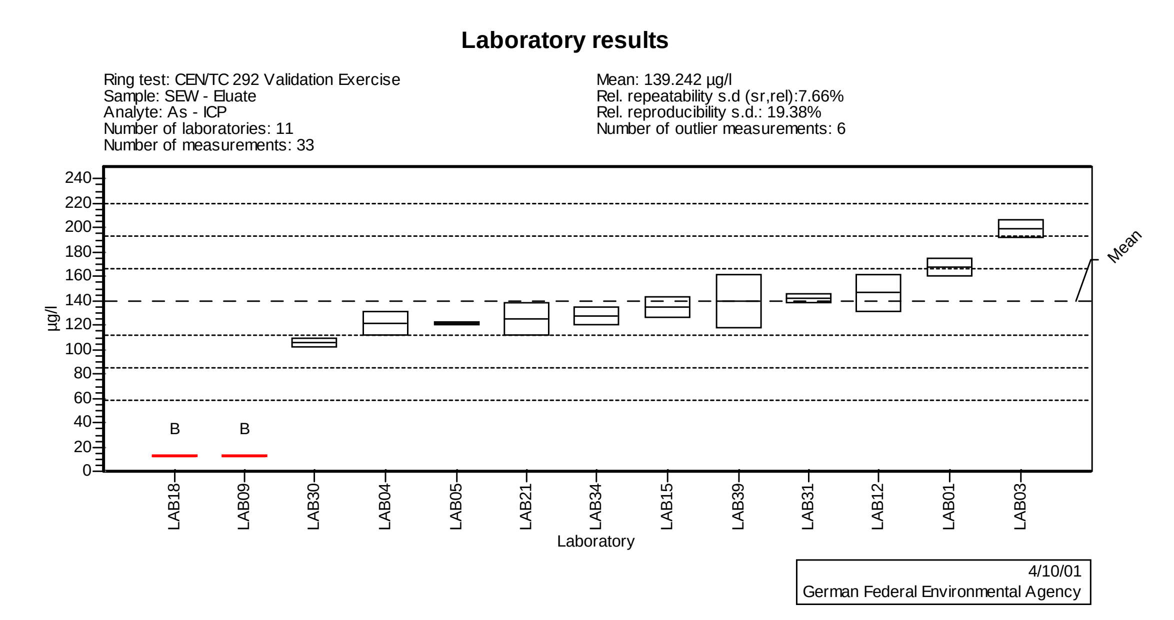


Figure 8 Evaluation of the repeatability and reproducibilities of the analytical procedures of As by ICP in SBW eluate. (B denotes rejected values).

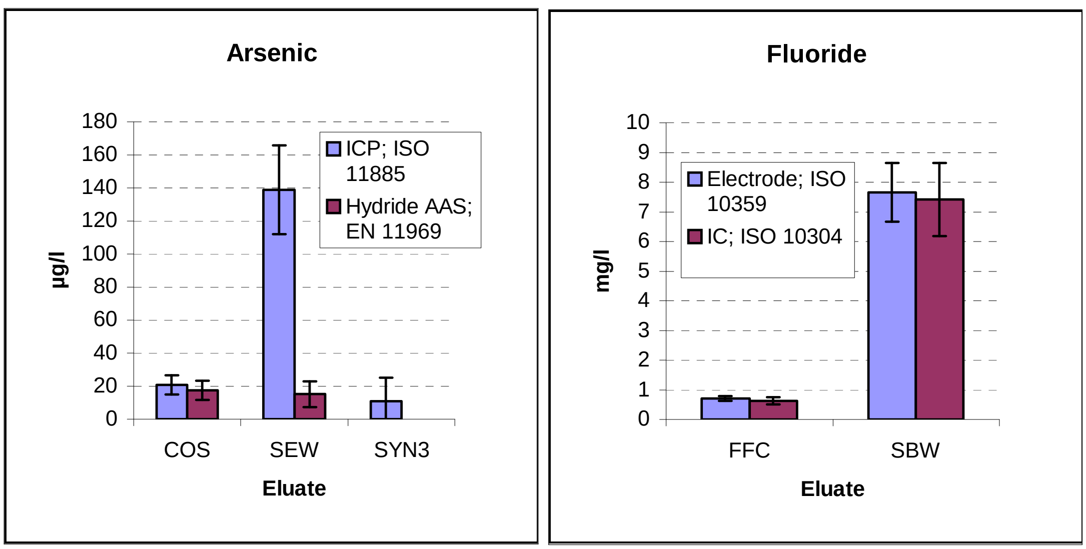


Figure 9. Examples of the comparison of different methods for the same parameter.

11. ELUATE ANALYSIS PERFORMANCE

The data from the validation of PREN 12506 have been assessed according to ISO 5725-2. In table VI the tested parameter (here As), the accepted combination of method, parameter and sample, and the results and statistics are shown.
The acceptance criterion was:

– Minimum number of laboratories: 6
– Minimum number of results (outliers excluded): 18

Table VI. Results of the in the interlaboratory study on validation of methods for eluate analysis for As in different matrices.

Parameter	Matrix	Standard	Units	Number of					Mean	s_r	s_R	S_r *	S_R *
				Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%
As - Hydride AAS	COS	EN ISO 11969	µg/l	13	13	39	39	-	17.4	0,92	5,90	5.32	33.9
As – ICP	COS	EN ISO 11885	µg/l	12	11	36	33	3	20.6	0,98	5,79	4.76	28.1
As – ICP	SEW	EN ISO 11885	µg/l	13	11	39	33	6	139	10,6	26,9	7.7	19.4

* S_r relative repeatability; S_R relative reproducibility

The validation of this standard was performed on a selection of waste and synthetic eluates. For some parameters different analytical methods were validated. For most methods validation data are available for at least two eluates per parameter. In the case of As (EN ISO 11969), NO_2 (EN ISO 10304-1, EN ISO 10304-2 and EN ISO 13395) and V (EN ISO 11885) only one matrix was validated. In any case, for the analyses of a given parameter within a specific matrix, it is the responsibility of the laboratory to choose the appropriate analytical method depending on the expected interference and concentration range as mentioned in the according standards.

The data from the validation of PREN 13370 have been assessed according to ISO 5725-2. In table VII the tested parameter (here F), the accepted combination of method, parameter and sample, and the results and statistics are given. The acceptance criterion was the same as stated above

Table VII. Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) for F in different matrices.

Parameter	Matrix	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R
				Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%
F - Electrode	SBW	ISO10359-1	mg/l	10	10	30	30	-	7.66	0,060	0,99	0.78	12.9
F - IC	SBW	EN ISO 10304-1	mg/l	11	11	33	33	-	7.42	0,153	1,23	2.06	16.6
F - Electrode	FCM	ISO 10359-1	mg/l	9	9	27	21	6	0.709	0,023	0,086	3.25	12.2
F – IC	FCM	EN ISO 10304-1	mg/l	8	7	24	20	4	0.629	0,0085	0,123	1.35	19.5

The validation of this standard was performed on a selection of waste and synthetic eluates. For some parameters different analytical methods were validated. For some methods validation data are available for at least two eluates per parameter. In the case of Hg (EN 1483), CN- (ISO 6703-2, ISO/FDIS 14403), phenol index (ISO 6439, ISO/FDIS 14402) only one matrix was validated. For the analyses of a given parameter within a specific matrix, it is the responsibility of the laboratory to choose the appropriate analytical method depending on the expected interference and concentration range as mentioned in the according standards.

There is no international standard on equivalence testing between alternative physical or chemical methods available. However based on the F-test and the t-test for means (used are the s_R values) there is a realistic chance to prove equivalence between a number of method/matrix combinations.

12. CONTRIBUTORS AND PARTICIPANTS

The validation study was carried out with financial support from: - the European Commission DG Environment; Umwelt Bundes Amt – Berlin Germany; Bundesministerium für Land- und Forestwirtschaft, Umwelt und Wasserwirtschaft – Austria; Danish Environmental Protection Agency and Centre for Waste Research – Denmark; Ministry of Housing, Spatial Planning and the Environment – The Netherlands; Environmental Services Association Research Trust – United Kingdom; ADEME – France and Openbare Afvalstoffen Maatschappij voor het Vlaamse Gewest – Belgium. In the validation of EN 12457, 36 European laboratories from 11 EU member states and from Norway, Switzerland and Hungary participated. In the eluate analysis validation 40 European laboratories from EU member states and from the Czech Republic participated.

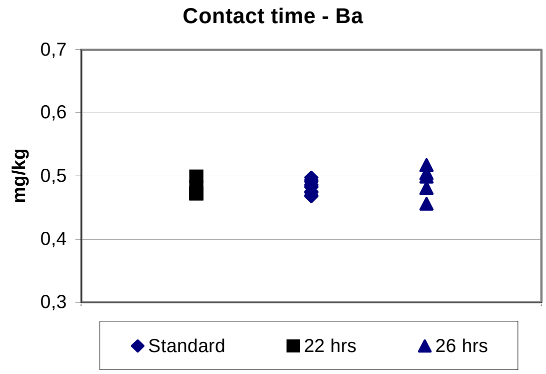
ACKNOWLEDGEMENT

The financial support from Member States has been crucial for realising this project. The financial contribution from DG Environment is gratefully acknowledged. In view of the importance of validation for standards that are to be used in European legislation, it is important that European funds are made available to support this type of work.

A P P E N D I X 0

Graphical presentation of all results

Part 1: MBA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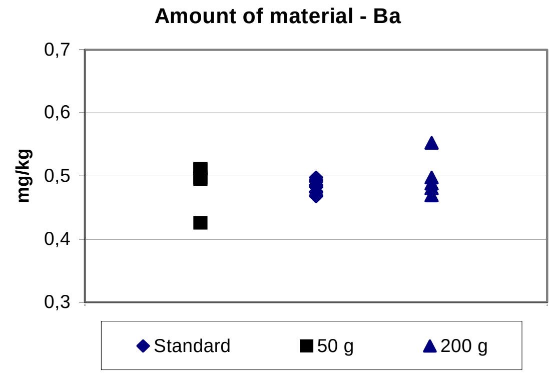
mg/kg
0,7
0,6
0,5
0,4
0,3
Standard
22 hrs
26 hrs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mg/kg
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0,6
0,5
0,4
0,3
Standard
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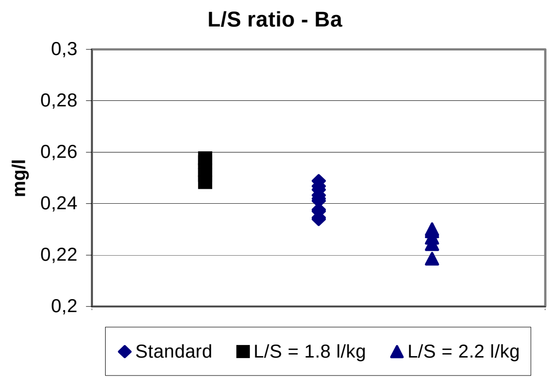
200 g


L/S ratio - Ba
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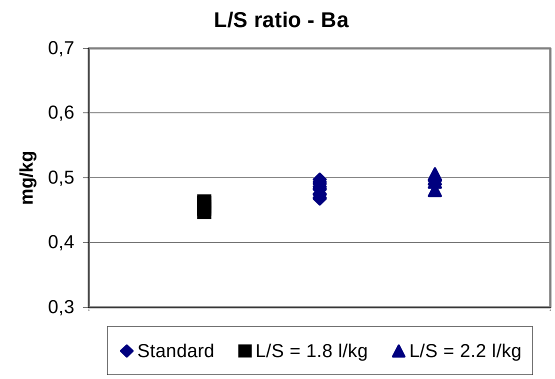
0,28
0,26
0,24
0,22
0,2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg


L/S ratio - Ba
mg/kg
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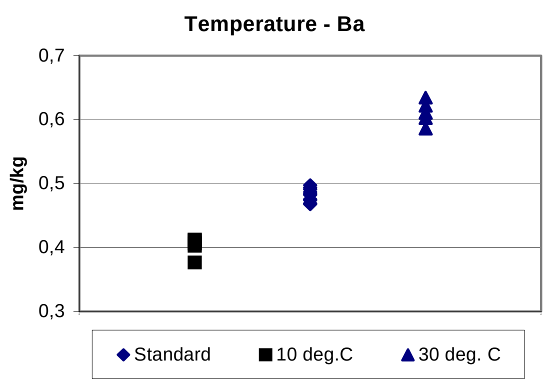
0,6
0,5
0,4
0,3
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg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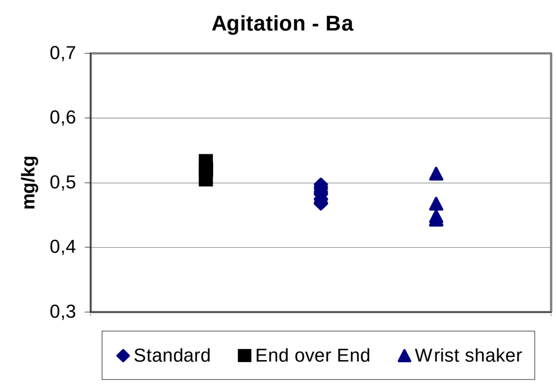
0,5
0,4
0,3
Standard
10 deg.C
30 deg. C


Agitation - Ba
mg/kg
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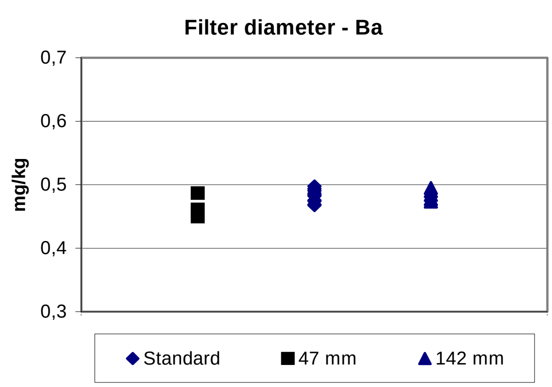
0,6
0,5
0,4
0,3
Standard
End over End
Wrist shaker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0,3
Standard
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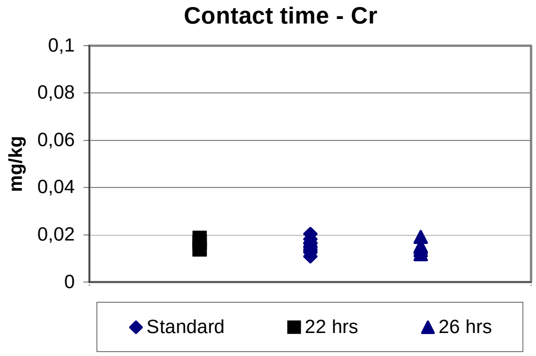
142 mm

Part 1: MBA



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0,04
0,02
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Standard
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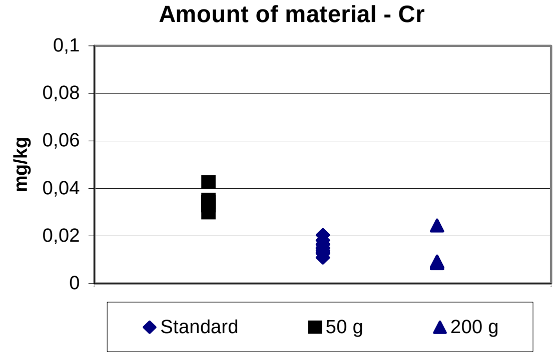
26 hrs



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0,04
0,02
0
Standard
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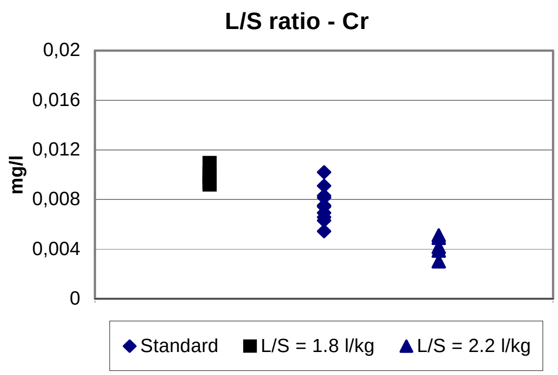
200 g



L/S ratio - Cr
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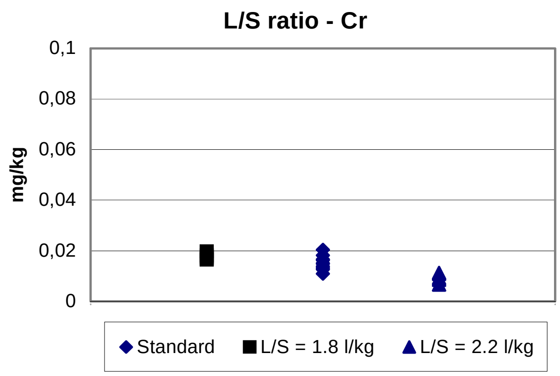
0,012
0,008
0,004
0
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg



L/S ratio - Cr
mg/kg
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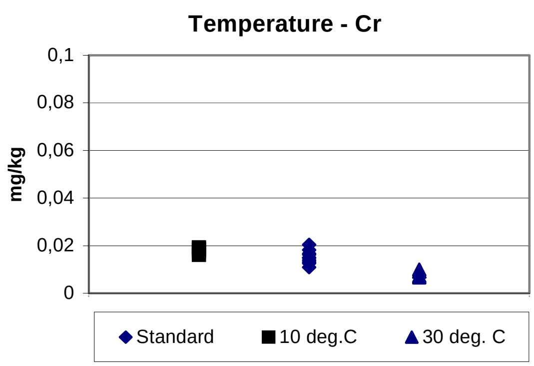
0,08
0,06
0,04
0,02
0
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg



Temperature - Cr
mg/kg
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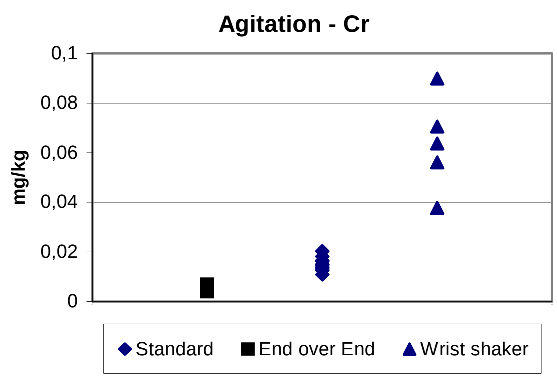
0,06
0,04
0,02
0
Standard
10 deg.C
30 deg. C



Agitation - Cr
mg/kg
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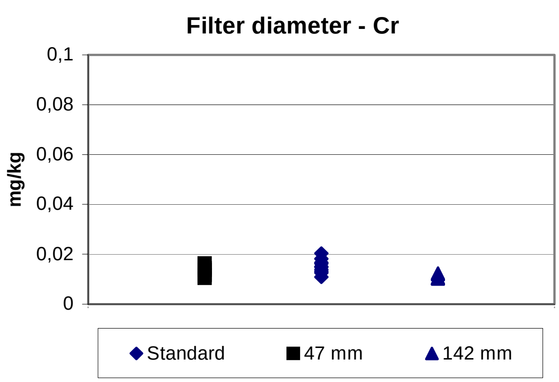
0,08
0,06
0,04
0,02
0
Standard
End over End
Wrist shaker



Filter diameter - Cr
mg/kg
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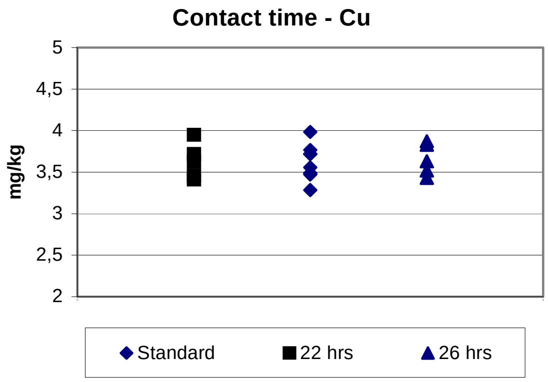
0,06
0,04
0,02
0
Standard
47 mm
142 mm

Part 1: MBA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3
2,5
2
Standard
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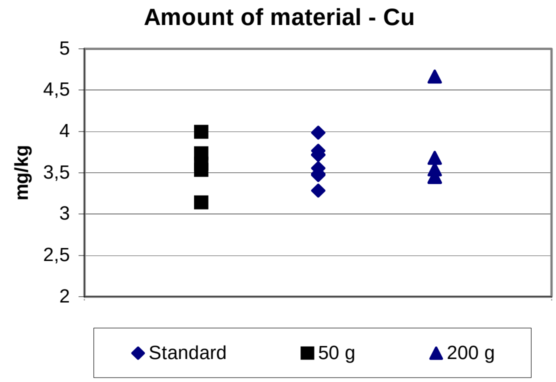
26 hrs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mg/kg
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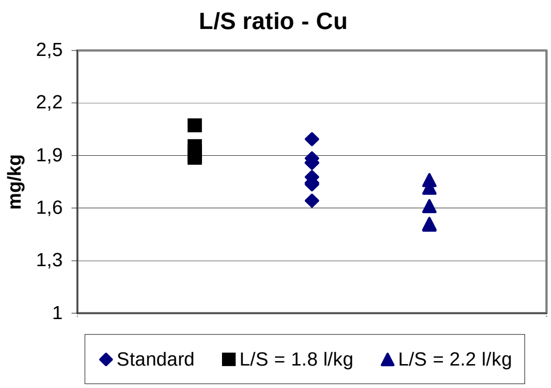
4
3,5
3
2,5
2
Standard
50 g
200 g


L/S ratio - Cu
mg/kg
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2,2
1,9
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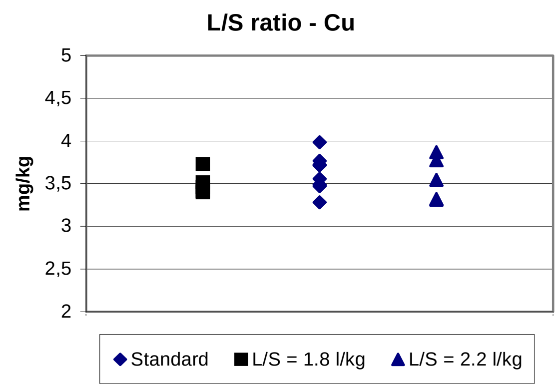
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg


L/S ratio - Cu
mg/kg
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4
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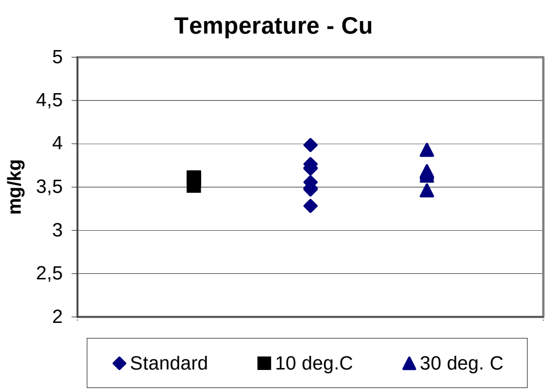
2,5
2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg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mg/kg
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3,5
3
2,5
2
Standard
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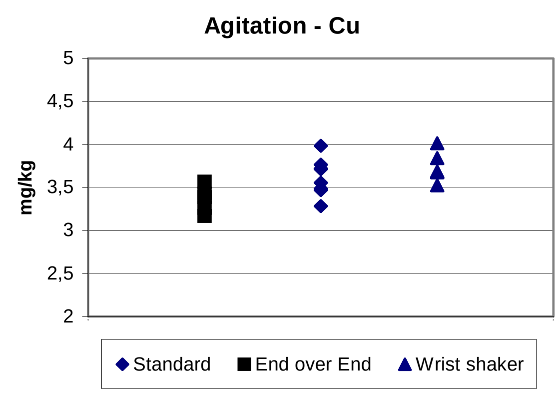
30 deg. C


Agitation - Cu
mg/kg
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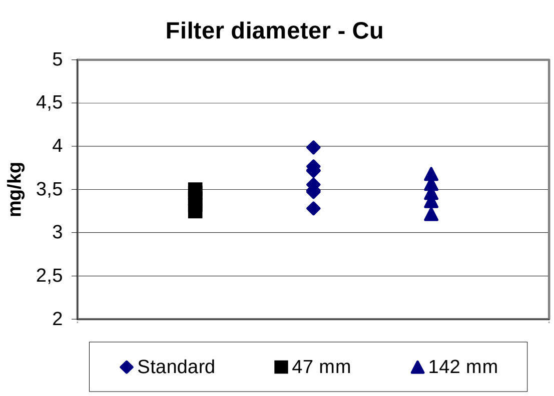
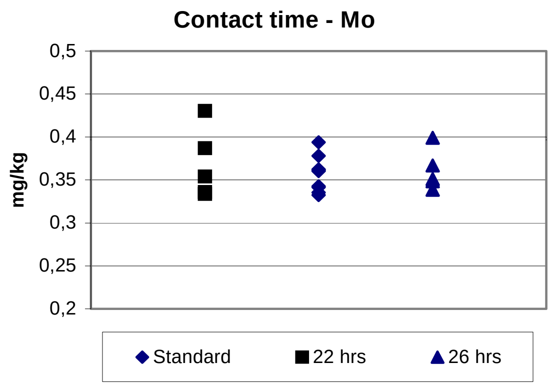
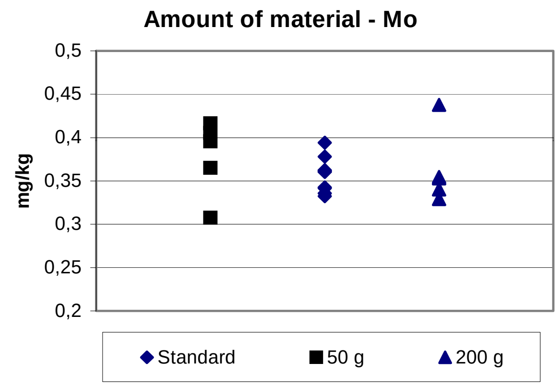
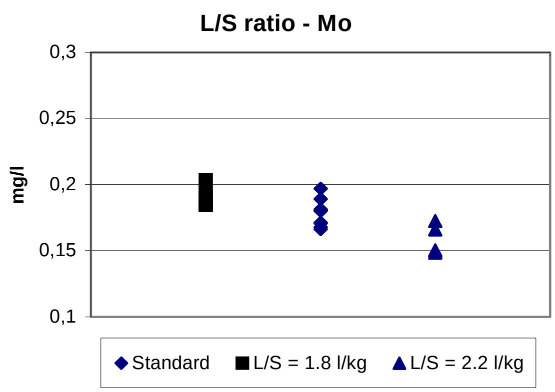
4,5
4
3,5
3
2,5
2
Standard
End over End
Wrist shaker

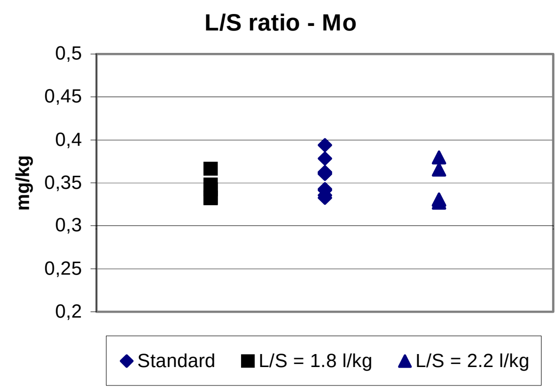

Filter diameter - Cu
mg/kg
5
4,5
4
3,5
3
2,5
2
Standard
47 mm
142 mm

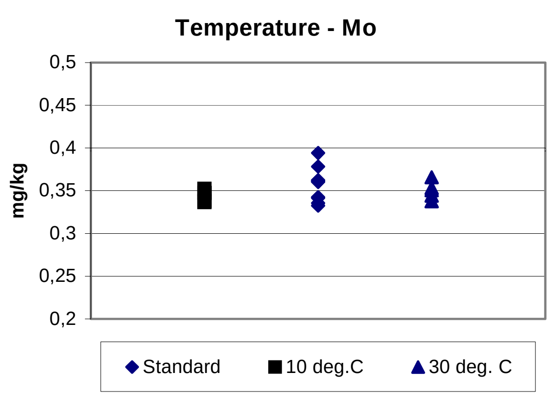
Part 1: MBA

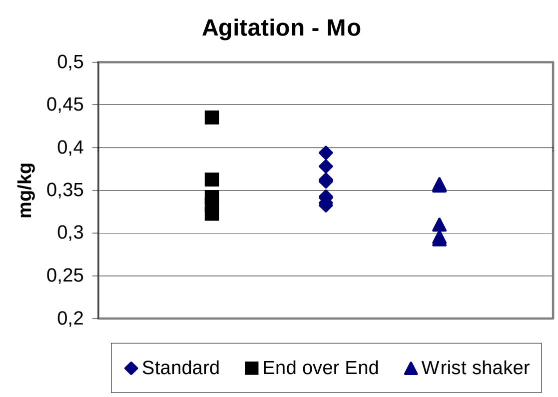

Contact time - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
22 hrs
26 hrs

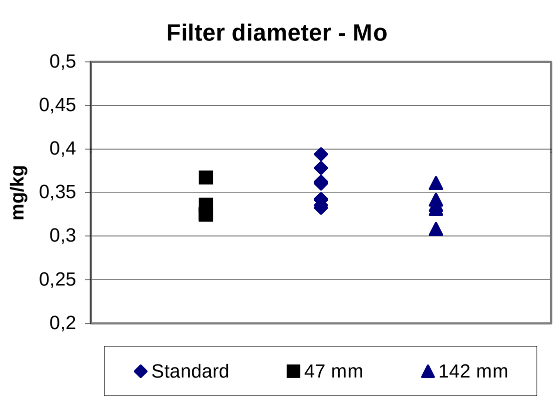

Amount of material - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
50 g
200 g


L/S ratio - Mo
mg/l
0,3
0,25
0,2
0,15
0,1
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

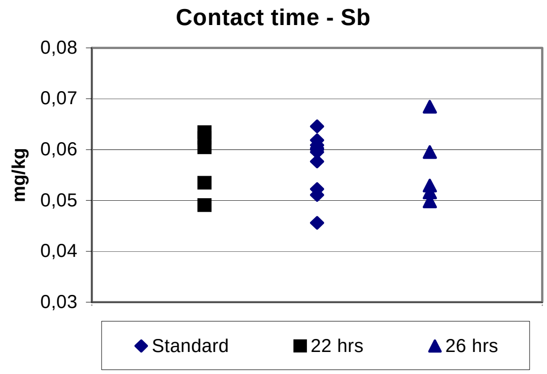

L/S ratio - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

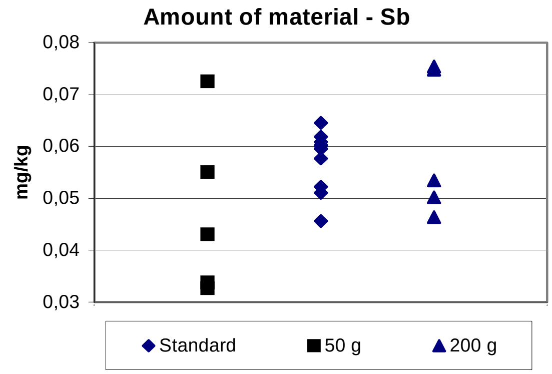

Temperature - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
10 deg.C
30 deg. C

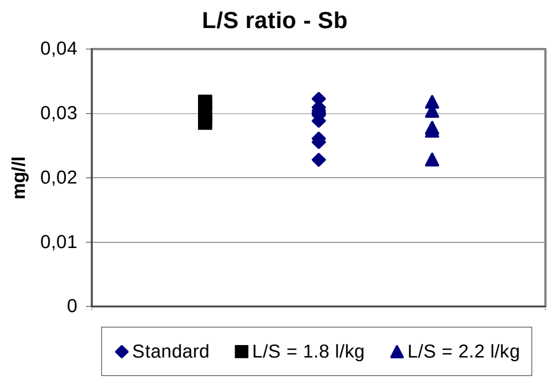

Agitation - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
End over End
Wrist shaker

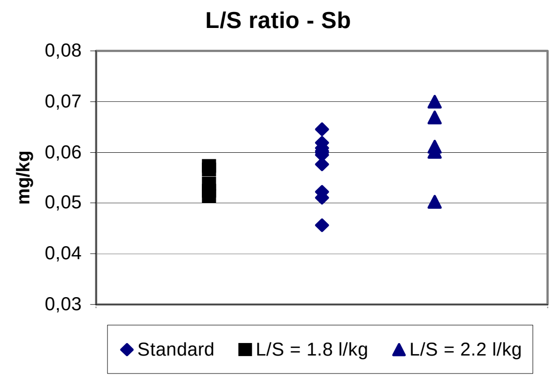

Filter diameter - Mo
mg/kg
0,5
0,45
0,4
0,35
0,3
0,25
0,2
Standard
47 mm
142 mm

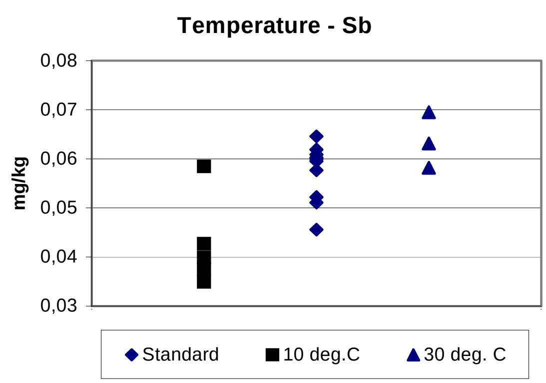
Part 1: MBA


Contact time - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
22 hrs
26 hrs

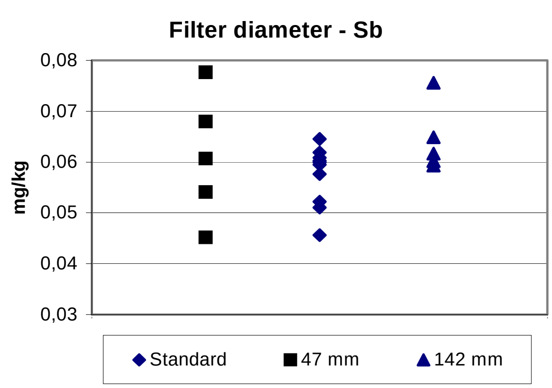

Amount of material - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
50 g
200 g


L/S ratio - Sb
mg/l
0,04
0,03
0,02
0,01
0
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg


L/S ratio - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

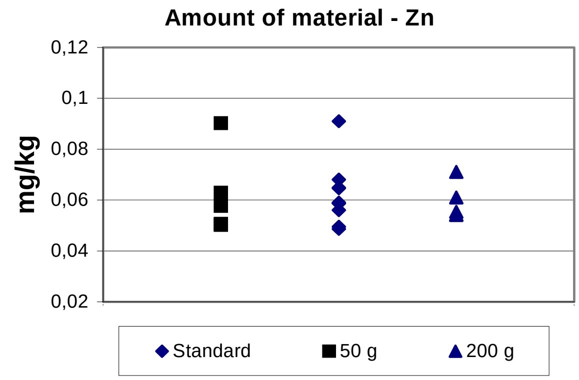

Temperature - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
10 deg.C
30 deg. C

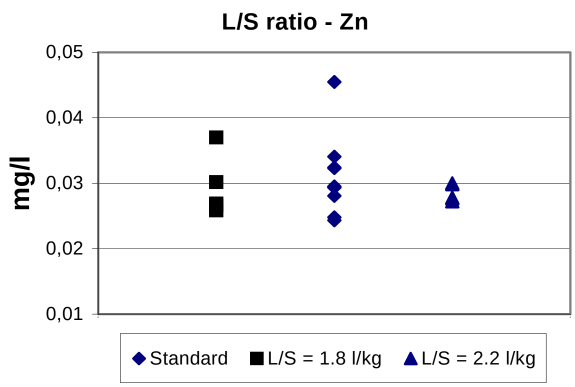

Agitation - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
End over End
Wrist shaker

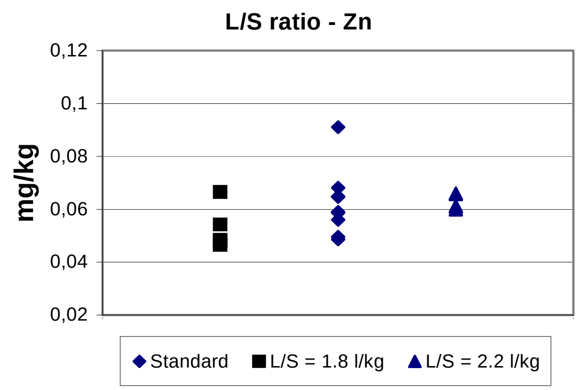

Filter diameter - Sb
mg/kg
0,08
0,07
0,06
0,05
0,04
0,03
Standard
47 mm
142 mm

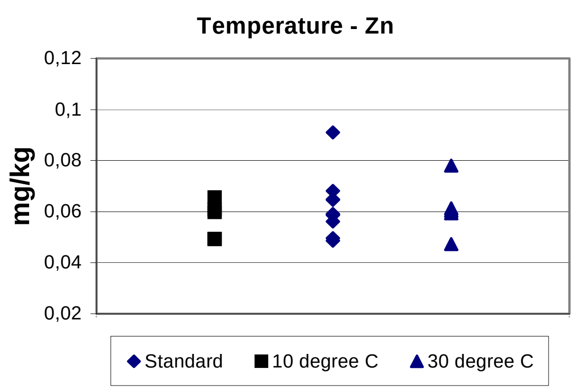
Part 1: MBA

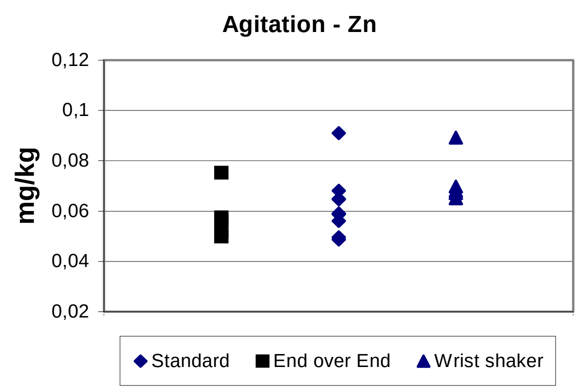

Contact time - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
22 hrs
26 hrs

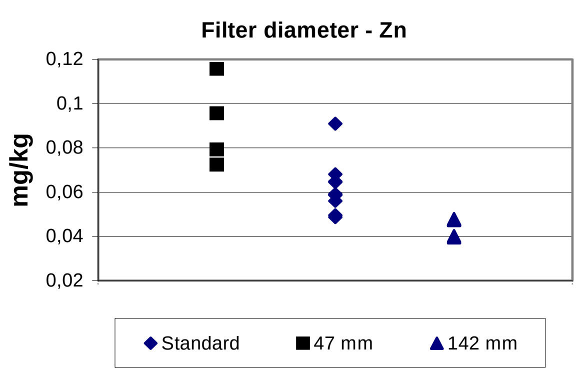

Amount of material - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
50 g
200 g


L/S ratio - Zn
0,05
0,04
0,03
0,02
0,01
mg/l
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

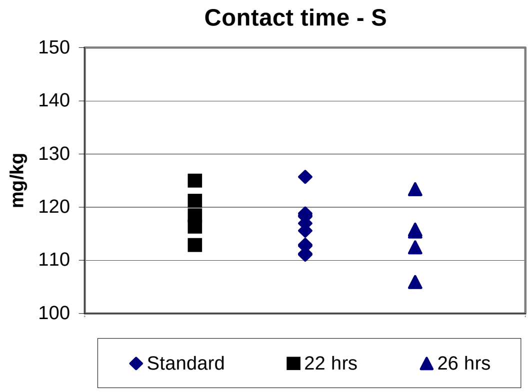

L/S ratio - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

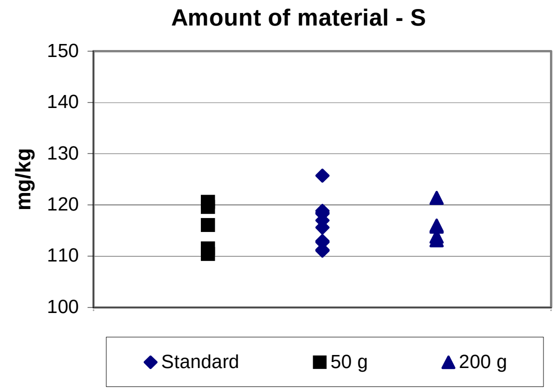

Temperature - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
10 degree C
30 degree C

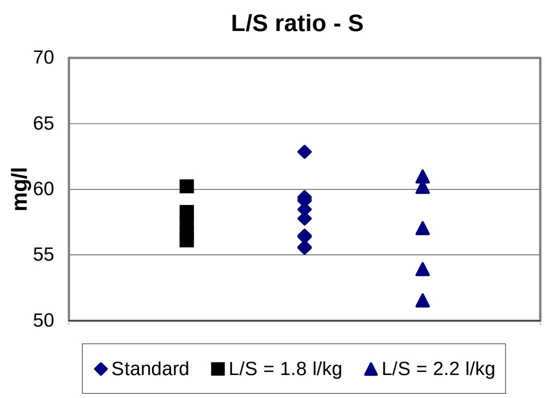

Agitation - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
End over End
Wrist shaker

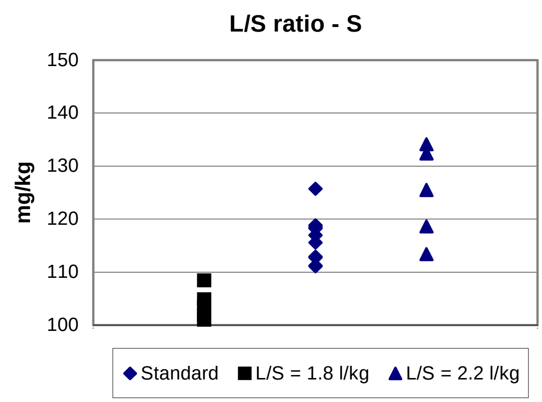

Filter diameter - Zn
0,12
0,1
0,08
0,06
0,04
0,02
mg/kg
Standard
47 mm
142 mm

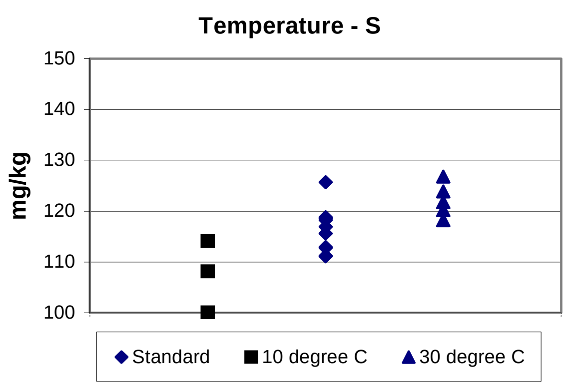
Part 1: MBA

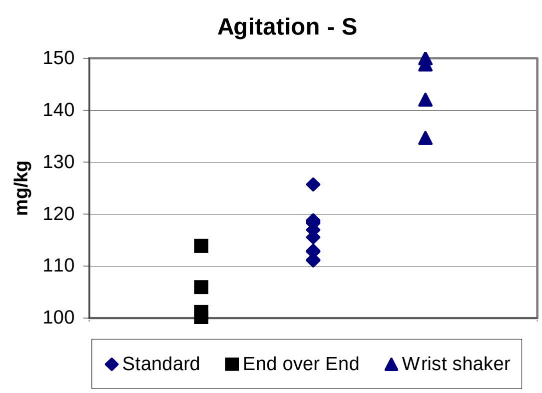

Contact time - S
mg/kg
150
140
130
120
110
100
Standard
22 hrs
26 hrs

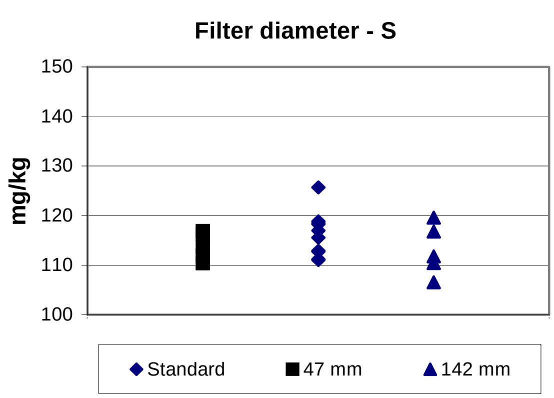

Amount of material - S
mg/kg
150
140
130
120
110
100
Standard
50 g
200 g


L/S ratio - S
mg/l
70
65
60
55
50
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

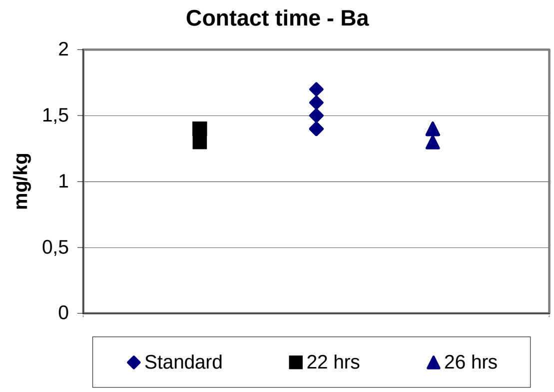

L/S ratio - S
mg/kg
150
140
130
120
110
100
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

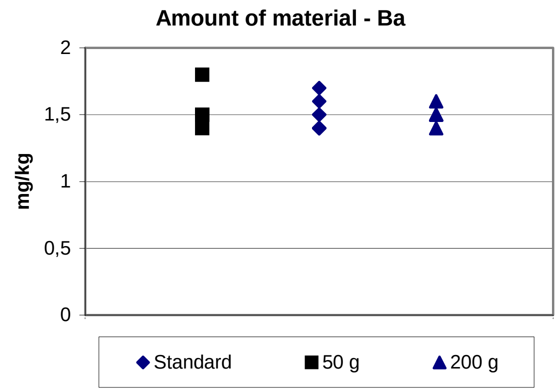

Temperature - S
mg/kg
150
140
130
120
110
100
Standard
10 degree C
30 degree C

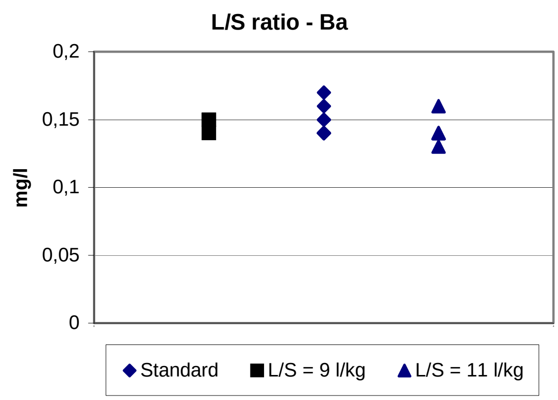

Agitation - S
mg/kg
150
140
130
120
110
100
Standard
End over End
Wrist shaker

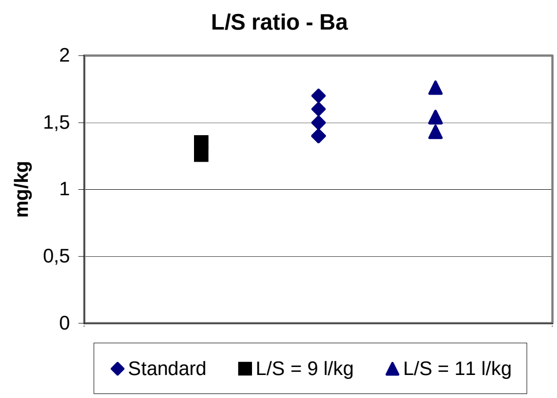

Filter diameter - S
mg/kg
150
140
130
120
110
100
Standard
47 mm
142 mm

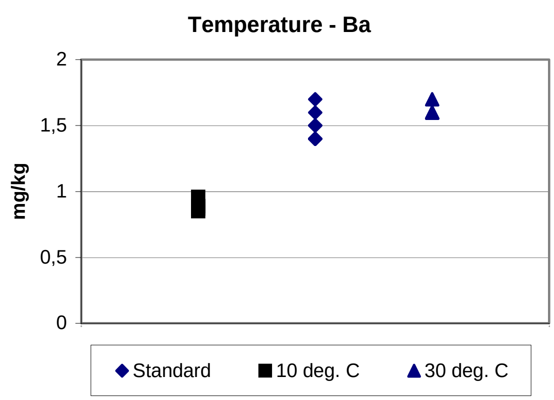
Part 2: MBA

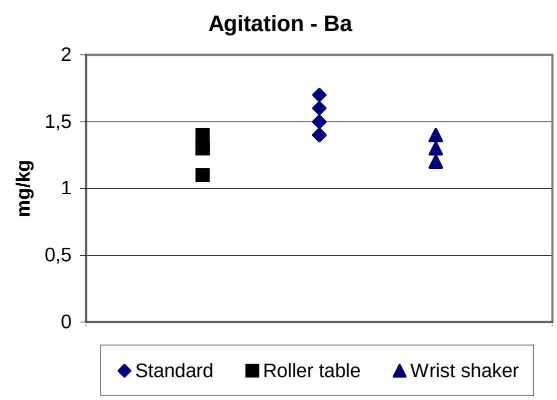

Contact time - Ba
mg/kg
0
0,5
1
1,5
2
Standard
22 hrs
26 hrs

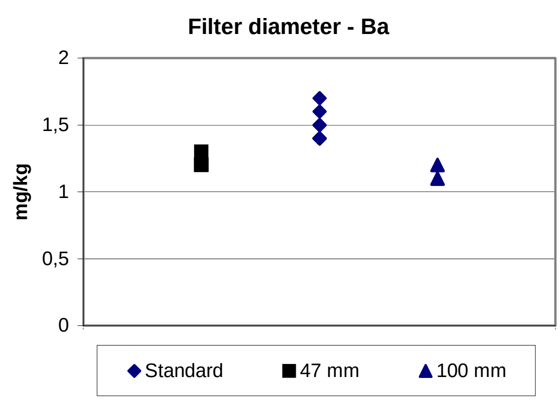

Amount of material - Ba
mg/kg
0
0,5
1
1,5
2
Standard
50 g
200 g

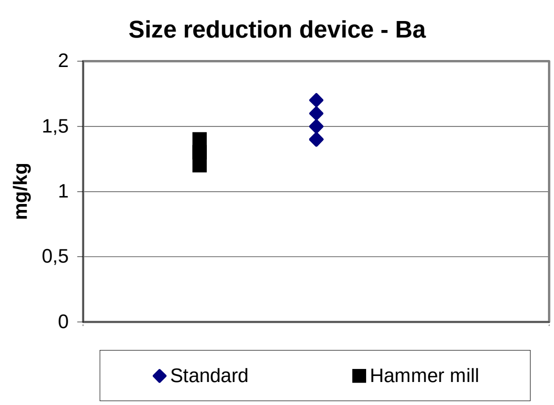

L/S ratio - Ba
mg/l
0
0,05
0,1
0,15
0,2
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Ba
mg/kg
0
0,5
1
1,5
2
Standard
L/S = 9 l/kg
L/S = 11 l/kg

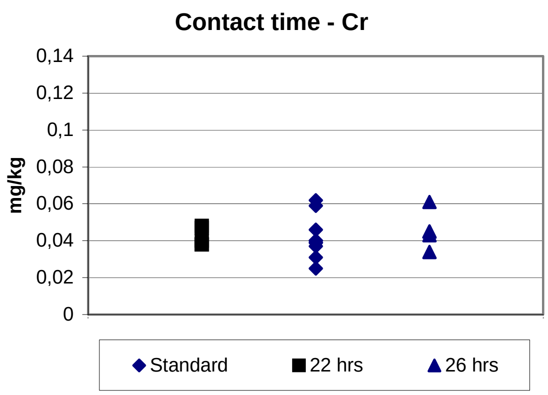

Temperature - Ba
mg/kg
0
0,5
1
1,5
2
Standard
10 deg. C
30 deg. C

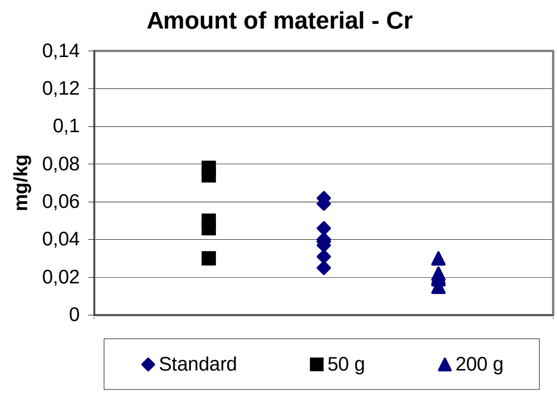

Agitation - Ba
mg/kg
0
0,5
1
1,5
2
Standard
Roller table
Wrist shaker

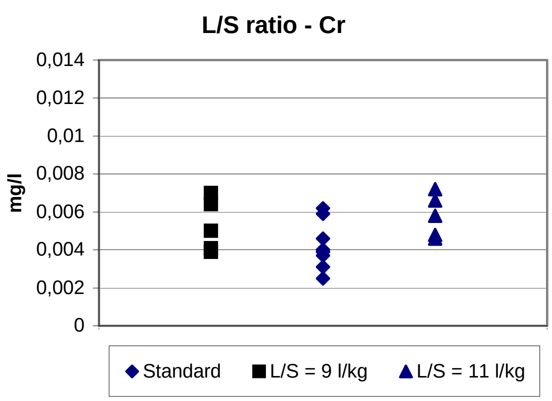

Filter diameter - Ba
mg/kg
0
0,5
1
1,5
2
Standard
47 mm
100 mm

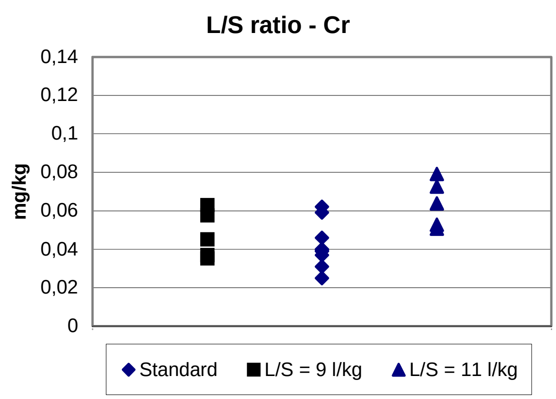

Size reduction device - Ba
mg/kg
0
0,5
1
1,5
2
Standard
Hammer mill

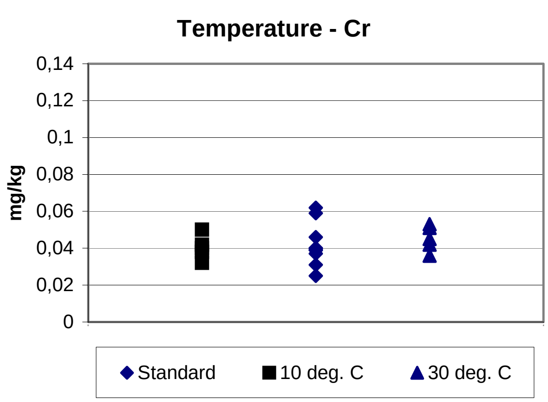
Part 2: MBA

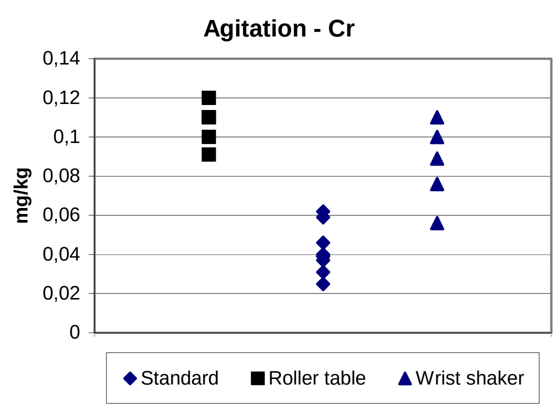

Contact time - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
22 hrs
26 hrs

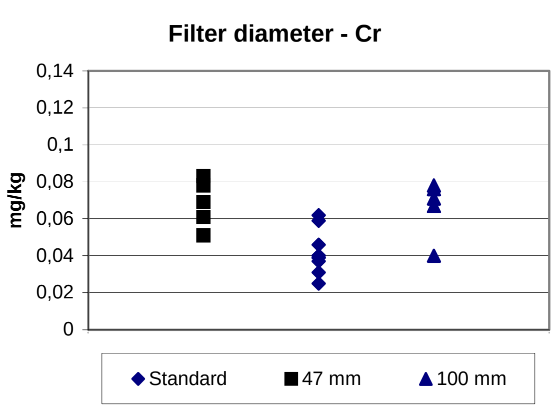

Amount of material - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
50 g
200 g

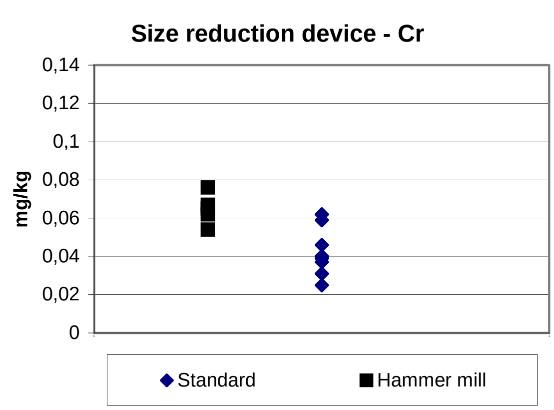

L/S ratio - Cr
mg/l
0,014
0,012
0,01
0,008
0,006
0,004
0,002
0
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
L/S = 9 l/kg
L/S = 11 l/kg

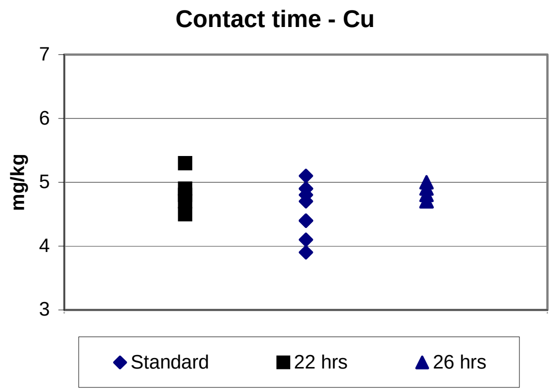

Temperature - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
10 deg. C
30 deg. C

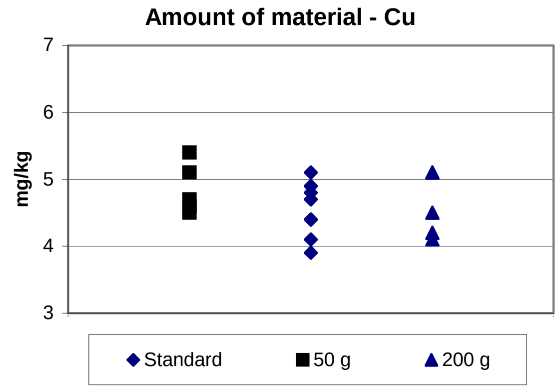

Agitation - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
Roller table
Wrist shaker

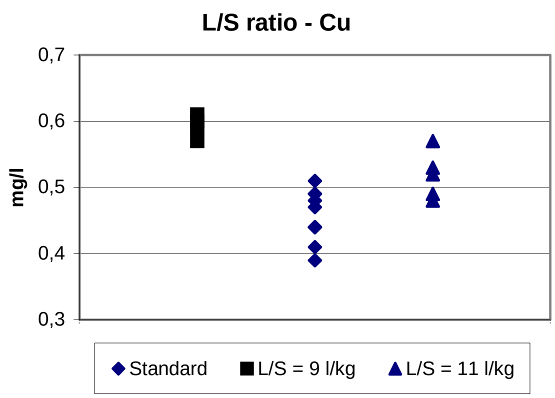

Filter diameter - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
47 mm
100 mm

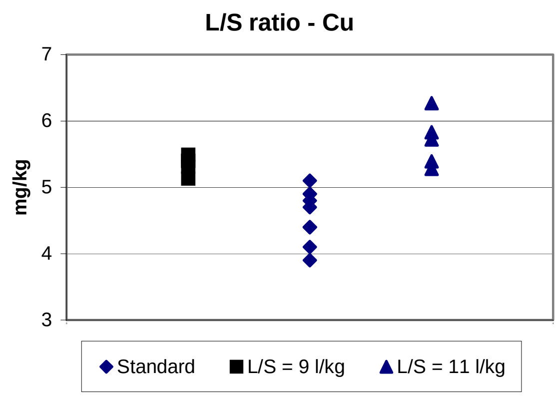

Size reduction device - Cr
mg/kg
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
Standard
Hammer mill

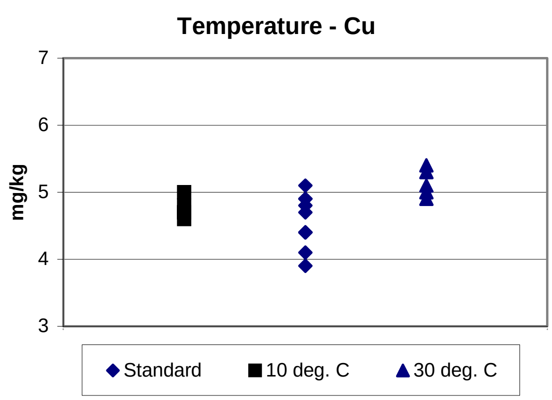
Part 2; MBA

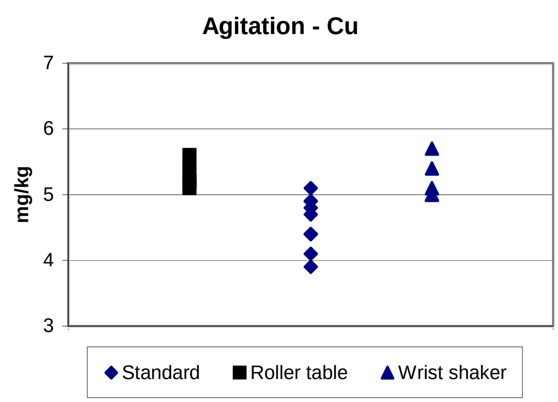

Contact time - Cu
mg/kg
3
4
5
6
7
Standard
22 hrs
26 hrs

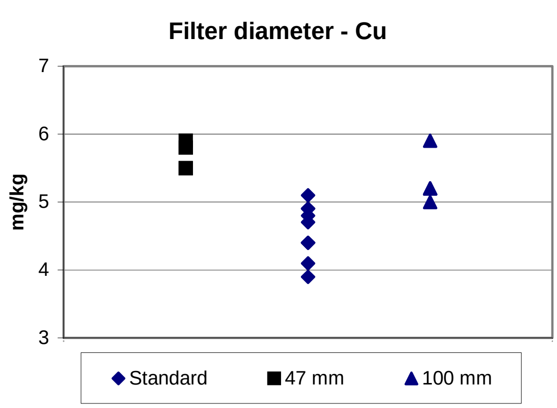

Amount of material - Cu
mg/kg
3
4
5
6
7
Standard
50 g
200 g

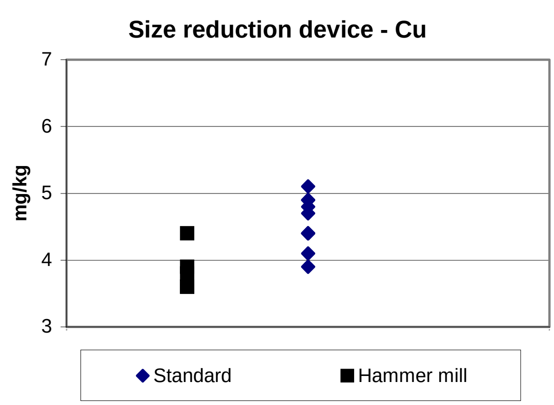

L/S ratio - Cu
mg/l
0,3
0,4
0,5
0,6
0,7
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cu
mg/kg
3
4
5
6
7
Standard
L/S = 9 l/kg
L/S = 11 l/kg

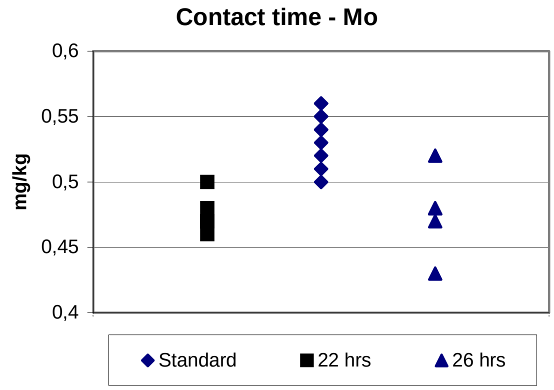

Temperature - Cu
mg/kg
3
4
5
6
7
Standard
10 deg. C
30 deg. C

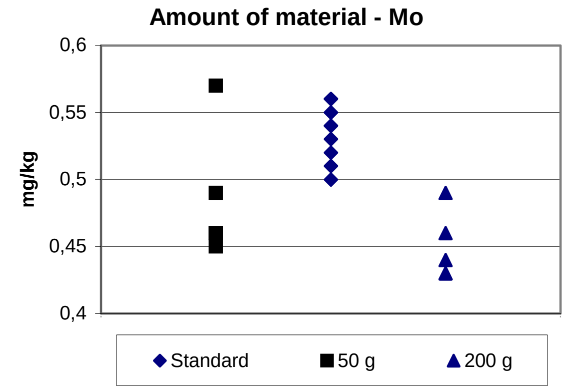

Agitation - Cu
mg/kg
3
4
5
6
7
Standard
Roller table
Wrist shaker

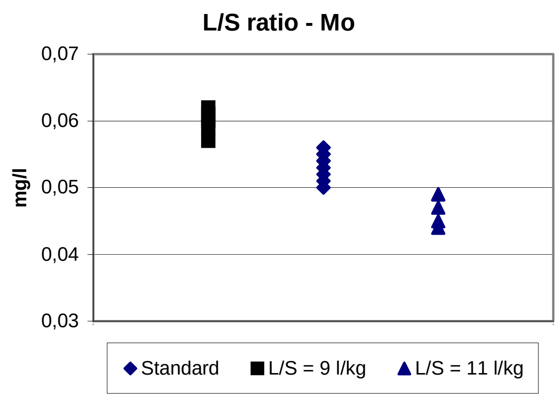

Filter diameter - Cu
mg/kg
3
4
5
6
7
Standard
47 mm
100 mm

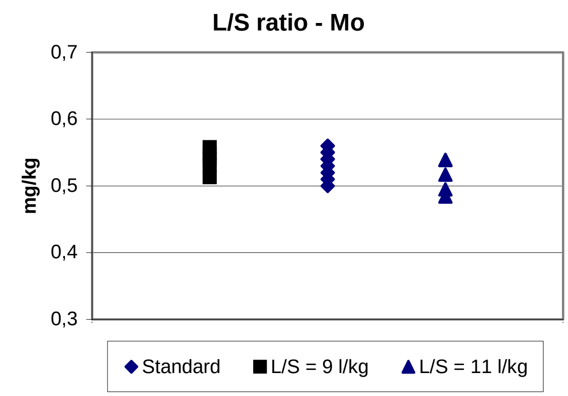

Size reduction device - Cu
mg/kg
3
4
5
6
7
Standard
Hammer mill

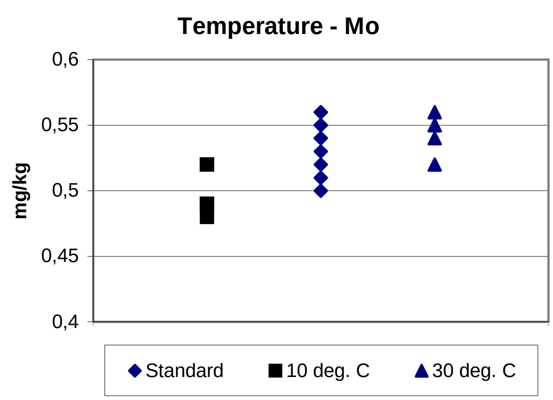
Part 2: MBA

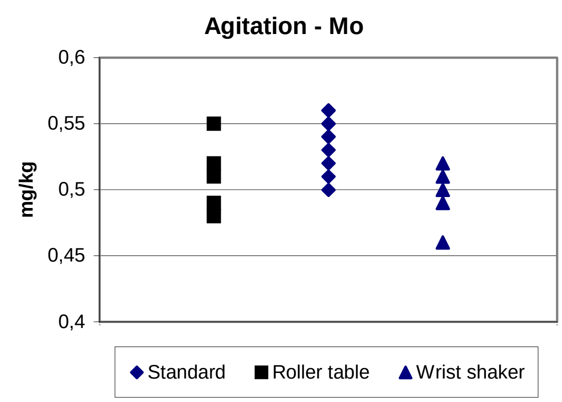

Contact time - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
22 hrs
26 hrs

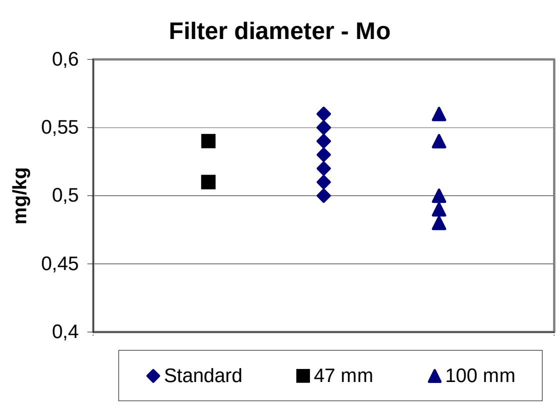

Amount of material - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
50 g
200 g

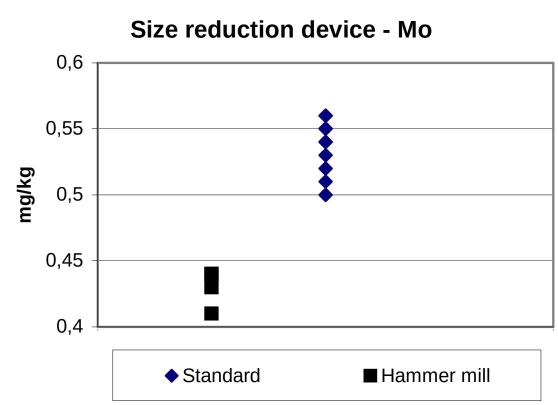

L/S ratio - Mo
0,07
0,06
0,05
0,04
0,03
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

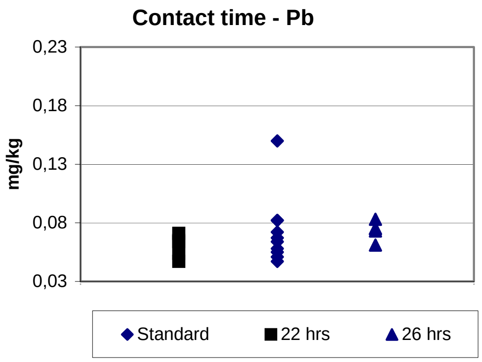

Temperature - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
10 deg. C
30 deg. C


Agitation - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
Roller table
Wrist shaker

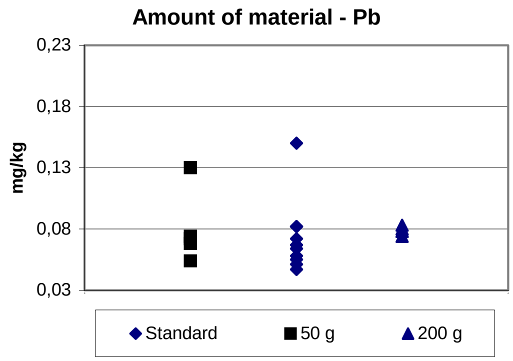

Filter diameter - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
47 mm
100 mm


Size reduction device - Mo
0,6
0,55
0,5
0,45
0,4
mg/kg
Standard
Hammer mill

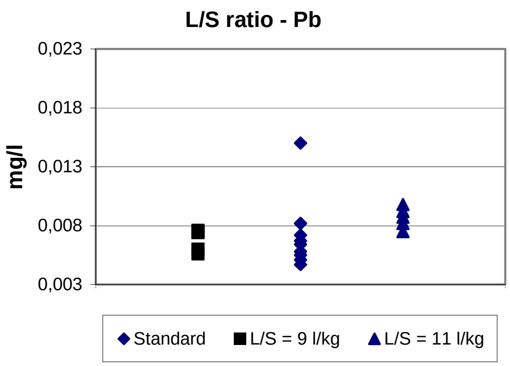
Part 2: MBA



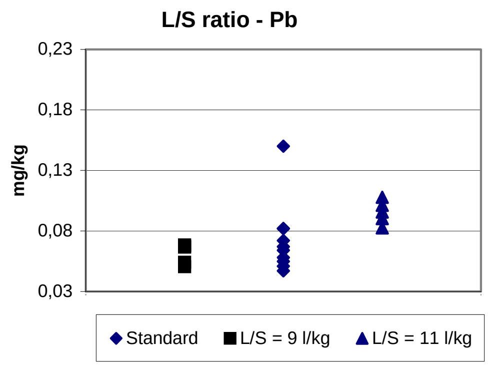
Contact time - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
22 hrs
26 hrs



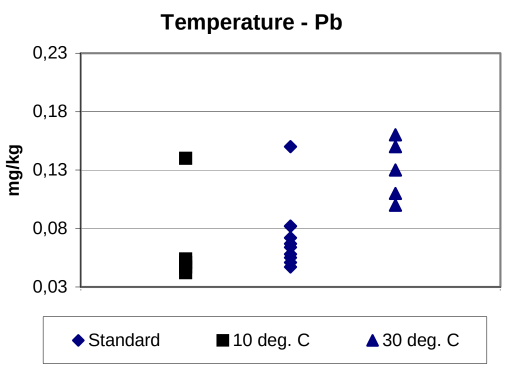
Amount of material - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
50 g
200 g



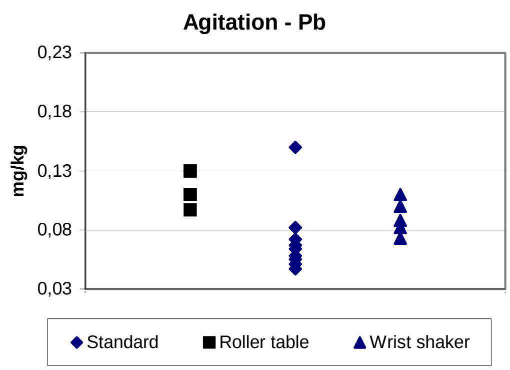
L/S ratio - Pb
0,023
0,018
0,013
0,008
0,003
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg



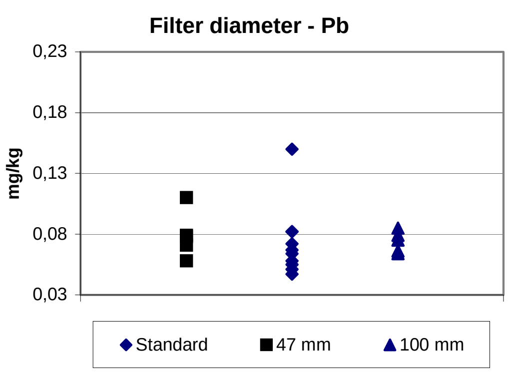
L/S ratio - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg



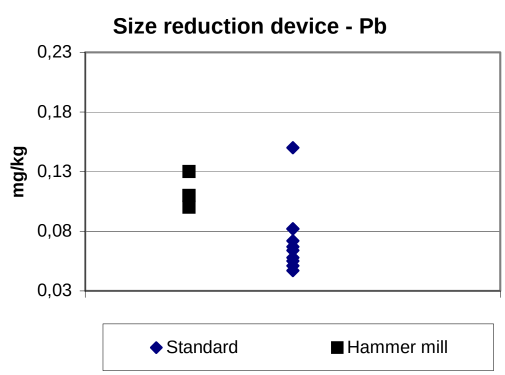
Temperature - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
10 deg. C
30 deg. C



Agitation - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
Roller table
Wrist shaker

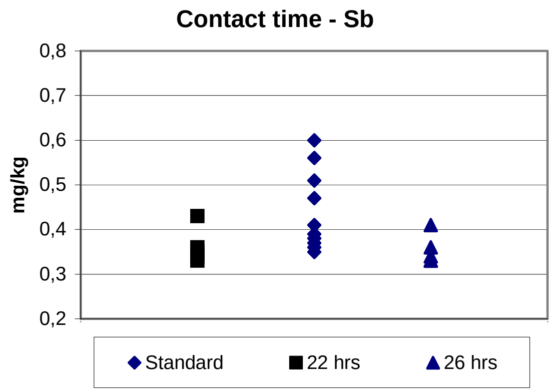


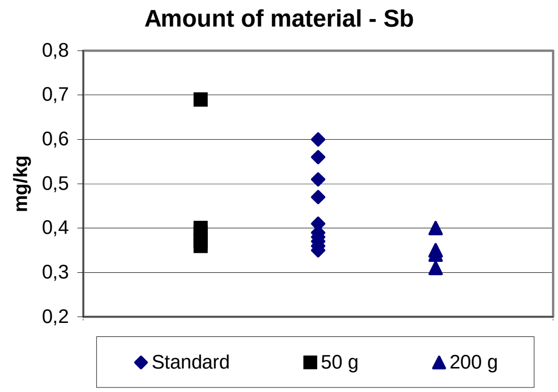
Filter diameter - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
47 mm
100 mm

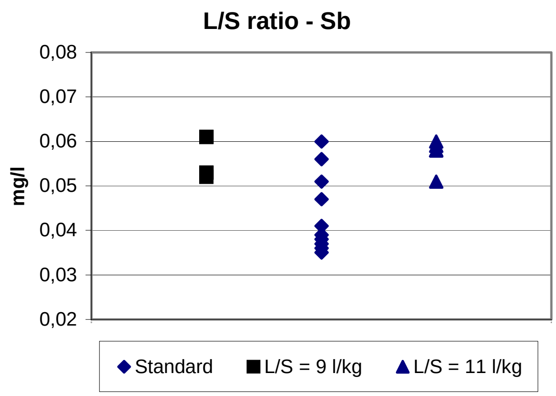


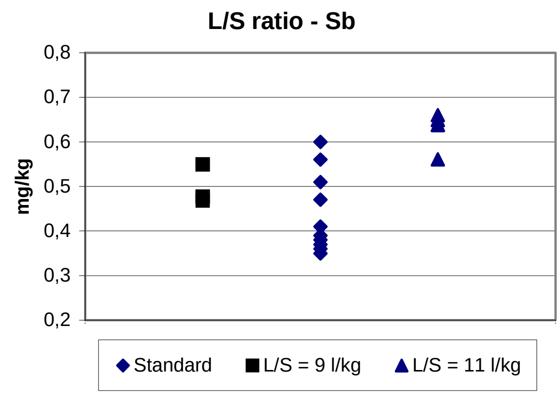
Size reduction device - Pb
0,23
0,18
0,13
0,08
0,03
mg/kg
Standard
Hammer mill

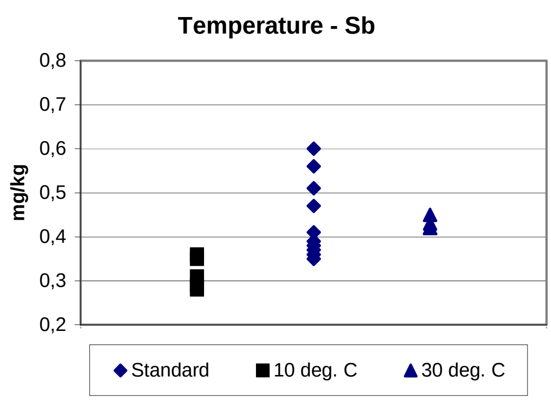
Part 2: MBA

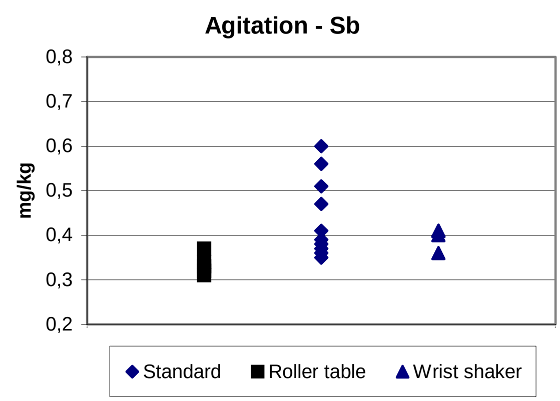

Contact time - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
22 hrs
26 hrs

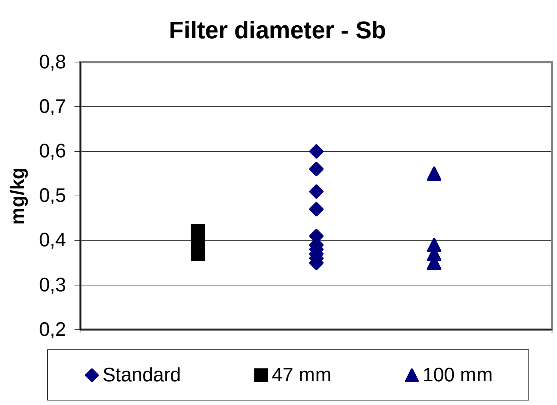

Amount of material - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
50 g
200 g

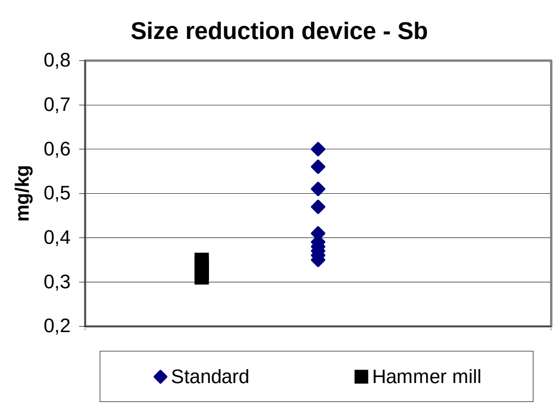

L/S ratio - Sb
mg/l
0,08
0,07
0,06
0,05
0,04
0,03
0,02
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
L/S = 9 l/kg
L/S = 11 l/kg

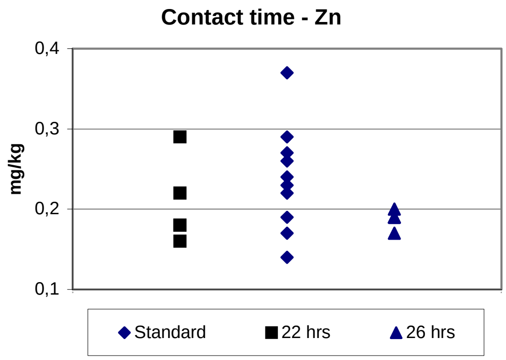

Temperature - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
10 deg. C
30 deg. C

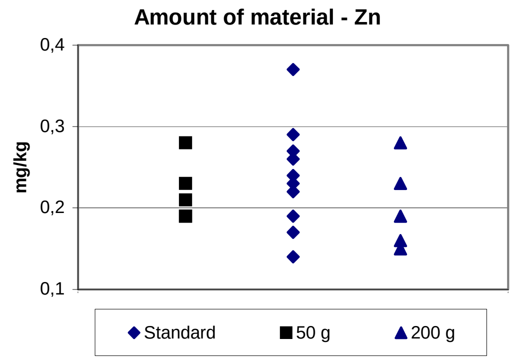

Agitation - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
Roller table
Wrist shaker

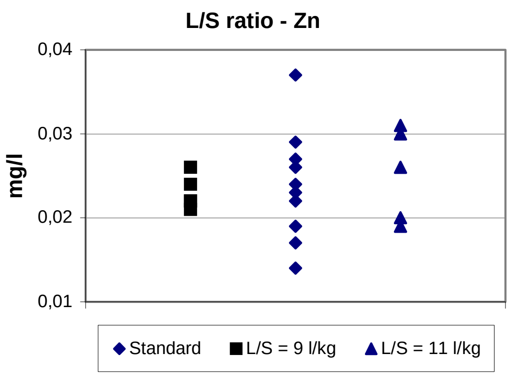

Filter diameter - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
47 mm
100 mm

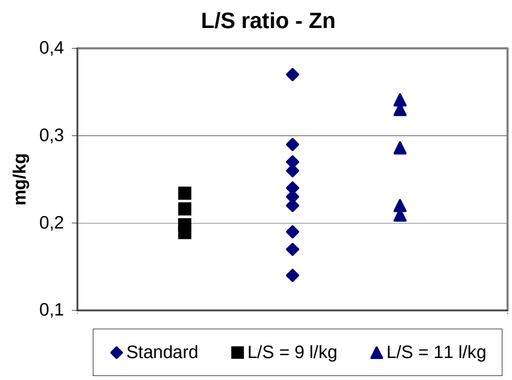

Size reduction device - Sb
mg/kg
0,8
0,7
0,6
0,5
0,4
0,3
0,2
Standard
Hammer mill

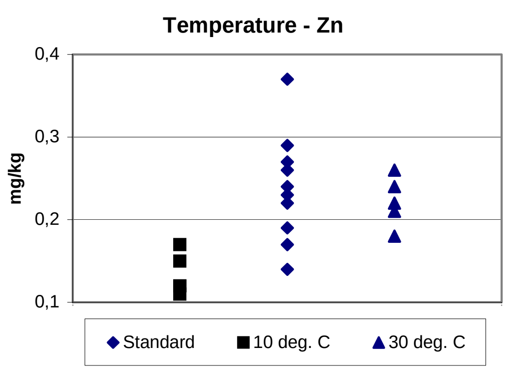
Part 2: MBA

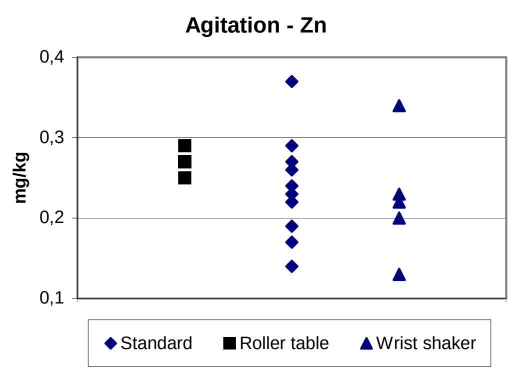

Contact time - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
22 hrs
26 hrs

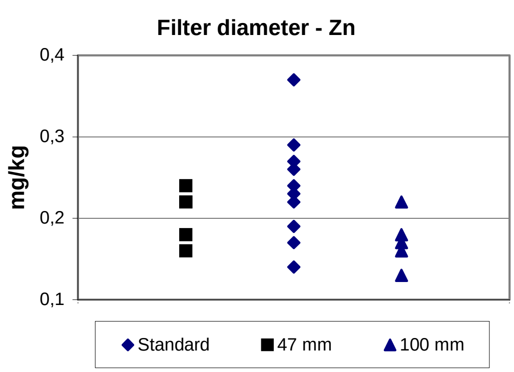

Amount of material - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
50 g
200 g

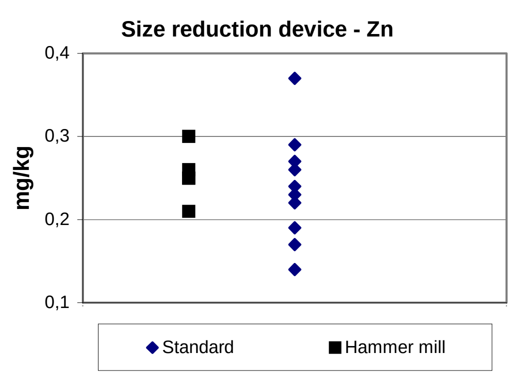

L/S ratio - Zn
0,04
0,03
0,02
0,01
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

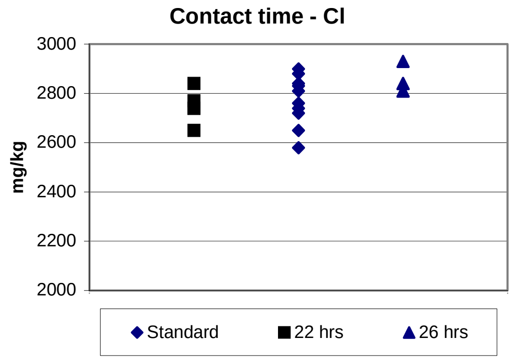

Temperature - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
10 deg. C
30 deg. C

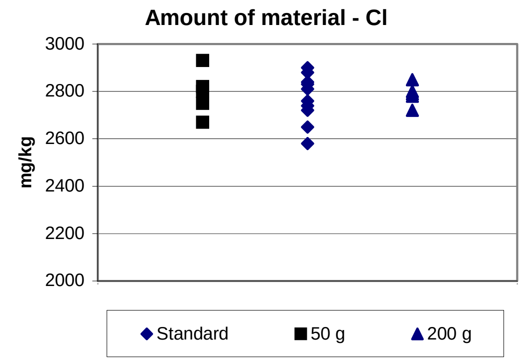

Agitation - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
Roller table
Wrist shaker

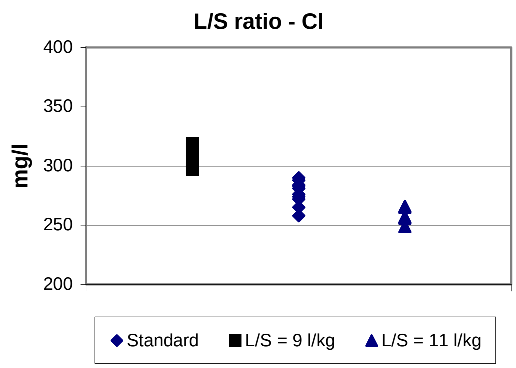

Filter diameter - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
47 mm
100 mm

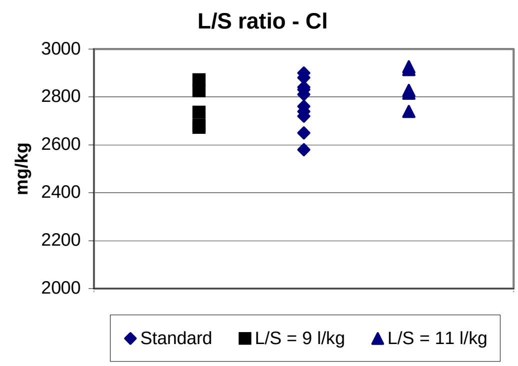

Size reduction device - Zn
0,4
0,3
0,2
0,1
mg/kg
Standard
Hammer mill

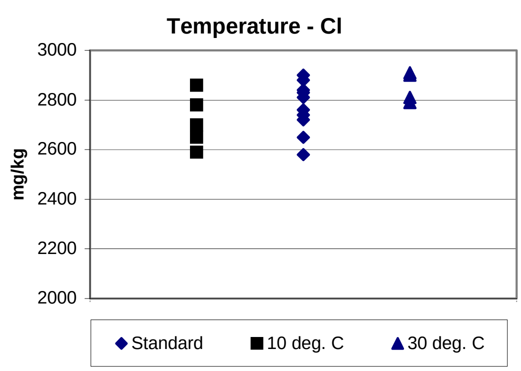
Part 2: MBA

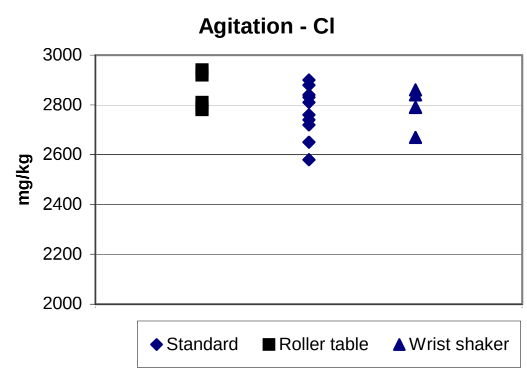

Contact time - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
22 hrs
26 hrs

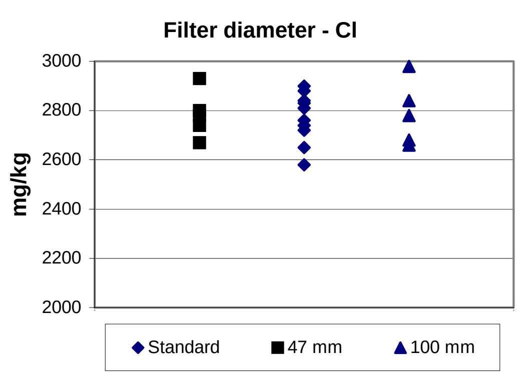

Amount of material - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
50 g
200 g

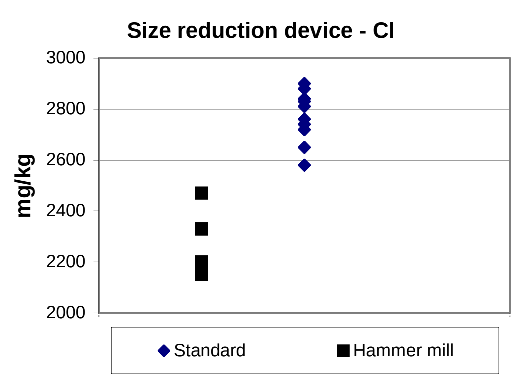

L/S ratio - Cl
mg/l
400
350
300
250
200
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
L/S = 9 l/kg
L/S = 11 l/kg

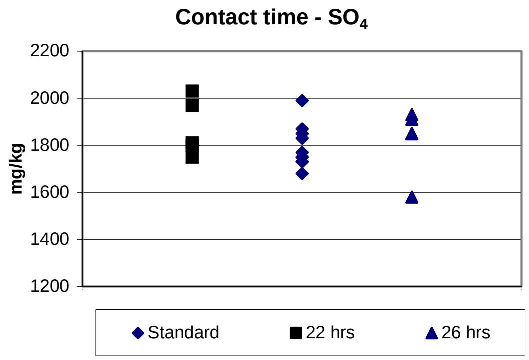

Temperature - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
10 deg. C
30 deg. C

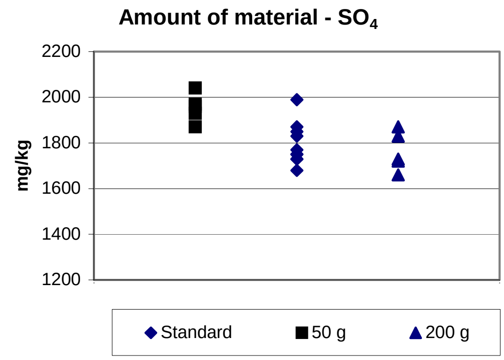

Agitation - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
Roller table
Wrist shaker

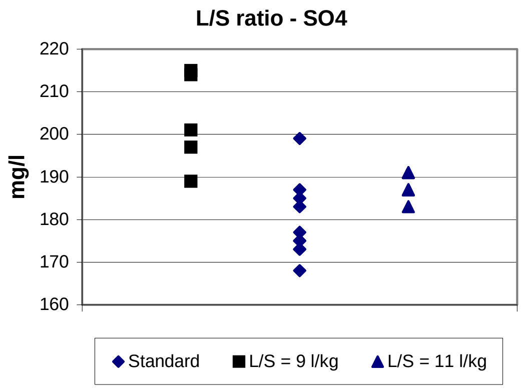

Filter diameter - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
47 mm
100 mm

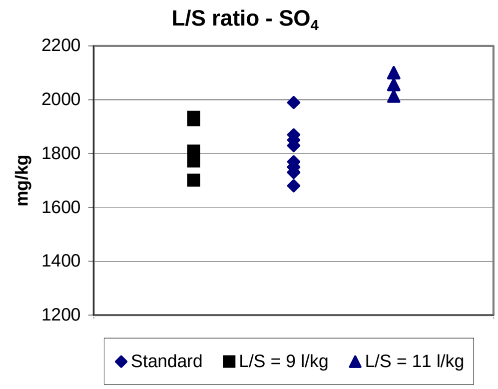

Size reduction device - Cl
mg/kg
3000
2800
2600
2400
2200
2000
Standard
Hammer mill

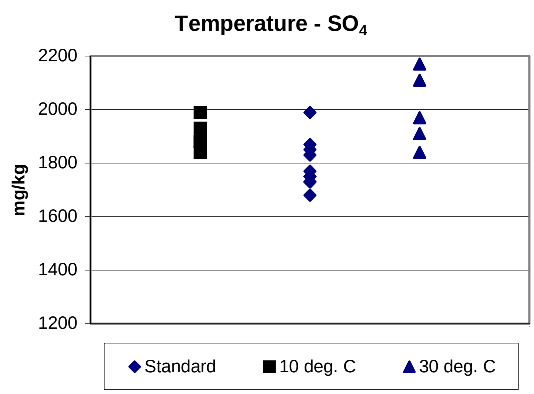
Part "2: MBA

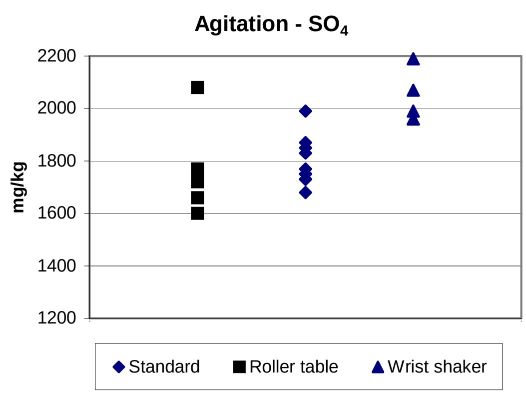

Contact time - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
22 hrs
26 hrs

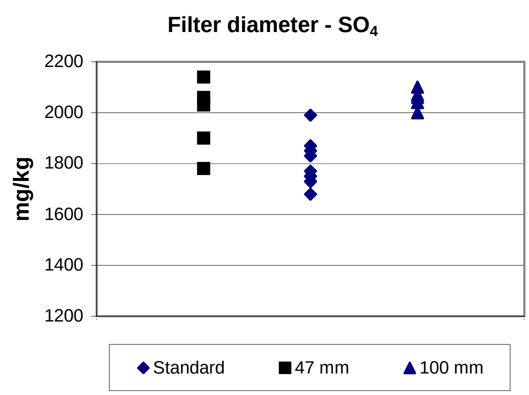

Amount of material - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
50 g
200 g

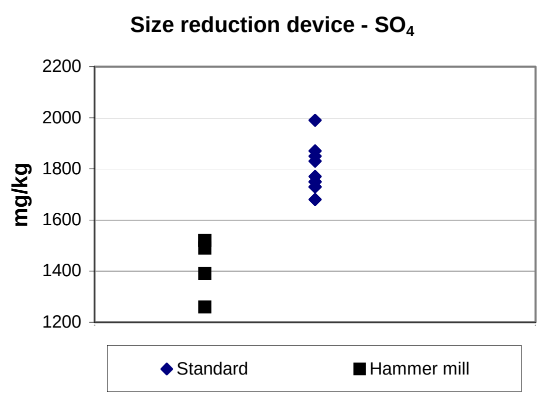

L/S ratio - SO4
mg/l
220
210
200
190
180
170
160
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
L/S = 9 l/kg
L/S = 11 l/kg

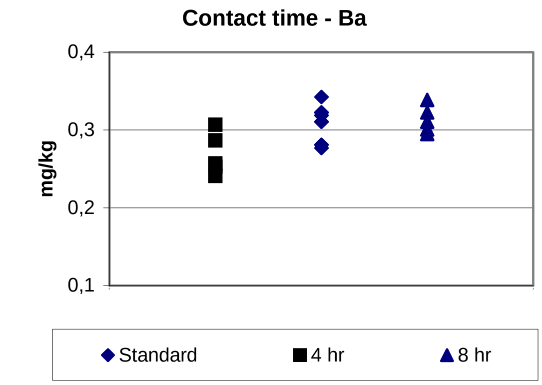

Temperature - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
10 deg. C
30 deg. C

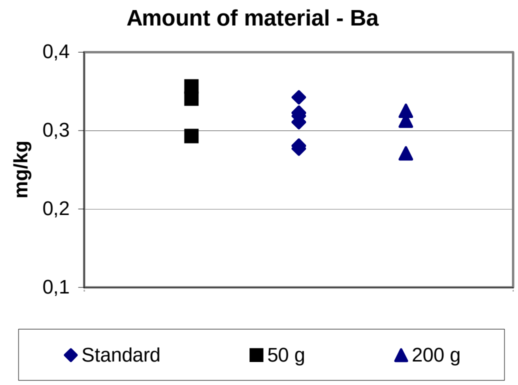

Agitation - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
Roller table
Wrist shaker

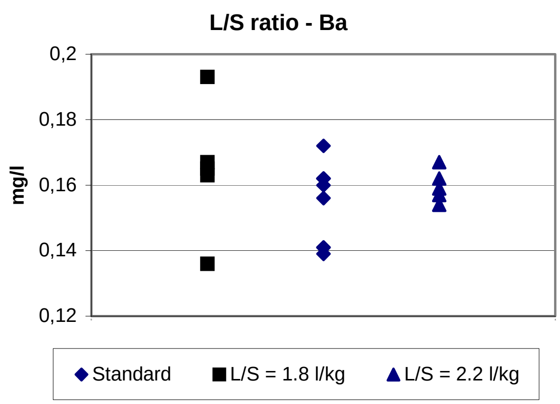

Filter diameter - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
47 mm
100 mm

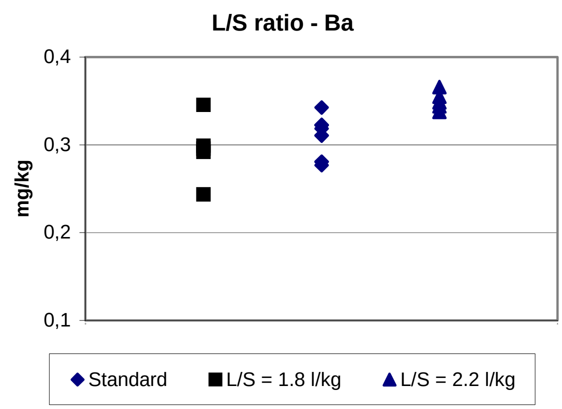

Size reduction device - SO_4
mg/kg
2200
2000
1800
1600
1400
1200
Standard
Hammer mill

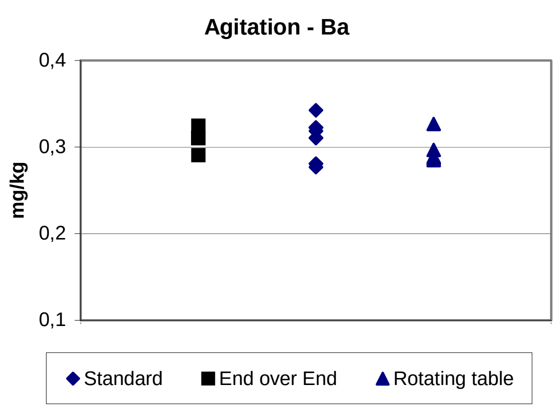
Part 3-1: MBA

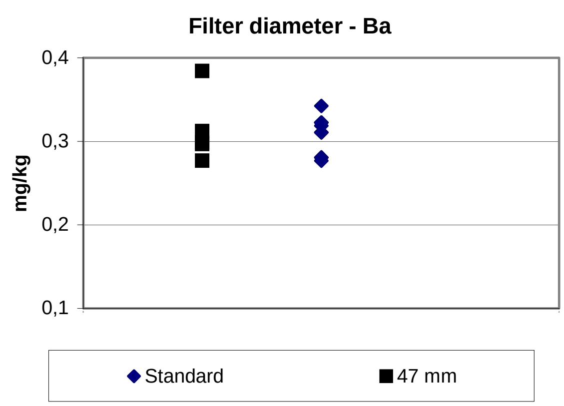

Contact time - Ba
0,4
0,3
0,2
0,1
mg/kg
Standard
4 hr
8 hr


Amount of material - Ba
0,4
0,3
0,2
0,1
mg/kg
Standard
50 g
200 g

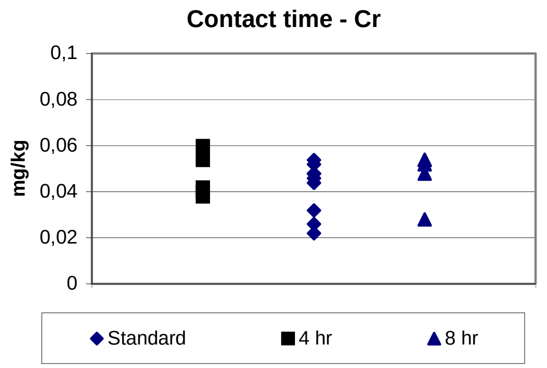

L/S ratio - Ba
0,2
0,18
0,16
0,14
0,12
mg/l
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg


L/S ratio - Ba
0,4
0,3
0,2
0,1
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

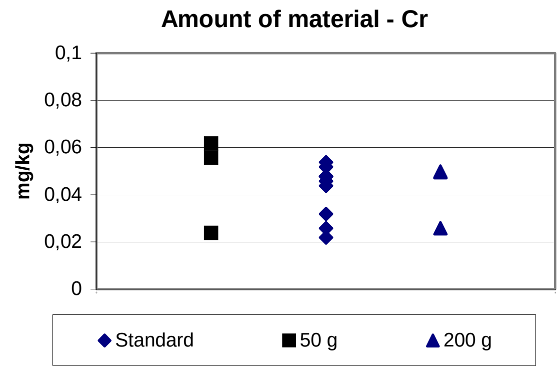

Agitation - Ba
0,4
0,3
0,2
0,1
mg/kg
Standard
End over End
Rotating table


Filter diameter - Ba
0,4
0,3
0,2
0,1
mg/kg
Standard
47 mm

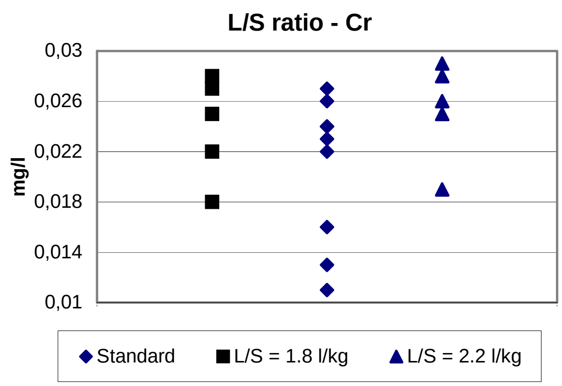
Part 3-1: MBA



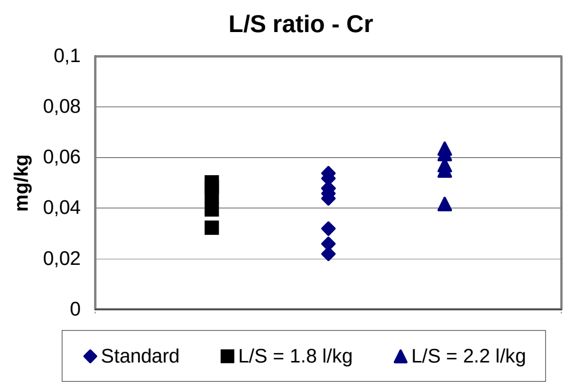
Contact time - Cr
mg/kg
0,1
0,08
0,06
0,04
0,02
0
Standard
4 hr
8 hr



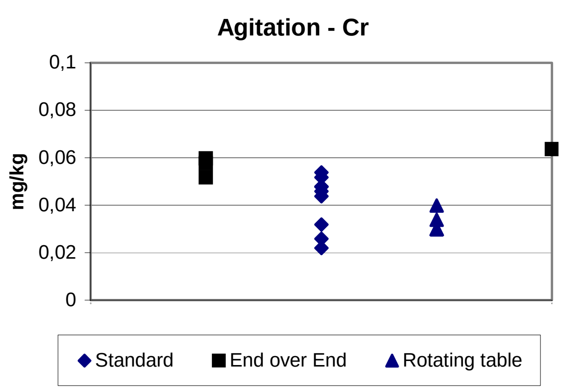
Amount of material - Cr
mg/kg
0,1
0,08
0,06
0,04
0,02
0
Standard
50 g
200 g



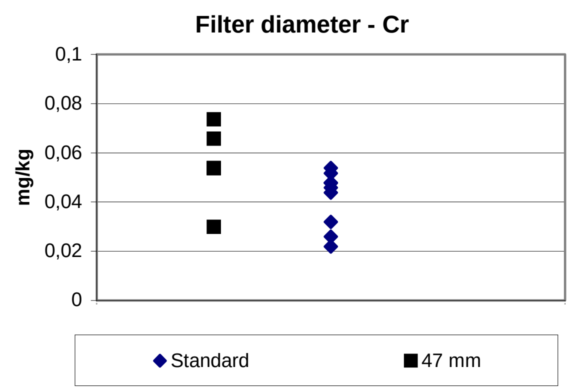
L/S ratio - Cr
mg/l
0,03
0,026
0,022
0,018
0,014
0,01
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg



L/S ratio - Cr
mg/kg
0,1
0,08
0,06
0,04
0,02
0
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

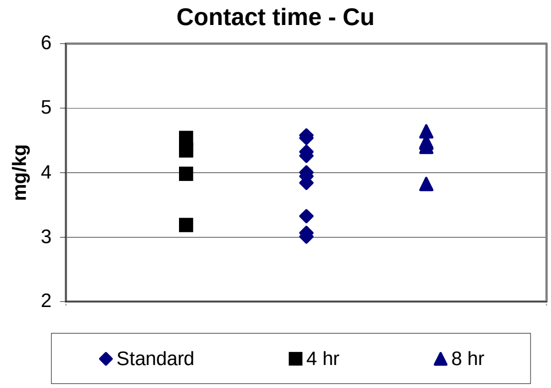


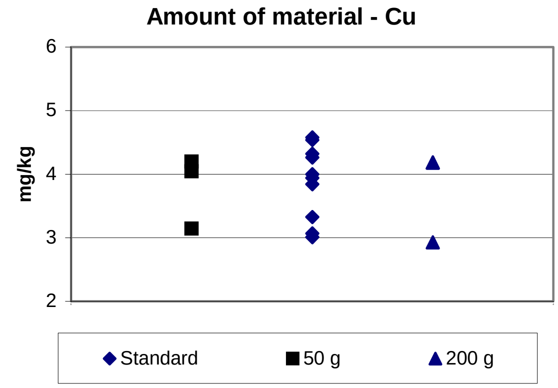
Agitation - Cr
mg/kg
0,1
0,08
0,06
0,04
0,02
0
Standard
End over End
Rotating table

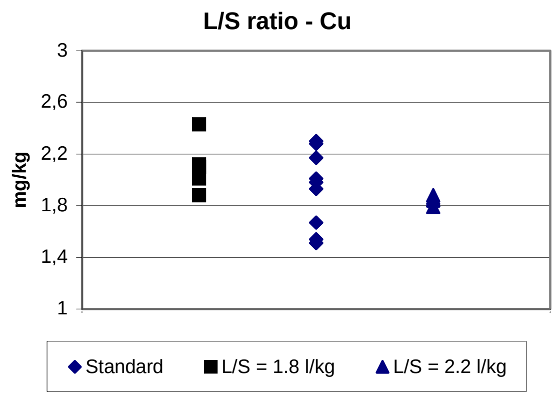


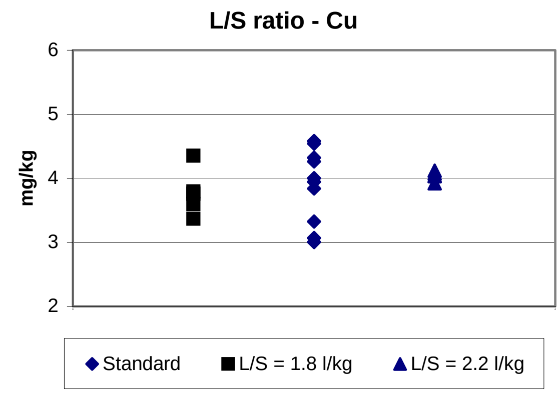
Filter diameter - Cr
mg/kg
0,1
0,08
0,06
0,04
0,02
0
Standard
47 mm

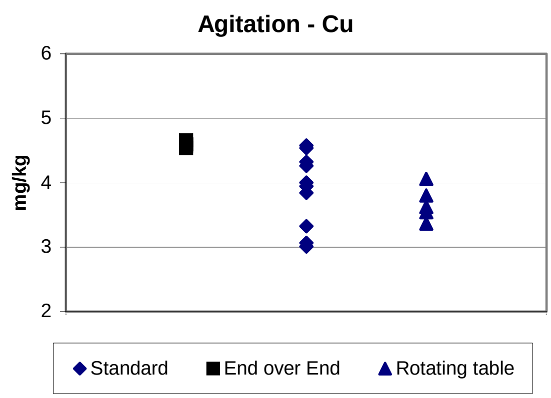
Part 3-1: MBA

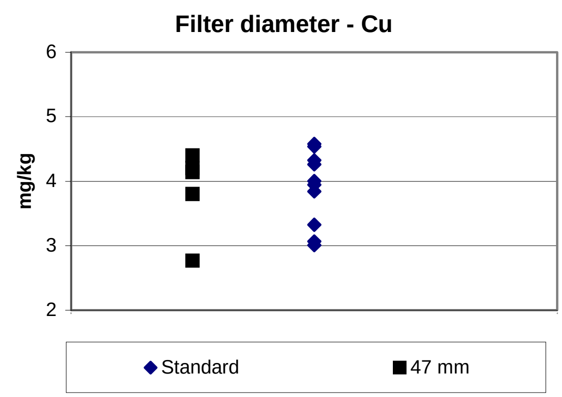

Contact time - Cu
mg/kg
6
5
4
3
2
Standard
4 hr
8 hr


Amount of material - Cu
mg/kg
6
5
4
3
2
Standard
50 g
200 g


L/S ratio - Cu
mg/kg
3
2,6
2,2
1,8
1,4
1
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

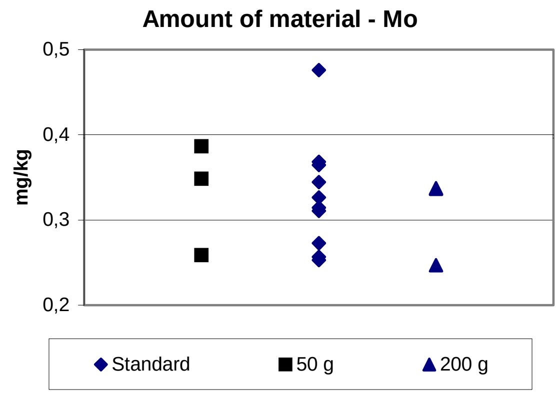

L/S ratio - Cu
mg/kg
6
5
4
3
2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg


Agitation - Cu
mg/kg
6
5
4
3
2
Standard
End over End
Rotating table

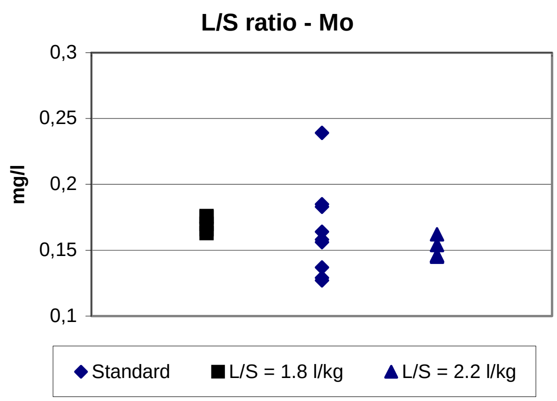

Filter diameter - Cu
mg/kg
6
5
4
3
2
Standard
47 mm

Part 3-1: MBA

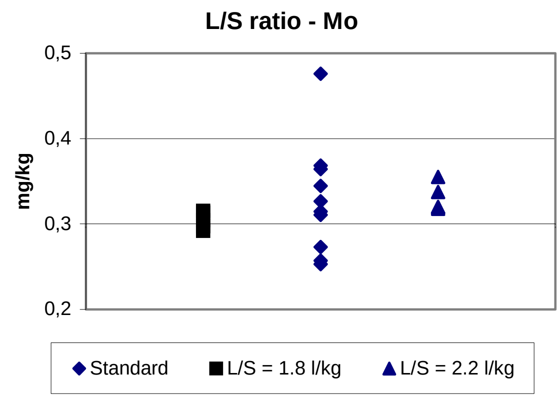
Contact time - Mo
0,5
0,4
0,3
0,2
mg/kg
Standard
4 hr
8 hr



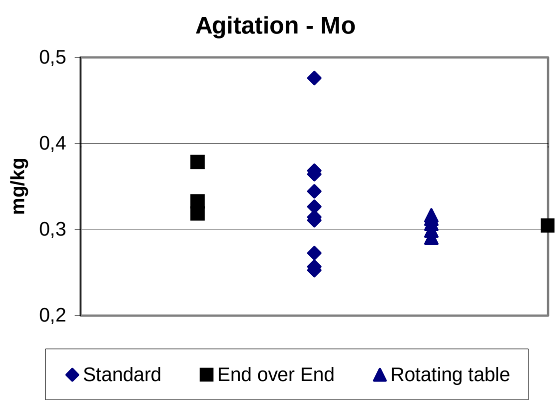
Amount of material - Mo
0,5
0,4
0,3
0,2
mg/kg
Standard
50 g
200 g



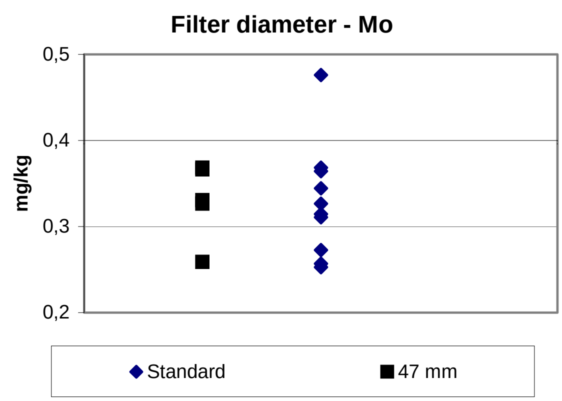
L/S ratio - Mo
0,3
0,25
0,2
0,15
0,1
mg/l
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg



L/S ratio - Mo
0,5
0,4
0,3
0,2
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

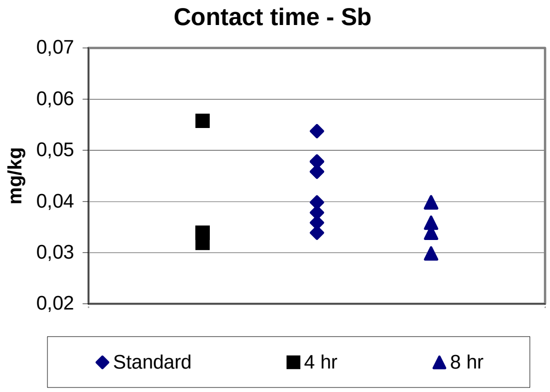


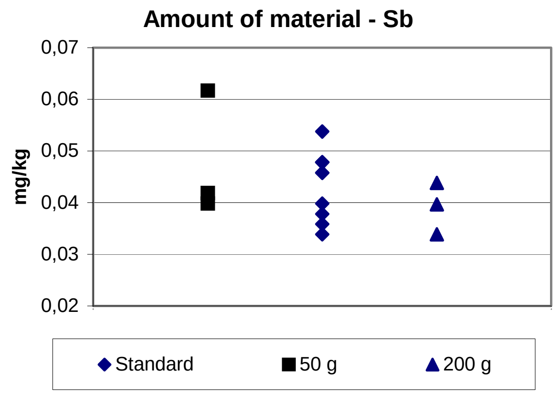
Agitation - Mo
0,5
0,4
0,3
0,2
mg/kg
Standard
End over End
Rotating table

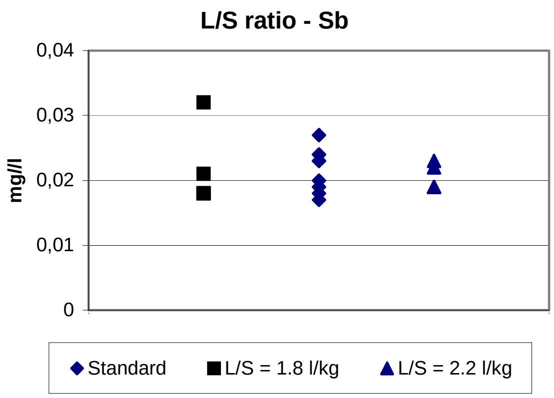


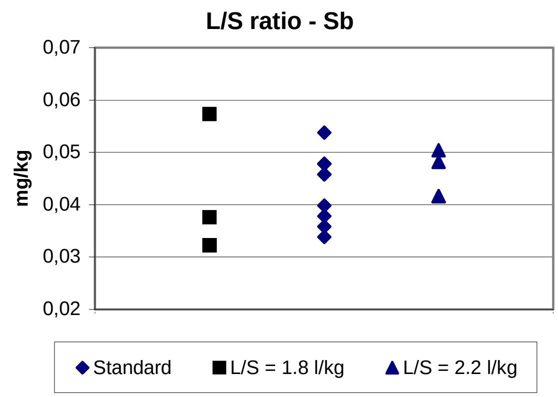
Filter diameter - Mo
0,5
0,4
0,3
0,2
mg/kg
Standard
47 mm

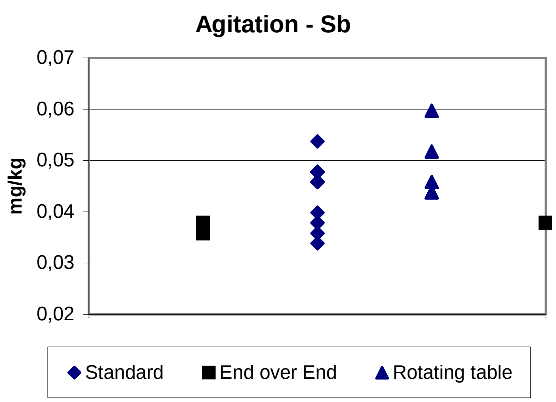
Part 3-1: MBA

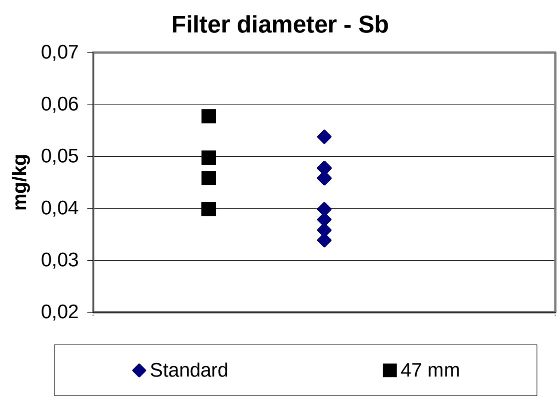

Contact time - Sb
mg/kg
0,07
0,06
0,05
0,04
0,03
0,02
Standard
4 hr
8 hr


Amount of material - Sb
mg/kg
0,07
0,06
0,05
0,04
0,03
0,02
Standard
50 g
200 g

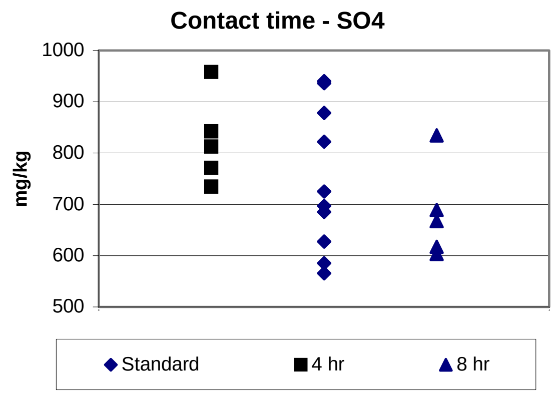

L/S ratio - Sb
mg/l
0,04
0,03
0,02
0,01
0
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

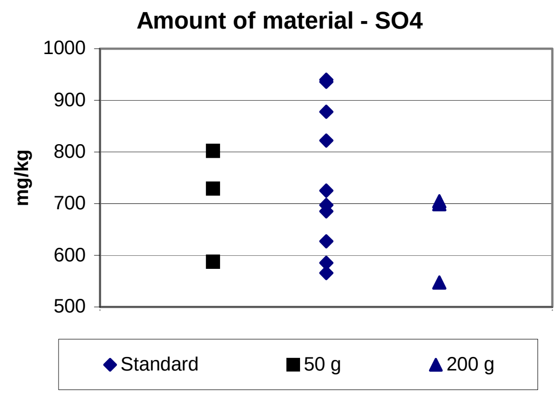

L/S ratio - Sb
mg/kg
0,07
0,06
0,05
0,04
0,03
0,02
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

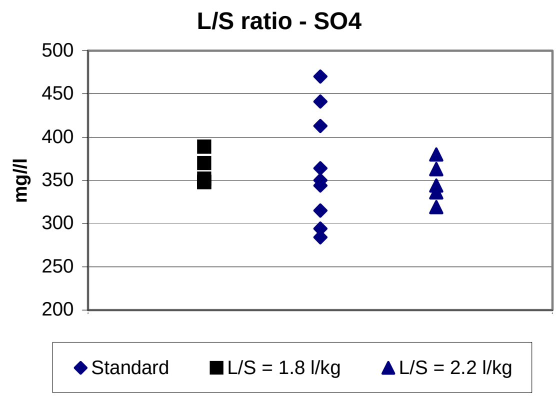

Agitation - Sb
mg/kg
0,07
0,06
0,05
0,04
0,03
0,02
Standard
End over End
Rotating table

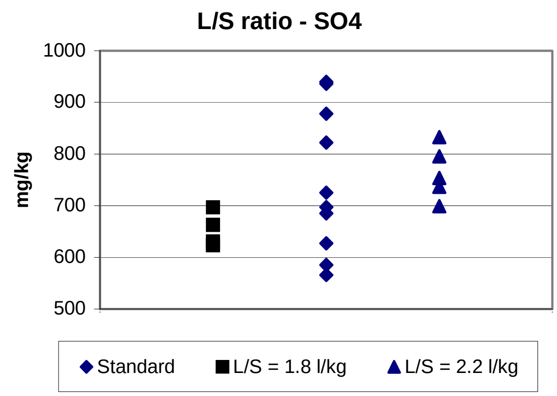

Filter diameter - Sb
mg/kg
0,07
0,06
0,05
0,04
0,03
0,02
Standard
47 mm

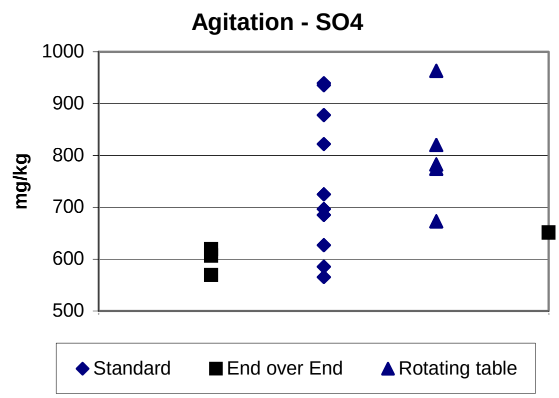
Part 3-1: MBA

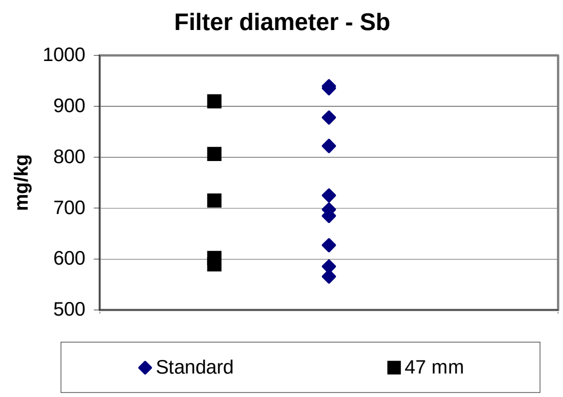

Contact time - SO4
mg/kg
1000
900
800
700
600
500
Standard
4 hr
8 hr


Amount of material - SO4
mg/kg
1000
900
800
700
600
500
Standard
50 g
200 g

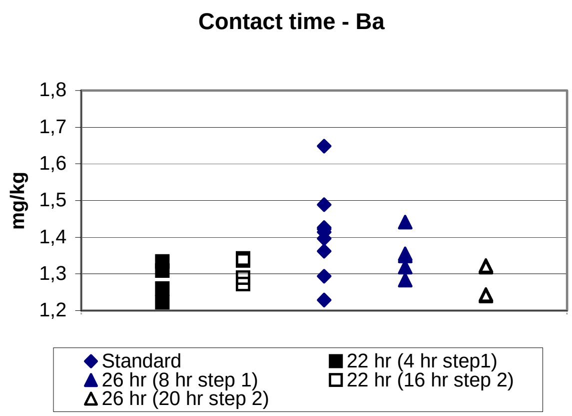

L/S ratio - SO4
mg/l
500
450
400
350
300
250
200
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

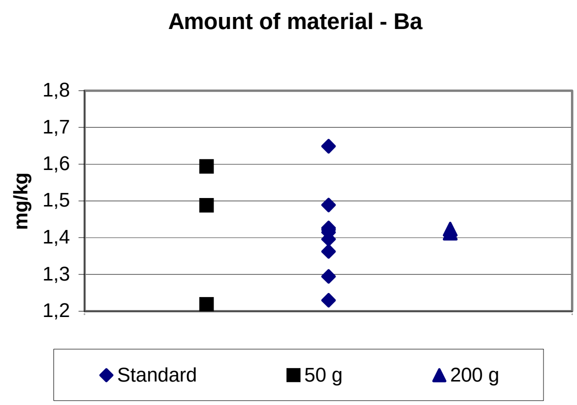

L/S ratio - SO4
mg/kg
1000
900
800
700
600
500
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

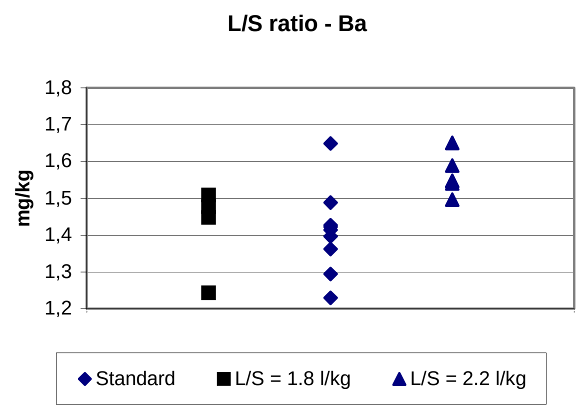

Agitation - SO4
mg/kg
1000
900
800
700
600
500
Standard
End over End
Rotating table

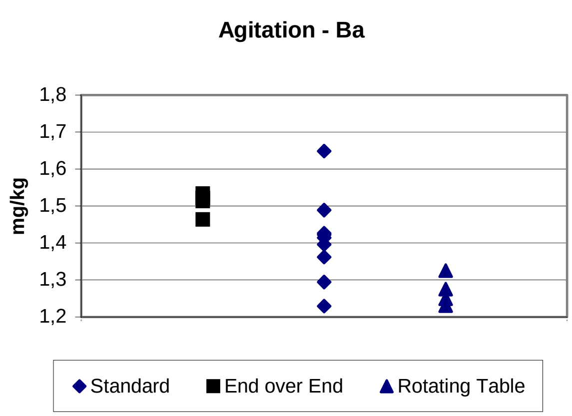

Filter diameter - Sb
mg/kg
1000
900
800
700
600
500
Standard
47 mm

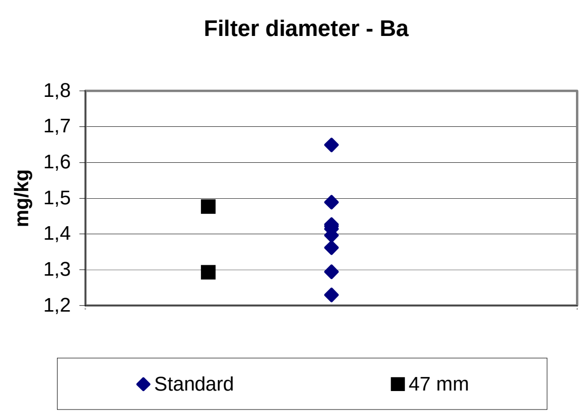
Part 3-2: MBA


Contact time - Ba
1,8
1,7
1,6
1,5
1,4
1,3
1,2
mg/kg
Standard
22 hr (4 hr step1)
26 hr (8 hr step 1)
22 hr (16 hr step 2)
26 hr (20 hr step 2)

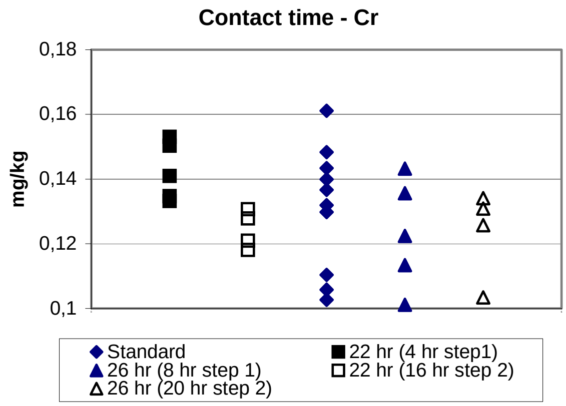

Amount of material - Ba
1,8
1,7
1,6
1,5
1,4
1,3
1,2
mg/kg
Standard
50 g
200 g

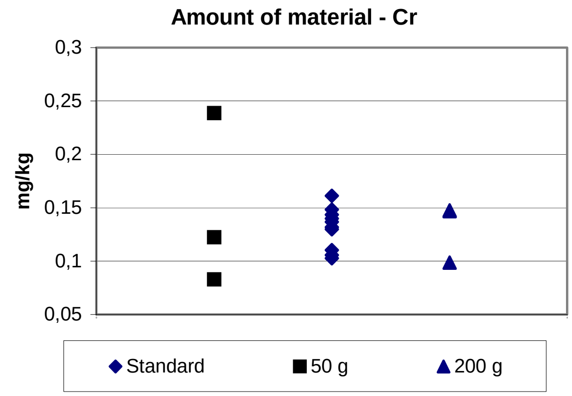

L/S ratio - Ba
1,8
1,7
1,6
1,5
1,4
1,3
1,2
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

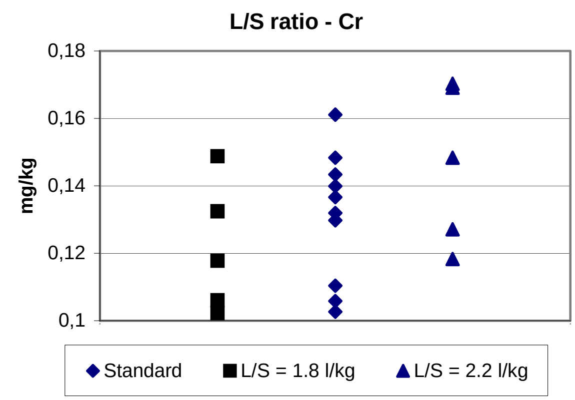

Agitation - Ba
1,8
1,7
1,6
1,5
1,4
1,3
1,2
mg/kg
Standard
End over End
Rotating Table

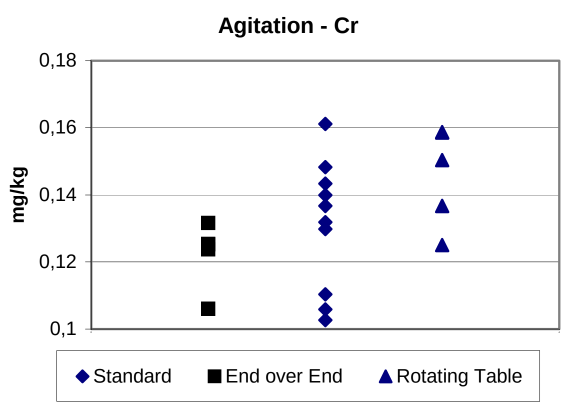

Filter diameter - Ba
1,8
1,7
1,6
1,5
1,4
1,3
1,2
mg/kg
Standard
47 mm

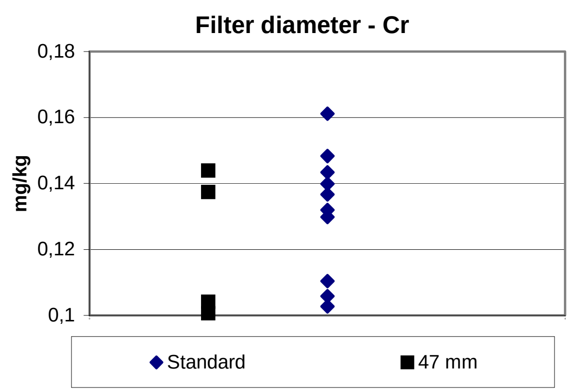
Part 3-2: MBA


Contact time - Cr
mg/kg
0,18
0,16
0,14
0,12
0,1
Standard
26 hr (8 hr step 1)
26 hr (20 hr step 2)
22 hr (4 hr step1)
22 hr (16 hr step 2)

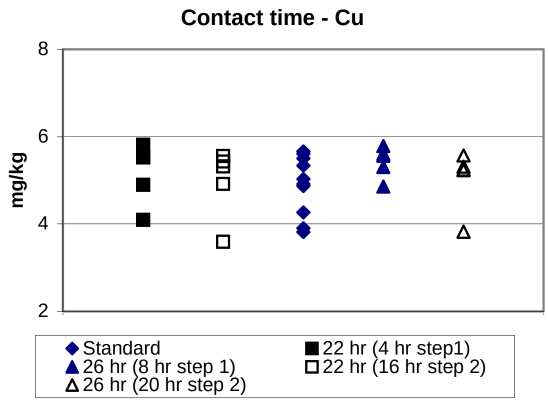

Amount of material - Cr
mg/kg
0,3
0,25
0,2
0,15
0,1
0,05
Standard
50 g
200 g

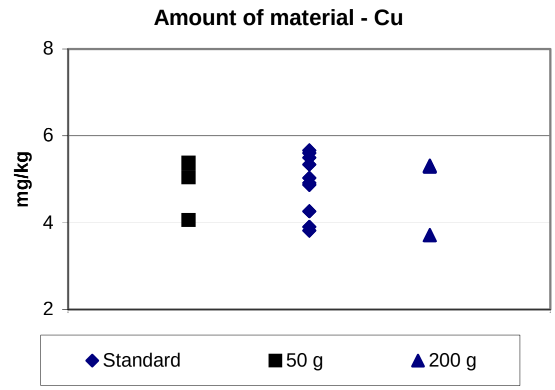

L/S ratio - Cr
mg/kg
0,18
0,16
0,14
0,12
0,1
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

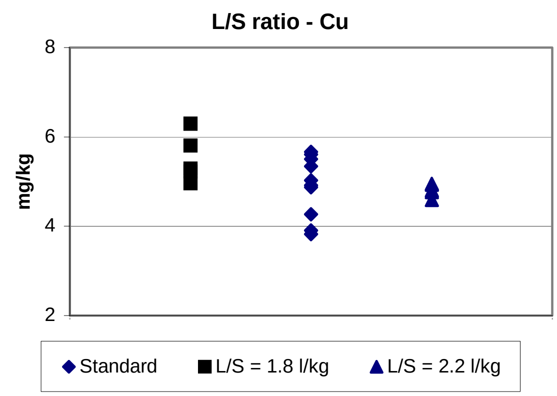

Agitation - Cr
mg/kg
0,18
0,16
0,14
0,12
0,1
Standard
End over End
Rotating Table

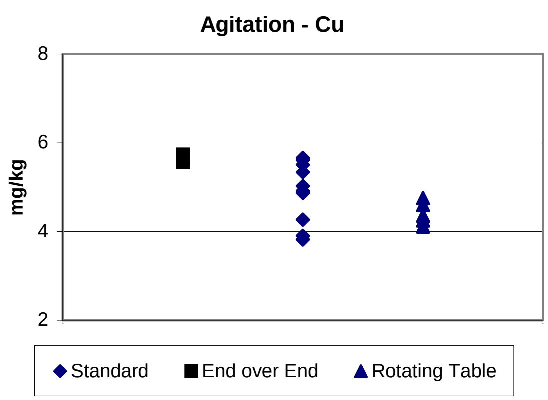

Filter diameter - Cr
mg/kg
0,18
0,16
0,14
0,12
0,1
Standard
47 mm

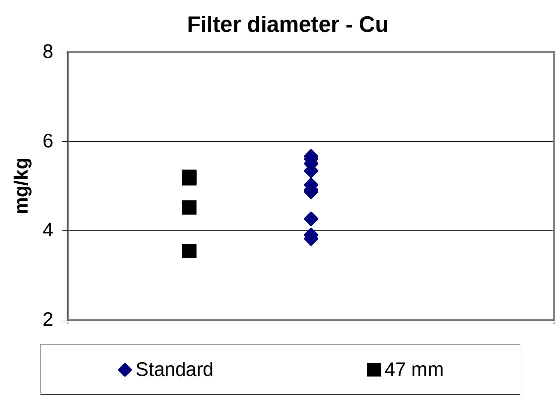
Part 3-2: MBA


Contact time - Cu
mg/kg
8
6
4
2
Standard
22 hr (4 hr step1)
26 hr (8 hr step 1)
22 hr (16 hr step 2)
26 hr (20 hr step 2)

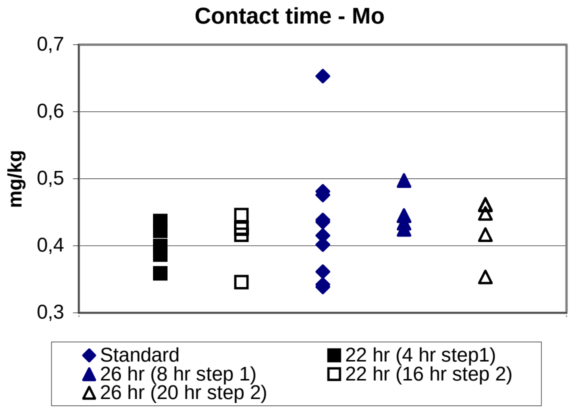

Amount of material - Cu
mg/kg
8
6
4
2
Standard
50 g
200 g

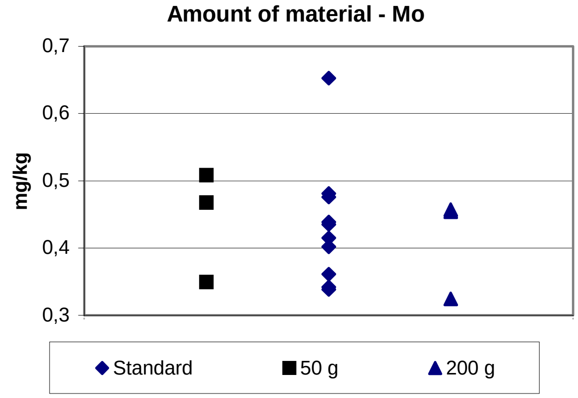

L/S ratio - Cu
mg/kg
8
6
4
2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

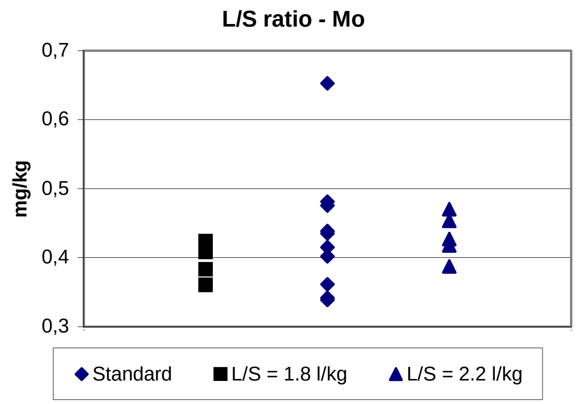

Agitation - Cu
mg/kg
8
6
4
2
Standard
End over End
Rotating Table

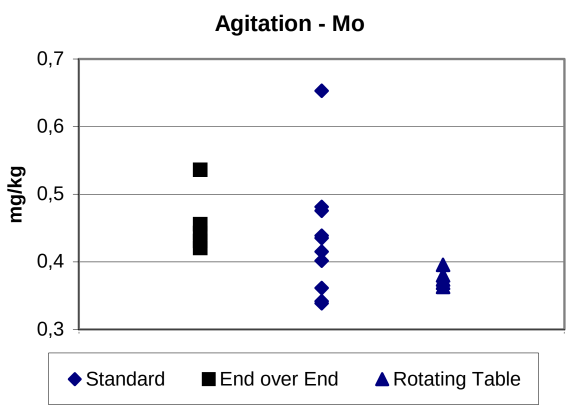

Filter diameter - Cu
mg/kg
8
6
4
2
Standard
47 mm

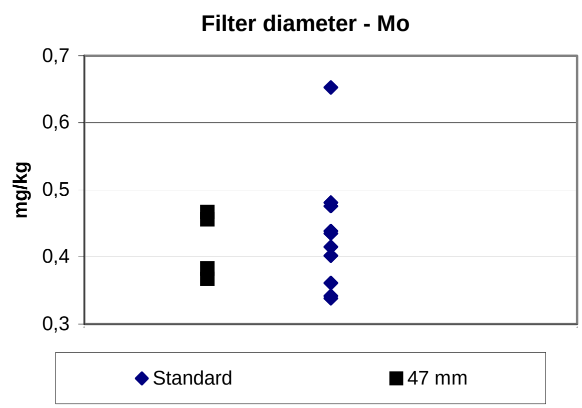
Part 3-2: MBA


Contact time - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
22 hr (4 hr step1)
26 hr (8 hr step 1)
22 hr (16 hr step 2)
26 hr (20 hr step 2)

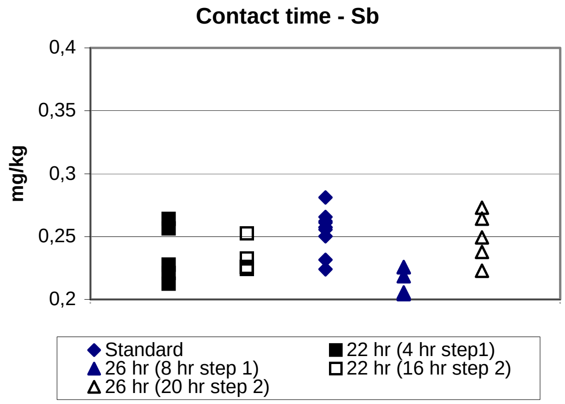

Amount of material - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
50 g
200 g

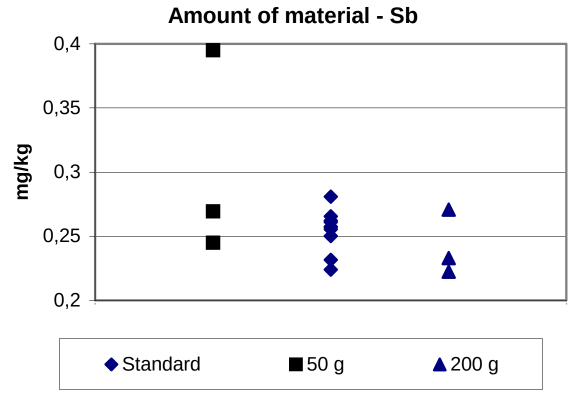

L/S ratio - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

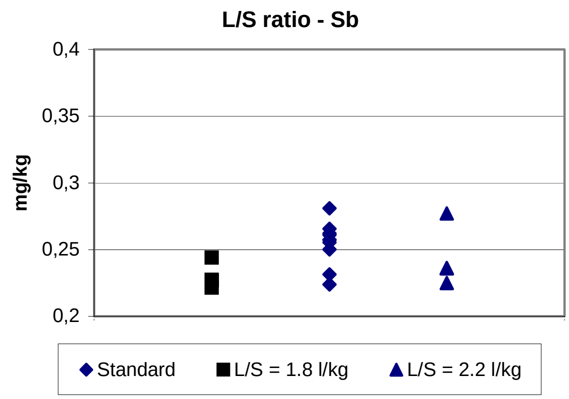

Agitation - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
End over End
Rotating Table

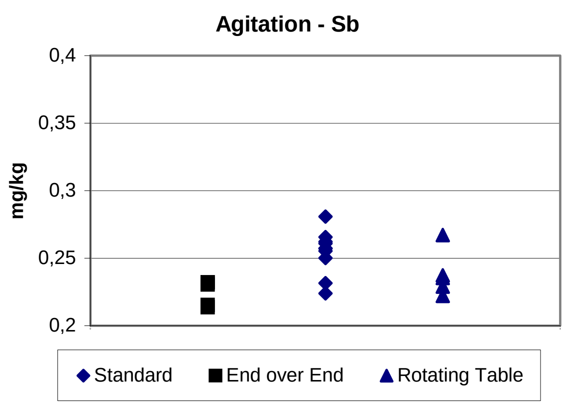

Filter diameter - Mo
0,7
0,6
0,5
0,4
0,3
mg/kg
Standard
47 mm

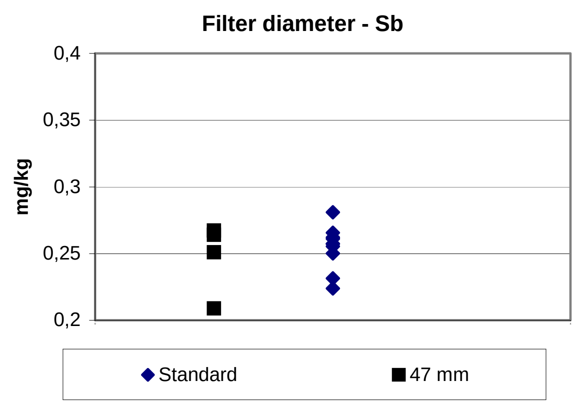
Part 3-2: MBA


Contact time - Sb
mg/kg
0,4
0,35
0,3
0,25
0,2
Standard
26 hr (8 hr step 1)
26 hr (20 hr step 2)
22 hr (4 hr step1)
22 hr (16 hr step 2)

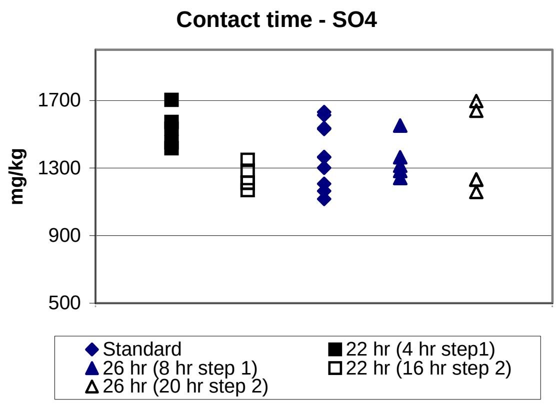

Amount of material - Sb
mg/kg
0,4
0,35
0,3
0,25
0,2
Standard
50 g
200 g


L/S ratio - Sb
mg/kg
0,4
0,35
0,3
0,25
0,2
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

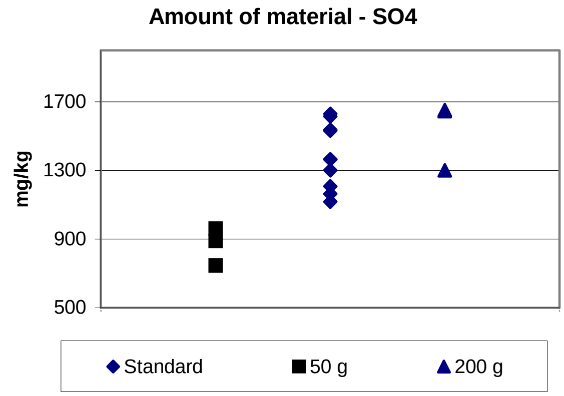

Agitation - Sb
mg/kg
0,4
0,35
0,3
0,25
0,2
Standard
End over End
Rotating Table


Filter diameter - Sb
mg/kg
0,4
0,35
0,3
0,25
0,2
Standard
47 mm

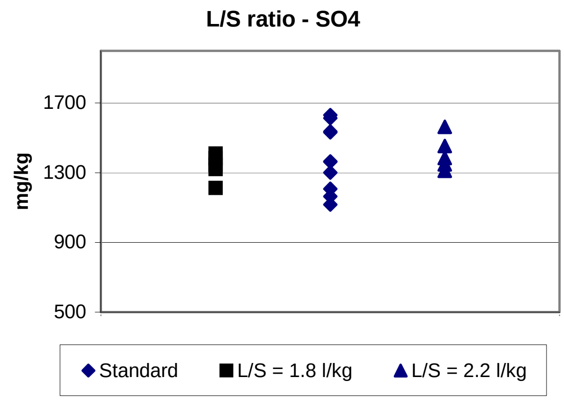
Part 3-2: MBA



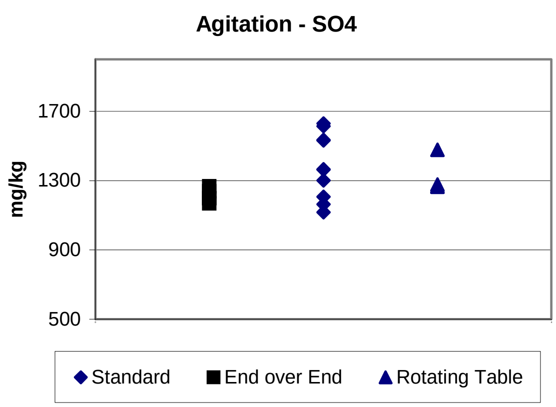
Contact time - SO4
1700
1300
900
500
mg/kg
Standard
26 hr (8 hr step 1)
26 hr (20 hr step 2)
22 hr (4 hr step1)
22 hr (16 hr step 2)



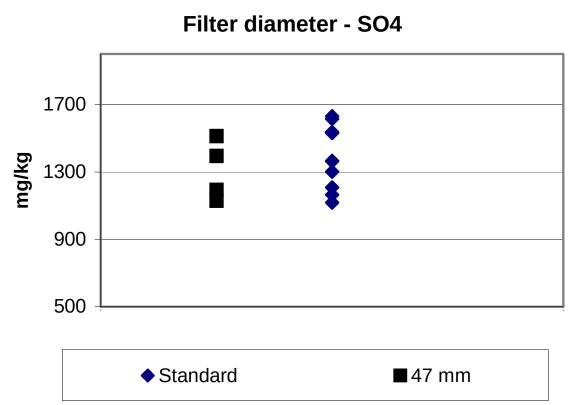
Amount of material - SO4
1700
1300
900
500
mg/kg
Standard
50 g
200 g



L/S ratio - SO4
1700
1300
900
500
mg/kg
Standard
L/S = 1.8 l/kg
L/S = 2.2 l/kg

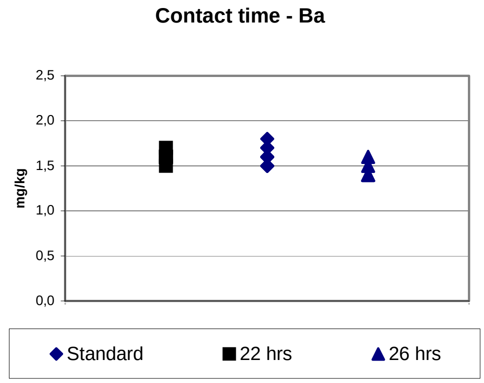


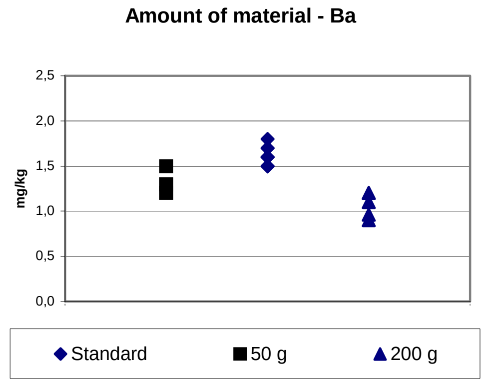
Agitation - SO4
1700
1300
900
500
mg/kg
Standard
End over End
Rotating Table

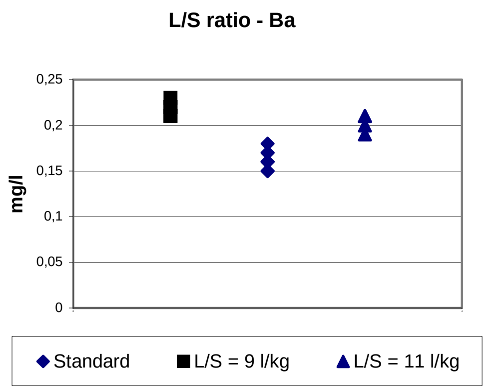


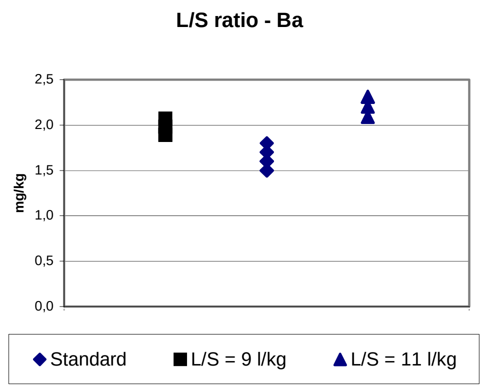
Filter diameter - SO4
1700
1300
900
500
mg/kg
Standard
47 mm

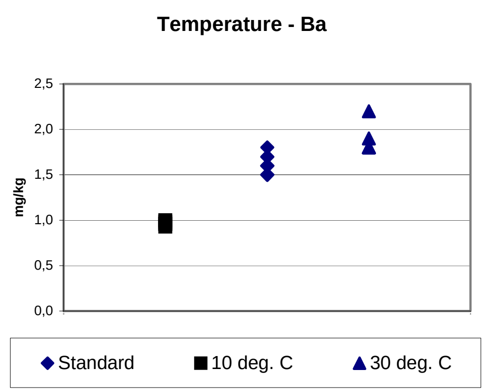
Part 4: MBA

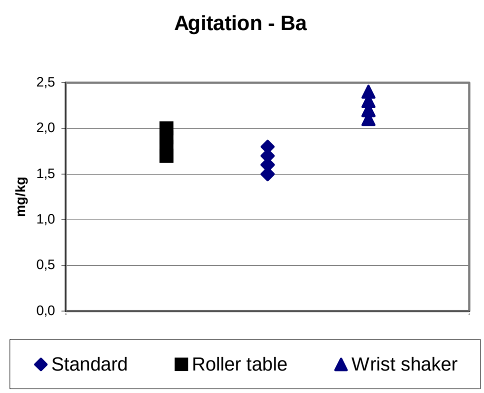

Contact time - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
22 hrs
26 hrs

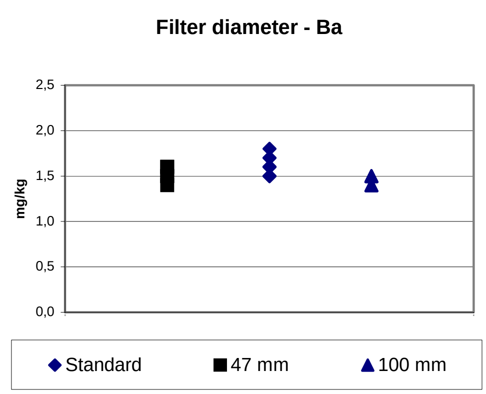

Amount of material - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
50 g
200 g

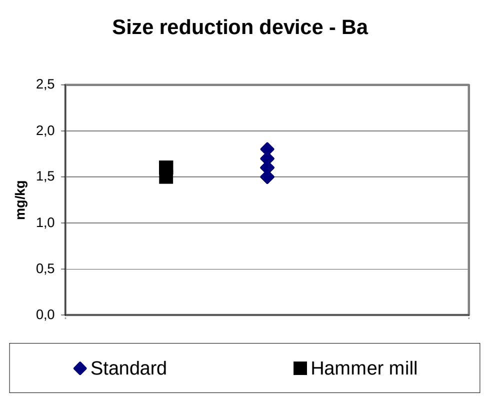

L/S ratio - Ba
0,25
0,2
0,15
0,1
0,05
0
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

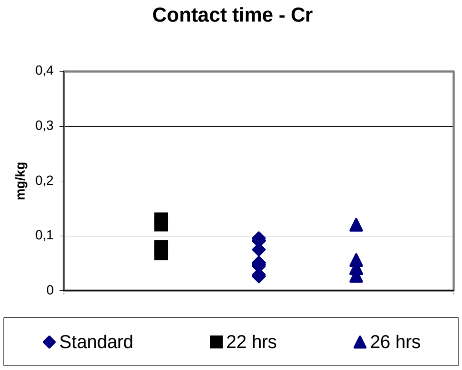

Temperature - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
10 deg. C
30 deg. C

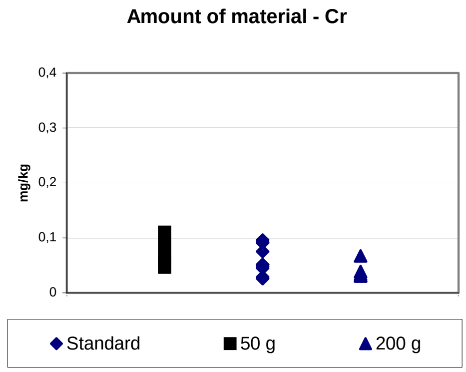

Agitation - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
Roller table
Wrist shaker

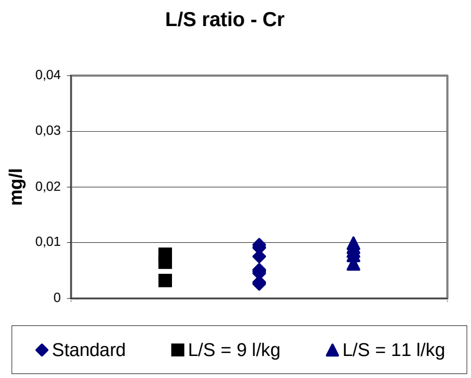

Filter diameter - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
47 mm
100 mm

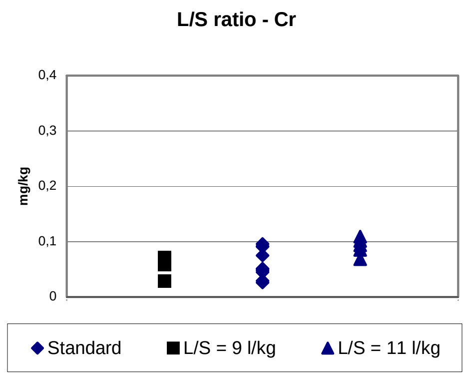

Size reduction device - Ba
2,5
2,0
1,5
1,0
0,5
0,0
mg/kg
Standard
Hammer mill

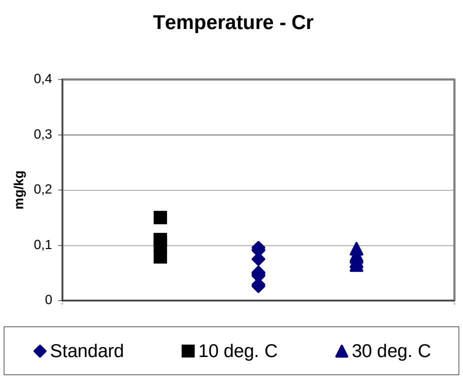
Part 4: MBA

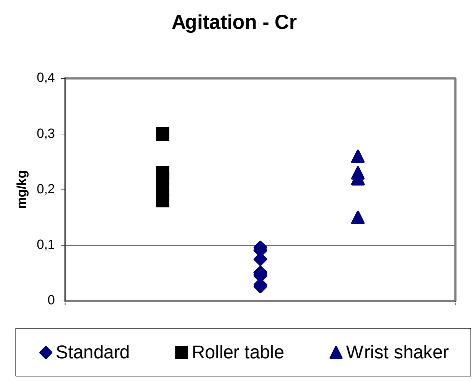

Contact time - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
22 hrs
26 hrs

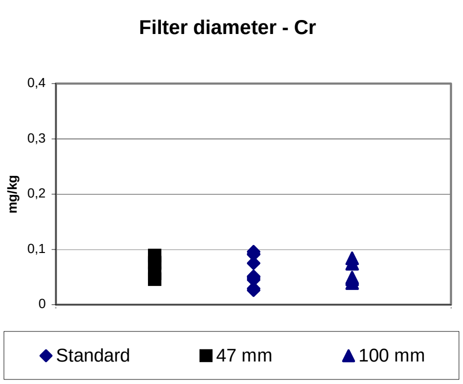

Amount of material - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
50 g
200 g

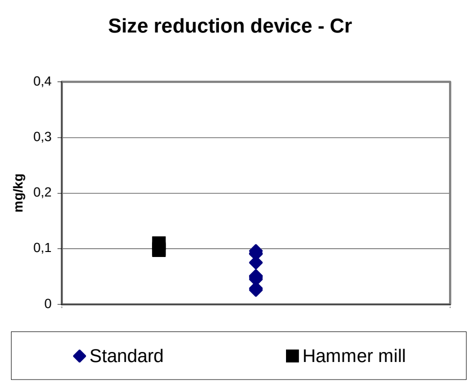

L/S ratio - Cr
0,04
0,03
0,02
0,01
0
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

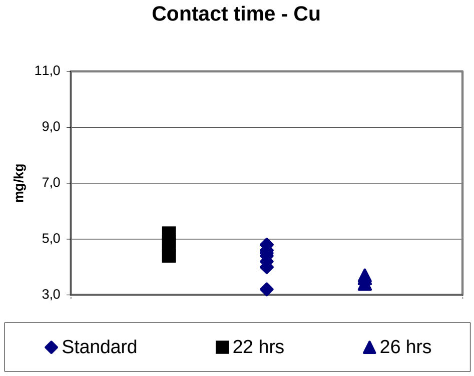

Temperature - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
10 deg. C
30 deg. C

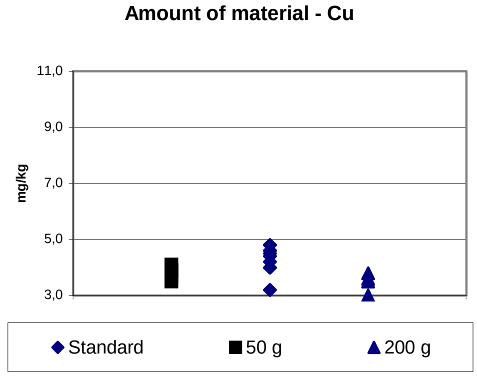

Agitation - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
Roller table
Wrist shaker

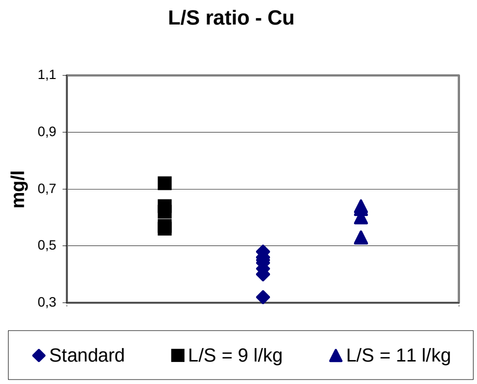

Filter diameter - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
47 mm
100 mm

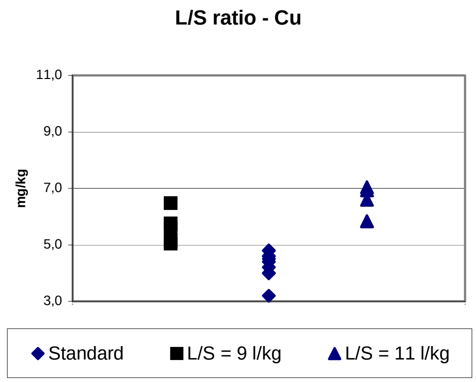

Size reduction device - Cr
0,4
0,3
0,2
0,1
0
mg/kg
Standard
Hammer mill

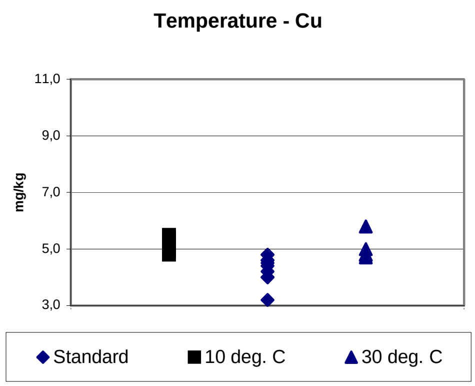
Part 4: MBA

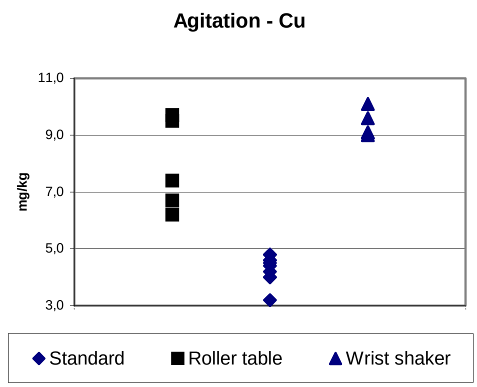

Contact time - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
22 hrs
26 hrs

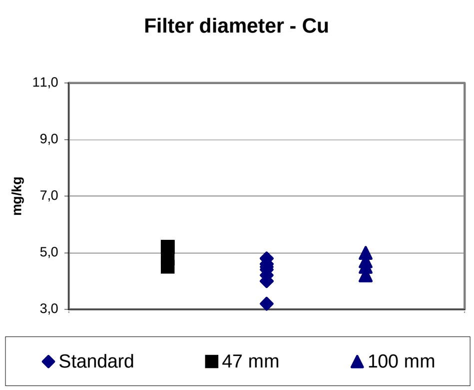

Amount of material - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
50 g
200 g

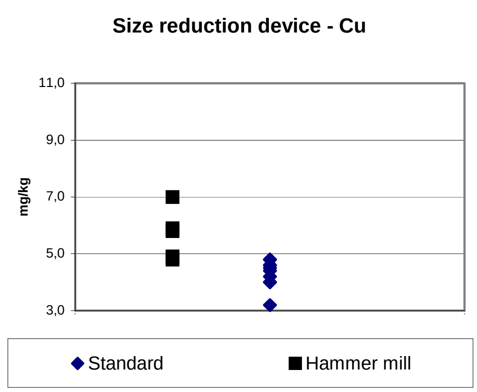

L/S ratio - Cu
mg/l
1,1
0,9
0,7
0,5
0,3
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
L/S = 9 l/kg
L/S = 11 l/kg


Temperature - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
10 deg. C
30 deg. C

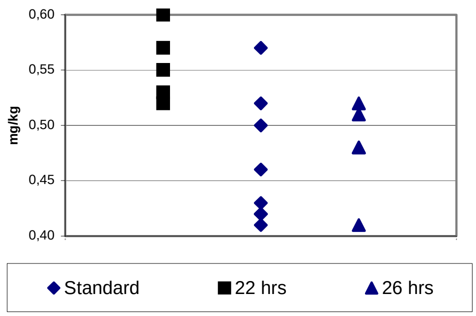

Agitation - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
Roller table
Wrist shaker


Filter diameter - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
47 mm
100 mm

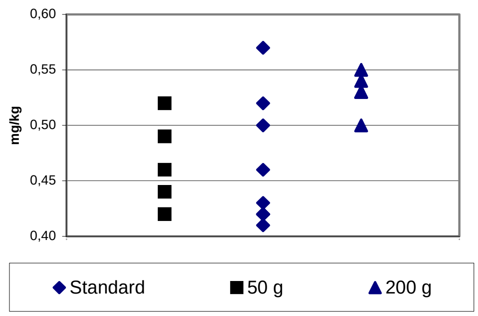

Size reduction device - Cu
mg/kg
11,0
9,0
7,0
5,0
3,0
Standard
Hammer mill

Part 4: MBA

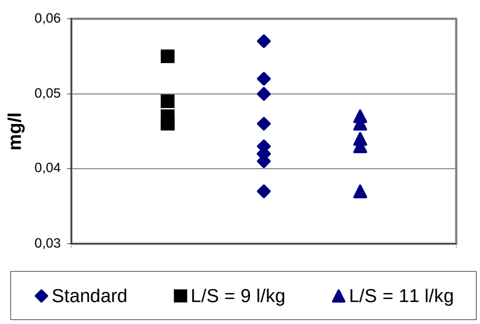
Contact time - Mo



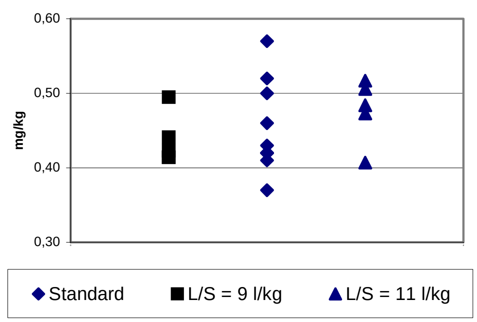
Amount of material - Mo



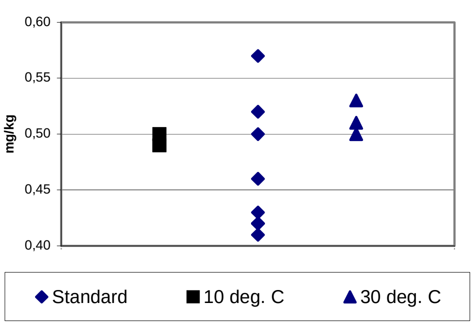
L/S ratio - Mo



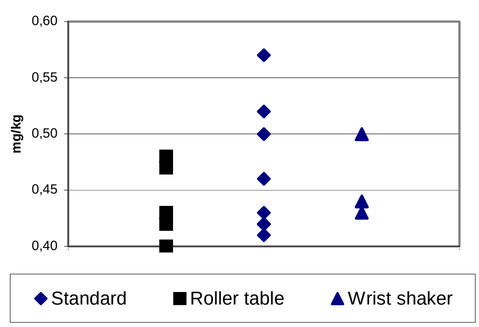
L/S ratio - Mo



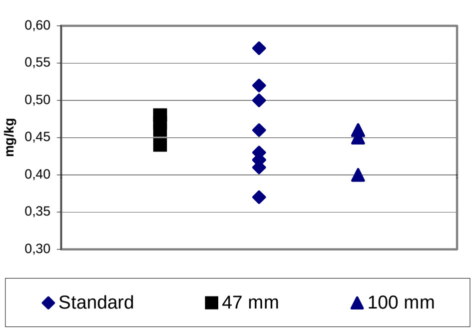
Temperature - Mo



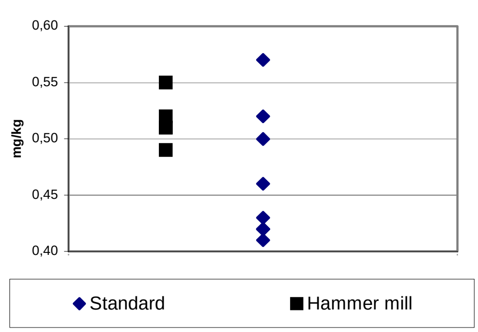
Agitation - Mo



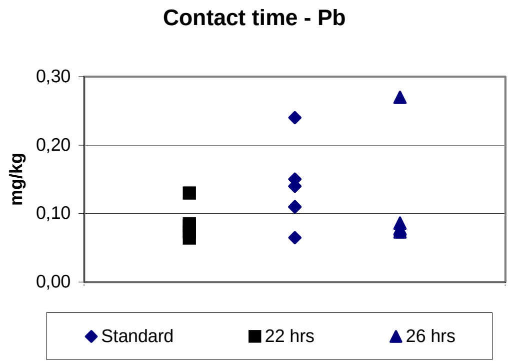
Filter diameter - Mo

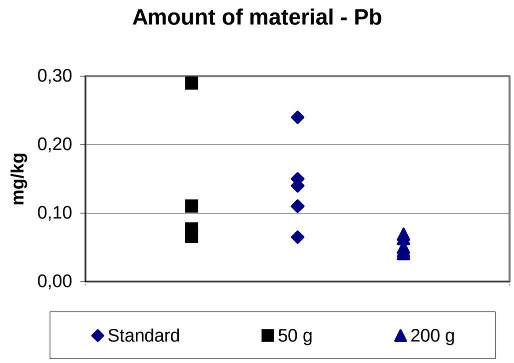


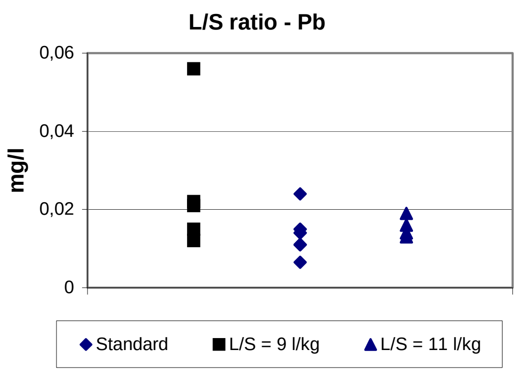
Size reduction device - Mo

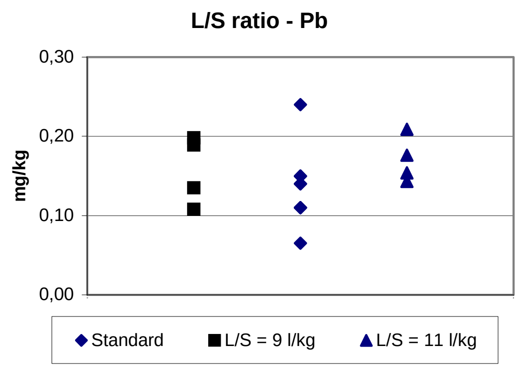


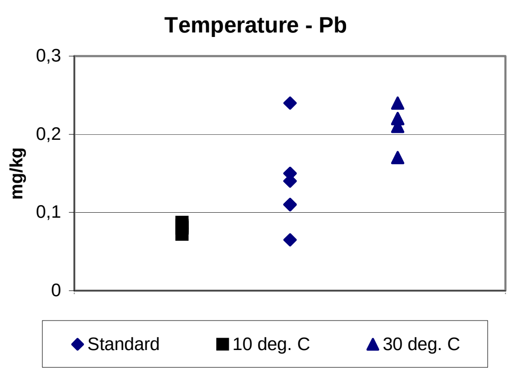
Part 4: MBA

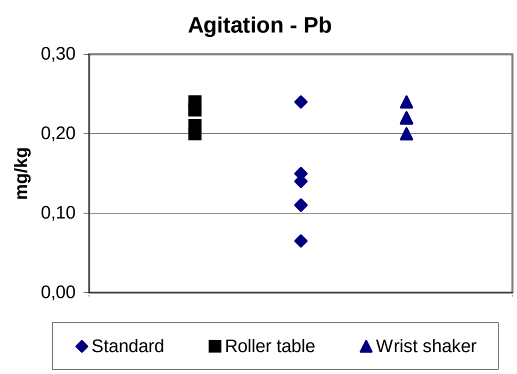

Contact time - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
22 hrs
26 hrs

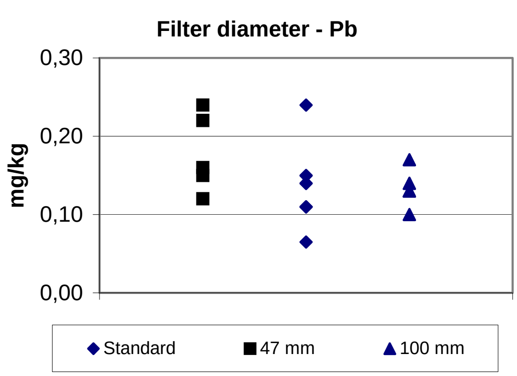

Amount of material - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
50 g
200 g

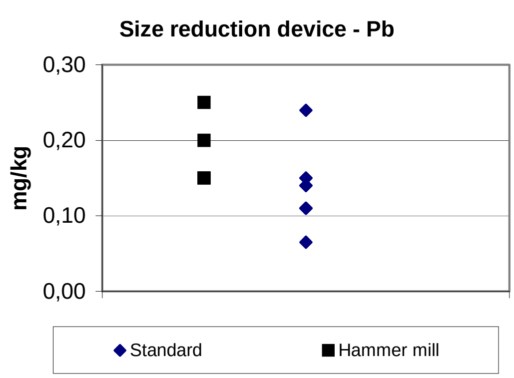

L/S ratio - Pb
mg/l
0,06
0,04
0,02
0
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
L/S = 9 l/kg
L/S = 11 l/kg

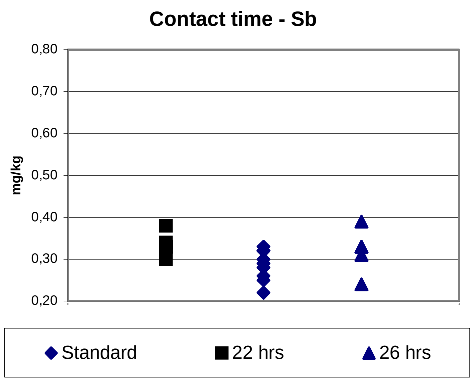

Temperature - Pb
mg/kg
0,3
0,2
0,1
0
Standard
10 deg. C
30 deg. C

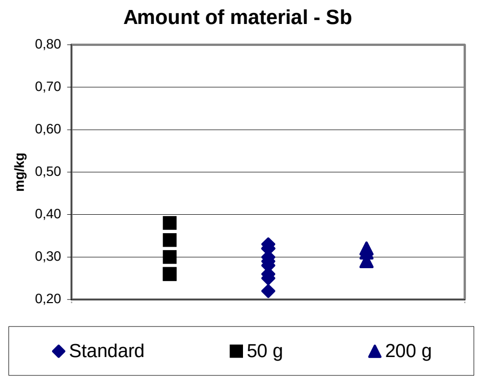

Agitation - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
Roller table
Wrist shaker

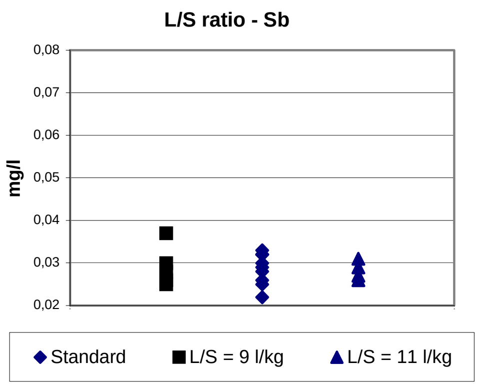

Filter diameter - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
47 mm
100 mm

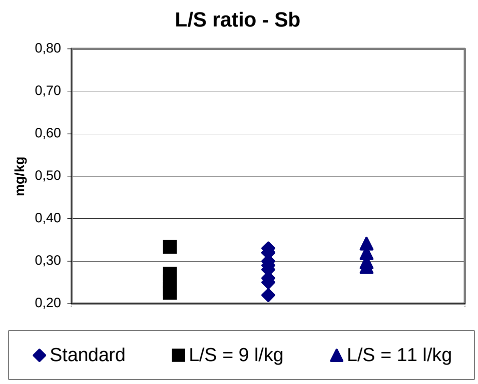

Size reduction device - Pb
mg/kg
0,30
0,20
0,10
0,00
Standard
Hammer mill

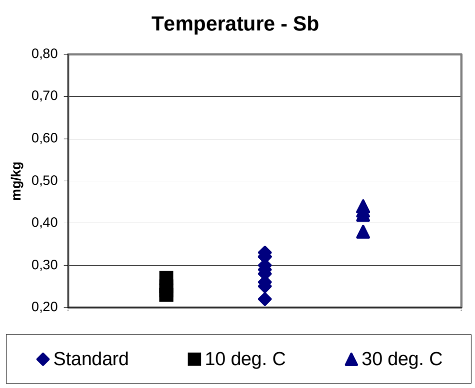
Part 4: MBA

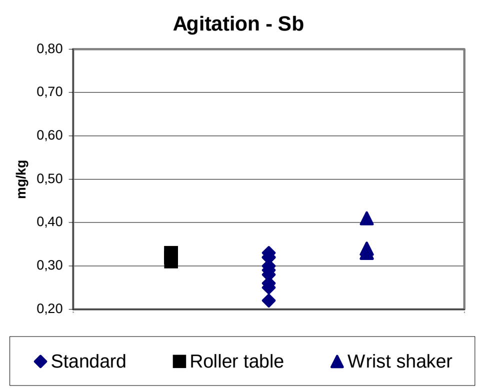

Contact time - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
22 hrs
26 hrs

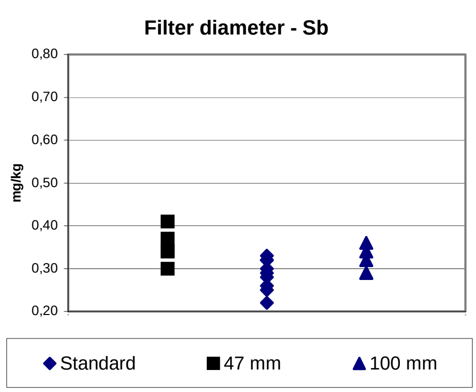

Amount of material - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
50 g
200 g

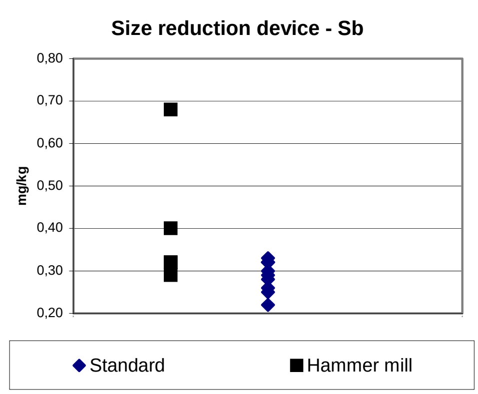

L/S ratio - Sb
mg/l
0,08
0,07
0,06
0,05
0,04
0,03
0,02
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
L/S = 9 l/kg
L/S = 11 l/kg

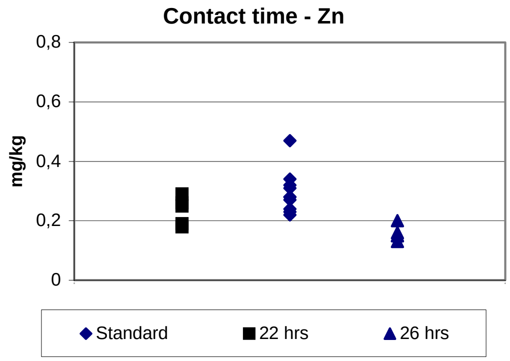

Temperature - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
10 deg. C
30 deg. C

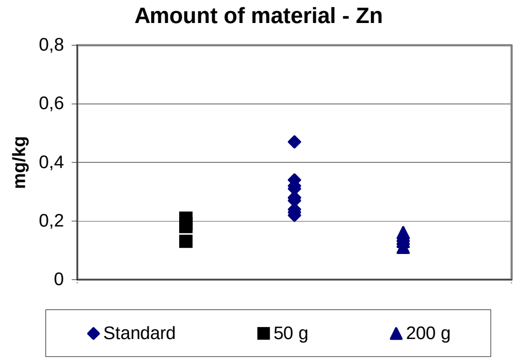

Agitation - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
Roller table
Wrist shaker

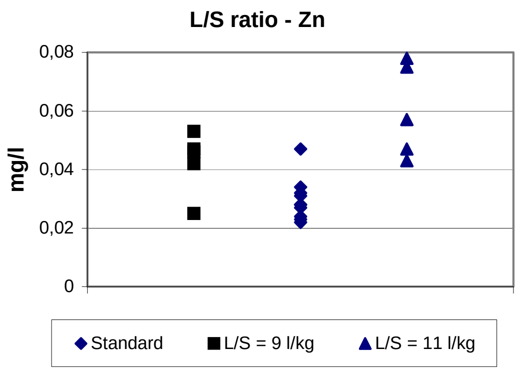

Filter diameter - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
47 mm
100 mm

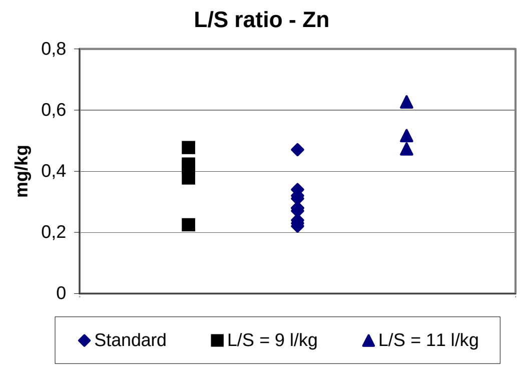

Size reduction device - Sb
mg/kg
0,80
0,70
0,60
0,50
0,40
0,30
0,20
Standard
Hammer mill

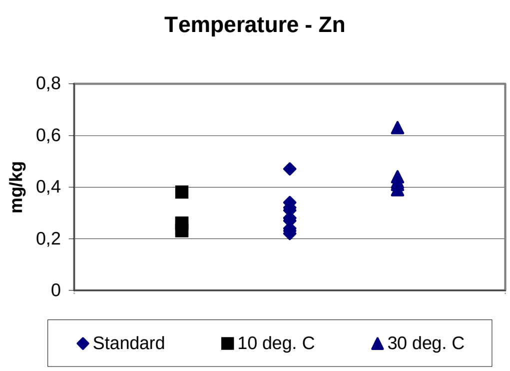
Part 4: MBA

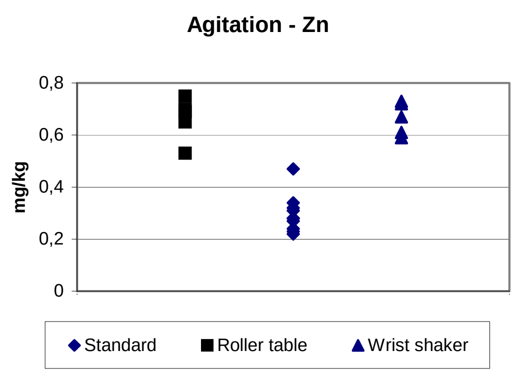

Contact time - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
22 hrs
26 hrs

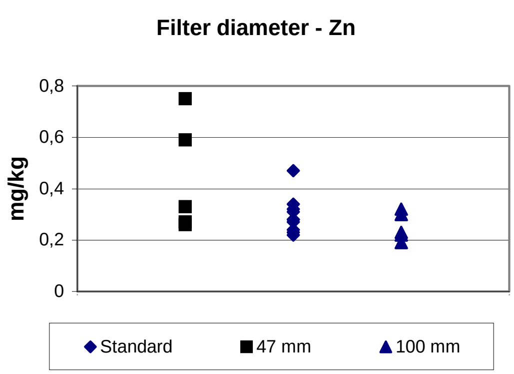

Amount of material - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
50 g
200 g

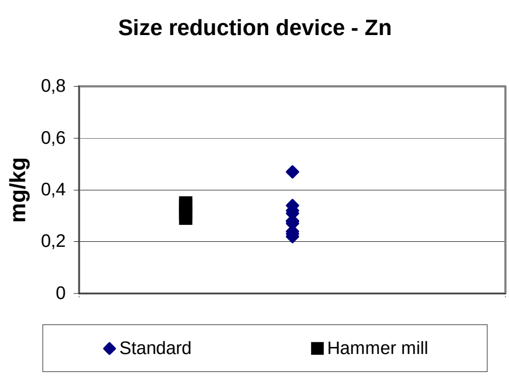

L/S ratio - Zn
mg/l
0,08
0,06
0,04
0,02
0
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
L/S = 9 l/kg
L/S = 11 l/kg

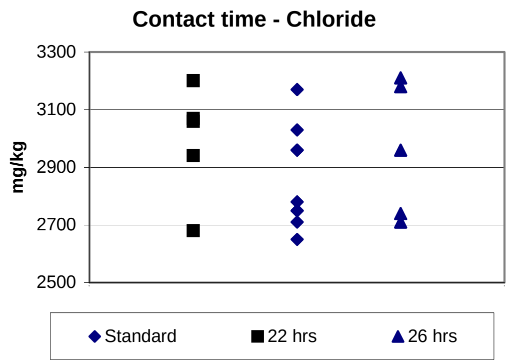

Temperature - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
10 deg. C
30 deg. C

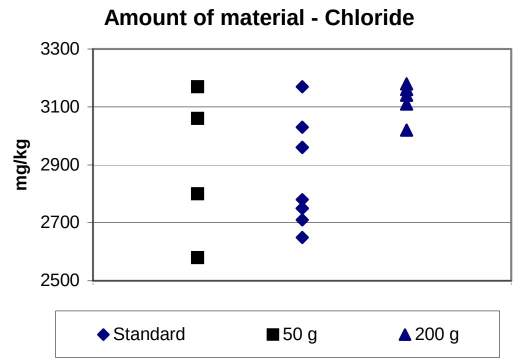

Agitation - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
Roller table
Wrist shaker

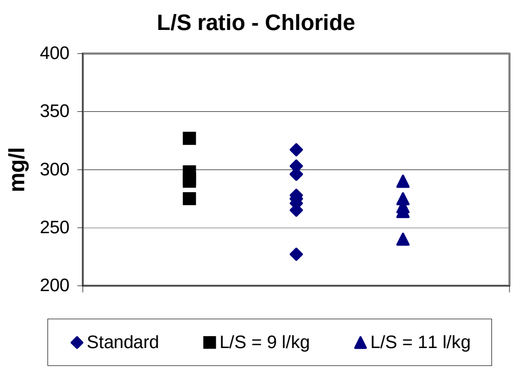

Filter diameter - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
47 mm
100 mm

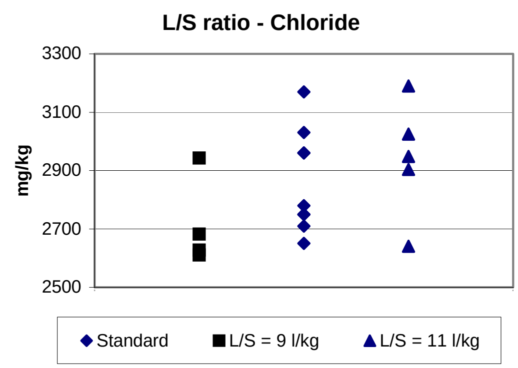

Size reduction device - Zn
mg/kg
0,8
0,6
0,4
0,2
0
Standard
Hammer mill

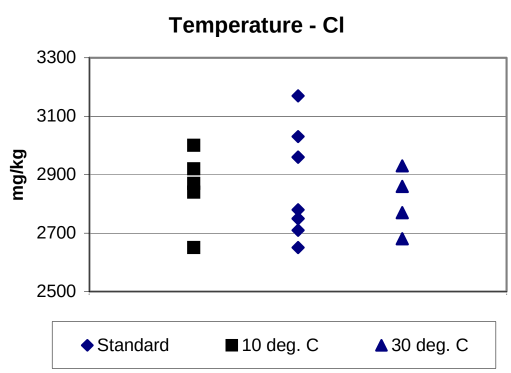
Part 4: MBA

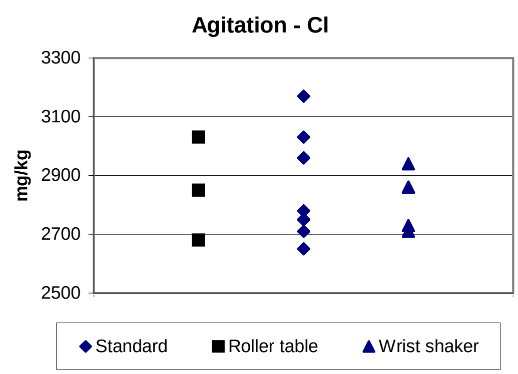

Contact time - Chloride
3300
3100
2900
2700
2500
mg/kg
Standard
22 hrs
26 hrs

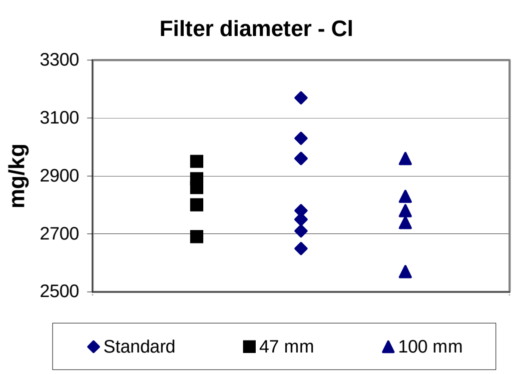

Amount of material - Chloride
3300
3100
2900
2700
2500
mg/kg
Standard
50 g
200 g

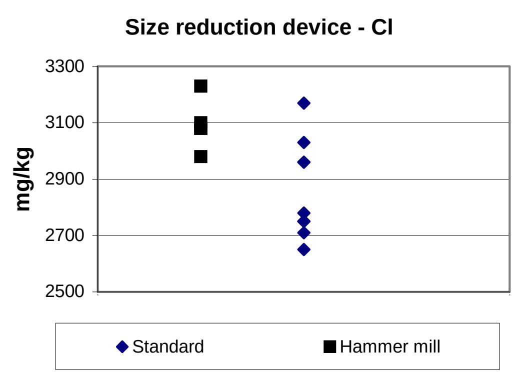

L/S ratio - Chloride
400
350
300
250
200
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Chloride
3300
3100
2900
2700
2500
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

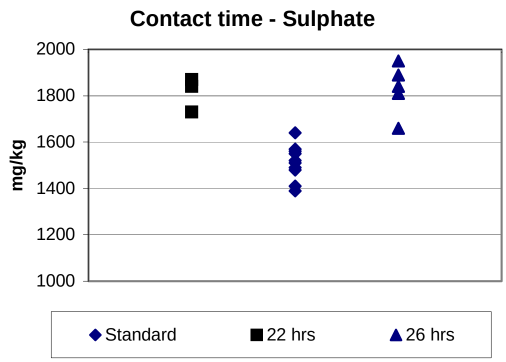

Temperature - Cl
3300
3100
2900
2700
2500
mg/kg
Standard
10 deg. C
30 deg. C

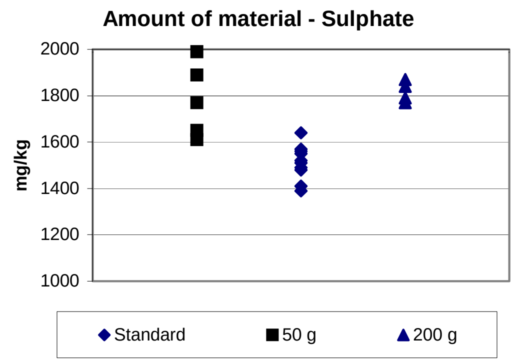

Agitation - Cl
3300
3100
2900
2700
2500
mg/kg
Standard
Roller table
Wrist shaker

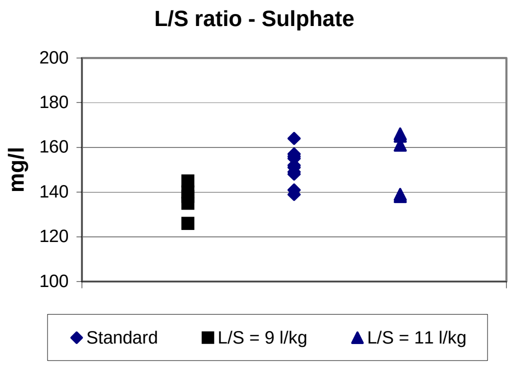

Filter diameter - Cl
3300
3100
2900
2700
2500
mg/kg
Standard
47 mm
100 mm

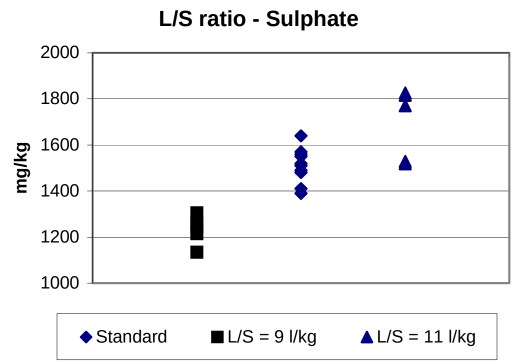

Size reduction device - Cl
3300
3100
2900
2700
2500
mg/kg
Standard
Hammer mill

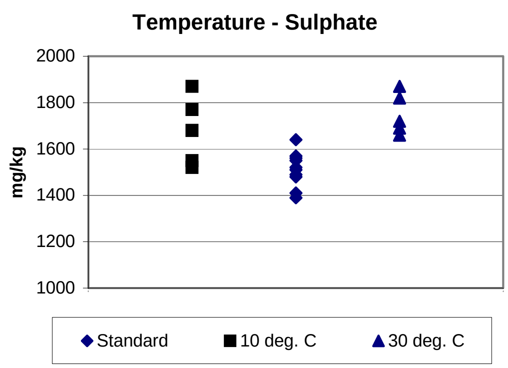
Part 4: MBA

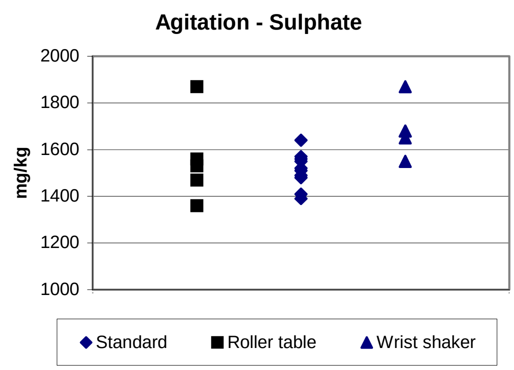

Contact time - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
22 hrs
26 hrs

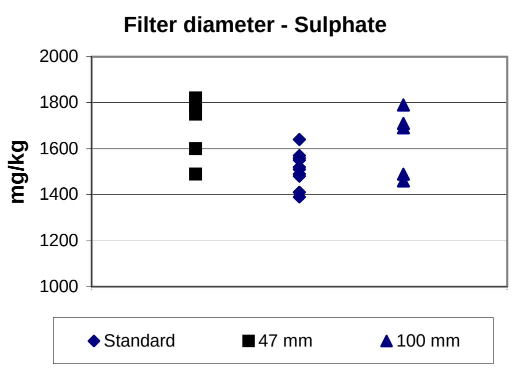

Amount of material - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
50 g
200 g

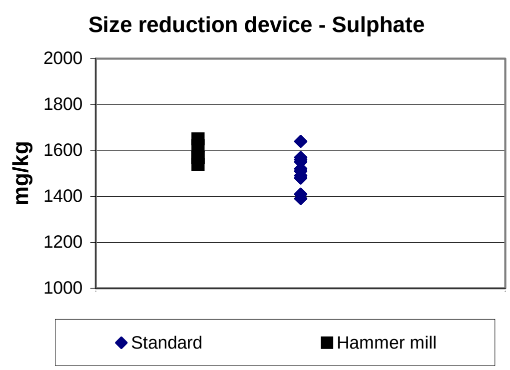

L/S ratio - Sulphate
mg/l
200
180
160
140
120
100
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
L/S = 9 l/kg
L/S = 11 l/kg


Temperature - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
10 deg. C
30 deg. C

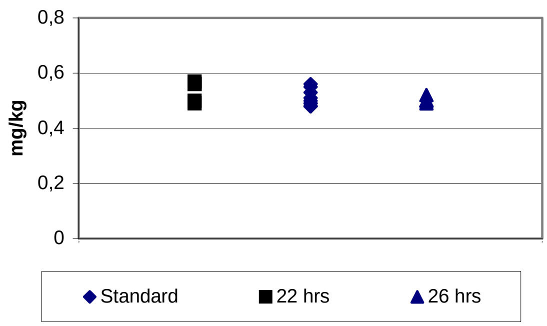

Agitation - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
Roller table
Wrist shaker


Filter diameter - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
47 mm
100 mm

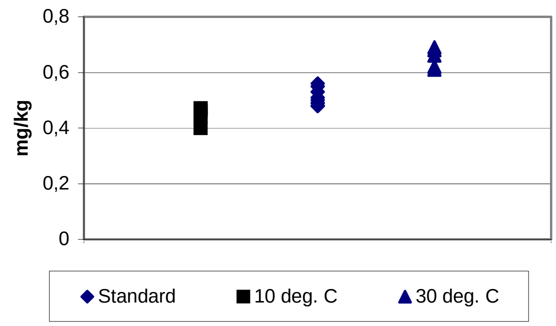

Size reduction device - Sulphate
mg/kg
2000
1800
1600
1400
1200
1000
Standard
Hammer mill

Part 2: FCM

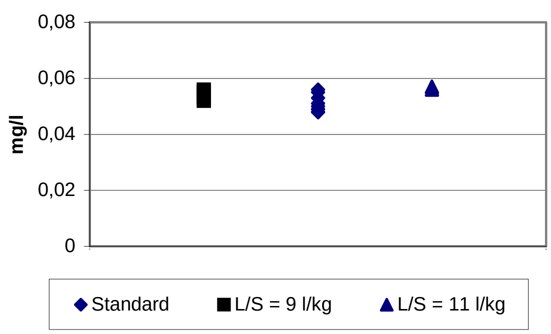
Contact time - Ba



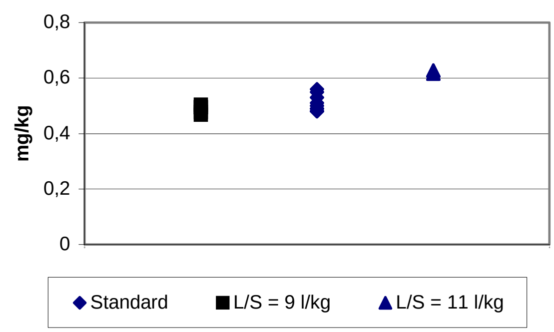
Temperature - Ba



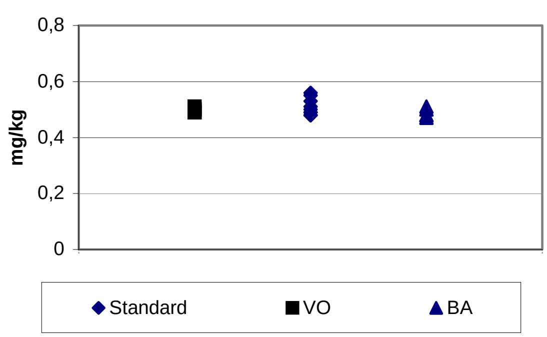
L/S ratio - Ba



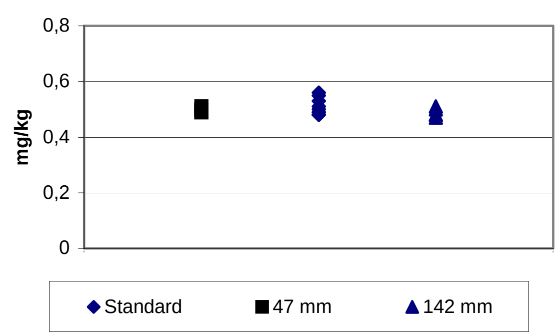
L/S ratio - Ba



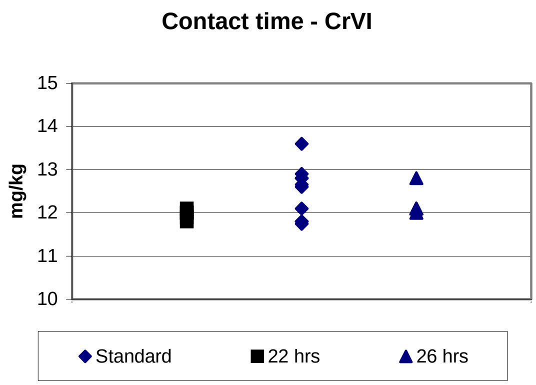
Agitation - Ba

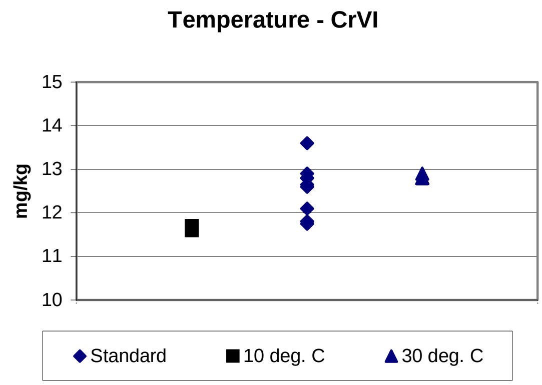


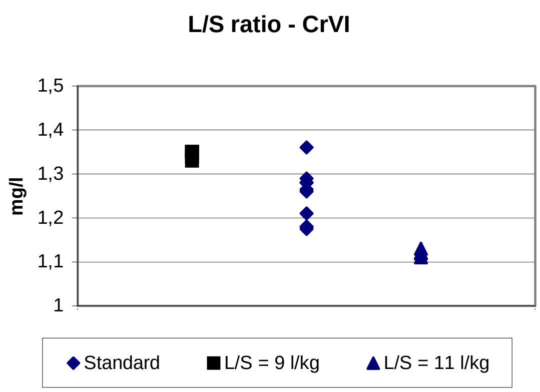
Filter diameter - Ba

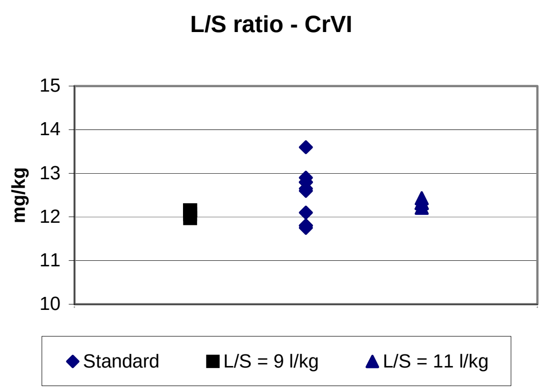


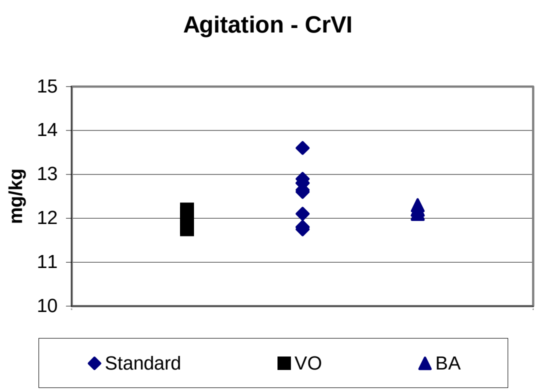
Part 2: FCM

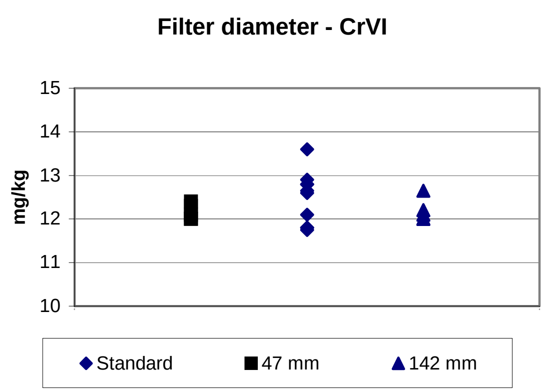

Contact time - CrVI
mg/kg
15
14
13
12
11
10
Standard
22 hrs
26 hrs


Temperature - CrVI
mg/kg
15
14
13
12
11
10
Standard
10 deg. C
30 deg. C

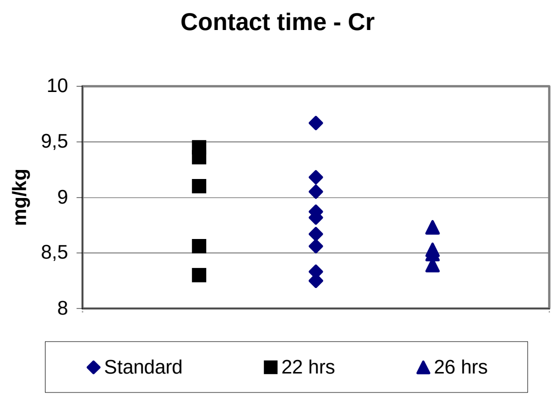

L/S ratio - CrVI
mg/l
1,5
1,4
1,3
1,2
1,1
1
Standard
L/S = 9 l/kg
L/S = 11 l/kg

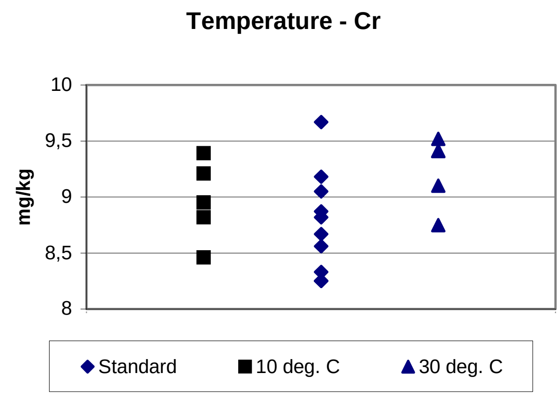

L/S ratio - CrVI
mg/kg
15
14
13
12
11
10
Standard
L/S = 9 l/kg
L/S = 11 l/kg

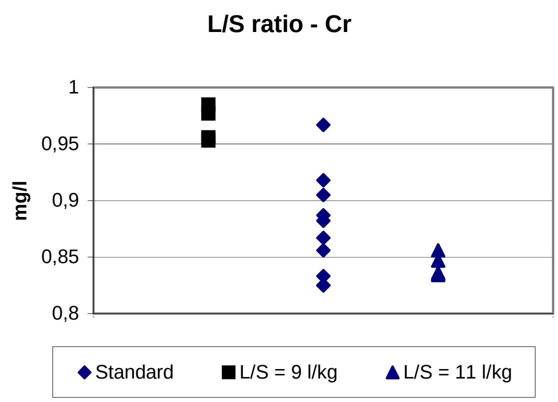

Agitation - CrVI
mg/kg
15
14
13
12
11
10
Standard
VO
BA

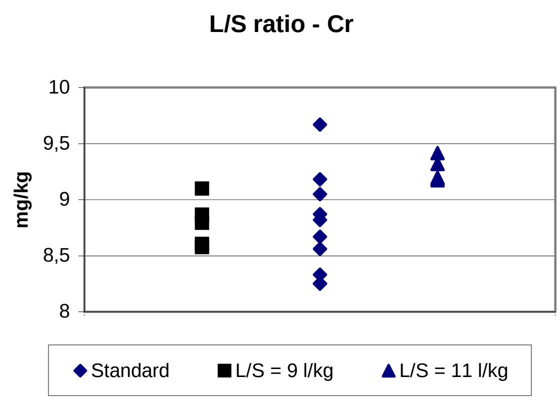

Filter diameter - CrVI
mg/kg
15
14
13
12
11
10
Standard
47 mm
142 mm

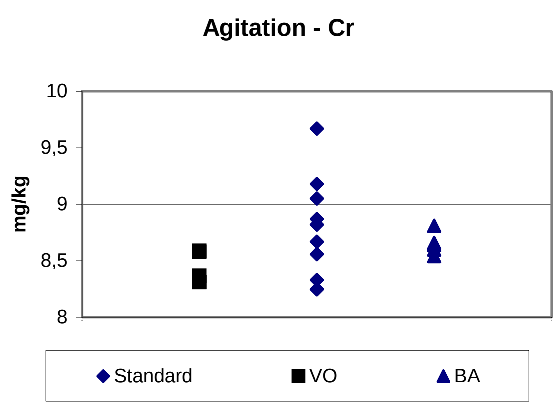
Part 2: FCM

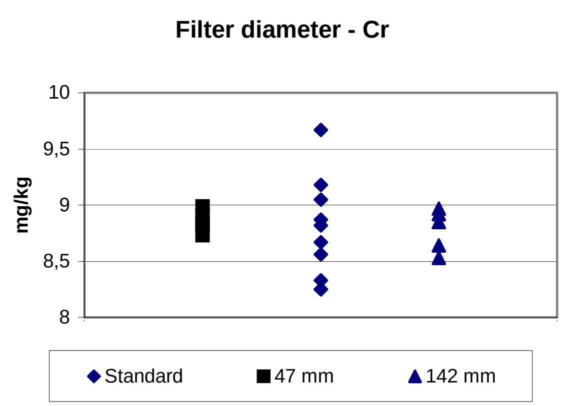

Contact time - Cr
mg/kg
10
9,5
9
8,5
8
Standard
22 hrs
26 hrs


Temperature - Cr
mg/kg
10
9,5
9
8,5
8
Standard
10 deg. C
30 deg. C

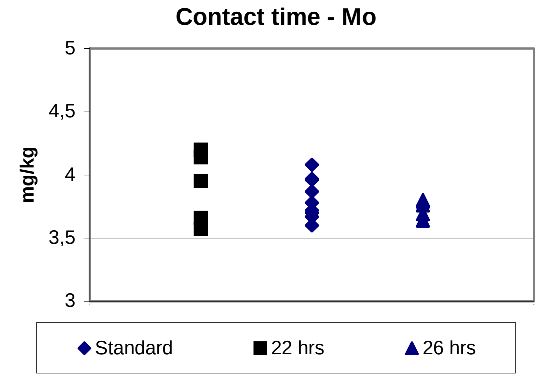

L/S ratio - Cr
mg/l
1
0,95
0,9
0,85
0,8
Standard
L/S = 9 l/kg
L/S = 11 l/kg

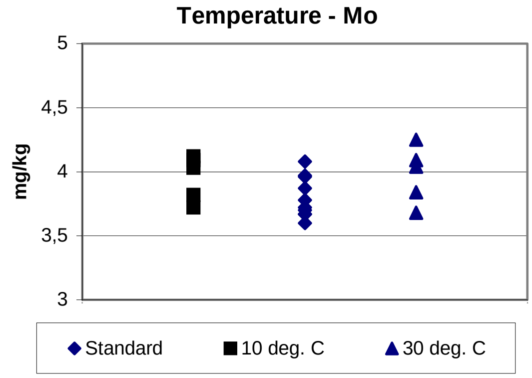

L/S ratio - Cr
mg/kg
10
9,5
9
8,5
8
Standard
L/S = 9 l/kg
L/S = 11 l/kg

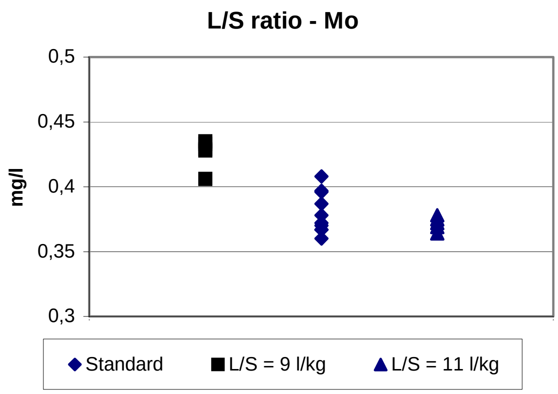

Agitation - Cr
mg/kg
10
9,5
9
8,5
8
Standard
VO
BA

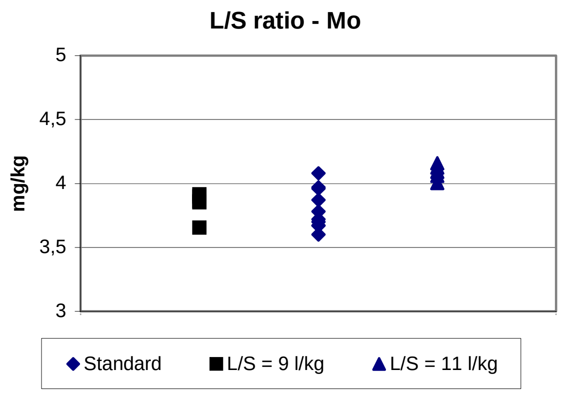

Filter diameter - Cr
mg/kg
10
9,5
9
8,5
8
Standard
47 mm
142 mm

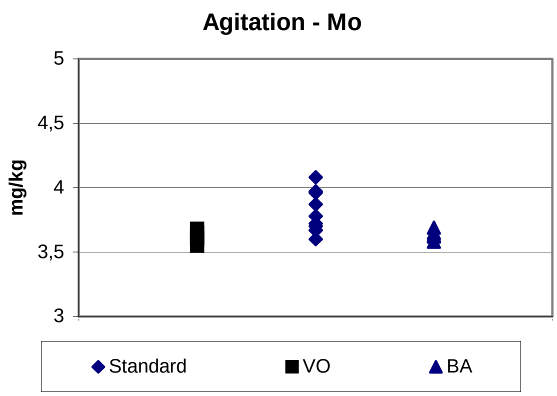
Part 2: FCM

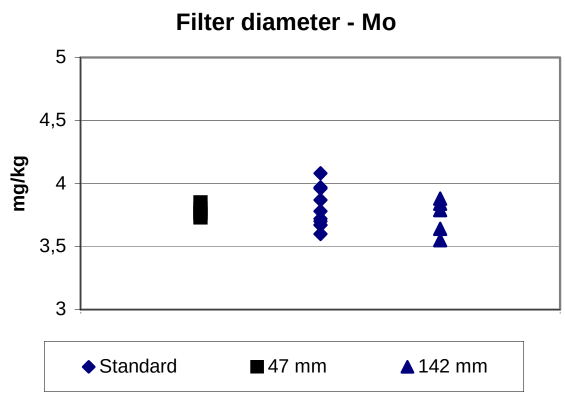

Contact time - Mo
mg/kg
5
4,5
4
3,5
3
Standard
22 hrs
26 hrs


Temperature - Mo
mg/kg
5
4,5
4
3,5
3
Standard
10 deg. C
30 deg. C

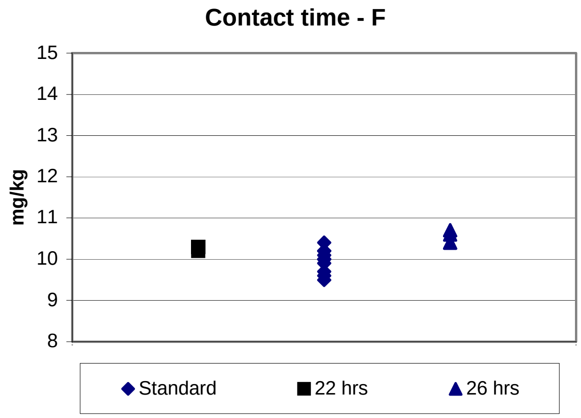

L/S ratio - Mo
mg/l
0,5
0,45
0,4
0,35
0,3
Standard
L/S = 9 l/kg
L/S = 11 l/kg

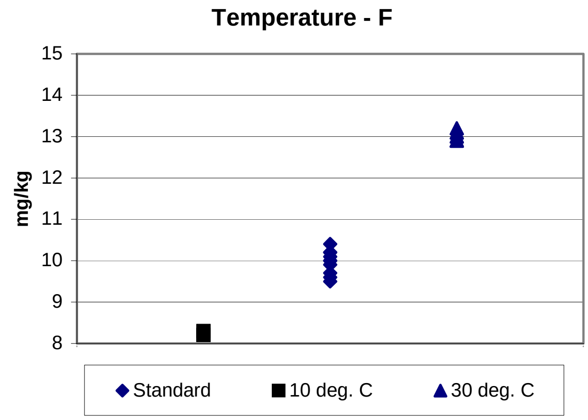

L/S ratio - Mo
mg/kg
5
4,5
4
3,5
3
Standard
L/S = 9 l/kg
L/S = 11 l/kg

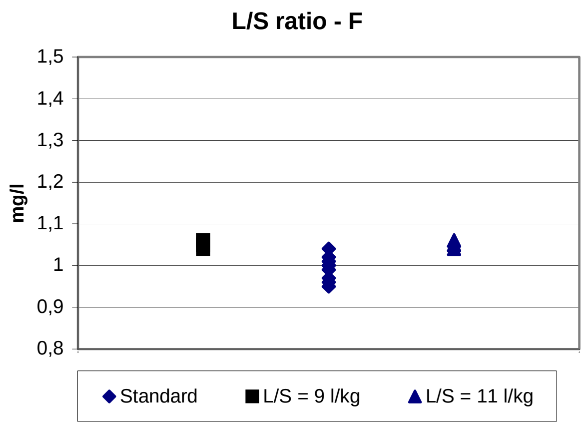

Agitation - Mo
mg/kg
5
4,5
4
3,5
3
Standard
VO
BA

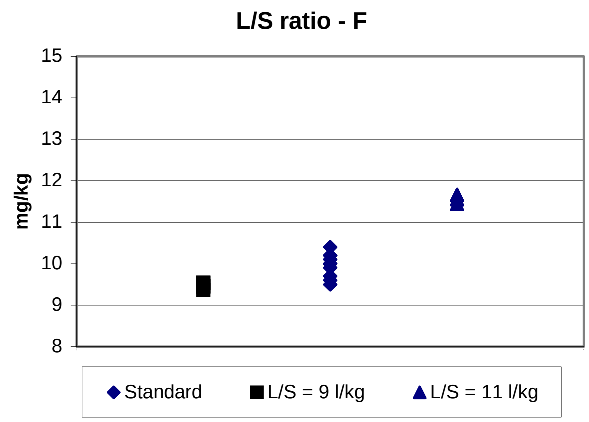

Filter diameter - Mo
mg/kg
5
4,5
4
3,5
3
Standard
47 mm
142 mm

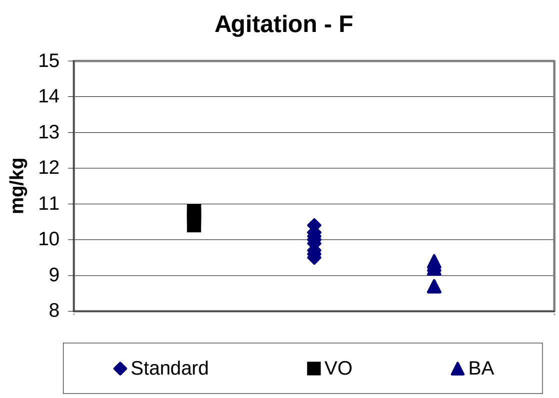
Part 2: FCM

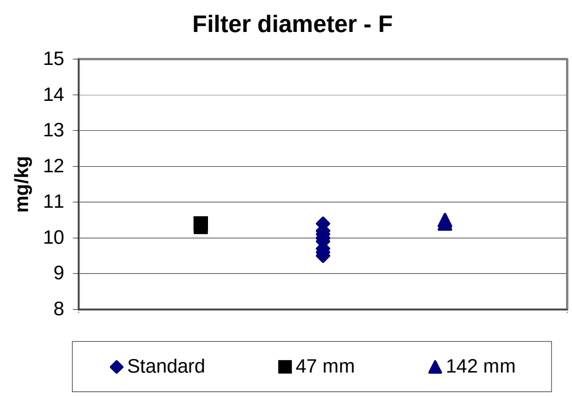

Contact time - F
mg/kg
15
14
13
12
11
10
9
8
Standard
22 hrs
26 hrs


Temperature - F
mg/kg
15
14
13
12
11
10
9
8
Standard
10 deg. C
30 deg. C

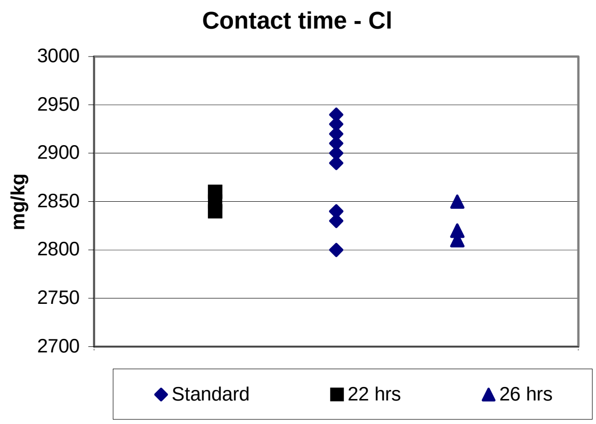

L/S ratio - F
mg/l
1,5
1,4
1,3
1,2
1,1
1
0,9
0,8
Standard
L/S = 9 l/kg
L/S = 11 l/kg

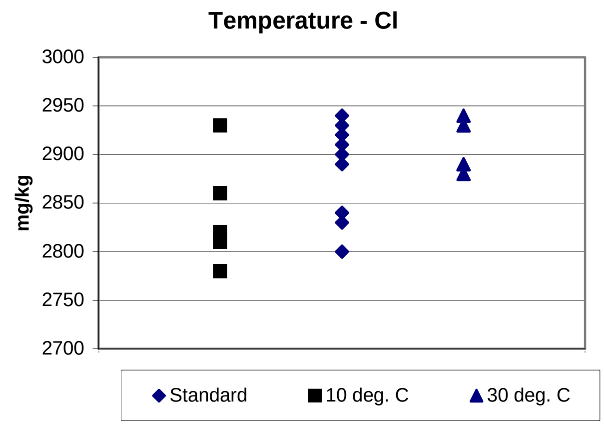

L/S ratio - F
mg/kg
15
14
13
12
11
10
9
8
Standard
L/S = 9 l/kg
L/S = 11 l/kg

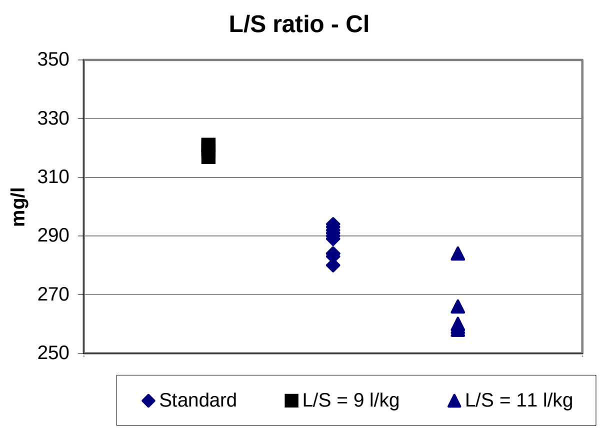

Agitation - F
mg/kg
15
14
13
12
11
10
9
8
Standard
VO
BA

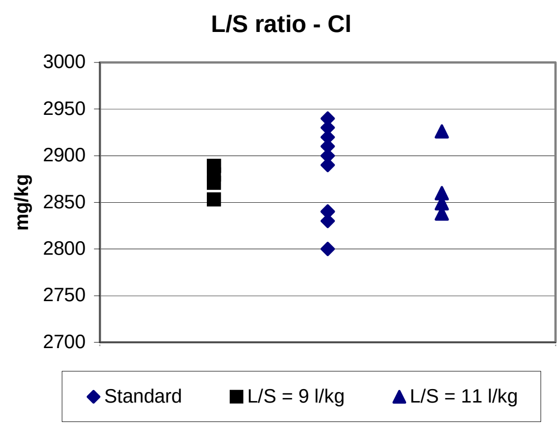

Filter diameter - F
mg/kg
15
14
13
12
11
10
9
8
Standard
47 mm
142 mm

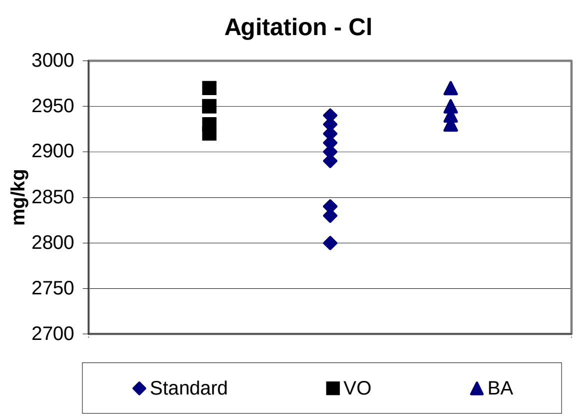
Part 2: FCM

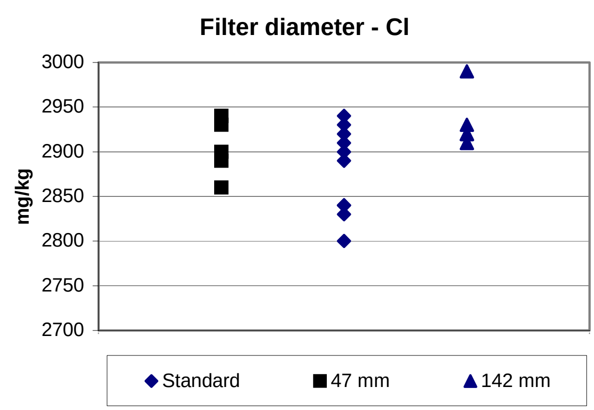

Contact time - Cl
mg/kg
3000
2950
2900
2850
2800
2750
2700
Standard
22 hrs
26 hrs


Temperature - Cl
mg/kg
3000
2950
2900
2850
2800
2750
2700
Standard
10 deg. C
30 deg. C

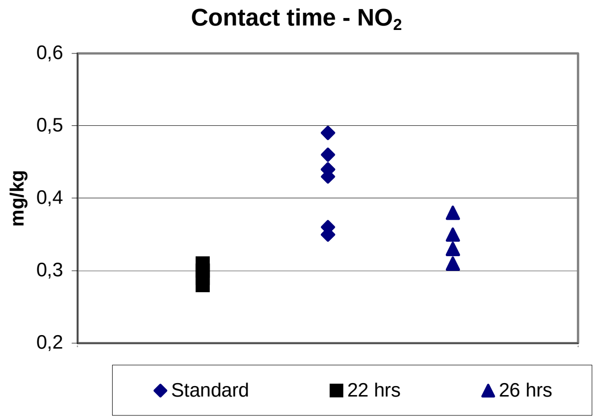

L/S ratio - Cl
mg/l
350
330
310
290
270
250
Standard
L/S = 9 l/kg
L/S = 11 l/kg

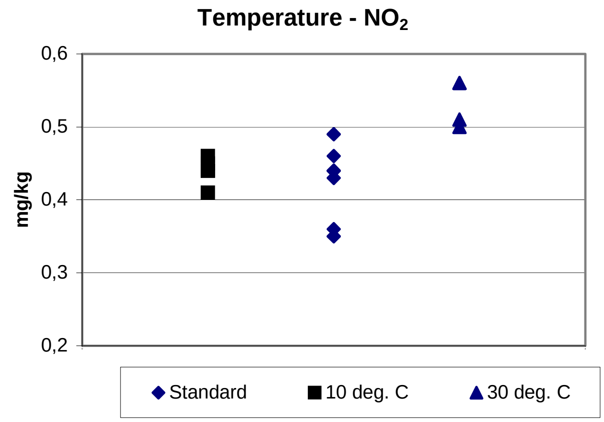

L/S ratio - Cl
mg/kg
3000
2950
2900
2850
2800
2750
2700
Standard
L/S = 9 l/kg
L/S = 11 l/kg

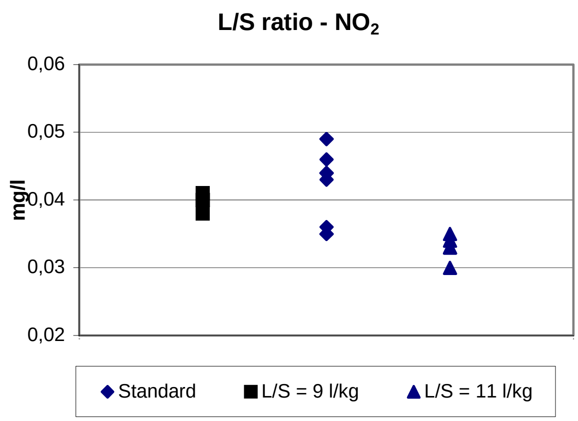

Agitation - Cl
mg/kg
3000
2950
2900
2850
2800
2750
2700
Standard
VO
BA

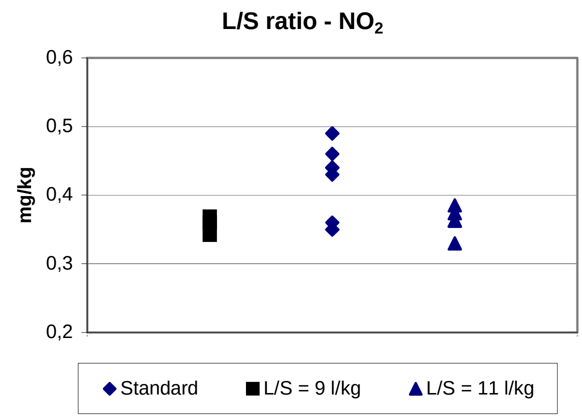

Filter diameter - Cl
mg/kg
3000
2950
2900
2850
2800
2750
2700
Standard
47 mm
142 mm

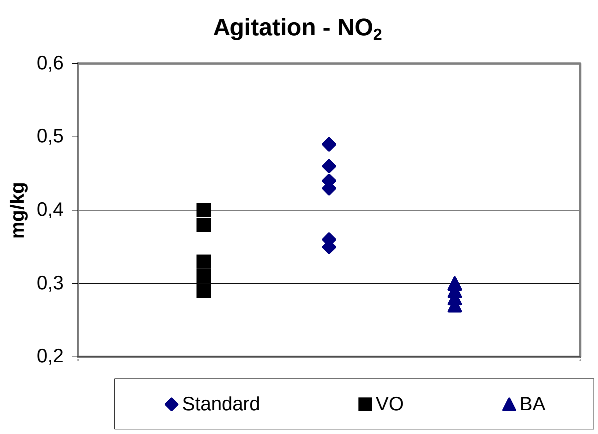
Part 2: FCM

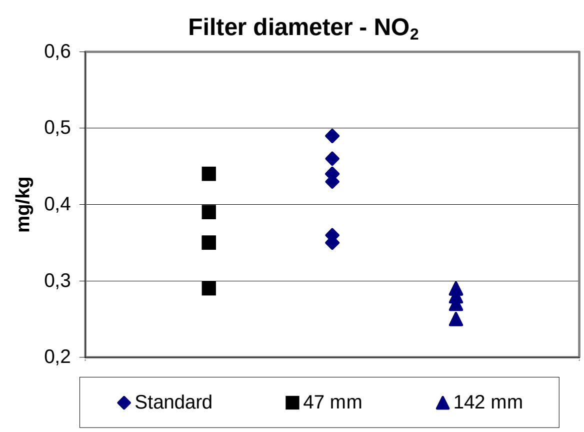

Contact time - NO_2
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
22 hrs
26 hrs


Temperature - NO_2
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
10 deg. C
30 deg. C

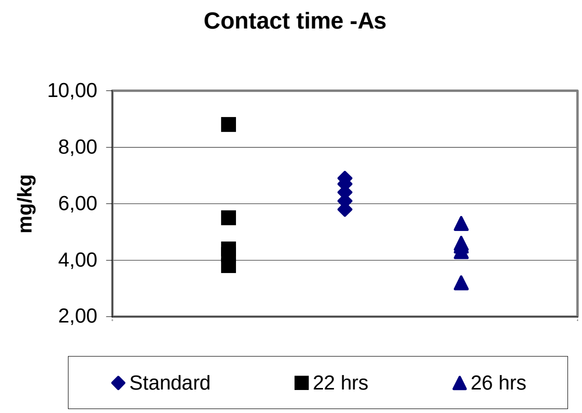

L/S ratio - NO_2
mg/l
0,06
0,05
0,04
0,03
0,02
Standard
L/S = 9 l/kg
L/S = 11 l/kg

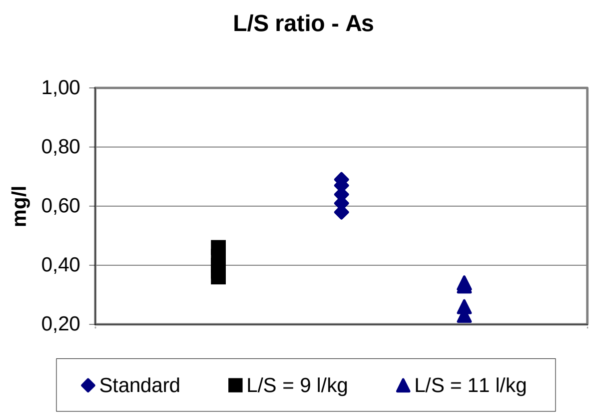

L/S ratio - NO_2
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
L/S = 9 l/kg
L/S = 11 l/kg

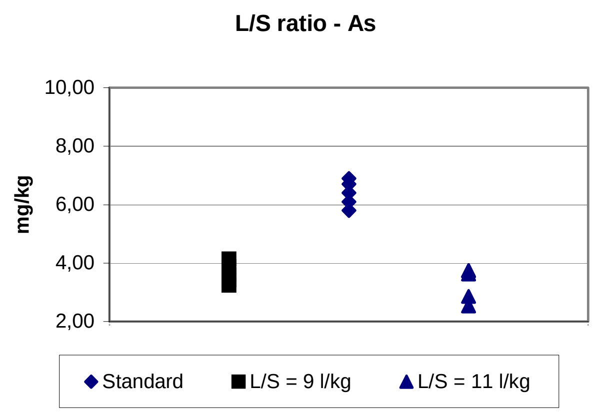

Agitation - NO_2
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
VO
BA

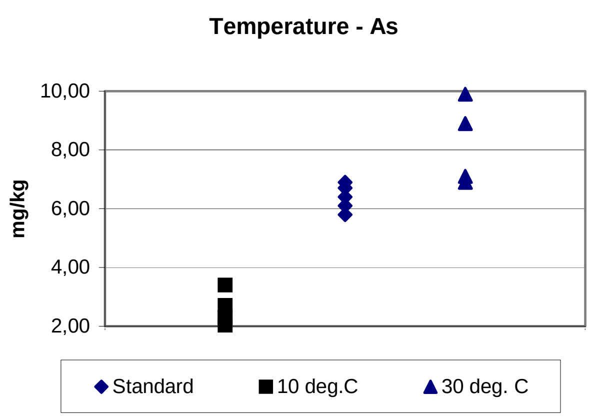

Filter diameter - NO_2
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
47 mm
142 mm

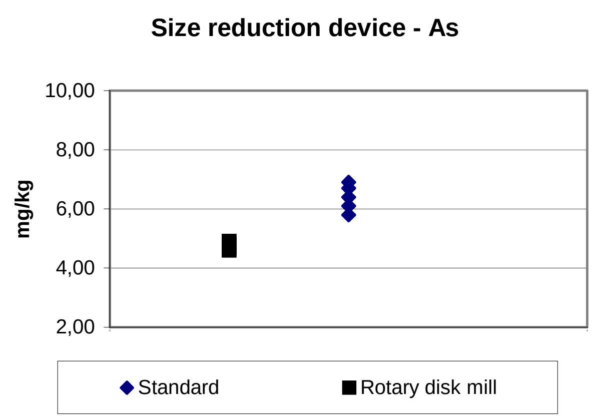
Part 2: COS


Contact time -As
mg/kg
10,00
8,00
6,00
4,00
2,00
Standard
22 hrs
26 hrs

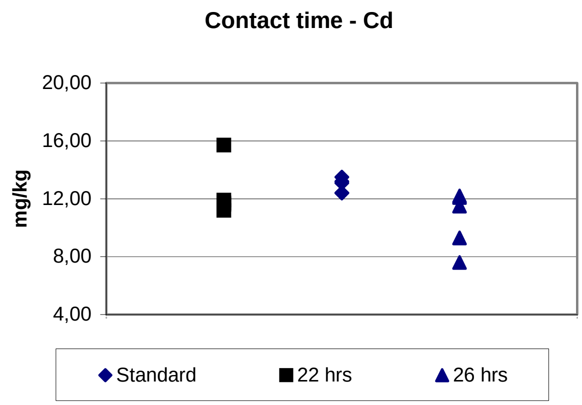

L/S ratio - As
mg/l
1,00
0,80
0,60
0,40
0,20
Standard
L/S = 9 l/kg
L/S = 11 l/kg

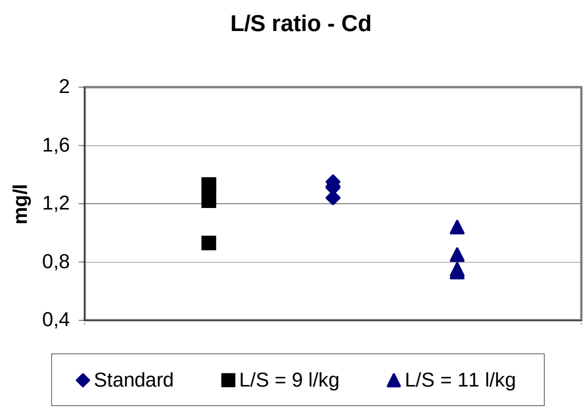

L/S ratio - As
mg/kg
10,00
8,00
6,00
4,00
2,00
Standard
L/S = 9 l/kg
L/S = 11 l/kg

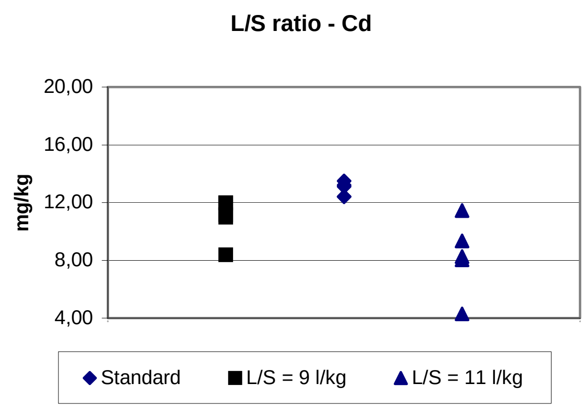

Temperature - As
mg/kg
10,00
8,00
6,00
4,00
2,00
Standard
10 deg.C
30 deg. C

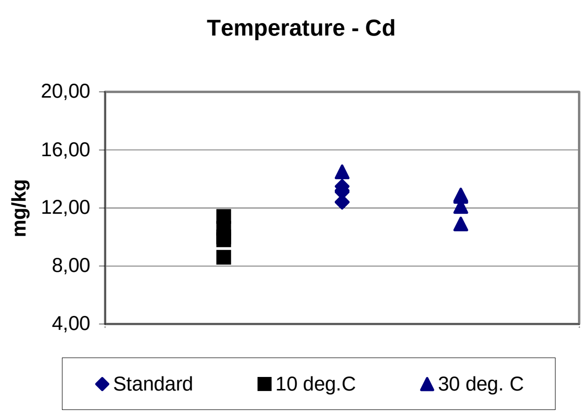

Size reduction device - As
mg/kg
10,00
8,00
6,00
4,00
2,00
Standard
Rotary disk mill

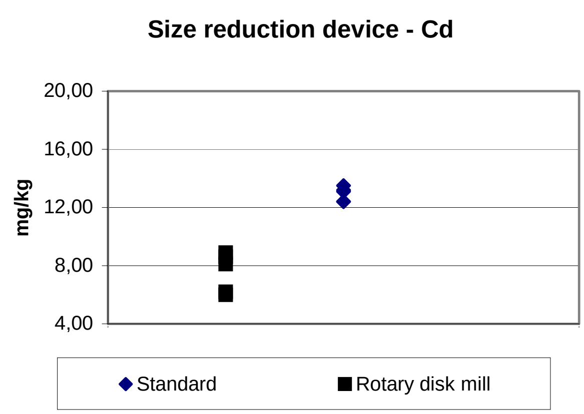
Part 2: COS


Contact time - Cd
mg/kg
20,00
16,00
12,00
8,00
4,00
Standard
22 hrs
26 hrs

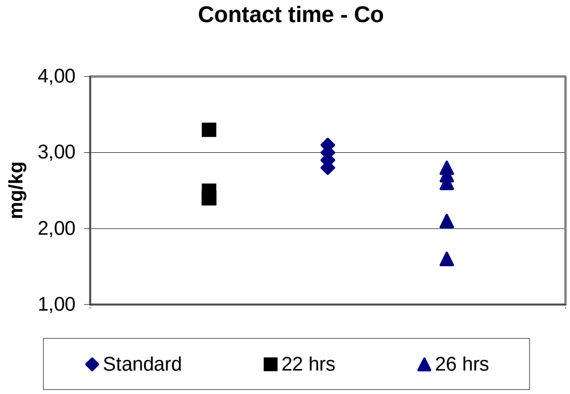

L/S ratio - Cd
mg/l
2
1,6
1,2
0,8
0,4
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Cd
mg/kg
20,00
16,00
12,00
8,00
4,00
Standard
L/S = 9 l/kg
L/S = 11 l/kg

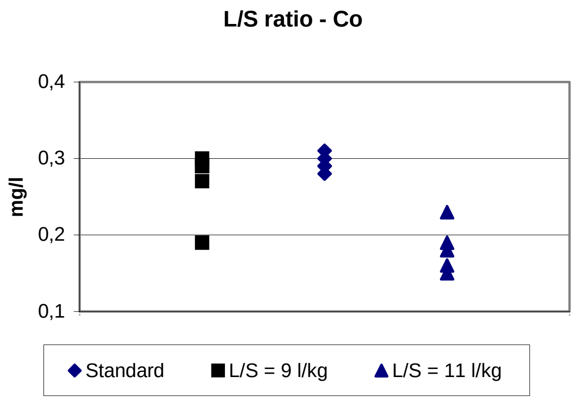

Temperature - Cd
mg/kg
20,00
16,00
12,00
8,00
4,00
Standard
10 deg.C
30 deg. C


Size reduction device - Cd
mg/kg
20,00
16,00
12,00
8,00
4,00
Standard
Rotary disk mill

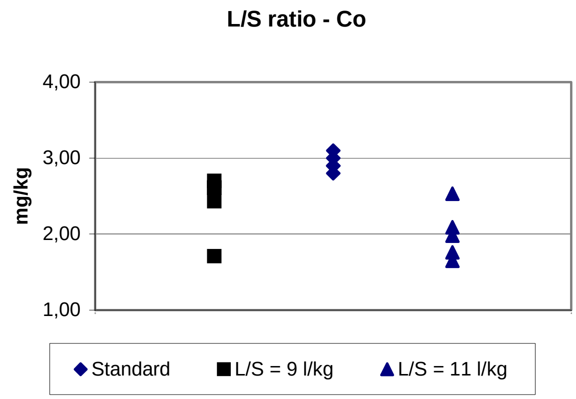
Part 2: COS



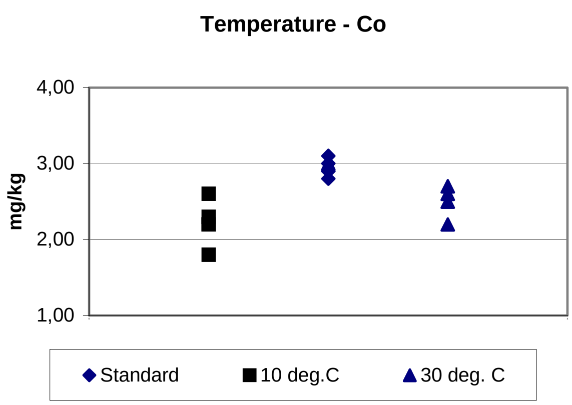
Contact time - Co
mg/kg
4,00
3,00
2,00
1,00
Standard
22 hrs
26 hrs



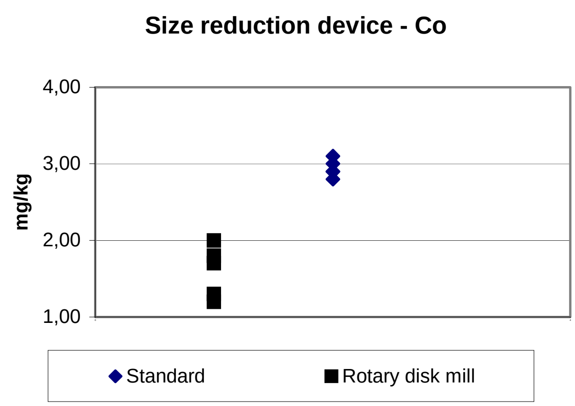
L/S ratio - Co
mg/l
0,4
0,3
0,2
0,1
Standard
L/S = 9 l/kg
L/S = 11 l/kg



L/S ratio - Co
mg/kg
4,00
3,00
2,00
1,00
Standard
L/S = 9 l/kg
L/S = 11 l/kg

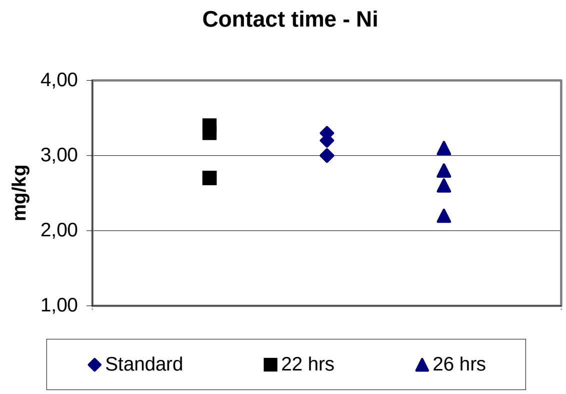


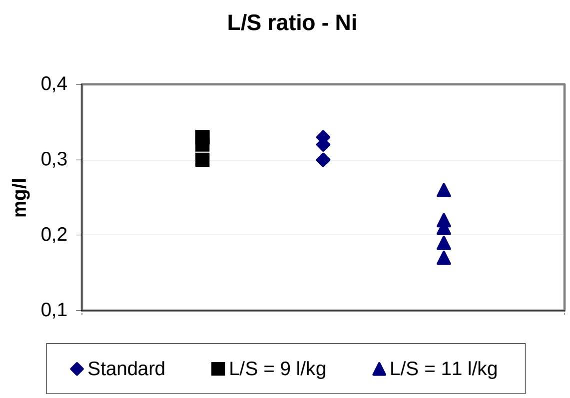
Temperature - Co
mg/kg
4,00
3,00
2,00
1,00
Standard
10 deg.C
30 deg. C

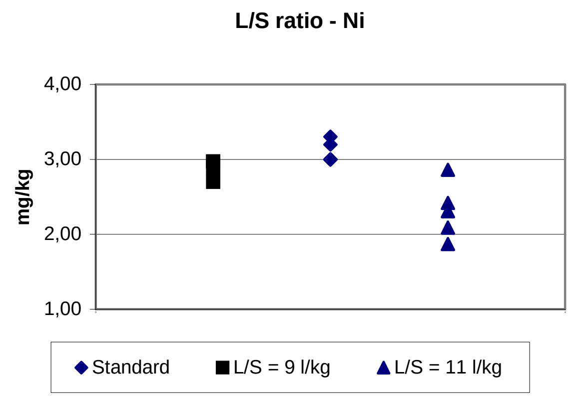


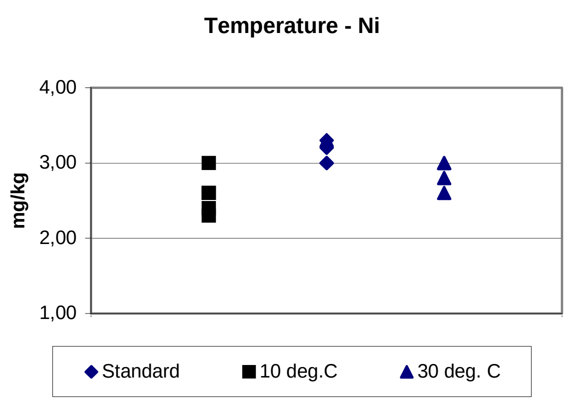
Size reduction device - Co
mg/kg
4,00
3,00
2,00
1,00
Standard
Rotary disk mill

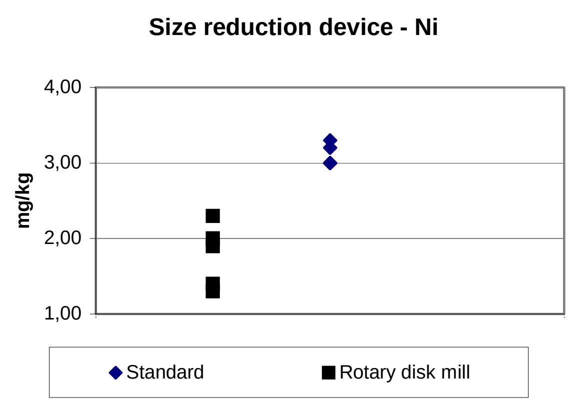
Part 2: COS


Contact time - Ni
4,00
3,00
2,00
1,00
mg/kg
Standard
22 hrs
26 hrs

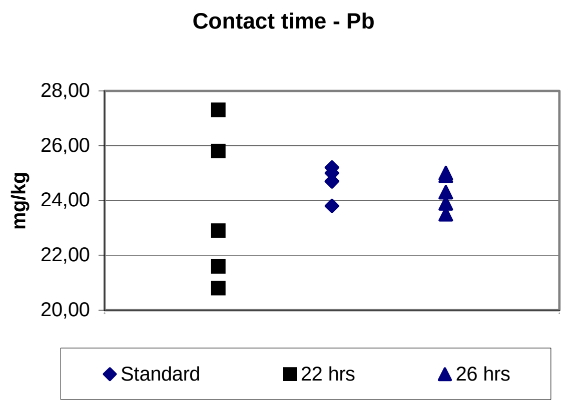

L/S ratio - Ni
0,4
0,3
0,2
0,1
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg

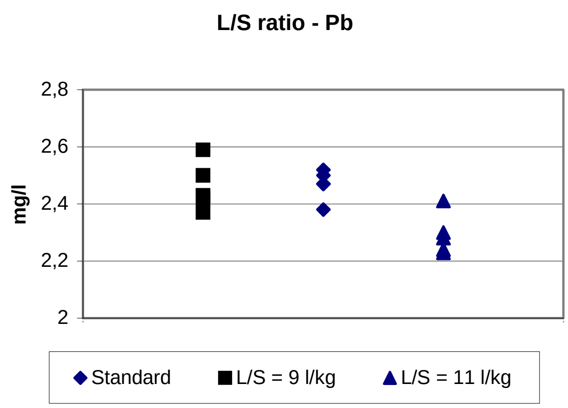

L/S ratio - Ni
4,00
3,00
2,00
1,00
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

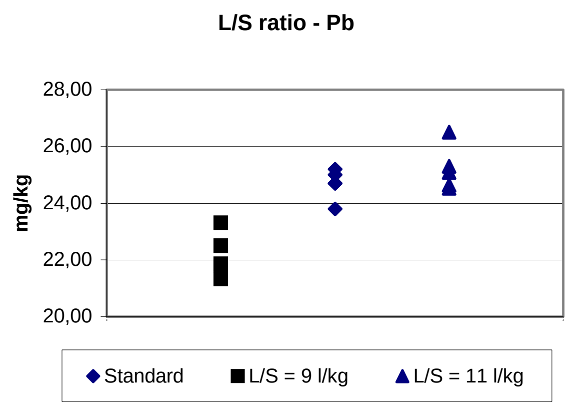

Temperature - Ni
4,00
3,00
2,00
1,00
mg/kg
Standard
10 deg.C
30 deg. C

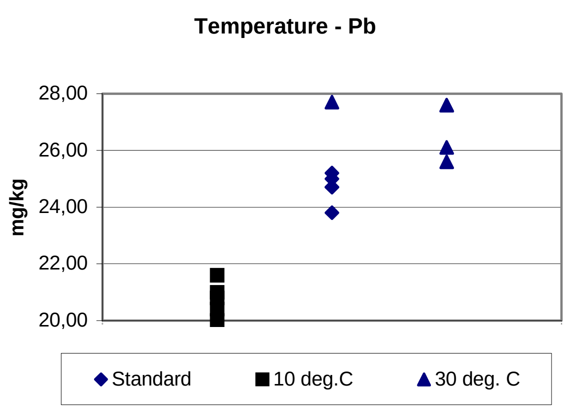

Size reduction device - Ni
4,00
3,00
2,00
1,00
mg/kg
Standard
Rotary disk mill

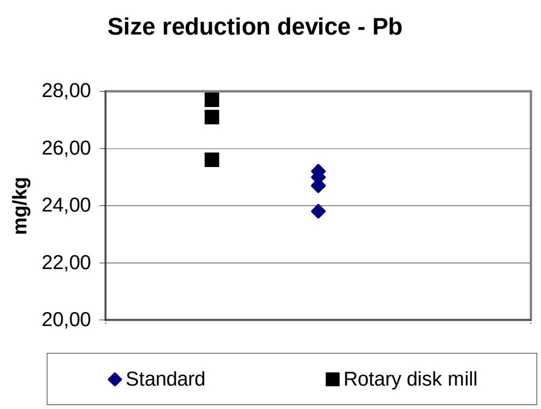
Part 2: COS


Contact time - Pb
28,00
26,00
24,00
22,00
20,00
mg/kg
Standard
22 hrs
26 hrs

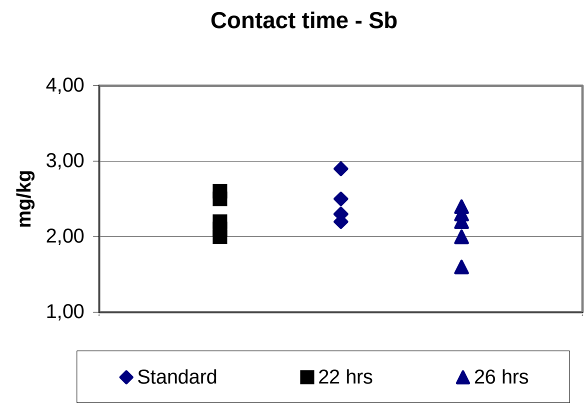

L/S ratio - Pb
2,8
2,6
2,4
2,2
2
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg

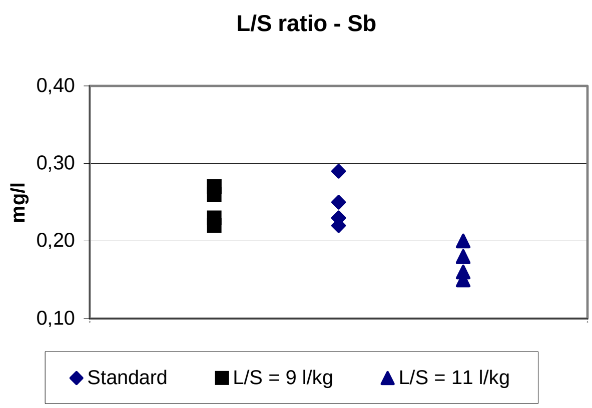

L/S ratio - Pb
28,00
26,00
24,00
22,00
20,00
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

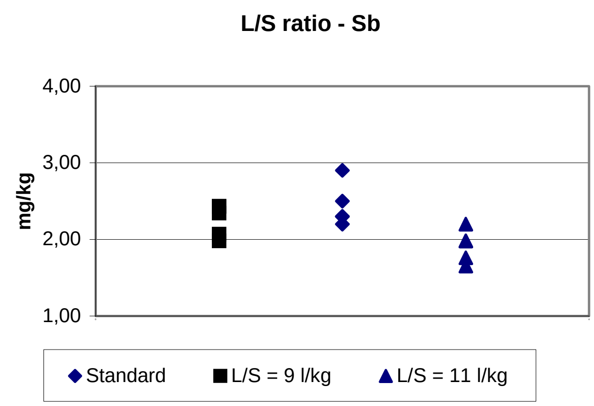

Temperature - Pb
28,00
26,00
24,00
22,00
20,00
mg/kg
Standard
10 deg.C
30 deg. C

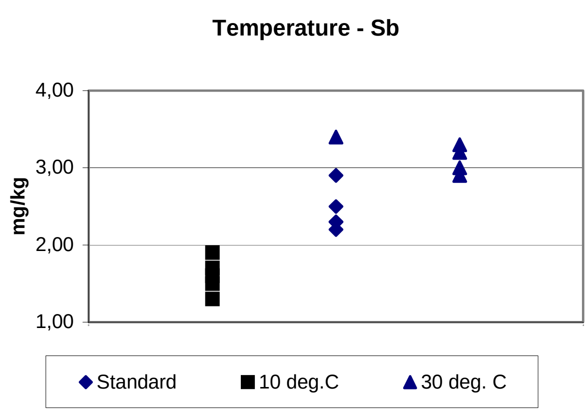

Size reduction device - Pb
28,00
26,00
24,00
22,00
20,00
mg/kg
Standard
Rotary disk mill

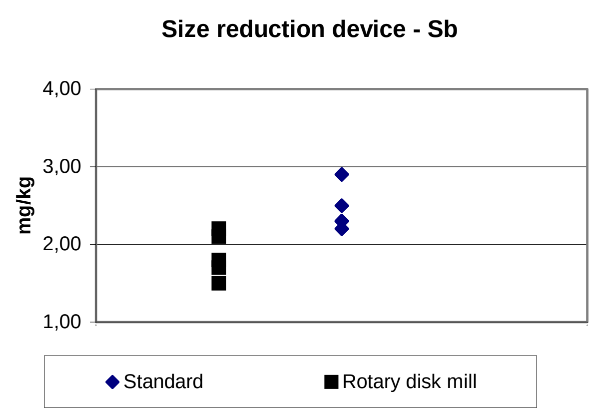
Part 2: COS

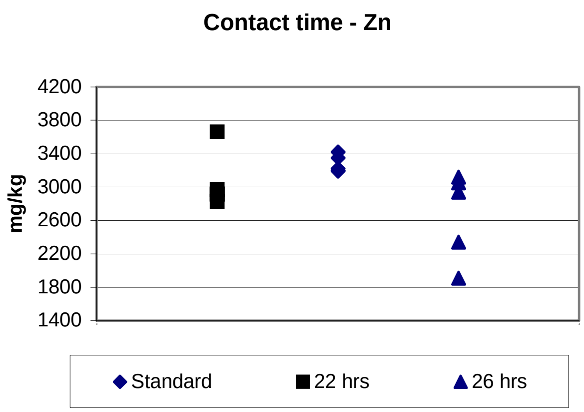

Contact time - Sb
4,00
3,00
2,00
1,00
mg/kg
Standard
22 hrs
26 hrs

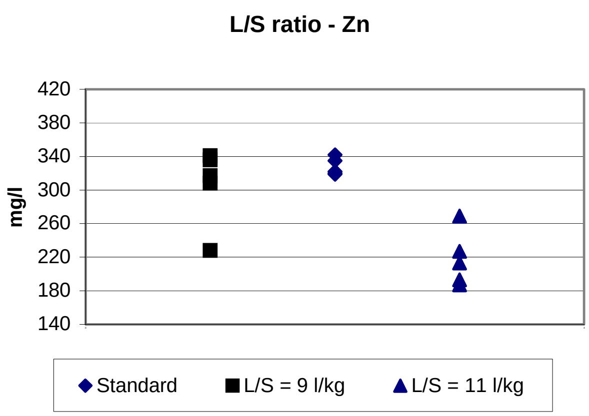

L/S ratio - Sb
0,40
0,30
0,20
0,10
mg/l
Standard
L/S = 9 l/kg
L/S = 11 l/kg

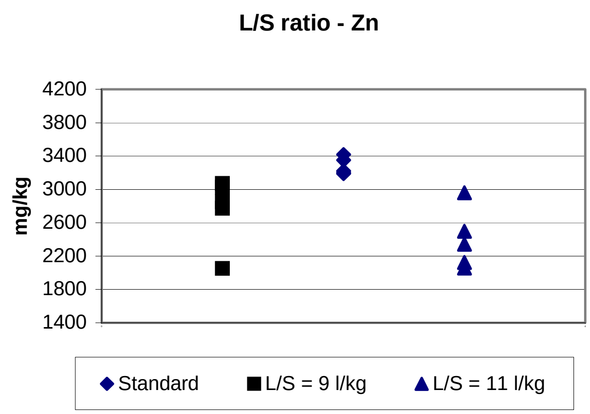

L/S ratio - Sb
4,00
3,00
2,00
1,00
mg/kg
Standard
L/S = 9 l/kg
L/S = 11 l/kg

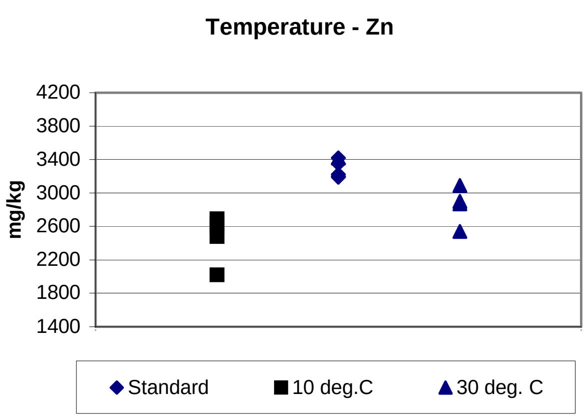

Temperature - Sb
4,00
3,00
2,00
1,00
mg/kg
Standard
10 deg.C
30 deg. C

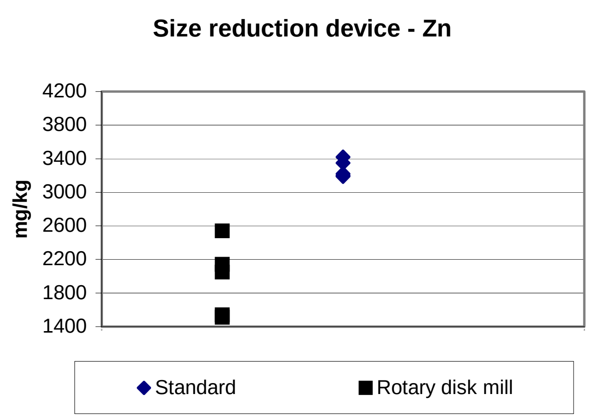

Size reduction device - Sb
4,00
3,00
2,00
1,00
mg/kg
Standard
Rotary disk mill


Contact time - Zn
mg/kg
4200
3800
3400
3000
2600
2200
1800
1400
Standard
22 hrs
26 hrs

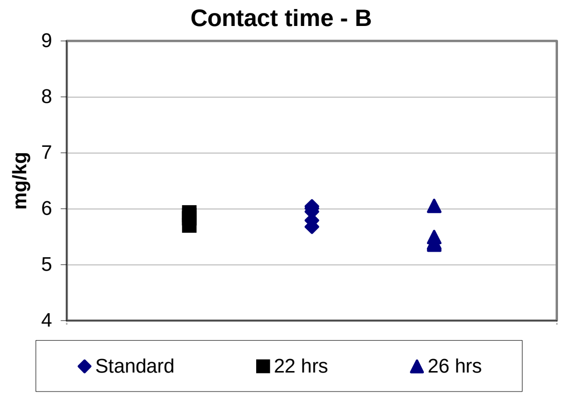

L/S ratio - Zn
mg/l
420
380
340
300
260
220
180
140
Standard
L/S = 9 l/kg
L/S = 11 l/kg


L/S ratio - Zn
mg/kg
4200
3800
3400
3000
2600
2200
1800
1400
Standard
L/S = 9 l/kg
L/S = 11 l/kg

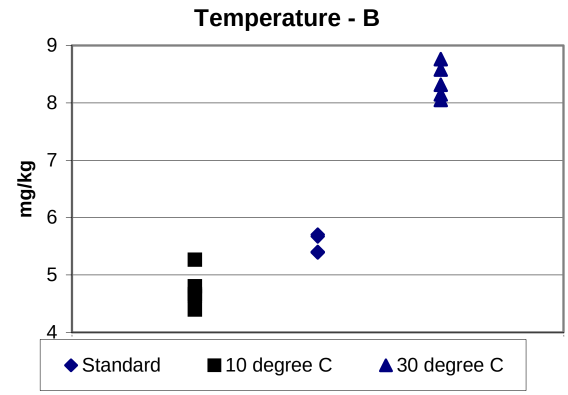

Temperature - Zn
mg/kg
4200
3800
3400
3000
2600
2200
1800
1400
Standard
10 deg.C
30 deg. C


Size reduction device - Zn
mg/kg
4200
3800
3400
3000
2600
2200
1800
1400
Standard
Rotary disk mill

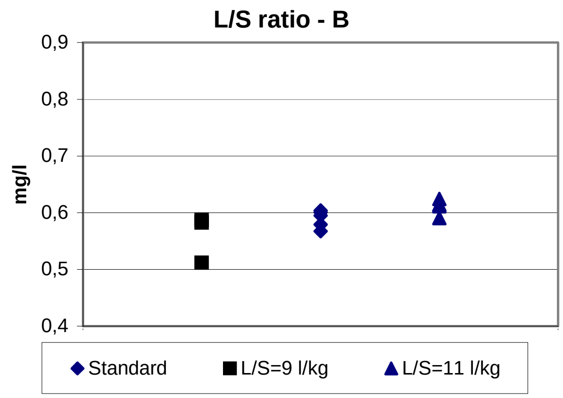
Part 2: SEW



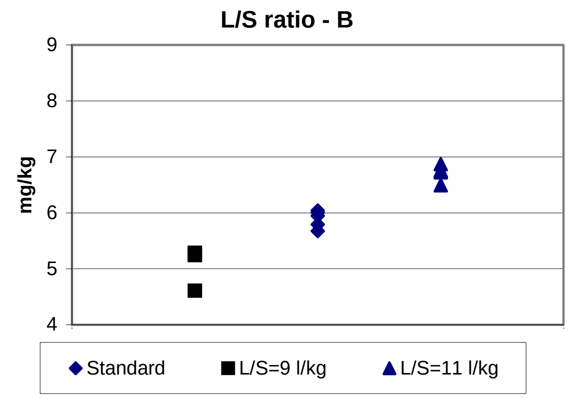
Contact time - B
mg/kg
9
8
7
6
5
4
Standard
22 hrs
26 hrs



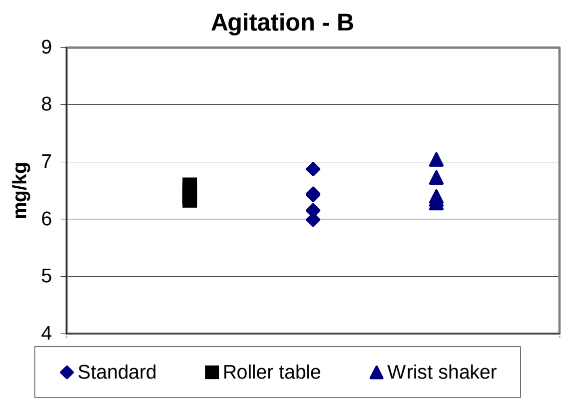
Temperature - B
mg/kg
9
8
7
6
5
4
Standard
10 degree C
30 degree C



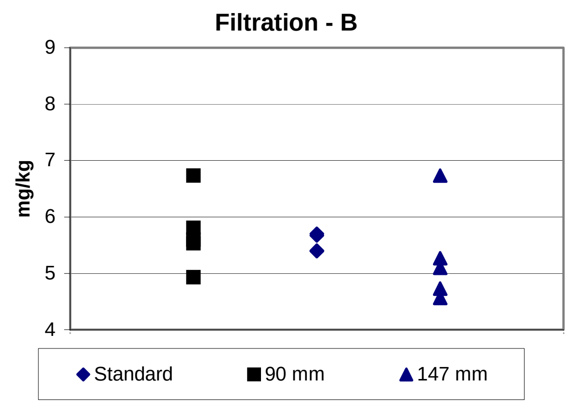
L/S ratio - B
mg/l
0,9
0,8
0,7
0,6
0,5
0,4
Standard
L/S=9 l/kg
L/S=11 l/kg



L/S ratio - B
mg/kg
9
8
7
6
5
4
Standard
L/S=9 l/kg
L/S=11 l/kg

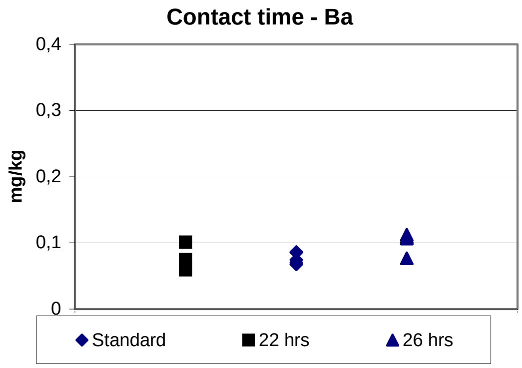


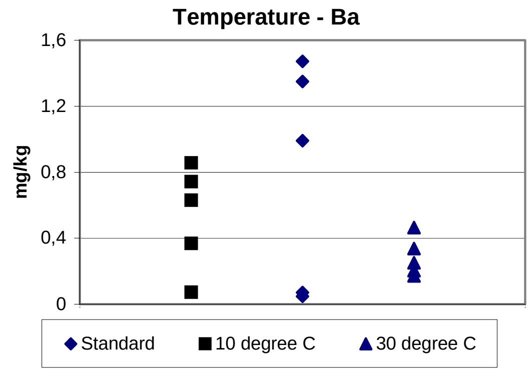
Agitation - B
mg/kg
9
8
7
6
5
4
Standard
Roller table
Wrist shaker

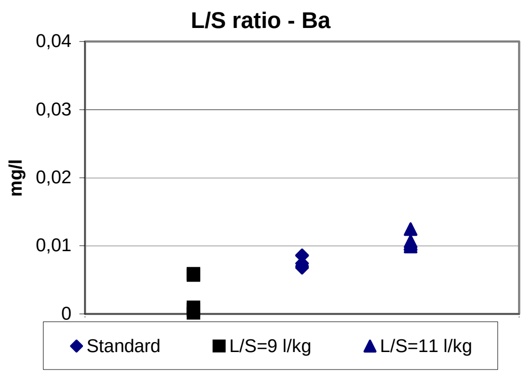


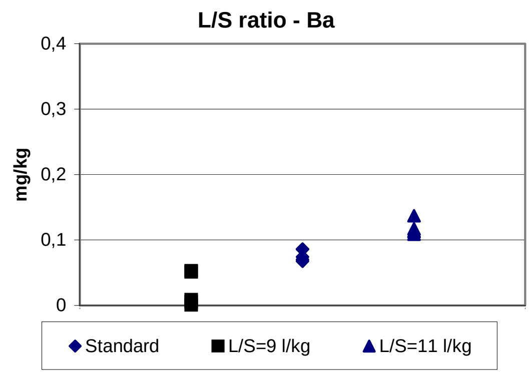
Filtration - B
mg/kg
9
8
7
6
5
4
Standard
90 mm
147 mm

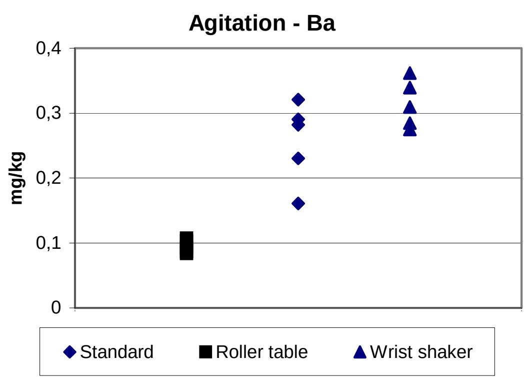
Part 2: SEW

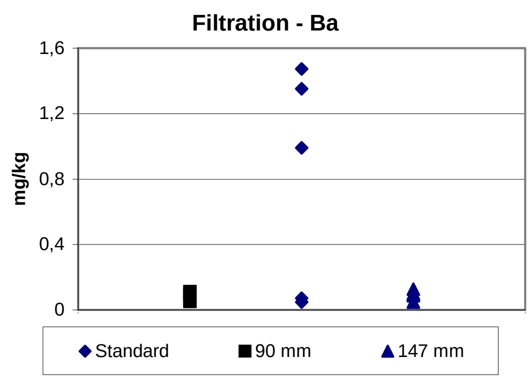

Contact time - Ba
mg/kg
0,4
0,3
0,2
0,1
0
Standard
22 hrs
26 hrs


Temperature - Ba
mg/kg
1,6
1,2
0,8
0,4
0
Standard
10 degree C
30 degree C

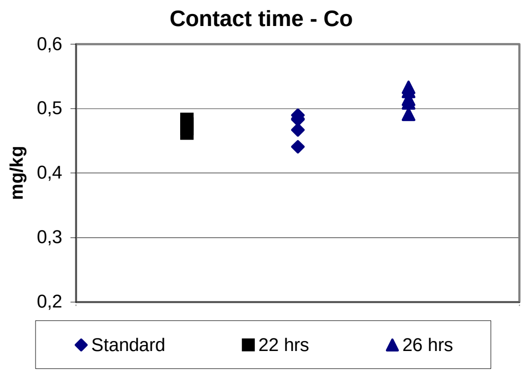

L/S ratio - Ba
mg/l
0,04
0,03
0,02
0,01
0
Standard
L/S=9 l/kg
L/S=11 l/kg

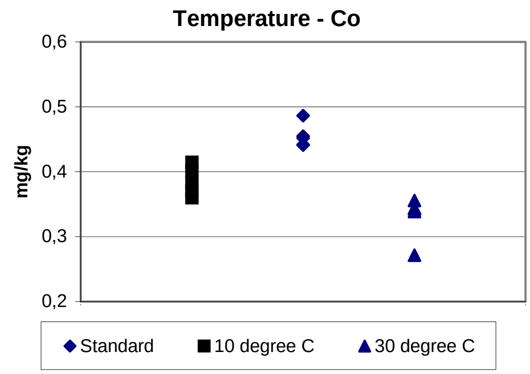

L/S ratio - Ba
mg/kg
0,4
0,3
0,2
0,1
0
Standard
L/S=9 l/kg
L/S=11 l/kg

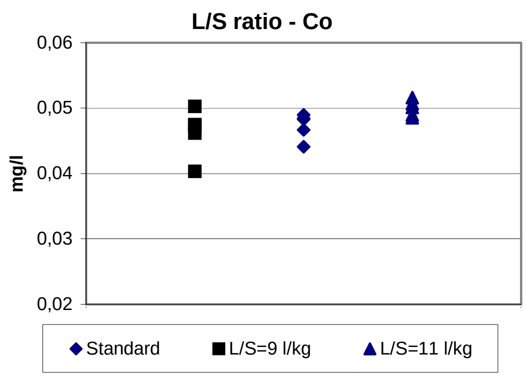

Agitation - Ba
mg/kg
0,4
0,3
0,2
0,1
0
Standard
Roller table
Wrist shaker

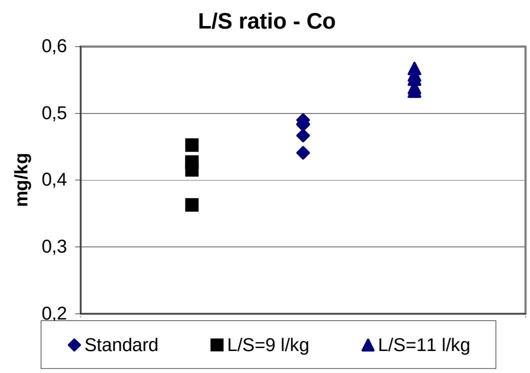

Filtration - Ba
mg/kg
1,6
1,2
0,8
0,4
0
Standard
90 mm
147 mm

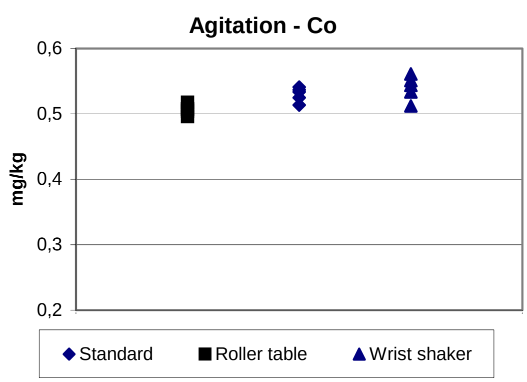
Part 2: SEW

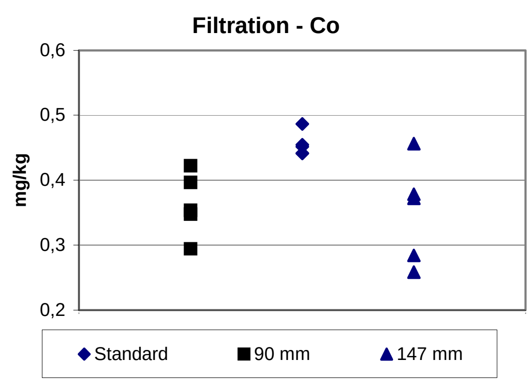

Contact time - Co
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
22 hrs
26 hrs


Temperature - Co
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
10 degree C
30 degree C

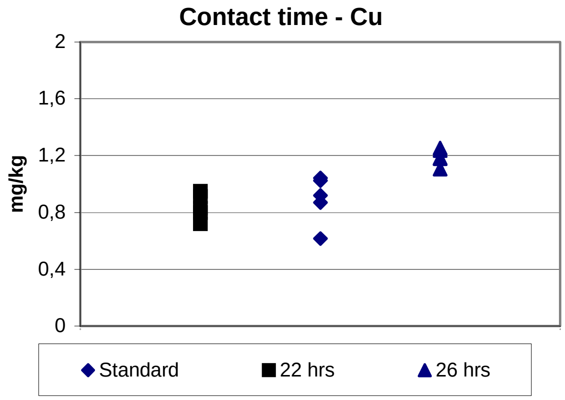

L/S ratio - Co
mg/l
0,06
0,05
0,04
0,03
0,02
Standard
L/S=9 l/kg
L/S=11 l/kg

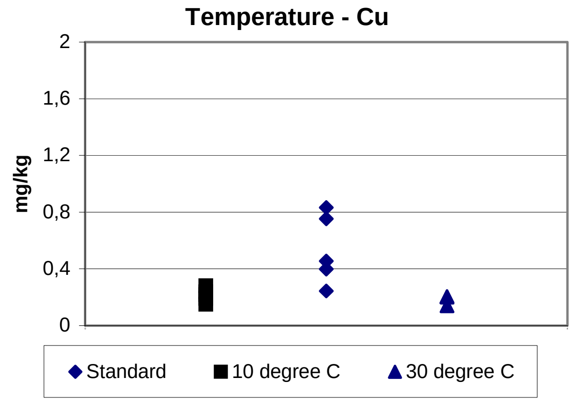

L/S ratio - Co
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
L/S=9 l/kg
L/S=11 l/kg

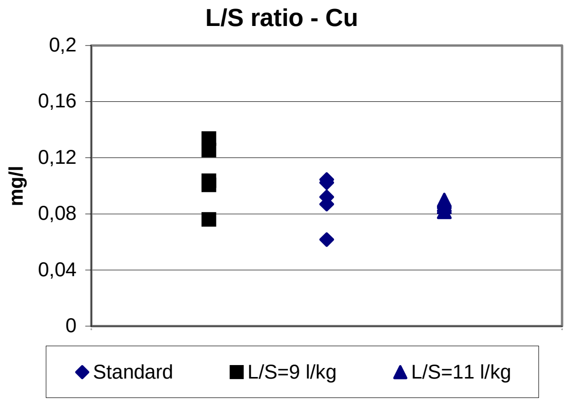

Agitation - Co
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
Roller table
Wrist shaker

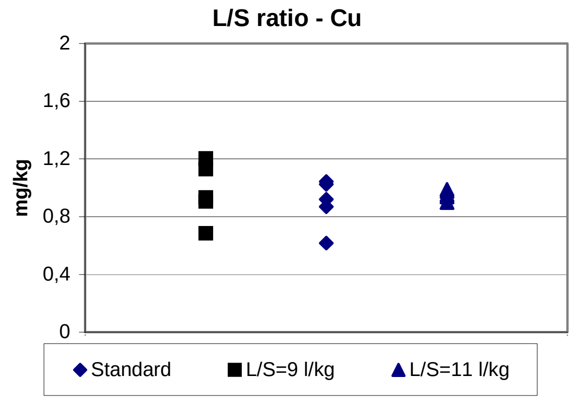

Filtration - Co
mg/kg
0,6
0,5
0,4
0,3
0,2
Standard
90 mm
147 mm

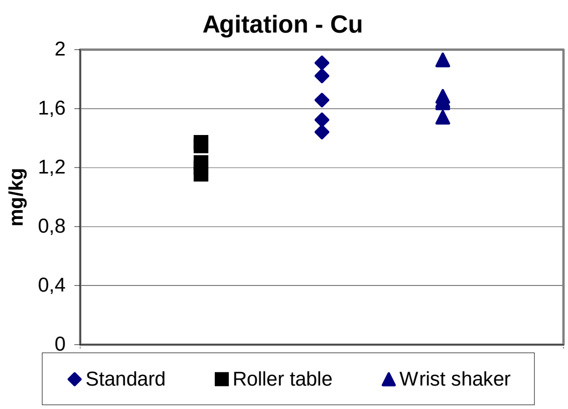
Part 2: SEW

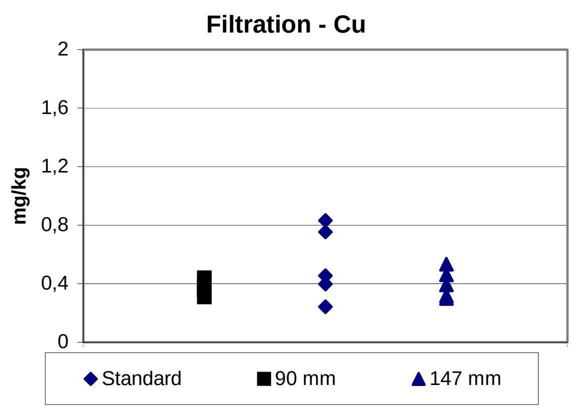

Contact time - Cu
mg/kg
2
1,6
1,2
0,8
0,4
0
Standard
22 hrs
26 hrs


Temperature - Cu
mg/kg
2
1,6
1,2
0,8
0,4
0
Standard
10 degree C
30 degree C

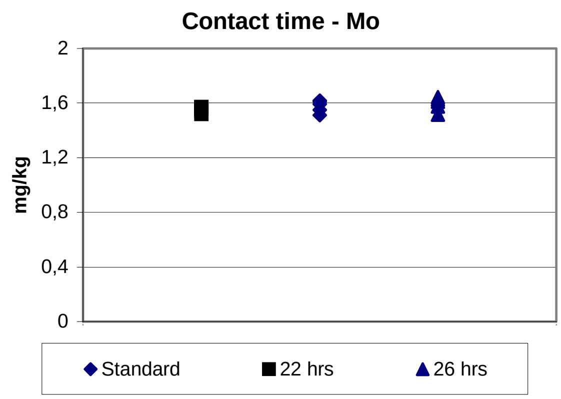

L/S ratio - Cu
mg/l
0,2
0,16
0,12
0,08
0,04
0
Standard
L/S=9 l/kg
L/S=11 l/kg

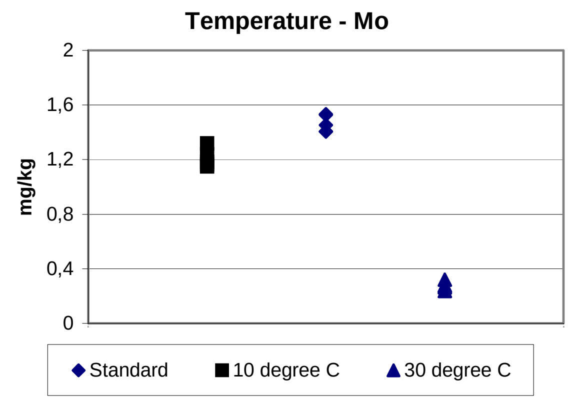

L/S ratio - Cu
mg/kg
2
1,6
1,2
0,8
0,4
0
Standard
L/S=9 l/kg
L/S=11 l/kg

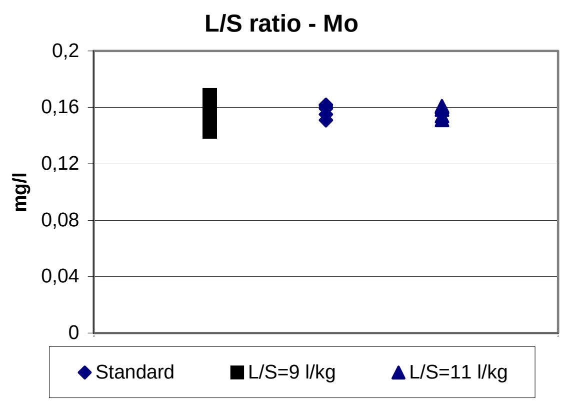

Agitation - Cu
mg/kg
2
1,6
1,2
0,8
0,4
0
Standard
Roller table
Wrist shaker

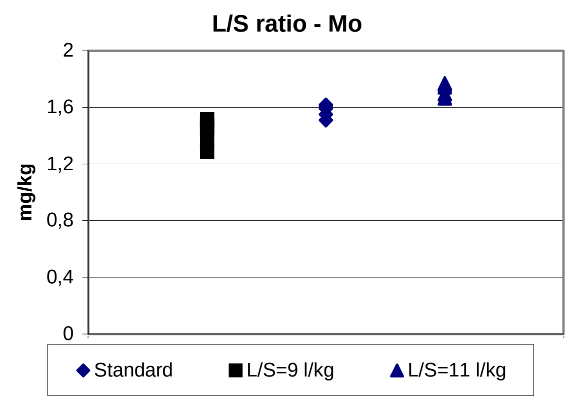

Filtration - Cu
mg/kg
2
1,6
1,2
0,8
0,4
0
Standard
90 mm
147 mm

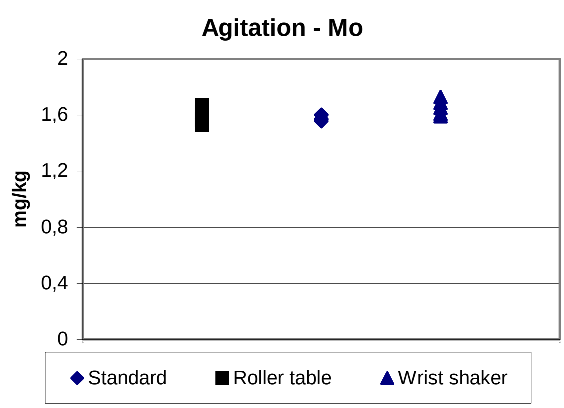
Part 2: SEW

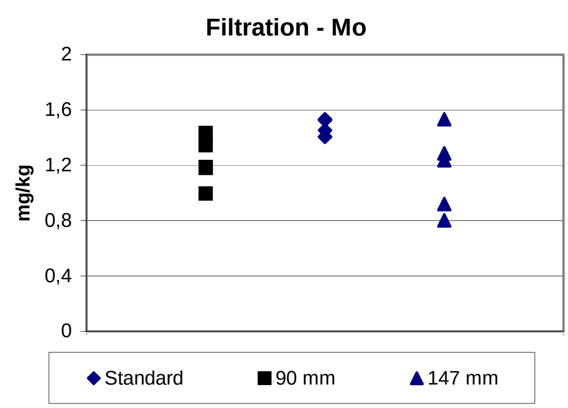

Contact time - Mo
2
1,6
1,2
0,8
0,4
0
mg/kg
Standard
22 hrs
26 hrs


Temperature - Mo
2
1,6
1,2
0,8
0,4
0
mg/kg
Standard
10 degree C
30 degree C

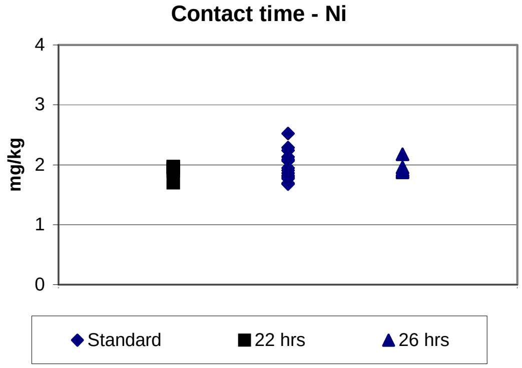

L/S ratio - Mo
0,2
0,16
0,12
0,08
0,04
0
mg/l
Standard
L/S=9 l/kg
L/S=11 l/kg


L/S ratio - Mo
2
1,6
1,2
0,8
0,4
0
mg/kg
Standard
L/S=9 l/kg
L/S=11 l/kg

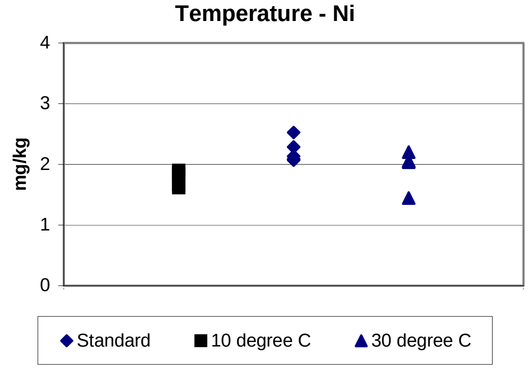

Agitation - Mo
2
1,6
1,2
0,8
0,4
0
mg/kg
Standard
Roller table
Wrist shaker


Filtration - Mo
2
1,6
1,2
0,8
0,4
0
mg/kg
Standard
90 mm
147 mm

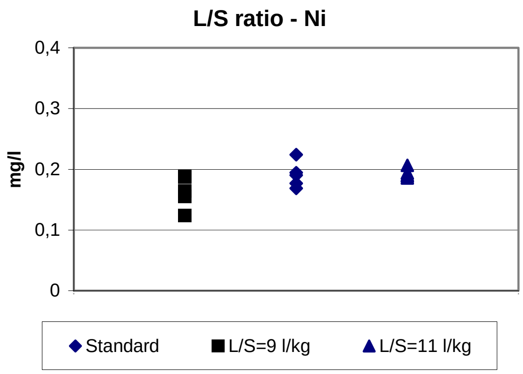
Part 2: SEW



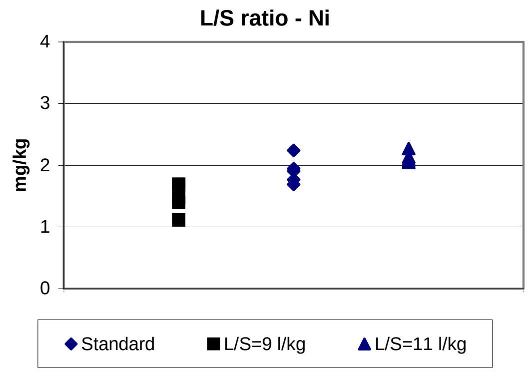
Contact time - Ni
mg/kg
4
3
2
1
0
Standard
22 hrs
26 hrs



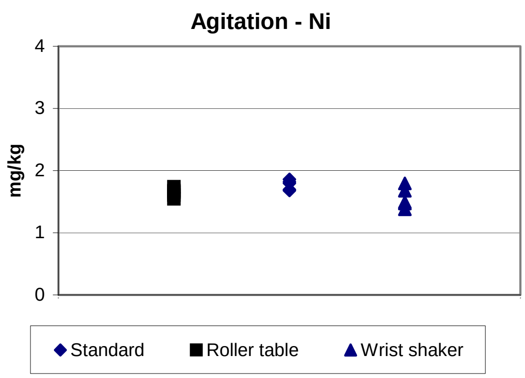
Temperature - Ni
mg/kg
4
3
2
1
0
Standard
10 degree C
30 degree C



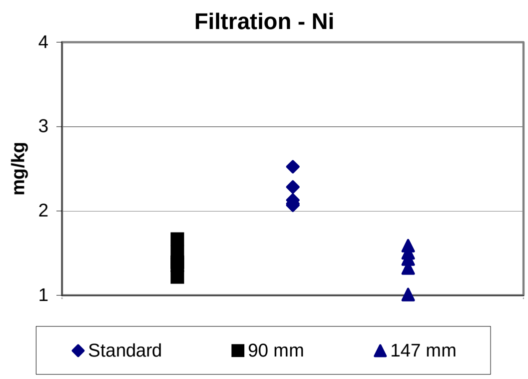
L/S ratio - Ni
mg/l
0,4
0,3
0,2
0,1
0
Standard
L/S=9 l/kg
L/S=11 l/kg



L/S ratio - Ni
mg/kg
4
3
2
1
0
Standard
L/S=9 l/kg
L/S=11 l/kg

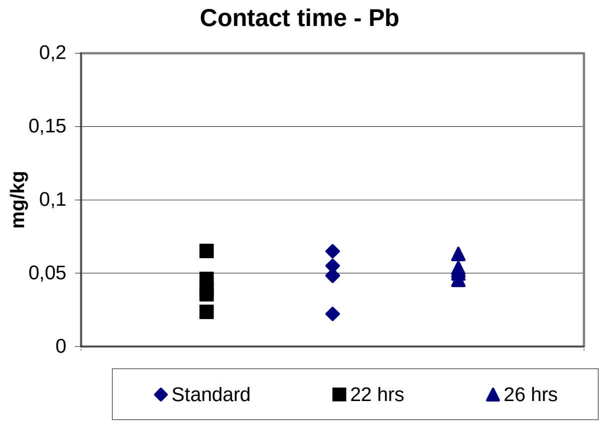


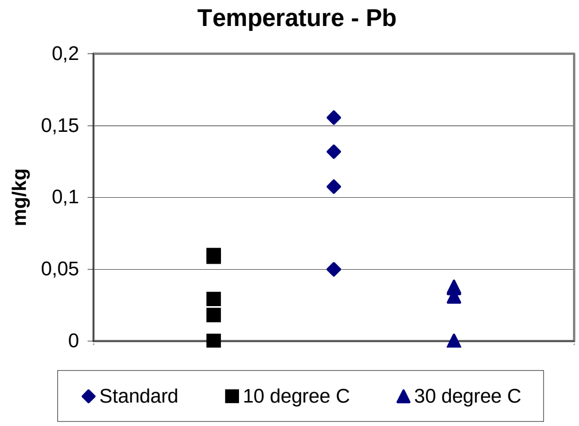
Agitation - Ni
mg/kg
4
3
2
1
0
Standard
Roller table
Wrist shaker

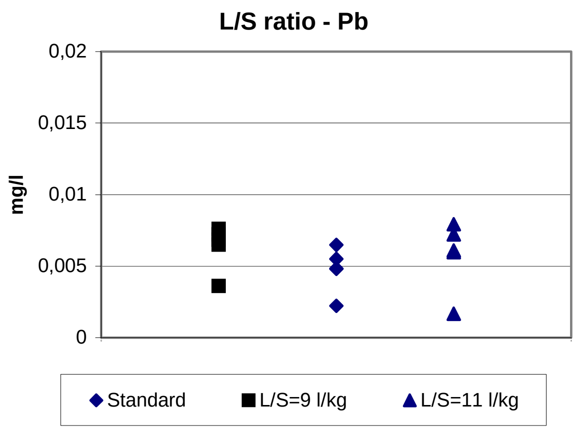


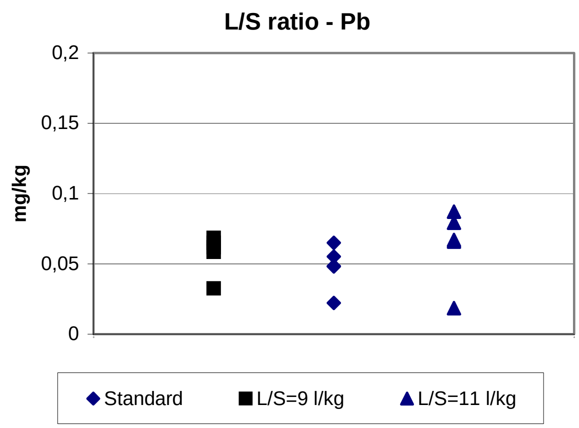
Filtration - Ni
mg/kg
4
3
2
1
Standard
90 mm
147 mm

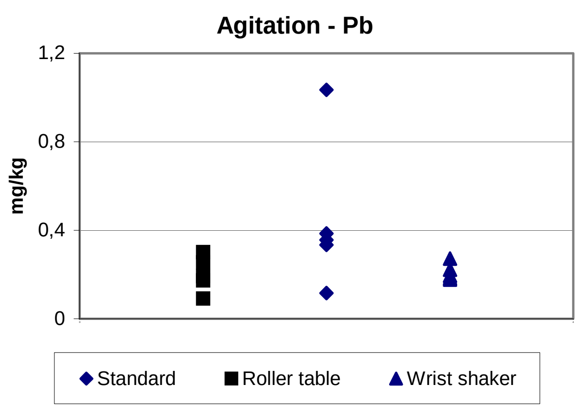
Part 2: SEW

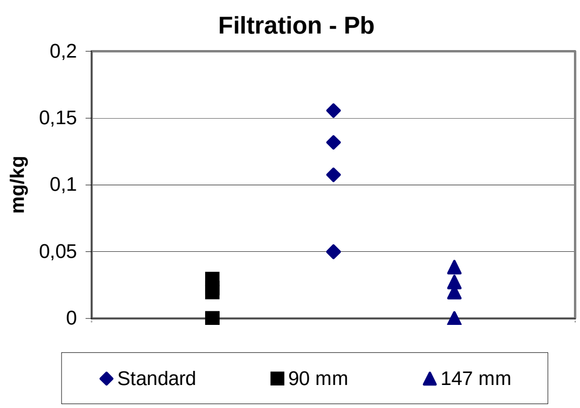

Contact time - Pb
mg/kg
0,2
0,15
0,1
0,05
0
Standard
22 hrs
26 hrs


Temperature - Pb
mg/kg
0,2
0,15
0,1
0,05
0
Standard
10 degree C
30 degree C

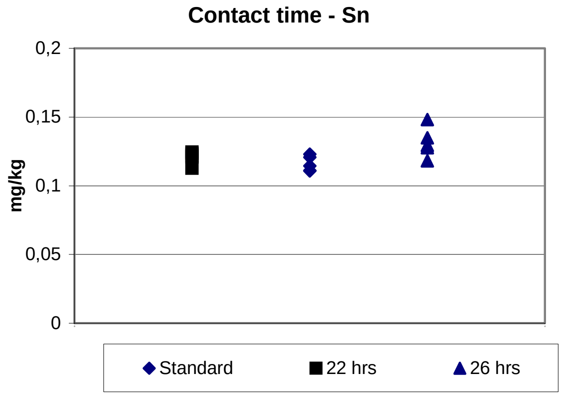

L/S ratio - Pb
mg/l
0,02
0,015
0,01
0,005
0
Standard
L/S=9 l/kg
L/S=11 l/kg

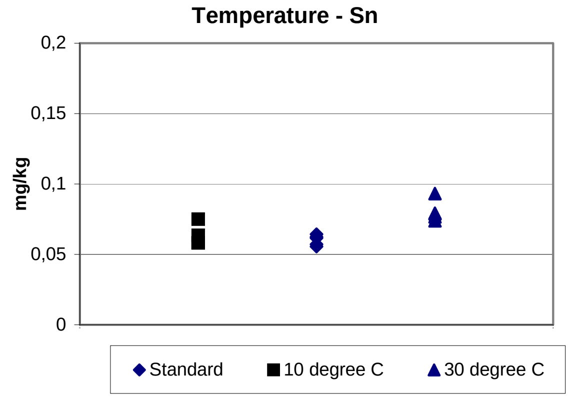

L/S ratio - Pb
mg/kg
0,2
0,15
0,1
0,05
0
Standard
L/S=9 l/kg
L/S=11 l/kg

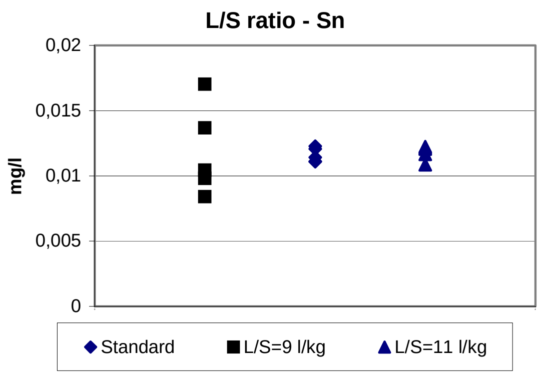

Agitation - Pb
mg/kg
1,2
0,8
0,4
0
Standard
Roller table
Wrist shaker

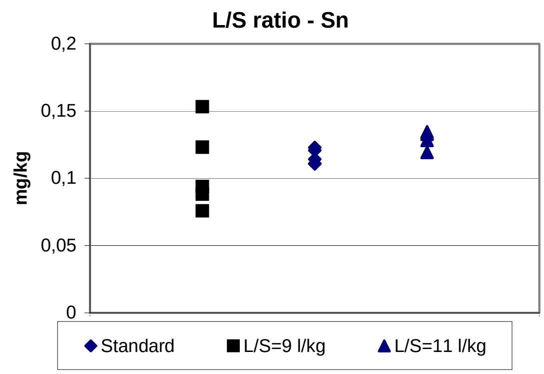

Filtration - Pb
mg/kg
0,2
0,15
0,1
0,05
0
Standard
90 mm
147 mm

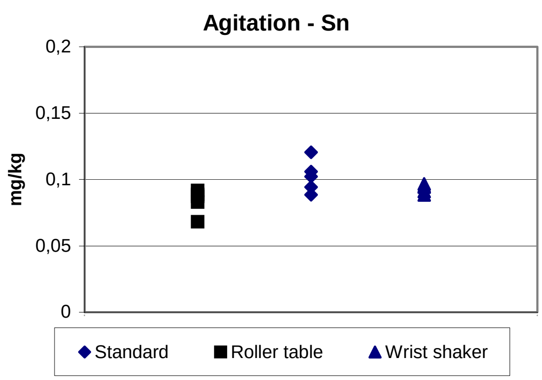
Part 2: SEW

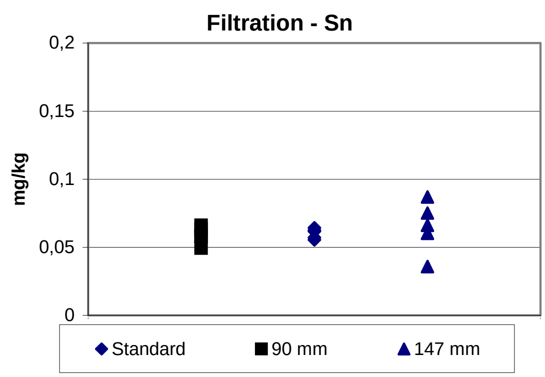

Contact time - Sn
mg/kg
0,2
0,15
0,1
0,05
0
Standard
22 hrs
26 hrs


Temperature - Sn
mg/kg
0,2
0,15
0,1
0,05
0
Standard
10 degree C
30 degree C

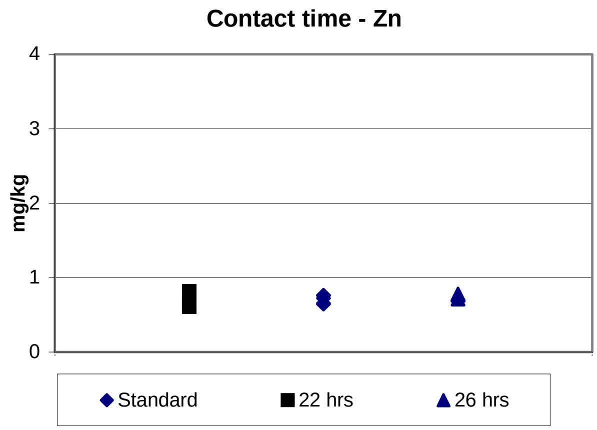

L/S ratio - Sn
mg/l
0,02
0,015
0,01
0,005
0
Standard
L/S=9 l/kg
L/S=11 l/kg

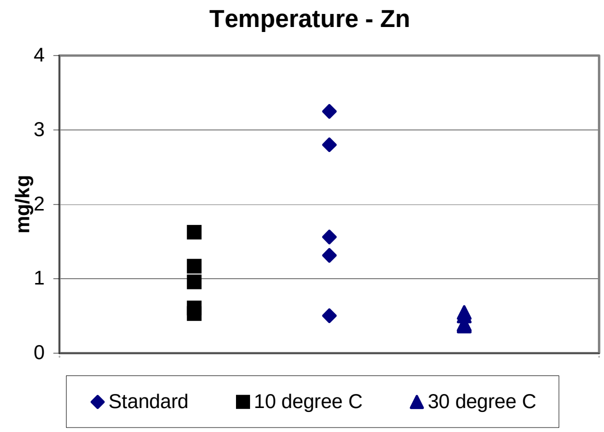

L/S ratio - Sn
mg/kg
0,2
0,15
0,1
0,05
0
Standard
L/S=9 l/kg
L/S=11 l/kg

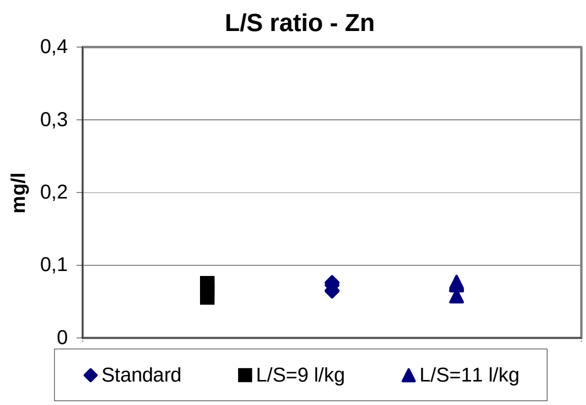

Agitation - Sn
mg/kg
0,2
0,15
0,1
0,05
0
Standard
Roller table
Wrist shaker

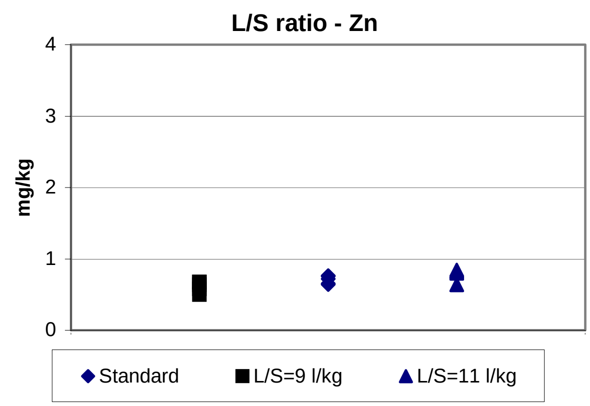

Filtration - Sn
mg/kg
0,2
0,15
0,1
0,05
0
Standard
90 mm
147 mm

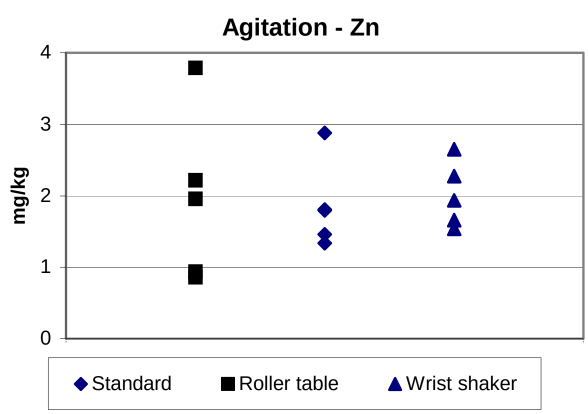
Part 2: SEW

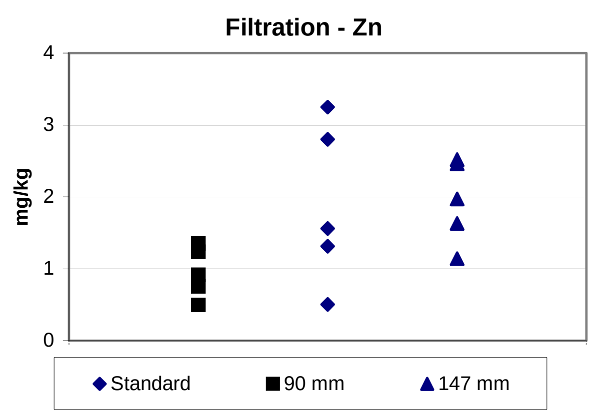

Contact time - Zn
4
3
2
1
0
mg/kg
Standard
22 hrs
26 hrs


Temperature - Zn
4
3
2
1
0
mg/kg
Standard
10 degree C
30 degree C

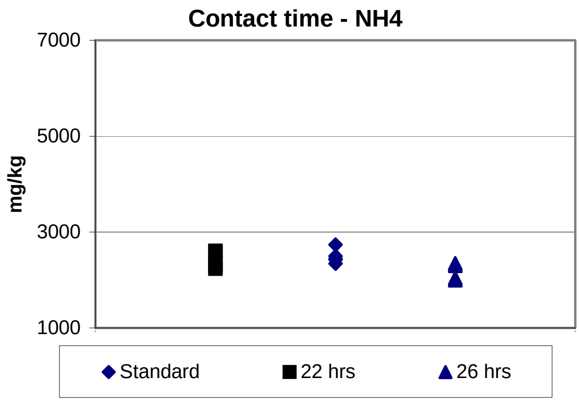

L/S ratio - Zn
0,4
0,3
0,2
0,1
0
mg/l
Standard
L/S=9 l/kg
L/S=11 l/kg


L/S ratio - Zn
4
3
2
1
0
mg/kg
Standard
L/S=9 l/kg
L/S=11 l/kg

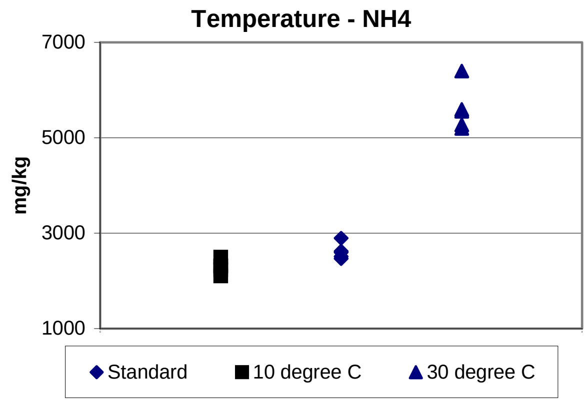

Agitation - Zn
4
3
2
1
0
mg/kg
Standard
Roller table
Wrist shaker


Filtration - Zn
4
3
2
1
0
mg/kg
Standard
90 mm
147 mm

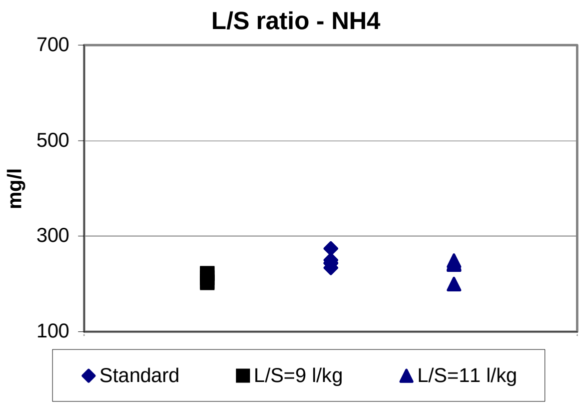
Part 2: SEW



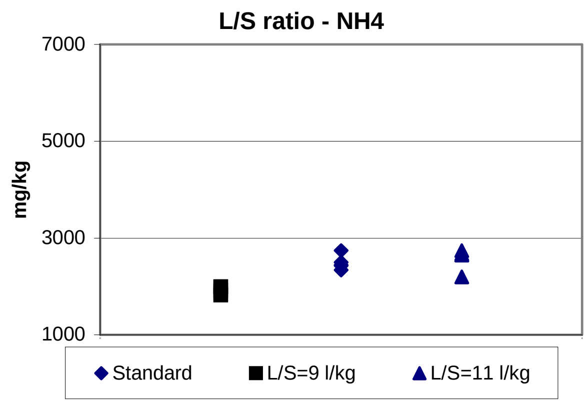
Contact time - NH4
7000
5000
3000
1000
mg/kg
Standard
22 hrs
26 hrs



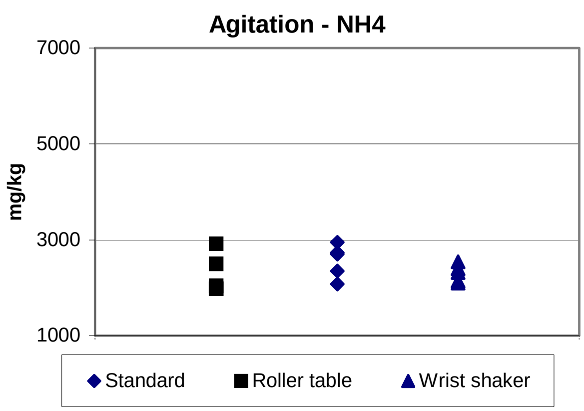
Temperature - NH4
7000
5000
3000
1000
mg/kg
Standard
10 degree C
30 degree C



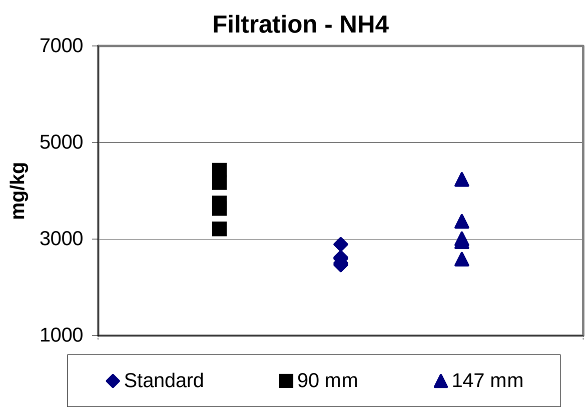
L/S ratio - NH4
700
500
300
100
mg/l
Standard
L/S=9 l/kg
L/S=11 l/kg



L/S ratio - NH4
7000
5000
3000
1000
mg/kg
Standard
L/S=9 l/kg
L/S=11 l/kg

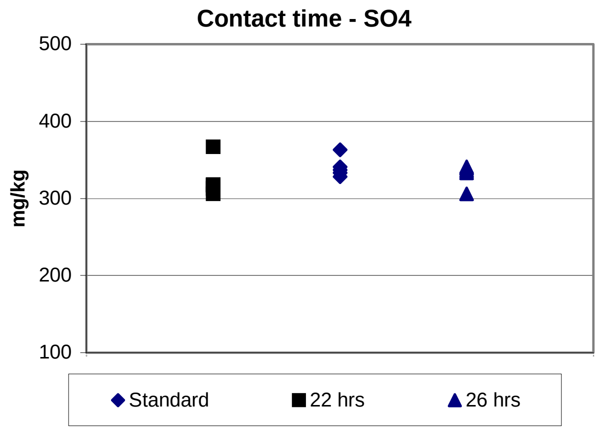


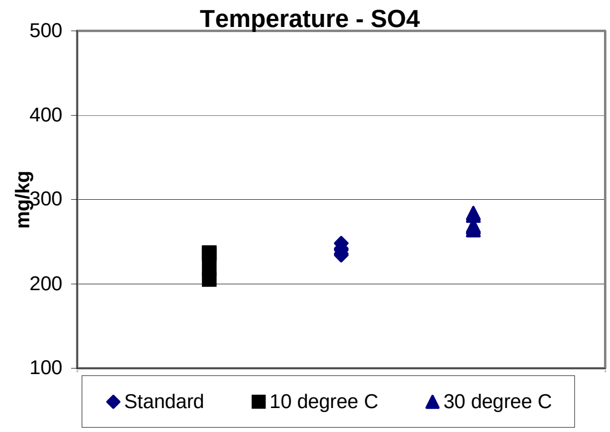
Agitation - NH4
7000
5000
3000
1000
mg/kg
Standard
Roller table
Wrist shaker

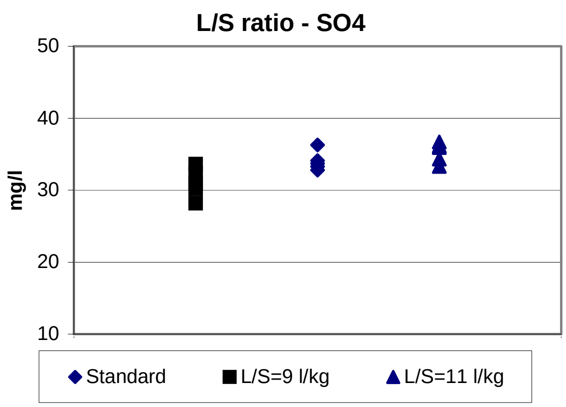


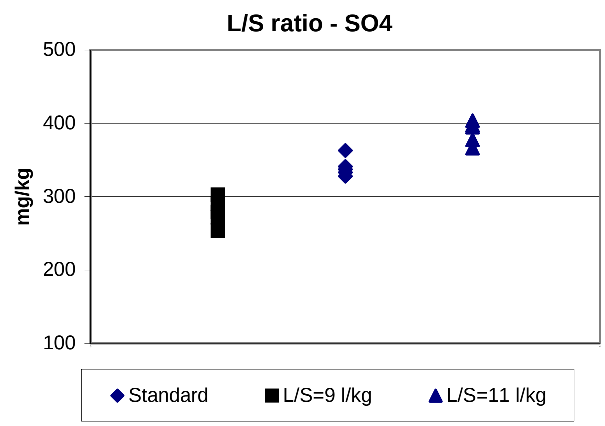
Filtration - NH4
7000
5000
3000
1000
mg/kg
Standard
90 mm
147 mm

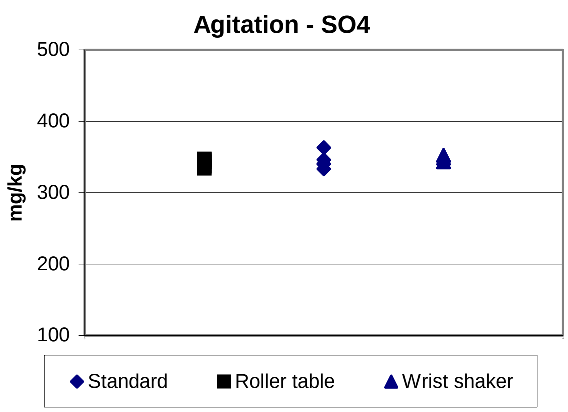
Part 2: SEW

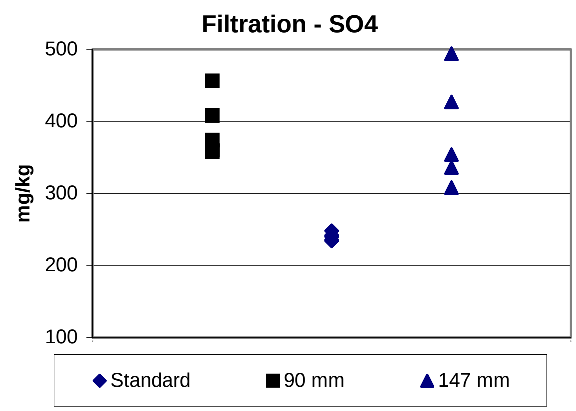

Contact time - SO4
mg/kg
500
400
300
200
100
Standard
22 hrs
26 hrs


Temperature - SO4
mg/kg
500
400
300
200
100
Standard
10 degree C
30 degree C

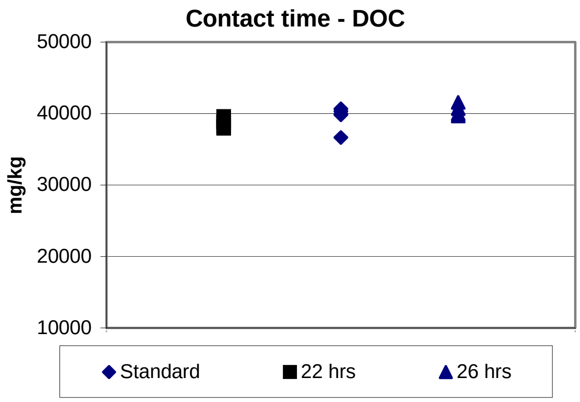

L/S ratio - SO4
mg/l
50
40
30
20
10
Standard
L/S=9 l/kg
L/S=11 l/kg

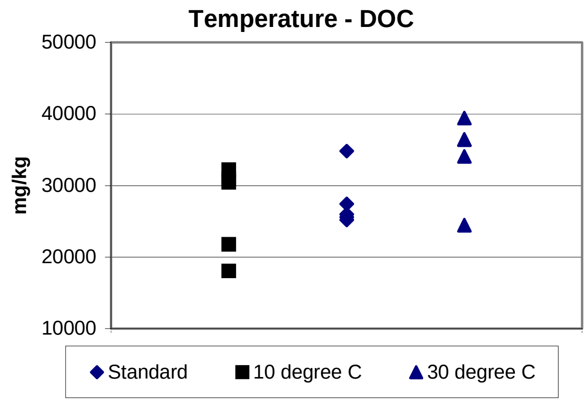

L/S ratio - SO4
mg/kg
500
400
300
200
100
Standard
L/S=9 l/kg
L/S=11 l/kg

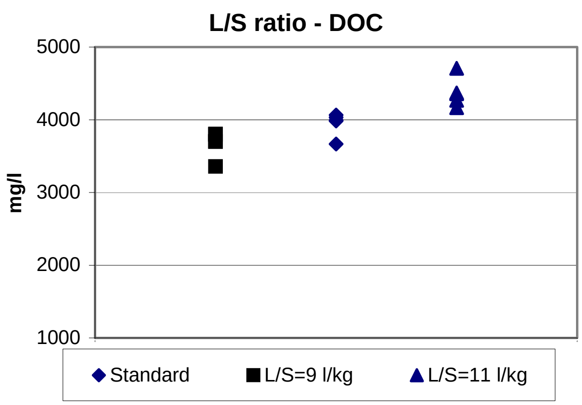

Agitation - SO4
mg/kg
500
400
300
200
100
Standard
Roller table
Wrist shaker

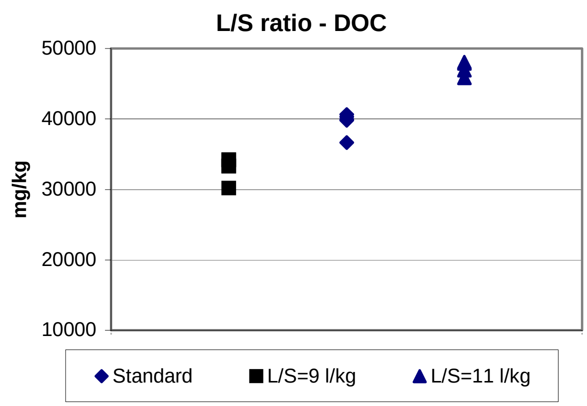

Filtration - SO4
mg/kg
500
400
300
200
100
Standard
90 mm
147 mm

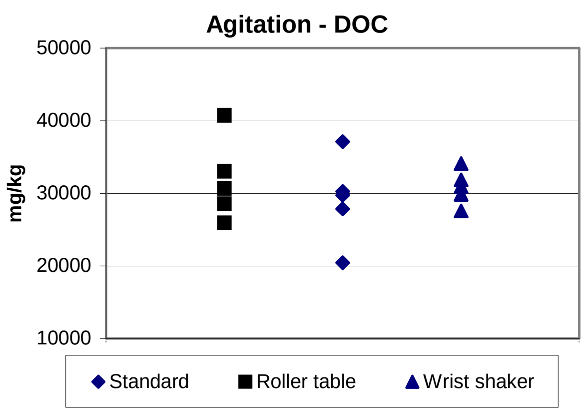
Part 2: SEW

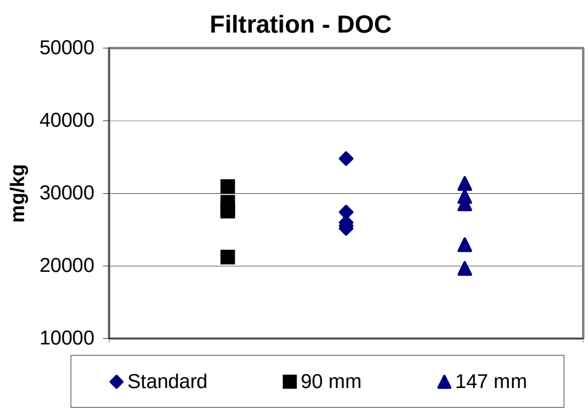

Contact time - DOC
mg/kg
50000
40000
30000
20000
10000
Standard
22 hrs
26 hrs


Temperature - DOC
mg/kg
50000
40000
30000
20000
10000
Standard
10 degree C
30 degree C


L/S ratio - DOC
mg/l
5000
4000
3000
2000
1000
Standard
L/S=9 l/kg
L/S=11 l/kg


L/S ratio - DOC
mg/kg
50000
40000
30000
20000
10000
Standard
L/S=9 l/kg
L/S=11 l/kg


Agitation - DOC
mg/kg
50000
40000
30000
20000
10000
Standard
Roller table
Wrist shaker


Filtration - DOC
mg/kg
50000
40000
30000
20000
10000
Standard
90 mm
147 mm

A P P E N D I X   1

prEN 12457 part 1: MBA

Part 1 on MBA: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.1.1

Table A.1.1. Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	Assumption of normality on entire population	Assumption of normality on reduced population	Comments
Ba	Reasonable	Fulfilled	
Cr	Not fulfilled	Reasonable	The assumption of common variance of the entire population was not reasonable. This can be concluded, as the variance of the test conditions on the reduced population is significantly lower. Therefore additional test conditions becomes significantly different from the standard conditions during the second regression analysis. This aspect is not accounted for in the estimates of the modified standard
Cu	Fulfilled	Fulfilled	
Mo	Reasonable	Reasonable	The analysis of variance on the entire population showed no significant differences between variances within test conditions and between test conditions. This is due to that only one test condition was significantly different from standard condition and only on 3% level.
Sb	Fulfilled	Fulfilled	
Zn	Doubtful	Doubtful	
S	Reasonable	Reasonable	

prEN 12457 -1 MBA

Barium

					Grubbs' test			
					Test for one outlier			
	Ba mg/l	Ba mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.24	0.47			1.390	2.482	2.29	-
STD	0.25	0.47						
STD	0.24	0.47						
STD	0.25	0.48						
STD	0.23	0.48						
STD	0.24	0.48						
STD	0.23	0.49						
STD	0.24	0.49						
STD	0.24	0.49						
STD	0.25	0.50	0.482065	0.0102944	1.509	2.482	2.29	-
C1	0.24	0.47			0.679	1.764	1.715	-
C1	0.24	0.47						
C1	0.25	0.47						
C1	0.24	0.48						
C1	0.24	0.50	0.479818	0.0119095	1.645	1.764	1.715	-
C2	0.25	0.46			1.497	1.764	1.715	-
C2	0.24	0.48						
C2	0.26	0.50						
C2	0.25	0.50						
C2	0.23	0.52	0.491497	0.0237184	1.086	1.764	1.715	-
L1	0.25	0.45			1.318	1.764	1.715	-
L1	0.26	0.45						
L1	0.26	0.46						
L1	0.25	0.46						
L1	0.25	0.46	0.45581	0.0068018	1.163	1.764	1.715	-
L2	0.23	0.48			1.564	1.764	1.715	-
L2	0.22	0.49						
L2	0.23	0.50						
L2	0.22	0.50						
L2	0.23	0.51	0.496634	0.0101186	0.924	1.764	1.715	-
W1	0.25	0.43			1.750	1.764	1.715	*
W1	0.26	0.50						
W1	0.25	0.50						
W1	0.21	0.51						
W1	0.26	0.51	0.487885	0.0354617	0.652	1.764	1.715	-
W2	0.25	0.47			0.872	1.764	1.715	-
W2	0.24	0.48						
W2	0.23	0.49						
W2	0.24	0.50						
W2	0.28	0.55	0.497513	0.0323862	1.695	1.764	1.715	-

prEN 12457 -1 Barium
MBA

					Grubbs' test			
					Test for one outlier			
	Ba mg/l	Ba mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	0.20	0.38			1.721	1.764	1.715	*
T1	0.20	0.40						
T1	0.21	0.41						
T1	0.21	0.41						
T1	0.19	0.41	0.401595	0.0145225	0.724	1.764	1.715	-
T2	0.31	0.59			1.363	1.764	1.715	-
T2	0.32	0.60						
T2	0.30	0.61						
T2	0.31	0.62						
T2	0.29	0.63	0.61104	0.018532	1.263	1.764	1.715	-
A1	0.27	0.50			1.489	1.764	1.715	-
A1	0.26	0.52						
A1	0.26	0.52						
A1	0.25	0.52						
A1	0.26	0.53	0.520033	0.0103026	1.320	1.764	1.715	-
A2	0.26	0.44			0.676	1.764	1.715	-
A2	0.23	0.44						
A2	0.22	0.45						
A2	0.22	0.47						
A2	0.22	0.51	0.463163	0.0301393	1.684	1.764	1.715	-
F1	0.22	0.45			0.891	1.764	1.715	-
F1	0.24	0.46						
F1	0.23	0.46						
F1	0.23	0.46						
F1	0.23	0.49	0.462508	0.014176	1.714	1.764	1.715	-
F2	0.24	0.47			1.177	1.764	1.715	-
F2	0.24	0.48						
F2	0.24	0.48						
F2	0.25	0.49						
F2	0.24	0.50	0.483715	0.0089484	1.277	1.764	1.715	-

prEN 12457 -1 MBA

Chromium

					Grubbs' test			
					Test for one outlier			
	Cr	Cr	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	0.0075	0.011			1.536	2.482	2.29	-
STD	0.0082	0.013						
STD	0.0066	0.013						
STD	0.0074	0.014						
STD	0.0054	0.015						
STD	0.0102	0.015						
STD	0.0063	0.016						
STD	0.0069	0.017						
STD	0.0091	0.018						
STD	0.0083	0.020	0.015179	0.002805	1.854	2.482	2.29	-
C1	0.007	0.014			1.060	1.764	1.715	-
C1	0.0069	0.014						
C1	0.0085	0.017						
C1	0.0084	0.017						
C1	0.0094	0.019	0.016067	0.0021417	1.276	1.764	1.715	-
C2	0.0068	0.012			1.130	1.764	1.715	-
C2	0.0074	0.014						
C2	0.0096	0.015						
C2	0.0076	0.015						
C2	0.0059	0.019	0.014862	0.0027104	1.568	1.764	1.715	-
L1	0.0092	0.017			1.020	1.764	1.715	-
L1	0.0101	0.017						
L1	0.011	0.018						
L1	0.0094	0.018						
L1	0.0098	0.020	0.017801	0.0012324	1.555	1.764	1.715	-
L2	0.0051	0.007			1.424	1.764	1.715	-
L2	0.0039	0.008						
L2	0.003	0.009						
L2	0.0042	0.011						
L2	0.0049	0.011	0.009261	0.0018801	1.074	1.764	1.715	-
W1	0.0164	0.030			1.074	1.764	1.715	-
W1	0.015	0.033						
W1	0.0176	0.034						
W1	0.0172	0.035						
W1	0.0213	0.043	0.034992	0.0046994	1.619	1.764	1.715	-
W2	0.0046	0.0085			0.520	1.764	1.715	-
W2	0.0043	0.0091						
W2	0.0046	0.0092						
W2	0.0045	0.0093						
W2	0.0122	0.0244	0.012117	0.0068728	1.787	1.764	1.715	**

prEN 12457 -1 Chromium
MBA

					Grubbs' test			
					Test for one outlier			
	Cr	Cr	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	0.008	0.016			1.501	1.764	1.715	-
T1	0.0092	0.017						
T1	0.0095	0.018						
T1	0.0097	0.019						
T1	0.0087	0.019	0.018035	0.0013489	0.943	1.764	1.715	-
T2	0.0046	0.007			1.272	1.764	1.715	-
T2	0.005	0.007						
T2	0.0045	0.009						
T2	0.0033	0.009						
T2	0.0036	0.010	0.008412	0.0014045	1.156	1.764	1.715	-
A1	0.0025	0.004			1.197	1.764	1.715	-
A1	0.0024	0.005						
A1	0.002	0.005						
A1	0.0034	0.006						
A1	0.0029	0.007	0.005329	0.0010727	1.453	1.764	1.715	-
A2	0.028	0.038			1.351	1.764	1.715	-
A2	0.0449	0.056						
A2	0.0353	0.064						
A2	0.0318	0.071						
A2	0.0189	0.090	0.063601	0.0191043	1.374	1.764	1.715	-
F1	0.0052	0.010			1.252	1.764	1.715	-
F1	0.0072	0.012						
F1	0.0068	0.014						
F1	0.0058	0.014						
F1	0.0082	0.016	0.01333	0.0023608	1.298	1.764	1.715	-
F2	0.006	0.010			0.919	1.764	1.715	-
F2	0.0051	0.010						
F2	0.0052	0.011						
F2	0.0062	0.012						
F2	0.0053	0.012	0.011069	0.0010117	1.228	1.764	1.715	-

prEN 12457 -1 **Copper**

MBA

					Grubbs' test			
					Test for one outlier			
	Cu	**Cu**	**mean value**	**Std dev.**		**Test parameter**		
	mg/l	**mg/kg**	**mg/kg**		**Gp**	**1%**	**5%**	**Test results**
STD	1.7	3.3			1.682	2.482	2.29	-
STD	1.9	3.5						
STD	1.7	3.5						
STD	1.9	3.5						
STD	1.6	3.6						
STD	1.9	3.7						
STD	1.8	3.7						
STD	1.7	3.7						
STD	2.0	3.8						
STD	1.9	4.0	3.61899	0.1997479	1.831	2.482	2.29	-
C1	1.7	3.4			1.026	1.764	1.715	-
C1	1.7	3.5						
C1	2.0	3.6						
C1	1.8	3.7						
C1	1.9	3.9	3.632021	0.217401	1.460	1.764	1.715	-
C2	1.8	3.4			1.178	1.764	1.715	-
C2	1.7	3.5						
C2	1.9	3.6						
C2	1.9	3.8						
C2	1.8	3.9	3.655863	0.1919441	1.130	1.764	1.715	-
L1	1.9	3.4			0.797	1.764	1.715	-
L1	1.9	3.4						
L1	2.1	3.5						
L1	2.0	3.5						
L1	1.9	3.7	3.503899	0.1344152	1.683	1.764	1.715	-
L2	1.7	3.3			0.991	1.764	1.715	-
L2	1.5	3.3						
L2	1.5	3.5						
L2	1.8	3.8						
L2	1.6	3.9	3.565035	0.2557138	1.199	1.764	1.715	-
W1	1.8	3.1			1.481	1.764	1.715	-
W1	1.8	3.5						
W1	1.9	3.6						
W1	1.6	3.7						
W1	2.0	4.0	3.602936	0.3111754	1.256	1.764	1.715	-
W2	1.8	3.4			0.599	1.764	1.715	-
W2	1.7	3.5						
W2	1.7	3.5						
W2	1.8	3.7						
W2	2.3	4.7	3.75735	0.5162407	1.759	1.764	1.715	*

prEN 12457 -1 **Copper**

MBA

					Grubbs' test			
					Test for one outlier			
	Cu	**Cu**	**mean value**	**Std dev.**		**Test parameter**		
	mg/l	**mg/kg**	**mg/kg**		**Gp**	**1%**	**5%**	**Test results**
T1	1.8	3.5			1.640	1.764	1.715	-
T1	1.8	3.6						
T1	1.8	3.6						
T1	1.8	3.6						
T1	1.8	3.6	3.580525	0.0408377	0.800	1.764	1.715	-
T2	2.0	3.5			1.269	1.764	1.715	-
T2	1.8	3.6						
T2	1.8	3.7						
T2	1.7	3.7						
T2	1.8	3.9	3.674161	0.1666932	1.523	1.764	1.715	-
A1	1.7	3.2			1.261	1.764	1.715	-
A1	1.6	3.3						
A1	1.6	3.4						
A1	1.8	3.4						
A1	1.7	3.6	3.363403	0.1540392	1.334	1.764	1.715	-
A2	1.9	3.5			1.199	1.764	1.715	-
A2	2.0	3.7						
A2	1.8	3.7						
A2	1.8	3.8						
A2	1.8	4.0	3.749974	0.1859398	1.434	1.764	1.715	-
F1	1.6	3.2			1.342	1.764	1.715	-
F1	1.7	3.3						
F1	1.7	3.4						
F1	1.7	3.5						
F1	1.7	3.5	3.384244	0.1021902	1.127	1.764	1.715	-
F2	1.8	3.2			1.355	1.764	1.715	-
F2	1.8	3.4						
F2	1.7	3.5						
F2	1.7	3.6						
F2	1.6	3.7	3.456978	0.178331	1.239	1.764	1.715	-

prEN 12457 -1 MBA

Molybdenum

	Mo mg/l	Mo mg/kg	mean value mg/kg	Std dev.	Grubbs' test: Test for one outlier Gp	Test parameter 1%	Test parameter 5%	Test results
STD	0.20	0.33			1.259	2.482	2.29	-
STD	0.18	0.34						
STD	0.17	0.34						
STD	0.18	0.34						
STD	0.17	0.36						
STD	0.18	0.36						
STD	0.17	0.36						
STD	0.17	0.36						
STD	0.19	0.38						
STD	0.18	0.39	0.356993	0.0194698	1.902	2.482	2.29	-
C1	0.17	0.33			0.848	1.764	1.715	-
C1	0.17	0.34						
C1	0.19	0.35						
C1	0.18	0.39						
C1	0.22	0.43	0.368201	0.0407565	1.526	1.764	1.715	-
C2	0.17	0.34			0.935	1.764	1.715	-
C2	0.17	0.35						
C2	0.20	0.35						
C2	0.18	0.37						
C2	0.18	0.40	0.360796	0.023641	1.616	1.764	1.715	-
L1	0.18	0.33			0.884	1.764	1.715	-
L1	0.19	0.33						
L1	0.20	0.34						
L1	0.19	0.35						
L1	0.19	0.37	0.344434	0.0140286	1.572	1.764	1.715	-
L2	0.17	0.33			0.812	1.764	1.715	-
L2	0.15	0.33						
L2	0.15	0.33						
L2	0.17	0.37						
L2	0.15	0.38	0.34659	0.0241608	1.360	1.764	1.715	-
W1	0.20	0.31			1.608	1.764	1.715	-
W1	0.21	0.36						
W1	0.18	0.40						
W1	0.15	0.41						
W1	0.20	0.42	0.378052	0.0438472	0.879	1.764	1.715	-
W2	0.18	0.33			0.787	1.764	1.715	-
W2	0.16	0.34						
W2	0.17	0.35						
W2	0.18	0.35						
W2	0.22	0.44	0.362902	0.0431417	1.736	1.764	1.715	*

prEN 12457 -1 **Molybdenum**

MBA

					Grubbs' test			
					Test for one outlier			
	Mo	Mo	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	0.17	0.34			1.122	1.764	1.715	-
T1	0.17	0.34						
T1	0.17	0.35						
T1	0.17	0.35						
T1	0.18	0.35	0.344277	0.0067508	1.203	1.764	1.715	-
T2	0.18	0.34			1.197	1.764	1.715	-
T2	0.17	0.34						
T2	0.18	0.35						
T2	0.17	0.35						
T2	0.18	0.37	0.350227	0.0104895	1.471	1.764	1.715	-
A1	0.22	0.32			0.811	1.764	1.715	-
A1	0.16	0.33						
A1	0.17	0.34						
A1	0.18	0.36						
A1	0.17	0.44	0.359168	0.0449933	1.691	1.764	1.715	-
A2	0.18	0.29			0.921	1.764	1.715	-
A2	0.18	0.30						
A2	0.15	0.31						
A2	0.15	0.36						
A2	0.15	0.36	0.322218	0.0319761	1.097	1.764	1.715	-
F1	0.16	0.32			0.617	1.764	1.715	-
F1	0.17	0.33						
F1	0.16	0.33						
F1	0.18	0.34						
F1	0.16	0.37	0.335698	0.0181602	1.729	1.764	1.715	*
F2	0.18	0.31			1.433	1.764	1.715	-
F2	0.17	0.33						
F2	0.17	0.34						
F2	0.17	0.34						
F2	0.15	0.36	0.33556	0.0190647	1.335	1.764	1.715	-

prEN 12457 -1 Antimony
MBA

					Grubbs' test			
					Test for one outlier			
	Sb mg/l	Sb mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.030	0.046			2.007	2.482	2.29	-
STD	0.030	0.051						
STD	0.031	0.052						
STD	0.026	0.058						
STD	0.026	0.060						
STD	0.030	0.060						
STD	0.032	0.060						
STD	0.029	0.061						
STD	0.023	0.062						
STD	0.030	0.065	0.05736	0.0058595	1.230	2.482	2.29	-
C1	0.025	0.049			1.397	1.764	1.715	-
C1	0.031	0.053						
C1	0.030	0.060						
C1	0.027	0.062						
C1	0.032	0.063	0.057723	0.0061916	0.917	1.764	1.715	-
C2	0.034	0.050			0.871	1.764	1.715	-
C2	0.026	0.052						
C2	0.030	0.053						
C2	0.025	0.060						
C2	0.026	0.068	0.056456	0.0076171	1.568	1.764	1.715	-
L1	0.029	0.051			1.144	1.764	1.715	-
L1	0.031	0.052						
L1	0.029	0.054						
L1	0.032	0.057						
L1	0.030	0.057	0.054287	0.0026037	1.159	1.764	1.715	-
L2	0.023	0.050			1.505	1.764	1.715	-
L2	0.030	0.060						
L2	0.032	0.061						
L2	0.028	0.067						
L2	0.027	0.070	0.061656	0.0075845	1.100	1.764	1.715	-
W1	0.028	0.033			0.886	1.764	1.715	-
W1	0.016	0.034						
W1	0.036	0.043						
W1	0.022	0.055						
W1	0.017	0.073	0.047422	0.0166855	1.507	1.764	1.715	-
W2	0.027	0.046			0.979	1.764	1.715	-
W2	0.037	0.050						
W2	0.038	0.053						
W2	0.023	0.075						
W2	0.025	0.075	0.060047	0.0139732	1.100	1.764	1.715	-

prEN 12457 -1 MBA

Antimony

					Grubbs' test			
					Test for one outlier			
	Sb	Sb	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	0.017	0.035			0.839	1.764	1.715	-
T1	0.019	0.038						
T1	0.021	0.040						
T1	0.029	0.043						
T1	0.020	0.058	0.042703	0.0092478	1.701	1.764	1.715	-
T2	0.029	0.058			1.168	1.764	1.715	-
T2	0.042	0.063						
T2	0.041	0.070						
T2	0.035	0.082						
T2	0.032	0.083	0.071123	0.0110698	1.093	1.764	1.715	-
A1	0.039	0.055			0.788	1.764	1.715	-
A1	0.030	0.056						
A1	0.027	0.060						
A1	0.028	0.078						
A1	0.049	0.098	0.069298	0.0185169	1.550	1.764	1.715	-
A2	0.028	0.030			1.625	1.764	1.715	-
A2	0.015	0.050						
A2	0.029	0.056						
A2	0.033	0.058						
A2	0.025	0.065	0.051913	0.0132269	1.010	1.764	1.715	-
F1	0.027	0.045			1.276	1.764	1.715	-
F1	0.023	0.054						
F1	0.030	0.061						
F1	0.034	0.068						
F1	0.039	0.078	0.061123	0.0125053	1.324	1.764	1.715	-
F2	0.030	0.059			0.753	1.764	1.715	-
F2	0.030	0.060						
F2	0.032	0.062						
F2	0.038	0.065						
F2	0.031	0.076	0.064338	0.0066463	1.697	1.764	1.715	-

prEN 12457 -1 Zinc
MBA

					Grubbs' test			
					Test for one outlier			
	Zn mg/l	Zn mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.029	0.049			1.110	2.482	2.29	-
STD	0.034	0.050						
STD	0.030	0.056						
STD	0.029	0.059						
STD	0.024	0.059						
STD	0.032	0.059						
STD	0.025	0.065						
STD	0.028	0.065						
STD	0.032	0.068						
STD	0.046	0.091	0.061954	0.011968	2.427	2.482	2.29	*
C1	0.034	0.055			1.541	1.764	1.715	-
C1	0.038	0.067						
C1	0.028	0.072						
C1	0.036	0.076						
C1	0.040	0.080	0.070083	0.0095172	1.084	1.764	1.715	-
C2	0.031	0.048			1.225	1.764	1.715	-
C2	0.026	0.052						
C2	0.035	0.062						
C2	0.024	0.069						
C2	0.036	0.073	0.060839	0.0106784	1.120	1.764	1.715	-
L1	0.030	0.046			0.754	1.764	1.715	-
L1	0.027	0.048						
L1	0.026	0.048						
L1	0.027	0.054						
L1	0.037	0.067	0.052733	0.0083056	1.670	1.764	1.715	-
L2	0.028	0.060			0.998	1.764	1.715	-
L2	0.028	0.061						
L2	0.030	0.061						
L2	0.027	0.066						
L2	0.030	0.066	0.062719	0.0028868	1.137	1.764	1.715	-
W1	0.031	0.050			0.739	1.764	1.715	-
W1	0.029	0.051						
W1	0.025	0.058						
W1	0.025	0.063						
W1	0.045	0.090	0.062321	0.016455	1.694	1.764	1.715	-
W2	0.036	0.054			0.693	1.764	1.715	-
W2	0.027	0.054						
W2	0.027	0.055						
W2	0.028	0.061						
W2	0.031	0.071	0.059155	0.0072325	1.646	1.764	1.715	-

prEN 12457 -1 **Zinc**
MBA

					Grubbs' test			
					Test for one outlier			
	Zn mg/l	Zn mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	0.025	0.049			1.061	1.764	1.715	-
T1	0.033	0.049						
T1	0.030	0.060						
T1	0.030	0.061						
T1	0.025	0.066	0.056968	0.0073229	1.183	1.764	1.715	-
T2	0.030	0.047			1.268	1.764	1.715	-
T2	0.039	0.059						
T2	0.031	0.060						
T2	0.024	0.061						
T2	0.030	0.078	0.061245	0.0109678	1.534	1.764	1.715	-
A1	0.029	0.050			0.827	1.764	1.715	-
A1	0.028	0.052						
A1	0.025	0.056						
A1	0.026	0.058						
A1	0.038	0.075	0.058183	0.0099982	1.702	1.764	1.715	-
A2	0.033	0.065			0.685	1.764	1.715	-
A2	0.034	0.067						
A2	0.034	0.068						
A2	0.035	0.070						
A2	0.045	0.089	0.071823	0.0098636	1.762	1.764	1.715	*
F1	0.078	0.072			0.936	1.764	1.715	-
F1	0.058	0.079						
F1	0.040	0.096						
F1	0.036	0.116						
F1	0.048	0.156	0.103739	0.0334995	1.551	1.764	1.715	-
F2	0.024	0.040			1.172	1.764	1.715	-
F2	0.020	0.040						
F2	0.024	0.047						
F2	0.020	0.048						
F2	0.024	0.048	0.044498	0.0042061	0.800	1.764	1.715	-

prEN 12457 -1 Sulfur
MBA

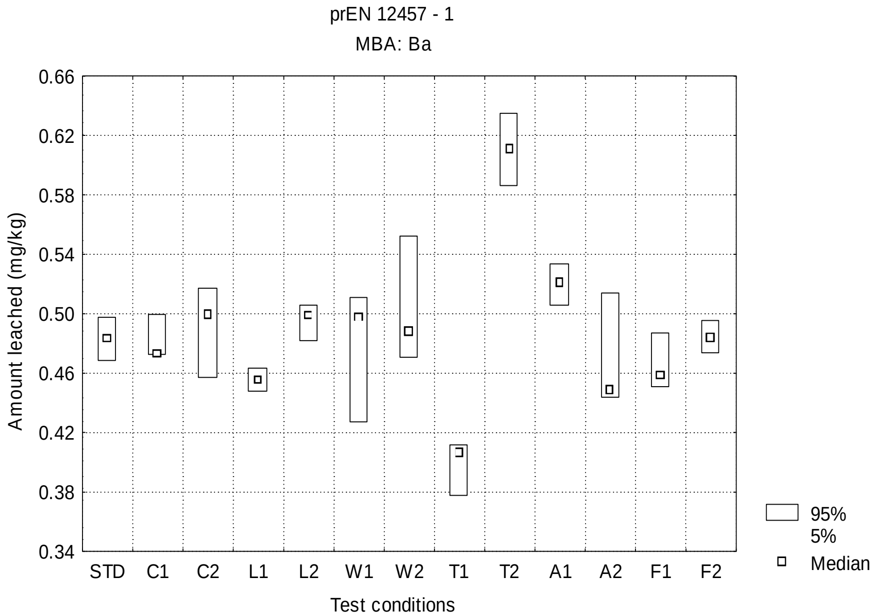
	S	S	mean value	Std dev.	Grubbs' test – Test for one outlier: Gp	Test parameter 1%	Test parameter 5%	Test results
	mg/l	mg/kg	mg/kg					
STD	55.538	111.08			1.136	2.482	2.29	-
STD	57.784	111.22						
STD	56.373	112.75						
STD	59.413	112.92						
STD	59.259	115.57						
STD	56.461	116.95						
STD	59.129	118.26						
STD	55.611	118.52						
STD	62.855	118.83						
STD	58.475	125.71	116.1795	4.4922016	2.122	2.482	2.29	-
C1	56.438	112.88			1.274	1.764	1.715	-
C1	59.213	116.31						
C1	62.483	118.43						
C1	58.153	121.22						
C1	60.611	124.97	118.7589	4.6187656	1.344	1.764	1.715	-
C2	52.977	105.95			1.373	1.764	1.715	-
C2	56.222	112.44						
C2	57.723	115.45						
C2	57.892	115.78						
C2	61.687	123.37	114.6004	6.2945899	1.394	1.764	1.715	-
L1	56.104	100.99			1.011	1.764	1.715	-
L1	56.619	101.91						
L1	58.262	103.47						
L1	60.231	104.87						
L1	57.485	108.42	103.9322	2.9129268	1.539	1.764	1.715	-
L2	57.039	113.38			1.290	1.764	1.715	-
L2	53.925	118.63						
L2	51.537	125.49						
L2	60.969	132.41						
L2	60.186	134.13	124.8091	8.8579506	1.053	1.764	1.715	-
W1	55.767	110.40			1.139	1.764	1.715	-
W1	55.201	111.53						
W1	58.049	116.10						
W1	60.295	119.58						
W1	59.79	120.59	115.6406	4.5968958	1.077	1.764	1.715	-
W2	56.901	113.13			0.890	1.764	1.715	-
W2	57.99	113.80						
W2	57.878	115.76						
W2	56.566	115.98						
W2	60.671	121.34	116.0025	3.2271543	1.655	1.764	1.715	-

prEN 12457 -1 MBA

Sulfur

					Grubbs' test			
					Test for one outlier			
	S mg/l	S mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	Test parameter 5%	Test results
T1	54.074	99.53			0.738	1.764	1.715	-
T1	50.024	99.93						
T1	49.966	100.05						
T1	49.763	108.15						
T1	57.059	114.12	104.3543	6.5406137	1.493	1.764	1.715	-
T2	63.393	118.20			1.193	1.764	1.715	-
T2	60.086	120.17						
T2	59.1	121.78						
T2	61.939	123.88						
T2	60.89	126.79	122.1631	3.3213811	1.392	1.764	1.715	-
A1	49.977	99.95			0.713	1.764	1.715	-
A1	52.952	100.06						
A1	50.572	101.14						
A1	56.935	105.90						
A1	50.028	113.87	104.1856	5.936553	1.631	1.764	1.715	-
A2	74.999	134.66			1.482	1.764	1.715	-
A2	67.33	142.02						
A2	76.854	148.81						
A2	71.011	150.00						
A2	74.403	153.71	145.8387	7.5419088	1.043	1.764	1.715	-
F1	58.465	110.34			1.249	1.764	1.715	-
F1	56.839	111.95						
F1	55.172	113.68						
F1	55.974	116.21						
F1	58.107	116.93	113.8231	2.7842796	1.116	1.764	1.715	-
F2	58.39	106.55			1.249	1.764	1.715	-
F2	59.786	110.40						
F2	55.902	111.80						
F2	55.2	116.78						
F2	53.277	119.57	113.0222	5.1769886	1.265	1.764	1.715	-

prEN 12457 - 1 **Barium**
MBA



Multiple regression analysis of ruggedness data
All data are included

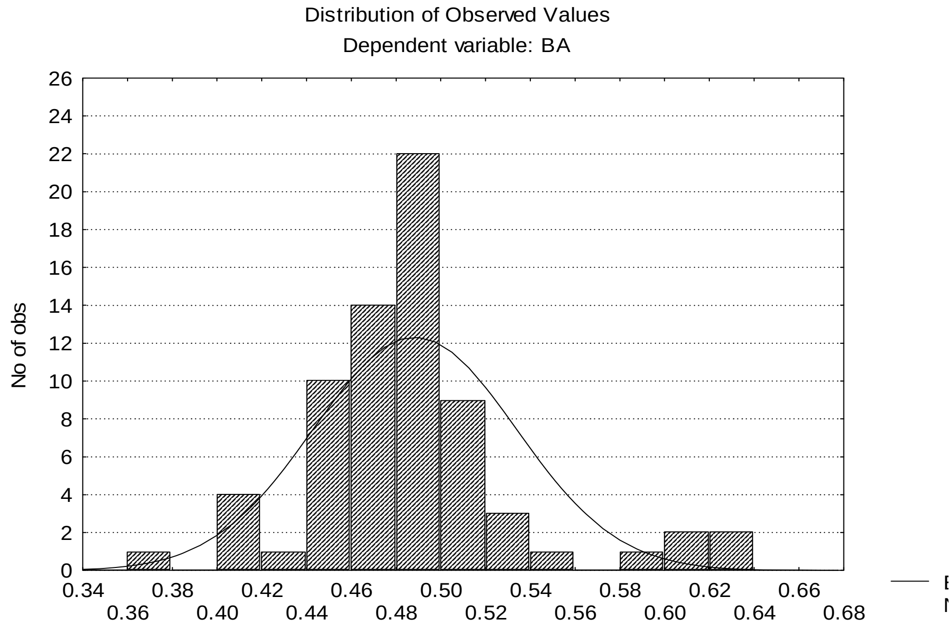
Regression Summary for Dependent Variable: BA
R= .92849620 R²= .86210520 Adjusted R²= .83307472
F(12,57)=29.697 p<.00000 Std.Error of estimate: .01919

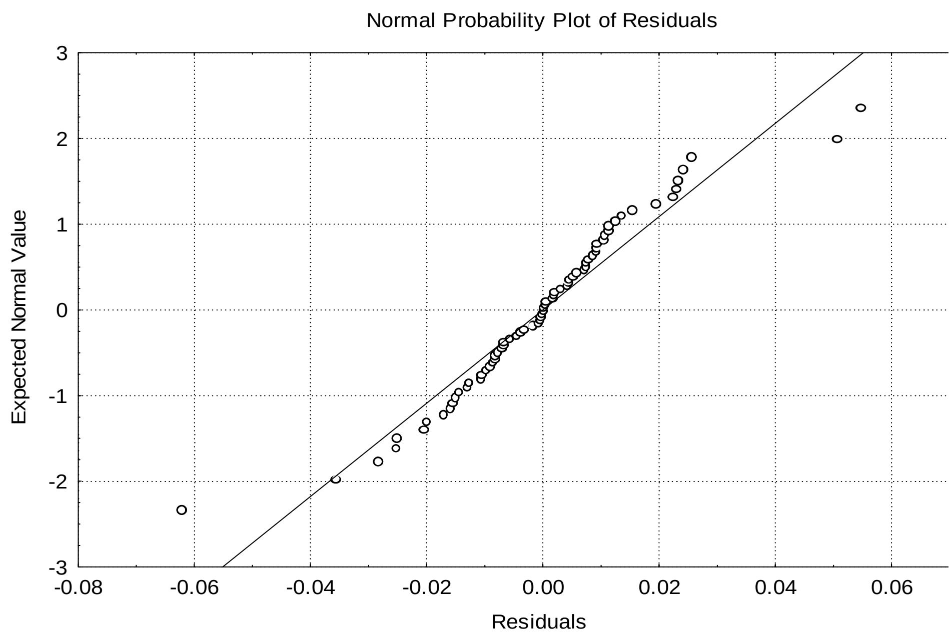
	BETA	St. Err. of BETA	B	St. Err. of B	t(57)	p-level
Intercpt			0.482	0.006	79.437	0.00
C1	-0.012	0.058	-0.002	0.011	-0.214	0.83
C2	0.052	0.058	0.009	0.011	0.897	0.37
L1	-0.145	0.058	-0.026	0.011	-2.498	0.02
L2	0.080	0.058	0.015	0.011	1.386	0.17
W1	0.032	0.058	0.006	0.011	0.554	0.58
W2	0.085	0.058	0.015	0.011	1.470	0.15
T1	-0.444	0.058	-0.080	0.011	-7.656	0.00
T2	0.712	0.058	0.129	0.011	12.271	0.00
A1	0.210	0.058	0.038	0.011	3.612	0.00
A2	-0.104	0.058	-0.019	0.011	-1.798	0.08
F1	-0.108	0.058	-0.020	0.011	-1.861	0.07
F2	0.009	0.058	0.002	0.011	0.157	0.88

Analysis of Variance; DV: BA (part 1 data.sta)

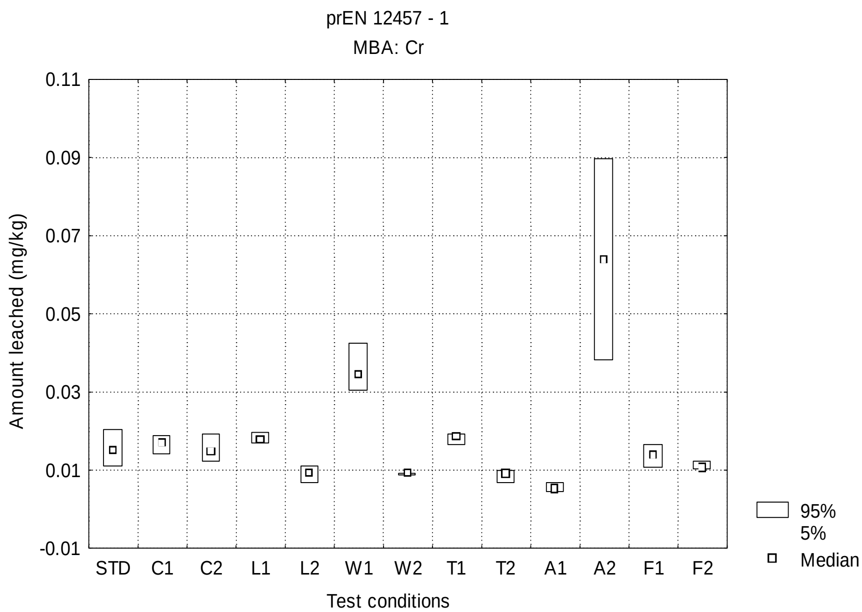
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.13123	12	0.01094	29.696548	3.77535E-20
Residual	0.02099	57	0.00037		
Total	0.15223				

prEN 12457 - 1 **Barium**
MBA





prEN 12457 - 1 **Chromium**
MBA



Multiple regression analysis of ruggedness data
All data are included

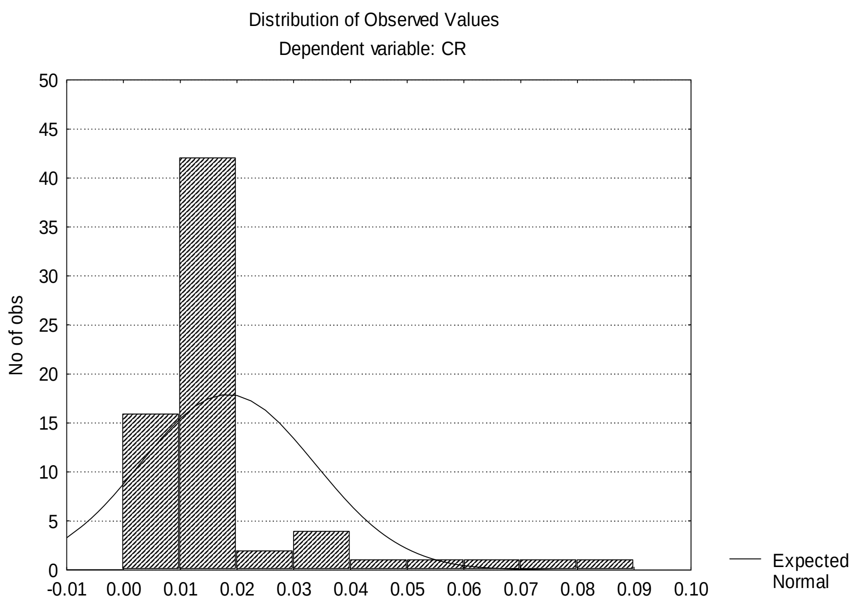
Regression Summary for Dependent Variable: CR
R= .94440047 R^2= .89189224 Adjusted R^2= .86872629
F(12,56)=38.500 p<.00000 Std.Error of estimate: .00556

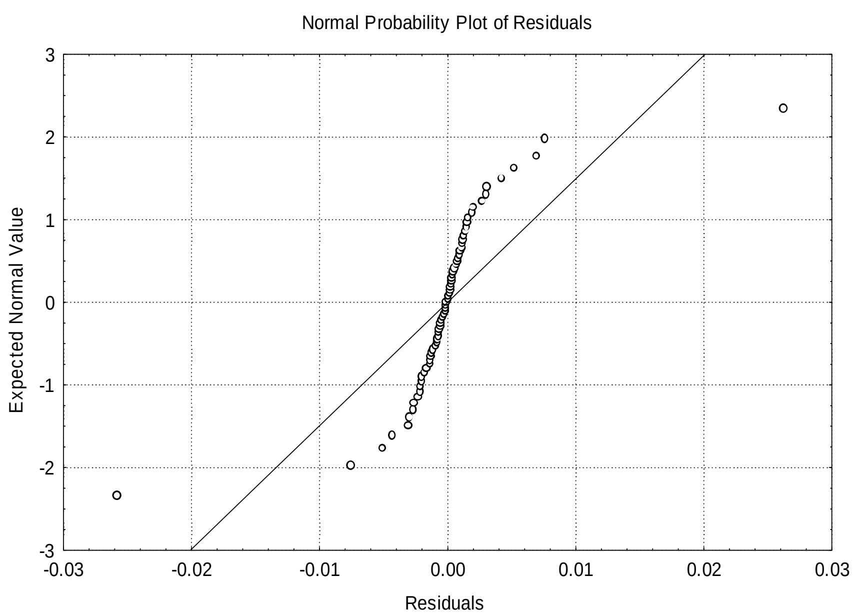
	BETA	St. Err. of BETA	B	St. Err. of B	t(56)	p-level
Intercpt			0.015	0.002	8.627	0.00
C1	0.015	0.052	0.001	0.003	0.291	0.77
C2	-0.005	0.052	0.000	0.003	-0.104	0.92
L1	0.045	0.052	0.003	0.003	0.861	0.39
L2	-0.101	0.052	-0.006	0.003	-1.942	0.06
W1	0.337	0.052	0.020	0.003	6.502	0.00
W2	-0.094	0.050	-0.006	0.003	-1.863	0.07
T1	0.049	0.052	0.003	0.003	0.937	0.35
T2	-0.115	0.052	-0.007	0.003	-2.220	0.03
A1	-0.168	0.052	-0.010	0.003	-3.232	0.00
A2	0.824	0.052	0.048	0.003	15.890	0.00
F1	-0.031	0.052	-0.002	0.003	-0.607	0.55
F2	-0.070	0.052	-0.004	0.003	-1.348	0.18

Analysis of Variance; DV: CR (part 1 data.sta)

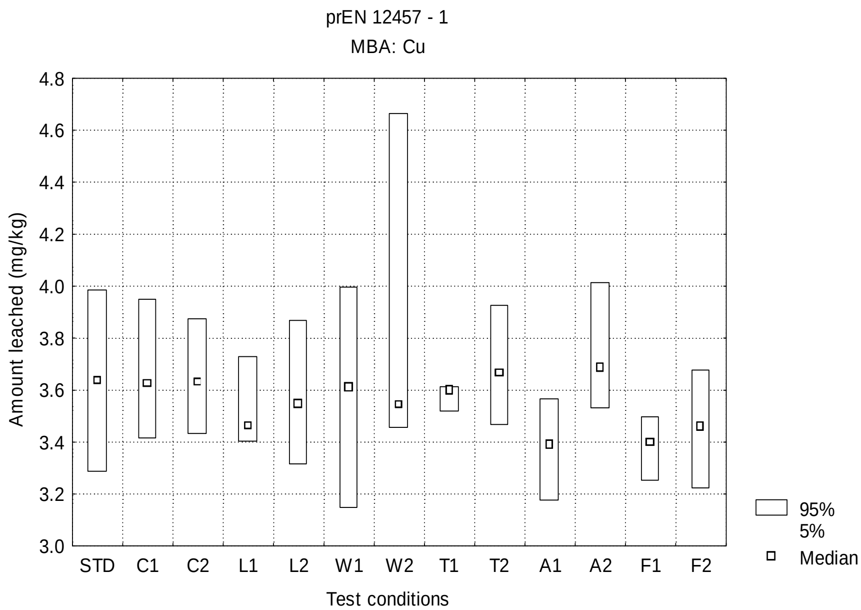
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.0143**	**12**	**0.00119**	**38.500137**	1E-22
Residual	0.00173	56	3.1E-05		
Total	0.01604				

prEN 12457 - 1 **Chromium**
MBA


Distribution of Observed Values
Dependent variable: CR
No of obs
50
45
40
35
30
25
20
15
10
5
0
-0.01
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
Residuals

prEN 12457 - 1 MBA Copper



Multiple regression analysis of ruggedness data
All data are included

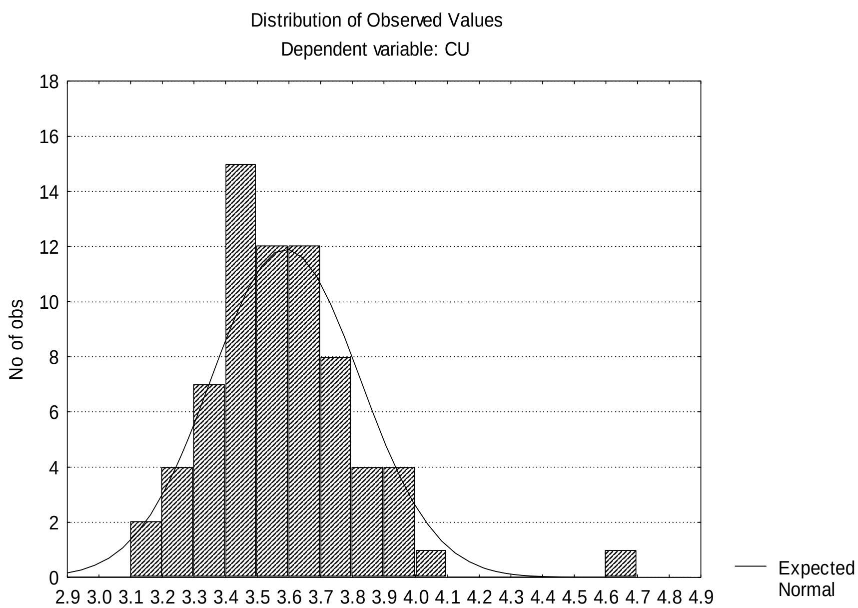
Regression Summary for Dependent Variable: CU
R= .48776607 R²= .23791574 Adjusted R²= .07747695
F(12,57)=1.4829 p<.15771 Std.Error of estimate: .22952

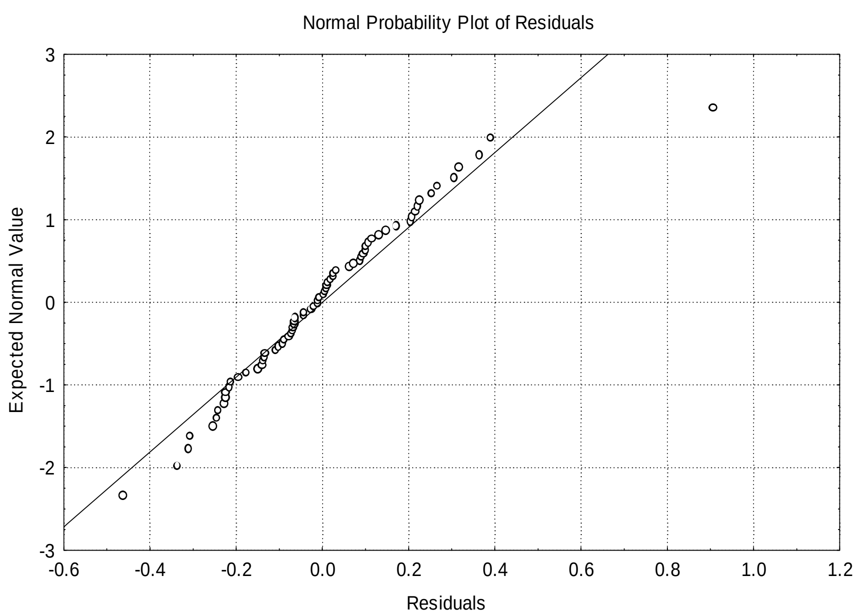
	BETA	St. Err. of BETA	B	St. Err. of B	t(57)	p-level
Intercpt			3.619	0.073	49.862	0.00
C1	0.014	0.136	0.013	0.126	0.104	0.92
C2	0.040	0.136	0.037	0.126	0.293	0.77
L1	-0.125	0.136	-0.115	0.126	-0.916	0.36
L2	-0.059	0.136	-0.054	0.126	-0.429	0.67
W1	-0.017	0.136	-0.016	0.126	-0.128	0.90
W2	0.150	0.136	0.138	0.126	1.101	0.28
T1	-0.042	0.136	-0.038	0.126	-0.306	0.76
T2	0.060	0.136	0.055	0.126	0.439	0.66
A1	-0.277	0.136	-0.256	0.126	-2.033	0.05
A2	0.142	0.136	0.131	0.126	1.042	0.30
F1	-0.255	0.136	-0.235	0.126	-1.867	0.07
F2	-0.176	0.136	-0.162	0.126	-1.289	0.20

Analysis of Variance; DV: CU (part 1 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.93741	12	0.07812	1.4829066	0.1577
Residual	3.00269	57	0.05268		
Total	3.9401				

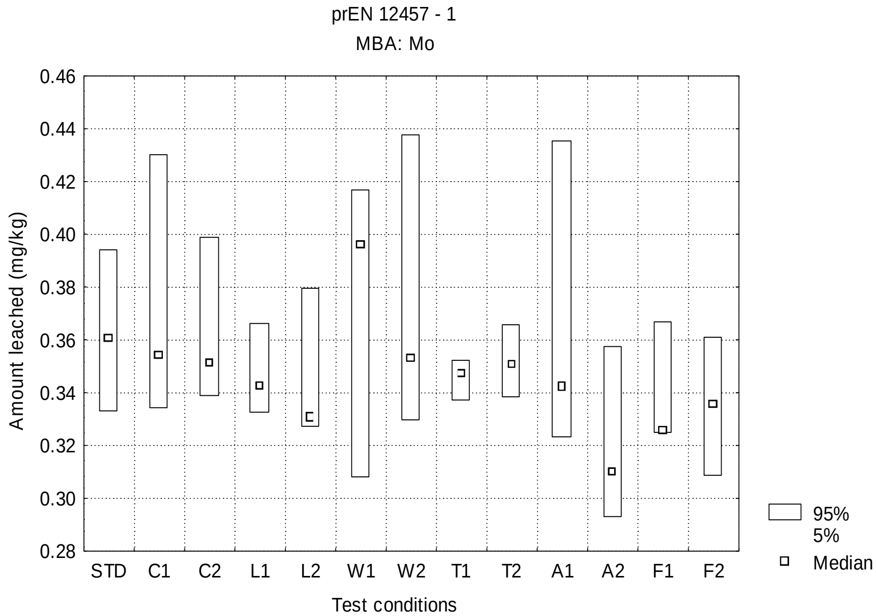
prEN 12457 - 1 MBA Copper


Distribution of Observed Values
Dependent variable: CU
No of obs
0
2
4
6
8
10
12
14
16
18
2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
-3
-2
-1
0
1
2
3
-0.6 -0.4 -0.2 0.0 0.2 0.4 0.6 0.8 1.0 1.2
Residuals

prEN 12457 - 1 MBA

Molybdenum



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= .48307905 R²= .23336537 Adjusted R²= .07196860
F(12,57)=1.4459 p<.17267 Std.Error of estimate: .02845

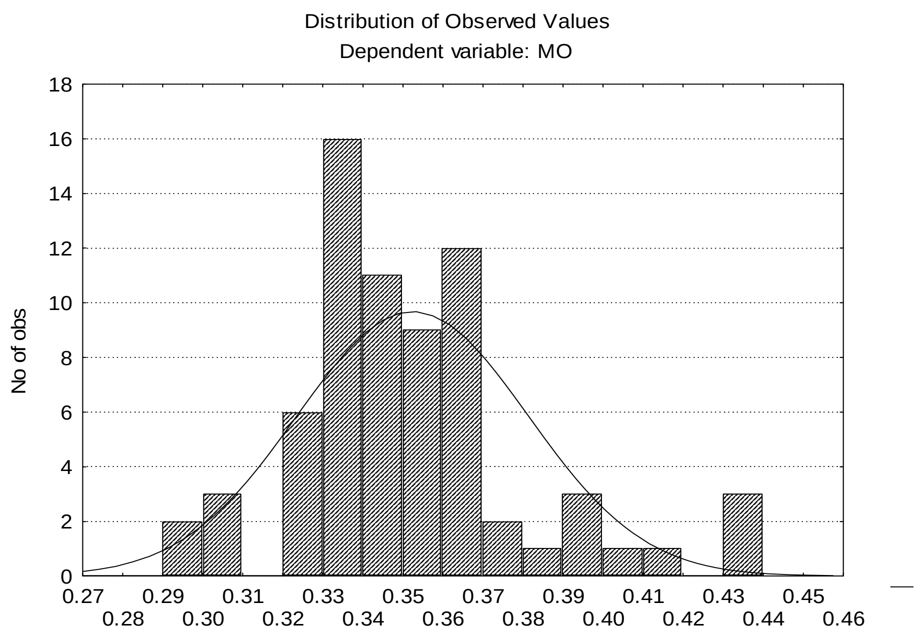
	BETA	St. Err. of BETA	B	St. Err. of B	t(57)	p-level
Intercpt			0.357	0.009	39.682	0.00
C1	0.098	0.137	0.011	0.016	0.719	0.47
C2	0.033	0.137	0.004	0.016	0.244	0.81
L1	-0.110	0.137	-0.013	0.016	-0.806	0.42
L2	-0.091	0.137	-0.010	0.016	-0.668	0.51
W1	0.185	0.137	0.021	0.016	1.352	0.18
W2	0.052	0.137	0.006	0.016	0.379	0.71
T1	-0.112	0.137	-0.013	0.016	-0.816	0.42
T2	-0.059	0.137	-0.007	0.016	-0.434	0.67
A1	0.019	0.137	0.002	0.016	0.140	0.89
A2	-0.305	0.137	-0.035	0.016	-2.232	0.03
F1	-0.187	0.137	-0.021	0.016	-1.367	0.18
F2	-0.188	0.137	-0.021	0.016	-1.375	0.17

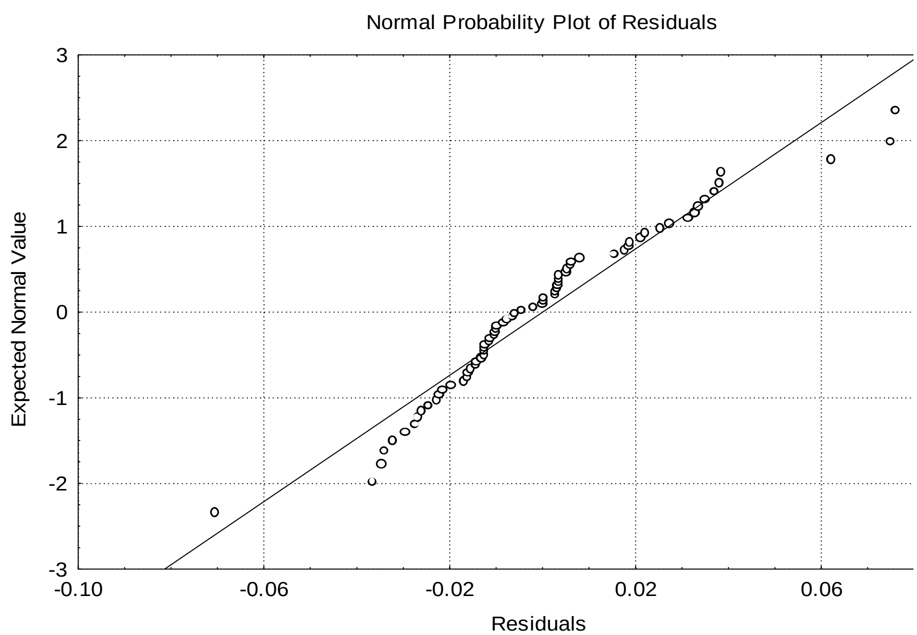
Analysis of Variance; DV: MO (part 1 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.01404	12	0.00117	1.445911	0.1727
Residual	0.04613	57	0.00081		
Total	0.06017				

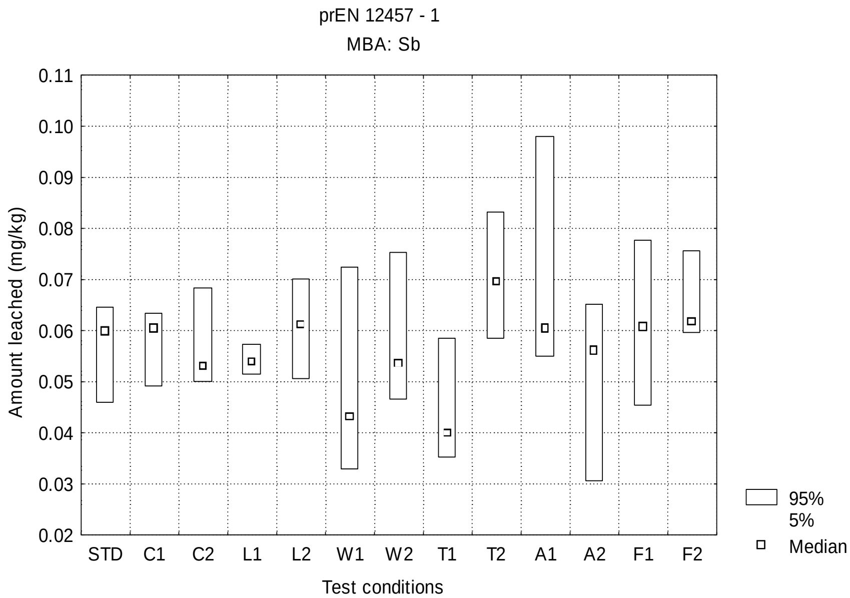
prEN 12457 - 1 MBA

Molybdenum


Distribution of Observed Values
Dependent variable: MO
No of obs
18
16
14
12
10
8
6
4
2
0
0.27
0.28
0.29
0.30
0.31
0.32
0.33
0.34
0.35
0.36
0.37
0.38
0.39
0.40
0.41
0.42
0.43
0.44
0.45
0.46


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.10
-0.06
-0.02
0.02
0.06
Residuals

prEN 12457 - 1 **Antimony**
MBA



Multiple regression analysis of ruggedness data
All data are included

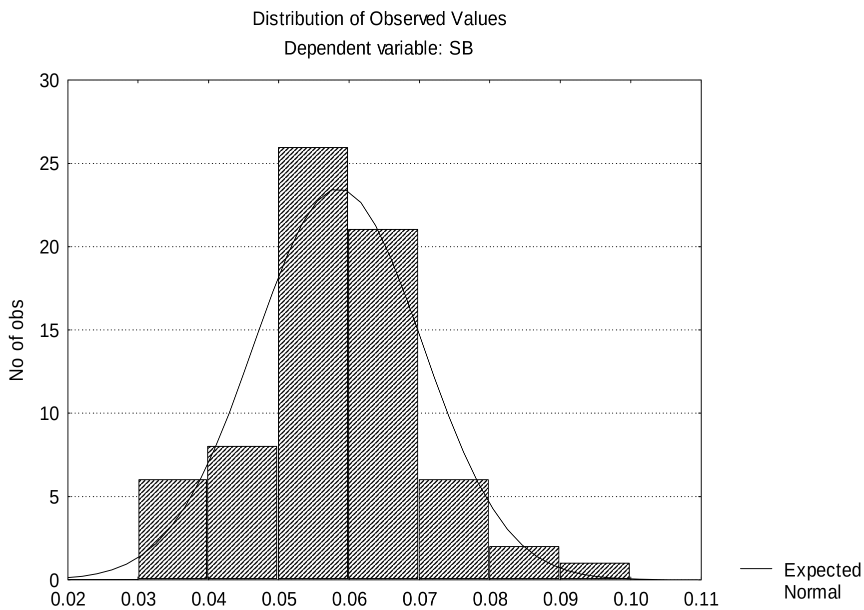
Regression Summary for Dependent Variable: SB
R= .60769989 R^2= .36929916 Adjusted R^2= .23652003
F(12,57)=2.7813 p<.00476 Std.Error of estimate: .01072

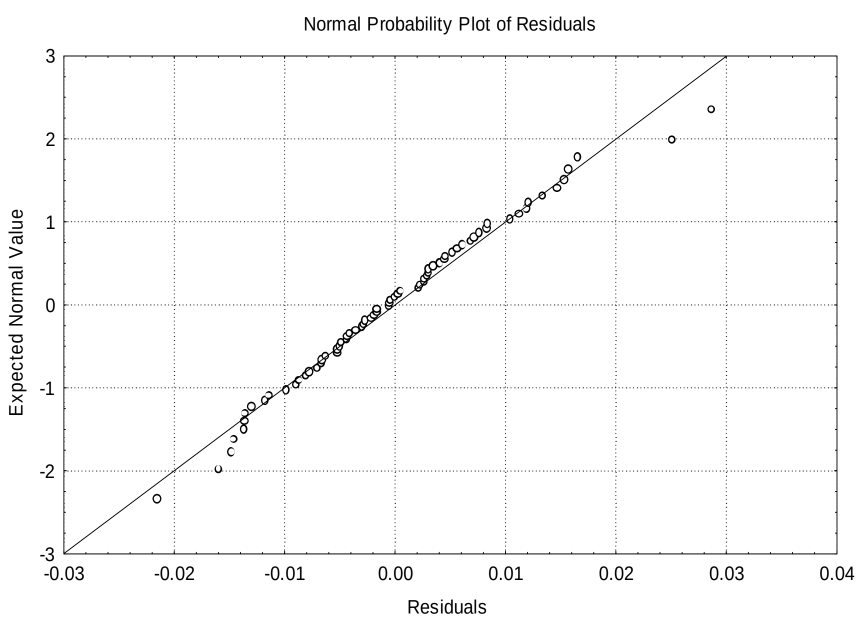
	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(57)**	**p-level**
Intercpt			0.057	0.003	16.918	0.00
C1	0.008	0.124	0.000	0.006	0.062	0.95
C2	-0.019	0.124	-0.001	0.006	-0.154	0.88
L1	-0.065	0.124	-0.003	0.006	-0.523	0.60
L2	0.091	0.124	0.004	0.006	0.731	0.47
W1	-0.210	0.124	-0.010	0.006	-1.692	0.10
W2	0.057	0.124	0.003	0.006	0.457	0.65
T1	-0.310	0.124	-0.015	0.006	-2.496	0.02
T2	0.291	0.124	0.014	0.006	2.344	0.02
A1	0.252	0.124	0.012	0.006	2.033	0.05
A2	-0.115	0.124	-0.005	0.006	-0.928	0.36
F1	0.080	0.124	0.004	0.006	0.641	0.52
F2	0.148	0.124	0.007	0.006	1.188	0.24

Analysis of Variance; DV: SB (part 1 data.sta)

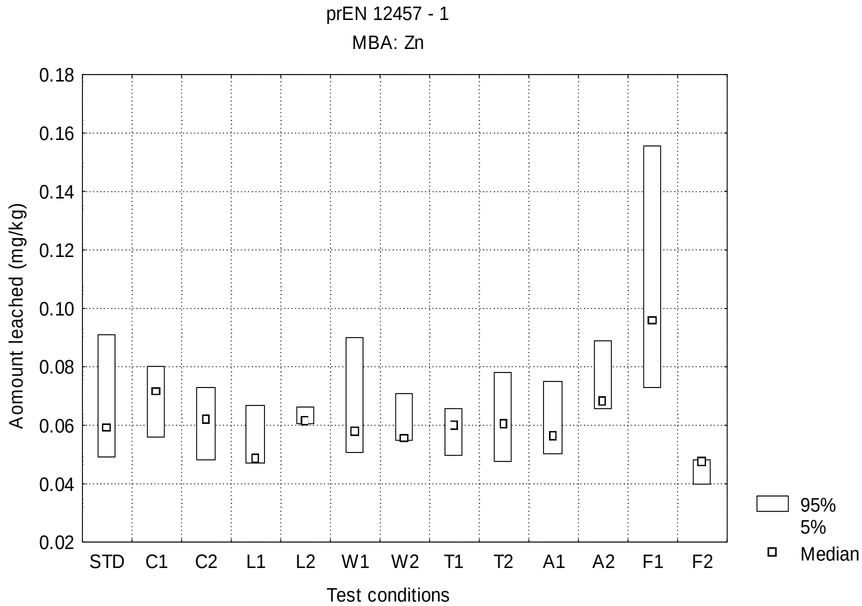
	Sums of Squares	**df**	**Mean Squares**	**F**	**p-level**
Regress.	**0.00384**	**12**	**0.00032**	**2.7813044**	0.0048
Residual	0.00655	57	0.00011		
Total	0.01039				

prEN 12457 - 1 **Antimony**
MBA





prEN 12457 - 1 Zinc
MBA



Multiple regression analysis of ruggedness data
All data are included

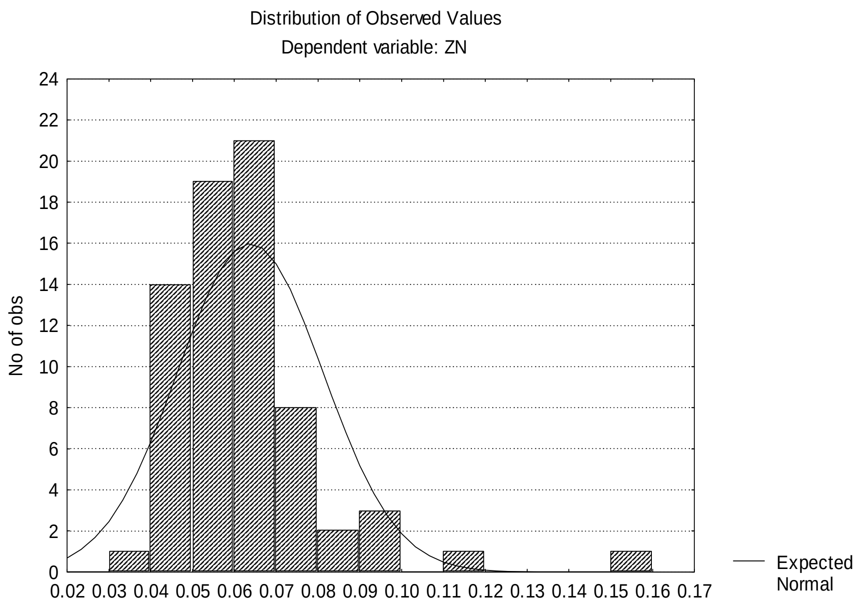
Regression Summary for Dependent Variable: ZN
R= .73687015 R^2= .54297762 Adjusted R^2= .44676239
F(12,57)=5.6434 p<.00000 Std.Error of estimate: .01308

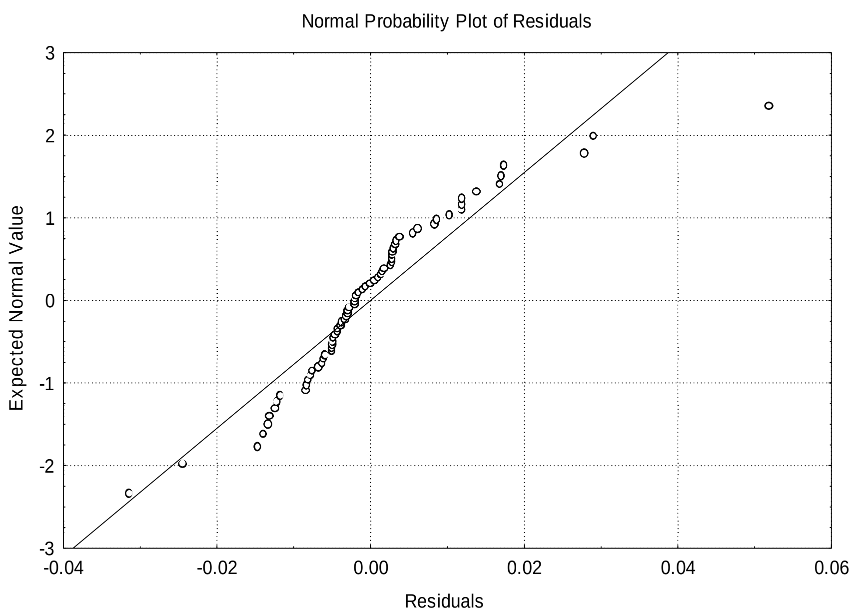
	BETA	St. Err. of BETA	B	St. Err. of B	t(57)	p-level
Intercpt			0.062	0.004	14.977	0.00
C1	0.120	0.106	0.008	0.007	1.135	0.26
C2	-0.016	0.106	-0.001	0.007	-0.156	0.88
L1	-0.136	0.106	-0.009	0.007	-1.287	0.20
L2	0.011	0.106	0.001	0.007	0.107	0.92
W1	0.005	0.106	0.000	0.007	0.051	0.96
W2	-0.041	0.106	-0.003	0.007	-0.391	0.70
T1	-0.074	0.106	-0.005	0.007	-0.696	0.49
T2	-0.010	0.106	-0.001	0.007	-0.099	0.92
A1	-0.056	0.106	-0.004	0.007	-0.526	0.60
A2	0.146	0.106	0.010	0.007	1.377	0.17
F1	0.616	0.106	0.042	0.007	5.832	0.00
F2	-0.257	0.106	-0.017	0.007	-2.436	0.02

Analysis of Variance; DV: ZN (part 1 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.01159	12	0.00097	5.643364	3E-06
Residual	0.00975	57	0.00017		
Total	0.02134				

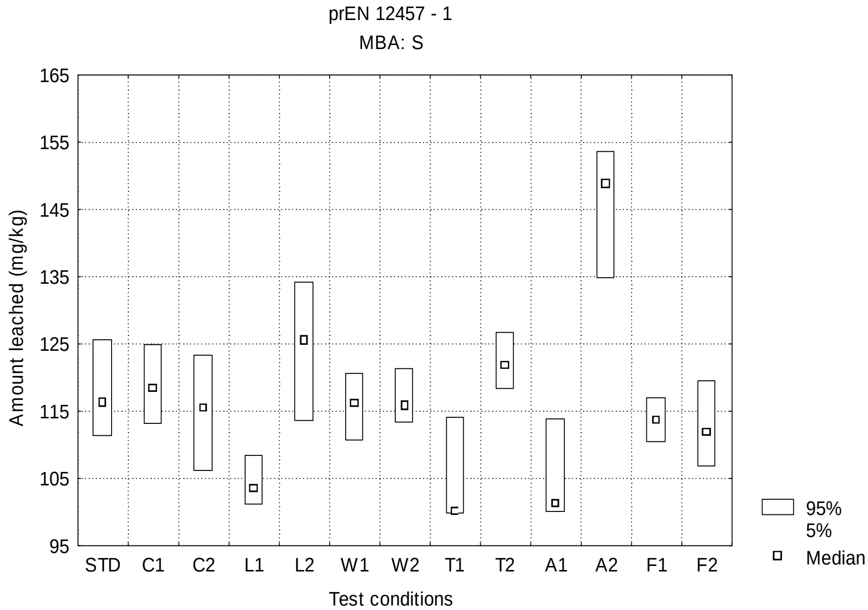
prEN 12457 - 1 **Zinc**
MBA





prEN 12457 - 1 MBA

Sulfur



Multiple regression analysis of ruggedness data
All data are included

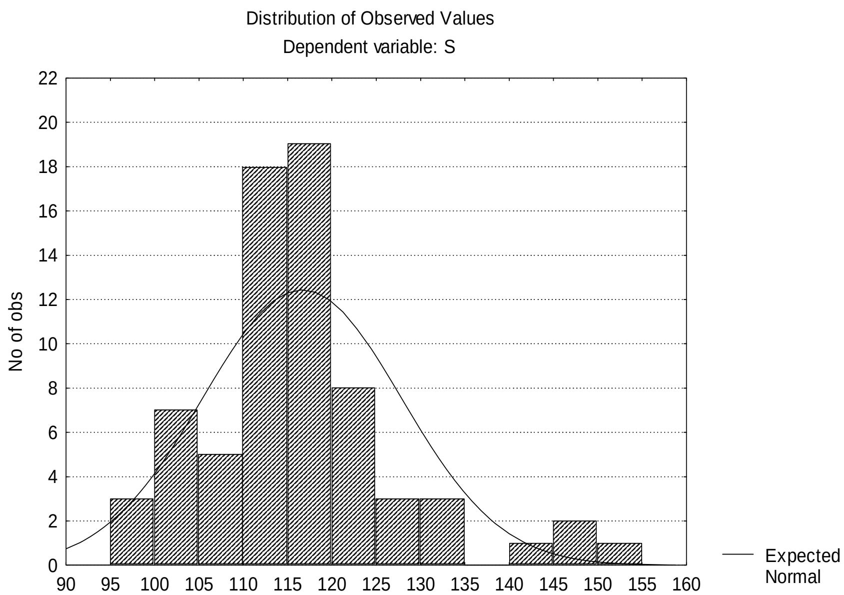
Regression Summary for Dependent Variable: S
R= .90389602 R²= .81702801 Adjusted R²= .77850759
F(12,57)=21.210 p<.00000 Std.Error of estimate: 5.3334

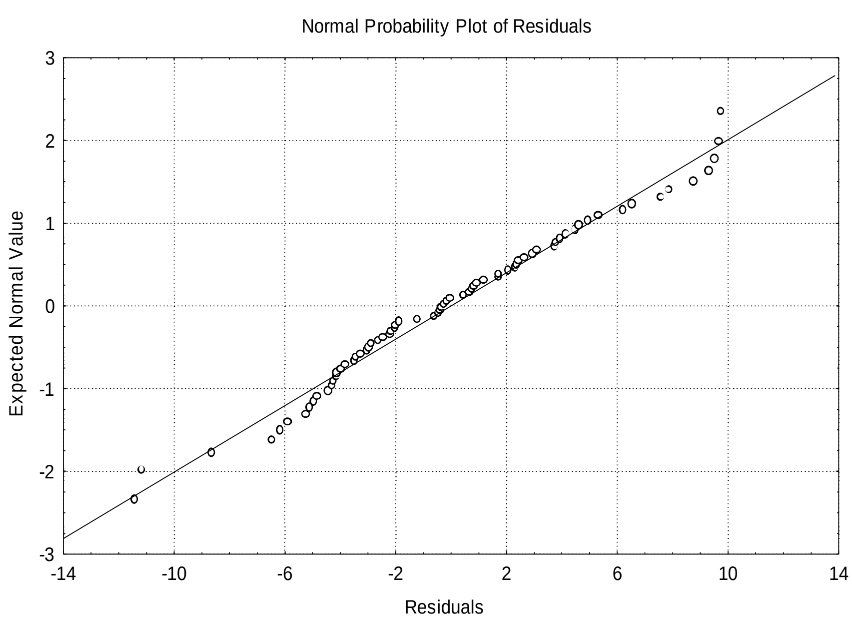
	BETA	St. Err. of BETA	B	St. Err. of B	t(57)	p-level
Intercpt			116	2	68.89	0.00
C1	0.059	0.067	3	3	0.88	0.38
C2	-0.036	0.067	-2	3	-0.54	0.59
L1	-0.280	0.067	-12	3	-4.19	0.00
L2	0.198	0.067	9	3	2.95	0.00
W1	-0.012	0.067	-1	3	-0.18	0.85
W2	-0.004	0.067	0	3	-0.06	0.95
T1	-0.271	0.067	-12	3	-4.05	0.00
T2	0.137	0.067	6	3	2.05	0.05
A1	-0.275	0.067	-12	3	-4.11	0.00
A2	0.679	0.067	30	3	10.15	0.00
F1	-0.054	0.067	-2	3	-0.81	0.42
F2	-0.072	0.067	-3	3	-1.08	0.28

Analysis of Variance; DV: S (part 1 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	7239.92	12	603.326	21.210257	9E-17
Residual	1621.37	57	28.445		
Total	8861.28				

prEN 12457 - 1 **Sulfur**
MBA





A P P E N D I X   2

prEN 12457 part 2: MBA

Part 2 on MBA: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.2.1

Table A.2.1. Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	Assumption of normality on entire population	Assumption of normality on reduced population	Comments
Ba	Reasonable	Reasonable	
Cr	Reasonable	Reasonable	
Cu	Fulfilled	Fulfilled	
Mo	Reasonable	Reasonable	
Pb	Reasonable	Reasonable	The analysis of variance on the reduced population showed significant differences between variances within test conditions and between test conditions. This implies a significant variance between the test conditions even though the mean values of the test conditions are not significantly different from the mean value of the standard condition.
Sb	Reasonable	Reasonable	
Zn	Fulfilled	Fulfilled	
Cl	Reasonable	Fulfilled	
SO_4	Reasonable	Reasonable	

prEN 12457 -2 Barium
MBA

	Ba	Ba	mean value	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	Test parameter 5%	Test results
	µg/l	mg/kg	mg/kg					
STD	170	1.4			0.817	2.482	2.29	-
STD	150	1.4						
STD	160	1.4						
STD	140	1.4						
STD	150	1.4						
STD	140	1.4						
STD	140	1.5						
STD	140	1.5						
STD	140	1.6						
STD	140	1.7	1.470521	0.0981528	2.358	2.482	2.29	*
C1	140	1.3			1.444	1.764	1.715	-
C1	140	1.4						
C1	140	1.4						
C1	130	1.4						
C1	140	1.4	1.375791	0.0498784	1.220	1.764	1.715	-
C2	140	1.3			1.552	1.764	1.715	-
C2	130	1.4						
C2	140	1.4						
C2	140	1.4						
C2	140	1.4	1.388424	0.0389442	1.213	1.764	1.715	-
L1	150	1.3			1.614	1.764	1.715	-
L1	140	1.4						
L1	150	1.5						
L1	150	1.5						
L1	140	1.5	1.437412	0.0614195	0.876	1.764	1.715	-
L2	130	1.3			1.116	1.764	1.715	-
L2	140	1.4						
L2	140	1.4						
L2	140	1.4						
L2	160	1.6	1.422484	0.107673	1.616	1.764	1.715	-
W1	140	1.4			1.053	1.764	1.715	-
W1	150	1.5						
W1	150	1.5						
W1	180	1.5						
W1	150	1.8	1.529319	0.1503083	1.641	1.764	1.715	-
W2	150	1.4			1.486	1.764	1.715	-
W2	150	1.5						
W2	160	1.5						
W2	150	1.5						
W2	140	1.6	1.496484	0.090749	1.035	1.764	1.715	-

prEN 12457 -2 **Barium**

MBA

					Grubbs' test			
					one outlier			
	Ba	**Ba**	**mean value**	**Std dev.**		**Test parameter**		
	µg/l	**mg/kg**	**mg/kg**		**Gp**	**1%**	**5%**	**Test results**
T1	89	0.9			0.962	1.764	1.715	-
T1	85	0.9						
T1	87	0.9						
T1	96	0.9						
T1	89	1.0	0.892837	0.0431358	1.660	1.764	1.715	-
T2	160	0.9			1.756	1.764	1.715	*
T2	170	1.6						
T2	160	1.6						
T2	160	1.6						
T2	160	1.7	1.4747	0.3419639	0.750	1.764	1.715	-
A1	140	1.1			1.557	1.764	1.715	-
A1	130	1.3						
A1	130	1.3						
A1	130	1.3						
A1	110	1.4	1.286454	0.0972704	1.232	1.764	1.715	-
A2	120	1.2			1.193	1.764	1.715	-
A2	140	1.2						
A2	130	1.3						
A2	120	1.4						
A2	140	1.4	1.291243	0.1062513	1.046	1.764	1.715	-
F1	120	1.1			0.886	1.764	1.715	-
F1	120	1.2						
F1	130	1.2						
F1	120	1.2						
F1	120	1.3	1.188831	0.0482365	1.703	1.764	1.715	-
F2	120	1.1			1.150	1.764	1.715	-
F2	110	1.1						
F2	110	1.1						
F2	120	1.2						
F2	110	1.2	1.127949	0.0337889	1.132	1.764	1.715	-
S1	130	1.2			1.329	1.764	1.715	-
S1	130	1.3						
S1	120	1.3						
S1	140	1.3						
S1	130	1.4	1.297248	0.0686999	1.437	1.764	1.715	-

prEN 12457 - 2 Chromium
MBA

					Grubbs' test			
					one outlier			
	Cr µg/l	Cr mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	6,2	0.025			1.476	2.482	2.29	-
STD	3,9	0.031						
STD	4,6	0.037						
STD	5,9	0.039						
STD	3,7	0.039						
STD	3,1	0.04						
STD	4,0	0.04						
STD	2,5	0.046						
STD	4,0	0.059						
STD	3,9	0.062	0.0418	0.0113803	1.775	2.482	2.29	-
C1	4,7	0.038			0.854	1.764	1.715	-
C1	3,8	0.038						
C1	3,8	0.04						
C1	4,0	0.047						
C1	4,8	0.048	0.0422	0.0049193	1.179	1.764	1.715	-
C2	3,4	0.034			1.191	1.764	1.715	-
C2	4,5	0.043						
C2	4,3	0.045						
C2	4,5	0.045						
C2	6,1	0.061	0.0456	0.0097365	1.582	1.764	1.715	-
L1	7,0	0.0351			1.002	1.764	1.715	-
L1	3,9	0.0369						
L1	4,1	0.045						
L1	6,4	0.0576						
L1	5,0	0.063	0.04752	0.0123958	1.249	1.764	1.715	-
L2	6,6	0.0506			1.069	1.764	1.715	-
L2	7,2	0.0528						
L2	4,8	0.0638						
L2	4,6	0.0726						
L2	5,8	0.0792	0.0638	0.0123475	1.247	1.764	1.715	-
W1	5,0	0.03			1.272	1.764	1.715	-
W1	7,4	0.046						
W1	3,0	0.05						
W1	7,8	0.074						
W1	4,6	0.078	0.0556	0.0201196	1.113	1.764	1.715	-
W2	2,2	0.015			1.119	1.764	1.715	-
W2	3,0	0.019						
W2	2,0	0.02						
W2	1,5	0.022						
W2	1,9	0.03	0.0212	0.0055408	1.588	1.764	1.715	-

prEN 12457 - 2 Chromium
MBA

					Grubbs' test			
					one outlier			
	Cr µg/l	Cr mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	5,0	0.032			1.284	1.764	1.715	-
T1	4,2	0.038						
T1	4,0	0.04						
T1	3,2	0.042						
T1	3,8	0.05	0.0404	0.0065422	1.467	1.764	1.715	-
T2	5,1	0.036			1.367	1.764	1.715	-
T2	4,5	0.042						
T2	3,6	0.045						
T2	5,3	0.051						
T2	4,2	0.053	0.0454	0.0068775	1.105	1.764	1.715	-
A1	11	0.091			1.375	1.764	1.715	-
A1	9,1	0.1						
A1	10	0.11						
A1	11	0.11						
A1	12	0.12	0.1062	0.0110544	1.248	1.764	1.715	-
A2	7,6	0.056			1.431	1.764	1.715	-
A2	8,9	0.076						
A2	11	0.089						
A2	5,6	0.1						
A2	10	0.11	0.0862	0.0210998	1.128	1.764	1.715	-
F1	7,8	0.051			1.351	1.764	1.715	-
F1	5,1	0.061						
F1	8,3	0.069						
F1	6,1	0.078						
F1	6,9	0.083	0.0684	0.0128763	1.134	1.764	1.715	-
F2	7,1	0.04			1.717	1.764	1.715	*
F2	7,6	0.067						
F2	4,0	0.071						
F2	7,8	0.076						
F2	6,7	0.078	0.0664	0.0153721	0.755	1.764	1.715	-
S1	7,6	0.054			1.353	1.764	1.715	-
S1	5,4	0.062						
S1	6,5	0.065						
S1	6,7	0.067						
S1	6,2	0.076	0.0648	0.0079812	1.403	1.764	1.715	-

prEN 12457 - 2 Copper
MBA

					Grubbs' test one outlier			
	Cu µg/l	Cu mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	480	3.9			1.721	2.482	2.29	-
STD	510	4.1						
STD	490	4.4						
STD	490	4.4						
STD	470	4.4						
STD	410	4.7						
STD	440	4.8						
STD	390	4.9						
STD	440	4.9						
STD	440	5.1	4.56	0.3836	1.408	2.482	2.29	-
C1	450	4.5			1.146	1.764	1.715	-
C1	530	4.7						
C1	480	4.8						
C1	490	4.9						
C1	470	5.3	4.84	0.2966	1.551	1.764	1.715	-
C2	470	4.7			0.920	1.764	1.715	-
C2	480	4.7						
C2	490	4.8						
C2	500	4.9						
C2	470	5	4.82	0.1304	1.381	1.764	1.715	-
L1	590	5.13			1.583	1.764	1.715	-
L1	600	5.31						
L1	600	5.4						
L1	610	5.4						
L1	570	5.49	5.346	0.1365	1.055	1.764	1.715	-
L2	530	5.28			1.066	1.764	1.715	-
L2	570	5.39						
L2	480	5.72						
L2	490	5.83						
L2	520	6.27	5.698	0.392	1.459	1.764	1.715	-
W1	470	4.5			0.952	1.764	1.715	-
W1	540	4.6						
W1	450	4.7						
W1	460	5.1						
W1	510	5.4	4.86	0.3782	1.428	1.764	1.715	-
W2	510	4.1			1.043	1.764	1.715	-
W2	510	4.2						
W2	450	4.5						
W2	410	5.1						
W2	420	5.1	4.6	0.4796	1.043	1.764	1.715	-

prEN 12457 - 2 **Copper**

MBA

					Grubbs' test one outlier			
	Cu **µg/l**	**Cu** **mg/kg**	**mean value** **mg/kg**	**Std dev.**	**Gp**	**Test parameter** **1%**	**5%**	**Test results**
T1	480	4.6			1.055	1.764	1.715	-
T1	470	4.7						
T1	470	4.7						
T1	460	4.8						
T1	500	5	4.76	0.1517	1.583	1.764	1.715	-
T2	500	4.9			1.157	1.764	1.715	-
T2	530	5						
T2	510	5.1						
T2	540	5.3						
T2	490	5.4	5.14	0.2074	1.254	1.764	1.715	-
A1	520	5.1			1.000	1.764	1.715	-
A1	510	5.2						
A1	540	5.2						
A1	520	5.4						
A1	560	5.6	5.3	0.2	1.500	1.764	1.715	-
A2	500	5			0.787	1.764	1.715	-
A2	570	5						
A2	510	5.1						
A2	500	5.4						
A2	540	5.7	5.24	0.305	1.508	1.764	1.715	-
F1	550	5.5			1.069	1.764	1.715	-
F1	550	5.5						
F1	580	5.8						
F1	580	5.8						
F1	590	5.9	5.7	0.1871	1.069	1.764	1.715	-
F2	590	5			0.866	1.764	1.715	-
F2	520	5.2						
F2	500	5.2						
F2	520	5.2						
F2	520	5.9	5.3	0.3464	1.732	1.764	1.715	*
S1	440	3.6			0.791	1.764	1.715	-
S1	360	3.6						
S1	390	3.8						
S1	380	3.9						
S1	360	4.4	3.86	0.3286	1.643	1.764	1.715	-

prEN 12457 - 2 — Molybdenum

MBA

					Grubbs' test			
					one outlier			
	Mo	Mo	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	55	0.5			1.743	2.482	2.29	-
STD	54	0.51						
STD	56	0.52						
STD	52	0.53						
STD	56	0.54						
STD	51	0.54						
STD	53	0.55						
STD	50	0.55						
STD	55	0.56						
STD	54	0.56	0.536	0.0207	1.162	2.482	2.29	-
C1	47	0.46			1.055	1.764	1.715	-
C1	48	0.47						
C1	47	0.47						
C1	46	0.48						
C1	50	0.5	0.476	0.0152	1.583	1.764	1.715	-
C2	47	0.43			1.433	1.764	1.715	-
C2	48	0.47						
C2	52	0.48						
C2	48	0.48						
C2	43	0.52	0.476	0.0321	1.371	1.764	1.715	-
L1	57	0.513			1.456	1.764	1.715	-
L1	62	0.531						
L1	60	0.54						
L1	61	0.549						
L1	59	0.558	0.5382	0.0173	1.144	1.764	1.715	-
L2	47	0.484			1.228	1.764	1.715	-
L2	49	0.495						
L2	45	0.517						
L2	44	0.539						
L2	49	0.539	0.5148	0.0251	0.965	1.764	1.715	-
W1	49	0.45			0.730	1.764	1.715	-
W1	46	0.46						
W1	57	0.46						
W1	45	0.49						
W1	46	0.57	0.486	0.0493	1.704	1.764	1.715	-
W2	46	0.43			0.784	1.764	1.715	-
W2	44	0.43						
W2	43	0.44						
W2	49	0.46						
W2	43	0.49	0.45	0.0255	1.569	1.764	1.715	-

T1	49	0.48			1.069	1.764	1.715	-
T1	52	0.49						
T1	49	0.49						
T1	48	0.52						
T1	52	0.52	0.5	0.0187	1.069	1.764	1.715	-
T2	55	0.52			1.583	1.764	1.715	-
T2	52	0.54						
T2	55	0.55						
T2	56	0.55						
T2	54	0.56	0.544	0.0152	1.055	1.764	1.715	-
A1	49	0.48			1.095	1.764	1.715	-
A1	48	0.49						
A1	55	0.51						
A1	51	0.52						
A1	52	0.55	0.51	0.0274	1.461	1.764	1.715	-
A2	52	0.46			1.564	1.764	1.715	-
A2	51	0.49						
A2	50	0.5						
A2	46	0.51						
A2	49	0.52	0.496	0.023	1.042	1.764	1.715	-
F1	120	0.51			0.552	1.764	1.715	-
F1	61	0.51						
F1	51	0.54						
F1	51	0.61						
F1	54	1.2	0.674	0.2969	1.772	1.764	1.715	**
F2	56	0.48			0.990	1.764	1.715	-
F2	48	0.49						
F2	49	0.5						
F2	50	0.54						
F2	54	0.56	0.514	0.0344	1.339	1.764	1.715	-
S1	43	0.39			1.476	1.764	1.715	-
S1	39	0.41						
S1	44	0.43						
S1	44	0.44						
S1	41	0.44	0.422	0.0217	0.830	1.764	1.715	-

prEN 12457 - 2 **Antimony**

MBA

					Grubbs' test one outlier			
	Sb	**Sb**	**mean value**	**Std dev.**		**Test parameter**		
	µg/l	**mg/kg**	**mg/kg**		**Gp**	**1%**	**5%**	**Test results**
STD	56	0.35			1.005	2.482	2.29	-
STD	60	0.36						
STD	37	0.37						
STD	51	0.38						
STD	47	0.39						
STD	38	0.41						
STD	36	0.47						
STD	35	0.51						
STD	41	0.56						
STD	39	0.6	0.44	0.0895669	1.786	2.482	2.29	-
C1	34	0.33			0.808	1.764	1.715	-
C1	36	0.34						
C1	35	0.35						
C1	43	0.36						
C1	33	0.43	0.362	0.0396232	1.716	1.764	1.715	*
C2	36	0.33			0.714	1.764	1.715	-
C2	41	0.33						
C2	33	0.34						
C2	34	0.36						
C2	33	0.41	0.354	0.0336155	1.666	1.764	1.715	-
L1	53	0.477			0.655	1.764	1.715	-
L1	61	0.549						
L1	53	0.477						
L1	52	0.468						
L1	61	0.549	0.504	0.0412432	1.091	1.764	1.715	-
L2	58	0.561			1.740	1.764	1.715	*
L2	58	0.638						
L2	60	0.638						
L2	59	0.649						
L2	51	0.66	0.6292	0.0392008	0.786	1.764	1.715	-
W1	37	0.36			0.588	1.764	1.715	-
W1	39	0.37						
W1	69	0.39						
W1	40	0.4						
W1	36	0.69	0.442	0.1395349	1.777	1.764	1.715	**
W2	40	0.31			1.234	1.764	1.715	-
W2	34	0.34						
W2	31	0.35						
W2	35	0.35						
W2	35	0.4	0.35	0.0324037	1.543	1.764	1.715	-

prEN 12457 - 2 **Antimony**

MBA

					Grubbs' test one outlier			
	Sb	**Sb**	**mean value**	**Std dev.**		**Test parameter**		
	µg/l	**mg/kg**	**mg/kg**		**Gp**	**1%**	**5%**	**Test results**
T1	31	0.28			1.066	1.764	1.715	-
T1	29	0.29						
T1	35	0.31						
T1	28	0.35						
T1	36	0.36	0.318	0.0356371	1.179	1.764	1.715	-
T2	45	0.42			0.614	1.764	1.715	-
T2	43	0.42						
T2	42	0.42						
T2	42	0.43						
T2	42	0.45	0.428	0.0130384	1.687	1.764	1.715	-
A1	34	0.31			1.042	1.764	1.715	-
A1	31	0.32						
A1	32	0.33						
A1	33	0.34						
A1	37	0.37	0.334	0.0230217	1.564	1.764	1.715	-
A2	41	0.36			1.753	1.764	1.715	*
A2	36	0.4						
A2	41	0.41						
A2	40	0.41						
A2	41	0.41	0.398	0.0216795	0.554	1.764	1.715	-
F1	38	0.37			0.772	1.764	1.715	-
F1	39	0.37						
F1	42	0.38						
F1	37	0.39						
F1	37	0.42	0.386	0.0207364	1.640	1.764	1.715	-
F2	55	0.35			0.616	1.764	1.715	-
F2	39	0.35						
F2	35	0.37						
F2	35	0.39						
F2	37	0.55	0.402	0.0843801	1.754	1.764	1.715	*
S1	31	0.31			1.265	1.764	1.715	-
S1	32	0.32						
S1	34	0.33						
S1	35	0.34						
S1	33	0.35	0.33	0.0158114	1.265	1.764	1.715	-

prEN 12457 - 2 MBA

Lead

	Pb	Pb	mean value	Std dev.	Grubbs' test one outlier			
	μg/l	mg/kg	mg/kg		Gp	Test parameter 1%	5%	Test results
STD	5,5	0.047			0.870	2.482	2.29	-
STD	15	0.051						
STD	7,2	0.055						
STD	8,2	0.058						
STD	8,2	0.064						
STD	4,7	0.067						
STD	6,4	0.072						
STD	5,1	0.082						
STD	6,7	0.082						
STD	5,8	0.15	0.0728	0.0297	2.603	2.482	2.29	**
C1	6,5	0.047			1.378	1.764	1.715	-
C1	5,4	0.054						
C1	7,1	0.064						
C1	4,7	0.065						
C1	6,4	0.071	0.0602	0.0096	1.128	1.764	1.715	-
C2	7,5	0.061			1.565	1.764	1.715	-
C2	7,3	0.073						
C2	7,5	0.075						
C2	8,3	0.075						
C2	6,1	0.083	0.0734	0.0079	1.211	1.764	1.715	-
L1	6,0	0.0504			1.292	1.764	1.715	-
L1	7,4	0.054						
L1	7,5	0.0666						
L1	7,6	0.0675						
L1	5,6	0.0684	0.06138	0.0085	0.826	1.764	1.715	-
L2	8,7	0.0825			1.330	1.764	1.715	-
L2	7,5	0.0902						
L2	9,8	0.0957						
L2	9,2	0.1012						
L2	8,2	0.1078	0.09548	0.0098	1.262	1.764	1.715	-
W1	5,4	0.054			0.876	1.764	1.715	-
W1	6,8	0.068						
W1	13	0.072						
W1	7,4	0.074						
W1	7,2	0.13	0.0796	0.0292	1.724	1.764	1.715	*
W2	7,8	0.074			1.400	1.764	1.715	-
W2	8,3	0.078						
W2	7,8	0.078						
W2	8,0	0.08						
W2	7,4	0.083	0.0786	0.0033	1.339	1.764	1.715	-

prEN 12457 - 2 Lead
MBA

					Grubbs' test one outlier			
	Pb	Pb	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	5,4	0.042			0.602	1.764	1.715	-
T1	4,2	0.047						
T1	4,7	0.051						
T1	14	0.054						
T1	5,1	0.14	0.0668	0.0412	1.778	1.764	1.715	**
T2	16	0.1			1.177	1.764	1.715	-
T2	10	0.11						
T2	15	0.13						
T2	13	0.15						
T2	11	0.16	0.13	0.0255	1.177	1.764	1.715	-
A1	13	0.097			1.283	1.764	1.715	-
A1	13	0.11						
A1	9,7	0.11						
A1	11	0.13						
A1	11	0.13	0.1154	0.0143	1.018	1.764	1.715	-
A2	8,2	0.073			1.204	1.764	1.715	-
A2	10	0.082						
A2	11	0.088						
A2	7,3	0.1						
A2	8,8	0.11	0.0906	0.0146	1.327	1.764	1.715	-
F1	7,1	0.058			1.107	1.764	1.715	-
F1	7,8	0.071						
F1	11	0.078						
F1	7,9	0.079						
F1	5,8	0.11	0.0792	0.0191	1.608	1.764	1.715	-
F2	8,5	0.064			1.112	1.764	1.715	-
F2	6,6	0.066						
F2	7,9	0.075						
F2	6,4	0.079						
F2	7,5	0.085	0.0738	0.0088	1.271	1.764	1.715	-
S1	11	0.1			0.584	1.764	1.715	-
S1	31	0.11						
S1	10	0.11						
S1	11	0.13						
S1	13	0.31	0.152	0.089	1.775	1.764	1.715	**

prEN 12457 - 2 Zinc
MBA

					Grubbs' test one outlier			
	Zn µg/l	Zn mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	37	0.14			1.497	2.482	2.29	-
STD	26	0.17						
STD	23	0.19						
STD	24	0.22						
STD	22	0.23						
STD	29	0.24						
STD	17	0.26						
STD	14	0.27						
STD	27	0.29						
STD	19	0.37	0.238	0.0654557	2.017	2.482	2.29	-
C1	29	0.16			0.889	1.764	1.715	-
C1	18	0.18						
C1	18	0.18						
C1	16	0.22						
C1	22	0.29	0.206	0.0517687	1.623	1.764	1.715	-
C2	19	0.17			1.643	1.764	1.715	-
C2	17	0.19						
C2	19	0.19						
C2	20	0.19						
C2	19	0.2	0.188	0.0109545	1.095	1.764	1.715	-
L1	22	0.189			1.000	1.764	1.715	-
L1	21	0.198						
L1	22	0.198						
L1	26	0.216						
L1	24	0.234	0.207	0.018	1.500	1.764	1.715	-
L2	31	0.209			1.119	1.764	1.715	-
L2	30	0.22						
L2	20	0.286						
L2	19	0.33						
L2	26	0.341	0.2772	0.0609483	1.047	1.764	1.715	-
W1	19	0.19			0.802	1.764	1.715	-
W1	23	0.19						
W1	19	0.21						
W1	21	0.23						
W1	28	0.28	0.22	0.0374166	1.604	1.764	1.715	-
W2	23	0.15			0.971	1.764	1.715	-
W2	28	0.16						
W2	19	0.19						
W2	16	0.23						
W2	15	0.28	0.202	0.0535724	1.456	1.764	1.715	-

prEN 12457 - 2 Zinc
MBA

	Zn	Zn	mean value	Std dev.	Grubbs' test one outlier			
						Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	15	0.11			0.956	1.764	1.715	-
T1	12	0.12						
T1	11	0.12						
T1	17	0.15						
T1	12	0.17	0.134	0.0250998	1.434	1.764	1.715	-
T2	26	0.18			1.385	1.764	1.715	-
T2	18	0.21						
T2	24	0.22						
T2	22	0.24						
T2	21	0.26	0.222	0.0303315	1.253	1.764	1.715	-
A1	29	0.25			1.414	1.764	1.715	-
A1	25	0.27						
A1	27	0.27						
A1	27	0.27						
A1	27	0.29	0.27	0.0141421	1.414	1.764	1.715	-
A2	34	0.13			1.242	1.764	1.715	-
A2	20	0.2						
A2	23	0.22						
A2	13	0.23						
A2	22	0.34	0.224	0.0756968	1.532	1.764	1.715	-
F1	24	0.16			1.339	1.764	1.715	-
F1	22	0.18						
F1	22	0.22						
F1	18	0.22						
F1	16	0.24	0.204	0.0328634	1.095	1.764	1.715	-
F2	22	0.13			1.284	1.764	1.715	-
F2	17	0.16						
F2	18	0.17						
F2	13	0.18						
F2	16	0.22	0.172	0.0327109	1.467	1.764	1.715	-
S1	25	0.21			1.371	1.764	1.715	-
S1	21	0.25						
S1	25	0.25						
S1	30	0.26						
S1	26	0.3	0.254	0.0320936	1.433	1.764	1.715	-

prEN 12457 - 2 Chloride
MBA

	Cl	Cl	mean value	Std dev.	Grubbs' test one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	284	2580			1.878	2.482	2.29	-
STD	276	2650						
STD	274	2720						
STD	283	2740						
STD	281	2760						
STD	272	2810						
STD	288	2830						
STD	258	2840						
STD	265	2880						
STD	290	2900	2771	101.70218	1.268	2.482	2.29	-
C1	265	2650			1.434	1.764	1.715	-
C1	284	2740						
C1	274	2740						
C1	274	2770						
C1	277	2840	2748	68.337398	1.346	1.764	1.715	-
C2	293	2810			0.730	1.764	1.715	-
C2	284	2810						
C2	284	2840						
C2	281	2840						
C2	281	2930	2846	49.29503	1.704	1.764	1.715	-
L1	319	2673			0.963	1.764	1.715	-
L1	314	2682						
L1	304	2736						
L1	298	2826						
L1	297	2871	2757.6	87.859547	1.291	1.764	1.715	-
L2	265	2739			1.367	1.764	1.715	-
L2	266	2816						
L2	249	2827						
L2	256	2915						
L2	257	2926	2844.6	77.235355	1.054	1.764	1.715	-
W1	282	2670			1.298	1.764	1.715	-
W1	280	2750						
W1	293	2800						
W1	267	2820						
W1	275	2930	2794	95.551033	1.423	1.764	1.715	-
W2	280	2720			1.460	1.764	1.715	-
W2	285	2780						
W2	278	2790						
W2	272	2800						
W2	279	2850	2788	46.583259	1.331	1.764	1.715	-

prEN 12457 - 2 Chloride

MBA

					Grubbs' test			
					one outlier			
	Cl mg/l	Cl mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	265	2590			1.184	1.764	1.715	-
T1	278	2650						
T1	259	2700						
T1	270	2780						
T1	286	2860	2716	106.44247	1.353	1.764	1.715	-
T2	290	2790			0.973	1.764	1.715	-
T2	281	2810						
T2	279	2900						
T2	306	2910						
T2	291	3060	2894	106.91118	1.553	1.764	1.715	-
A1	279	2780			0.895	1.764	1.715	-
A1	278	2790						
A1	292	2810						
A1	281	2920						
A1	294	2940	2848	75.960516	1.211	1.764	1.715	-
A2	279	2670			1.625	1.764	1.715	-
A2	279	2790						
A2	267	2790						
A2	286	2840						
A2	284	2860	2790	73.824115	0.948	1.764	1.715	-
F1	274	2670			1.193	1.764	1.715	-
F1	267	2740						
F1	280	2780						
F1	278	2800						
F1	293	2930	2784	95.551033	1.528	1.764	1.715	-
F2	298	2660			0.984	1.764	1.715	-
F2	268	2680						
F2	266	2780						
F2	278	2840						
F2	284	2980	2788	130.0769	1.476	1.764	1.715	-
S1	247	2150			1.162	1.764	1.715	-
S1	215	2200						
S1	233	2330						
S1	233	2330						
S1	220	2470	2296	125.61847	1.385	1.764	1.715	-

prEN 12457 - 2 MBA

Sulfate

	SO4 mg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	Test parameter 5%	Test results
STD	177	1680			1.266	2.482	2.29	-
STD	185	1730						
STD	173	1730						
STD	199	1750						
STD	173	1750						
STD	168	1770						
STD	175	1830						
STD	175	1850						
STD	187	1870						
STD	183	1990	1795	90.829511	2.147	2.482	2.29	-
C1	180	1750			1.009	1.764	1.715	-
C1	203	1800						
C1	181	1810						
C1	197	1970						
C1	175	2030	1872	120.91319	1.307	1.764	1.715	-
C2	185	1580			1.731	1.764	1.715	*
C2	193	1850						
C2	185	1850						
C2	191	1910						
C2	158	1930	1824	140.99645	0.752	1.764	1.715	-
L1	201	1701			1.269	1.764	1.715	-
L1	215	1773						
L1	197	1809						
L1	189	1926						
L1	214	1935	1828.8	100.70353	1.055	1.764	1.715	-
L2	191	2013			1.434	1.764	1.715	-
L2	187	2057						
L2	187	2057						
L2	191	2101						
L2	183	2101	2065.8	36.813041	0.956	1.764	1.715	-
W1	204	1870			1.357	1.764	1.715	-
W1	196	1930						
W1	193	1960						
W1	187	1970						
W1	197	2040	1954	61.886994	1.390	1.764	1.715	-
W2	173	1660			1.188	1.764	1.715	-
W2	172	1720						
W2	166	1730						
W2	187	1830						
W2	183	1870	1762	85.848704	1.258	1.764	1.715	-

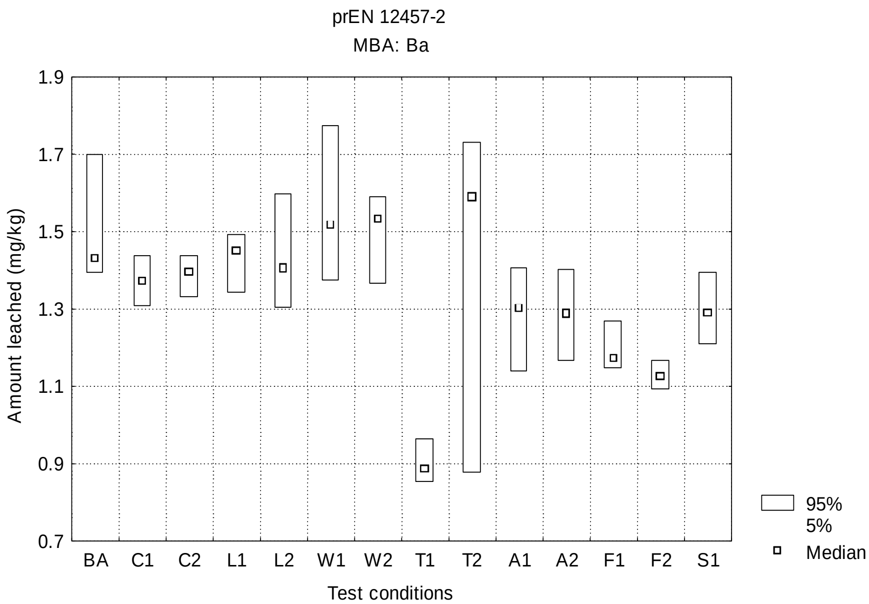
prEN 12457 - 2 Sulfate

MBA

	SO4 mg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	5%	Test results
T1	188	1840			1.109	1.764	1.715	-
T1	199	1880						
T1	184	1880						
T1	188	1930						
T1	193	1990	1904	57.706152	1.490	1.764	1.715	-
T2	217	1840			1.164	1.764	1.715	-
T2	191	1910						
T2	184	1970						
T2	211	2110						
T2	197	2170	2000	137.47727	1.237	1.764	1.715	-
A1	160	1600			0.889	1.764	1.715	-
A1	177	1660						
A1	172	1720						
A1	166	1770						
A1	208	2080	1766	186.76188	1.681	1.764	1.715	-
A2	219	1960			0.754	1.764	1.715	-
A2	199	1960						
A2	196	1990						
A2	207	2070						
A2	196	2190	2034	98.132563	1.590	1.764	1.715	-
F1	178	1780			1.421	1.764	1.715	-
F1	203	1900						
F1	190	2030						
F1	206	2060						
F1	214	2140	1982	142.19705	1.111	1.764	1.715	-
F2	207	2000			1.454	1.764	1.715	-
F2	204	2040						
F2	206	2060						
F2	200	2070						
F2	210	2100	2054	37.148351	1.238	1.764	1.715	-
S1	149	1260			1.572	1.764	1.715	-
S1	126	1390						
S1	152	1490						
S1	152	1520						
S1	139	1520	1436	111.93748	0.750	1.764	1.715	-

prEN 12457 - 2 MBA

Barium



Multiple regression analysis of ruggedness data
All data are included

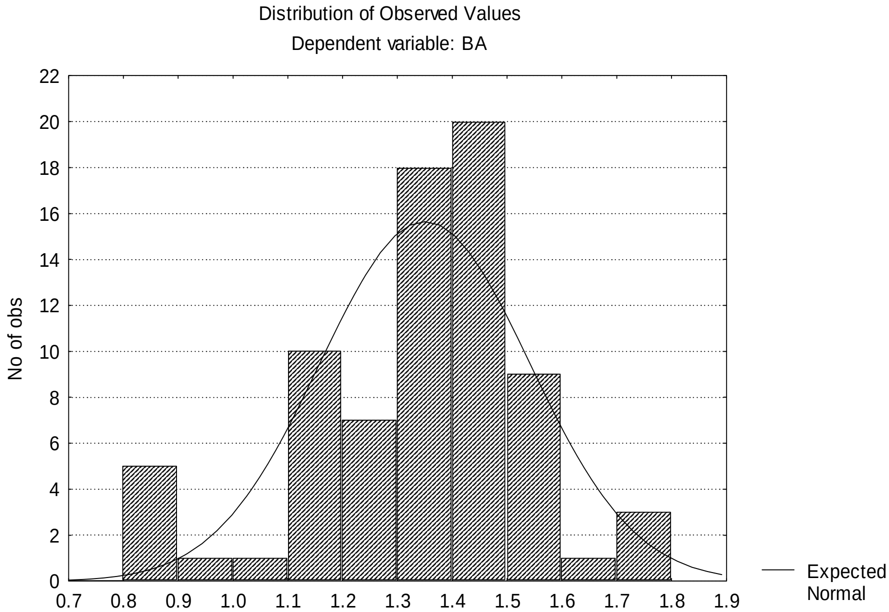
Regression Summary for Dependent Variable: BA
R= .83579645 R²= .69855571 Adjusted R²= .63431349
F(13,61)=10.874 p<.00000 Std.Error of estimate: .12000

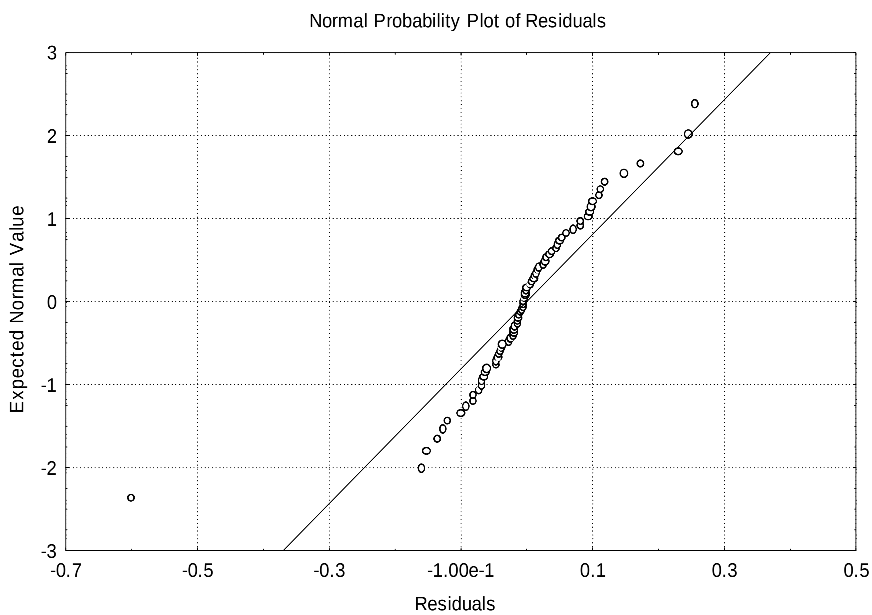
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			1.471	0.038	38.750	0.00
C1	-0.120	0.083	-0.095	0.066	-1.441	0.15
C2	-0.104	0.083	-0.082	0.066	-1.249	0.22
L1	-0.042	0.083	-0.033	0.066	-0.504	0.62
L2	-0.061	0.083	-0.048	0.066	-0.731	0.47
W1	0.074	0.083	0.059	0.066	0.895	0.37
W2	0.033	0.083	0.026	0.066	0.395	0.69
T1	-0.731	0.083	-0.578	0.066	-8.789	0.00
T2	0.005	0.083	0.004	0.066	0.064	0.95
A1	-0.233	0.083	-0.184	0.066	-2.800	0.01
A2	-0.227	0.083	-0.179	0.066	-2.728	0.01
F1	-0.356	0.083	-0.282	0.066	-4.286	0.00
F2	-0.434	0.083	-0.343	0.066	-5.212	0.00
S1	-0.219	0.083	-0.173	0.066	-2.636	0.01

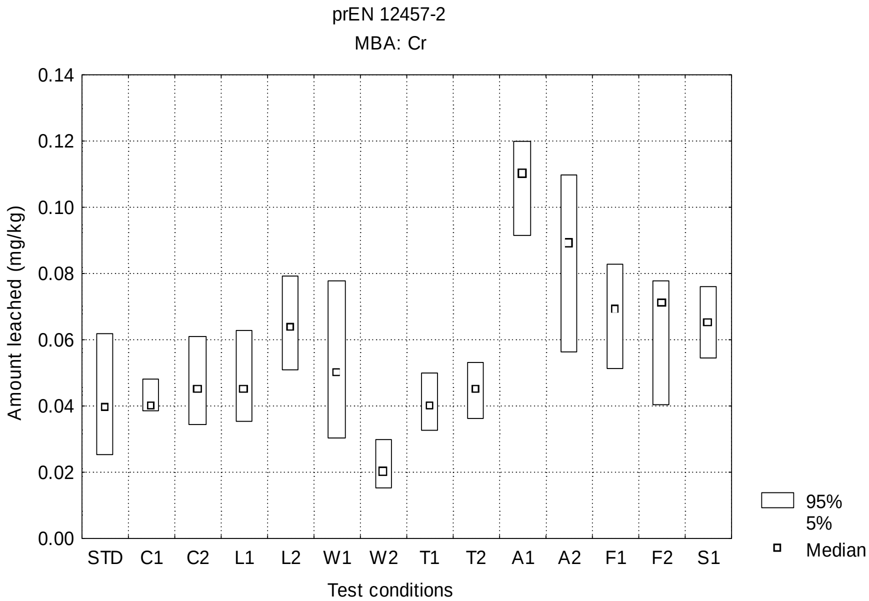
Analysis of Variance; DV: BA (part 2 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	2.0357	13	0.15659	10.873778	2E-11
Residual	0.87846	61	0.0144		
Total	2.91415				

prEN 12457 - 2 Barium
MBA







Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CR
R= .87878458 R^2= .77226234 Adjusted R^2= .72372809
F(13,61)=15.912 p<.00000 Std.Error of estimate: .01221

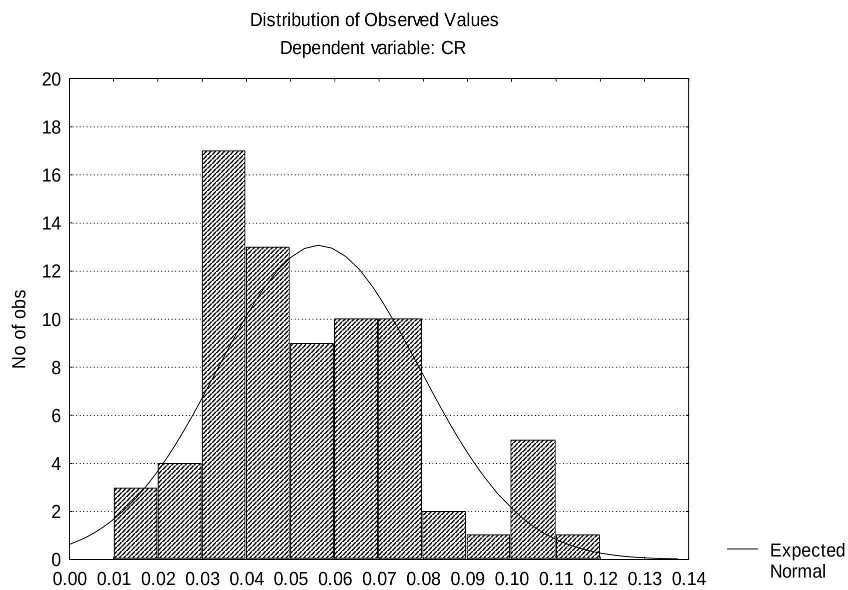
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			0.042	0.004	10.822	0.00
C1	0.004	0.072	0.000	0.007	0.060	0.95
C2	0.041	0.072	0.004	0.007	0.568	0.57
L1	0.062	0.072	0.006	0.007	0.855	0.40
L2	0.238	0.072	0.022	0.007	3.288	0.00
W1	0.149	0.072	0.014	0.007	2.063	0.04
W2	-0.223	0.072	-0.021	0.007	-3.079	0.00
T1	-0.015	0.072	-0.001	0.007	-0.209	0.83
T2	0.039	0.072	0.004	0.007	0.538	0.59
A1	0.696	0.072	0.064	0.007	9.626	0.00
A2	0.480	0.072	0.044	0.007	6.636	0.00
F1	0.287	0.072	0.027	0.007	3.976	0.00
F2	0.266	0.072	0.025	0.007	3.677	0.00
S1	0.249	0.072	0.023	0.007	3.438	0.00

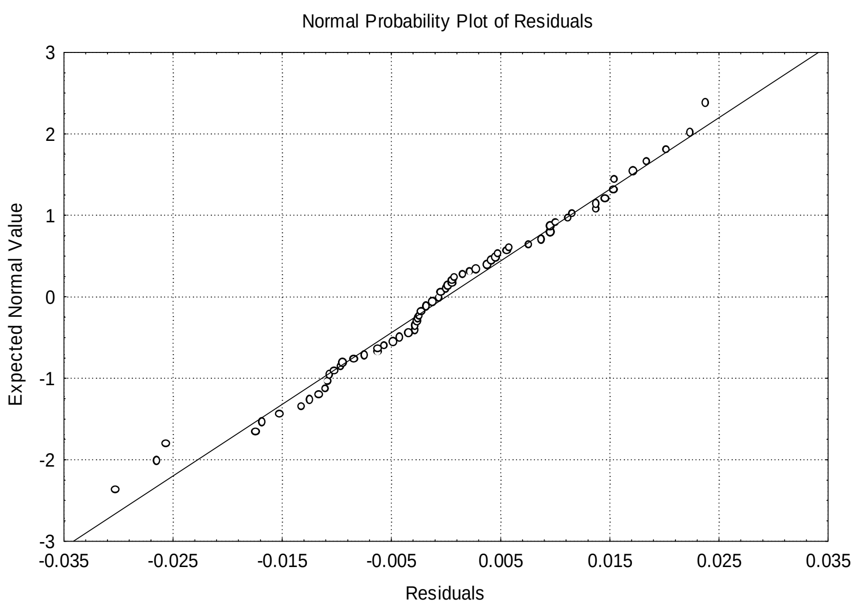
Analysis of Variance; DV: CR (part 2 data.sta)

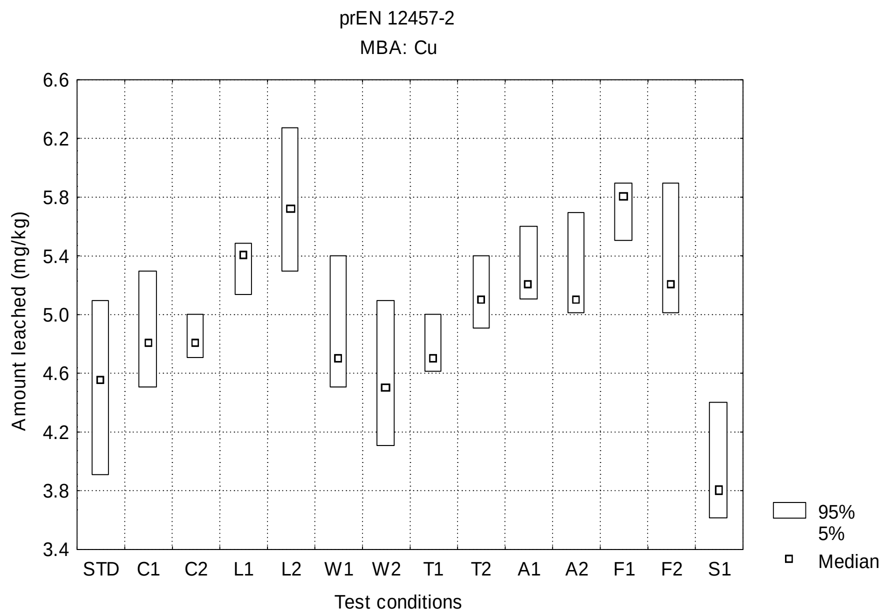
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.03086**	**13**	**0.00237**	**15.911696**	6E-15
Residual	0.0091	61	0.00015		
Total	0.03996				

prEN 12457 - 2
MBA

Chromium


Distribution of Observed Values
Dependent variable: CR
No of obs
0
2
4
6
8
10
12
14
16
18
20
0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.035 -0.025 -0.015 -0.005 0.005 0.015 0.025 0.035
Residuals



Multiple regression analysis of ruggedness data
All data are included

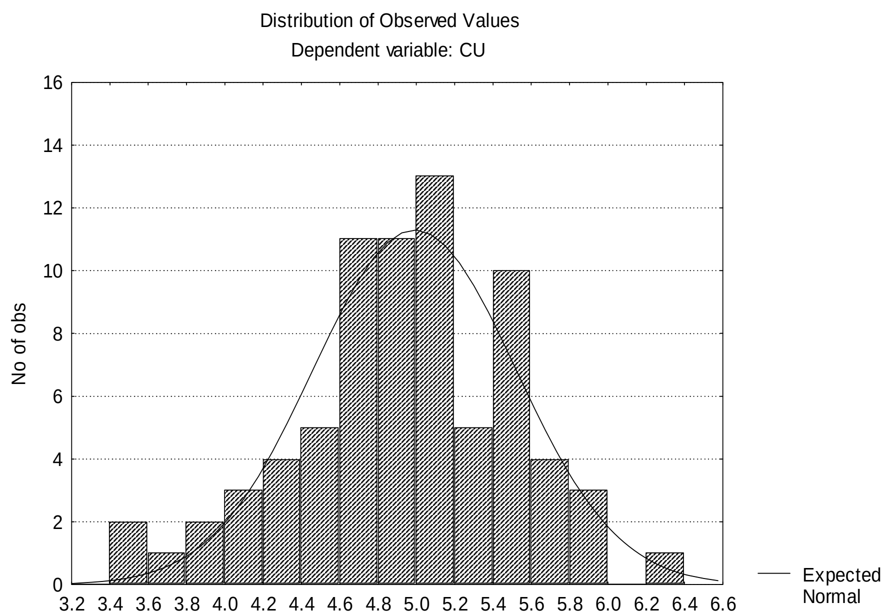
Regression Summary for Dependent Variable: CU
R= .86152373 R^2= .74222315 Adjusted R^2= .68728709
F(13,61)=13.511 p<.00000 Std.Error of estimate: .30764

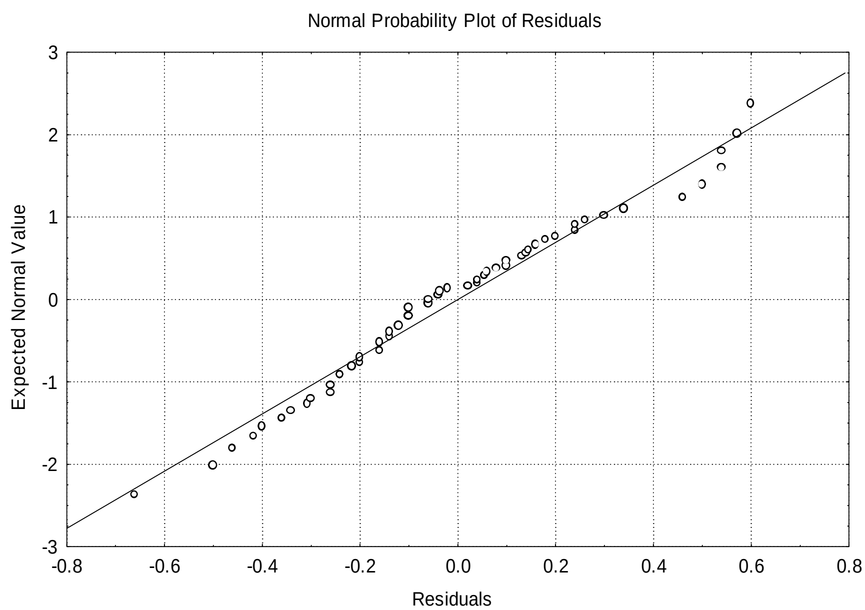
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			4.560	0.097	46.873	0.00
C1	0.128	0.077	0.280	0.169	1.662	0.10
C2	0.119	0.077	0.260	0.169	1.543	0.13
L1	0.359	0.077	0.786	0.169	4.665	0.00
L2	0.519	0.077	1.138	0.169	6.754	0.00
W1	0.137	0.077	0.300	0.169	1.780	0.08
W2	0.018	0.077	0.040	0.169	0.237	0.81
T1	0.091	0.077	0.200	0.169	1.187	0.24
T2	0.265	0.077	0.580	0.169	3.442	0.00
A1	0.338	0.077	0.740	0.169	4.392	0.00
A2	0.310	0.077	0.680	0.169	4.036	0.00
F1	0.520	0.077	1.140	0.169	6.766	0.00
F2	0.338	0.077	0.740	0.169	4.392	0.00
S1	-0.320	0.077	-0.700	0.169	-4.154	0.00

Analysis of Variance; DV: CU (part 2 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**16.6229**	**13**	**1.27869**	**13.510675**	2E-13
Residual	5.7732	61	0.09464		
Total	22.3961				

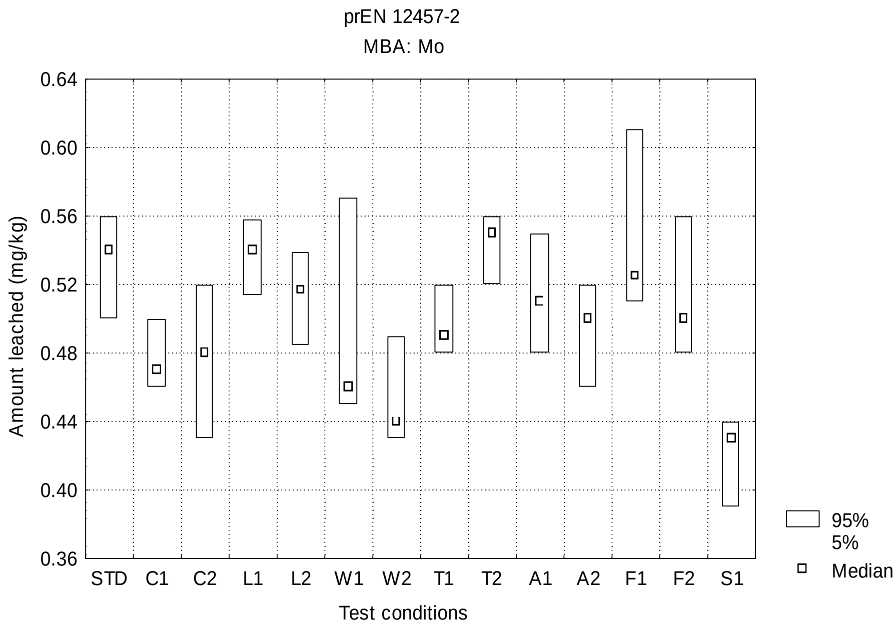
prEN 12457 - 2 **Copper**
MBA


Distribution of Observed Values
Dependent variable: CU
No of obs
0
2
4
6
8
10
12
14
16
3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2 5.4 5.6 5.8 6.0 6.2 6.4 6.6
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
-3
-2
-1
0
1
2
3
-0.8 -0.6 -0.4 -0.2 0.0 0.2 0.4 0.6 0.8
Residuals

prEN 12457 - 2 MBA

Molybdenum



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= .81322878 R^2= .66134105 Adjusted R^2= .58796495
F(13,60)=9.0130 p<.00000 Std.Error of estimate: .02758

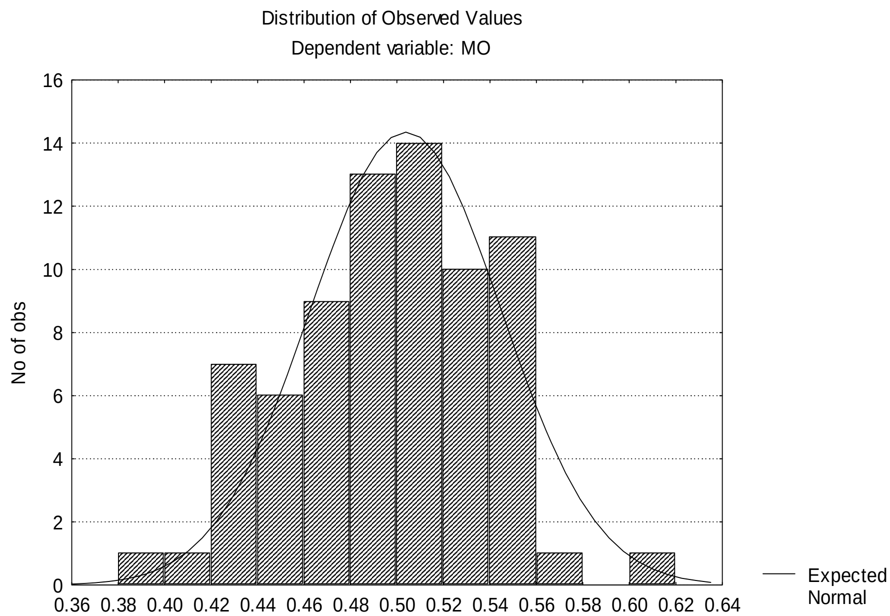
	BETA	St. Err. of BETA	B	St. Err. of B	t(60)	p-level
Intercpt			0.536	0.009	61.463	0.00
C1	-0.353	0.089	-0.060	0.015	-3.972	0.00
C2	-0.353	0.089	-0.060	0.015	-3.972	0.00
L1	0.013	0.089	0.002	0.015	0.146	0.88
L2	-0.125	0.089	-0.021	0.015	-1.404	0.17
W1	-0.294	0.089	-0.050	0.015	-3.310	0.00
W2	-0.506	0.089	-0.086	0.015	-5.694	0.00
T1	-0.212	0.089	-0.036	0.015	-2.383	0.02
T2	0.047	0.089	0.008	0.015	0.530	0.60
A1	-0.153	0.089	-0.026	0.015	-1.721	0.09
A2	-0.235	0.089	-0.040	0.015	-2.648	0.01
F1	0.034	0.086	0.006	0.016	0.398	0.69
F2	-0.129	0.089	-0.022	0.015	-1.456	0.15
S1	-0.671	0.089	-0.114	0.015	-7.547	0.00

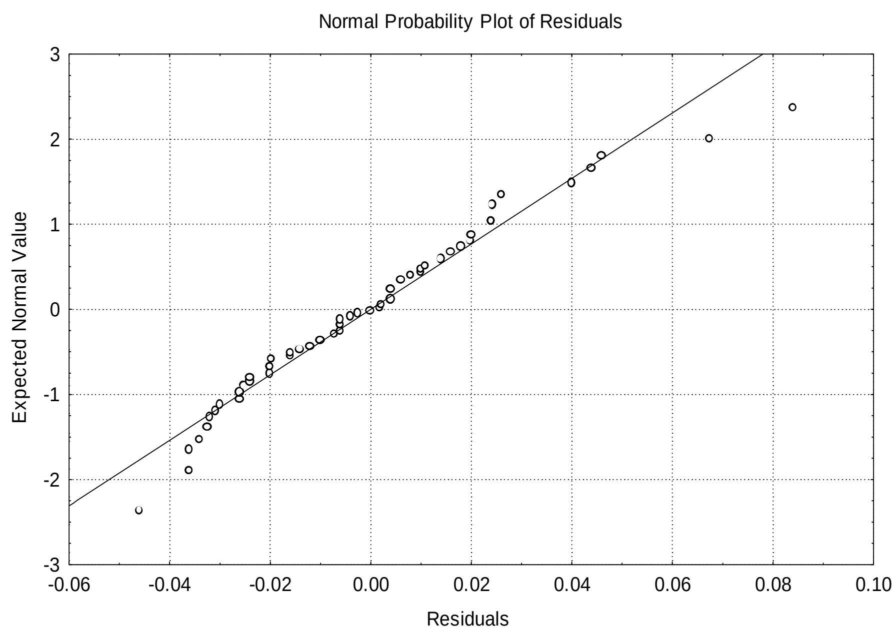
Analysis of Variance; DV: MO (part 2 data.sta)

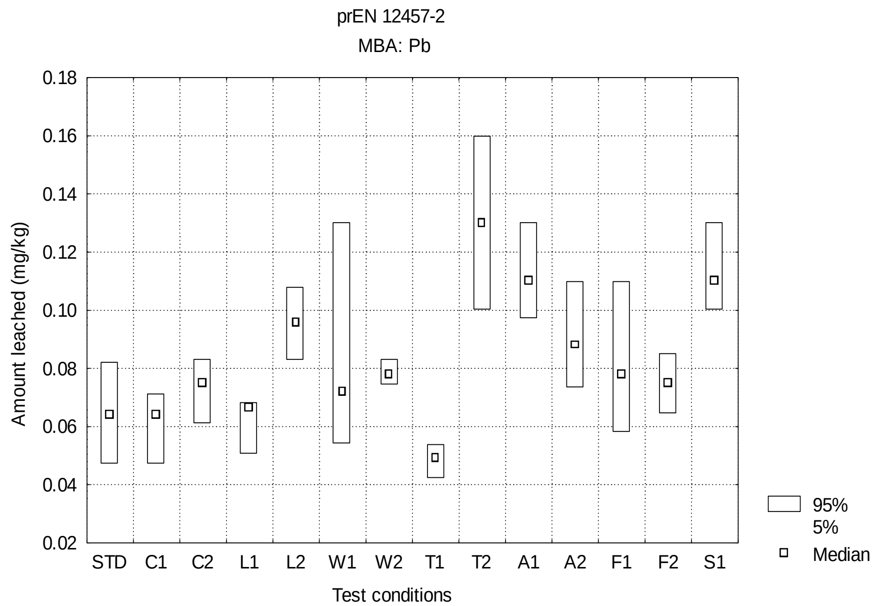
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.08911**	**13**	**0.00685**	**9.0130301**	7E-10
Residual	0.04563	60	0.00076		
Total	0.13474				

prEN 12457 - 2 MBA

Molybdenum


Distribution of Observed Values
Dependent variable: MO
No of obs
16
14
12
10
8
6
4
2
0
0.36 0.38 0.40 0.42 0.44 0.46 0.48 0.50 0.52 0.54 0.56 0.58 0.60 0.62 0.64
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.06 -0.04 -0.02 0.00 0.02 0.04 0.06 0.08 0.10
Residuals



Multiple regression analysis of ruggedness data
All data are included

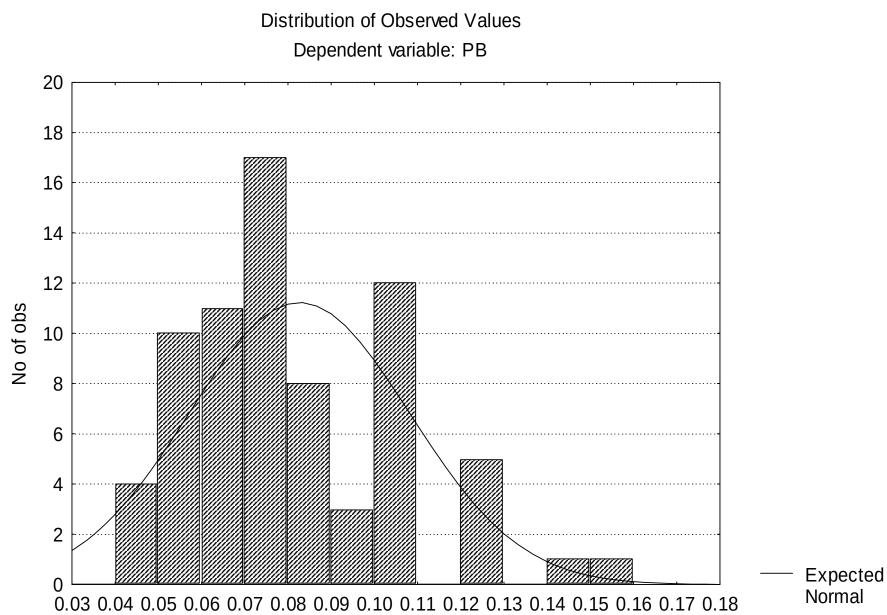
Regression Summary for Dependent Variable: PB
R= .85620049 R²= .73307928 Adjusted R²= .67325222
F(13,58)=12.253 p<.00000 Std.Error of estimate: .01477

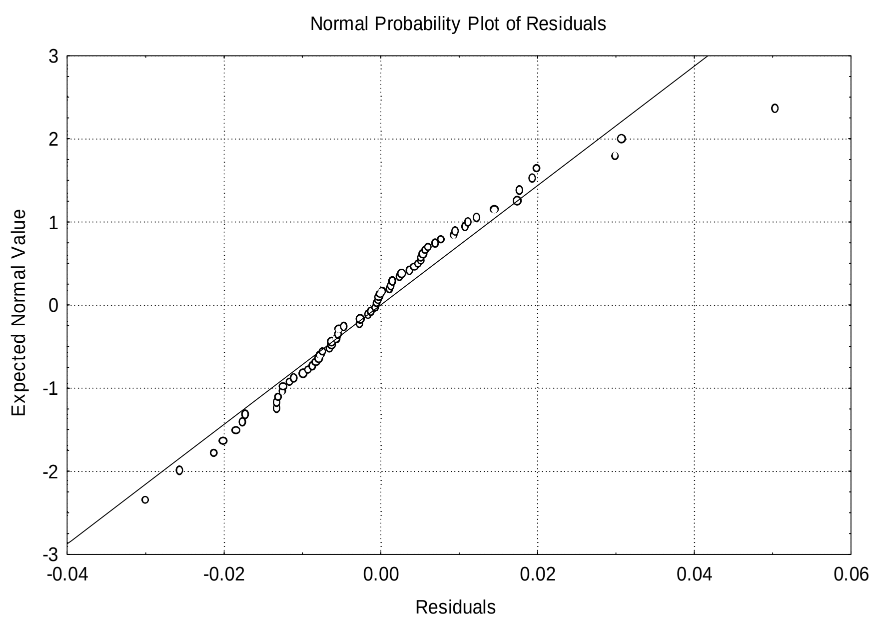
	BETA	St. Err. of BETA	B	St. Err. of B	t(58)	p-level
Intercpt			0.064	0.005	13.042	0.00
C1	-0.040	0.082	-0.004	0.008	-0.488	0.63
C2	0.091	0.082	0.009	0.008	1.114	0.27
L1	-0.028	0.082	-0.003	0.008	-0.345	0.73
L2	0.310	0.082	0.031	0.008	3.793	0.00
W1	0.152	0.082	0.015	0.008	1.866	0.07
W2	0.142	0.082	0.014	0.008	1.745	0.09
T1	-0.140	0.079	-0.016	0.009	-1.771	0.08
T2	0.652	0.082	0.066	0.008	7.983	0.00
A1	0.507	0.082	0.051	0.008	6.211	0.00
A2	0.261	0.082	0.026	0.008	3.201	0.00
F1	0.148	0.082	0.015	0.008	1.818	0.07
F2	0.095	0.082	0.010	0.008	1.162	0.25
S1	0.431	0.079	0.048	0.009	5.438	0.00

Analysis of Variance; DV: PB (part 2 data.sta)

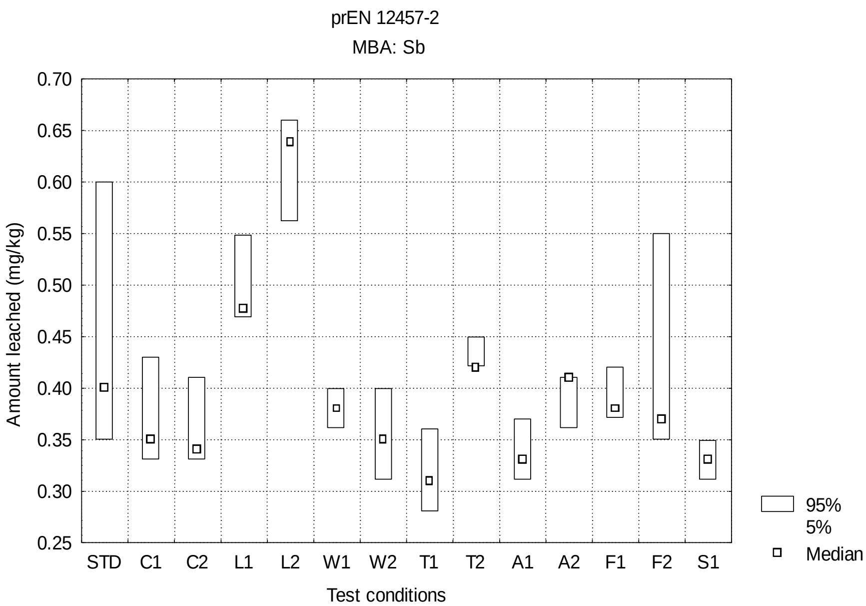
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.03476**	**13**	**0.00267**	**12.253306**	3E-12
Residual	0.01266	58	0.00022		
Total	0.04742				

prEN 12457 - 2 **Lead**
MBA


Distribution of Observed Values
Dependent variable: PB
No of obs
0
2
4
6
8
10
12
14
16
18
20
0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18
Expected
Normal


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.04
-0.02
0.00
0.02
0.04
0.06
Residuals

prEN 12457 - 2 **Antimony**
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: SB
R= .87137908 R^2= .75930150 Adjusted R^2= .70715016
F(13,60)=14.560 p<.00000 Std.Error of estimate: .04867

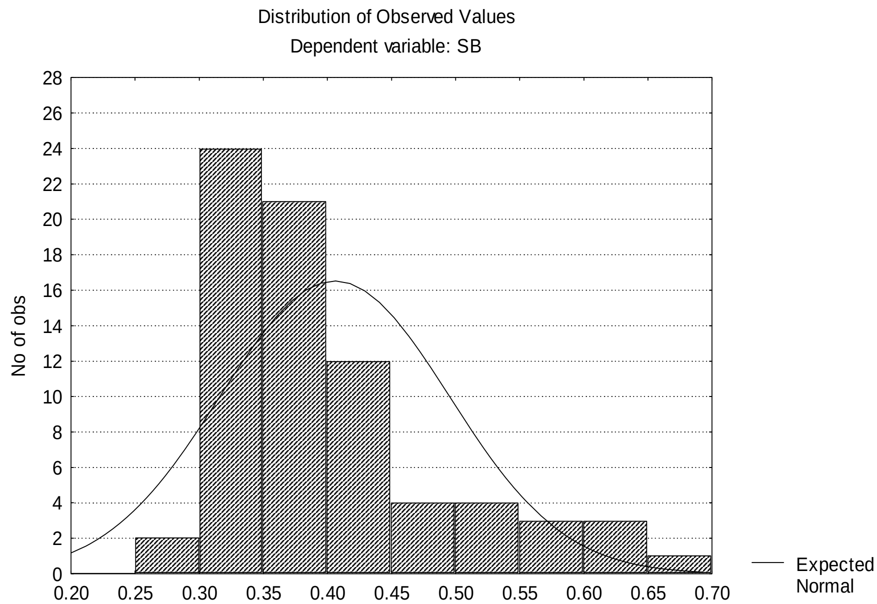
	BETA	St. Err. of BETA	B	St. Err. of B	t(60)	p-level
Intercpt			0.440	0.015	28.590	0.00
C1	-0.219	0.075	-0.078	0.027	-2.926	0.00
C2	-0.242	0.075	-0.086	0.027	-3.226	0.00
L1	0.180	0.075	0.064	0.027	2.401	0.02
L2	0.532	0.075	0.189	0.027	7.098	0.00
W1	-0.152	0.073	-0.060	0.029	-2.084	0.04
W2	-0.253	0.075	-0.090	0.027	-3.376	0.00
T1	-0.343	0.075	-0.122	0.027	-4.577	0.00
T2	-0.034	0.075	-0.012	0.027	-0.450	0.65
A1	-0.298	0.075	-0.106	0.027	-3.977	0.00
A2	-0.118	0.075	-0.042	0.027	-1.576	0.12
F1	-0.152	0.075	-0.054	0.027	-2.026	0.05
F2	-0.107	0.075	-0.038	0.027	-1.426	0.16
S1	-0.309	0.075	-0.110	0.027	-4.127	0.00

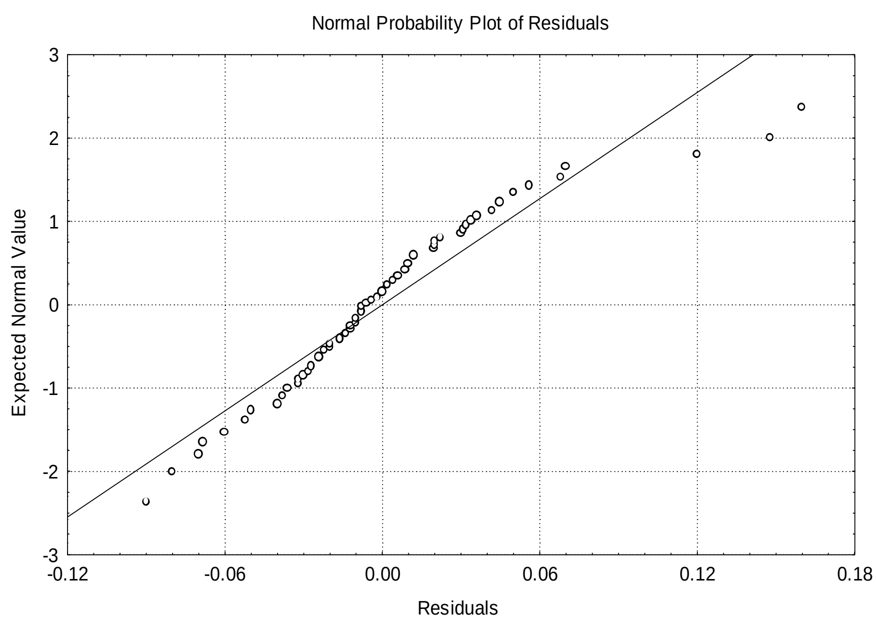
Analysis of Variance; DV: SB (part 2 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.4483**	**13**	**0.03448**	**14.559578**	5E-14
Residual	0.14211	60	0.00237		
Total	0.59041				

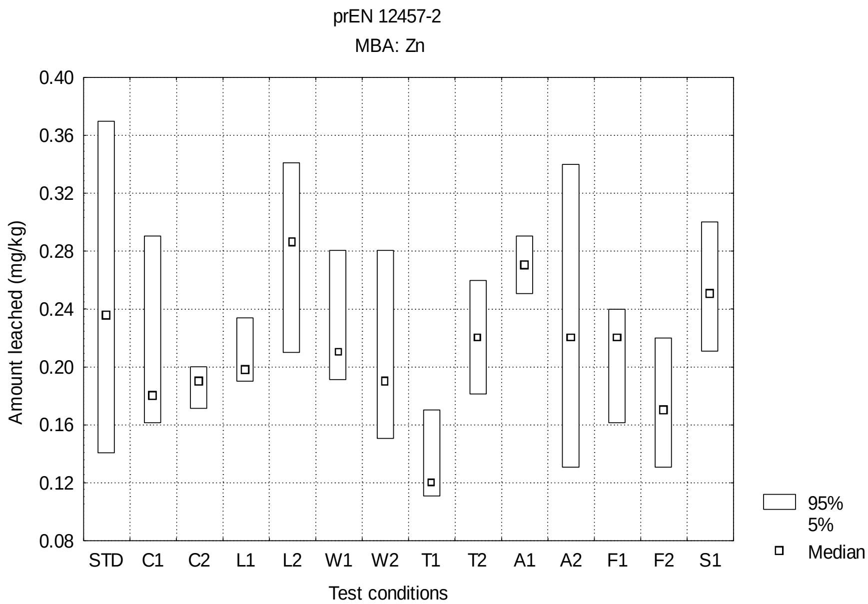
prEN 12457 - 2
MBA

Antimony





prEN 12457 - 2 **Zinc**
MBA



Multiple regression analysis of ruggedness data
All data are included

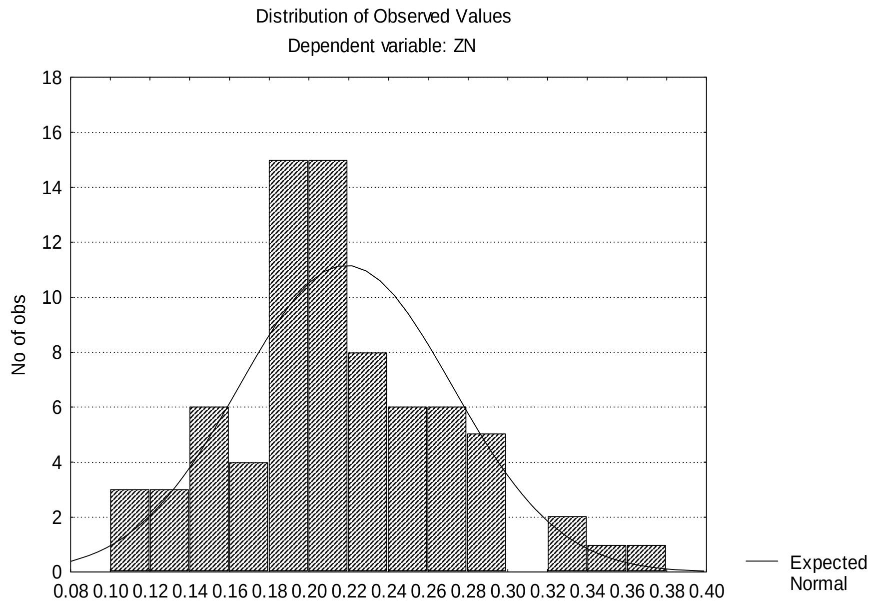
Regression Summary for Dependent Variable: ZN
R= .65752374 R²= .43233746 Adjusted R²= .31136020
F(13,61)=3.5737 p<.00035 Std.Error of estimate: .04538

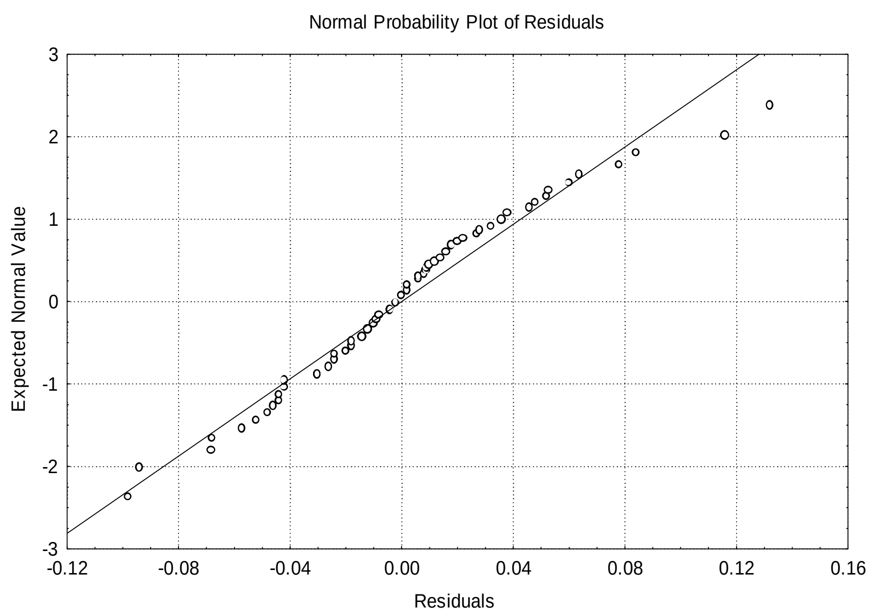
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			0.238	0.014	16.584	0.00
C1	-0.147	0.114	-0.032	0.025	-1.287	0.20
C2	-0.230	0.114	-0.050	0.025	-2.011	0.05
L1	-0.142	0.114	-0.031	0.025	-1.247	0.22
L2	0.180	0.114	0.039	0.025	1.577	0.12
W1	-0.083	0.114	-0.018	0.025	-0.724	0.47
W2	-0.165	0.114	-0.036	0.025	-1.448	0.15
T1	-0.478	0.114	-0.104	0.025	-4.184	0.00
T2	-0.073	0.114	-0.016	0.025	-0.644	0.52
A1	0.147	0.114	0.032	0.025	1.287	0.20
A2	-0.064	0.114	-0.014	0.025	-0.563	0.58
F1	-0.156	0.114	-0.034	0.025	-1.368	0.18
F2	-0.303	0.114	-0.066	0.025	-2.655	0.01
S1	0.073	0.114	0.016	0.025	0.644	0.52

Analysis of Variance; DV: ZN (part 2 data.sta)

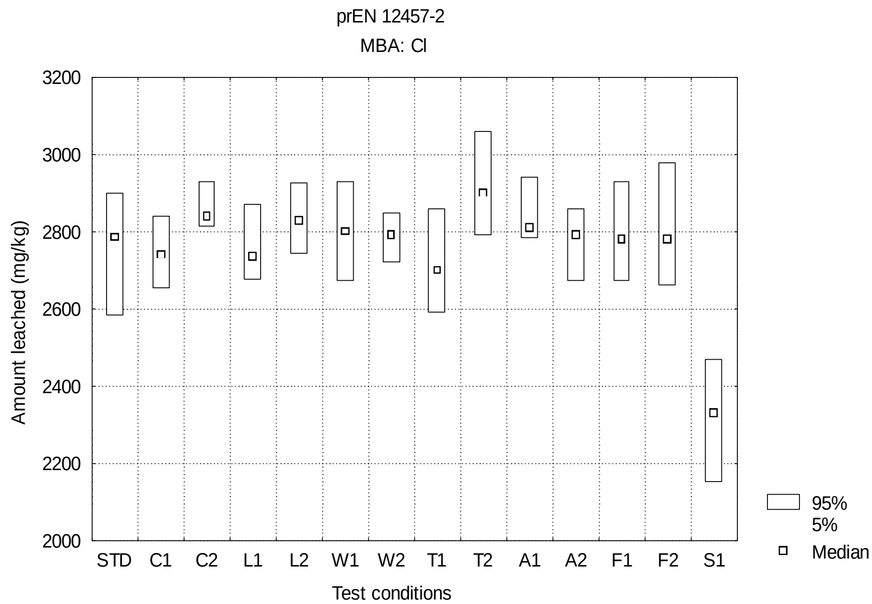
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.09568**	**13**	**0.00736**	**3.5737085**	0.0004
Residual	0.12563	61	0.00206		
Total	0.22132				

prEN 12457 - 2 **Zinc**
MBA





prEN 12457 - 2 **Chloride**
MBA



Multiple regression analysis of ruggedness data
All data are included

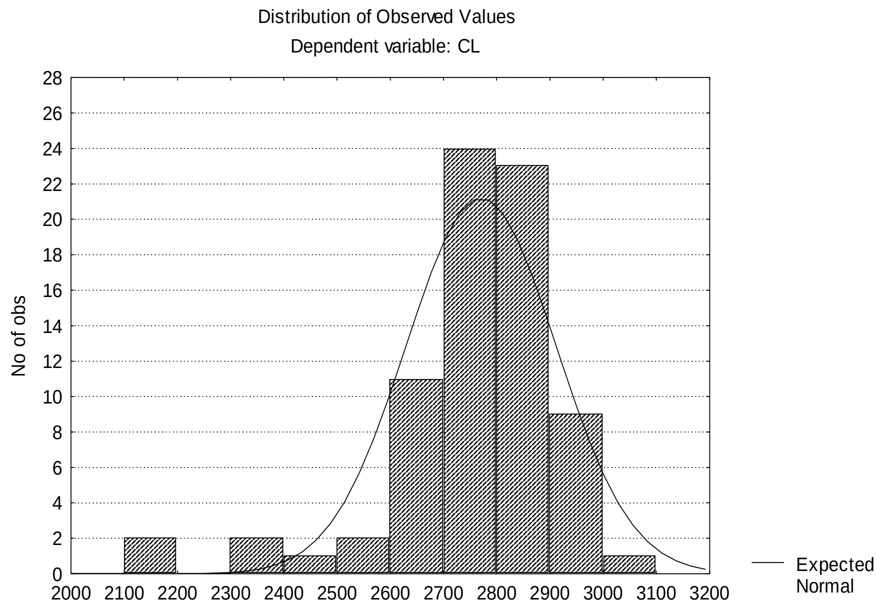
Regression Summary for Dependent Variable: CL
R= .84499547 R^2= .71401735 Adjusted R^2= .65307023
F(13,61)=11.715 p<.00000 Std.Error of estimate: 92.742

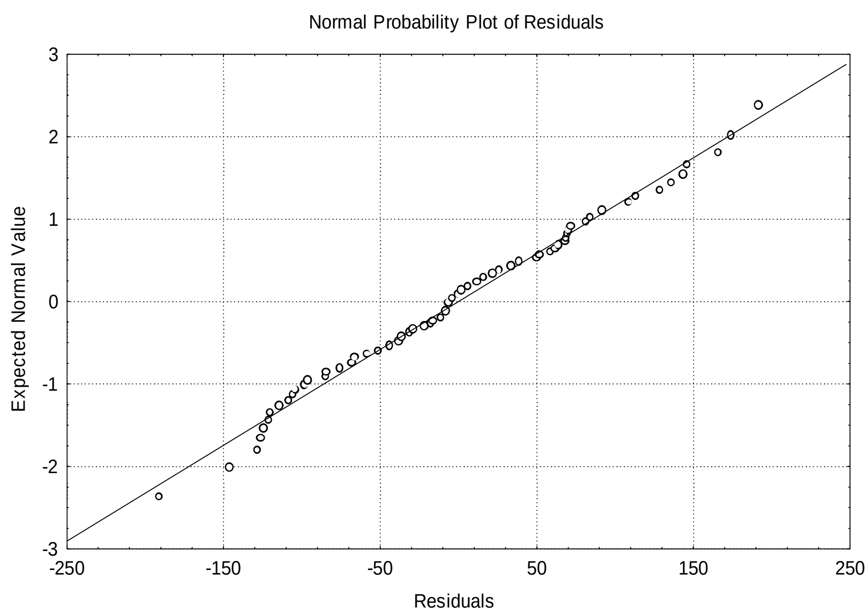
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			2771	29	94.484	0.00
C1	-0.037	0.081	-23	51	-0.453	0.65
C2	0.120	0.081	75	51	1.476	0.14
L1	-0.021	0.081	-13	51	-0.264	0.79
L2	0.117	0.081	74	51	1.449	0.15
W1	0.037	0.081	23	51	0.453	0.65
W2	0.027	0.081	17	51	0.335	0.74
T1	-0.088	0.081	-55	51	-1.083	0.28
T2	0.196	0.081	123	51	2.421	0.02
A1	0.123	0.081	77	51	1.516	0.13
A2	0.030	0.081	19	51	0.374	0.71
F1	0.021	0.081	13	51	0.256	0.80
F2	0.027	0.081	17	51	0.335	0.74
S1	-0.758	0.081	-475	51	-9.351	0.00

Analysis of Variance; DV: CL (part 2 data.sta)

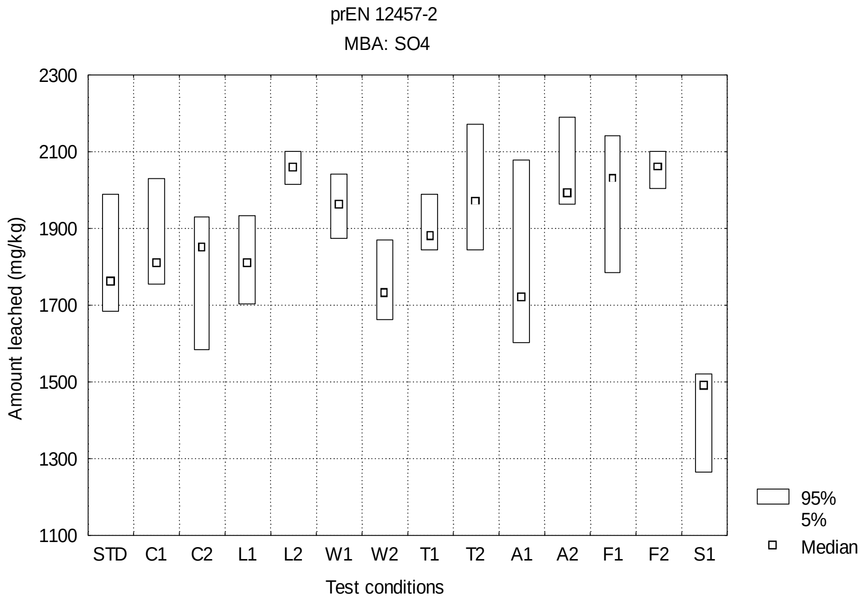
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**1309948**	**13**	**100765**	**11.715358**	4E-12
Residual	524668	61	8601.12		
Total	1834616				

prEN 12457 - 2 **Chloride**
MBA





prEN 12457 - 2 Sulfate
MBA



Multiple regression analysis of ruggedness data
All data are included

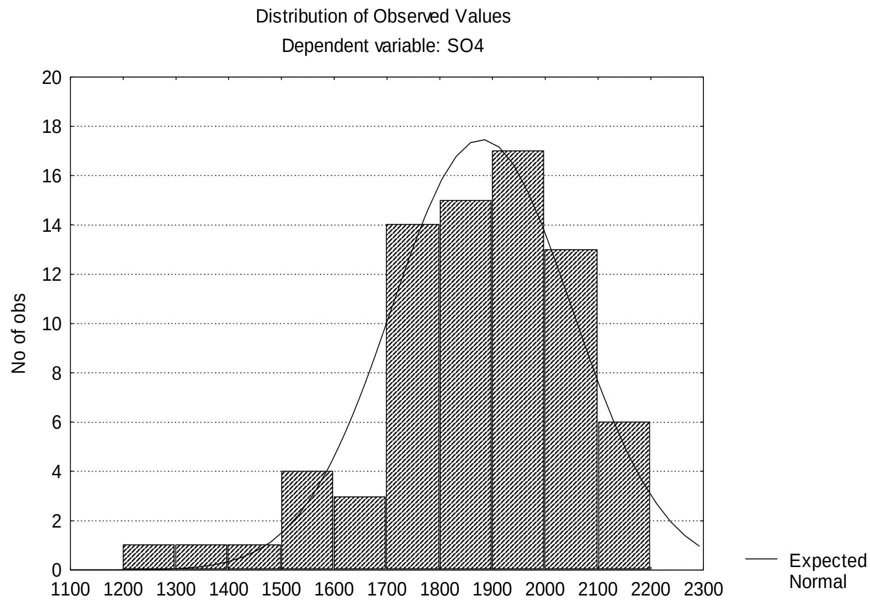
Regression Summary for Dependent Variable: SO4
R= .84828717 R^2= .71959113 Adjusted R^2= .65983186
F(13,61)=12.041 p<.00000 Std.Error of estimate: 107.62

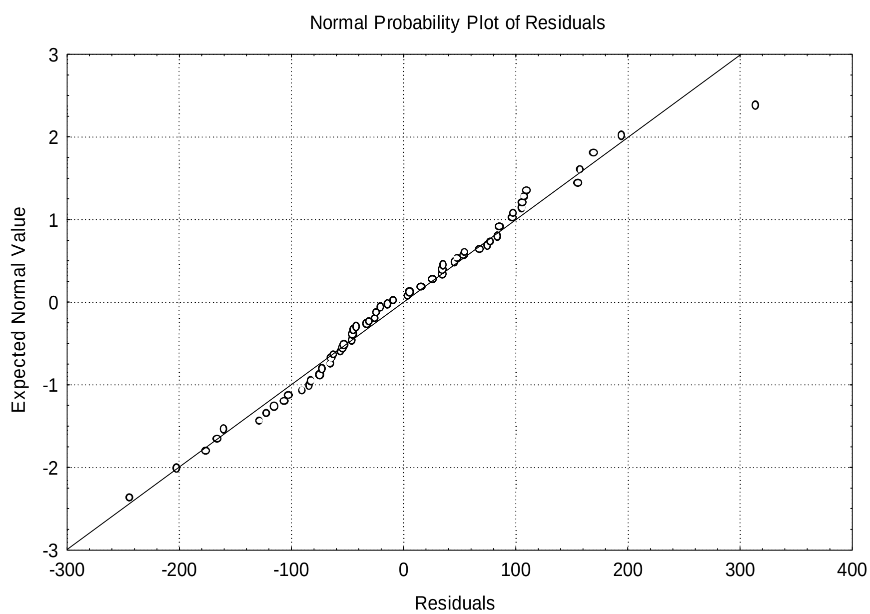
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			1795	34	52.74	0.00
C1	0.105	0.080	77	59	1.31	0.20
C2	0.039	0.080	29	59	0.49	0.62
L1	0.046	0.080	34	59	0.57	0.57
L2	0.369	0.080	271	59	4.59	0.00
W1	0.216	0.080	159	59	2.70	0.01
W2	-0.045	0.080	-33	59	-0.56	0.58
T1	0.148	0.080	109	59	1.85	0.07
T2	0.279	0.080	205	59	3.48	0.00
A1	-0.039	0.080	-29	59	-0.49	0.62
A2	0.325	0.080	239	59	4.05	0.00
F1	0.254	0.080	187	59	3.17	0.00
F2	0.352	0.080	259	59	4.39	0.00
S1	-0.489	0.080	-359	59	-6.09	0.00

Analysis of Variance; DV: SO4 (part 2 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**1813075**	**13**	**139467**	**12.041498**	2E-12
Residual	706516	61	11582.2		
Total	2519591				

prEN 12457 - 2 **Sulfate**
MBA





A P P E N D I X   3

prEN 12457 part 3: MBA

Part 3 on MBA: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.3.1

Table A.3.1. Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	Assumption of normality on entire population	Assumption of normality on reduced population	Comments
Part 3 / 1			
Ba	Reasonable	Reasonable	
Cr	Doubtful	Doubtful	
Cu	Doubtful	Reasonable	
Mo	Reasonable	-	
Sb	Reasonable	Reasonable	
SO_4	Reasonable	Reasonable	
Part 3 / 1+2			
Ba	Fulfilled	Fulfilled	
Cr	Fulfilled	-	
Cu	Doubtful	Doubtful	
Mo	Fulfilled	-	
Sb	Reasonable	Doubtful	The assumption of common variance of the entire population was not reasonable. This can be concluded, as the variance of the test conditions on the reduced population is significantly lower. Therefore additional test conditions becomes significantly different from the standard conditions during the second regression analysis. This aspect is not accounted for in the estimates of the modified standard
SO_4	Reasonable	Reasonable	

prEN 12457 - 3/1 Barium
MBA

	Ba	Ba	mean value	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	Test parameter 5%	Test results
	µg/l	mg/kg	mg/kg					
STD	141	0.28			1.449	2.482	2.29	-
STD	141	0.28						
STD	162	0.28						
STD	160	0.31						
STD	156	0.31						
STD	139	0.32						
STD	162	0.32						
STD	172	0.32						
STD	162	0.32						
STD	156	0.34	0.31	0.022111	1.520	2.482	2.29	-
C1	129	0.24			1.033	1.764	1.715	-
C1	144	0.25						
C1	121	0.26						
C1	127	0.29						
C1	154	0.31	0.269	0.0270242	1.399	1.764	1.715	-
C2	151	0.29			1.064	1.764	1.715	-
C2	148	0.30						
C2	170	0.31						
C2	156	0.32						
C2	162	0.34	0.313	0.0176101	1.431	1.764	1.715	-
L1	136	0.24			1.425	1.764	1.715	-
L1	163	0.29						
L1	165	0.30						
L1	167	0.30						
L1	193	0.35	0.295174	0.0361542	1.396	1.764	1.715	-
L2	154	0.34			1.167	1.764	1.715	-
L2	157	0.34						
L2	159	0.35						
L2	162	0.35						
L2	167	0.37	0.350122	0.0108891	1.449	1.764	1.715	-
W1	147	0.29			1.122	1.155	1.155	-
W1	179	0.34						
W1	171	0.36	0.329891	0.0330982	0.797	1.155	1.155	-
W2	136	0.27			1.126	1.155	1.155	-
W2	157	0.31						
W2	164	0.33	0.302962	0.028541	0.786	1.155	1.155	-
A1	163	0.29			1.550	1.764	1.715	-
A1	156	0.31						
A1	156	0.31						
A1	146	0.31						
A1	156	0.32	0.309401	0.012078	1.253	1.764	1.715	-
A2	144	0.28			0.691	1.764	1.715	-
A2	145	0.29						
A2	149	0.29						
A2	143	0.30						
A2	164	0.33	0.296659	0.0172999	1.726	1.764	1.715	*
F1	150	0.28			0.894	1.764	1.715	-
F1	157	0.30						
F1	193	0.30						
F1	149	0.31						
F1	139	0.38	0.313823	0.0414616	1.702	1.764	1.715	-

prEN 12457 - 3/1 Chromium
MBA

					Grubbs' test			
					one outlier			
	Cr	Cr	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	13	0.022			1.786	2.482	2.29	-
STD	16	0.026						
STD	27	0.032						
STD	24	0.044						
STD	23	0.046						
STD	11	0.048						
STD	22	0.048						
STD	24	0.048						
STD	26	0.052						
STD	24	0.054	0.041815	0.0111457	1.073	2.482	2.29	-
C1	19	0.038			0.912	1.764	1.715	-
C1	27	0.040						
C1	21	0.042						
C1	20	0.054						
C1	30	0.060	0.047	0.0096063	1.367	1.764	1.715	-
C2	14	0.028			1.744	1.764	1.715	*
C2	26	0.048						
C2	27	0.052						
C2	24	0.054						
C2	27	0.054	0.047	0.0109629	0.619	1.764	1.715	-
L1	18	0.032			1.477	1.764	1.715	-
L1	22	0.039						
L1	28	0.045						
L1	25	0.048						
L1	27	0.050	0.042986	0.0072708	0.985	1.764	1.715	-
L2	19	0.042			1.636	1.764	1.715	-
L2	28	0.055						
L2	26	0.057						
L2	25	0.061						
L2	29	0.064	0.055651	0.0085701	0.920	1.764	1.715	-
W1	12	0.024			1.142	1.155	1.155	-
W1	31	0.056						
W1	28	0.062	0.047126	0.0203326	0.717	1.155	1.155	-
W2	13	0.026			1.155	1.155	1.155	-
W2	25	0.050						
W2	25	0.050	0.041759	0.0137447	0.584	1.155	1.155	-
A1	29	0.052			1.552	1.764	1.715	-
A1	26	0.058						
A1	30	0.060						
A1	32	0.060						
A1	30	0.064	0.058535	0.0043621	1.187	1.764	1.715	-
A2	15	0.030			0.639	1.764	1.715	-
A2	15	0.030						
A2	17	0.030						
A2	15	0.034						
A2	20	0.040	0.032652	0.0043621	1.643	1.764	1.715	-
F1	15	0.030			1.539	1.764	1.715	-
F1	27	0.054						
F1	27	0.054						
F1	33	0.066						
F1	37	0.074	0.055355	0.0165586	1.106	1.764	1.715	-

prEN 12457 - 3/1 MBA

Copper

					Grubbs' test			
					one outlier			
	Cu	Cu	mean value	Std dev.		Test parameter		Test results
	µg/l	mg/kg	mg/kg		Gp	1%	5%	
STD	1670	3.01			1.524	2.482	2.29	-
STD	1540	3.07						
STD	2170	3.33						
STD	1980	3.84						
STD	2010	3.94						
STD	1510	4.00						
STD	1930	4.26						
STD	2300	4.32						
STD	2280	4.54						
STD	2141	4.58	3.88903	0.5789162	1.192	2.482	2.29	-
C1	1600	3.2			1.659	1.764	1.715	-
C1	2280	4.0						
C1	2190	4.3						
C1	2180	4.4						
C1	2000	4.5	4.082	0.5401304	0.847	1.764	1.715	-
C2	1920	3.8			1.717	1.764	1.715	*
C2	2250	4.4						
C2	2240	4.5						
C2	2330	4.5						
C2	2210	4.6	4.361	0.3133703	0.888	1.764	1.715	-
L1	1880	3.4			1.119	1.764	1.715	-
L1	2010	3.6						
L1	2430	3.8						
L1	2120	3.8						
L1	2100	4.4	3.775669	0.3639447	1.584	1.764	1.715	-
L2	1840	3.9			1.554	1.764	1.715	-
L2	1880	4.0						
L2	1790	4.0						
L2	1840	4.1						
L2	1860	4.1	4.035822	0.0733249	1.135	1.764	1.715	-
W1	1580	3.1			1.144	1.155	1.155	-
W1	2110	4.0						
W1	2030	4.2	3.79672	0.5683764	0.709	1.155	1.155	-
W2	1470	2.9			1.155	1.155	1.155	-
W2	2100	4.2						
W2	2110	4.2	3.76531	0.7256504	0.580	1.155	1.155	-
A1	2340	4.5			1.292	1.764	1.715	-
A1	2310	4.6						
A1	2300	4.6						
A1	2280	4.6						
A1	2310	4.7	4.595228	0.0431639	1.476	1.764	1.715	-
A2	1690	3.4			1.185	1.764	1.715	-
A2	1780	3.5						
A2	1910	3.6						
A2	1820	3.8						
A2	2040	4.1	3.679368	0.2654086	1.440	1.764	1.715	-
F1	1390	2.8			1.688	1.764	1.715	-
F1	1910	3.8						
F1	2110	4.1						
F1	2080	4.2						
F1	2210	4.4	3.862961	0.6486468	0.828	1.764	1.715	-

prEN 12457 - 3/1 Molybdenum
MBA

	Mo	Mo	mean value	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	5%	Test results
	µg/l	mg/kg	mg/kg					
STD	137	0.25			1.147	2.482	2.29	-
STD	129	0.26						
STD	239	0.27						
STD	156	0.31						
STD	164	0.31						
STD	127	0.33						
STD	158	0.34						
STD	183	0.36						
STD	185	0.37						
STD	173	0.48	0.328751	0.0661148	2.227	2.482	2.29	-
C1	132	0.26			1.512	1.764	1.715	-
C1	160	0.29						
C1	144	0.30						
C1	152	0.30						
C1	152	0.32	0.295	0.0210655	1.133	1.764	1.715	-
C2	183	0.33			1.036	1.764	1.715	-
C2	169	0.34						
C2	174	0.35						
C2	167	0.35						
C2	174	0.36	0.345	0.0123252	1.549	1.764	1.715	-
L1	166	0.29			1.252	1.764	1.715	-
L1	163	0.30						
L1	176	0.30						
L1	175	0.31						
L1	170	0.32	0.304491	0.0100331	1.069	1.764	1.715	-
L2	145	0.32			0.763	1.764	1.715	-
L2	154	0.32						
L2	146	0.32						
L2	146	0.34						
L2	162	0.35	0.329965	0.0160707	1.554	1.764	1.715	-
W1	130	0.26			1.105	1.155	1.155	-
W1	175	0.35						
W1	194	0.39	0.331223	0.0654715	0.844	1.155	1.155	-
W2	124	0.25			1.155	1.155	1.155	-
W2	169	0.34						
W2	170	0.34	0.306931	0.0519568	0.584	1.155	1.155	-
A1	167	0.30			0.867	1.764	1.715	-
A1	160	0.31						
A1	190	0.32						
A1	153	0.33						
A1	158	0.38	0.32971	0.0289415	1.679	1.764	1.715	-
A2	146	0.29			1.368	1.764	1.715	-
A2	150	0.30						
A2	157	0.31						
A2	154	0.31						
A2	159	0.32	0.305021	0.0104788	1.102	1.764	1.715	-
F1	130	0.26			1.607	1.764	1.715	-
F1	164	0.33						
F1	166	0.33						
F1	185	0.37						
F1	184	0.37	0.330143	0.0443194	0.862	1.764	1.715	-

prEN 12457 - 3/1 — Antimony
MBA

	Sb	Sb	mean value	Std dev.	Grubbs' test, one outlier: Gp	Test parameter 1%	Test parameter 5%	Test results
	µg/l	mg/kg	mg/kg					
STD	17	0.034			1.525	2.482	2.29	-
STD	20	0.036						
STD	23	0.038						
STD	23	0.040						
STD	27	0.046						
STD	18	0.046						
STD	19	0.048						
STD	24	0.048						
STD	24	0.048						
STD	24	0.054	0.043608	0.0063956	1.587	2.482	2.29	-
C1	17	0.032			0.593	1.764	1.715	-
C1	17	0.034						
C1	17	0.034						
C1	16	0.034						
C1	28	0.056	0.038	0.0100516	1.782	1.764	1.715	**
C2	15	0.030			1.414	1.764	1.715	-
C2	18	0.034						
C2	20	0.036						
C2	17	0.040						
C2	20	0.040	0.036	0.0042273	0.945	1.764	1.715	-
L1	18	0.032			0.561	1.764	1.715	-
L1	18	0.032						
L1	18	0.032						
L1	21	0.038						
L1	32	0.057	0.03833	0.0108631	1.747	1.764	1.715	*
L2	19	0.042			0.718	1.764	1.715	-
L2	19	0.042						
L2	19	0.042						
L2	22	0.048						
L2	23	0.050	0.044696	0.004271	1.334	1.764	1.715	-
W1	20	0.040			0.658	1.155	1.155	-
W1	31	0.042						
W1	21	0.062	0.047788	0.0120915	1.151	1.155	1.155	-
W2	17	0.034			1.052	1.155	1.155	-
W2	22	0.040						
W2	20	0.044	0.039116	0.0050033	0.939	1.155	1.155	-
A1	19	0.036			1.095	1.764	1.715	-
A1	18	0.036						
A1	18	0.038						
A1	19	0.038						
A1	19	0.038	0.037033	0.0010905	0.730	1.764	1.715	-
A2	26	0.044			0.757	1.764	1.715	-
A2	22	0.044						
A2	22	0.046						
A2	23	0.052						
A2	30	0.060	0.048979	0.0068393	1.572	1.764	1.715	-
F1	25	0.040			0.900	1.764	1.715	-
F1	20	0.040						
F1	20	0.046						
F1	23	0.050						
F1	29	0.058	0.046595	0.0075279	1.480	1.764	1.715	-

prEN 12457 - 3/1 MBA

Sulfate

	SO4 µg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	5%	Test results
STD	294000	566			1.292	2.482	2.29	-
STD	344000	585						
STD	350000	627						
STD	364000	685						
STD	470000	697						
STD	284000	725						
STD	315000	822						
STD	413000	878						
STD	441000	936						
STD	472000	940	746.1016	139.77185	1.385	2.482	2.29	-
C1	408000	735			1.041	1.764	1.715	-
C1	369000	771						
C1	423000	812						
C1	387000	842						
C1	481000	958	823.567	85.347292	1.571	1.764	1.715	-
C2	335000	603			0.858	1.764	1.715	-
C2	310000	617						
C2	346000	667						
C2	303000	689						
C2	419000	834	682.172	91.986365	1.653	1.764	1.715	-
L1	348000	623			0.751	1.764	1.715	-
L1	352000	623						
L1	348000	630						
L1	370000	663						
L1	389000	697	647.3121	32.036768	1.542	1.764	1.715	-
L2	344000	699			1.240	1.764	1.715	-
L2	336000	736						
L2	319000	754						
L2	363000	795						
L2	380000	833	763.3444	51.954889	1.333	1.764	1.715	-
W1	295000	588			1.088	1.155	1.155	-
W1	403000	729						
W1	366000	802	706.2372	109.12318	0.879	1.155	1.155	-
W2	275000	548			1.154	1.155	1.155	-
W2	351000	699						
W2	355000	704	650.3343	88.972541	0.607	1.155	1.155	-
A1	305000	569			1.481	1.764	1.715	-
A1	311000	607						
A1	286000	617						
A1	327000	619						
A1	310000	651	612.8298	29.308981	1.304	1.764	1.715	-
A2	412000	673			1.234	1.764	1.715	-
A2	389000	774						
A2	393000	782						
A2	338000	820						
A2	484000	964	802.7712	105.17871	1.530	1.764	1.715	-
F1	296000	590			0.988	1.764	1.715	-
F1	359000	601						
F1	302000	715						
F1	405000	806						
F1	457000	910	724.3978	136.4939	1.359	1.764	1.715	-

prEN 12457 - 3/2 Barium
MBA

					Grubbs' test			
					one outlier			
	Ba µg/l	Ba mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD		1.14			1.720	2.482	2.29	-
STD		1.23						
STD		1.29						
STD		1.36						
STD		1.40						
STD		1.41						
STD		1.42						
STD		1.43						
STD		1.49						
STD		1.65	1.38	0.14	1.901	2.482	2.29	-
C1		1.19			1.245	1.764	1.715	-
C1		1.22						
C1		1.26						
C1		1.31						
C1		1.33	1.26	0.06	1.183	1.764	1.715	-
C2		1.28			1.127	1.764	1.715	-
C2		1.32						
C2		1.35						
C2		1.35						
C2		1.44	1.35	0.06	1.565	1.764	1.715	-
C3		1.16			1.631	1.764	1.715	-
C3		1.27						
C3		1.29						
C3		1.34						
C3		1.34	1.28	0.07	0.851	1.764	1.715	-
C4		1.15			1.487	1.764	1.715	-
C4		1.24						
C4		1.24						
C4		1.32						
C4		1.32	1.25	0.07	0.954	1.764	1.715	-
L1		1.01			1.555	1.764	1.715	-
L1		1.24						
L1		1.45						
L1		1.48						
L1		1.51	1.34	0.21	0.815	1.764	1.715	-
L2		1.50			1.179	1.764	1.715	-
L2		1.54						
L2		1.55						
L2		1.59						
L2		1.65	1.56	0.06	1.473	1.764	1.715	-
W1		1.22			1.111	1.155	1.155	-
W1		1.49						
W1		1.59	1.43	0.19	0.828	1.155	1.155	-
W2		1.15			1.154	1.155	1.155	
W2		1.41						
W2		1.42	1.33	0.15	0.614	1.155	1.155	-
A1		1.46			1.727	1.764	1.715	*
A1		1.51						
A1		1.52						
A1		1.52						
A1		1.53	1.51	0.03	0.829	1.764	1.715	-
A2		1.1			1.590	1.764	1.715	-
A2		1.2						
A2		1.2						
A2		1.3						
A2		1.3	1.24	0.08	1.110	1.764	1.715	-
F1		0.9			1.214	1.496	1.481	-
F1		1.3						
F1		1.5						
F1		1.9	1.38	0.40	1.192	1.496	1.481	-

prEN 12457 - 3/2 **Chromium**
MBA

					Grubbs' test			
					one outlier			
	Cr µg/l	Cr mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD		0.103			1.471	2.482	2.29	-
STD		0.106						
STD		0.110						
STD		0.130						
STD		0.132						
STD		0.137						
STD		0.140						
STD		0.143						
STD		0.148						
STD		0.161	0.131	0.019	1.566	2.482	2.29	-
C1		0.133			1.033	1.764	1.715	-
C1		0.135						
C1		0.141						
C1		0.150						
C1		0.153	0.142	0.009	1.186	1.764	1.715	-
C2		0.101			1.307	1.764	1.715	-
C2		0.113						
C2		0.122						
C2		0.136						
C2		0.143	0.123	0.017	1.189	1.764	1.715	-
C3		0.086			1.714	1.764	1.715	-
C3		0.118						
C3		0.121						
C3		0.128						
C3		0.131	0.117	0.018	0.785	1.764	1.715	-
C4		0.103			1.041	1.764	1.715	-
C4		0.126						
C4		0.131						
C4		0.134						
C4		0.190	0.137	0.032	1.660	1.764	1.715	-
L1		0.102			0.999	1.764	1.715	-
L1		0.106						
L1		0.118						
L1		0.132						
L1		0.149	0.121	0.019	1.416	1.764	1.715	-
L2		0.118			1.196	1.764	1.715	-
L2		0.127						
L2		0.148						
L2		0.169						
L2		0.170	0.147	0.024	0.997	1.764	1.715	-
W1		0.083			0.803	1.155	1.155	-
W1		0.122						
W1		0.239	0.148	0.081	1.120	1.155	1.155	-
W2		0.099			1.155	1.155	1.155	
W2		0.147						
W2		0.148	0.131	0.028	0.593	1.155	1.155	-
A1		0.106			1.699	1.764	1.715	-
A1		0.124						
A1		0.125						
A1		0.125						
A1		0.132	0.122	0.010	0.954	1.764	1.715	-
A2		0.1			1.418	1.764	1.715	-
A2		0.1						
A2		0.2						
A2		0.2						
A2		0.2	0.146	0.015	0.875	1.764	1.715	-
F1		0.1			0.938	1.496	1.481	-
F1		0.1						
F1		0.1						
F1		0.1	0.122	0.022	1.004	1.496	1.481	-

prEN 12457 - 3/2 Copper
MBA

	Cu	Cu	mean value	Std dev.	Grubbs' test, one outlier	Test parameter		Test results
	µg/l	mg/kg	mg/kg		Gp	1%	5%	
STD		3.8			1.565	2.482	2.29	-
STD		3.9						
STD		4.3						
STD		4.9						
STD		4.9						
STD		5.0						
STD		5.3						
STD		5.5						
STD		5.6						
STD		5.7	4.89	0.68	1.127	2.482	2.29	-
C1		4.1			1.563	1.764	1.715	-
C1		4.9						
C1		5.5						
C1		5.5						
C1		5.8	5.17	0.69	0.920	1.764	1.715	-
C2		4.9			1.574	1.764	1.715	-
C2		5.3						
C2		5.6						
C2		5.6						
C2		5.8	5.42	0.36	1.013	1.764	1.715	-
C3		3.6			1.707	1.764	1.715	-
C3		4.9						
C3		5.3						
C3		5.4						
C3		5.6	4.96	0.80	0.740	1.764	1.715	-
C4		3.8			1.755	1.764	1.715	*
C4		5.2						
C4		5.2						
C4		5.3						
C4		5.6	5.04	0.69	0.766	1.764	1.715	-
L1		5.0			1.043	1.764	1.715	-
L1		5.2						
L1		5.3						
L1		5.8						
L1		6.3	5.51	0.53	1.464	1.764	1.715	-
L2		4.6			1.501	1.764	1.715	-
L2		4.8						
L2		4.8						
L2		4.9						
L2		4.9	4.81	0.15	0.981	1.764	1.715	-
W1		4.1			1.118	1.155	1.155	-
W1		5.0						
W1		5.4	4.83	0.69	0.809	1.155	1.155	-
W2		3.7			1.155	1.155	1.155	
W2		5.3						
W2		5.3	4.77	0.92	0.587	1.155	1.155	-
A1		5.6			1.386	1.764	1.715	-
A1		5.6						
A1		5.7						
A1		5.7						
A1		5.7	5.66	0.07	1.130	1.764	1.715	-
A2		4.1			1.158	1.764	1.715	-
A2		4.2						
A2		4.4						
A2		4.6						
A2		4.8	4.41	0.26	1.310	1.764	1.715	-
F1		3.5			1.370	1.496	1.481	-
F1		4.5						
F1		5.2						
F1		5.2	4.61	0.77	0.770	1.496	1.481	-

prEN 12457 - 3/2 Molybdenum
MBA

					Grubbs' test one outlier			
	Mo µg/l	Mo mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD		0.34			1.039	2.482	2.29	-
STD		0.34						
STD		0.36						
STD		0.40						
STD		0.42						
STD		0.44						
STD		0.44						
STD		0.48						
STD		0.48						
STD		0.65	0.434	0.092	2.376	2.482	2.29	*
C1		0.36			1.385	1.764	1.715	-
C1		0.39						
C1		0.40						
C1		0.42						
C1		0.44	0.401	0.031	1.176	1.764	1.715	-
C2		0.42			0.866	1.764	1.715	-
C2		0.43						
C2		0.44						
C2		0.44						
C2		0.50	0.449	0.028	1.705	1.764	1.715	-
C3		0.35			1.719	1.764	1.715	*
C3		0.42						
C3		0.43						
C3		0.43						
C3		0.45	0.412	0.039	0.871	1.764	1.715	-
C4		0.35			1.640	1.764	1.715	-
C4		0.42						
C4		0.45						
C4		0.46						
C4		0.46	0.428	0.046	0.734	1.764	1.715	-
L1		0.36			1.452	1.764	1.715	-
L1		0.38						
L1		0.41						
L1		0.41						
L1		0.42	0.398	0.026	1.010	1.764	1.715	-
L2		0.39			1.360	1.764	1.715	-
L2		0.42						
L2		0.43						
L2		0.45						
L2		0.47	0.431	0.032	1.214	1.764	1.715	-
W1		0.35			1.119	1.155	1.155	-
W1		0.47						
W1		0.51	0.442	0.082	0.806	1.155	1.155	-
W2		0.32			1.154	1.155	1.155	
W2		0.45						
W2		0.46	0.412	0.075	0.598	1.155	1.155	-
A1		0.42			0.792	1.764	1.715	-
A1		0.43						
A1		0.44						
A1		0.46						
A1		0.54	0.457	0.046	1.715	1.764	1.715	*
A2		0.4			1.077	1.764	1.715	-
A2		0.4						
A2		0.4						
A2		0.4						
A2		0.4	0.376	0.012	1.544	1.764	1.715	-
F1		0.4			1.007	1.496	1.481	-
F1		0.4						
F1		0.5						
F1		0.5	0.418	0.051	0.964	1.496	1.481	-

prEN 12457 - 3/2 Antimony
MBA

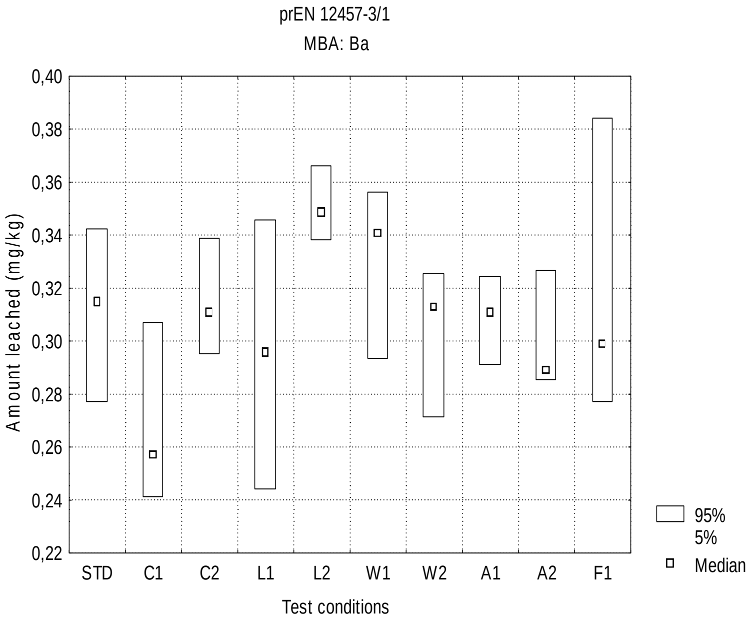
	Sb µg/l	Sb mg/kg	mean value mg/kg	Std dev.	Grubbs' test, one outlier: Gp	Test parameter 1%	Test parameter 5%	Test results
STD		0.224			1.866	2.482	2.29	-
STD		0.232						
STD		0.250						
STD		0.255						
STD		0.257						
STD		0.257						
STD		0.261						
STD		0.262						
STD		0.266						
STD		0.281	0.255	0.016	1.611	2.482	2.29	-
C1		0.212			1.054	1.764	1.715	-
C1		0.221						
C1		0.228						
C1		0.256						
C1		0.264	0.236	0.023	1.224	1.764	1.715	-
C2		0.204			1.118	1.764	1.715	-
C2		0.206						
C2		0.218						
C2		0.226						
C2		0.226	0.216	0.011	0.932	1.764	1.715	-
C3		0.224			0.674	1.764	1.715	-
C3		0.226						
C3		0.226						
C3		0.232						
C3		0.252	0.232	0.012	1.723	1.764	1.715	*
C4		0.223			1.323	1.764	1.715	-
C4		0.238						
C4		0.249						
C4		0.264						
C4		0.273	0.249	0.020	1.170	1.764	1.715	-
L1		0.198			1.538	1.764	1.715	-
L1		0.221						
L1		0.227						
L1		0.227						
L1		0.244	0.224	0.017	1.235	1.764	1.715	-
L2		0.225			0.851	1.764	1.715	-
L2		0.236						
L2		0.236						
L2		0.236						
L2		0.277	0.242	0.020	1.736	1.764	1.715	*
W1		0.245			0.722	1.155	1.155	-
W1		0.269						
W1		0.395	0.303	0.080	1.142	1.155	1.155	-
W2		0.222			0.774	1.155	1.155	
W2		0.233						
W2		0.271	0.242	0.025	1.129	1.155	1.155	-
A1		0.214			1.180	1.764	1.715	-
A1		0.215						
A1		0.231						
A1		0.232						
A1		0.232	0.225	0.009	0.791	1.764	1.715	-
A2		0.2			0.930	1.764	1.715	-
A2		0.2						
A2		0.2						
A2		0.2						
A2		0.3	0.238	0.017	1.679	1.764	1.715	-
F1		0.2			1.448	1.496	1.481	-
F1		0.3						
F1		0.3						
F1		0.3	0.248	0.027	0.724	1.496	1.481	-

prEN 12457 - 3/2 MBA

Sulfate

	SO4 µg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Grubbs' test one outlier Gp	Test parameter 1%	Test parameter 5%	Test results
STD		1118			1.414	2.482	2.29	-
STD		1164						
STD		1208						
STD		1301						
STD		1363						
STD		1365						
STD		1532						
STD		1536						
STD		1614						
STD		1630	1383	187.6	1.318	2.482	2.29	-
C1		1418			1.048	1.764	1.715	-
C1		1451						
C1		1533						
C1		1572						
C1		1704	1536	112.6	1.495	1.764	1.715	-
C2		1241			0.908	1.764	1.715	-
C2		1283						
C2		1314						
C2		1364						
C2		1552	1351	121.4	1.661	1.764	1.715	-
C3		1169			1.087	1.764	1.715	-
C3		1213						
C3		1214						
C3		1285						
C3		1348	1246	70.8	1.447	1.764	1.715	-
C4		1159			0.913	1.764	1.715	-
C4		1231						
C4		1233						
C4		1640						
C4		1697	1392	255.2	1.197	1.764	1.715	-
L1		1212			1.598	1.764	1.715	-
L1		1320						
L1		1345						
L1		1383						
L1		1409	1334	76.0	0.989	1.764	1.715	-
L2		1312			1.014	1.764	1.715	-
L2		1348						
L2		1385						
L2		1454						
L2		1563	1412	99.4	1.519	1.764	1.715	-
W1		746			1.088	1.155	1.155	-
W1		888						
W1		962	865	109.8	0.879	1.155	1.155	-
W2		1301			1.155	1.155	1.155	
W2		1646						
W2		1652	1533	201.0	0.593	1.155	1.155	-
A1		1168			1.196	1.764	1.715	-
A1		1198						
A1		1199						
A1		1240						
A1		1268	1215	39.1	1.353	1.764	1.715	-
A2		1263.8			0.471	1.764	1.715	-
A2		1266.3						
A2		1277.8						
A2		1477.8						
A2		6668.5	2391	2393.0	1.788	1.764	1.715	**
F1		1128.4			1.010	1.496	1.481	-
F1		1194.5						
F1		1394.8						
F1		1512.3	1307	177.4	1.155	1.496	1.481	-

prEN 12457 - 3/1 **Barium**
MBA



Multiple regression analysis of ruggedness data
All data are included

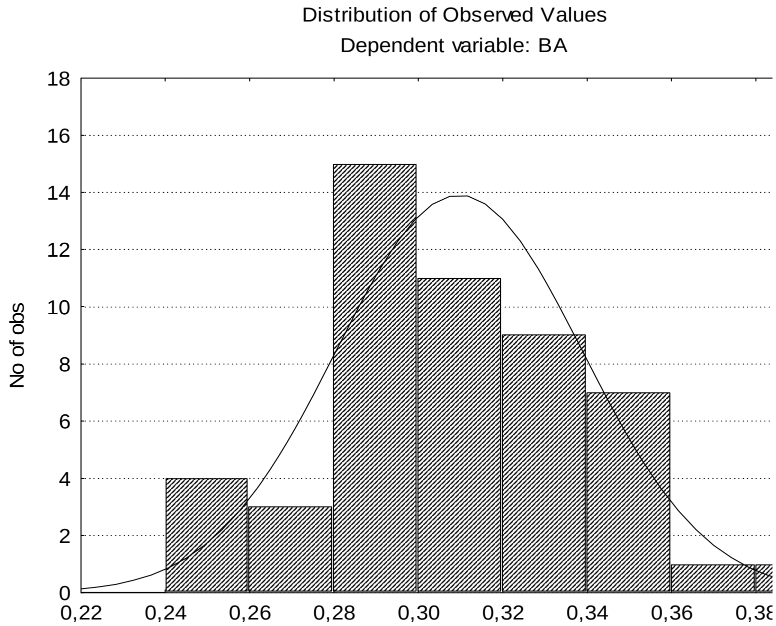
Regression Summary for Dependent Variable: BA
R= ,65277569 R²= ,42611610 Adjusted R²= ,30014159
F(9,41)=3,3826 p<,00347 Std.Error of estimate: ,02554

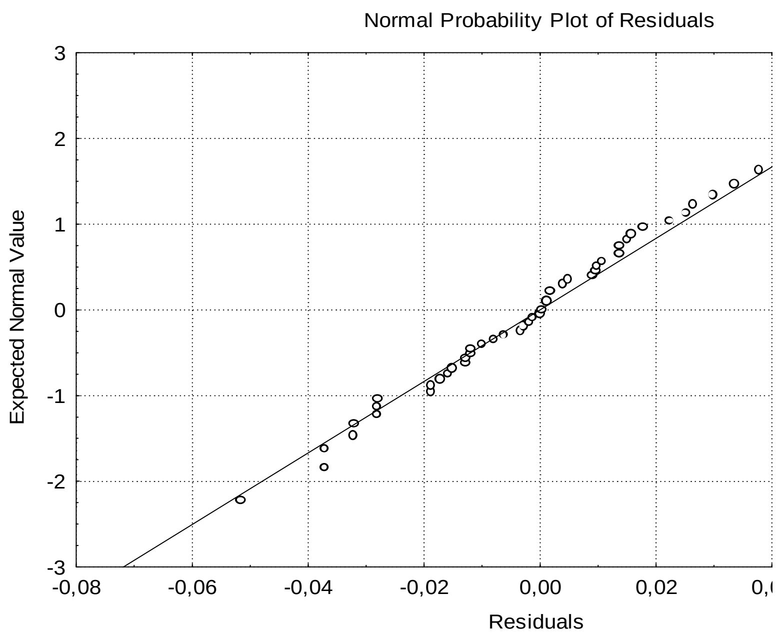
	BETA	St. Err. of BETA	B	St. Err. of B	t(41)	p-level
Intercpt			0.309	0.008	38.241	0.00
C1	-0.394	0.138	#####	0.014	-2.861	0.01
C2	0.045	0.138	0.005	0.014	0.327	0.75
L1	-0.134	0.138	#####	0.014	-0.977	0.33
L2	0.406	0.138	0.041	0.014	2.951	0.01
W1	0.164	0.131	0.021	0.017	1.252	0.22
W2	-0.046	0.131	#####	0.017	-0.349	0.73
A1	0.006	0.138	0.001	0.014	0.040	0.97
A2	-0.120	0.138	#####	0.014	-0.871	0.39
F1	0.049	0.138	0.005	0.014	0.356	0.72

Analysis of Variance; DV: BA (part 31 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	0.02	9	0.002	3.3826	0.00347
Residua	0.027	41	7E-04		
Total	0.047				

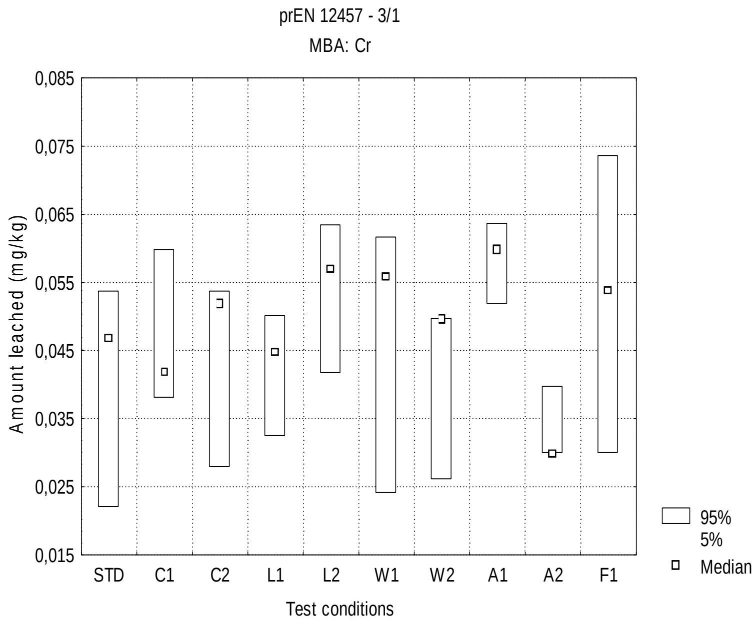
prEN 12457 - 3/1 **Barium**
MBA





prEN 12457 - 3/1 MBA

Chromium



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CR
R= ,60495823 R²= ,36597447 Adjusted R²= ,22679813
F(9,41)=2,6296 p<,01681 Std.Error of estimate: ,01096

	BETA	St. Err. of BETA	B	St. Err. of B	t(41)	p-level
Intercpt			0.042	0.003	#####	0.00
C1	0.115	0.145	0.005	0.006	0.796	0.43
C2	0.125	0.145	0.005	0.006	0.862	0.39
L1	0.028	0.145	0.001	0.006	0.195	0.85
L2	0.333	0.145	0.014	0.006	2.304	0.03
W1	0.101	0.138	0.005	0.007	0.736	0.47
W2	-0.001	0.138	0.000	0.007	-0.008	0.99
A1	0.403	0.145	0.017	0.006	2.785	0.01
A2	-0.221	0.145	#####	0.006	-1.526	0.13
F1	0.326	0.145	0.014	0.006	2.255	0.03

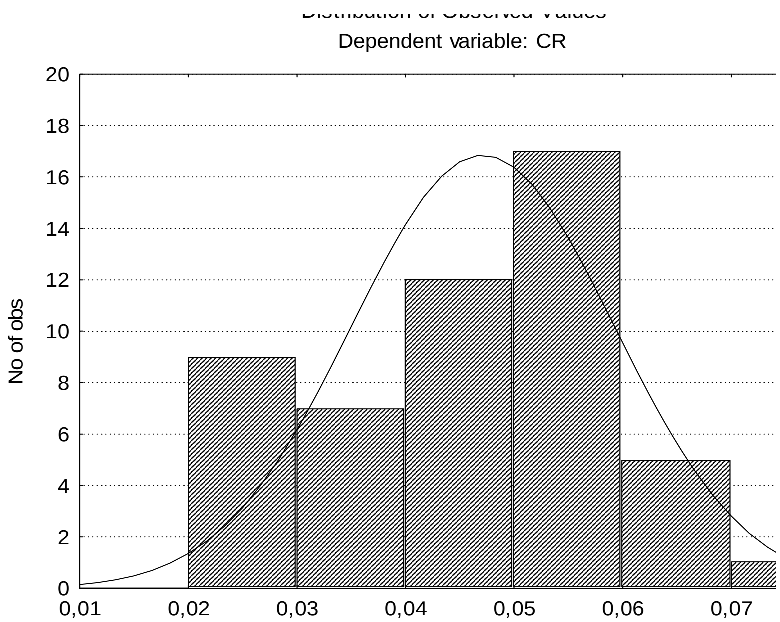
Analysis of Variance; DV: CR (part 31 data.sta)

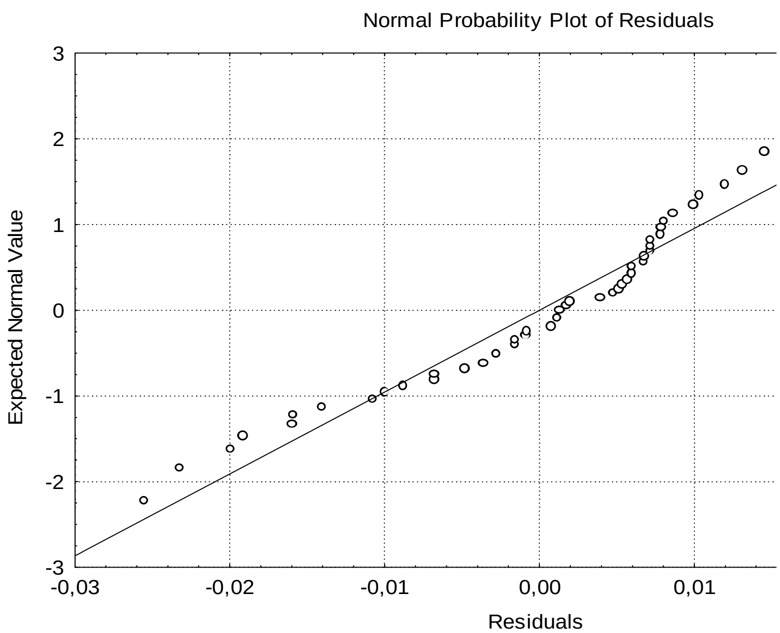
	Sums of Squares	df	Mean Squares	F	p-level
Regress	######	**9**	#####	2.6296	0.017
Residual	0.0049	41	1E-04		
Total	0.0078				

prEN 12457 - 3/1

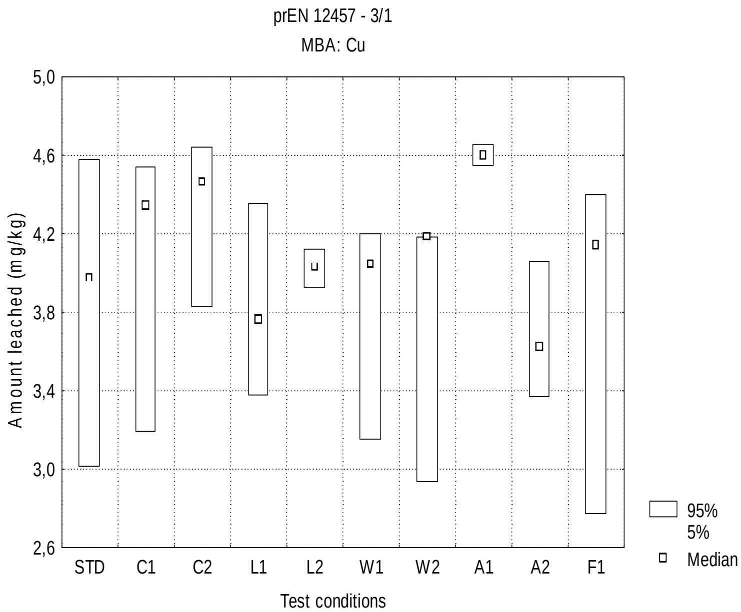
Chromium

Distribution of Observed Values


Distribution of Observed Values
Dependent variable: CR
No of obs
20
18
16
14
12
10
8
6
4
2
0
0,01
0,02
0,03
0,04
0,05
0,06
0,07


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0,03
-0,02
-0,01
0,00
0,01
Residuals

prEN 12457 - 3/1 **Copper**
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CU
R= ,54560642 R²= ,29768636 Adjusted R²= ,14351996
F(9,41)=1,9309 p<,07425 Std.Error of estimate: ,46326

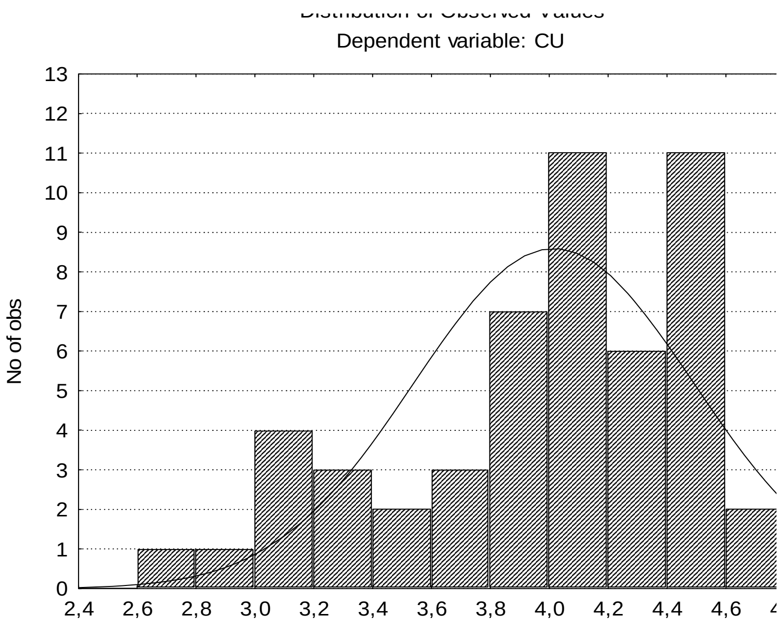
	BETA	St. Err. of BETA	B	St. Err. of B	t(41)	p-level
Intercpt			3.889	0.146	#####	0.00
C1	0.116	0.152	0.193	0.254	0.761	0.45
C2	0.283	0.152	0.472	0.254	1.859	0.07
L1	#####	0.152	#####	0.254	#####	0.66
L2	0.088	0.152	0.147	0.254	0.579	0.57
W1	#####	0.145	#####	0.305	#####	0.76
W2	#####	0.145	#####	0.305	#####	0.69
A1	0.424	0.152	0.706	0.254	2.783	0.01
A2	#####	0.152	#####	0.254	#####	0.41
F1	#####	0.152	#####	0.254	#####	0.92

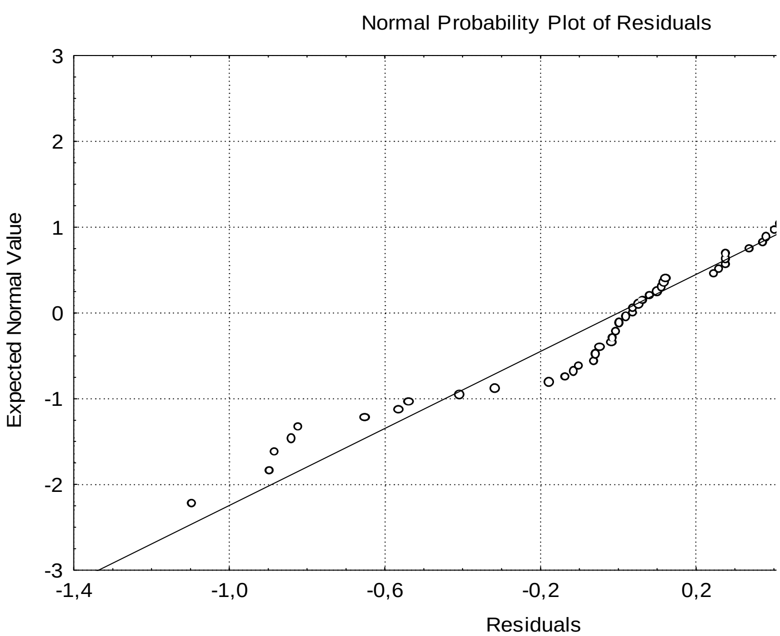
Analysis of Variance; DV: CU (part 31 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	3.73	9	0.414	1.9309	0.074
Residual	8.799	41	0.215		
Total	12.53				

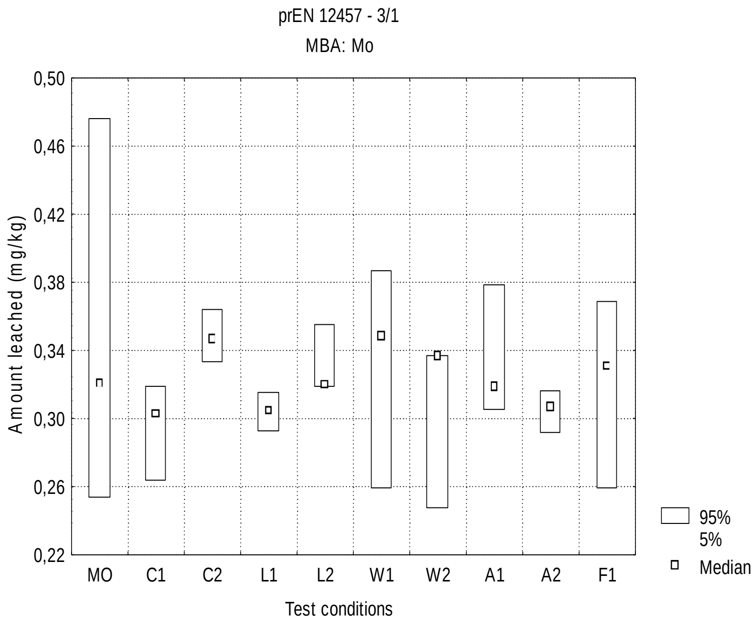
prEN 12457 - 3/1 **Copper**

Distribution of Observed Values


Dependent variable: CU
No of obs
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2,4
2,6
2,8
3,0
3,2
3,4
3,6
3,8
4,0
4,2
4,4
4,6


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-1,4
-1,0
-0,6
-0,2
0,2
Residuals

prEN 12457 - 3/1 **Molybdenum**
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= ,38176918 R²= ,14574771 Adjusted R²= -----
F(9,41)=,77724 p<,63801 Std.Error of estimate: ,04096

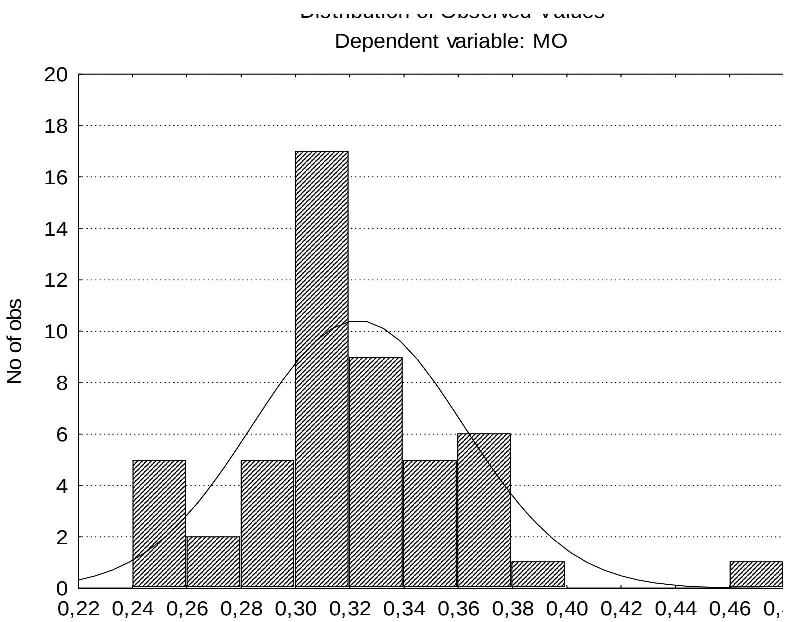
	BETA	St. Err. of BET/	B	St. Err. of B	t(41)	p-level
Intercpt			0.329	0.013	####	0.00
C1	-0.255	0.168	-0.034	0.022	####	0.14
C2	0.124	0.168	0.017	0.022	0.736	0.47
L1	-0.182	0.168	-0.024	0.022	####	0.29
L2	0.009	0.168	0.001	0.022	0.054	0.96
W1	0.015	0.160	0.002	0.027	0.092	0.93
W2	-0.129	0.160	-0.022	0.027	####	0.42
A1	0.007	0.168	0.001	0.022	0.043	0.97
A2	-0.178	0.168	-0.024	0.022	####	0.30
F1	0.010	0.168	0.001	0.022	0.062	0.95

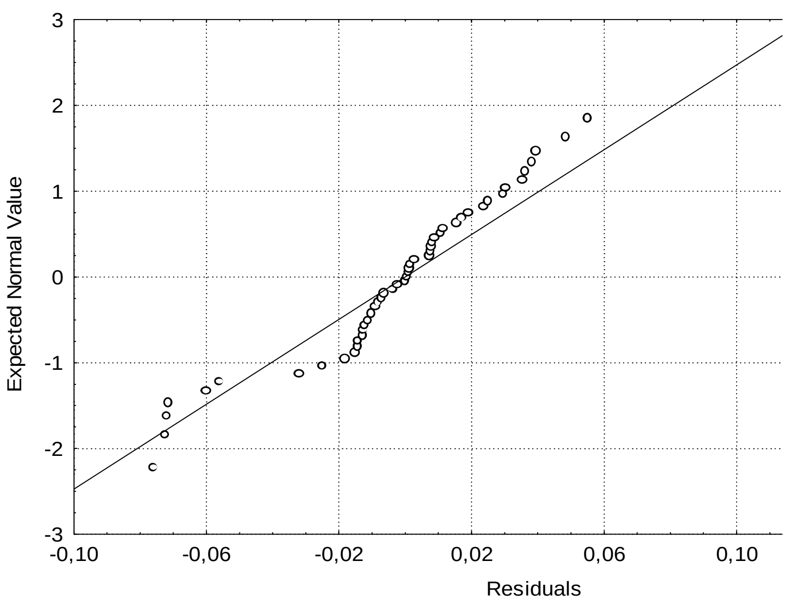
Analysis of Variance; DV: MO (part 31 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.0117	9	0.0013	0.7772	0.64
Residual	0.0688	41	0.00168		
Total	0.0805	50	0.00161		

prEN 12457 - 3/1 **Molybdenum**

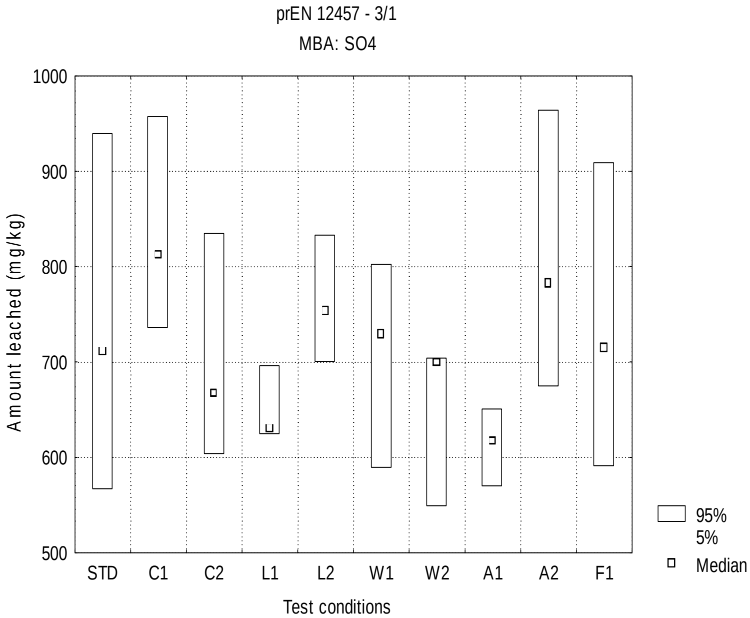
Distribution of Observed Values


Distribution of Observed Values
Dependent variable: MO
No of obs
0
2
4
6
8
10
12
14
16
18
20
0,22 0,24 0,26 0,28 0,30 0,32 0,34 0,36 0,38 0,40 0,42 0,44 0,46


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0,10 -0,06 -0,02 0,02 0,06 0,10
Residuals

prEN 12457 - 3/1 MBA

Sulfate



Multiple regression analysis of ruggedness data
All data are included

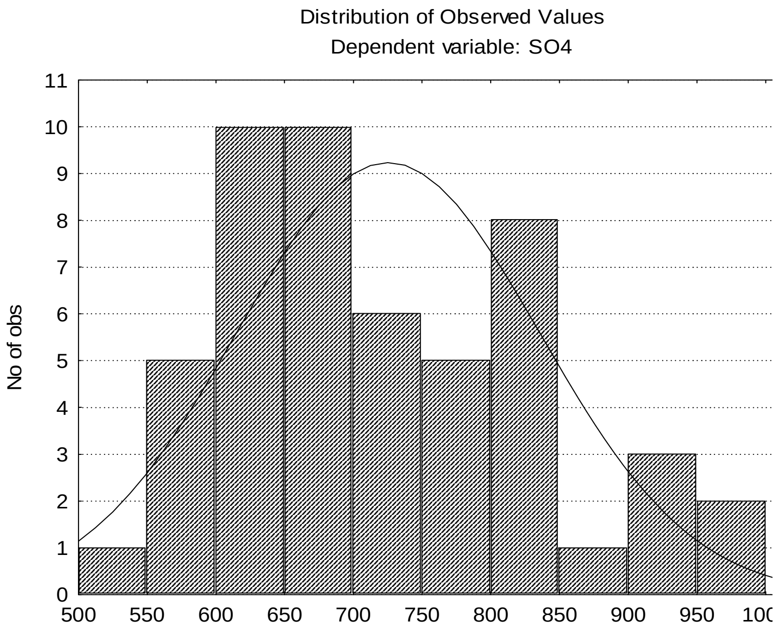
Regression Summary for Dependent Variable: SO4
R= ,57952847 R²= ,33585325 Adjusted R²= ,19006494
F(9,41)=2,3037 p<,03366 Std.Error of estimate: 100,68

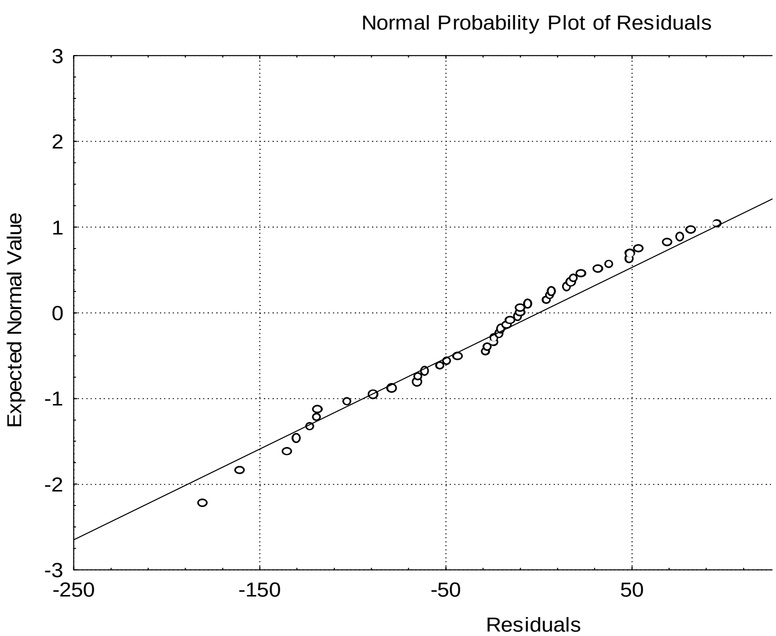
	BETA	St. Err. of BETA	B	St. Err. of B	t(41)	p-level
Intercpt			746	32	23.44	0.00
C1	0.208	0.148	77	55	1.40	0.17
C2	#####	0.148	-64	55	-1.16	0.25
L1	#####	0.148	-99	55	-1.79	0.08
L2	0.046	0.148	17	55	0.31	0.76
W1	#####	0.141	-40	66	-0.60	0.55
W2	#####	0.141	-96	66	-1.45	0.16
A1	#####	0.148	-133	55	-2.42	0.02
A2	0.152	0.148	57	55	1.03	0.31
F1	#####	0.148	-22	55	-0.39	0.70

Analysis of Variance; DV: SO4 (part 31 data.sta)

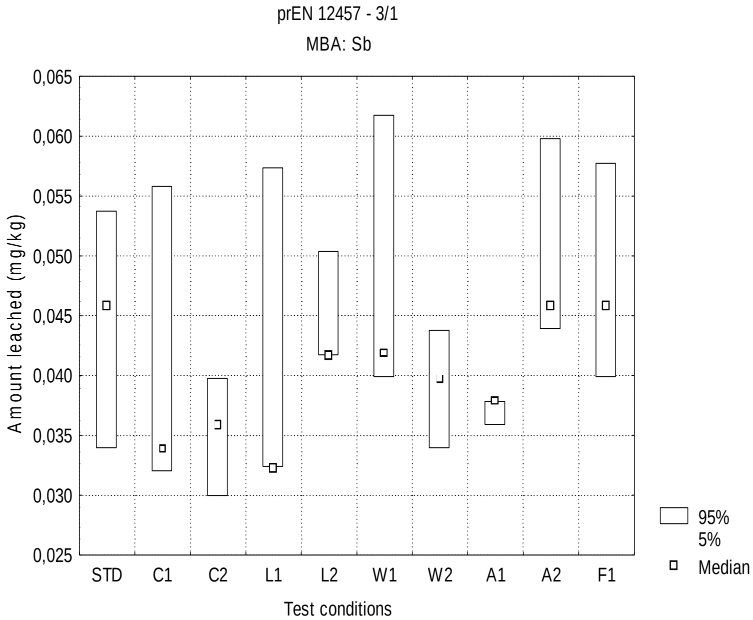
	Sums of Squares	df	Mean Squares	F	p-level
Regress	#####	9	23350	2.3037	0.03
Residual	#####	41	10136		
Total	#####				

prEN 12457 - 3/1 **Sulfate**





prEN 12457 - 3/1 **Antimony**
MBA



Multiple regression analysis of ruggedness data
All data are included

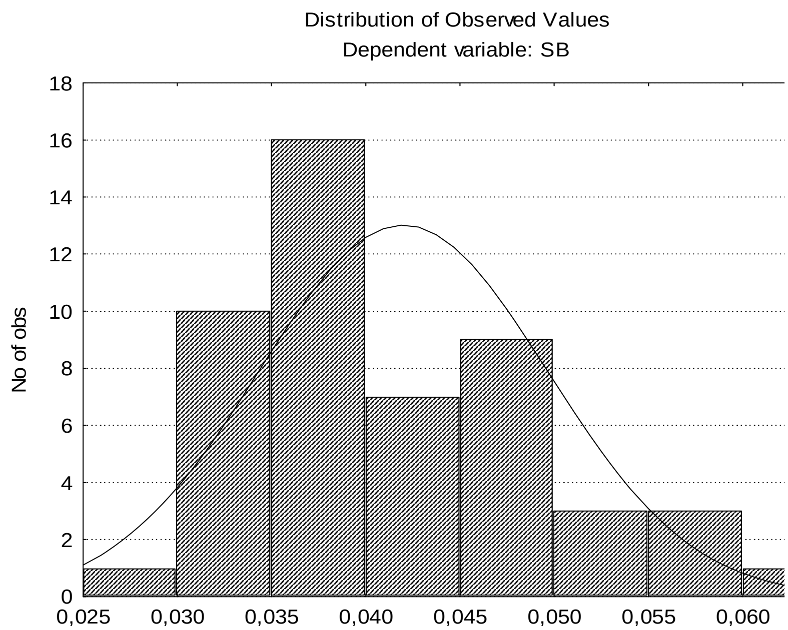
Regression Summary for Dependent Variable: SB
R= ,63999162 R²= ,40958927 Adjusted R²= ,27674686
F(9,40)=3,0833 p<,00666 Std.Error of estimate: ,00661

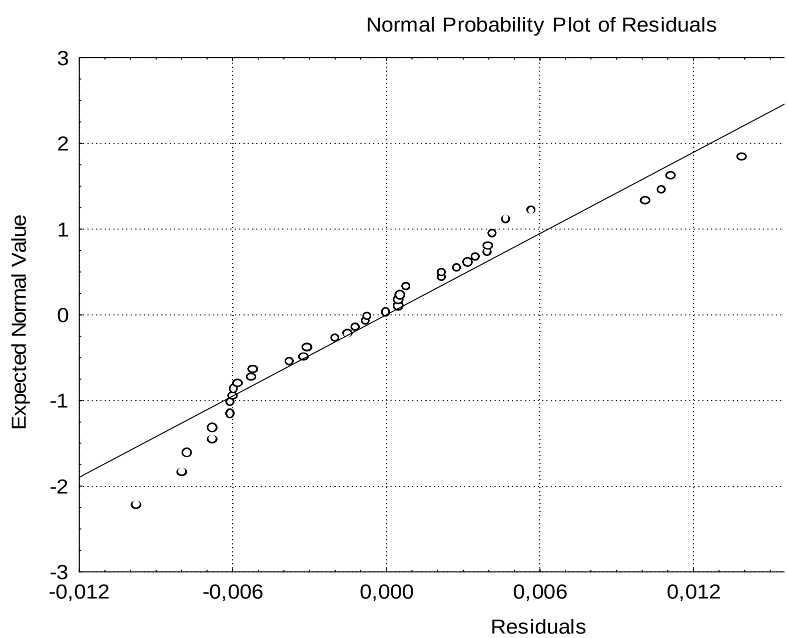
	BETA	St. Err. of BETA	B	St. Err. of B	t(40)	p-level
Intercpt			0.044	0.002	20.857	0.00
C1	#####	0.138	#####	0.004	-2.621	0.01
C2	#####	0.141	#####	0.004	-2.145	0.04
L1	#####	0.141	#####	0.004	-1.457	0.15
L2	0.042	0.141	0.001	0.004	0.301	0.77
W1	0.129	0.134	0.004	0.004	0.961	0.34
W2	#####	0.134	#####	0.004	-1.032	0.31
A1	#####	0.141	#####	0.004	-1.816	0.08
A2	0.209	0.141	0.005	0.004	1.483	0.15
F1	0.116	0.141	0.003	0.004	0.825	0.41

Analysis of Variance; DV: SB (part 31 data.sta)

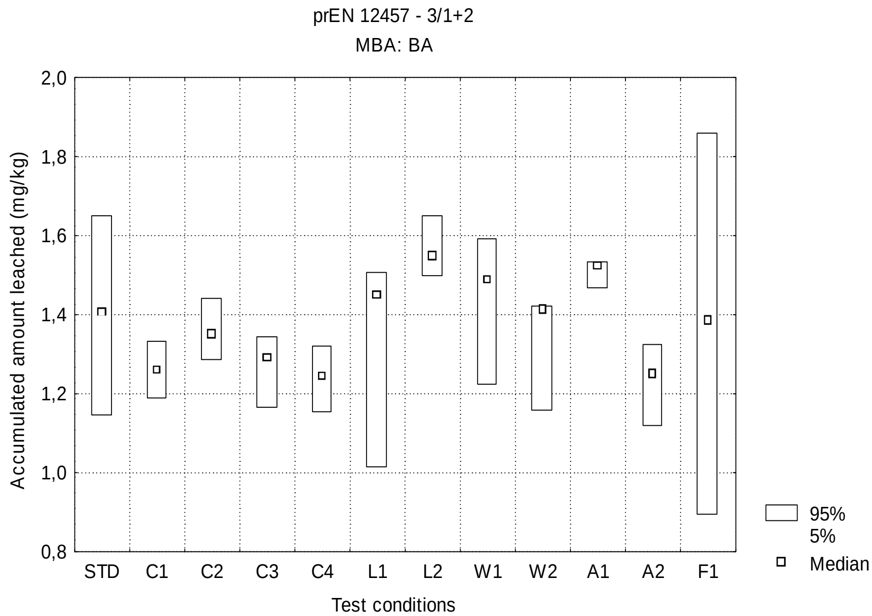
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**0.001**	**9**	**1E-04**	**3.0833**	0.007
Residual	0.002	40	4E-05		
Total	0.003				

prEN 12457 - 3/1 Antimony





prEN 12457 - 3/2 Barium
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: BA
R= ,58593897 R²= ,34332448 Adjusted R²= ,19283634
F(11,48)=2,2814 p<,02457 Std.Error of estimate: ,14917

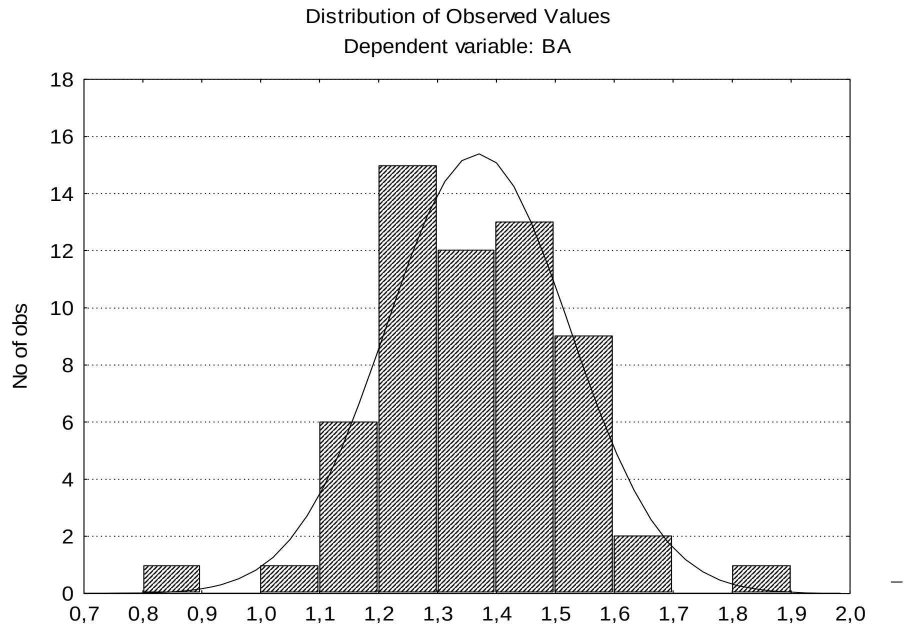
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			1.382	0.047	29.304	0.00
C1	-0.201	0.137	-0.120	0.082	-1.465	0.15
C2	-0.055	0.137	-0.033	0.082	-0.401	0.69
C3	-0.171	0.137	-0.102	0.082	-1.248	0.22
C4	-0.214	0.137	-0.127	0.082	-1.559	0.13
L1	-0.075	0.137	-0.045	0.082	-0.549	0.59
L2	0.306	0.137	0.182	0.082	2.234	0.03
W1	0.068	0.130	0.051	0.098	0.521	0.60
W2	-0.069	0.130	-0.052	0.098	-0.535	0.60
A1	0.215	0.137	0.128	0.082	1.571	0.12
A2	-0.239	0.137	-0.143	0.082	-1.746	0.09
F1	-0.004	0.134	-0.002	0.088	-0.028	0.98

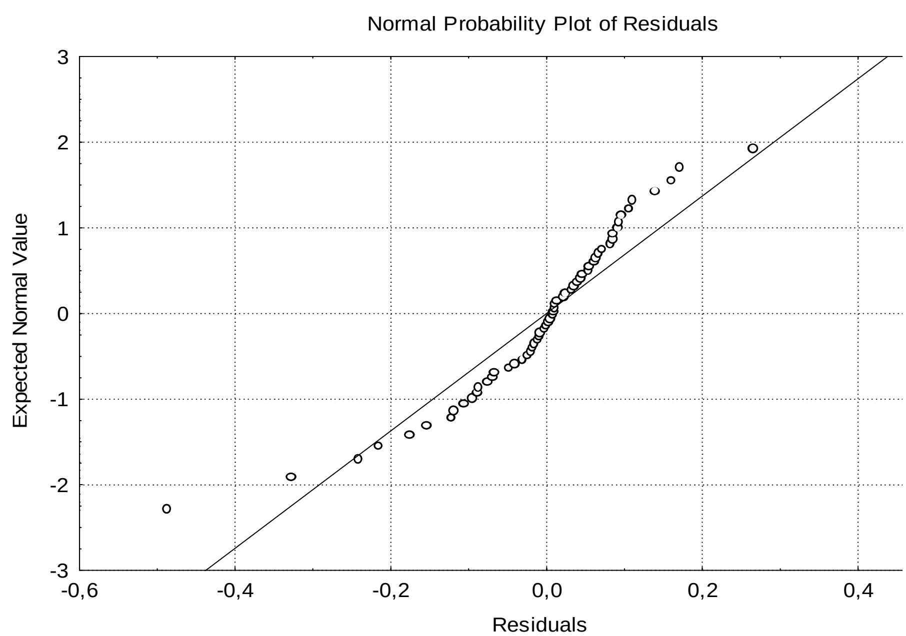
Analysis of Variance; DV: BA (part 32 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.5584	11	0.0508	2.28141	0.0245727
Residual	1.0681	48	0.0223		
Total	1.6266				

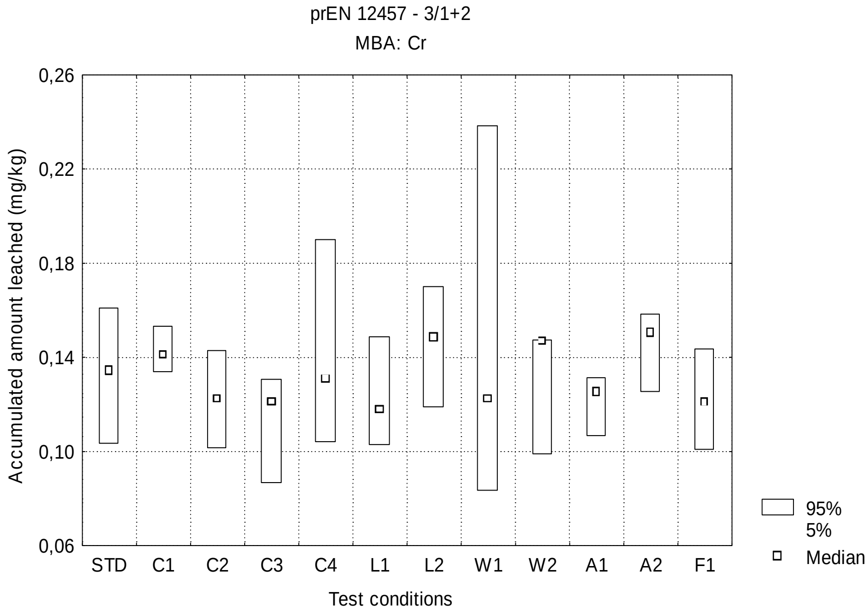
prEN 12457 - 3/2 MBA

Barium





prEN 12457 - 3/2 **Chromium**
MBA



Multiple regression analysis of ruggedness data
All data are included

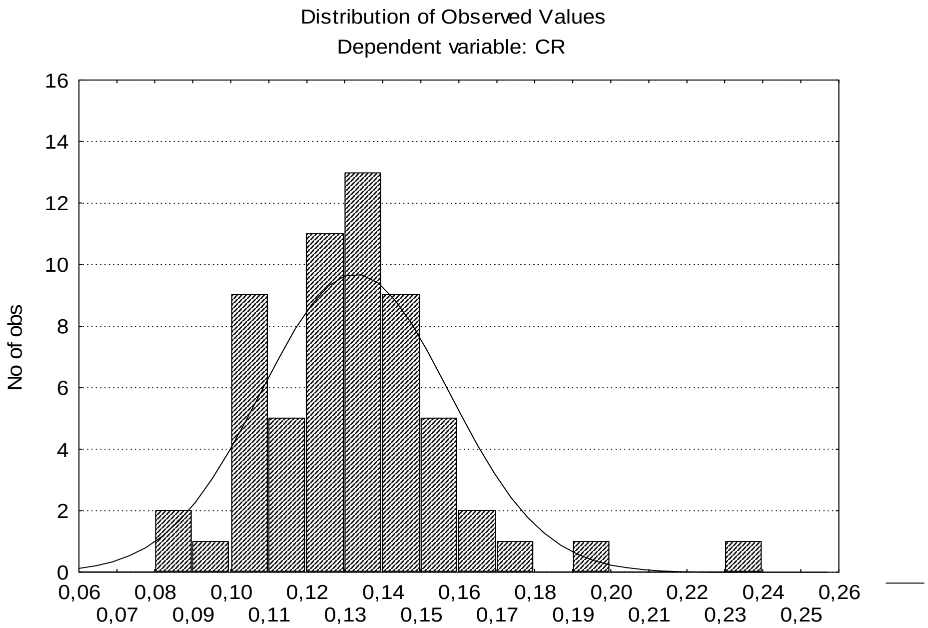
Regression Summary for Dependent Variable: CR
R= ,41396683 R²= ,17136854 Adjusted R²= -----
F(11,48)=,90244 p<,54500 Std.Error of estimate: ,02555

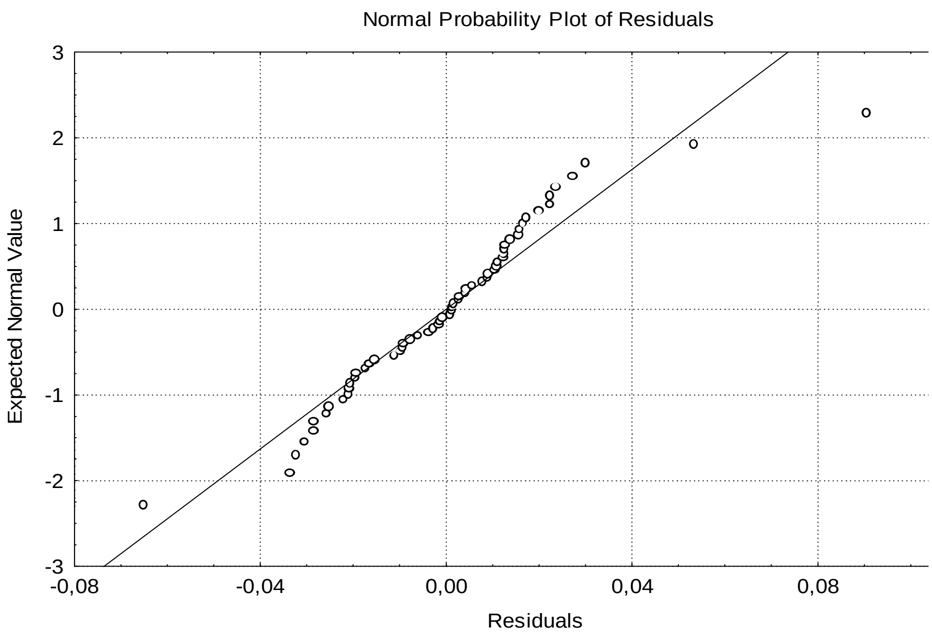
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			0.131	0.008	16.215	0.00
C1	0.126	0.154	0.011	0.014	0.818	0.42
C2	-0.086	0.154	-0.008	0.014	-0.559	0.58
C3	-0.157	0.154	-0.014	0.014	-1.018	0.31
C4	0.065	0.154	0.006	0.014	0.421	0.68
L1	-0.105	0.154	-0.010	0.014	-0.682	0.50
L2	0.172	0.154	0.016	0.014	1.118	0.27
W1	0.147	0.146	0.017	0.017	1.007	0.32
W2	0.000	0.146	0.000	0.017	-0.001	1.00
A1	-0.094	0.154	-0.009	0.014	-0.613	0.54
A2	0.164	0.154	0.015	0.014	1.064	0.29
F1	-0.094	0.150	-0.009	0.015	-0.627	0.53

Analysis of Variance; DV: CR (part 32 data.sta)

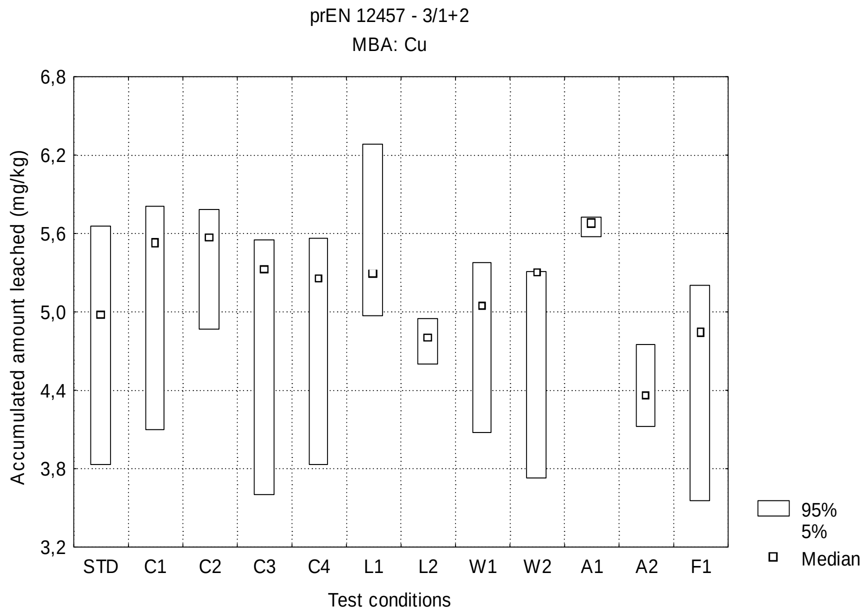
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.00648	11	0.0006	0.90244	0.545
Residual	0.03133	48	0.00065		
Total	0.03781	59	0.00064		

prEN 12457 - 3/2 Chromium





prEN 12457 - 3/2 Copper
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CU
R= ,55004087 R²= ,30254496 Adjusted R²= ,14271151
F(11,48)=1,8929 p<,06413 Std.Error of estimate: ,59610

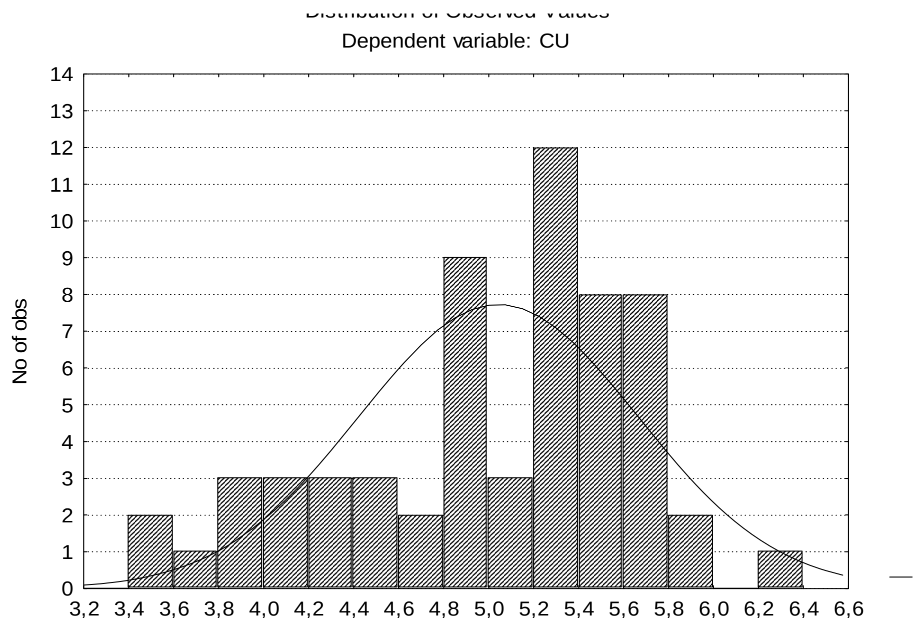
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			4.892	0.189	25.951	0.00
C1	0.122	0.141	0.282	0.326	0.865	0.39
C2	0.231	0.141	0.533	0.326	1.632	0.11
C3	0.031	0.141	0.071	0.326	0.217	0.83
C4	0.063	0.141	0.146	0.326	0.448	0.66
L1	0.270	0.141	0.623	0.326	1.908	0.06
L2	-0.037	0.141	-0.086	0.326	-0.264	0.79
W1	-0.021	0.134	-0.063	0.392	-0.160	0.87
W2	-0.041	0.134	-0.119	0.392	-0.302	0.76
A1	0.331	0.141	0.764	0.326	2.339	0.02
A2	-0.207	0.141	-0.478	0.326	-1.464	0.15
F1	-0.111	0.138	-0.283	0.353	-0.804	0.43

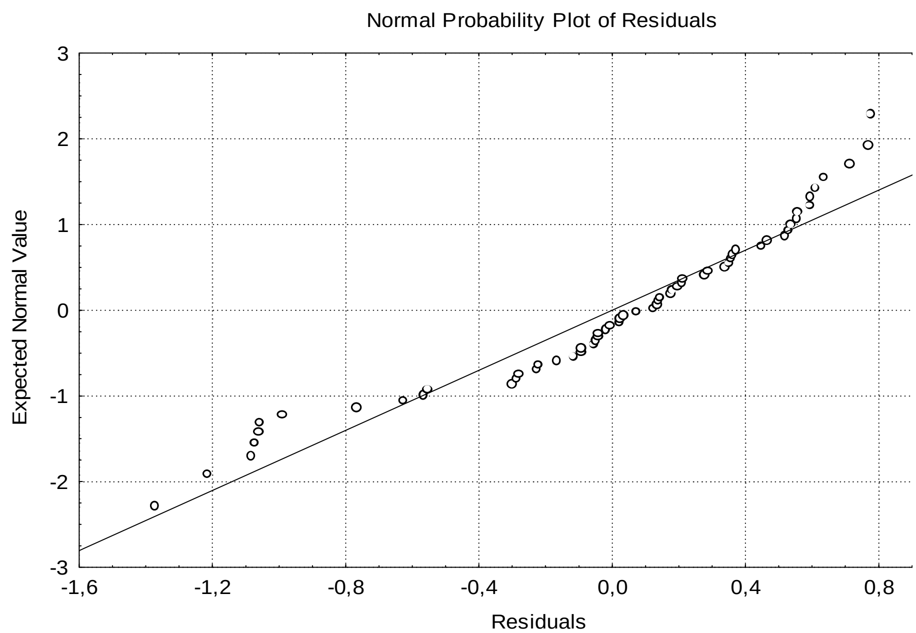
Analysis of Variance; DV: CU (part 32 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	7.3986	11	0.6726	1.89288	0.0641
Residua	17.056	48	0.3553		
Total	24.455				

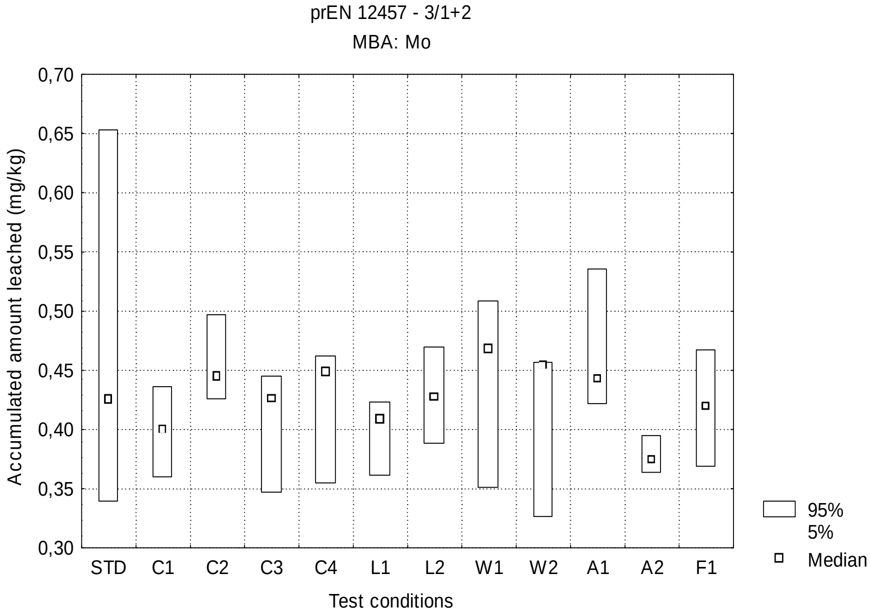
prEN 12457 - 3/2 Copper

Distribution of Observed Values


Dependent variable: CU
No of obs
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
3,2 3,4 3,6 3,8 4,0 4,2 4,4 4,6 4,8 5,0 5,2 5,4 5,6 5,8 6,0 6,2 6,4 6,6


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-1,6 -1,2 -0,8 -0,4 0,0 0,4 0,8
Residuals

prEN 12457 - 3/2 Molybdenum
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= ,40987275 R²= ,16799567 Adjusted R²= -----
F(11,48)=,88109 p<,56432 Std.Error of estimate: ,05513

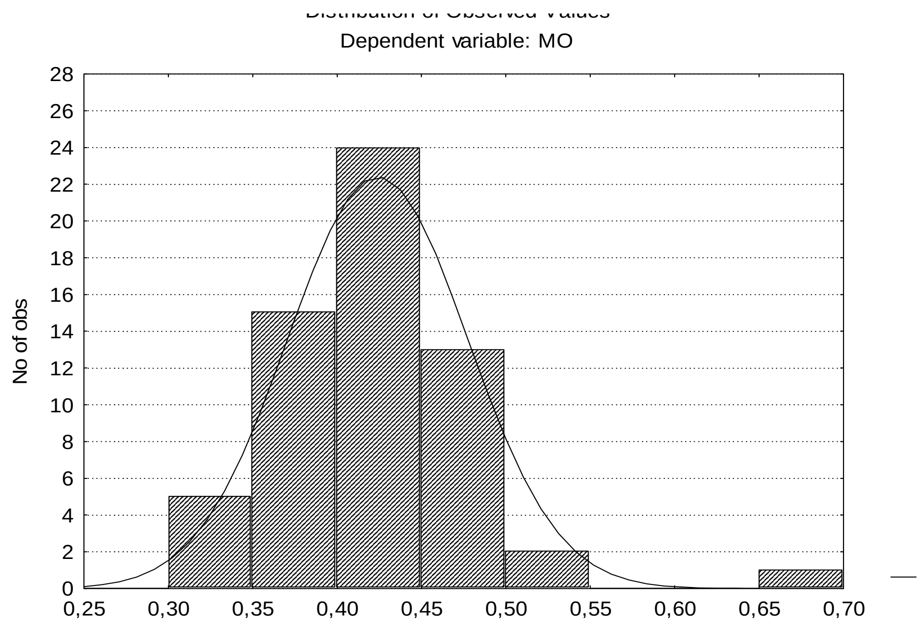
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			0.434	0.017	24.909	0.00
C1	-0.171	0.154	-0.033	0.030	-1.106	0.27
C2	0.075	0.154	0.015	0.030	0.489	0.63
C3	-0.114	0.154	-0.022	0.030	-0.737	0.46
C4	-0.031	0.154	-0.006	0.030	-0.200	0.84
L1	-0.185	0.154	-0.036	0.030	-1.200	0.24
L2	-0.016	0.154	-0.003	0.030	-0.103	0.92
W1	0.031	0.146	0.008	0.036	0.211	0.83
W2	-0.090	0.146	-0.022	0.036	-0.618	0.54
A1	0.116	0.154	0.023	0.030	0.754	0.45
A2	-0.296	0.154	-0.058	0.030	-1.916	0.06
F1	-0.073	0.150	-0.016	0.033	-0.485	0.63

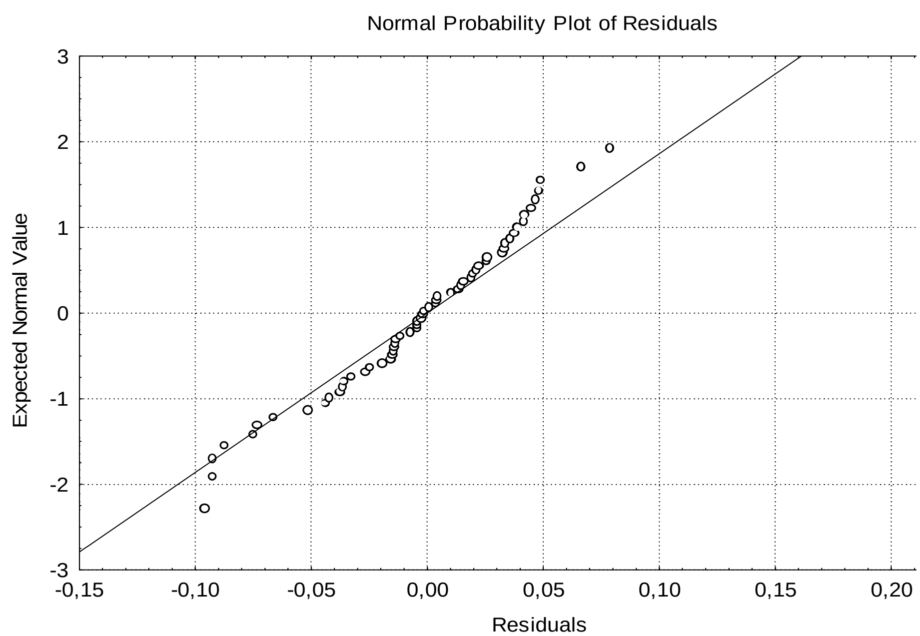
Analysis of Variance; DV: MO (part 32 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.02946	11	0.002678	0.88109	0.564
Residual	0.14591	48	0.00304		
Total	0.17537	59	0.002972		

prEN 12457 - 3/2 Molybdenum

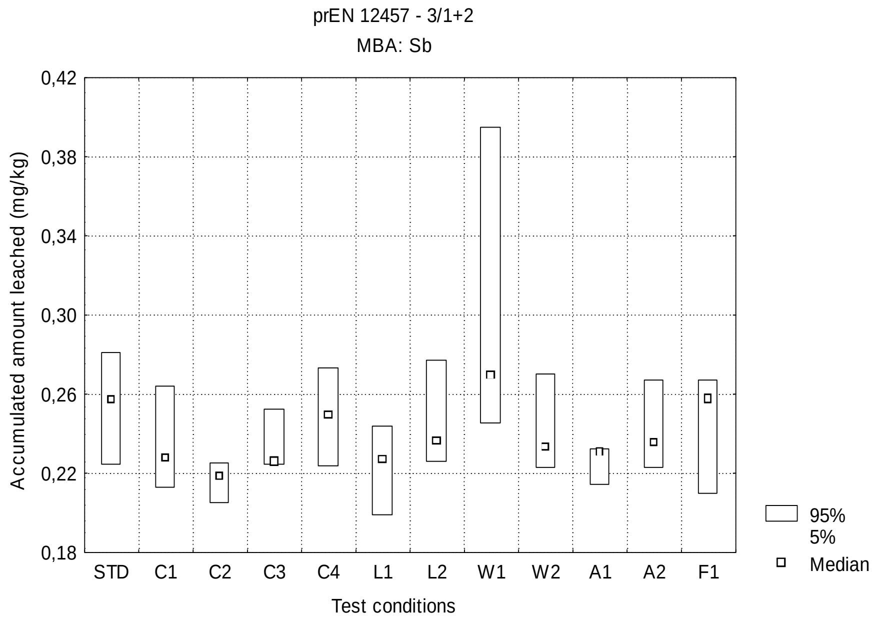
Distribution of Observed Values


Dependent variable: MO
No of obs
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0,25
0,30
0,35
0,40
0,45
0,50
0,55
0,60
0,65
0,70


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0,15
-0,10
-0,05
0,00
0,05
0,10
0,15
0,20
Residuals

prEN 12457 - 3/2 MBA

Antimony



Multiple regression analysis of ruggedness data
All data are included

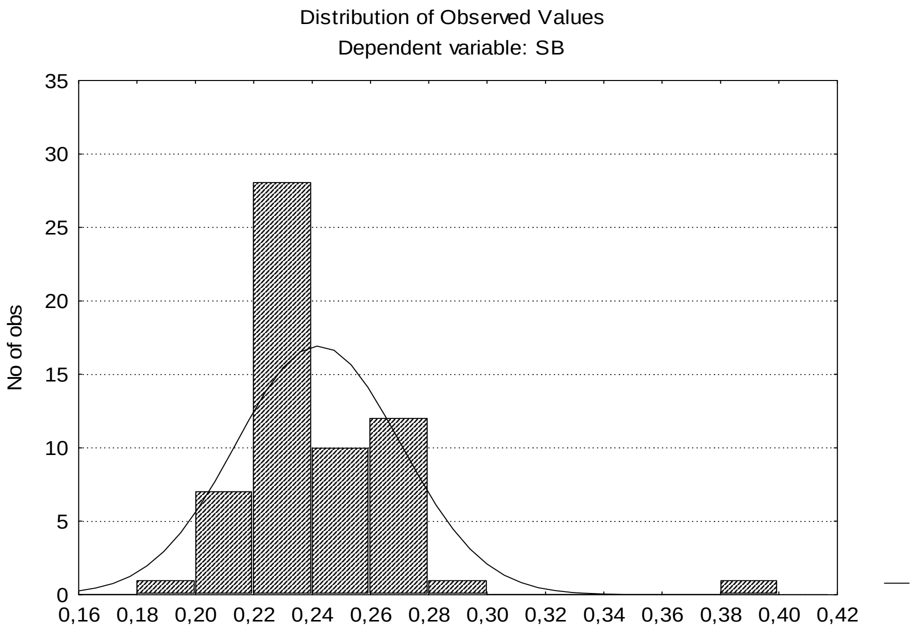
Regression Summary for Dependent Variable: SB
R= ,65125802 R²= ,42413701 Adjusted R²= ,29216841
F(11,48)=3,2139 p<,00243 Std.Error of estimate: ,02407

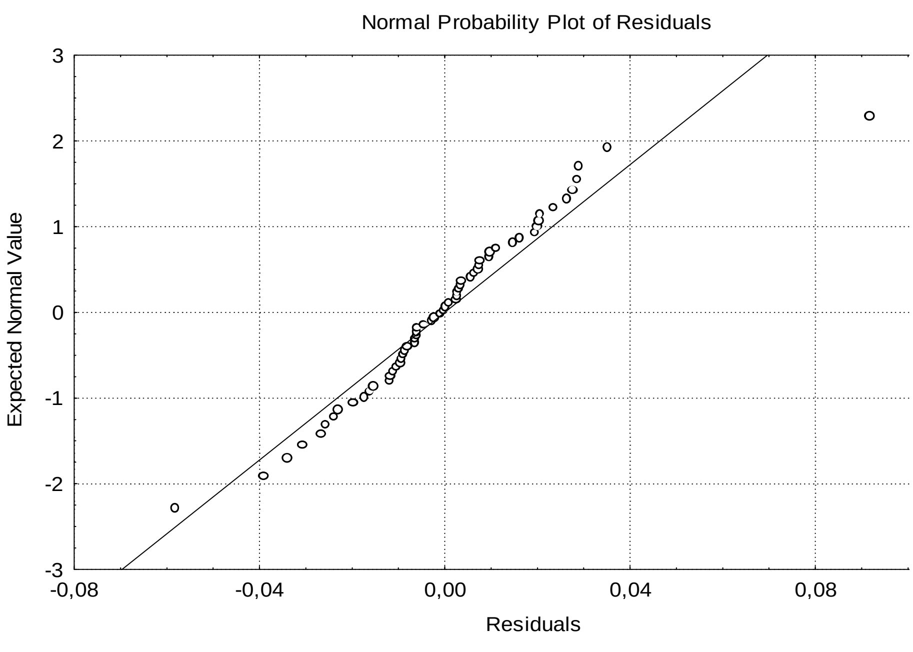
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			0.255	0.008	33.445	0.00
C1	-0.179	0.128	-0.018	0.013	-1.392	0.17
C2	-0.377	0.128	-0.039	0.013	-2.932	0.01
C3	-0.219	0.128	-0.022	0.013	-1.705	0.09
C4	-0.050	0.128	-0.005	0.013	-0.391	0.70
L1	-0.302	0.128	-0.031	0.013	-2.353	0.02
L2	-0.121	0.128	-0.012	0.013	-0.945	0.35
W1	0.373	0.122	0.049	0.016	3.064	0.00
W2	-0.096	0.122	-0.013	0.016	-0.792	0.43
A1	-0.289	0.128	-0.030	0.013	-2.254	0.03
A2	-0.160	0.128	-0.016	0.013	-1.243	0.22
F1	-0.059	0.125	-0.007	0.014	-0.471	0.64

Analysis of Variance; DV: SB (part 32 data.sta)

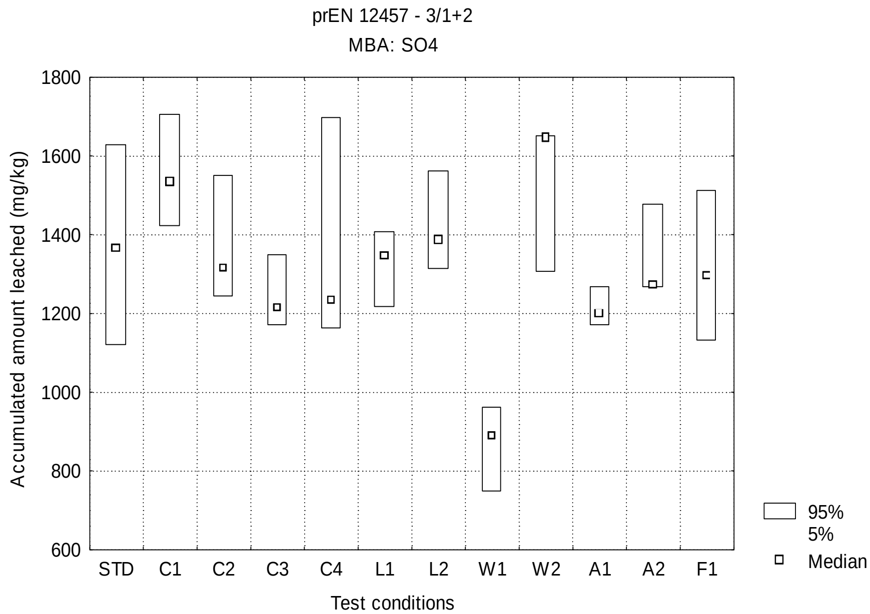
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**0.0205**	**11**	**0.0019**	**3.21392**	0.0024
Residua	0.0278	48	0.0006		
Total	0.0483				

prEN 12457 - 3/2 Antimony





prEN 12457 - 3/2 **Sulfate**
MBA



Multiple regression analysis of ruggedness data
All data are included

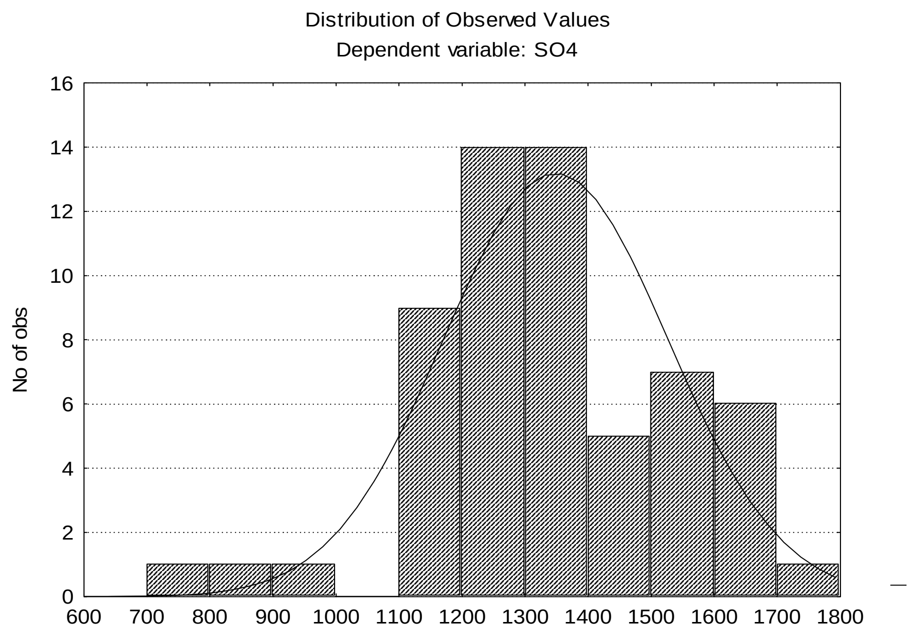
Regression Summary for Dependent Variable: SO4
R= ,73240855 R²= ,53642228 Adjusted R²= ,42792537
F(11,47)=4,9441 p<,00005 Std.Error of estimate: 146,44

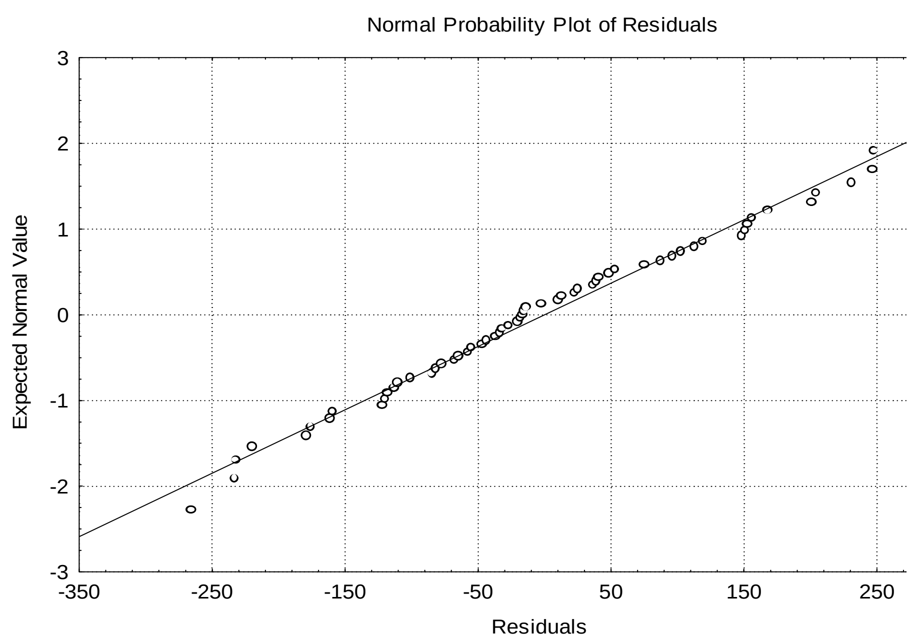
	BETA	St. Err. of BETA	B	St. Err. of B	t(47)	p-level
Intercpt			1383	46	29.87	0.00
C1	0.221	0.116	152	80	1.90	0.06
C2	-0.047	0.116	-32	80	-0.40	0.69
C3	-0.199	0.116	-137	80	-1.71	0.09
C4	0.013	0.116	9	80	0.11	0.91
L1	-0.071	0.116	-49	80	-0.61	0.54
L2	0.043	0.116	29	80	0.37	0.72
W1	-0.592	0.110	-518	96	-5.37	0.00
W2	0.172	0.110	150	96	1.56	0.13
A1	-0.245	0.116	-169	80	-2.10	0.04
A2	-0.081	0.113	-62	87	-0.71	0.48
F1	-0.099	0.113	-76	87	-0.87	0.39

Analysis of Variance; DV: SO4 (part 32 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	1E+06	11	106029	4.94412	5E-05
Residua	1E+06	47	21445		
Total	2E+06				

prEN 12457 - 3/2 **Sulfate**





A P P E N D I X 4

prEN 12457 part 4: MBA

Part 4 on MBA: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.4.1

Table A.4.1. Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	Assumption of normality on entire population	Assumption of normality on reduced population	Comments
Ba	Reasonable	Reasonable	
Cr	Doubtful	Reasonable	
Cu	Doubtful	Reasonable	The assumption of common variance of the entire population was not reasonable. This can be concluded, as the variance of the test conditions on the reduced population is significantly lower. Therefore additional test conditions becomes significantly different from the standard conditions during the second regression analysis. This aspect is not accounted for in the estimates of the modified standard
Mo	Reasonable	Reasonable	
Pb	Doubtful	Doubtful	The analysis of variance on the reduced population showed significant differences between variances within test conditions and between test conditions. This implies a significant variance between the test conditions even though the mean values of the test conditions are not significantly different from the mean value of the standard condition.
Sb	Reasonable	Reasonable	The assumption of common variance of the entire population was not reasonable. This can be concluded, as the variance of the test conditions on the reduced population is significantly lower. Therefore additional test conditions becomes significantly different from the standard conditions during the second regression analysis. This aspect is not accounted for in the estimates of the modified standard
Zn	Doubtful	Doubtful	The assumption of common variance of the entire population was not reasonable. This can be concluded, as the variance of the test conditions on the reduced population is significantly lower. Therefore additional test conditions becomes significantly different from the standard conditions during the second regression analysis. This aspect is not accounted for in the estimates of the modified standard
Cl	Reasonable	Reasonable	
SO_4	Reasonable	Reasonable	

prEN 12457 - 4 Barium
MBA

	Ba	Ba	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	170	2			1.117	2.482	2.29	-
STD	160	2						
STD	150	2						
STD	160	2						
STD	150	2						
STD	170	2						
STD	160	2						
STD	180	2						
STD	150	2						
STD	160	2	1.618843	0.087015	1.806	2.482	2.29	-
C1	150	1			1.395	1.764	1.715	-
C1	160	2						
C1	160	2						
C1	170	2						
C1	160	2	1.574416	0.064725	1.345	1.764	1.715	-
C2	160	1			0.810	1.764	1.715	-
C2	140	1						
C2	140	1						
C2	150	1						
C2	140	2	1.430041	0.102217	1.595	1.764	1.715	-
L1	210	2			1.063	1.764	1.715	-
L1	220	2						
L1	210	2						
L1	230	2						
L1	220	2	2.162147	0.095485	1.288	1.764	1.715	-
L2	200	2			1.477	1.764	1.715	-
L2	210	2						
L2	210	2						
L2	190	2						
L2	210	2	2.070009	0.0855121	0.754	1.764	1.715	-
W1	120	1			1.079	1.764	1.715	-
W1	150	1						
W1	130	1						
W1	130	1						
W1	120	1	1.2844	0.115806	1.463	1.764	1.715	-
W2	120	1			1.226	1.764	1.715	-
W2	96	1						
W2	120	1						
W2	110	1						
W2	90	1	1.071125	0.1357218	1.169	1.764	1.715	-

prEN 12457 - 4 — Barium
MBA

					Grubbs' test			
					Test for one outlier			
	Ba mg/l	Ba mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	93	1			1.459	1.764	1.715	-
T1	98	1						
T1	96	1						
T1	100	1						
T1	96	1	0.96529	0.0271032	1.147	1.764	1.715	-
T2	180	2			0.710	1.764	1.715	-
T2	180	2						
T2	190	2						
T2	180	2						
T2	220	2	1.896197	0.1459819	1.765	1.764	1.715	**
A1	190	2			0.937	1.764	1.715	-
A1	170	2						
A1	170	2						
A1	180	2						
A1	200	2	1.825768	0.126771	1.501	1.764	1.715	-
A2	240	2			0.885	1.764	1.715	-
A2	230	2						
A2	210	2						
A2	220	2						
A2	220	2	2.229379	0.0958253	1.595	1.764	1.715	-
F1	140	1			1.681	1.764	1.715	-
F1	160	2						
F1	150	2						
F1	150	2						
F1	160	2	1.508729	0.0826188	0.831	1.764	1.715	-
F2	150	1			0.857	1.764	1.715	-
F2	150	1						
F2	140	1						
F2	140	1						
F2	150	2	1.464915	0.0417088	1.688	1.764	1.715	-
S1	160	2			1.193	1.764	1.715	-
S1	160	2						
S1	150	2						
S1	160	2						
S1	160	2	1.573721	0.0297893	1.076	1.764	1.715	-

prEN 12457 - 4 Chromium

MBA

	Cr	Cr	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	9,6	0			1.316	2.482	2.29	-
STD	9,1	0						
STD	2,9	0						
STD	5,1	0						
STD	7,5	0						
STD	4,5	0						
STD	5,1	0						
STD	2,6	0						
STD	4,8	0						
STD	9,2	0	0.0604	0.0261457	1.362	2.482	2.29	-
C1	6,8	0			0.953	1.764	1.715	-
C1	8,0	0						
C1	13	0						
C1	12	0						
C1	7,6	0	0.0948	0.0281283	1.251	1.764	1.715	-
C2	4,1	0			0.818	1.764	1.715	-
C2	12	0						
C2	4,1	0						
C2	2,7	0						
C2	5,6	0	0.057	0.0366811	1.718	1.764	1.715	*
L1	3,2	0			1.691	1.764	1.715	-
L1	6,6	0						
L1	6,5	0						
L1	7,9	0						
L1	7,6	0	0.05724	0.0168206	0.824	1.764	1.715	-
L2	9,9	0			1.468	1.764	1.715	-
L2	7,7	0						
L2	6,2	0						
L2	8,5	0						
L2	9,2	0	0.0913	0.0157304	1.119	1.764	1.715	-
W1	6,3	0			0.968	1.764	1.715	-
W1	11	0						
W1	5,4	0						
W1	8,6	0						
W1	4,7	0	0.072	0.025836	1.471	1.764	1.715	-
W2	6,7	0			0.617	1.764	1.715	-
W2	3,9	0						
W2	3,4	0						
W2	3,1	0						
W2	3,1	0	0.0404	0.015225	1.747	1.764	1.715	*

prEN 12457 - 4 MBA

Chromium

					Grubbs' test			
					Test for one outlier			
	Cr	Cr	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	7,9	0			1.194	1.764	1.715	-
T1	15	0						
T1	10	0						
T1	11	0						
T1	11	0	0.1098	0.0257915	1.559	1.764	1.715	-
T2	7,9	0			1.230	1.764	1.715	-
T2	9,4	0						
T2	8,2	0						
T2	7,1	0						
T2	6,4	0	0.078	0.0113798	1.406	1.764	1.715	-
A1	18	0			1.009	1.764	1.715	-
A1	20	0						
A1	23	0						
A1	22	0						
A1	30	0	0.226	0.045607	1.623	1.764	1.715	-
A2	26	0			1.635	1.764	1.715	-
A2	22	0						
A2	22	0						
A2	23	0						
A2	15	0	0.216	0.0403733	1.090	1.764	1.715	-
F1	8,9	0			1.329	1.764	1.715	-
F1	7,5	0						
F1	4,6	0						
F1	5,7	0						
F1	7,6	0	0.0686	0.0170088	1.199	1.764	1.715	-
F2	4,6	0			0.996	1.764	1.715	-
F2	3,9	0						
F2	4,9	0						
F2	8,4	0						
F2	7,4	0	0.0584	0.0194756	1.314	1.764	1.715	-
S1	9,8	0			0.926	1.764	1.715	-
S1	10	0						
S1	11	0						
S1	9,7	0						
S1	11	0	0.103	0.0064807	1.080	1.764	1.715	-

prEN 12457 - 4 Copper
MBA

	Cu	Cu	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	460	3			2.282	2.482	2.29	-
STD	460	4						
STD	320	4						
STD	440	4						
STD	480	4						
STD	420	5						
STD	400	5						
STD	480	5						
STD	400	5						
STD	450	5	4.31	0.4863698	1.007	2.482	2.29	-
C1	440	4			0.990	1.764	1.715	-
C1	490	4						
C1	520	5						
C1	440	5						
C1	480	5	4.74	0.3435113	1.339	1.764	1.715	-
C2	360	3			1.043	1.764	1.715	-
C2	340	3						
C2	370	4						
C2	340	4						
C2	360	4	3.54	0.1341641	1.193	1.764	1.715	-
L1	560	5			0.966	1.764	1.715	-
L1	620	5						
L1	570	6						
L1	720	6						
L1	640	6	5.598	0.577685	1.527	1.764	1.715	-
L2	600	6			1.053	1.764	1.715	-
L2	640	6						
L2	630	7						
L2	530	7						
L2	530	7	6.446	0.5851752	1.015	1.764	1.715	-
W1	410	4			1.403	1.764	1.715	-
W1	350	4						
W1	390	4						
W1	390	4						
W1	370	4	3.82	0.2280351	1.228	1.764	1.715	-
W2	380	3			1.280	1.764	1.715	-
W2	350	3						
W2	360	4						
W2	300	4						
W2	280	4	3.34	0.4219005	1.090	1.764	1.715	-

prEN 12457 - 4 MBA

Copper

	Cu	Cu	mean value	Std dev.	Grubbs' test			
					Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	480	5			1.180	1.764	1.715	-
T1	550	5						
T1	540	5						
T1	520	5						
T1	490	6	5.16	0.304959	1.115	1.764	1.715	-
T2	580	5			0.712	1.764	1.715	-
T2	480	5						
T2	500	5						
T2	480	5						
T2	470	6	5.02	0.4494441	1.735	1.764	1.715	*
A1	620	6			1.055	1.764	1.715	-
A1	670	7						
A1	740	7						
A1	950	10						
A1	970	10	7.9	1.6109004	1.117	1.764	1.715	-
A2	960	9			0.816	1.764	1.715	-
A2	910	9						
A2	910	9						
A2	1010	10						
A2	900	10	9.38	0.4658326	1.546	1.764	1.715	-
F1	520	5			1.503	1.764	1.715	-
F1	450	5						
F1	520	5						
F1	520	5						
F1	480	5	4.98	0.3193744	0.689	1.764	1.715	-
F2	470	4			0.936	1.764	1.715	-
F2	420	4						
F2	420	5						
F2	500	5						
F2	450	5	4.52	0.3420526	1.403	1.764	1.715	-
S1	480	5			0.986	1.764	1.715	-
S1	490	5						
S1	580	6						
S1	590	6						
S1	700	7	5.68	0.8927486	1.479	1.764	1.715	-

prEN 12457 - 4 Molybdenum
MBA

	Mo	Mo	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	46	0			1.355	2.482	2.29	-
STD	57	0						
STD	37	0						
STD	52	0						
STD	50	0						
STD	42	0						
STD	42	0						
STD	43	1						
STD	41	1						
STD	42	1	0.452	0.0605163	1.950	2.482	2.29	-
C1	53	1			1.059	1.764	1.715	-
C1	57	1						
C1	60	1						
C1	55	1						
C1	52	1	0.554	0.0320936	1.433	1.764	1.715	-
C2	41	0			1.627	1.764	1.715	-
C2	52	0						
C2	51	0						
C2	48	1						
C2	48	1	0.48	0.0430116	0.930	1.764	1.715	-
L1	46	0			0.688	1.764	1.715	-
L1	47	0						
L1	46	0						
L1	55	0						
L1	49	0	0.4374	0.0340338	1.692	1.764	1.715	-
L2	47	0			1.636	1.764	1.715	-
L2	43	0						
L2	46	0						
L2	37	1						
L2	44	1	0.4774	0.0430267	0.920	1.764	1.715	-
W1	44	0			1.157	1.764	1.715	-
W1	42	0						
W1	49	0						
W1	52	0						
W1	46	1	0.466	0.0397492	1.359	1.764	1.715	-
W2	54	1			1.604	1.764	1.715	-
W2	50	1						
W2	53	1						
W2	55	1						
W2	53	1	0.53	0.0187083	1.069	1.764	1.715	-

prEN 12457 - 4 MBA

Molybdenum

	Mo	Mo	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	49	0			0.730	1.764	1.715	-
T1	49	0						
T1	50	0						
T1	49	1						
T1	50	1	0.494	0.0054772	1.095	1.764	1.715	-
T2	67	1			0.884	1.764	1.715	-
T2	63	1						
T2	51	1						
T2	50	1						
T2	53	1	0.568	0.0769415	1.326	1.764	1.715	-
A1	43	0			1.180	1.764	1.715	-
A1	40	0						
A1	42	0						
A1	48	0						
A1	47	0	0.44	0.0339116	1.180	1.764	1.715	-
A2	44	0			0.916	1.764	1.715	-
A2	43	0						
A2	44	0						
A2	50	1						
A2	50	1	0.462	0.0349285	1.088	1.764	1.715	-
F1	48	0			1.554	1.764	1.715	-
F1	44	0						
F1	47	0						
F1	48	0						
F1	46	0	0.466	0.0167332	0.837	1.764	1.715	-
F2	40	0			1.764	1.764	1.715	**
F2	46	0						
F2	45	0						
F2	46	0						
F2	46	0	0.446	0.0260768	0.537	1.764	1.715	-
S1	51	0			1.187	1.764	1.715	-
S1	51	1						
S1	52	1						
S1	55	1						
S1	49	1	0.516	0.0219089	1.552	1.764	1.715	-

prEN 12457 - 4 MBA

Antimony

					Grubbs' test			
					Test for one outlier			
	Sb mg/l	Sb mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	32	0			1.898	2.482	2.29	-
STD	32	0						
STD	28	0						
STD	32	0						
STD	29	0						
STD	25	0						
STD	26	0						
STD	30	0						
STD	33	0						
STD	22	0	0.289	0.0363471	1.128	2.482	2.29	-
C1	33	0			1.250	1.764	1.715	-
C1	34	0						
C1	38	0						
C1	30	0						
C1	33	0	0.336	0.0288097	1.527	1.764	1.715	-
C2	33	0			1.486	1.764	1.715	-
C2	39	0						
C2	31	0						
C2	24	0						
C2	33	0	0.32	0.0538516	1.300	1.764	1.715	-
L1	28	0			0.882	1.764	1.715	-
L1	26	0						
L1	37	0						
L1	30	0						
L1	25	0	0.2628	0.0428801	1.637	1.764	1.715	-
L2	29	0			0.518	1.764	1.715	-
L2	26	0						
L2	98	0						
L2	31	0						
L2	27	1	0.4642	0.3437742	1.785	1.764	1.715	**
W1	26	0			0.920	1.764	1.715	-
W1	30	0						
W1	38	0						
W1	26	0						
W1	34	0	0.308	0.0521536	1.381	1.764	1.715	-
W2	29	0			1.055	1.764	1.715	-
W2	29	0						
W2	31	0						
W2	32	0						
W2	32	0	0.306	0.0151658	0.923	1.764	1.715	-

prEN 12457 - 4 MBA

Antimony

	Sb	Sb	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	24	0			0.837	1.764	1.715	-
T1	23	0						
T1	23	0						
T1	25	0						
T1	27	0	0.244	0.0167332	1.554	1.764	1.715	-
T2	44	0			1.687	1.764	1.715	-
T2	42	0						
T2	43	0						
T2	44	0						
T2	38	0	0.422	0.0248998	0.723	1.764	1.715	-
A1	32	0			1.434	1.764	1.715	-
A1	33	0						
A1	31	0						
A1	32	0						
A1	33	0	0.322	0.0083666	0.956	1.764	1.715	-
A2	33	0			0.590	1.764	1.715	-
A2	34	0						
A2	33	0						
A2	34	0						
A2	41	0	0.35	0.0339116	1.769	1.764	1.715	**
F1	34	0			1.272	1.764	1.715	-
F1	37	0						
F1	34	0						
F1	30	0						
F1	41	0	0.352	0.0408656	1.419	1.764	1.715	-
F2	29	0			0.973	1.764	1.715	-
F2	29	0						
F2	36	0						
F2	32	0						
F2	34	0	0.32	0.0308221	1.298	1.764	1.715	-
S1	32	0			0.697	1.764	1.715	-
S1	32	0						
S1	29	0						
S1	68	0						
S1	40	1	0.402	0.160686	1.730	1.764	1.715	*

prEN 12457 - 4 Lead
MBA

					Grubbs' test			
					Test for one outlier			
	Pb	Pb	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	15	0			0.705	2.482	2.29	-
STD	11	0						
STD	6,5	0						
STD	15	0						
STD	14	0						
STD	11	0						
STD	14	0						
STD	67	0						
STD	11	0						
STD	24	1	0.1885	0.1750881	2.750	2.482	2.29	**
C1	6,4	0			0.894	1.764	1.715	-
C1	8,5	0						
C1	13	0						
C1	8,2	0						
C1	7,3	0	0.0868	0.0255088	1.694	1.764	1.715	-
C2	27	0			0.511	1.764	1.715	-
C2	7,3	0						
C2	7,8	0						
C2	8,6	0						
C2	7,7	0	0.1168	0.0857712	1.786	1.764	1.715	**
L1	22	0			0.745	1.764	1.715	-
L1	21	0						
L1	12	0						
L1	56	0						
L1	15	1	0.2268	0.1594042	1.739	1.764	1.715	*
L2	13	0			0.486	1.764	1.715	-
L2	19	0						
L2	160	0						
L2	14	0						
L2	16	2	0.4884	0.7112927	1.788	1.764	1.715	**
W1	7,7	0			0.589	1.764	1.715	-
W1	6,8	0						
W1	6,6	0						
W1	11	0						
W1	29	0	0.1222	0.0954526	1.758	1.764	1.715	*
W2	5,0	0			1.054	1.764	1.715	-
W2	4,5	0						
W2	6,9	0						
W2	6,3	0						
W2	4,1	0	0.0536	0.0119499	1.289	1.764	1.715	-

prEN 12457 - 4 **Lead**

MBA

	Pb	Pb	mean value	Std dev.	Grubbs' test / Test for one outlier	Test parameter		Test results
	mg/l	mg/kg	mg/kg		Gp	1%	5%	
T1	8,0	0			1.562	1.764	1.715	-
T1	8,7	0						
T1	7,2	0						
T1	8,3	0						
T1	8,1	0	0.0806	0.0055045	1.163	1.764	1.715	-
T2	21	0			1.623	1.764	1.715	-
T2	24	0						
T2	17	0						
T2	22	0						
T2	22	0	0.212	0.0258844	1.082	1.764	1.715	-
A1	24	0			1.339	1.764	1.715	-
A1	20	0						
A1	21	0						
A1	23	0						
A1	23	0	0.222	0.0164317	1.095	1.764	1.715	-
A2	24	0			1.414	1.764	1.715	-
A2	22	0						
A2	22	0						
A2	22	0						
A2	20	0	0.22	0.0141421	1.414	1.764	1.715	-
F1	12	0			1.155	1.764	1.715	-
F1	15	0						
F1	22	0						
F1	16	0						
F1	24	0	0.178	0.0501996	1.235	1.764	1.715	-
F2	14	0			1.355	1.764	1.715	-
F2	13	0						
F2	13	0						
F2	17	0						
F2	10	0	0.134	0.0250998	1.434	1.764	1.715	-
S1	15	0			0.671	1.764	1.715	-
S1	15	0						
S1	20	0						
S1	25	0						
S1	125	0	0.18	0.0447214	1.565	1.764	1.715	-

prEN 12457 - 4 **Zinc**

MBA

					Grubbs' test			
					Test for one outlier			
	Zn	Zn	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	47	0			1.047	2.482	2.29	-
STD	28	0						
STD	23	0						
STD	32	0						
STD	27	0						
STD	24	0						
STD	34	0						
STD	31	0						
STD	22	0						
STD	28	0	0.296	0.0726024	2.397	2.482	2.29	*
C1	18	0			1.144	1.764	1.715	-
C1	25	0						
C1	26	0						
C1	29	0						
C1	19	0	0.234	0.0472229	1.186	1.764	1.715	-
C2	16	0			1.082	1.764	1.715	-
C2	15	0						
C2	20	0						
C2	13	0						
C2	15	0	0.158	0.0258844	1.623	1.764	1.715	-
L1	42	0			1.661	1.764	1.715	-
L1	53	0						
L1	25	0						
L1	47	0						
L1	46	0	0.3834	0.0953745	0.981	1.764	1.715	-
L2	43	0			1.067	1.764	1.715	-
L2	78	1						
L2	75	1						
L2	47	1						
L2	57	1	0.66	0.1753112	1.129	1.764	1.715	-
W1	19	0			1.667	1.764	1.715	-
W1	21	0						
W1	19	0						
W1	18	0						
W1	13	0	0.18	0.03	1.000	1.764	1.715	-
W2	16	0			1.456	1.764	1.715	-
W2	15	0						
W2	13	0						
W2	14	0						
W2	11	0	0.138	0.0192354	1.144	1.764	1.715	-

prEN 12457 - 4 Zinc
MBA

					Grubbs' test			
					Test for one outlier			
	Zn mg/l	Zn mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	24	0			0.725	1.764	1.715	-
T1	38	0						
T1	23	0						
T1	26	0						
T1	26	0	0.274	0.060663	1.747	1.764	1.715	*
T2	42	0			0.695	1.764	1.715	-
T2	44	0						
T2	39	0						
T2	41	0						
T2	63	1	0.458	0.0978264	1.758	1.764	1.715	*
A1	75	1			1.616	1.764	1.715	-
A1	53	1						
A1	65	1						
A1	69	1						
A1	70	1	0.664	0.0829458	1.037	1.764	1.715	-
A2	67	1			1.173	1.764	1.715	-
A2	73	1						
A2	59	1						
A2	61	1						
A2	72	1	0.664	0.0630872	1.046	1.764	1.715	-
F1	27	0			0.822	1.764	1.715	-
F1	33	0						
F1	26	0						
F1	75	1						
F1	59	1	0.44	0.219089	1.415	1.764	1.715	-
F2	30	0			1.119	1.764	1.715	-
F2	19	0						
F2	22	0						
F2	32	0						
F2	23	0	0.252	0.0554076	1.227	1.764	1.715	-
S1	29	0			0.484	1.764	1.715	-
S1	35	0						
S1	31	0						
S1	34	0						
S1	230	2	0.718	0.8846864	1.788	1.764	1.715	**

prEN 12457 - 4 MBA

Chloride

	Cl	Cl	mean value	Std dev.	Grubbs' test: Test for one outlier	Test parameter		Test results
	mg/l	mg/kg	mg/kg		Gp	1%	5%	
STD	275	2270			2.141	2.482	2.29	-
STD	317	2650						
STD	227	2710						
STD	296	2750						
STD	303	2750						
STD	278	2780						
STD	271	2960						
STD	275	2960						
STD	265	3030						
STD	296	3170	2803	248.9556	1.474	2.482	2.29	-
C1	294	2680			1.580	1.764	1.715	-
C1	307	2940						
C1	320	3060						
C1	268	3070						
C1	306	3200	2990	196.21417	1.070	1.764	1.715	-
C2	271	2710			1.062	1.764	1.715	-
C2	274	2740						
C2	318	2960						
C2	321	3180						
C2	296	3210	2960	235.47824	1.062	1.764	1.715	-
L1	290	2475			1.121	1.764	1.715	-
L1	292	2610						
L1	275	2628						
L1	327	2682						
L1	298	2943	2667.6	171.7798	1.603	1.764	1.715	-
L2	268	2640			1.502	1.764	1.715	-
L2	275	2904						
L2	290	2948						
L2	240	3025						
L2	264	3190	2941.4	200.67087	1.239	1.764	1.715	-
W1	317	2580			1.359	1.764	1.715	-
W1	258	2800						
W1	306	3060						
W1	334	3170						
W1	280	3340	2990	301.66206	1.160	1.764	1.715	-
W2	318	3020			1.629	1.764	1.715	-
W2	302	3110						
W2	314	3140						
W2	311	3160						
W2	316	3180	3122	62.609903	0.926	1.764	1.715	-

prEN 12457 - 4 MBA

Chloride

	Cl	Cl	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	287	2650			1.583	1.764	1.715	-
T1	300	2840						
T1	292	2870						
T1	284	2920						
T1	265	3000	2856	130.11533	1.107	1.764	1.715	-
T2	338	2680			0.898	1.764	1.715	-
T2	277	2770						
T2	268	2860						
T2	293	2930						
T2	286	3380	2924	271.71676	1.678	1.764	1.715	-
A1	215	2150			1.389	1.764	1.715	-
A1	244	2440						
A1	268	2680						
A1	303	2850						
A1	285	3030	2630	345.47069	1.158	1.764	1.715	-
A2	286	2710			1.132	1.764	1.715	-
A2	273	2730						
A2	271	2860						
A2	294	2860						
A2	286	2940	2820	97.21111	1.234	1.764	1.715	-
F1	286	2690			1.497	1.764	1.715	-
F1	269	2800						
F1	295	2860						
F1	289	2890						
F1	280	2950	2838	98.84331	1.133	1.764	1.715	-
F2	274	2570			1.452	1.764	1.715	-
F2	296	2740						
F2	257	2780						
F2	283	2830						
F2	278	2960	2776	141.88023	1.297	1.764	1.715	-
S1	308	2980			1.276	1.764	1.715	-
S1	308	3080						
S1	310	3080						
S1	323	3100						
S1	298	3230	3094	89.330846	1.522	1.764	1.715	-

prEN 12457 - 4 MBA

Sulfate

					Grubbs' test			
					Test for one outlier			
	SO4 mg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	139	1390			1.631	2.482	2.29	-
STD	156	1410						
STD	152	1480						
STD	151	1490						
STD	164	1510						
STD	148	1520						
STD	141	1550						
STD	149	1560						
STD	155	1570						
STD	157	1640	1512	74.803446	1.711	2.482	2.29	-
C1	203	1730			1.268	1.764	1.715	-
C1	187	1840						
C1	207	1870						
C1	173	2030						
C1	184	2070	1908	140.42792	1.154	1.764	1.715	-
C2	166	1660			1.562	1.764	1.715	-
C2	184	1810						
C2	195	1840						
C2	181	1890						
C2	189	1950	1830	108.85771	1.102	1.764	1.715	-
L1	135	1134			1.532	1.764	1.715	-
L1	138	1215						
L1	140	1242						
L1	145	1260						
L1	126	1305	1231.2	63.448404	1.163	1.764	1.715	-
L2	161	1518			1.121	1.764	1.715	-
L2	166	1529						
L2	165	1771						
L2	138	1815						
L2	139	1826	1691.8	155.05709	0.865	1.764	1.715	-
W1	161	1610			1.077	1.764	1.715	-
W1	165	1650						
W1	199	1770						
W1	177	1890						
W1	189	1990	1782	159.7498	1.302	1.764	1.715	-
W2	179	1770			0.908	1.764	1.715	-
W2	201	1790						
W2	187	1840						
W2	184	1870						
W2	177	2010	1856	94.762862	1.625	1.764	1.715	-

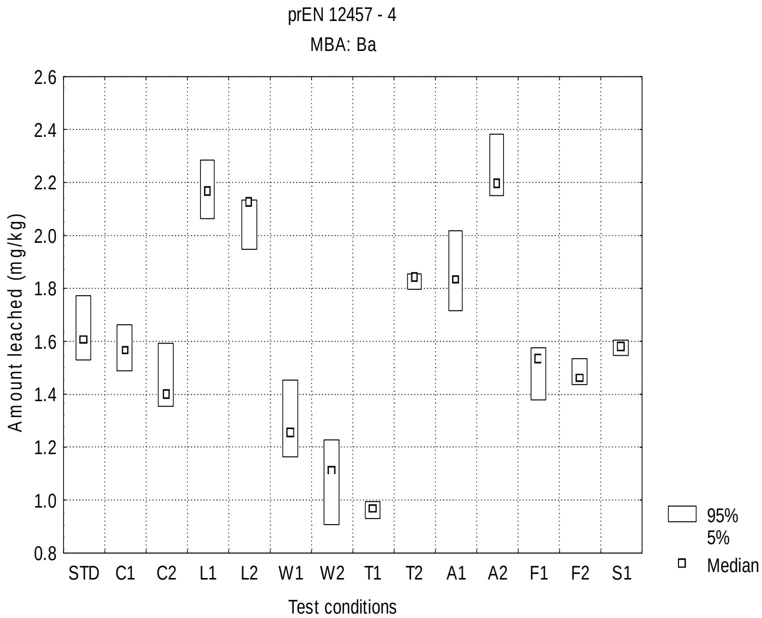
prEN 12457 - 4 Sulfate

MBA

					Grubbs' test			
					Test for one outlier			
	SO4 mg/l	SO4 mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	168	1520			1.073	1.764	1.715	-
T1	177	1550						
T1	187	1680						
T1	152	1770						
T1	155	1870	1678	147.20734	1.304	1.764	1.715	-
T2	187	1660			1.031	1.764	1.715	-
T2	172	1690						
T2	182	1720						
T2	166	1820						
T2	169	1870	1752	89.274856	1.322	1.764	1.715	-
A1	136	1360			1.040	1.764	1.715	-
A1	153	1470						
A1	156	1530						
A1	187	1560						
A1	147	1870	1558	190.44684	1.638	1.764	1.715	-
A2	155	1550			1.174	1.764	1.715	-
A2	165	1650						
A2	168	1680						
A2	187	1680						
A2	168	1870	1686	115.88788	1.588	1.764	1.715	-
F1	182	1490			1.427	1.764	1.715	-
F1	149	1600						
F1	179	1750						
F1	175	1790						
F1	160	1820	1690	140.17846	0.927	1.764	1.715	-
F2	146	1460			1.159	1.764	1.715	-
F2	171	1490						
F2	149	1690						
F2	169	1710						
F2	179	1790	1628	144.98276	1.117	1.764	1.715	-
S1	162	1540			1.132	1.764	1.715	-
S1	154	1570						
S1	165	1570						
S1	157	1620						
S1	157	1650	1590	44.158804	1.359	1.764	1.715	-

prEN 12457 - 4 MBA

Barium



Multiple regression analysis of ruggedness data
All data are included

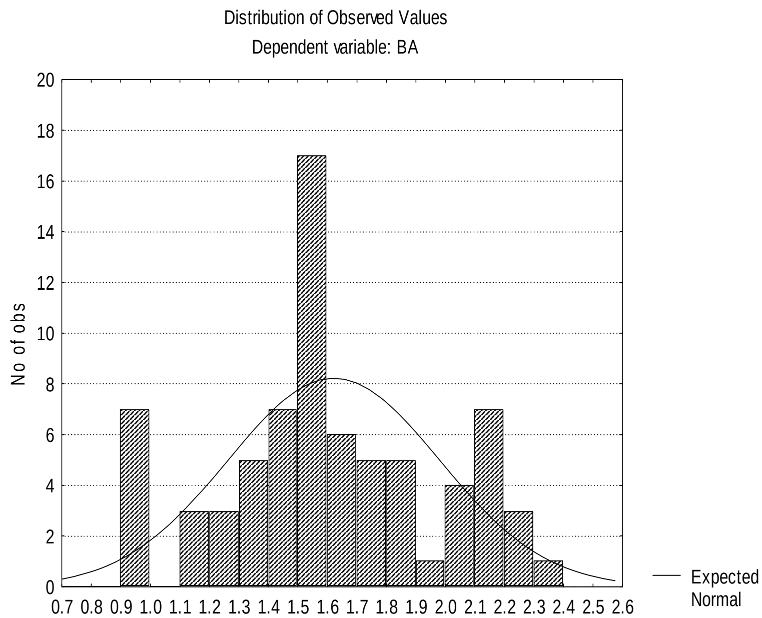
Regression Summary for Dependent Variable: BA
R= .97601483 R²= .95260495 Adjusted R²= .94233602
F(13,60)=92.766 p<.00000 Std.Error of estimate: .08792

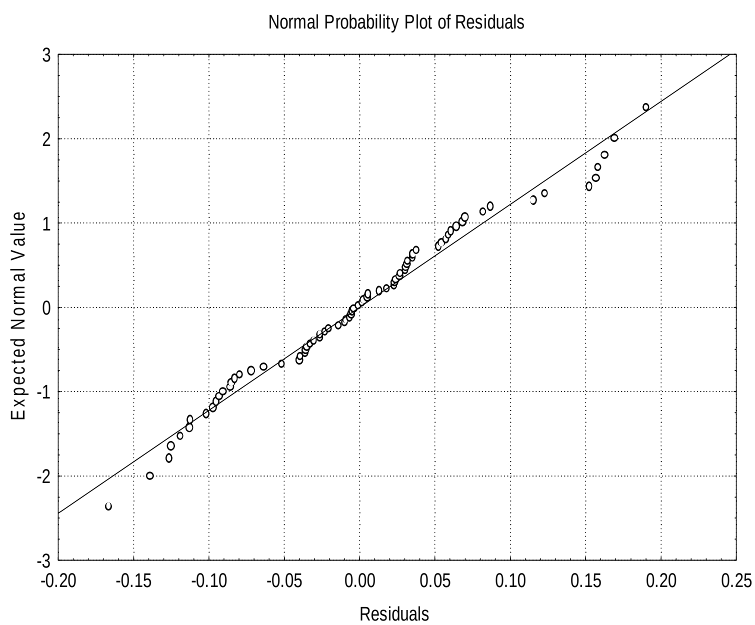
	BETA	St. Err. of BETA	B	St. Err. of B	t(60)	p-level
Intercpt			1.619	0.028	58.226	0.00
C1	-0.031	0.033	-0.044	0.048	-0.923	0.36
C2	-0.130	0.033	-0.189	0.048	-3.921	0.00
L1	0.375	0.033	0.543	0.048	11.282	0.00
L2	0.311	0.033	0.451	0.048	9.369	0.00
W1	-0.231	0.033	-0.334	0.048	-6.945	0.00
W2	-0.378	0.033	-0.548	0.048	-11.374	0.00
T1	-0.451	0.033	-0.654	0.048	-13.572	0.00
T2	0.132	0.032	0.213	0.052	4.094	0.00
A1	0.143	0.033	0.207	0.048	4.297	0.00
A2	0.421	0.033	0.611	0.048	12.678	0.00
F1	-0.076	0.033	-0.110	0.048	-2.287	0.03
F2	-0.106	0.033	-0.154	0.048	-3.196	0.00
S1	-0.031	0.033	-0.045	0.048	-0.937	0.35

Analysis of Variance; DV: BA (part 4 data.sta)

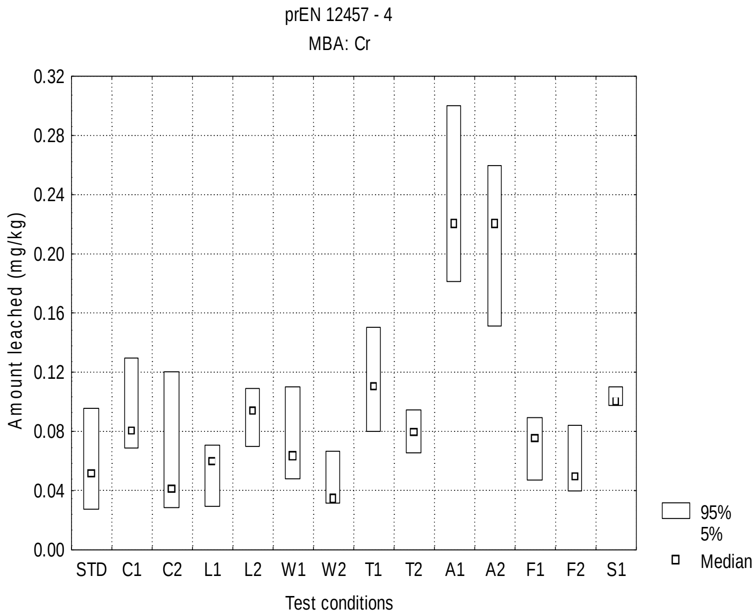
	Sums of Squares	df	Mean Squares	F	p-level
Regress	9.3221	13	0.7171	92.7658	1.2E-34
Residua	0.4638	60	0.0077		
Total	9.7859				

prEN 12457 - 4 **Barium**
MBA





prEN 12457 - 4 Chromium
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CR
R= .91615615 R²= .83934209 Adjusted R²= .80510351
F(13,61)=24.515 p<.00000 Std.Error of estimate: .02601

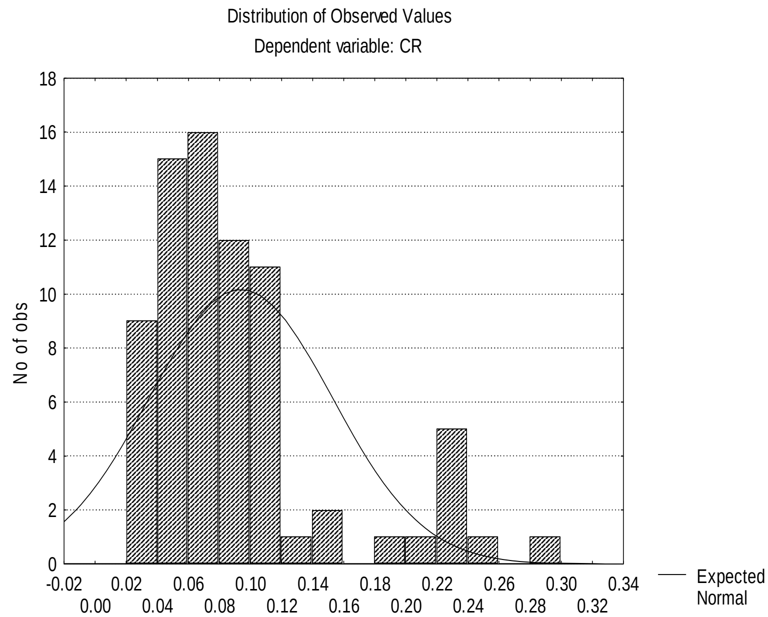
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			0.060	0.008	7.342	0.00
C1	0.147	0.061	0.034	0.014	2.414	0.02
C2	-0.014	0.061	-0.003	0.014	-0.239	0.81
L1	-0.013	0.061	-0.003	0.014	-0.222	0.83
L2	0.132	0.061	0.031	0.014	2.169	0.03
W1	0.049	0.061	0.012	0.014	0.814	0.42
W2	-0.085	0.061	-0.020	0.014	-1.404	0.17
T1	0.211	0.061	0.049	0.014	3.467	0.00
T2	0.075	0.061	0.018	0.014	1.235	0.22
A1	0.706	0.061	0.166	0.014	#####	0.00
A2	0.663	0.061	0.156	0.014	#####	0.00
F1	0.035	0.061	0.008	0.014	0.576	0.57
F2	-0.009	0.061	-0.002	0.014	-0.140	0.89
S1	0.182	0.061	0.043	0.014	2.990	0.00

Analysis of Variance; DV: CR (part 4 data.sta)

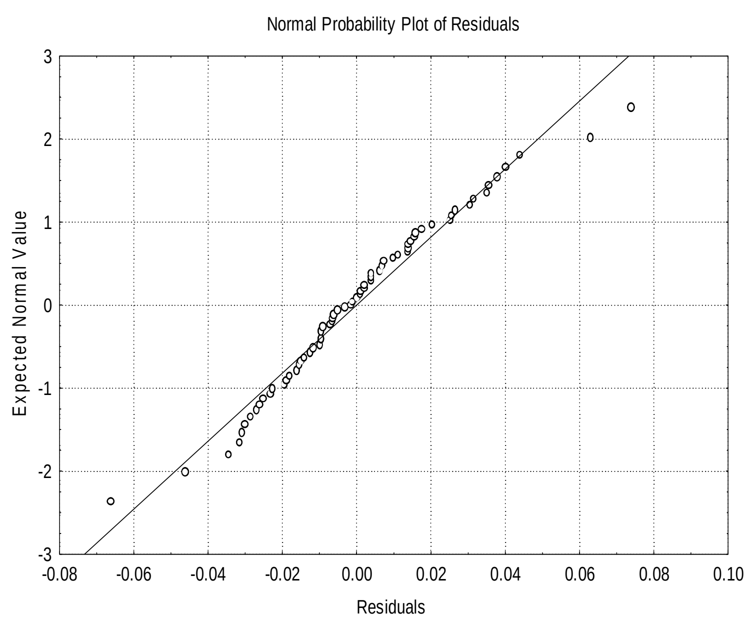
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**0.2157**	**13**	**0.0166**	**24.5145**	2E-19
Residua	0.0413	61	0.0007		
Total	0.2569				

prEN 12457 - 4 Chromium

MBA

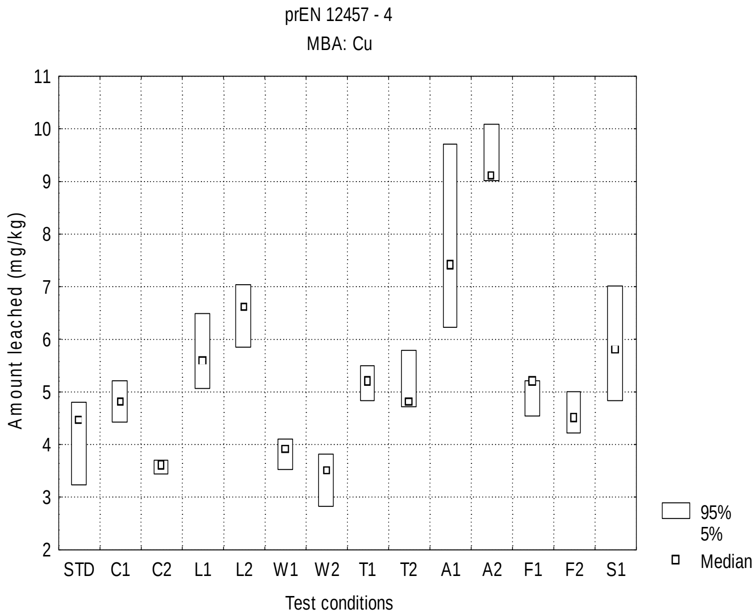


Distribution of Observed Values
Dependent variable: CR
No of obs
Expected Normal



Normal Probability Plot of Residuals
Expected Normal Value
Residuals

prEN 12457 - 4 Copper
MBA



Multiple regression analysis of ruggedness data
All data are included

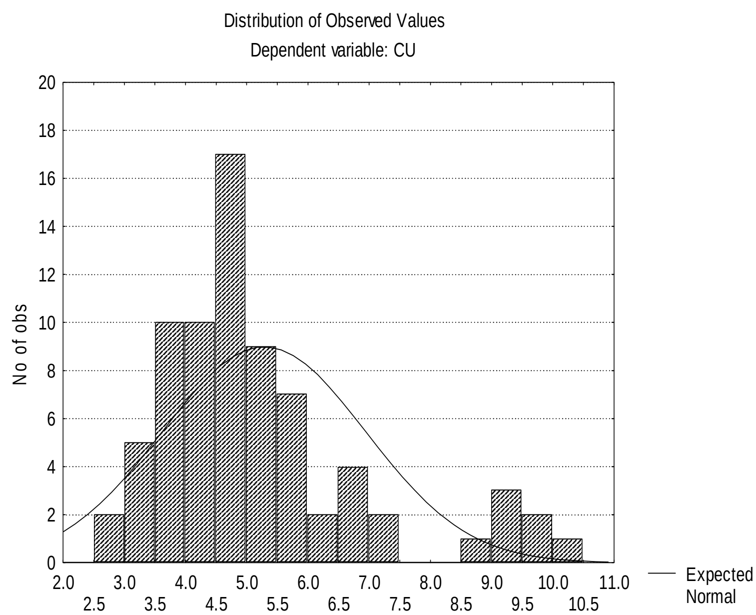
Regression Summary for Dependent Variable: CU
R= .94374672 R^2= .89065787 Adjusted R^2= .86735544
F(13,61)=38.222 p<.00000 Std.Error of estimate: .61123

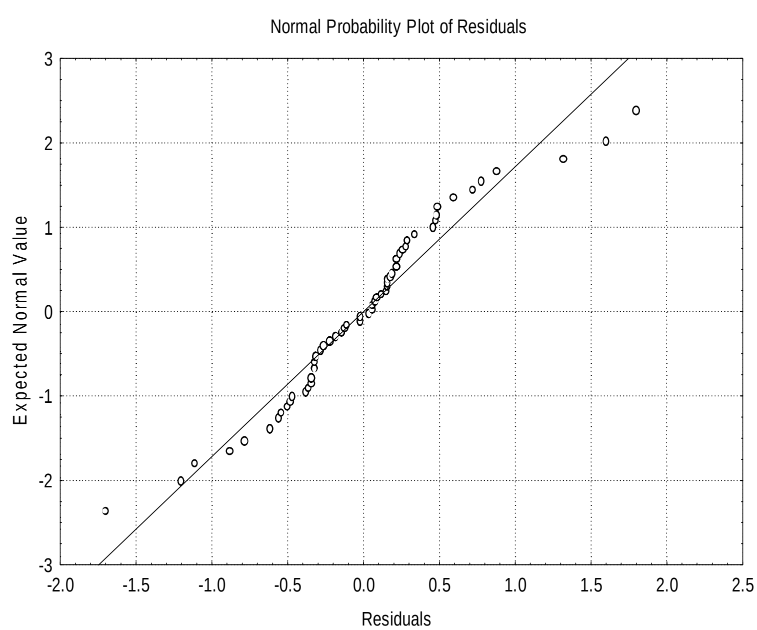
	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(61)**	**p-level**
Intercpt			4.310	0.193	#####	0.00
C1	0.064	0.050	0.430	0.335	1.284	0.20
C2	-0.115	0.050	-0.770	0.335	-2.300	0.02
L1	0.193	0.050	1.288	0.335	3.847	0.00
L2	0.320	0.050	2.136	0.335	6.380	0.00
W1	-0.073	0.050	-0.490	0.335	-1.464	0.15
W2	-0.145	0.050	-0.970	0.335	-2.897	0.01
T1	0.127	0.050	0.850	0.335	2.539	0.01
T2	0.106	0.050	0.710	0.335	2.121	0.04
A1	0.537	0.050	3.590	0.335	#####	0.00
A2	0.759	0.050	5.070	0.335	#####	0.00
F1	0.100	0.050	0.670	0.335	2.001	0.05
F2	0.031	0.050	0.210	0.335	0.627	0.53
S1	0.205	0.050	1.370	0.335	4.092	0.00

Analysis of Variance; DV: CU (part 4 data.sta)

	Sums of Squares	**df**	**Mean Squares**	**F**	**p-level**
Regress	**185.64**	**13**	**14.28**	**38.2217**	2E-24
Residua	22.79	61	0.3736		
Total	208.42				

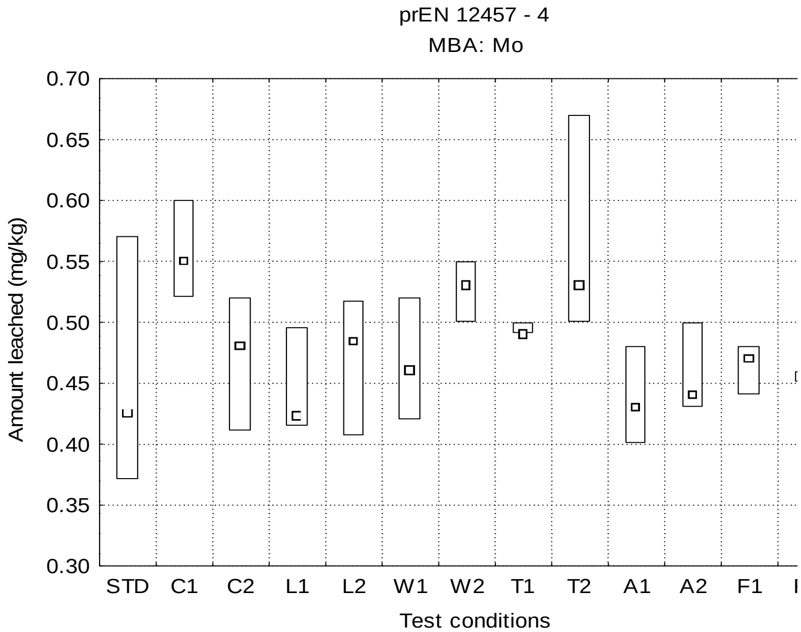
MBA


Distribution of Observed Values
Dependent variable: CU
No of obs
0
2
4
6
8
10
12
14
16
18
20
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
-3
-2
-1
0
1
2
3
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Residuals

prEN 12457 - 4 MBA

Molybdenum



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= .73105471 R²= .53444098 Adjusted R²= .43356986
F(13,60)=5.2983 p<.00000 Std.Error of estimate: .04095

	BETA	St. Err. of BETA	B	St. Err. of B	t(60)	p-level
Intercpt			0.452	0.013	#####	0.00
C1	0.474	0.104	0.102	0.022	4.547	0.00
C2	0.130	0.104	0.028	0.022	1.248	0.22
L1	-0.068	0.104	-0.015	0.022	-0.651	0.52
L2	0.118	0.104	0.025	0.022	1.132	0.26
W1	0.065	0.104	0.014	0.022	0.624	0.53
W2	0.362	0.104	0.078	0.022	3.477	0.00
T1	0.195	0.104	0.042	0.022	1.872	0.07
T2	0.539	0.104	0.116	0.022	5.171	0.00
A1	-0.056	0.104	-0.012	0.022	-0.535	0.59
A2	0.046	0.104	0.010	0.022	0.446	0.66
F1	0.065	0.104	0.014	0.022	0.624	0.53
F2	0.023	0.101	0.006	0.024	0.227	0.82
S1	0.297	0.104	0.064	0.022	2.853	0.01

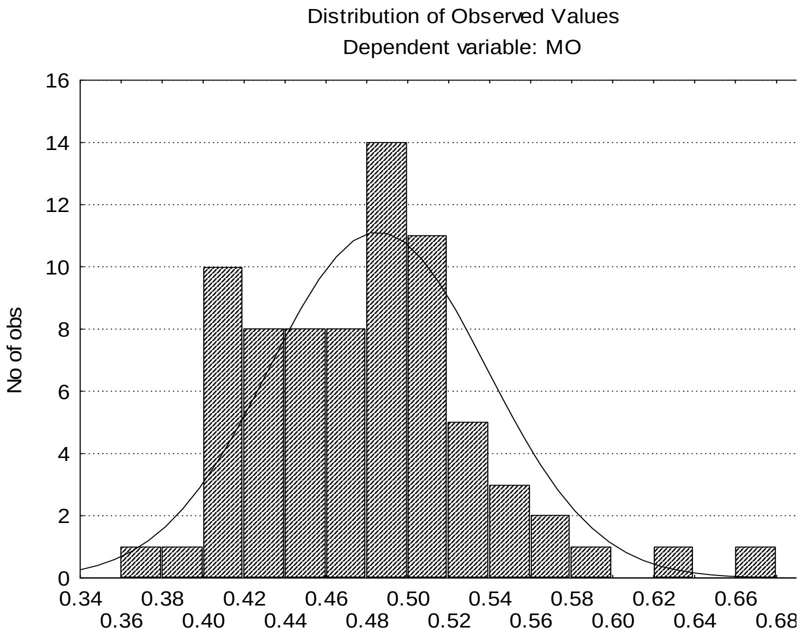
Analysis of Variance; DV: MO (part 4 data.sta)

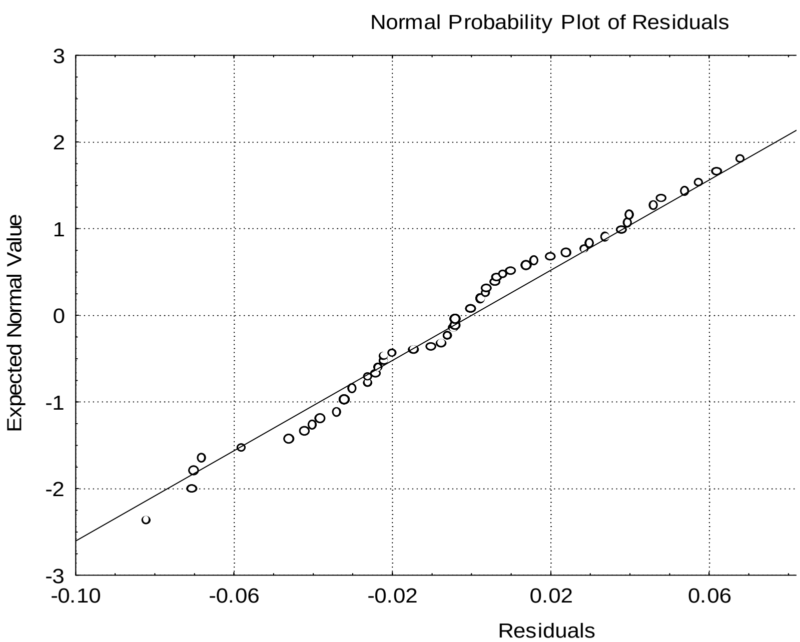
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**0.1155**	**13**	**0.0089**	**5.29826**	3E-06
Residual	0.1006	60	0.0017		
Total	0.2162				

prEN 12457 - 4

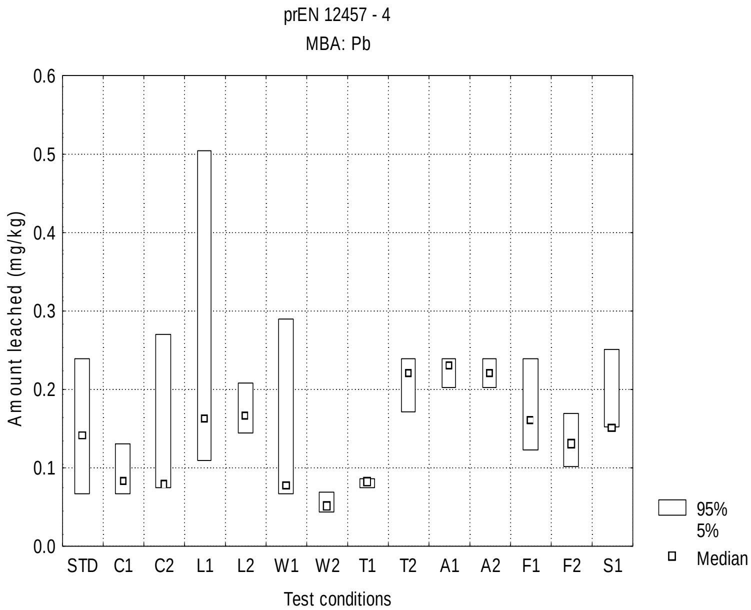
Molybdenum

MBA


Distribution of Observed Values
Dependent variable: MO
No of obs
16
14
12
10
8
6
4
2
0
0.34
0.36
0.38
0.40
0.42
0.44
0.46
0.48
0.50
0.52
0.54
0.56
0.58
0.60
0.62
0.64
0.66
0.68


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.10
-0.06
-0.02
0.02
0.06
Residuals

prEN 12457 - 4 Lead
MBA



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: PB
R= .70323520 R²= .49453974 Adjusted R²= .38124693
F(13,58)=4.3651 p<.00004 Std.Error of estimate: .06099

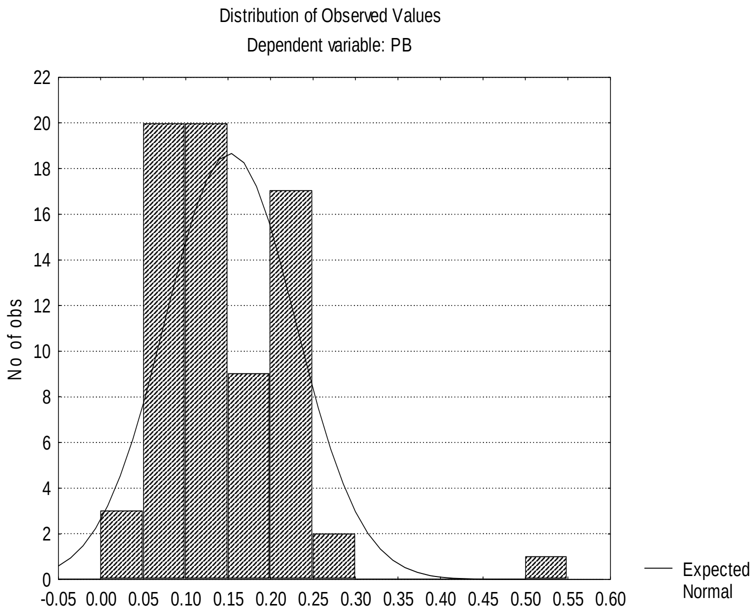
	BETA	St. Err. of BETA	B	St. Err. of B	t(58)	p-level
Intercpt			0.135	0.020	6.640	0.00
C1	-0.159	0.112	-0.048	0.034	-1.417	0.16
C2	-0.060	0.112	-0.018	0.034	-0.535	0.59
L1	0.295	0.109	0.099	0.037	2.701	0.01
L2	0.106	0.109	0.036	0.037	0.969	0.34
W1	-0.042	0.112	-0.013	0.034	-0.376	0.71
W2	-0.269	0.112	-0.081	0.034	-2.393	0.02
T1	-0.180	0.112	-0.054	0.034	-1.599	0.12
T2	0.254	0.112	0.077	0.034	2.263	0.03
A1	0.287	0.112	0.087	0.034	2.557	0.01
A2	0.281	0.112	0.085	0.034	2.499	0.02
F1	0.142	0.112	0.043	0.034	1.264	0.21
F2	-0.003	0.112	-0.001	0.034	-0.029	0.98
S1	0.149	0.112	0.045	0.034	1.323	0.19

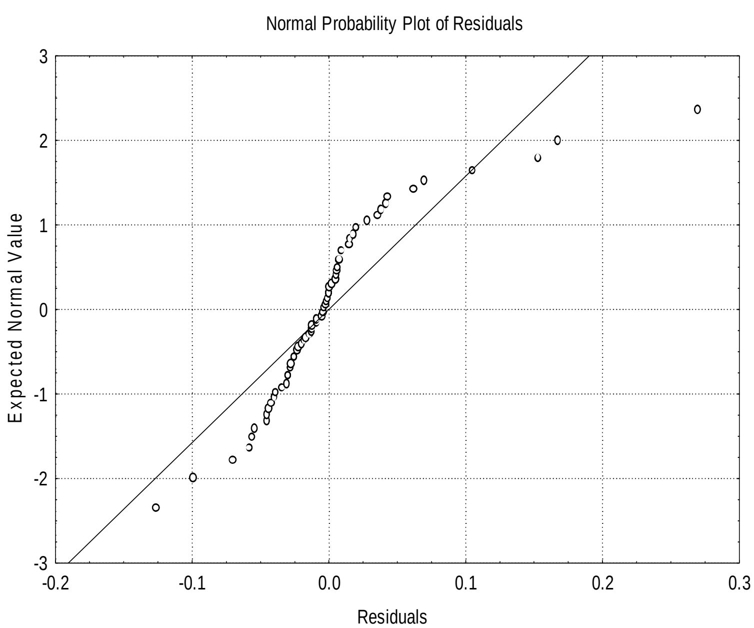
Analysis of Variance; DV: PB (part 4 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	0.2111	13	0.0162	4.36515	4E-05
Residua	0.2158	58	0.0037		
Total	0.4269				

prEN 12457 - 4 Lead

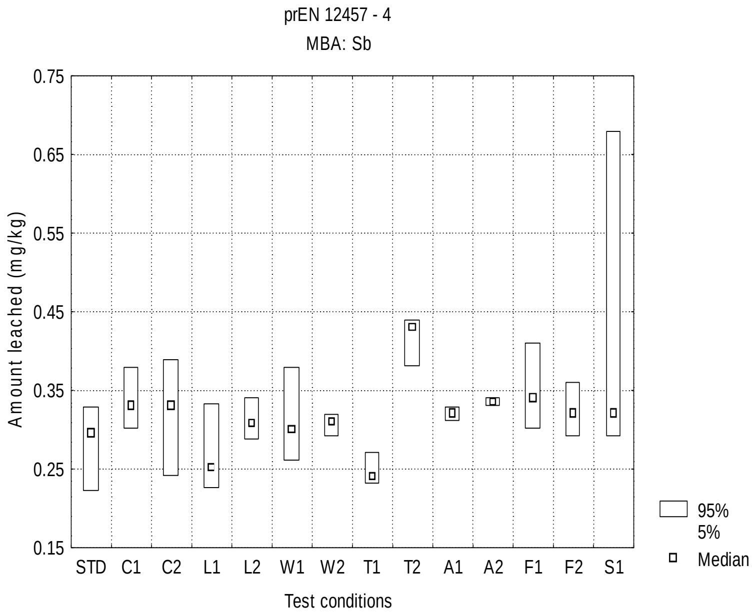
MBA


Distribution of Observed Values
Dependent variable: PB
No of obs
Expected Normal
-0.05 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60
0 2 4 6 8 10 12 14 16 18 20 22


Normal Probability Plot of Residuals
Expected Normal Value
Residuals
-0.2 -0.1 0.0 0.1 0.2 0.3
-3 -2 -1 0 1 2 3

prEN 12457 - 4 MBA

Antimony



Multiple regression analysis of ruggedness data
All data are included

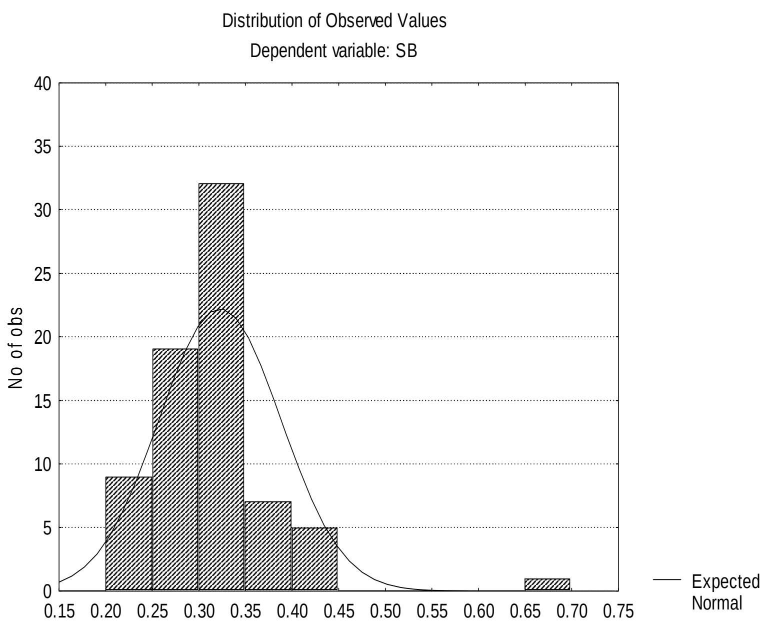
Regression Summary for Dependent Variable: SB
R= .68922554 R²= .47503185 Adjusted R²= .35936090
F(13,59)=4.1068 p<.00008 Std.Error of estimate: .05296

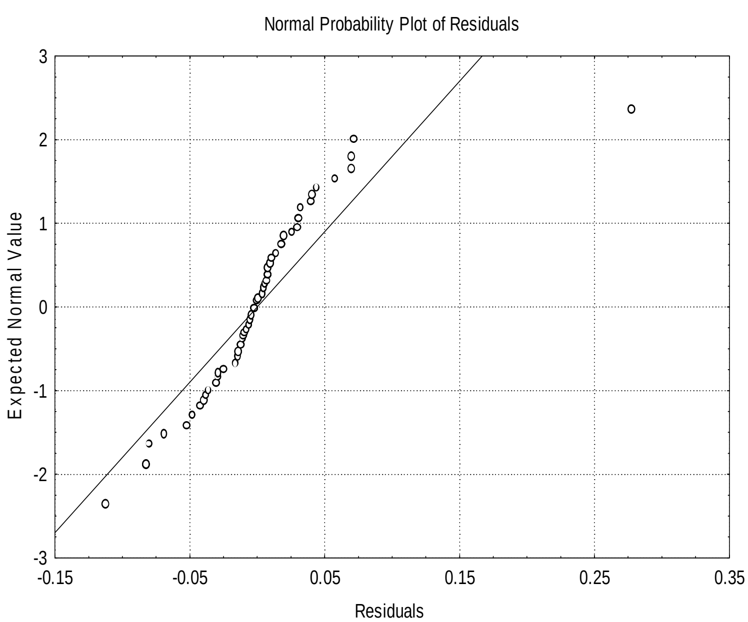
	BETA	St. Err. of BETA	B	St. Err. of B	t(59)	p-level
Intercpt			0.289	0.017	#####	0.00
C1	0.181	0.112	0.047	0.029	1.620	0.11
C2	0.119	0.112	0.031	0.029	1.069	0.29
L1	-0.101	0.112	-0.026	0.029	-0.903	0.37
L2	0.075	0.109	0.022	0.031	0.694	0.49
W1	0.073	0.112	0.019	0.029	0.655	0.52
W2	0.065	0.112	0.017	0.029	0.586	0.56
T1	-0.173	0.112	-0.045	0.029	-1.551	0.13
T2	0.511	0.112	0.133	0.029	4.585	0.00
A1	0.127	0.112	0.033	0.029	1.138	0.26
A2	0.159	0.109	0.046	0.031	1.468	0.15
F1	0.242	0.112	0.063	0.029	2.172	0.03
F2	0.119	0.112	0.031	0.029	1.069	0.29
S1	0.434	0.112	0.113	0.029	3.895	0.00

Analysis of Variance; DV: SB (part 4 data.sta)

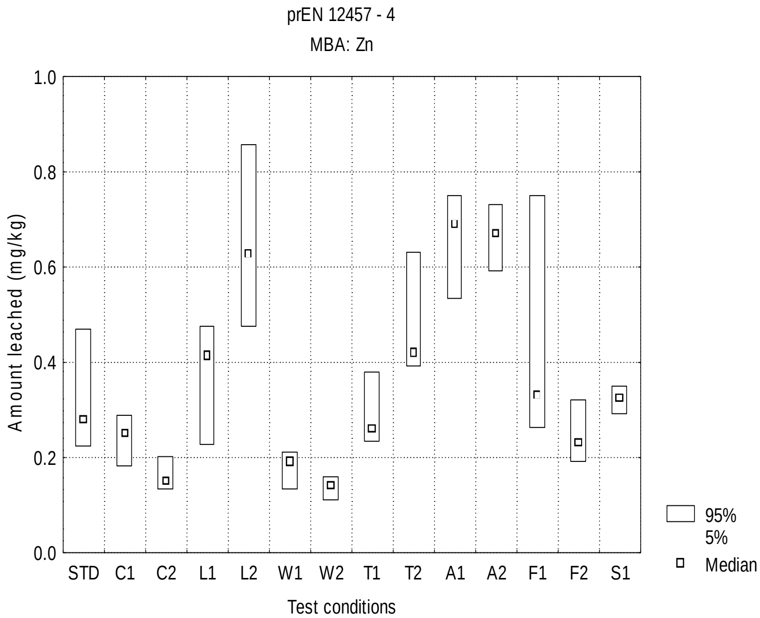
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**0.1497**	**13**	**0.0115**	**4.10675**	8E-05
Residua	0.1655	59	0.0028		
Total	0.3152				

prEN 12457 - 4 **Antimony**
MBA





prEN 12457 - 4 **Zinc**
MBA



Multiple regression analysis of ruggedness data
All data are included

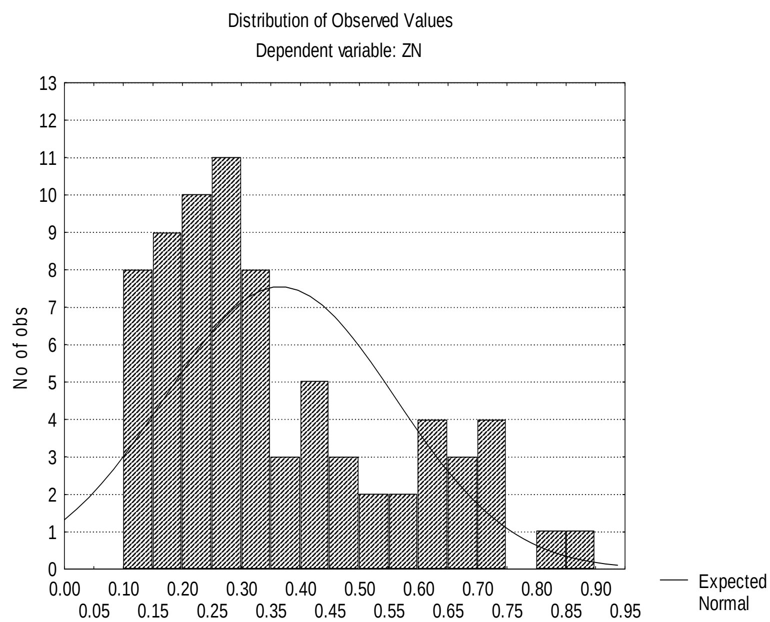
Regression Summary for Dependent Variable: ZN
R= .90172544 R²= .81310878 Adjusted R²= .77261568
F(13,60)=20.080 p<.00000 Std.Error of estimate: .09367

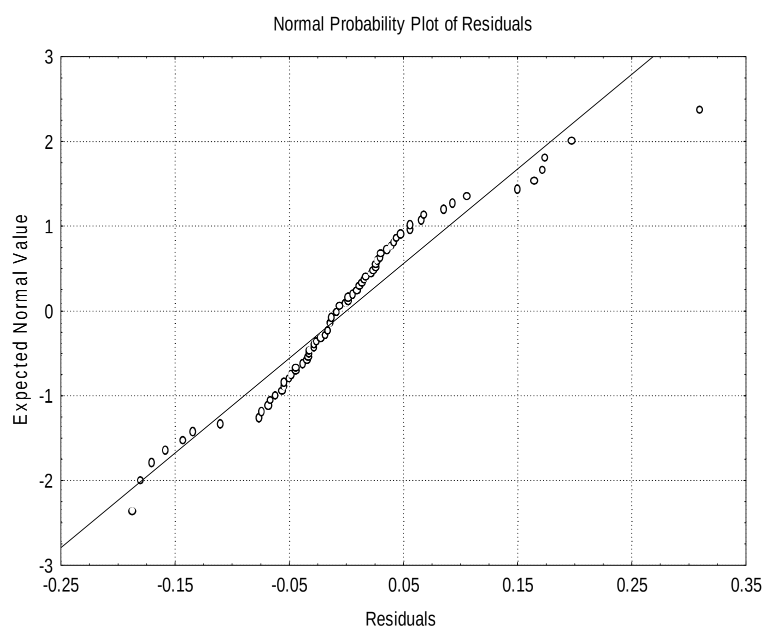
	BETA	St. Err. of BETA	B	St. Err. of B	t(60)	p-level
Intercpt			0.296	0.030	9.993	0.00
C1	-0.080	0.066	-0.062	0.051	-1.208	0.23
C2	-0.178	0.066	-0.138	0.051	-2.690	0.01
L1	0.112	0.066	0.087	0.051	1.704	0.09
L2	0.468	0.066	0.364	0.051	7.095	0.00
W1	-0.149	0.066	-0.116	0.051	-2.261	0.03
W2	-0.203	0.066	-0.158	0.051	-3.080	0.00
T1	-0.028	0.066	-0.022	0.051	-0.429	0.67
T2	0.208	0.066	0.162	0.051	3.158	0.00
A1	0.473	0.066	0.368	0.051	7.173	0.00
A2	0.473	0.066	0.368	0.051	7.173	0.00
F1	0.185	0.066	0.144	0.051	2.807	0.01
F2	-0.057	0.066	-0.044	0.051	-0.858	0.39
S1	0.031	0.064	0.027	0.055	0.478	0.63

Analysis of Variance; DV: ZN (part 4 data.sta)

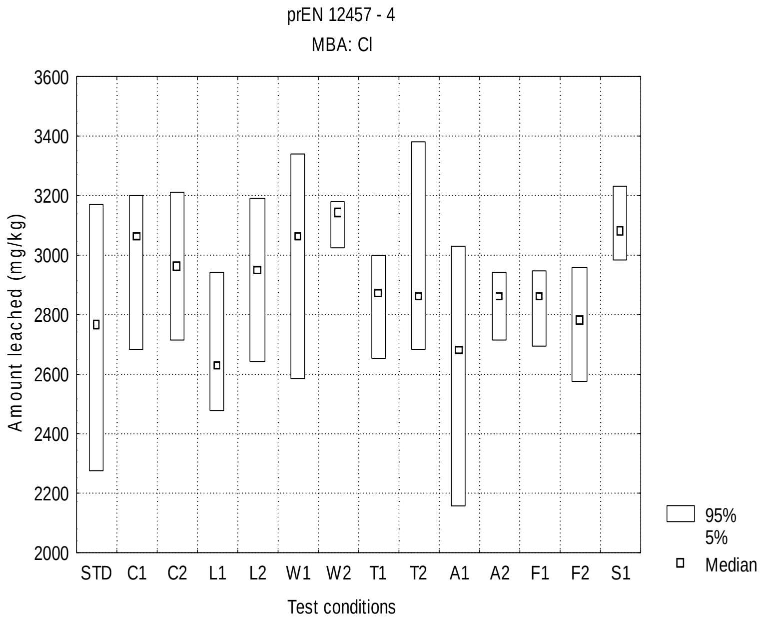
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**2.2904**	**13**	**0.1762**	**20.0802**	4E-17
Residua	0.5264	60	0.0088		
Total	2.8168				

prEN 12457 - 4 **Zinc**
MBA





prEN 12457 - 4 Chloride
MBA



Multiple regression analysis of ruggedness data
All data are included

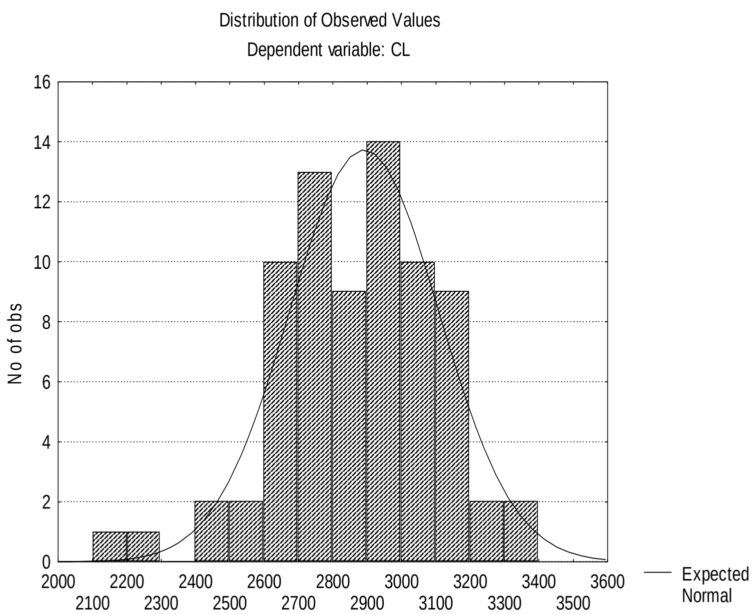
Regression Summary for Dependent Variable: CL
R= .58782006 R²= .34553242 Adjusted R²= .20605572
F(13,61)=2.4773 p<.00886 Std.Error of estimate: 207.33

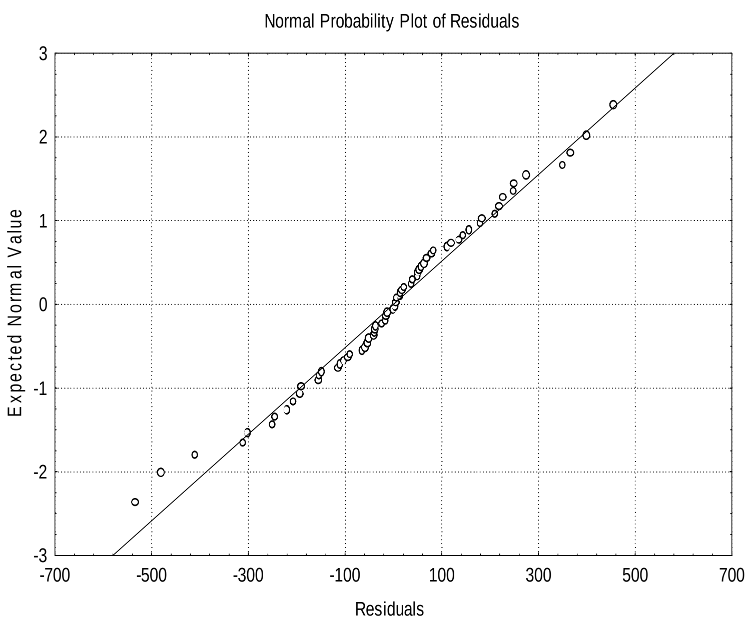
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			2803	66	#####	0.00
C1	0.202	0.123	187	114	1.647	0.10
C2	0.169	0.123	157	114	1.383	0.17
L1	-0.146	0.123	-135	114	-1.192	0.24
L2	0.149	0.123	138	114	1.219	0.23
W1	0.202	0.123	187	114	1.647	0.10
W2	0.344	0.123	319	114	2.809	0.01
T1	0.057	0.123	53	114	0.467	0.64
T2	0.131	0.123	121	114	1.066	0.29
A1	-0.187	0.123	-173	114	-1.523	0.13
A2	0.018	0.123	17	114	0.150	0.88
F1	0.038	0.123	35	114	0.308	0.76
F2	-0.029	0.123	-27	114	-0.238	0.81
S1	0.314	0.123	291	114	2.563	0.01

Analysis of Variance; DV: CL (part 4 data.sta)

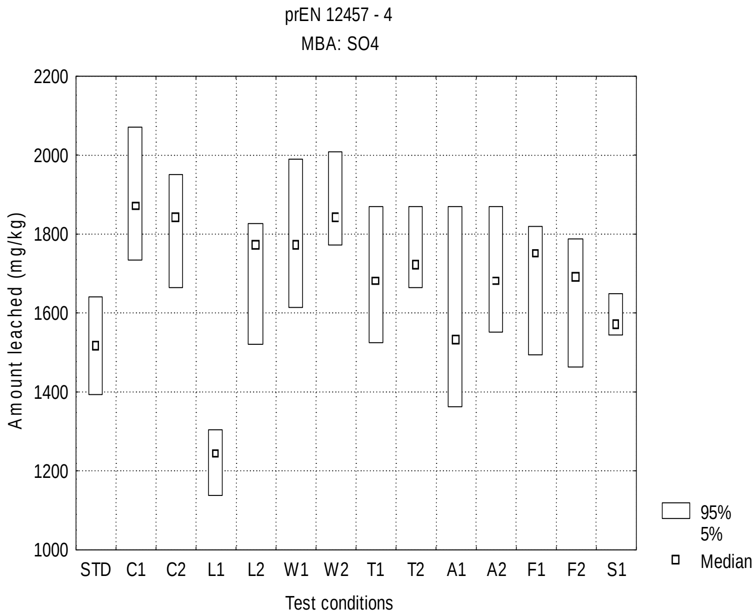
	Sums of Squares	df	Mean Squares	F	p-level
Regress	**1E+06**	**13**	**106492**	**2.47735**	0.009
Residua	3E+06	61	42986		
Total	4E+06				

prEN 12457 - 4 **Chloride**
MBA





prEN 12457 - 4 Sulfate
MBA



Multiple regression analysis of ruggedness data
All data are included

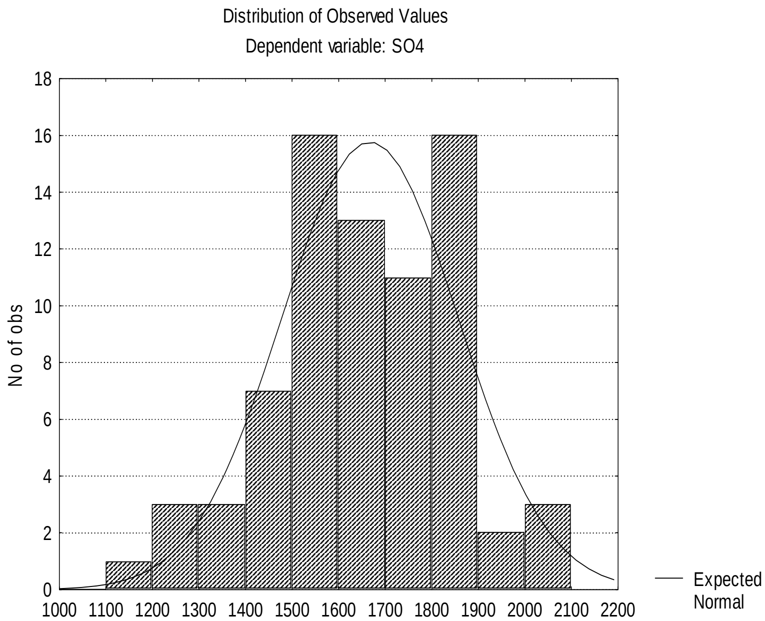
Regression Summary for Dependent Variable: SO4
R= .82805187 R²= .68566990 Adjusted R²= .61868152
F(13,61)=10.236 p<.00000 Std.Error of estimate: 122.46

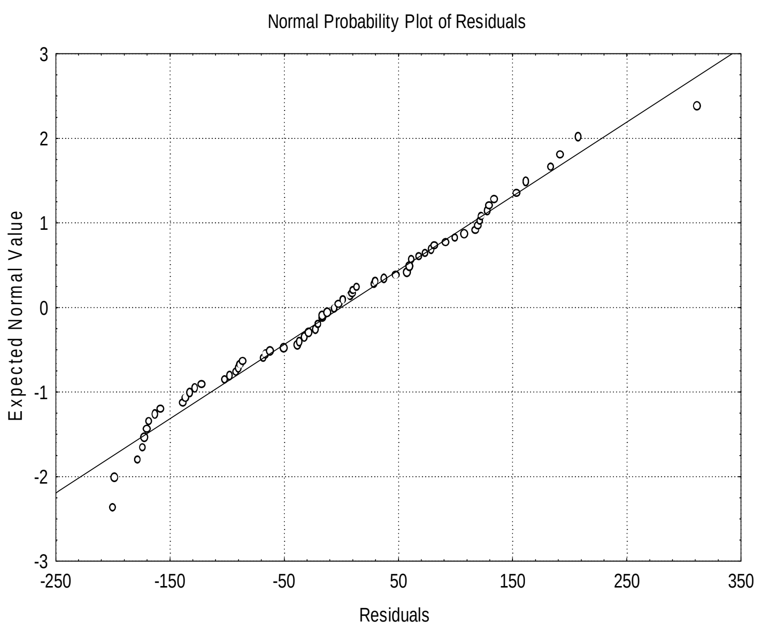
	BETA	St. Err. of BETA	B	St. Err. of B	t(61)	p-level
Intercpt			1512	39	39.04	0.00
C1	0.501	0.085	396	67	5.90	0.00
C2	0.403	0.085	318	67	4.74	0.00
L1	-0.356	0.085	-281	67	-4.19	0.00
L2	0.228	0.085	180	67	2.68	0.01
W1	0.342	0.085	270	67	4.03	0.00
W2	0.436	0.085	344	67	5.13	0.00
T1	0.210	0.085	166	67	2.47	0.02
T2	0.304	0.085	240	67	3.58	0.00
A1	0.058	0.085	46	67	0.69	0.50
A2	0.220	0.085	174	67	2.59	0.01
F1	0.225	0.085	178	67	2.65	0.01
F2	0.147	0.085	116	67	1.73	0.09
S1	0.099	0.085	78	67	1.16	0.25

Analysis of Variance; DV: SO4 (part 4 data.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	**2E+06**	**13**	**153493**	**10.2357**	6E-11
Residua	914754	61	14996		
Total	3E+06				

prEN 12457 - 4 **Sulfate**
MBA





A P P E N D I X   5

prEN 12457 part 2: FCM

Part 2 on FCM: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.5.1

Table A.5.1. Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	**Assumption of normality on entire population**	**Assumption of normality on reduced population**	**Comments**
Ba	Doubtful	Doubtful	
Cr VI	Doubtful	Doubtful	
Cr	Doubtful	Reasonable	
Mo	Reasonable	Reasonable	
F	Reasonable	-	
Cl	Reasonable	Reasonable	
NO_2	Doubtful	Doubtful	

prEN 12457 -2 FCM

Barium

					Grubbs' test			
					Test for one outlier			
	Ba	Ba	mean value	Std dev.	Test parameter			
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	48	0.48			0.905	2.482	2.29	-
STD	56	0.48						
STD	48	0.48						
STD	51	0.49						
STD	49	0.49						
STD	53	0.50						
STD	55	0.51						
STD	49	0.53						
STD	48	0.55						
STD	50	0.56	0.507	0.0298329	1.777	2.482	2.29	-
C1	49	0.49			1.216	1.764	1.715	-
C1	56	0.50						
C1	56	0.56						
C1	50	0.56						
C1	57	0.57	0.536	0.0378153	0.899	1.764	1.715	-
C2	50	0.49			1.095	1.764	1.715	-
C2	52	0.50						
C2	50	0.50						
C2	50	0.50						
C2	49	0.52	0.502	0.0109545	1.643	1.764	1.715	-
L1	53	0.47			1.339	1.764	1.715	-
L1	52	0.48						
L1	55	0.50						
L1	55	0.50						
L1	56	0.50	0.4878	0.0147885	1.095	1.764	1.715	-
L2	57	0.62			1.095	1.764	1.715	-
L2	56	0.62						
L2	57	0.63						
L2	56	0.63						
L2	57	0.63	0.6226	0.0060249	0.730	1.764	1.715	-
T1	47	0.40			1.627	1.764	1.715	-
T1	40	0.44						
T1	46	0.46						
T1	44	0.47						
T1	47	0.47	0.448	0.0294958	0.746	1.764	1.715	-
T2	62	0.61			1.179	1.764	1.715	-
T2	61	0.62						
T2	69	0.66						
T2	68	0.68						
T2	66	0.69	0.652	0.0356371	1.066	1.764	1.715	-
A1	52	0.48			1.583	1.764	1.715	-

prEN 12457 -2 Barium
FCM

					Grubbs' test			
					Test for one outlier			
	Ba µg/l	Ba mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
A1	50	0.50						
A1	48	0.51						
A1	51	0.51						
A1	51	0.52	0.504	0.0151658	1.055	1.764	1.715	-
A2	47	0.45			1.434	1.764	1.715	-
A2	47	0.46						
A2	46	0.46						
A2	45	0.47						
A2	46	0.47	0.462	0.0083666	0.956	1.764	1.715	-
F1	51	0.49			0.956	1.764	1.715	-
F1	50	0.49						
F1	49	0.50						
F1	50	0.50						
F1	49	0.51	0.498	0.0083666	1.434	1.764	1.715	-
F2	48	0.47			1.095	1.764	1.715	-
F2	48	0.48						
F2	51	0.48						
F2	47	0.50						
F2	50	0.51	0.488	0.0164317	1.339	1.764	1.715	-

prEN 12457 -2 Chromium VI
FCM

	Cr VI µg/l	Ba mg/kg	mean value mg/kg	Std dev.	Grubbs' test: Test for one outlier: Gp	Test parameter 1%	Test parameter 5%	Test results
STD	1265	11.8			1.209	2.482	2.29	-
STD	1260	11.8						
STD	1360	11.8						
STD	1290	12.1						
STD	1280	12.6						
STD	1210	12.7						
STD	1180	12.8						
STD	1175	12.8						
STD	1280	12.9						
STD	1180	13.6	12.48	0.6037844	1.855	2.482	2.29	-
C1	1200	11.8			1.403	1.764	1.715	-
C1	1190	11.9						
C1	1210	12.0						
C1	1200	12.0						
C1	1180	12.1	11.96	0.1140175	1.228	1.764	1.715	-
C2	1210	12.0			0.673	1.764	1.715	-
C2	1280	12.1						
C2	1210	12.1						
C2	1210	12.1						
C2	1200	12.8	12.22	0.3271085	1.773	1.764	1.715	**
L1	1330	12.0			1.565	1.764	1.715	-
L1	1350	12.1						
L1	1340	12.2						
L1	1350	12.2						
L1	1350	12.2	12.096	0.0804984	0.671	1.764	1.715	-
L2	1120	12.2			1.414	1.764	1.715	-
L2	1110	12.3						
L2	1120	12.3						
L2	1130	12.3						
L2	1120	12.4	12.32	0.0777817	1.414	1.764	1.715	-

prEN 12457 -2 **Chromium VI**
FCM

	Cr VI	Ba	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	1160	11.6			1.095	1.764	1.715	-
T1	1170	11.6						
T1	1170	11.7						
T1	1170	11.7						
T1	1160	11.7	11.66	0.0547723	0.730	1.764	1.715	-
T2	1280	12.8			0.447	1.764	1.715	-
T2	1280	12.8						
T2	1290	12.8						
T2	1280	12.8						
T2	1280	12.9	12.82	0.0447214	1.789	1.764	1.715	**
A1	1180	11.8			0.884	1.764	1.715	-
A1	1175	11.8						
A1	1220	12.2						
A1	1200	12.0						
A1	1210	12.1	11.97	0.1923538	0.676	1.764	1.715	-
A2	1210	12.1			0.956	1.764	1.715	-
A2	1220	12.1						
A2	1210	12.2						
A2	1220	12.2						
A2	1230	12.3	12.18	0.083666	1.434	1.764	1.715	-
F1	1200	12.0			0.881	1.764	1.715	-
F1	1200	12.0						
F1	1240	12.1						
F1	1210	12.3						
F1	1230	12.4	12.16	0.181659	1.321	1.764	1.715	-
F2	1200	12.0			0.703	1.764	1.715	-
F2	1220	12.0						
F2	1265	12.1						
F2	1210	12.2						
F2	1200	12.7	12.19	0.2701851	1.703	1.764	1.715	-

prEN 12457 -2 FCM

Chromium

					Grubbs' test			
					Test for one outlier			
	Cr µg/l	Cr mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	867	8.25			1.134	2.482	2.29	-
STD	967	8.25						
STD	856	8.33						
STD	918	8.56						
STD	825	8.67						
STD	882	8.82						
STD	905	8.87						
STD	825	9.05						
STD	887	9.18						
STD	833	9.67	8.765	0.4542699	1.992	2.482	2.29	-
C1	830	8.30			1.298	1.764	1.715	-
C1	910	8.56						
C1	945	9.10						
C1	856	9.36						
C1	936	9.45	8.954	0.5037658	0.985	1.764	1.715	-
C2	849	8.39			1.216	1.764	1.715	-
C2	853	8.49						
C2	873	8.53						
C2	873	8.73						
C2	839	8.73	8.574	0.1512614	1.031	1.764	1.715	-
L1	956	8.58			0.990	1.764	1.715	-
L1	953	8.60						
L1	985	8.79						
L1	977	8.87						
L1	1011	9.10	8.7876	0.2127506	1.464	1.764	1.715	-
L2	834	9.17			0.791	1.764	1.715	-
L2	847	9.19						
L2	836	9.20						
L2	835	9.32						
L2	856	9.42	9.2576	0.1056802	1.499	1.764	1.715	-

prEN 12457 -2 FCM

Chromium

					Grubbs' test			
					Test for one outlier			
	Cr µg/l	Cr mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
T1	939	8.46			1.408	1.764	1.715	-
T1	846	8.82						
T1	895	8.95						
T1	921	9.21						
T1	882	9.39	8.966	0.3594857	1.179	1.764	1.715	-
T2	910	8.75			1.551	1.764	1.715	-
T2	875	9.10						
T2	941	9.41						
T2	952	9.41						
T2	941	9.52	9.238	0.314595	0.896	1.764	1.715	-
A1	858	8.31			0.860	1.764	1.715	-
A1	831	8.31						
A1	831	8.37						
A1	837	8.58						
A1	859	8.59	8.432	0.141845	1.114	1.764	1.715	-
A2	881	8.54			1.095	1.764	1.715	-
A2	866	8.60						
A2	854	8.64						
A2	860	8.66						
A2	864	8.81	8.65	0.1004988	1.592	1.764	1.715	-
F1	899	8.73			1.308	1.764	1.715	-
F1	891	8.82						
F1	873	8.84						
F1	884	8.91						
F1	882	8.99	8.858	0.0978264	1.349	1.764	1.715	-
F2	885	8.53			1.334	1.764	1.715	-
F2	864	8.64						
F2	892	8.85						
F2	853	8.92						
F2	897	8.97	8.782	0.188865	0.995	1.764	1.715	-

prEN 12457 -2 FCM

Molybdenum

					Grubbs' test			
					Test for one outlier			
	Mo	Mo	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	360	3.60			1.268	2.482	2.29	-
STD	408	3.67						
STD	370	3.67						
STD	387	3.70						
STD	367	3.72						
STD	397	3.78						
STD	396	3.87						
STD	367	3.96						
STD	372	3.97						
STD	378	4.08	3.802	0.1592901	1.745	2.482	2.29	-
C1	357	3.57			1.187	1.764	1.715	-
C1	395	3.66						
C1	414	3.95						
C1	366	4.14						
C1	420	4.20	3.904	0.2813006	1.052	1.764	1.715	-
C2	379	3.64			1.396	1.764	1.715	-
C2	380	3.69						
C2	369	3.76						
C2	376	3.79						
C2	364	3.80	3.736	0.068775	0.931	1.764	1.715	-
L1	428	3.65			1.734	1.764	1.715	*
L1	406	3.85						
L1	429	3.86						
L1	433	3.90						
L1	435	3.92	3.8358	0.1048413	0.755	1.764	1.715	-
L2	372	4.00			1.404	1.764	1.715	-
L2	378	4.06						
L2	375	4.09						
L2	364	4.13						
L2	369	4.16	4.0876	0.0595424	1.182	1.764	1.715	-

prEN 12457 -2 FCM

Molybdenum

					Grubbs' test			
					Test for one outlier			
	Mo	Mo	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	409	3.72			1.338	1.764	1.715	-
T1	372	3.82						
T1	403	4.03						
T1	412	4.09						
T1	382	4.12	3.956	0.176437	0.930	1.764	1.715	-
T2	384	3.68			1.348	1.764	1.715	-
T2	368	3.84						
T2	425	4.04						
T2	404	4.09						
T2	409	4.25	3.98	0.2225983	1.213	1.764	1.715	-
A1	368	3.55			1.368	1.764	1.715	-
A1	355	3.60						
A1	361	3.61						
A1	365	3.65						
A1	360	3.68	3.618	0.0496991	1.248	1.764	1.715	-
A2	369	3.58			1.338	1.764	1.715	-
A2	363	3.62						
A2	358	3.63						
A2	365	3.65						
A2	362	3.69	3.634	0.0403733	1.387	1.764	1.715	-
F1	385	3.73			1.143	1.764	1.715	-
F1	373	3.76						
F1	380	3.77						
F1	377	3.80						
F1	376	3.85	3.782	0.0454973	1.495	1.764	1.715	-
F2	379	3.55			1.359	1.764	1.715	-
F2	364	3.64						
F2	388	3.79						
F2	355	3.84						
F2	384	3.88	3.74	0.1398213	1.001	1.764	1.715	-

prEN 12457 -2 FCM

Flouride

					Grubbs' test			
					Test for one outlier			
	F	F	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	1040	9.50			1.600	2.482	2.29	-
STD	1020	9.60						
STD	1020	9.70						
STD	1000	9.90						
STD	1010	10.00						
STD	950	10.00						
STD	990	10.10						
STD	970	10.20						
STD	1000	10.20						
STD	960	10.40	9.96	0.2875181	1.530	2.482	2.29	-
C1	1030	10.20			1.789	1.764	1.715	**
C1	1030	10.30						
C1	1030	10.30						
C1	1030	10.30						
C1	1020	10.30	10.28	0.0447214	0.447	1.764	1.715	-
C2	1040	10.40			1.055	1.764	1.715	-
C2	1060	10.40						
C2	1040	10.60						
C2	1070	10.70						
C2	1070	10.70	10.56	0.1516575	0.923	1.764	1.715	-
L1	1060	9.36			1.434	1.764	1.715	-
L1	1060	9.45						
L1	1050	9.45						
L1	1040	9.54						
L1	1050	9.54	9.468	0.0752994	0.956	1.764	1.715	-
L2	1060	11.44			1.434	1.764	1.715	-
L2	1060	11.55						
L2	1050	11.55						
L2	1040	11.66						
L2	1050	11.66	11.572	0.0920326	0.956	1.764	1.715	-

prEN 12457 -2 FCM

Flouride

					Grubbs' test			
					Test for one outlier			
	F	F	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
T1	830	8.20			0.730	1.764	1.715	-
T1	820	8.20						
T1	820	8.20						
T1	820	8.30						
T1	830	8.30	8.24	0.0547723	1.095	1.764	1.715	-
T2	1290	12.90			0.920	1.764	1.715	-
T2	1320	12.90						
T2	1310	13.00						
T2	1300	13.10						
T2	1290	13.20	13.02	0.130384	1.381	1.764	1.715	-
A1	1080	10.40			1.554	1.764	1.715	-
A1	1060	10.60						
A1	1040	10.70						
A1	1080	10.80						
A1	1070	10.80	10.66	0.167332	0.837	1.764	1.715	-
A2	930	8.70			1.071	1.764	1.715	-
A2	920	8.70						
A2	940	9.20						
A2	870	9.30						
A2	870	9.40	9.06	0.3361547	1.011	1.764	1.715	-
F1	1040	10.30			1.789	1.764	1.715	**
F1	1040	10.40						
F1	1040	10.40						
F1	1040	10.40						
F1	1030	10.40	10.38	0.0447214	0.447	1.764	1.715	-
F2	1040	10.40			1.095	1.764	1.715	-
F2	1050	10.40						
F2	1040	10.50						
F2	1050	10.50						
F2	1050	10.50	10.46	0.0547723	0.730	1.764	1.715	-

prEN 12457 -2
FCM

	Cl	Cl	mean value	Std dev.	Grubbs' test: Test for one outlier		
						Test parameter	
	µg/l	mg/kg	mg/kg		Gp	1%	5%
STD	284000	2800			1.648	2.482	2.29
STD	293000	2830					
STD	292000	2840					
STD	290000	2840					
STD	294000	2890					
STD	283000	2900					
STD	280000	2910					
STD	289000	2920					
STD	291000	2930					
STD	284000	2940	2880	48.534066	1.236	2.482	2.29
C1	286000	2840			1.000	1.764	1.715
C1	286000	2840					
C1	284000	2850					
C1	284000	2860					
C1	285000	2860	2850	10	1.000	1.764	1.715
C2	285000	2810			0.730	1.764	1.715
C2	281000	2810					
C2	282000	2820					
C2	282000	2820					
C2	281000	2850	2822	16.431677	1.704	1.764	1.715
L1	317000	2853			1.554	1.764	1.715
L1	321000	2871					
L1	321000	2880					
L1	320000	2889					
L1	319000	2889	2876.4	15.05988	0.837	1.764	1.715
L2	259000	2838			0.682	1.764	1.715
L2	258000	2849					
L2	266000	2860					
L2	284000	2926					
L2	260000	3124	2919.4	119.38928	1.714	1.764	1.715

prEN 12457 -2
FCM

	Cl	Cl	mean value	Std dev.	Grubbs' test: Test for one outlier		
						Test parameter	
	µg/l	mg/kg	mg/kg		Gp	1%	5%
T1	286000	2780			1.037	1.764	1.715
T1	282000	2810					
T1	278000	2820					
T1	293000	2860					
T1	281000	2930	2840	57.879185	1.555	1.764	1.715
T2	289000	2880			0.962	1.764	1.715
T2	288000	2890					
T2	294000	2890					
T2	289000	2930					
T2	293000	2940	2906	27.018512	1.258	1.764	1.715
A1	295000	2920			1.231	1.764	1.715
A1	293000	2930					
A1	292000	2950					
A1	295000	2950					
A1	297000	2970	2944	19.493589	1.334	1.764	1.715
A2	294000	2930			0.837	1.764	1.715
A2	293000	2930					
A2	295000	2940					
A2	297000	2950					
A2	293000	2970	2944	16.733201	1.554	1.764	1.715
F1	290000	2860			1.371	1.764	1.715
F1	289000	2890					
F1	286000	2900					
F1	293000	2930					
F1	294000	2940	2904	32.093613	1.122	1.764	1.715
F2	292000	2910			0.748	1.764	1.715
F2	292000	2920					
F2	291000	2920					
F2	293000	2930					
F2	299000	2990	2934	32.093613	1.745	1.764	1.715

Chloride

Test results
-
-
-
-
-
-
-
-
-

Chloride

Test results
-   -
-   -
-   -
-   -
-   -
-   *

prEN 12457 -2 FCM

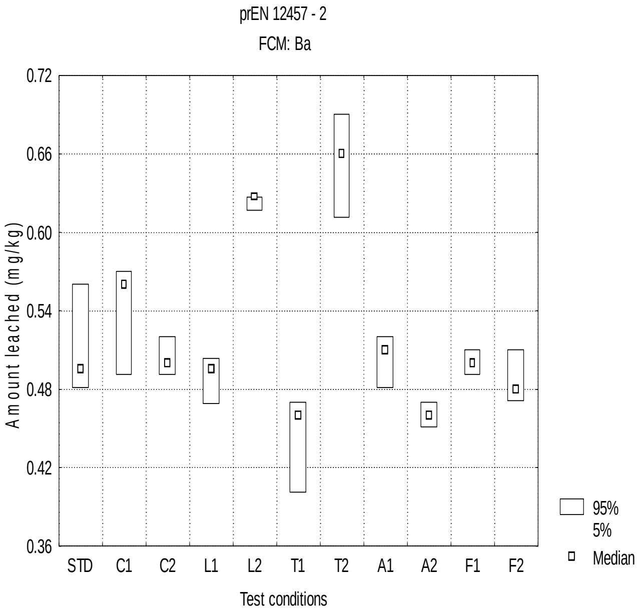
Nitrite

					Grubbs' test			
					Test for one outlier			
	NO2 mg/l	NO2 mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	49	0.35			1.399	2.482	2.29	-
STD	44	0.35						
STD	44	0.36						
STD	43	0.43						
STD	46	0.44						
STD	36	0.44						
STD	44	0.44						
STD	35	0.46						
STD	49	0.49						
STD	35	0.49	0.425	0.0535931	1.213	2.482	2.29	-
C1	28	0.28			1.403	1.764	1.715	-
C1	30	0.29						
C1	29	0.30						
C1	30	0.30						
C1	31	0.31	0.296	0.0114018	1.228	1.764	1.715	-
C2	35	0.31			1.134	1.764	1.715	-
C2	31	0.33						
C2	33	0.33						
C2	38	0.35						
C2	33	0.38	0.34	0.0264575	1.512	1.764	1.715	-
L1	40	0.34			1.643	1.764	1.715	-
L1	38	0.36						
L1	40	0.36						
L1	40	0.36						
L1	41	0.37	0.3582	0.009859	1.095	1.764	1.715	-
L2	33	0.33			1.604	1.764	1.715	-
L2	34	0.36						
L2	35	0.36						
L2	30	0.37						
L2	33	0.39	0.363	0.0205791	1.069	1.764	1.715	-

T1	44	0.41			1.604	1.764	1.715	-
T1	41	0.44						
T1	44	0.44						
T1	45	0.45						
T1	46	0.46	0.44	0.0187083	1.069	1.764	1.715	-
T2	61	0.50			1.081	1.764	1.715	-
T2	50	0.51						
T2	51	0.56						
T2	56	0.56						
T2	56	0.61	0.548	0.0443847	1.397	1.764	1.715	-
A1	33	0.29			1.116	1.764	1.715	-
A1	38	0.31						
A1	40	0.33						
A1	31	0.38						
A1	29	0.40	0.342	0.0465833	1.245	1.764	1.715	-
A2	29	0.27			1.381	1.764	1.715	-
A2	28	0.28						
A2	30	0.29						
A2	27	0.30						
A2	30	0.30	0.288	0.0130384	0.920	1.764	1.715	-
F1	35	0.29			1.333	1.764	1.715	-
F1	35	0.35						
F1	39	0.35						
F1	44	0.39						
F1	29	0.44	0.364	0.0554977	1.369	1.764	1.715	-
F2	29	0.25			1.554	1.764	1.715	-
F2	28	0.27						
F2	29	0.28						
F2	25	0.29						
F2	27	0.29	0.276	0.0167332	0.837	1.764	1.715	-

prEN 12457 - 2 FCM

Barium



Multiple regression analysis of ruggedness data
All data are included

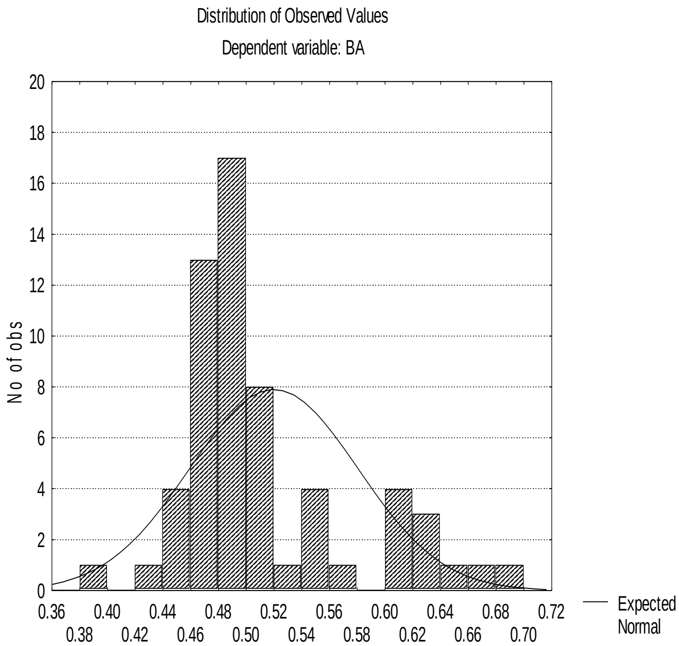
Regression Summary for Dependent Variable: BA
R= .94021539 R²= .88400498 Adjusted R²= .86033253
F(10,49)=37.343 p<.00000 Std.Error of estimate: .02319

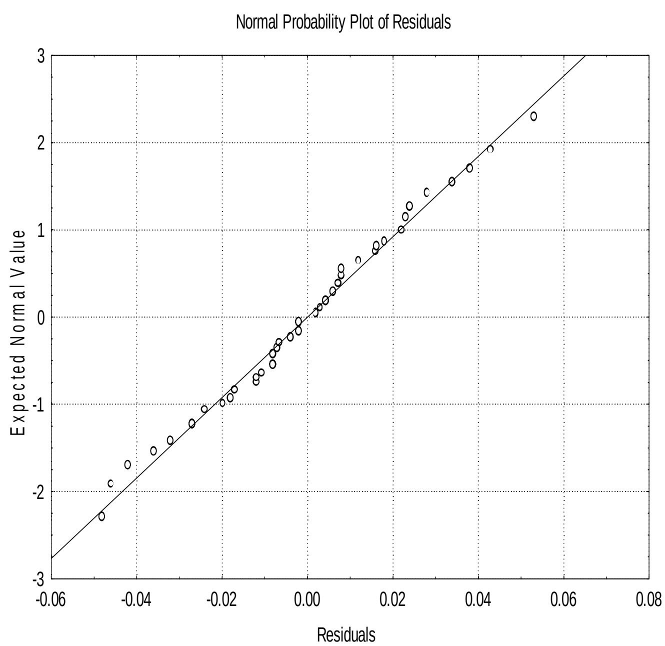
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			0.5070	0.0073	69.14	0.00
C1	0.130	0.057	0.0290	0.0127	2.28	0.03
C2	-0.022	0.057	-0.0050	0.0127	-0.39	0.70
L1	-0.086	0.057	-0.0192	0.0127	-1.51	0.14
L2	0.519	0.057	0.1156	0.0127	9.10	0.00
T1	-0.265	0.057	-0.0590	0.0127	-4.65	0.00
T2	0.651	0.057	0.1450	0.0127	11.42	0.00
A1	-0.013	0.057	-0.0030	0.0127	-0.24	0.81
A2	-0.202	0.057	-0.0450	0.0127	-3.54	0.00
F1	-0.040	0.057	-0.0090	0.0127	-0.71	0.48
F2	-0.085	0.057	-0.0190	0.0127	-1.50	0.14

Analysis of Variance; DV: BA (part 2 data - fcm.sta)

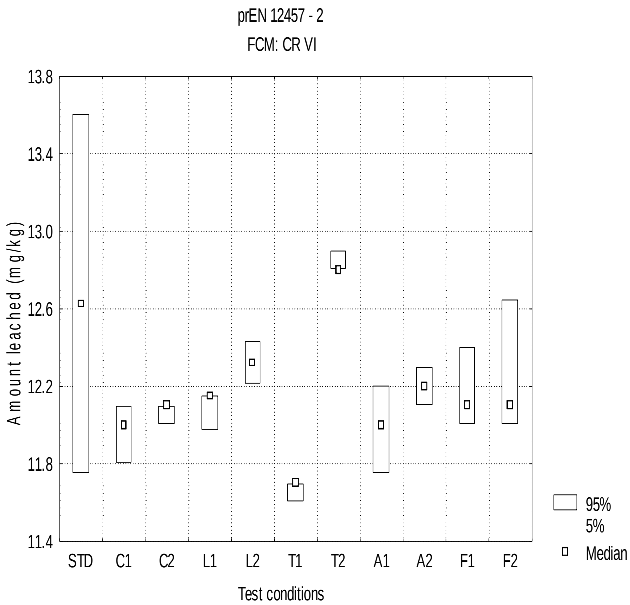
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	0.20081493	10	0.0200815	37.3432	1.65E-19
Residual	0.02635	49	0.0005378		
Total	0.22716493				

prEN 12457 - 2 **Barium**
FCM





prEN 12457 - 2 FCM   Chromium VI



Multiple regression analysis of ruggedness data
All data are included

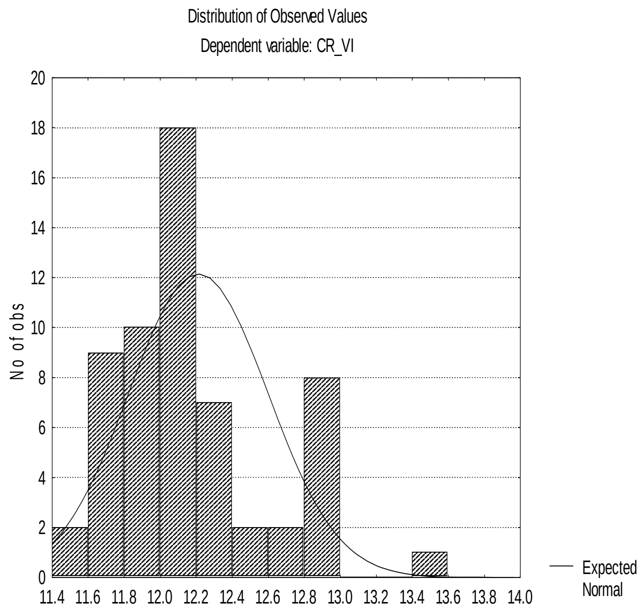
Regression Summary for Dependent Variable: CR_VI
R= .74208205 R²= .55068576 Adjusted R²= .45707863
F(10,48)=5.8829 p<.00001 Std.Error of estimate: .28906

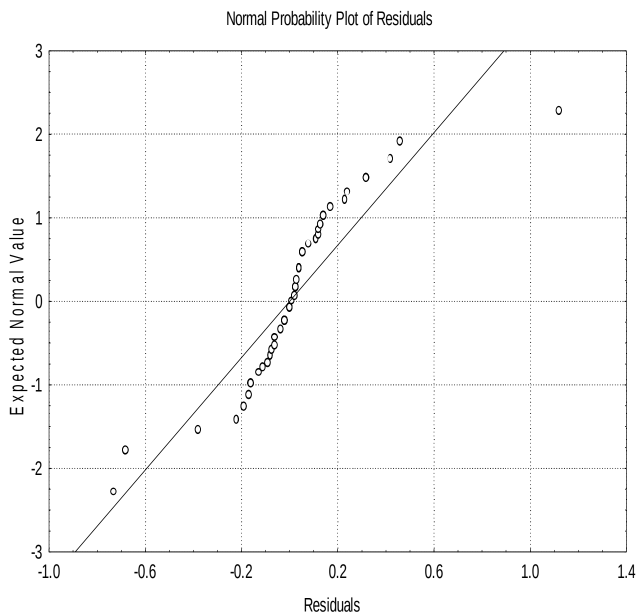
	BETA	St. Err. of BETA	B	St. Err. of B	t(48)	p-level
Intercpt			12.480	0.091	136.530	0.00
C1	-0.372	0.113	-0.520	0.158	-3.284	0.00
C2	-0.262	0.111	-0.405	0.171	-2.368	0.02
L1	-0.275	0.113	-0.384	0.158	-2.425	0.02
L2	-0.115	0.113	-0.160	0.158	-1.011	0.32
T1	-0.587	0.113	-0.820	0.158	-5.179	0.00
T2	0.243	0.113	0.340	0.158	2.147	0.04
A1	-0.365	0.113	-0.510	0.158	-3.221	0.00
A2	-0.215	0.113	-0.300	0.158	-1.895	0.06
F1	-0.229	0.113	-0.320	0.158	-2.021	0.05
F2	-0.208	0.113	-0.290	0.158	-1.832	0.07

Analysis of Variance; DV: CR_VI (part 2 data - fcm.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	4.9154715	10	0.49155	5.8829	9.9E-06
Residual	4.01062	48	0.08355		
Total	8.9260915				

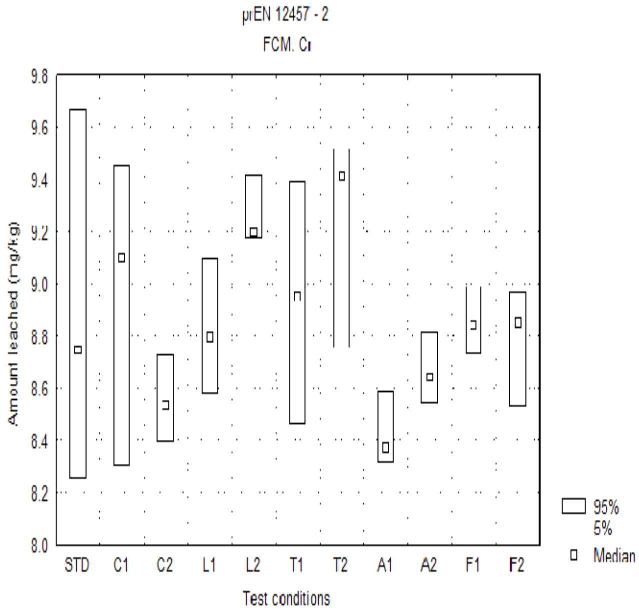
prEN 12457 - 2 FCM   Chromium VI


Distribution of Observed Values
Dependent variable: CR_VI
No of obs
20
18
16
14
12
10
8
6
4
2
0
11.4 11.6 11.8 12.0 12.2 12.4 12.6 12.8 13.0 13.2 13.4 13.6 13.8 14.0
Expected Normal


Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-1.0 -0.6 -0.2 0.2 0.6 1.0 1.4
Residuals

prEN 12457 - 2 FCM

Chromium



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: CR
R= .65232013 R^2= .42552155 Adjusted R^2= .30828105
F(10,49)=3.6295 p<.00114 Std.Error of estimate: .29980

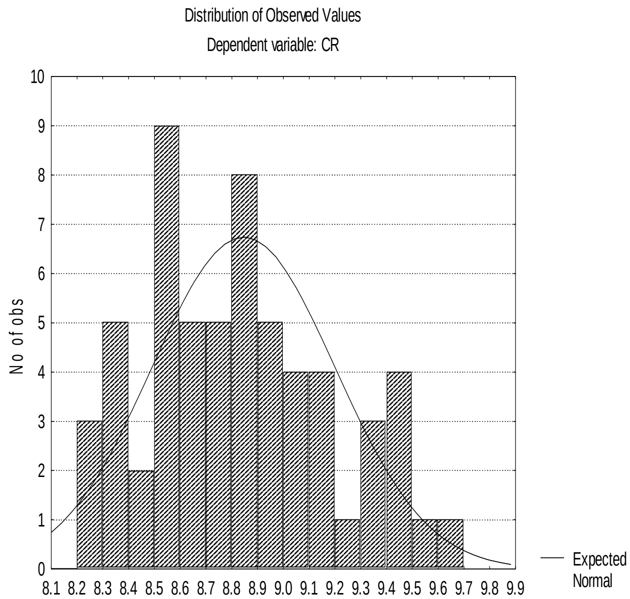
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			8.765	0.095	92.451	0.00
C1	0.146	0.127	0.189	0.164	1.151	0.26
C2	-0.148	0.127	-0.191	0.164	-1.163	0.25
L1	0.017	0.127	0.023	0.164	0.138	0.89
L2	0.381	0.127	0.493	0.164	3.000	0.00
T1	0.155	0.127	0.201	0.164	1.224	0.23
T2	0.366	0.127	0.473	0.164	2.880	0.01
A1	-0.257	0.127	-0.333	0.164	-2.028	0.05
A2	-0.089	0.127	-0.115	0.164	-0.700	0.49
F1	0.072	0.127	0.093	0.164	0.566	0.57
F2	0.013	0.127	0.017	0.164	0.104	0.92

Analysis of Variance; DV: CR (part 2 data - fcm.sta)

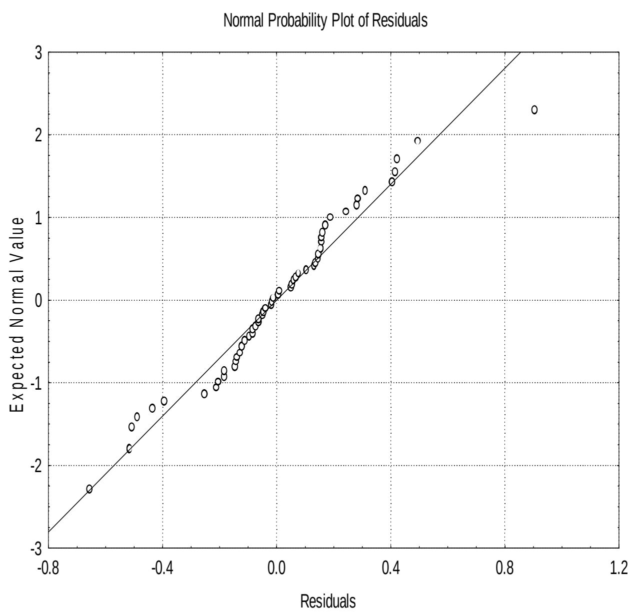
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	3.26227	10	0.3262	3.6295	0.0011
Residual	4.40425	49	0.0899		
Total	7.66653				

prEN 12457 - 2 FCM

Chromium



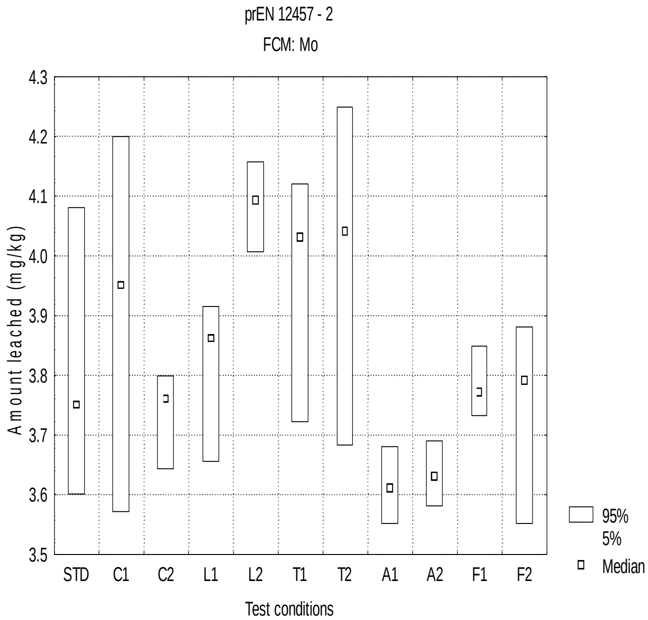
Distribution of Observed Values
Dependent variable: CR
No of obs
10
9
8
7
6
5
4
3
2
1
0
8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9
Expected Normal



Normal Probability Plot of Residuals
Expected Normal Value
3
2
1
0
-1
-2
-3
-0.8
-0.4
0.0
0.4
0.8
1.2
Residuals

prEN 12457 - 2 FCM

Molybdenum



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: MO
R= .71071637 R^2= .50511777 Adjusted R^2= .40412139
F(10,49)=5.0013 p<.00006 Std.Error of estimate: .14621

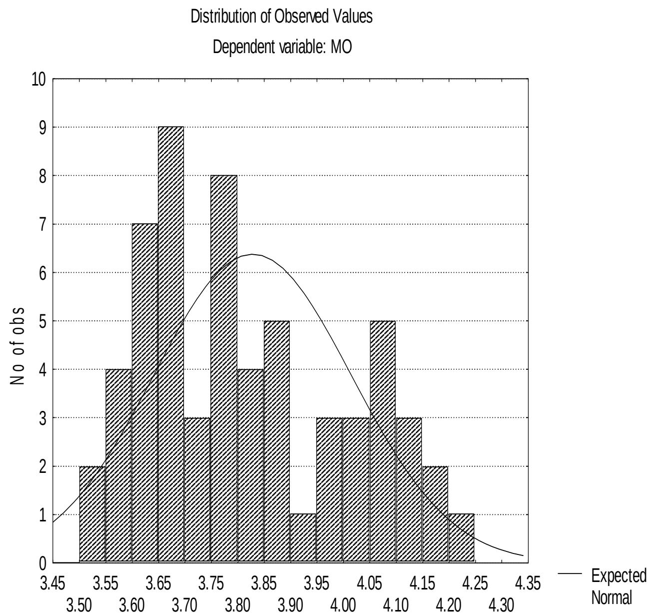
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			3.802	0.046	82.229	0.00
C1	0.150	0.118	0.102	0.080	1.274	0.21
C2	-0.097	0.118	-0.066	0.080	-0.824	0.41
L1	0.050	0.118	0.034	0.080	0.422	0.67
L2	0.420	0.118	0.286	0.080	3.566	0.00
T1	0.227	0.118	0.154	0.080	1.923	0.06
T2	0.262	0.118	0.178	0.080	2.223	0.03
A1	-0.271	0.118	-0.184	0.080	-2.298	0.03
A2	-0.247	0.118	-0.168	0.080	-2.098	0.04
F1	-0.029	0.118	-0.020	0.080	-0.250	0.80
F2	-0.091	0.118	-0.062	0.080	-0.774	0.44

Analysis of Variance; DV: MO (part 2 data - fcm.sta)

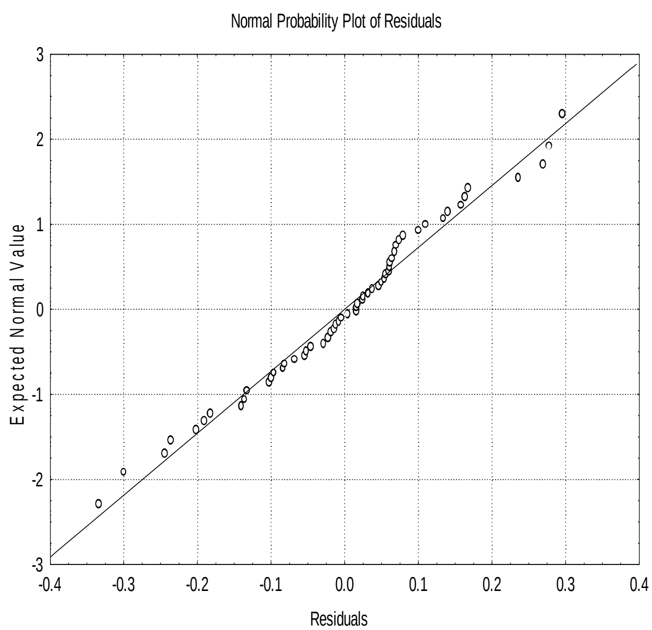
	Sums of Squares	df	Mean Squares	F	p-level
Regress	1.06921418	10	0.10692	5.001346	5.5E-05
Residua	1.047548	49	0.02138		
Total	2.11676218				

prEN 12457 - 2 FCM

Molybdenum



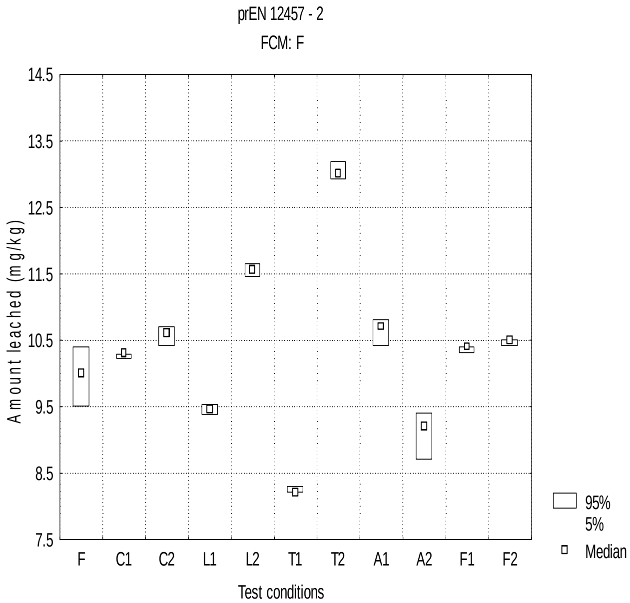
Distribution of Observed Values
Dependent variable: MO
No of obs
Expected Normal



Normal Probability Plot of Residuals
Expected Normal Value
Residuals

prEN 12457 - 2
FCM

Flouride



Multiple regression analysis of ruggedness data
All data are included

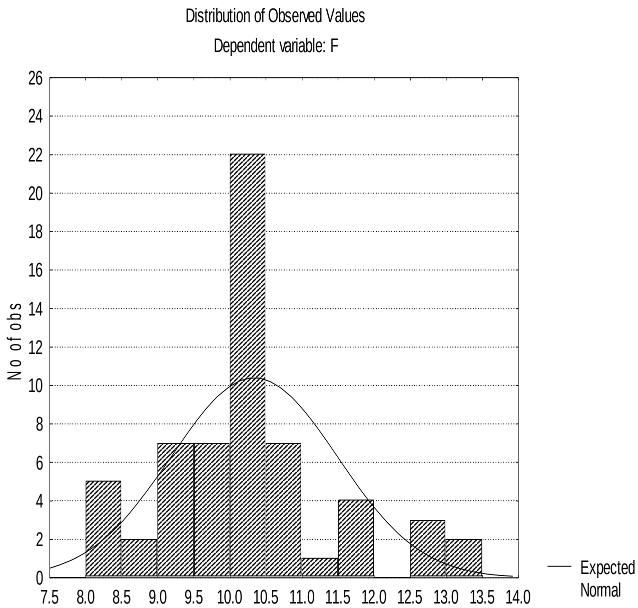
Regression Summary for Dependent Variable: F
R= .99033320 R^2= .98075985 Adjusted R^2= .97683328
F(10,49)=249.78 p<.00000 Std.Error of estimate: .17869

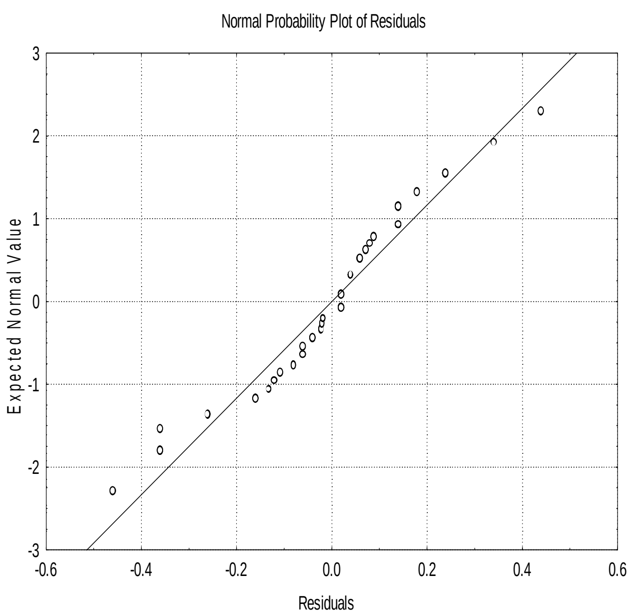
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			9.960	0.057	176.263	0.00
C1	0.076	0.023	0.320	0.098	3.270	0.00
C2	0.142	0.023	0.600	0.098	6.130	0.00
L1	-0.117	0.023	-0.492	0.098	-5.027	0.00
L2	0.383	0.023	1.612	0.098	16.470	0.00
T1	-0.408	0.023	-1.720	0.098	-17.574	0.00
T2	0.726	0.023	3.060	0.098	31.265	0.00
A1	0.166	0.023	0.700	0.098	7.152	0.00
A2	-0.214	0.023	-0.900	0.098	-9.196	0.00
F1	0.100	0.023	0.420	0.098	4.291	0.00
F2	0.119	0.023	0.500	0.098	5.109	0.00

Analysis of Variance; DV: F (part 2 data - fcm.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	**79.7528733**	**10**	**7.97529**	**249.7757**	1.9E-38
Residua	1.56456	49	0.03193		
Total	81.3174333				

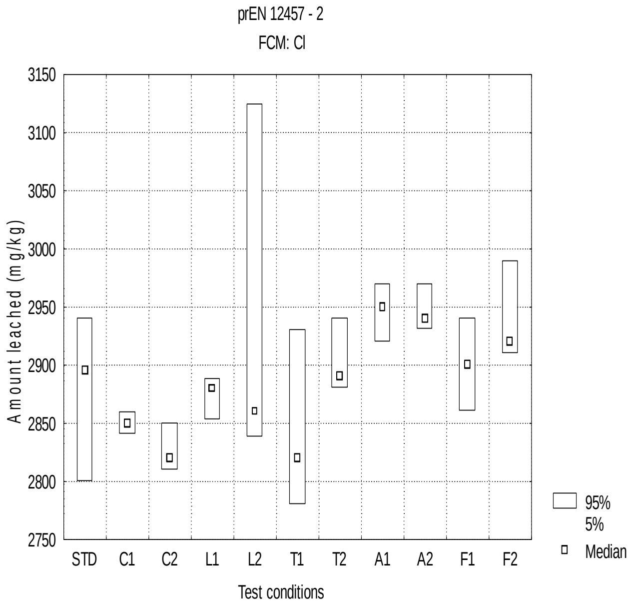
prEN 12457 - 2 **Flouride**
FCM





prEN 12457 - 2
FCM

Chloride



Multiple regression analysis of ruggedness data
All data are included

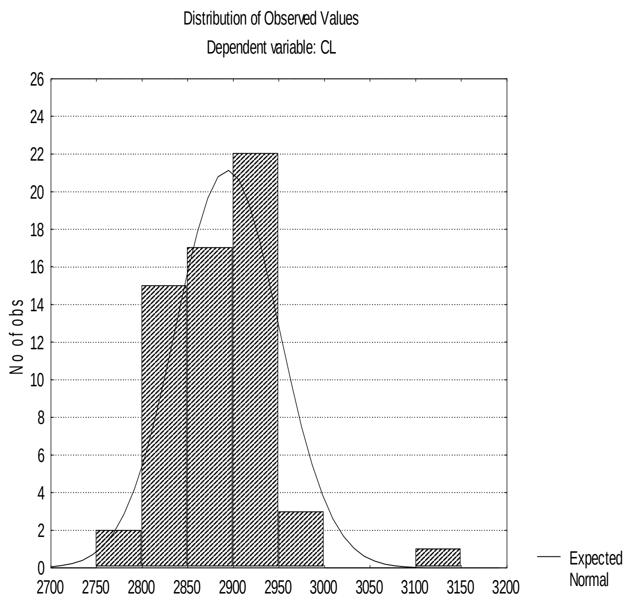
Regression Summary for Dependent Variable: CL
R= .67616844 R²= .45720376 Adjusted R²= .34642902
F(10,49)=4.1273 p<.00037 Std.Error of estimate: 46.905

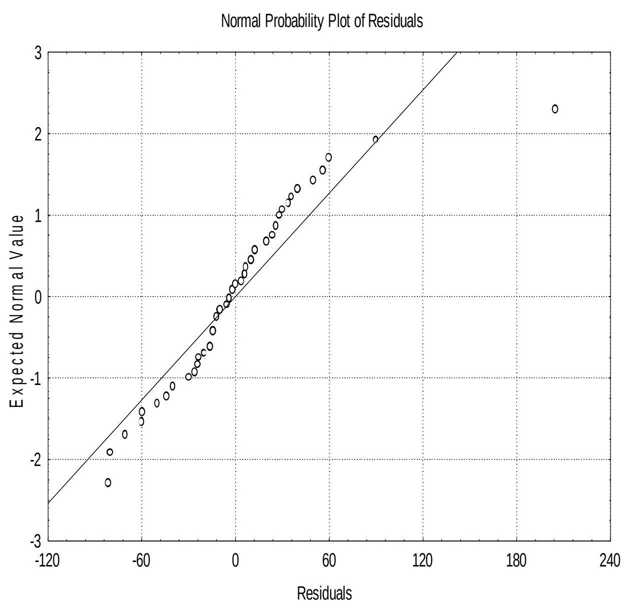
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			#######	14.833	194.167	0.00
C1	-0.144	0.123	-30.000	25.691	-1.168	0.25
C2	-0.279	0.123	-58.000	25.691	-2.258	0.03
L1	-0.017	0.123	-3.600	25.691	-0.140	0.89
L2	0.189	0.123	39.400	25.691	1.534	0.13
T1	-0.192	0.123	-40.000	25.691	-1.557	0.13
T2	0.125	0.123	26.000	25.691	1.012	0.32
A1	0.307	0.123	64.000	25.691	2.491	0.02
A2	0.307	0.123	64.000	25.691	2.491	0.02
F1	0.115	0.123	24.000	25.691	0.934	0.35
F2	0.259	0.123	54.000	25.691	2.102	0.04

Analysis of Variance; DV: CL (part 2 data - fcm.sta)

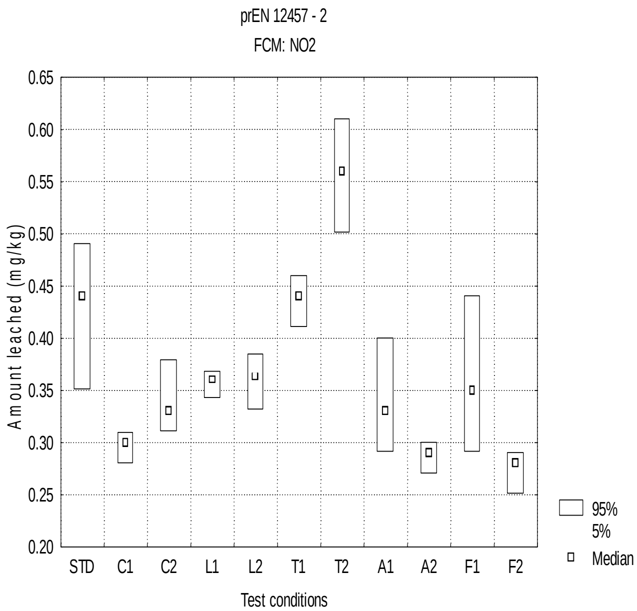
	Sums of Squares	df	Mean Squares	F	p-level
Regress	90803.25	10	9080.33	4.127328	0.00037
Residual	107802.4	49	2200.05		
Total	198605.65				

prEN 12457 - 2 **Chloride**
FCM





prEN 12457 - 2 **Nitrit**
FCM



Multiple regression analysis of ruggedness data
All data are included

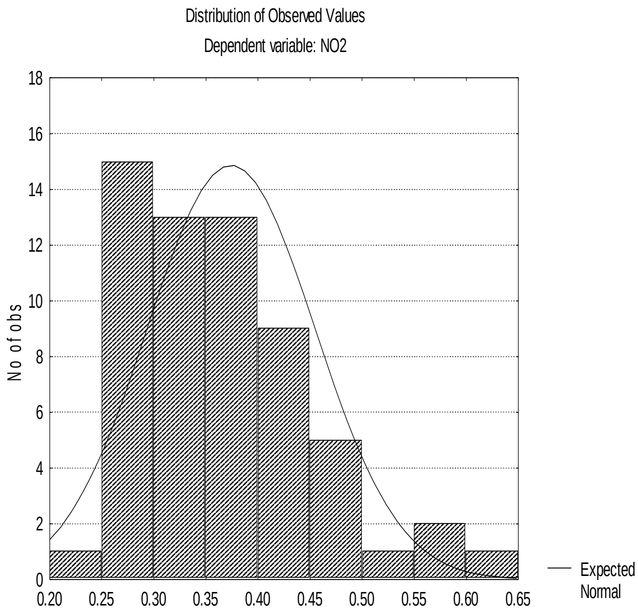
Regression Summary for Dependent Variable: NO2
R= .91542706 R²= .83800671 Adjusted R²= .80494685
F(10,49)=25.348 p<.00000 Std.Error of estimate: .03595

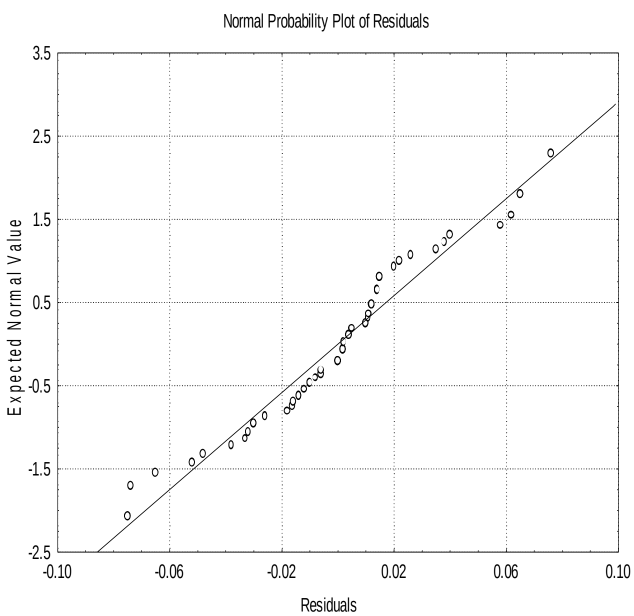
	BETA	St. Err. of BETA	B	St. Err. of B	t(49)	p-level
Intercpt			0.425	0.011	37.38	0.00
C1	-0.442	0.067	-0.129	0.020	-6.55	0.00
C2	-0.291	0.067	-0.085	0.020	-4.32	0.00
L1	-0.229	0.067	-0.067	0.020	-3.39	0.00
L2	-0.212	0.067	-0.062	0.020	-3.15	0.00
T1	0.051	0.067	0.015	0.020	0.76	0.45
T2	0.421	0.067	0.123	0.020	6.25	0.00
A1	-0.284	0.067	-0.083	0.020	-4.22	0.00
A2	-0.469	0.067	-0.137	0.020	-6.96	0.00
F1	-0.209	0.067	-0.061	0.020	-3.10	0.00
F2	-0.510	0.067	-0.149	0.020	-7.57	0.00

Analysis of Variance; DV: NO2 (part 2 data - fcm.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress	0.3276266	10	0.03276	25.34817	4.8E-16
Residua	0.0633328	49	0.00129		
Total	0.3909594				

prEN 12457 - 2 **Nitrit**
FCM





A P P E N D I X   6

prEN 12457 part 2: COS

Part 2 on COS: Comments to the statistical analysis of the data

The judgement of the fulfilment of the assumption of normality during the processing of the data is evaluated visually using a histogram and a normal probability plot of the residuals. Four categories are used

- Assumption fulfilled
- Assumption reasonable
- Assumption doubtful
- Assumption not fulfilled

The evaluation of the data is shown in Table A.6.1

Table A.6.1 Evaluation and comments to the statistical analysis of the ruggedness results

Parameter	Assumption of normality on entire population	Assumption of normality on reduced population	Comments
As	Reasonable	Doubtful	
Cd	Reasonable	Doubtful	The second run of the regression analysis on a reduced population showed that another test condition became significantly different from the standard conditions due to a reduction in the common variance. This aspect is not included in the estimation of the modified standard condition
Co	Doubtful	Doubtful	After the second rerun of regression analysis all test conditions turned out to be significantly different from the standard conditions. However test conditions identified as different from standard conditions in the second run have not been sorted out of the modified standard condition.
Ni	Reasonable	Doubtful	
Pb	Reasonable	Reasonable	
Sb	Reasonable	Doubtful	
Zn	Doubtful	Doubtful	

prEN 12457 -2 Arsen
COS

					Grubbs' test			
					Test for one outlier			
	As mg/l	As mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.67	5.80			1.307	1.764	1.715	-
STD	0.58	6.10						
STD	0.69	6.40						
STD	0.64	6.70						
STD	0.61	6.90	6.38	0.4438468	1.172	2.482	2.29	-
C1	0.42	3.80			0.757	1.764	1.715	-
C1	0.38	4.20						
C1	0.44	4.40						
C1	0.55	5.50						
C1	0.88	8.80	5.34	2.0342075	1.701	1.764	1.715	-
C2	0.43	3.20			1.553	1.764	1.715	-
C2	0.53	4.30						
C2	0.32	4.50						
C2	0.45	4.60						
C2	0.46	5.30	4.38	0.7596052	1.211	1.764	1.715	-
L1	0.36	3.24			1.157	1.764	1.715	-
L1	0.38	3.42						
L1	0.40	3.60						
L1	0.46	3.87						
L1	0.43	4.14	3.65	0.3577429	1.359	1.764	1.715	-
L2	0.34	2.53			1.360	1.764	1.715	-
L2	0.33	2.86						
L2	0.23	3.63						
L2	0.26	3.74						
L2	0.34	3.74	3.30	0.5662597	0.777	1.764	1.715	-
T1	0.20	2.00			0.998	1.764	1.715	-
T1	0.23	2.30						
T1	0.27	2.30						
T1	0.34	2.70						
T1	0.23	3.40	2.54	0.5412947	1.589	1.764	1.715	-
T2	1.20	6.90			0.976	1.764	1.715	-
T2	0.69	7.10						
T2	0.89	8.90						
T2	0.99	9.90						
T2	0.71	12.00	8.96	2.1113976	1.440	1.764	1.715	-
S1	0.47	4.60			1.228	1.764	1.715	-
S1	0.47	4.70						
S1	0.46	4.70						
S1	0.48	4.80						
S1	0.49	4.90	4.74	0.1140175	1.403	1.764	1.715	-

prEN 12457 -2 **Cadmium**

COS

	Cd	Cd	mean value	Std dev.	Grubbs' test: Test for one outlier			
						Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	1.24	12.4			1.046	1.764	1.715	-
STD	1.32	12.4						
STD	1.35	13.1						
STD	1.24	13.2						
STD	1.31	13.5	12.9	0.4969909	1.167	2.482	2.29	-
C1	1.17	11.2			0.659	1.764	1.715	-
C1	1.12	11.6						
C1	1.16	11.7						
C1	1.19	11.9						
C1	1.57	15.7	12.4	1.8512158	1.772	1.764	1.715	**
C2	1.15	7.6			1.457	1.764	1.715	-
C2	0.93	9.3						
C2	0.76	11.5						
C2	1.21	12.1						
C2	1.22	12.2	10.5	2.0181675	0.823	1.764	1.715	-
L1	1.22	8.4			1.702	1.764	1.715	-
L1	0.93	11.0						
L1	1.33	11.2						
L1	1.33	12.0						
L1	1.24	12.0	10.9	1.4802196	0.730	1.764	1.715	-
L2	0.85	4.3			1.529	1.764	1.715	-
L2	1.04	8.0						
L2	0.75	8.3						
L2	0.73	9.4						
L2	0.39	11.4	8.3	2.6035399	1.217	1.764	1.715	-
T1	0.86	8.6			1.429	1.764	1.715	-
T1	0.98	9.8						
T1	1.00	10.0						
T1	1.06	10.6						
T1	1.14	11.4	10.1	1.0353743	1.275	1.764	1.715	-
T2	1.45	10.9			1.328	1.764	1.715	-
T2	1.29	12.1						
T2	1.21	12.8						
T2	1.28	12.9						
T2	1.09	14.5	12.6	1.310725	1.419	1.764	1.715	-
S1	0.89	6.0			1.143	1.764	1.715	-
S1	0.60	6.2						
S1	0.62	8.1						
S1	0.81	8.6						
S1	0.86	8.9	7.6	1.3649176	0.982	1.764	1.715	-

prEN 12457 -2 Cobalt

COS

					Grubbs' test			
					Test for one outlier			
	Co µg/l	Co mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.28	2.80			1.228	1.764	1.715	-
STD	0.30	2.90						
STD	0.31	2.90						
STD	0.29	3.00						
STD	0.29	3.10	2.94	0.1140175	1.403	2.482	2.29	-
C1	0.25	2.40			0.508	1.764	1.715	-
C1	0.24	2.40						
C1	0.24	2.40						
C1	0.24	2.50						
C1	0.33	3.30	2.60	0.3937004	1.778	1.764	1.715	**
C2	0.26	1.60			1.511	1.764	1.715	-
C2	0.21	2.10						
C2	0.16	2.60						
C2	0.27	2.70						
C2	0.28	2.80	2.36	0.5029911	0.875	1.764	1.715	-
L1	0.27	1.71			1.735	1.764	1.715	*
L1	0.19	2.43						
L1	0.30	2.61						
L1	0.29	2.61						
L1	0.29	2.70	2.41	0.4044997	0.712	1.764	1.715	-
L2	0.19	1.65			1.027	1.764	1.715	-
L2	0.23	1.76						
L2	0.16	1.98						
L2	0.15	2.09						
L2	0.18	2.53	2.00	0.3425931	1.541	1.764	1.715	-
T1	0.18	1.80			1.467	1.764	1.715	-
T1	0.22	2.20						
T1	0.22	2.20						
T1	0.23	2.30						
T1	0.26	2.60	2.22	0.2863564	1.327	1.764	1.715	-
T2	0.30	2.20			1.372	1.764	1.715	-
T2	0.27	2.50						
T2	0.25	2.60						
T2	0.26	2.70						
T2	0.22	3.00	2.60	0.2915476	1.372	1.764	1.715	-
S1	0.20	1.20			1.180	1.764	1.715	-
S1	0.12	1.30						
S1	0.13	1.70						
S1	0.17	1.80						
S1	0.18	2.00	1.60	0.3391165	1.180	1.764	1.715	-

prEN 12457 -2 **Nickel**

COS

					Grubbs' test			
					Test for one outlier			
	Ni µg/l	Ni mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	0.30	3.00			0.707	1.764	1.715	-
STD	0.32	3.00						
STD	0.33	3.00						
STD	0.30	3.20						
STD	0.30	3.30	3.10	0.1414214	1.414	2.482	2.29	-
C1	0.33	2.70			0.727	1.764	1.715	-
C1	0.27	2.70						
C1	0.27	2.70						
C1	0.27	3.30						
C1	0.34	3.40	2.96	0.3577709	1.230	1.764	1.715	-
C2	0.31	2.20			1.508	1.764	1.715	-
C2	0.26	2.60						
C2	0.22	2.80						
C2	0.28	2.80						
C2	0.28	3.10	2.70	0.3316625	1.206	1.764	1.715	-
L1	0.30	0.18			1.781	1.764	1.715	**
L1	0.02	2.70						
L1	0.33	2.88						
L1	0.33	2.97						
L1	0.32	2.97	2.34	1.2124974	0.520	1.764	1.715	-
L2	0.22	1.87			1.180	1.764	1.715	-
L2	0.26	2.09						
L2	0.19	2.31						
L2	0.17	2.42						
L2	0.21	2.86	2.31	0.3730281	1.474	1.764	1.715	-
T1	0.24	2.30			1.043	1.764	1.715	-
T1	0.26	2.40						
T1	0.23	2.60						
T1	0.26	2.60						
T1	0.30	3.00	2.58	0.2683282	1.565	1.764	1.715	-
T2	0.33	2.60			1.304	1.764	1.715	-
T2	0.30	2.80						
T2	0.28	3.00						
T2	0.30	3.00						
T2	0.26	3.30	2.94	0.2607681	1.381	1.764	1.715	-
S1	0.23	1.30			1.141	1.764	1.715	-
S1	0.13	1.40						
S1	0.14	1.90						
S1	0.19	2.00						
S1	0.20	2.30	1.78	0.4207137	1.236	1.764	1.715	-

prEN 12457 -2 **Lead**

COS

					Grubbs' test			
					Test for one outlier			
	Pb	Pb	mean value	Std dev.		Test parameter		
	mg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	2.50	23.80			1.643	1.764	1.715	-
STD	2.52	24.70						
STD	2.38	24.70						
STD	2.47	25.00						
STD	2.47	25.20	24.68	0.5357238	0.971	2.482	2.29	-
C1	2.29	20.80			1.037	1.764	1.715	-
C1	2.16	21.60						
C1	2.08	22.90						
C1	2.73	25.80						
C1	2.58	27.30	23.68	2.7761484	1.304	1.764	1.715	-
C2	2.49	23.50			1.278	1.764	1.715	-
C2	2.35	23.90						
C2	2.43	24.30						
C2	2.50	24.90						
C2	2.39	25.00	24.32	0.6418723	1.059	1.764	1.715	-
L1	2.42	21.33			1.079	1.764	1.715	-
L1	2.43	21.78						
L1	2.50	21.87						
L1	2.59	22.50						
L1	2.37	23.31	22.16	0.7673787	1.501	1.764	1.715	-
L2	2.41	24.52			0.871	1.764	1.715	-
L2	2.28	24.64						
L2	2.24	25.08						
L2	2.30	25.30						
L2	2.23	26.51	25.21	0.7933128	1.639	1.764	1.715	-
T1	2.10	20.00			1.253	1.764	1.715	-
T1	2.00	20.40						
T1	2.16	20.80						
T1	2.08	21.00						
T1	2.04	21.60	20.76	0.60663	1.385	1.764	1.715	-
T2	2.77	25.60			1.329	1.764	1.715	-
T2	2.61	26.10						
T2	2.56	27.60						
T2	2.76	27.60						
T2	2.76	27.70	26.92	0.9934787	0.785	1.764	1.715	-
S1	2.56	25.60			1.465	1.764	1.715	-
S1	2.71	27.10						
S1	2.92	27.70						
S1	2.77	28.30						
S1	2.83	29.20	27.58	1.3516656	1.199	1.764	1.715	-

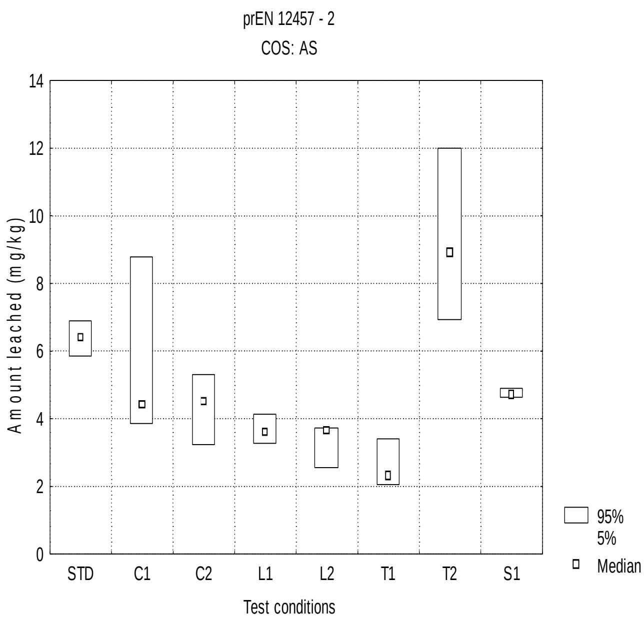
prEN 12457 -2 Antimony
COS

					Grubbs' test			
					Test for one outlier			
	Sb	Sb	mean value	Std dev.		Test parameter		
	µg/l	mg/kg	mg/kg		Gp	1%	5%	Test results
STD	0.23	2.20			0.859	1.764	1.715	-
STD	0.25	2.30						
STD	0.23	2.30						
STD	0.22	2.50						
STD	0.29	2.90	2.44	0.2792848	1.647	2.482	2.29	-
C1	0.20	2.00			1.082	1.764	1.715	-
C1	0.21	2.10						
C1	0.22	2.20						
C1	0.26	2.50						
C1	0.25	2.60	2.28	0.2588436	1.236	1.764	1.715	-
C2	0.23	1.60			1.581	1.764	1.715	-
C2	0.20	2.00						
C2	0.16	2.20						
C2	0.22	2.30						
C2	0.24	2.40	2.10	0.3162278	0.949	1.764	1.715	-
L1	0.27	1.98			1.279	1.764	1.715	-
L1	0.22	2.07						
L1	0.23	2.34						
L1	0.26	2.43						
L1	0.27	2.43	2.25	0.2110687	0.853	1.764	1.715	-
L2	0.18	1.65			1.231	1.764	1.715	-
L2	0.20	1.76						
L2	0.16	1.98						
L2	0.18	1.98						
L2	0.15	2.20	1.91	0.2144295	1.334	1.764	1.715	-
T1	0.13	1.30			1.342	1.764	1.715	-
T1	0.16	1.50						
T1	0.15	1.60						
T1	0.19	1.70						
T1	0.17	1.90	1.60	0.2236068	1.342	1.764	1.715	-
T2	0.34	2.90			1.254	1.764	1.715	-
T2	0.32	3.00						
T2	0.30	3.20						
T2	0.33	3.30						
T2	0.29	3.40	3.16	0.2073644	1.157	1.764	1.715	-
S1	0.22	1.50			1.250	1.764	1.715	-
S1	0.17	1.70						
S1	0.15	1.80						
S1	0.18	2.10						
S1	0.21	2.20	1.86	0.2880972	1.180	1.764	1.715	-

prEN 12457 -2 Zinc
COS

					Grubbs' test			
					Test for one outlier			
	Zn mg/l	Zn mg/kg	mean value mg/kg	Std dev.	Gp	Test parameter 1%	5%	Test results
STD	320	3190			0.834	1.764	1.715	-
STD	335	3200						
STD	342	3220						
STD	319	3350						
STD	322	3420	3276	103.10189	1.397	1.764	1.715	-
C1	292	2830			0.670	1.764	1.715	-
C1	283	2910						
C1	297	2920						
C1	291	2970						
C1	366	3660	3058	340.24991	1.769	1.764	1.715	**
C2	294	1910			1.449	1.764	1.715	-
C2	234	2340						
C2	191	2940						
C2	305	3050						
C2	312	3120	2672	525.89923	0.852	1.764	1.715	-
L1	308	2052			1.709	1.764	1.715	-
L1	228	2772						
L1	336	2853						
L1	341	3024						
L1	317	3069	2754	410.80835	0.767	1.764	1.715	-
L2	227	2057			0.940	1.764	1.715	-
L2	269	2123						
L2	193	2343						
L2	187	2497						
L2	213	2959	2396	360.35705	1.563	1.764	1.715	-
T1	202	2020			1.716	1.764	1.715	*
T1	248	2480						
T1	260	2600						
T1	263	2630						
T1	269	2690	2484	270.42559	0.762	1.764	1.715	-
T2	342	2540			1.314	1.764	1.715	-
T2	309	2870						
T2	287	2900						
T2	290	3090						
T2	254	3420	2964	322.6918	1.413	1.764	1.715	-
S1	254	1510			1.026	1.764	1.715	-
S1	151	1540						
S1	154	2050						
S1	205	2140						
S1	214	2540	1956	434.66079	1.344	1.764	1.715	-

prEN 12457 - 2 **Arsenic**
COS



Multiple regression analysis of ruggedness data
All data are included

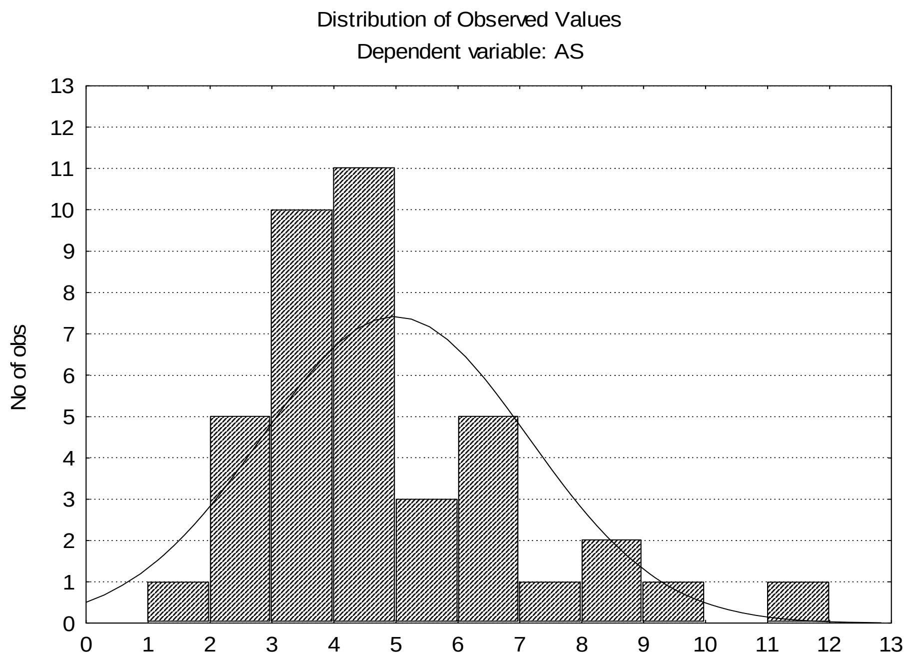
Regression Summary for Dependent Variable: AS
R= .88360575 R²= .78075913 Adjusted R²= .73280019
F(7,32)=16.280 p<.00000 Std.Error of estimate: 1.1250

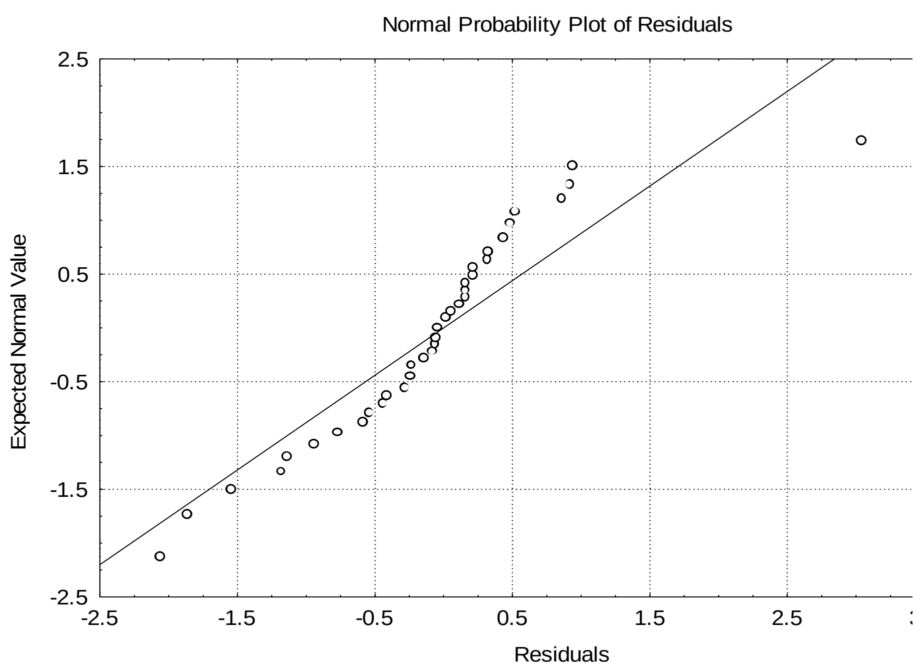
	BETA	St. Err. of BETA	B	St. Err. of B	t(32)	p-level
Intercpt			6.38	0.50	12.68	0.00
C1	-0.160	0.109	-1.04	0.71	-1.46	0.15
C2	-0.308	0.109	-2.00	0.71	-2.81	0.01
L1	-0.420	0.109	-2.73	0.71	-3.83	0.00
L2	-0.474	0.109	-3.08	0.71	-4.33	0.00
T1	-0.591	0.109	-3.84	0.71	-5.40	0.00
T2	0.397	0.109	2.58	0.71	3.63	0.00
S1	-0.252	0.109	-1.64	0.71	-2.30	0.03

Analysis of Variance; DV: AS (part 2 data - cos.sta)

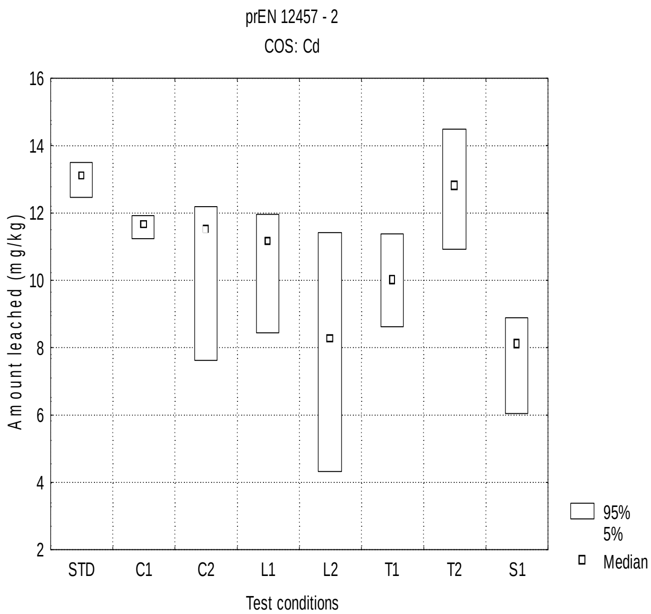
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	144.223058	7	20.603	16.28	6.38E-09
Residual	40.49852	32	1.2656		
Total	184.721578				

prEN 12457 - 2 **Arsenic**
COS





prEN 12457 - 2 **Cadmium**
COS



Multiple regression analysis of ruggedness data
All data are included

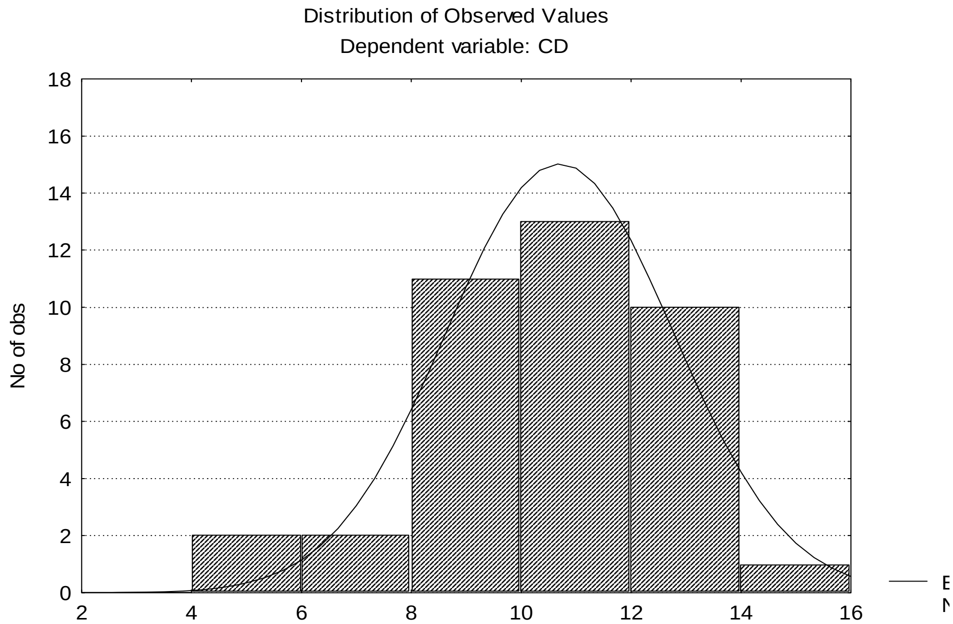
Regression Summary for Dependent Variable: CD
R= ,79841793 R²= ,63747118 Adjusted R²= ,55560984
F(7,31)=7,7872 p<,00002 Std.Error of estimate: 1,5243

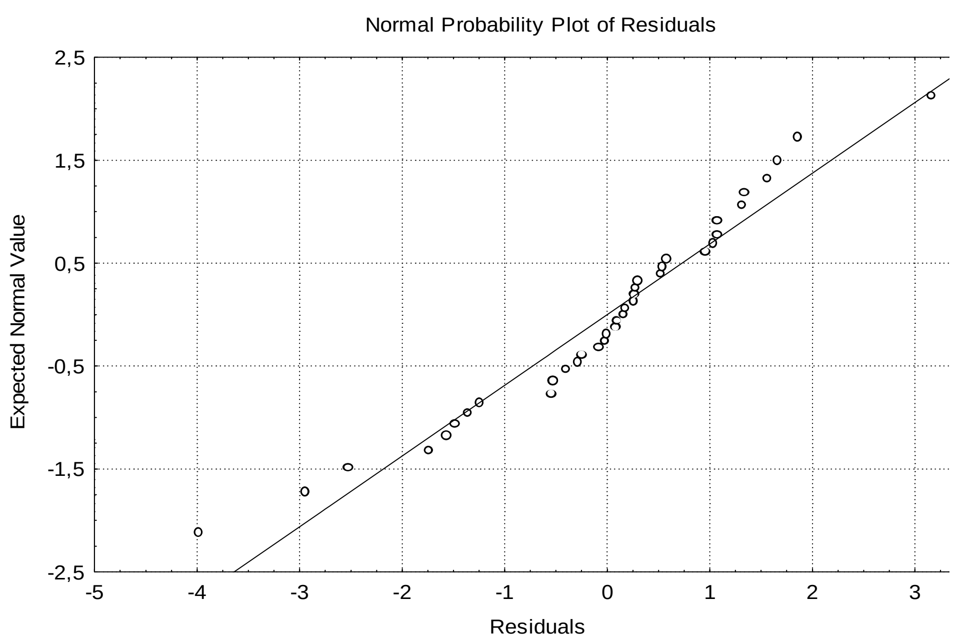
	BETA	St. Err. of BETA	B	St. Err. of B	t(31)	p-level
Intercpt			12.920	0.682	18.953	0.00
C1	-0.177	0.137	-1.320	1.023	-1.291	0.21
C2	-0.353	0.143	-2.380	0.964	-2.469	0.02
L1	-0.301	0.143	-2.030	0.964	-2.106	0.04
L2	-0.688	0.143	-4.648	0.964	-4.821	0.00
T1	-0.421	0.143	-2.840	0.964	-2.946	0.01
T2	-0.041	0.143	-0.280	0.964	-0.290	0.77
S1	-0.794	0.143	-5.360	0.964	-5.560	0.00

Analysis of Variance; DV: CD (part 2 data - cos.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**126.657443**	**7**	**18.094**	**7.7872**	1.94E-05
Residual	72.02988	31	2.3235		
Total	198.687323				

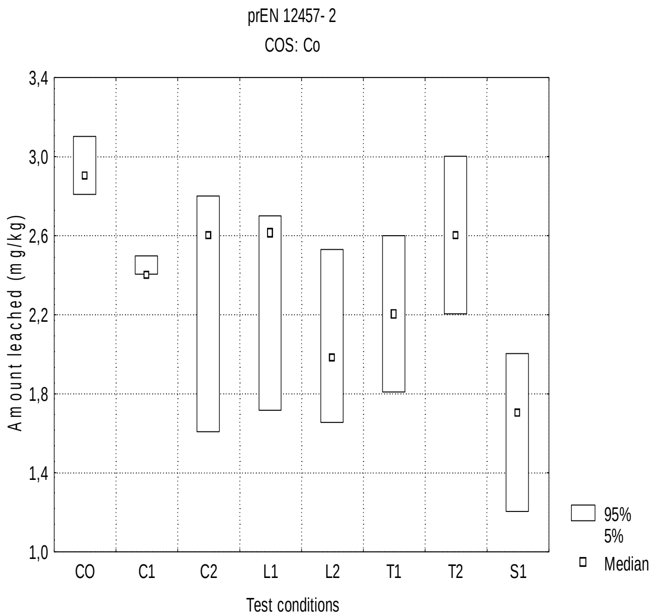
prEN 12457 - 2 **Cadmium**
COS





prEN 12457 - 2 COS

Cobalt



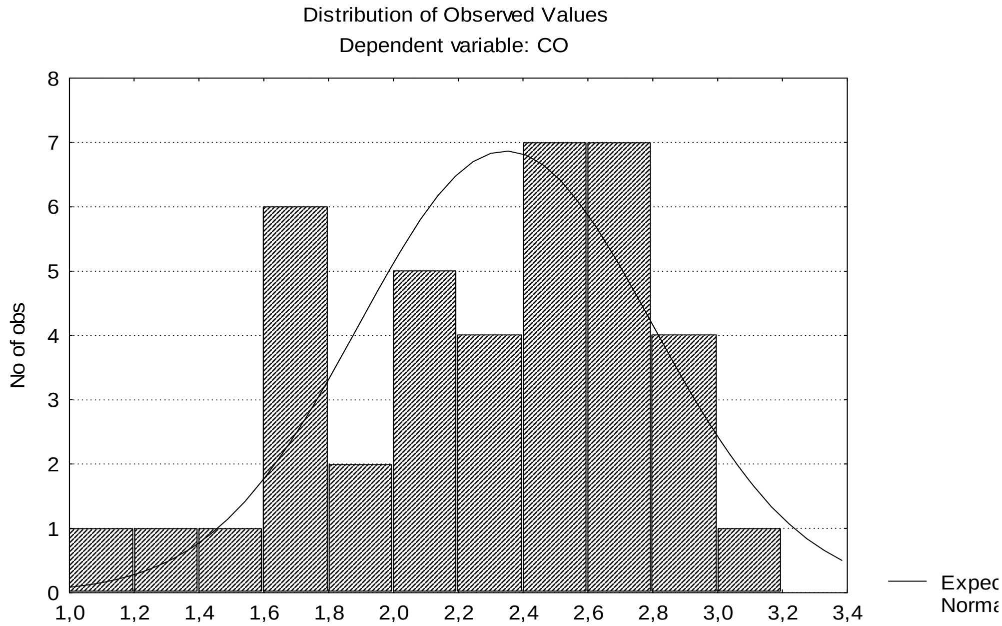
Multiple regression analysis of ruggedness data
All data are included

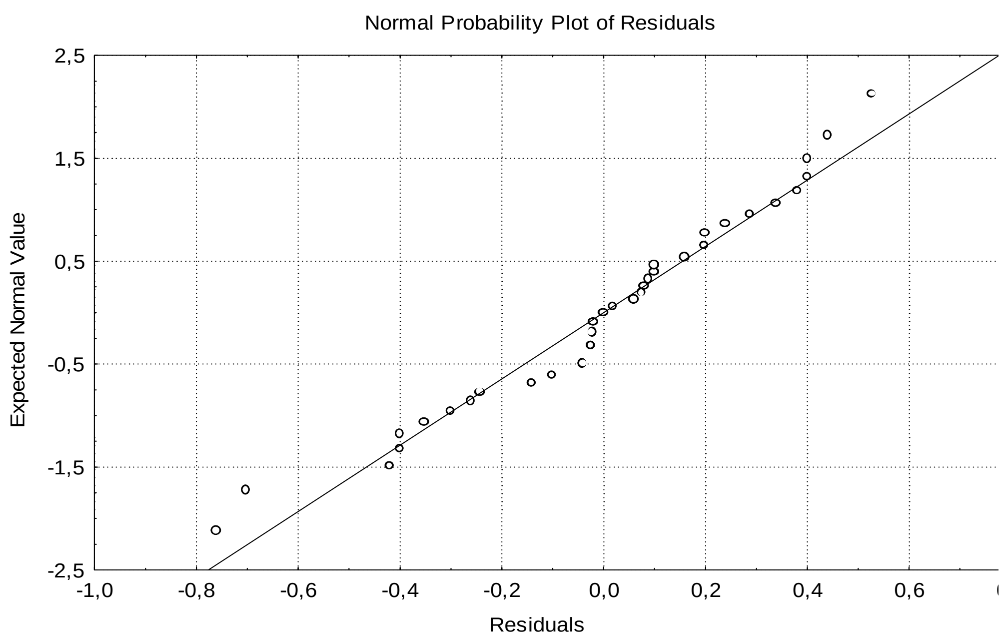
Regression Summary for Dependent Variable: CO
R= ,79101349 R²= ,62570233 Adjusted R²= ,54118351
F(7,31)=7,4031 p<,00003 Std.Error of estimate: ,32743

	BETA	St. Err. of BETA	B	St. Err. of B	t(31)	p-level
Intercpt			2.940	0.146	20.078	0.00
C1	-0.327	0.140	-0.515	0.220	-2.345	0.03
C2	-0.406	0.145	-0.580	0.207	-2.801	0.01
L1	-0.370	0.145	-0.528	0.207	-2.550	0.02
L2	-0.657	0.145	-0.938	0.207	-4.530	0.00
T1	-0.504	0.145	-0.720	0.207	-3.477	0.00
T2	-0.238	0.145	-0.340	0.207	-1.642	0.11
S1	-0.939	0.145	-1.340	0.207	-6.471	0.00

Analysis of Variance; DV: CO (part 2 data - cos.sta)

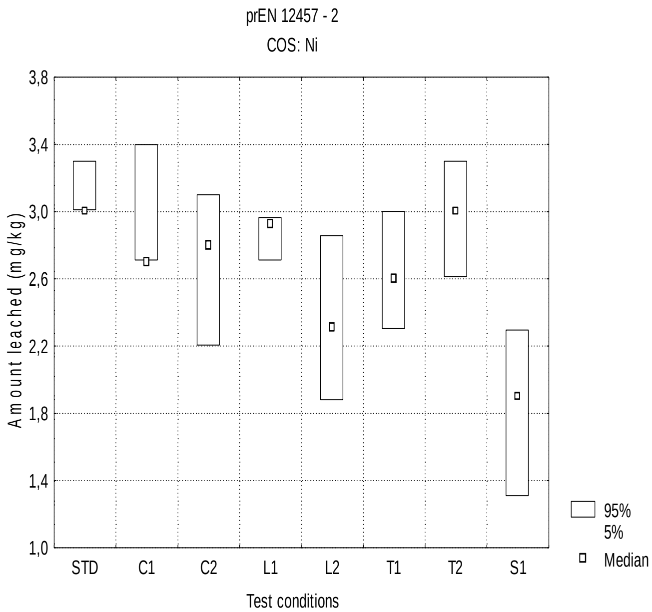
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	5.55572974	7	0.7936757	7.4031	3.1E-05
Residual	3.32346	31	0.1072084		
Total	8.87918974				


Distribution of Observed Values
Dependent variable: CO
No of obs
0
1
2
3
4
5
6
7
8
1,0
1,2
1,4
1,6
1,8
2,0
2,2
2,4
2,6
2,8
3,0
3,2
3,4
Expec
Norma


Normal Probability Plot of Residuals
Expected Normal Value
2,5
1,5
0,5
-0,5
-1,5
-2,5
-1,0
-0,8
-0,6
-0,4
-0,2
0,0
0,2
0,4
0,6
Residuals

prEN 12457 - 2 COS

Nickel



Multiple regression analysis of ruggedness data
All data are included

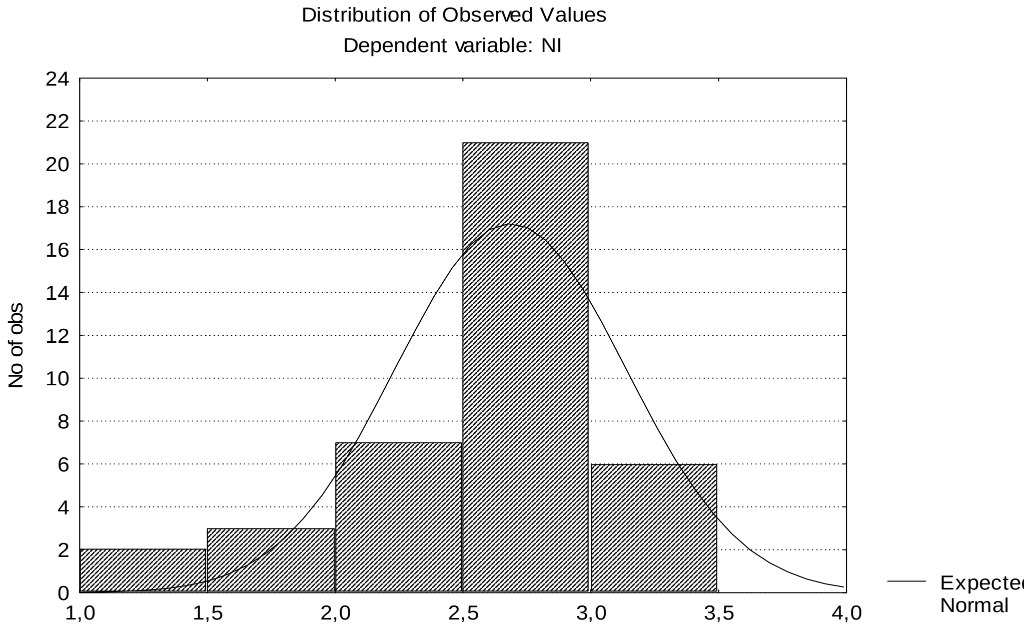
Regression Summary for Dependent Variable: NI
R= ,83181280 R²= ,69191254 Adjusted R²= ,62234440
F(7,31)=9,9458 p<,00000 Std.Error of estimate: ,30613

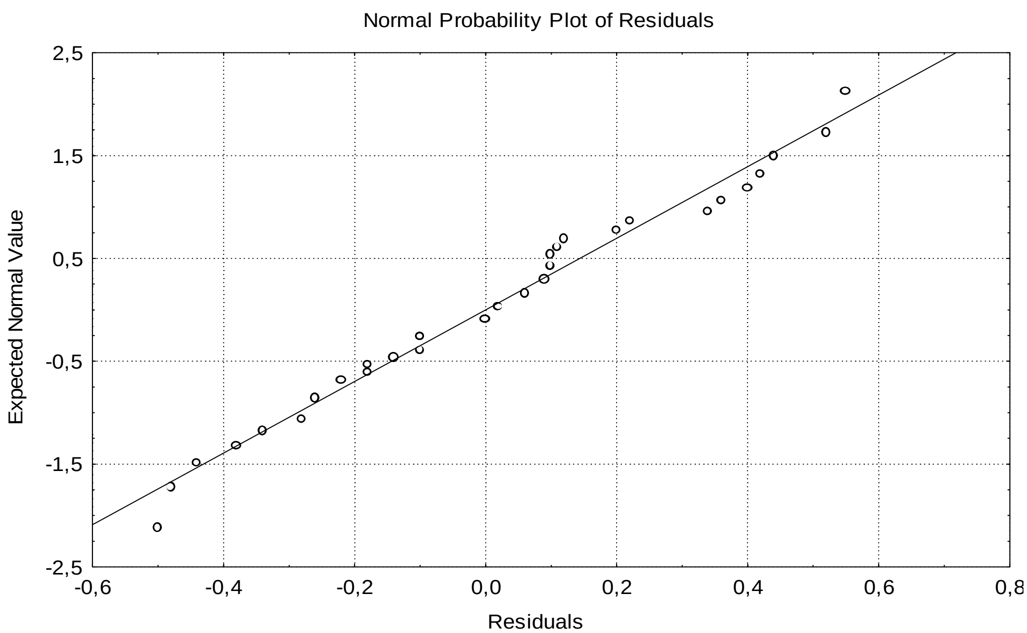
	BETA	St. Err. of BETA	B	St. Err. of B	t(31)	p-level
Intercpt			3.100	0.137	22.643	0.00
C1	-0.095	0.132	-0.140	0.194	-0.723	0.48
C2	-0.272	0.132	-0.400	0.194	-2.066	0.05
L1	-0.136	0.127	-0.220	0.205	-1.071	0.29
L2	-0.537	0.132	-0.790	0.194	-4.080	0.00
T1	-0.354	0.132	-0.520	0.194	-2.686	0.01
T2	-0.109	0.132	-0.160	0.194	-0.826	0.41
S1	-0.897	0.132	-1.320	0.194	-6.818	0.00

Analysis of Variance; DV: NI (part 2 data - cos.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	6.52458974	7	0.9320842	9.945826	1.88E-06
Residual	2.9052	31	0.0937161		
Total	9.42978974				

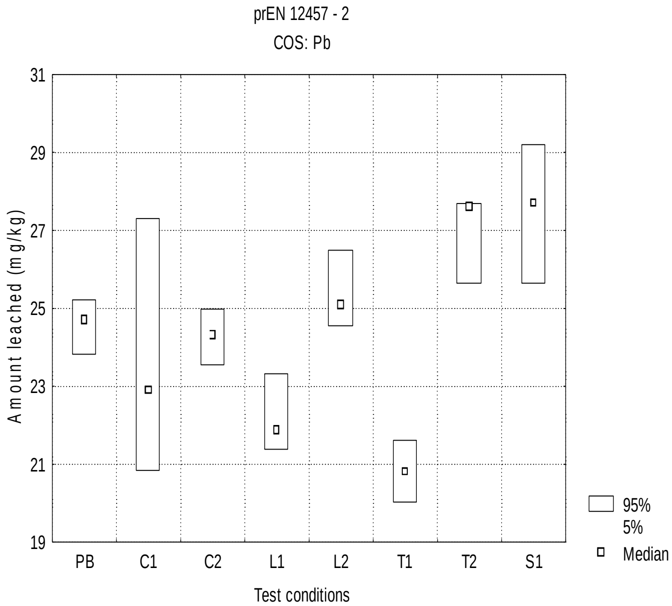
prEN 12457 - 2 **Nickel**
COS





prEN 12457 - 2 COS

Lead



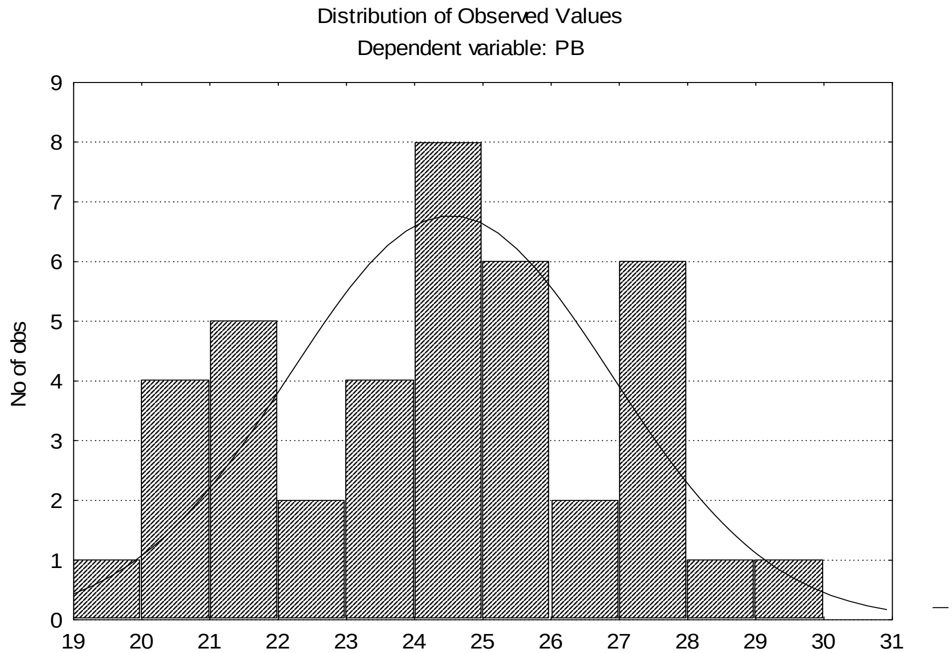
Multiple regression analysis of ruggedness data
All data are included

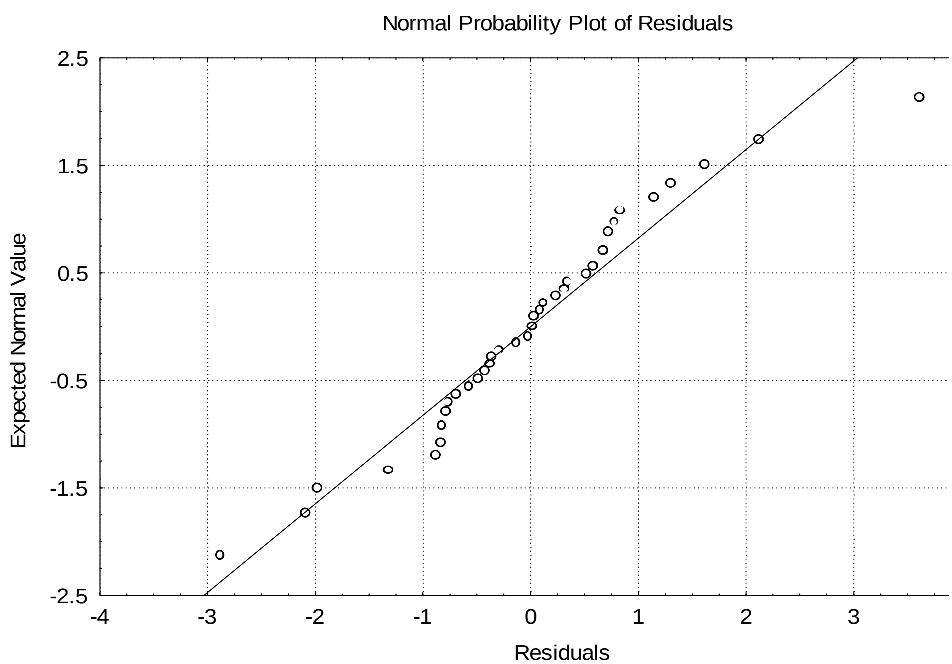
Regression Summary for Dependent Variable: PB
R= .88229597 R²= .77844618 Adjusted R²= .72998128
F(7,32)=16.062 p<.00000 Std.Error of estimate: 1.2652

	BETA	St. Err. of BETA	B	St. Err. of B	t(32)	p-level
Intercpt			24.680	0.566	43.618	0.00
C1	-0.138	0.110	-1.000	0.800	-1.250	0.22
C2	-0.050	0.110	-0.360	0.800	-0.450	0.66
L1	-0.347	0.110	-2.522	0.800	-3.152	0.00
L2	0.073	0.110	0.530	0.800	0.662	0.51
T1	-0.539	0.110	-3.920	0.800	-4.899	0.00
T2	0.308	0.110	2.240	0.800	2.799	0.01
S1	0.399	0.110	2.900	0.800	3.624	0.00

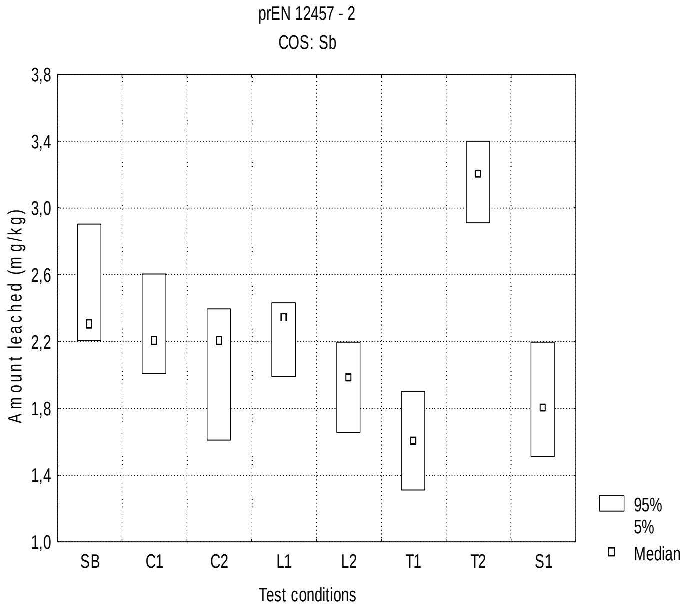
Analysis of Variance; DV: PB (part 2 data - cos.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	**179.982437**	**7**	**25.711777**	**16.062**	7.5E-09
Residual	51.2248608	32	1.6007769		
Total	231.207298				


Distribution of Observed Values
Dependent variable: PB
No of obs
0
1
2
3
4
5
6
7
8
9
19
20
21
22
23
24
25
26
27
28
29
30
31


Normal Probability Plot of Residuals
Expected Normal Value
2.5
1.5
0.5
-0.5
-1.5
-2.5
-4
-3
-2
-1
0
1
2
3
Residuals

prEN 12457 - 2 **Antimony**
COS



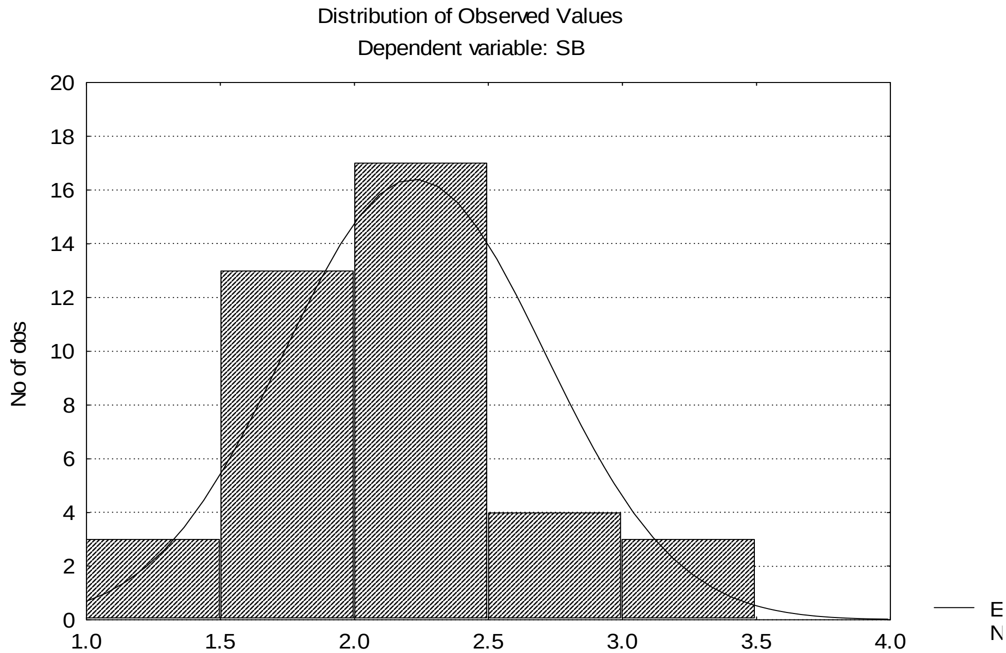
Multiple regression analysis of ruggedness data
All data are included

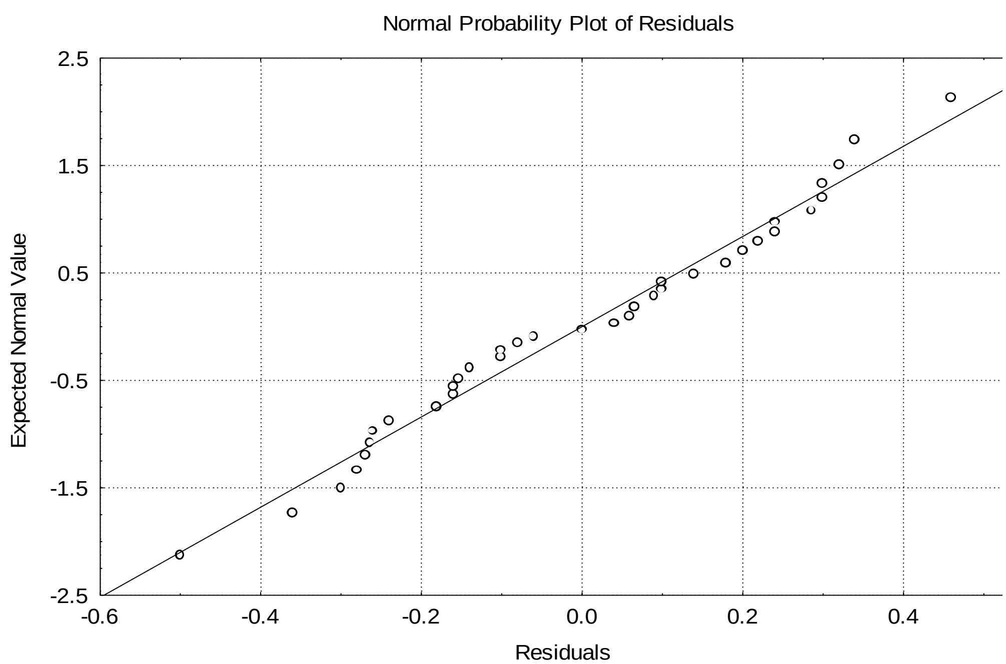
Regression Summary for Dependent Variable: SB
R= .88978291 R²= .79171362 Adjusted R²= .74615097
F(7,32)=17.376 p<.00000 Std.Error of estimate: .25287

	BETA	St. Err. of BETA	B	St. Err. of B	t(32)	p-level
Intercpt			2.440	0.113	21.577	0.00
C1	-0.107	0.107	-0.160	0.160	-1.000	0.32
C2	-0.227	0.107	-0.340	0.160	-2.126	0.04
L1	-0.127	0.107	-0.190	0.160	-1.188	0.24
L2	-0.351	0.107	-0.526	0.160	-3.289	0.00
T1	-0.561	0.107	-0.840	0.160	-5.252	0.00
T2	0.480	0.107	0.720	0.160	4.502	0.00
S1	-0.387	0.107	-0.580	0.160	-3.627	0.00

Analysis of Variance; DV: SB (part 2 data - cos.sta)

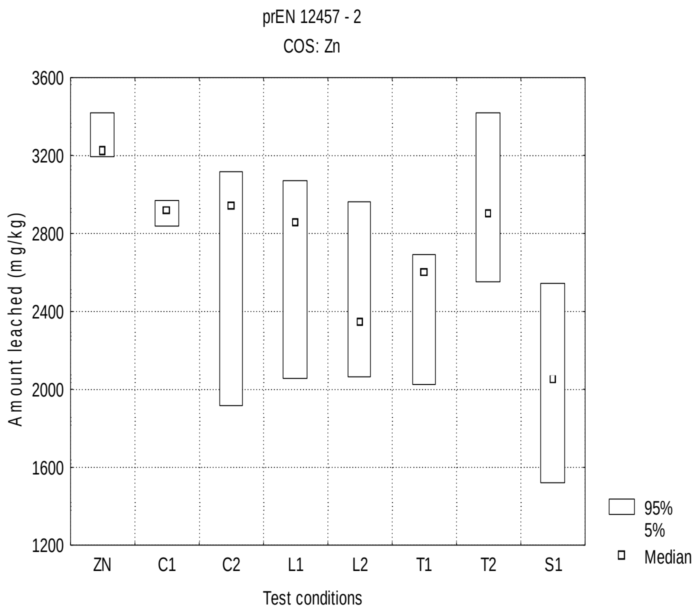
	Sums of Squares	df	Mean Squares	F	p-level
Regress.	7.77747	7	1.1110671	17.376375	2.9E-09
Residual	2.04612	32	0.0639413		
Total	9.82359				


Distribution of Observed Values
Dependent variable: SB
No of obs
20
18
16
14
12
10
8
6
4
2
0
1.0
1.5
2.0
2.5
3.0
3.5
4.0


Normal Probability Plot of Residuals
Expected Normal Value
2.5
1.5
0.5
-0.5
-1.5
-2.5
-0.6
-0.4
-0.2
0.0
0.2
0.4
Residuals

prEN 12457 - 2 COS

Zinc



Multiple regression analysis of ruggedness data
All data are included

Regression Summary for Dependent Variable: ZN
R= ,77185805 R²= ,59576485 Adjusted R²= ,50448594
F(7,31)=6,5269 p<,00009 Std.Error of estimate: 350,95

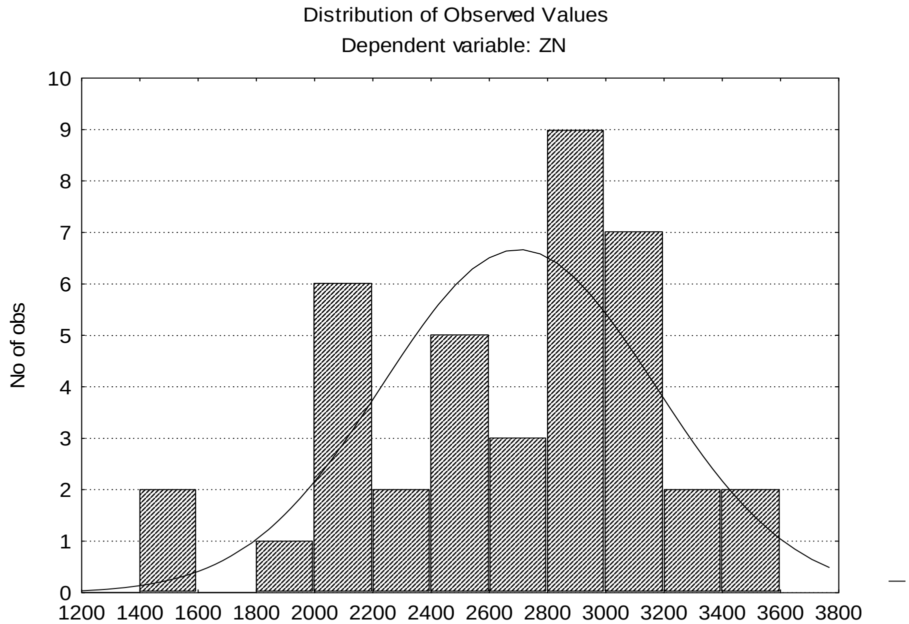
	BETA	St. Err. of BETA	B	St. Err. of B	t(31)	p-level
Intercpt			3276	157	20.87	0.00
C1	-0.227	0.145	-369	235	-1.57	0.13
C2	-0.410	0.151	-604	222	-2.72	0.01
L1	-0.355	0.151	-522	222	-2.35	0.03
L2	-0.598	0.151	-880	222	-3.97	0.00
T1	-0.538	0.151	-792	222	-3.57	0.00
T2	-0.212	0.151	-312	222	-1.41	0.17
S1	-0.897	0.151	-1320	222	-5.95	0.00

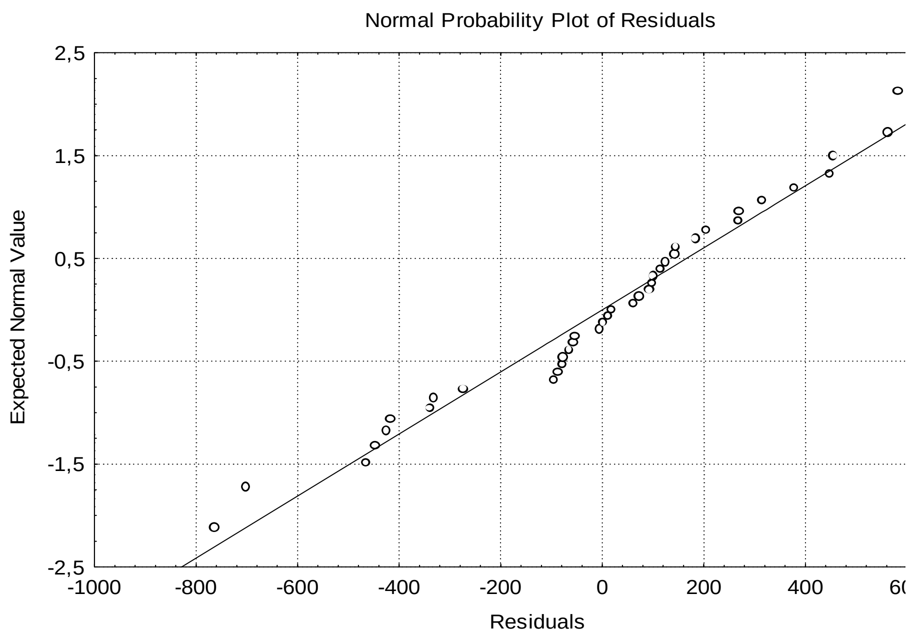
Analysis of Variance; DV: ZN (part 2 data - cos.sta)

	Sums of Squares	df	Mean Squares	F	p-level
Regress.	5627171.12	7	803881.589	6.5269	9.016E-05
Residual	3818117.8	31	123165.09		
Total	9445288.92				

prEN 12457 - 2 COS

Zinc





A P P E N D I X   7

prEN 12457 part 2: SEW

prEN 12457 -2 SEW — Boron

		Sorted numbers			Grubbs test one outlier			Test results
		B mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	5.99			1.146	1.764	1.715	-
STD	SEWRD	6.15						
STD	SEWRD	6.42						
STD	SEWRD	6.44						
STD	SEWRD	6.88	6.38	0.33802668	1.483	1.764	1.715	-
STD	SEWRD	5.39			0.748	1.764	1.715	-
STD	SEWRD	5.40						
STD	SEWRD	5.40						
STD	SEWRD	5.67						
STD	SEWRD	5.70	5.51294	0.15887117	1.182	1.764	1.715	-
STD	SEWRD	5.68			1.403	1.764	1.715	-
STD	SEWRD	5.79						
STD	SEWRD	5.95						
STD	SEWRD	6.01						
STD	SEWRD	6.04	5.8921	0.15430578	0.958	1.764	1.715	-
C1	SEWRC1	5.70			1.550	1.764	1.715	-
C1	SEWRC1	5.83						
C1	SEWRC1	5.83						
C1	SEWRC1	5.89						
C1	SEWRC1	5.93	5.83446	0.0883024	1.115	1.764	1.715	-
C2	SEWRC2	5.36			0.615	1.764	1.715	-
C2	SEWRC2	5.39						
C2	SEWRC2	5.39						
C2	SEWRC2	5.50						
C2	SEWRC2	6.05	5.53702	0.29292011	1.759	1.764	1.715	*
L1	SEWRL1	1.88			1.225	1.764	1.715	-
L1	SEWRL1	2.37						
L1	SEWRL1	4.61						
L1	SEWRL1	5.24						
L1	SEWRL1	5.28	3.877074	1.63186906	0.862	1.764	1.715	-
L2	SEWRL2	6.49			1.634	1.764	1.715	-
L2	SEWRL2	6.73						
L2	SEWRL2	6.75						
L2	SEWRL2	6.75						
L2	SEWRL2	6.87	6.718404	0.13789161	1.101	1.764	1.715	-
T1	SEWRT1	4.39			1.116	1.764	1.715	-
T1	SEWRT1	4.64						
T1	SEWRT1	4.67						
T1	SEWRT1	4.80						
T1	SEWRT1	5.26	4.75314	0.32140259	1.590	1.764	1.715	-
T2	SEWRT2	8.05			1.073	1.764	1.715	-
T2	SEWRT2	8.15						
T2	SEWRT2	8.31						
T2	SEWRT2	8.58						
T2	SEWRT2	8.76	8.36952	0.29690411	1.325	1.764	1.715	-
A1	SEWRA1	6.33			1.073	1.764	1.715	-
A1	SEWRA1	6.38						
A1	SEWRA1	6.40						
A1	SEWRA1	6.52						
A1	SEWRA1	6.60	6.44636	0.11007785	1.408	1.764	1.715	-
A2	SEWRA2	6.28			0.864	1.764	1.715	-
A2	SEWRA2	6.35						
A2	SEWRA2	6.40						
A2	SEWRA2	6.73						
A2	SEWRA2	7.05	6.55974	0.3218465	1.510	1.764	1.715	-
F1	SEWRF1	4.93			1.207	1.764	1.715	-
F1	SEWRF1	5.53						
F1	SEWRF1	5.60						
F1	SEWRF1	5.81						
F1	SEWRF1	6.73	5.72062	0.65181355	1.551	1.764	1.715	-
F2	SEWRF2	4.57			0.829	1.764	1.715	-
F2	SEWRF2	4.73						
F2	SEWRF2	5.10						
F2	SEWRF2	5.27						
F2	SEWRF2	6.73	5.2801	0.86018596	1.691	1.764	1.715	-

prEN 12457 -2 Barium
SEW

		Sorted numbers			Grubbs test one outlier			Test results
		Ba mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	0.161			1.529	1.764	1.715	-
STD	SEWRD	0.230						
STD	SEWRD	0.282						
STD	SEWRD	0.291						
STD	SEWRD	0.321	0.257	0.06283594	1.017	1.764	1.715	-
STD	SEWRD	0.048			1.075	1.764	1.715	-
STD	SEWRD	0.071						
STD	SEWRD	0.992						
STD	SEWRD	1.351						
STD	SEWRD	1.472	0.7868	0.68700862	0.998	1.764	1.715	-
STD	SEWRD	0.068			1.045	1.764	1.715	-
STD	SEWRD	0.070						
STD	SEWRD	0.074						
STD	SEWRD	0.086						
STD	SEWRD	0.086	0.07668	0.00868775	1.061	1.764	1.715	-
C1	SEWRC1	0.059			0.698	1.764	1.715	-
C1	SEWRC1	0.060						
C1	SEWRC1	0.063						
C1	SEWRC1	0.075						
C1	SEWRC1	0.101	0.07158	0.01745428	1.674	1.764	1.715	-
C2	SEWRC2	0.077			1.767	1.764	1.715	**
C2	SEWRC2	0.106						
C2	SEWRC2	0.108						
C2	SEWRC2	0.109						
C2	SEWRC2	0.113	0.10242	0.01461376	0.690	1.764	1.715	-
L1	SEWRL1	0.005			0.927	1.496	1.481	-
L1	SEWRL1	0.009						
L1	SEWRL1	0.051						
L1	SEWRL1	0.053	0.030	0.02602282	0.896	1.496	1.481	-
L2	SEWRL2	0.109			0.815	1.764	1.715	-
L2	SEWRL2	0.113						
L2	SEWRL2	0.113						
L2	SEWRL2	0.117						
L2	SEWRL2	0.137	0.117788	0.01117445	1.725	1.764	1.715	*
T1	SEWRT1	0.073			1.464	1.764	1.715	-
T1	SEWRT1	0.369						
T1	SEWRT1	0.630						
T1	SEWRT1	0.743						
T1	SEWRT1	0.857	0.53432	0.31503322	1.024	1.764	1.715	-
T2	SEWRT2	0.171			0.969	1.764	1.715	-
T2	SEWRT2	0.203						
T2	SEWRT2	0.252						
T2	SEWRT2	0.338						
T2	SEWRT2	0.466	0.28614	0.11845754	1.516	1.764	1.715	-
A1	SEWRA1	0.084			1.050	1.764	1.715	-
A1	SEWRA1	0.086						
A1	SEWRA1	0.092						
A1	SEWRA1	0.103						
A1	SEWRA1	0.107	0.09456	0.01034278	1.241	1.764	1.715	-
A2	SEWRA2	0.275			1.072	1.764	1.715	-
A2	SEWRA2	0.285						
A2	SEWRA2	0.310						
A2	SEWRA2	0.340						
A2	SEWRA2	0.362	0.31412	0.03640449	1.304	1.764	1.715	-
F1	SEWRF1	0.052			1.624	1.764	1.715	-
F1	SEWRF1	0.086						
F1	SEWRF1	0.094						
F1	SEWRF1	0.098						
F1	SEWRF1	0.112	0.08844	0.02238265	1.057	1.764	1.715	-
F2	SEWRF2	0.048			1.525	1.764	1.715	-
F2	SEWRF2	0.086						
F2	SEWRF2	0.096						
F2	SEWRF2	0.098						
F2	SEWRF2	0.126	0.0908	0.02833664	1.242	1.764	1.715	-

prEN 12457 -2 SEW Cobalt

		Sorted numbers			Grubbs test one outlier			Test results
		Co mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	0.5136			1.496	1.764	1.715	-
STD	SEWRD	0.5247						
STD	SEWRD	0.5337						
STD	SEWRD	0.537						
STD	SEWRD	0.541	0.53	0.01096289	1.003	1.764	1.715	-
STD	SEWRD	0.4411			0.761	1.764	1.715	-
STD	SEWRD	0.4418						
STD	SEWRD	0.4519						
STD	SEWRD	0.4547						
STD	SEWRD	0.4866	0.45522	0.01854365	1.692	1.764	1.715	-
STD	SEWRD	0.441			1.615	1.764	1.715	-
STD	SEWRD	0.467						
STD	SEWRD	0.4832						
STD	SEWRD	0.4844						
STD	SEWRD	0.4899	0.4731	0.01987184	0.845	1.764	1.715	-
C1	SEWRC1	0.4618			1.406	1.764	1.715	-
C1	SEWRC1	0.4691						
C1	SEWRC1	0.4753						
C1	SEWRC1	0.4758						
C1	SEWRC1	0.483	0.473	0.00796524	1.255	1.764	1.715	-
C2	SEWRC2	0.4914			1.445	1.764	1.715	-
C2	SEWRC2	0.509						
C2	SEWRC2	0.5145						
C2	SEWRC2	0.5268						
C2	SEWRC2	0.5333	0.515	0.01633508	1.120	1.764	1.715	-
L1	SEWRL1	0.36297			1.631	1.764	1.715	-
L1	SEWRL1	0.41544						
L1	SEWRL1	0.42651						
L1	SEWRL1	0.42723						
L1	SEWRL1	0.45252	0.416934	0.0330848	1.076	1.764	1.715	-
L2	SEWRL2	0.5335			1.170	1.764	1.715	-
L2	SEWRL2	0.53867						
L2	SEWRL2	0.55121						
L2	SEWRL2	0.55737						
L2	SEWRL2	0.56749	0.549648	0.01379928	1.293	1.764	1.715	-
T1	SEWRT1	0.3599			1.155	1.764	1.715	-
T1	SEWRT1	0.3702						
T1	SEWRT1	0.3825						
T1	SEWRT1	0.4013						
T1	SEWRT1	0.4147	0.38572	0.02236341	1.296	1.764	1.715	-
T2	SEWRT2	0.2713			1.758	1.764	1.715	*
T2	SEWRT2	0.3389						
T2	SEWRT2	0.3429						
T2	SEWRT2	0.3439						
T2	SEWRT2	0.3556	0.33052	0.0336843	0.745	1.764	1.715	-
A1	SEWRA1	0.496			1.353	1.764	1.715	-
A1	SEWRA1	0.5043						
A1	SEWRA1	0.5071						
A1	SEWRA1	0.5077						
A1	SEWRA1	0.5178	0.50658	0.00781902	1.435	1.764	1.715	-
A2	SEWRA2	0.5124			1.501	1.764	1.715	-
A2	SEWRA2	0.5335						
A2	SEWRA2	0.5435						
A2	SEWRA2	0.5512						
A2	SEWRA2	0.5611	0.54034	0.01861674	1.115	1.764	1.715	-
F1	SEWRF1	0.2944			1.392	1.764	1.715	-
F1	SEWRF1	0.3477						
F1	SEWRF1	0.3535						
F1	SEWRF1	0.3967						
F1	SEWRF1	0.4224	0.36294	0.0492299	1.208	1.764	1.715	-
F2	SEWRF2	0.2586			1.149	1.764	1.715	-
F2	SEWRF2	0.2841						
F2	SEWRF2	0.3722						
F2	SEWRF2	0.3786						
F2	SEWRF2	0.4563	0.34996	0.07954127	1.337	1.764	1.715	-

prEN 12457 -2 **Copper**
SEW

					Grubbs test				**Test results**
		Sorted numbers			**one outlier**				
		Cu	**mean value**	**Std dev.**		**Test parameter**			
		mg/kg			**Gp**	**1%**	**5%**		
STD	SEWRD	1.44			1.169	1.764	1.715		-
STD	SEWRD	1.52							
STD	SEWRD	1.66							
STD	SEWRD	1.82							
STD	SEWRD	1.91	1.67	0.19696352	1.214	1.764	1.715		-
STD	SEWRD	0.24			1.181	1.764	1.715		-
STD	SEWRD	0.40							
STD	SEWRD	0.45							
STD	SEWRD	0.75							
STD	SEWRD	0.83	0.53656	0.24829688	1.191	1.764	1.715		-
STD	SEWRD	0.62			1.625	1.764	1.715		-
STD	SEWRD	0.87							
STD	SEWRD	0.92							
STD	SEWRD	1.02							
STD	SEWRD	1.04	0.89458	0.17158293	0.867	1.764	1.715		-
C1	SEWRC1	0.72			1.331	1.764	1.715		-
C1	SEWRC1	0.80							
C1	SEWRC1	0.83							
C1	SEWRC1	0.91							
C1	SEWRC1	0.95	0.84182	0.09147752	1.181	1.764	1.715		-
C2	SEWRC2	1.10			1.484	1.764	1.715		-
C2	SEWRC2	1.18							
C2	SEWRC2	1.18							
C2	SEWRC2	1.24							
C2	SEWRC2	1.25	1.19102	0.05828308	1.074	1.764	1.715		-
L1	SEWRL1	0.68			1.403	1.764	1.715		-
L1	SEWRL1	0.91							
L1	SEWRL1	0.93							
L1	SEWRL1	1.13							
L1	SEWRL1	1.20	0.970632	0.20459449	1.136	1.764	1.715		-
L2	SEWRL2	0.90			1.468	1.764	1.715		-
L2	SEWRL2	0.94							
L2	SEWRL2	0.95							
L2	SEWRL2	0.97							
L2	SEWRL2	0.99	0.949564	0.03607485	1.100	1.764	1.715		-
T1	SEWRT1	0.15			1.349	1.764	1.715		-
T1	SEWRT1	0.19							
T1	SEWRT1	0.22							
T1	SEWRT1	0.24							
T1	SEWRT1	0.28	0.21634	0.04953477	1.328	1.764	1.715		-
T2	SEWRT2	0.14			1.783	1.764	1.715		**
T2	SEWRT2	0.20							
T2	SEWRT2	0.20							
T2	SEWRT2	0.20							
T2	SEWRT2	0.21	0.19046	0.02852609	0.524	1.764	1.715		-
A1	SEWRA1	1.15			1.135	1.764	1.715		-
A1	SEWRA1	1.20							
A1	SEWRA1	1.23							
A1	SEWRA1	1.35							
A1	SEWRA1	1.37	1.26058	0.09426366	1.175	1.764	1.715		-
A2	SEWRA2	1.54			1.026	1.764	1.715		-
A2	SEWRA2	1.64							
A2	SEWRA2	1.65							
A2	SEWRA2	1.68							
A2	SEWRA2	1.93	1.6891	0.14462415	1.662	1.764	1.715		-
F1	SEWRF1	0.31			1.285	1.764	1.715		-
F1	SEWRF1	0.35							
F1	SEWRF1	0.36							
F1	SEWRF1	0.41							
F1	SEWRF1	0.44	0.37482	0.05175314	1.258	1.764	1.715		-
F2	SEWRF2	0.30			1.032	1.764	1.715		-
F2	SEWRF2	0.32							
F2	SEWRF2	0.39							
F2	SEWRF2	0.46							
F2	SEWRF2	0.53	0.40034	0.09800009	1.349	1.764	1.715		-

prEN 12457 -2 SEW

Molybdenum

		Sorted numbers			Grubbs test one outlier	Test parameter		Test results
		Mo mg/kg	mean value	Std dev.	Gp	1%	5%	
STD	SEWRD	1.56			1.141	1.764	1.715	-
STD	SEWRD	1.57						
STD	SEWRD	1.57						
STD	SEWRD	1.60						
STD	SEWRD	1.60	1.58	0.02069154	1.083	1.764	1.715	-
STD	SEWRD	1.41			0.959	1.764	1.715	-
STD	SEWRD	1.41						
STD	SEWRD	1.45						
STD	SEWRD	1.53						
STD	SEWRD	1.53	1.4649	0.06193396	1.079	1.764	1.715	-
STD	SEWRD	1.51			1.457	1.764	1.715	-
STD	SEWRD	1.55						
STD	SEWRD	1.59						
STD	SEWRD	1.61						
STD	SEWRD	1.62	1.57632	0.04537893	0.923	1.764	1.715	-
C1	SEWRC1	1.52			1.511	1.764	1.715	-
C1	SEWRC1	1.54						
C1	SEWRC1	1.56						
C1	SEWRC1	1.57						
C1	SEWRC1	1.57	1.55268	0.02163463	0.851	1.764	1.715	-
C2	SEWRC2	1.52			1.557	1.764	1.715	-
C2	SEWRC2	1.58						
C2	SEWRC2	1.61						
C2	SEWRC2	1.63						
C2	SEWRC2	1.64	1.594	0.05075234	0.967	1.764	1.715	-
L1	SEWRL1	1.29			1.476	1.764	1.715	-
L1	SEWRL1	1.37						
L1	SEWRL1	1.45						
L1	SEWRL1	1.48						
L1	SEWRL1	1.52	1.421262	0.0914094	1.038	1.764	1.715	-
L2	SEWRL2	1.66			1.361	1.764	1.715	-
L2	SEWRL2	1.69						
L2	SEWRL2	1.74						
L2	SEWRL2	1.76						
L2	SEWRL2	1.77	1.726032	0.04600798	0.953	1.764	1.715	-
T1	SEWRT1	1.15			0.909	1.764	1.715	-
T1	SEWRT1	1.16						
T1	SEWRT1	1.18						
T1	SEWRT1	1.24						
T1	SEWRT1	1.32	1.21124	0.06881114	1.549	1.764	1.715	-
T2	SEWRT2	0.24			1.237	1.764	1.715	-
T2	SEWRT2	0.26						
T2	SEWRT2	0.27						
T2	SEWRT2	0.28						
T2	SEWRT2	0.32	0.27448	0.02981622	1.533	1.764	1.715	-
A1	SEWRA1	1.53			1.138	1.764	1.715	-
A1	SEWRA1	1.57						
A1	SEWRA1	1.57						
A1	SEWRA1	1.62						
A1	SEWRA1	1.67	1.59098	0.0541203	1.451	1.764	1.715	-
A2	SEWRA2	1.59			1.100	1.764	1.715	-
A2	SEWRA2	1.61						
A2	SEWRA2	1.65						
A2	SEWRA2	1.69						
A2	SEWRA2	1.73	1.65426	0.05560834	1.340	1.764	1.715	-
F1	SEWRF1	1.00			1.378	1.764	1.715	-
F1	SEWRF1	1.18						
F1	SEWRF1	1.19						
F1	SEWRF1	1.35						
F1	SEWRF1	1.43	1.22918	0.16891171	1.216	1.764	1.715	-
F2	SEWRF2	0.80			1.203	1.764	1.715	-
F2	SEWRF2	0.92						
F2	SEWRF2	1.24						
F2	SEWRF2	1.29						
F2	SEWRF2	1.53	1.15532	0.29387861	1.281	1.764	1.715	-

prEN 12457 -2 **Nickel**
SEW

					Grubbs test			Test results
		Sorted numbers			one outlier			
		Ni mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	1.68			1.128	1.764	1.715	-
STD	SEWRD	1.69						
STD	SEWRD	1.80						
STD	SEWRD	1.82						
STD	SEWRD	1.86	1.77	0.07985363	1.120	1.764	1.715	-
STD	SEWRD	2.07			0.793	1.764	1.715	-
STD	SEWRD	2.09						
STD	SEWRD	2.13						
STD	SEWRD	2.28						
STD	SEWRD	2.52	2.21894	0.19075147	1.601	1.764	1.715	-
STD	SEWRD	1.69			1.042	1.764	1.715	-
STD	SEWRD	1.77						
STD	SEWRD	1.91						
STD	SEWRD	1.95						
STD	SEWRD	2.24	1.91014	0.21194421	1.563	1.764	1.715	-
C1	SEWRC1	1.70			1.732	1.764	1.715	*
C1	SEWRC1	1.90						
C1	SEWRC1	1.93						
C1	SEWRC1	1.96						
C1	SEWRC1	1.97	1.89256	0.11051461	0.703	1.764	1.715	-
C2	SEWRC2	1.87			0.739	1.764	1.715	-
C2	SEWRC2	1.89						
C2	SEWRC2	1.92						
C2	SEWRC2	1.96						
C2	SEWRC2	2.18	1.96388	0.12364278	1.729	1.764	1.715	*
L1	SEWRL1	1.11			1.504	1.764	1.715	-
L1	SEWRL1	1.40						
L1	SEWRL1	1.48						
L1	SEWRL1	1.69						
L1	SEWRL1	1.69	1.473012	0.24025946	0.919	1.764	1.715	-
L2	SEWRL2	2.04			0.906	1.764	1.715	-
L2	SEWRL2	2.08						
L2	SEWRL2	2.09						
L2	SEWRL2	2.14						
L2	SEWRL2	2.27	2.125486	0.08895041	1.666	1.764	1.715	-
T1	SEWRT1	1.62			1.263	1.764	1.715	-
T1	SEWRT1	1.67						
T1	SEWRT1	1.84						
T1	SEWRT1	1.86						
T1	SEWRT1	1.90	1.7766	0.12736045	0.963	1.764	1.715	-
T2	SEWRT2	1.44			1.740	1.764	1.715	*
T2	SEWRT2	2.03						
T2	SEWRT2	2.05						
T2	SEWRT2	2.05						
T2	SEWRT2	2.20	1.95558	0.29498519	0.834	1.764	1.715	-
A1	SEWRA1	1.55			1.331	1.764	1.715	-
A1	SEWRA1	1.60						
A1	SEWRA1	1.65						
A1	SEWRA1	1.68						
A1	SEWRA1	1.74	1.64452	0.07455449	1.318	1.764	1.715	-
A2	SEWRA2	1.38			1.082	1.764	1.715	-
A2	SEWRA2	1.47						
A2	SEWRA2	1.49						
A2	SEWRA2	1.68						
A2	SEWRA2	1.80	1.56222	0.16965023	1.376	1.764	1.715	-
F1	SEWRF1	1.22			1.244	1.764	1.715	-
F1	SEWRF1	1.36						
F1	SEWRF1	1.39						
F1	SEWRF1	1.51						
F1	SEWRF1	1.67	1.42852	0.16905265	1.407	1.764	1.715	-
F2	SEWRF2	1.01			1.608	1.764	1.715	-
F2	SEWRF2	1.32						
F2	SEWRF2	1.43						
F2	SEWRF2	1.50						
F2	SEWRF2	1.59	1.3718	0.22412681	0.972	1.764	1.715	-

prEN 12457 -2 Lead
SEW

					Grubbs test			Test results
		Sorted numbers			one outlier			
		Pb mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	0.116			0.951	1.764	1.715	-
STD	SEWRD	0.334						
STD	SEWRD	0.357						
STD	SEWRD	0.385						
STD	SEWRD	1.036	0.446	0.34663857	1.702	1.764	1.715	-
STD	SEWRD	0.050			1.026	1.764	1.715	-
STD	SEWRD	0.050						
STD	SEWRD	0.108						
STD	SEWRD	0.132						
STD	SEWRD	0.156	0.09894	0.0478886	1.183	1.764	1.715	-
STD	SEWRD	0.022			1.614	1.764	1.715	-
STD	SEWRD	0.048						
STD	SEWRD	0.048						
STD	SEWRD	0.055						
STD	SEWRD	0.065	0.04778	0.01578344	1.085	1.764	1.715	-
C1	SEWRC1	0.024			1.185	1.764	1.715	-
C1	SEWRC1	0.036						
C1	SEWRC1	0.039						
C1	SEWRC1	0.046						
C1	SEWRC1	0.065	0.04178	0.01533842	1.520	1.764	1.715	-
C2	SEWRC2	0.045			1.121	1.764	1.715	-
C2	SEWRC2	0.050						
C2	SEWRC2	0.052						
C2	SEWRC2	0.054						
C2	SEWRC2	0.063	0.05278	0.00658346	1.583	1.764	1.715	-
L1	SEWRL1	0.032			1.728	1.764	1.715	*
L1	SEWRL1	0.059						
L1	SEWRL1	0.062						
L1	SEWRL1	0.065						
L1	SEWRL1	0.068	0.05724	0.01432542	0.785	1.764	1.715	-
L2	SEWRL2	0.018			1.688	1.764	1.715	-
L2	SEWRL2	0.066						
L2	SEWRL2	0.067						
L2	SEWRL2	0.079						
L2	SEWRL2	0.087	0.063558	0.02677652	0.884	1.764	1.715	-
T1	SEWRT1	0.018			1.112	1.496	1.481	-
T1	SEWRT1	0.029						
T1	SEWRT1	0.059						
T1	SEWRT1	0.060	0.041	0.02100548	0.874	1.496	1.481	-
T2	SEWRT2	0.031			1.148	1.155	1.155	-
T2	SEWRT2	0.037						
T2	SEWRT2	0.038	0.035	0.00360185	0.685	1.155	1.155	-
A1	SEWRA1	0.092			1.386	1.764	1.715	-
A1	SEWRA1	0.174						
A1	SEWRA1	0.192						
A1	SEWRA1	0.254						
A1	SEWRA1	0.301	0.20246	0.08007074	1.231	1.764	1.715	-
A2	SEWRA2	0.177			0.835	1.764	1.715	-
A2	SEWRA2	0.184						
A2	SEWRA2	0.194						
A2	SEWRA2	0.222						
A2	SEWRA2	0.273	0.2099	0.03892827	1.611	1.764	1.715	-
F1	SEWRF1	0.020			0.861	1.155	1.155	-
F1	SEWRF1	0.023						
F1	SEWRF1	0.029	0.024	0.00495412	1.097	1.155	1.155	-
F2	SEWRF2	0.020			0.933	1.155	1.155	-
F2	SEWRF2	0.027						
F2	SEWRF2	0.039	0.028	0.00950386	1.056	1.155	1.155	-

prEN 12457 -2 Tin
SEW

		Sorted numbers			Grubbs test one outlier			Test results
		Sn mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	0.089			1.122	1.764	1.715	-
STD	SEWRD	0.094						
STD	SEWRD	0.102						
STD	SEWRD	0.106						
STD	SEWRD	0.121	0.102	0.01225022	1.491	1.764	1.715	-
STD	SEWRD	0.056			1.250	1.764	1.715	-
STD	SEWRD	0.057						
STD	SEWRD	0.062						
STD	SEWRD	0.063						
STD	SEWRD	0.064	0.06024	0.00371187	1.094	1.764	1.715	-
STD	SEWRD	0.111			0.921	1.764	1.715	-
STD	SEWRD	0.111						
STD	SEWRD	0.114						
STD	SEWRD	0.121						
STD	SEWRD	0.123	0.11594	0.00558149	1.247	1.764	1.715	-
C1	SEWRC1	0.113			1.714	1.764	1.715	-
C1	SEWRC1	0.121						
C1	SEWRC1	0.122						
C1	SEWRC1	0.123						
C1	SEWRC1	0.125	0.12078	0.00465532	0.821	1.764	1.715	-
C2	SEWRC2	0.118			1.234	1.764	1.715	-
C2	SEWRC2	0.128						
C2	SEWRC2	0.130						
C2	SEWRC2	0.135						
C2	SEWRC2	0.148	0.13168	0.01100236	1.492	1.764	1.715	-
L1	SEWRL1	0.076			0.997	1.764	1.715	-
L1	SEWRL1	0.088						
L1	SEWRL1	0.094						
L1	SEWRL1	0.123						
L1	SEWRL1	0.153	0.106866	0.03119462	1.485	1.764	1.715	-
L2	SEWRL2	0.119			1.652	1.764	1.715	-
L2	SEWRL2	0.128						
L2	SEWRL2	0.133						
L2	SEWRL2	0.134						
L2	SEWRL2	0.135	0.129668	0.00624554	0.778	1.764	1.715	-
T1	SEWRT1	0.058			0.616	1.764	1.715	-
T1	SEWRT1	0.058						
T1	SEWRT1	0.058						
T1	SEWRT1	0.064						
T1	SEWRT1	0.075	0.0626	0.0073065	1.697	1.764	1.715	-
T2	SEWRT2	0.074			0.865	1.764	1.715	-
T2	SEWRT2	0.077						
T2	SEWRT2	0.079						
T2	SEWRT2	0.079						
T2	SEWRT2	0.093	0.0804	0.00751731	1.716	1.764	1.715	*
A1	SEWRA1	0.068			1.679	1.764	1.715	-
A1	SEWRA1	0.083						
A1	SEWRA1	0.087						
A1	SEWRA1	0.089						
A1	SEWRA1	0.092	0.08376	0.00927001	0.867	1.764	1.715	-
A2	SEWRA2	0.088			1.407	1.764	1.715	-
A2	SEWRA2	0.091						
A2	SEWRA2	0.094						
A2	SEWRA2	0.095						
A2	SEWRA2	0.097	0.09306	0.00338423	1.105	1.764	1.715	-
F1	SEWRF1	0.049			1.502	1.764	1.715	-
F1	SEWRF1	0.058						
F1	SEWRF1	0.058						
F1	SEWRF1	0.064						
F1	SEWRF1	0.066	0.05898	0.00651207	1.093	1.764	1.715	-
F2	SEWRF2	0.036			1.519	1.764	1.715	-
F2	SEWRF2	0.060						
F2	SEWRF2	0.066						
F2	SEWRF2	0.075						
F2	SEWRF2	0.087	0.0649	0.01909254	1.158	1.764	1.715	-

prEN 12457 -2 Zinc
SEW

		Sorted numbers			Grubbs test one outlier			Test results
		Zn mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	1.34			0.855	1.764	1.715	-
STD	SEWRD	1.46						
STD	SEWRD	1.79						
STD	SEWRD	1.81						
STD	SEWRD	2.88	1.86	0.60790003	1.683	1.764	1.715	-
STD	SEWRD	0.50			1.232	1.764	1.715	-
STD	SEWRD	1.32						
STD	SEWRD	1.56						
STD	SEWRD	2.80						
STD	SEWRD	3.25	1.8864	1.12207788	1.216	1.764	1.715	-
STD	SEWRD	0.64			1.149	1.764	1.715	-
STD	SEWRD	0.65						
STD	SEWRD	0.72						
STD	SEWRD	0.76						
STD	SEWRD	0.76	0.70794	0.0569385	0.986	1.764	1.715	-
C1	SEWRC1	0.61			0.760	1.764	1.715	-
C1	SEWRC1	0.62						
C1	SEWRC1	0.64						
C1	SEWRC1	0.68						
C1	SEWRC1	0.81	0.67318	0.08373937	1.682	1.764	1.715	-
C2	SEWRC2	0.71			1.699	1.764	1.715	-
C2	SEWRC2	0.76						
C2	SEWRC2	0.76						
C2	SEWRC2	0.78						
C2	SEWRC2	0.78	0.75788	0.02824158	0.762	1.764	1.715	-
L1	SEWRL1	0.50			1.510	1.764	1.715	-
L1	SEWRL1	0.58						
L1	SEWRL1	0.64						
L1	SEWRL1	0.67						
L1	SEWRL1	0.68	0.613224	0.07377438	0.848	1.764	1.715	-
L2	SEWRL2	0.64			1.753	1.764	1.715	*
L2	SEWRL2	0.80						
L2	SEWRL2	0.82						
L2	SEWRL2	0.82						
L2	SEWRL2	0.85	0.783662	0.08432662	0.746	1.764	1.715	-
T1	SEWRT1	0.53			1.001	1.764	1.715	-
T1	SEWRT1	0.61						
T1	SEWRT1	0.96						
T1	SEWRT1	1.17						
T1	SEWRT1	1.62	0.9782	0.4438957	1.454	1.764	1.715	-
T2	SEWRT2	0.37			0.886	1.764	1.715	-
T2	SEWRT2	0.39						
T2	SEWRT2	0.39						
T2	SEWRT2	0.50						
T2	SEWRT2	0.55	0.4381	0.08198399	1.362	1.764	1.715	-
A1	SEWRA1	0.86			0.919	1.764	1.715	-
A1	SEWRA1	0.94						
A1	SEWRA1	1.96						
A1	SEWRA1	2.22						
A1	SEWRA1	3.79	1.95276	1.19017209	1.544	1.764	1.715	-
A2	SEWRA2	1.54			1.041	1.764	1.715	-
A2	SEWRA2	1.66						
A2	SEWRA2	1.94						
A2	SEWRA2	2.27						
A2	SEWRA2	2.65	2.01138	0.4555493	1.401	1.764	1.715	-
F1	SEWRF1	0.50			1.302	1.764	1.715	-
F1	SEWRF1	0.76						
F1	SEWRF1	0.92						
F1	SEWRF1	1.24						
F1	SEWRF1	1.35	0.95194	0.34923958	1.147	1.764	1.715	-
F2	SEWRF2	1.14			1.388	1.764	1.715	-
F2	SEWRF2	1.63						
F2	SEWRF2	1.97						
F2	SEWRF2	2.46						
F2	SEWRF2	2.52	1.9443	0.57713368	0.990	1.764	1.715	-

prEN 12457 -2 SEW								Ammonium
					Grubbs test			Test results
		Sorted numbers			one outlier			
		NH4 mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	2470.4			0.897	1.764	1.715	-
STD	SEWRD	2508.8						
STD	SEWRD	2598.4						
STD	SEWRD	2624						
STD	SEWRD	2892.8	2618.88	165.560962	1.654	1.764	1.715	-
STD	SEWRD	2340			0.993	1.764	1.715	-
STD	SEWRD	2430						
STD	SEWRD	2440						
STD	SEWRD	2500						
STD	SEWRD	2740	2490	150.996689	1.656	1.764	1.715	-
STD	SEWRD	2080			1.399	1.764	1.715	-
STD	SEWRD	2350						
STD	SEWRD	2700						
STD	SEWRD	2730						
STD	SEWRD	2950	2562	344.630237	1.126	1.764	1.715	-
C1	SEWRC1	2240			0.997	1.764	1.715	-
C1	SEWRC1	2280						
C1	SEWRC1	2350						
C1	SEWRC1	2590						
C1	SEWRC1	2610	2414	174.441967	1.124	1.764	1.715	-
C2	SEWRC2	2000			1.205	1.764	1.715	-
C2	SEWRC2	2040						
C2	SEWRC2	2300						
C2	SEWRC2	2300						
C2	SEWRC2	2350	2198	164.377614	0.925	1.764	1.715	-
L1	SEWRL1	1818			1.168	1.764	1.715	-
L1	SEWRL1	1845						
L1	SEWRL1	1917						
L1	SEWRL1	1989						
L1	SEWRL1	1998	1913.4	81.6474127	1.036	1.764	1.715	-
L2	SEWRL2	2200			1.764	1.764	1.715	*
L2	SEWRL2	2651						
L2	SEWRL2	2651						
L2	SEWRL2	2673						
L2	SEWRL2	2739	2582.8	217.009677	0.720	1.764	1.715	-
T1	SEWRT1	2099.2			1.339	1.764	1.715	-
T1	SEWRT1	2240						
T1	SEWRT1	2304						
T1	SEWRT1	2316.8						
T1	SEWRT1	2496	2291.2	143.394282	1.428	1.764	1.715	-
T2	SEWRT2	5196.8			0.853	1.764	1.715	-
T2	SEWRT2	5273.6						
T2	SEWRT2	5555.2						
T2	SEWRT2	5593.6						
T2	SEWRT2	6400	5603.84	477.252939	1.668	1.764	1.715	-
A1	SEWRA1	1980			0.729	1.764	1.715	-
A1	SEWRA1	1980						
A1	SEWRA1	2040						
A1	SEWRA1	2500						
A1	SEWRA1	2920	2284	416.989208	1.525	1.764	1.715	-
A2	SEWRA2	2100			1.094	1.764	1.715	-
A2	SEWRA2	2140						
A2	SEWRA2	2320						
A2	SEWRA2	2400						
A2	SEWRA2	2540	2300	182.756669	1.313	1.764	1.715	-
F1	SEWRF1	3212.8			1.322	1.764	1.715	-
F1	SEWRF1	3635.2						
F1	SEWRF1	3750.4						
F1	SEWRF1	4172.8						
F1	SEWRF1	4428.8	3840	474.550398	1.241	1.764	1.715	-
F2	SEWRF2	2585.6			1.023	1.764	1.715	-
F2	SEWRF2	2944						
F2	SEWRF2	3008						
F2	SEWRF2	3366.4						
F2	SEWRF2	4236.8	3228.16	628.204909	1.606	1.764	1.715	-

prEN 12457 -2 **Sulfate**
SEW

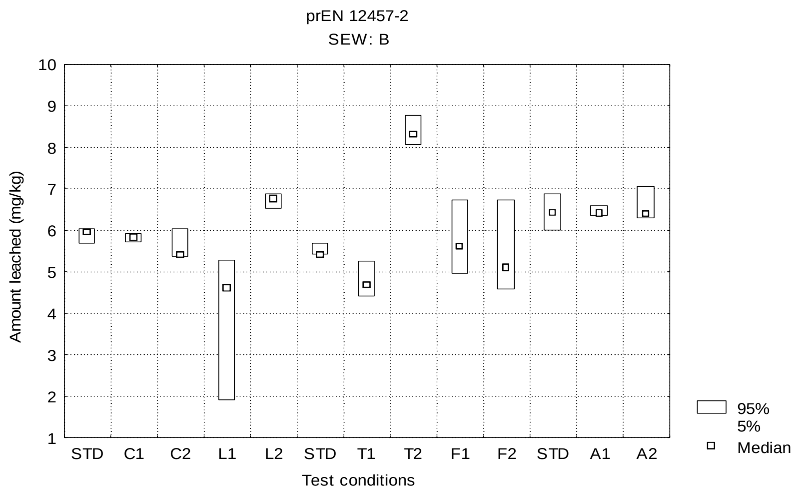
		Sorted numbers			Grubbs test one outlier			Test results
		SO4 mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	234			1.095	1.764	1.715	-
STD	SEWRD	236						
STD	SEWRD	240						
STD	SEWRD	242						
STD	SEWRD	248	240	5.47722558	1.461	1.764	1.715	-
STD	SEWRD	328			0.917	1.764	1.715	-
STD	SEWRD	333						
STD	SEWRD	337						
STD	SEWRD	341						
STD	SEWRD	363	340.4	13.520355	1.672	1.764	1.715	-
STD	SEWRD	333			1.003	1.764	1.715	-
STD	SEWRD	340						
STD	SEWRD	340						
STD	SEWRD	346						
STD	SEWRD	363	344.4	11.3710158	1.636	1.764	1.715	-
C1	SEWRC1	306			0.746	1.764	1.715	-
C1	SEWRC1	313						
C1	SEWRC1	317						
C1	SEWRC1	318						
C1	SEWRC1	367	324.2	24.3864717	1.755	1.764	1.715	*
C2	SEWRC2	306			1.748	1.764	1.715	*
C2	SEWRC2	333						
C2	SEWRC2	336						
C2	SEWRC2	339						
C2	SEWRC2	341	331	14.3003496	0.699	1.764	1.715	-
L1	SEWRL1	254			1.391	1.764	1.715	-
L1	SEWRL1	272						
L1	SEWRL1	279						
L1	SEWRL1	291						
L1	SEWRL1	302	279.54	18.505891	1.235	1.764	1.715	-
L2	SEWRL2	366			1.390	1.764	1.715	-
L2	SEWRL2	377						
L2	SEWRL2	395						
L2	SEWRL2	397						
L2	SEWRL2	404	387.86	15.5096099	1.021	1.764	1.715	-
T1	SEWRT1	205			1.493	1.764	1.715	-
T1	SEWRT1	218						
T1	SEWRT1	235						
T1	SEWRT1	236						
T1	SEWRT1	237	226.2	14.2021125	0.760	1.764	1.715	-
T2	SEWRT2	264			1.009	1.764	1.715	-
T2	SEWRT2	267						
T2	SEWRT2	269						
T2	SEWRT2	281						
T2	SEWRT2	284	273	8.91627725	1.234	1.764	1.715	-
A1	SEWRA1	334			1.302	1.764	1.715	-
A1	SEWRA1	337						
A1	SEWRA1	343						
A1	SEWRA1	346						
A1	SEWRA1	347	341.4	5.6833089	0.985	1.764	1.715	-
A2	SEWRA2	343			1.021	1.764	1.715	-
A2	SEWRA2	343						
A2	SEWRA2	348						
A2	SEWRA2	352						
A2	SEWRA2	352	347.6	4.50555213	0.977	1.764	1.715	-
F1	SEWRF1	358			0.802	1.764	1.715	-
F1	SEWRF1	360						
F1	SEWRF1	374						
F1	SEWRF1	408						
F1	SEWRF1	456	391.2	41.3908202	1.566	1.764	1.715	-
F2	SEWRF2	308			1.001	1.764	1.715	-
F2	SEWRF2	336						
F2	SEWRF2	354						
F2	SEWRF2	427						
F2	SEWRF2	494	383.8	75.7112937	1.456	1.764	1.715	-

prEN 12457 -2 SEW

Dissolved organic carbon

		Sorted numbers			Grubbs test one outlier			Test results
		DOC mg/kg	mean value	Std dev.	Gp	Test parameter 1%	5%	
STD	SEWRD	25180			0.648	1.764	1.715	-
STD	SEWRD	25550						
STD	SEWRD	25980						
STD	SEWRD	27400						
STD	SEWRD	34800	27782	4012.4083	1.749	1.764	1.715	*
STD	SEWRD	36650			1.752	1.764	1.715	*
STD	SEWRD	39820						
STD	SEWRD	39950						
STD	SEWRD	40310						
STD	SEWRD	40660	39478	1614.5185	0.732	1.764	1.715	-
STD	SEWRD	20450			1.448	1.764	1.715	-
STD	SEWRD	27860						
STD	SEWRD	29750						
STD	SEWRD	30280						
STD	SEWRD	37110	29090	5965.2033	1.344	1.764	1.715	-
C1	SEWRC1	37930			1.112	1.764	1.715	-
C1	SEWRC1	38130						
C1	SEWRC1	38820						
C1	SEWRC1	38830						
C1	SEWRC1	39580	38658	654.72895	1.408	1.764	1.715	-
C2	SEWRC2	39650			0.818	1.764	1.715	-
C2	SEWRC2	39690						
C2	SEWRC2	39970						
C2	SEWRC2	40710						
C2	SEWRC2	41550	40314	811.34456	1.523	1.764	1.715	-
L1	SEWRL1	30204			1.724	1.764	1.715	*
L1	SEWRL1	33309						
L1	SEWRL1	33336						
L1	SEWRL1	34164						
L1	SEWRL1	34236	33049.8	1650.4685	0.719	1.764	1.715	-
L2	SEWRL2	45837			1.017	1.764	1.715	-
L2	SEWRL2	46948						
L2	SEWRL2	47916						
L2	SEWRL2	48070						
L2	SEWRL2	51766	48107.4	2231.7208	1.639	1.764	1.715	-
T1	SEWRT1	18040			1.360	1.764	1.715	-
T1	SEWRT1	21780						
T1	SEWRT1	30420						
T1	SEWRT1	30870						
T1	SEWRT1	32210	26664	6340.0103	0.875	1.764	1.715	-
T2	SEWRT2	24440			1.688	1.764	1.715	-
T2	SEWRT2	34080						
T2	SEWRT2	36420						
T2	SEWRT2	36420						
T2	SEWRT2	39440	34160	5757.1347	0.917	1.764	1.715	-
A1	SEWRA1	25950			1.035	1.764	1.715	-
A1	SEWRA1	28560						
A1	SEWRA1	30670						
A1	SEWRA1	33030						
A1	SEWRA1	40740	31790	5644.3113	1.586	1.764	1.715	-
A2	SEWRA2	27590			1.365	1.764	1.715	-
A2	SEWRA2	29870						
A2	SEWRA2	30930						
A2	SEWRA2	31850						
A2	SEWRA2	34080	30864	2399.2874	1.340	1.764	1.715	-
F1	SEWRF1	21200			1.667	1.764	1.715	-
F1	SEWRF1	27530						
F1	SEWRF1	27870						
F1	SEWRF1	28750						
F1	SEWRF1	30920	27254	3632.634	1.009	1.764	1.715	-
F2	SEWRF2	19650			1.374	1.764	1.715	-
F2	SEWRF2	22930						
F2	SEWRF2	28550						
F2	SEWRF2	29560						
F2	SEWRF2	31360	26410	4919.6697	1.006	1.764	1.715	-

prEN 12457 - 2 Boron
SEW



Regression Summary for Dependent Variable: B
R= ,81279230 R²= ,66063133 Adjusted R²= ,59275759
F(4,20)=9,7332 p<,00015 Std.Error of estimate: ,74825

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			5.892	0.335	17.608	0.000
C1	-0.020	0.165	-0.058	0.473	-0.122	0.904
C2	-0.124	0.165	-0.355	0.473	-0.750	0.462
L1	-0.702	0.165	-2.015	0.473	-4.258	0.000
L2	0.288	0.165	0.826	0.473	1.746	0.096

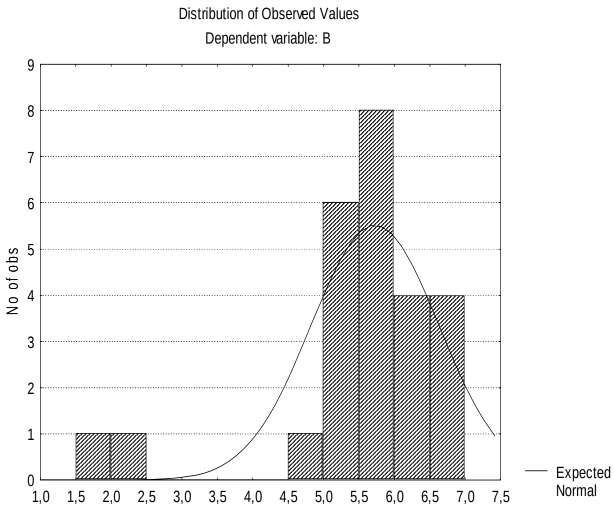
Regression Summary for Dependent Variable: B
R= ,93717933 R²= ,87830509 Adjusted R²= ,85396611
F(4,20)=36,086 p<,00000 Std.Error of estimate: ,52564

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			5.513	0.235	23.452	0.000
T1	-0.226	0.099	-0.760	0.332	-2.286	0.033
T2	0.848	0.099	2.857	0.332	8.593	0.000
F1	0.062	0.099	0.208	0.332	0.625	0.539
F2	-0.069	0.099	-0.233	0.332	-0.700	0.492

Regression Summary for Dependent Variable: B
R= ,29047212 R²= ,08437405 Adjusted R²= -----
F(2,12)=,55289 p<,58926 Std.Error of estimate: ,27687

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			6.377	0.124	51.506	0.000
A1	0.126	0.319	0.069	0.175	0.394	0.701
A2	0.332	0.319	0.182	0.175	1.041	0.318

Boron


Distribution of Observed Values
Dependent variable: B
No of obs
0
1
2
3
4
5
6
7
8
9
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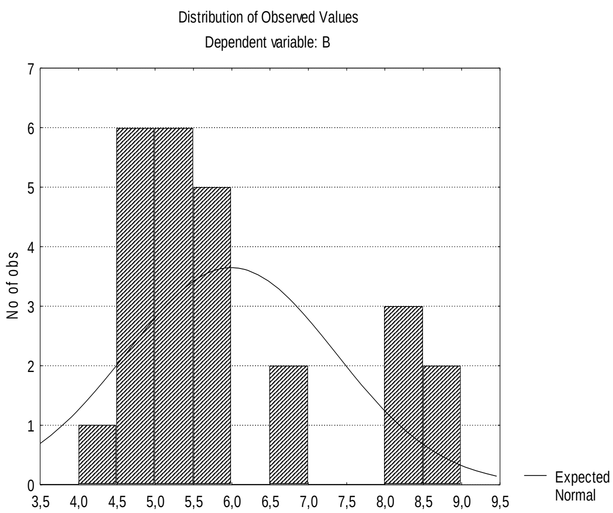
1,5
2,0
2,5
3,0
3,5
4,0
4,5
5,0
5,5
6,0
6,5
7,0
7,5
Expected Normal


Distribution of Observed Values
Dependent variable: B
No of obs
0
1
2
3
4
5
6
7
3,5
4,0
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6,0
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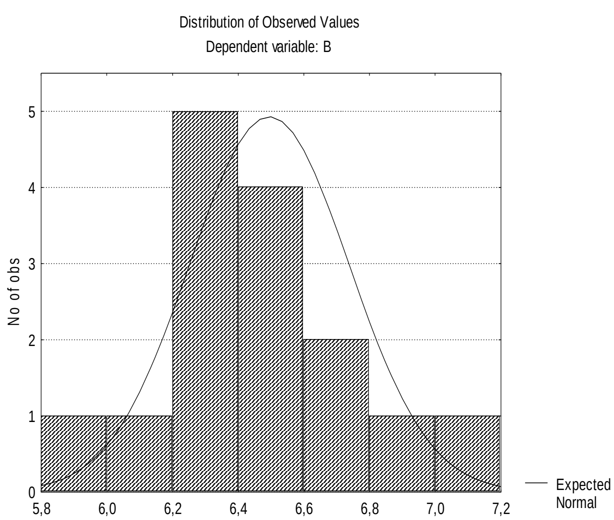
9,5
Expected Normal


Distribution of Observed Values
Dependent variable: B
No of obs
0
1
2
3
4
5
5,8
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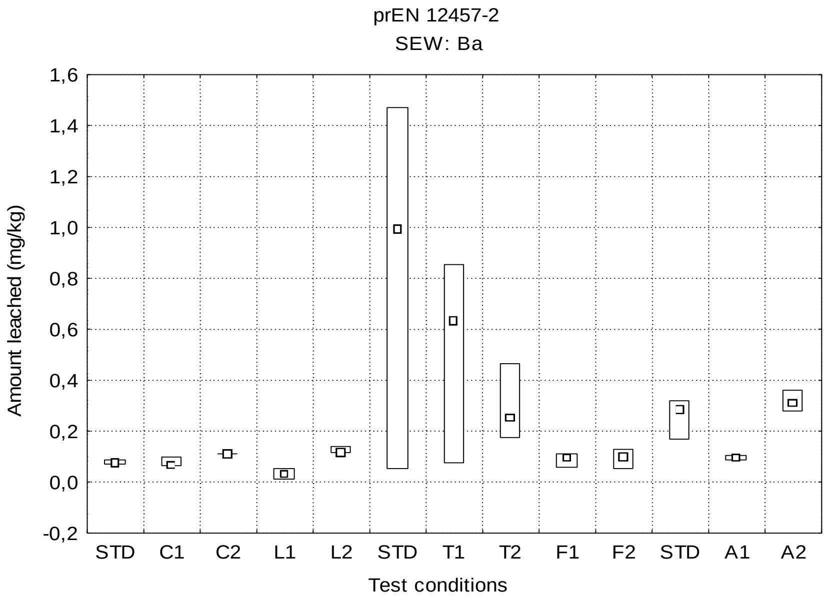
6,2
6,4
6,6
6,8
7,0
7,2
Expected Normal

prEN 12457 - 2 **Barium**
SEW



Regression Summary for Dependent Variable: BA
R= ,91503406 R²= ,83728733 Adjusted R²= ,80112895
F(4,18)=23,156 p<,00000 Std.Error of estimate: ,01504

	BETA	St. Err. of BETA	B	St. Err. of B	t(18)	p-level
Intercpt			0.0767	0.0067	11.3992	0.000
C1	-0.064	0.119	-0.0051	0.0095	-0.5361	0.598
C2	0.370	0.116	0.0322	0.0101	3.19073	0.005
L1	-0.541	0.116	-0.0471	0.0101	-4.665	0.000
L2	0.514	0.119	0.0411	0.0095	4.321	0.000

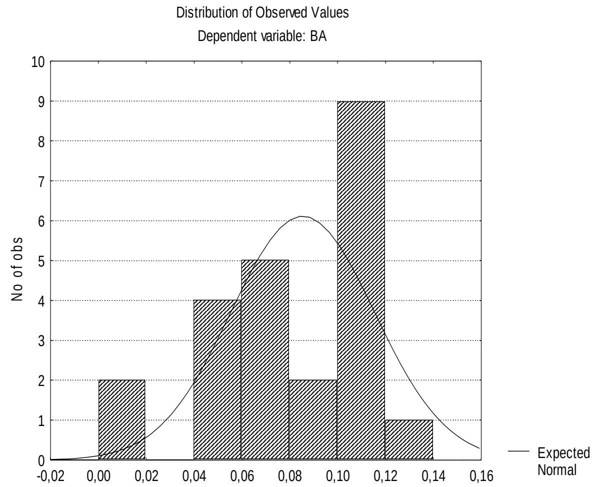
Regression Summary for Dependent Variable: BA
R= ,66103238 R²= ,43696381 Adjusted R²= ,32435657
F(4,20)=3,8804 p<,01719 Std.Error of estimate: ,34251

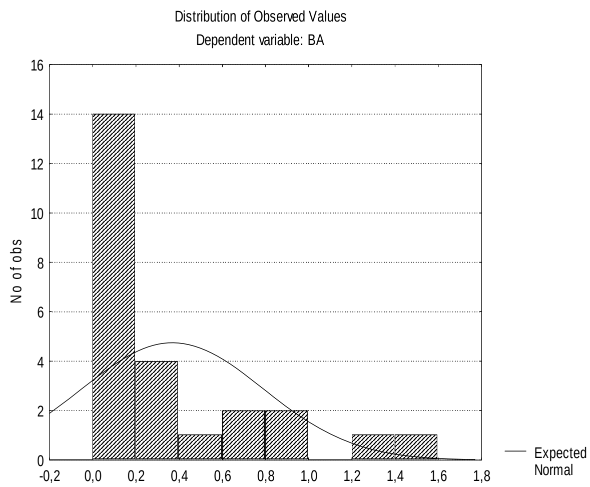
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			0.787	0.153	5.137	0.000
T1	-0.247	0.212	-0.252	0.217	-1.166	0.258
T2	-0.491	0.212	-0.501	0.217	-2.311	0.032
F1	-0.684	0.212	-0.698	0.217	-3.224	0.004
F2	-0.682	0.212	-0.696	0.217	-3.213	0.004

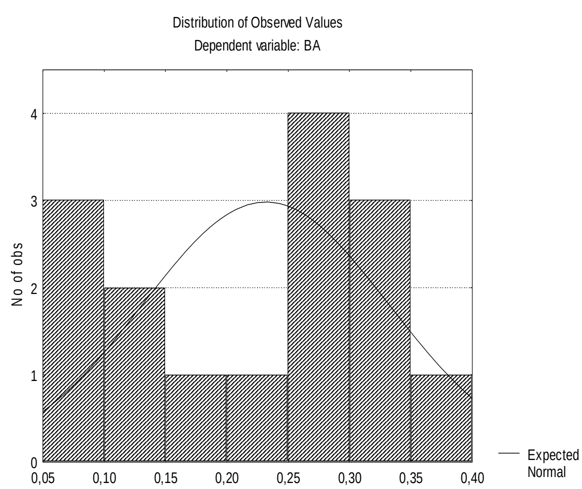
Regression Summary for Dependent Variable: BA
R= ,92612113 R²= ,85770035 Adjusted R²= ,83398374
F(2,12)=36,165 p<,00001 Std.Error of estimate: ,04235

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			0.257	0.019	13.5642	0.000
A1	-0.762116	0.12574	-0.162	0.027	-6.06094	0.000
A2	0.268623	0.12574	0.057	0.027	2.1363	0.054

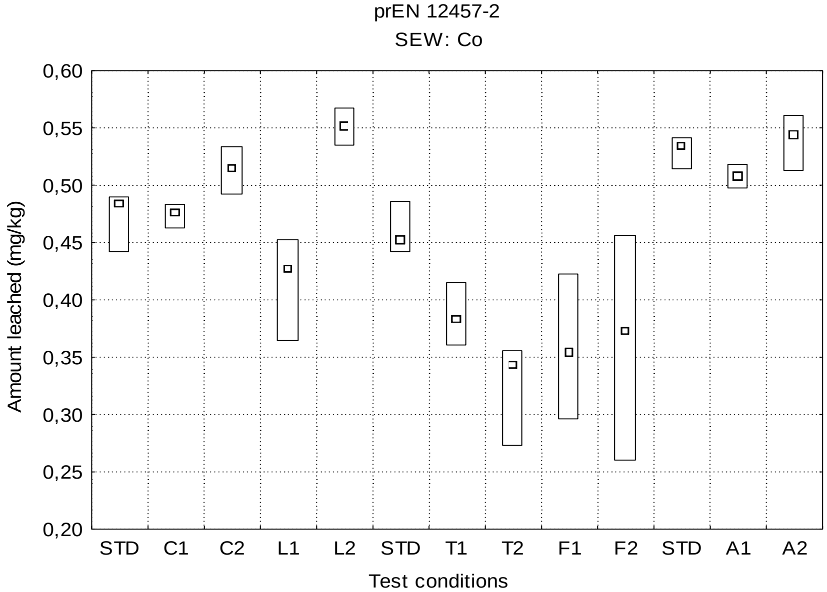
prEN 12457 - 2 **Barium**
SEW







prEN 12457 - 2
SEW



Regression Summary for Dependent Variable: CO
R= ,92812807 R²= ,86142172 Adjusted R²= ,83370607
F(4,20)=31,081 p<,00000 Std.Error of estimate: ,02005

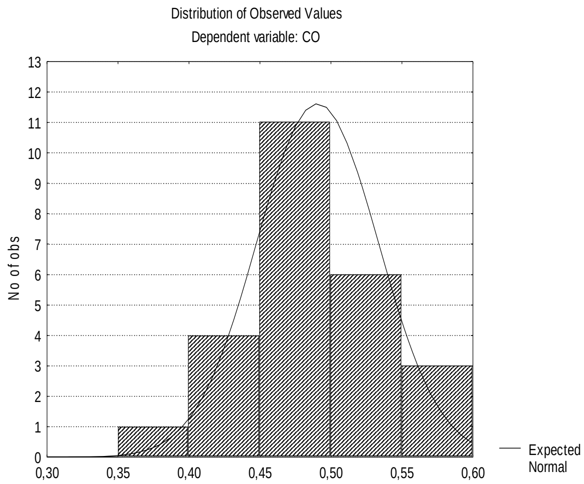
	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(20)**	**p-level**
Intercpt			0.4731	0.0090	52.7599	6E-23
C1	-0.001	0.105	-0.0001	0.0127	-0.00789	0.994
C2	0.348	0.105	0.0419	0.0127	3.30408	0.004
L1	-0.466	0.105	-0.0562	0.0127	-4.429	0.000
L2	0.636	0.105	0.0765	0.0127	6.036	0.000

Regression Summary for Dependent Variable: CO
R= ,72083226 R²= ,51959914 Adjusted R²= ,42351897
F(4,20)=5,4080 p<,00406 Std.Error of estimate: ,04632

	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(20)**	**p-level**
Intercpt			0.455	0.021	21.974	0.000
T1	-0.465	0.196	-0.070	0.029	-2.372	0.028
T2	-0.834	0.196	-0.125	0.029	-4.256	0.000
F1	-0.617	0.196	-0.092	0.029	-3.150	0.005
F2	-0.704	0.196	-0.105	0.029	-3.593	0.002

Regression Summary for Dependent Variable: CO
R= ,76566555 R²= ,58624373 Adjusted R²= ,51728436
F(2,12)=8,5013 p<,00502 Std.Error of estimate: ,01327

	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(12)**	p-level
Intercpt			0.530	0.006	89.340	3E-18
A1	-0.599	0.214	-0.023	0.008	-2.792	0.0163
A2	0.264	0.214	0.010	0.008	1.232	0.2414


Distribution of Observed Values
Dependent variable: CO
No of obs
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2
3
4
5
6
7
8
9
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11
12
13
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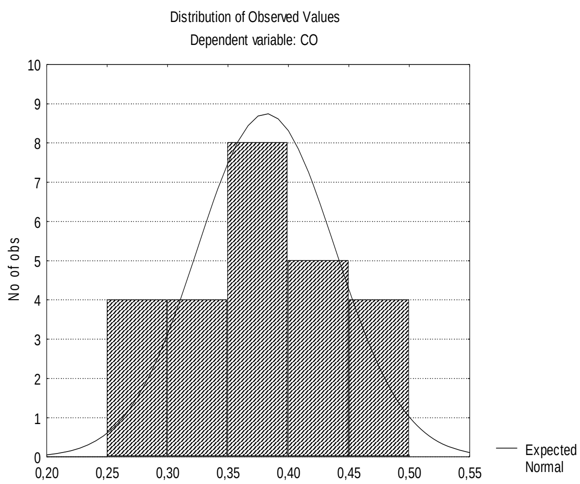
0,35
0,40
0,45
0,50
0,55
0,60
Expected
Normal


Distribution of Observed Values
Dependent variable: CO
No of obs
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1
2
3
4
5
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Expected
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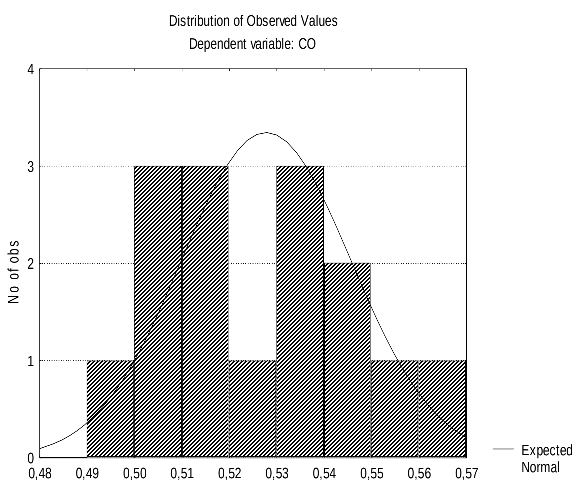
Distribution of Observed Values
Dependent variable: CO
No of obs
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3
4
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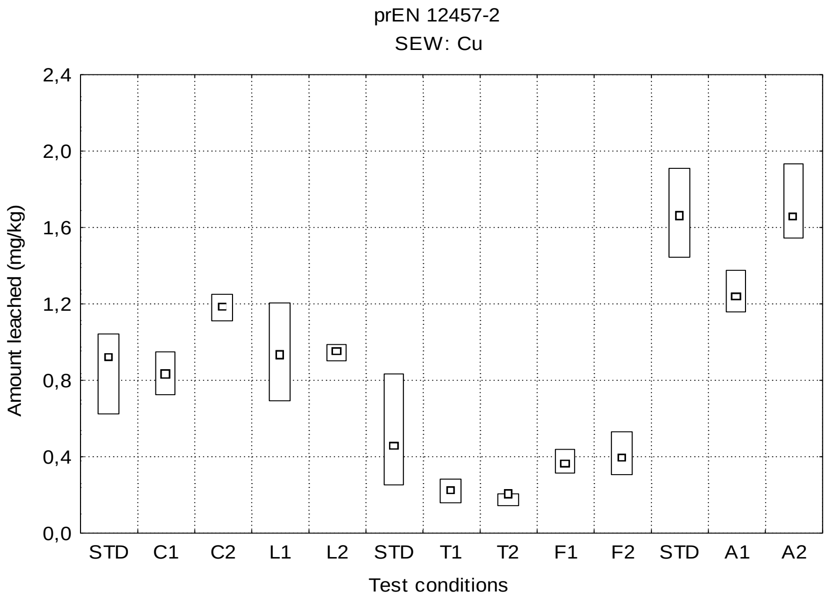
0,53
0,54
0,55
0,56
0,57
Expected
Normal

prEN 12457 - 2 **Copper**
SEW



;ummary for Dependent Variable: CU
R²= ,51401295 Adjusted R²= ,41681554
3 p<,00451 Std.Error of estimate: ,12990

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			0.895	0.058	15.399	0.000
C1	-0.127	0.197	-0.053	0.082	-0.642	0.528
C2	0.711	0.197	0.296	0.082	3.608	0.002
L1	0.183	0.197	0.076052	0.082	0.926	0.366
L2	0.1319668	0.197	0.055	0.082	0.669	0.511

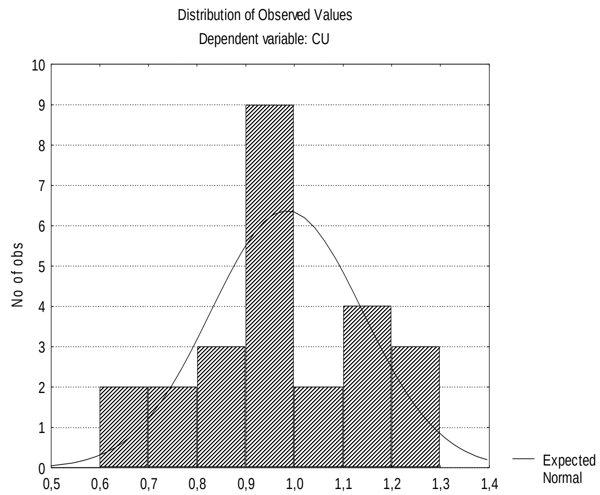
Regression Summary for Dependent Variable: CU
R= ,73787271 R²= ,54445613 Adjusted R²= ,44855216
F(4,19)=5,6771 p<,00352 Std.Error of estimate: ,12682

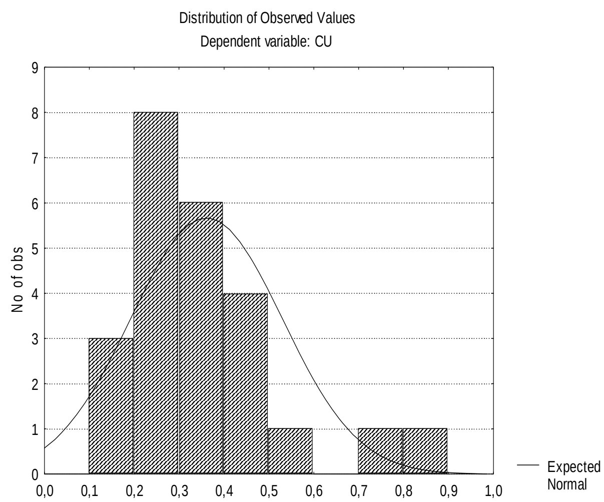
	BETA	St. Err. of BETA	B	St. Err. of B	t(19)	p-level
Intercpt			0.537	0.057	9.461	0.00
T1	-0.778	0.195	-0.320	0.080	-3.992	0.00
T2	-0.743	0.190	-0.333	0.085	-3.919	0.00
F1	-0.393	0.195	-0.162	0.080	-2.017	0.06
F2	-0.331	0.195	-0.136	0.080	-1.698	0.11

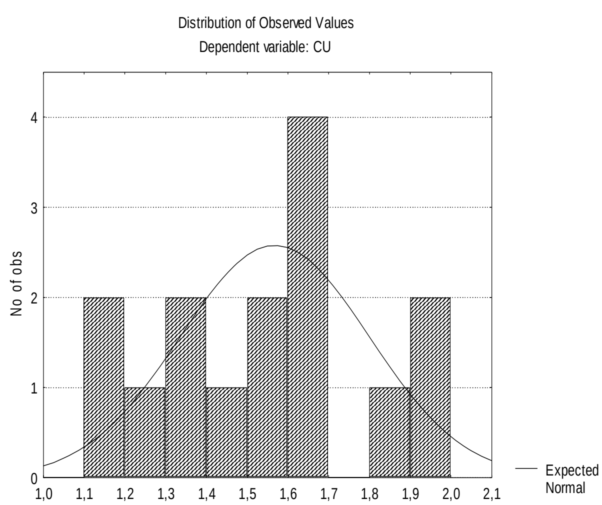
Regression Summary for Dependent Variable: CU
R= ,82544665 R²= ,68136218 Adjusted R²= ,62825587
F(2,12)=12,830 p<,00105 Std.Error of estimate: ,15121

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			1.67054	0.068	24.703	0.000
A1	-0.806583	0.18816	-0.40996	0.096	-4.287	0.001
A2	0.0365162	0.18816	0.01856	0.096	0.194	0.849

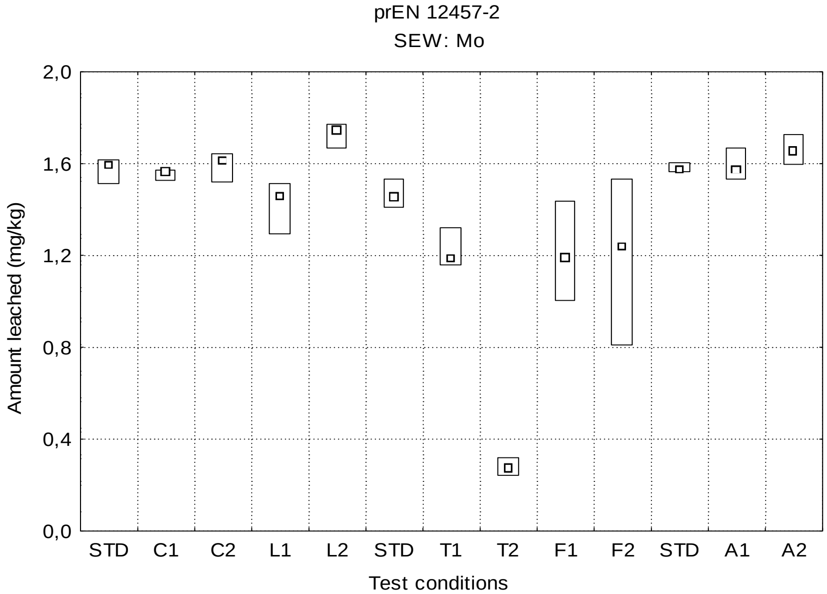
prEN 12457 - 2 **Copper**
SEW







prEN 12457 - 2 **Molybdenum**
SEW



Regression Summary for Dependent Variable: MO
R= ,88966437 R²= ,79150270 Adjusted R²= ,74980324
F(4,20)=18,981 p<,00000 Std.Error of estimate: ,05581

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			1.57632	0.02496	63.1529	2E-24
C1	-0.086492	0.12915	-0.02364	0.0353	-0.6697	0.511
C2	0.0646861	0.12915	0.01768	0.0353	0.50086	0.622
L1	-0.567314	0.12915	-0.155	0.035	-4.393	0.000
L2	0.548	0.129	0.150	0.035	4.241	0.000

Regression Summary for Dependent Variable: MO
R= ,94565109 R²= ,89425598 Adjusted R²= ,87310718
F(4,20)=42,284 p<,00000 Std.Error of estimate: ,15771

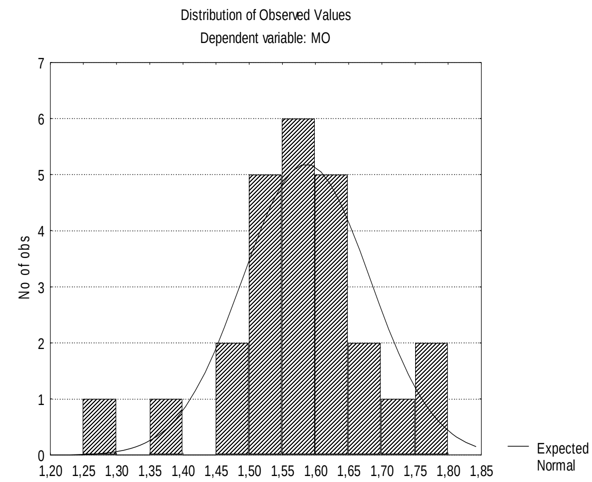
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			1.465	0.071	20.770	0.000
T1	-0.234	0.092	-0.254	0.100	-2.543	0.019
T2	-1.098	0.092	-1.190	0.100	-11.935	0.000
F1	-0.217	0.092	-0.236	0.100	-2.363	0.028
F2	-0.285	0.092	-0.310	0.100	-3.104	0.006

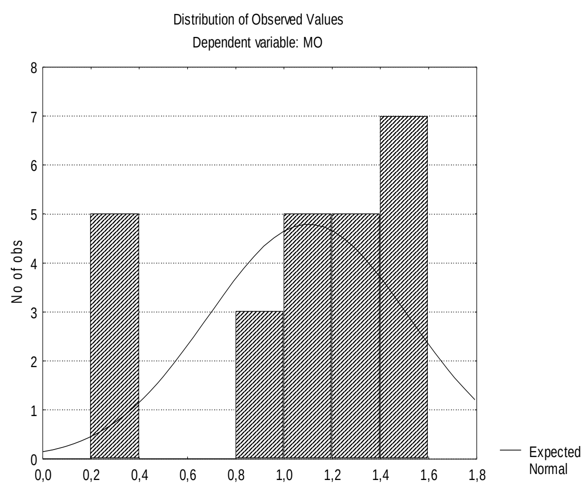
Regression Summary for Dependent Variable: MO
R= ,62016361 R²= ,38460290 Adjusted R²= ,28203672
F(2,12)=3,7498 p<,05432 Std.Error of estimate: ,04637

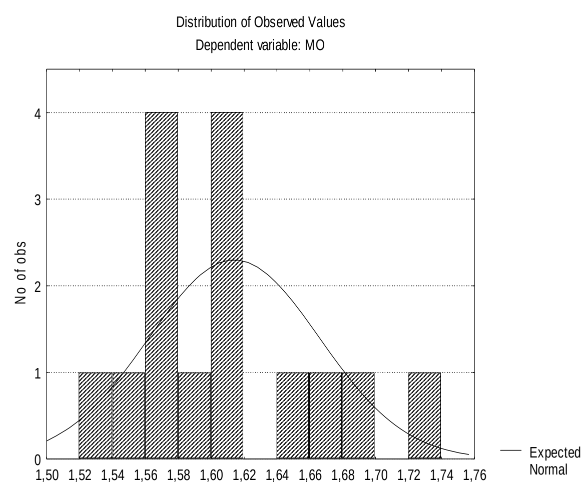
	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			1.580	0.021	76.188	0.000
A1	0.100	0.261	0.011	0.029	0.381	0.710
A2	0.664	0.261	0.074	0.029	2.539	0.026

prEN 12457 - 2 SEW

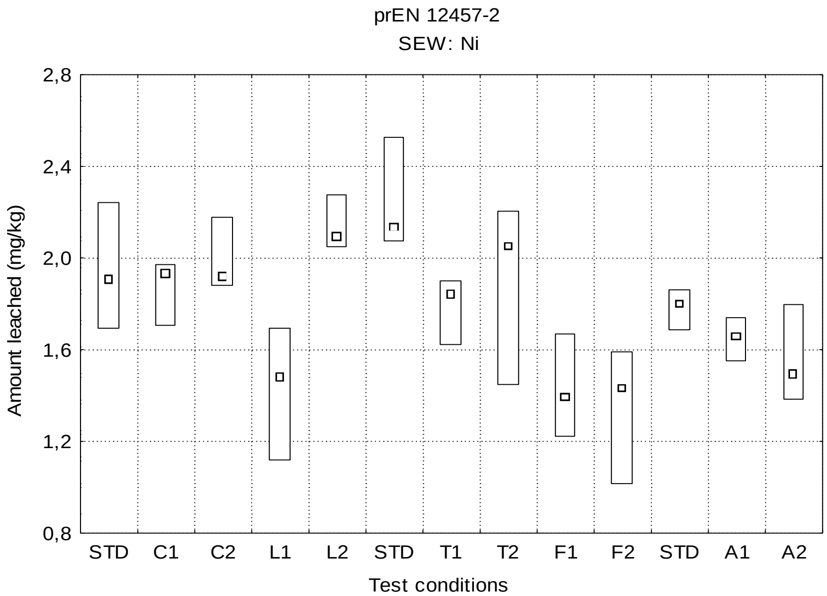
Molybdenum







prEN 12457 - 2 **Nickel**
SEW



Regression Summary for Dependent Variable: NI
R= ,82409214 R²= ,67912785 Adjusted R²= ,61495343
F(4,20)=10,583 p<,00009 Std.Error of estimate: ,16617

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			1.910	0.074	25.704	0.000
C1	-0.026801	0.16022	-0.018	0.105	-0.167	0.869
C2	0.0819281	0.16022	0.054	0.105	0.511	0.615
L1	-0.666413	0.16022	-0.437	0.105	-4.159	0.00
L2	0.328	0.160	0.215	0.105	2.049	0.05

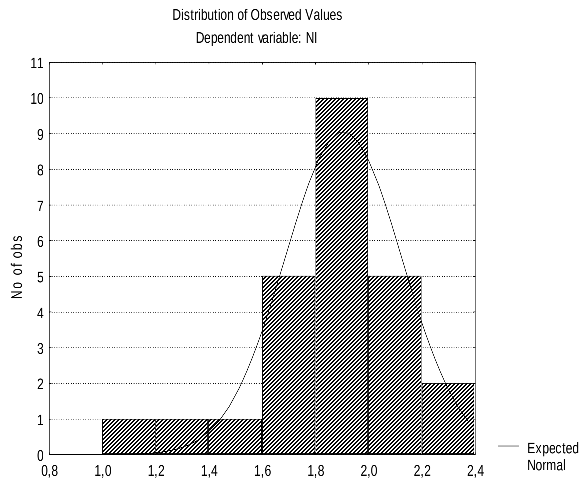
Regression Summary for Dependent Variable: NI
R= ,86285780 R²= ,74452359 Adjusted R²= ,69342831
F(4,20)=14,571 p<,00001 Std.Error of estimate: ,20901

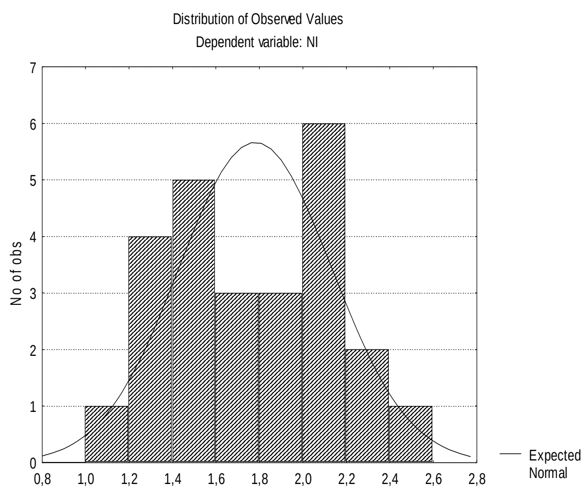
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			2.219	0.093	23.739	0.00
T1	-0.478	0.143	-0.442	0.132	-3.346	0.00
T2	-0.285	0.143	-0.263	0.132	-1.992	0.06
F1	-0.855	0.143	-0.790	0.132	-5.979	0.00
F2	-0.916	0.143	-0.847	0.132	-6.408	0.00

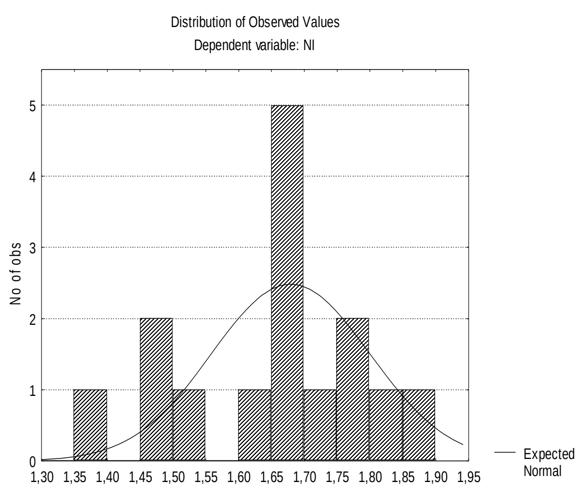
Regression Summary for Dependent Variable: NI
R= ,63488142 R²= ,40307442 Adjusted R²= ,30358682
F(2,12)=4,0515 p<,04524 Std.Error of estimate: ,11650

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			1.770	0.052	33.982	0.000
A1	-0.44013	0.25754	-0.126	0.074	-1.709	0.113
A2	-0.727794	0.25754	-0.208	0.074	-2.826	0.015

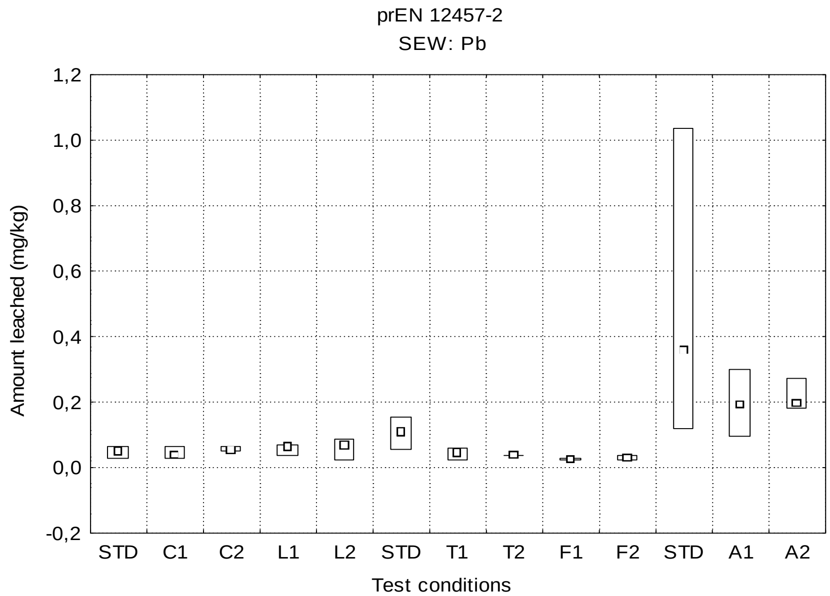
prEN 12457 - 2 **Nickel**
SEW







prEN 12457 - 2 **lead**
SEW



Regression Summary for Dependent Variable: PB
R= ,44219539 R²= ,19553676 Adjusted R²= ,03464411
F(4,20)=1,2153 p<,33549 Std.Error of estimate: ,01703

	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(20)**	**p-level**
Intercpt			0.048	0.008	6.274	0.000
C1	-0.141	0.254	-0.006	0.011	-0.557	0.584
C2	0.118	0.254	0.005	0.011	0.464	0.647
L1	0.223	0.254	0.009	0.011	0.878	0.390
L2	0.372	0.254	0.016	0.011	1.465	0.158

Regression Summary for Dependent Variable: PB
R= ,77637651 R²= ,60276048 Adjusted R²= ,48053293
F(4,13)=4,9315 p<,01218 Std.Error of estimate: ,02876

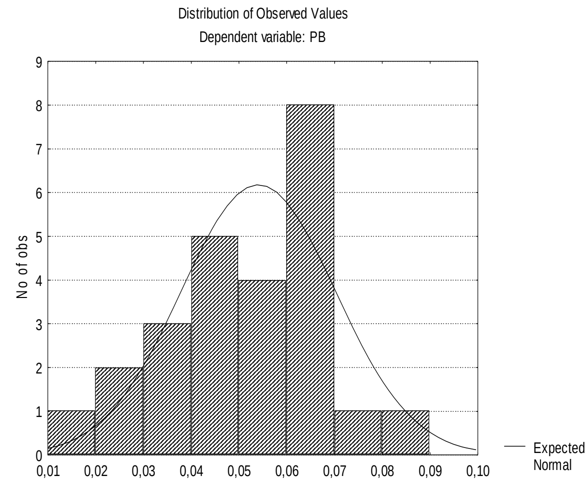
	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(13)**	**p-level**
Intercpt			0.099	0.013	7.693	0.00
T1	-0.616	0.207	-0.057	0.019	-2.980	0.01
T2	-0.612	0.202	-0.064	0.021	-3.033	0.01
F1	-0.721	0.202	-0.075	0.021	-3.570	0.00
F2	-0.677	0.202	-0.070	0.021	-3.355	0.01

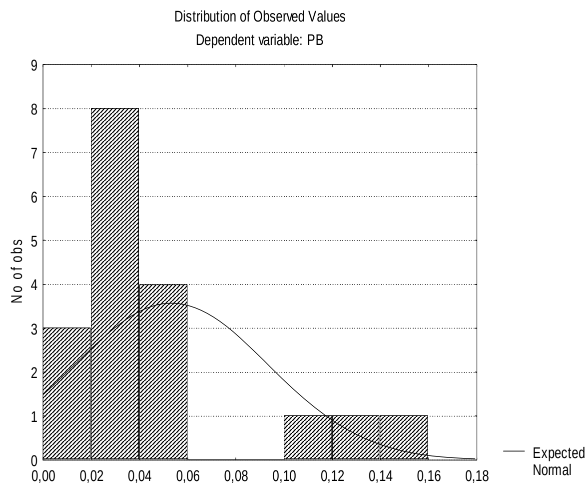
Regression Summary for Dependent Variable: PB
R= ,52129388 R²= ,27174731 Adjusted R²= ,15037186
F(2,12)=2,2389 p<,14917 Std.Error of estimate: ,20663

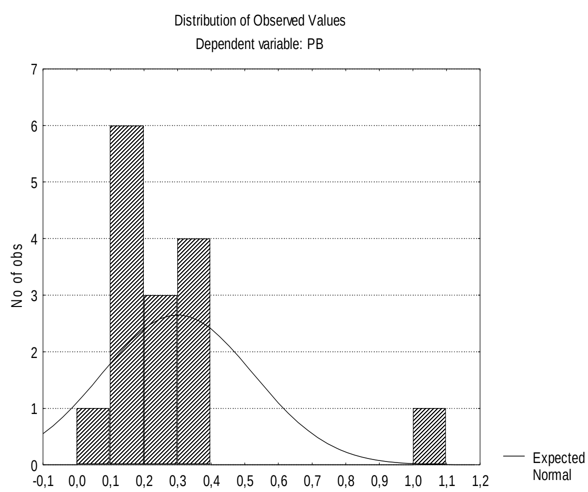
	BETA	**St. Err. of BETA**	**B**	**St. Err. of B**	**t(12)**	p-level
Intercpt			0.446	0.092	4.822	0.000
A1	-0.529	0.284	-0.243	0.131	-1.860	0.088
A2	-0.513	0.284	-0.236	0.131	-1.803	0.096

prEN 12457 - 2 SEW

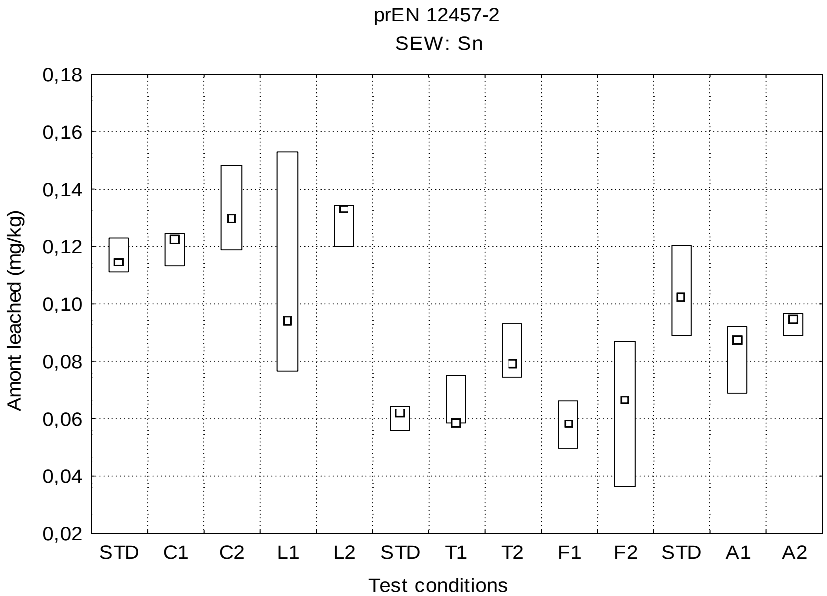
Lead







prEN 12457 - 2 **Tin**
SEW



Regression Summary for Dependent Variable: SN
R= ,55145619 R²= ,30410393 Adjusted R²= ,16492471
F(4,20)=2,1850 p<,10763 Std.Error of estimate: ,01540

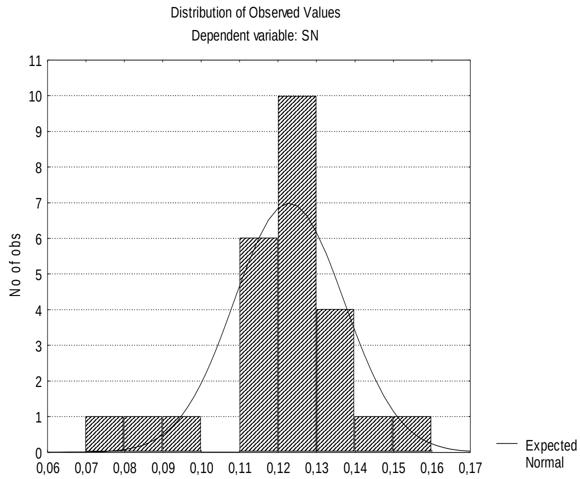
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			0.116	0.007	16.833	0.000
C1	0.117	0.236	0.005	0.010	0.497	0.625
C2	0.381	0.236	0.016	0.010	1.616	0.122
L1	-0.220	0.236	-0.009	0.010	-0.932	0.363
L2	0.333	0.236	0.014	0.010	1.409	0.174

Regression Summary for Dependent Variable: SN
R= ,64407939 R²= ,41483826 Adjusted R²= ,29780592
F(4,20)=3,5446 p<,02423 Std.Error of estimate: ,01030

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			0.060	0.005	13.076	0.00
T1	0.078	0.216	0.002	0.007	0.362	0.72
T2	0.669	0.216	0.020	0.007	3.094	0.01
F1	-0.042	0.216	-0.001	0.007	-0.193	0.85
F2	0.155	0.216	0.005	0.007	0.715	0.48

Regression Summary for Dependent Variable: SN
R= ,68248767 R²= ,46578941 Adjusted R²= ,37675432
F(2,12)=5,2315 p<,02324 Std.Error of estimate: ,00908

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			0.102	0.004	25.197	0.000
A1	-0.788	0.244	-0.019	0.006	-3.235	0.007
A2	-0.394	0.244	-0.009	0.006	-1.616	0.132


Distribution of Observed Values
Dependent variable: SN
No of obs
0 1 2 3 4 5 6 7 8 9 10 11
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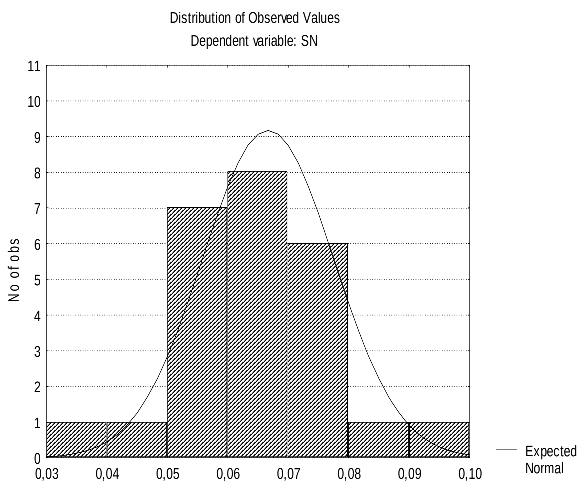
Expected Normal


Distribution of Observed Values
Dependent variable: SN
No of obs
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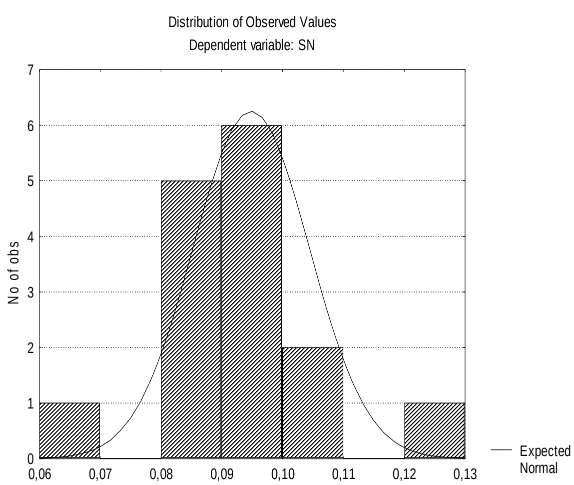
0,03 0,04 0,05 0,06 0,07 0,08 0,09 0,10
Expected Normal


Distribution of Observed Values
Dependent variable: SN
No of obs
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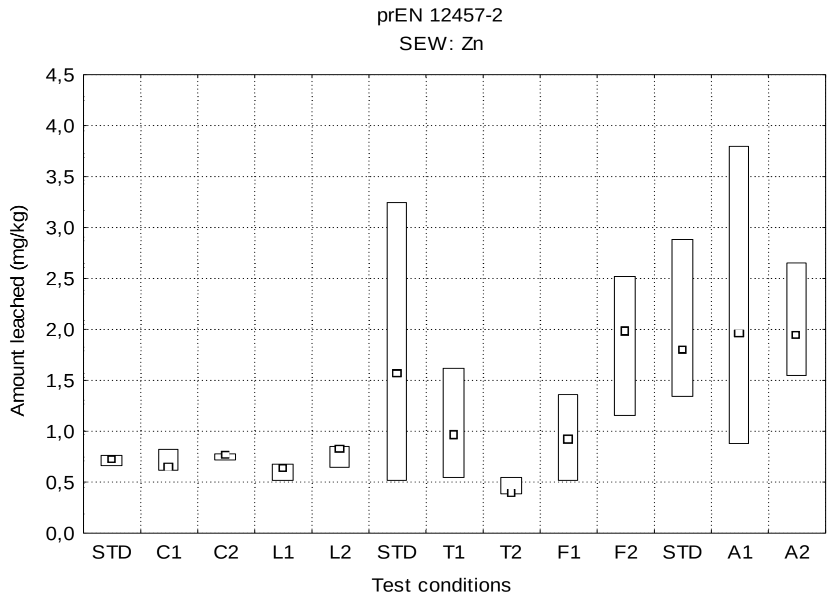
0,06 0,07 0,08 0,09 0,10 0,11 0,12 0,13
Expected Normal

prEN 12457 - 2 SEW

Zinc



Regression Summary for Dependent Variable: ZN
R= ,70253989 R²= ,49356230 Adjusted R²= ,39227476
F(4,20)=4,8729 p<,00659 Std.Error of estimate: ,06871

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			0.708	0.031	23.039	0.000
C1	-0.161	0.201	-0.035	0.043	-0.800	0.433
C2	0.231	0.201	0.050	0.043	1.149	0.264
L1	-0.439	0.201	-0.095	0.043	-2.180	0.041
L2	0.351	0.201	0.076	0.043	1.742	0.097

Regression Summary for Dependent Variable: ZN
R= ,72584410 R²= ,52684966 Adjusted R²= ,43221959
F(4,20)=5,5675 p<,00352 Std.Error of estimate: ,61933

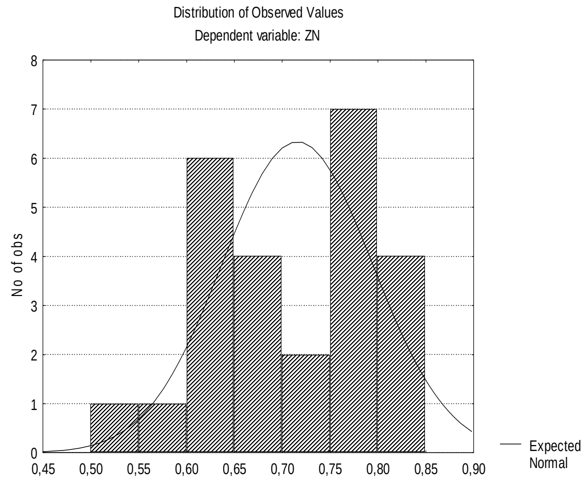
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			1.886	0.277	6.811	0.000
T1	-0.451	0.195	-0.908	0.392	-2.319	0.031
T2	-0.719	0.195	-1.448	0.392	-3.697	0.001
F1	-0.464	0.195	-0.934	0.392	-2.386	0.027
F2	0.029	0.195	0.058	0.392	0.148	0.884

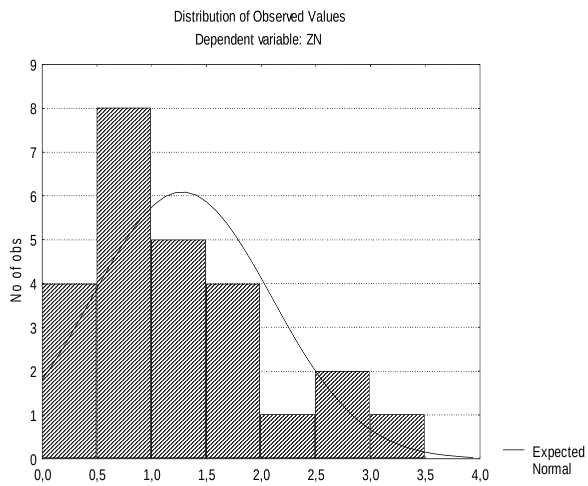
Regression Summary for Dependent Variable: ZN
R= ,08800638 R²= ,00774512 Adjusted R²= -----
F(2,12)=,04683 p<,95442 Std.Error of estimate: ,81518

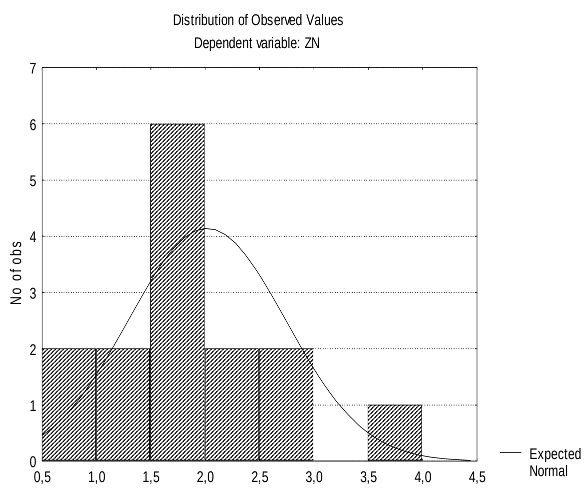
	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			1.855	0.365	5.089	0.000
A1	0.0628	0.3320	0.098	0.516	0.189	0.853
A2	0.1006	0.3320	0.156	0.516	0.303	0.767

prEN 12457 - 2 SEW

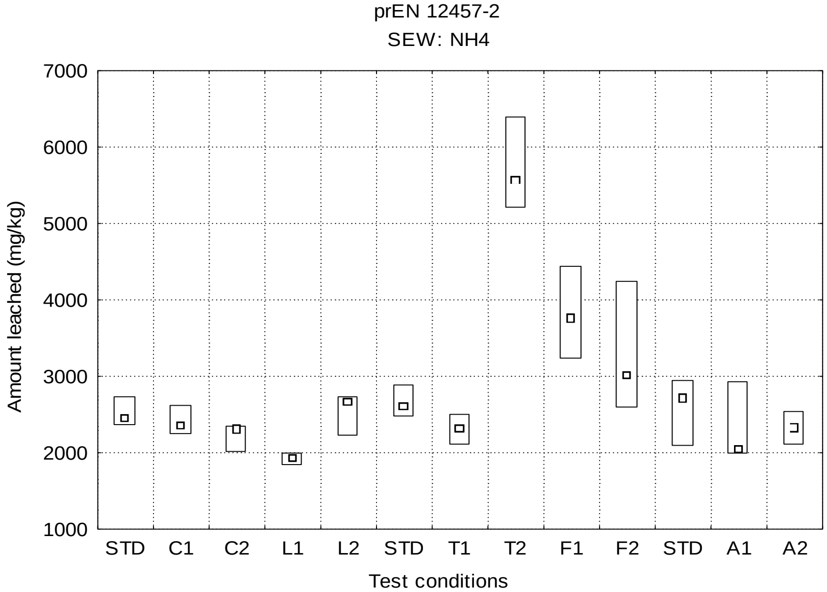
Zinc







prEN 12457 - 2 **Amonium**
SEW



Regression Summary for Dependent Variable: NH4
R= ,85325696 R²= ,72804745 Adjusted R²= ,67365693
F(4,20)=13,386 p<,00002 Std.Error of estimate: 163,71

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			2490	73	34.0096	4E-19
C1	**-0.108266**	**0.1475**	-76	104	-0.73401	0.471
C2	**-0.41597**	**0.1475**	-292	104	-2.82014	0.011
L1	-0.821398	0.1475	-577	104	-5.569	0.000
L2	0.132	0.147	93	104	0.896	0.381

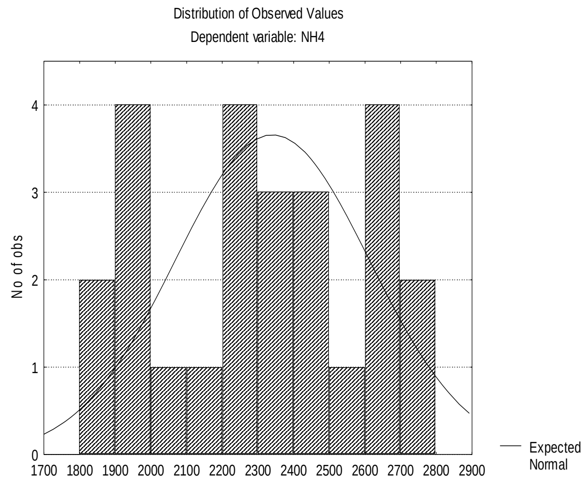
Regression Summary for Dependent Variable: NH4
R= ,95149024 R²= ,90533368 Adjusted R²= ,88640041
F(4,20)=47,817 p<,00000 Std.Error of estimate: 423,22

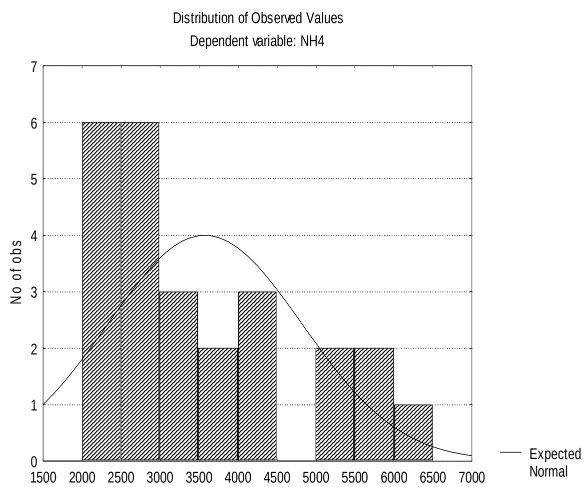
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			2619	189	13.837	0.000
T1	-0.107	0.087	-328	268	-1.224	0.235
T2	0.970	0.087	2985	268	11.152	0.000
F1	0.397	0.087	1221	268	4.562	0.000
F2	0.198	0.087	609	268	2.276	0.034

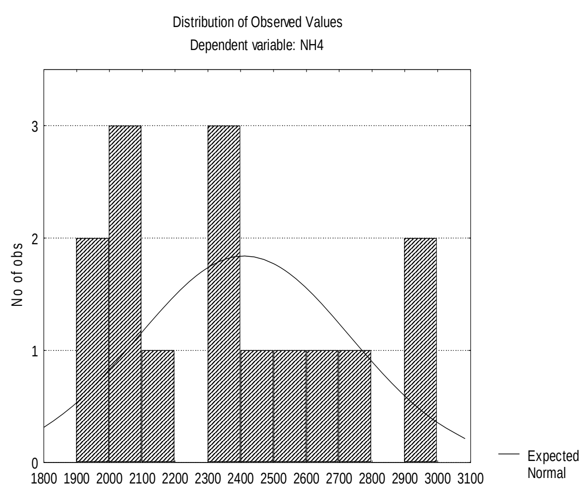
Regression Summary for Dependent Variable: NH4
R= ,39674482 R²= ,15740645 Adjusted R²= ,01697419
F(2,12)=1,1209 p<,35786 Std.Error of estimate: 329,67

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			2562	147	17.3773	7E-10
A1	-0.407963	0.30598	-278	209	-1.33332	0.207
A2	-0.384483	0.30598	-262	209	-1.25658	0.233

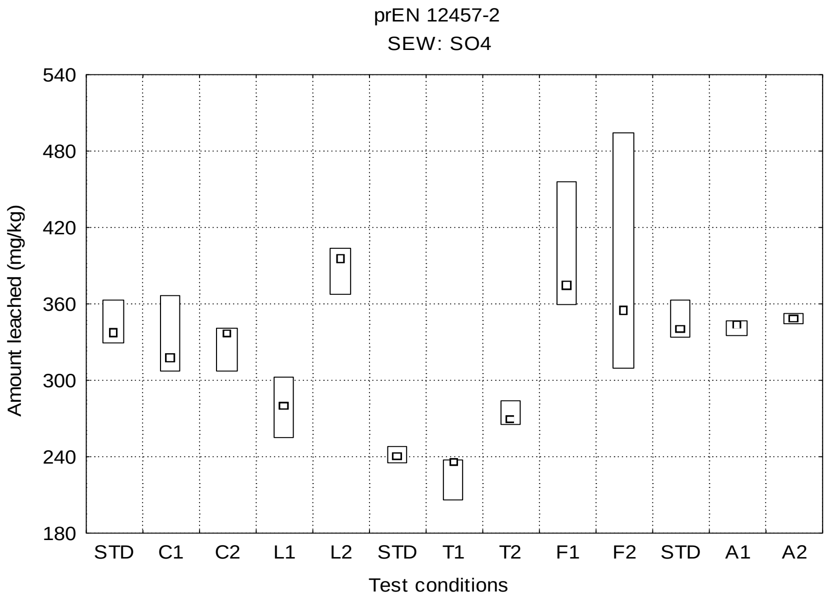
prEN 12457 - 2 **Amonium**
SEW







prEN 12457 - 2 **Sulfate**
SEW



Regression Summary for Dependent Variable: SO4
R= ,90963052 R²= ,82742769 Adjusted R²= ,79291323
F(4,20)=23,973 p<,00000 Std.Error of estimate: 17,692

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			340.400	8	43.023	0.000
C1	-0.170114	0.1175	-16.200	11	-1.448	0.163
C2	-0.098708	0.1175	-9.400	11	-0.840	0.411
L1	-0.639084	0.1175	-61	11	-5.44	0.00
L2	0.498	0.117	47	11	4.24	0.00

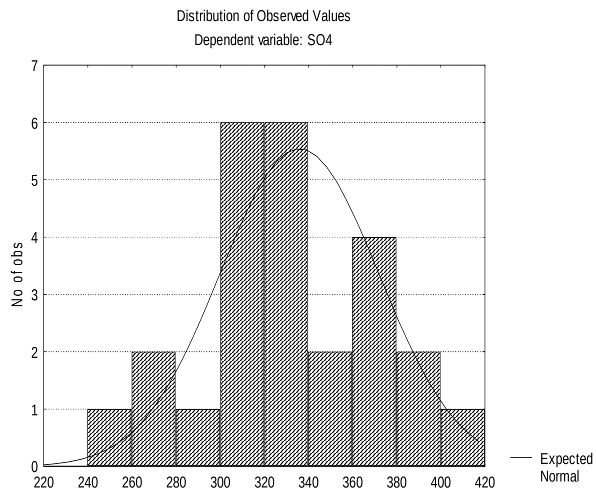
Regression Summary for Dependent Variable: SO4
R= ,89533413 R²= ,80162321 Adjusted R²= ,76194785
F(4,20)=20,205 p<,00000 Std.Error of estimate: 39,387

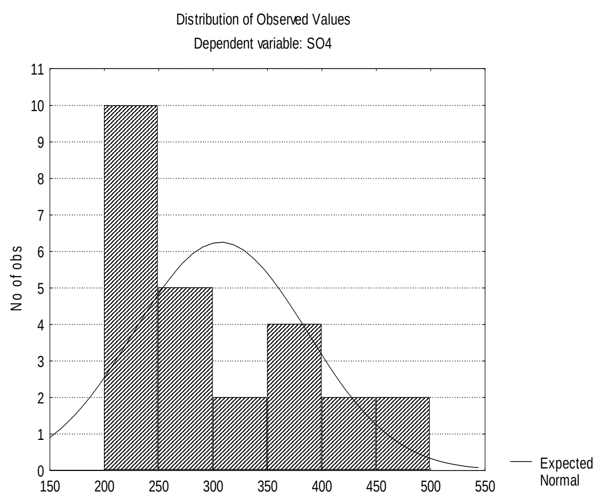
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			240	18	13.63	0.000
T1	-0.070	0.126	-14	25	-0.55	0.586
T2	0.167	0.126	33	25	1.32	0.200
F1	0.765	0.126	151	25	6.07	0.000
F2	0.727	0.126	144	25	5.77	0.000

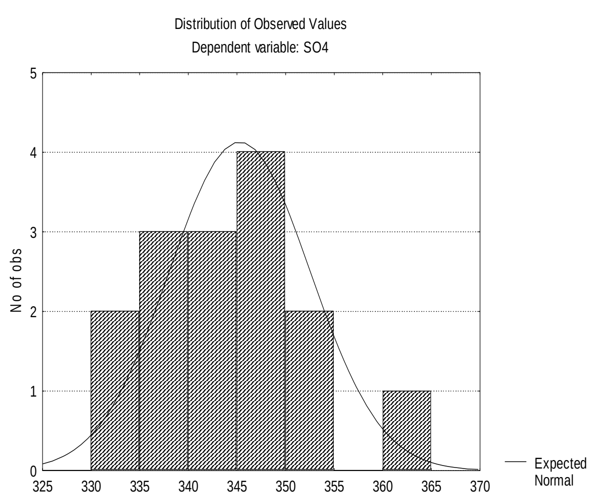
Regression Summary for Dependent Variable: SO4
R= ,34162031 R²= ,11670444 Adjusted R²= -----
F(2,12)=,79274 p<,47494 Std.Error of estimate: 7,7867

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			344.4	3.482	98.8991	8E-19
A1	-0.190839	0.31328	-3	4.925	-0.60917	0.554
A2	0.2035617	0.31328	3.2	4.925	0.64978	0.528

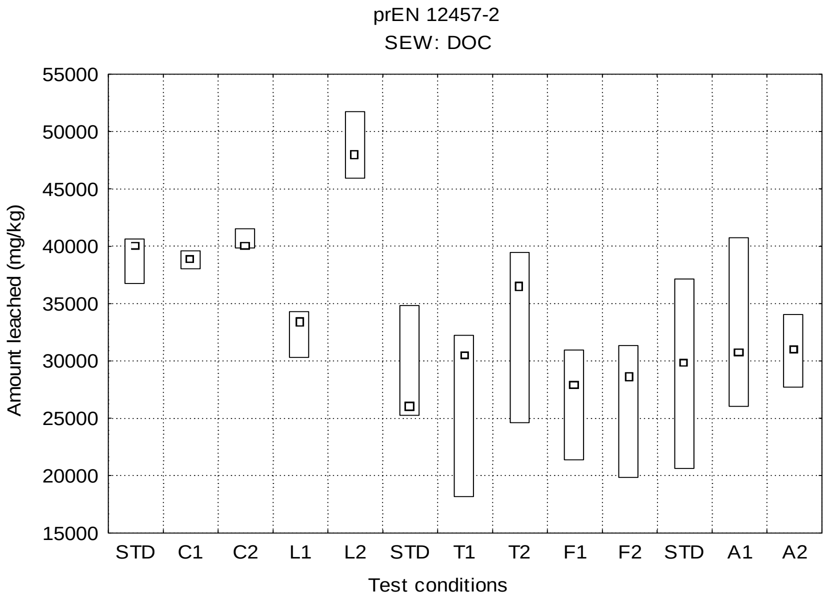
prEN 12457 - 2 **Sulfate**
SEW







prEN 12457 - 2 **Dissolved organic carbon**
SEW



Regression Summary for Dependent Variable: DOC
R= ,96292419 R²= ,92722299 Adjusted R²= ,91266759
F(4,20)=63,703 p<,00000 Std.Error of estimate: 1509,9

	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			39478.000	675.226	58.466	0.000
C1	-0.065523	0.0763	-820.000	954.913	-0.859	0.401
C2	0.0668012	0.0763	836	955	0.875	0.392
L1	-0.514	0.076	-6428	955	-6.732	0.000
L2	0.690	0.076	8629	955	9.037	0.000

Regression Summary for Dependent Variable: DOC
R= ,54028967 R²= ,29191292 Adjusted R²= ,15029551
F(4,20)=2,0613 p<,12418 Std.Error of estimate: 5036,6

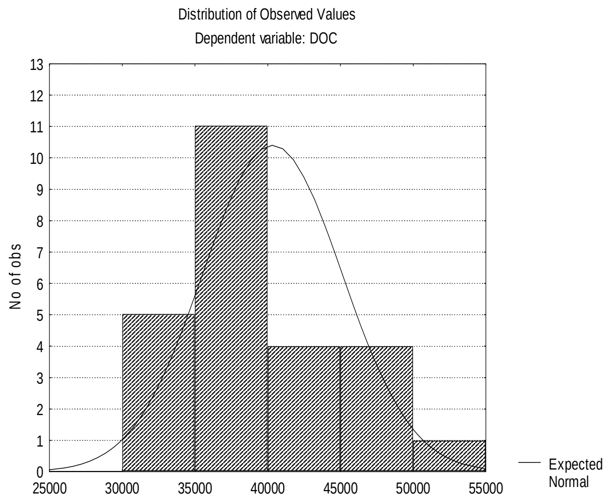
	BETA	St. Err. of BETA	B	St. Err. of B	t(20)	p-level
Intercpt			27782	2252	12.33	0.000
T1	-0.084	0.238	-1118	3185	-0.35	0.729
T2	0.477	0.238	6378	3185	2.00	0.059
F1	-0.039	0.238	-528	3185	-0.17	0.870
F2	-0.103	0.238	-1372	3185	-0.43	0.671

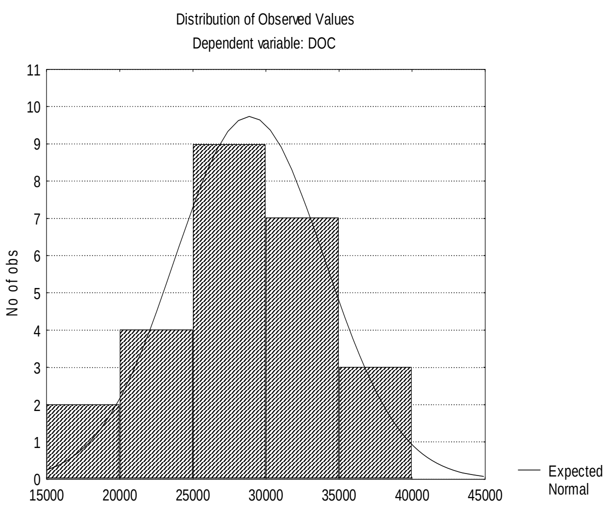
Regression Summary for Dependent Variable: DOC
R= ,24578054 R²= ,06040807 Adjusted R²= -----
F(2,12)=,38575 p<,68807 Std.Error of estimate: 4939,6

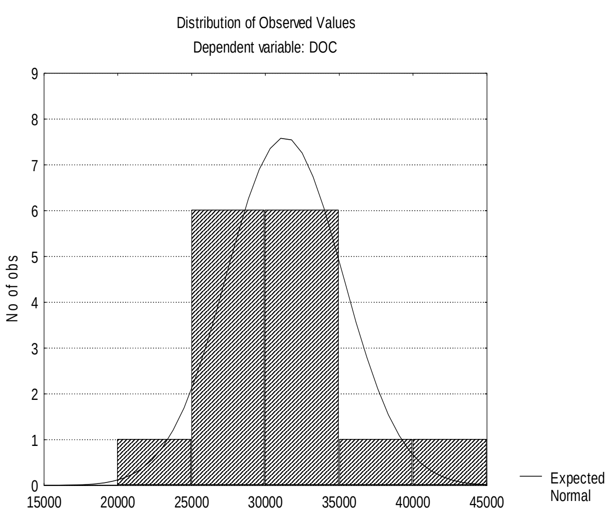
	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
Intercpt			29090	2209.05	13.1686	2E-08
A1	0.2792491	0.32311	2700	3124.07	0.86	0.404
A2	0.183477	0.32311	1774	3124.07	0.57	0.581

prEN 12457 - 2 SEW

Disolved organic carbon







A P P E N D I X 8

prEN 12457 part 2: MBA
Factorial design experiment

Underlying Structure									
A	B	C	D		E=bcd	F=acd	G=abd	H=abc	Codes
-1	-1	-1	-1	(i)	-1	-1	-1	-1	(i)
1	-1	-1	-1	a	-1	1	1	1	afgh
-1	1	-1	-1	b	1	-1	1	1	begh
1	1	-1	-1	ab	1	1	-1	-1	abef
-1	-1	1	-1	c	1	1	-1	1	cefh
1	-1	1	-1	ac	1	-1	1	-1	aceg
-1	1	1	-1	bc	-1	1	1	-1	bcfg
1	1	1	-1	abc	-1	-1	-1	1	abch
-1	-1	-1	1	d	1	1	1	-1	defg
1	-1	-1	1	ad	1	-1	-1	1	adeh
-1	1	-1	1	bd	-1	1	-1	1	bdfh
1	1	-1	1	abd	-1	-1	1	-1	abdg
-1	-1	1	1	cd	-1	-1	1	1	cdgh
1	-1	1	1	acd	-1	1	-1	-1	acdf
-1	1	1	1	bcd	1	-1	-1	-1	bcde
1	1	1	1	abcd	1	1	1	1	abcdefgh

Factors and levels used		
Factor	Low level	High level
A: Head space	(.) Half full bottle	(a) Almost full bottle
B: Contact time	(.) 22 hours	(b) 26 hours
C: L/S ratio	(.) 9 l/kg	(c) 11 l/kg
D:Particle size	(.) < 125 µm	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)	(e) 30 C
F: Time before filtration	(.) 15 min	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester	(h) Polyvinyl fluoride

	A	B	C	D	E	F	G	H
Kodning	**Head space**	**Contact time**	**L/S ratio**	**Partikle size**	**temperature**	**Time before filt**	**Mode of filtration**	**Filter material**
(i)	(.) Half full bottle	(.) 22 hours	(.) 9 l/kg	(.) < 125 µm	(.) Room temp (22 C)	(.) 15 min	(.) Vacuum filtration	(.) Cellulose ester
a fgh	(a) Almost full bottle	(.) 22 hours	(.) 9 l/kg	(.) < 125 µm	(.) Room temp (22 C)	(f) 3 hours	(g) High pressure filt	(h) Polyvinyl fluoride
b egh	(.) Half full bottle	(b) 26 hours	(.) 9 l/kg	(.) < 125 µm	(e) 30 C	(.) 15 min	(g) High pressure filt	(h) Polyvinyl fluoride
ab ef	(a) Almost full bottle	(b) 26 hours	(.) 9 l/kg	(.) < 125 µm	(e) 30 C	(f) 3 hours	(.) Vacuum filtration	(.) Cellulose ester
c efh	(.) Half full bottle	(.) 22 hours	(c) 11 l/kg	(.) < 125 µm	(e) 30 C	(f) 3 hours	(.) Vacuum filtration	(h) Polyvinyl fluoride
ac eg	(a) Almost full bottle	(.) 22 hours	(c) 11 l/kg	(.) < 125 µm	(e) 30 C	(.) 15 min	(g) High pressure filt	(.) Cellulose ester
bc fg	(.) Half full bottle	(b) 26 hours	(c) 11 l/kg	(.) < 125 µm	(.) Room temp (22 C)	(f) 3 hours	(g) High pressure filt	(.) Cellulose ester
abc h	(a) Almost full bottle	(b) 26 hours	(c) 11 l/kg	(.) < 125 µm	(.) Room temp (22 C)	(.) 15 min	(.) Vacuum filtration	(h) Polyvinyl fluoride
d efg	(.) Half full bottle	(.) 22 hours	(.) 9 l/kg	(d) < 4 mm	(e) 30 C	(f) 3 hours	(g) High pressure filt	(.) Cellulose ester
ad eh	(a) Almost full bottle	(.) 22 hours	(.) 9 l/kg	(d) < 4 mm	(e) 30 C	(.) 15 min	(.) Vacuum filtration	(h) Polyvinyl fluoride
bd fh	(.) Half full bottle	(b) 26 hours	(.) 9 l/kg	(d) < 4 mm	(.) Room temp (22 C)	(f) 3 hours	(.) Vacuum filtration	(h) Polyvinyl fluoride
abd g	(a) Almost full bottle	(b) 26 hours	(.) 9 l/kg	(d) < 4 mm	(.) Room temp (22 C)	(.) 15 min	(g) High pressure filt	(.) Cellulose ester
cd gh	(.) Half full bottle	(.) 22 hours	(c) 11 l/kg	(d) < 4 mm	(.) Room temp (22 C)	(.) 15 min	(g) High pressure filt	(h) Polyvinyl fluoride
acd f	(a) Almost full bottle	(.) 22 hours	(c) 11 l/kg	(d) < 4 mm	(.) Room temp (22 C)	(f) 3 hours	(.) Vacuum filtration	(.) Cellulose ester
bcd e	(.) Half full bottle	(b) 26 hours	(c) 11 l/kg	(d) < 4 mm	(e) 30 C	(.) 15 min	(.) Vacuum filtration	(.) Cellulose ester
abcd efgh	(a) Almost full bottle	(b) 26 hours	(c) 11 l/kg	(d) < 4 mm	(e) 30 C	(f) 3 hours	(g) High pressure filt	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = (i)	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = a fgh	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = b egh	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(e) 30 C
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = ab ef	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(e) 30 C
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = c efh	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(e) 30 C
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = ac eg	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(c) 11 l/kg
D:Particle size	(.) < 125 µm
E: Temperature	(e) 30 C
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = bc fg	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = 0	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(.) < 125 µm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = d efg	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(e) 30 C
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = ad eh	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(e) 30 C
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = bd fh	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = abd g	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(.) 9 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = cd gh	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(h) Polyvinyl fluoride

To be carried out in the laboratory	
Experiment no.	
Code = acd f	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = bcd e	
Process parameter	**Level in experiment**
A: Head space	(.) Half full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(e) 30 C
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(.) Vacuum filtration
H: Filter material	(.) Cellulose ester

To be carried out in the laboratory	
Experiment no.	
Code = abcd efgh	
Process parameter	**Level in experiment**
A: Head space	(a) Almost full bottle
B: Contact time	(b) 26 hours
C: L/S ratio	(c) 11 l/kg
D:Partikle size	(d) < 4 mm
E: Temperature	(e) 30 C
F: Time before filtration	(f) 3 hours
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(h) Polyvinyl fluoride

Analysis of 2**k complete and fractional factorial designs

This program was prepared by Henrik Spliid
Institute of Mathematical Modelling (IMM)
Technical University of Denmark (DTU)
Lyngby, DK-2800, Denmark.
Version: 23/08/94

Jette Bjerre Hansens Datafil. 1/2 2000.
Input for this problem was read from file data.dat
Output was written to file data.out

The 8 factors A - H are treated in the design
The 4 factors A - D define the complete underlying factorial structure
The 4 factors E - H are embedded in the underlying factorial structure

Description and options given by user :
Confoundings:(E=DBCD, F=DACD, G=DABD, H=DABC),
Options(Dispersion)

The treatments of the experiment were :

(1)	afgh	begh	abef
cefh	aceg	bcfg	abch
defg	adeh	bdfh	abdg
cdgh	acdf	bcde	abcdefgh

Data ordering in relation to standard order is :

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

From the treatments given above the following confoundings
have been computed.
Interactions between factors and blocks assumed = zero
Max. factorial interaction order considered = 2

Alias relations to interaction order 2 :

```
*
A
B
AB     = +EF   = +DG   = +CH
C
AC     = +DF   = +EG   = +BH
BC     = +DE   = +FG   = +AH
ABC    = +H
D
AD     = +CF   = +BG   = +EH
BD     = +CE   = +AG   = +FH
ABD    = +G
CD     = +BE   = +AF   = +GH
ACD    = +F
BCD    = +E
ABCD   = +AE   = +BF   = +CG   = +DH
```

Analysis of 2k complete and fractional factorial designs**

Response:
Cl mg/kg

Printout of input data:

			Response	Code	A B C D E F G H
1	(1)	=	2934.00	(1)	0 0 0 0 0 0 0 0
2	a	=	2934.00	afgh	1 0 0 0 0 1 1 1
3	b	=	3006.00	begh	0 1 0 0 1 0 1 1
4	ab	=	3015.00	abef	1 1 0 0 1 1 0 0
5	c	=	3014.00	cefh	0 0 1 0 1 1 0 1
6	ac	=	3025.00	aceg	1 0 1 0 1 0 1 0
7	bc	=	2959.00	bcfg	0 1 1 0 0 1 1 0
8	abc	=	2959.00	abch	1 1 1 0 0 0 0 1
9	d	=	2718.00	defg	0 0 0 1 1 1 1 0
10	ad	=	2664.00	adeh	1 0 0 1 1 0 0 1
11	bd	=	2664.00	bdfh	0 1 0 1 0 1 0 1
12	abd	=	2709.00	abdg	1 1 0 1 0 0 1 0
13	cd	=	2761.00	cdgh	0 0 1 1 0 0 1 1
14	acd	=	2651.00	acdf	1 0 1 1 0 1 0 0
15	bcd	=	2816.00	bcde	0 1 1 1 1 0 0 0
16	abcd	=	2695.00	abcdefgh	1 1 1 1 1 1 1 1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	129527161.0000	1	2845.2500
A	1	3025.0000	1	-27.5000
B	2	930.2500	1	15.2500
A B	3	462.2500	1	10.7500
C	4	3481.0000	1	29.5000
A C	5	3025.0000	1	-27.5000
B C	6	1722.2500	1	-20.7500
A B C = + H	7	1056.2500	1	-16.2500
D	8	293764.0000	1	-271.0000
A D	9	4225.0000	1	-32.5000
B D	10	210.2500	1	7.2500
A B D = + G	11	506.2500	1	11.2500
C D	12	625.0000	1	12.5000
A C D = + F	13	3136.0000	1	-28.0000
B C D = + E	14	9120.2500	1	47.7500
A B C D	15	506.2500	1	-11.2500
Total for Effects		325795.0000	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	2845.2500	11.9581	>99.95%
D	-271.0000	23.9161	>99.95%

Variability	Estimate	Stand. dev.
Residual standard dev.	47.8323	9.0395
Coefficient of variation	1.68 %	.32 %

```
             Normal probability plot for estimates

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                               X  I
       I                                                  I
 1.5000-                                                  -
       I                                            X     I
       I                                                  I
       I                                                  I
       I                                          X       I
  .7500-                                          X       -
       I                                                  I
       I                                          X       I
       I                                          X       I
       I                                         X        I
  .0000-                                      X           -
       I                                      X           I
       I                                     X            I
       I                                    X             I
       I                                                  I
 -.7500-                                    X             -
       I                                    X             I
       I                                                  I
       I                                                  I
       I                                   X              I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
    -280.0000          -147.0000             -7.0000
             -217.0000           -77.0000            63.0000
```

```
 Cl    mg/kg

Eff(rank)  1( 4)  2(13)  3(10)  4(14)  5( 5)  6( 6)  7( 7)  8( 1)
           9( 2) 10( 9) 11(11) 12(12) 13( 3) 14(15) 15( 8)
Estimate  -27.50  15.25  10.75  29.50 -27.50 -20.75 -16.25-271.00
          -32.50   7.25  11.25  12.50 -28.00  47.75 -11.25
Probabil.    .23    .83    .63    .90    .30    .37    .43    .03
             .10    .57    .70    .77    .17    .97    .50
Fractile    -.73    .97    .34   1.28   -.52   -.34   -.17  -1.83
           -1.28    .17    .52    .73   -.97   1.83    .00
```

```
             Normal probability plot for dispersion effects

         HS +I--------I---------I---------I---------I---------I+
      2.2500-                                                   -
            I                                                   I
            I                                                   I
            I                                              X    I
            I                                                   I
      1.5000-                                                   -
            I                                         X         I
            I                                                   I
            I                                                   I
            I                                       X           I
       .7500-                                     X             -
            I                                 X                 I
            I                                X                  I
            I                         X                         I
       .0000-                X                                  -
            I            X                                      I
            I           X                                       I
            I          X                                        I
            I                                                   I
      -.7500-         X                                         -
            I      X                                            I
            I                                                   I
            I                                                   I
            I  X                                                I
     -1.5000-                                                   -
            I                                                   I
            I X                                                 I
            I                                                   I
            I                                                   I
     -2.2500-                                                   -
         HS +I--------I---------I---------I---------I---------I+
           -1.2000             -.2500              .7500
                     -.7500              .2500              1.2500
```

```
  Cl    mg/kg

 Eff(rank)        1( 6)  2( 9)  3( 1)  4(14)  5( 5)  6(10)  7( 7)
8(13)
                  9( 3) 10(12) 11( 2) 12(15) 13( 4) 14(11) 15( 8)
 log((s+/s-)**2)   -.64    .04  -1.15    .83   -.71    .40   -.61
.76
                   -.90    .65  -1.09   1.08   -.76    .45   -.41
 Probabil.          .37    .57    .03    .90    .30    .63    .43
.83
                    .17    .77    .10    .97    .23    .70    .50
 Fractile          -.34    .17  -1.83   1.28   -.52    .34   -.17
.97
                   -.97    .73  -1.28   1.83   -.73    .52    .00

 Stand.dev-low    38.20  34.20  42.92  25.86  38.66  30.62  39.29
26.98
                  38.98  28.94  42.62  24.73  38.92  26.21  38.19
 Stand.dev-high   27.79  34.96  24.21  39.08  27.13  37.34  28.96
39.50
                  24.89  40.12  24.67  42.48  26.60  32.80  31.09
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
SO4 mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	2898.00	(1)	0	0	0	0	0	0	0	0
2	a	=	2979.00	afgh	1	0	0	0	0	1	1	1
3	b	=	2475.00	begh	0	1	0	0	1	0	1	1
4	ab	=	2772.00	abef	1	1	0	0	1	1	0	0
5	c	=	3168.00	cefh	0	0	1	0	1	1	0	1
6	ac	=	2651.00	aceg	1	0	1	0	1	0	1	0
7	bc	=	2673.00	bcfg	0	1	1	0	0	1	1	0
8	abc	=	2739.00	abch	1	1	1	0	0	0	0	1
9	d	=	2007.00	defg	0	0	0	1	1	1	1	0
10	ad	=	1944.00	adeh	1	0	0	1	1	0	0	1
11	bd	=	2007.00	bdfh	0	1	0	1	0	1	0	1
12	abd	=	1962.00	abdg	1	1	0	1	0	0	1	0
13	cd	=	2145.00	cdgh	0	0	1	1	0	0	1	1
14	acd	=	2046.00	acdf	1	0	1	1	0	1	0	0
15	bcd	=	2145.00	bcde	0	1	1	1	1	0	0	0
16	abcd	=	2101.00	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	93663684.0000	1	2419.5000
A	1	6561.0000	1	-40.5000
B	2	58081.0000	1	-120.5000
A B	3	47524.0000	1	109.0000
C	4	24336.0000	1	78.0000
A C	5	46656.0000	1	-108.0000
B C	6	4225.0000	1	32.5000
A B C = + H	7	10201.0000	1	50.5000
D	8	2248500.2500	1	-749.7500
A D	9	1980.2500	1	-22.2500
B D	10	77006.2500	1	138.7500
A B D = + G	11	32942.2500	1	-90.7500
C D	12	10506.2500	1	51.2500
A C D = + F	13	39402.2500	1	99.2500
B C D = + E	14	2162.2500	1	-23.2500
A B C D	15	6806.2500	1	-41.2500
Total for Effects		2616890.0000	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	2419.5000	40.5536	>99.95%
D	-749.7500	81.1073	>99.95%

Variability	Estimate	Stand. dev.
Residual standard dev.	162.2145	30.6557
Coefficient of variation	6.70 %	1.27 %

```
             Normal probability plot for estimates

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                 -
       I                                                 I
       I                                                 I
       I                                            X    I
       I                                                 I
 1.5000-                                                 -
       I                                          X      I
       I                                                 I
       I                                                 I
       I                                          X      I
  .7500-                                         X       -
       I                                                 I
       I                                        X        I
       I                                        X        I
       I                                       X         I
  .0000-                                    X            -
       I                                    X            I
       I                                   X             I
       I                                   X             I
       I                                                 I
 -.7500-                                X                -
       I                                X                I
       I                                                 I
       I                                                 I
       I                               X                 I
-1.5000-                                                 -
       I                                                 I
       I X                                               I
       I                                                 I
       I                                                 I
-2.2500-                                                 -
    HS +I--------I---------I---------I---------I---------I+
    -760.0000          -380.0000            20.0000
             -580.0000          -180.0000           220.0000
```

```
 SO4    mg/kg

Eff(rank)  1( 6)  2( 2)  3(14)  4(12)  5( 3)  6( 9)  7(10)  8( 1)
           9( 8) 10(15) 11( 4) 12(11) 13(13) 14( 7) 15( 5)
Estimate  -40.50-120.50 109.00  78.00-108.00  32.50  50.50-749.75
          -22.25 138.75 -90.75  51.25  99.25 -23.25 -41.25
Probabil.    .37    .10    .90    .77    .17    .57    .63    .03
             .50    .97    .23    .70    .83    .43    .30
Fractile    -.34  -1.28   1.28    .73   -.97    .17    .34  -1.83
             .00   1.83   -.73    .52    .97   -.17   -.52
```

Normal probability plot for dispersion effects

```
    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                              X   I
       I                                                  I
 1.5000-                                                  -
       I                                          X       I
       I                                                  I
       I                                                  I
       I                                          X       I
  .7500-                                 X                -
       I                                                  I
       I                            X                     I
       I                            X                     I
       I                           X                      I
  .0000-                         X                        -
       I                        X                         I
       I                   X                              I
       I                   X                              I
       I                                                  I
 -.7500-           X                                      -
       I         X                                        I
       I                                                  I
       I                                                  I
       I        X                                         I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
      -2.0800             -.5600              1.0400
               -1.3600               .2400             1.8400
```

```
  SO4    mg/kg

 Eff(rank)        1( 3)  2( 5)  3( 8)  4(11)  5( 6)  6( 4)  7(15)  8(
1)
                  9(13) 10(12) 11( 9) 12( 7) 13(10) 14(14) 15( 2)
 log((s+/s-)**2)  -1.34   -.56   -.11    .20   -.53  -1.18   1.61  -
2.02
                   1.27    .60    .10   -.15    .13   1.28  -1.46
 Probabil.          .17    .30    .50    .70    .37    .23    .97
.03
                    .83    .77    .57    .43    .63    .90    .10
 Fractile          -.97   -.52    .00    .52   -.34   -.73   1.83  -
1.83
                    .97    .73    .17   -.17    .34   1.28  -1.28

 Stand.dev-low   148.52 123.27 114.10 109.17 124.87 146.46  67.79
152.43
                  78.55  89.19 110.61 121.68 108.76  78.38 150.30
 Stand.dev-high   75.99  93.13 108.00 120.61  95.69  81.01 151.52
55.49
                 148.38 120.25 116.49 112.80 116.10 148.42  72.28
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Ba mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	1.08	(1)	0	0	0	0	0	0	0	0
2	a	=	1.17	afgh	1	0	0	0	0	1	1	1
3	b	=	1.53	begh	0	1	0	0	1	0	1	1
4	ab	=	1.65	abef	1	1	0	0	1	1	0	0
5	c	=	1.65	cefh	0	0	1	0	1	1	0	1
6	ac	=	1.65	aceg	1	0	1	0	1	0	1	0
7	bc	=	1.32	bcfg	0	1	1	0	0	1	1	0
8	abc	=	1.32	abch	1	1	1	0	0	0	0	1
9	d	=	1.44	defg	0	0	0	1	1	1	1	0
10	ad	=	1.53	adeh	1	0	0	1	1	0	0	1
11	bd	=	1.08	bdfh	0	1	0	1	0	1	0	1
12	abd	=	1.08	abdg	1	1	0	1	0	0	1	0
13	cd	=	1.32	cdgh	0	0	1	1	0	0	1	1
14	acd	=	1.54	acdf	1	0	1	1	0	1	0	0
15	bcd	=	1.87	bcde	0	1	1	1	1	0	0	0
16	abcd	=	1.87	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	33.3506	1	1.4438
A	1	.0169	1	.0650
B	2	.0072	1	.0425
A B	3	.0049	1	-.0350
C	4	.2450	1	.2475
A C	5	.0004	1	-.0100
B C	6	.0006	1	.0125
A B C = + H	7	.0016	1	-.0200
D	8	.0081	1	.0450
A D	9	.0006	1	.0125
B D	10	.0025	1	-.0250
A B D = + G	11	.0072	1	-.0425
C D	12	.0576	1	.1200
A C D = + F	13	.0072	1	.0425
B C D = + E	14	.6724	1	.4100
A B C D	15	.0006	1	-.0125
Total for Effects		1.0330	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	1.4438	.0236	>99.95%
C	.2475	.0471	>99.95%
B C D = + E	.4100	.0471	>99.95%

Variability	Estimate	Stand. dev.
Residual standard dev.	.0943	.0185
Coefficient of variation	6.53 %	1.29 %

```
                Normal probability plot for estimates

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                              X   I
       I                                                  I
 1.5000-                                                  -
       I                              X                   I
       I                                                  I
       I                                                  I
       I                 X                                I
  .7500-            X                                     -
       I                                                  I
       I          X                                       I
       I         X                                        I
       I         X                                        I
  .0000-      X                                           -
       I      X                                           I
       I    X                                             I
       I    X                                             I
       I                                                  I
 -.7500-   X                                              -
       I   X                                              I
       I                                                  I
       I                                                  I
       I  X                                               I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
       -.0500              .1400               .3400
                 .0400               .2400              .4400
```

Ba mg/kg

Eff(rank)	1(12)	2(9)	3(2)	4(14)	5(6)	6(7)	7(4)	8(11)
	9(8)	10(3)	11(1)	12(13)	13(10)	14(15)	15(5)	
Estimate	.07	.04	-.03	.25	-.01	.01	-.02	.05
	.01	-.02	-.04	.12	.04	.41	-.01	
Probabil.	.77	.57	.10	.90	.37	.43	.23	.70
	.50	.17	.03	.83	.63	.97	.30	
Fractile	.73	.17	-1.28	1.28	-.34	-.17	-.73	.52
	.00	-.97	-1.83	.97	.34	1.83	-.52	

```
             Normal probability plot for dispersion effects

         HS +I--------I---------I---------I---------I---------I+
      2.2500-                                                  -
            I                                                 I
            I                                                 I
            I                                          X      I
            I                                                 I
      1.5000-                                                  -
            I                                          X      I
            I                                                 I
            I                                                 I
            I                                         X       I
       .7500-                                     X            -
            I                                                 I
            I                              X                  I
            I                           X                     I
            I                       X                         I
       .0000-                      X                           -
            I                   X                             I
            I                 X                               I
            I            X                                    I
            I                                                 I
      -.7500-       X                                          -
            I      X                                          I
            I                                                 I
            I                                                 I
            I   X                                             I
     -1.5000-                                                  -
            I                                                 I
            I X                                               I
            I                                                 I
            I                                                 I
     -2.2500-                                                  -
         HS +I--------I---------I---------I---------I---------I+
           -1.0000             -.0500               .9500
                     -.5500               .4500             1.4500


  Ba    mg/kg

 Eff(rank)        1(12)  2( 4)  3( 6)  4(13)  5(10)  6( 2)  7( 1)  8(
9)
                  9( 8) 10( 7) 11( 3) 12(14) 13(15) 14(11) 15( 5)
 log((s+/s-)**2)    .86   -.65   -.16   1.07    .34   -.87   -.96
.16
                    .09   -.07   -.70   1.10   1.10    .50   -.41
 Probabil.          .77    .23    .37    .83    .63    .10    .03
.57
                    .50    .43    .17    .90    .97    .70    .30
 Fractile           .73   -.73   -.34    .97    .34  -1.28  -1.83
.17
                    .00   -.17   -.97   1.28   1.83    .52   -.52

 Standard deviations multiplied by      100.
 Stand.dev-low     4.95   7.70   7.05   4.77   6.31   8.22   8.28
6.42
                   6.76   6.99   7.76   3.48   4.74   5.79   7.58
 Stand.dev-high    7.60   5.56   6.52   8.13   7.49   5.31   5.13
6.95
                   7.07   6.74   5.48   6.02   8.23   7.44   6.19
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Cr mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	.07	(1)	0	0	0	0	0	0	0	0
2	a	=	.02	afgh	1	0	0	0	0	1	1	1
3	b	=	.07	begh	0	1	0	0	1	0	1	1
4	ab	=	.04	abef	1	1	0	0	1	1	0	0
5	c	=	.08	cefh	0	0	1	0	1	1	0	1
6	ac	=	.04	aceg	1	0	1	0	1	0	1	0
7	bc	=	.08	bcfg	0	1	1	0	0	1	1	0
8	abc	=	.02	abch	1	1	1	0	0	0	0	1
9	d	=	.06	defg	0	0	0	1	1	1	1	0
10	ad	=	.03	adeh	1	0	0	1	1	0	0	1
11	bd	=	.06	bdfh	0	1	0	1	0	1	0	1
12	abd	=	.03	abdg	1	1	0	1	0	0	1	0
13	cd	=	.07	cdgh	0	0	1	1	0	0	1	1
14	acd	=	.04	acdf	1	0	1	1	0	1	0	0
15	bcd	=	.06	bcde	0	1	1	1	1	0	0	0
16	abcd	=	.04	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	.0401	1	.0501
A	1	.0059	1	-.0383
B	2	.0000	1	-.0031
A B	3	.0000	1	.0008
C	4	.0001	1	.0046
A C	5	.0000	1	-.0033
B C	6	.0001	1	-.0054
A B C = + H	7	.0000	1	-.0016
D	8	.0000	1	-.0027
A D	9	.0002	1	.0071
B D	10	.0000	1	.0001
A B D = + G	11	.0000	1	.0001
C D	12	.0000	1	.0002
A C D = + F	13	.0001	1	.0036
B C D = + E	14	.0001	1	.0052
A B C D	15	.0001	1	.0052
Total for Effects		.0066	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	.0501	.0019	>99.95%
A	-.0383	.0038	>99.95%

Variability	Estimate	Stand. dev.
Residual standard dev.	.0075	.0014
Coefficient of variation	15.02 %	2.89 %

```
               Normal probability plot for estimates

      HS +I--------I---------I---------I---------I---------I+
   2.2500-                                                  -
         I                                                  I
         I                                                  I
         I                                              X   I
         I                                                  I
   1.5000-                                                  -
         I                                            X     I
         I                                                  I
         I                                                  I
         I                                            X     I
    .7500-                                            X     -
         I                                                  I
         I                                           X      I
         I                                        X         I
         I                                       X          I
    .0000-                                       X          -
         I                                       X          I
         I                                     X            I
         I                                    X             I
         I                                                  I
   -.7500-                                    X             -
         I                                    X             I
         I                                                  I
         I                                                  I
         I                                  X               I
  -1.5000-                                                  -
         I                                                  I
         I X                                                I
         I                                                  I
         I                                                  I
  -2.2500-                                                  -
      HS +I--------I---------I---------I---------I---------I+
         -.0390             -.0200               .0000
                  -.0300              -.0100               .0100
```

Cr mg/kg

Eff(rank)	1(1)	2(4)	3(10)	4(12)	5(3)	6(2)	7(6)	8(5)
	9(15)	10(7)	11(8)	12(9)	13(11)	14(13)	15(14)	
Estimate	-.04	.00	.00	.00	.00	-.01	.00	.00
	.01	.00	.00	.00	.00	.01	.01	
Probabil.	.03	.23	.63	.77	.17	.10	.37	.30
	.97	.43	.50	.57	.70	.83	.90	
Fractile	-1.83	-.73	.34	.73	-.97	-1.28	-.34	-.52
	1.83	-.17	.00	.17	.52	.97	1.28	

```
        Normal probability plot for dispersion effects

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                            X     I
       I                                                  I
 1.5000-                                                  -
       I                                        X         I
       I                                                  I
       I                                                  I
       I                                     X            I
  .7500-                                     X            -
       I                              X                   I
       I                           X                      I
       I                           X                      I
  .0000-                        X                         -
       I                        X                         I
       I                     X                            I
       I             X                                    I
       I                                                  I
 -.7500-        X                                         -
       I   X                                              I
       I                                                  I
       I                                                  I
       I  X                                               I
-1.5000-                                                  -
       I                                                  I
       IX                                                 I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
      -1.2000             -.2500               .7500
                -.7500               .2500             1.2500
```

```
  Cr    mg/kg

 Eff(rank)        1( 7)  2( 8)  3(12)  4(15)  5( 6)  6(10)  7(14)  8(
2)
                  9( 5) 10(11) 11( 4) 12( 3) 13(13) 14( 9) 15( 1)
 log((s+/s-)**2)   -.01    .00    .64   1.02   -.15    .15    .79  -
1.09
                   -.56    .28   -.78  -1.06    .65    .13  -1.18
 Probabil.          .43    .50    .77    .97    .37    .63    .90
.10
                    .30    .70    .23    .17    .83    .57    .03
 Fractile          -.17    .00    .73   1.83   -.34    .34   1.28  -
1.28
                   -.52    .52   -.73   -.97    .97    .17  -1.83

 Standard deviations multiplied by     1000.
 Stand.dev-low     5.33   5.39   4.59   3.79   5.56   4.89   4.33
6.64
                   5.38   5.12   6.47   6.72   4.41   4.97   6.35
 Stand.dev-high    5.31   5.39   6.30   6.32   5.17   5.28   6.44
3.84
                   4.06   5.89   4.37   3.97   6.12   5.30   3.53
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Cu mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	4.41	(1)	0	0	0	0	0	0	0	0
2	a	=	2.52	afgh	1	0	0	0	0	1	1	1
3	b	=	4.95	begh	0	1	0	0	1	0	1	1
4	ab	=	3.41	abef	1	1	0	0	1	1	0	0
5	c	=	5.06	cefh	0	0	1	0	1	1	0	1
6	ac	=	3.30	aceg	1	0	1	0	1	0	1	0
7	bc	=	4.73	bcfg	0	1	1	0	0	1	1	0
8	abc	=	2.64	abch	1	1	1	0	0	0	0	1
9	d	=	5.22	defg	0	0	0	1	1	1	1	0
10	ad	=	4.68	adeh	1	0	0	1	1	0	0	1
11	bd	=	4.68	bdfh	0	1	0	1	0	1	0	1
12	abd	=	4.77	abdg	1	1	0	1	0	0	1	0
13	cd	=	4.84	cdgh	0	0	1	1	0	0	1	1
14	acd	=	4.73	acdf	1	0	1	1	0	1	0	0
15	bcd	=	5.17	bcde	0	1	1	1	1	0	0	0
16	abcd	=	4.73	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	304.8516	1	4.3650
A	1	4.2849	1	-1.0350
B	2	.0064	1	.0400
A B	3	.0064	1	.0400
C	4	.0196	1	.0700
A C	5	.0169	1	-.0650
B C	6	.1681	1	-.2050
A B C = + H	7	.1681	1	-.2050
D	8	3.8025	1	.9750
A D	9	2.4649	1	.7850
B D	10	.0196	1	-.0700
A B D = + G	11	.0049	1	.0350
C D	12	.0064	1	-.0400
A C D = + F	13	.0064	1	.0400
B C D = + E	14	.6400	1	.4000
A B C D	15	.0049	1	-.0350
Total for Effects		11.6200	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	4.3650	.0746	>99.95%
A	-1.0350	.1491	>99.95%
D	.9750	.1491	>99.95%
A D	.7850	.1491	>99.95%

Variability	Estimate	Stand. dev.
Residual standard dev.	.2983	.0609
Coefficient of variation	6.83 %	1.40 %

```
                Normal probability plot for estimates

      HS +I--------I---------I---------I---------I---------I+
   2.2500-                                                  -
         I                                                  I
         I                                                  I
         I                                          X       I
         I                                                  I
   1.5000-                                                  -
         I                                      X           I
         I                                                  I
         I                                                  I
         I                              X                   I
    .7500-                       X                          -
         I                                                  I
         I                       X                          I
         I                       X                          I
         I                       X                          I
    .0000-                       X                          -
         I                     X                            I
         I                     X                            I
         I                     X                            I
         I                                                  I
   -.7500-                     X                            -
         I                  X                               I
         I                                                  I
         I                                                  I
         I                  X                               I
  -1.5000-                                                  -
         I                                                  I
         I X                                                I
         I                                                  I
         I                                                  I
  -2.2500-                                                  -
      HS +I--------I---------I---------I---------I---------I+
        -1.1000             -.1500               .8500
                  -.6500               .3500             1.3500
```

```
 Cu    mg/kg

Eff(rank)  1( 1)  2( 9)  3(10)  4(12)  5( 5)  6( 2)  7( 3)  8(15)
           9(14) 10( 4) 11( 8) 12( 6) 13(11) 14(13) 15( 7)
Estimate   -1.03    .04    .04    .07   -.06   -.20   -.20    .98
             .79   -.07    .04   -.04    .04    .40   -.03
Probabil.    .03    .57    .63    .77    .30    .10    .17    .97
             .90    .23    .50    .37    .70    .83    .43
Fractile   -1.83    .17    .34    .73   -.52  -1.28   -.97   1.83
            1.28   -.73    .00   -.34    .52    .97   -.17
```

Normal probability plot for dispersion effects

```
    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                      X           I
       I                                                  I
 1.5000-                                                  -
       I                                    X             I
       I                                                  I
       I                                                  I
       I                                    X             I
  .7500-                                   X              -
       I                                                  I
       I                                  X               I
       I                               X                  I
       I                               X                  I
  .0000-                             X                    -
       I                            X                     I
       I                        X                         I
       I                       X                          I
       I                                                  I
 -.7500-                    X                             -
       I              X                                   I
       I                                                  I
       I                                                  I
       I     X                                            I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
      -1.4500             -.5000               .5000
               -1.0000               .0000             1.0000
```

```
  Cu    mg/kg

 Eff(rank)        1(12)  2( 5)  3(11)  4( 3)  5( 8)  6( 9)  7( 7)  8(
1)
                  9( 2) 10(15) 11( 4) 12(13) 13(14) 14( 6) 15(10)
 log((s+/s-)**2)    .32   -.28    .25   -.73    .00    .08   -.07  -
1.42
                  -1.18    .47   -.44    .33    .33   -.27    .11
 Probabil.          .77    .30    .70    .17    .50    .57    .43
.03
                    .10    .97    .23    .83    .90    .37    .63
 Fractile           .73   -.52    .52   -.97    .00    .17   -.17  -
1.83
                  -1.28   1.83   -.73    .97   1.28   -.34    .34

 Standard deviations multiplied by       10.
 Stand.dev-low     1.94   2.34   2.06   2.53   2.19   1.98   2.06
2.68
                   2.61   1.91   2.42   2.01   2.01   1.48   2.14
 Stand.dev-high    2.27   2.04   2.33   1.76   2.19   2.06   1.99
1.31
                   1.44   2.42   1.95   2.37   2.37   1.30   2.26
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Mo mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	.57	(1)	0	0	0	0	0	0	0	0
2	a	=	.50	afgh	1	0	0	0	0	1	1	1
3	b	=	.53	begh	0	1	0	0	1	0	1	1
4	ab	=	.66	abef	1	1	0	0	1	1	0	0
5	c	=	.59	cefh	0	0	1	0	1	1	0	1
6	ac	=	.57	aceg	1	0	1	0	1	0	1	0
7	bc	=	.61	bcfg	0	1	1	0	0	1	1	0
8	abc	=	.55	abch	1	1	1	0	0	0	0	1
9	d	=	.47	defg	0	0	0	1	1	1	1	0
10	ad	=	.46	adeh	1	0	0	1	1	0	0	1
11	bd	=	.49	bdfh	0	1	0	1	0	1	0	1
12	abd	=	.48	abdg	1	1	0	1	0	0	1	0
13	cd	=	.56	cdgh	0	0	1	1	0	0	1	1
14	acd	=	.47	acdf	1	0	1	1	0	1	0	0
15	bcd	=	.52	bcde	0	1	1	1	1	0	0	0
16	abcd	=	.48	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	4.5146	1	.5312
A	1	.0016	1	-.0199
B	2	.0009	1	.0151
A B	3	.0031	1	.0279
C	4	.0028	1	.0266
A C	5	.0035	1	-.0296
B C	6	.0027	1	-.0261
A B C = + H	7	.0020	1	-.0224
D	8	.0263	1	-.0811
A D	9	.0009	1	-.0149
B D	10	.0008	1	-.0144
A B D = + G	11	.0008	1	-.0141
C D	12	.0004	1	.0096
A C D = + F	13	.0001	1	.0039
B C D = + E	14	.0003	1	.0089
A B C D	15	.0052	1	.0361
Total for Effects		.0515	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	.5312	.0106	>99.95%
D	-.0811	.0212	99.8 %

Variability	Estimate	Stand. dev.
Residual standard dev.	.0424	.0080
Coefficient of variation	7.98 %	1.52 %

```
                   Normal probability plot for estimates

     HS +I--------I---------I---------I---------I---------I+
  2.2500-                                                   -
        I                                                   I
        I                                                   I
        I                                               X   I
        I                                                   I
  1.5000-                                                   -
        I                                            X      I
        I                                                   I
        I                                                   I
        I                                            X      I
   .7500-                                       X           -
        I                                                   I
        I                                     X             I
        I                                     X             I
        I                                   X               I
   .0000-                           X                       -
        I                           X                       I
        I                           X                       I
        I                         X                         I
        I                                                   I
  -.7500-                        X                          -
        I                       X                           I
        I                                                   I
        I                                                   I
        I                     X                             I
 -1.5000-                                                   -
        I                                                   I
        I X                                                 I
        I                                                   I
        I                                                   I
 -2.2500-                                                   -
     HS +I--------I---------I---------I---------I---------I+
        -.0825             -.0350               .0150
                 -.0600              -.0100              .0400
```

Mo mg/kg

Eff(rank)	1(5)	2(12)	3(14)	4(13)	5(2)	6(3)	7(4)	8(1)
	9(6)	10(7)	11(8)	12(11)	13(9)	14(10)	15(15)	
Estimate	-.02	.02	.03	.03	-.03	-.03	-.02	-.08
	-.01	-.01	-.01	.01	.00	.01	.04	
Probabil.	.30	.77	.90	.83	.10	.17	.23	.03
	.37	.43	.50	.70	.57	.63	.97	
Fractile	-.52	.73	1.28	.97	-1.28	-.97	-.73	-1.83
	-.34	-.17	.00	.52	.17	.34	1.83	

```
            Normal probability plot for dispersion effects

         HS +I--------I---------I---------I---------I---------I+
      2.2500-                                                  -
            I                                                  I
            I                                                  I
            I                                               X  I
            I                                                  I
      1.5000-                                                  -
            I                                   X              I
            I                                                  I
            I                                                  I
            I                                  X               I
       .7500-                                  X               -
            I                                                  I
            I                                X                 I
            I                                X                 I
            I                                X                 I
       .0000-                            X                     -
            I                            X                     I
            I                        X                         I
            I                     X                            I
            I                                                  I
      -.7500-                    X                             -
            I                    X                             I
            I                                                  I
            I                                                  I
            I              X                                   I
     -1.5000-                                                  -
            I                                                  I
            I X                                                I
            I                                                  I
            I                                                  I
     -2.2500-                                                  -
         HS +I--------I---------I---------I---------I---------I+
           -2.9000            -1.0000              1.0000
                    -2.0000               .0000             2.0000


  Mo    mg/kg

 Eff(rank)        1(13)  2( 7)  3(11)  4( 4)  5( 1)  6( 6)  7(10)  8(
5)
                  9( 2) 10( 3) 11( 9) 12(15) 13(14) 14( 8) 15(12)
 log((s+/s-)**2)    .54   -.10    .35   -.86  -2.76   -.52    .34   -
.81
                  -1.51   -.92    .29   1.77    .59   -.06    .48
 Probabil.          .83    .43    .70    .23    .03    .37    .63
.30
                    .10    .17    .57    .97    .90    .50    .77
 Fractile           .97   -.17    .52   -.73  -1.83   -.34    .34   -
.52
                  -1.28   -.97    .17   1.83   1.28    .00    .73

 Standard deviations multiplied by      100.
 Stand.dev-low     2.58   3.13   2.65   3.47   3.96   3.29   2.72
3.53
                   3.91   3.66   2.83   1.67   2.63   3.14   2.42
 Stand.dev-high    3.39   2.98   3.15   2.26   1.00   2.54   3.23
2.35
                   1.84   2.31   3.28   4.04   3.52   3.04   3.08
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Sb mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	.43	(1)	0	0	0	0	0	0	0	0
2	a	=	.46	afgh	1	0	0	0	0	1	1	1
3	b	=	.48	begh	0	1	0	0	1	0	1	1
4	ab	=	.70	abef	1	1	0	0	1	1	0	0
5	c	=	.67	cefh	0	0	1	0	1	1	0	1
6	ac	=	.65	aceg	1	0	1	0	1	0	1	0
7	bc	=	.48	bcfg	0	1	1	0	0	1	1	0
8	abc	=	.51	abch	1	1	1	0	0	0	0	1
9	d	=	.34	defg	0	0	0	1	1	1	1	0
10	ad	=	.40	adeh	1	0	0	1	1	0	0	1
11	bd	=	.33	bdfh	0	1	0	1	0	1	0	1
12	abd	=	.33	abdg	1	1	0	1	0	0	1	0
13	cd	=	.36	cdgh	0	0	1	1	0	0	1	1
14	acd	=	.36	acdf	1	0	1	1	0	1	0	0
15	bcd	=	.45	bcde	0	1	1	1	1	0	0	0
16	abcd	=	.50	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	3.4764	1	.4661
A	1	.0077	1	.0440
B	2	.0007	1	.0135
A B	3	.0034	1	.0293
C	4	.0160	1	.0632
A C	5	.0044	1	-.0330
B C	6	.0067	1	-.0410
A B C = + H	7	.0002	1	-.0073
D	8	.1066	1	-.1632
A D	9	.0015	1	-.0195
B D	10	.0022	1	.0235
A B D = + G	11	.0040	1	-.0318
C D	12	.0001	1	.0038
A C D = + F	13	.0037	1	.0305
B C D = + E	14	.0520	1	.1140
A B C D	15	.0040	1	.0318
Total for Effects		.2133	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	.4661	.0218	>99.95%
D	-.1632	.0437	99.7 %

Variability	Estimate	Stand. dev.
Residual standard dev.	.0873	.0165
Coefficient of variation	18.73 %	3.65 %

```
             Normal probability plot for estimates

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                               X  I
       I                                                  I
 1.5000-                                                  -
       I                                       X          I
       I                                                  I
       I                                                  I
       I                                   X              I
  .7500-                                 X                -
       I                                                  I
       I                                 X                I
       I                                 X                I
       I                                X                 I
  .0000-                              X                   -
       I                             X                    I
       I                           X                      I
       I                         X                        I
       I                                                  I
 -.7500-                       X                          -
       I                       X                          I
       I                                                  I
       I                                                  I
       I                     X                            I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
       -.1680             -.0540               .0660
                -.1140               .0060              .1260
```

Sb mg/kg

Eff(rank)	1(13)	2(8)	3(10)	4(14)	5(3)	6(2)	7(6)	8(1)
	9(5)	10(9)	11(4)	12(7)	13(11)	14(15)	15(12)	
Estimate	.04	.01	.03	.06	-.03	-.04	-.01	-.16
	-.02	.02	-.03	.00	.03	.11	.03	
Probabil.	.83	.50	.63	.90	.17	.10	.37	.03
	.30	.57	.23	.43	.70	.97	.77	
Fractile	.97	.00	.34	1.28	-.97	-1.28	-.34	-1.83
	-.52	.17	-.73	-.17	.52	1.83	.73	

```
           Normal probability plot for dispersion effects

   HS +I---------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                             X    I
       I                                                  I
 1.5000-                                                  -
       I                             X                    I
       I                                                  I
       I                                                  I
       I                           X                      I
  .7500-                           X                      -
       I                                                  I
       I                          X                       I
       I                          X                       I
       I                      X                           I
  .0000-                    X                             -
       I                  X                               I
       I               X                                  I
       I               X                                  I
       I                                                  I
 -.7500-              X                                   -
       I              X                                   I
       I                                                  I
       I                                                  I
       I             X                                    I
-1.5000-                                                  -
       I                                                  I
       I X                                                I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
   HS +I---------I---------I---------I---------I---------I+
      -1.2600              .0700              1.4700
                -.6300               .7700              2.1700
```

```
  Sb    mg/kg

 Eff(rank)        1( 9)  2( 8)  3(14)  4( 6)  5( 5)  6( 3)  7( 4)  8(
1)
                  9( 7) 10(12) 11( 2) 12(11) 13(13) 14(15) 15(10)
 log((s+/s-)**2)    .26    .14    .75   -.20   -.23   -.31   -.31  -
1.20
                   -.01    .60   -.36    .57    .61   1.87    .57
 Probabil.          .57    .50    .90    .37    .30    .17    .23
.03
                    .43    .77    .10    .70    .83    .97    .63
 Fractile           .17    .00   1.28   -.34   -.52   -.97   -.73  -
1.83
                   -.17    .73  -1.28    .52    .97   1.83    .34

 Standard deviations multiplied by      100.
 Stand.dev-low     5.76   6.15   5.05   6.20   6.62   6.66   6.87
7.65
                   6.38   5.33   6.82   5.44   5.28   2.37   5.35
 Stand.dev-high    6.56   6.61   7.35   5.60   5.91   5.70   5.89
4.21
                   6.35   7.21   5.71   7.24   7.17   6.04   7.10
```

```
normal program return
```

Analysis of 2k complete and fractional factorial designs**

Response:
Pb mg/kg

Printout of input data:

			Response	Code	A	B	C	D	E	F	G	H
1	(1)	=	.02	(1)	0	0	0	0	0	0	0	0
2	a	=	.05	afgh	1	0	0	0	0	1	1	1
3	b	=	.11	begh	0	1	0	0	1	0	1	1
4	ab	=	.07	abef	1	1	0	0	1	1	0	0
5	c	=	.07	cefh	0	0	1	0	1	1	0	1
6	ac	=	.12	aceg	1	0	1	0	1	0	1	0
7	bc	=	.05	bcfg	0	1	1	0	0	1	1	0
8	abc	=	.04	abch	1	1	1	0	0	0	0	1
9	d	=	.10	defg	0	0	0	1	1	1	1	0
10	ad	=	.04	adeh	1	0	0	1	1	0	0	1
11	bd	=	.04	bdfh	0	1	0	1	0	1	0	1
12	abd	=	.07	abdg	1	1	0	1	0	0	1	0
13	cd	=	.08	cdgh	0	0	1	1	0	0	1	1
14	acd	=	.06	acdf	1	0	1	1	0	1	0	0
15	bcd	=	.11	bcde	0	1	1	1	1	0	0	0
16	abcd	=	.12	abcdefgh	1	1	1	1	1	1	1	1

Effects and aliases	no.	Sum of Squares	Deg.fr.	Effect estimates
*	0	.0812	1	.0712
A	1	.0000	1	.0001
B	2	.0002	1	.0066
A B	3	.0000	1	-.0014
C	4	.0018	1	.0211
A C	5	.0005	1	.0106
B C	6	.0005	1	-.0113
A B C = + H	7	.0001	1	-.0044
D	8	.0007	1	.0134
A D	9	.0003	1	-.0087
B D	10	.0001	1	.0046
A B D = + G	11	.0035	1	.0296
C D	12	.0005	1	.0110
A C D = + F	13	.0001	1	-.0053
B C D = + E	14	.0070	1	.0418
A B C D	15	.0003	1	-.0084
Total for Effects		.0155	15	

Effect	Estimate	Stand. dev.	t-test
Grand mean	.0712	.0041	>99.95%
C	.0211	.0082	97.5 %
A B D = + G	.0296	.0082	99.6 %
B C D = + E	.0418	.0082	99.9 %

Variability	Estimate	Stand. dev.
Residual standard dev.	.0164	.0033
Coefficient of variation	22.96 %	4.87 %

```
                 Normal probability plot for estimates

    HS +I--------I---------I---------I---------I---------I+
 2.2500-                                                  -
       I                                                  I
       I                                                  I
       I                                    X             I
       I                                                  I
 1.5000-                                                  -
       I                            X                     I
       I                                                  I
       I                                                  I
       I                      X                           I
  .7500-                 X                                -
       I                                                  I
       I               X                                  I
       I               X                                  I
       I            X                                     I
  .0000-           X                                      -
       I        X                                         I
       I       X                                          I
       I     X                                            I
       I                                                  I
 -.7500-    X                                             -
       I  X                                               I
       I                                                  I
       I                                                  I
       I  X                                               I
-1.5000-                                                  -
       I                                                  I
       IX                                                 I
       I                                                  I
       I                                                  I
-2.2500-                                                  -
    HS +I--------I---------I---------I---------I---------I+
       -.0120              .0165               .0465
                 .0015               .0315              .0615


  Pb     mg/kg

 Eff(rank)  1( 7)  2( 9)  3( 6)  4(13)  5(10)  6( 1)  7( 5)  8(12)
            9( 2) 10( 8) 11(14) 12(11) 13( 4) 14(15) 15( 3)
 Estimate     .00    .01    .00    .02    .01   -.01    .00    .01
             -.01    .00    .03    .01   -.01    .04   -.01
 Probabil.    .43    .57    .37    .83    .63    .03    .30    .77
              .10    .50    .90    .70    .23    .97    .17
 Fractile    -.17    .17   -.34    .97    .34  -1.83   -.52    .73
            -1.28    .00   1.28    .52   -.73   1.83   -.97
```

```
             Normal probability plot for dispersion effects

         HS +I--------I---------I---------I---------I---------I+
      2.2500-                                                  -
            I                                                  I
            I                                                  I
            I                                                X I
            I                                                  I
      1.5000-                                                  -
            I                                     X            I
            I                                                  I
            I                                                  I
            I                                     X            I
       .7500-                                X                 -
            I                                                  I
            I                               X                  I
            I                              X                   I
            I                           X                      I
       .0000-                       X                          -
            I                     X                            I
            I                    X                             I
            I                  X                               I
            I                                                  I
      -.7500-              X                                   -
            I            X                                     I
            I                                                  I
            I                                                  I
            I X                                                I
     -1.5000-                                                  -
            I                                                  I
            I X                                                I
            I                                                  I
            I                                                  I
     -2.2500-                                                  -
         HS +I--------I---------I---------I---------I---------I+
           -1.5600             -.4200              .7800
                    -1.0200               .1800              1.3800

   Pb    mg/kg

 Eff(rank)        1( 4)  2(11)  3( 2)  4(13)  5( 1)  6(14)  7( 6)  8(
9)
                  9(15) 10( 5) 11( 7) 12( 3) 13(12) 14( 8) 15(10)
 log((s+/s-)**2)   -.70    .32  -1.48    .66  -1.51    .67   -.35
.07
                   1.29   -.47   -.32   -.83    .36   -.17    .21
 Probabil.          .23    .70    .10    .83    .03    .90    .37
.57
                    .97    .30    .43    .17    .77    .50    .63
 Fractile          -.73    .52  -1.28    .97  -1.83   1.28   -.34
.17
                   1.83   -.52   -.17   -.97    .73    .00    .34

 Standard deviations multiplied by      100.
 Stand.dev-low     1.40   1.08   1.54    .96   1.43    .91   1.29
1.05
                    .75   1.32   1.25   1.31   1.08   1.20   1.09
 Stand.dev-high     .98   1.26    .73   1.33    .68   1.28   1.08
1.08
                   1.44   1.05   1.06    .87   1.29   1.11   1.21
      normal program return
```

A P P E N D I X   9

Evaluation of test conditions (temperature and L/S ratio) with a range of variation as specified in prEN 12457 part 1-4

Temperature

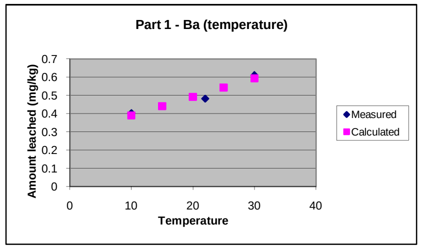
PrEN 12457 part 1
Ba

Measured values

10	0.402
22	0.482
30	0.611

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9690353
R Square	0.93902942
Adjusted R Square	0.87805884
Standard Error	0.03682426
Observations	3



Calculated values

10	0.390053
15	0.440809
20	0.491566
25	0.542322
30	0.593079

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.02088464	0.020885	15.40135	0.158838433
Residual	1	0.001356026	0.001356		
Total	2	0.022240667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.28853947	0.057530642	5.015405	0.12529
X Variable 1	0.01015132	0.002586681	3.924456	0.158838

	B values	**St. Err. of B**	**t values**	**t (57)**	**Significance at 1% level**
15	0.050757	0.011	4.61423445	2.666	**YES**
20	-				
25	0.050757	0.011	4.61423445	2.666	**YES**

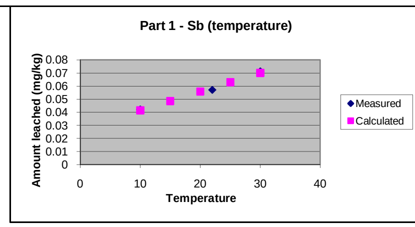
PrEN 12457 part 1
Sb

Measured values

10	0.042
22	0.057
30	0.071

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99548568
R Square	0.99099174
Adjusted R Square	0.98198348
Standard Error	0.00194666
Observations	3



Calculated values

10	0.041368
15	0.048539
20	0.055711
25	0.062882
30	0.070053

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.000416877	0.000417	110.0093	0.060513842
Residual	1	3.78947E-06	3.79E-06		
Total	2	0.000420667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.02702632	0.003041267	8.886531	0.071339
X Variable 1	0.00143421	0.000136741	10.48853	0.060514

	B values	**St. Err. of B**	**t values**	**t (57)**	**Significance at 1% level**
15	0.007171	0.006	1.195175439	2.666	**No**
22	-				
25	0.007171	0.006	1.195175439	2.666	**No**

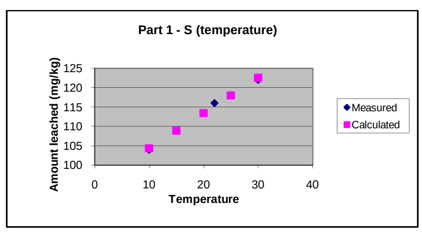
PrEN 12457 part 1
S

Measured values

10	104
22	116
30	122

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99717646
R Square	0.9943609
Adjusted R Square	0.9887218
Standard Error	0.97332853
Observations	3



Calculated values

10	104.3
15	108.9
20	113.4
25	117.9
30	122.5

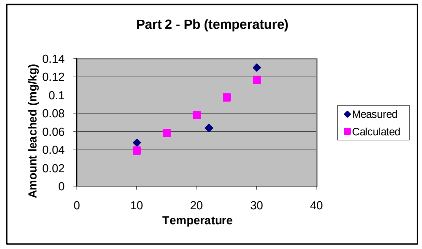
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	167.0526316	167.0526	176.3333	0.047851323
Residual	1	0.947368421	0.947368		
Total	2	168			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	95.2368421	1.520633707	62.62971	0.010164
X Variable 1	0.90789474	0.068370427	13.27906	0.047851

	B values	**St. Err. of B**	**t values**	**t (57)**	**Significance at 1% level**
15	4.539474	3	1.513157895	2.666	**No**
20	-				
25	4.5	3	1.513157895	2.666	**No**

Cr : Can not be evaluated using this approach



PrEN 12457 part 2
Pb

Measured values

10	0.048
22	0.064
30	0.13

Calculated values

10	0.039263
15	0.058671
20	0.078079
25	0.097487
30	0.116895

SUMMARY OUTPUT

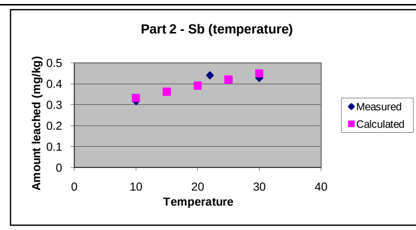
Regression Statistics	
Multiple R	0.89893915
R Square	0.808091595
Adjusted R Square	0.616183189
Standard Error	0.026928756
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.003053509	0.003054	4.210819	0.288678093
Residual	1	0.000725158	0.000725		
Total	2	0.003778667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.000447368	0.042070866	0.010634	0.993231
X Variable 1	0.003881579	0.001891582	2.052028	0.288678

	B values	**St. Err. of B**	**t values**	**t (58)**	**Significance at 1% level**
15	0.019408	0.008	2.425986842	2.664	**No**
20	-				
25	0.019408	0.008	2.425986842	2.664	**No**



PrEN 12457 part 2
Sb

Measured values

10	0.318
22	0.44
30	0.428

Calculated values

10	0.332737
15	0.362079
20	0.391421
25	0.420763
30	0.450105

SUMMARY OUTPUT

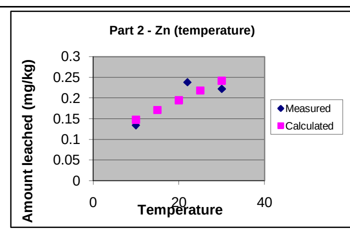
Regression Statistics	
Multiple R	0.878545316
R Square	0.771841872
Adjusted R Square	0.543683745
Standard Error	0.045421998
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.006979509	0.00698	3.382925	0.317029104
Residual	1	0.002063158	0.002063		
Total	2	0.009042667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.274052632	0.070962906	3.861914	0.161303
X Variable 1	0.005868421	0.00319062	1.839273	0.317029

	B values	**St. Err. of B**	**t values**	**t (60)**	**Significance at 1% level**
15	0.029342	0.027	1.086744639	2.660	**No**
20	-				
25	0.029342	0.027	1.086744639	2.660	**No**



PrEN 12457 part 2
Zn

Measured values

10	0.134
22	0.238
30	0.222

Calculated values

10	0.147474
15	0.171158
20	0.194842
25	0.218526
30	0.242211

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.851485087
R Square	0.725026853
Adjusted R Square	0.450053706
Standard Error	0.041528684
Observations	3

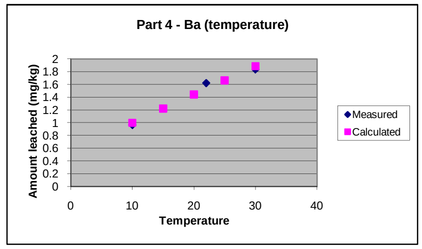
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.004547368	0.004547	2.636719	0.351404835
Residual	1	0.001724632	0.001725		
Total	2	0.006272			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.100105263	0.064880371	1.542921	0.36609
X Variable 1	0.004736842	0.002917138	1.623798	0.351405

	B values	**St. Err. of B**	**t values**	**t (61)**	**Significance at 1% level**
15	0.023684	0.114	0.207756233	2.659	**No**
20	-				
25	0.023684	0.114	0.207756233	2.659	**No**

Cr, SO4 : Can not be evaluated using this approach



PrEN 12457 part 4
Ba

Measured values

10	0.965
22	1.619
30	1.832

Calculated values

10	1.000211
15	1.221362
20	1.442513
25	1.663664
30	1.884816

SUMMARY OUTPUT

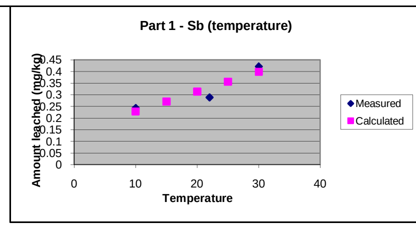
Regression Statistics	
Multiple R	0.98546983
R Square	0.97115079
Adjusted R Square	0.94230158
Standard Error	0.10852613
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.396480079	0.39648	33.66299	0.108657001
Residual	1	0.011777921	0.011778		
Total	2	0.408258			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.55790789	0.169550658	3.290509	0.187825
X Variable 1	0.04423026	0.007623303	5.801982	0.108657

	B values	**St. Err. of B**	**t values**	**t (60)**	**Significance at 1% level**
15	0.221151	0.028	7.898261278	2.660	**YES**
20	-				
25	0.221151	0.028	7.898261278	2.660	**YES**



PrEN 12457 part 4
Sb

Measured values

10	0.244
22	0.289
30	0.422

Calculated values

10	0.227737
15	0.270204
20	0.312671
25	0.355138
30	0.397605

SUMMARY OUTPUT

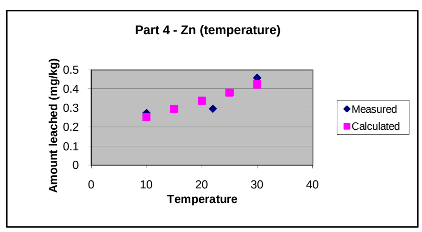
Regression Statistics	
Multiple R	0.92376464
R Square	0.85334111
Adjusted R Square	0.70668222
Standard Error	0.05012642
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.014620009	0.01462	5.818543	0.250191063
Residual	1	0.002512658	0.002513		
Total	2	0.017132667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.14280263	0.078312636	1.823494	0.319336
X Variable 1	0.00849342	0.003521077	2.412166	0.250191

	B values	**St. Err. of B**	**t values**	**t (59)**	**Significance at 1% level**
15	0.042467	0.029	1.46438294	2,662	**No**
20	-				
25	0.042467	0.029	1.46438294	2,662	**No**



PrEN 12457 part 4
Zn

Measured values

10	0.274
22	0.296
30	0.458

Calculated values

10	0.251
15	0.294
20	0.337
25	0.380
30	0.423

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.8633771
R Square	0.74542002
Adjusted R Square	0.49084003
Standard Error	0.07170187
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.015053509	0.015054	2.928039	0.336689946
Residual	1	0.005141158	0.005141		
Total	2	0.020194667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.16455263	0.112020016	1.468957	0.380503
X Variable 1	0.00861842	0.005036621	1.711151	0.33669

	B values	**St. Err. of B**	**t values**	**t (60)**	**Significance at 1% level**
15	0.043092	0.051	0.84494324	2.660	**No**
20	-				
25	0.043	0.051	0.84494324	2.660	**No**

Cr, Cu, SO4 : Can not be evaluated using this approach

PrEN 12457 part 2
Ba

Measured values

10	0.448
22	0.507
30	0.652

Calculated values

10	0.431316
15	0.48023
20	0.529145
25	0.578059
30	0.626974

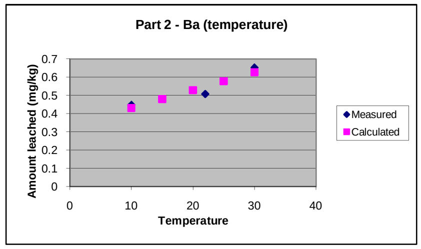
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.938093614
R Square	0.880019629
Adjusted R Square	0.760039258
Standard Error	0.05142419
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.019396219	0.019396	7.334697	0.225179673
Residual	1	0.002644447	0.002644		
Total	2	0.022040667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.333486842	0.080340148	4.150936	0.1505
X Variable 1	0.009782895	0.003612238	2.708265	0.22518



	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
15	0.048914	0.0127	3.851533361	2.6842	**YES**
22	-				
25	0.048914	0.0127	3.851533361	2.6842	**YES**

PrEN 12457 part 2
Cr VI

Measured values

10	11.66
22	12.48
30	12.82

Calculated values

10	11.69263
15	11.98671
20	12.28079
25	12.57487
30	12.86895

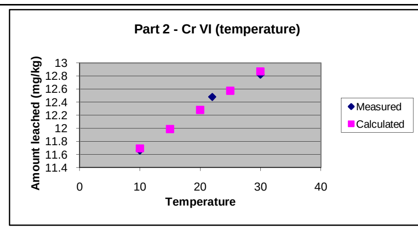
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.992862754
R Square	0.985776449
Adjusted R Square	0.971552898
Standard Error	0.100577281
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.701084211	0.701084	69.30593	0.076106033
Residual	1	0.010115789	0.010116		
Total	2	0.7112			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	11.10447368	0.15713215	70.66965	0.009008
X Variable 1	0.058815789	0.007064944	8.325018	0.076106



	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
15	0.294079	0.158	1.861259161	2.6842	**No**
20	-				
25	0.294079	0.158	1.861259161	2.6842	**No**

PrEN 12457 part 2
F

Measured values

10	8.24
22	9.96
30	13.02

Calculated values

10	7.937895
15	9.095132
20	10.25237
25	11.40961
30	12.56684

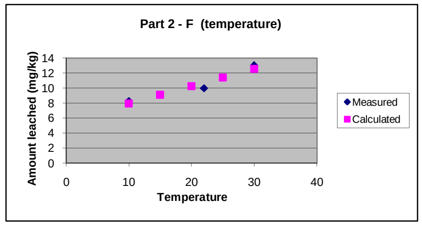
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.962310851
R Square	0.926042174
Adjusted R Square	0.852084348
Standard Error	0.931150957
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10.85642456	10.85642	12.52122	0.175338314
Residual	1	0.867042105	0.867042		
Total	2	11.72346667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5.623421053	1.454739579	3.865586	0.161156
X Variable 1	0.231447368	0.065407708	3.538534	0.175338



	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
15	1.157237	0.098	11.80853921	2.6842	**YES**
20	-				
25	1.157237	0.098	11.80853921	2.6842	**YES**

PrEN 12457 part 2
NO2

Measured values

10	0.44
22	0.425
30	0.548

Calculated values

10	0.419
15	0.443375
20	0.46775
25	0.492125
30	0.5165

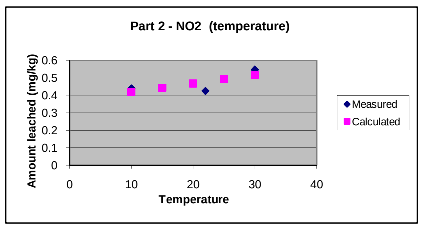
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.731307136
R Square	0.534810127
Adjusted R Square	0.069620253
Standard Error	0.064726347
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0048165	0.004817	1.14966	0.477821244
Residual	1	0.0041895	0.00419		
Total	2	0.009006			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.37025	0.101122141	3.661414	0.169733
X Variable 1	0.004875	0.004546633	1.072222	0.477821



	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
15	0.024375	0.02	1.21875	2.6842	**No**
20	-				
25	0.024375	0.02	1.21875	2.6842	**No**

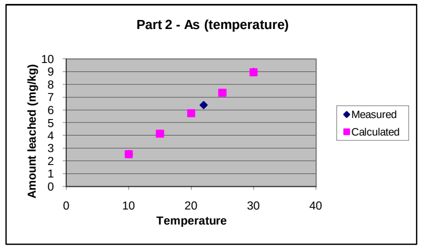
PrEN 12457 part 2
As

Measured values

10	2.54
22	6.38
30	8.96

Calculated values

10	2.536842
15	4.141447
20	5.746053
25	7.350658
30	8.955263



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999997731
R Square	0.999995461
Adjusted R Square	0.999990922
Standard Error	0.009733285
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	20.87270526	20.87271	220323	0.001356281
Residual	1	9.47368E-05	9.47E-05		
Total	2	20.8728			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.672368421	0.015206337	-44.2163	0.014395
X Variable 1	0.320921053	0.000683704	469.3858	0.001356

	B values	**St. Err. of B**	**t values**	**t (32)**	**Significance at 1% level**
15	1.604605	0.71	2.260007413	2.7400	**No**
20	-				
25	1.604605	0.71	2.260007413	2.7400	**No**

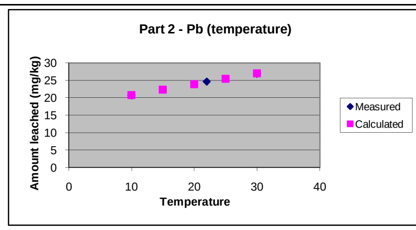
PrEN 12457 part 2
Pb

Measured values

10	20.76
22	24.68
30	26.92

Calculated values

10	20.81895
15	22.36632
20	23.91368
25	25.46105
30	27.00842



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999150743
R Square	0.998302207
Adjusted R Square	0.996604414
Standard Error	0.181687992
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	19.41018947	19.41019	588	0.026238889
Residual	1	0.033010526	0.033011		
Total	2	19.4432			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	17.72421053	0.283851625	62.44181	0.010195
X Variable 1	0.309473684	0.01276248	24.24871	0.026239

	B values	**St. Err. of B**	**t values**	**t (32)**	**Significance at 1% level**
15	1.547368	0.8	1.934210526	2.7400	**No**
20	-				
25	1.547368	0.8	1.934210526	2.7400	**No**

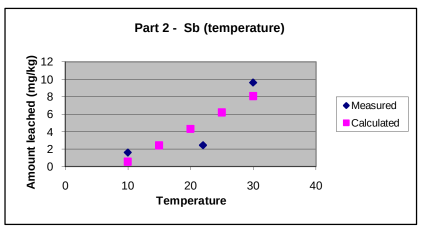
PrEN 12457 part 2
Sb

Measured values

10	1.6
22	2.44
30	9.64

Calculated values

10	0.551579
15	2.430526
20	4.309474
25	6.188421
30	8.067368



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.855965601
R Square	0.732677109
Adjusted R Square	0.465354219
Standard Error	3.231450709
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	28.62012632	28.62013	2.740795	0.345926951
Residual	1	10.44227368	10.44227		
Total	2	39.0624			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-3.206315789	5.048503906	-0.6351	0.639781
X Variable 1	0.375789474	0.226989816	1.655535	0.345927

	B values	**St. Err. of B**	**t values**	**t (32)**	**Significance at 1% level**
15	1.878947	0.16	11.74342105	2.7400	**YES**
20	-				
25	1.878947	0.16	11.74342105	2.7400	**YES**

Cd, Co, Zn : Can not be evaluated using this approach

PrEN 12457 part 2
B

Measured values

10	4.753
22	5.513
30	8.37

Calculated values

10	4.381895
15	5.239757
20	6.097618
25	6.95548
30	7.813342

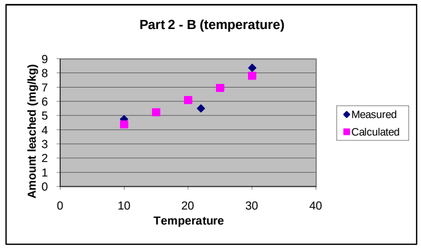
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.905616896
R Square	0.820141963
Adjusted R Square	0.640283926
Standard Error	1.14382324
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5.965914395	5.965914	4.559941	0.278816698
Residual	1	1.308331605	1.308332		
Total	2	7.274246			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.666171053	1.786998044	1.491983	0.37591
X Variable 1	0.171572368	0.080346646	2.135402	0.278817



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
15	0.857862	0.71	1.208256116	2.8450	**No**
20 -					
25	0.857862	0.71	1.208256116	2.8450	**No**

PrEN 12457 part 2
NH4

Measured values

22	2619
30	5604

Calculated values

20	1872.75
25	3738.375
30	5604

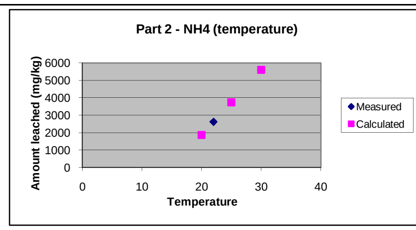
SUMMARY OUTPUT

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	65535
Standard Error	0
Observations	2

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4455112.5	4455113	0	#NUM!
Residual	0	6.61744E-24	65535		
Total	1	4455112.5			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-5589.75	0	65535	#NUM!
X Variable 1	373.125	0	65535	#NUM!



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
20 -					
25	1865.625	104	17.93870192	2.8450	**YES**

Co, Cu, Mo, Ni, Pb, Zn : Can not be evaluated using this approach

L/S-ratio

PrEN 12457 part 1
Ba

Measured values

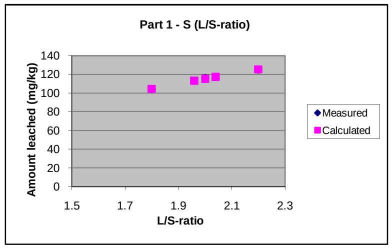
1.8	104
2	116
2.2	125

Calculated values

1.8	104.5
1.96	112.9
2	115
2.04	117.1
2.2	125.5

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996616
R Square	0.993243
Adjusted R Squa	0.986486
Standard Error	1.224745
Observations	3



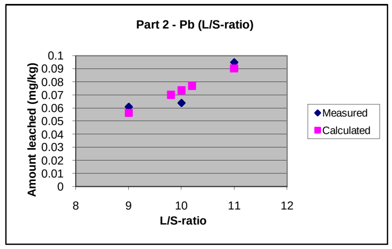
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	220.5	220.5	147	0.05238893
Residual	1	1.5	1.5		
Total	2	222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	10	8.6890736	1.150871	0.455418
X Variable 1	52.5	4.33012702	12.12436	0.052389

	B values	**St. Err. of B**	**t values**	**t (57)**	**Significance at 1% level**
1.96	2.1	3	0.7	2.666	**NO**
2	-				
2.04	2.1	3	0.7	2.666	**NO**

L/S-ratio



PrEN 12457 part 2
Pb

Measured values

9	0.061
10	0.064
11	0.095

Calculated values

9	0.056333
9.8	0.069933
10	0.073333
10.2	0.076733
11	0.090333

SUMMARY OUTPUT

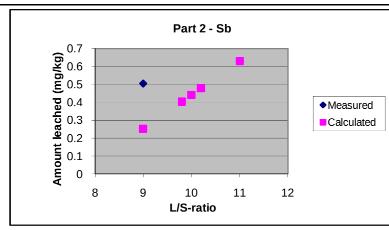
Regression Statistics	
Multiple R	0.90311471
R Square	0.81561618
Adjusted R Squai	0.63123236
Standard Error	0.01143095
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.000578	0.000578	4.423469	0.28254943
Residual	1	0.00013067	0.000131		
Total	2	0.00070867			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.0966667	0.08109802	-1.19197	0.444387
X Variable 1	0.017	0.0080829	2.103205	0.282549

	B values	**St. Err. of B**	**t values**	**t (58)**	**Significance at 1% level**
9.8	0.0034	0.008	0.425	2.664	**No**
10	-				
10.2	0.0034	0.008	0.425	2.664	**No**



PrEN 12457 part 2
Sb

Measured values

9	0.504
10	0.44
11	0.629

Calculated values

9	0.251
9.8	0.4022
10	0.44
10.2	0.4778
11	0.629

SUMMARY OUTPUT

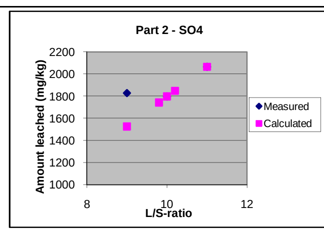
Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Squai	65535
Standard Error	0
Observations	2

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0178605	0.017861	0	#NUM!
Residual	0	5.0074E-30	65535		
Total	1	0.0178605			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1.45	0	65535	#NUM!
X Variable 1	0.189	0	65535	#NUM!

	B values	**St. Err. of B**	**t values**	**t (61)**	**Significance at 1% level**
9.8	0.0378	0.027	1.4	2.660	**No**
10	-				
10.2	0.0378	0.027	1.4	2.660	**No**



PrEN 12457 part 2
SO4

Measured values

9	1829
10	1795
11	2066

Calculated values

9	1524
9.8	1740.8
10	1795
10.2	1849.2
11	2066

SUMMARY OUTPUT

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Squai	65535
Standard Error	0
Observations	2

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	36720.5	36720.5	0	#NUM!
Residual	0	3.3501E-23	65535		
Total	1	36720.5			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-915	0	65535	#NUM!
X Variable 1	271	0	65535	#NUM!

	B values	**St. Err. of B**	**t values**	**t (61)**	**Significance at 1% level**
9.8	54.2	59	0.918644068	2.659	**No**
10	-				
10.2	54.2	59	0.918644068	2.659	**No**

Cr and Cu : Can not be evaluated using this approach

L/S-ratio

PrEN 12457 part 3-1
Ba

Measured values

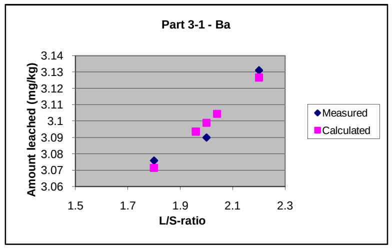
1.8	3.076
2	3.09
2.2	3.131

Calculated values

1.8	3.0715
1.96	3.0935
2	3.099
2.04	3.1045
2.2	3.1265

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.962103
R Square	0.925643
Adjusted R Squa	0.851285
Standard Error	0.011023
Observations	3



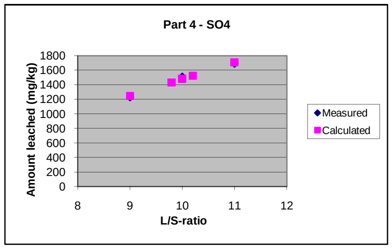
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0015125	0.001512	12.44856	0.17582372
Residual	1	0.0001215	0.000122		
Total	2	0.001634			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.824	0.07820166	36.11176	0.017625
X Variable 1	0.1375	0.03897114	3.528252	0.175824

	B values	**St. Err. of B**	**t values**	**t (41)**	**Significance at 1% level**
1.96	0.0055	0.014	0.392857143	2.041	**NO**
2	-				
2.04	0.0055	0.014	0.392857143	2.041	**NO**

L/S-ratio



PrEN 12457 part 4
SO4

Measured values

9	1231
10	1512
11	1692

Calculated values

9	1247.833
9.8	1432.233
10	1478.333
10.2	1524.433
11	1708.833

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.992095
R Square	0.984252
Adjusted R Squa	0.968504
Standard Error	41.23308
Observations	3

ANOVA

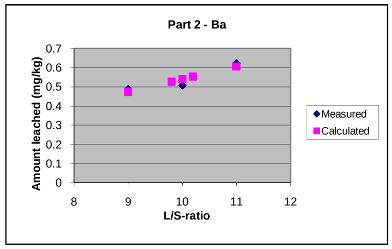
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	106260.5	106260.5	62.50005	0.08010131
Residual	1	1700.16667	1700.167		
Total	2	107960.667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-826.6667	292.532144	-2.8259	0.216526
X Variable 1	230.5	29.1561886	7.905697	0.080101

	B values	**St. Err. of I**	**t values**	**t (61)**	**Significance at 1% level**
9.8	46.1	67	0.688059701	2.660	**No**
10	-				
10.2	46.1	67	0.688059701	2.660	**No**

Ba, Cu, Zn : Can not be evaluated using this approach

L/S-ratio
FCM



PrEN 12457 part 2
Ba

Measured values

9	0.4878
10	0.507
11	0.6226

Calculated values

9	0.471733
9.8	0.525653
10	0.539133
10.2	0.552613
11	0.606533

SUMMARY OUTPUT

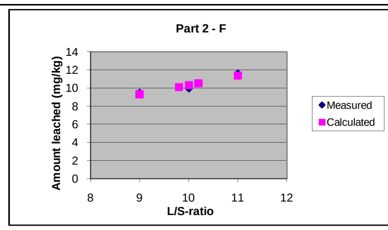
Regression Statistics	
Multiple R	0.92431391
R Square	0.8543562
Adjusted R Squa	0.7087124
Standard Error	0.03935514
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00908552	0.009086	5.866066	0.2492764
Residual	1	0.00154883	0.001549		
Total	2	0.01063435			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.1348667	0.2792089	-0.48303	0.713533
X Variable 1	0.0674	0.02782828	2.421996	0.249276

	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
9.8	0.01348	0.0127	1.061417323	2.6842	**NO**
10	-				
10.2	0.01348	0.0127	1.061417323	2.6842	**NO**



PrEN 12457 part 2
F

Measured values

9	9.468
10	9.96
11	11.572

Calculated values

9	9.281333
9.8	10.12293
10	10.33333
10.2	10.54373
11	11.38533

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.95587503
R Square	0.91369707
Adjusted R Squa	0.82739414
Standard Error	0.45723809
Observations	3

ANOVA

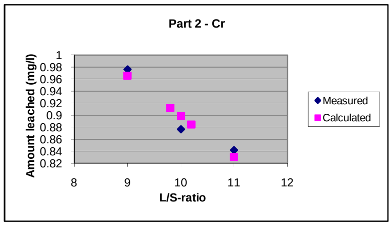
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.213408	2.213408	10.58709	0.18982236
Residual	1	0.20906667	0.209067		
Total	2	2.42247467			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.1866667	3.24392081	-0.05754	0.963407
X Variable 1	1.052	0.32331615	3.253781	0.189822

	B values	**St. Err. of B**	**t values**	**t(49)**	**Significance at 1% level**
9.8	0.2104	0.098	2.146938776	2.6842	**No**
10	-				
10.2	0.2104	0.098	2.146938776	2.6842	**No**

Availability control

PrEN 12457 part 2
Cr



Measured values

	mg/l	mg/kg
9	0.976444	8.788
10	0.8765	8.765
11	0.841636	9.258

Calculated values

	mg/l	mg/kg
9	0.965598	8.69
9.8	0.911674	8.93
10	0.898194	8.98
10.2	0.884713	9.02
11	0.83079	9.14

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.96328216
R Square	0.92791253
Adjusted R Squa	0.85582505
Standard Error	0.02656913
Observations	3

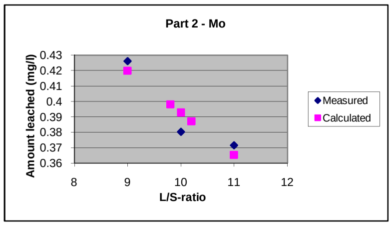
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00908661	0.009087	12.87204	0.17304998
Residual	1	0.00070592	0.000706		
Total	2	0.00979253			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.57223401	0.18849731	8.340883	0.075963
X Variable 1	-0.067404	0.01878721	-3.58776	0.17305

	B values	**St. Err. of I**	**t values**	**t(49)**	**Significance at 1% level**
9.8	0.013481	0.0164	0.822000493	2.6842	**NO**
10	-				
10.2	0.013481	0.0164	0.822000493	2.6842	**NO**

PrEN 12457 part 2
Mo



Measured values

	mg/l	mg/kg
9	0.426222	3.836
10	0.3802	3.802
11	0.371636	4.088

Calculated values

	mg/l	mg/kg
9	0.419979	3.78
9.8	0.398145	3.90
10	0.392686	3.93
10.2	0.387228	3.95
11	0.365393	4.02

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.92969103
R Square	0.86432542
Adjusted R Squa	0.72865083
Standard Error	0.0152924
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00148981	0.00149	6.370577	0.24014773
Residual	1	0.00023386	0.000234		
Total	2	0.00172367			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.66561549	0.10849347	6.135074	0.102863
X Variable 1	-0.0272929	0.01081336	-2.524	0.240148

	B values	**St. Err. of I**	**t values**	**t(49)**	**Significance at 1% level**
9.8	0.005459	0.008	0.682323232	2.6842	**NO**
10	-				
10.2	0.005459	0.008	0.682323232	2.6842	**NO**

NO2 : Can not be evaluated using this approach

L/S-ratio
COS

PrEN 12457 part 2
Pb

Measured values

9	22.158
10	24.68
11	25.21

Calculated values

9	22.49
9.8	23.7108
10	24.016
10.2	24.3212
11	25.542

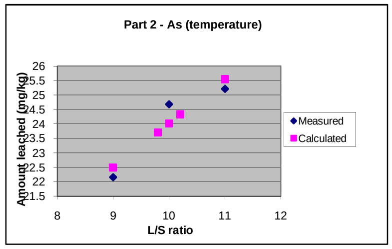
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.93576532
R Square	0.87565674
Adjusted R Squa	0.75131348
Standard Error	0.81323059
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4.657352	4.657352	7.042253	0.22942064
Residual	1	0.661344	0.661344		
Total	2	5.318696			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	8.756	5.76954487	1.517624	0.37091
X Variable 1	1.526	0.57504087	2.653724	0.229421



9.8	**B values**	**St. Err. of l**	**t values**	**t(49)**	**Significance at 1% level**
9.8	0.3052	0.8	0.3815	2.7400	**No**
10 -					
10.2	0.3052	0.8	0.3815	2.7400	**No**

As, Cd, Co, Ni, Sb, Zn : Can not be evaluated using this approach

Here we have many elements that can not be evaluated because there is no linear relation. This may expresses only the uncertainties of the test and the fact that the variation on the standard conditions is very low and thus many test conditions become significantly different from the standard condition

L/S-ratio
SEW

PrEN 12457 part 2
B

Measured values

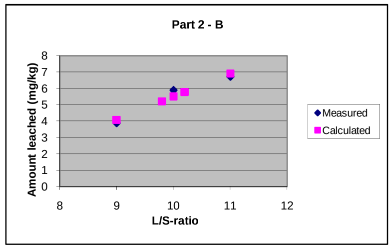
9	3.877
10	5.892
11	6.718

Calculated values

9	4.075167
9.8	5.211567
10	5.495667
10.2	5.779767
11	6.916167

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.97202671
R Square	0.94483592
Adjusted R Squa	0.88967184
Standard Error	0.48540722
Observations	3



ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4.0356405	4.035641	17.12774	0.15093312
Residual	1	0.23562017	0.23562		
Total	2	4.27126067			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-8.7093333	3.4437695	-2.52901	0.239716
X Variable 1	1.4205	0.34323474	4.138567	0.150933

	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
9.8	0.2841	0.473	0.600634249	2.8450	**No**
10	-				
10.2	0.2841	0.473	0.600634249	2.8450	**No**

PrEN 12457 part 2
Ba

Measured values

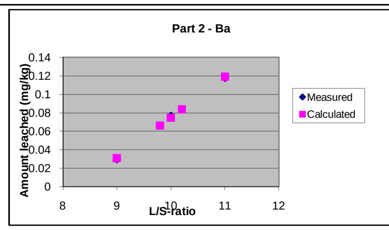
9	0.0296
10	0.0767
11	0.1178

Calculated values

9	0.0306
9.8	0.06588
10	0.0747
10.2	0.08352
11	0.1188

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99922961
R Square	0.99845981
Adjusted R Squa	0.99691962
Standard Error	0.00244949
Observations	3



ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00388962	0.00389	648.27	0.02499073
Residual	1	6E-06	6E-06		
Total	2	0.00389562			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.3663	0.01737815	-21.0782	0.03018
X Variable 1	0.0441	0.00173205	25.46115	0.024991

	B values	**St. Err. of I**	**t values**	**t (18)**	**Significance at 1% level**
9.8	0.00882	0.0101	0.873267327	2.8780	**No**
10	-				
10.2	0.00882	0.0095	0.928421053	2.8780	**No**

PrEN 12457 part 2
Co

Measured values

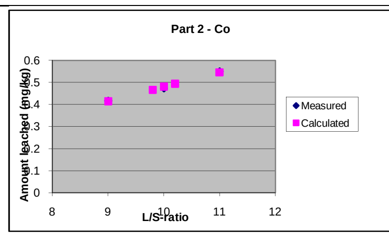
9	0.4169
10	0.4731
11	0.5496

Calculated values

9	0.413517
9.8	0.466597
10	0.479867
10.2	0.493137
11	0.546217

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99612236
R Square	0.99225976
Adjusted R Squa	0.98451952
Standard Error	0.00828744
Observations	3



ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00880464	0.008805	128.195	0.05608144
Residual	1	6.8682E-05	6.87E-05		
Total	2	0.00887333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.1836333	0.05879606	-3.12322	0.197268
X Variable 1	0.06635	0.00586011	11.32232	0.056081

	B values	**St. Err. of I**	**t values**	**t (20)**	**Significance at 1% level**
9.8	0.01327	0.0127	1.04488189	2.8450	**No**
10	-				
10.2	0.01327	0.0127	1.04488189	2.8450	**No**

PrEN 12457 part 2
Mo

Measured values

9	1.421
10	1.576
11	1.726

Calculated values

9	1.421833
9.8	1.543833
10	1.574333
10.2	1.604833
11	1.726833

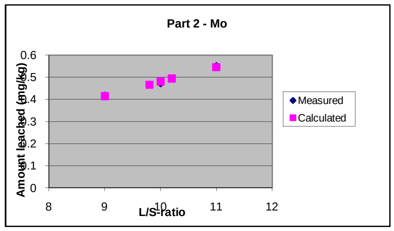
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99995521
R Square	0.99991043
Adjusted R Squa	0.99982085
Standard Error	0.00204124
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0465125	0.046513	11163	0.00602527
Residual	1	4.1667E-06	4.17E-06		
Total	2	0.04651667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.04933333	0.01448179	3.406577	0.181773
X Variable 1	0.1525	0.00144338	105.6551	0.006025



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
9.8	0.0305	0.035	0.871428571	2.8450	**No**
10	-				
10.2	0.0305	0.035	0.871428571	2.8450	**No**

PrEN 12457 part 2
Ni

Measured values

9	1.473
10	1.91
11	2.125

Calculated values

9	1.51
9.8	1.7708
10	1.836
10.2	1.9012
11	2.162

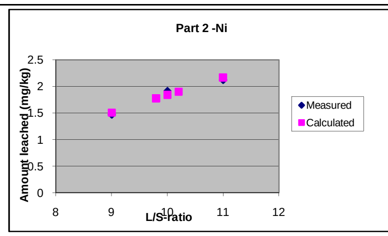
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.98122025
R Square	0.96279318
Adjusted R Squa	0.92558637
Standard Error	0.09063112
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.212552	0.212552	25.8768	0.12357255
Residual	1	0.008214	0.008214		
Total	2	0.220766			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1.424	0.64299145	-2.21465	0.270011
X Variable 1	0.326	0.06408588	5.086924	0.123573



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
9.8	0.0652	0.105	0.620952381	2.8450	**No**
10	-				
10.2	0.0652	0.105	0.620952381	2.8450	**No**

PrEN 12457 part 2
SO4

Measured values

9	279.4
10	340.4
11	387.4

Calculated values

9	281.7333
9.8	324.9333
10	335.7333
10.2	346.5333
11	389.7333

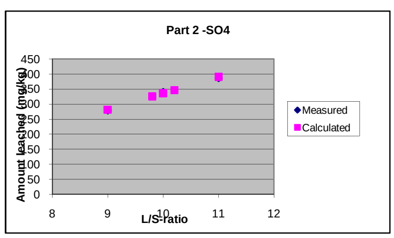
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99721107
R Square	0.99442992
Adjusted R Squa	0.98885984
Standard Error	5.71547607
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5832	5832	178.5306	0.04755705
Residual	1	32.6666667	32.66667		
Total	2	5864.66667			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-204.26667	40.5490101	-5.03753	0.124754
X Variable 1	54	4.04145188	13.36153	0.047557



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
9.8	10.8	11	0.981818182	2.8450	**No**
10	-				
10.2	10.8	11	0.981818182	2.8450	**No**

PrEN 12457 part 2
DOC

Measured values

9	33050
10	39478
11	48107

Calculated values

9	32683.17
9.8	38705.97
10	40211.67
10.2	41717.37
11	47740.17

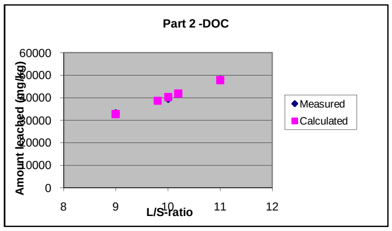
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.99645758
R Square	0.99292772
Adjusted R Squa	0.98585544
Standard Error	898.554487
Observations	3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	113356625	1.13E+08	140.3971	0.05360103
Residual	1	807400.167	807400.2		
Total	2	114164025			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-35073.333	6374.88366	-5.5018	0.114462
X Variable 1	7528.5	635.373971	11.84893	0.053601



	B values	**St. Err. of B**	**t values**	**t (20)**	**Significance at 1% level**
9.8	1505.7	955	1.576649215	2.8450	**No**
10	-				
10.2	1505.7	955	1.576649215	2.8450	**No**

NH4 : Can not be evaluated using this approach

Validation of CEN/TC 292 leaching tests and eluate analysis methods EN 12457 part 1 - 4, EN 13370 and EN 12506 in co-operation with CEN/TC 308

Part 1. Ruggedness testing of EN 12457 Part 1 - 4

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Ole Hjelmar
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DHI WATER & ENVIRONMENT

With contributions from:

DHI (DK)
ECN (NL)
VITO (B)
INERIS (F)
ENEL (I)
UBA (D)

CONTENTS

APPENDICES

1 RUGGEDNESS OF THE LEACHING PROCEDURE

1.1 Objectives

The objective of the ruggedness testing is to assess the sensitivity of the leaching procedures with respect to realistic variations in parameters that might be critical to the results of the leaching procedures.

1.2 Testing programme

Potentially critical test conditions during the performance of the batch compliance leaching tests prEN 12457 (part 1-4) were investigated to assess the sensitivity of the leaching procedures. In Annex A to the draft standard information is given on conditions that may affect leaching (e.g. pH changes due to CO_2 uptake, liquid solid ratio, temperature, time and type of agitation size reduction procedure and filtration). In this ruggedness testing 7 potentially critical test conditions were varied (confer Table 1.2.1).

Table 1.2.1 Potentially critical test conditions to be addressed in the ruggedness testing

Test conditions	Standard Condition	"Low" value	"High" value
Liquid to solid ratio Part 1 and 3 Part 2 and 4	 2.0 l/kg 10 l/kg	 1.8 l/kg 9 l/kg	 2.2 l/kg 11 l/kg
Temperature[1]	15-25 ºC	10 ºC	30 ºC
Contact time[2] Part 1, 2 and 4 Part 3 first step Part 3 second step	 24 hours 6 hours 18 hours	 22 hours 4 hours 16 hours	 26 hours 8 hours 20 hours
Agitation[3]	Not specified in draft standard (see note the below)	-	-
Size reduction[4]	Jaw crusher	Hammer mill or rotary disk mill	-
Filter diameter[5]	Not specified in draft standard (see the note below)	-	-
Weight of test material[6]	100 g	50 g	200 g

[1] Temperature: the following conditions can be considered relevant: 10 and 30 °C. These temperatures may be considered as potentially occurring due to failure of heating or air conditioning.

[2] Contact time: variation between 22 and 26 hours (10% variation around 24 hours).

[3] Mode of agitation is not specified in the draft standard. Roller table, End-over-End tumbler and wrist shaker have been used side by side to verify their comparability.

[4] Equipment used for size reduction is not specified in the draft standard: Jaw crusher and hammer mill or rotary disk mill have been used in the ruggedness testing.

[5] Filtration through a filter 0.45 μm: The diameter of the filter is not specified in the draft standard. Filters with diameters of 47 mm, 100 mm and 142 mm have been used side by side to verify their comparability.

[6] Weight of test material: Vary weight of test material used in the test according to homogeneity/heterogeneity of laboratory sample: 50 g and 200 g of test material are used.

The ruggedness testing was performed on 4 materials. The materials used for ruggedness testing are listed in Table 1.2.2

Table 1.2.2 Materials used in the ruggedness testing

Material	Coding
MSWI bottom ash	MBA
Sludge from municipal wastewater treatment plant	SEW
Filter cake of treated fly ash (MSWI)	FCM
Contaminated soil	COS

The ruggedness testing was performed by varying one potentially critical test condition at the time. The results of 5 replicates for each potentially critical test conditions were compared to the results of 10 replicates of the standard conditions for an individual parameter. An overview of the ruggedness testing is provided in Figure 1.2.1. The figure shows the minimum requirements of the ruggedness testing for each part of the standard and for each material, respectively.

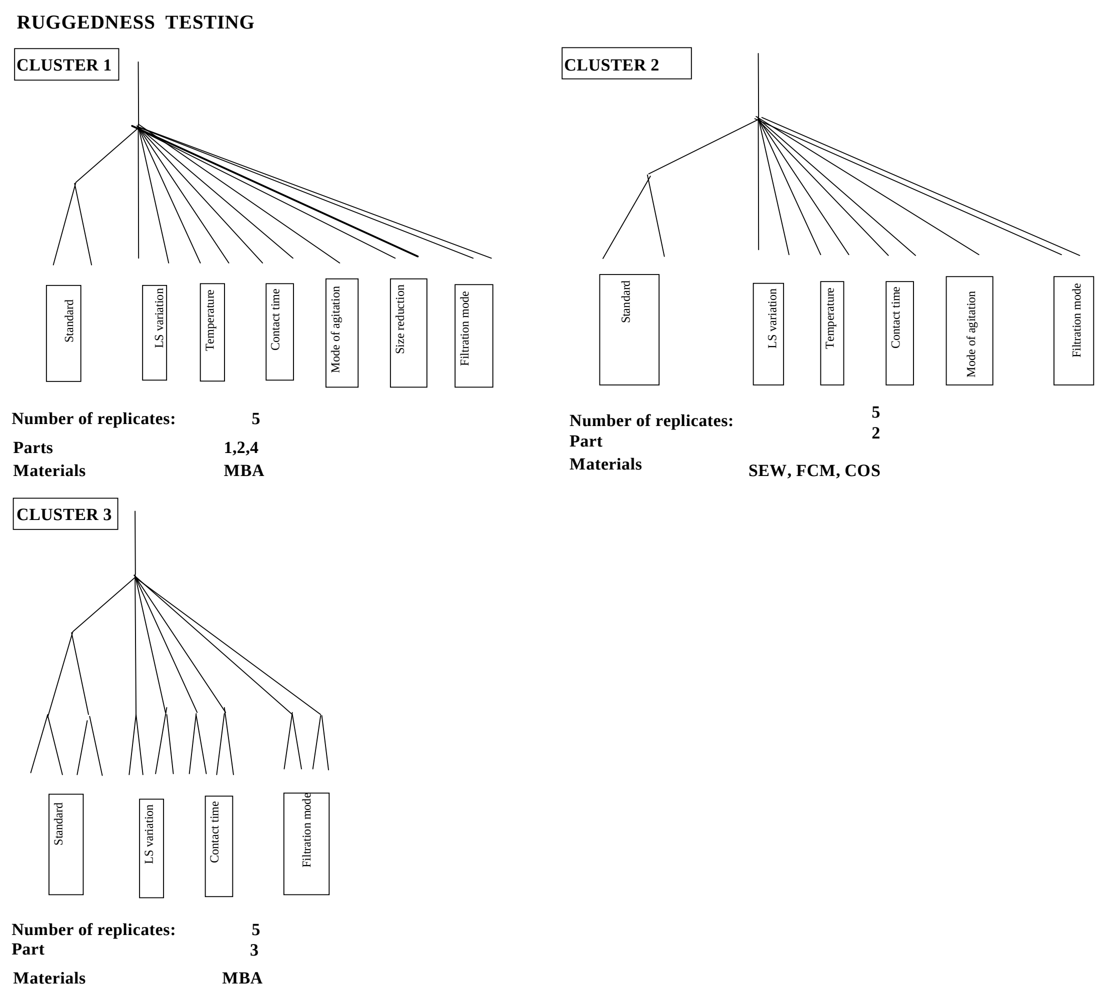


Fig. 1.2.1 Overview of the ruggedness testing.

Based on a previous study of the leachability of the four materials, parameters relevant for each material were selected for the ruggedness testing. A list of the parameters selected for each material is given in Table 1.2.3.

Table 1.2.3. Parameters included in the ruggedness testing given for the four materials

	Parameters
MBA	Ba, Cr, Cu, Mo, Pb, Sb, Zn, Cl, S
SEW	B, Ba, Cd, Co, Cu, Mo, Ni, Pb, Sn, Zn, NH_4, SO_4, DOC
FCM	Ba, Cd, Cr, Mo, F^-, Cl^-, NO_2, Cr(VI)
COS	As, Cd, Co, Ni, Pb, Sb, Zn

In all tests pH and conductivity were measured as required to ensure that mutual relationships between parameters could be identified.

Five laboratories have carried out the ruggedness testing as it is listed below.

MBA - part 1: ECN (Netherlands Energy Research Foundation)
MBA - part 2: DHI - Water and Environment (formerly VKI)
MBA - part 3: VITO (Flemish Institute for Technological Research)
MBA - part 4: DHI - Water and Environment (formerly VKI)
FCM - part 2: INERIS (National Institut for Industrial Environment and Risks)
SEW - part 2: ENEL (Italy)
COS - part 2: UBA (Umweltbundesamt)

In addition to the general ruggedness testing, an extra test was carried out on MBA using prEN 12457 part 2 and applying a factorial test design. The methodology and the results of this test, which was carried out by DHI, are described in section 3.2.1.

The results of the ruggedness testing were reported to ECN and DHI. The further processing of the results was performed by DHI.

2 DATA TREATMENT

A stepwise procedure has been used to process the results of the ruggedness testing.

The stepwise procedure consists of following steps:

1. A test for one outlier within each test condition (Grubbs' test).

2. A multiple regression analysis tool is used to analyse the results with outliers within each condition removed. During the multiple regression analysis t-tests are performed comparing an estimated mean value (μ) for a specific potentially critical test condition to the mean value of the standard condition. The following hypotheses are tested:

$$H_0 : \mu_{\text{test condition}} = \mu_{\text{standard condition}}$$
$$H_1 : \mu_{\text{test condition}} \neq \mu_{\text{standard condition}}$$

   A common variance of the population is estimated and thus it is necessary to assume that the population is normally distributed (although moderate departures from normality will not seriously affect the results). The null hypothesis is rejected if $|t_0 \text{ (test value)}| > t_{\alpha/2,\ n-1,}$ where $t_{\alpha/2,\ n-1}$ represents the upper $\alpha/2$ percentage point of the t-distribution with n-1 degrees of freedom. Rejection of $|\text{test value } (t_0)| > t_{\alpha/2,\ n-1}$ means that the estimated mean value of this test condition is different from the estimated mean value of the standard condition at the α level of significance. The multiple regression analysis computes the level of significance (called the p-level, probability of rejection of H_0 when H_0 is true) for each potentially critical test condition based on a t-test. If a potentially critical test condition differs from the standard conditions at a 1% (or lower) level of significance the test conditions are identified as a critical test condition for a specific parameter.

3. In an analysis of variance it is tested if the variations between test conditions are significantly different from the variations within test conditions and this test generally confirms the results of the regression analysis.

4. The conditions that have been chosen outside the working range specified in the test procedures like temperature and L/S ratio have been treated separately to assess the performance at temperature and L/S range specified in the test procedures.

The assumption of normality is analysed by a histogram of the population and a normal probability plot of residuals.

All data are presented graphical in Appendix 0 and data sorted for outliers are illustrated a box plot giving the median, 5% and 95% limits in Appendices 1 through 7.

A summary of the stepwise procedure will be presented for each part of the standard and for each test materiel. Detailed calculations and figures are presented in appendices 1 to 7.

3 RESULTS

The ruggedness testing includes up to seven potentially critical test conditions. However, not all test conditions were specified normatively in the draft standard (e.g. mode of agitation, diameter of the filter and mode of size reduction). Thus, for these conditions the performing laboratories have chosen to apply the procedures they commonly use. Table 3.1 presents an overview of the options used as standard condition for the four materials.

Table 3.1. Standard conditions in the ruggedness testing for part 1-4 and materials respectively

	Standard Conditions						
	Contact time (hrs)	**L/S-ratio (l/kg)**	**Weight of Material (g)**	**Temperature (°C)**	**Mode of Agitation**	**Filtration diameter of filter (mm)**	**Mode of size reduction**
MBA							
Part 1	24	2	100	20-22	Roller table	100	?
Part 2	24	10	100	20-22	End over End	147	Jaw crusher
Part 3-1	6	2	100	20-22	Roller table	100	Jaw crusher
Part 3-2	18	8	100	20-22	Roller table	100	-
Part 4	24	10	100	20-22	End over End	147	Jaw crusher
FCM							
Part 2	24	10	100	20-22	?	100	-
SEW							
Part 2	24	10	100	20-22	End over End	47	-
COS							
Part 2	24	10	100	20-22	?	?	?

Due to the fact that some potentially critical test conditions are not specified there are variations in the performance of the ruggedness testing on different parts of the standard and different materials. The presentation of the results obtained in the ruggedness testing therefore contains a short description of the potentially critical test conditions used for each part of the standard and for each test material.

3.1 prEN 12457 part 1: MBA

The ruggedness testing of part 1 on MBA was performed by ECN in the Netherlands. The potentially critical test conditions used for ruggedness testing performed by ECN are described in Table 3.1.1.

The results of the ruggedness testing were processed according to the description given in section 2.

The main results of Grubbs' test for one outlier are presented in Table 3.1.2 (detailed calculations can be seen in Appendix 1).

Table 3.1.1 Description of potentially critical test conditions and codings.

	Description	Coding
Standard conditions	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	1.8 l/kg 2.2 l/kg	L1 L2
Mass of test material	50 g 200 g	W1 W2
Temperature	10 °C 30 °C	T1 T2
Agitation	End over End Wrist shaker	A1 A2
Filter diameter	47 mm 142 mm	F1 F2

Table 3.1.2 Results of Grubbs' test for one outlier within each test condition

Parameter	Straggler identified	Outlier identified
Ba	W1, T1	No outlier
Cr	No straggler	W2
Cu	W2	No outlier
Mo	W2, F47	No outlier
Sb	No straggler	No outlier
Zn	STD, A2	No outlier
S	No straggler	No outlier

Tables 3.1.3 and 3.1.4 present a summary of the data processing. It can be seen that for different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others. Table 3.1.5 gives a summary of the number of parameters significantly different from the standard condition results at 1% level for each test condition.

Table 3.1.5 Number of parameters for which the specified test condition differs significantly from the standard condition

Test condition	Description	Number of significant parameters out of 7 parameters
Contact time	C1 (22 hours) C2 (26 hours)	0 0
L/S – ratio	L1 (1.8 l/kg) L2 (2.2 l/kg)	1 1
Mass of test material	W1 (50 g) W2 (200 g)	1 0
Temperature	T1 (10 °C) T2 (30 °C)	2 **1**
Mode of agitation	A1 (End over End) A2 (Wrist shaker)	**3** 2
Diameter of filter	F1 (47 mm) F2 (147 mm)	0 0

Table 3.1.3 **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 1: MBA

Condition		Ba		Cr		Cu	Mo	Sb	Zn		S	
		p-level		p-level		p-level	p-level	p-level	p-level		p-level	
Contact time	C1 (22 hours)	0.830		0.770		0.920	0.470	0.950	0.260		0.380	
	C2 (26 hours)	0.370		0.920		0.770	0.810	0.880	0.880		0.590	
L/S	L1 (1,8 l/kg)	0.020		0.390		0.360	0.420	0.600	0.200		0.000	*
	L2 (2,2 l/kg)	0.170		0.060		0.670	0.510	0.470	0.920		0.000	*
Mass	W1 (50 g)	0.580		0.000	*	0.900	0.180	0.100	0.960		0.850	
	W2 (200 g)	0.150		0.070		0.280	0.710	0.650	0.700		0.950	
Temperature	T1 (10 degree C)	0.000	*	0.350		0.760	0.420	0.020	0.490		0.000	*
	T2 (30 degree C)	0.000	*	0.030		0.660	0.670	0.020	0.920		0.050	
Agitation	A1 (End over End)	0.000	*	0.000	*	0.050	0.890	0.050	0.600		0.000	*
	A2 (Wrist shaker)	0.080		0.000	*	0.300	0.030	0.360	0.170		0.000	*
Filter	F1 (47 mm diameter)	0.070		0.550		0.070	0.180	0.520	0.000	*	0.420	
	F2 (142 mm diameter)	0.880		0.180		0.200	0.170	0.240	0.020		0.280	

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.1.4 **Summary of variances for standard condition**

prEN 12457 - 1: MBA

	Ba	Cr	Cu	Mo	Sb	Zn	S
Standard conditions							
Mean (µ), mg/kg	0.48	0.015	3.6	0.36	0.057	0.062	116
Variance (S2within)	0.00011	0.00001	0.03990	0.00038	0.00003	0.00014	20
Std.	0.010	0.0028	0.20	0.019	0.0059	0.012	4.5
Relative std. %	**2**	**19**	**6**	**5**	**10**	**19**	**4**

Table 3.1.4 shows estimates of the mean values and variances obtained for the standard condition.

3.2 prEN 12457 part 2: MBA

3.2.1 General ruggedness testing procedure

The ruggedness testing of part 2 on MBA was performed by DHI in Denmark. The potentially critical test conditions used for ruggedness testing performed by DHI are described in Table 3.2.1.

Table 3.2.1. Description of potentially critical test conditions and coding

	Description	**Coding**
Standard conditions	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	9 l/kg 11 l/kg	L1 L2
Mass of test material	50 g 200 g	W1 W2
Temperature	10 °C 30 °C	T1 T2
Agitation	Roller table Wrist shaker	A1 A2
Filter diameter	47 mm 100 mm	F1 F2
Size reduction mode	Hammer mill	S1

The results of the ruggedness testing were processed according to the description given in section 2.

The results of the ruggedness testing of part 2 on MBA were analysed for outliers within each test condition using Grubbs' test for one outlier. Table 3.2.2 shows the main results of Grubbs' test (detailed calculations are shown in Appendix 2).

Table 3.2.2 Results of Grubbs' test for one outlier within each test condition

Parameter	**Straggler identified**	**Outlier identified**
Ba	STD, T2	No outlier
Cr	F2	No outlier
Cu	F2	No outlier
Mo	No straggler	F1
Pb	W1	STD, T1, S1
Sb	C1, L2, A2, F2	W1
Zn	No straggler	No outlier
Cl	No straggler	No outlier
SO_4	C2	No outlier

Table 3.2.3 and 3.2.4 contain a summary of the data processing. It can be seen that for different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others. Table 3.2.5 gives a summary of the number of parameters significantly different from the standard condition results at 1% level for each test condition.

Table 3.2.3 Comparison of potentially critical test conditions to standard condition

prEN 12457 - 2: MBA

Condition		Ba	Cr	Cu	Mo	Pb	Sb	Zn	Cl	SO_4
		p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level
Contact time	**C1 (22 hours)**	0.150	0.950	0.100	0.000 *	0.630	0.005 *	0.203	0.652	0.196
	C2 (26 hours)	0.220	0.570	0.130	0.000 *	0.270	0.002 *	0.049	0.145	0.625
L/S	**L1 (9 l/kg)**	0.620	0.390	0.000 *	0.880	0.730	0.020	0.217	0.793	0.569
	L2 (11 l/kg)	0.470	0.002 *	0.000 *	0.170	0.000 *	0.000 *	0.120	0.152	0.000 *
Mass	**W1 (50 g)**	0.380	0.043	0.800	0.001 *	0.067	0.041	0.472	0.652	0.009 *
	W2 (200 g)	0.690	0.003 *	0.810	0.000 *	0.086	0.001 *	0.153	0.739	0.578
Temperature	**T1 (10 degree C)**	0.000 *	0.830	0.240	0.020	0.081	0.000 *	0.000 *	0.283	0.069
	T2 (30 degree C)	0.950	0.590	0.001 *	0.600	0.000 *	0.654	0.522	0.019	0.001 *
Agitation	**A1 (Roller table)**	0.010	0.000 *	0.000 *	0.090	0.000 *	0.000 *	0.203	0.135	0.625
	A2 (Wrist shaker)	0.010	0.000 *	0.000 *	0.010	0.002 *	0.120	0.575	0.710	0.000 *
Filter	**F1 (47 mm diameter)**	0.000 *	0.000 *	0.000 *	0.692	0.074	0.047	0.176	0.799	0.002 *
	F2 (100 mm diameter)	0.000 *	0.001 *	0.000 *	0.150	0.250	0.159	0.010	0.739	0.000 *
Size reduction	**S1 (Hammer Mill)**	0.010	0.001 *	0.000 *	0.000 *	0.000 *	0.000 *	0.522	0.000 *	0.000 *

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.2.4 Summary of variances for standard condition

prEN 12457 - 2: MBA

	Ba	Cr	Cu	Mo	Pb	Sb	Zn	Cl	SO_4
Standard conditions									
Mean (μ), mg/kg	1.5	0.042	4.6	0.54	0.064	0.44	0.24	2771	1795
Variance	0.0096	0.00013	0.15	0.00043	0.00017	0.0080	0.0043	10343	8250
Std.	0.098	0.011	0.38	0.021	0.013	0.090	0.065	102	91
Relative std. %	**7**	**27**	**8**	**4**	**20**	**20**	**28**	**4**	**5**

Table 3.2.5 Number of parameters for which the specified test condition differs significantly from the standard condition

Test condition	Description	Number of significant parameters out of 9 parameters
Contact time	C1 (22 hours) C2 (26 hours)	2 2
L/S - ratio	L1 (9 l/kg) L2 (11 l/kg)	1 **5**
Mass of test material	W1 (50 g) W2 (200 g)	2 3
Temperature	T1 (10 °C) T2 (30 °C)	3 3
Mode of agitation	A1 (Roller table) A2 (Wrist shaker)	**4** **4**
Diameter of filter	F1 (47 mm) F2 (100 mm)	**4** **4**
Mode of size reduction	S1 (hammer mill)	**7**

Table 3.2.4 contains estimates of the mean value and variances obtained for the standard condition and the modified standard conditions.

3.2.2 Particle size distribution (MBA)

The particle size reduction using af hammer mill instead of a jaw crusher appears particularly critical. The particle size distributions of the test material that had been size reduced by jaw crusher and by hammer mill, respectively, were determined. The results are shown in Figure 3.2.1.

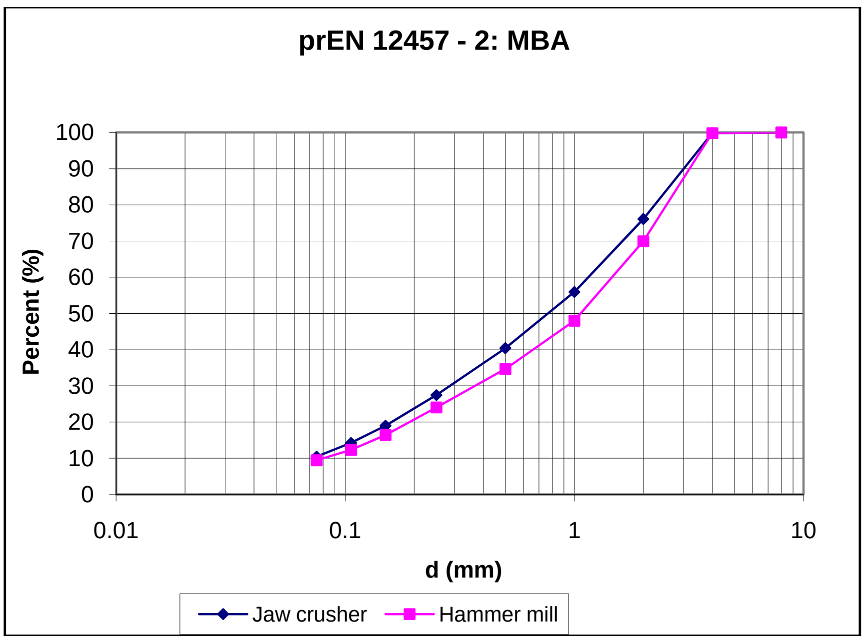


Fig 3.2.1 Size distribution of material crushed by jaw crusher and hammer mill, respectively

The particle size distributions show that the differences are relatively small. It is therefore likely that the different leaching test results obtained for the two methods are caused by the creation of different particle surfaces exposed to leaching.

3.2.3 Ruggedness testing performed as a factorial design experiment

Experimental design

In order to be able to address some additional questions, which occurred during the originally planned ruggedness testing, a new ruggedness test for part 2 on MBA was performed. The new ruggedness test was carried out as a factorial design experiment. 8 factors that may potentially be sources of variation were investigated in a so-called fractional $2^{-4}*2^{8}$ factorial design. The factors considered and their levels are displayed in Table 3.2.6. New factors that were not investigated in the first ruggedness testing were: The presence of headspace, the particle size, the time before filtration, the mode of filtration, and the filter material. Only three factors were repeated from the first ruggedness testing (the contact time, the L/S ratio and the temperature).

Table 3.2.6 Factors considered in the factorial design.

Factors and levels used		
Factor	**Low level**	**High level**
A: Head space	(.) Half full bottle	(a) Almost full bottle
B: Contact time	(.) 22 hours	(b) 26 hours
C: L/S ratio	(.) 9 l/kg	(c) 11 l/kg
D:Particle size	(.) < 125 µm	(d) < 4 mm
E: Temperature	(.) Room temp (22 C)	(e) 30 C
F: Time before filtration	(.) 15 min	(f) 3 hours
G: Mode of Filtration	(.) Vacuum filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester	(h) Polyvinyl fluoride

In addition to evaluation of new and potentially critical factors the factorial design experiment also offers the opportunity to evaluate the possibility of combined effects of the factors.

The fractional $2^{-4}*2^{8}$ factorial design is a resolution IV design in which main effects are confounded with interaction effects of order three or higher. Generally, second order interaction effects are confounded with other second order effects and higher order effects. This design was constructed by embedding the factors E, F, G and H in the complete 2^{4}factorial design defined by the factors A, B, C and D. The resulting design is described in Table 3.2.7.

An example of a description of a single experiment is given in Table 3.2.8. The description of all experiments that were carried out can be found in appendix 8.

Table 3.2.7 Factorial design experiment

Underlying Structure									
A	**B**	**C**	**D**		**E=bcd**	**F=acd**	**G=abd**	**H=abc**	**Codes**
-1	-1	-1	-1	(i)	-1	-1	-1	-1	(i)
1	-1	-1	-1	a	-1	1	1	1	afgh
-1	1	-1	-1	b	1	-1	1	1	begh
1	1	-1	-1	ab	1	1	-1	-1	abef
-1	-1	1	-1	c	1	1	-1	1	cefh
1	-1	1	-1	ac	1	-1	1	-1	aceg
-1	1	1	-1	bc	-1	1	1	-1	bcfg
1	1	1	-1	abc	-1	-1	-1	1	abch
-1	-1	-1	1	d	1	1	1	-1	defg
1	-1	-1	1	ad	1	-1	-1	1	adeh
-1	1	-1	1	bd	-1	1	-1	1	bdfh
1	1	-1	1	abd	-1	-1	1	-1	abdg
-1	-1	1	1	cd	-1	-1	1	1	cdgh
1	-1	1	1	acd	-1	1	-1	-1	acdf
-1	1	1	1	bcd	1	-1	-1	-1	bcde
1	1	1	1	abcd	1	1	1	1	abcdefgh

Table 3.2.8 Example of experiment to be carried out in the laboratory.

To be carried out in the laboratory	
Experiment no.	
Code = ac eg	
Process parameter	**Level in experiment**
A: Headspace	(a) Almost full bottle
B: Contact time	(.) 22 hours
C: L/S ratio	(c) 11 l/kg
D:Particle size	(.) < 125 µm
E: Temperature	(e) 30 C
F: Time before filtration	(.) 15 min
G: Mode of Filtration	(g) High pressure filtration
H: Filter material	(.) Cellulose ester

Statistical evaluation

When a fractional design is analysed the complete underlying factorial structure can be utilised and contrasts corresponding to the effects in the underlying factorial structure are computed, neglecting the embedded factors.

Contrast corresponding to factor A is given by:

$$[A]= [-(1) + a - b + ab - c + ac - bc + abc - d + ad - bd + abd - cd + acd - bcd + abcd]$$

The sum of squares corresponding to [A] is:

$$SS_A = [A]^2/2^k$$

where k denotes the number of factors in the underlying structure. The estimate of the A-effect is:

$$\hat{A} = 2*[A]/2^k$$

The effect of A is the estimated increase (or decrease) in response when factor A is changed from its low level to its high level. The computations corresponding to the remaining effects are performed in the same way as described for the factor A.

In a normal probability plot, the points will tend to form a straight line and points that falls far from that line can be identified as critical factors. The remaining effect estimates represent uncertainties.

In this procedure it is assumed that the variance of the residuals is independent of the levels of the factors under consideration. However, in some situations the variance of the data increases (or decreases) when an important factor is changed from its low level to its high level. Normal probability plots of the dispersion effects can reveal such situations. In a normal probability plot the points will tend to form a straight line with no points falling far to the left or far to the right of the line. In that case it can be concluded that the residual variance is constant when the factors are varying within the limits of the levels used in the experiment.

Results

The results were analysed according to the procedure described above. Table 3.2.9 gives a summary of the critical factors identified by using a normal probability plot for each parameter analysed for.

Table 3.2.9 Factors identified as critical factors by using normal probability plots.

	Ba	Cr	Cu	Mo	Pb	Sb	Cl	SO_4
Mean values (mg/kg)[a]	1.4 ± 0.05	0.050 ± 0.004	4.4 ± 0.1	0.53 ± 0.02	0.071 ± 0.008	0.47 ± 0.04	2845 ± 24	2420 ± 81
Headspace		-0.038	-1.0					
Contact time								
Combined effect of A and B								
L/S ratio	0.25							
Combined effect of A and C								
Combined effect of B and C								
Filter material								
Particle size			0.98	-0.081		-0.16	-271	-750
Combined effect of A and D			0.79					
Combined effect of B and D								
Mode of filtration					0.030			
Combined effect of C and D								
Time before filtration								
Temperature	0.41				0.042			
Combined effect of A, B, C and D								

[a]: For estimates of the mean values uncertainty intervals are given. Approximately 95% confidence degree (computed as 2* estimated standard deviation of the estimate).

A detailed analysis of the results is presented in Appendix 8. The numbers in Table 3.2.9 refer to the change in the expected response if the critical factor is changed from the low level to the high level. For example, if the factor C is applied at its low level, the expected response for Ba will be equal to the mean value of all responses minus C-effect/2 (μ – 0.25/2). If C is applied at its high level the expected response for Ba will be equal to the mean value of all responses plus C-effect/2 (μ+ 0.25/2).

The results of this ruggedness testing can easily be analysed and interpreted. The second order effects seem to be significant only for Cu, and in that case it is reasonable to believe that it is the combination of two significant effects that gives an effect. There is also no reason to believe that third order effects should be presented and thus the effects for these codes can be related to the confounded single factors E, F, G or H. No significant dispersion effects were detected. Therefore, for the responses it is concluded that generally there are no tendencies of dispersion effects for any of the analysed factors.

As can be seen from Table 3.2.9 different factors are identified as critical factors for different parameters. However, the particle size seems to be the most critical test condition. Less critical test conditions are the presence of headspace, the temperature, the L/S ratio and the mode of filtration. The time before the filtration and the filter material that has been used in this experiment were not critical to the test results.

The results obtained from this ruggedness testing have provided information on another critical test condition, particle size, and no combined effects of the test conditions investigated were found. In general, the results of the two ruggedness tests performed on part 2 were in good agreement with each other, and the results obtained from the factorial design experiment are helpful in the interpretation of the results of the original planned ruggedness testing.

3.3 prEN 12457 part 3: MBA

The ruggedness testing of part 3 on MBA was performed by VITO in Belgium. The potentially critical test conditions used for the ruggedness testing performed by VITO are described in Table 3.3.1.

Table 3.3.1 Description of potentially critical test conditions and coding.

	Description	**Coding**
Standard conditions	(see Table 3.1)	STD
Contact time	4 hours 8 hours 16 hours 20 hours	C1 C2 C3 C4
Liquid to solid ratio (L/S)	1,8kg 2,2kg	L1 L2
Mass of test material	50 g 200 g	W1 W2
Agitation	End over end Rotating table	A1 A2
Filter diameter	47 mm	F1

The results of the ruggedness testing were processed according to the description given in section 2.

The results of the ruggedness testing of part 3 on MBA were analysed for one outlier within each test condition using Grubbs' test. Table 3.3.2 shows the main results of Grubbs' test (detailed calculations are shown in Appendix 3).

Table 3.3.2. Results of Grubbs' test for one outlier within each test condition.

Parameter	**Straggler identified**	**Outlier identified**
part 3 - 1		
Ba	A2	No outlier
Cr	C2	No outlier
Cu	C2	No outlier
Mo	No Straggler	No outlier
Sb	L1	C1
SO_4	No Straggler	No outlier
part 3 - (1+2) (accumulated amount leached)		
Ba	A1	No outlier
Cr	No Straggler	No outlier
Cu	C4	No outlier
Mo	STD, C3, A1	No outlier
Sb	C3, L2	No outlier
SO_4	No Straggler	A2

From Table 3.3.2 it can be seen that a straggler or an outlier identified in the first step of part 3 is not necessarily a straggler or an outlier when the accumulated amount leached is analysed for stragglers and outliers.

Tables 3.3.3 and 3.3.4 contain a summary of the data processing for part 3 step 1 and tables 3.3.5 and 3.3.6 contain a summary of the data processing for part 3 step 1 and 2 (accumulated amount leached).

The summary tables (3.3.3 and 3.3.5) show that only the test results for a few parameters at a few test conditions were significantly different from the results obtained under standard conditions. However, the picture is rather scattered, and there is no logical pattern. Further analysis of the results shows that the relative standard deviations obtained for the standard condition (Tables 3.3.4 and 3.3.6) are relative high, especially for sulphate, compared to experiences obtained from the ruggedness testing of part 1 and 2 on MBA. In addition, the performing laboratory reported that the ruggedness testing was performed in square bottles and that the combination of square bottles on a roller table caused settlings of some test materials in the corners. Insufficient agitation of the test batches may have caused relatively high standard deviations and thus have made it harder to identify critical test conditions at a statistically significant level. Due to these irregularity in the performance of the test some additional experiments were performed using round bottles in an end over end tumbler. In figure 3.3.1 the results obtained for part 3 first step for standard conditions and one test condition (F1: filtration using 47 mm filters) are compared to the original results.

Table 3.3.3 **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 3/1: MBA

Condition		**Ba**	**Cr**	**Cu**	**Mo**	**Sb**	**SO4**
		p-level	p-level	p-level	p-level	p-level	p-level
Contact time	**C1 (4 hours)**	0.007 *	0.431	0.451	0.137	0.012	0.168
	C2 (8 hours)	0.745	0.394	0.070	0.466	0.038	0.253
L/S	**L1 (1,8 l/kg)**	0.334	0.846	0.657	0.286	0.153	0.081
	L2 (2,2 l/kg)	0.005 *	0.026	0.566	0.957	0.765	0.756
Mass	**W1 (50 g)**	0.218	0.466	0.764	0.927	0.343	0.551
	W2 (200 g)	0.729	0.994	0.687	0.423	0.308	0.156
Agitation	**A1 (End over End)**	0.968	0.008 *	0.008 *	0.966	0.077	0.020
	A2 (Rotating table)	0.389	0.135	0.413	0.296	0.146	0.310
Filter	**F1 (47 mm diameter)**	0.723	0.030	0.919	0.951	0.414	0.696

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1**

Table 3.3.4 **Summary of variances for standard condition**

prEN 12457 - 3/1: MBA

	Ba	**Cr**	**Cu**	**Mo**	**Sb**	**SO4**
Standard condition						
Mean (μ), mg/kg	0.31	0.042	3.9	0.33	0.044	746
Variance	0.00048	0.00012	0.34	0.0044	0.000036	19600
Std.	0.022	0.011	0.58	0.066	0.0060	140
Relative std. %	**7**	**26**	**15**	**20**	**14**	**19**

Table 3.3.5 **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 3/1+2: MBA

Condition		Ba	Cr	Cu	Mo	Sb		SO4	
		p-level	p-level	p-level	p-level	p-level		p-level	
Contact time	**C1 (1. Step 4 hours)**	0.149	0.417	0.391	0.274	0.170		0.064	
	C2 (1. Step 8 hours)	0.690	0.579	0.109	0.627	0.005	*	0.689	
	C3 (2. Step 16 hours)	0.218	0.314	0.829	0.465	0.095		0.094	
	C4 (2. Step 20 hours)	0.126	0.676	0.656	0.842	0.698		0.914	
L/S	**L1 (1. Step 1.8 l/kg)**	0.586	0.499	0.062	0.236	0.023		0.542	
	L2 (1. Step 2.2 l/kg)	0.030	0.269	0.793	0.919	0.349		0.716	
Mass	**W1 (50 g)**	0.605	0.319	0.873	0.833	0.004	*	0.000	*
	W2 (200 g)	0.595	0.999	0.764	0.539	0.433		0.126	
Agitation	**A1 (End over End)**	0.123	0.543	0.024	0.455	0.029		0.041	
	A2 (Rotating table)	0.087	0.293	0.150	0.061	0.220		0.480	
Filter	**F1 (47 mm diameter)**	0.978	0.534	0.426	0.630	0.640		0.387	

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.3.6 **Summary of variances for standard condition**

prEN 12457 - 3/1+2: MBA

	Ba	Cr	Cu	Mo	Sb	SO4
Standard conditions						
Mean (µ), mg/kg	1.38	0.13	4.9	0.43	0.255	1383
Variance	0.01964	0.00037	0.47	0.00846	0.0002688	35205
Std.	0.140	0.019	0.68	0.092	0.0164	188
Relative std. %	**10**	**15**	**14**	**21**	**6**	**14**

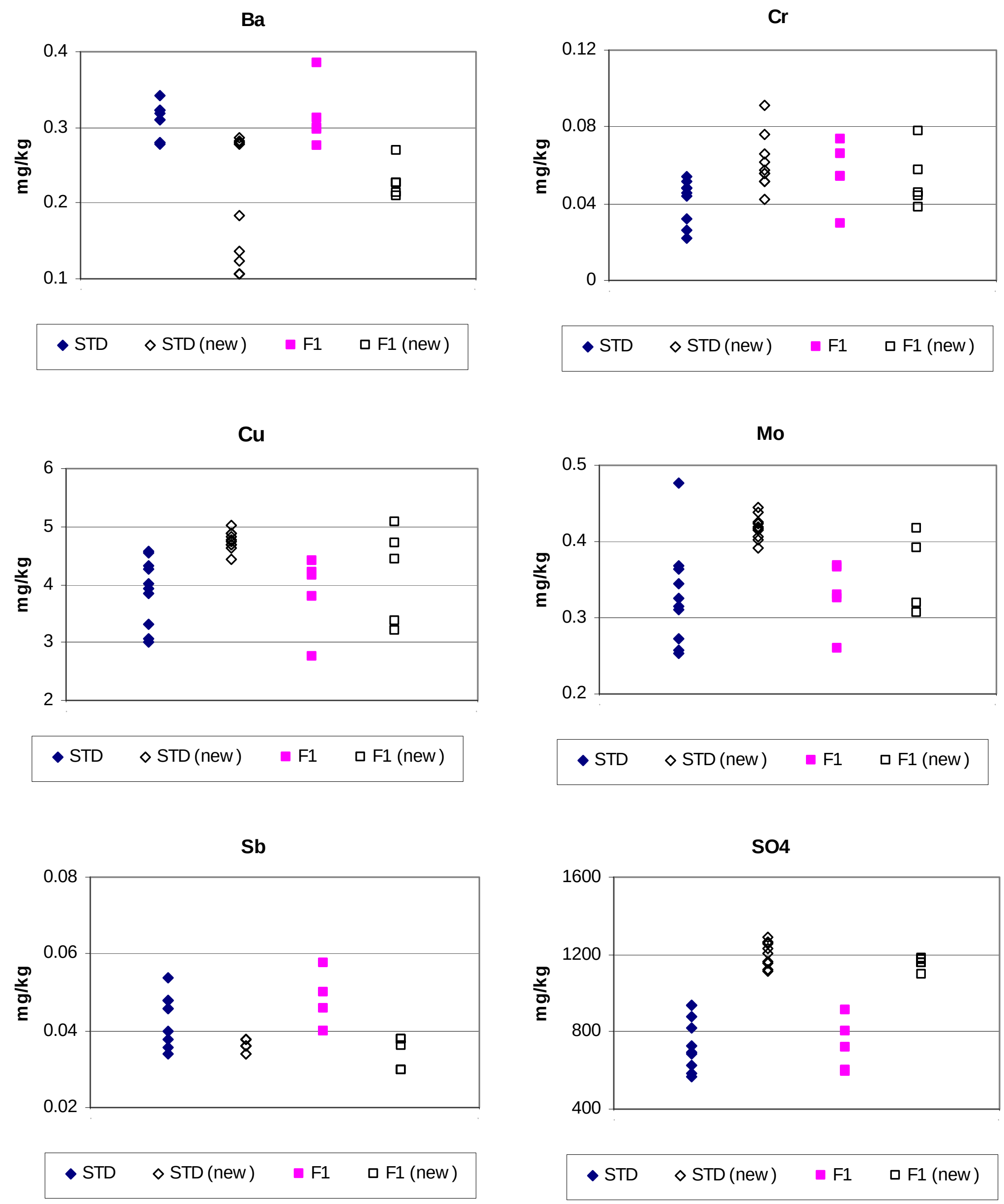


Figure 3.3.1. Results of prEN 12457 part 3-1. Comparison of test conditions performed in squared bottles using a roller table (STD and F1) to test conditions performed in circular bottles using an end over end tumbler (STD (new) and F1 (new)).

Figure 3.3.1 shows that for Cu, Mo, Sb and SO_4 the relative standard deviation within the standard condition have been reduced using round bottles and an end over end tumbler. However, for Ba and Cr the relative standard deviations have increased. It is notable that the amounts of a specific parameter leached have changed compared to the results originallyobtained. This change is consistent with results obtained for the test condition F1. The changes in the specific amount leached may for Cu, Cr, Mo and SO_4 be explained by changes in the pH of the eluates. Figure 3.3.2 shows the pH measured in the eluates from the early leaching of MBA and the later leaching of MBA at standard conditions. It is clear that the pH has become lower in the later leaching of MBA.

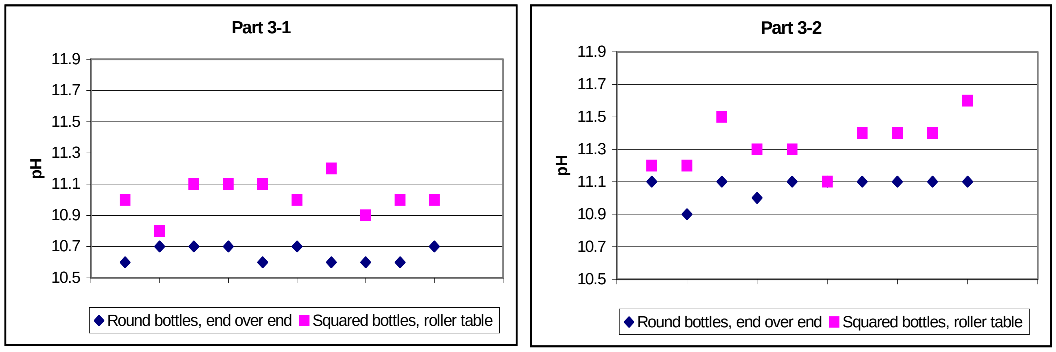


Figure 3.3.2 pH in eluates from early leaching of MBA at standard condition using squared bottles and roller table and from later leaching at standard condition using round bottles and end over end tumbler.

However, for Ba and Cr the pH changes cannot explain the variations in the specific amount leached.

3.4 prEN 12457 part 4: MBA

The ruggedness testing of part 4 on MBA was performed by DHI in Denmark. The potentially critical test conditions used for ruggedness testing performed by DHI are described in Table 3.4.1.

Table 3.4.1 Description of potentially critical test conditions and coding.

	Description	**Coding**
Standard conditions	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	9 l/kg 11 l/kg	L1 L2
Mass of test material	50 g 200 g	W1 W2
Temperature	10 °C 30 °C	T1 T2
Agitation	Roller table Wrist shaker	A1 A2
Filter diameter	47 mm 100 mm	F1 F2
Size reduction mode	Hammer mill	S1

The results of the ruggedness testing were processed according to the description given in section 2.

The results of the ruggedness testing of part 4 on MBA were analysed for one outlier within each test condition using Grubbs' test. Table 3.4.2 contains the main results of Grubbs' test (detailed calculations are shown in Appendix 4).

Table 3.4.2. Results of Grubbs' test for one outlier within each test condition

Parameter	Straggler identified	Outlier identified
Ba	No straggler	T2
Cr	C2, W2	No outlier
Cu	T2	No outlier
Mo	No straggler	F2
Pb	L1, W1	STD, C2, L2
Sb	No straggler	L2, A2
Zn	STD, T1, T2	S1
Cl	No straggler	No outlier
SO_4	No straggler	No outlier

Tables 3.4.3 and 3.4.4 contain a summary of the data processing. For different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others.

Table 3.4.4 presents the mean value and relative standard deviations obtained for the standard condition. The relative standard deviations are relatively high for most parameters compared to results for part 1 and 2 on MBA.

Table 3.4.5 shows a summary of the number of parameters significantly different from the standard condition results at 1% level for each test condition.

The particle size distribution of the test material that has been size reduced by jaw crusher and hammer mill was determined and the results shown in Figure 3.4.1.

The particle size distributions for test material crushed by a jaw crusher and a hammer mill, respectively, show that the differences between the distributions are small. It is therefore more likely that the two size reduction methods create different surfaces, which when exposed to leaching leads to significantly different test results for a number of parameters.

Table 3.4.3 **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 4: MBA

Condition		**Ba**	**Cr**	**Cu**	**Mo**	**Pb**	**Sb**	**Zn**	**Cl**	**SO_4**
		p-level	**p-level**	**p-level**	**p-level**	**p-level**	**p-level**	**p-level**	**p-level**	**p-level**
Contact time	**C1 (22 hours)**	0.360	0.020	0.200	0.000 *	0.160	0.110	0.230	0.100	0.000 *
	C2 (26 hours)	0.000 *	0.810	0.020	0.220	0.590	0.290	0.010	0.170	0.000 *
L/S	**L1 (9 l/kg)**	0.000 *	0.830	0.000 *	0.520	0.010	0.370	0.090	0.240	0.000 *
	L2 (11 l/kg)	0.000 *	0.030	0.000 *	0.260	0.340	0.490	0.000 *	0.230	0.010
Mass	**W1 (50 g)**	0.000 *	0.420	0.150	0.530	0.710	0.520	0.030	0.100	0.000 *
	W2 (200 g)	0.000 *	0.170	0.010	0.000 *	0.020	0.560	0.000 *	0.010	0.000 *
Temperature	**T1 (10 degree C)**	0.000 *	0.000 *	0.010	0.070	0.120	0.130	0.670	0.640	0.020
	T2 (30 degree C)	0.000 *	0.220	0.040	0.000 *	0.030	0.000 *	0.000 *	0.290	0.000 *
Agitation	**A1 (Roller table)**	0.000 *	0.000 *	0.000 *	0.590	0.010	0.260	0.000 *	0.130	0.500
	A2 (Wrist shaker)	0.000 *	0.000 *	0.000 *	0.660	0.020	0.150	0.000 *	0.880	0.010
Filter	**F1 (47 mm diameter)**	0.030	0.570	0.050	0.530	0.210	0.030	0.010	0.760	0.010
	F2 (100 mm diameter)	0.000 *	0.890	0.530	0.820	0.980	0.290	0.390	0.810	0.090
Size reduction	**S1 (Hammer Mill)**	0.350	0.000 *	0.000 *	0.010	0.190	0.000 *	0.630	0.010	0.250

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.4.4 **Summary of variances for standard condition and "Modified** standard condition"**

prEN 12457 - 4: MBA

	Ba	**Cr**	**Cu**	**Mo**	**Pb**	**Sb**	**Zn**	**Cl**	**SO_4**
Standard conditions									
Mean (μ), mg/kg	1.6	0.060	4.3	0.45	0.14	0.29	0.30	2803.0000	1512
Variance	0.0076	0.00068	0.24	0.0037	0.0023	0.0013	0.0053	62001	5595
Std.	0.087	0.026	0.49	0.061	0.048	0.036	0.073	249	75
Relative std. %	**5**	**43**	**11**	**13**	**35**	**13**	**25**	**9**	**5**

Table 3.4.5 Number of parameters for which the specified test condition differs significantly from the standard condition.

Test condition	Description	Number of significant parameters out of 9 parameters
Contact time	C1 (22 hours) C2 (26 hours)	2 2
L/S - ratio	L1 (9 l/kg) L2 (11 l/kg)	3 3
Mass of test material	W1 (50 g) W2 (200 g)	2 4
Temperature	T1 (10 °C) T2 (30 °C)	2 5
Mode of agitation	A1 (Roller table) A2 (Wrist shaker)	4 4
Diameter of filter	F1 (47 mm) F2 (100 mm)	0 1
Mode of size reduction	S1 (hammer mill)	3

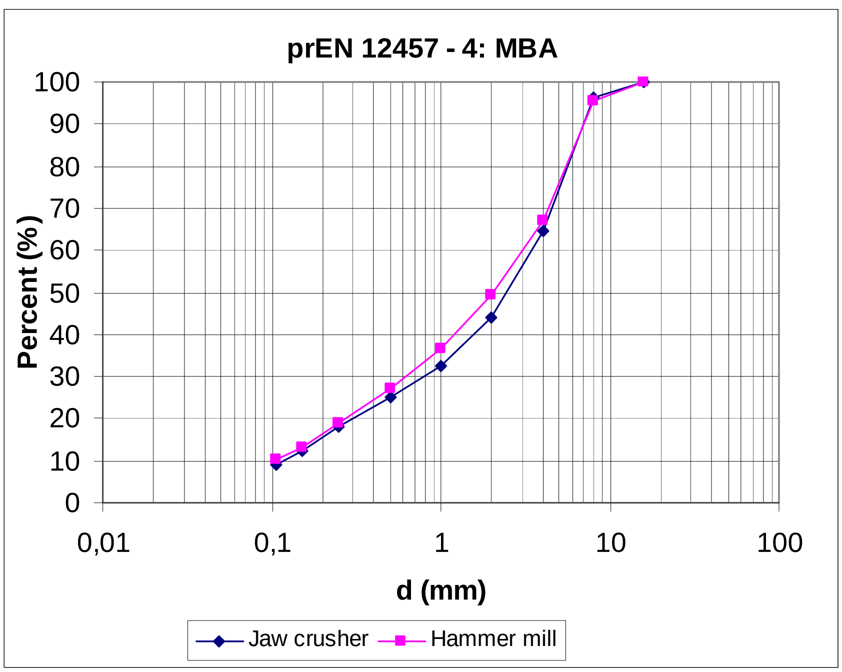


Fig 3.4.1 Size distribution of material crushed by jaw crusher and hammer mill, respectively

3.5 prEN 12457 part 2: FCM

The ruggedness testing of part 2 on FCM was performed by INERIS in France. The potentially critical test conditions used for ruggedness testing performed by INERIS are described in Table 3.5.1.

Table 3.5.1 Description of potentially critical test conditions and coding

	Description	**Coding**
Standard conditions	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	9 l/kg 11 l/kg	L1 L2
Temperature	10 °C 30 °C	T1 T2
Agitation	Roller table Wrist shaker	A1 A2
Filter diameter	47 mm 147 mm	F1 F2

The results of the ruggedness testing were processed according to the description given in section 2.

The results of the ruggedness testing of part 2 on FCM were analysed for one outlier within each test condition using Grubbs' test. Table 3.5.2 presents the main results of Grubbs' test (detailed calculations can be seen in Appendix 5.

Table 3.5.2. Results of Grubbs' test for one outlier within each test condition.

Parameter	**Straggler identified**	**Outlier identified**
Ba	No straggler	No outlier
Cr VI	No straggler	C2, T2
Cr	No straggler	No outlier
Mo	L1	No outlier
F	No straggler	***C1***, ***F1 (Not outliers)***
Cl	No straggler	No outlier
NO_2	No straggler	No outlier

Tables 3.5.3 and 3.5.4 contain a summary of the data processing. It can be seen that for different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others.

Table 3.5.3. **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 2: FCM

Condition		**Ba**		**Cr VI**		**Cr**		**Mo**		**F**		**Cl**		**NO2**	
		p-level		**p-level**		**p-level**		**p-level**		**p-level**		**p-level**		**p-level**	
Contact time	**C1 (22 hours)**	0.027		0.002	*	0.255		0.209		0.002	*	0.249		0.000	*
	C2 (26 hours)	0.696		0.022		0.250		0.414		0.000	*	0.028		0.000	*
L/S	**L1 (9 l/kg)**	0.137		0.019		0.891		0.675		0.000	*	0.889		0.001	*
	L2 (11 l/kg)	0.000	*	0.317		0.004	*	0.001	*	0.000	*	0.132		0.003	*
Temperature	**T1 (10 degree C)**	0.000	*	0.000	*	0.227		0.060		0.000	*	0.126		0.450	
	T2 (30 degree C)	0.000	*	0.037		0.006	*	0.031		0.000	*	0.316		0.000	*
Agitation	**A1 (Roller table)**	0.814		0.002	*	0.048		0.026		0.000	*	0.016		0.000	*
	A2 (Wrist shaker)	0.001	*	0.064		0.487		0.041		0.000	*	0.016		0.000	*
Filter	**F1 (47 mm diameter)**	0.482		0.049		0.574		0.804		0.000	*	0.355		0.003	*
	F2 (142 mm diameter	0.141		0.073		0.918		0.443		0.000	*	0.041		0.000	*

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.5.4. **Summary of variances for standard condition**

prEN 12457 - 2: FCM

	Ba	**Cr VI**	**Cr**	**Mo**	**F**	**Cl**	**NO2**
Standard conditions							
Mean (µ), mg/kg	0.51	12	8.8	3.8	10.0	2880	0.43
Variance	0.00089	0.36	0.21	0.025	0.083	2356	0.0029
Std.	0.030	0.60	0.45	0.16	0.29	49	0.054
Relative std. %	**6**	**5**	**5**	**4**	**3**	**2**	**13**

Table 3.5.4 contains estimates of the mean value and variance obtained for the standard condition. It can be seen that the relative standard deviations for all parameters are relatively low and thus the test for identification of significantly different test conditions becomes relative hard compared to cases with higher relative standard deviations.

Table 3.5.5 gives a summary of the number of parameters for which results are significantly different from the standard condition results at 1% level for each test condition.

Table 3.5.5 Number of parameters for which the specified test condition differs significantly from the standard condition.

Test condition	Description	Number of significant parameters out of 7 parameters
Contact time	C1 (22 hours) C2 (26 hours)	**3** **2**
L/S - ratio	L1 (9 l/kg) L2 (11 l/kg)	2 **5**
Temperature	T1 (10 °C) T2 (30 °C)	3 **4**
Mode of agitation	A1 (Roller table) A2 (Wrist shaker)	**3** **3**
Diameter of filter	F1 (47 mm) F2 (142 mm)	2 2

3.6 prEN 12457 part 2: COS

The ruggedness testing of part 2 on COS was performed by UBA in Germany. The potentially critical test conditions used for ruggedness testing performed by UBA are described in Table 3.6.1.

Table 3.6.1 Description of potentially critical test conditions and coding

	Description	Coding
Standard conditions	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	9 l/kg 11 l/kg	L1 L2
Temperature	10 °C 30 °C	T1 T2
Size reduction	Rotary disk mill	S1

The results of the ruggedness testing were processed according to the description given in section 2.

The results of the ruggedness testing of part 2 on COS were analysed for one outlier within each test condition using Grubbs' test. Table 3.6.2 contains the main results of Grubbs' test (detailed conclusions can be seen in Appendix 6).

Table 3.6.2 Results of Grubbs' test for one outlier within each test condition

Parameter	**Straggler identified**	**Outlier identified**
As	No straggler	No outlier
Cd	No straggler	C1
Co	L1	C1
Ni	No straggler	L1
Pb	No straggler	No outlier
Sb	No straggler	No outlier
Zn	T1	C1

Table 3.6.3 and 3.6.4 contain a summary of the data processing. For different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others.

Table 3.6.4 contains estimates of the mean value and variance obtained for the standard condition. The relative standard deviations for all parameters are relatively low and thus the test for identification of significantly different test conditions becomes relative hard to pass compared to cases with higher relative standard deviations. This may help explain the relatively large number of parameters showing significant differences from the results obtained under standard conditions for a specific test condition.

Table 3.6.5 gives a summary of the number of parameters for which results are significantly different from the standard condition results at 1% level for each test condition.

Table 3.6.3 **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 2: COS

Condition		As		Cd		Co		Ni		Pb		Sb		Zn	
		p-level		p-level		p-level		p-level		p-level		p-level		p-level	
Contact time	C1 (22 hours)	0.154		0.206		0.026		0.475		0.220		0.325		0.128	
	C2 (26 hours)	0.008	*	0.019		0.009	*	0.047		0.656		0.041		0.011	
L/S	L1 (9 l/kg)	0.001	*	0.043		0.016		0.292		0.004	*	0.244		0.025	
	L2 (11 l/kg)	0.000	*	0.000	*	0.000	*	0.000	*	0.513		0.002	*	0.000	*
Temperature	T1 (10 degree C)	0.000	*	0.006	*	0.002	*	0.012		0.000	*	0.000	*	0.001	*
	T2 (30 degree C)	0.001	*	0.773		0.111		0.415		0.009	*	0.000	*	0.170	
Size reduction	S1 (Rotary disk mill)	0.028		0.000	*	0.000	*	0.000	*	0.001	*	0.001	*	0.000	*

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.6.4 **Summary of variances for standard condition**

prEN 12457 - 2: COS

	As	Cd	Co	Ni	Pb	Sb	Zn
Standard conditions							
Mean (µ), mg/kg	6.4	13	2.9	3.1	25	2.4	3276
Variance	0.20	0.25	0.013	0.020	0.29	0.078	10630
Std.	0.44	0.50	0.11	0.14	0.54	0.28	103
Relative std. %	**7**	**4**	**4**	**5**	**2**	**11**	**3**

Table 3.6.5 Number of parameters for which the specified test condition differs significantly from the standard condition.

Test condition	Description	Number of significant parameters out of 7 parameters
Contact time	C1 (22 hours) C2 (26 hours)	0 **2**
L/S - ratio	L1 (9 l/kg) L2 (11 l/kg)	**2** **6**
Temperature	T1 (10 °C) T2 (30 °C)	**6** 3
Size reduction	Rotary disk mill	**6**

3.7 prEN 12457 part 2: SEW

The ruggedness testing of part 2 on SEW was performed by ENEL in Italy. The ruggedness testing on SEW was performed slightly differently from what was originally planned due to a possible unstable test material. The ruggedness test was performed in 3 clusters as described in table 3.5.1. Within each cluster the test was performed 5 times at standard conditions to enable comparison.

Table 3.5.1 Description of potentially critical test conditions and coding.

	Description	Coding
Cluster 1		
Standard condition	(see Table 3.1)	STD
Contact time	22 hours 24 hours	C1 C2
Liquid to solid ratio (L/S)	9 l/kg 11 l/kg	L1 L2
Cluster 2		
Standard condition	(see Table 3.1)	STD
Temperature	10 °C 30 °C	T1 T2
Filter diameter	90 mm 147 mm	F1 F2
Cluster 3		
Standard condition	(see Table 3.1)	STD
Agitation	Roller table	A1
	Wrist shaker	A2

The results of the ruggedness testing were processed according to the description given in section 2. The potentially critical test conditions were compared to the standard conditions only within each cluster.

The results of the ruggedness testing of part 2 on SEW were analysed for one outlier within each test condition using Grubbs' test for. Table 3.7.2 contains the main results of Grubbs' test (detailed calculations can be seen in Appendix 7).

Table 3.7.2. Results of Grubbs' test for one outlier within each test condition.

Parameter	Straggler identified	Outlier identified
B	C2	No outlier
Ba	L2	C2
Co	T2	No outlier
Cu	No straggler	T2
Mo	No straggler	No outlier
Ni	C1, C2, T2	No outlier
Pb	L1	No outlier
Sn	T2	No outlier
Zn	L2	No outlier
NH_4	L2	No outlier
SO_4	C1, C2	No outlier
DOC	2*STD, L1	No outlier

Table 3.7.3 and 3.7.4 contain a summary of the data processing. For different parameters different test conditions were significantly different (at 1% level) from the standard condition. However, some test conditions turned out to cause significant deviations from the results obtained at standard conditions for more parameters than others.

Table 3.7.4 contains estimates of the mean value and variance obtained for the standard conditions performed in 3 clusters. For Ba, Cu, Pb, and Zn the relative standard deviations for the standard conditions varies considerably and the evaluation of the test conditions becomes difficult when the results obtained for some of these have a much smaller variation. Therefore some test conditions for Ba and Pb were not included in the evaluation.

Table 3.7.5 gives a summary of the number of parameters for which results are significantly different from the standard condition results at 1% level for each test condition.

Table 3.7.3: **Comparison of potentially critical test conditions to standard condition**

prEN 12457 - 2: SEW

Condition		B	Ba	Co	Cu	Mo	Ni	Pb	Sn	Zn	NH4	SO4	DOC
		p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level	p-level
Contact time	C1 (22 hours)	0.904	0.598	0.994	0.528	0.511	0.869	0.584	0.625	0.433	0.471	0.163	0.401
	C2 (26 hours)	0.462	0.005 *	0.004 *	0.002 *	0.622	0.615	0.647	0.122	0.264	0.011	0.411	0.392
L/S	L1 (9 l/kg)	0.000 *	0.000 *	0.000 *	0.366	0.000 *	0.000 *	0.390	0.363	0.041	0.000 *	0.000 *	0.000 *
	L2 (11 l/kg)	0.096	0.000 *	0.000 *	0.511	0.000 *	0.054	0.158	0.174	0.097	0.381	0.000 *	0.000 *
Temperature	T1 (10 degree C)	0.033		0.028	0.001 *	0.019	0.003 *	0.011	0.721	0.031	0.235	0.586	0.729
	T2 (30 degree C)	0.000 *		0.000 *	0.001 *	0.000 *	0.060	0.010	0.006 *	0.001 *	0.000 *	0.200	0.059
Agitation	A1 (Roller table)	0.701	0.000 *	0.016	0.001 *	0.710	0.113		0.007 *	0.853	0.207	0.554	0.404
	A2 (Wrist shaker)	0.318	0.054	0.241	0.849	0.026	0.015		0.132	0.767	0.233	0.528	0.581
Filter	F1 (90 mm diameter)	0.539		0.005 *	0.058	0.028	0.000 *	0.003 *	0.849	0.027	0.000 *	0.000 *	0.870
	F2 (147 mm diameter)	0.492		0.002 *	0.106	0.006 *	0.000 *	0.005 *	0.483	0.884	0.034	0.000 *	0.671

***: The mean value for the test condition is significantly different from the mean value of the standard condition at 1% level**

Table 3.7.4: **Summary of variances for standard condition**

prEN 12457 - 2: SEW

	B	Ba	Co	Cu	Mo	Ni	Pb	Sn	Zn	NH4	SO4	DOC
Standard condition												
Mean (µ), mg/kg	5.8921	0.07668	0.4731	0.89458	1.57632	1.91014	0.04778	0.11594	0.70794	2562	344	29090
Variance (S2within)	0.02381	0.00008	0.00039	0.02944	0.00206	0.04490	0.00025	0.00003	0.00324	119025	129	35581225
Std.	0.154	0.009	0.020	0.172	0.045	0.212	0.016	0.006	0.057	345	11.370	5965
Relative std. %	**3**	**11**	**4**	**19**	**3**	**11**	**33**	**5**	**8**	**13**	**3**	**21**
Standard condition												
Mean (µ), mg/kg	5.51294	0.7868	0.45522	0.53656	1.4649	2.21894	0.09894	0.06024	1.8864	2490	340	39478
Variance (S2within)	0.02524	0.47198	0.00034	0.06165	0.00383	0.03639	0.00229	0.00001	1.25906	22801.00000	182.79040	2608225
Std.	0.159	0.687	0.019	0.248	0.062	0.191	0.048	0.004	1.122	151.000	13.520	1615
Relative std. %	**3**	**87**	**4**	**46**	**4**	**9**	**48**	**6**	**59**	**6**	**4**	**4**
Standard condition												
Mean (µ), mg/kg	6.377	0.2569	0.53	1.67054	1.5798	1.77	0.44558	0.10234	1.8552	2619	240	27782
Variance (S2within)	0.11426	0.00394	0.00012	0.03879	0.00043	0.00638	0.12016	0.00015	0.36954	27556.00000	30.03040	16096144
Std.	0.338	0.063	0.011	0.197	0.021	0.080	0.347	0.012	0.608	166.000	5.480	4012
Relative std. %	**5**	**24**	**2**	**12**	**1**	**5**	**78**	**12**	**33**	**6**	**2**	**14**

Table 3.7.5 Number of parameters for which the specified test condition differs significantly from the standard condition.

Test condition	**Description**	**Number of significant parameters out of 12 parameters**
Contact time	C1 (22 hours) C2 (26 hours)	**0** **3**
L/S - ratio	L1 (9 l/kg) L2 (11 l/kg)	8 **5**
Temperature	T1 (10 °C) T2 (30 °C)	2 **7**
Mode of agitation	A1 (Roller table) A2 (Wrist shaker)	**3** **0**
Diameter of filter	F1 (47 mm) F2 (147 mm)	5 5

4 DISCUSSION

The data obtained in the ruggedness testing have resulted in the identification of conditions that influence the results of prEN 12457 Parts 1 – 4. In the following sections the results for each test condition are discussed.

4.1 Contact time

The ranges of variation of the contact time used in the ruggedness testing are specified below:

- part 1, part 2, part 4: 22 hours and 26 hours
- part 3-1: 4 hours and 8 hours
- part 3-2: 16 hours and 20 hours

The ranges chosen for the ruggedness testing are wider than allowed in the draft standard. In the ruggedness testing contact time ± 2 hours are used whereas in the draft standard a variation in contact time of only ± 0.5 hours is accepted.

Table 4.1.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA.

Table 4.1.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in contact time. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	Part 1 22 hours	**Part 2 22 hours**	**Part 3-1 4 hours**	**Part 3-2 16 hours**	**Part 4 22 hours**	**Part 1 26 hours**	**Part 2 26 hours**	**Part 3-1 8 hours**	**Part 3-2 20 hours**	**Part 4 26 hours**
MBA										
Ba										X
Cr			X							
Cu										
Mo		X			X		X			
Pb										
Sb		X					X			
Zn										
Cl										
SO4/S					X					X

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

Table 4.1.2 illustrates the results obtained in the ruggedness testing of part 2 on different materials.

Table 4.1.2 The results of the ruggedness testing of part 2 on different materials. Variations in contact time. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	22 hours				**26 hours**			
	MBA	**FCM**	**COS**	**SEW**	**MBA**	**FCM**	**COS**	**SEW**
Part 2								
As							X	
B								
Ba								X
Cd								
Co								**X**
Cr VI		**X**						
Cr								
Cu								X
Mo	X				X			
Ni								
Pb								
Sb	**X**				X			
Sn								
Zn								
Cl								
SO4/S								
F		X				x		
NO2		X				x		
NH4								
DOC								

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

From table 4.1.1 and 4.1.2 it can be seen that the variation in contact time included in this ruggedness testing rarely is a critical test condition. The graphical presentation of the results in Appendix 0 shows that the observed variations of the test results (based on 1% level) do not exhibit a consistent pattern and thus may be random variations. Based on the results of this ruggedness testing the variations in contact time specified in the draft standard are believed not to cause any significant influence on the leaching test results.

4.2 L/S-ratio

The range of variation of the L/S ratio used in the ruggedness testing is the specified standard condition ± 10%.

The ranges chosen for the ruggedness testing are thus wider than those allowed in the draft standard (specified L/S ± 2%).

Table 4.2.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA.

Table 4.2.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in L/S ratio. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	- 10%				**+ 10%**			
	Part 1	**Part 2**	**Part 3-1**	**Part 4**	**Part 1**	**Part 2**	**Part 3-1**	**Part 4**
MBA								
Ba				X			X	X
Cr						X		
Cu		X		X		X		X
Mo								
Pb						X		
Sb						X		
Zn								X
Cl								
SO4/S	X			X	X	X		

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

Table 4.2.2 illustrates the results obtained in the ruggedness testing of part 2 on different materials.

Table 4.2.2 The results of the ruggedness testing of part 2 on different materials. Variations in L/S ratio. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	9 l/kg				**11 l/kg**			
	MBA	**FCM**	**COS**	**SEW**	**MBA**	**FCM**	**COS**	**SEW**
Part 2								
As			X				X	
B				X				
Ba				X		X		X
Cd							**X**	
Co				**X**			**X**	**X**
Cr VI								
Cr					X	X		
Cu	X				X			
Mo				X		X		X
Ni				**X**			X	
Pb			X		**X**			
Sb					X		**X**	
Sn								
Zn							X	
Cl								
SO4/S				X	X			X
F		X				X		
NO2		X				X		
NH4				X				
DOC				X				X

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

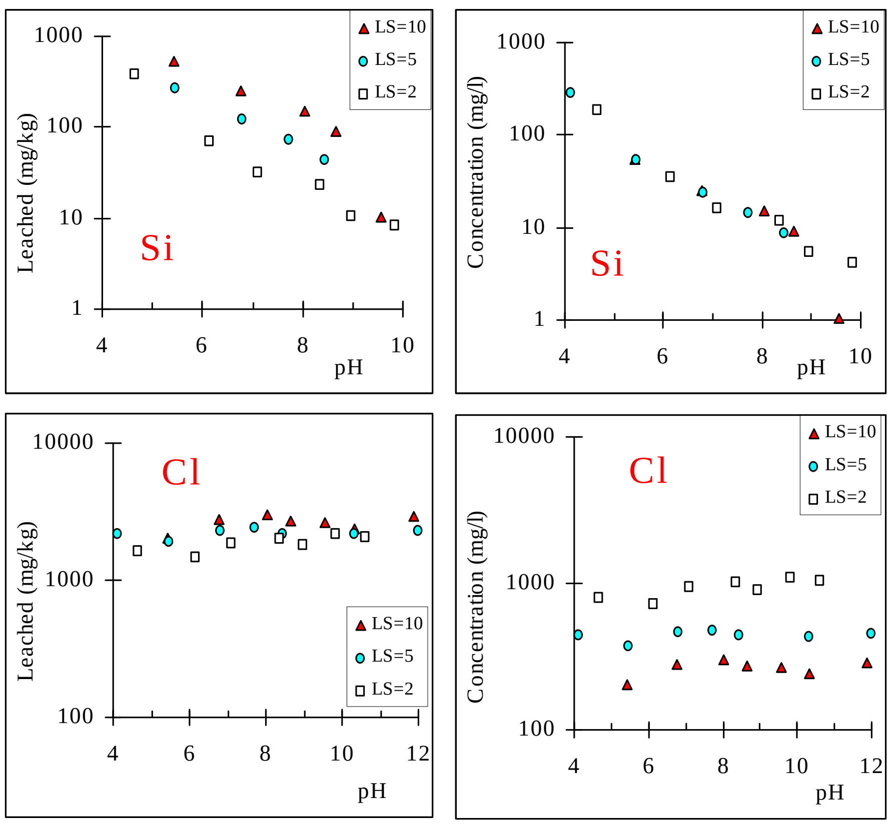
From table 4.1.1 and 4.1.2 it can be seen that the variations in L/S ratio included in this ruggedness testing are to be considered a critical test condition. Above, the evaluation of the ruggedness test results is based on the results expressed in mg/kg but in the case of L/S ratio, the behaviour of elements can be included in this evaluation, since some elements are solubility controlled and thus exhibit a partly predictable behaviour. Other elements are availability controlled (most is washed out at L/S=1-2 l/kg). In that case the amount leached (expressed in mg/kg) will be the same for different values of L/S larger than 1-2 l/kg, whereas a difference is observed for data expressed in terms of mg/l.

This may be illustrated graphically: The interpretation of leaching data is related to the behaviour of constituents in terms of leaching controlled by either availability or solubility [1]. Leaching test results may be expressed either as

- Leachate concentration in [mg/l], or as
- Constituent release in [mg/kg of material].

Results expressed as eluate concentrations allow the comparison of constituent solubility reflecting the chemical speciation of the elements and the eluate properties (i.e. pH). Transformation of measured eluate concentrations into constituent release is necessary for the comparison of data obtained at different liquid to solid (L/S) ratios. Examples are shown in Figure 4.2.1:

Figure 4.2.1 Distinction between solubility control (Si) and availability control (Cl) in the presentation of leaching test results.



- Chloride (Cl) represents an availability-controlled element. Data from tests at different L/S ratios expressed in [mg/l] lead to apparent differences, while data presented in [mg/kg] show that in all cases the whole part available for leaching is released.

- Silicon (Si) represents a solubility-controlled element. Here, presentation of leaching data in [mg/kg] leads to differences, whereas data presented in [mg/l] show the solubility control in the pH region of 3 to 8.

The graphical presentations of the results in Appendix 0 also illustrate this point for some elements.

An evaluation of a more narrow range of L/S ratio as allowed in the draft standard was performed in cases where a consistent linear relation was observed (about 60% of the cases). Details of this evaluation are shown in Appendix 9. The variations in the L/S ratio of ± 2% was in no cases significantly different from those of the standard condition at a 1% level, and it can therefore be concluded that the variations allowed in the draft standard is an acceptable range of variation.

4.3 Weight of test material

The levels of the weight of test material used in the ruggedness testing are 50 g and 200 g of test material. The range chosen is much wider than the ± 5 g allowed in the draft standard.

Table 4.3.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA.

Table 4.3.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in weight of test material. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	50 g				**200 g**			
	Part 1	**Part 2**	**Part 3-1**	**Part 4**	**Part 1**	**Part 2**	**Part 3-1**	**Part 4**
MBA								
Ba				**X**				X
Cr	**X**					**X**		
Cu								
Mo		**X**				**X**		X
Pb								
Sb			**X**			**X**		
Zn								**X**
Cl								
SO4/S		**x**	**X**	**X**				X

The weight variation, in which the L/S ratio is maintained, results in a limited number of random deviations from the standard (based on 1% level). The results of the factorial design experiment (section 3.2.1) indicate that headspace may influence the results for some parameters (Cr and Cu). It would therefore be advisable to prescribe test conditions, which prevent significant variations in headspace. Based on the limited number of deviations from the standard condition and a scattered pattern of these deviations it can be expected that a deviation on ± 5 g on the weight of test material as specified in the draft standard would not influence the leaching test results. The results of the ruggedness also imply that it is an option to use a larger test sample if there is a need for a larger portion of eluate or a need to minimise heterogeneity. It is mandatory to report such a deviation from the standard procedure in the test report.

4.4 Temperature

The temperature variations used in the ruggedness testing are 10 °C and 30 °C. The range chosen is wider than allowed in the draft standard where the temperature should be within a range of 15-25 °C.

Table 4.4.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA

Table 4.4.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in temperature. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	10 °C				30 °C			
	Part 1	**Part 2**	**Part 3-1**	**Part 4**	**Part 1**	**Part 2**	**Part 3-1**	**Part 4**
MBA								
Ba	X	X		X				X
Cr				X				
Cu						X		
Mo								X
Pb						X		
Sb		X						X
Zn		X						X
Cl								
SO4/S	X				X	X		X

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

Table 4.4.2 illustrates the results obtained in the ruggedness testing of part 2 on different materials.

The results in tables 4.4.1 and 4.4.2 show that the variations in temperature as selected for the ruggedness testing (10 - 30 °C) should be considered a critical test condition.

The sensitivity of the leaching test results at more narrow temperature range as specified in the standard is therefore evaluated for those elements that turned out to be significant in the ruggedness testing and can be analysed with adequate sensitivity. Based on a linear interpolation between the extremes, estimates can be made for the deviation at a temperature range of 20 ± 5 ºC. Since an actual measurement was done at wider ranges it is expected that the standard deviations are unchanged for the estimated values. The details of this evaluation are provided in Appendix 9.

The evaluation of a temperature range of 20 ± 5 °C shows that the temperatures at 15 °C and 25 °C will influence the leaching test results significantly (at 1% level) only for Ba. The influence of temperature on the amount of Ba leached will be within the order of ± 20%.

Table 4.4.2 The results of the ruggedness testing of part 2 on different materials. Variations in temperature. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	10 °C	30 °C

	MBA	FCM	COS	SEW	MBA	FCM	COS	SEW
Part 2								
As			X				X	
B								X
Ba	X	X				X		
Cd			X					
Co			X					**X**
Cr VI		**X**						
Cr						X		
Cu				X	X			X
Mo								X
Ni				**X**				
Pb			X		**X**		X	
Sb	**X**		**X**				**X**	
Sn								**X**
Zn	**X**		X					**X**
Cl								
SO4/S					X			
F		X				X		
NO2						X		
NH4								X
DOC								

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

4.5 Agitation

The agitation devices used in the ruggedness testing are end over end tumbler, roller table and wrist shaker. The performing laboratories have applied the procedure commonly used in-house for the standard condition. Table 4.5.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA.

Table 4.5.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in the mode of agitation. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	Part 1 E o E	Part 2 Roller table	Part 3-1 E o E	Part 4 Roller table	Part 1 Wrist shk.	Part 2 Wrist sh.	Part 3-1 Rotating table	Part 4 Wrist shk.
MBA								
Ba	X			X				X
Cr	X	X	X	X	X	X		X
Cu		X	X	X		X		X
Mo								
Pb		X				X		
Sb		X						
Zn				X				X
Cl								
SO4/S	X				X	X		

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

Table 4.5.2 illustrates the results obtained in the ruggedness testing of part 2 on different materials.

Table 4.5.2 The results of the ruggedness testing of part 2 on different materials. Variations in mode of agitation. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	MBA	FCM	SEW	MBA	FCM	SEW
	Roller table	**Roller table**	**Roller table**	**Wrist sh.**	**Wrist sh.**	**Wrist sh.**
Part 2						
As						
B						
Ba			X		X	
Cd						
Co						
Cr VI		**X**				
Cr	X			X		
Cu	X		X	X		
Mo						
Ni						
Pb	X			**X**		
Sb	**X**					
Sn			**X**			
Zn						
Cl						
SO4/S				X		
F		X			X	
NO2		X			X	
NH4						
DOC						

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

The results of the ruggedness testing show that the mode of agitation is a significantly critical test condition for several parameters leached from different materials.

In the Steering Committee and subsequently in CEN TC 292, a decision has been taken to narrow down the number of acceptable agitation methods to a roller table or an end-over-end tumbler (with eccentric motion).

4.6 Diameter of filter

The diameter of the filter used for filtration in the ruggedness testing is not specified in the draft standard. In the ruggedness testing the diameter of the filters used was in the range of 47 mm - 142 mm. The performing laboratories have applied the filtering equipment commonly used in-house for the standard condition.

Table 4.6.1 illustrates the results obtained in the ruggedness testing for each part of the standard performed on MBA

Table 4.6.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in the diameter of the filter. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	47 mm	47 mm	47 mm	47 mm	142 mm	100 mm	100 mm

	Part 1	Part 2	Part 3-1	Part 4	Part 1	Part 2	Part 4
MBA							
Ba		X				X	X
Cr		X				X	
Cu		X				X	
Mo							
Pb							
Sb							
Zn	X						
Cl							
SO4/S		X				X	

Table 4.6.2 illustrates the results obtained in the ruggedness testing of part 2 on different materials.

Table 4.6.2 The results of the ruggedness testing of part 2 on different materials. Variations in the diameter of the filter. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	MBA	FCM	SEW	MBA	FCM	SEW
	47 mm	47 mm	90 mm	100 mm	142 mm	147 mm
Part 2						
As						
B						
Ba	X			X		
Cd						
Co			**X**			**X**
Cr VI						
Cr	X			X		
Cu	X			X		
Mo						X
Ni			**X**			**X**
Pb			**X**			**X**
Sb						
Sn						
Zn						
Cl						
SO4/S	X		X	X		X
F		X			X	
NO2		X			X	
NH4			X			
DOC						

Gray area means that the parameter was not measured or below the detection limit and thus not evaluated.

The results of the ruggedness testing show that the diameter of the filter was a significantly critical test condition for several parameters leached from different materials. Unfortunately, the filtration flow rates were not reported with the results, and thus a more detailed evaluation of the ruggedness results is not possible. The results, however, stresses the importance of determination of and reporting the filtration flow rate that should fulfil the requirements of the standard prEN 12457 part 1-4.

4.7 Size reduction

The alternative methods of size reduction of the test materials in the ruggedness testing were using a hammer mill and a rotary disc mill, respectively, whereas a jaw crusher was used for the standard condition. The size reduction method is not specified in the draft standard.

Table 4.7.1 illustrates the results obtained in the ruggedness testing for part 2 and 4 of the test method performed on MBA and COS.

Table 4.7.1 The results of the ruggedness testing of part 1-4 on MBA. Variations in the mode of size reduction. X means that for the specific parameter the test condition was significantly different from the standard condition at 1% level.

	Hammer mill			
	Part 2	**Part 4**		**Part 2**
MBA			COS	
Ba			As	
Cr	X	X	Cd	X
Cu	X	X	Co	X
Mo	X		Ni	X
Pb	X		Pb	X
Sb	X	X	Sb	X
Zn			Zn	X
Cl	X			
SO4/S	X			

The results of the ruggedness testing shows that the method used for size reduction was a significantly critical test condition for many parameters leached from MBA and COS.

In the Steering Committee and subsequently in CEN TC 292, a decision has been taken to specify that only a jaw crusher is acceptable for size reduction of the test material.

4.8 Comparison of results obtained for part 1 and part 3 (L/S 0-2 l/kg) on MBA

The results obtained for standard conditions in the ruggedness testing for part 1 and 3 (L/S = 2) can be compared. However, some variations between the test results for part 1 and part 3 will be expected due to differences in contact time and other minor differences in the performance of part 1 and 3 (performed by different laboratories). The results obtained for the standard conditions are shown in Table 4.8.1.

Table 4.8.1 Comparison of results obtained for standard conditions performing part 1 and part 3 (L/S = 2 l/kg) on MBA.

	Ba mg/kg	**Cr** mg/kg	**Cu** mg/kg	**Mo** mg/kg	**Sb** mg/kg	**SO_4** mg/kg

part 1 **(Contact time 24 hours, round bottles on roller table)**						
Average	0.48	0.015	3.6	0.36	0.057	349*
Std.	0.010	0.0028	0.20	0.019	0.0059	13
Relative std. (%)	2	19	6	5	10	4
part 3-1 **(Contact time 6 hours, squared bottles on roller table)**						
Average	0.31	0.042	3.9	0.33	0.044	746
Std.	0.022	0.011	0.58	0.066	0.0064	140
Relative std (%)	7	26	15	20	14	19
Repetition part 3-1 **(Contact time 6 hours, round bottles in end over end tumbler)**						
Average	0.19	0.061	4.8	0.42	0.036	1207
Std.	0.084	0.014	0.16	0.016	0.0016	65
Relative std (%)	44	23	3	4	4	5

*: Recalculation of sulfur to sulfate in order to be able to compare results from part 1 and part 3-1

From Table 4.8.1 it can be seen that for Ba, Cr and SO_4 the average values obtained for the standard conditions differ significantly for part 1 and part 3-1. For Cu, Mo and Sb the average values are in reasonable agreement. These differences may be due to differences in contact time or other minor differences. However, as mentioned in section 3.3 it was reported from the performing laboratory of part 3 that settling of test material was observed during equilibration. Therefore, the standard conditions and one critical test condition were repeated ensuring a proper agitation of the test material. The results of repetition of part 3-1 are also shown in Table 4.2.1. The results obtained from the repeated tests deviate for most parameters analysed for significantly from the results obtained original as already discussed in section 3.3 and a better agreement with results of part 1 was not obtained. The relative standard deviations of the results of the repetition of part 3-1 lower than those originally found for five parameters, and in much better agreement with the relative standard deviations obtained for part 1. The general inverse relationship between the concentrations of Ba and sulphate is indicative of the solubility of those parameters being controlled by barium sulphate or a barium sulphate containing mineral.

4.9 Comparison of results obtained for part 2 and part 4 on MBA

Leaching tests performed as described in part 2 and part 4 are similar except for the fact that the particle size distributions of the test material may be different. For part 2, 90% of the test material must have a particle size of less than 4 mm, whereas for part 4, 90% of the test material must have a particle size less than 10 mm.

Overall, the ruggedness testing of part 2 and 4 gave similar results identifying almost the same test conditions as being critical. However, the results of part 4 gave a more scattered picture of the critical test conditions than that observed for part 2.

The relative standard deviations have been estimated for the results obtained for part 2 and part 4, respectively (see Tables 3.2.4 and 3.4.4). The same laboratory performed part 2 and part 4 and the estimates may thus be compared directly. Such a comparison for MBA shows that in general the relative standard deviation observed for a specific parameter is higher for the results of part 4 than for the results of part 2.

The higher relative standard deviations for standard condition and a more scattered picture of critical test conditions are probably related to the fact that the mean particle size of the test material in part 4 is lager than in part 2. A larger particle size may lead to a more inhomogeneous test portion and thus the results of the leaching test may be more dispersed.

4.10 Comparison of results obtained from two types of ruggedness tests for part 2 on MBA

Two separate ruggedness tests were performed for part 2 on MBA:

1. Ruggedness test performed by varying one critical test condition at the time and the mean value was compared to the mean value of test results performed at standard conditions.

2. Ruggedness testing performed as a factorial design experiment.

The results obtained in the ruggedness tests may be compared for 4 potentially critical test conditions. The comparison of the results based on identification of critical test conditions is shown in Table 4.10.1.

Table 4.10.1 Comparison of the results of the ruggedness tests performed for prEN 12457 part 2 on MBA.

	Ba		Cr		Cu		Mo		Pb		Sb		Zn		Cl		SO_4	
	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]
Head space or weight of material[c]			S[d]	S		S	S				S						S	
Contact time							S				S							
L/S ratio		S	S		S				S		S						S	
Temperature	S	S			S				S	S							S	

[a]: 1 refers to the results of the ruggedness performed by varying one test condition at the time.
[b]: 2 refers to the results of the ruggedness testing performed as a factorial design experiment.
[c]: It is suspected that the effect on the factor “weight of material” might be due to the presence/absence of headspace. Therefore the significance of the factors “head space” and “weight of material” is compared.
[d]. S indicates that the variation in the test condition for a specific parameter significantly influence the test results.

In Table 4.10.1 it can be seen that the effect of the variation in the amount of test material used in the leaching test for Cr may be explained by the presence of headspace in the batches during leaching. The leaching of Cr may be sensitive to redox conditions that might be different depending on the headspace in the leaching vessels.

For Mo, Sb and SO_4 it is likely that the amount of material used in the leaching test affected the test results significantly due to heterogeneity of the test material.

For Cu the presence or volume of headspace in the batches seems to influence the test result, whereas the amount of test material does not affect the leaching results.

In general, the results obtained from the two ruggedness tests of part 2 on MBA were in good agreement and the ruggedness test performed as a factorial design experiment has supported the results obtained by the originally planned ruggedness testing.

4.11 Relation between dispersion observed for standard conditions and the analytical detection limit

The dispersion in results obtained by the leaching test prEN 12457 part 1-4 on MBA when it is performed under standard conditions is caused partly by the performance of the test itself and partly by the analysis of the different components in the eluates. To obtain a better understanding of the dispersion, the ratio between the mean estimate (in mg/l) and the detection limit (M/DL $\geq$ 1) is compared with the relative standard deviation estimated for the standard condition. When M/DL is relatively low the analysis has been carried out close to the detection limit, and the analytical error is relative high.

Table 4.1.1 shows the relative standard deviation estimated for the standard conditions and the ratios of the mean value and the detection limit (M/DL) for the eluate components analysed. It can be seen from the table that the relative standard deviation in general decreases as M/DL increases.

In the case of e.g. Cr, Pb and Zn leached from MBA the relative standard deviations are in general high and M/DL values are relative low. This implies that the analyses have been carried out relatively close to the detection limits and that analytical errors therefore may be high.

In the case of e.g. Sb leached from MBA, high relative standard deviations are not consistently associated with low M/DL values. For part 2 the relative standard deviation is high and the M/DL -value is also high. The dispersion of Sb may therefore be due to either test performance or inhomogeneity of the sample.

Table 4.11.1 Relationship between relative standard deviation in prEN 12457 parts 1-4 and analytical sensitivity expressed as the ration between concetration measured and the detektion limit.

	Part 1		Part 2		Part 3-1		Part 4	
	Rel. std. (%)	M/DL	Rel. std. (%)	M/DL	Rel. std. (%)	M/DL	Rel. std. (%)	M/DL
MBA								
Ba	2	240	7	147	7	31	5	162
Cr	**19**	**3**	**27**	**5**	**26**	**4**	**43**	**8**
Cu	6	905	8	456	15	389	11	431
Mo	5	26	4	268	20	33	13	226
Pb			**20**	**11**			**35**	**23**
Sb	**10**	**4**	20	220	**14**	**2**	13	145
Zn	**19**	**16**	**28**	**2**			**25**	**3**
Cl			4	277			9	280
SO_4/S	4	630	5	180	19	373	5	151

M/DL: Mean value (mg/l) divided by the detection limit

Part 2			Part 2			Part 2		
	Rel. std. (%)	M/DL	M/DL	Rel. std. (%)	M/DL		Rel. std. (%)	M/DL
FCM			**COS**			**SEW**		
Ba	**6**	**5**	As	**7**	DL not available from UBA	B	5	34
Cr VI	5	62	Cd	4		Ba	24	51
Cr	5	175	Cu	4		Co	4	76
Mo	4	38	Ni	5		Cu	46	26
F	**3**	**5**	Pb	**2**		Mo	4	293
Cl	2	5760	Sb	11		Ni	11	119
NO_2	**13**	**2**	Zn	**3**		Pb	48	6
						Sn	12	17
						Zn	33	232
						NH4	13	25620
						SO4	4	680
						DOC	21	2909

M/DL: Mean value (mg/l) divided by the detection limit

4.12 Practical observations

The practical work with the draft standards prEN 12457 part 1-4 during the ruggedness testing have given rise to some additional observations and recommendations for changes: In section 4.2.3 of the draft standard a filtration vacuum of 2500 Pa to 4000 Pa (25 to 40 mbars) is prescribed. This is far too little to have any influence on the filtration, and it is recommended to change the range to 30000 – 70000 Pa (300 to 700 mbars). A normal water ejection pump typically operates in the vicinity of 50000 Pa.

In section 4.2.4 of the standard pre-rinsed filters are prescribed. This is probably a remnant from previous times when it was necessary to rinse the filters. Today very clean filters are available and the prescribed rinsing procedure is unnecessary and it actually makes the filters less stable. It is therefore recommended to change the wording to „Prerinsed or similarly clean 0.45 µm filters…“

CONCLUSIONS AND RECOMMENDATIONS

A ruggedness testing programme has been carried out to assess the sensitivity of the leaching procedures prEN 12457 part 1-4 to variations in several test conditions. The test was performed by varying one of 7 potentially critical test conditions at a time and compare the result of 5 replicates to the results of 10 replicates carried out under "standard" conditions for each parameter. All 4 parts were tested but the most thorough testing was carried out on part 2 alone since most of the test conditions and procedures are common for all 4 parts. The test conditions addressed were: contact time, liquid to solid ration (L/S), weight of test material, temperature, mode of agitation, diameter of the filter and size reduction of test material. A few additional test conditions, including head space and particle size, were addressed using a factorial design experiment. Four materials were tested: MSWI bottom ash (MBA), filter cake of treated MSWI fly ash (FCM), contaminated soil (COS) and sewage sludge from a municipal wastewater treatment plant (SEW). All parts of the test were performed on MBA whereas only part 2 (L/S = 10 l/kg) were performed on the other materials. The choice of analytical parameters to be addressed in the test were based mainly on the nature of the materials, the levels of concentration in the eluates and the analytical capabilities of the participants. They were: MBA (Ba, Cr, Cu, Mo, Pb, Sb, Zn, Cl^-, S/SO_4^{2-}), FCM (Ba, Cd, Cr, Mo, F^-, Cl^-, NO_2^-, Cr(VI)), COS (As, Cd, Co, Ni, Pb, Sb, Zn) and SEW (B, Ba, Cd, co, Cu, Mo, Ni, Pb, Sn, Zn, NH_4^+, SO_4^{2-}, DOC). Effects were generally evaluated at a 1% level of significance.

Contact time was tested for variations of ± 2 hours, whereas only variations of ± 0.5 hours are allowed by the draft standard. The results indicate that contact time variations within the ranges prescribed by the draft standard do not appear to have any significant influence on the test result. The results of the factorial design experiment indicate that the settling time prior to filtration (0 – 15 minutes) is not critical.

The variations of the L/S ratio in the test were ± 10% of the designated value, whereas the variations allowed by the draft standard are only 2%. The larger variation turned out to be critical for a number of parameters, but a subsequent further analysis of the data indicated that variations within the L/S ranges allowed by the standard are unlikely to influence the results significantly. It should be noted that solubility controlled components are most sensitive to changes in L/S when the results are reported in terms of leached amount (mg/kg), whereas availability controlled components are most sensitive when results are reported in terms of eluate concentration (mg/l).

The sensitivity to the weight of the test material was tested at 50 g and 200 g with the prescribed standard value of 100 g (with the prescribed L/S value). This is a much wider range than the ± 5 g allowed by the draft standard. The general ruggedness test indicated that the wide range of variation did have a significant on the results for a few components. The factorial test design experiment showed that for some of these components the effect observed could be ascribed to variations in headspace. This has lead to recommendation and implementation of changes to draft standard aimed at ensuring a constant and limited headspace in the leaching vessels. The results indicate that the use of small portions of material may affect the results due to inhomogeneity effects for some parameters.

In the ruggedness testing the temperature was varied between 10 °C and 30 °C, whereas the range allowed by the draft standard is 15 °C – 25 °C. This variation did have a significant effect on the test results for several components. Further analysis of the data indicated that a range of variation corresponding to that prescribed by the standard would have a significant effect only for Ba. The maximum effect of this temperature variation on the amount of Ba leached was estimated to be within the order of ± 20%. Since temperature does have an effect, a change in the temperature specifications of the standard from 15 °C – 25 °C to 20 °C ± 5 °C has been recommended and implemented. This change signals more clearly that 20 °C is the target temperature.

The effect of the mode of agitation was tested using an end over end tumbler, a roller table and a wrist shaker, respectively. The results indicated that the mode of agitation does have a significant effect on the results for several components. Based on the results it was recommended and implemented into the draft standard that only end over end tumbling and roller tables should used for agitation. It its further recommended that any roller table used should have eccentric motion and that only round (as opposed to square) bottles are used.

Filter sizes between 47 and 147 mm were tested. The filter size is not specified in the draft standard, but it was shown to have a significant apparent effect on the results for several components. Due to lacking information on filtration flow rates, the results could not be evaluated in-depth. The results do, however, stress the importance of the filtration procedure and of observing the prescribed minimum flow rate (and of reporting the actual flow rate). The results of the factorial design experiment indicated that it is unimportant whether the filters are made of cellulose esters or vinyl fluoride. The results also indicated that the use of pressure filtration instead of vacuum filtration only had a significant influence of the result for Pb.

The mode of size reduction applied to the test material (jaw crusher, hammer mill and ratary disc mill) does have a significant influence on the results for several components. It has therefore been recommended and implemented into the draft standard that only a jaw crusher should be used for size reduction of the material.

The practical work with the draft standards prEN 12457 part 1-4 during the ruggedness testing have given rise to some additional observations and recommendations for changes: In section 4.2.3 of the draft standard a filtration vacuum of 2500 Pa to 4000 Pa (25 to 40 mbars) is prescribed. This is far too little to have any influence on the filtration, and it is recommended to change the range to 30000 – 70000 Pa (300 to 700 mbars). A normal water ejection pump typically operates in the vicinity of 50000 Pa.

In section 4.2.4 of the standard pre-rinsed filters are prescribed. This is probably a remnant from previous times when it was necessary to rinse the filters. Today very clean filters are available and the prescribed rinsing procedure is unnecessary and it actually makes the filters less stable. It is therefore recommended to change the wording to „Prerinsed or similarly clean 0.45 μm filters…“.

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VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 2. Characterization of wastes (CEN TC 292 WG 6)

With contributions from
WRc (UK)
INSA-Polden (F)
VTT (FIN)
VITO (B)
SGI (S)
DHI (DK)
ECN (NL)

CONTENTS

1. INTRODUCTION

For a full evaluation of the leaching behaviour of the 7 wastes studied, it was decided to characterize the waste by means of the pH dependence leaching test [1] and the percolation leaching test [2] as developed by CEN TC 292 Working group 6. The elemental composition of the materials has also been determined. The performance of the leaching tests on the different materials was split between different European laboratories active in CEN TC 292 Working Group 6. The leaching characteristics of the materials studied over a wider range of exposure conditions can be obtained from these methods. In addition, these methods are relevant for assessment of long term behaviour. The methodology guideline ENV 12920 [3] provides a framework for the steps to be taken in judging environmental properties of materials in specific scenarios.

Tests to characterise the behaviour of waste materials can generally be divided into three categories:

(1) "Basic Characterisation" tests are used to obtain information on the short and long term leaching behaviour and characteristics properties of waste materials. Liquid/solid (L/S) ratios, leachant composition, factors controlling leachability such as pH, redox potential, complexing capacity and physical parameters are addressed in these tests.

(2) "Compliance" tests are used to determine whether the waste complies with specific reference values. The tests focus on key variables and leaching behaviour identified by basic characterisation tests.

(3) "On-site verification" tests are used as a rapid check to confirm that the waste is the same as that which has been subjected to the compliance test(s).

The procedures described in EN 12457 Parts 1 – 4 fall in the category of compliance leaching tests. The results obtained from this work can provide a preliminary relationship between the different levels of testing as described above.

2. MATERIALS AND METHODS

2.1 Materials

The wastes, contaminated soil and sludge selected in this validation study are relevant to the different types of landfills in the draft EU Directive and also for other directives and regulations at European and national level. The wastes have been selected to address some typical aspects of leaching behaviour (moisture content, particle size aspects, concentration levels of pollutants, physical properties), to be reasonably representative for the typical wastes landfilled in the EU and for relevant other uses of the tests. Given the large number of different wastes, it is impossible and unnecessary to cover all materials as long as the selected materials can be considered to be sufficiently representative of aspects to be encountered in the wide range of wastes relevant to the EU.

The following wastes have been selected:
- sludge from a chemical wastewater treatment plant
- filter cake of treated fly ash (MSWI)
- sand blasting material
- processed and aged MSWI bottom ash
- metallurgical slag (coarse)
- sludge from municipal wastewater treatment plant and
- contaminated soil.

Justification
The materials selected cover a wide range of final pH values, which is one of the key parameters in leaching. In addition, the materials selected all occur in bulk quantities in Europe.

MSWI Bottom ash (MBA) - Municipal Solid Waste Incinerator Bottom ash is an inherently heterogeneous material with a grain size distribution extending from very fine to relatively coarse. The concentration levels encountered in bottom ash are intermediate. This material can be tested in a coarse particle size (procedure 4) and in size reduced mode.

Metalurgical slag (MES) - metallurgical slag is selected for its potentially high metal leachability. It comes in different particle size ranges to make it suitable for a comparison of particle size classes. Another feature of (some of) the metallurgical slags is their low porosity and permeability (very low infiltration of water in the material). This makes the material fit for the evaluation of the influence of grain-size on the test. The main feature to be tested on these materials is therefore the performance characteristics of Part 2 and 4. A specific feature of the metallurgical slag is the relative low buffer capacity. This makes the material appropriate for the evaluation of the pH-conditions of the leaching test.

Sand blasting material (SBW) - This material is relatively low in leachable elements. Sand blasting material is also relatively inert. It is however rather heterogeneous. In view of analytical capabilities a materials with low, but measurable leachability is necessary.

Sludge from chemical waste water plant (CHS) - The industrial sludge is an example of a moisture retaining waste as described in § 4.3.2.3 of the draft standard. It can only be tested by the procedure 2.

Filter cake of treated fly ash from waste incineration (FCM) - This material has a soluble salt loading, which has consequences on the eluate analysis with low specific element loadings. In addition, the material has a high water content. The filter cake has a high pH (> 10).

Sludge from municipal wastewater treatment (SEW) - This material is particularly relevant to CEN/TC 308. This is typically a material with a high water content. Therefor, only procedure 2 is useful. For the municipal sludge the presence of high concentrations of dissolved organic matter provide a complex matrix in the analysis of the eluates.

Contaminated soil (CS) - Contaminated soil is often designated as waste and very abundant all around Europe. Contaminated soil is usually a relatively fine-grained material. In this case the main focus is on the low L/S conditions in Parts 1 and 3. In addition, the low L/S values provide, in comparison with the Parts 2 and 4, higher concentrations in the extracts. These matrices may lead to higher contamination levels. This provides a broad range of concentrations to be measured.

2.2 Methods

2.2.1 pH dependence leaching test

This European standard specifies a test method for determining the influence of pH on the leachability of inorganic constituents from a waste material. Equilibrium conditions as defined in the standard are established by addition of pre-determined amounts of acid or base to reach desired end pH values.
ANC method- Separate test portions are subjected to leaching according to a fixed L/S ratio with leachants containing pre-selected amounts of acid or base in order to reach stationary pH values at the end of the extraction period. Each leachant is added in three steps in the beginning of the test. At least 8 final pH-values are required, covering at the minimum the range pH 4 -pH 12 (both included i.e. the lowest value 4 and the highest value 12). The amounts of acid or base needed to cover the pH range can be derived from the results of a preliminary titration, from available information or from an arbitrary division of the predetermined maximum consumption of acid and base. The tests are carried out at a fixed contact time at the end of which equilibrium conditions can be assumed to be reached for most constituents in most waste materials to be characterised. The equilibrium conditions as defined in the standard are verified at the end of the extraction period.
The results are expressed in mg/l of constituents as a function of the final pH and as a function of acid and base amounts expressed in mol H+/kg (mmol OH- are expressed as -mmol H+).
pH stat method - Separate test portions are subjected to leaching at a fixed L/S ratio with leachants where the pH is adjusted and controlled at pre-determined pH-values. This is achieved by means of automated addition of acid or base into the solutions. At least 8 final pH-values are required, covering at the minimum the range pH 4 - pH 12 (both included i.e. the lowest value 4 and the highest value 12). The tests are carried out at a fixed contact time at the end of which equilibrium conditions can be assumed to be reached for most constituents in most waste materials to be characterised. The equilibrium conditions as defined in the standard are verified at the end of the extraction period.
The results are expressed in mg/l of constituents as a function of the final pH and as a function of acid and base amounts expressed in mol H+/kg (mol OH- are expressed as -mol H+).

2.2.2 Percolation test

A method of test to determine the release of constituents from waste, with or without size reduction, packed in a column with a leachant percolating through it. A continuous vertical up-flow is used, so that the column is water saturated. The test conditions, including the flow rate of the leachant, enable a conclusion to be drawn from the results as to which components are rapidly being washed out and which components are released under the influence of interaction with the matrix.
The test portion of the waste to be tested is packed in a column in a standardized manner. l The leachant is percolated in up-flow through the column at a specified flow rate up to a fixed L/S ratio. The eluate is collected in several separate fractions that are characterized physically and

chemically according to existing standard methods. In the test, equilibrium conditions at the outlet of the column are verified after equilibration by measuring pH in two subsequent small portions of eluate.
The results of the test are expressed as a function of L/S ratio, in terms of both mg of the constituents released per litre eluate, and mg of the constituents released cumulatively per kg of waste material (dry mass).

2.2.3 Total composition

The total composition has been determined by the participating laboratories with the methods common in their labs.

2.2.4 Analysis

The participating laboratories have applied the most common techniques in their respective laboratories. For quality control purposes, the Standard Eluate (see Part 4) was sent along to provide a measure of the analytical performance. ICP-AES was recommended as analytical technique.

3. RESULTS AND DISCUSSION

3.1 pH dependence leaching test and percolation test data

A graphical presentation of the data is given in sections 3.1.1 to 3.1.7 for the elements selected in the validation for the 7 materials studied. In the figures, the data from other Parts of the validation program are included for comparison. This includes the results from a pre-qualification of the materials by EN 12457 Part 2, the results from the homogeneity testing of the prepared laboratory samples, selected results from the ruggedness testing and finally results from the EU wide validation of EN 12457 Parts 1 – 4.
A more complete set of parameters is provided in the Appendices I to VII, in which respectively all leaching data of the pH dependence test and the percolation test are given. In Appendix VIII, the total composition is given for the materials studied. The complete results of a comparison between pH dependence test and percolation test are provided in Appendix IX.

The data are all expressed in mg/kg leached to allow direct comparison between leaching data at different L/S ratios. pH dependence test data (carried out at L/S=10) are presented side by side with percolation test data (L/S 0.1 – 10). In the graph with percolation data a dotted line representing the leaching behaviour in case of solubility control is given.

3.1.1 Municipal solid waste incinerator ash (MBA)

In figure 3.1 characterization leaching data are given for the elements selected for the validation of MBA.

The results from pH dependence test, percolation test and EN 12457 are consistent as they form a cluster of data points around the full pH dependent leaching curve and the dynamic leaching curve. The graphs illustrate also the manner in which compliance test data can be related to characterization test data. Thus making single data points more meaningful. The repeatability of the percolation test falls well within the repeatability as observed for the compliance test.
In terms of behaviour, Sb shows pure solubility controlled leaching behaviour (cumulative release - L/S plot has a slope of 1). Ba is largely solubility controlled. The leachable fractions of Cu and Mo are rapidly depleted, as illustrated by the horizontal section in the cumulative release - L/S plot at L/S >1. Sulphate shows intermediate behaviour with a significant fraction readily washed out by percolation.

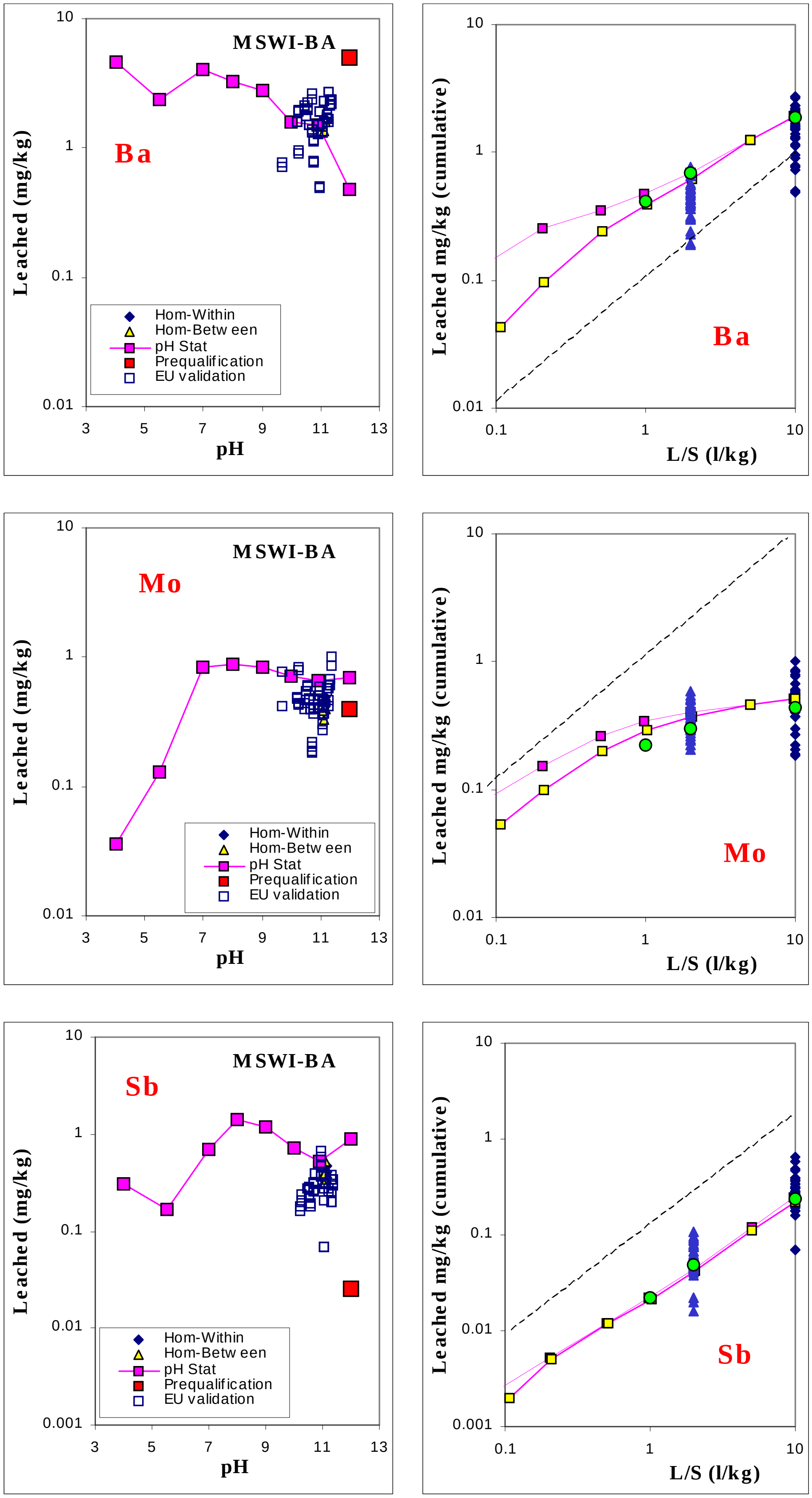


Figure 3.1 *Relationship between characterization and compliance leaching tests for MBA*

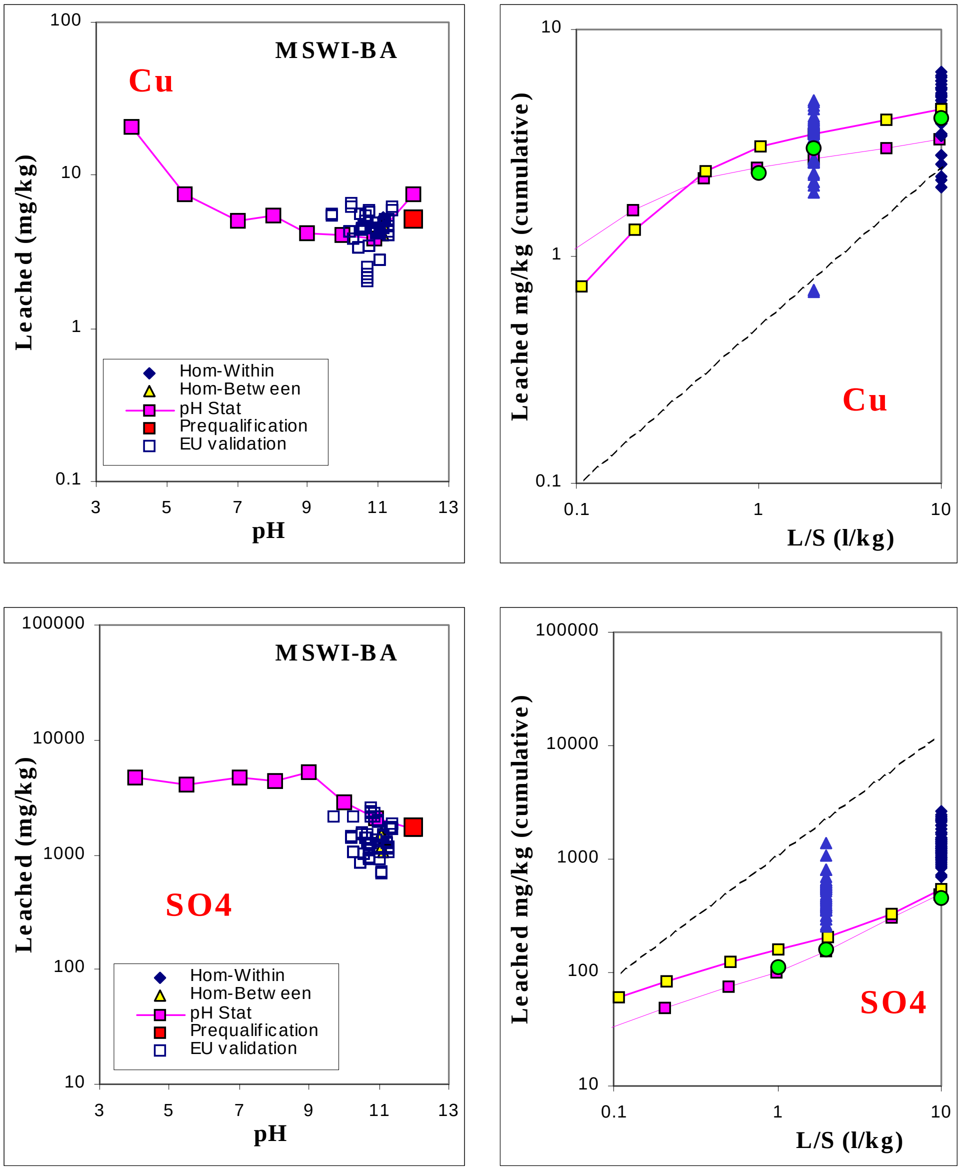


Figure 3.1 *continued*

3.1.2 Metalurgical slag (MES)

In figure 3.2 characterization leaching data are given for the elements selected for the validation of MES. The scatter in the data obtained for metalurgical slag is quite substantial. This is attributed largely to sample heterogeneity (see Part 5). In spite of the high variability, the data match reasonably well with the pH dependence and percolation test data.

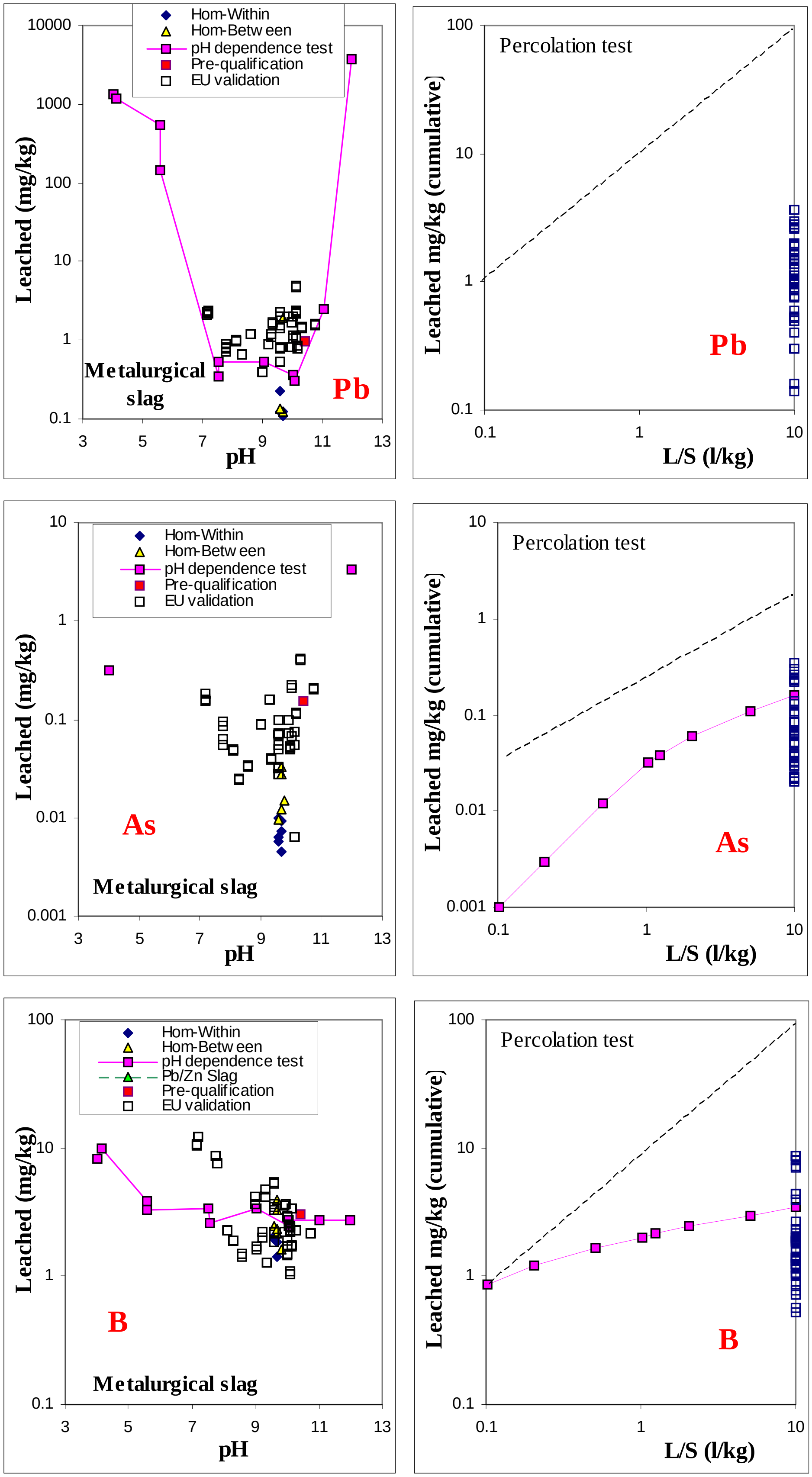


Figure 3.2 *Relationship between characterization and compliance leaching tests for MES*

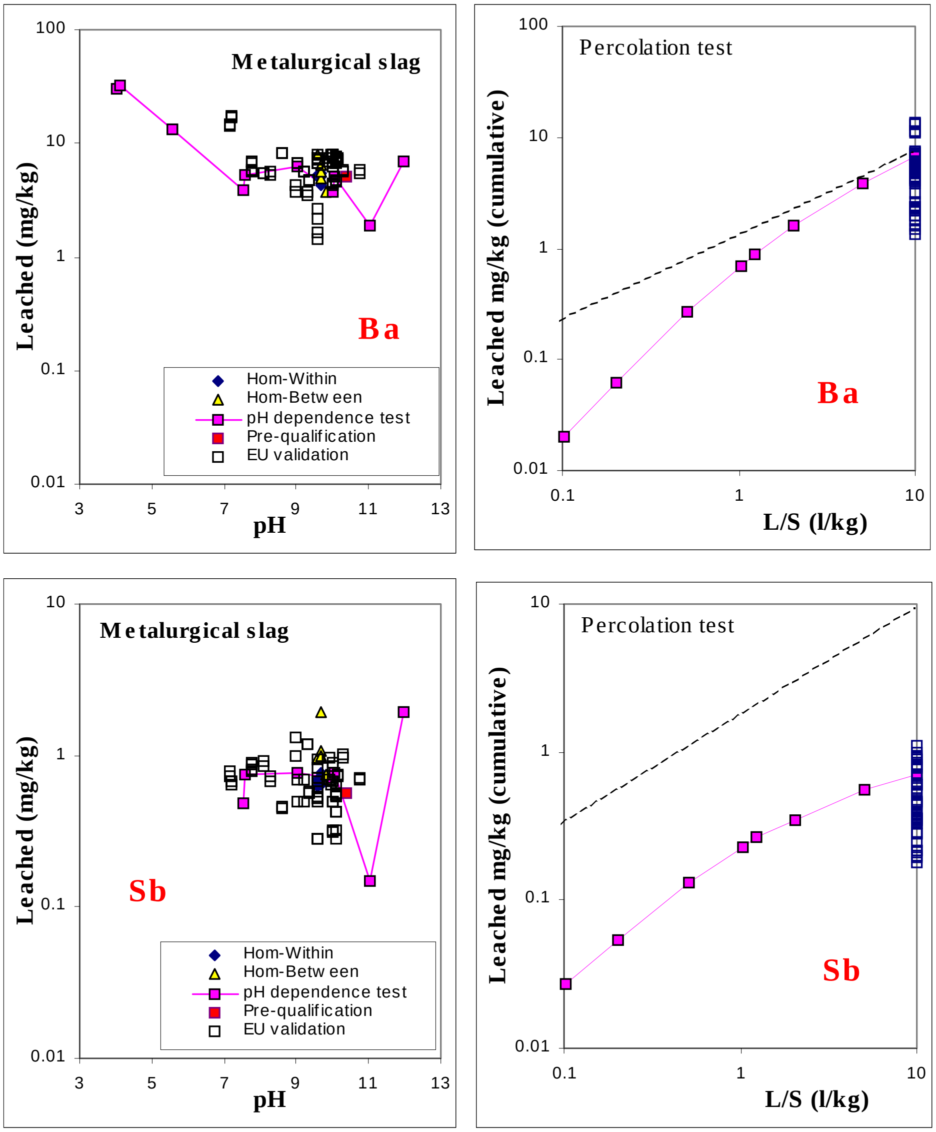


Figure 3.2 *Continued.*

3.1.3 Sand blasting waste (SBW)

In figure 3.3 characterization leaching data are given for the elements selected for the validation of SBW. The scatter in the data obtained for sand blasting waste is quite substantial. This is attributed largely to sample heterogeneity (see Part 5). In spite of the high variability, the data match reasonably well with the pH dependence and percolation test data. Ba is strictly solubility controlled. In case of Cu and Zn, the release at longer term decreases rapidly after an initial release.

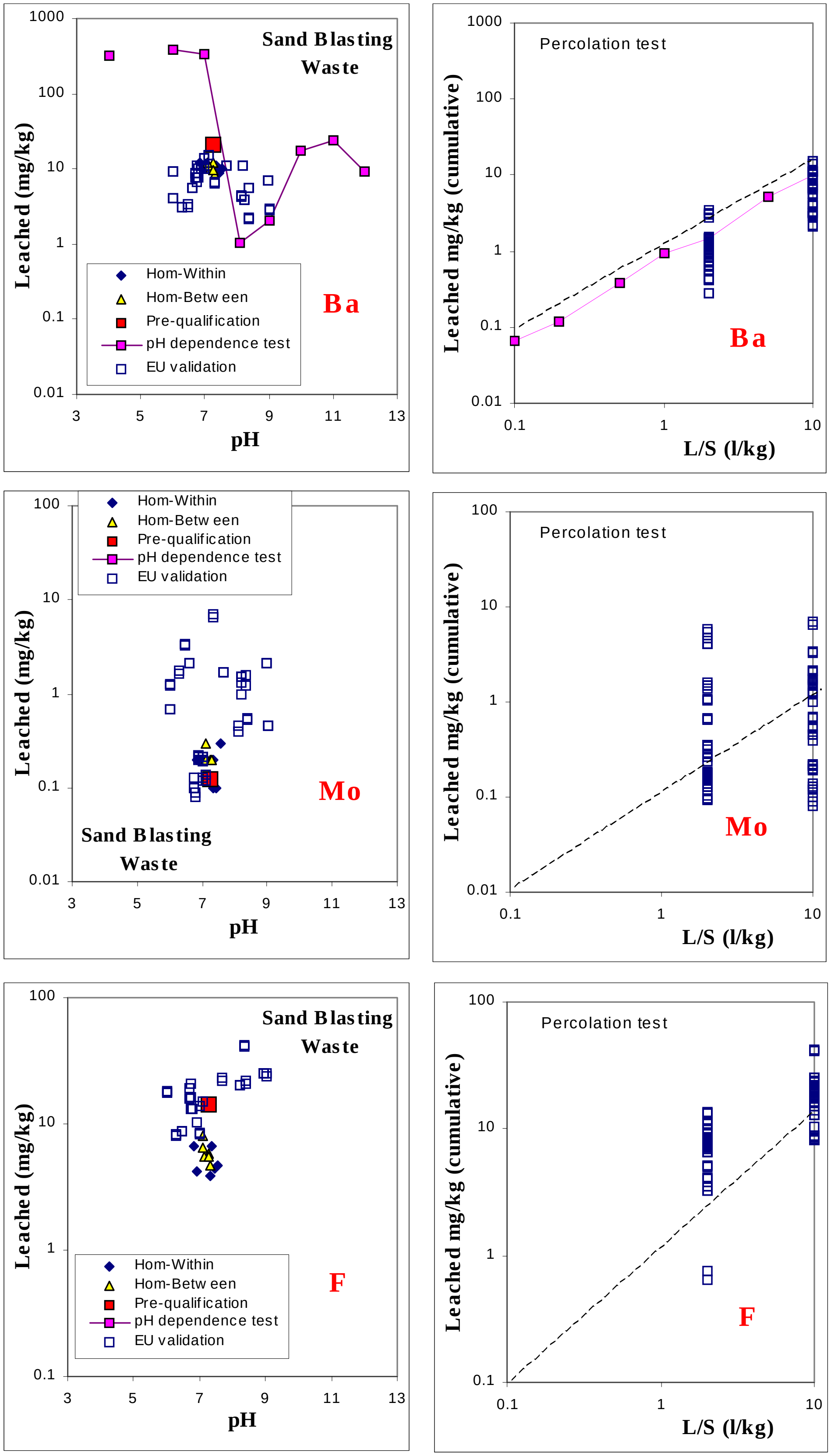


Figure 3.3 *Relationship between characterization and compliance leaching tests for SBW*

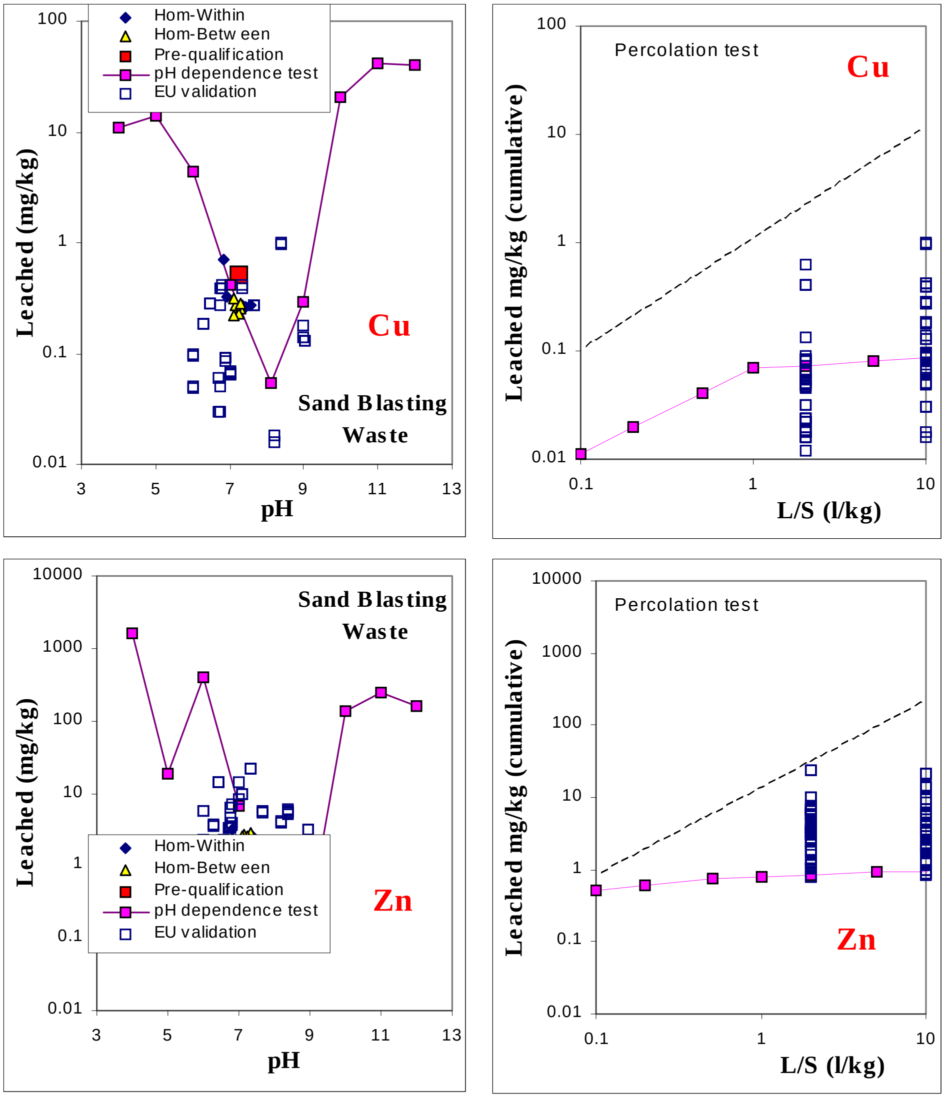


Figure 3.3 *Continued.*

3.1.4 Contaminated soil (COS)

In figure 3.4 characterization leaching data are given for the elements selected for the validation of COS. The results from pH dependence test, percolation test and EN 12457 are consistent as they form a cluster of data points around the full pH dependent leaching curve and the dynamic leaching curve. In spite of the low pH, Pb, As and Sb appear to be largely solubility controlled. Whereas Cd, Ni and Co are very mobile at this low pH and the leachable fraction is depleted within L/S=2.

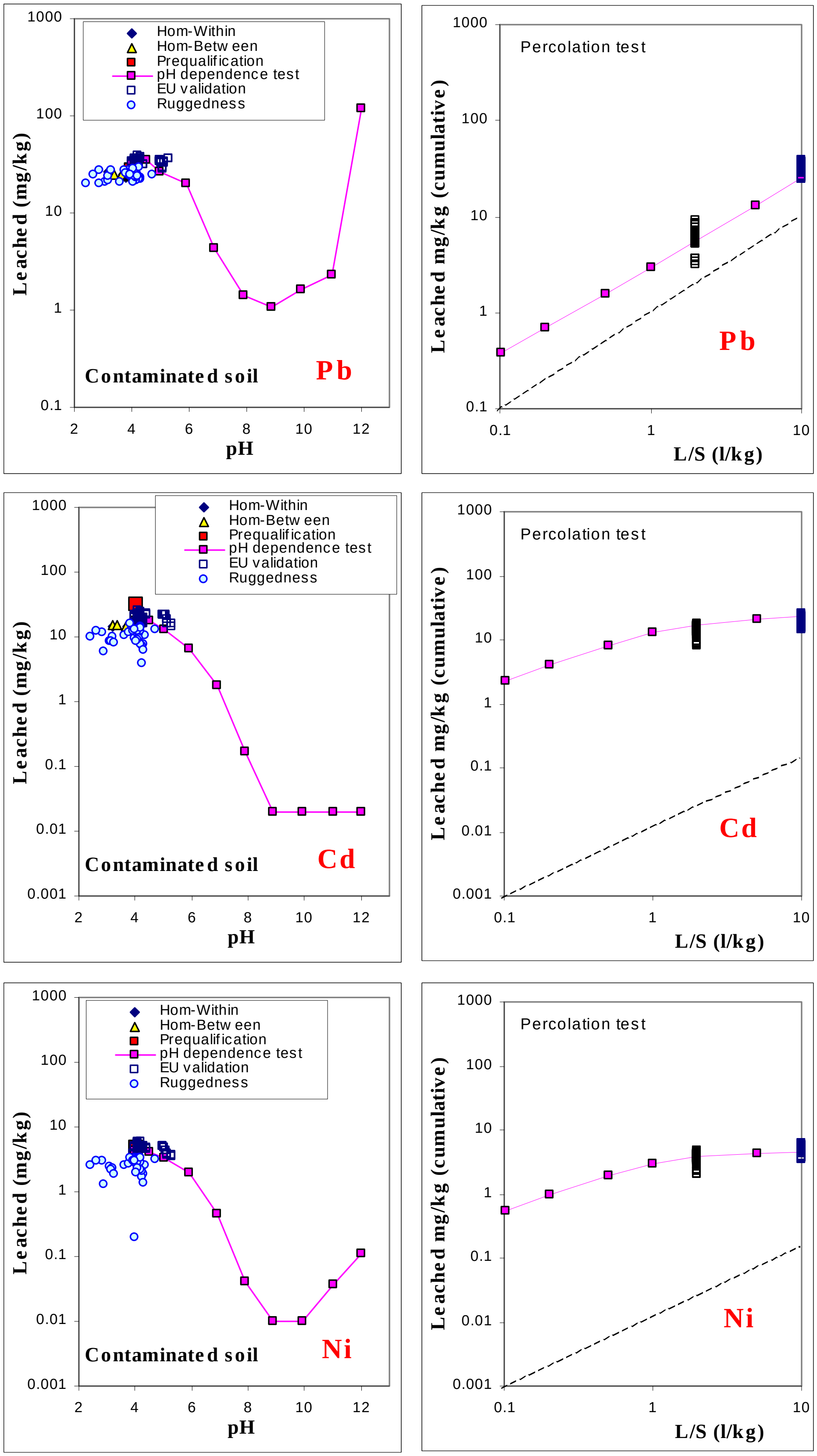


Figure 3.4 *Relationship between characterization and compliance leaching tests for COS*

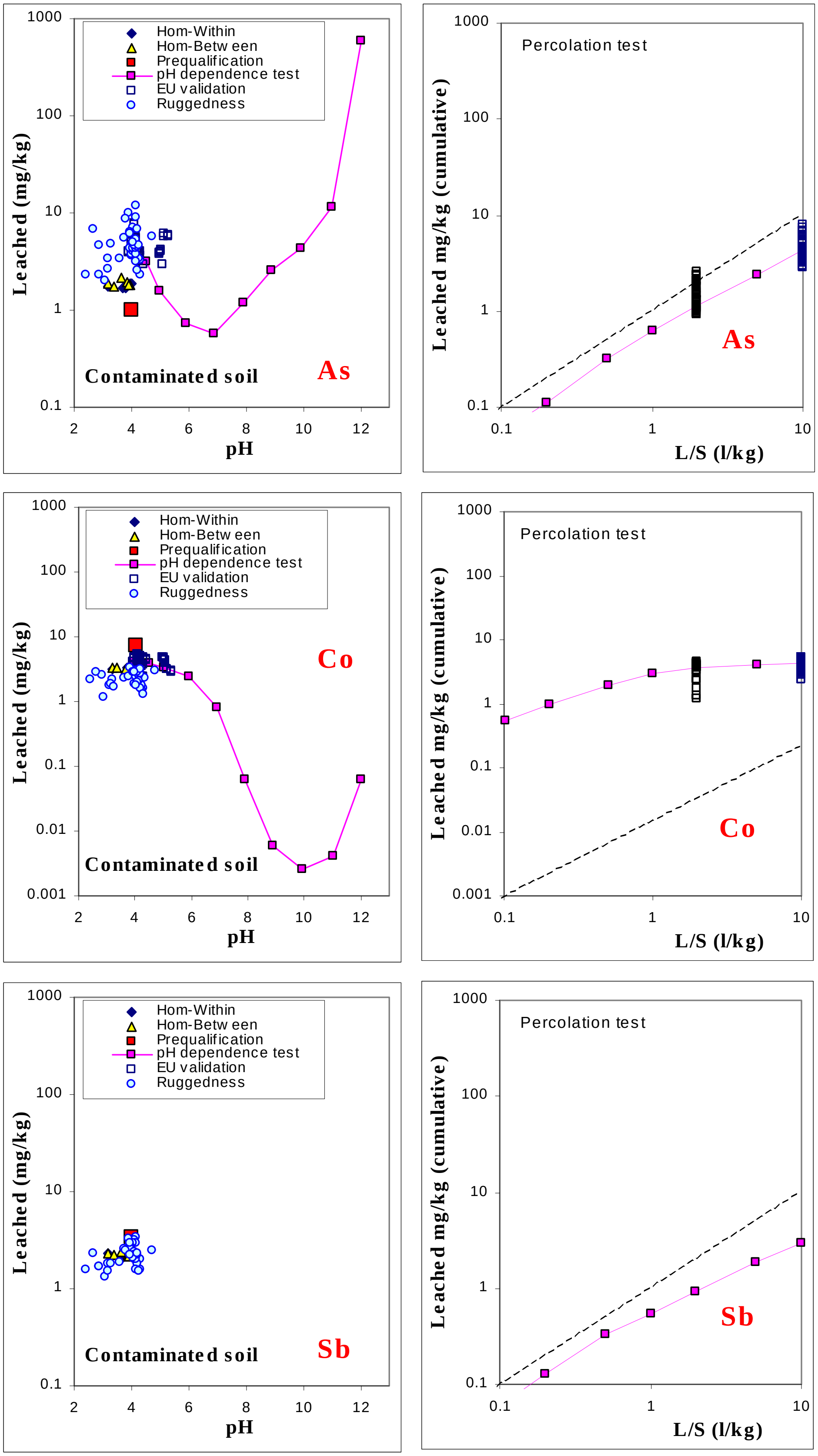


Figure 3.4 *Continued.*

3.1.5 Sewage sludge (SEW)

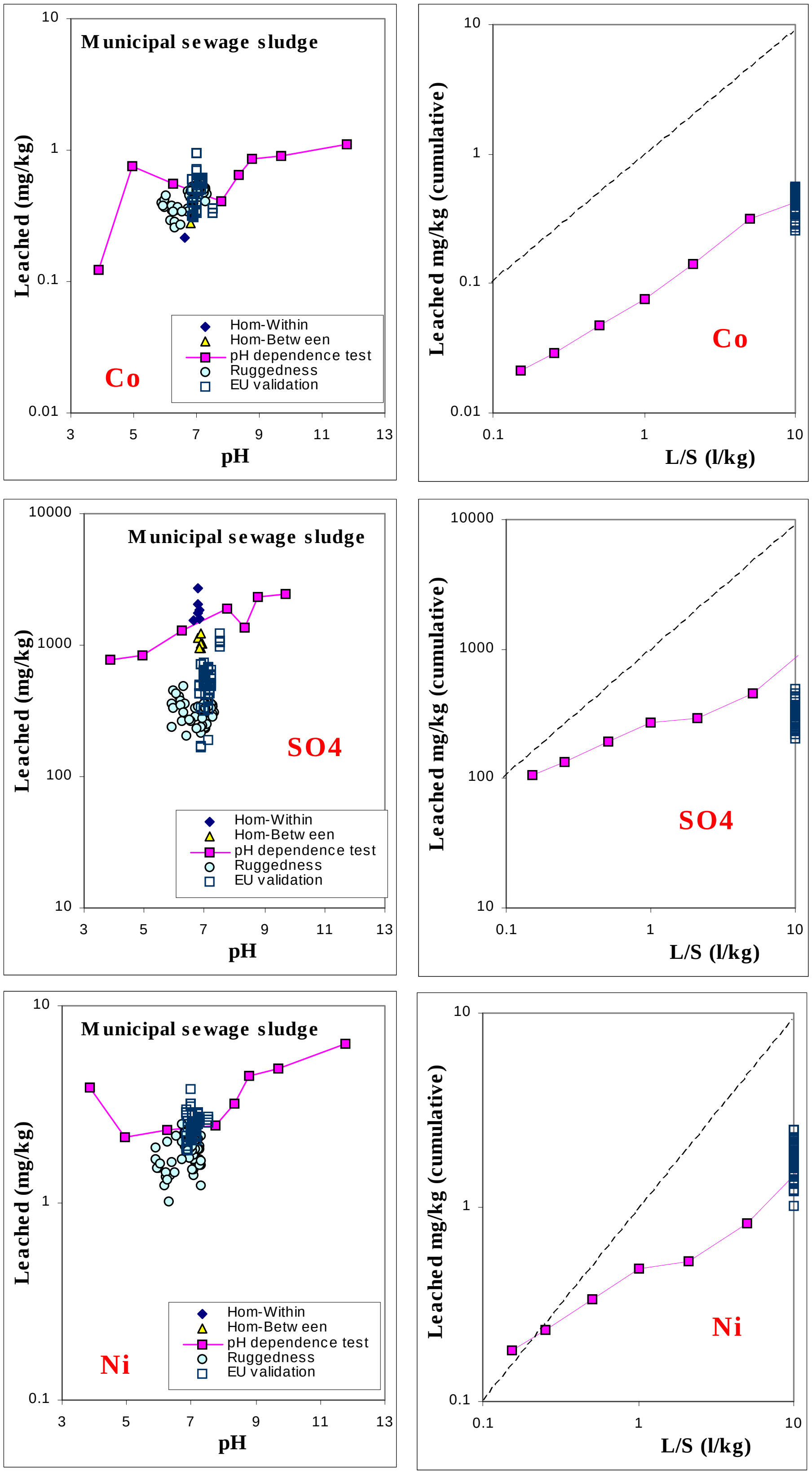


Figure 3.5 *Relationship between characterization and compliance leaching tests for SEW*

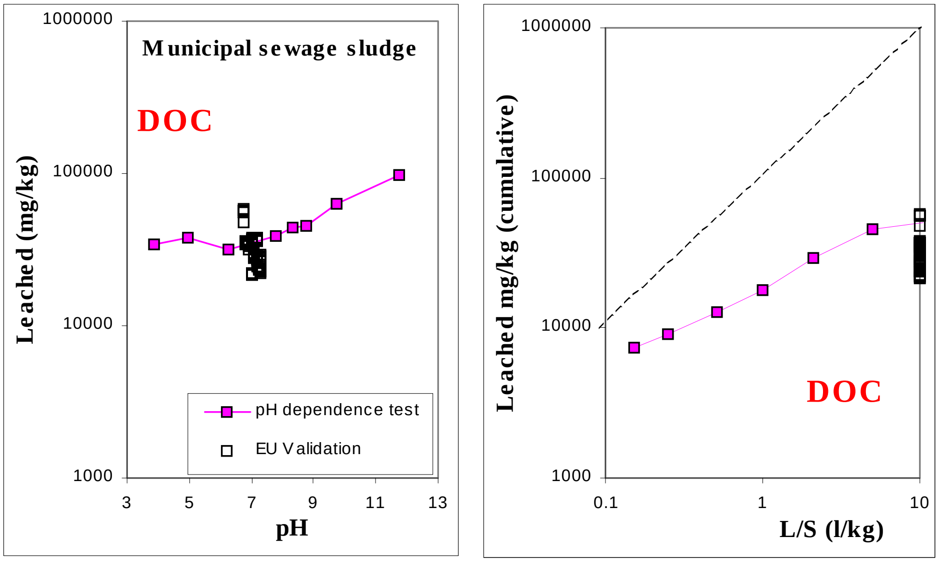


Figure 3.5 *Continued*

In figure 3.5 characterization leaching data are given for the elements selected for the validation of SEW. The sewage sludge matrix is typically a very bioactive matrix, which implies that leaching results are affected by the biological activity. This may explian some of the deviations observed between characterization and compliance test results, as those tests were performed at different times after sampling. For some parameters there is a reasonable good match between compliance and characterization (DOC, Ni, Co). However for sulphate the results obtained with the compliance test are significantly lower than the results obtained in the characterization testing. This may be attributed to changes resulting from biological activity. The time dependent leaching as reflected by the percolation test does not give a clear indication of constituent behaviour as observed for largely inorganic matrices.

3.1.6 Chemical sludge (CHS)

In figure 3.6 characterization leaching data are given for the elements selected for the validation of CHS. The results from pH dependence test, percolation test and EN 12457 are consistent as they form a cluster of data points around the full pH dependent leaching curve and the dynamic leaching curve. Mo that was not part of the validation appears to be solubility controlled. Cd is washed out by percolation. There is a very significant difference in behaviour between pH dependence test and percolation test. The release levels do not match. The validation results match with the percolation data. The pre-qualification study and homogeneity testing are in agreement with the pH dependence test. There is no direct explanation for this apparent discrepancy. Cr is present as chromate and the leachable fraction is washed out almost completely form the waste by percolation at L/S=10.

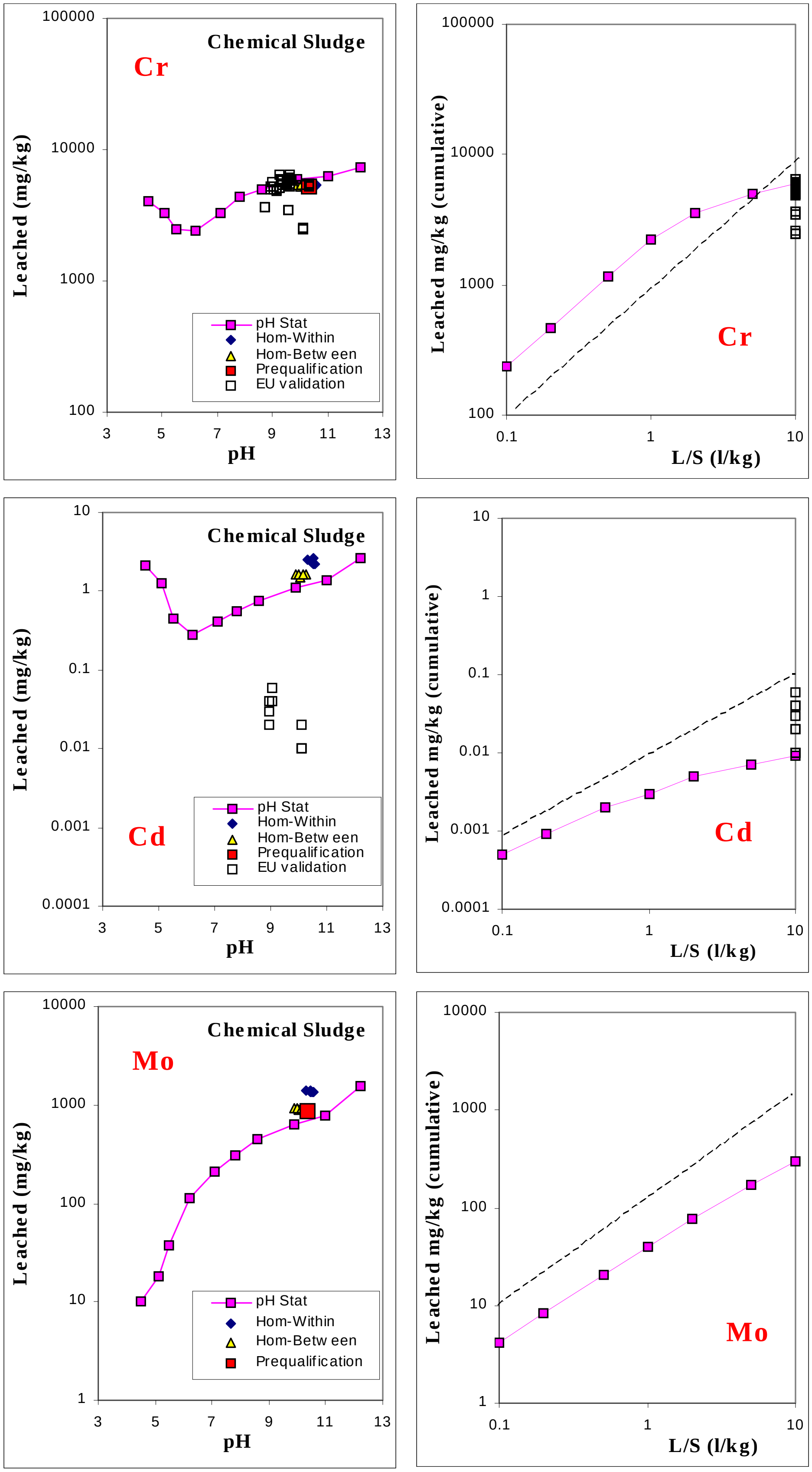


Figure 3.6 *Relationship between characterization and compliance leaching tests for CHS*

3.1.7 Filtercake from incineration (FCM)

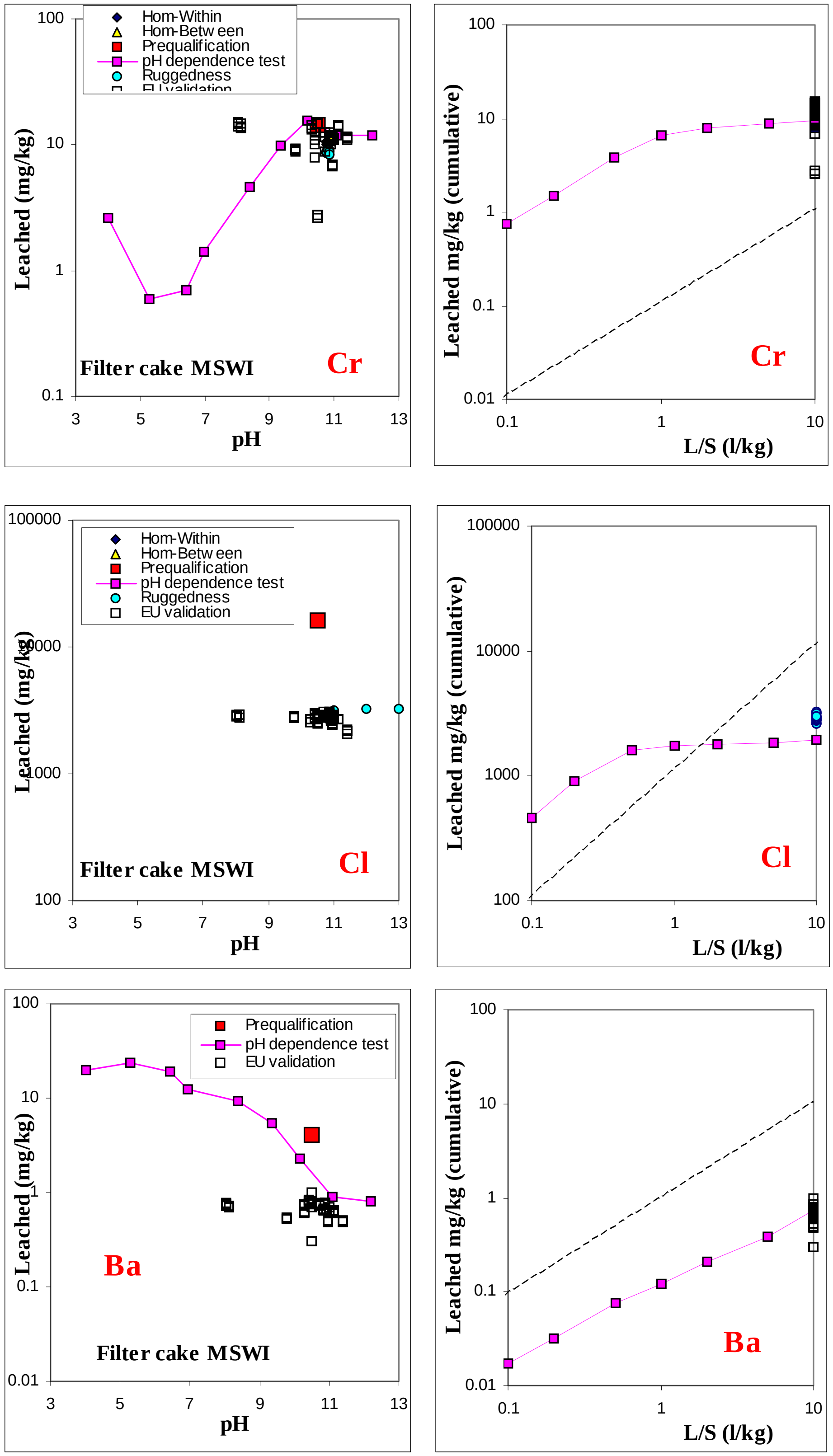


Figure 3.7 *Relationship between characterization and compliance leaching tests for FCM*

In figure 3.7 characterization leaching data are given for the elements selected for the validation of FCM. With a few exceptions, the results from pH dependence test, percolation test and EN 12457 are consistent as they form a cluster of data points around the full pH dependent leaching curve and the dynamic leaching curve. Ba is clearly solubility controlled. Both Cl and Cr (as chromate) are readily (within L/S=1) washed out by percolation.

3.2 Changes in leaching behaviour with time

MBA has been analysed at different stages of the Validation program. This has resulted in observations that provide evidence for a pH decrease with time due to carbonation. In figure 3.8 the leaching behaviour of Pb is given for the first measurement to assess the material for suitability, later in the homogeneity testing, subsequently in the tests carried out for ruggedness study and test for sub-sampling of MBA and finally in the EU wide validation. These analysis of the same sample are spaced over a time frame of more than a year.

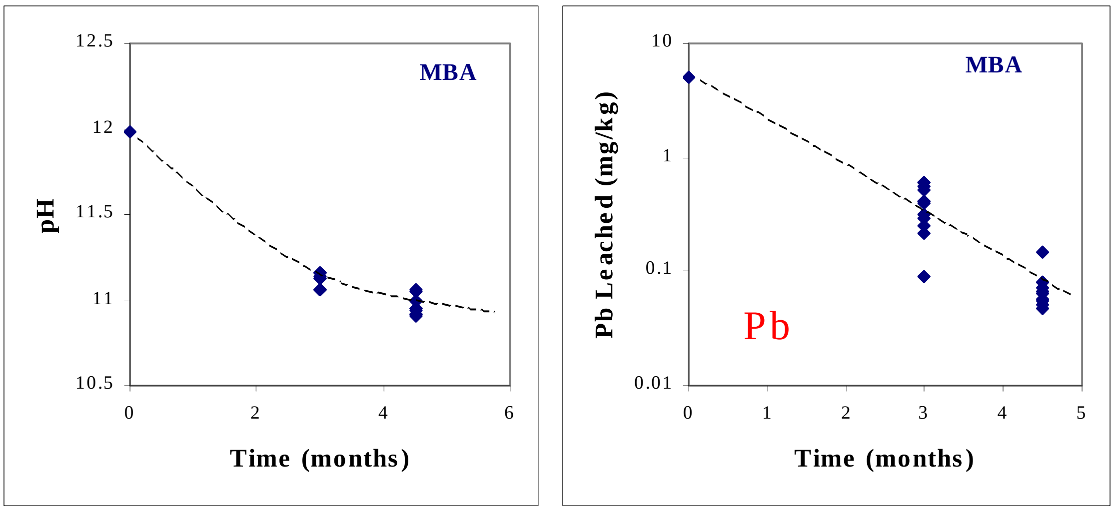


Figure 3.8 *Changes in pH of bottom ash with time and associated changes in Pb leachability*.

3.3 Relationship between pH dependence test and percolation test and consistency between EN 12457 and the percolation test

For compliance purposes it is important to be able to relate different test results obtained under comparable conditions to one another. This is relevant for the L/S=10 condition of the percolation test with the corresponding pH condition in the pH dependence test. This comparison may not work very well when large pH changes occur in the course of the percolation test. Another comparison is the relationship between the compliance leaching tests and the percolation test. In Appendix I -VII a full comparison is given for all measured components in the 7 materials. Obviously, in case of measurements close to the detection limit significant differences appear, which are not meaningful in verifying the question, if on a more general basis there is agreement between the test results within the variability that can be encountered in performing leaching tests. In table 3.1 a summary of this comparison is given for the materials studied for those parameters with sufficient analytical precision.

Table 3.1 *Ratio of pH stat data versus column data and EN 12457-2 data versus column test data for all materials studied.*

	pH stat/Column		EN 12457-2/Column	
	Average	stdev	Average	stdev
COS	1.06	0.18	1.05	0.12
SBW	ND	ND	0.91	0.17
CHS	0.89	0.14	0.84	
SEW	1.06	0.18	1.29	0.13
FCM	1.16	0.19	0.88	
MES	0.84	0.28	0.80	0.10
MBA	0.99	0.23	0.93	0.07
Overall			1.00	0.22

In SBW it was not possible to make this comparison for the pH dependence test. Across all materials and averaged over all significant elements measured, the agreement between pH dependence leaching test and percolation test at L/S=10 and between the EN 12457-2 and the percolation test is quite reasonable. It appears that discrepancies are specific for some element material combinations (e.g. Cu in CHS) and are more likely to occur, when measurements are carried out close to the limit of determination.

4. CONCLUSIONS

The characterization data presented provide a basis of reference that allow conclusions on behaviour of materials under different exposure conditions. In particular, the pH dependence test data provide information on the chemical speciation of elements in the various matrices. Factors that control leachability in specific matrices can be recognized (e.g. role of DOC, control of leachability by common mineral phases) [3].

The agreement between the pH dependence leaching test and the percolation leaching test at the corresponding pH and L/S=10 condition is generally good. However, differences can occur in case of measurements close to the detection limit or in cases where relatively large changes in pH or other controlling parameters occur over the course of the percolation test.

The agreement between the EN 12457 methods and the percolation test is generally good (see also comparison in Part 5 Leaching Test Validation).

REFERENCES

[1] pH dependence leaching test. CEN TC 292 Working Group 6, Characterisation leaching test: Work item 292015 (in prep.)

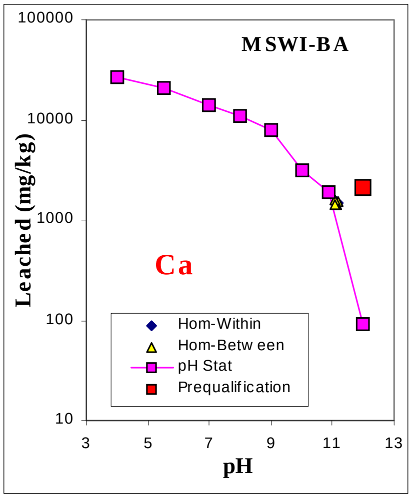
[2] Percolation simulation test CEN TC 292 Working Group 6 Characterisation leaching test, Work item 292016 (in prep.)

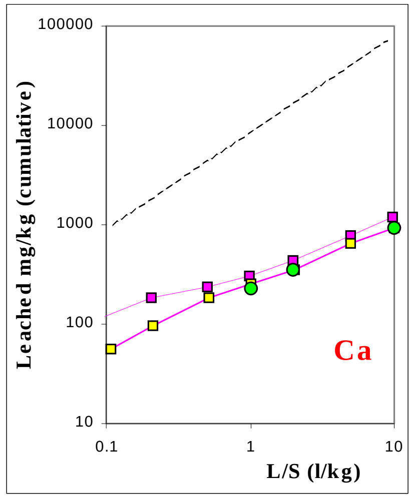
[3] Harmonization of leaching/extraction tests, 1997. Studies in Environmental Science, Volume 70. Eds. H.A. van der Sloot, L. Heasman, Ph. Quevauviller, Elsevier Science, Amsterdam, 292 pp.

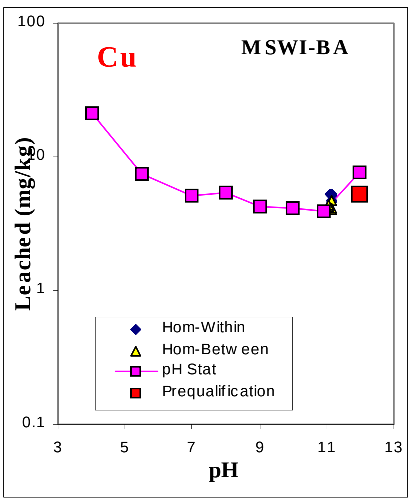
[4] EU project SMT4-CT96-2066. Technical support to the Network Harmonization of Leaching/Extraction tests (2000).

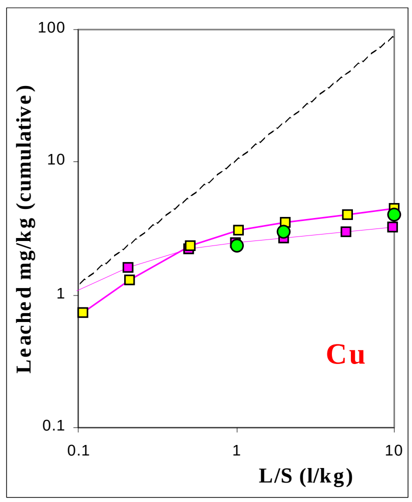
[5] IAWG (International Ash Working Group; A.J. Chandler, T.T. Eighmy, J. Hartlen, O. Hjelmar, D.S. Kosson, S.E. Sawell, H.A. van der Sloot, J. Vehlow). 1997. Municipal Solid Waste Incinerator Residues. Studies in Environmental Science 67, Elsevier Science, Amsterdam, 974 pp.

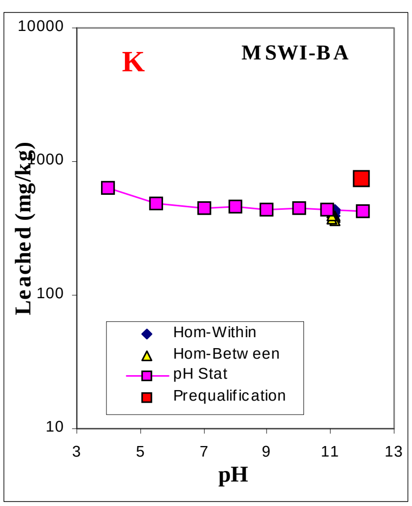
APPENDIX I PH DEPENDENCE DATA AND PERCOLATION TEST DATA FOR MBA

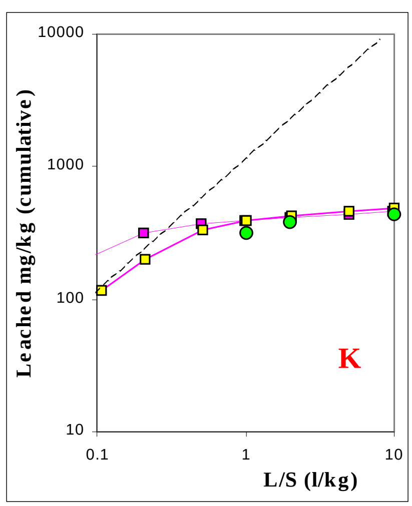


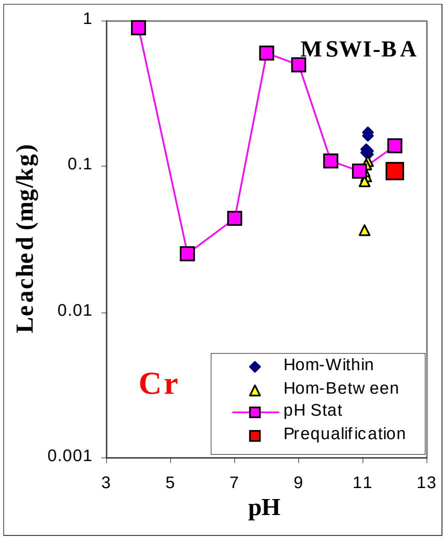


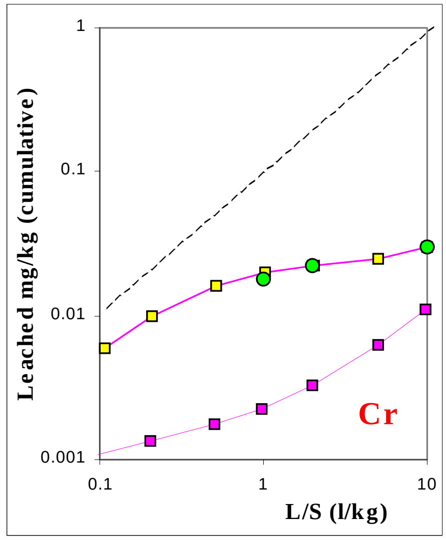


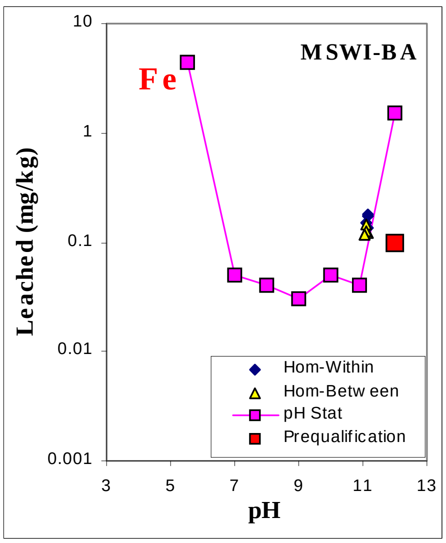


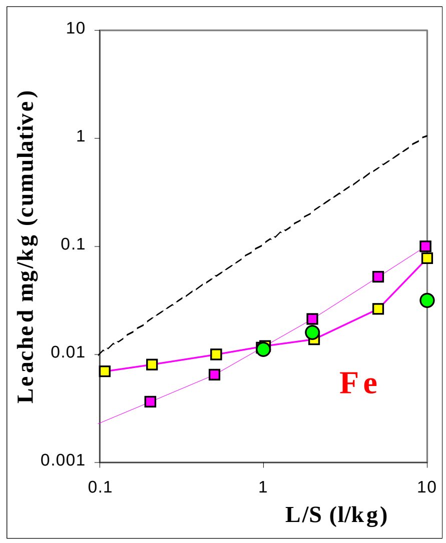


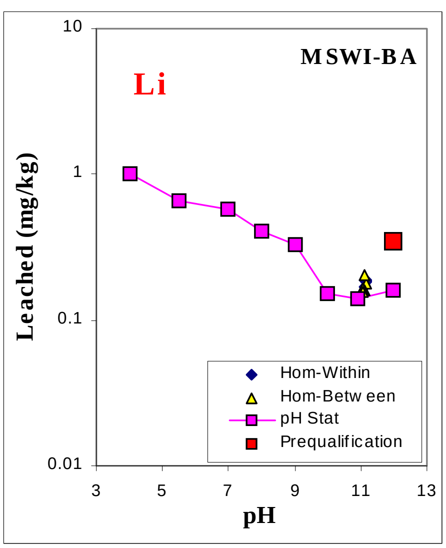



MSWI-BA
Cr
Leached (mg/kg)
pH
1
0.1
0.01
0.001
3
5
7
9
11
13
Hom-Within
Hom-Betw een
pH Stat
Prequalification


Cr
Leached mg/kg (cumulative)
L/S (l/kg)
1
0.1
0.01
0.001
0.1
1
10


MSWI-BA
Fe
Leached (mg/kg)
pH
10
1
0.1
0.01
0.001
3
5
7
9
11
13
Hom-Within
Hom-Betw een
pH Stat
Prequalification


Fe
Leached mg/kg (cumulative)
L/S (l/kg)
10
1
0.1
0.01
0.001
0.1
1
10


MSWI-BA
Li
Leached (mg/kg)
pH
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0.1
0.01
3
5
7
9
11
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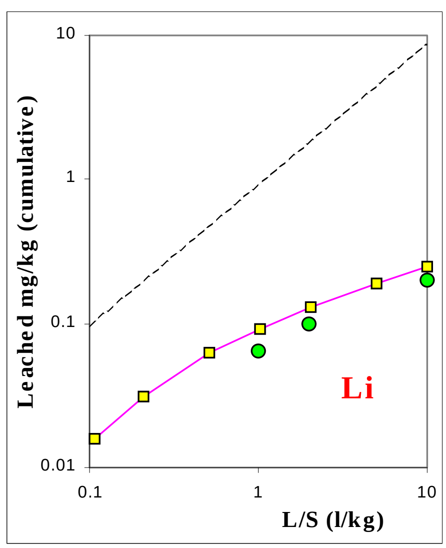
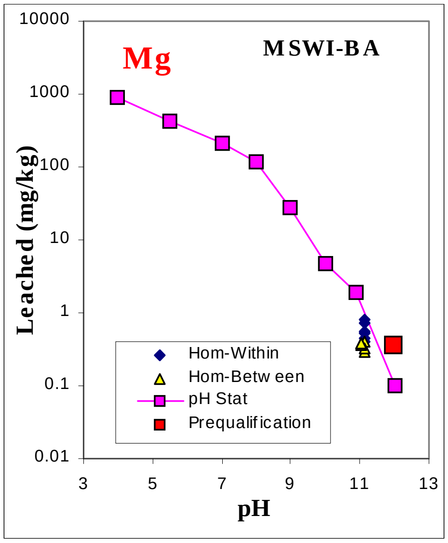
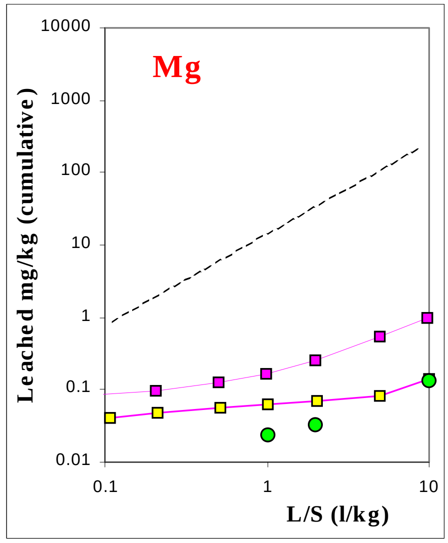
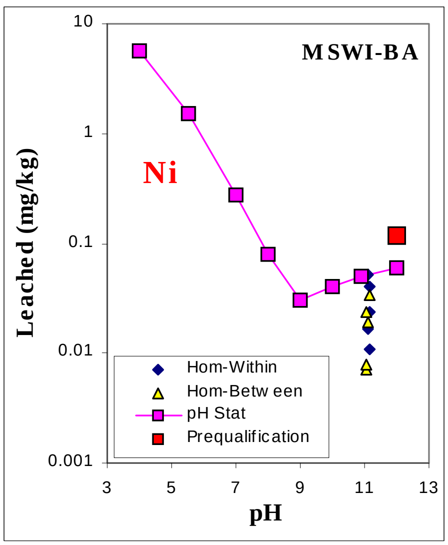
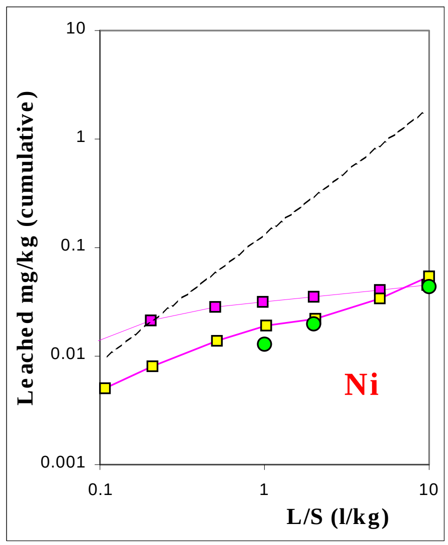
Hom-Within
Hom-Betw een
pH Stat
Prequalification

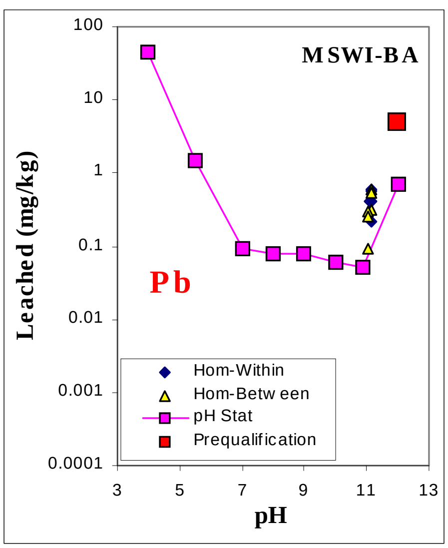

Li
Leached mg/kg (cumulative)
L/S (l/kg)
10
1
0.1
0.01
0.1
1
10

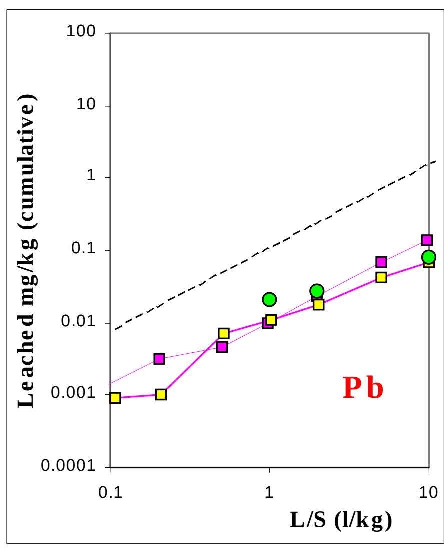

Mg
MSWI-BA
Leached (mg/kg)
pH
Hom-Within
Hom-Betw een
pH Stat
Prequalification

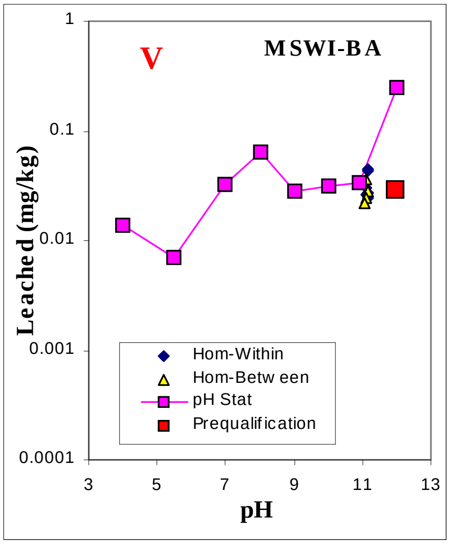

Mg
Leached mg/kg (cumulative)
L/S (l/kg)

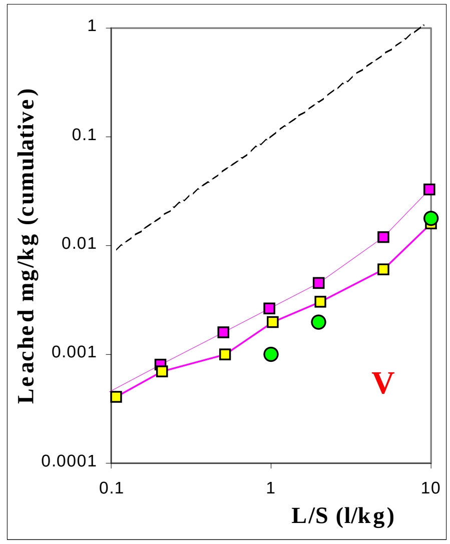

MSWI-BA
Ni
Leached (mg/kg)
pH
Hom-Within
Hom-Betw een
pH Stat
Prequalification

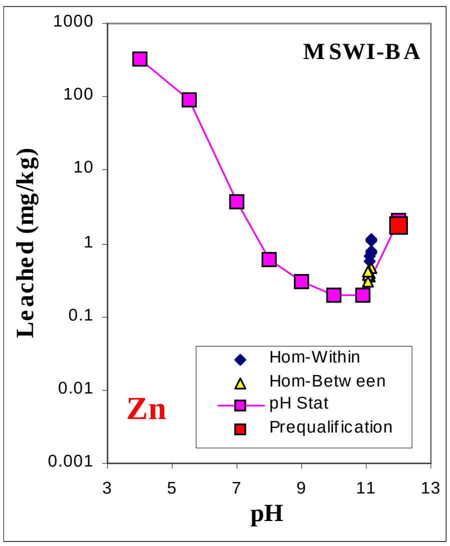

Ni
Leached mg/kg (cumulative)
L/S (l/kg)

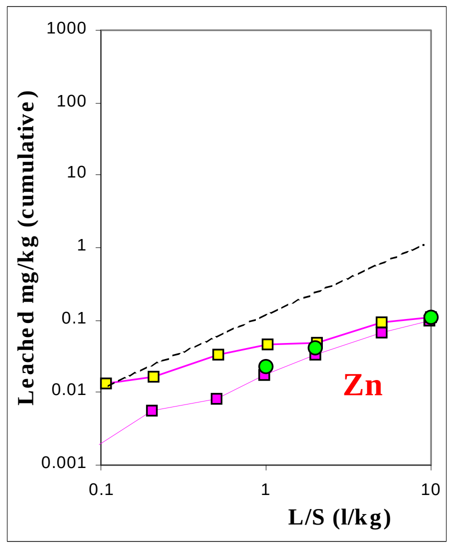

MSWI-BA
Pb
Leached (mg/kg)
pH
Hom-Within
Hom-Betw een
pH Stat
Prequalification

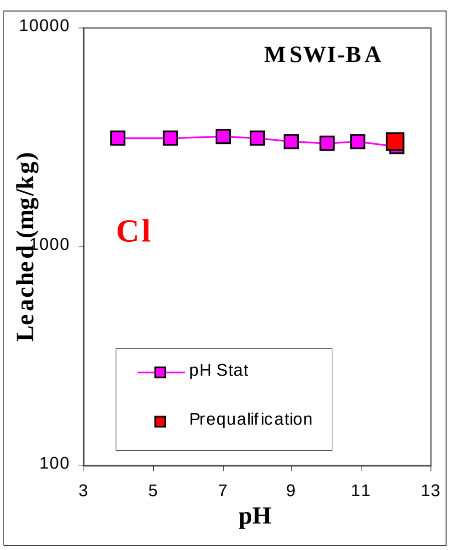

Pb
Leached mg/kg (cumulative)
L/S (l/kg)

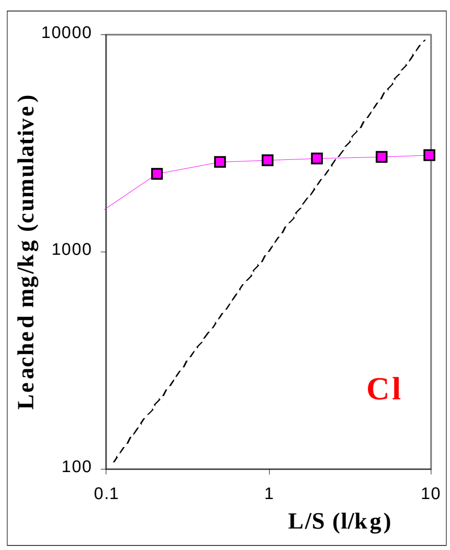

V
MSWI-BA
Leached (mg/kg)
1
0.1
0.01
0.001
0.0001
Hom-Within
Hom-Betw een
pH Stat
Prequalification
3
5
7
9
11
13
pH


Leached mg/kg (cumulative)
1
0.1
0.01
0.001
0.0001
V
0.1
1
10
L/S (l/kg)

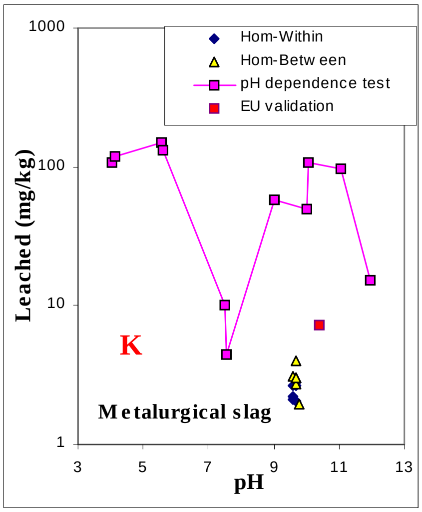

MSWI-BA
Leached (mg/kg)
1000
100
10
1
0.1
0.01
0.001
Zn
Hom-Within
Hom-Betw een
pH Stat
Prequalification
3
5
7
9
11
13
pH

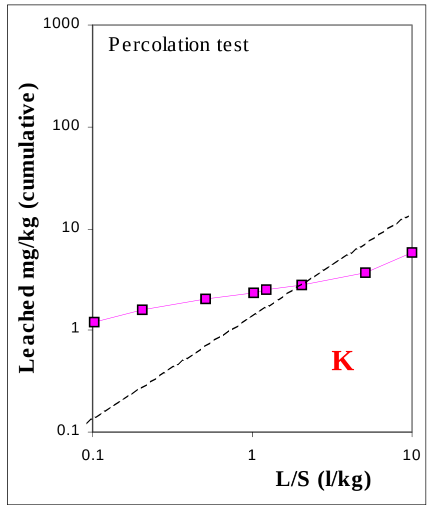

Leached mg/kg (cumulative)
1000
100
10
1
0.1
0.01
0.001
Zn
0.1
1
10
L/S (l/kg)

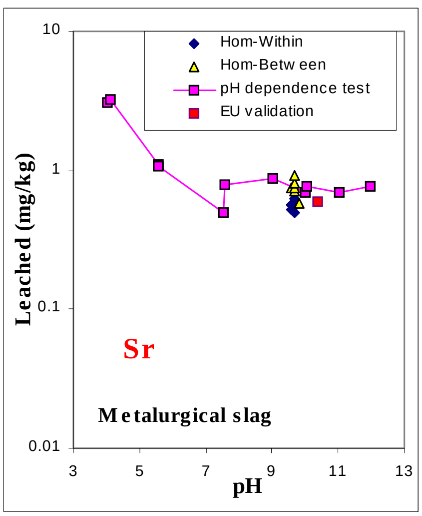

MSWI-BA
Leached (mg/kg)
10000
1000
100
Cl
pH Stat
Prequalification
3
5
7
9
11
13
pH

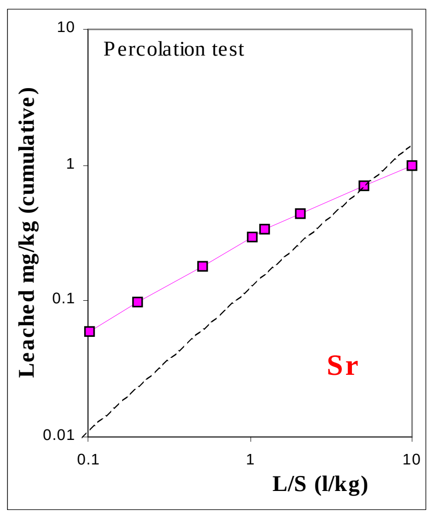

Leached mg/kg (cumulative)
10000
1000
100
Cl
0.1
1
10
L/S (l/kg)

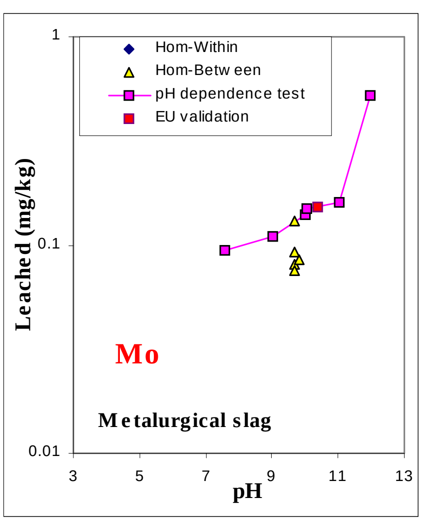
APPENDIX II PH DEPENDENCE AND PERCOLATION TEST DATA FOR MES

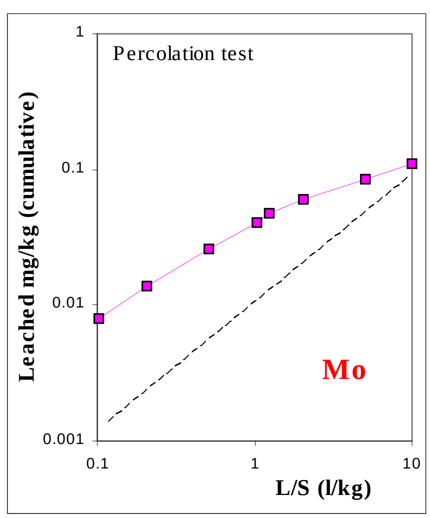




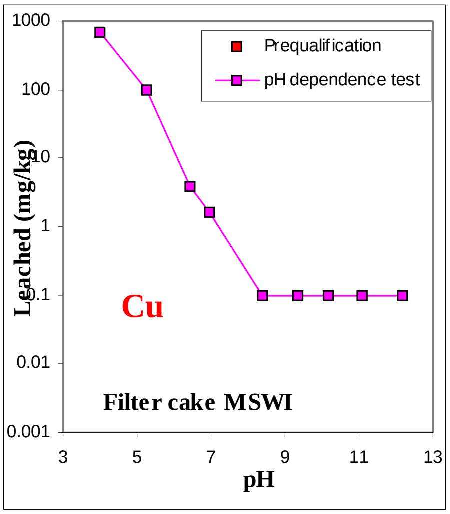


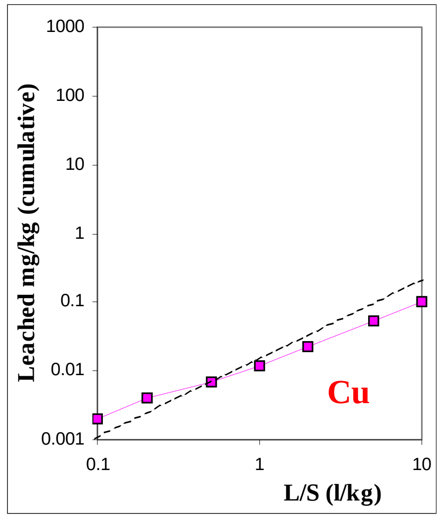


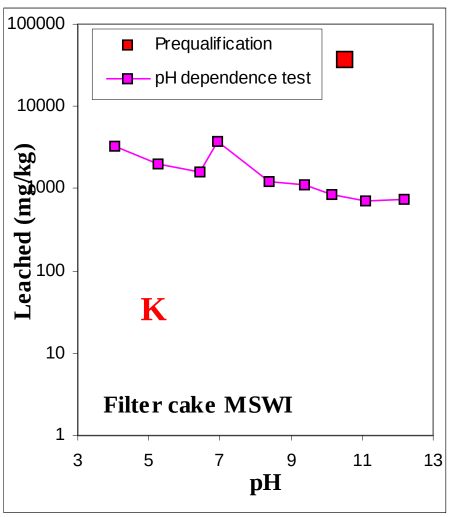


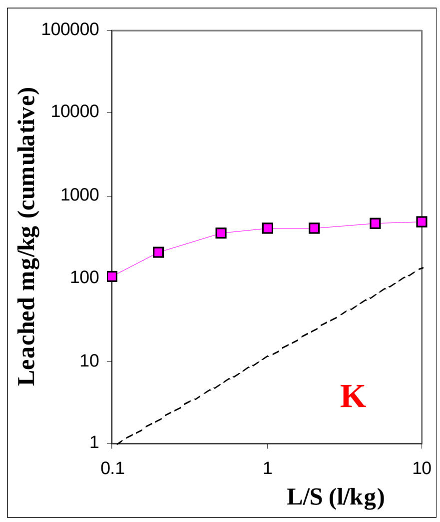


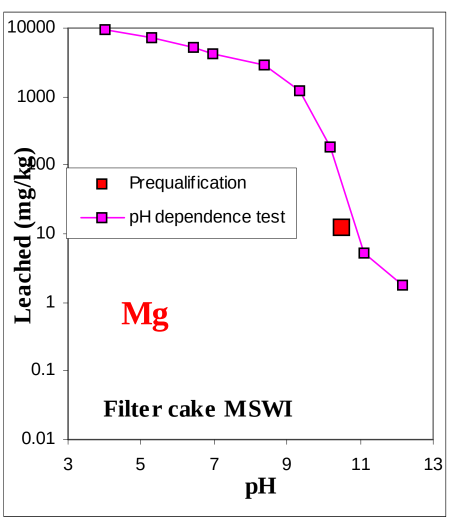
APPENDIX III PH DEPENDENCE AND PERCOLATION TEST DATA FOR FCM

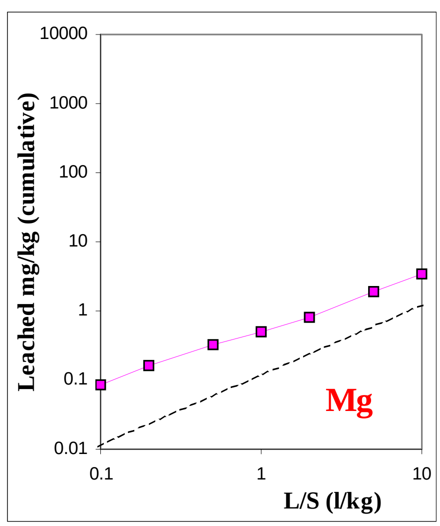


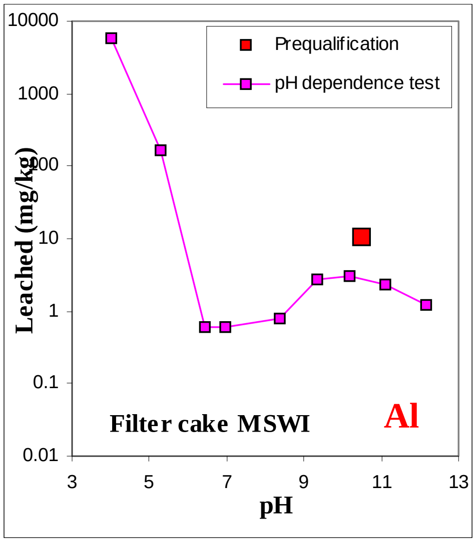


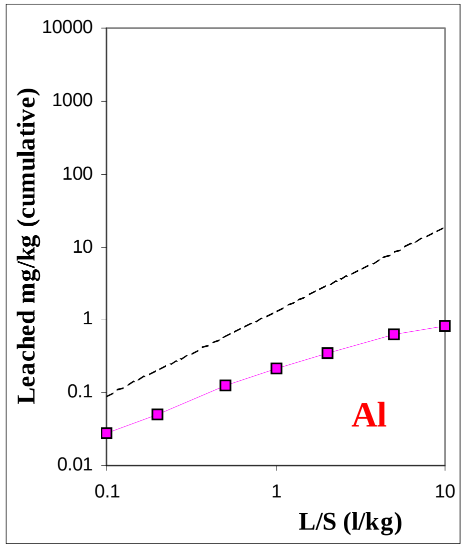


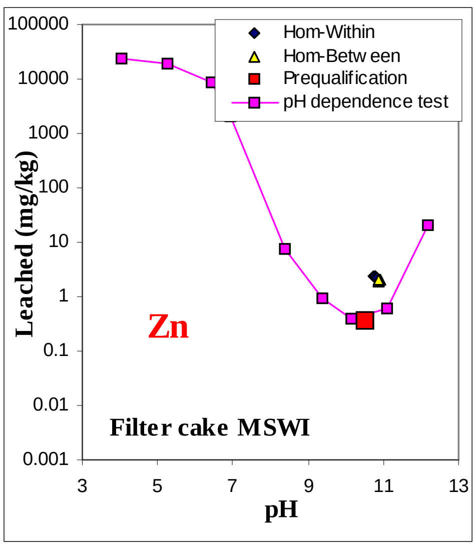


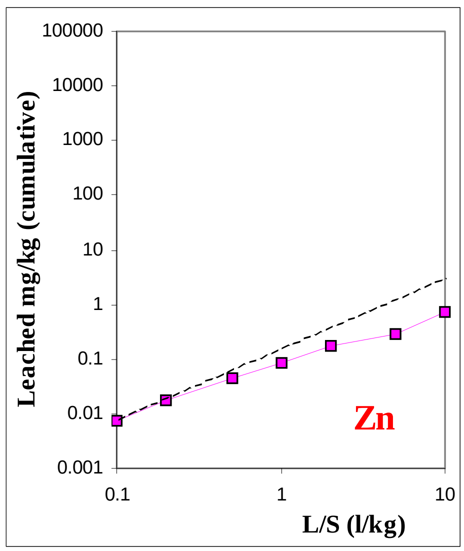


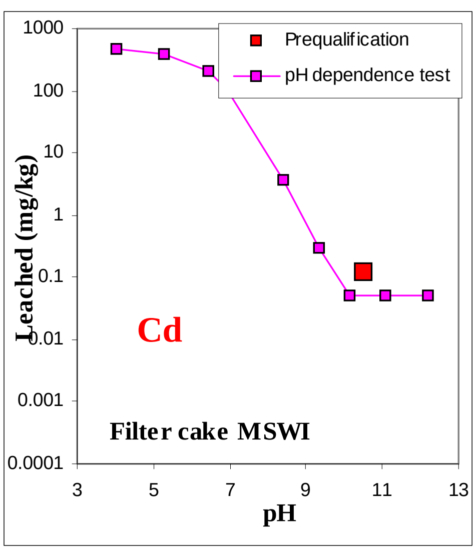


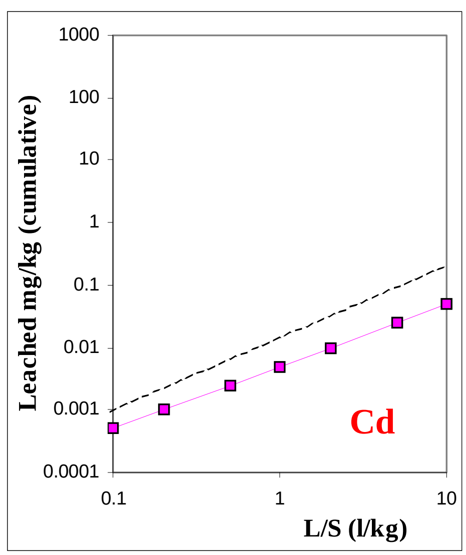

Prequalification
pH dependence test
Leached (mg/kg)
Filter cake MSWI
Al
pH
10000
1000
100
10
1
0.1
0.01
3
5
7
9
11
13

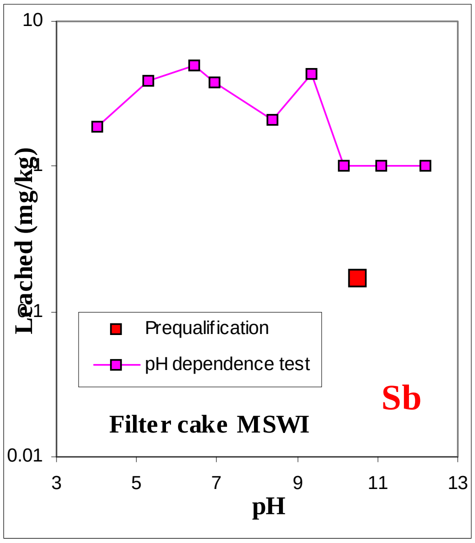

Leached mg/kg (cumulative)
Al
L/S (l/kg)
10000
1000
100
10
1
0.1
0.01
0.1
1
10

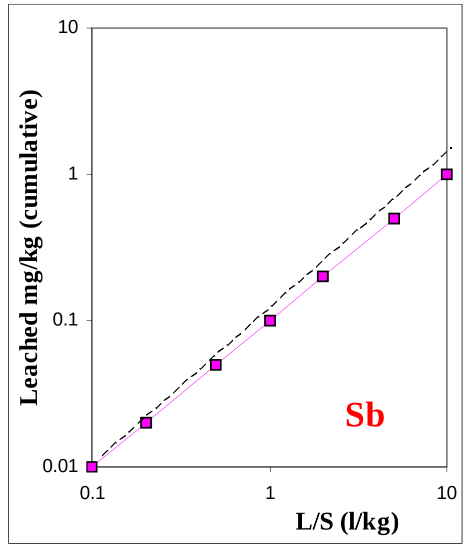

Hom-Within
Hom-Betw een
Prequalification
pH dependence test
Leached (mg/kg)
Zn
Filter cake MSWI
pH
100000
10000
1000
100
10
1
0.1
0.01
0.001
3
5
7
9
11
13

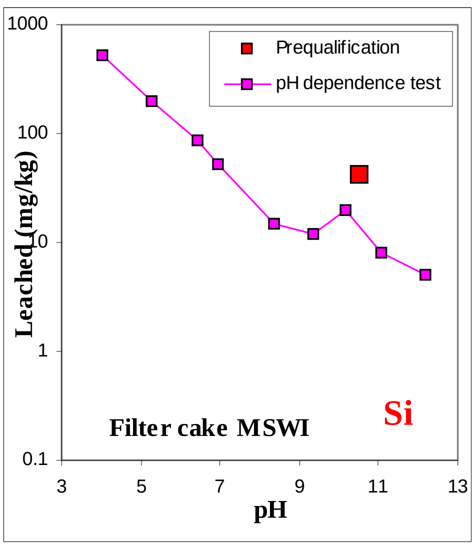

Leached mg/kg (cumulative)
Zn
L/S (l/kg)
100000
10000
1000
100
10
1
0.1
0.01
0.001
0.1
1
10

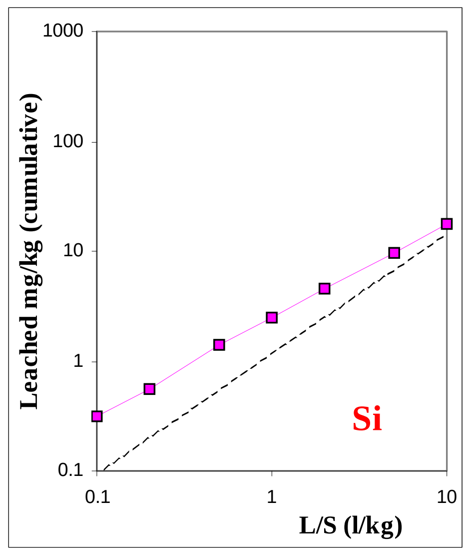

Prequalification
pH dependence test
Leached (mg/kg)
Cd
Filter cake MSWI
pH
1000
100
10
1
0.1
0.01
0.001
0.0001
3
5
7
9
11
13

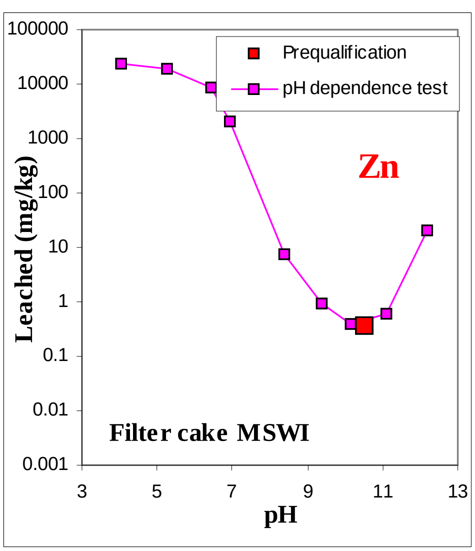

Leached mg/kg (cumulative)
Cd
L/S (l/kg)
1000
100
10
1
0.1
0.01
0.001
0.0001
0.1
1
10

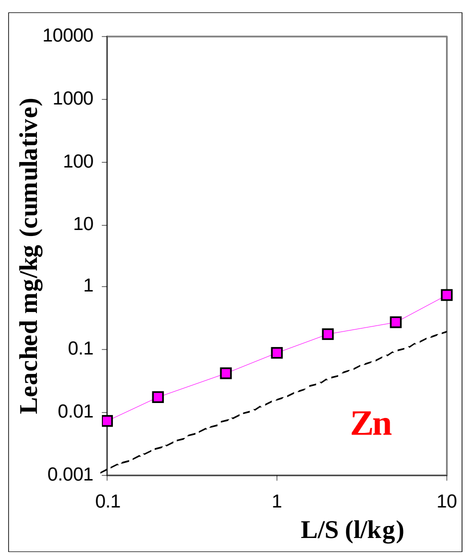

10
1
0.1
0.01
3
5
7
9
11
13
Leached (mg/kg)
pH
Prequalification
pH dependence test
Sb
Filter cake MSWI


10
1
0.1
0.01
0.1
1
10
Leached mg/kg (cumulative)
L/S (l/kg)
Sb

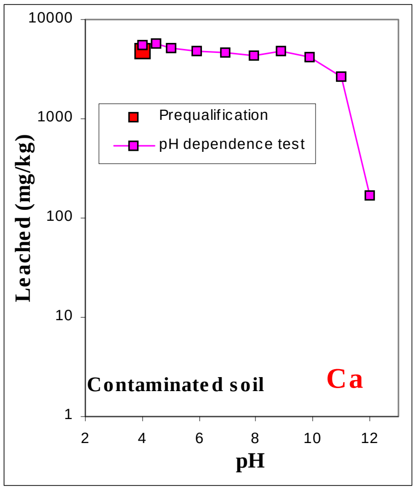

1000
100
10
1
0.1
3
5
7
9
11
13
Leached (mg/kg)
pH
Prequalification
pH dependence test
Si
Filter cake MSWI

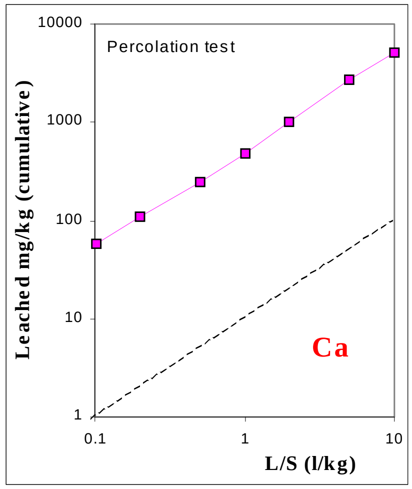

1000
100
10
1
0.1
0.1
1
10
Leached mg/kg (cumulative)
L/S (l/kg)
Si

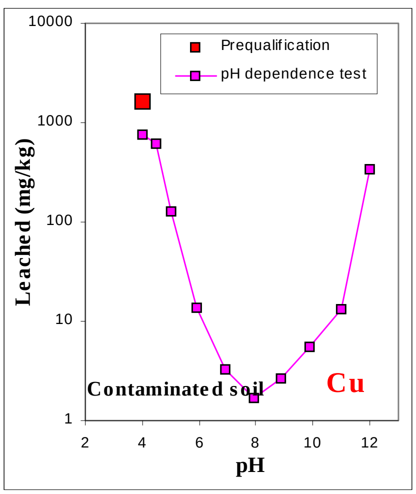

100000
10000
1000
100
10
1
0.1
0.01
0.001
3
5
7
9
11
13
Leached (mg/kg)
pH
Prequalification
pH dependence test
Zn
Filter cake MSWI

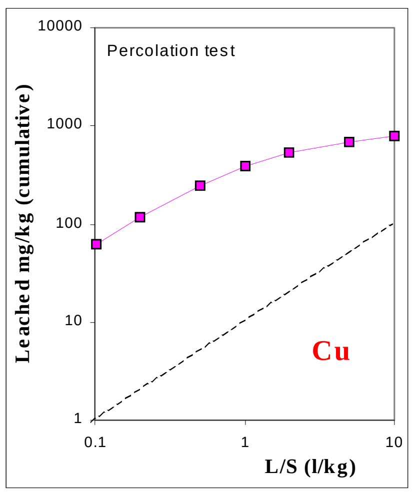

10000
1000
100
10
1
0.1
0.01
0.001
0.1
1
10
Leached mg/kg (cumulative)
L/S (l/kg)
Zn

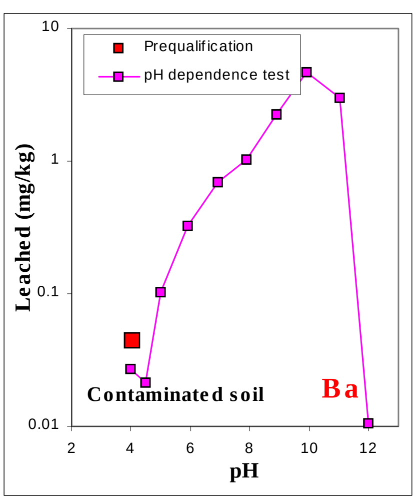
APPENDIX IV PH DEPENDENCE AND PERCOLATION TEST DATA FOR COS

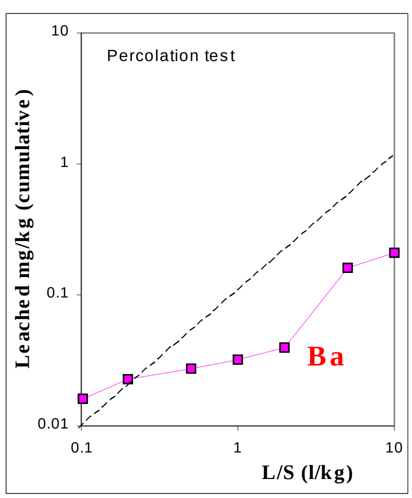




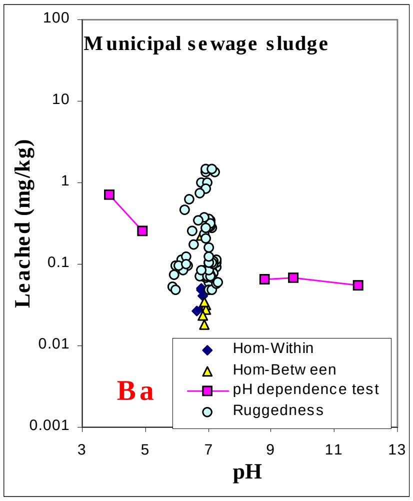


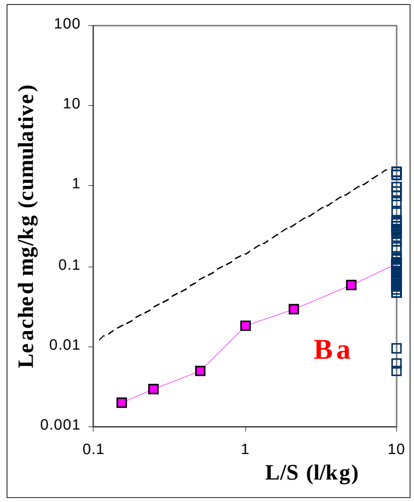


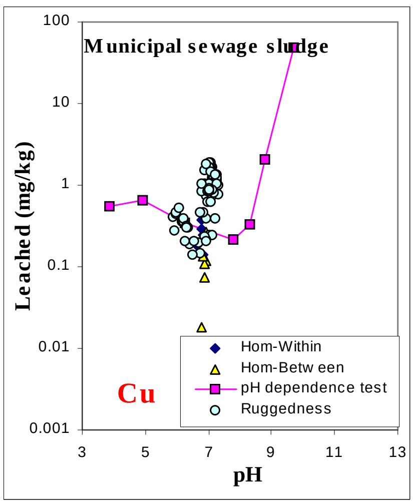


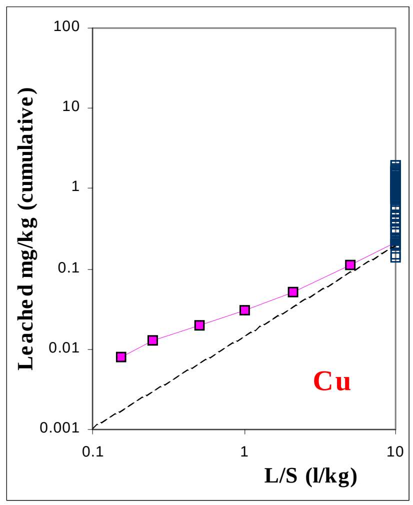


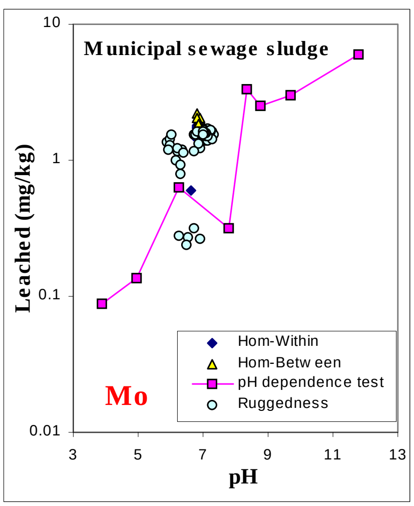
APPENDIX V PH DEPENDENCE AND PERCOLATION TEST DATA FOR SEW

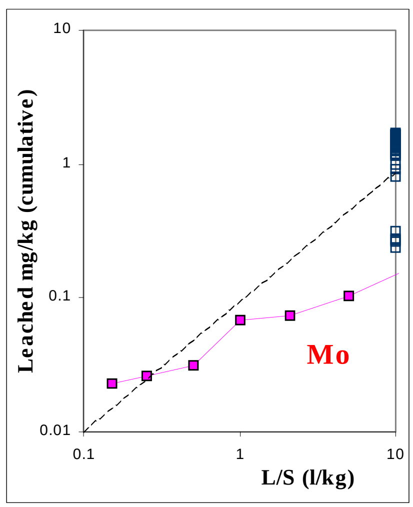




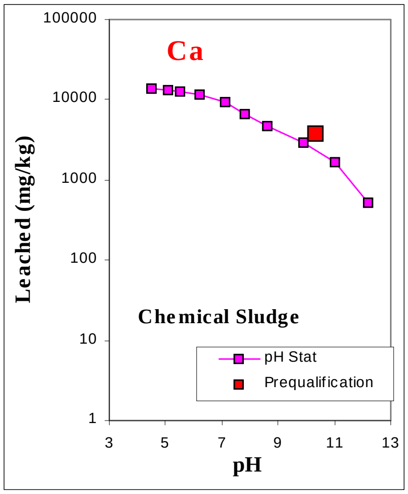


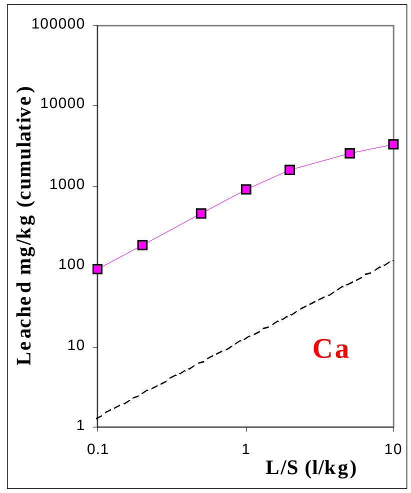


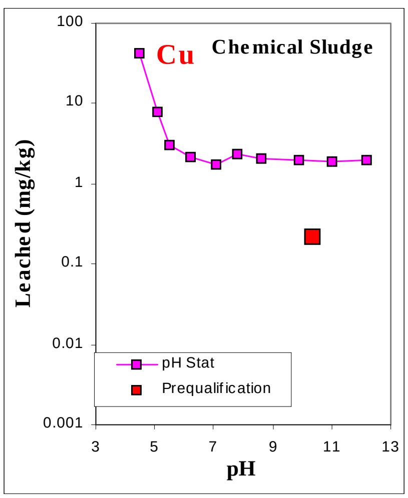


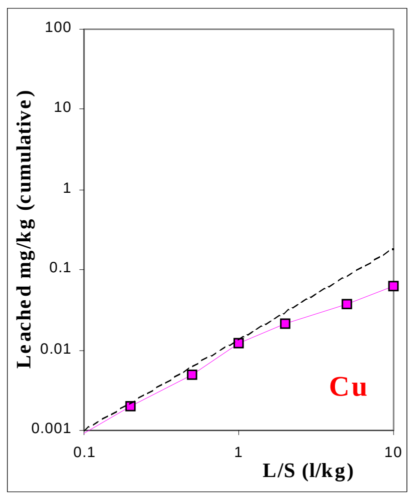


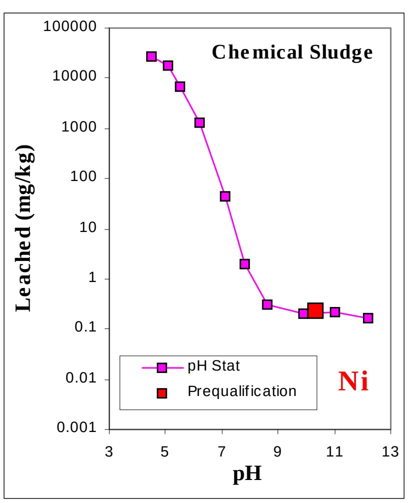
APPENDIX VI PH DEPENDENCE AND PERCOLATION TEST DATA FOR CHS

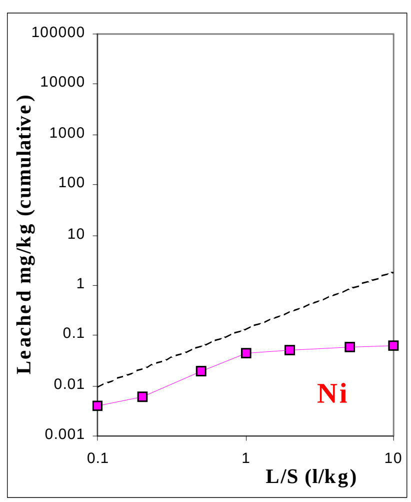




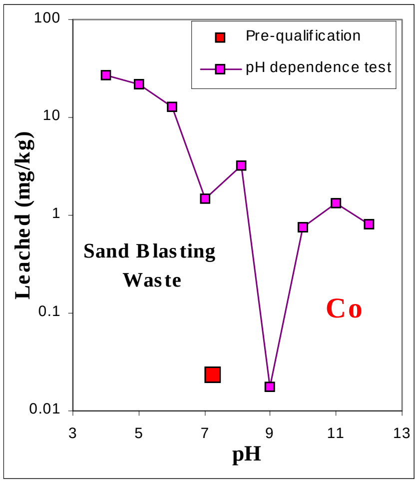


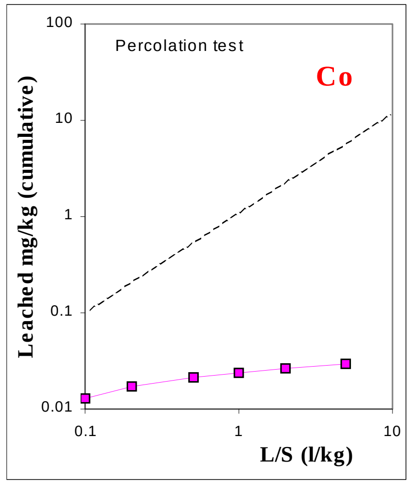


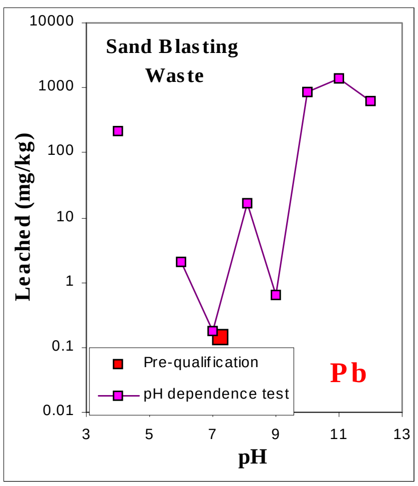


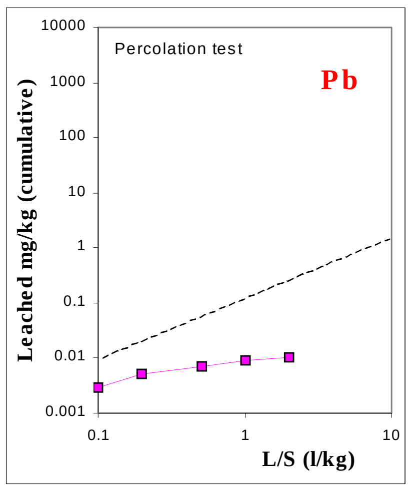


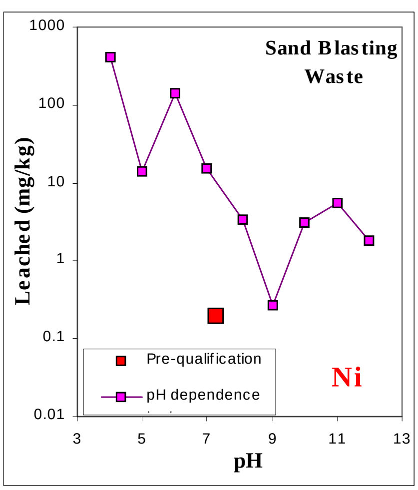
APPENDIX VII PH DEPENDENCE AND PERCOLATION TEST DATA FOR SBW

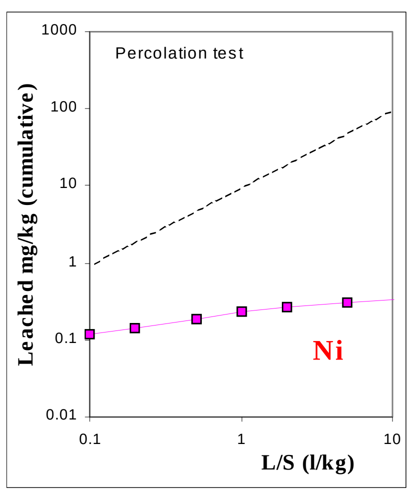












APPENDIX VIII TOTAL COMPOSITION DATA

Total composition (all data in mg/kg).

	MBA		CHS	SEW	MES	SBW		FCM	COS
	Average	Stdev				Average	Stdev		
Al	25792	2018		22500	3380	3386.00	61.07	77563	
As	13.8	1.7		15	400	54.02	1.53	42.4	
B	87.3	7.7						239	
Ba	683.5	59.3	244	230				831	
Ca	60795.3	3798.9	130325	32500	115000			190914	
Cd	4.4	1.2		1.7	16	39.44	1.04	491	
Co	22.1	8.5		8	887			11.7	
Cr	200.9	28.5		37	972	1116.00	20.74	469	
Cu	2153.0	691.0		350	7300	2776.00	94.50	1063	
Fe	101735	4777		39200	255000			11174	
K	3281.9	183.2	5544		2260			8837	
Li	12.7	0.6	17.1		22			27.9	
Mg	6504.8	357.2		6000	7540			19720	
Mn	799.9	26.9		540	3450			657	
Mo	5.3	2.9	7.4	11	179			23.4	
Na	8794.8	483.3	4581		11100			8691	
Ni	175.9	64.1		23	657	768	25.61	74.5	
P	2696.6	281.2						2887	
Pb	982.5	87.8	691.8	120	21500	3374	73.01	6154	
S	2935.3	328.8	20672	14900				9263	
Sb	27.9	2.3			510	153.58	4.91	1264	
Se	-4.9	0.3		< 10	156			10.2	
Si	14933.5	406.3	279981					2352	
Sn	138.8	24.9			8270			2176	
Sr	193.6	18.5	323.6		512			368	
Ti	2678.1	166.2							
V	23.8	3.1		20	57			24.8	
Zn	2275.4	792.5	1826	840	39100	9692	276	29438	
Hg						0.42	0.03		

APPENDIX IX COMPARISON FOR PH DEPENDENCE AND L/S = 10 DATA FROM THE PERCOLATION TEST

Ratio of pH stat data versus column data and EN data versus column test data for all materials studied*.

		Al	As	B	Ba	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni	Pb	S	Sb	Se	Si	Sn	SO4	Sr	V	Zn	TOC	Cl
COS	kol1 pH/Kol	0.73	0.80		7.94	0.74	1.19	1.08		1.20	1.53	0.07		1.00	1.05		0.71	1.11	0.78	0.92					0.92			1.22		
	kol2 pH/Kol	0.66	1.37		9.81	0.92	1.29	1.08		1.32	1.64	0.08		0.99	1.06			1.10	0.74	1.06					1.06			1.27		
	kol3 pH/Kol	0.74	0.72		0.12	1.05	0.96	1.22	0.58	0.86	0.40	10.71		1.15	1.17		1.21	1.13	1.38	0.98					1.09			1.04		
	kol4 pH/Kol	0.76	0.72		0.12	1.03	0.95	1.18	0.57	0.88	0.41	12.61		1.14	1.14		1.08	1.11	1.38	0.98					0.83			1.03		
	CEN/KOL		1.05				0.91	1.02										1.05	1.24											
SBW	kol1 pH/Kol		43.33		0.11	7.47		22.86			1.43	12.64		1.34	1.00		0.40	6.39	66.40	23.30					28.81					
	kol2 pH/Kol		101.74		0.10	8.55					0.43	12.05		1.25	1.46		0.35	11.13		27.81					41.14					
	kol3 pH/Kol		101.74		0.10	8.83					0.51	12.58		1.30	1.50		0.37	10.45		28.88					23.52					
	CEN/KOL				0.79					1.03						2.29												0.71		
CHS	kol1 pH/Kol	1.40		3.33	1.41	0.90			0.99			0.76	0.75	10.53		2.14	1.06						1.97			0.84				
	CEN/KOL								0.84																					
SEW	kol1 pH/Kol		1.00			1.01		0.96		0.96	0.11			0.60	0.52	1.51		1.37		1.58					4.75			1.49	0.77	
	CEN/KOL							1.20										1.38							0.45	check sulfate				
FCM	kol1 pH/Kol	2.83	1.00	25.94	1.22	1.18	1.00	1.00	1.26	0.98	0.74	1.46	1.21	1.52	1.00	1.45	1.48	1.00	1.00	0.96	1.00	0.94	0.45	1.00	1.01	1.01	1.00	0.82		
	CEN/KOL				0.88																									
MES	kol1 pH/Kol	0.84		0.80	0.74	0.69						18.46		0.79		1.36	26.46		3.00	4.56	1.10	1.41	1.39			0.79				
	kol2 pH/Kol	0.61		0.70	0.68	0.65						17.20		0.70		1.15	23.33		1.88	3.78	0.97	1.33	1.26			0.77				
	kol3 pH/Kol	0.50		1.29	0.50	0.80						15.98		0.63		1.76	31.45		0.38	3.20	1.67	1.21	0.55			0.82				
	CEN/KOL		0.52	0.73	0.87														13.84		0.97									
MBA	kol1 pH/Kol			1.63	0.78	2.01			3.07	0.88		0.91	0.56	13.57	2.00	1.27		0.93		3.75	2.41				1.25		2.13	1.82		
	kol2 pH/Kol			2.00	0.79	2.02			3.07	0.96	1.25	1.00	0.70	14.62		1.50		1.14		4.57	2.21			0.74	1.523		1.89	1.82		
	kol2 pH/Kol		0.39		0.78	1.59	2.01	0.00	8.27	1.19	0.40	0.95		1.96	3.73	1.30		1.10	0.36		2.16			1.84	1.399		1.03	2.04		1.08
	CEN/KOL				0.87					1.00						0.92					1.30				0.91					

EN12457 Part 2

Material **MBA**

	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %
pH	11.153	0.1	11.10	0.4
mS	1.457	0.3	1.37	1.6
Al	59.67	5.9	69.71	8.2
B	0.05	6.5	0.06	17.6
Ba	0.17	1.5	0.15	6.1
Ca	148.29	1.9	149.80	4.5
Cr	0.01	13.0	0.01	21.2
Cu	0.50	4.8	0.43	4.4
Fe	0.02	8.6	0.01	6.2
K	42.41	3.3	38.48	3.4
Li	0.018	2.8	0.017	7.4
Mg	0.058	20.7	0.035	9.8
Mn	0.001	22.0	0.001	20.8
Mo	0.045	5.2	0.039	6.8
Na	155.15	3.5	139.85	3.5
Ni	0.003	43.7	0.001	111.0
P	0.10	2.6	0.10	6.8
Pb	0.04	23.0	0.03	41.4
S	41.63	2.0	45.40	12.0
Sb	0.04	9.4	0.04	12.9
Sn	0.004	85.4	0.002	167.6
Sr	0.89	3.0	0.80	4.6
V	0.003	22.8	0.003	16.6
Zn	0.08	22.7	0.04	10.2

SEW

	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %
pH	6.862	0.5	6.808	0.2
mS	2.207	1.6	2.260	1.4
Al	0.076	6.2	0.092	16.6
As	0.193	7.2	0.196	7.1
B	0.654	3.8	0.648	1.6
Ba	0.006	91.6	0.005	22.5
Ca	76.914	2.5	77.014	1.8
Co	0.038	15.6	0.038	14.5
Cr	0.004	32.7	0.007	47.8
Cu	0.012	44.6	0.029	28.4
Fe	1.193	7.3	1.770	15.7
K	156.798	2.0	155.163	1.2
Li	0.008	8.7	0.008	14.2
Mg	42.278	2.5	42.025	1.8
Mn	0.154	5.7	0.098	8.0
Mo	0.201	4.1	0.171	5.8
Na	93.382	4.4	92.024	1.1
Ni	0.218	0.7	0.222	4.0
P	37.031	1.6	36.386	2.1
S	104.870	8.2	198.573	15.4
Se	0.023	41.1	0.036	42.8
Si	30.113	0.8	27.969	1.3
Sn	0.029	95.9	0.037	43.4
Sr	0.194	4.3	0.194	2.4
Ti	0.002	59.6	0.003	36.8
V	0.019	5.9	0.018	9.8
Zn	0.056	19.8	0.142	33.1

EN12457 Part 2

MES

	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %	Average mg/liter within bottle	Var %
pH	9.65	0.5	9.70	0.4	9.68	0.9
mS	0.09	4.7	0.10	3.4	0.09	3.1
Sb	68.33	5.1	95.20	8.3	107.25	4.4
Pb	14.63	26.9	71.50	109.1	26.50	39.6
As	0.72	23.0	1.84	39.8	1.04	100.0
Ba	504.17	5.1	576.60	20.3	527.83	15.8
B	188.50	9.0	236.20	17.2	220.83	5.5
Ca	5451.67	5.9	6454.00	5.7	5825.00	7.8
Co	5.30	2.5	7.00	28.6	7.47	20.2
K	241.00	12.4	294.60	16.6	249.67	8.9
Pb	31.67	28.1	143.00	109.1	53.00	39.6
Mg	394.50	9.1	329.60	7.8	319.17	5.8
Mn	7.92	18.8	13.50	3.7	10.90	33.0
Na	10381.67	4.7	11000.00	5.8	10528.33	5.4
Ni	21.83	7.1	15.54	38.4	20.58	34.4
Sr	55.50	5.7	71.60	7.9	63.50	8.1
Zn	13.20	13.9	81.00	75.3	20.25	11.1

FCM

	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %
pH	10.78	0.2	10.89	0.1
mS	3.10	1.6	3.17	0.4
Cr	1.03	1.7	1.10	0.9
Mo	0.44	1.6	0.45	0.8
Zn	0.23	3.1	0.20	3.5
Cl-	282.50	0.9	286.83	0.4
SO4--	1504.50	0.3	1502.50	0.8

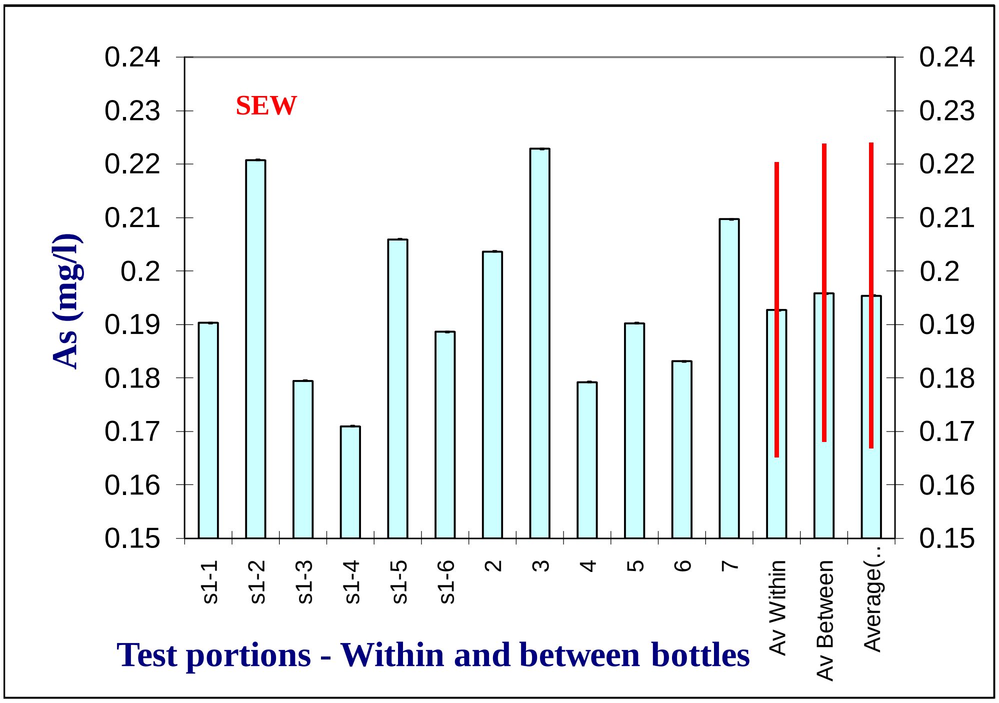
EN12457 Part 2

COS

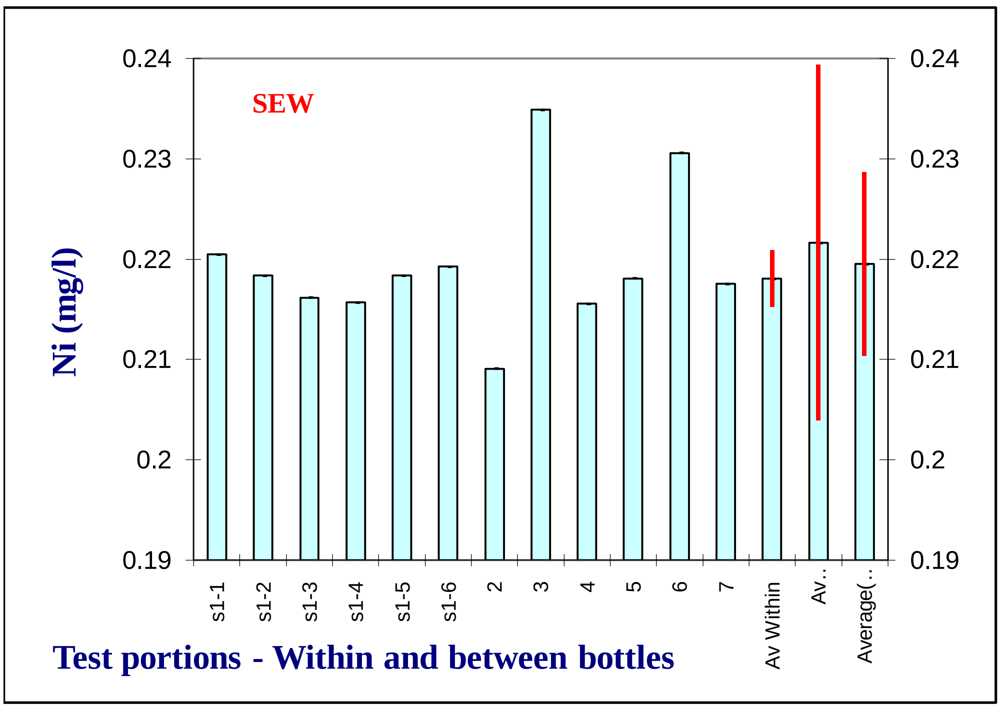
	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %
pH	3.76	5.4	3.61	7.2
mS	6.85	2.2	6.74	2.3
As [mg/l]	0.18	4.8	0.19	5.6
Sb [mg/l]	0.24	9.0	0.23	3.0
Pb [mg/l]	2.51	3.0	2.43	1.5
Cd [mg/l]	1.47	2.4	1.48	1.5
Co [mg/l]	0.33	2.5	0.32	2.1

CHS

	Average mg/liter within bottle	Var %	Average mg/liter between bottles	Var %
pH	10.5	0.6	10.1	0.8
mS	39.4	0.3	39.5	0.7
Cd	0.2	5.7	0.2	2.8
Cr	533.3	1.1	526.2	0.8
CrVI	571.0	3.9	542.5	5.0
Mo	137.3	0.6	91.0	1.2
Fe	0.3	46.7	0.3	0.0
Na	11333.3	1.0	11533.3	0.7
Cl	594.0	1.0	564.5	2.6
SO4	116.0	2.3	120.8	2.9
F	1.5	2.9	1.3	1.4

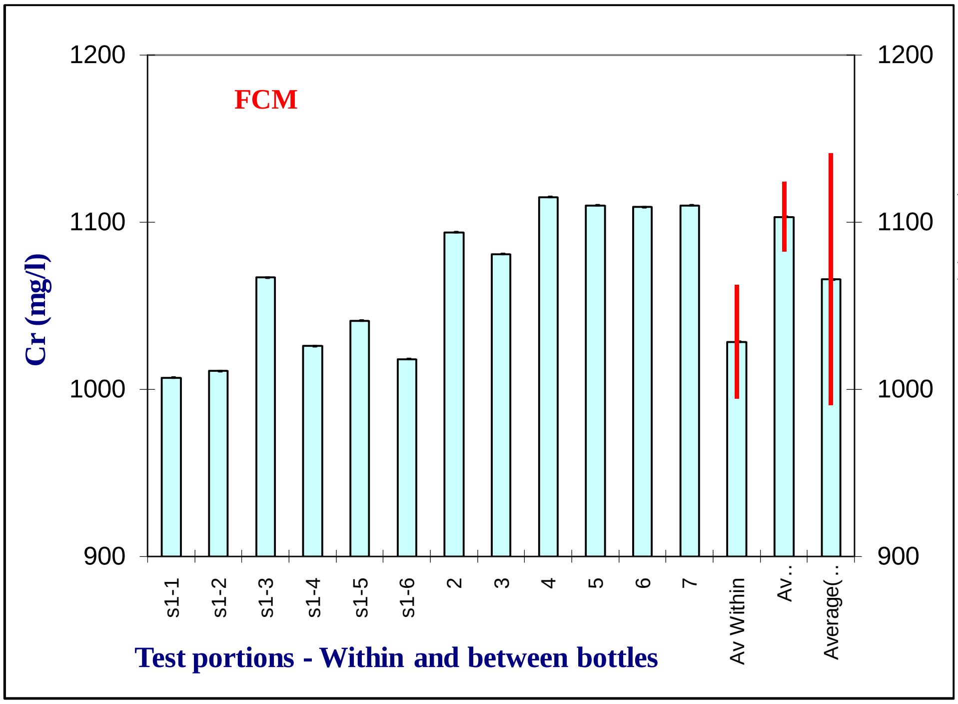


Within
7.16%
Between
7.12%
Overall
6.10%

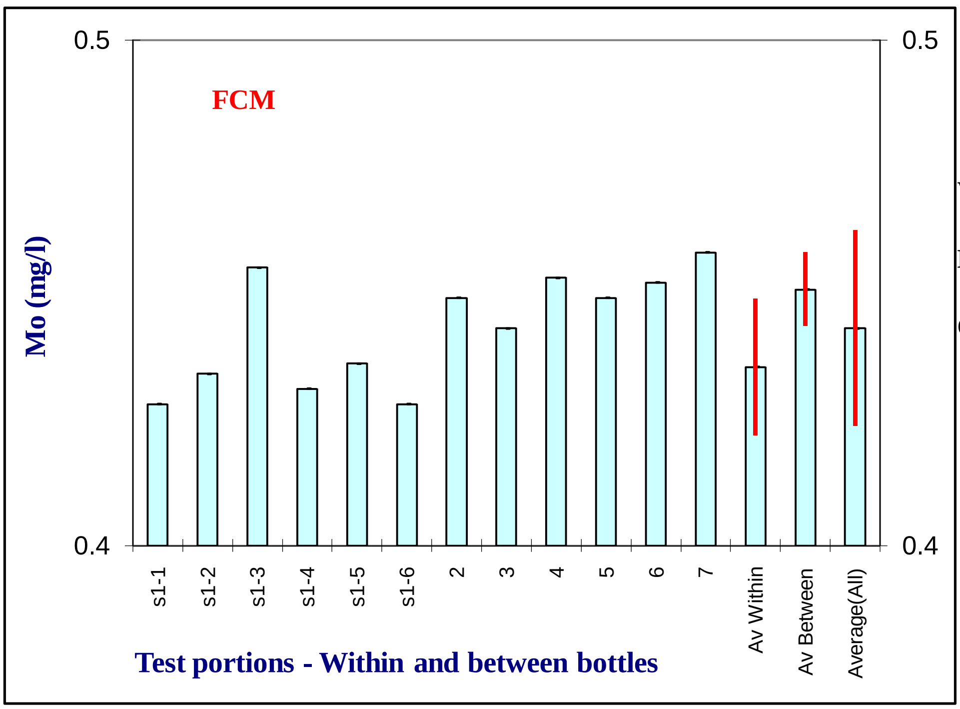


Within
0.65%
Between
4.05%
Overall
3.52%

HOMOGENEITY TEST ON SEWAGE SLUDGE

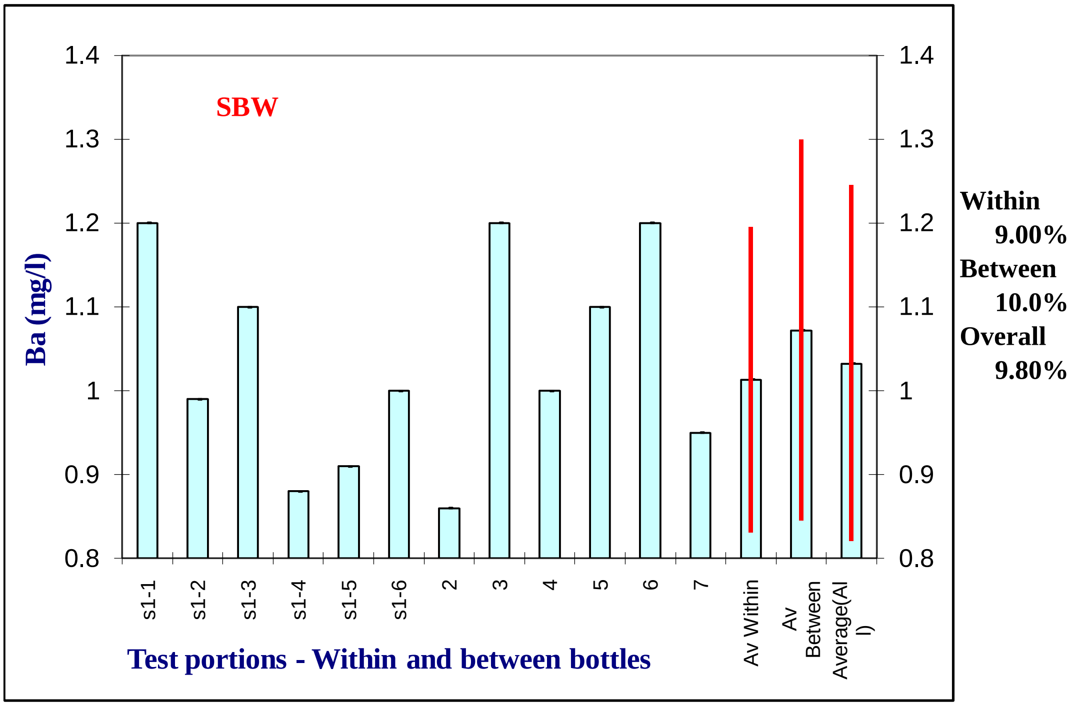


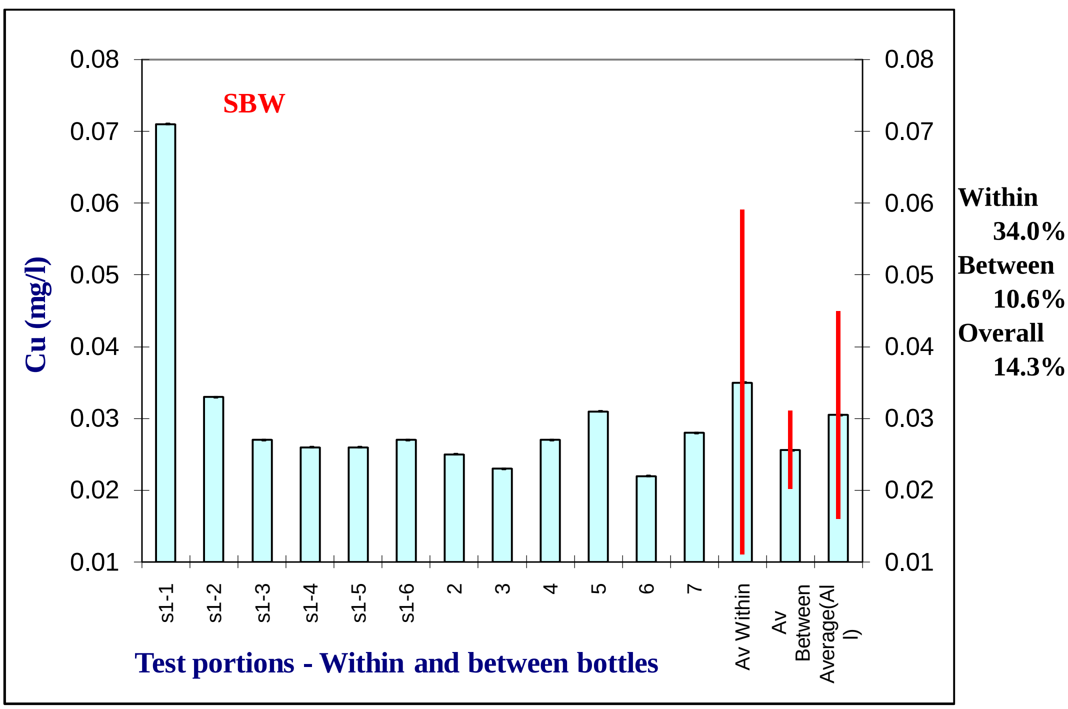
Within 1.66%
Between 0.96%
Overall 2.10%



Within 1.56%
Between 0.81%
Overall 1.21%

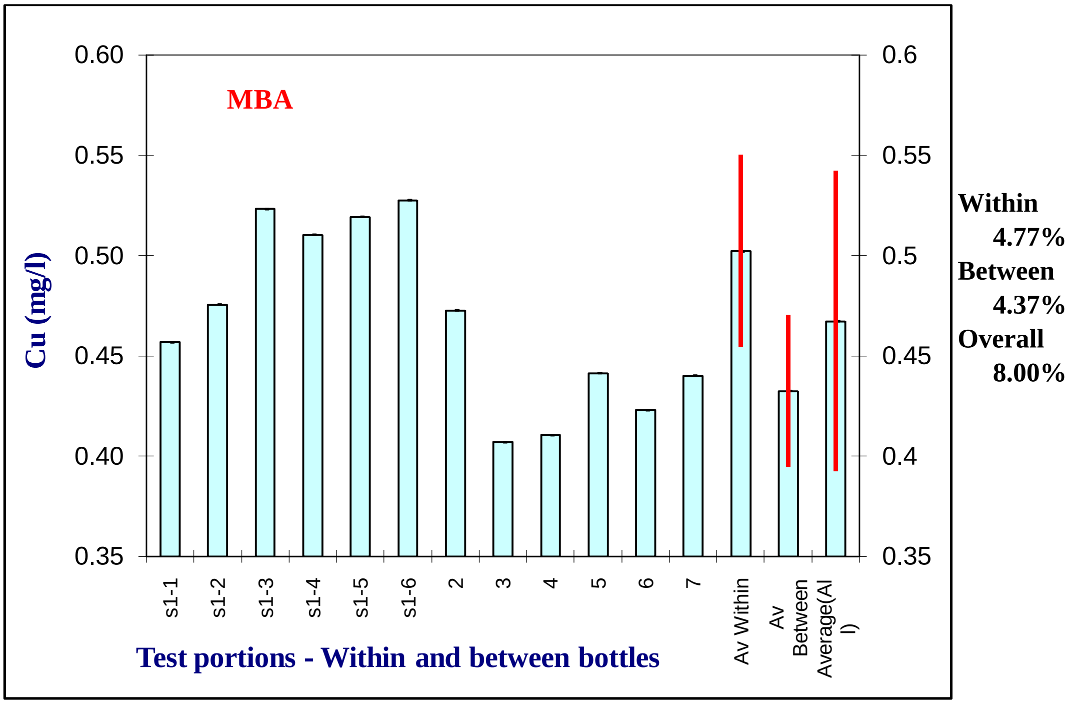
HOMOGENEITY TEST ON FILTER CAKE

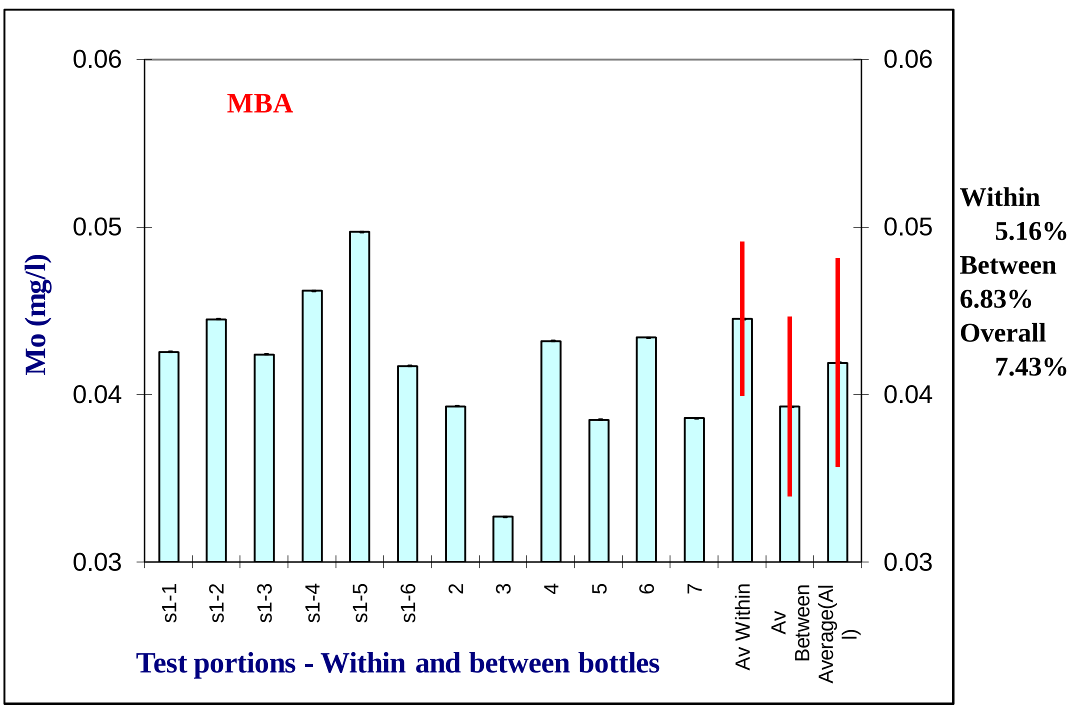




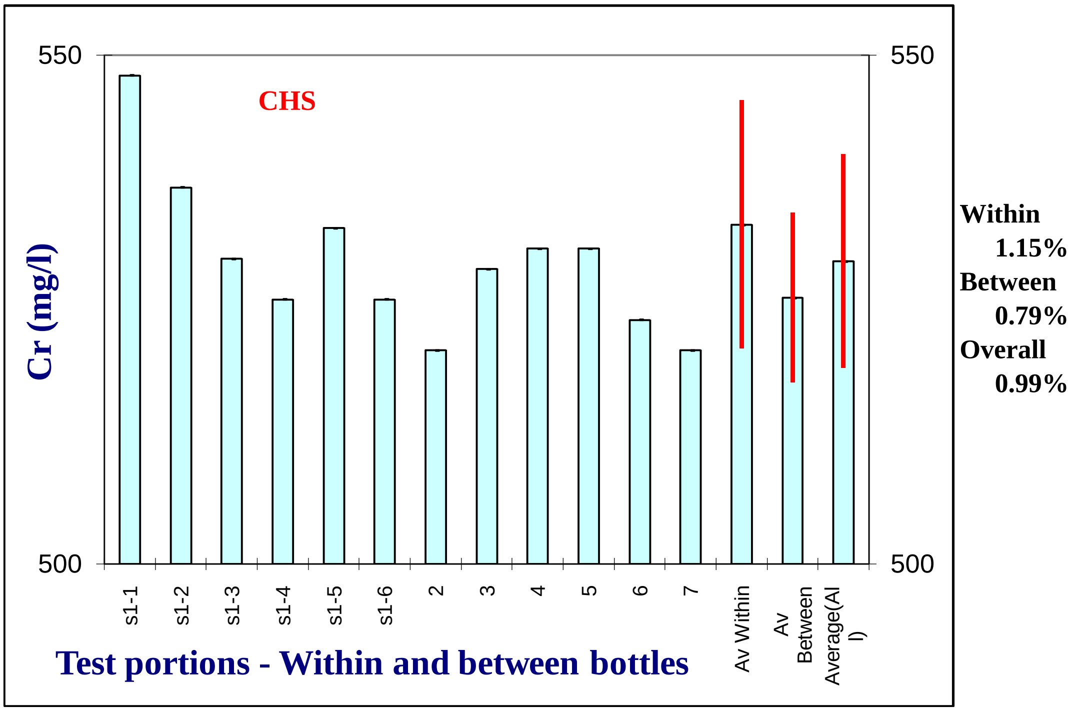
HOMOGENEITY TEST ON SAND BLASTING MATERIAL

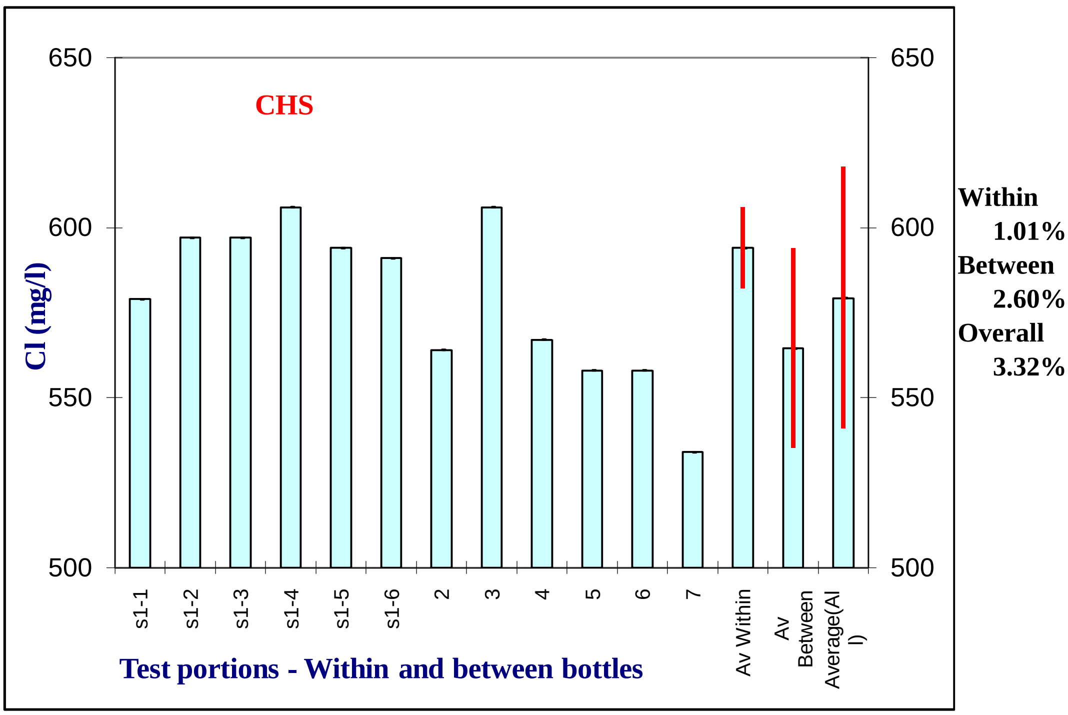
Average	**0.035**	**0.028**
STD	**0.012**	**0.002**
%	**34.3**	**7.5**



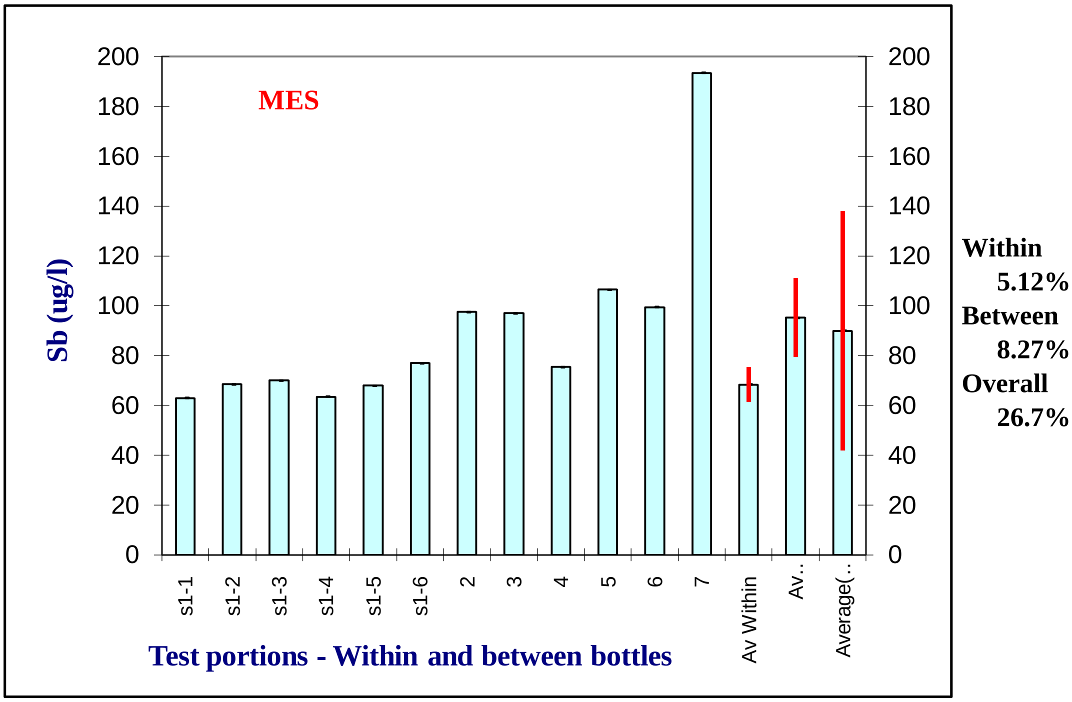


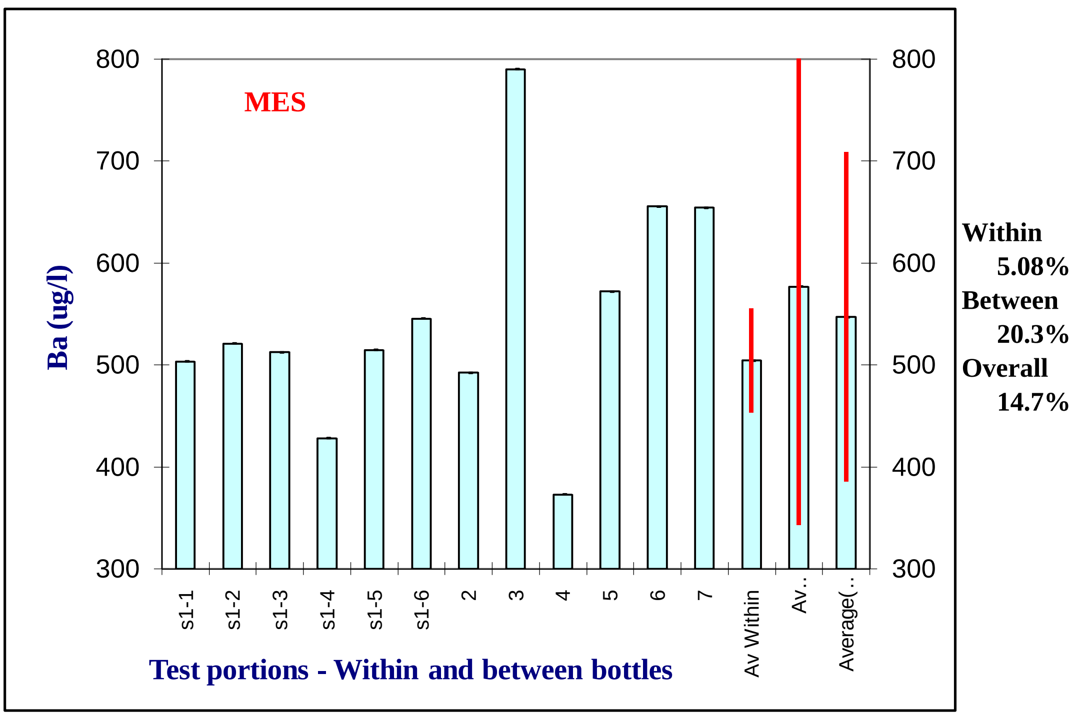
HOMOGENEITY TEST ON MUNICIPAL SOLID WASTE INCINERATOR ASH



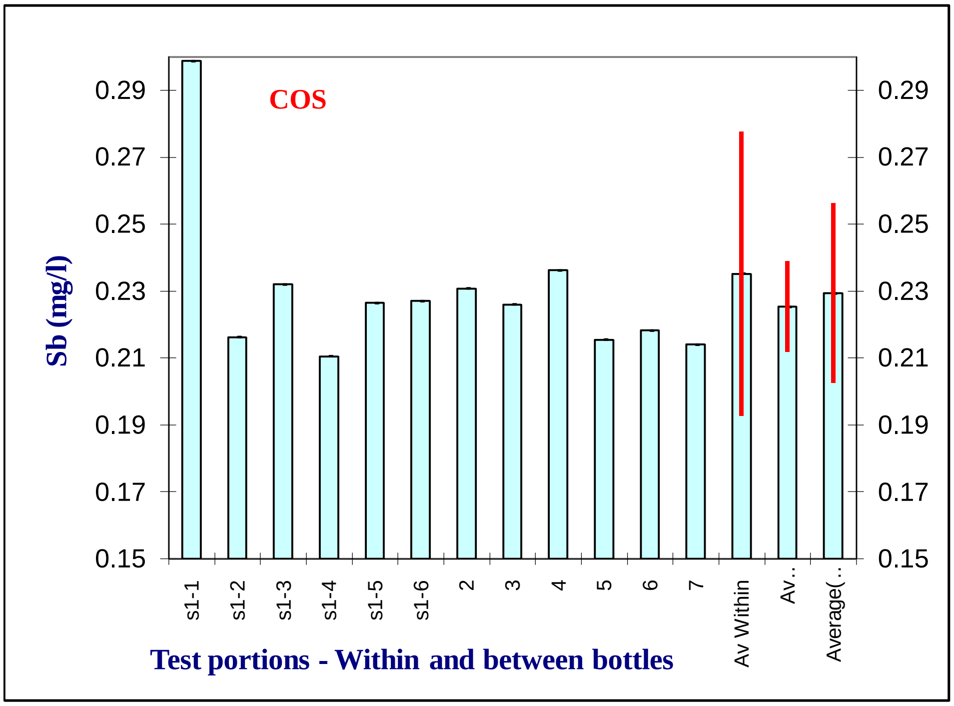


HOMOGENEITY TEST ON CHEMICAL SLUDGE

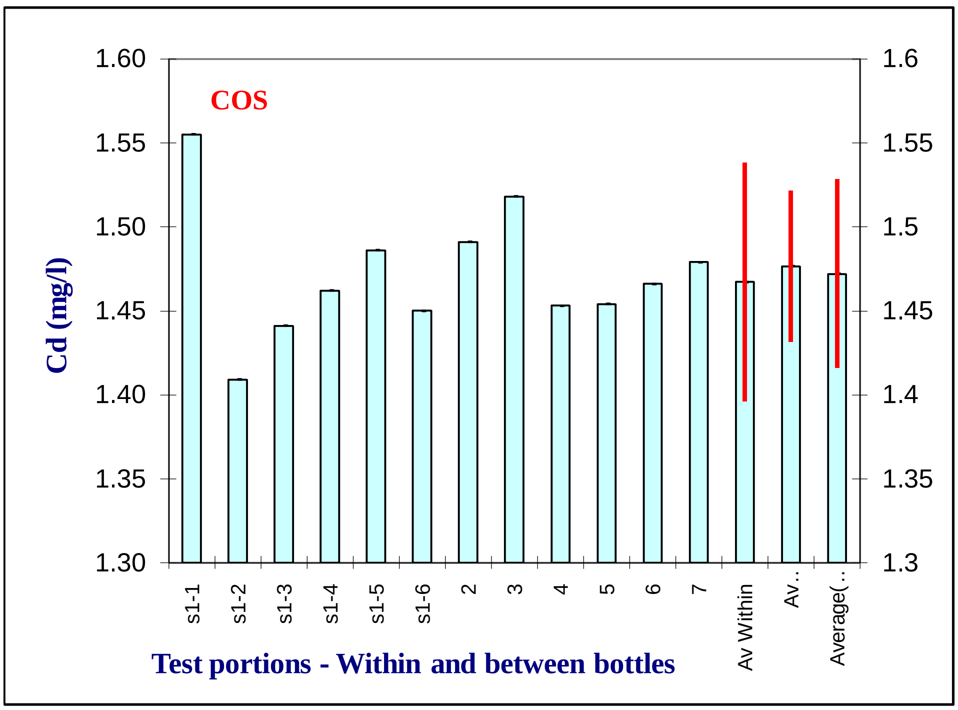




HOMOGENEITY TEST ON METALUGICAL SLAG

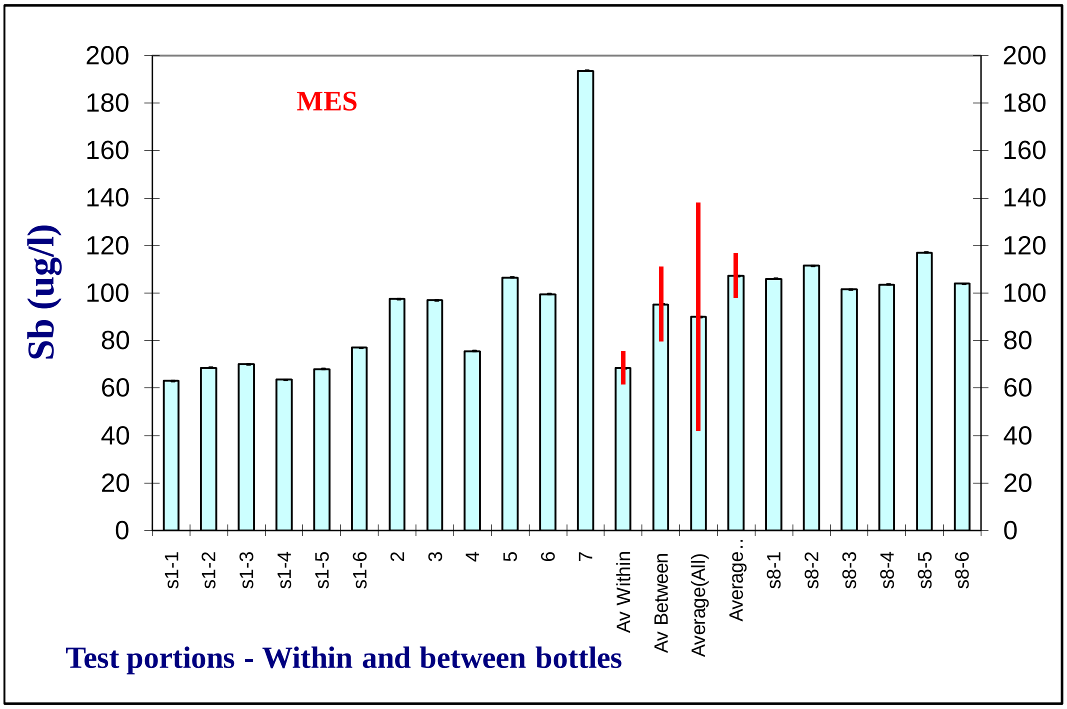


Within
9.01%
Between
3.01%
Overall
5.85%

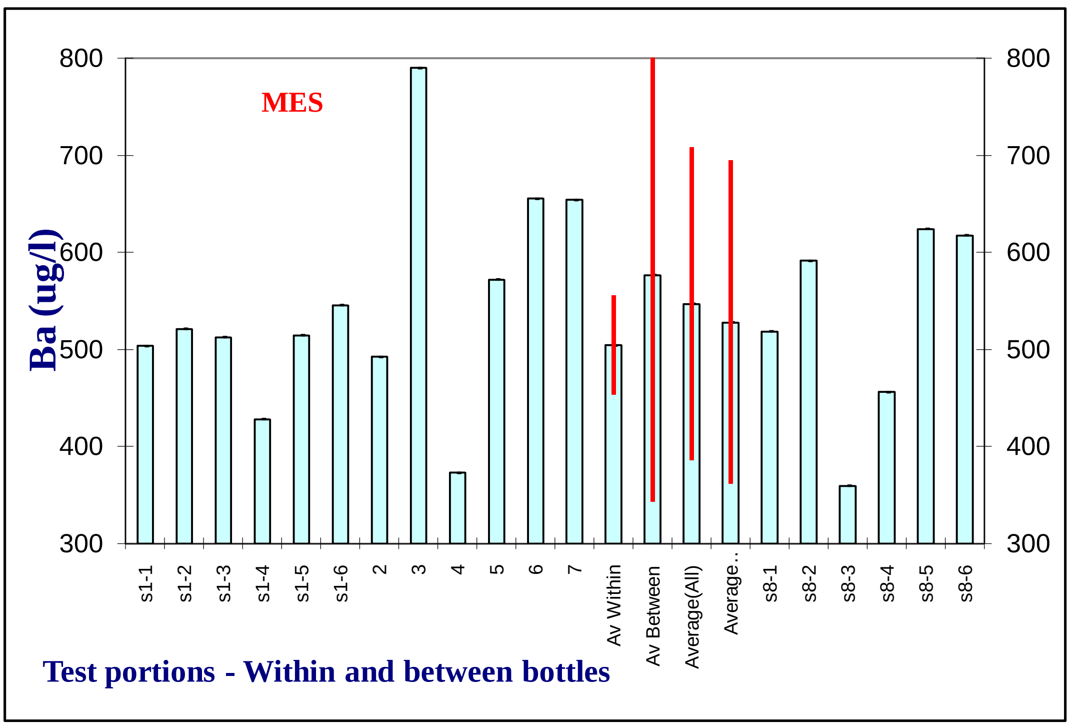


Within
2.42%
Between
1.52%
Overall
1.91%

HOMOGENEITY TEST ON CONTAMINATED SOIL



Sb (ug/l)
MES
0
20
40
60
80
100
120
140
160
180
200
s1-1
s1-2
s1-3
s1-4
s1-5
s1-6
2
3
4
5
6
7
Av Within
Av Between
Average(All)
Average..
s8-1
s8-2
s8-3
s8-4
s8-5
s8-6
Test portions - Within and between bottles



Ba (ug/l)
MES
300
400
500
600
700
800
s1-1
s1-2
s1-3
s1-4
s1-5
s1-6
2
3
4
5
6
7
Av Within
Av Between
Average(All)
Average..
s8-1
s8-2
s8-3
s8-4
s8-5
s8-6
Test portions - Within and between bottles

	As SEW					Cr FC	
s1-1	0.19025			0.19025		1007	
s1-2	0.2207			0.2207		1011	
s1-3	0.1794			0.1794		1067	
s1-4	0.1709			0.1709		1026	
s1-5	0.2059			0.2059		1041	
s1-6	0.1886			0.1886		1018	
2	0.2036			0.2036		1094	
3	0.2228			0.2228		1081	
4	0.1792			0.1792		1115	
5	0.1902			0.1902		1110	
6	0.1831			0.1831		1109	
7	0.20965			0.20965		1110	
Av Within	0.192625	0.220192	0.165058	0.192625	0.013783	1028.333	1062.556
Av Between	0.19578	0.223652	0.167908	0.19578	0.013936	1103.167	1124.056
Average(All)	0.195358	0.223978	0.166739	0.195358	0.01431	1065.75	1141
Average Within 2							
s8-1							
s8-2							
s8-3							
s8-4							
s8-5							
s8-6							

				Ni SEW			
	1007		s1-1	0.2205			0.2205
	1011		s1-2	0.2184			0.2184
	1067		s1-3	0.2162			0.2162
	1026		s1-4	0.2157			0.2157
	1041		s1-5	0.2184			0.2184
	1018		s1-6	0.2193			0.2193
	1094		2	0.2091			0.2091
	1081		3	0.2349			0.2349
	1115		4	0.2156			0.2156
	1110		5	0.2181			0.2181
	1109		6	0.2306			0.2306
	1110		7	0.21755			0.21755
994.1111	1028.333	17.11111	Av Within	0.218083	0.220928	0.215239	0.218083
1082.278	1103.167	10.44444	Av Betwe	0.22166	0.239404	0.203916	0.22166
990.5	1065.75	37.625	Average(A	0.219529	0.228667	0.210392	0.219529

	N	**6**	**5**			
		Mo FCM				
	s1-1	0.428			0.428	
	s1-2	0.434			0.434	
	s1-3	0.455			0.455	
	s1-4	0.431			0.431	
	s1-5	0.436			0.436	
	s1-6	0.428			0.428	
	2	0.449			0.449	
	3	0.443			0.443	
	4	0.453			0.453	
	5	0.449			0.449	
	6	0.452			0.452	
	7	0.458			0.458	
0.001422	Av Within	0.435333	0.448889	0.421778	0.435333	0.006778
0.008872	Av Betwee	0.450667	0.458	0.443333	0.450667	0.003667
0.004569	Average(A	0.443	0.462333	0.423667	0.443	0.009667

	Ba SBW				
s1-1	1.2			1.2	
s1-2	0.99			0.99	
s1-3	1.1			1.1	
s1-4	0.88			0.88	
s1-5	0.91			0.91	
s1-6	1			1	
2	0.86			0.86	
3	1.2			1.2	
4	1			1	
5	1.1			1.1	
6	1.2			1.2	
7	0.95			0.95	
Av Within	1.013333	1.195556	0.831111	1.013333	0.091111
Av Betwe	1.072	1.2992	0.8448	1.072	0.1136
Average(A	1.0325	1.245	0.82	1.0325	0.10625

	Cu SBW
s1-1	0.071
s1-2	0.033
s1-3	0.027
s1-4	0.026
s1-5	0.026
s1-6	0.027
2	0.025
3	0.023
4	0.027
5	0.031
6	0.022
7	0.028
Av Within	0.035
Av Betwe	0.0256
Average(A	0.0305

					Cr CHS		
		0.071		s1-1	548.00		
		0.033		s1-2	537.00		
		0.027		s1-3	530.00		
		0.026		s1-4	526.00		
		0.026		s1-5	533.00		
		0.027		s1-6	526.00		
		0.025		2	521.00		
		0.023		3	529.00		
		0.027		4	531.00		
		0.031		5	531.00		
		0.022		6	524.00		
		0.028		7	521.00		
0.059	0.011	0.035	0.012	Av Within	533.33	545.5556	521.1111
0.03104	0.02016	0.0256	0.00272	Av Betwee	526.17	534.5	517.8333
0.045	0.016	0.0305	0.00725	Average(A	529.75	540.25	519.25

		Cl CHS					
548		579.00			579		s1-1
537		597.00			597		s1-2
530		597.00			597		s1-3
526		606.00			606		s1-4
533		594.00			594		s1-5
526		591.00			591		s1-6
521		564.00			564		2
529		606.00			606		3
531		567.00			567		4
531		558.00			558		5
524		558.00			558		6
521		534.00			534		7
533.3333	6.11	594.00	606	582	594	6.00	Av Within
526.1667	4.17	564.50	593.8333	535.1667	564.5	14.67	Av Betwee
529.75	5.25	579.25	617.75	540.75	579.25	19.25	Average(A

Cu MBA							Mo MBA	
0.46			0.45685		0.04	s1-1	0.04	
0.48			0.4756			s1-2	0.04	
0.52			0.5233			s1-3	0.04	
0.51			0.5103			s1-4	0.05	
0.52			0.5193			s1-5	0.05	
0.53			0.5276			s1-6	0.04	
0.47			0.4727			2	0.04	
0.41			0.407			3	0.03	
0.41			0.4106			4	0.04	
0.44			0.4413			5	0.04	
0.42			0.423			6	0.04	
0.44			0.4401			7	0.04	
0.50	0.550069	0.454247	0.502158	0.02		Av Within	0.04	0.049097
0.43	0.470283	0.394617	0.43245	0.02		Av Betwee	0.04	0.04465
0.47	0.542296	0.392313	0.467304	0.04		Average(A	0.04	0.048122

				SB COS			
	0.04255		s1-1	0.30			0.29875
	0.0445		s1-2	0.22			0.21625
	0.0424		s1-3	0.23			0.232
	0.0462		s1-4	0.21			0.2105
	0.0497		s1-5	0.23			0.2265
	0.0417		s1-6	0.23			0.227
	0.0393		2	0.23			0.23075
	0.0327		3	0.23			0.226
	0.0432		4	0.24			0.23625
	0.0385		5	0.22			0.2155
	0.0434		6	0.22			0.21825
	0.0386		7	0.21			0.214
0.039919	0.044508	0.002	Av Within	0.24	0.277556	0.192778	0.235167
0.033917	0.039283	0.003	Av Betwee	0.23	0.23891	0.21179	0.22535
0.035669	0.041896	0.003	Average(A	0.23	0.256146	0.202479	0.229313

		Cd COS					
	0.00 s1-1	1.56			1.555		
	s1-2	1.41			1.409		
	s1-3	1.44			1.441		
	s1-4	1.46			1.462		
	s1-5	1.49			1.486		
	s1-6	1.45			1.45		
	2	1.49			1.491		
	3	1.52			1.518		
	4	1.45			1.453		
	5	1.45			1.454		
	6	1.47			1.466		
	7	1.48			1.479		
0.021	Av Within	1.47	1.538278	1.396056	1.467167	0.036	
0.007	Av Betwee	1.48	1.52136	1.43144	1.4764	0.022	
0.013	Average(A	1.47	1.528333	1.415667	1.472	0.028	

	SB MES						Ba MES
s1-1	63.00			63		s1-1	503.50
s1-2	68.50			68.5		s1-2	521.00
s1-3	70.00			70		s1-3	512.50
s1-4	63.50			63.5		s1-4	428.00
s1-5	68.00			68		s1-5	514.50
s1-6	77.00			77		s1-6	545.50
2	97.50			97.5		2	492.50
3	97.00			97		3	790.00
4	75.50			75.5		4	373.00
5	106.50			106.5		5	572.00
6	99.50			99.5		6	655.50
7	193.50			193.5		7	654.00
Av Within	68.33	75.33333	61.33333	68.33333	3.500	Av Within	504.17
Av Betwee	95.20	110.96	79.44	95.2	7.880	Av Betwee	576.60
Average(A	89.96	138.0278	41.88889	89.95833	24.035	Average(A	546.83
	107.25	116.5833	97.91667	107.25	4.666667		527.8333
	106			106			518.5
	111.5			111.5			591.5
	101.5			101.5			359.5
	103.5			103.5			456
	117			117			624
	104			104			617.5

		503.5	
		521	
		512.5	
		428	
		514.5	
		545.5	
		492.5	
		790	
		373	
		572	
		655.5	
		654	
555.3889	452.9444	504.1667	25.611
810.44	342.76	576.6	116.920
708.2222	385.4444	546.8333	80.694
694.1667	361.5	527.8333	83.16667
		518.5	
		591.5	
		359.5	
		456	
		624	
		617.5	

December 2001 ECN-C--01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS EN 12457 PART 1-4, EN 13370 AND EN 12506 IN CO-OPERATION WITH CEN/TC 308

Part 3. Sub-sampling of wastes

With contributions from
WRc (UK)
ECN (NL)

CONTENTS

1. INTRODUCTION

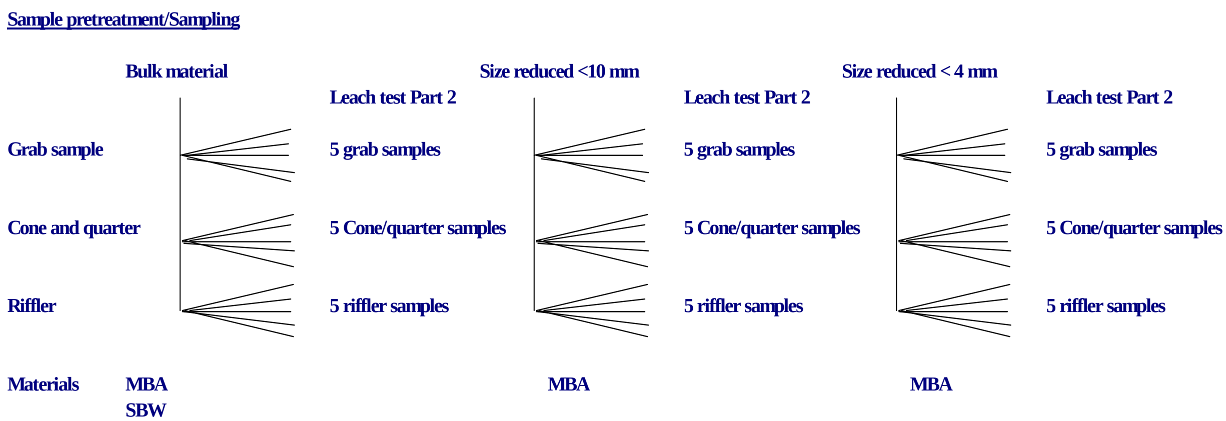
In the preparation of laboratory samples for testing a sub-sampling [1] is generally required. For an overall assessment of uncertainty it is therefor important to be able to separate contributions to the overall error of a leachability measurement. The standard deviation resulting from three commonly applied sub-sampling methods is aimed for in this part of the ruggedness testing.

2. MATERIALS AND METHODS

The materials evaluated in this part of the ruggedness testing were the sand blasting waste (SBW) and the municipal solid waste incinerator bottom ash (MBA). Originally contaminated soil was selected for the sub-sampling, but due to too homogeneous nature of the contaminated soil it was not considered useful to analyse this material.

The methods used for the sub-sampling were:
- grab sampling
- cone and quartering
- riffler sampling

The testing program is given below:



The SBW sample is already relatively fine (95% < 4 mm), which implies that only one size fraction could be tested with the three sub-sampling methods.
From a bulk sample (x kg) of SBW 5 laboratory samples were prepared for each of the following sampling techniques: grab, cone and quarter, riffler.

The entire sample of SBW was placed on a clean sheet of plastic.
5 grab samples were taken (approximately 1 kg each) from the bulk sample. This was done by randomly taking small scoops (minimum of three) for each laboratory (grab) sample.

The remaining bulk sample was divided into 2 using a shovel, allocating alternate shovel loads into 2 separated piles.
The sub-sample technique, cone and quartering was applied to one of the sub-samples until the sample size was reduced to 6 kg. This sample was divided into 5 equal laboratory samples.

The riffler box was used to recover 5 laboratory samples (minimum of 1 kg in weight).
The 5 samples from each sub-division technique were submitted for laboratory analysis (EN 12457-2 test)

In case of MBA, particle size fractions of 0 - 4, 0 - 10 and 0 - 40 mm were prepared from the bulk of materials mixed previously for preparing sub samples for validation (See setion on sample preparation) and subsequently laboratory samples prepared for sampling by the different sub-sampling methods. The 0 - 40 mm sample is the untreated material as received from the production facility. Separate portions of respectively the bulk material, the < 10 mm size-

reduced material and the < 4 mm size-reduced material were subjected to the different sub-sampling methods similar as described for SBW. The sub-sampling resulted in test portions suitable for analysis of the solids for chemical composition and separate test portions were obtained for leaching using EN 12457 Part 2 [2].
The particle size distribution is given in figure 2.1.

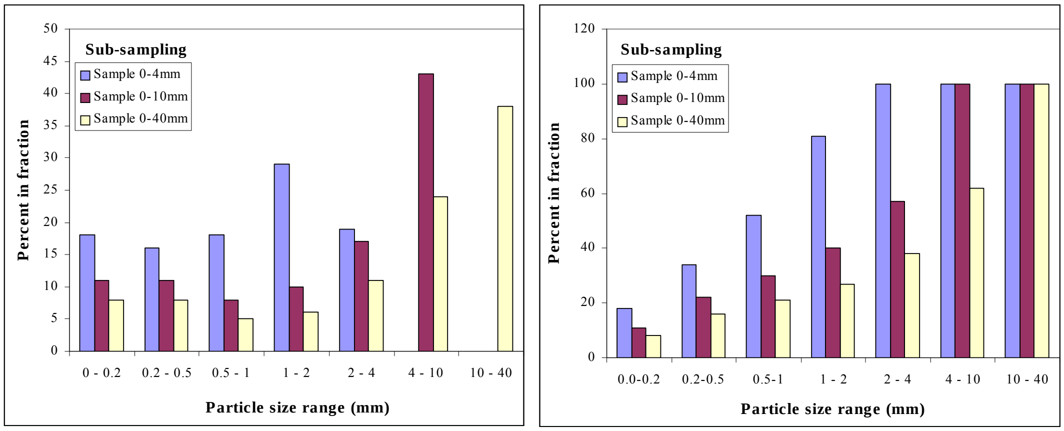


Figure 2.1 *Particle size distribution of samples of MBA for sub-sampling study. Left by fraction and right cumulative*

3. RESULTS AND DISCUSSION

Below the sub-sampling results are given for sand blasting waste and for MSWI bottom ash. Full test data are provided in the Appendices I and II.

3.1 Sand blasting waste

3.1.1 Composition

In table 3.1 the results of sub-sampling for analysis of composition of SBW are given.

Table 3.1 *Average, standard deviation and percent variability for three sub-sampling methods for determination of total composition in SBW (data in mg/kg). Lowest relative standard deviation in italics.*

	Grab			C&Q			Riffler		
Element	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %
Hg	0.37	0.08	22.49	0.42	0.03	*6.50*	0.42	0.04	10.35
As	55.60	3.21	5.78	54.02	1.53	*2.83*	53.52	2.57	4.79
Cd	41.22	3.11	7.54	39.44	1.04	*2.63*	47.40	3.00	6.33
Cr	1154	39	3.39	1116	20.7	*1.86*	1274	43.9	3.45
Ni	773	97	12.5	769	25.6	*3.33*	912	90	9.86
Pb	3558	618	17.4	3374	73.0	*2.16*	3632	236	6.51
Sb	153	20	13.1	154	4.9	*3.20*	147	11.3	7.70
Al	3358	648	19.3	3386	61.1	*1.80*	3590	373	10.38
Cu	2730	397	14.5	2776	94.5	*3.40*	3014	157	5.22
Zn	10092	1483	14.7	9692	276.9	*2.86*	10182	689	6.77

*Avg= average; Stdev=standard deviation; Rstd % = relative standard deviation

Based on a T test on the means it is clear that significant differences in the mean occur between C&Q and riffler for Cr, Ni and Cd. The elements Pb, Al and Zn are heterogeneously distributed in the material, which effect can be largely eliminated by proper cone&quartering.
The results in table 3.1 point at cone & quartering as the more suitable method as it provides the lowest relative standard deviations. Because of the much lower standard deviation, the mean corresponding with the cone&quartering would be the most appropriate value. The riffler sampling method is second best.

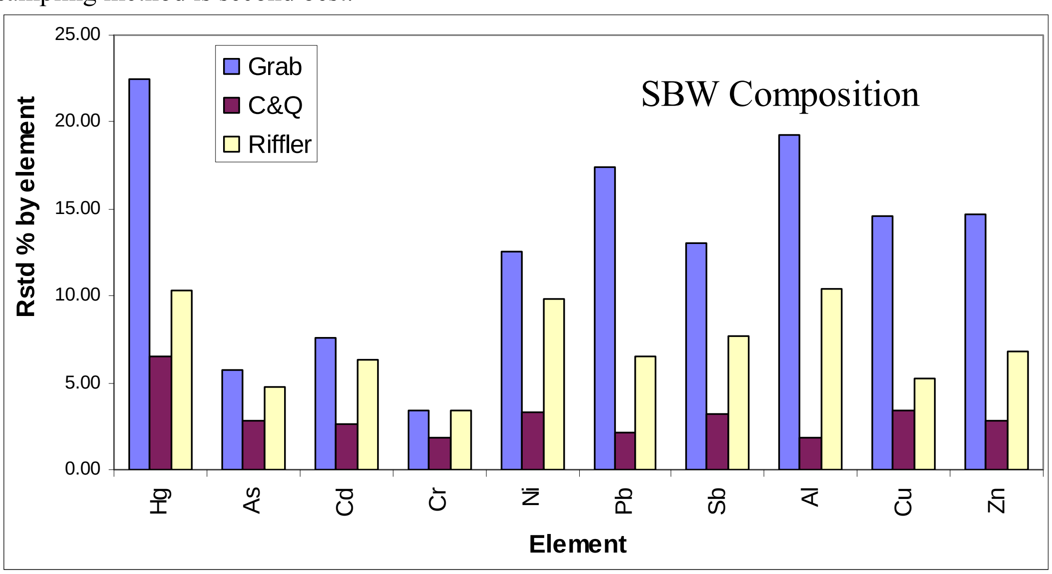


Figure 3.1 *Relative standard deviation by element and sub-sampling method for SBW composition*

3.1.2 Leaching

In table 3.2 the results of sub-sampling for leachability of SBW are given. From the data it can be concluded that both cone and quartering and riffler provide adequate results. It must be noted that leaching, which provides a better assessment of environmental impact than composition results in much lower concentrations to be measured.

Table 3.2 *Average, standard deviation and relative standard deviation in perrcent for three sub-sampling methods for determination of leachability by EN 12457-2 in SBW (data in microgram/l). Lowest relative standard deviation in italics.*

Leaching											Avg leached
	Grab			C&Q			Riffler			Factor	At L/S=10 in
	Avg*	Stdev*	Rstd %*	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	above DTL*	Mg/kg
Sb	13.2	1.88	14.2	13.0	1.13	8.68	11.58	0.31	*2.69*	12.6	0.38
As	< 0.5										0.0050
Cd	0.32	0.06	19.1	0.31	0.02	*6.45*	0.28	0.03	10.6	15.2	0.0091
Cr	5.68	1.73	30.5	5.50	1.21	22.1	4.72	0.68	*14.3*	26.5	0.159
Hg	0.14										0.0014
Ni	224	26.5	11.8	222	5.15	*2.32*	245	9.73	3.97	1151.0	6.91
Pb	10.2	11.8	115	8.50	1.82	*21.42*	8.96	5.15	57.4	30.8	0.28
Al	238	168	70	192	3.29	*1.72*	151	10.6	7.04	96.8	5.81
Cu	3.34	2.61	78.1	5.26	3.20	60.90	2.88	1.14	*39.7*	7.7	0.11
Zn	147	66.9	45.6	135	9.07	*6.73*	142	26.0	18.3	47.0	4.23

*Avg=average; Stdev=standard deviation; Rstd%=relative standard deviation; DTL=detection limit

This has an influence on the repeatability in comparison with analysis of composition at much higher concentration levels. The last column in table 3.2 allows the comparison with the average composition in table 3.1. In many cases orders of magnitude difference is observed between composition and leachability.

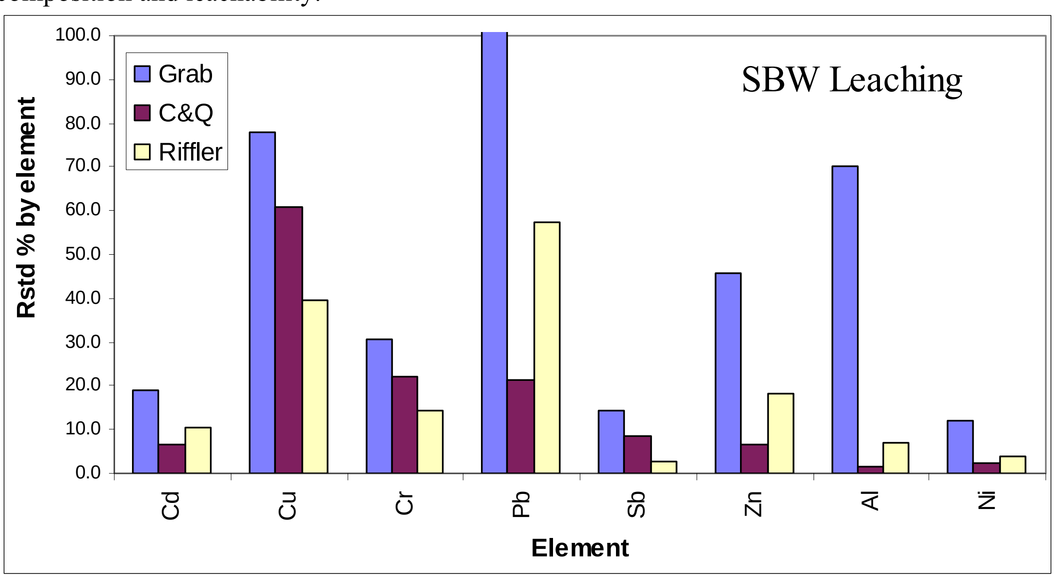


Figure 3.2 *Relative standard deviation by element and sub-sampling method for SBW leaching*

3.2 Municipal solid waste bottom ash

3.2.1 Composition

The lowest standard deviation are marked in the tables.

In table 3.3 a limited set of results of sub-sampling for analysis of composition of MBA is given. In Appendix II the full set of data is given.

Table 3.3 *Average, standard deviation and percent relative standard deviation for three sub-sampling methods on MBA*

	Grab			CQ			Riffler			Overall	
	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	Stdev	Avg
Ba	813.2	345.8	42.5	683.5	59.3	*8.7*	641.7	82.6	12.9	21.4	712.8
Cu	5509.7	3694.6	67.1	2153.0	691.0	*32.1*	3293.2	2513.0	76.3	58.5	3652.0
Mo	4.1	1.0	*25.4*	5.3	2.9	55.3	4.0	1.3	33.3	38.0	4.4
S	2852.3	168.7	*5.9*	2935.3	328.8	11.2	2866.3	246.1	8.6	8.6	2884.6
Sb	29.8	4.6	15.4	27.9	2.3	*8.1*	27.4	5.8	21.1	14.9	28.4

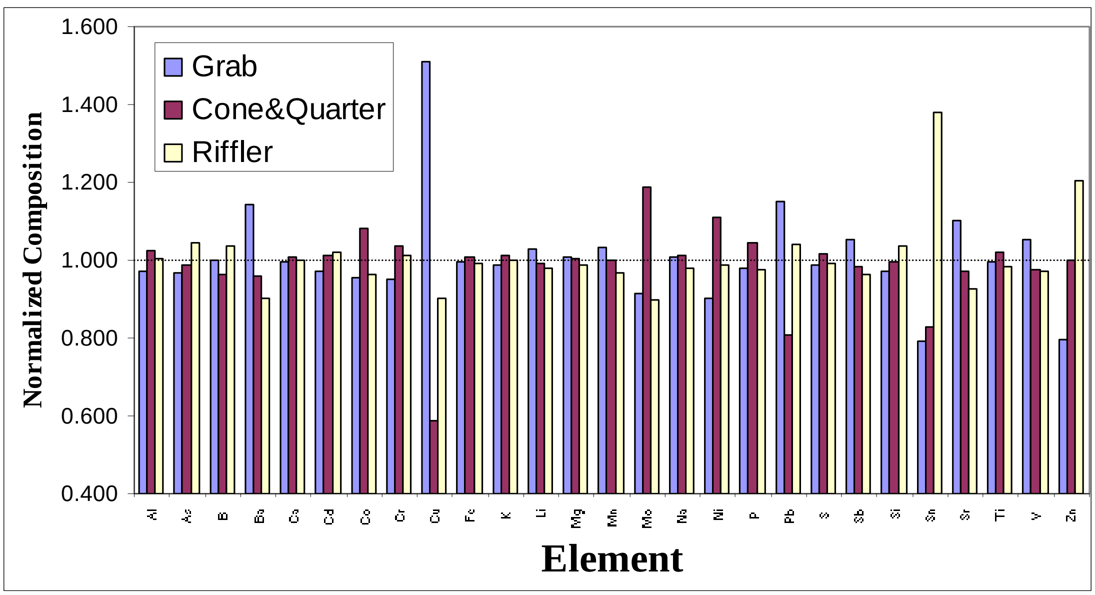


Figure 3.3 *Normalized concentrations of MBA in de solid after sub-sampling*

In figure 3.3 the composition of MBA as obtained after sub-sampling with the specified methods is normalized against the average composition obtained from all measurements for a given element. This illustrates that MBA is not heterogeneous for all elements, but in particular for Ba, Cu, Mo, Ni, Pb, Sn, Zn.

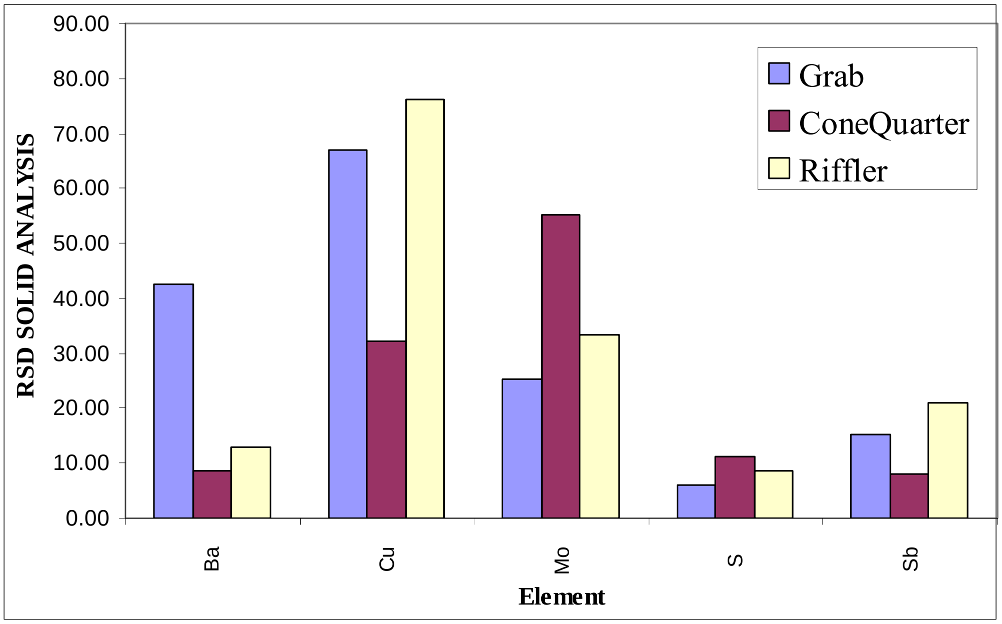


Figure 3.4 *Relative standard deviation per sub-sampling method for analysis of the solid (MBA)*

In figure 3.4 the relative standard deviation is given for the three sub-sampling methods on MBA. The results illustrate that particularly large standard deviations occur for Ba, Cd, Co, Cu, Mo, Ni, Pb, Sn, V, and Zn. Overall cone and quartering appears to provide an average lower standard deviations also for the notorious heterogeneous elements in this matrix.

3.2.2 Leaching

In table 3.4 the results of sub-sampling for leaching according to EN 12457-2 of MBA in the size range 0 – 40, 0 - 10 and 0 - 4 mm is given.

In figure 3.5 the graphical presentation of variance (%) is given for leaching according to EN 12457-2 of MBA in the size range 0 – 40 mm, 0 – 10 mm and 0 – 4 mm.

The results indicate that at 4 mm cone & quartering shows the lowest relative standard deviations and may be judged therefor as is the more appropriate method. At 0-10 mm the relative standard deviation is slightly higher than for 4 mm. The difference between the sampling methods is less. Significantly larger relative standard deviations are noted for the 0-40 mm fraction.

Table 3.4 *Leaching tests results on sub-sampled MBA fractions 0 - 40, 0 - 10 and 0 - 4 mm.*

	Grab 40 mm			Cone Quarter 40 mm			Riffler 40 mm		
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %
Ba	0.128	0.003	2.55	0.123	0.007	5.55	0.119	0.004	3.03
Cu	0.508	0.034	6.71	0.480	0.086	17.90	0.529	0.052	9.82
Mo	0.042	0.007	17.22	0.040	0.008	20.31	0.046	0.003	7.44
S	80.982	4.804	5.93	75.975	11.479	15.11	94.010	10.808	11.50
Sb	0.030	0.004	14.35	0.032	0.004	12.60	0.035	0.002	4.96
pH	11.088	0.020	0.18	11.118	0.059	0.53	11.050	0.097	0.88
mS	1.512	0.081	5.38	1.362	0.136	9.98	1.550	0.100	6.47

Part 3. Sub-sampling

mg/liter	Grab 10 mm Average	STDEV	Rstd %	Cone Quarter 10 mm Average	STDEV	Rstd %	Riffler 10 mm Average	STDEV	Rstd %
Ba	0.113	0.002	1.75	0.110	0.002	2.22	0.107	0.004	3.51
Cu	0.580	0.051	8.77	0.592	0.065	10.91	0.566	0.050	8.85
Mo	0.049	0.006	11.40	0.053	0.007	13.27	0.052	0.005	8.72
S	97.896	9.445	9.65	102.115	9.916	9.71	108.031	11.460	10.61
Sb	0.028	0.004	14.39	0.028	0.004	15.09	0.030	0.002	7.58
pH	11.020	0.062	0.56	11.008	0.049	0.44	11.048	0.086	0.78
mS	1.560	0.024	1.57	1.644	0.109	6.62	1.606	0.044	2.74

mg/liter	Grab 4 mm Average	STDEV	Rstd %	Cone Quarter 4 mm Average	STDEV	Rstd %	Riffler 4 mm Average	STDEV	Rstd %
Ba	0.107	0.004	3.50	0.106	0.002	1.90	0.102	0.003	3.10
Cu	0.515	0.054	10.49	0.546	0.031	5.62	0.496	0.038	7.59
Mo	0.048	0.005	10.23	0.054	0.003	5.09	0.051	0.006	11.45
S	100.890	7.263	7.20	104.867	7.040	6.71	110.253	7.377	6.69
Sb	0.030	0.004	13.16	0.032	0.004	12.16	0.033	0.004	13.38
pH	11.004	0.029	0.26	10.962	0.056	0.51	10.984	0.048	0.44
mS	1.570	0.068	4.34	1.620	0.046	2.86	1.524	0.077	5.03

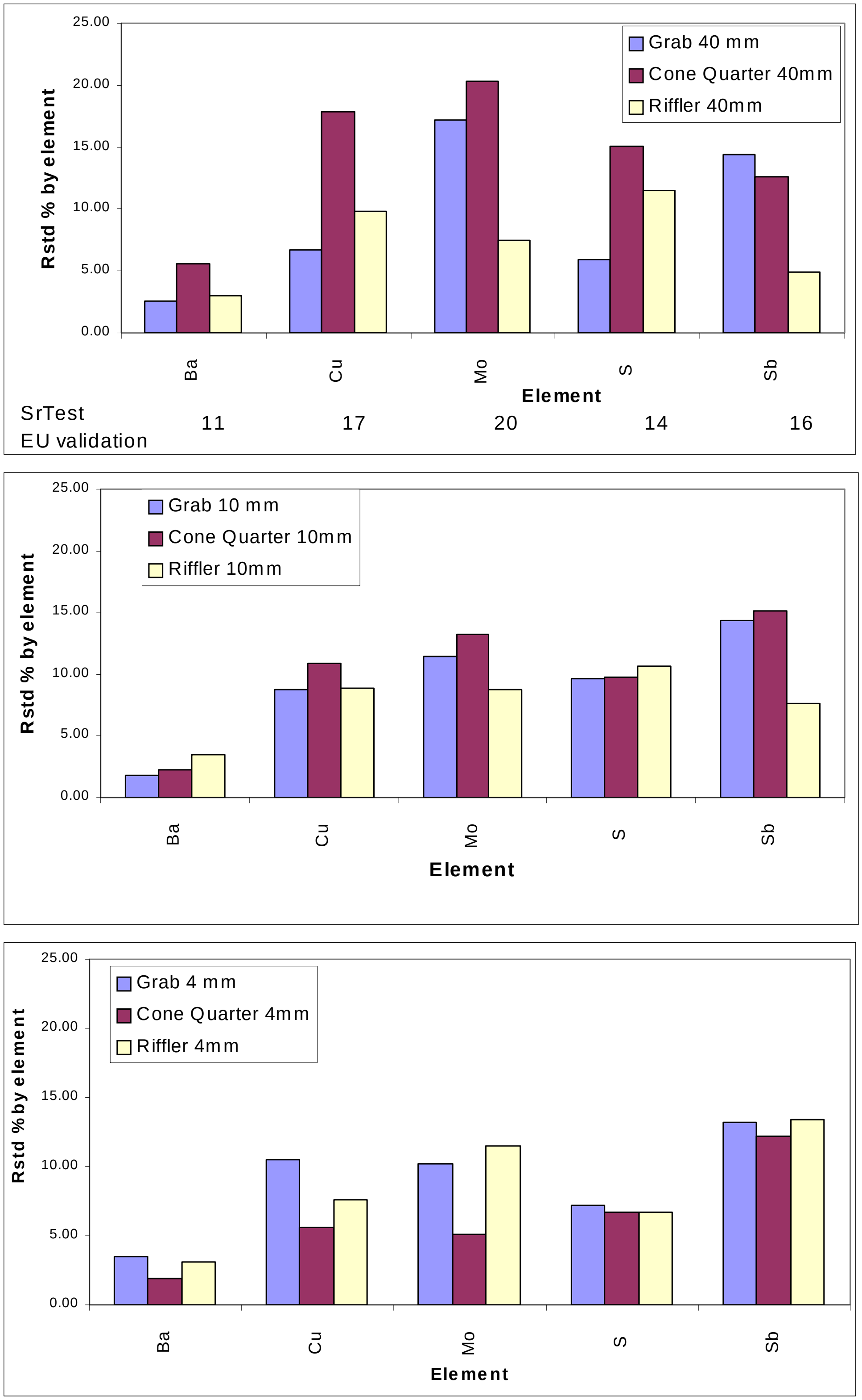


Figure 3.5 *Relative standard deviation (%) for MBA 0 - 40, 0-10 and 0- 4 mm by element and sampling method*

The data have been sorted differently to show the relative standard deviation as a function the different sub-sampling methods employed.

In table 3.5 the results of sub-sampling for leaching according to EN 12457-2 of MBA is given sorted by sub-sampling method. For comparison, the relevant parameters for composition analysis are given.

In figure 3.6 the graphical presentation of relative standard deviation (%) is given for leaching according to EN 12457-2 of MBA sorted by sub-sampling method.

Table 3.5

	Grab 40 mm			Grab 10 mm			Grab 4 mm			Grab Solid
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Rstd %
Ba	0.128	0.003	2.55	0.113	0.002	1.75	0.107	0.004	3.50	42.525
Cu	0.508	0.034	6.71	0.580	0.051	8.77	0.515	0.054	10.49	67.056
Mo	0.042	0.007	17.22	0.049	0.006	11.40	0.048	0.005	10.23	25.373
S	80.982	4.804	5.93	97.896	9.445	9.65	100.890	7.263	7.20	5.916
Sb	0.030	0.004	14.35	0.028	0.004	14.39	0.030	0.004	13.16	
pH	11.088	0.020	0.18	11.020	0.062	0.56	11.004	0.029	0.26	
mS	1.512	0.081	5.38	1.560	0.024	1.57	1.570	0.068	4.34	

	Cone Quarter 40 mm			Cone Quarter 10 mm			Cone Quarter 4 mm			C%Q Solid
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Rstd %
Ba	0.123	0.007	5.55	0.110	0.002	2.22	0.106	0.002	1.90	*8.7*
Cu	0.480	0.086	17.90	0.592	0.065	10.91	0.546	0.031	5.62	*32.1*
Mo	0.040	0.008	20.31	0.053	0.007	13.27	0.054	0.003	5.09	55.3
S	75.975	11.479	15.11	102.115	9.916	9.71	104.867	7.040	6.71	11.2
Sb	0.032	0.004	12.60	0.028	0.004	15.09	0.032	0.004	12.16	*8.1*
pH	11.118	0.059	0.53	11.008	0.049	0.44	10.962	0.056	0.51	
mS	1.362	0.136	9.98	1.644	0.109	6.62	1.620	0.046	2.86	

	Riffler 40 mm			Riffler 10 mm			Riffler 4 mm			Riffler Solid
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Rstd %
Ba	0.119	0.004	**3.03**	0.107	0.004	3.51	0.102	0.003	3.10	12.9
Cu	0.529	0.052	9.82	0.566	0.050	8.85	0.496	0.038	**7.59**	**76.3**
Mo	0.046	0.003	**7.44**	0.052	0.005	8.72	0.051	0.006	11.45	33.3
S	94.010	10.808	11.50	108.031	11.460	10.61	110.253	7.377	**6.69**	8.6
Sb	0.035	0.002	**4.96**	0.030	0.002	7.58	0.033	0.004	13.38	**21.1**
pH	11.050	0.097	0.88	11.048	0.086	0.78	10.984	0.048	**0.44**	
mS	1.550	0.100	6.47	1.606	0.044	**2.74**	1.524	0.077	5.03	

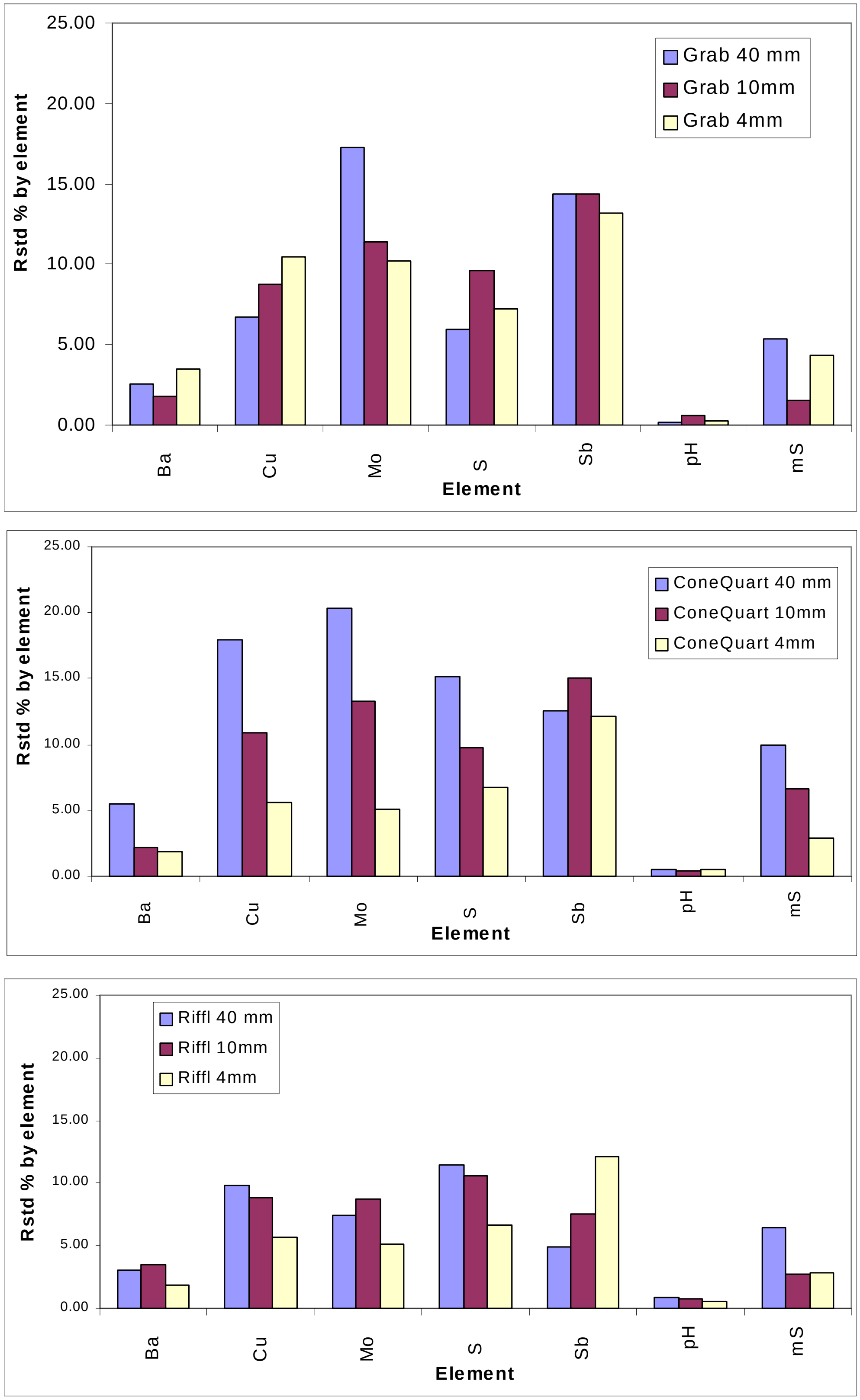


Figure 3.6 *Relative standard deviation (%) for MBA by element and sampling method.*

3.2.3 Comparison of evaluation based on composition versus leaching

In table 3.7 the comparison of sub-sampling for analysis of composition and for leaching according to EN 12457-2 of MBA is given.

Table 3.7 *Comparison of sub-sampling of MBA by three methods based on composition versus leaching (all data in mg/kg)*

		Grab			Cone&Quarter			Riffler		
		Avg	Std	Rstd %	Avg	Std	Rstd %	Avg	Std	Rstd %
COMPOSITION	Cu	5510	3695	67	2153	691	32	3293	2513	76
LEACHING 40mm	Cu	0.51	0.03	6.7	0.48	0.09	18	0.53	0.05	9.8
10mm	Cu	0.58	0.05	8.8	0.59	0.06	11	0.57	0.05	8.9
4mm	Cu	0.51	0.05	10	0.55	0.03	5.6	0.50	0.04	7.6
COMPOSITION	Ba	813.2	345.8	42.5	683.5	59.3	8.7	641.7	82.6	12.9
LEACHING 40mm	Ba	0.128	0.003	2.55	0.123	0.007	5.55	0.119	0.004	3.03
10mm	Ba	0.113	0.002	1.75	0.110	0.002	2.22	0.107	0.004	3.51
4mm	Ba	0.107	0.004	3.50	0.106	0.002	1.90	0.102	0.003	3.10
COMPOSITION	Zn	1810	145	8	2275	793	35	2739	1622	59
LEACHING 40mm	Zn	0.025	0.005	22	0.022	0.003	15	0.020	0.006	30
10mm	Zn	0.018	0.003	15	0.016	0.002	13	0.017	0.003	20
4mm	Zn	0.018	0.002	13	0.016	0.002	12	0.015	0.003	17
COMPOSITION	S	2852	168	5.9	2935	328	11.2	2866	246	8.6
LEACHING 40mm	S	81	4.8	5.93	75	11.4	15.1	94	10.8	11.50
10mm	S	98	9.4	9.65	102	9.9	9.71	108	11.4	10.61
4mm	S	100	7.2	7.20	104	7.0	6.71	110	7.37	6.69
COMPOSITION	Sb	29.8	4.6	15.4	27.9	2.3	8.1	27.4	5.8	21.1
LEACHING 40mm	Sb	0.030	0.004	14.35	0.032	0.004	12.60	0.035	0.002	4.96
10mm	Sb	0.028	0.004	14.39	0.028	0.004	15.09	0.030	0.002	7.58
4mm	Sb	0.030	0.004	13.16	0.032	0.004	12.16	0.033	0.004	13.38
COMPOSITION	Mo	4.1	1.0	25	5.3	2.9	55	4.0	1.3	33
LEACHING 40mm	Mo	0.042	0.007	17	0.040	0.008	20	0.046	0.003	7.4
10mm	Mo	0.049	0.006	11	0.053	0.007	13	0.052	0.005	8.7
4mm	Mo	0.048	0.005	10	0.054	0.003	5.1	0.051	0.006	11.5

The results indicate that the variability in analysis for composition in MBA is generally larger than that for assessing leachability in spite of the large difference in concentrations to be measured in solids versus liquids. Only in a few cases, where leachability is very low, then the relative standard deviation is largely determined by the analytical capabilities and no longer a function of sampling method or size fraction (e.g. Mo C&Q; Sb C&Q; Zn Grab).

Apart from the 0-40 mm material, the relative standard deviation within a size/sub-sampling method combination does not vary very much between the size/sub-sampling method combinations (Cu: 7 -11 %, Ba: 2 - 3.5 %, Zn: 12 - 20). The differences are mainly between the elements analysed, which is largely related to the concentration levels measured.

3.2.4 Evaluation of results of sub-sampling by size and sub-sampling method

To evaluate the results in another manner all attributes have been considered to come from the same sample. This implies that differences are evaluated as variabilities within a sub-sampling method and between sub-sampling methods.

In table 3.8 the variability within the 5 replicates for a given sub-sampling method is compared with the variation caused by the three sub-sampling methods. It appears that the variabilities are very close and consistent with the observations of the test variability in the main EU validation work for EN 12457- Part 2. This indicates that in the case of MBA different sub-sampling methods do not contribute significantly to the outcome of the test. The results of the mean concentrations in the eluate from EN 12457-2 between sub-sampling and EU wide validation for Mo, Cu and Sb are in close agreement. The pH is significantly different, which is related to the time at which the experiment was performed relative to time of the EU wide validation work. The difference in Ba leaching is consistent with this pH difference (see Part 2). The difference in sulfate is not directly obvious.

Table 3.8 *Comparison of sub-sampling data with validation results for MBA for EN 12457-2*

Elements	Ba	Cu	Mo	SO4 as S	Sb	pH
Overall average (mg/l)	0.115	0.53	0.047	93.6	0.031	11.04
Overall STD	0.0067	0.038	0.0043	10.36	0.0025	0.035
s_r Within sampling method variability (n=5)	0.0079	0.056	0.0068	12.38	0.0036	0.073
s_R Between sampling method (6) variability	0.0095	0.062	0.0073	14.84	0.0041	0.074
s_r % (n=5)	6.9	10.6	14.5	13.2	11.7	
s_R %	8.2	11.7	15.6	15.9	13.2	
Average EU test validation*	0.168	0.465	0.049	50.7	0.028	10.8
s_r test Within lab variability test method (n=2)	0.019	0.078	0.01	6.8	0.0044	0.14
s_r test % (n=5)	11.3	16.7	20.4	13.5	15.7	
s_r test % (n=2) calculated	7.2	10.6	12.9	8.5	9.9	

* Data from EU wide validation of EN 12457-2

4. DISCUSSION

Particle size issues have several aspects, which often lead to conflicting requirements. This implies that a choice needs to be made on preferred conditions of testing. Size reduction is generally advantageous for obtaining more repeatable test results.
However, size reduction of large particles may lead to exposure of fresh surfaces to leaching, which may lead to a deviation from practice in terms of carbonation and oxidation state. The latter aspect is particularly relevant for non-porous materials, such as industrial slag. Many materials are relatively porous and in that case the effects are much less pronounced.

When a material contains a significant fraction of fines, then size reduction will generally not have a major effect on the leaching result for solubility controlled elements. It may be significant for very soluble species (soluble salts). From larger particle sizes diffusion from the interior of particles contributes significantly to the overall release. Since this process is slow, the testing time generally needs to be much longer than 24 hours to compensate for this effect. Theoretically one would rather not size reduce, however, the testing time needs to be long to compensate for the slow matrix diffusion.
When materials have a high porosity, there is no real difference between the longer-term release of small (0 - 10 mm) and bigger particles (0 - 40 mm). After a slightly longer period, the total leaching effect will be about the same as the effect of leaching of small particles. Thus size reduction will help to speed up the process and be able to obtain the appropriate result in a relatively short time.
Only if the materials are much bigger (> 50 - 100 mm) leaching time will be such that it is important to understand the diffusion process better. For such big particles then a tank leaching test (such as now under development in CEN CT 292 WG6[]) should be carried out, since a batch test does not provide this information.

From previous studies in the development of EN 12457 [16] information on the influence of particle size can be obtained for the MSWI bottom ash as studied here. In Appendix A the batch test data for MSWI bottom ash are give in the form of bar graphs for a range of elements and a wide variety of particle size ranging from 0 - 0.2 up to 40 mm. In this Appendix the pH dependence test data are used to illustrate that the MSWI bottom ash studied in the previous work and in this work have the same leaching behaviour and thus observations on particle size effects from the previous work are equally relevant for this work. The particle size distribution for the different particle sizes is provided for information. In case of larger particles, slow release by diffusion out of larger particles is a main release restriction. The notion of increased leaching with smaller particle sizes is a misconception, as the pH of leaching may have a dominating influence on the release (examples V and Zn in MSWI bottom ash).

Diffusion limitation
Based on mobility data for relatively mobile constituents and less mobile species, the time needed for full exchange between (mobile) constituents in a particle of specific size with the surrounding solution can be estimated. If we assume an effective diffusion coefficient (D_e) for mobile species such as salts of 10^{-10} m/s and a value of 3.10^{-12} m/s for retained species, then the time it takes to reach equilibrium between the inside of the particles and the surrounding solution can be estimated ($x = \sqrt{(2D_e.t)}$). In the case of retained species solubility control is most likely. So for judgement of contact time, the times needed for equilibration with soluble species is most relevant.

Particle size	Mobile (10^{-10} m/s)	Retained (3.10^{-12} m/s)
mm	Time for equilibrium (days)	Time for equilibrium (days)
4	1	29
10	6	184
20	23	736
40	93	2942

It follows that with particles sizes in excess of 4 mm it will take very long before equilibrium is established. In the field, however, this time is normally no limitation at all.

Based on the experimental data, it can be shown that different particles size distributions within the specified particle size range for EN 12457-2 (95% < 4 mm) lead to a significantly increased within and between laboratory variabilities as compared to a repeated measurement of the same size distribution. In figure 4.1 this is illustrated. In view of the within laboratory variability of 12 – 19 % for Mo, Sb, Ba, SO4 and Cu as obtained in the validation study on MSWI bottom ash, the uncertainty in the end result caused by an insufficiently defined particle size is at least of the same order of magnitude and would require further elaboration, when improvement of repeatability is aimed for.

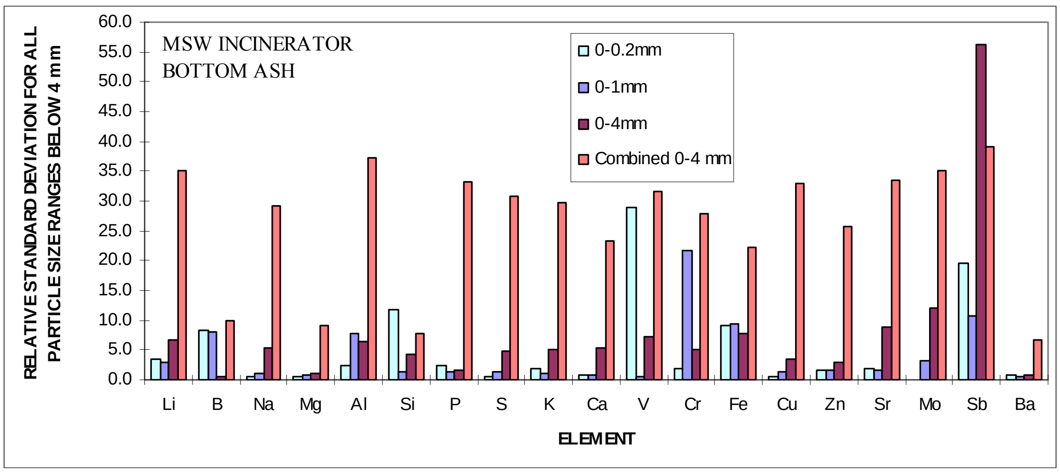


Figure 4.1 *Comparison of relative standard deviations for duplicate testing of different particle size distributions of the same material below 4 mm in comparison with the overall relative standard deviation of all measurements on material below 4 mm combined*

5. CONCLUSIONS

In judging performance of (sub-) sampling methods, the analytical sensitivity plays an important role. Preferably this factor should be ruled out by selecting parameters with sufficient analytical sensitivity in judging sub-sampling performance.

Sub-sampling performance may be very element specific, as a material may be homogeneous for many, but not for all constituents of interest. This requires more knowledge of the material under consideration.

Cone and quartering and sampling with a riffler are suitable methods for sub-sampling in the laboratory.

The results indicate that 4 mm size-reduced laboratory samples show the lowest relative standard deviations and may be judged therefor as the more appropriate method. At 0-10 mm the relative standard deviation is slightly higher than for 4 mm. Significantly larger relative standard deviations in sub-sampling are noted for the 0-40 mm fraction.

In case of obvious sample heterogeneity, such as in MSWI bottom ash, analysis for composition may be less repeatable than analysis by leaching in spite of the higher concentration levels, which are to be measured by total chemical analysis.

Heterogeneity may appear in forms that are unrelated to environmental impact, such as in case of metals (e.g Pb, Cu, Zn) in MSWI bottom ash. The metals do not significantly contribute to leaching. In such cases, leaching is the preferred method of assessing environmental properties of materials.

Sub-sampling in the laboratory for testing should be carried out after size reduction to within the specified particle size range for the standard (resp. 4 and 10 mm). Under this condition the additional variability caused by sub-sampling is minimized.

Apart from the 0-40 mm material, the relative standard deviation within a size/sub-sampling method combination does not vary very much between the size/sub-sampling method combinations. The differences are mainly between the elements analysed, which is largely related to the concentration levels measured.

For MBA the variability within sampling method/ size combinations (n=5) for the elements analysed in the EU wide validation of EN 12457-2 corresponds well with the within laboratory variability on the test method as determined in the validation of EN 12457 -2 (See part 5).

The result obtained for batch tests carried out on the same material with different particle size distributions meeting the requirements of the respective standards is significantly larger than the reproducibility limit obtained for such a standard. This implies that particularly with EN 12457-4, in which a statement is given on its application to even larger particle sizes (up to 40 mm), the user must be aware of the effects of particle size on the test result.

REFERENCES

[1] CEN WG 1. Draft sampling and sub-sampling methods (in preparation).

[2] EN 12457-2 Compliance leaching test for granular materials, CEN/TC 292 WG 2 (Standard for formal vote in 2002).

[3] Sloot, H.A. van der and D. Hoede (1998): The influence of particle size on leaching of elements from coarse granular materials, ECN-C--98-045.

[4] Dynamic leach test for monolithic materials. New work item CEN TC 292 WG 6, 2002

APPENDIX I ANALYTICAL DATA SAND BLASTING WASTE

LEACHING

Sample Code	Sb ug/l	As ug/l	Cd ug/l	Cr ug/l	Hg ug/l	Ni ug/l	Pb ug/l	Al ug/l	Cu ug/l	Zn ug/l
Scoop 1	16.1	<= 0.5	0.40	4.8	<= 0.1	211	4.1	522	2.0	106
Scoop 2	11.1	<= 0.5	0.25	5.0	0.14	267	5.7	113	3.1	129
Scoop 3	12.2	<= 0.5	0.28	4.4	<= 0.1	209	4.0	127	1.6	103
Scoop 4	13.0	<= 0.5	0.37	8.7	<= 0.1	230	31.2	178	7.9	264
Scoop 5	13.7	<= 0.5	0.32	5.5	<= 0.1	201	6.2	252	2.1	131
Cone & Quarter 1	12.9	<= 0.5	0.34	7.5	<= 0.1	220	7.9	197	10.5	133
Cone & Quarter 2	15.0	<= 0.5	0.30	4.4	<= 0.1	214	7.4	192	3.3	127
Cone & Quarter 3	12.4	<= 0.5	0.30	5.7	<= 0.1	224	9.7	189	2.5	141
Cone & Quarter 4	12.3	<= 0.5	0.32	5.1	<= 0.1	225	11.0	189	4.0	147
Cone & Quarter 5	12.5	<= 0.5	0.29	4.8	<= 0.1	227	6.5	191	6.0	126
Riffler 1	11.3	<= 0.5	0.29	4.2	<= 0.1	241	6.4	138	2.6	126
Riffler 2	11.8	<= 0.5	0.28	5.4	<= 0.1	244	14.3	151	3.7	168
Riffler 3	11.3	<= 0.5	0.25	4.1	<= 0.1	252	3.4	151	1.7	112
Riffler 4	12.0	<= 0.5	0.32	5.5	<= 0.1	232	14.6	167	4.4	170
Riffler 5	11.5	<= 0.5	0.25	4.4	<= 0.1	257	6.1	146	2.0	133

COMPOSITION

Sample Code	Sb ug/g	As ug/g	Cd ug/g	Cr ug/g	Hg ug/g	Ni ug/g	Pb ug/g	Al ug/g	Cu ug/g	Zn ug/g
Scoop 1	182	50.2	36.9	1210	0.40	633	4580	4190	2450	12300
Scoop 2	147	58.4	44.9	1180	0.45	871	2960	3630	3420	8230
Scoop 3	135	57.5	42.7	1120	0.26	825	3270	2670	2530	9720
Scoop 4	165	56.4	39.4	1130	0.43	716	3620	3570	2710	10500
Scoop 5	137	55.5	42.2	1130	0.30	821	3360	2730	2540	9710
Cone & Quarter 1	152	56.0	40.5	1140	0.41	782	3460	3470	2810	9860
Cone & Quarter 2	147	55.3	40.4	1120	0.46	765	3330	3310	2830	9470
Cone & Quarter 3	156	53.3	38.2	1090	0.41	727	3350	3370	2620	9520
Cone & Quarter 4	161	52.6	39.5	1130	0.40	794	3440	3420	2860	10100
Cone & Quarter 5	152	52.9	38.6	1100	0.40	776	3290	3360	2760	9510
Riffler / 1	137	55.9	48.7	1300	0.36	960	3410	3360	3130	9720
Riffler / 2	138	54.7	50.9	1310	0.39	971	3510	3440	3080	9800
Riffler / 3	144	54.3	47.4	1270	0.44	914	3500	3400	3030	9690
Riffler / 4	149	53.5	47.3	1290	0.43	959	3750	3500	3090	10400
Riffler / 5	165	49.2	42.7	1200	0.47	756	3990	4250	2740	11300

APPENDIX II ANALYTICAL DATA MSWI BOTTOM ASH

COMPOSITION Grab sampling MBA

ppm	G1	G2	G3	G4	G5
Al	23716.5	23778.4	22611.5	27033.3	25202.7
As	15.4	11.6	14.6	14.2	11.4
B	75.5	90.0	116.4	83.5	87.3
B1	96.6	105.6	136.4	103.3	108.5
Ba	1418.9	557.2	748.9	647.7	693.3
Ca	61053.9	60801.4	57467.2	60570.4	60785.7
Cd	4.1	3.2	4.1	5.1	4.8
Co	22.9	19.8	18.3	18.1	18.5
Cr	200.8	176.8	206.4	178.8	155.7
Cu	10341.3	4968.8	1779.7	8135.6	2323.1
Fe	110026.1	87449.1	108174.6	97006.1	99843.8
K	3292.1	3155.6	3150.6	3355.0	3082.0
Li	12.8	14.8	12.5	13.6	12.4
Mg	6454.9	6592.5	6968.2	6555.5	6119.7
Mn	782.3	784.0	960.6	844.0	748.2
Mo	5.8	3.4	3.8	4.1	3.2
Na	8784.0	8743.8	8964.6	9098.6	8138.4
Ni	145.8	197.1	107.9	147.5	115.6
P	2647.5	2366.7	2441.7	2543.2	2683.5
Pb	2171.6	1014.2	814.3	787.7	2220.2
S	2898.6	2605.3	2800.7	2888.2	3068.6
Sb	34.5	29.1	27.1	24.0	34.4
Se	-4.0	-2.1	-4.0	-3.9	-4.8
Si	15815.3	14402.2	14519.6	14441.1	13618.4
Sn	134.5	108.2	141.4	124.3	155.0
Sr	192.6	189.9	325.6	207.1	183.5
Ti	2563.3	2607.3	2694.4	2500.9	2697.6
V	22.9	40.5	21.5	22.4	21.1
Zn	2008.3	1839.4	1613.7	1846.9	1744.2

COMPOSITION Cone and Quarter MBA

	C1	C2	C3	C4	C5
Al	28460.6	26396.9	24546.4	23166.6	26389.6
As	12.5	14.6	16.4	12.5	12.7
B	81.7	86.1	85.5	82.5	100.7
B1	101.9	106.4	110.6	104.9	125.4
Ba	731.6	761.3	631.8	634.2	658.7
Ca	57959.1	64991.3	55849.6	61817.8	63358.9
Cd	3.6	6.4	3.3	4.3	4.7
Co	15.2	20.1	36.9	18.1	20.1
Cr	172.9	199.1	180.7	206.0	246.0
Cu	2536.2	3015.3	1317.9	1603.1	2292.7
Fe	93897.5	100518.6	105388.3	103976.0	104895.6
K	3037.8	3500.3	3171.7	3297.0	3402.9
Li	12.3	13.1	13.2	11.9	13.2
Mg	6281.7	6854.2	6033.9	6507.7	6846.4
Mn	814.8	780.7	830.2	810.0	764.0

Mo	2.3	8.7	2.9	4.4	8.1
Na	8173.2	9025.0	8382.1	9222.0	9171.4
Ni	125.3	140.1	194.8	139.2	280.3
P	2402.0	2993.0	2416.5	2946.3	2725.4
Pb	1064.7	1061.2	953.3	852.0	981.3
S	2848.6	3376.4	2464.6	3026.0	2961.1
Sb	27.6	30.4	27.8	29.4	24.4
Se	-5.1	-4.5	-5.3	-4.8	-4.6
Si	14591.4	14927.3	14705.7	15624.9	14818.1
Sn	126.5	175.5	124.3	153.0	114.8
Sr	183.8	213.5	168.6	192.6	209.4
Ti	2530.9	2777.6	2468.4	2776.5	2837.3
V	22.6	27.2	21.8	20.6	27.0
Zn	1932.4	1968.6	1784.3	2006.6	3685.0

COMPOSITION			Riffler sampling MBA		
	R1	R2	R3	R4	R5
Al	22997.9	23906.1	25608.3	24425.2	29294.3
As	17.3	14.4	14.3	12.3	14.3
B	88.0	107.6	89.7	89.4	96.1
B1	113.0	131.8	117.3	108.2	118.6
Ba	604.0	782.3	597.1	578.0	647.0
Ca	59309.9	64964.8	58480.6	57388.6	61512.1
Cd	4.6	5.6	3.6	3.9	4.7
Co	19.6	20.6	24.7	16.9	16.4
Cr	178.2	175.9	273.8	171.8	179.3
Cu	7726.7	2520.1	2132.3	1525.8	2561.4
Fe	107349.7	104082.1	108584.9	87479.2	93096.6
K	3282.6	3259.8	3257.9	3189.3	3218.7
Li	12.6	12.3	12.1	12.8	13.1
Mg	6352.8	6520.3	6516.7	6183.3	6456.8
Mn	754.4	733.0	787.8	683.4	901.0
Mo	3.5	3.6	3.5	6.3	3.0
Na	9143.0	8494.6	7960.3	8289.1	8657.6
Ni	135.9	111.1	312.8	93.8	126.6
P	2329.5	2761.8	2490.3	2317.5	2695.5
Pb	1049.9	958.2	1337.0	806.8	2191.5
S	2743.3	3152.6	2667.5	2654.8	3113.3
Sb	21.4	28.6	29.1	22.2	35.5
Se	-5.0	-5.8	-4.5	-5.6	-3.8
Si	16359.8	16384.8	15550.8	14977.8	14380.7
Sn	238.5	169.2	479.6	112.3	155.2
Sr	177.2	193.8	174.5	168.7	206.8
Ti	2652.3	2732.9	2551.8	2421.4	2571.9
V	20.8	21.9	31.9	21.5	22.4
Zn	5584.6	2057.5	2465.0	1571.4	2016.4

LEACHING

MBA 0 - 40 mm
G=grab, C=cone&quarter, R=riffle

mg/liter	G1-40	G2-40	G3-40	G4-40	G5-40	C1-40	C2-40	C3-40	C4-40	C5-40	R1-40	R2-40	R3-40	R4-40	R5-40
Al	47.5	62.3	54.0	60.0	57.0	55.1	56.8	55.2	45.8	60.0	50.7	53.6	61.5	59.6	71.4
B	0.108	0.085	0.051	0.052	0.055	0.060	0.059	0.069	0.060	0.063	0.055	0.064	0.068	0.054	0.077
Ba	0.133	0.129	0.126	0.126	0.126	0.121	0.119	0.119	0.135	0.121	0.116	0.121	0.114	0.119	0.123
Ca	177	174	185	189	187	181	186	175	144	193	180	181	214	193	226
Cr	0.024	0.028	0.025	0.023	0.026	0.022	0.024	0.023	0.015	0.022	0.016	0.019	0.023	0.014	0.032
Cu	0.477	0.523	0.560	0.481	0.499	0.523	0.524	0.479	0.332	0.542	0.479	0.485	0.588	0.513	0.581
Fe	0.024	0.023	0.019	0.018	0.018	0.019	0.017	0.016	0.016	0.015	0.010	0.014	0.014	0.014	0.013
K	38.4	45.5	44.8	30.4	36.8	41.1	37.2	37.7	23.8	37.6	38.7	37.0	41.8	37.9	39.3
Li	0.010	0.010	0.014	0.013	0.012	0.010	0.012	0.009	0.010	0.012	0.011	0.012	0.015	0.014	0.013
Mg	0.032	0.032	0.027	0.033	0.034	0.030	0.032	0.030	0.026	0.033	0.030	0.031	0.039	0.033	0.049
Mo	0.038	0.042	0.054	0.038	0.037	0.044	0.044	0.040	0.026	0.046	0.046	0.043	0.050	0.043	0.049
Na	138	169	162	113	134	154	136	141	86	138	145	137	155	142	145
P	0.098	0.104	0.108	0.106	0.109	0.106	0.110	0.105	0.077	0.114	0.107	0.110	0.131	0.115	0.124
S	81.5	72.7	82.6	83.5	84.8	80.1	81.6	76.4	56.3	85.5	84.5	84.3	105.8	90.0	105.4
Sb	0.032	0.032	0.027	0.025	0.036	0.026	0.034	0.036	0.033	0.030	0.033	0.036	0.034	0.037	0.034
Si	2.643	2.576	2.828	2.365	2.360	2.661	2.759	2.469	2.042	2.782	3.182	2.427	2.720	2.562	2.794
Sr	0.871	0.804	0.903	1.006	0.897	0.816	0.836	0.749	0.556	0.876	0.735	0.784	0.941	0.837	1.002
Zn	0.033	0.021	0.028	0.022	0.020	0.024	0.020	0.020	0.026	0.018	0.028	0.021	0.017	0.020	0.012
pH	11.11	11.07	11.11	11.07	11.08	11.09	11.10	11.11	11.22	11.07	11.15	11.12	11.00	11.07	10.91
mS	1.49	1.61	1.57	1.40	1.49	1.28	1.41	1.44	1.17	1.51	1.45	1.45	1.66	1.55	1.64

LEACHING

MBA 0 - 10 mm
G=grab, C=cone&quarter, R=riffle

mg/liter	G1-10	G2-10	G3-10	G4-10	G5-10	C1-10	C2-10	C3-10	C4-10	C5-10	R1-10	R2-10	R3-10	R4-10	R5-10
Al	56.60	64.87	51.52	63.19	58.44	66.84	60.93	61.17	65.71	69.54	52.09	58.96	58.15	53.96	71.37
B	0.060	0.081	0.048	0.059	0.061	0.070	0.063	0.069	0.069	0.074	0.049	0.064	0.073	0.044	0.084
Ba	0.113	0.116	0.114	0.112	0.111	0.110	0.114	0.107	0.111	0.109	0.107	0.106	0.104	0.104	0.113
Ca	208	205	192	222	191	222	204	192	224	221	201	204	203	211	247
Cr	0.036	0.031	0.021	0.026	0.020	0.022	0.027	0.020	0.020	0.024	0.017	0.024	0.012	0.021	0.032
Cu	0.637	0.620	0.544	0.581	0.516	0.622	0.572	0.488	0.647	0.630	0.548	0.553	0.500	0.603	0.628
Fe	0.016	0.016	0.014	0.014	0.013	0.014	0.015	0.013	0.012	0.011	0.013	0.013	0.012	0.010	0.010
K	44.2	40.7	42.4	39.6	40.6	45.5	42.7	36.4	49.4	48.5	40.9	41.3	37.6	44.2	41.5
Li	0.013	0.015	0.013	0.015	0.013	0.013	0.013	0.015	0.013	0.013	0.014	0.013	0.013	0.017	0.016
Mg	0.035	0.040	0.032	0.042	0.033	0.041	0.034	0.034	0.040	0.042	0.032	0.036	0.034	0.037	0.049
Mo	0.056	0.051	0.044	0.051	0.043	0.057	0.049	0.042	0.059	0.056	0.051	0.051	0.046	0.056	0.057
Na	162	150	159	147	147	170	159	136	188	180	151	157	139	165	152
P	0.137	0.131	0.128	0.144	0.121	0.145	0.130	0.120	0.151	0.150	0.130	0.136	0.136	0.146	0.160
S	102.8	93.3	92.4	112.1	88.9	107.5	95.2	88.2	109.2	110.6	99.0	103.4	101.3	109.0	127.4
Sb	0.022	0.030	0.025	0.031	0.030	0.030	0.024	0.025	0.025	0.034	0.031	0.029	0.034	0.030	0.028
Si	3.313	3.041	2.624	2.808	2.467	2.999	2.960	2.632	3.181	3.203	2.821	2.690	2.527	2.900	3.049
Sr	1.046	1.018	0.919	0.992	0.835	1.002	0.923	0.847	1.051	0.999	0.898	0.883	0.829	0.937	1.095
Zn	0.020	0.015	0.021	0.015	0.019	0.014	0.018	0.019	0.015	0.015	0.022	0.019	0.018	0.016	0.012
pH	11.00	10.97	11.10	10.96	11.07	10.96	11.05	11.07	10.98	10.98	11.12	11.07	11.09	11.06	10.90
mS	1.55	1.55	1.59	1.58	1.53	1.67	1.60	1.48	1.76	1.71	1.58	1.60	1.55	1.65	1.65

LEACHING

MBA 0 - 4 mm

G=grab, C=cone&quarter, R=riffle

mg/liter	G1-4	G2-4	G3-4	G4-4	G5-4	C1-4	C2-4	C3-4	C4-4	C5-4	R1-4	R2-4	R3-4	R4-4	R5-4
Al	59.8	68.5	59.6	74.0	72.0	83.8	68.0	74.8	76.2	75.4	66.3	69.2	74.8	66.5	77.2
B	0.122	0.078	0.049	0.086	0.070	0.081	0.064	0.071	0.071	0.068	0.062	0.077	0.088	0.061	0.095
Ba	0.113	0.108	0.107	0.103	0.105	0.107	0.108	0.103	0.106	0.105	0.099	0.105	0.099	0.103	0.106
Ca	208	196	200	213	207	233	215	212	205	223	207	209	213	226	232
Cr	0.019	0.018	0.008	0.008	0.014	0.011	0.013	0.013	0.011	0.011	0.010	0.010	0.007	0.013	0.013
Cu	0.600	0.516	0.484	0.456	0.518	0.560	0.575	0.515	0.511	0.568	0.471	0.483	0.462	0.556	0.508
Fe	0.011	0.013	0.011	0.011	0.010	0.016	0.011	0.010	0.010	0.010	0.012	0.009	0.009	0.009	0.007
K	46.1	40.3	38.3	34.4	44.8	44.2	45.1	42.2	44.2	46.1	36.3	38.6	39.0	44.3	36.0
Li	0.014	0.014	0.015	0.014	0.016	0.015	0.014	0.016	0.014	0.014	0.015	0.015	0.015	0.016	0.014
Mg	0.034	0.038	0.037	0.043	0.040	0.053	0.040	0.043	0.039	0.042	0.041	0.042	0.048	0.045	0.049
Mo	0.056	0.045	0.044	0.045	0.050	0.054	0.059	0.054	0.051	0.054	0.047	0.048	0.047	0.061	0.053
Na	173	149	141	131	165	165	169	158	164	173	137	144	144	168	133
P	0.139	0.133	0.139	0.152	0.140	0.157	0.155	0.147	0.145	0.152	0.141	0.139	0.151	0.160	0.160
S	102	89	104	109	100	114	105	99	97	110	104	105	106	120	117
Sb	0.024	0.030	0.028	0.035	0.032	0.032	0.031	0.038	0.028	0.029	0.032	0.039	0.036	0.027	0.033
Si	3.793	2.797	2.406	2.351	2.499	2.793	3.032	2.742	2.731	2.929	2.363	2.385	2.301	2.690	2.503
Sr	1.030	0.976	0.897	0.995	0.893	1.017	0.965	0.972	0.937	0.986	0.888	0.858	0.848	0.960	0.975
Zn	0.022	0.017	0.018	0.016	0.017	0.014	0.019	0.015	0.017	0.017	0.017	0.016	0.019	0.014	0.012
pH	11.01	11.00	11.04	10.96	11.01	10.87	11.01	10.98	11.00	10.95	11.04	11.01	10.98	10.98	10.91
mS	1.67	1.54	1.52	1.51	1.61	1.66	1.65	1.56	1.58	1.65	1.48	1.48	1.50	1.66	1.50

APPENDIX III AVERAGE, STANDARD DEVIATION AND RELATIVE STANDARD DEVIATION FOR ALL ELEMENTS

Table III.1 *Average, standard deviation and percent relative standard deviation for three sub-sampling methods on MBA composition*

	Grab			CQ			Riffler			Overall	
	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	Avg	Stdev	Rstd %	Stdev	Avg
Al	24468	1703	*7.0*	25792	2018	*7.8*	25246	2452	9.7	8.2	25169
As	13.4	1.8	13.6	13.8	1.7	*12.6*	14.5	1.8	*12.3*	12.8	13.9
B	90.5	15.5	17.1	87.3	7.7	*8.9*	94.2	8.1	*8.6*	11.5	90.7
Ba	813.2	345.8	42.5	683.5	59.3	*8.7*	641.7	82.6	12.9	21.4	712.8
Ca	60136	1502	*2.5*	60795	3799	6.2	60331	3000	5.0	4.6	60421
Cd	4.3	0.7	17.4	4.4	1.2	27.6	4.5	0.8	*17.3*	20.8	4.4
Co	19.5	2.0	10.3	22.1	8.5	38.6	19.6	3.4	17.1	22.0	20.4
Cr	183.7	20.4	*11.1*	200.9	28.5	14.2	195.8	43.7	22.3	15.9	193.5
Cu	5509.7	3694.6	67.1	2153.0	691.0	*32.1*	3293.2	2513.0	76.3	58.5	3652.0
Fe	100500	9119	9.1	101735	4777	*4.7*	100119	9337	9.3	7.7	100785
K	3207.1	112.5	3.5	3281.9	183.2	5.6	3241.6	37.2	*1.1*	3.4	3243.5
Li	13.2	1.0	7.7	12.7	0.6	*4.8*	12.6	0.4	*3.0*	5.2	12.8
Mg	6538	304	4.7	6505	357	5.5	6406	142	*2.2*	4.1	6483
Mn	823.8	83.9	10.2	799.9	26.9	*3.4*	771.9	81.5	10.6	8.0	798.6
Mo	4.1	1.0	*25.4*	5.3	2.9	55.3	4.0	1.3	33.3	38.0	4.4
Na	8746	368	4.2	8795	483	5.5	8509	440	5.2	5.0	8683
Ni	142.8	35.1	*24.6*	175.9	64.1	36.4	156.0	89.1	57.1	39.4	158.2
P	2536.5	134.0	*5.3*	2696.6	281.2	10.4	2518.9	204.6	8.1	7.9	2584.0
Pb	1401.6	730.5	52.1	982.5	87.8	*8.9*	1268.7	550.9	43.4	34.8	1217.6
S	2852.3	168.7	*5.9*	2935.3	328.8	11.2	2866.3	246.1	8.6	8.6	2884.6
Sb	29.8	4.6	15.4	27.9	2.3	*8.1*	27.4	5.8	21.1	14.9	28.4
Si	14559	791	5.4	14933	406	*2.7*	15531	873	5.6	4.6	15008
Sn	132.7	17.7	*13.3*	138.8	24.9	18.0	231.0	146.2	63.3	31.5	167.5
Sr	219.7	59.8	27.2	193.6	18.5	*9.6*	184.2	15.7	*8.5*	15.1	199.2
Ti	2612.7	84.9	*3.3*	2678.1	166.2	6.2	2586.0	116.7	4.5	4.7	2625.6
V	25.7	8.3	32.4	23.8	3.1	*13.0*	23.7	4.6	19.5	21.6	24.4
Zn	1810.5	145.3	*8.0*	2275.4	792.5	34.8	2739.0	1621.9	59.2	34.0	2274.9

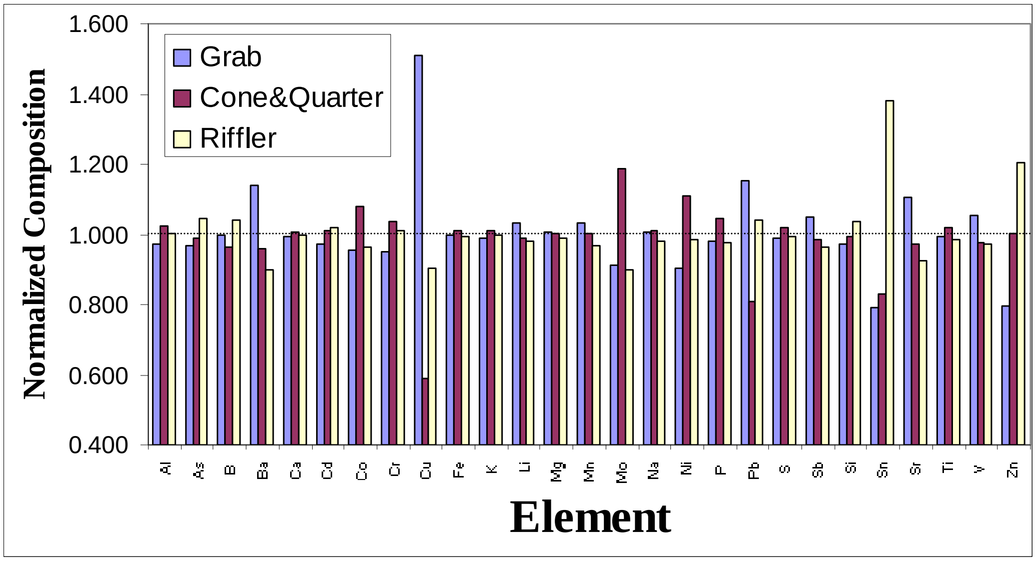


Figure III.1 *Normalized composition of MBA after sub-sampling*

Table III.2 *Leaching tests results on sub-sampled MBA (0 – 40 mm)*

	Grab 40 mm			Cone Quarter 40 mm			Riffler 40 mm		
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %
Al	56.154	5.746	10.23	54.569	5.296	9.70	59.354	8.051	13.56
As				-0.005	0.005	-102.18			
B	0.070	0.025	36.29	0.062	0.004	6.29	0.064	0.010	15.05
Ba	0.128	0.003	2.55	0.123	0.007	5.55	0.119	0.004	3.03
Ca	182.432	6.754	3.70	175.816	18.838	10.71	198.800	20.538	10.33
Cd	-0.001	0.000	-15.00	-0.001	0.000	-27.28	-0.001	0.000	-29.08
Co	0.000	0.003	544.74	0.000	0.001	752.08	-0.001	0.002	-178.34
Cr	0.025	0.002	7.50	0.021	0.004	17.03	0.021	0.007	33.62
Cu	0.508	0.034	6.71	0.480	0.086	17.90	0.529	0.052	9.82
Fe	0.020	0.003	12.54	0.016	0.001	9.07	0.013	0.002	13.31
K	39.169	6.220	15.88	35.461	6.700	18.89	38.921	1.815	4.66
Li	0.012	0.002	13.52	0.011	0.001	9.30	0.013	0.001	10.93
Mg	0.032	0.003	8.29	0.030	0.003	8.42	0.036	0.008	21.53
Mn	0.001	0.000	18.89	0.001	0.000	31.62	0.000	0.000	29.54
Mo	0.042	0.007	17.22	0.040	0.008	20.31	0.046	0.003	7.44
Na	143.225	22.482	15.70	131.057	25.958	19.81	144.910	6.528	4.51
Ni	0.006	0.001	8.75	0.004	0.001	25.04	0.005	0.002	53.71
P	0.105	0.004	4.08	0.102	0.015	14.44	0.117	0.010	8.44
Pb	-0.007	0.034	-462.67	0.003	0.012	447.39	0.009	0.028	314.28
S	80.982	4.804	5.93	75.975	11.479	15.11	94.010	10.808	11.50
Sb	0.030	0.004	14.35	0.032	0.004	12.60	0.035	0.002	4.96
Se	0.001	0.002	128.05	0.001	0.002	131.39	0.000	0.003	-1481.10
Si	2.554	0.198	7.74	2.542	0.306	12.04	2.737	0.287	10.47
Sn	0.006	0.007	113.51	0.001	0.004	646.31	-0.002	0.008	-425.54
Sr	0.896	0.073	8.14	0.766	0.126	16.48	0.860	0.110	12.85
Ti	0.000	0.000	408.89	0.000	0.000	#DIV/0!	0.000	0.000	187.08
V	0.002	0.001	41.98	0.001	0.001	40.05	0.001	0.000	45.54
Zn	0.025	0.005	22.11	0.022	0.003	14.82	0.020	0.006	29.77
pH	11.088	0.020	0.18	11.118	0.059	0.53	11.050	0.097	0.88
mS	1.512	0.081	5.38	1.362	0.136	9.98	1.550	0.100	6.47

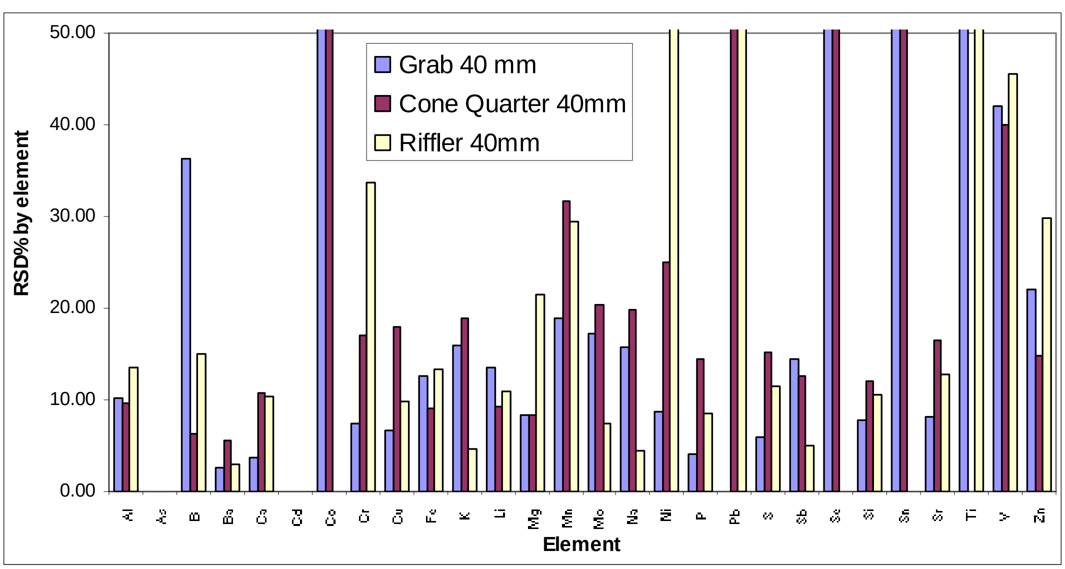


Figure III.2 *Relative standard deviation (%) for MBA 0 - 40 mm by element and sampling method*

Table III.3 *Leaching tests results on sub-sampled MBA (0 – 10 mm)*

	Grab 10 mm			Cone Quarter 10 mm			Riffler 10 mm		
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %
Al	58.924	5.338	9.06	64.836	3.730	5.75	58.905	7.530	12.78
As	-0.009	0.007	-72.10	-0.006	0.004	-58.56	-0.009	0.008	-84.01
B	0.062	0.012	19.37	0.069	0.004	5.89	0.063	0.017	26.47
Ba	0.113	0.002	1.75	0.110	0.002	2.22	0.107	0.004	3.51
Ca	203.503	12.763	6.27	212.583	13.908	6.54	213.155	19.342	9.07
Cd	-0.001	0.000	-35.55	-0.001	0.000	-46.90	-0.001	0.000	-5.73
Co	0.001	0.001	147.65	0.001	0.003	420.91	-0.001	0.002	-184.78
Cr	0.027	0.006	24.36	0.023	0.003	13.96	0.021	0.007	34.98
Cu	0.580	0.051	8.77	0.592	0.065	10.91	0.566	0.050	8.85
Fe	0.014	0.001	6.99	0.013	0.002	12.52	0.012	0.002	14.18
K	41.508	1.814	4.37	44.519	5.244	11.78	41.109	2.356	5.73
Li	0.014	0.001	6.79	0.013	0.001	7.06	0.015	0.002	10.99
Mg	0.036	0.004	11.81	0.038	0.004	10.56	0.038	0.007	17.86
Mn	0.001	0.000	39.09	0.001	0.000	28.46	0.000	0.000	52.70
Mo	0.049	0.006	11.40	0.053	0.007	13.27	0.052	0.005	8.72
Na	153.114	6.805	4.44	166.376	20.205	12.14	152.549	9.517	6.24
Ni	0.004	0.002	44.43	0.003	0.001	29.16	0.003	0.001	46.84
P	0.132	0.009	6.57	0.139	0.014	9.86	0.141	0.012	8.28
Pb	-0.005	0.013	-251.23	-0.001	0.014	-1066.20	0.002	0.016	1025.72
S	97.896	9.445	9.65	102.115	9.916	9.71	108.031	11.460	10.61
Sb	0.028	0.004	14.39	0.028	0.004	15.09	0.030	0.002	7.58
Se	0.003	0.003	109.55	0.002	0.003	188.28	0.002	0.002	106.01
Si	2.851	0.335	11.77	2.995	0.230	7.66	2.797	0.200	7.14
Sn	-0.003	0.005	-188.81	0.003	0.004	162.79	-0.009	0.005	-54.23
Sr	0.962	0.085	8.87	0.964	0.080	8.30	0.928	0.101	10.87
Ti	0.000	0.000	215.70	0.000	0.000	-156.49	0.000	0.000	-840.39
V	0.001	0.000	21.99	0.002	0.000	7.20	0.001	0.000	41.66
Zn	0.018	0.003	15.14	0.016	0.002	12.88	0.017	0.003	19.93
pH	11.020	0.062	0.56	11.008	0.049	0.44	11.048	0.086	0.78
mS	1.560	0.024	1.57	1.644	0.109	6.62	1.606	0.044	2.74

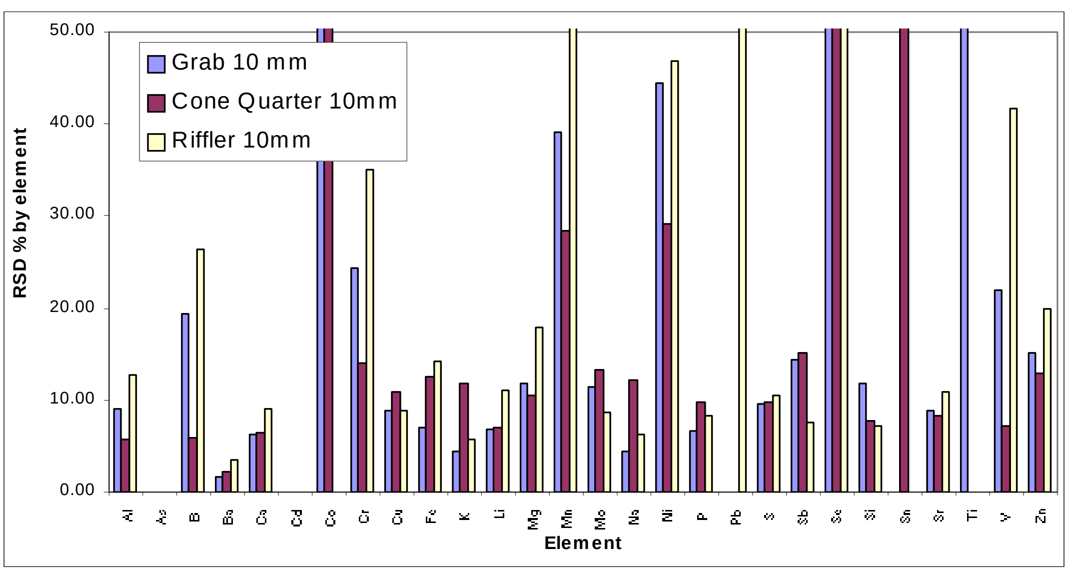


Figure III.3 *Relative standard deviation (%) for MBA 0 - 10 mm by element and sampling method*

Table III.4 *Leaching tests results on sub-sampled MBA (0 – 4 mm)*

	Grab 4 mm			Cone Quarter 4 mm			Riffler 4 mm		
mg/liter	Average	STDEV	Rstd %	Average	STDEV	Rstd %	Average	STDEV	Rstd %
Al	66.797	6.775	10.14	75.661	5.628	7.44	70.793	4.952	7.00
As	-0.008	0.005	-55.06	-0.013	0.005	-40.38	-0.005	0.004	-80.73
B	0.081	0.027	32.97	0.071	0.006	8.75	0.076	0.015	19.55
Ba	0.107	0.004	3.50	0.106	0.002	1.90	0.102	0.003	3.10
Ca	204.708	6.612	3.23	217.564	10.891	5.01	217.153	11.305	5.21
Cd	-0.001	0.000	-24.12	-0.001	0.000	-17.80	-0.001	0.000	-39.12
Co	-0.001	0.003	-263.28	-0.002	0.002	-134.40	-0.001	0.003	-447.77
Cr	0.014	0.005	38.22	0.012	0.001	9.90	0.010	0.002	23.37
Cu	0.515	0.054	10.49	0.546	0.031	5.62	0.496	0.038	7.59
Fe	0.011	0.001	11.28	0.011	0.003	22.37	0.009	0.002	17.44
K	40.772	4.781	11.73	44.368	1.412	3.18	38.835	3.335	8.59
Li	0.015	0.001	5.99	0.014	0.001	5.72	0.015	0.001	4.04
Mg	0.038	0.003	8.57	0.043	0.005	12.55	0.045	0.003	7.58
Mn	0.000	0.000	39.49	0.001	0.000	28.08	0.000	0.000	26.15
Mo	0.048	0.005	10.23	0.054	0.003	5.09	0.051	0.006	11.45
Na	152.079	17.332	11.40	165.923	5.616	3.38	145.192	13.598	9.37
Ni	0.003	0.001	55.23	0.002	0.001	48.17	0.003	0.001	34.05
P	0.140	0.007	4.90	0.151	0.005	3.42	0.150	0.010	6.57
Pb	-0.012	0.008	-70.01	-0.002	0.013	-668.04	-0.008	0.007	-85.20
S	100.890	7.263	7.20	104.867	7.040	6.71	110.253	7.377	6.69
Sb	0.030	0.004	13.16	0.032	0.004	12.16	0.033	0.004	13.38
Se	0.001	0.004	348.43	0.002	0.003	123.16	0.001	0.004	409.63
Si	2.769	0.598	21.58	2.845	0.131	4.59	2.448	0.153	6.27
Sn	0.000	0.006	3112.68	-0.004	0.010	-243.90	0.003	0.007	224.60
Sr	0.958	0.061	6.35	0.975	0.029	3.01	0.906	0.058	6.43
Ti	0.000	0.000	309.71	0.000	0.001	288.07	0.000	0.000	-452.77
V	0.001	0.000	33.42	0.002	0.000	18.67	0.001	0.000	21.02
Zn	0.018	0.002	12.66	0.016	0.002	11.91	0.015	0.003	17.24
pH	11.004	0.029	0.26	10.962	0.056	0.51	10.984	0.048	0.44
mS	1.570	0.068	4.34	1.620	0.046	2.86	1.524	0.077	5.03

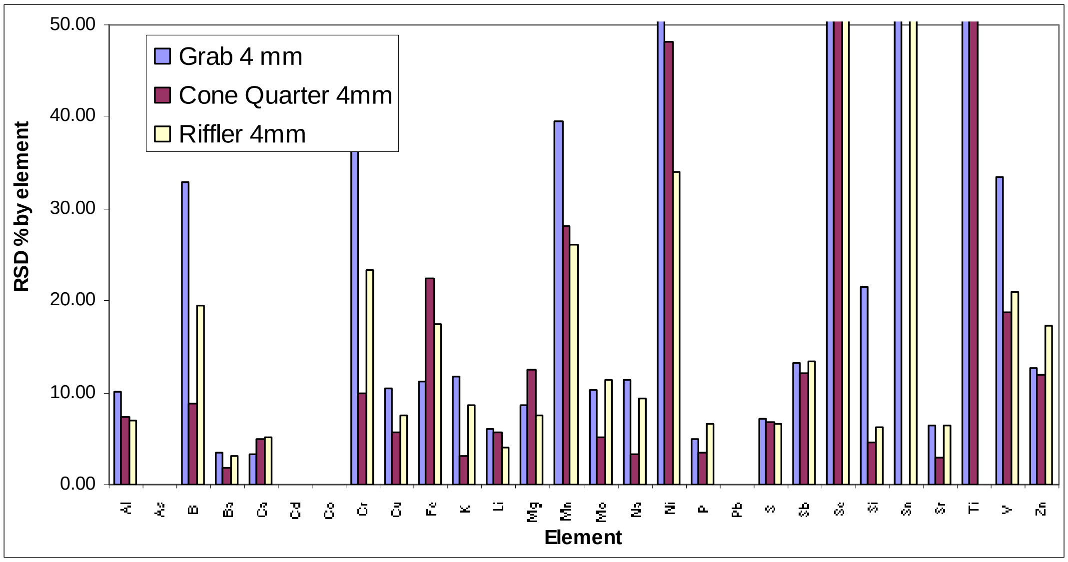


Figure III.4 *Relative standard deviation (%) for MBA 0 - 4 mm by element and by sampling method*

APPENDIX IV PARTICLE SIZE EFFECTS ON LEACHING (FROM REF [3])

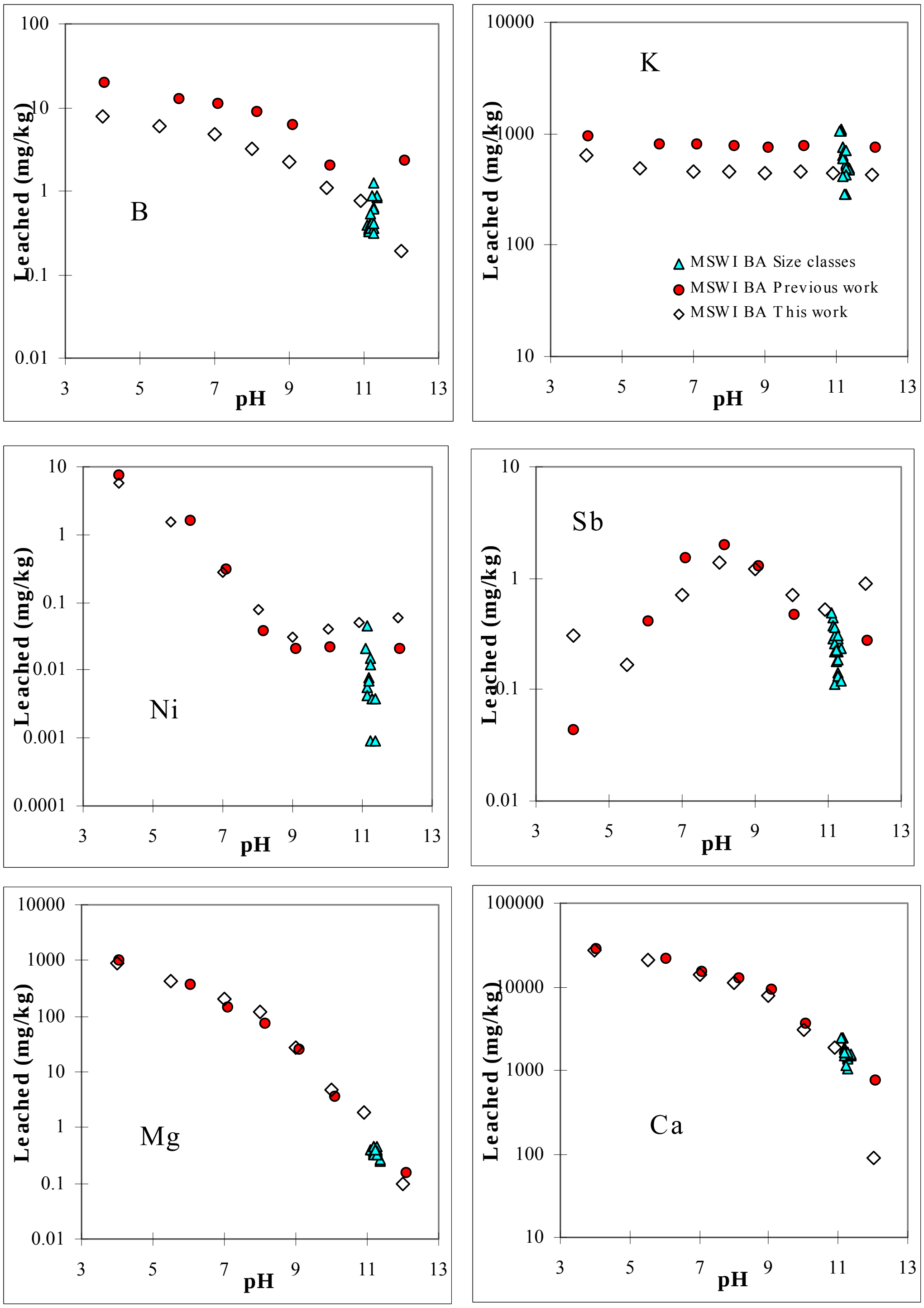


Figure 1 *Comparison of pH dependence test data for MSWI bottom ash from previous work [16] and from this work to illustrate consistent leaching behaviour. Triangles reflect the batch test results for different particle size distributions*

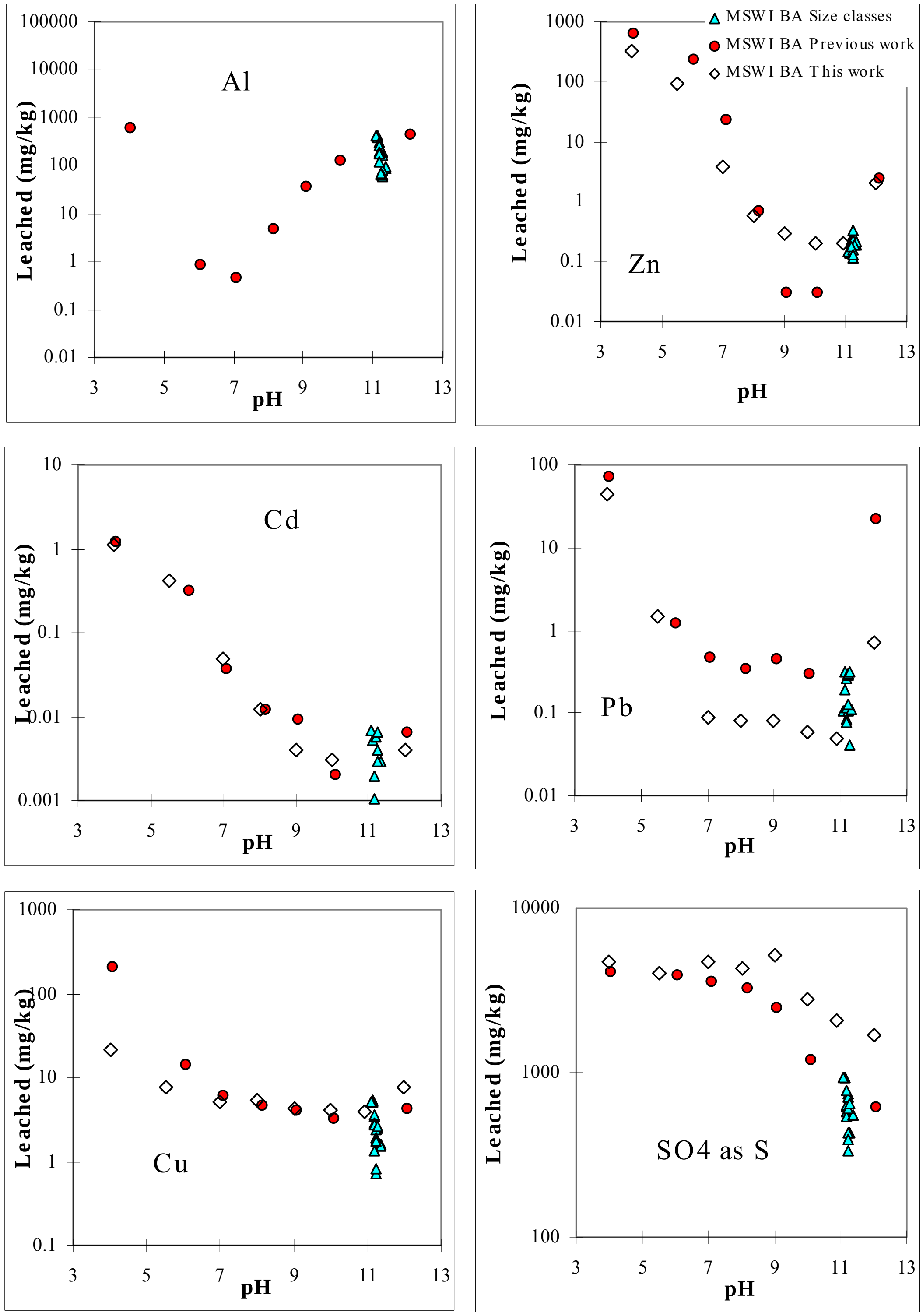


Figure 1 (continued) *Comparison of pH dependence test data for MSWI bottom ash from previous work [16] and from this work to illustrate consistent leaching behaviour. Triangles reflect the batch test results for different particle size distributions*

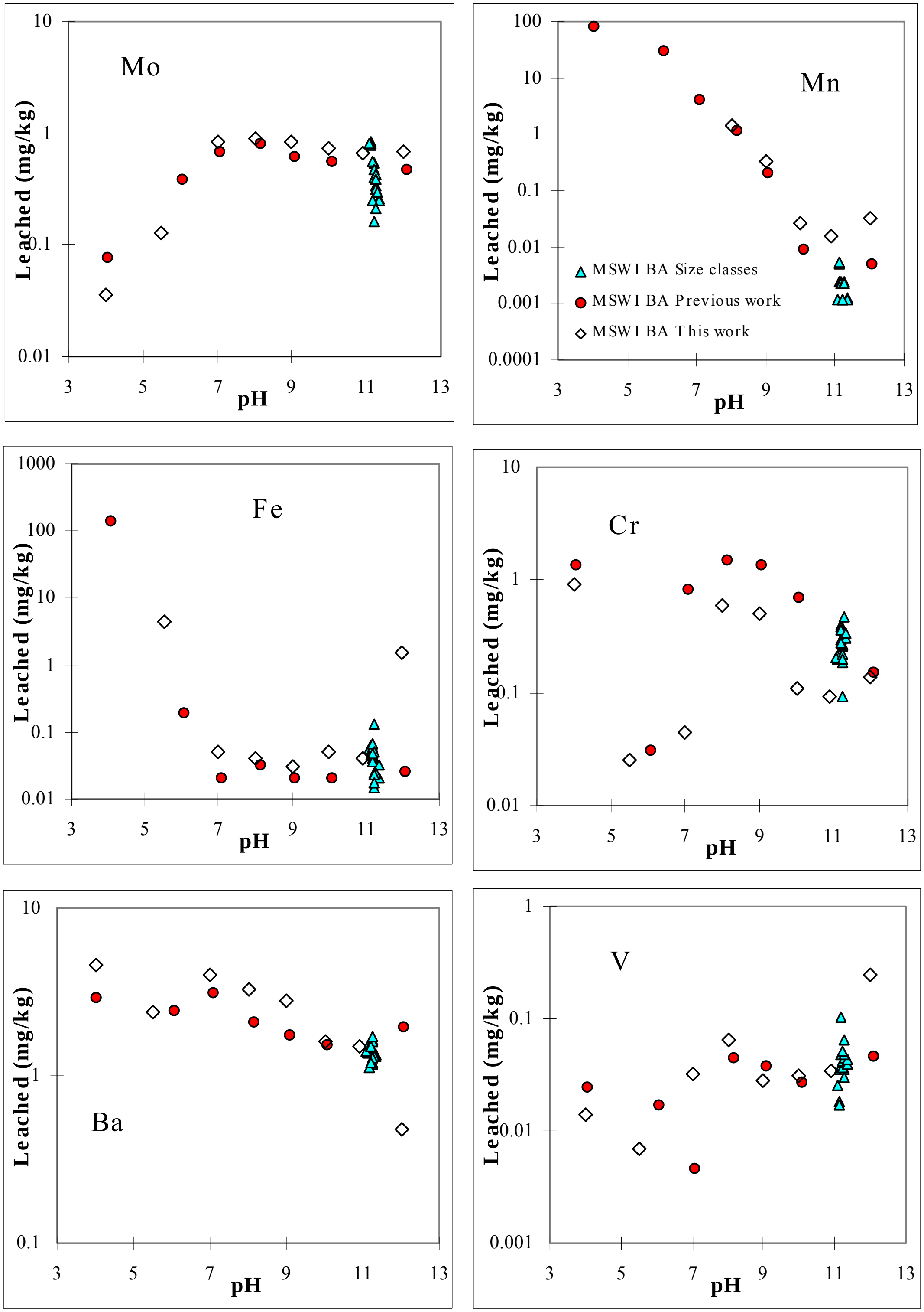


Figure 1 (continued) *Comparison of pH dependence test data for MSWI bottom ash from previous work [16] and from this work to illustrate consistent leaching behaviour. Triangles reflect the batch test results for different particle size distributions*

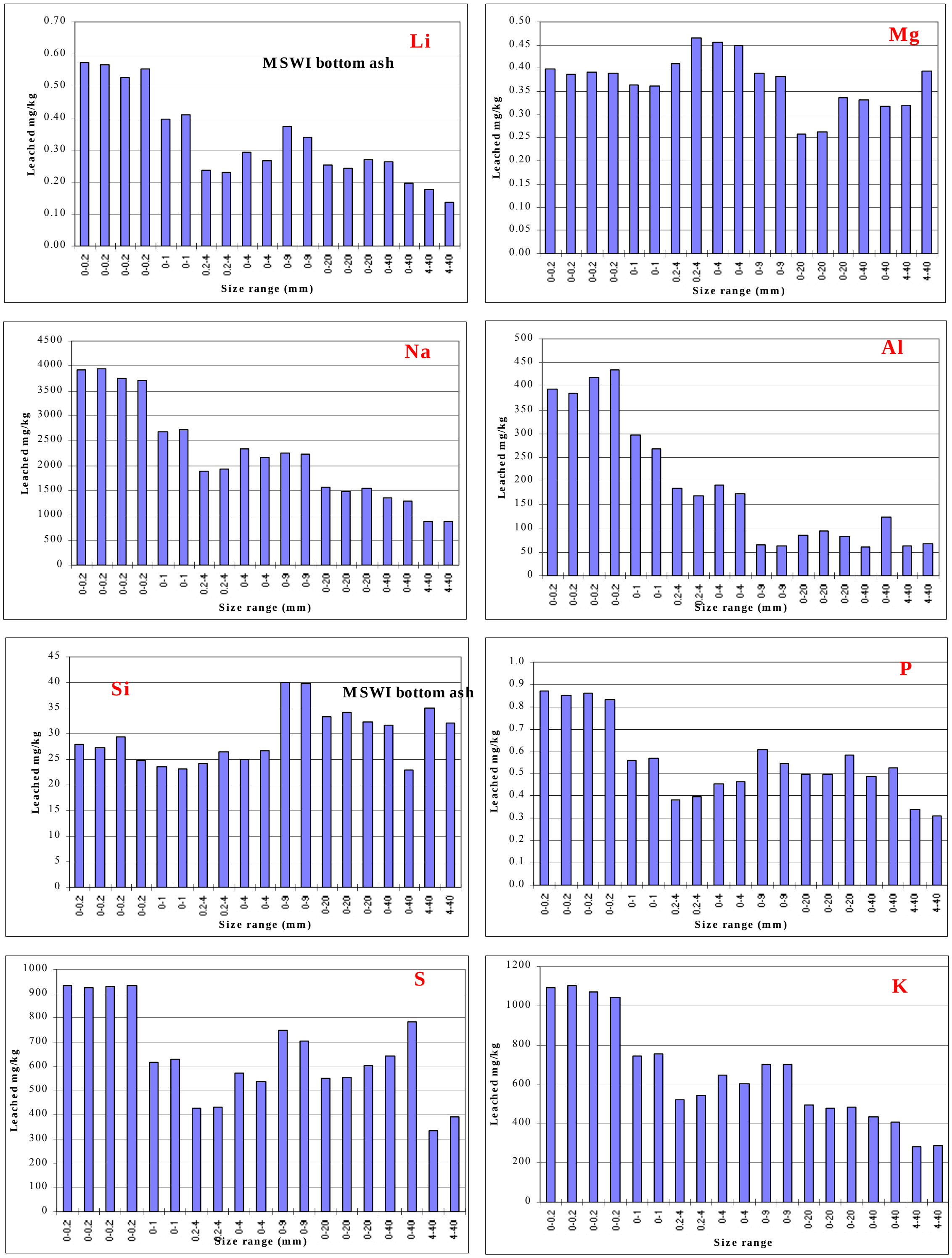


Figure 2 *Bar graphs of test results obtained in a 24 hours leaching test according to EN 12457-2 for different particle size distributions*

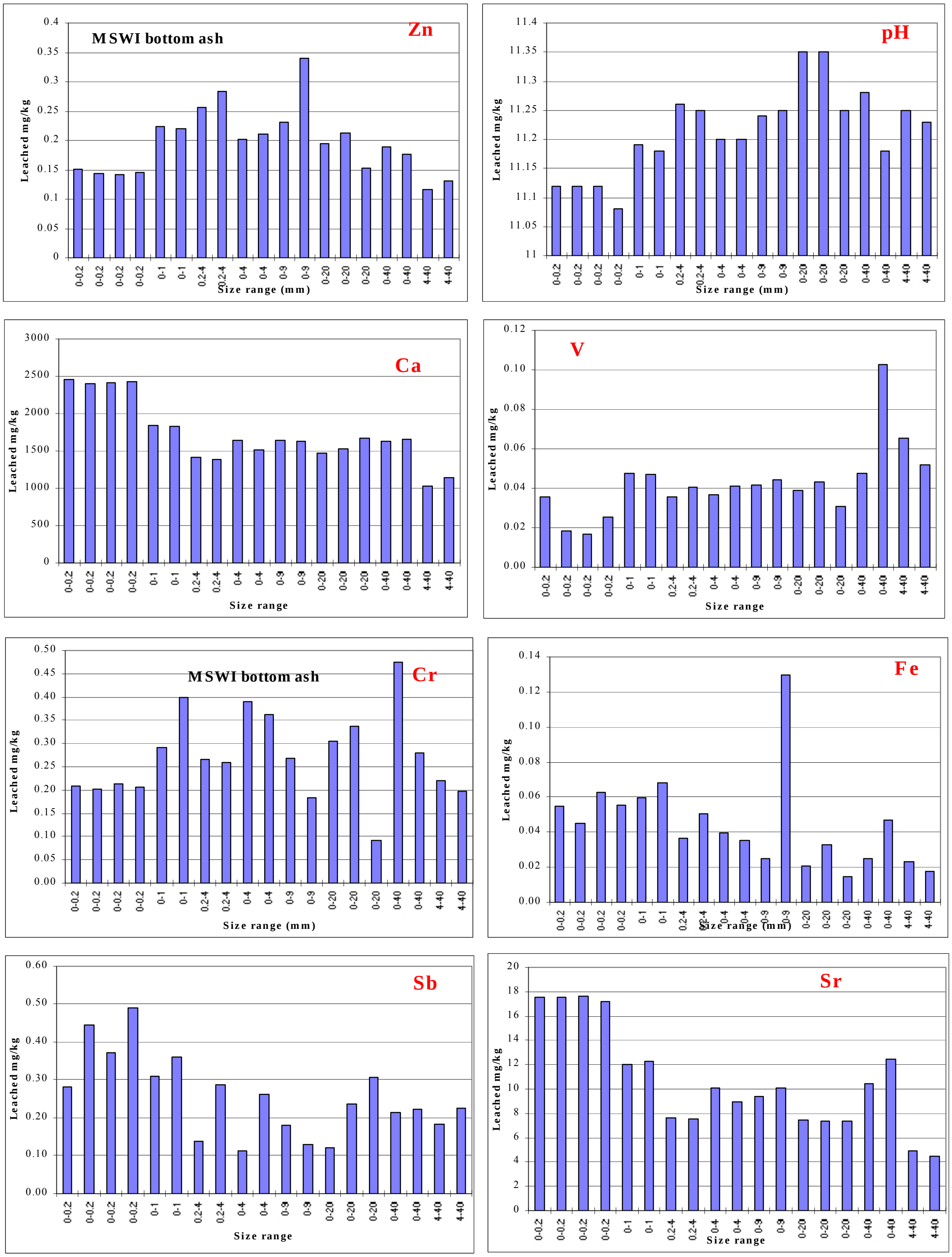


Figure 2 (Continued) *Bar graphs of test results obtained in a 24 hours leaching test according to EN 12457-2 for different particle size distributions*

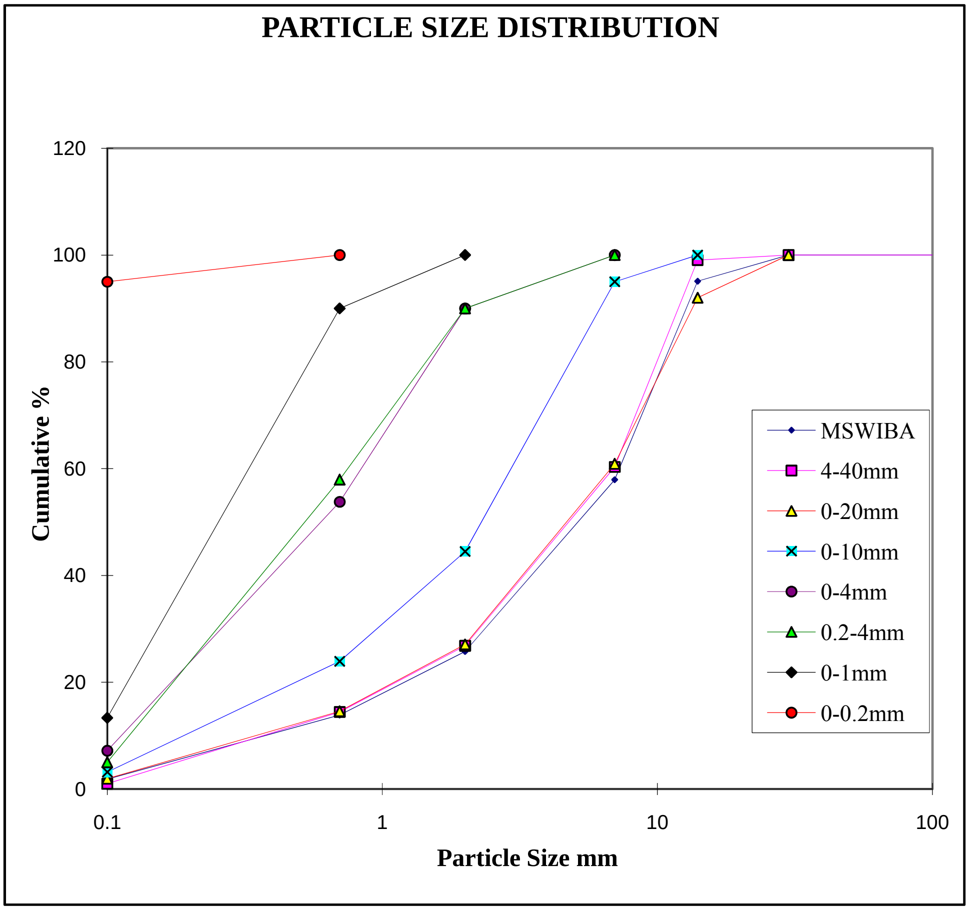


Figure 3 *Particle size distributions for the different size fractions of MSWI bottom ash*

December 2001 ECN-C--01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 4. Statistical evaluation of the standard eluate analysis

ECN (NL)

CONTENTS

1. INTRODUCTION

For a proper evaluation of analytical performance of participating laboratories a Standard Eluate has been prepared to be analysed by all participants in ruggedness testing, validation of EN 12457 and eluate analysis methods EN 13370 and EN 12506. Each analytical laboratory involved in testing within this intercomparison work shall run an analysis of Standard Eluate in parallel to the eluates from leaching tests. This Standard Eluate is to be prepared by one laboratory and tested by it for composition and stability. The stability is tested over the time frame of the validation study.

All laboratories taking part in the leaching test validation shall analyse the parameters selected for the respective wastes using a limited selection of most common analytical methods (e.g ICP-AES, AAS, IC) to be specified with the delivery of the samples.

2. MATERIALS AND METHODS

The Standard Eluate is composed of a pulverized coal fly ash leachate and a MSWI fly ash leachate in a suitable mixing ratio. Previous experience has demonstrated the suitability of this mixture [1]. The eluate from coal fly ash provides oxyanions and the eluate from MSWI fly ash provided elevated metal concentrations. These solutions are true eluates and not synthetic solutions, but the level of interference has been shown to be low.

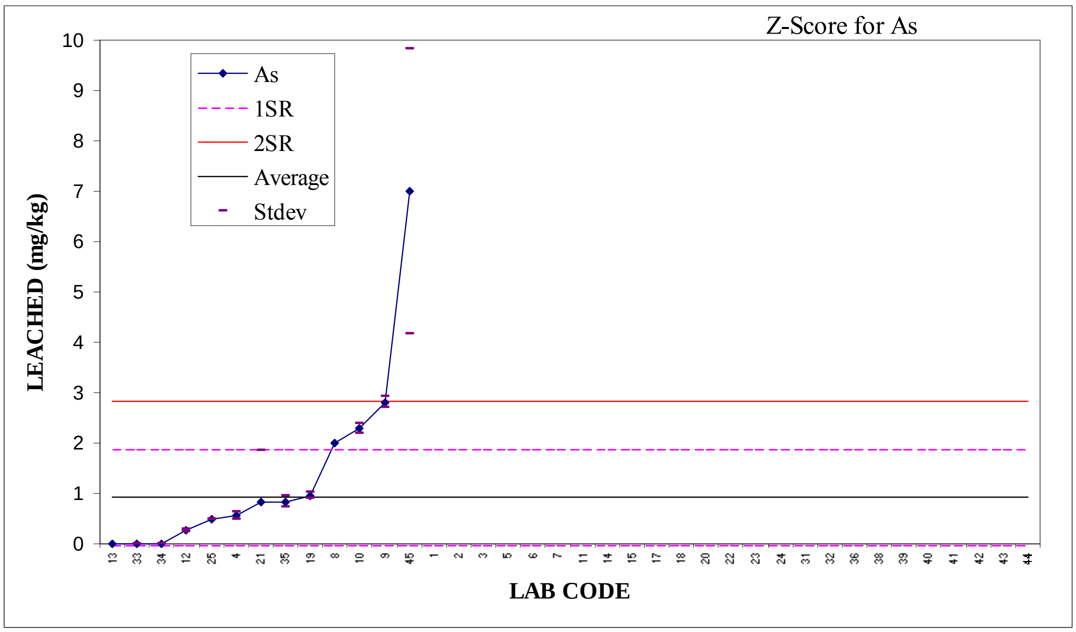
3. DATA HANDLING

The data obtained for the Standard Eluate as obtained in different parts of the program are evaluated using ISO 5725 – 2, in which Grubb's and Cochran's criteria are applied to identify outliers. A spreadsheet has been developed [2] for the evaluation of the data.

4. RESULTS OF THE STATISTICAL TREATMENT

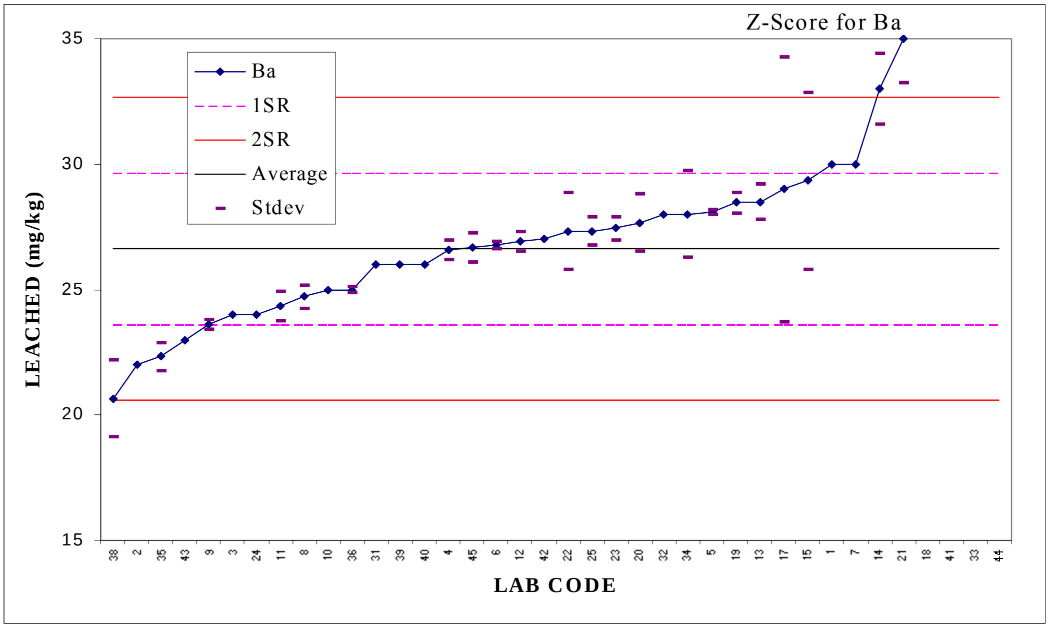
A graphical presentation of the data by element (alphabetical) is given in sections 4.1 to 4.14 for the elements selected in the validation for the 7 materials studied. An additional set of parameters is provided in the Appendix I. In total 37 laboratories participating in the EN 12457 validation have provided data on this Standard Eluate. In the Eluate analysis validation program an additional 14 labs have analysed this eluate. Results will be presented in Part 8 Eluate Analysis validation. Here only the results will be presented to allow a comparison between the two similar data sets.

4.1 Arsenic



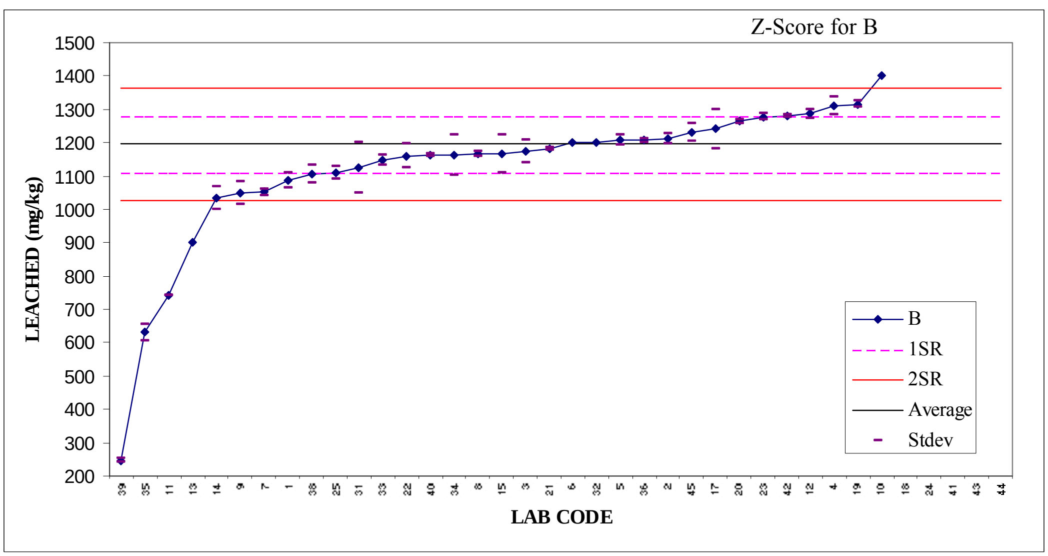
Sample	**STE**	Average	0.93	µg/l	s_r	0.06	ug/l	6.7	%
Test	**ANALYSIS**	STD	1.00	µg/l	s_R	0.95	ug/l	102	%
Reject	21, 45								

4.2 Barium



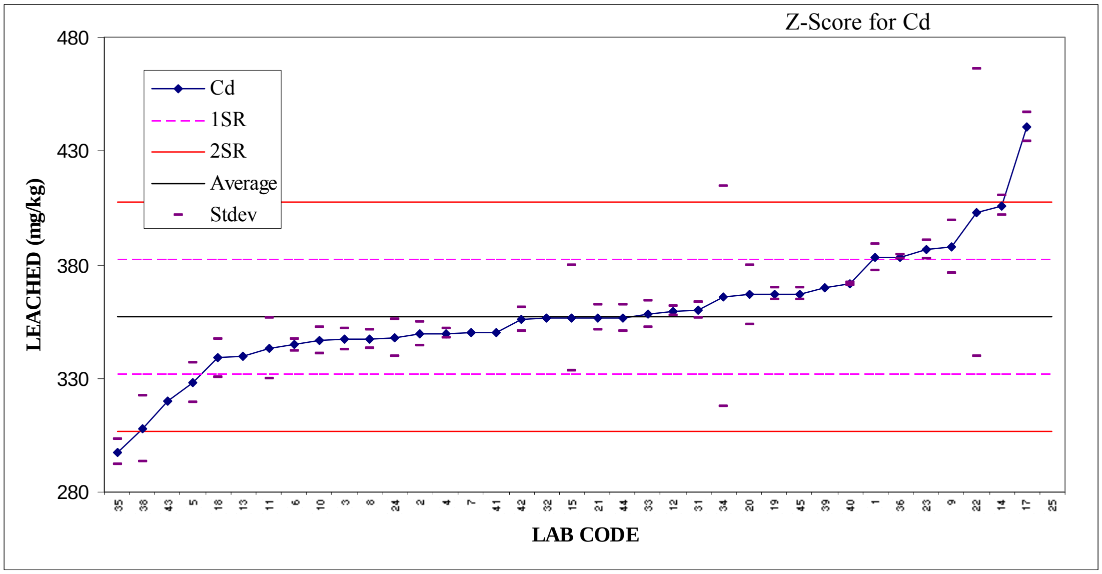
Sample	**STE**	Average	26.63	µg/l	s_r	0.95	ug/l	3.6	%
Test	**ANALYSIS**	STD	2.98	µg/l	s_R	3.03	ug/l	11	%
Reject	17,18,33,41								

4.3 Boron



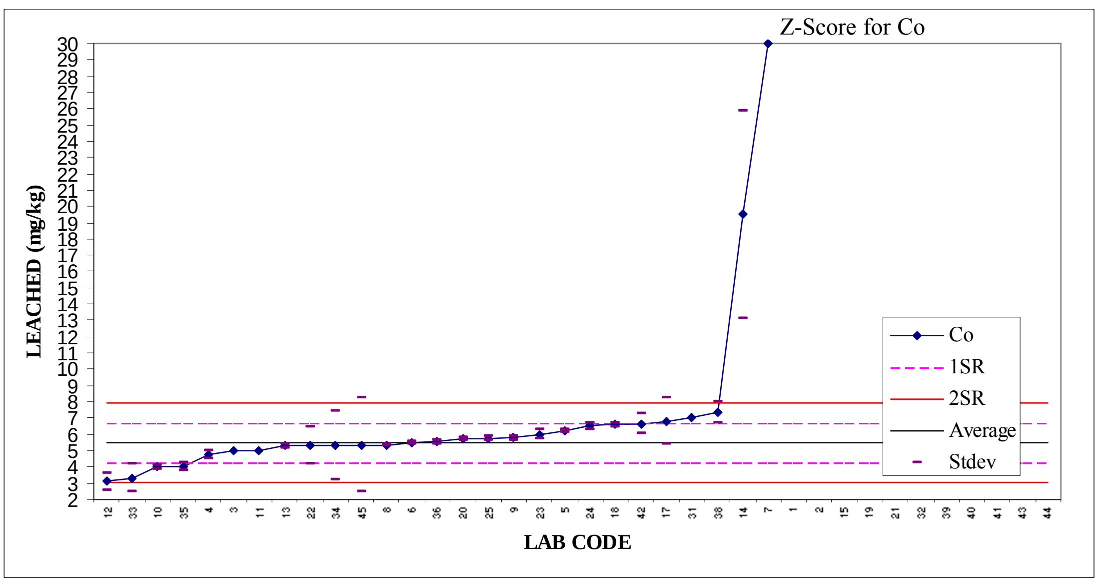
Sample	**STE**	Average	1196	µg/l	s_r	29.1	ug/l	2.4	%
Test	**ANALYSIS**	STD	82	µg/l	s_R	84.5	ug/l	7	%
Reject	11,13,14,35,39								

4.4 Cadmium



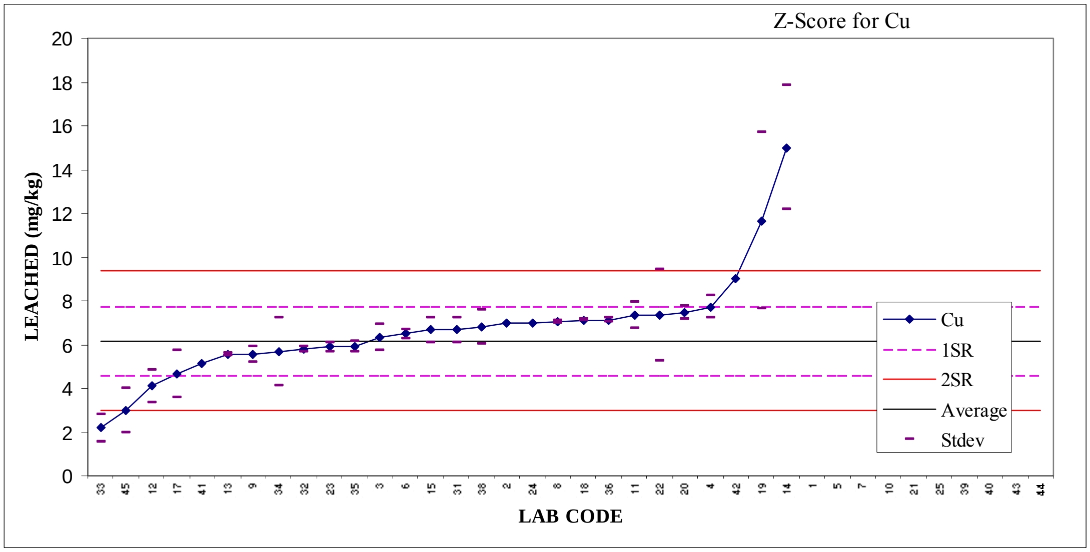
Sample	**STE**	Average	357	µg/l	s_r	7.36	ug/l	2.1 %
Test	**ANALYSIS**	STD	26.0	µg/l	s_R	25.21	ug/l	7 %
Reject	22,34							

4.5 Cobalt



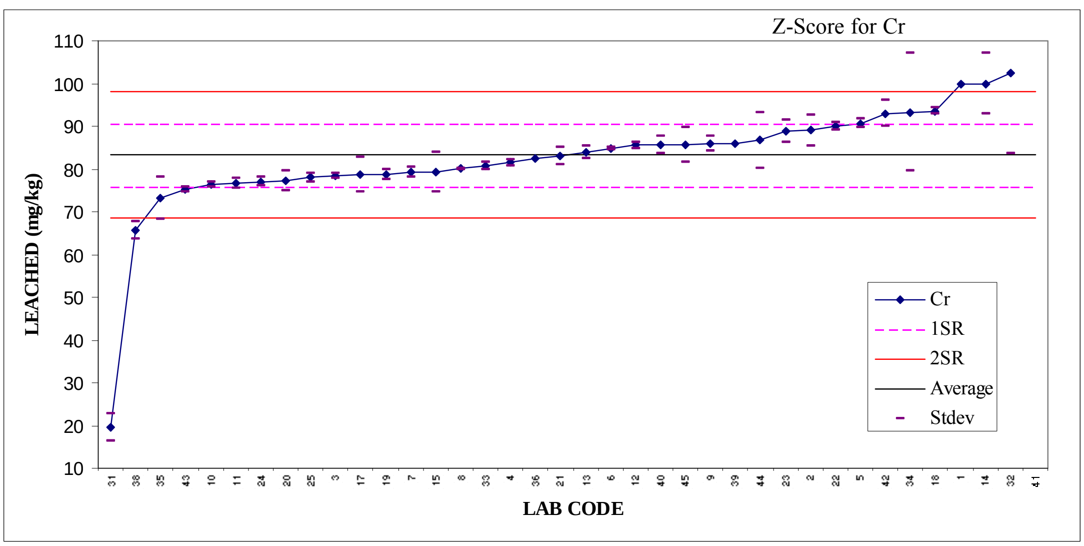
Sample	**STE**	Average	6	µg/l	s_r	0.6	ug/l	11.4 %
Test	**ANALYSIS**	STD	1	µg/l	s_R	1.2	ug/l	22 %
Reject	7,14,45							

4.6 Copper



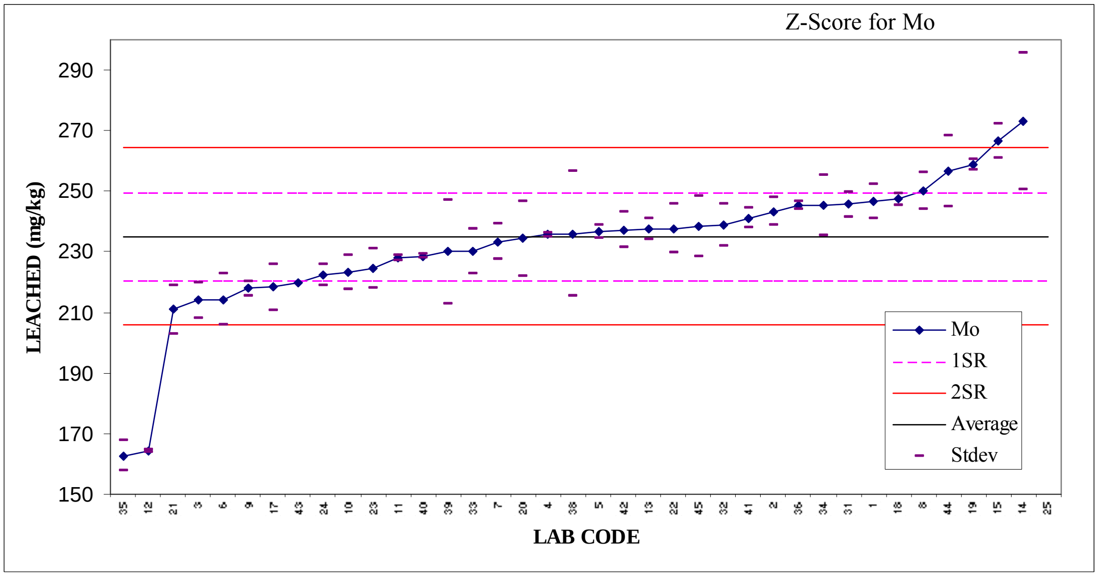
Sample	**STE**	Average	6.17	µg/l	s_r	0.69	ug/l	11.2 %
Test	**ANALYSIS**	STD	1.48	µg/l	s_R	1.59	ug/l	26 %
Reject	14,19							

4.7 Chromium



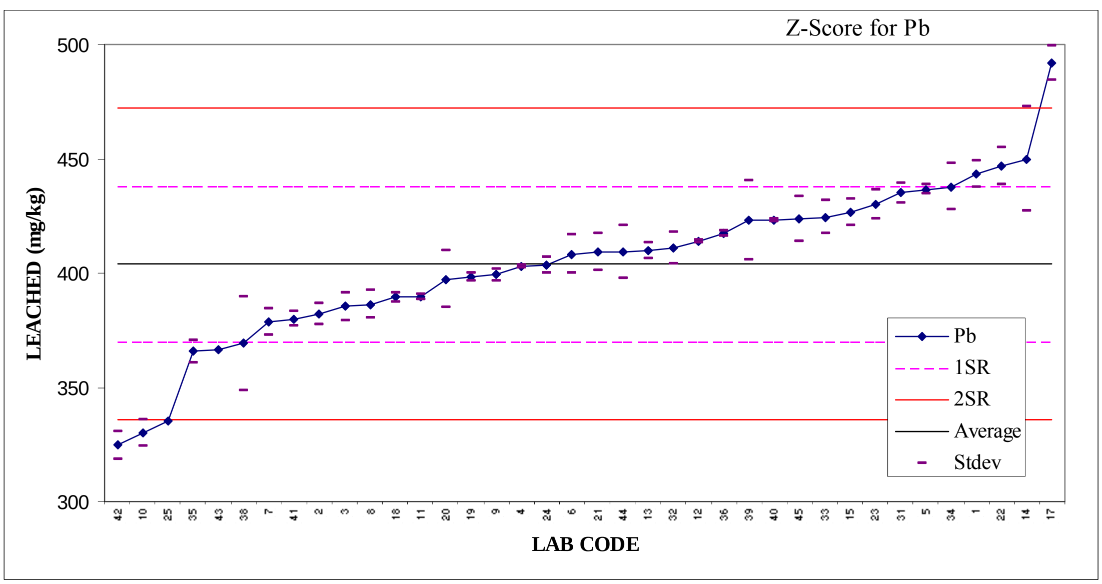
Sample	**STE**	Average	83.3	µg/l	s_r	2.53	ug/l	3.0 %
Test	**ANALYSIS**	STD	7.29	µg/l	s_R	7.41	ug/l	9 %
Reject	31,32,34							

4.8 Molybdenum



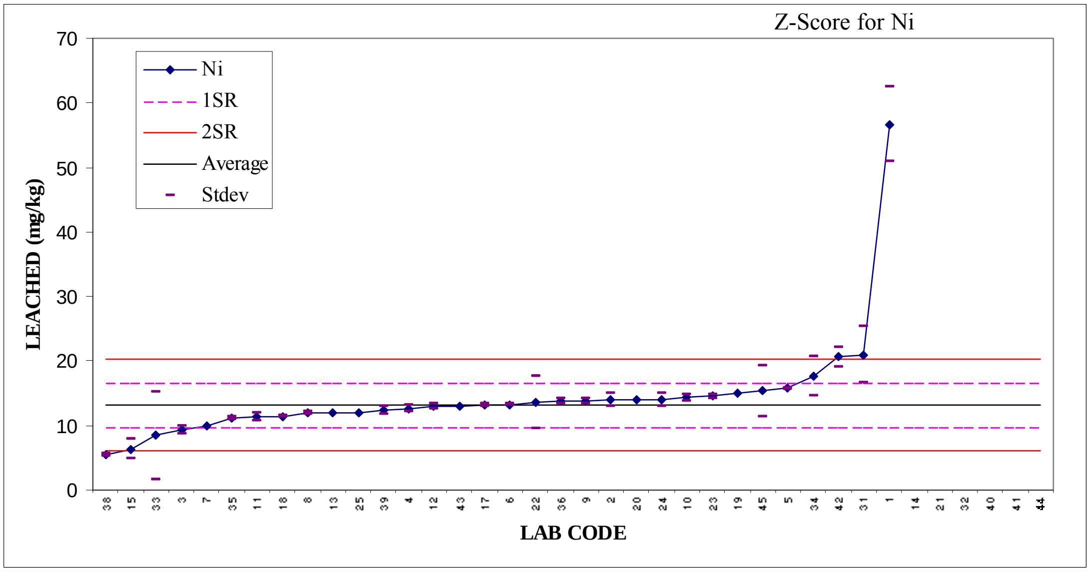
Sample	**STE**	Average	235.14	µg/l	s_r	6.84	ug/l	2.9	%
Test	**ANALYSIS**	STD	13.50	µg/l	s_R	14.65	ug/l	6	%
Reject	12,14,35,38								

4.9 Lead



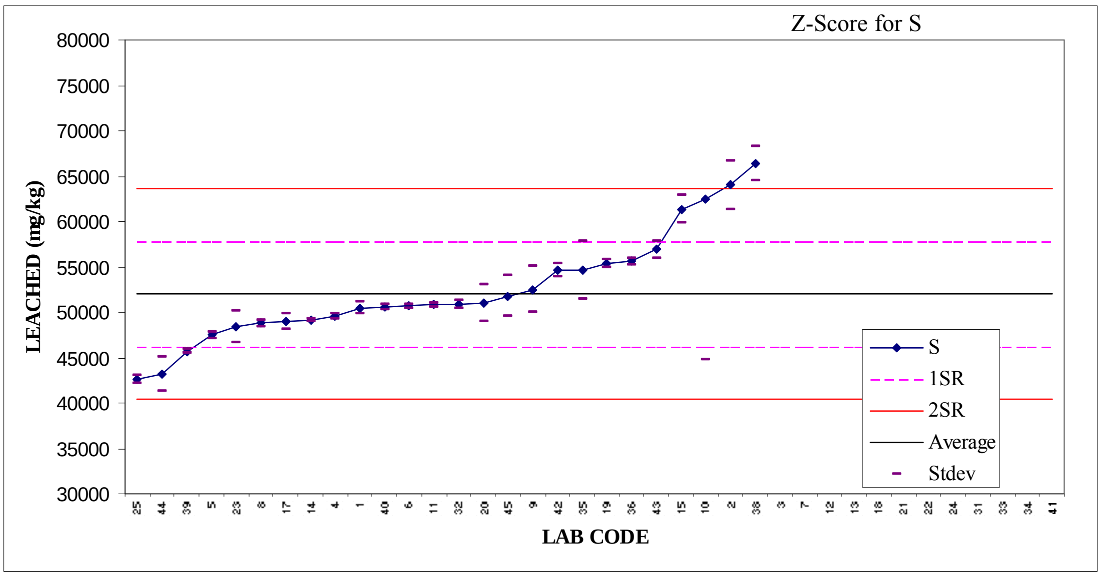
Sample	**STE**	Average	404.09	µg/l	s_r	13.58	ug/l	3.4	%
Test	**ANALYSIS**	STD	34.11	µg/l	s_R	34.15	ug/l	8	%
Reject	none								

4.10 Nickel



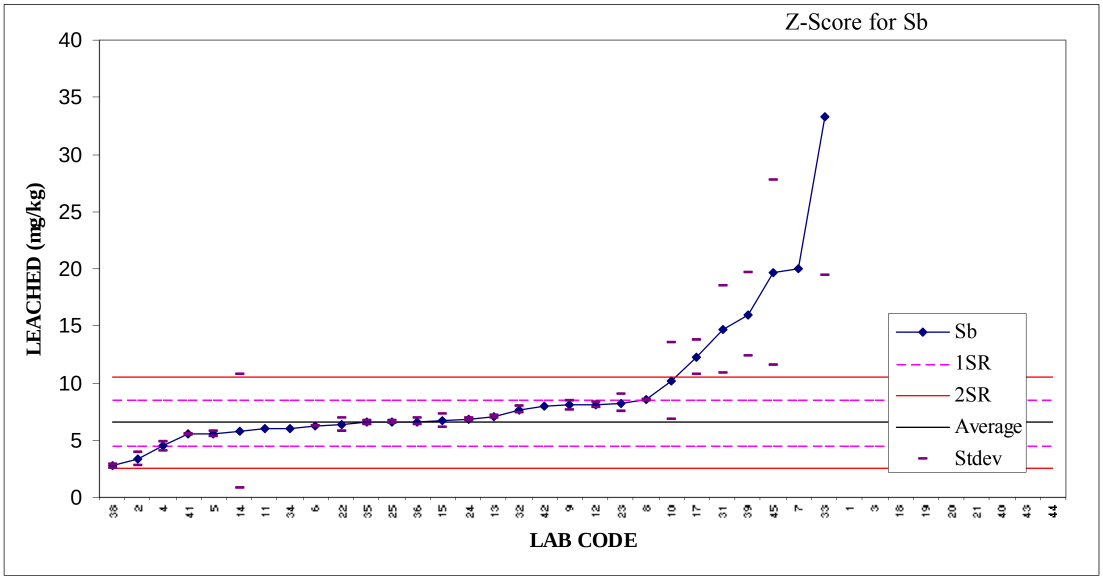
Sample	STE	Average	13.20	µg/l	s_r	1.57	ug/l	11.9	%
Test	ANALYSIS	STD	3.25	µg/l	s_R	3.53	ug/l	27	%
Reject	1,33								

4.11 Sulphate



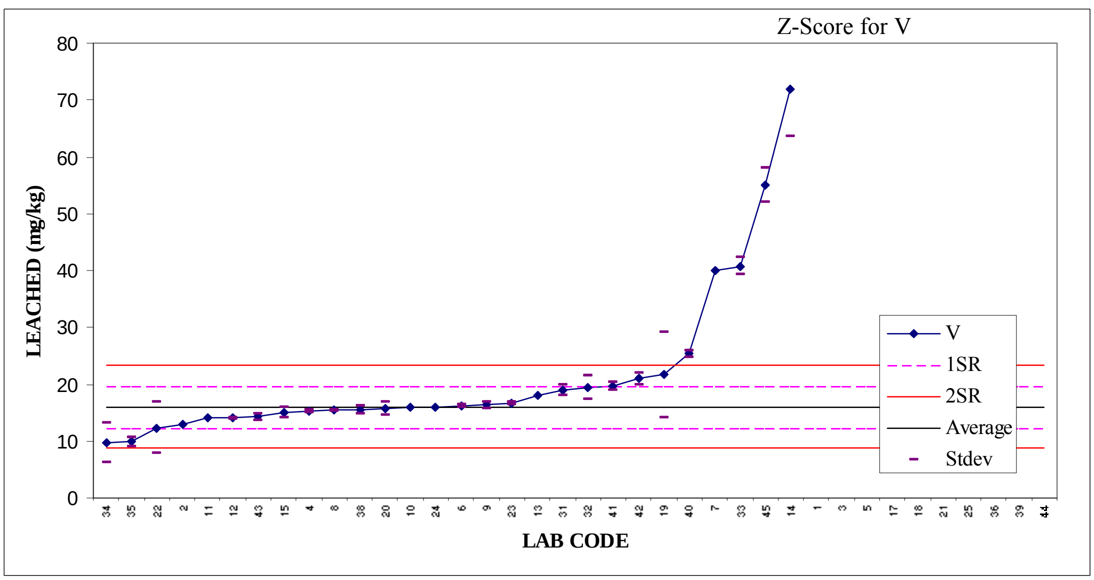
Sample	STE	Average	52054	µg/l	s_r	1437	ug/l	2.8	%
Test	ANALYSIS	STD	5704	µg/l	s_R	5778	ug/l	11	%
Reject	10								

4.12 Antimony



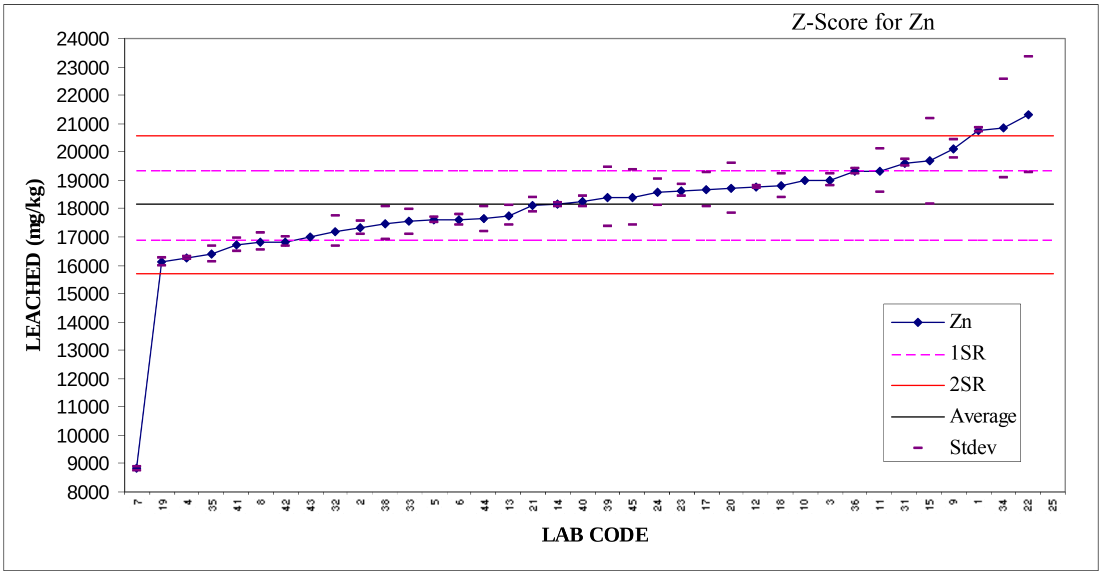
Sample	**STE**	Average	6.56	µg/l	s_r	1.33	ug/l	20.3	%
Test	**ANALYSIS**	STD	1.66	µg/l	s_R	2.00	ug/l	30	%
Reject	7,17,31,33,39, 45								

4.13 Vanadium



Sample	**STE**	Average	15.99	µg/l	s_r	1.40	ug/l	8.8	%
Test	**ANALYSIS**	STD	3.46	µg/l	s_R	3.65	ug/l	23	%
Reject	7,14,19,33,45								

4.14 Zinc



Sample	**STE**	Average	18134	µg/l	s_r	500.5	ug/l	2.8	%
Test	**ANALYSIS**	STD	1132	µg/l	s_R	1217	ug/l	7	%
Reject	7,22,34								

5. COMPARISON STANDARD ELUATE ANALYSIS OF LEACH TEST AND ELUATE ANALYSIS VALIDATION PROGRAM

The data from the Eluate Analysis Validation program (Part 8) are given in table 5.1 together with the data from the Leaching test validation program (Part 5).

Table 5.1 *Standard Eluate analysis*

		Eluate Analysis Validation						Leaching Test Validation					
Element	Units	Labs	Values	Outl.	Mean	s_r %	s_R %	Labs	Values	Outl.	Mean	s_r %	s_R %
As	µg/l	3	7		10.9	112.8	130.3	13	26	2	0.93	6.7	102
Ba	µg/l	15	42	1	27.1	3.95	12.85	34	68	4	26.6	3.6	11
Be	µg/l	4	10		1.39	1.06	145.1						
B	mg/l							34	68	5	1.196	2.4	7.1
Cd	µg/l	14	42	6	365	2.01	8.09	36	72	2	357	2.1	7.1
Co	µg/l	9	27	3	5.85	7.21	9.3	25	50	3	6.00	11.4	21
Cr	µg/l	15	45	3	81.8	4.18	8.53	36	72	3	83.3	3	8.9
Cu	µg/l	10	30	5	7.66	14.98	16.75	25	50	2	6.17	11.2	26
Mo	µg/l	14	41	3	70.3	5.27	16.05	36	72	4	235	2.9	6.2
Ni	µg/l	11	32	3	13.3	6.23	17.22	29	58	2	13.2	11.9	27
P	mg/l	4	12		91.7	10.27	86.76						
Pb	µg/l	14	41	4	75.9	4.21	21.2	37	74		404	3.4	8.5
Sb	µg/l							31	62	6	6.56	20.3	30
SO4 as S	mg/l	9	27	3	50.5	1.48	7.62	28	56	1	52.0	2.8	11
V	µg/l	12	34	4	24.9	5.71	18.5	31	62	5	15.99	8.8	23
Zn	µg/l	16	47		18600	3.31	8.9	36	72	3	18134	2.8	6.7

The analysis of the Standard Eluate by laboratories participating in the validation work in September 2000 (Leaching test validation) and March 2001 (Eluate Analysis validation) lead to the same results with the exception of Mo and Pb. When the concentration difference between September 2000 and March 2001 is recalculated to molar concentration, it turns out that the decrease of Pb and Mo is equimolar, which would point at precipitation of a form of Pbmolybdate. The within laboratory variability s_r (repeatability) and the between laboratory variability s_R (reproducibility) between the two series of analysis proves to be very similar, which implies that the analytical capabilities of European laboratories are consistent. Discrepancies will develop as soon as measurements are carried near the detection limits of the methods applied.

6. CONCLUSIONS

The within laboratory variability or repeatability in the chemical analysis of the Standard Eluate is generally very good. The repeatability (s_r) is often within 4 %. As the concentration to be measured decreases the uncertainty increases, here up to about 12%.

The between laboratory variability or reproducibility in the chemical analysis of the Standard Eluate is on average a factor 2.6 larger than the within laboratory variability, which is quite good for a European wide validation. The repeatability (s_R) is often within 10 % relative standard deviation.

A Standard Eluate such as applied here is a useful means of evaluating analytical performance in validating leaching tests, in which eluate analysis is an integral part.

In table 5.2 the performance characteristics of the Standard eluate analyses for the individual elements are provided.

Table 5.2 Repeatability (s_r) and reproducibility (s_R) of the Standard Eluate (n=37).

	Average µg/l	Stdev	s_r %	s_R %	r	R	Rejected
As	0.93	1.00	6.7	102	0.17	2.7	21, 45
B	1195	82	2.4	7.1	81	236	11,13,14,35,39
Ba	26.6	2.98	3.6	11	2.7	8.5	17,18,33,41
Ca	95905	5808	2.2	6.4	6016	17107	7,31
Cd	357	26.0	2.1	7.1	20	70	22,34
Co	5.51	1.10	11.4	22	1.8	3.4	7,14,45
Cr	83.3	7.29	3.0	8.9	7.1	21	31,32,34
Cu	6.17	1.48	11	26	1.9	4.5	14,19
K	42734	4535	2.6	10.5	3067	12581	none
Mn	214	11.1	3.1	5.7	19	34	35,44
Mo	235	13.5	2.9	6.2	19	41	12,14,35,38
Na	43341	2634	3.0	6.4	3609	7818	12,15,35,38
Ni	13.2	3.25	12	27	4.4	9.9	1,33
Pb	404	34	3.4	8.5	38	96	none
S	52054	5704	2.8	11	4021	16178	10
Sb	6.56	1.66	20	30	3.7	5.6	7,17,31,33,39,45
V	16.0	3.46	8.8	23	3.9	10	7,14,19,33,45
Zn	18134	1132	2.8	6.7	1401	3406	7,22,34

If the repeatability is limited to 10% then the following overall characteristics apply:

	Median	Min.	Max.
s_r %	2.9	2.1	8.8
s_R %	7.7	5.7	22.8

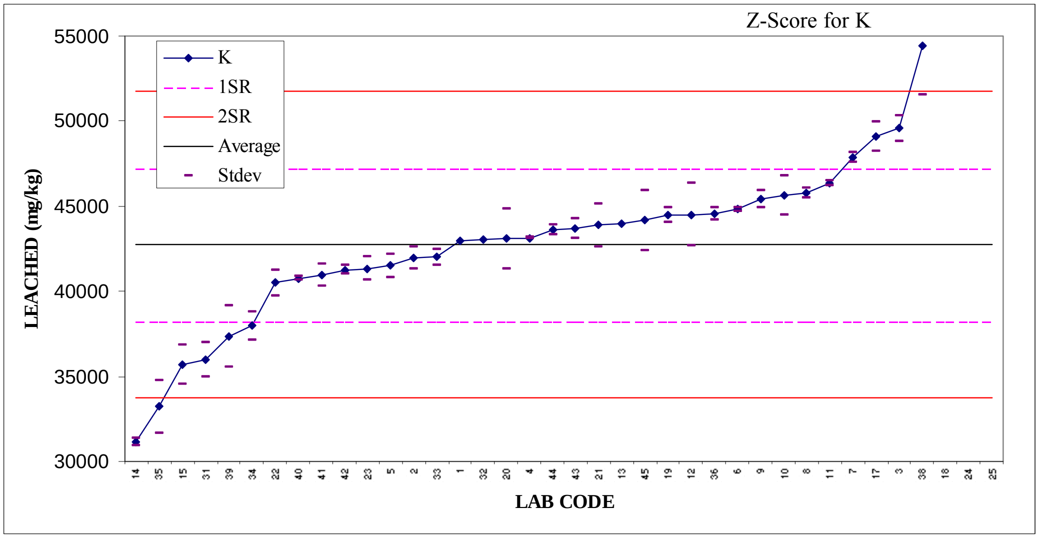
REFERENCES

[1] Sloot, H.A. van der, G.J.L. van der Wegen, D. Hoede, G.J. de Groot and Ph. Quevauviller. Intercomparison of leaching tests for stabilized waste. Commission of the European Communities, EUR 16133 EN, 1995.

[2] ISO 5725 Part 2.

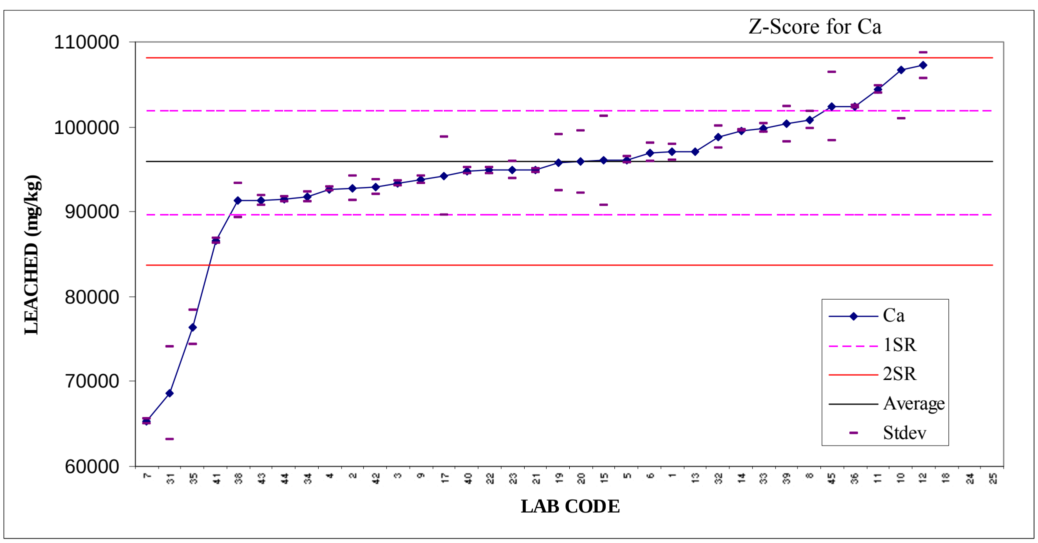
APPENDIX I ADDITIONAL ELEMENTS

Potassium



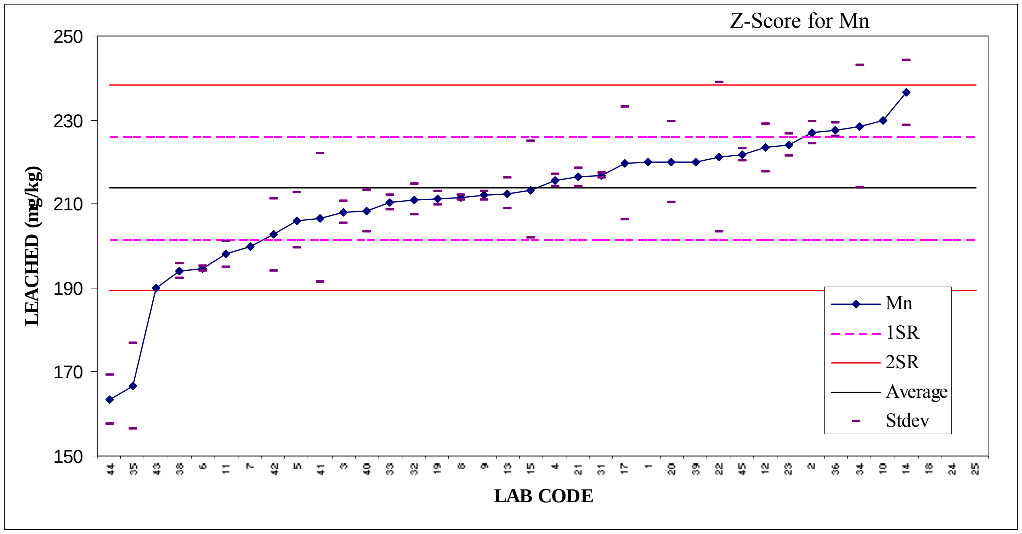
Sample	STE	Average	42734	µg/l	s_r	1094	ug/l	2.6	%
Test	**ANALYSIS**	STD	4536	µg/l	s_R	4496	ug/l	11	%
Rejected:	None								

Calcium



Sample	STE	Average	95905	µg/l	s_r	2148	ug/l	2.2	%
Test	**ANALYSIS**	STD	5808	µg/l	s_R	6109	ug/l	6	%
Rejected:	None								

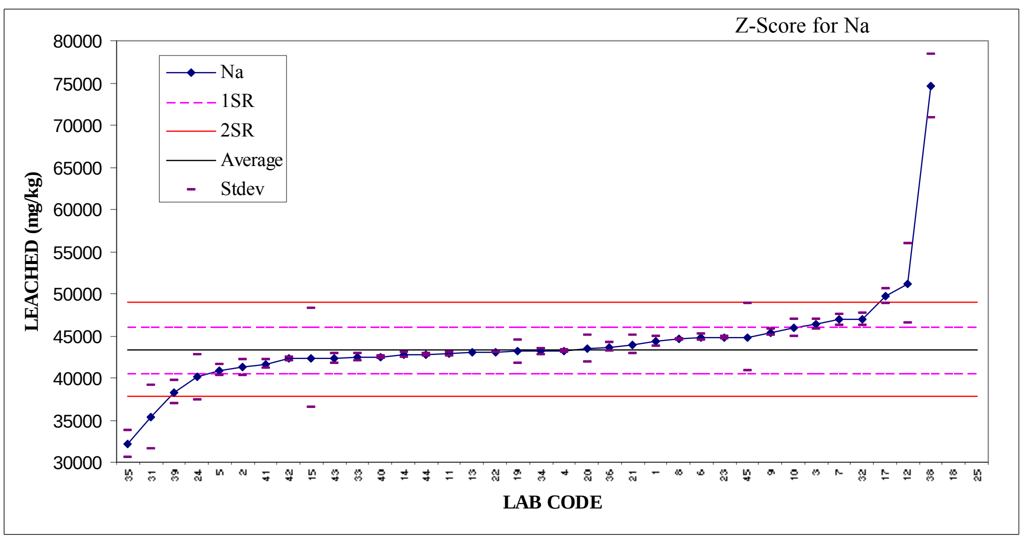
Manganese



Sample	STE	Average	213.88	µg/l	s_r	6.72	ug/l	3.1	%
Test	**ANALYSIS**	STD	11.08	µg/l	s_R	12.23	ug/l	6	%

Rejected: 35,44

Sodium



Sample	STE	Average	43341	µg/l	s_r	1287	ug/l	3.0	%
Test	**ANALYSIS**	STD	2634	µg/l	s_R	2791	ug/l	6	%

Rejected: 12,15,35,38

APPENDIX II RAW TEST DATA

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	STE				
Laboratory code:	1				
Date experiment:	08/08/00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	<50	50	NF EN ISO 11885
	As	2	<50	50	NF EN ISO 11885
	As	3	<50	50	NF EN ISO 11885
	B	1	1100	10	NF EN ISO 11885
	B	2	1100	10	NF EN ISO 11885
	B	3	1060	10	NF EN ISO 11885
	Ba	1	30	10	NF EN ISO 11885
	Ba	2	30	10	NF EN ISO 11885
	Ba	3	30	10	NF EN ISO 11885
	Ca	1	98000	500	NF EN ISO 11885
	Ca	2	97000	500	NF EN ISO 11885
	Ca	3	96000	500	NF EN ISO 11885
	Cd	1	390	10	NF EN ISO 11885
	Cd	2	380	10	NF EN ISO 11885
	Cd	3	380	10	NF EN ISO 11885
	Co	1	<10	10	NF EN ISO 11885
	Co	2	<10	10	NF EN ISO 11885
	Co	3	<10	10	NF EN ISO 11885
	Cr	1	100	10	NF EN ISO 11885
	Cr	2	100	10	NF EN ISO 11885
	Cr	3	100	10	NF EN ISO 11885
	Cu	1	<10	10	NF EN ISO 11885
	Cu	2	<10	10	NF EN ISO 11885
	Cu	3	<10	10	NF EN ISO 11885
	K	1	43000	100	NF EN ISO 11885
	K	2	43000	100	NF EN ISO 11885
	K	3	43000	100	NF EN ISO 11885
	Mn	1	220	10	NF EN ISO 11885
	Mn	2	220	10	NF EN ISO 11885
	Mn	3	220	10	NF EN ISO 11885
	Mo	1	250	50	NF EN ISO 11885
	Mo	2	250	50	NF EN ISO 11885
	Mo	3	240	50	NF EN ISO 11885
	Na	1	45000	1000	NF EN ISO 11885
	Na	2	44000	1000	NF EN ISO 11885
	Na	3	44000	1000	NF EN ISO 11885
	Ni	1	50	10	NF EN ISO 11885
	Ni	2	60	10	NF EN ISO 11885
	Ni	3	60	10	NF EN ISO 11885
	P	1	<50	500	NF EN ISO 11885
	P	2	<50	500	NF EN ISO 11885
	P	3	<50	500	NF EN ISO 11885
	Pb	1	460	50	NF EN ISO 11885
	Pb	2	450	50	NF EN ISO 11885
	Pb	3	420	50	NF EN ISO 11885
	S	1	51300	100	NF EN ISO 11885
	S	2	50200	100	NF EN ISO 11885
	S	3	50000	100	NF EN ISO 11885
	Sb	1	<50	50	NF EN ISO 11885
	Sb	2	<50	50	NF EN ISO 11885
	Sb	3	<50	50	NF EN ISO 11885
	V	1	<50	50	NF EN ISO 11885
	V	2	<50	50	NF EN ISO 11885
	V	3	<50	50	NF EN ISO 11885
	Zn	1	20700	10	NF EN ISO 11885
	Zn	2	20800	10	NF EN ISO 11885
	Zn	3	20800	10	NF EN ISO 11885

V: Intercomparison/Validation					**CLUSTER 2**
Standard Eluaat	**STE**				
Laboratory code:	2				
Date experiment:	01-08-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	< 1	1	Hydride AAS
	As	2	< 1	1	Hydride AAS
	As	3	< 1	1	Hydride AAS
	B	1	1220	100	ICP
	B	2	1196	100	ICP
	B	3	1220	100	ICP
	Ba	1	22	10	ICP
	Ba	2	22	10	ICP
	Ba	3	22	10	ICP
	Ca	1	93600	1000	ICP
	Ca	2	91110	1000	ICP
	Ca	3	93550	1000	ICP
	Cd	1	354	5	ICP
	Cd	2	344	5	ICP
	Cd	3	351	5	ICP
	Co	1	< 10	10	ICP
	Co	2	< 10	10	ICP
	Co	3	< 10	10	ICP
	Cr	1	92	10	ICP
	Cr	2	85	10	ICP
	Cr	3	90	10	ICP
	Cu	1	7	1	AAS
	Cu	2	7	1	AAS
	Cu	3	7	1	AAS
	K	1	42470	1000	ICP
	K	2	42110	1000	ICP
	K	3	41230	1000	ICP
	Mn	1	230	5	ICP
	Mn	2	225	5	ICP
	Mn	3	226	5	ICP
	Mo	1	243	10	ICP
	Mo	2	248	10	ICP
	Mo	3	239	10	ICP
	Na	1	42010	500	ICP
	Na	2	40140	500	ICP
	Na	3	41610	500	ICP
	Ni	1	15	10	AAS
	Ni	2	14	10	AAS
	Ni	3	13	10	AAS
	P	1	< 100	100	ICP
	P	2	< 100	100	ICP
	P	3	< 100	100	ICP
	Pb	1	386	40	ICP
	Pb	2	373	40	ICP
	Pb	3	387	40	ICP
	S	1	60980	1000	ICP
	S	2	64830	1000	ICP
	S	3	66210	1000	ICP
	Sb	1	3	2	Hydride AAS
	Sb	2	3	2	Hydride AAS
	Sb	3	4	2	Hydride AAS
	V	1	13	10	ICP
	V	2	13	10	ICP
	V	3	13	10	ICP
	Zn	1	17580	10	ICP
	Zn	2	17320	10	ICP
	Zn	3	17090	10	ICP

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	3				
Date experiment:	17-10-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<5	5	ISO 11885
	As	2	<5	5	ISO 11885
	As	3	<5	5	ISO 11885
	B	1	1144	5	ISO 11885
	B	2	1209	5	ISO 11885
	B	3	1170	5	ISO 11885
	Ba	1	24	1	ISO 11885
	Ba	2	24	1	ISO 11885
	Ba	3	24	1	ISO 11885
	Ca	1	93460	1	ISO 11885
	Ca	2	92980	1	ISO 11885
	Ca	3	93500	1	ISO 11885
	Cd	1	343	1	ISO 11885
	Cd	2	352	1	ISO 11885
	Cd	3	347	1	ISO 11885
	Co	1	5	5	ISO 11885
	Co	2	5	5	ISO 11885
	Co	3	5	5	ISO 11885
	Cr	1	79	2	ISO 11885
	Cr	2	78	2	ISO 11885
	Cr	3	78	2	ISO 11885
	Cu	1	6	5	ISO 11885
	Cu	2	7	5	ISO 11885
	Cu	3	6	5	ISO 11885
	K	1	49580	500	ISO 11885
	K	2	48830	500	ISO 11885
	K	3	50290	500	ISO 11885
	Mn	1	205	1	ISO 11885
	Mn	2	209	1	ISO 11885
	Mn	3	210	1	ISO 11885
	Mo	1	214	5	ISO 11885
	Mo	2	220	5	ISO 11885
	Mo	3	208	5	ISO 11885
	Na	1	46430	50	ISO 11885
	Na	2	45850	50	ISO 11885
	Na	3	46890	50	ISO 11885
	Ni	1	10	2	ISO 11885
	Ni	2	9	2	ISO 11885
	Ni	3	9	2	ISO 11885
	P	1	<10	10	ISO 11885
	P	2	<10	10	ISO 11885
	P	3	<10	10	ISO 11885
	Pb	1	380	10	ISO 11885
	Pb	2	389	10	ISO 11885
	Pb	3	387	10	ISO 11885
	S	1			
	S	2			
	S	3			
	Sb	1	<5	5	ISO 11885
	Sb	2	<5	5	ISO 11885
	Sb	3	<5	5	ISO 11885
	V	1	<20	20	ISO 11885
	V	2	<20	20	ISO 11885
	V	3	<20	20	ISO 11885
	Zn	1	18780	2	ISO 11885
	Zn	2	19030	2	ISO 11885
	Zn	3	19200	2	ISO 11885

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	4				
Date experiment:	24-08-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0.48	0.4	H-AAS
	As	2	0.56	0.4	H-AAS
	As	3	0.63	0.4	H-AAS
	B	1	1280	2	ICP-AES
	B	2	1320	2	ICP-AES
	B	3	1330	2	ICP-AES
	Ba	1	26.83	0.3	ICP-AES
	Ba	2	26.78	0.3	ICP-AES
	Ba	3	26.15	0.3	ICP-AES
	Ca	1	92870	3	ICP-AES
	Ca	2	92440	3	ICP-AES
	Ca	3	92650	3	ICP-AES
	Cd	1	352	0.3	ICP-AES
	Cd	2	348	0.3	ICP-AES
	Cd	3	349	0.3	ICP-AES
	Co	1	4.55	0.7	ICP-AES
	Co	2	5.02	0.7	ICP-AES
	Co	3	4.77	0.7	ICP-AES
	Cr	1	81.3	0.7	ICP-AES
	Cr	2	82.3	0.7	ICP-AES
	Cr	3	80.9	0.7	ICP-AES
	Cu	1	7.2	1	ICP-AES
	Cu	2	7.73	1	ICP-AES
	Cu	3	8.24	1	ICP-AES
	K	1	43120	100	ICP-AES
	K	2	43160	100	ICP-AES
	K	3	43100	100	ICP-AES
	Mn	1	217	0.1	ICP-AES
	Mn	2	216	0.1	ICP-AES
	Mn	3	214	0.1	ICP-AES
	Mo	1	236	2	ICP-AES
	Mo	2	235	2	ICP-AES
	Mo	3	236	2	ICP-AES
	Na	1	43390	30	ICP-AES
	Na	2	43160	30	ICP-AES
	Na	3	43040	30	ICP-AES
	Ni	1	12.3	2	ICP-AES
	Ni	2	13.2	2	ICP-AES
	Ni	3	12.5	2	ICP-AES
	P	1			
	P	2			
	P	3			
	Pb	1	407	5	ICP-AES
	Pb	2	400	5	ICP-AES
	Pb	3	402	5	ICP-AES
	S	1	49900	60	ICP-AES
	S	2	49450	60	ICP-AES
	S	3	49420	60	ICP-AES
	Sb	1	4.34	1	EAAS
	Sb	2	4.92	1	EAAS
	Sb	3	4.12	1	EAAS
	V	1	15.2	0.5	ICP-AES
	V	2	15.4	0.5	ICP-AES
	V	3	15.1	0.5	ICP-AES
	Zn	1	16300	0.5	ICP-AES
	Zn	2	16230	0.5	ICP-AES
	Zn	3	16230	0.5	ICP-AES

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	5				
Date experiment:	10-07-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<=0.5	0.5	prEN 31969
	As	2	<=0.5	0.5	prEN 31969
	As	3	<=0.5	0.5	prEN 31969
	B	1	1190	1	ICP/MS
	B	2	1210	1	ICP/MS
	B	3	1220	1	ICP/MS
	Ba	1	28	0.3	ICP/MS
	Ba	2	28.1	0.3	ICP/MS
	Ba	3	28.2	0.3	ICP/MS
	Ca	1	95800	500	ISO/DIS 11885
	Ca	2	96000	500	ISO/DIS 11885
	Ca	3	96600	500	ISO/DIS 11885
	Cd	1	320	10	ISO/DIS 11885
	Cd	2	327	10	ISO/DIS 11885
	Cd	3	337	10	ISO/DIS 11885
	Co	1	6.2	1	ICP/MS
	Co	2	6.2	1	ICP/MS
	Co	3	6.3	1	ICP/MS
	Cr	1	89.6	1	ICP/MS
	Cr	2	91	1	ICP/MS
	Cr	3	91.5	1	ICP/MS
	Cu	1	<=10	10	ISO/DIS 11885
	Cu	2	<=10	10	ISO/DIS 11885
	Cu	3	<=10	10	ISO/DIS 11885
	K	1	40800	500	ISO/DIS 11885
	K	2	41500	500	ISO/DIS 11885
	K	3	42200	500	ISO/DIS 11885
	Mn	1	199	5	ISO/DIS 11885
	Mn	2	207	5	ISO/DIS 11885
	Mn	3	212	5	ISO/DIS 11885
	Mo	1	235	1	ICP/MS
	Mo	2	236	1	ICP/MS
	Mo	3	239	1	ICP/MS
	Na	1	40300	500	ISO/DIS 11885
	Na	2	40900	500	ISO/DIS 11885
	Na	3	41600	500	ISO/DIS 11885
	Ni	1	15.7	0.5	ICP/MS
	Ni	2	15.8	0.5	ICP/MS
	Ni	3	15.9	0.5	ICP/MS
	P	1	<=50	50	ISO/DIS 11885
	P	2	<=50	50	ISO/DIS 11885
	P	3	<=50	50	ISO/DIS 11885
	Pb	1	420	50	ISO 8288
	Pb	2	440	50	ISO 8288
	Pb	3	450	50	ISO 8288
	S	1	47200	500	ISO/DIS 11885
	S	2	47400	500	ISO/DIS 11885
	S	3	47800	500	ISO/DIS 11885
	Sb	1	5.4	1	prEN 31969
	Sb	2	5.53	1	prEN 31969
	Sb	3	5.83	1	prEN 31969
	V	1	<=20	20	ISO/DIS 11885
	V	2	<=20	20	ISO/DIS 11885
	V	3	<=20	20	ISO/DIS 11885
	Zn	1	17500	10	ISO/DIS 11885
	Zn	2	17600	10	ISO/DIS 11885
	Zn	3	17700	10	ISO/DIS 11885

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	6				
Date experiment:	31-aug				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*μg/L*	*μg/L*	-
	As	1	<1,0	1	
	As	2	<1,0		
	As	3	<1,0		
	B	1	1200	10	
	B	2	1200		
	B	3	1200		
	Ba	1	26.9	0.2	
	Ba	2	26.8		
	Ba	3	26.6		
	Ca	1	96300	200	
	Ca	2	96400		
	Ca	3	98200		
	Cd	1	345	0.05	
	Cd	2	347		
	Cd	3	342		
	Co	1	5.56	0.05	
	Co	2	5.43		
	Co	3	5.5		
	Cr	1	85.1	0.5	
	Cr	2	84.4		
	Cr	3	84.8		
	Cu	1	6.53	1	
	Cu	2	6.65		
	Cu	3	6.26		
	K	1	44900	500	
	K	2	44900		
	K	3	44700		
	Mn	1	194	0.2	
	Mn	2	195		
	Mn	3	195		
	Mo	1	205	0.5	
	Mo	2	216		
	Mo	3	222		
	Na	1	45200	120	
	Na	2	44700		
	Na	3	44500		
	Ni	1	13.2	0.5	
	Ni	2	13.2		
	Ni	3	13.3		
	P	1	<50	50	
	P	2	<50		
	P	3	<50		
	Pb	1	408	0.2	
	Pb	2	407		
	Pb	3	410		
	S	1	50400	160	
	S	2	50800		
	S	3	50800		
	Sb	1	6.19	0.01	
	Sb	2	6.28		
	Sb	3	6.26		
	V	1	16	0.005	
	V	2	16.3		
	V	3	16.5		
	Zn	1	17500	1	
	Zn	2	17500		
	Zn	3	17800		

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	7				
Date experiment:	05-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<1	1	NF ISO 11969
	As	2	<1	1	NF ISO 11969
	As	3	<1	1	NF ISO 11969
	B	1	1040	10	NF ISO 11885
	B	2	1060	10	NF ISO 11885
	B	3	1055	10	NF ISO 11885
	Ba	1	30	5	NF ISO 11885
	Ba	2	30	5	NF ISO 11885
	Ba	3	30	5	NF ISO 11885
	Ca	1	65600	50	NF ISO 11885
	Ca	2	65000	50	NF ISO 11885
	Ca	3	65450	50	NF ISO 11885
	Cd	1	350	1	NF ISO 11885
	Cd	2	350	1	NF ISO 11885
	Cd	3	350	1	NF ISO 11885
	Co	1	30	5	NF ISO 11885
	Co	2	30	5	NF ISO 11885
	Co	3	30	5	NF ISO 11885
	Cr	1	80	1	NF ISO 11885
	Cr	2	80	1	NF ISO 11885
	Cr	3	78	1	NF ISO 11885
	Cu	1	<10	10	NF ISO 11885
	Cu	2	<10	10	NF ISO 11885
	Cu	3	<10	10	NF ISO 11885
	K	1	48000	50	NF ISO 90-020
	K	2	48000	50	NF ISO 90-020
	K	3	47500	50	NF ISO 90-020
	Mn	1	200	50	NF ISO 11885
	Mn	2	200	50	NF ISO 11885
	Mn	3	200	50	NF ISO 11885
	Mo	1	230	5	NF ISO 11885
	Mo	2	240	5	NF ISO 11885
	Mo	3	230	5	NF ISO 11885
	Na	1	47400	50	NF ISO 90-020
	Na	2	46200	50	NF ISO 90-020
	Na	3	47200	50	NF ISO 90-020
	Ni	1	10	1	NF ISO 11885
	Ni	2	10	1	NF ISO 11885
	Ni	3	10	1	NF ISO 11885
	P	1	100	100	NF ISO 11885
	P	2	100	100	NF ISO 11885
	P	3	100	100	NF ISO 11885
	Pb	1	380	1	NF ISO 11885
	Pb	2	380	1	NF ISO 11885
	Pb	3	375	1	NF ISO 11885
	S	1		10	NF ISO 11885
	S	2		10	NF ISO 11885
	S	3		10	NF ISO 11885
	Sb	1	20	5	NF ISO 11885
	Sb	2	20	5	NF ISO 11885
	Sb	3	20	5	NF ISO 11885
	V	1	40	5	NF ISO 11885
	V	2	40	5	NF ISO 11885
	V	3	40	5	NF ISO 11885
	Zn	1	8900	10	NF ISO 11885
	Zn	2	8750	10	NF ISO 11885
	Zn	3	8800	10	NF ISO 11885

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	8				
Date experiment:	aug-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*μg/L*	*μg/L*	-
	As	1	2	2	NVN 6432
	As	2	2	2	NVN 6432
	As	3	2	2	NVN 6432
	B	1	1156.7	50	NEN 6426
	B	2	1171	50	NEN 6426
	B	3	1171.6	50	NEN 6426
	Ba	1	24.3	10	NEN 6426
	Ba	2	24.646	10	NEN 6426
	Ba	3	25.195	10	NEN 6426
	Ca	1	101815	100	NEN 6426
	Ca	2	100715	100	NEN 6426
	Ca	3	99867	100	NEN 6426
	Cd	1	344	0.4	NEN 6426
	Cd	2	346	0.4	NEN 6426
	Cd	3	352	0.4	NEN 6426
	Co	1	5.39	3	NEN 6426
	Co	2	5.34	3	NEN 6426
	Co	3	5.34	3	NEN 6426
	Cr	1	79.89	1	NEN 6426
	Cr	2	80.16	1	NEN 6426
	Cr	3	80.21	1	NEN 6426
	Cu	1	6.99	2	NEN 6426
	Cu	2	6.98	2	NEN 6426
	Cu	3	7.1	2	NEN 6426
	K	1	46087	1000	NEN 6426
	K	2	45712	1000	NEN 6426
	K	3	45554	1000	NEN 6426
	Mn	1	211.7	5	NEN 6426
	Mn	2	211	5	NEN 6426
	Mn	3	212	5	NEN 6426
	Mo	1	244	1	NEN 6426
	Mo	2	250	1	NEN 6426
	Mo	3	256	1	NEN 6426
	Na	1	44582	1000	NEN 6426
	Na	2	44510	1000	NEN 6426
	Na	3	44708	1000	NEN 6426
	Ni	1	11.79	5	NEN 6426
	Ni	2	11.82	5	NEN 6426
	Ni	3	12.13	5	NEN 6426
	P	1	50	5	NEN 6426
	P	2	50	50	NEN 6426
	P	3	50	50	NEN 6426
	Pb	1	381	5	NEN 6426
	Pb	2	385	5	NEN 6426
	Pb	3	393	5	NEN 6426
	S	1	48585	200	NEN 6426
	S	2	48588	200	NEN 6426
	S	3	49142	200	NEN 6426
	Sb	1	8.47	0.9	NEN 6433
	Sb	2	8.49	0.9	NEN 6433
	Sb	3	8.61	0.9	NEN 6433
	V	1	15.31	2	NEN 6426
	V	2	15.54	2	NEN 6426
	V	3	15.44	2	NEN 6426
	Zn	1	16614	5	NEN 6426
	Zn	2	17164	5	NEN 6426
	Zn	3	16700	5	NEN 6426

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	9				
Date experiment:	28-08-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	2.89	0.1	ICP-OES
	As	2	2.74	0.1	ICP-OES
	As	3	-	0.1	ICP-OES
	B	1	1025	10	ICP-OES
	B	2	1072	10	ICP-OES
	B	3	-	10	ICP-OES
	Ba	1	23.4	5	ICP-OES
	Ba	2	23.8	5	ICP-OES
	Ba	3	23.6	5	ICP-OES
	Ca	1	94200	100	ICP-OES
	Ca	2	93400	100	ICP-OES
	Ca	3	93600	100	ICP-OES
	Cd	1	389	0.2	ICP-OES
	Cd	2	399	0.2	ICP-OES
	Cd	3	376	0.2	ICP-OES
	Co	1	5.79	2	ICP-OES
	Co	2	5.68	2	ICP-OES
	Co	3	5.94	2	ICP-OES
	Cr	1	84.6	5	ICP-OES
	Cr	2	88	5	ICP-OES
	Cr	3	85.1	5	ICP-OES
	Cu	1	5.26	5	ICP-OES
	Cu	2	5.96	5	ICP-OES
	Cu	3	5.45	5	ICP-OES
	K	1	44990	100	ICP-OES
	K	2	45920	100	ICP-OES
	K	3	45340	100	ICP-OES
	Mn	1	211.2	5	ICP-OES
	Mn	2	211.8	5	ICP-OES
	Mn	3	213.2	5	ICP-OES
	Mo	1	215.7	5	ICP-OES
	Mo	2	220.7	5	ICP-OES
	Mo	3	217.2	5	ICP-OES
	Na	1	45140	100	ICP-OES
	Na	2	45200	100	ICP-OES
	Na	3	45860	100	ICP-OES
	Ni	1	13.4	5	ICP-OES
	Ni	2	14.1	5	ICP-OES
	Ni	3	14.1	5	ICP-OES
	P	1	17.6	10	ICP-OES
	P	2	17.9	10	ICP-OES
	P	3	-	10	ICP-OES
	Pb	1	410.8	2	ICP-OES
	Pb	2	383.9	2	ICP-OES
	Pb	3	402.7	2	ICP-OES
	S	1	55370	100	ICP-OES
	S	2	51540	100	ICP-OES
	S	3	50580	100	ICP-OES
	Sb	1	7.77	2	ICP-OES
	Sb	2	8.31	2	ICP-OES
	Sb	3	-	2	ICP-OES
	V	1	15.61	5	ICP-OES
	V	2	16.78	5	ICP-OES
	V	3	16.6	5	ICP-OES
	Zn	1	19750	10	ICP-OES
	Zn	2	20200	10	ICP-OES
	Zn	3	20370	10	ICP-OES

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	STE				
Laboratory code:	10				
Date experiment:	27.09.2000				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	2.4	2	ICP
	As	2	2.2	2	ICP
	As	3	2.3	2	ICP
	B	1	1,400	30	ICP
	B	2	1,400	30	ICP
	B	3	1,400	30	ICP
	Ba	1	25,000	10	ICP
	Ba	2	25,000	10	ICP
	Ba	3	25,000	10	ICP
	Ca	1	110,000	5,000	ICP
	Ca	2	110,000	5,000	ICP
	Ca	3	100,000	5,000	ICP
	Cd	1	350	0.3	ICP
	Cd	2	340	0.3	ICP
	Cd	3	350	0.3	ICP
	Co	1	3.9	1	ICP
	Co	2	4.1	1	ICP
	Co	3	4.0	1	ICP
	Cr	1	76	2	ICP
	Cr	2	77	2	ICP
	Cr	3	76	2	ICP
	Cu	1	< 20	20	ICP
	Cu	2	< 20	20	ICP
	Cu	3	< 20	20	ICP
	K	1	47,000	1,000	ICP
	K	2	45,000	1,000	ICP
	K	3	45,000	1,000	ICP
	Mn	1	230	30	ICP
	Mn	2	230	30	ICP
	Mn	3	230	30	ICP
	Mo	1	220	10	ICP
	Mo	2	230	10	ICP
	Mo	3	220	10	ICP
	Na	1	47,000	1,000	ICP
	Na	2	46,000	1,000	ICP
	Na	3	45,000	1,000	ICP
	Ni	1	14	1	ICP
	Ni	2	15	1	ICP
	Ni	3	14	1	ICP
	P	1	14	10	prEN1484
	P	2	13	10	prEN1484
	P	3	11	10	prEN1484
	Pb	1	330	1	ICP
	Pb	2	330	1	ICP
	Pb	3	330	1	ICP
	S	1	50,000	50,000	ICP
	S	2	75,000	50,000	ICP
	S	3	< 50.000	50,000	ICP
	Sb	1	8.3	5	ICP
	Sb	2	14	5	ICP
	Sb	3	8.1	5	ICP
	V	1	16	1	ICP
	V	2	16	1	ICP
	V	3	16	1	ICP
	Zn	1	19,000	5	ICP
	Zn	2	19,000	5	ICP
	Zn	3	19,000	5	ICP

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	11				
Date experiment:	08-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	< 3	3	ICP - ISO/DIS 11885
	As	2	< 3	3	ICP - ISO/DIS 11885
	As	3	< 3	3	ICP - ISO/DIS 11885
	B	1	741	7	ICP - ISO/DIS 11885
	B	2	741	7	ICP - ISO/DIS 11885
	B	3	743	7	ICP - ISO/DIS 11885
	Ba	1	25	0.01	ICP - ISO/DIS 11885
	Ba	2	24	0.01	ICP - ISO/DIS 11885
	Ba	3	24	0.01	ICP - ISO/DIS 11885
	Ca	1	104800	0.01	ICP - ISO/DIS 11885
	Ca	2	104000	0.01	ICP - ISO/DIS 11885
	Ca	3	104500	0.01	ICP - ISO/DIS 11885
	Cd	1	328	0.1	ICP - ISO/DIS 11885
	Cd	2	350	0.1	ICP - ISO/DIS 11885
	Cd	3	352	0.1	ICP - ISO/DIS 11885
	Co	1	5	0.4	ICP - ISO/DIS 11885
	Co	2	5	0.4	ICP - ISO/DIS 11885
	Co	3	5	0.4	ICP - ISO/DIS 11885
	Cr	1	78	0.3	ICP - ISO/DIS 11885
	Cr	2	76	0.3	ICP - ISO/DIS 11885
	Cr	3	76	0.3	ICP - ISO/DIS 11885
	Cu	1	7	0.3	ICP - ISO/DIS 11885
	Cu	2	8	0.3	ICP - ISO/DIS 11885
	Cu	3	7	0.3	ICP - ISO/DIS 11885
	K	1	46500	0.5	ICP - ISO/DIS 11885
	K	2	46200	0.5	ICP - ISO/DIS 11885
	K	3	46300	0.5	ICP - ISO/DIS 11885
	Mn	1	201	0.2	ICP - ISO/DIS 11885
	Mn	2	198	0.2	ICP - ISO/DIS 11885
	Mn	3	195	0.2	ICP - ISO/DIS 11885
	Mo	1	229	0.6	ICP - ISO/DIS 11885
	Mo	2	228	0.6	ICP - ISO/DIS 11885
	Mo	3	227	0.6	ICP - ISO/DIS 11885
	Na	1	43000	0.2	ICP - ISO/DIS 11885
	Na	2	42600	0.2	ICP - ISO/DIS 11885
	Na	3	42900	0.2	ICP - ISO/DIS 11885
	Ni	1	11	0.9	ICP - ISO/DIS 11885
	Ni	2	12	0.9	ICP - ISO/DIS 11885
	Ni	3	11	0.9	ICP - ISO/DIS 11885
	P	1	< 10	10	ICP - ISO/DIS 11885
	P	2	< 10	10	ICP - ISO/DIS 11885
	P	3	< 10	10	ICP - ISO/DIS 11885
	Pb	1	373	1	ICP - ISO/DIS 11885
	Pb	2	397	1	ICP - ISO/DIS 11885
	Pb	3	399	1	ICP - ISO/DIS 11885
	S	1	50500	9	ICP - ISO/DIS 11885
	S	2	50900	9	ICP - ISO/DIS 11885
	S	3	51000	9	ICP - ISO/DIS 11885
	Sb	1	< 5	5	ICP - ISO/DIS 11885
	Sb	2	6	5	ICP - ISO/DIS 11885
	Sb	3	6	5	ICP - ISO/DIS 11885
	V	1	14	0.2	ICP - ISO/DIS 11885
	V	2	14	0.2	ICP - ISO/DIS 11885
	V	3	14	0.2	ICP - ISO/DIS 11885
	Zn	1	19100	0.2	ICP - ISO/DIS 11885
	Zn	2	20200	0.2	ICP - ISO/DIS 11885
	Zn	3	18700	0.2	ICP - ISO/DIS 11885

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	12				
Date experiment:	07-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0.3	0.12	Hydrid AAS
	As	2	0.24	0.12	Hydrid AAS
	As	3	0.27	0.12	Hydrid AAS
	B	1	1301	4.5	ICP
	B	2	1286	4.5	ICP
	B	3	1275	4.5	ICP
	Ba	1	26.5	2.7	ICP
	Ba	2	27.1	2.7	ICP
	Ba	3	27.2	2.7	ICP
	Ca	1	109000	39	IC
	Ca	2	106200	39	IC
	Ca	3	106400	39	IC
	Cd	1	359	1.3	ICP
	Cd	2	362	1.3	ICP
	Cd	3	358	1.3	ICP
	Co	1	3.3	2.1	ICP
	Co	2	2.5	2.1	ICP
	Co	3	3.5	2.1	ICP
	Cr	1	85.2	1.5	ICP
	Cr	2	85.1	1.5	ICP
	Cr	3	86.4	1.5	ICP
	Cu	1	3.4	1.9	ICP
	Cu	2	4.9	1.9	ICP
	Cu	3	4	1.9	ICP
	K	1	44400	113	IC
	K	2	46400	113	IC
	K	3	42700	113	IC
	Mn	1	0.22	5.1	ICP
	Mn	2	0.22	5.1	ICP
	Mn	3	0.23	5.1	ICP
	Mo	1	165	2.2	ICP
	Mo	2	164	2.2	ICP
	Mo	3	164	2.2	ICP
	Na	1	55800	136	IC
	Na	2	46400	136	IC
	Na	3	51400	136	IC
	Ni	1	12.9	2.2	ICP
	Ni	2	12.5	2.2	ICP
	Ni	3	13.3	2.2	ICP
	P	1			
	P	2			
	P	3			
	Pb	1	414	5	ICP
	Pb	2	418	5	ICP
	Pb	3	409	5	ICP
	S	1			
	S	2			
	S	3			
	Sb	1	8.3	1.6	ICP
	Sb	2	7.9	1.6	ICP
	Sb	3	8.1	1.6	ICP
	V	1	13.9	2	ICP
	V	2	14.1	2	ICP
	V	3	14	2	ICP
	Zn	1	18800	13	ICP
	Zn	2	18800	13	ICP
	Zn	3	18700	13	ICP

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	14				
Date experiment:	01-08-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<2	2	AAHG
	As	2	<2		
	As	3			
	B	1	1059	10	ICP-AES
	B	2	1009		
	B	3			
	Ba	1	32	10	ICP-AES
	Ba	2	34		
	Ba	3			
	Ca	1	99500	50	ICP-AES
	Ca	2	99600		
	Ca	3			
	Cd	1	403	10	ICP-AES
	Cd	2	409		
	Cd	3			
	Co	1	15	10	ICP-AES
	Co	2	24		
	Co	3			
	Cr	1	105	10	ICP-AES
	Cr	2	95		
	Cr	3			
	Cu	1	13	10	ICP-AES
	Cu	2	17		
	Cu	3			
	K	1	31000	100	FAE
	K	2	31300		
	K	3			
	Mn	1	242	10	ICP-AES
	Mn	2	231		
	Mn	3			
	Mo	1	289	100	ICP-AES
	Mo	2	257		
	Mo	3			
	Na	1	42500	100	FAE
	Na	2	42900		
	Na	3			
	Ni	1	<100	100	ICP-AES
	Ni	2	<100		
	Ni	3			
	P	1	<200	200	ICP-AES
	P	2	<200		
	P	3			
	Pb	1	472	200	ICP-AES
	Pb	2	428		
	Pb	3			
	S	1	49200	5000	Gravimmetry (sulfates)
	S	2	49000		
	S	3			
	Sb	1	8.6	2	AAHG
	Sb	2	8.6		
	Sb	3			
	V	1	78	10	ICP-AES
	V	2	66		
	V	3			
	Zn	1	18200	10	ICP-AES
	Zn	2	18100		
	Zn	3			

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	15				
Date experiment:	00-09-20				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<1	0.5	DIN EN ISO 11969
	As	2	<1	0.5	DIN EN ISO 11969
	As	3	<1	0.5	DIN EN ISO 11969
	B	1	1200	50	DIN EN ISO 11885
	B	2	1100	50	DIN EN ISO 11885
	B	3	1200	50	DIN EN ISO 11885
	Ba	1	33	0.5	DIN EN ISO 11885
	Ba	2	26	0.5	DIN EN ISO 11885
	Ba	3	29	0.5	DIN EN ISO 11885
	Ca	1	99000	50	DIN EN ISO 11885
	Ca	2	90000	50	DIN EN ISO 11885
	Ca	3	99000	50	DIN EN ISO 11885
	Cd	1	370	0.5	DIN EN ISO 11885
	Cd	2	330	0.5	DIN EN ISO 11885
	Cd	3	370	0.5	DIN EN ISO 11885
	Co	1	<5	5	DIN EN ISO 11885
	Co	2	<5	5	DIN EN ISO 11885
	Co	3	<5	5	DIN EN ISO 11885
	Cr	1	82	1	DIN EN ISO 11885
	Cr	2	74	1	DIN EN ISO 11885
	Cr	3	82	1	DIN EN ISO 11885
	Cu	1	6	1	DIN EN ISO 11885
	Cu	2	7	1	DIN EN ISO 11885
	Cu	3	7	1	DIN EN ISO 11885
	K	1	35000	5	DIN EN ISO 11885
	K	2	35000	5	DIN EN ISO 11885
	K	3	37000	5	DIN EN ISO 11885
	Mn	1	220	1	DIN EN ISO 11885
	Mn	2	200	1	DIN EN ISO 11885
	Mn	3	220	1	DIN EN ISO 11885
	Mo	1	270	1	DIN EN ISO 11885
	Mo	2	260	1	DIN EN ISO 11885
	Mo	3	270	1	DIN EN ISO 11885
	Na	1	40000	50	DIN EN ISO 11885
	Na	2	38000	50	DIN EN ISO 11885
	Na	3	49000	50	DIN EN ISO 11885
	Ni	1	8	5	DIN EN ISO 11885
	Ni	2	6	5	DIN EN ISO 11885
	Ni	3	5	5	DIN EN ISO 11885
	P	1	<50	50	DIN EN ISO 11885
	P	2	<50	50	DIN EN ISO 11885
	P	3	<50	50	DIN EN ISO 11885
	Pb	1	440	5	DIN EN ISO 11885
	Pb	2	400	5	DIN EN ISO 11885
	Pb	3	440	5	DIN EN ISO 11885
	S	1	63	100	DIN EN ISO 11885
	S	2	61	100	DIN EN ISO 11885
	S	3	60	100	DIN EN ISO 11885
	Sb	1	7	5	*
	Sb	2	7	5	*
	Sb	3	6	5	*
	V	1	16	5	DIN EN ISO 11885
	V	2	14	5	DIN EN ISO 11885
	V	3	15	5	DIN EN ISO 11885
	Zn	1	18000	5	DIN EN ISO 11885
	Zn	2	20000	5	DIN EN ISO 11885
	Zn	3	21000	5	DIN EN ISO 11885

V: Intercomparison/Validation					**CLUSTER 3**
Standard Eluaat	**STE**				
Laboratory code:	18				
Date experiment:	14-07-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<0,2	0.2	HG-AAS
	As	2	<0,2	0.2	HG-AAS
	As	3			
	B	1			
	B	2			
	B	3			
	Ba	1	41.1	2	ET-AAS
	Ba	2	42.2	2	ET-AAS
	Ba	3			
	Ca	1			
	Ca	2			
	Ca	3			
	Cd	1	333	0.02	ET-AAS
	Cd	2	345	0.02	ET-AAS
	Cd	3			
	Co	1	6.5	0.6	ET-AAS
	Co	2	6.7	0.6	ET-AAS
	Co	3			
	Cr	1	93	0.3	ET-AAS
	Cr	2	94	0.3	ET-AAS
	Cr	3			
	Cu	1	7.1	0.2	ET-AAS
	Cu	2	7.1	0.2	ET-AAS
	Cu	3			
	K	1			
	K	2			
	K	3			
	Mn	1			
	Mn	2			
	Mn	3			
	Mo	1	249	0.6	ET-AAS
	Mo	2	248	0.6	ET-AAS
	Mo	3			
	Na	1			
	Na	2			
	Na	3			
	Ni	1	11.5	1	ET-AAS
	Ni	2	11.4	1	ET-AAS
	Ni	3			
	P	1			
	P	2			
	P	3			
	Pb	1	392	0.2	ET-AAS
	Pb	2	387	0.2	ET-AAS
	Pb	3			
	S	1			
	S	2			
	S	3			
	Sb	1			
	Sb	2			
	Sb	3			
	V	1			
	V	2			
	V	3			
	Zn	1	19.1	4	F-AAS
	Zn	2	18.5	4	F-AAS
	Zn	3			

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	19				
Date experiment:	11092000				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0.9	0.1	HGAAS
	As	2	1.02	0.1	HGAAS
	As	3	0.96	0.1	HGAAS
	B	1	1323	6	ICP
	B	2	1306	6	ICP
	B	3	1317	6	ICP
	Ba	1	28.1	6	ICP
	Ba	2	28.4	6	ICP
	Ba	3	28.9	6	ICP
	Ca	1	93600	35	ICP
	Ca	2	94100	35	ICP
	Ca	3	99600	35	ICP
	Cd	1	370	2	ICP
	Cd	2	365	2	ICP
	Cd	3	366	2	ICP
	Co	1	-	5	ICP
	Co	2	-	5	ICP
	Co	3	-	5	ICP
	Cr	1	80	2	ICP
	Cr	2	78	2	ICP
	Cr	3	78	2	ICP
	Cu	1	16	7	ICP
	Cu	2	11	7	ICP
	Cu	3	8	7	ICP
	K	1	44460	100	ICP
	K	2	44070	100	ICP
	K	3	44900	100	ICP
	Mn	1	213	5	ICP
	Mn	2	211	5	ICP
	Mn	3	210	5	ICP
	Mo	1	261	4	ICP
	Mo	2	258	4	ICP
	Mo	3	258	4	ICP
	Na	1	42060	50	ICP
	Na	2	42680	50	ICP
	Na	3	44610	50	ICP
	Ni	1	15	3	ICP
	Ni	2	15	3	ICP
	Ni	3	15	3	ICP
	P	1	-	20	ICP
	P	2	-	20	ICP
	P	3	-	20	ICP
	Pb	1	404	5	ICP
	Pb	2	390	5	ICP
	Pb	3	401	5	ICP
	S	1	55810	40	ICP
	S	2	54930	40	ICP
	S	3	55270	40	ICP
	Sb	1	-	10	ICP
	Sb	2	-	10	ICP
	Sb	3	-	10	ICP
	V	1	13	6	ICP
	V	2	27	6	ICP
	V	3	25	6	ICP
	Zn	1	16250	10	ICP
	Zn	2	15970	10	ICP
	Zn	3	16080	10	ICP

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	20				
Date experiment:					
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<10	10	ICP-AES
	As	2	<10		
	As	3			
	B	1	1230	100	ICP-AES
	B	2	1250		
	B	3			
	Ba	1	26	5	ICP-AES
	Ba	2	27		
	Ba	3			
	Ca	1	92700	100	ICP-AES
	Ca	2	91100		
	Ca	3			
	Cd	1	393	2.5	ICP-AES
	Cd	2	393		
	Cd	3			
	Co	1	5.2	5	ICP-AES
	Co	2	5.2		
	Co	3			
	Cr	1	76	5	ICP-AES
	Cr	2	75		
	Cr	3			
	Cu	1	<5	5	ICP-AES
	Cu	2	<5		
	Cu	3			
	K	1	41600	100	ICP-AES
	K	2	41800		
	K	3			
	Mn	1	212	5	ICP-AES
	Mn	2	212		
	Mn	3			
	Mo	1	223	5	ICP-AES
	Mo	2	222		
	Mo	3			
	Na	1	43100	100	ICP-AES
	Na	2	42800		
	Na	3			
	Ni	1	12	5	ICP-AES
	Ni	2	12		
	Ni	3			
	P	1	<75	75	ICP-AES
	P	2	<75		
	P	3			
	Pb	1	391	10	ICP-AES
	Pb	2	391		
	Pb	3			
	S	1	55000	100	ICP-AES
	S	2	55000		
	S	3			
	Sb	1	<10	10	ICP-AES
	Sb	2	<10		
	Sb	3			
	V	1	14	5	ICP-AES
	V	2	14		
	V	3			
	Zn	1	18100	10	ICP-AES
	Zn	2	18000		
	Zn	3			

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	21				
Date experiment:					
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	3	0.5	Hydr.-AAS
	As	2	4.3	0.5	Hydr.-AAS
	As	3	5	0.5	Hydr.-AAS
	B	1	1178	20	ICP-AES
	B	2	1184	20	ICP-AES
	B	3	1180	20	ICP-AES
	Ba	1	34	10	ICP-AES
	Ba	2	34	10	ICP-AES
	Ba	3	37	10	ICP-AES
	Ca	1	95130	20	ICP-AES
	Ca	2	94730	20	ICP-AES
	Ca	3	94820	20	ICP-AES
	Cd	1	362	10	ICP-AES
	Cd	2	357	10	ICP-AES
	Cd	3	351	10	ICP-AES
	Co	1	< 20	20	ICP-AES
	Co	2	< 20	20	ICP-AES
	Co	3	< 20	20	ICP-AES
	Cr	1	85	20	ICP-AES
	Cr	2	81	20	ICP-AES
	Cr	3	83	20	ICP-AES
	Cu	1	< 20	20	ICP-AES
	Cu	2	< 20	20	ICP-AES
	Cu	3	< 20	20	ICP-AES
	K	1	43820	200	ICP-AES
	K	2	42670	200	ICP-AES
	K	3	45140	200	ICP-AES
	Mn	1	214	20	ICP-AES
	Mn	2	217	20	ICP-AES
	Mn	3	218	20	ICP-AES
	Mo	1	217	20	ICP-AES
	Mo	2	202	20	ICP-AES
	Mo	3	214	20	ICP-AES
	Na	1	44270	200	ICP-AES
	Na	2	42720	200	ICP-AES
	Na	3	44850	200	ICP-AES
	Ni	1	< 35	35	ICP-AES
	Ni	2	< 35	35	ICP-AES
	Ni	3	< 35	35	ICP-AES
	P	1	< 350	350	ICP-AES
	P	2	< 350	350	ICP-AES
	P	3	< 350	350	ICP-AES
	Pb	1	407	100	ICP-AES
	Pb	2	406	100	ICP-AES
	Pb	3	415	100	ICP-AES
	S	1			
	S	2			
	S	3			
	Sb	1			
	Sb	2			
	Sb	3			
	V	1	< 25	25	ICP-AES
	V	2	< 25	25	ICP-AES
	V	3	< 25	25	ICP-AES
	Zn	1	18380	20	ICP-AES
	Zn	2	17840	20	ICP-AES
	Zn	3	18180	20	ICP-AES

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	STE				
Laboratory code:	22				
Date experiment:					
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	0	5	ICP-OES/USN
	As	2	0	5	ICP-OES/USN
	As	3	0	5	ICP-OES/USN
	B	1	1193	100	ICP-OES
	B	2	1122	100	ICP-OES
	B	3	1167	100	ICP-OES
	Ba	1	27	5	ICP-OES
	Ba	2	29	5	ICP-OES
	Ba	3	26	5	ICP-OES
	Ca	1	95230	10	ICP-OES
	Ca	2	94812	10	ICP-OES
	Ca	3	94555	10	ICP-OES
	Cd	1	413	1	ICP-OES
	Cd	2	460	1	ICP-OES
	Cd	3	335	1	ICP-OES
	Co	1	6	1	ICP-OES
	Co	2	6	1	ICP-OES
	Co	3	4	1	ICP-OES
	Cr	1	90	5	ICP-OES
	Cr	2	89	5	ICP-OES
	Cr	3	91	5	ICP-OES
	Cu	1	9	2	ICP-OES
	Cu	2	8	2	ICP-OES
	Cu	3	5	2	ICP-OES
	K	1	40410	100	ICP-OES
	K	2	39800	100	ICP-OES
	K	3	41265	100	ICP-OES
	Mn	1	227	5	ICP-OES
	Mn	2	235	5	ICP-OES
	Mn	3	201	5	ICP-OES
	Mo	1	233	5	ICP-OES
	Mo	2	247	5	ICP-OES
	Mo	3	233	5	ICP-OES
	Na	1	43003	100	ICP-OES
	Na	2	43111	100	ICP-OES
	Na	3	43001	100	ICP-OES
	Ni	1	16	2	ICP-OES
	Ni	2	16	2	ICP-OES
	Ni	3	9	2	ICP-OES
	P	1			ICP-OES
	P	2			ICP-OES
	P	3			ICP-OES
	Pb	1	464	10	ICP-OES
	Pb	2	468	10	ICP-OES
	Pb	3	408	10	ICP-OES
	S	1			ICP-OES
	S	2			ICP-OES
	S	3			ICP-OES
	Sb	1	6	2	ICP-OES/USN
	Sb	2	7	2	ICP-OES/USN
	Sb	3	6	2	ICP-OES/USN
	V	1	12	5	ICP-OES
	V	2	8	5	ICP-OES
	V	3	17	5	ICP-OES
	Zn	1	22800	10	ICP-OES
	Zn	2	22130	10	ICP-OES
	Zn	3	19009	10	ICP-OES

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	23				
Date experiment:	4/9 2000				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<0.5	0.5	GF-AAS
	As	2	<0.5	0.5	GF-AAS
	As	3	<0.5	0.5	GF-AAS
	B	1	1270	5	ICP-AES
	B	2	1275	5	ICP-AES
	B	3	1287	5	ICP-AES
	Ba	1	27.8	3	ICP-AES
	Ba	2	27.6	3	ICP-AES
	Ba	3	26.9	3	ICP-AES
	Ca	1	94400	10	ICP-AES
	Ca	2	96000	10	ICP-AES
	Ca	3	94200	10	ICP-AES
	Cd	1	382	2	ICP-AES
	Cd	2	390	2	ICP-AES
	Cd	3	388	2	ICP-AES
	Co	1	6.05	3	ICP-AES
	Co	2	5.73	3	ICP-AES
	Co	3	6.25	3	ICP-AES
	Cr	1	88.6	3	ICP-AES
	Cr	2	91.4	3	ICP-AES
	Cr	3	86.2	3	ICP-AES
	Cu	1	6.06	1	GF-AAS
	Cu	2	5.98	1	GF-AAS
	Cu	3	5.66	1	GF-AAS
	K	1	42100	20	ICP-AES
	K	2	40800	20	ICP-AES
	K	3	41100	20	ICP-AES
	Mn	1	223	5	ICP-AES
	Mn	2	227	5	ICP-AES
	Mn	3	222	5	ICP-AES
	Mo	1	222	2	ICP-AES
	Mo	2	232	2	ICP-AES
	Mo	3	220	2	ICP-AES
	Na	1	44800	30	ICP-AES
	Na	2	44700	30	ICP-AES
	Na	3	45000	30	ICP-AES
	Ni	1	14.7	10	ICP-AES
	Ni	2	14.1	10	ICP-AES
	Ni	3	14.8	10	ICP-AES
	P	1	<10	10	ICP-AES
	P	2	<10	10	ICP-AES
	P	3	<10	10	ICP-AES
	Pb	1	431	10	ICP-AES
	Pb	2	423	10	ICP-AES
	Pb	3	436	10	ICP-AES
	S	1	50400	30	ICP-AES
	S	2	47200	30	ICP-AES
	S	3	47600	30	ICP-AES
	Sb	1	8.85	2	Hydride-ICP
	Sb	2	7.41	2	Hydride-ICP
	Sb	3	8.42	2	Hydride-ICP
	V	1	16.8	2	ICP-AES
	V	2	16.7	2	ICP-AES
	V	3	16.5	2	ICP-AES
	Zn	1	18800	10	ICP-AES
	Zn	2	18400	10	ICP-AES
	Zn	3	18700	10	ICP-AES

V: Intercomparison/Validation					CLUSTER 3
Standard Eluaat	**STE**				
Laboratory code:	24				
Date experiment:	07-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	< 1	1	NVN 7323
	As	2	< 1	1	NVN 7323
	As	3	< 1	1	NVN 7323
	B	1			
	B	2			
	B	3			
	Ba	1	24	5	NVN 7322
	Ba	2	24	5	NVN 7322
	Ba	3	24	5	NVN 7322
	Ca	1			
	Ca	2			
	Ca	3			
	Cd	1	357	0.5	NVN 7322
	Cd	2	344	0.5	NVN 7322
	Cd	3	342	0.5	NVN 7322
	Co	1	6.7	5	NVN 7322
	Co	2	6.3	5	NVN 7322
	Co	3	6.6	5	NVN 7322
	Cr	1	76	5	NVN 7322
	Cr	2	78	5	NVN 7322
	Cr	3	77	5	NVN 7322
	Cu	1	6.9	5	NVN 7322
	Cu	2	7.3	5	NVN 7322
	Cu	3	6.8	5	NVN 7322
	K	1			
	K	2			
	K	3			
	Mn	1			
	Mn	2			
	Mn	3			
	Mo	1	219	2.5	NVN 7322
	Mo	2	226	2.5	NVN 7322
	Mo	3	222	2.5	NVN 7322
	Na	1	37000	100	NEN 6442
	Na	2	41600	100	NEN 6442
	Na	3	41700	100	NEN 6442
	Ni	1	14	5	NVN 7322
	Ni	2	15	5	NVN 7322
	Ni	3	13	5	NVN 7322
	P	1			
	P	2			
	P	3			
	Pb	1	380	10	NVN 7322
	Pb	2	430	10	NVN 7322
	Pb	3	400	10	NVN 7322
	S	1			
	S	2			
	S	3			
	Sb	1	7.0	2	NVN 7323
	Sb	2	6.8	2	NVN 7323
	Sb	3	6.8	2	NVN 7323
	V	1	16	10	NVN 7322
	V	2	16	10	NVN 7322
	V	3	16	10	NVN 7322
	Zn	1	19000	20	NVN 7322
	Zn	2	18100	20	NVN 7322
	Zn	3	18600	20	NVN 7322

V: Intercomparison/Validation					CLUSTER 2
Standard Eluaat	**STE**				
Laboratory code:	25				
Date experiment:	06-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0.5	0.1	ICP-MS
	As	2	0.5		
	As	3	0.5		
	B	1	1086	1	ICP-MS
	B	2	1117		
	B	3	1122		
	Ba	1	27	0.1	ICP-MS
	Ba	2	27		
	Ba	3	28		
	Co	1	5.9	0.1	ICP-MS
	Co	2	5.7		
	Co	3	5.7		
	Cr	1	77	0.1	ICP-MS
	Cr	2	78		
	Cr	3	79		
	Ni	1	12	0.5	ICP-MS
	Ni	2	12		
	Ni	3	12		
	Pb	1	340	0.1	ICP-MS
	Pb	2	342		
	Pb	3	323		
	Sb	1	6.6	0.1	ICP-MS
	Sb	2	6.5		
	Sb	3	6.7		
	Cl	1	94600	10	IC
	Cl	2	91200		
	F	1	780	10	ISE
	F	2	800		
	NO2	1	<20	20	IC
	NO2	2	<20		
	Cr (VI)	1	60	2.5	photometry
	Cr (VI)	2	70		
	TOC	1	177	50	IR-Detek.
	TOC	2	168		
	SO4	1	127100	100	IC
	SO4	2	128900		
	NH4	1	153	50	gassensitiv Electrode
	NH4	2	136		
	pH		2.3		
	mS/cm		4		COND

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	STE E 31				
Laboratory code:	31				
Date experiment:					
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	<5	5	AAS
	As	2	<5	5	AAS
	As	3	<5	5	AAS
	B	1	1145	20	ICP-OES
	B	2	1190	20	ICP-OES
	B	3	1043	20	ICP-OES
	Ba	1	26	10	ICP-OES
	Ba	2	26	10	ICP-OES
	Ba	3	26	10	ICP-OES
	Ca	1	74442	10	ICP-OES
	Ca	2	67969	10	ICP-OES
	Ca	3	63540	10	ICP-OES
	Cd	1	356	5	ICP-OES
	Cd	2	362	5	ICP-OES
	Cd	3	362	5	ICP-OES
	Co	1	7	5	ICP-OES
	Co	2	7	5	ICP-OES
	Co	3	7	5	ICP-OES
	Cr	1	16	5	ICP-OES
	Cr	2	21	5	ICP-OES
	Cr	3	22	5	ICP-OES
	Cu	1	6	5	ICP-OES
	Cu	2	7	5	ICP-OES
	Cu	3	7	5	ICP-OES
	K	1	37000	10	AAS
	K	2	36000	10	AAS
	K	3	35000	10	AAS
	Mn	1	216	5	ICP-OES
	Mn	2	217	5	ICP-OES
	Mn	3	217	5	ICP-OES
	Mo	1	241	10	ICP-OES
	Mo	2	247	10	ICP-OES
	Mo	3	249	10	ICP-OES
	Na	1	37000	10	AAS
	Na	2	38000	10	AAS
	Na	3	31000	10	AAS
	Ni	1	16	10	ICP-OES
	Ni	2	23	10	ICP-OES
	Ni	3	24	10	ICP-OES
	P	1			
	P	2			
	P	3			
	Pb	1	414	20	ICP-OES
	Pb	2	439	20	ICP-OES
	Pb	3	452	20	ICP-OES
	S	1			
	S	2			
	S	3			
	Sb	1	12	10	ICP-OES
	Sb	2	13	10	ICP-OES
	Sb	3	19	10	ICP-OES
	V	1	18	10	ICP-OES
	V	2	19	10	ICP-OES
	V	3	20	10	ICP-OES
	Zn	1	19460	10	ICP-OES
	Zn	2	19683	10	ICP-OES
	Zn	3	19663	10	ICP-OES

V: Intercomparison/Validation					**CLUSTER 1**
Standard Eluaat	**STE**				
Laboratory code:	32				
Date experiment:	05-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<1	1	ISO 11969
	As	2	<1	1	ISO 11969
	As	3	<1	1	ISO 11969
	B	1	1200	100	ISO 11885
	B	2	1200	100	ISO 11885
	B	3	1200	100	ISO 11885
	Ba	1	29	5	ISO 11885
	Ba	2	27	5	ISO 11885
	Ba	3	28	5	ISO 11885
	Ca	1	97400	50	ISO 11885
	Ca	2	99900	50	ISO 11885
	Ca	3	99200	50	ISO 11885
	Cd	1	352	5	ISO 11885
	Cd	2	358	5	ISO 11885
	Cd	3	359	5	ISO 11885
	Co	1	<10	10	ISO 11885
	Co	2	<10	10	ISO 11885
	Co	3	<10	10	ISO 11885
	Cr	1	81	30	ISO 11885
	Cr	2	115	30	ISO 11885
	Cr	3	111	30	ISO 11885
	Cu	1	5.8	2	ISO 11885
	Cu	2	5.9	2	ISO 11885
	Cu	3	5.7	2	ISO 11885
	K	1	44400	500	ISO 11885
	K	2	44600	500	ISO 11885
	K	3	40200	500	ISO 11885
	Mn	1	214	20	ISO 11885
	Mn	2	207	20	ISO 11885
	Mn	3	212	20	ISO 11885
	Mo	1	247	2	ISO 11885
	Mo	2	236	2	ISO 11885
	Mo	3	234	2	ISO 11885
	Na	1	47700	30	ISO 11885
	Na	2	46300	30	ISO 11885
	Na	3	47000	30	ISO 11885
	Ni	1	<20	20	ISO 11885
	Ni	2	<20	20	ISO 11885
	Ni	3	<20	20	ISO 11885
	P	1	<100	100	ISO 11885
	P	2	<100	100	ISO 11885
	P	3	<100	100	ISO 11885
	Pb	1	420	50	ISO 11885
	Pb	2	411	50	ISO 11885
	Pb	3	402	50	ISO 11885
	S	1	51160	330	ISO 11885
	S	2	50980	330	ISO 11885
	S	3	50440	330	ISO 11885
	Sb	1	7.5	1	HYBRIDE AAS
	Sb	2	7.5	1	HYBRIDE AAS
	Sb	3	8	1	HYBRIDE AAS
	V	1	21	50	ISO 11885
	V	2	17	50	ISO 11885
	V	3	20	50	ISO 11885
	Zn	1	16800	5	ISO 11885
	Zn	2	17800	5	ISO 11885
	Zn	3	17000	5	ISO 11885

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	34				
Date experiment:	25-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0	5	ICP-OES/USN
	As	2	0	5	ICP-OES/USN
	As	3	0	5	ICP-OES/USN
	B	1	1164	100	ICP-OES
	B	2	1102	100	ICP-OES
	B	3	1222	100	ICP-OES
	Ba	1	29	5	ICP-OES
	Ba	2	29	5	ICP-OES
	Ba	3	26	5	ICP-OES
	Ca	1	91300	10	ICP-OES
	Ca	2	92454	10	ICP-OES
	Ca	3	91578	10	ICP-OES
	Cd	1	335	1	ICP-OES
	Cd	2	422	1	ICP-OES
	Cd	3	341	1	ICP-OES
	Co	1	7	1	ICP-OES
	Co	2	6	1	ICP-OES
	Co	3	3	1	ICP-OES
	Cr	1	83	5	ICP-OES
	Cr	2	88	5	ICP-OES
	Cr	3	109	5	ICP-OES
	Cu	1	6	2	ICP-OES
	Cu	2	4	2	ICP-OES
	Cu	3	7	2	ICP-OES
	K	1	37410	100	ICP-OES
	K	2	37554	100	ICP-OES
	K	3	38941	100	ICP-OES
	Mn	1	240	5	ICP-OES
	Mn	2	233	5	ICP-OES
	Mn	3	212	5	ICP-OES
	Mo	1	256	5	ICP-OES
	Mo	2	244	5	ICP-OES
	Mo	3	236	5	ICP-OES
	Na	1	43007	100	ICP-OES
	Na	2	42872	100	ICP-OES
	Na	3	43581	100	ICP-OES
	Ni	1	17	2	ICP-OES
	Ni	2	15	2	ICP-OES
	Ni	3	21	2	ICP-OES
	P	1			ICP-OES
	P	2			ICP-OES
	P	3			ICP-OES
	Pb	1	464	10	ICP-OES
	Pb	2	441	10	ICP-OES
	Pb	3	408	10	ICP-OES
	S	1			ICP-OES
	S	2			ICP-OES
	S	3			ICP-OES
	Sb	1	6	2	ICP-OES/USN
	Sb	2	6	2	ICP-OES/USN
	Sb	3	6	2	ICP-OES/USN
	V	1	10	5	ICP-OES
	V	2	13	5	ICP-OES
	V	3	6	5	ICP-OES
	Zn	1	21660	10	ICP-OES
	Zn	2	22003	10	ICP-OES
	Zn	3	18820	10	ICP-OES

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	35				
Date experiment:	04.09.00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	0.84	0.01	ICP-MS
	As	2	0.73		ICP-MS
	As	3	0.94		ICP-MS
	B	1	648	0.2	ICP-MS
	B	2	603		ICP-MS
	B	3	642		ICP-MS
	Ba	1	21.7	0.01	ICP-MS
	Ba	2	22.8		ICP-MS
	Ba	3	22.5		ICP-MS
	Ca	1	74100	0.5	ICP-MS
	Ca	2	77500		ICP-MS
	Ca	3	77500		ICP-MS
	Cd	1	303	0.01	ICP-MS
	Cd	2	292		ICP-MS
	Cd	3	298		ICP-MS
	Co	1	3.82	0.01	ICP-MS
	Co	2	4.32		ICP-MS
	Co	3	4.04		ICP-MS
	Cr	1	68.5	0.01	ICP-MS
	Cr	2	78.5		ICP-MS
	Cr	3	72.7		ICP-MS
	Cu	1	5.84	0.01	ICP-MS
	Cu	2	5.73		ICP-MS
	Cu	3	6.15		ICP-MS
	K	1	31700	1	ICP-MS
	K	2	34800		ICP-MS
	K	3	33200		ICP-MS
	Mn	1	158	0.05	ICP-MS
	Mn	2	178		ICP-MS
	Mn	3	164		ICP-MS
	Mo	1	157	0.01	ICP-MS
	Mo	2	165		ICP-MS
	Mo	3	166		ICP-MS
	Na	1	31200	1	ICP-MS
	Na	2	31200		ICP-MS
	Na	3	34000		ICP-MS
	Ni	1	11	0.01	ICP-MS
	Ni	2	11.3		ICP-MS
	Ni	3	11.3		ICP-MS
	P	1	<5	5	ICP-MS
	P	2	<5		ICP-MS
	P	3	<5		ICP-MS
	Pb	1	353	0.01	ICP-MS
	Pb	2	371		ICP-MS
	Pb	3	373		ICP-MS
	S	1	55100	10	ICP-MS
	S	2	57600		ICP-MS
	S	3	51200		ICP-MS
	Sb	1	6.6	0.01	ICP-MS
	Sb	2	6.7		ICP-MS
	Sb	3	6.3		ICP-MS
	V	1	9	0.01	ICP-MS
	V	2	10.2		ICP-MS
	V	3	10.5		ICP-MS
	Zn	1	16.3	0.01	ICP-MS
	Zn	2	16.2		ICP-MS
	Zn	3	16.7		ICP-MS

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	36				
Date experiment:	09-10-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	<0.25	0.25	HG-AAS
	As	2	<0.25	0.25	HG-AAS
	As	3	<0.25	0.25	HG-AAS
	B	1	1200	25	ICP-OES
	B	2	1211	25	ICP-OES
	B	3	1210	25	ICP-OES
	Ba	1	25	5	ICP-OES
	Ba	2	24.9	5	ICP-OES
	Ba	3	25.1	5	ICP-OES
	Ca	1	102301	500	ICP-OES
	Ca	2	102198	500	ICP-OES
	Ca	3	102511	500	ICP-OES
	Cd	1	383.5	5	ICP-OES
	Cd	2	384.3	5	ICP-OES
	Cd	3	382.6	5	ICP-OES
	Co	1	5.5	1	ICP-OES
	Co	2	5.7	1	ICP-OES
	Co	3	5.4	1	ICP-OES
	Cr	1	82.5	5	ICP-OES
	Cr	2	82.5	5	ICP-OES
	Cr	3	82.5	5	ICP-OES
	Cu	1	7	2	ICP-OES
	Cu	2	7.2	2	ICP-OES
	Cu	3	7.2	2	ICP-OES
	K	1	44942	500	ICP-OES
	K	2	44176	500	ICP-OES
	K	3	44566	500	ICP-OES
	Mn	1	226.4	2	ICP-OES
	Mn	2	229.4	2	ICP-OES
	Mn	3	226.9	2	ICP-OES
	Mo	1	243.7	2	ICP-OES
	Mo	2	245.9	2	ICP-OES
	Mo	3	246.2	2	ICP-OES
	Na	1	44054	50	ICP-OES
	Na	2	43171	50	ICP-OES
	Na	3	43807	50	ICP-OES
	Ni	1	13.6	2.5	ICP-OES
	Ni	2	14.3	2.5	ICP-OES
	Ni	3	13.6	2.5	ICP-OES
	P	1	< 100	100	ICP-OES
	P	2	< 100	100	ICP-OES
	P	3	< 100	100	ICP-OES
	Pb	1	417	10	ICP-OES
	Pb	2	418	10	ICP-OES
	Pb	3	417	10	ICP-OES
	S	1	55289	200	ICP-OES
	S	2	55989	200	ICP-OES
	S	3	55541	200	ICP-OES
	Sb	1	6.7	1	H-AAS
	Sb	2	6.9	1	H-AAS
	Sb	3	6.3	1	H-AAS
	V	1	< 20	20	ICP-OES
	V	2	< 20	20	ICP-OES
	V	3	< 20	20	ICP-OES
	Zn	1	19351	250	ICP-OES
	Zn	2	19387	250	ICP-OES
	Zn	3	19223	250	ICP-OES

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	38				
Date experiment:	28/07/2000				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	nd	3	ISO 11885
	As	2	nd	3	ISO 11885
	As	3	nd	3	ISO 11885
	B	1	1088	0.9	ISO 11885
	B	2	1093	0.9	ISO 11885
	B	3	1135	0.9	ISO 11885
	Ba	1	19	0.1	ISO 11885
	Ba	2	21	0.1	ISO 11885
	Ba	3	22	0.1	ISO 11885
	Ca	1	89630	0.1	ISO 11885
	Ca	2	93570	0.1	ISO 11885
	Ca	3	90770	0.1	ISO 11885
	Cd	1	293	0.3	ISO 11885
	Cd	2	322	0.3	ISO 11885
	Cd	3	308	0.3	ISO 11885
	Co	1	7.1	0.3	ISO 11885
	Co	2	8.1	0.3	ISO 11885
	Co	3	6.9	0.3	ISO 11885
	Cr	1	65	2.5	ISO 11885
	Cr	2	68	2.5	ISO 11885
	Cr	3	64	2.5	ISO 11885
	Cu	1	6.4	1.3	ISO 11885
	Cu	2	6.3	1.3	ISO 11885
	Cu	3	7.7	1.3	ISO 11885
	K	1	57330	1	ISO 11885
	K	2	54310	1	ISO 11885
	K	3	51630	1	ISO 11885
	Mn	1	193	0.9	ISO 11885
	Mn	2	196	0.9	ISO 11885
	Mn	3	193	0.9	ISO 11885
	Mo	1	216	1.1	ISO 11885
	Mo	2	257	1.1	ISO 11885
	Mo	3	235	1.1	ISO 11885
	Na	1	77080	60	ISO 11885
	Na	2	76650	60	ISO 11885
	Na	3	70360	60	ISO 11885
	Ni	1	5.2	0.7	ISO 11885
	Ni	2	5.5	0.7	ISO 11885
	Ni	3	5.7	0.7	ISO 11885
	P	1	nd	5	ISO 11885
	P	2	nd	5	ISO 11885
	P	3	nd	5	ISO 11885
	Pb	1	381	2	ISO 11885
	Pb	2	370	2	ISO 11885
	Pb	3	357	2	ISO 11885
	S	1	65960	30	ISO 11885
	S	2	68400	30	ISO 11885
	S	3	64750	30	ISO 11885
	Sb	1	2.6	1.8	ISO 11885
	Sb	2	2.9	1.8	ISO 11885
	Sb	3	2.7	1.8	ISO 11885
	V	1	15.2	0.5	ISO 11885
	V	2	16.4	0.5	ISO 11885
	V	3	15.1	0.5	ISO 11885
	Zn	1	17088	2	ISO 11885
	Zn	2	17195	2	ISO 11885
	Zn	3	18130	2	ISO 11885

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	STE				
Laboratory code:	40				
Date experiment:					
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	< 100	100	ICP
	As	2	< 100	100	ICP
	As	3	< 100	100	ICP
	B	1	1,164	5	ICP
	B	2	1,164	5	ICP
	B	3	1,159	5	ICP
	Ba	1	26	3	ICP
	Ba	2	26	3	ICP
	Ba	3	26	3	ICP
	Ca	1	95,070	50	ICP
	Ca	2	94,370	50	ICP
	Ca	3	95,080	50	ICP
	Cd	1	372	5	ICP
	Cd	2	371	5	ICP
	Cd	3	371	5	ICP
	Co	1	< 10	10	ICP
	Co	2	< 10	10	ICP
	Co	3	< 10	10	ICP
	Cr	1	88	10	ICP
	Cr	2	84	10	ICP
	Cr	3	85	10	ICP
	Cu	1	< 10	10	ICP
	Cu	2	< 10	10	ICP
	Cu	3	< 10	10	ICP
	K	1	40,790	500	ICP
	K	2	40,640	500	ICP
	K	3	40,850	500	ICP
	Mn	1	214	20	ICP
	Mn	2	206	20	ICP
	Mn	3	205	20	ICP
	Mo	1	229	30	ICP
	Mo	2	228	30	ICP
	Mo	3	229	30	ICP
	Na	1	42,570	100	ICP
	Na	2	42,370	100	ICP
	Na	3	42,630	100	ICP
	Ni	1	< 20	20	ICP
	Ni	2	< 20	20	ICP
	Ni	3	< 20	20	ICP
	P	1	< 500	500	ICP
	P	2	< 500	500	ICP
	P	3	< 500	500	ICP
	Pb	1	423	50	ICP
	Pb	2	419	50	ICP
	Pb	3	428	50	ICP
	S	1	50,170	330	ICP
	S	2	50,710	330	ICP
	S	3	50,740	330	ICP
	Sb	1	< 100	100	ICP
	Sb	2	< 100	100	ICP
	Sb	3	< 100	100	ICP
	V	1	25	10	ICP
	V	2	25	10	ICP
	V	3	26	10	ICP
	Zn	1	18,170	5	ICP
	Zn	2	18,130	5	ICP
	Zn	3	18,480	5	ICP

V: Intercomparison/Validation					**CLUSTER 1**
Standard Eluaat	**STE**				
Laboratory code:	43				
Date experiment:	15.-19.9.2000				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	< 20	20	ICP-AES
	As	2	< 20	20	ICP-AES
	As	3	< 20	20	ICP-AES
	B	1			
	B	2			
	B	3			
	Ba	1	23	10	ICP-AES
	Ba	2	23	10	ICP-AES
	Ba	3	23	10	ICP-AES
	Ca	1	92000	100	ICP-AES
	Ca	2	91000	100	ICP-AES
	Ca	3	91000	100	ICP-AES
	Cd	1	320	2	ICP-AES
	Cd	2	320	2	ICP-AES
	Cd	3	320	2	ICP-AES
	Co	1	< 10	10	ICP-AES
	Co	2	< 10	10	ICP-AES
	Co	3	< 10	10	ICP-AES
	Cr	1	75	10	ICP-AES
	Cr	2	76	10	ICP-AES
	Cr	3	75	10	ICP-AES
	Cu	1	< 10	10	ICP-AES
	Cu	2	< 10	10	ICP-AES
	Cu	3	< 10	10	ICP-AES
	K	1	44000	200	FAAS
	K	2	44000	200	FAAS
	K	3	43000	200	FAAS
	Mn	1	190	10	ICP-AES
	Mn	2	190	10	ICP-AES
	Mn	3	190	10	ICP-AES
	Mo	1	220	10	ICP-AES
	Mo	2	220	10	ICP-AES
	Mo	3	220	10	ICP-AES
	Na	1	43000	200	FAAS
	Na	2	42000	200	FAAS
	Na	3	42000	200	FAAS
	Ni	1	13	10	ICP-AES
	Ni	2	13	10	ICP-AES
	Ni	3	13	10	ICP-AES
	P	1			
	P	2			
	P	3			
	Pb	1	370	20	ICP-AES
	Pb	2	370	20	ICP-AES
	Pb	3	360	20	ICP-AES
	S	1	56333.3333		
	S	2	58000		
	S	3	56333.3333		
	Sb	1	< 10	10	GFAAS
	Sb	2	< 10	10	GFAAS
	Sb	3	< 10	10	GFAAS
	V	1	14	10	ICP-AES
	V	2	14	10	ICP-AES
	V	3	15	10	ICP-AES
	Zn	1	17000	10	ICP-AES
	Zn	2	17000	10	ICP-AES
	Zn	3	17000	10	ICP-AES

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	44				
Date experiment:	00/07/13-00/09/04				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	µg/L	µg/L	-
	As	1	<DTL	5.00E+00	AAS (hydride)
	As	2	<DTL	5.00E+00	AAS (hydride)
	As	3	<DTL	5.00E+00	AAS (hydride)
	B	1	---	---	---
	B	2	---	---	---
	B	3	---	---	---
	Ba	1	---	---	---
	Ba	2	---	---	---
	Ba	3	---	---	---
	Ca	1	9.14E+04	1.00E+00	AAS (flame)
	Ca	2	9.12E+04	1.00E+00	AAS (flame)
	Ca	3	9.18E+04	1.00E+00	AAS (flame)
	Cd	1	3.60E+02	2.00E+00	AAS (flame)
	Cd	2	3.60E+02	2.00E+00	AAS (flame)
	Cd	3	3.50E+02	2.00E+00	AAS (flame)
	Co	1	<DTL	5.00E+00	AAS (flame)
	Co	2	<DTL	5.00E+00	AAS (flame)
	Co	3	<DTL	5.00E+00	AAS (flame)
	Cr	1	9.40E+01	2.00E+01	AAS (flame)
	Cr	2	8.40E+01	2.00E+01	AAS (flame)
	Cr	3	8.20E+01	2.00E+01	AAS (flame)
	Cu	1	<DTL	1.00E+01	AAS (flame)
	Cu	2	<DTL	1.00E+01	AAS (flame)
	Cu	3	<DTL	1.00E+01	AAS (flame)
	K	1	4.38E+04	1.00E+01	AAS (flame)
	K	2	4.33E+04	1.00E+01	AAS (flame)
	K	3	4.38E+04	1.00E+01	AAS (flame)
	Mn	1	1.60E+02	2.00E+00	AAS (flame)
	Mn	2	1.70E+02	2.00E+00	AAS (flame)
	Mn	3	1.60E+02	2.00E+00	AAS (flame)
	Mo	1	2.70E+02	3.00E+01	AAS (flame)
	Mo	2	2.50E+02	3.00E+01	AAS (flame)
	Mo	3	2.50E+02	3.00E+01	AAS (flame)
	Na	1	4.26E+04	1.00E+01	AAS (flame)
	Na	2	4.28E+04	1.00E+01	AAS (flame)
	Na	3	4.29E+04	1.00E+01	AAS (flame)
	Ni	1	<DTL	2.00E+01	AAS (flame)
	Ni	2	<DTL	2.00E+01	AAS (flame)
	Ni	3	<DTL	2.00E+01	AAS (flame)
	P	1	<DTL	1.00E+02	Photometry
	P	2	<DTL	1.00E+02	Photometry
	P	3	<DTL	1.00E+02	Photometry
	Pb	1	4.14E+02	2.00E+01	AAS (flame)
	Pb	2	4.14E+02		AAS (flame)
	Pb	3	4.00E+02		AAS (flame)
	S	1	4.53E+04	---	---
	S	2	4.17E+04	---	---
	S	3	4.27E+04	---	---
	Sb	1	---	---	---
	Sb	2	---	---	---
	Sb	3	---	---	---
	V	1	<DTL	6.00E+01	AAS (flame)
	V	2	<DTL	6.00E+01	AAS (flame)
	V	3	<DTL	6.00E+01	AAS (flame)
	Zn	1	1.81E+04	1.00E+01	AAS (flame)
	Zn	2	1.74E+04	1.00E+01	AAS (flame)
	Zn	3	1.74E+04	1.00E+01	AAS (flame)

V: Intercomparison/Validation					CLUSTER 1
Standard Eluaat	**STE**				
Laboratory code:	45				
Date experiment:	12-09-00				
Conc. parameters:	ELEMENT	MULTI_AN	CONC	DTL	ANAL_METH
	-	-	*µg/L*	*µg/L*	-
	As	1	-0.046	0.2	NEN 6426
	As	2	0.009	0.2	NEN 6426
	As	3	0.005	0.2	NEN 6426
	B	1	1.24	0.05	NEN 6426
	B	2	1.25	0.05	NEN 6426
	B	3	1.2	0.05	NEN 6426
	Ba	1	0.026	0.006	NEN 6426
	Ba	2	0.027	0.006	NEN 6426
	Ba	3	0.027	0.006	NEN 6426
	Ca	1	107	0.06	NEN 6426
	Ca	2	100	0.06	NEN 6426
	Ca	3	100	0.06	NEN 6426
	Cd	1	0.364	0.015	NEN 6426
	Cd	2	0.368	0.015	NEN 6426
	Cd	3	0.369	0.015	NEN 6426
	Co	1	0.007	0.02	NEN 6426
	Co	2	0.002	0.02	NEN 6426
	Co	3	0.007	0.02	NEN 6426
	Cr	1	0.081	0.015	NEN 6426
	Cr	2	0.089	0.015	NEN 6426
	Cr	3	0.087	0.015	NEN 6426
	Cu	1	0.002	0.015	NEN 6426
	Cu	2	0.003	0.015	NEN 6426
	Cu	3	0.004	0.015	NEN 6426
	K	1	42.3	1.2	NEN 6426
	K	2	45.8	1.2	NEN 6426
	K	3	44.4	1.2	NEN 6426
	Mn	1	0.22	0.02	NEN 6426
	Mn	2	0.222	0.02	NEN 6426
	Mn	3	0.223	0.02	NEN 6426
	Mo	1	0.227	0.14	NEN 6426
	Mo	2	0.245	0.14	NEN 6426
	Mo	3	0.243	0.14	NEN 6426
	Na	1	45	0.07	NEN 6426
	Na	2	40.8	0.07	NEN 6426
	Na	3	48.7	0.07	NEN 6426
	Ni	1	0.011	0.05	NEN 6426
	Ni	2	0.019	0.05	NEN 6426
	Ni	3	0.016	0.05	NEN 6426
	P	1	0.012	0.13	NEN 6426
	P	2	0.022	0.13	NEN 6426
	P	3	-0.002	0.13	NEN 6426
	Pb	1	0.416	0.03	NEN 6426
	Pb	2	0.434	0.03	NEN 6426
	Pb	3	0.421	0.03	NEN 6426
	S	1	51.2	0.07	NEN 6426
	S	2	54.3	0.07	NEN 6426
	S	3	49.9	0.07	NEN 6426
	Sb	1	0.011	0.1	NEN 6426
	Sb	2	0.021	0.1	NEN 6426
	Sb	3	0.027	0.1	NEN 6426
	V	1	0.058	0.005	NEN 6426
	V	2	0.052	0.005	NEN 6426
	V	3	0.055	0.005	NEN 6426
	Zn	1	18.7	0.005	NEN 6426
	Zn	2	17.3	0.005	NEN 6426
	Zn	3	19.2	0.005	NEN 6426

December 2001 ECN-C--01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 5. Statistical Evaluation of PrEN 12457-1 to 4 (Parts 1 - 4) Validation

CONTENTS

1. INTRODUCTION

CEN Technical Committee 292 “ Characterization of Waste”/Working Group 2 has developed compliance tests for leaching of granular waste materials and sludge (EN-12457-1, EN 12457-2, EN 12457-3 and EN 12457-4) to become CEN standards. CEN Technical Committee 308 “Sludge” has stated the intention to apply the leaching procedure developed by CEN TC 292 in their work. Wider uses of the standard are anticipated.

The European standard batch leaching tests for leaching of granular waste materials and sludges EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 are leaching tests that fall in category 2: compliance tests.
Four parts exists:
EN 12457-1 is Part 1 - Extraction with demineralised water (ISO 3696 grade 3) in one stage at L/S = 2 l/kg dry matter and particle size 95% < 4 mm.
EN 12457-2 is Part 2 - Extraction with demineralised water (ISO 3696 grade 3) in one stage at L/S = 10 l/kg dry matter and particle size 95% < 4 mm.
EN 12457-3 is Part 3 - Extraction with demineralised water (ISO 3696 grade 3) in two successive stages at L/S = 2 l/kg and L/S = 2-10 l/kg dry matter and particle size 95% < 4 mm.
EN 12457-4 is Part 4 - Extraction with demineralised water (ISO 3696 grade 3) in one stage at L/S = 10 l/kg dry matter and particle size 95% < 10 mm.

The choice of the procedure depends on the degree and type of information required for compliance testing. This choice has to be made by the organisation establishing the compliance requirements. The contact time is 24 hours for the one-stage procedures and 6 and 18 hours, respectively, for the two extractions in the two-stage procedure.

2. MATERIALS AND METHODS

The following materials have been selected:

- sludge from a chemical wastewater treatment plant (CHS)
- filter cake of treated fly ash (FCM)
- sand blasting material (SBW)
- processed and aged MSWI bottom ash (MBA)
- metallurgical slag (coarse, MES)
- sludge from municipal wastewater treatment plant (SEW)
- contaminated soil (COS).

For each waste material a field sample was obtained and considered as representative of normal production and consist of a time-integrated sampling from the facility. The field samples were sent to a selected laboratory for preparation and distribution of the laboratory samples.

Leaching tests

Each of these four European Standards specifies a compliance test providing information on leaching of granular wastes and sludges under the experimental conditions specified in the corresponding standard. It applies to waste, which has a particle size below 4 mm without or with size reduction or 10mm in EN 12457 - 4. The sample material, which originally or after pre-treatment has the specified particle size, is brought into contact with water under defined conditions. The standard is based on the assumption that equilibrium or near-equilibrium is achieved between the liquid and solid phases during the test period. The solid residue is separated by filtration. The properties of the eluate(s) are measured using methods developed for water analysis adapted to meet criteria for analysis of eluates. After the test the leaching conditions in terms of pH, conductivity and optionally redox potential dictated by the waste are recorded.

3. ORGANIZATION OF THE VALIDATION

The validation work includes an interlaboratory test as well as a ruggedness study (see Part 1). In a separate part the eluate analysis methods as developed by CEN TC 292 WG3 are validated (Part 8). The statistical interpretation of the results of this interlaboratory test is based on ISO 5725-5 taking into account the inherent variability of laboratory samples by providing to each laboratory two laboratory samples of the same waste and thus generating pairs of result that can be statistically evaluated.
For the validation of EN-12457-1, EN 12457-2, EN 12457-3 and EN 12457-4, the following requirements were defined per waste:

- at least 12 participating laboratories,
- 2 laboratory samples for each participating laboratory; with each laboratory sample the participating laboratory has to prepare a test portion for each procedure (up to 4 procedures),
- the analysis of extracts in duplicate on a maximum of 8 elements per material,
- the analysis of a Standard Eluate at a relevant concentration levels.

For validation of EN-12457-1, EN 12457-2, EN 12457-3 and EN 12457-4, a distinction is made between the leaching tests to be performed (EN 12457 - 1 - 4), the number of laboratory sample and of corresponding extracts generated per procedure and the duplicate analysis of each extract. All extractions performed by a laboratory for a given material are carried out in duplicate, each on a test portion obtained from one of the two laboratory samples received by the laboratory. Clusters have been identified based on the particle size, water content and properties of the materials. For filter cake and municipal sludge only one of the procedures in the standard qualifies. In the case of MSWI bottom ash and metallurgical slag, all four methods are applicable. In case of contaminated soil and sludge from a chemical treatment plant EN 12457 - 1 - 3 apply. The cluster composition is specified below.

Laboratory samples were not rigorously, homogenised materials. The normal size reduction and the normal repeated mixing were carried out as needed to obtain representative laboratory samples from the large field batch sample. For intercomparison they have been distributed to the participating laboratories. In Part 10 the participating laboratories in the various clusters are listed.

3.1 Description cluster 1

The cluster that has been allocated to your lab is

Cluster code	Sub clusters to form clusters
1 Materials	A+D+E MBA CHS STE

The parameters to be analysed in the respective materials subjected to the leaching tests, for which laboratory samples of solid waste have been shipped to each laboratory, are given below.

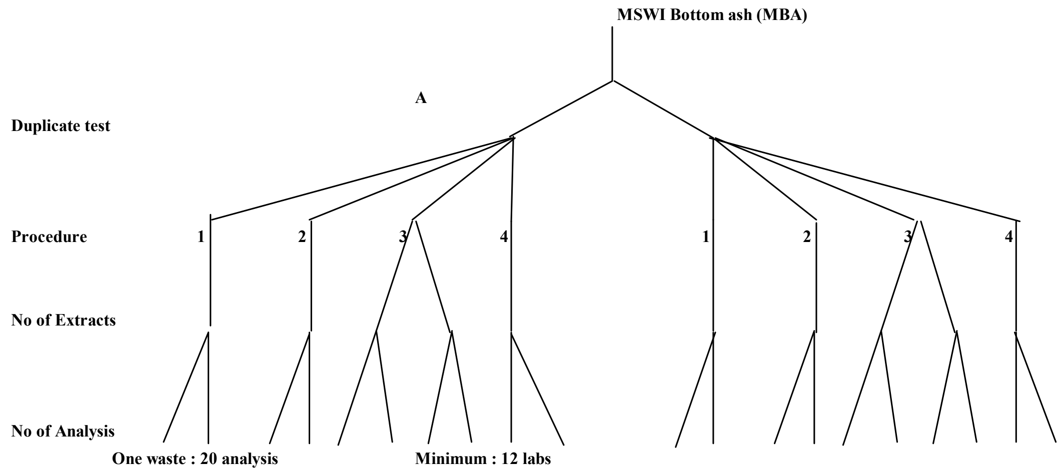
Material code	Material	Cluster code	Mandatory Parameters
MBA	MSWI bottom ash	1	Ba, Cu, Mo, Sb, SO4, pH, Conductivity
CHS	Chemical sludge	1	F, Cr VI, Cr, Cl, Cd, pH, Conductivity

The analytical methods to be used could be selected from Table I below. Laboratories were requested to specify, which method has been applied for which elements. The eluates from the leaching test must be analysed in duplicate. For those elements specified above the same methods shall be used for the Standard Eluate (STE).

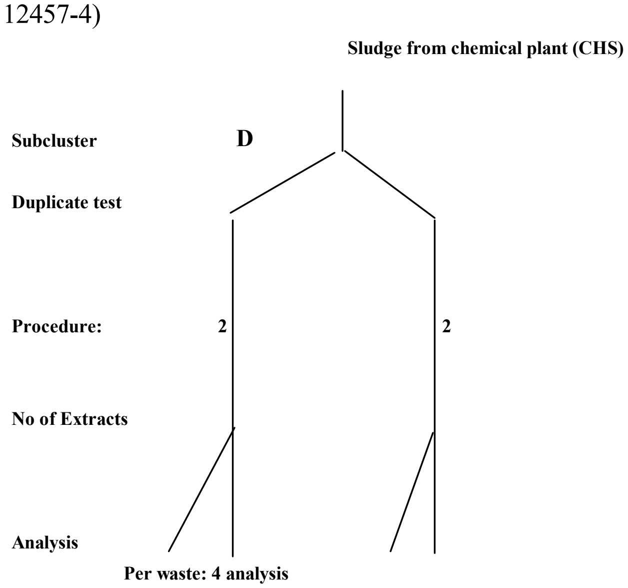
Minimum required detection limits for the above elements are:

Element (MBA)	DTL (mg/l)	Element (CHS)	DTL (mg/l)
Ba	0.005	F	0.05
Cu	0.002	Cr VI	1
Mo	0.002	Cr	1
Sb	0.002	Cl	1
SO4	1	Cd	0.005

The Standard Eluate (STE) allows a comparison between all participating laboratories. Parameters to be analysed in the Standard Eluate are: (As), B, Ba, Ca, Cd, Co, Cr, Cu, K, Mn, Mo, Na, Ni, P, Pb, S, (Sb), V, Zn (Preferably done by ICP, data in brackets may not the measurable by ICP). All participating labs are required to analyse the standard eluate in triplicate.



Composition sub-cluster A (1,2,3,4 refer to EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4)



Composition Sub-cluster D3

3.2 Description cluster 2

The cluster that has been allocated to your lab is

Cluster code	Sub clusters to form clusters
2 Materials	B+A2+2*D+E MES FCM SEW STE

The parameters to be analysed in the respective materials subjected to the leaching tests, for which laboratory samples of solid waste have been shipped to each laboratory, are given below.

Material code	Material	Cluster code	Mandatory Parameters
MES	Metalurgical slag	2	Sb, Ba, B, As, Pb, pH, Conductivity
SEW*	Sewage sludge	2	TOC, SO4, NH4, Ni, Co, pH, Conductivity
FCM	Filter cake MSWI	2	Cl, F, NO2, Ba, CrVI, pH, Conductivity

* To be shipped in late August 2000.

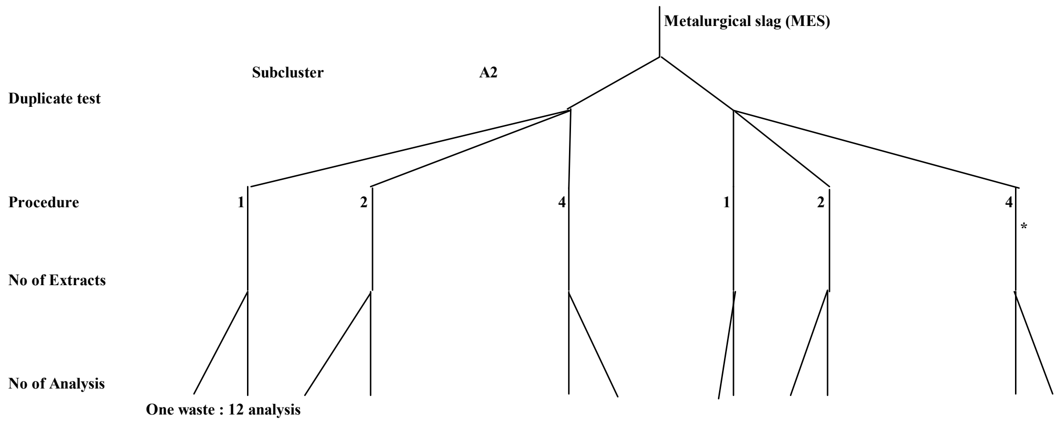
The analytical methods to be used could be selected from Table I below. Laboratories were requested to specify, which method has been applied for which elements. The eluates from the leaching test must be analysed in duplicate. For those elements specified above the same methods shall be used for the Standard Eluate (STE).

Minimum required detection limits for the above elements are:

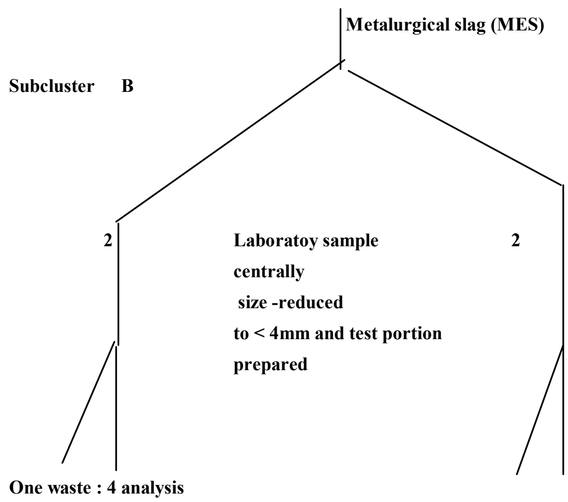
Element MES	DTL (mg/l)	Element FCM	DTL (mg/l)	Element SEW	DTL (mg/l)
Sb	0.002	Cl	1	TOC	10
Ba	0.005	F	0.01	SO4	1
B	0.01	NO2	0.05	NH4	1
As	0.0001	Ba	0.01	Ni	0.005
Pb	0.002	Cr VI	0.005	Co	0.002

The Standard Eluate, which allows a comparison between all participating laboratories. Parameters to be analysed in the Standard Eluate are: (As), B, Ba, Ca, Cd, Co, Cr, Cu, K, Mn, Mo, Na, Ni, P, Pb, S, (Sb), V, Zn (Preferably done by ICP, data in brackets may not the measurable by ICP). All participating labs were required to analyse the standard eluate in triplicate.

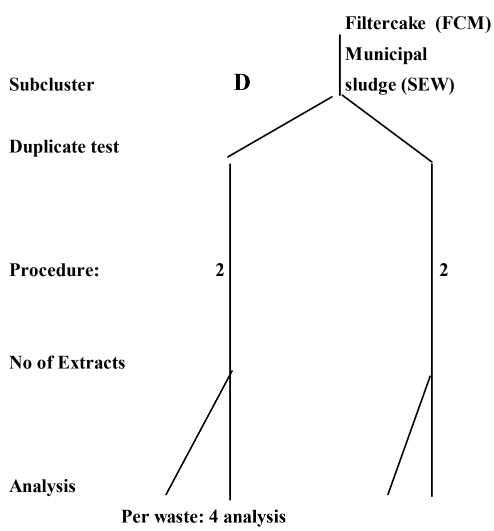
Part 5. Statistical evaluation of leaching test validation



Composition sub-cluster A2 (1,2,4 refer to EN 12457-1, EN 12457-2 and EN 12457-4)



Composition Sub-cluster B



Composition subcluster D 1 and D2

3.3 Description cluster 3

The cluster that has been allocated to your lab is

Cluster code	Sub clusters to form clusters
3	C+C2+E
Materials	COS SBW STE

The parameters to be analysed in the respective materials subjected to the leaching tests, for which laboratory samples of solid waste have been shipped to each laboratory, are given below.

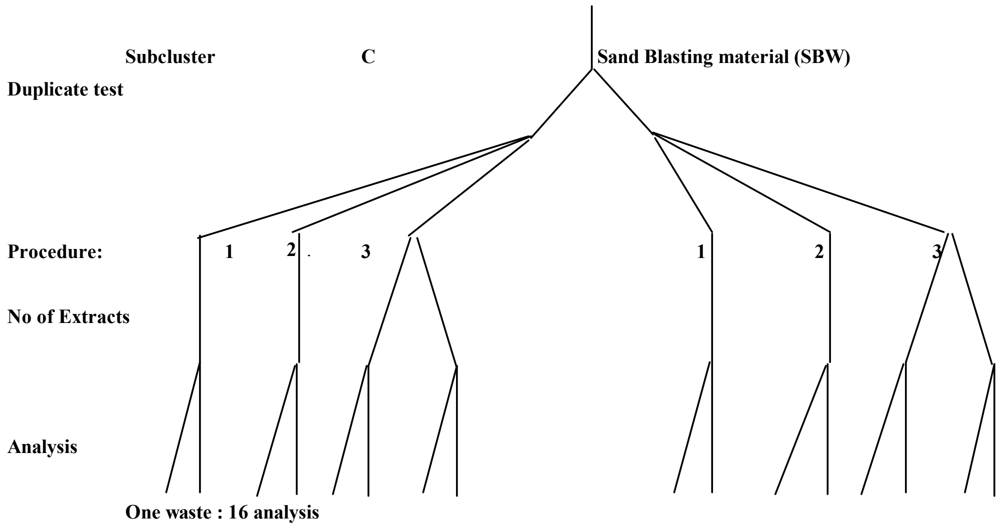
Material code	Material	Cluster code	Mandatory Parameters
COS	Contaminated Soil	3	As, Pb, Cd, Ni, Co, pH, Conductivity
SBW	Sand Blasting Waste	3	Ba, Cu, Mo, F, Zn, pH, Conductivity

The analytical methods to be used could be selected from Table I below. Laboratories were requested to specify, which method has been applied for which elements. The eluates from the leaching test must be analysed in duplicate. For those elements specified above the same methods shall be used for the Standard Eluate (STE).

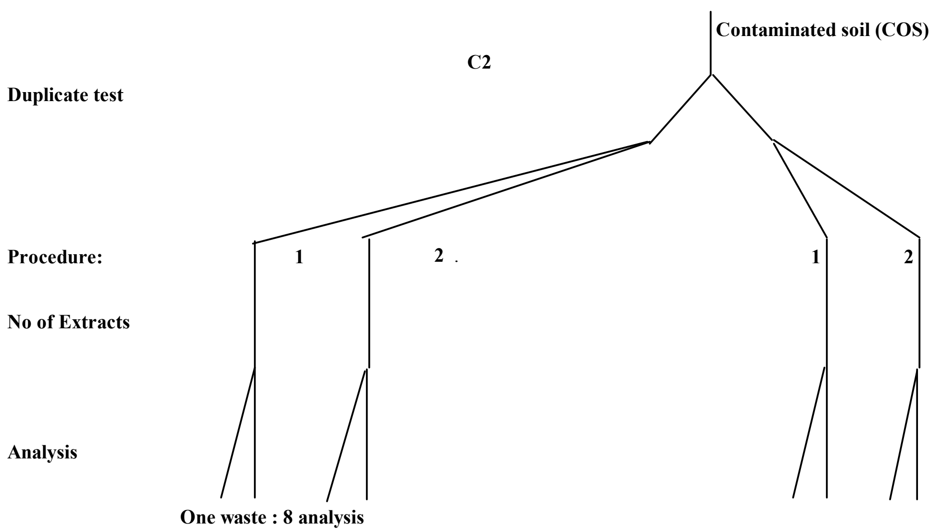
Minimum required detection limits for the above elements are:

Element COS	DTL (mg/l)	Element SBW	DTL (mg/l)
As	0.002	Ba	0.01
Pb	0.02	Cu	0.001
Cd	0.01	Mo	0.002
Sb	0.002	F	0.01
Co	0.005	Zn	0.01

The Standard Eluate, which allows a comparison between all participating laboratories. Parameters to be analysed in the Standard Eluate are: (As), B, Ba, Ca, Cd, Co, Cr, Cu, K, Mn, Mo, Na, Ni, P, Pb, S, (Sb), V, Zn (Preferably done by ICP, data in brackets may not the measurable by ICP). All participating labs were required to analyse the standard eluate at least in duplicate.



Composition sub-cluster C (1,2,3 refer to EN 12457-1, EN 12457-2 and EN 12457-3)



Composition Sub-cluster C2

4. SAMPLE PREPARATION

4.1 Municipal solid waste incinerator bottom ash – MBA (EWC code 19 01 11)

From a full scale incinerator in The Netherlands 24 barrels of 60 litre containing MSWI bottom ash was collected according to the normal routine of weekly composite samples for regular quality control. Dry matter was 83,72%.

A cement mortar truck was rented to mix the full amount of material obtained to one bulk sample. On November 3rd 1999 the full material load was mixed for 30 minutes. Separate containers were filled directly from the rotating cement mortar truck and sieved over a 40 mm screen to obtain a bulk sample of 0-40 mm. A total of 19 plastic containers (60 L) were filled. About half a container with oversized material was retained (< 3% of total).

The contents of 4 randomly selected containers were divided over 20 shallow containers (12 kg per container). These were dried over a period of 5 days in three laboratory ovens at 60 ºC until constant weight. After drying the material was put back in 4 containers after removal of oversized material (paper, plastic and iron scrap). At this stage only little additional material is removed.

From this bulk about 10 kg is used for the sub-sampling study (ECN).

The bulk sample is divided by quartering into laboratory samples for the validation and for larger samples for other tasks:

Validation leaching	: 30 buckets of 5 kg
Ruggedness	: 3 buckets of 15 kg (VITO, VKI, ECN)
Homogeneity	: 10 bottles of 2 kg (ECN)
Characterization	: 1 bucket of 10 kg (VKI)
Eluate production	: 1 bucket of 20 kg (VKI)

4.2 Filter cake from washed MSWI fly ash FCM (EWC code 19 01 05)

Bulk sample

The raw material for the validation (washed fly ash from incinerator flue gas electrostatic precipitator - ESP) comes from an industrial APC process (T.I.L process - LAB S.A.) including wet treatment of flue gases. Fly ash collected in the ESP is washed with water to extract mainly salts and a part of alkaline substances present. Then the solid residue was separated by filtration. All the alkaline filtrate produced was used, together with clean water, for wet scrubbing of filtered flue gas.

Due to a temporary break down of the industrial plant, the production of the bulk sample was realized manually in several batches. After filtration, all filter cakes were resuspended in water, filtered again and partially vacuum dried. The material was then packed in plastic drums or buckets.

The sample was received in two consignments:

The first (1999/10/08) was packed in a 200 l PE drum containing 144 kg (raw mass) of light grey partially agglomerated powder with lumps up to about 10 cm, lumps are easily crushable manually. The dry matter ratio was determined in duplicate on 100 g test portions obtained by quartering after manual crushing and mixing on two cores taken from the whole height of the drum. The dry matter ratio was 57.0%.

The second (1999/10/20) was packed in two 10 litre PE buckets. They were said to be both from the same batch and contained a total raw mass of 15.7 kg. After a similar procedure as for the drum (2 cores crushed, mixed together and quartered) dry matter was determined in duplicate: 72.2%. The total dry mass was ≈ 82 + 11.3 = 93.3 kg.

Bulk sample preparation

All the material remaining from the drum and buckets after dry matter determination was sieved at 31.5 mm and oversized lumps were crushed to < 31.5 cm using a twin fluted roller crusher. After crushing all the lumps, the whole sample was put in a heap on a clean polyethylene film and thoroughly mixed by transferring 4 times with a shovel from one heap to another.

Sub-sampling

The last heap was then split by cone and quartering, giving a 72 kg raw mass sub-sample immediately stored in a closed drum for further preparation of 40 1.8 kg laboratory samples (2x15 for validation – 10 for homogeneity testing (INERIS)) and other sub-samples of ≈ 44, 14.5 and 27 kg (raw mass), respectively for ruggedness testing (INERIS), characterisation (POLDEN) and bulk eluate preparation (INERIS). As soon as prepared, all were stored in closed drums.

Laboratory sample preparation (leaching validation and homogeneity testing)

The 72 kg sub-sample was, in turn, divided by cone and quartering into 40 ≈ 1.8 kg laboratory sample that were immediately packed in PE flasks.

4.3 Chemical Sludge – CHS (EWC code 06 05 02)

The following homogenisation protocol was followed:

1. Estimate the weight/volume of each drum
2. Estimate the weight/volume that the 'mixer' can take in one load.
3. Calculate the number of mixes, which will be having to taken place.
4. Calculate the weight of material, which needs to be taken from each mix to each bucket.
5. Place first aliquot into mixer. Mix until homogenised
6. Divide mix into containers.
7. Repeat 5 and 6 until all samples used.
8. Mix each bucket (2 samples).
9. Divide sub-samples into 4 kg containers for dispatch to laboratories

2 x 15 for inter lab study	30 pots
spare required	10 pots
WRc homogeneity testing	7 pots
WRc characterisation	1 x 10 kg sample

Although two 40 gallon drums (180 litres) were available only one was mixed up. It was not possible to mix the drum in one go, so the above homogenisation protocol was devised, which was reviewed before proceeding.

The available machinery could handle approximately 15 litres in one mix, so about 12 mixes were completed. After the machinery had homogenised the mix, it was divided equally into eight large containers (by weight). The process was continued until the 40 gallon drum was empty. Each container was then thoroughly mixed. The sludge was placed into 40 containers ready for shipping.

4.4 Sewage Sludge – SEW (EWC code 19 08 05)

Although originally sewage sludge should be prepared in Austria, technical problems required a crush program to provide material for testing. A sludge drying facility in the Netherlands 180 litre of dried sludge was collected. Upon delivery the particle size was relatively homogeneous. The dry matter content was 90.31 % d.s.

Some larger pieces of dried sludge were removed (10 – 15 % of total). In this manner a material with a particle size below 4 mm was obtained. The sample was split in sub-samples by cone & quartering. These sub-samples of the sludge were divided in laboratory samples for shipment by a sample splitter.

The bulk sample is divided by quartering into laboratory samples for the validation and for larger samples for other tasks:

Validation leaching	: 30 bottles of 1 kg
Ruggedness	: 2 buckets of 11 kg (ENEL)
Homogeneity	: 10 bottles of 1 kg (ECN)
Characterization	: 1 bucket of 9 kg (VTT)
Eluate production	: 1 bucket of 12 kg (NUA)

4.5 Metalurgical slag – MES (EWC code 10 04 01)

From an industrial site, approximately 2000 kg of coarse metallurgical slag was collected, having a particle size between 20 and 32 mm. Mixing was obtained by transfer (4 times) from one heap to another. The bulk sample was then divided by quartering to obtain laboratory samples of 10 kg. For the validation, additional laboratory samples were crushed to a particle size < 4 mm using using a jaw crusher, and then divided in laboratory samples by cone and quartering.

validation leaching	: 30 buckets of 10 kg coarse material
	: 30 buckets of 5 kg crushed material
homogeneity	: 10 buckets of 10 kg (Vito)
characterisation	: 1 bucket of 10 kg (Vito)

4.6 Sand Blasting Waste - SBW (EWC code 12 01 16)

Apparently it was received dry and as a fine powder from the source factory. It was mixed overnight in a cement mixer to ensure homogeneity. This was the only treatment it received.

4.7 Contaminated Soil – COS (EWC code 17 05 03)

From a slag-heap (copper slag) at Helbra near Eilsleben (Saxony-Anhalt) 300 kg of fine soil material was sampled on 1999-11-22 in pre-cleaned 50 L plastic barrels. The soil material was air dried in a clean room in the laboratory for 14 days at a temperature of 10-12 °C.
After air-drying the whole material was sieved through a 2 mm stainless steel sieve. Afterwards the whole material was mixed with a plastic fork for 2 hours every day over a 10 day period. Sub-samples of 50 kg were randomly taken from the whole material and further homogenized through a riffler dividing the samples into 4 kg sub-samples and into the laboratory samples for the validation and for larger samples for other tasks according to the recommendations of the organization committee for the validation program.

All materials used were pre-cleaned or checked for cross-contamination during contact with the samples.

Quantities prepared:
30 soil samples, 4 kg each, for validation leaching for all participants
12 soil samples, 1 kg each, for homogeneity testing UB
10 soil samples, 1 kg each, for ruggedness testing UB
2 soil samples, 20 kg each, to VKI and ENEL
1 soil sample, 10 kg, to SGI
1 soil ample, 50 kg, for sub-sampling to WRc

5. SAMPLE SHIPMENT

Shortly after sample shipment it became clear that the sand blasting waste (SBW) had problems with gas evolution after exposure to the leachant. Not all batches showed this behaviour. It was decided to send new samples to all participating laboratories in this cluster. The reason for the gas evolution, which proved to be H_2, was most likely the reaction of fine metallic parts with a higher pH (around 10) in some batches. This type of behaviour has been observed before in MSWI fly ash. In spite of the fine grained nature of the waste and the consistent behaviour in the sub-sampling study on SBW (see Part - 3) heterogeneity's are apparent in this material in the samples shipped for the EU wide validation. The homogeneity aspect will be addressed in more detail later.

6. DATA HANDLING

Standardized spreadsheets for data reporting have been provided, that allow direct evaluation of results by different statistical approaches according to ISO 5725-5 (Appendix I).
The data have been checked for obvious errors, such as L/S used in the test and results reported in mg/l instead of microgram per litre, as requested. The latter, particularly, occurred in cases of high concentrations measured for sulfate and Cl.

Table 5.1 *Data modifications prior to statistical evaluation*

Materia l	Lab code	Property	Incorrect	Modification
CHS	Lab 33	Cl	mg/l reported	Converted µg/l
MBA	Lab 33	SO4	mg/l reported	Converted µg/l
SEW	Lab 10	SO4	mg/l reported	Converted µg/l
SEW	Lab 12	SO4	factor 10 too high	Corrected
MESr	Lab10	Ba	factor 1000 too high	Corrected
MESc	Lab 10	Ba	factor 1000 too high	Corrected
MES	Lab 11	Ba/B	Spreadsheet modified	Corrected
CHS	Lab 40	All	L/S=2 in stead of L/S=10	Eliminated
MBA	Lab 35	SO4	mg/l reported	Converted µg/l
FCM	Lab 10	Ba	factor 1000 too high	Corrected
FCM	Lab10	Cr VI	factor 10 too low?	kept as is
FCM	Lab 11	Cr VI	factor 10 too low?	kept as is
MBA	Lab 33	All	L/S=2 in stead of L/S=10	Eliminated

7. RESULTS OF STATISTICAL TREATMENT

7.1 Statistical methods

a) The international standard ISO 5725 is designed to describe the accuracy of a measurement method in terms of trueness and precision. Trueness refers to the closeness of agreement between the average value of a large number of test results and the true or accepted reference value. Precision refers to the closeness of agreement between test results. In this validation experiment, the leaching test itself provides the true accepted reference value, so that only the issue of precision is to be addressed in both terms of repeatability and reproducibility. They are defined in ISO 5725-1 (especially definitions 3.14, 3.16, 3.18 and 3.20) and can be determined in the context of this validation experiment as follows:
The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions: The tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The repeatability limit is calculated using the relationship: $r_{test} = f\sqrt{2} * s_{r,test}$ where $s_{r,test}$ is the repeatability standard deviation and the critical range factor f=2.
The repeatability data are presented in %. For instance, a repeatability limit of 10,4 % for a measurement result of 4.69 mg/kg means that the repeatability limit around this measurement result of 4.69 mg /kg is ± 0.49 mg /kg (i.e. ±10.4% of 4,69)

The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. The value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also, this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). However it may be necessary to use a larger value for f in specific situations.

The reproducibility is determined as an interval around a measurement result (i.e. "reproducibility limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between this measurement result and another measurement result, both obtained in accordance with all the requirements of the present standard by two different laboratories using their own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The reproducibility limit was calculated using the relationship: $R = f\sqrt{2} * s_R$ with the critical range factor f = 2 and s_R as the reproducibility standard deviation.

The reproducibility data are presented in %. For instance a reproducibility limit of 82% for a measurement result of 4.69 mg/kg means that the reproducibility limit around this measurement result of 4.69 mg /kg is ± 3.85 mg /kg (i.e. ± 82.0% of 4.69)

The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. This value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1.96 for a pure normal distribution at 95% statistical confidence. Also this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in

Measurement (GUM). In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the dispersion limit is equal to $k \cdot s_R$ with the usual value k = 2, resulting in a dispersion limit lower than the reproducibility limit (i.e. a ratio of √2). However it may be necessary to use a larger value f√2 (or k) in specific situations .

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program.
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important (as indicated in section 6.1.3 of ISO 5725-5).

However in the case of heterogeneous materials, the concept of a distinction between “poor” and “good” laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results.

Consequently, in case of relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in tables 8.2 and 8.4 (this means that the value chosen for the critical range factor f is larger than 2 as well as for the extension factor k for dispersion). This is because the extreme results may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples.

b) ISO 5725-2 is applicable to measurement on material fully homogeneous for which it is possible to prepare according to normal pract
ice laboratory samples that can be considered as identical in view of the measurement to be performed. It describes a basic method to estimate, by means of interlaboratory experiments, standard measures of precision, namely the repeatability standard deviation and the reproducibility standard deviation. The repeatability and reproducibility are determined after identification of possible values that are inconsistent with all other values. Mandel’s k and h statistics are used to help identifying these outliers. Also numerical outlier tests, Cochran and Grubbs, can be applied. This statistical treatment has been applied to the Standard Eluate Analysis results (see Part 4) and the Eluate Analysis validation (see Part 8).

c) In ISO 5725-5 alternative methods are described. Section 5 is dedicated to heterogeneous material such as, for instance, sand or aggregate samples to be tested. The experimental plan was designed by CEN/TC 292 WG 2 in accordance with this section 5 on the basis of each laboratory being given two laboratory samples of each waste to be tested. They were also required to perform only a single complete leaching test for each laboratoty sample as provided in an option of section 5. The laboratory samples were all taken from one large batch of the different wastes. To be representative for normal practice rigorous homogenisation of wastes (i.e by size reduction and repeated mixing) was not applied. Only the normal primary sampling in the appropriate manner and size reduction as needed were carried out. Laboratories participating in the validation received two laboratory samples and were requested to analyse the eluates in duplicate.

It is to be noted that in the case of heterogeneous material the use of the basic method specified in ISO 5725-5 section 5 requires two or more tests per laboratory sample in order to give estimates of the repeatability and the reproducibility standard deviations that are not influenced by the variations between the laboratory samples. An option of ISO 5725-5 section 5 was selected and require a single test per laboratory sample. So that the repeatability and reproducibility evaluations include the variability of the laboratory samples obtained in the same conditions. This was combined with a duplicate analysis of each eluate so as to verify that the variability due to the eluate analysis is not dominant.

d) The basic method and section 5 of ISO 5725-5 requires tests for outliers to be used to identify data that should be excluded from the calculation of the repeatability and reproducibility standard deviations. The steering committee agreed that, since this compliance test is to be used for regulatory purpose, all data are to be used for the statistical evaluation, except for evident mistakes of laboratories (see above section 6 Data handling).
With the robust method for data analysis specified in section 6 of ISO 5725-5 an automatic method is applied for handling extreme results. As indicated in article 6.1.3 of ISO 5725-5, it is assumed that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories, provided that such extreme values are not too important. However the "poor quality" may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples. <u>Consequently the repeatability and the reproducibility may be larger than the values given in this report (see for instance Figure 5.3 and 5.9 hereafter).</u>
It is also to be underlined that this statistical evaluation relies, among others, on the hypothesis of a quasi normal distribution for the differences calculated for each pair of results: this is not generally the case in the validation program and may also results in more important value for the repeatability and reproducibility.

7.2 Data processing

The use of robust methods of data analysis does not affect the planning, organisation or execution of a precision experiment. The outlier tests and consistency checks described in ISO 5725-5 section 5 and ISO 5725-2 has been applied to the data, and the causes of any outliers, or patterns in the Mandel's h and k statistics, were investigated. Data were only discarded when it was certain that the laboratory made an evident mistake, but never on the basis of the statistical outlier tests.*(See table 5.1 Part 5 Section 6 for raw data modifications).*
Data processing has been done according to paragraph 6.2 to 6.4 from ISO 5725-5:1998. A data processing sheet was developed in Excel for the data evaluation of this project. The example 4 described in paragraph 6.5 from ISO 5725-5 was used to check the algorithm that has been used for the processing in this validation project.

7.3 Detailed presentation of an example

As an example the detailed data processing for Cu in MBA tested with EN 12457 -2 is presented.
In table 5.2 the raw data as obtained from the spreadsheets returned by the participating labs for Cu in MBA by EN 12457 - 2 are given. The duplicate analysis are denoted by A and B respectively for the two laboratory samples provided to each laboratory. The robust statistics applied to this data set results in the data shown in figure 5.1. The s_r calculated relates to the within laboratory variability of the eluate analysis (further denoted as $s_{r,Anal}$). The S_R denotes the overall between laboratory variability for Cu leaching by EN 12457 - 2 on MBA.
In a second run the average of the duplicate eluate analysis is calculated and a new input data set is created (table 5.3), in which the performance of the leaching test EN 12457 - 2 carried out on the two laboratory samples are evaluated. The leaching test results for the two laboratory samples provided to each laboratory are denoted by the lab code and X. In figure 5.2 the outcome of the robust statistics is shown. The s_r calculated relates to the within laboratory variability of the EN 12457 - 2 leaching test (further denoted as $s_{r,Test}$). The analytical uncertainty included in $s_{r,Test}$ is a relatively small contribution to $s_{r,Test}$. By averaging the raw eluate analysis data the contribution of the analytical uncertainty to the test uncertainty is

theoretically a factor 1.4 smaller than when a random selection was taken from the raw data. In table 5.4 the difference between random data selection and using the averaged eluate analysis data is given. The differences are marginal. The s_R denotes again the overall between laboratory variability for Cu leaching by EN 12457 - 2 on MBA. The latter number may deviate slightly from the value obtained in the first run. The value obtained in the first run is always used as overall s_R.
The average test results per laboratory sample as obtained in the first run are presented as Z-scores (figure 5.3). The analytical *standard deviation* as reported by the participating labs are given as uncertainty around these individual data points. In addition to the graph, the statistical parameters as obtained from the first and the second run are given. This allows a direct comparison between the within laboratory analytical variability, the within laboratory test variability and the between laboratory variability.
It is to be underlined that the handling of the extreme values is critical for the determination of the repeatability and reproducibility standard deviation. The robust statistics eliminates the influence of a single extremely high result or low results in such determination.
All other elements and material combinations have been treated the same way.

In Appendix II a graphical presentation of all data is given for the elements selected in the validation for the 7 materials studied. The z- score is given as a cumulative curve with the analytical standard deviation per laboratory for a given parameter in a given matrix. The performance data for the Part concerned, the element and the matrix are given. In addition, the results of the characterisation tests as well as from the ruggedness part are included for comparison. In case of MBA using EN 12457 - 2, also data from the sub-sampling can be used for comparison. In table 5.5, 5.6 and 5.7 the statistical data of repeatability and reproducibility are summarised for all materials.

Table 5.2 *Raw data for Cu from MBA by EN 12457-2 (Part 2)*

Labcode	Cu mg/kg	Labcode	Cu mg/kg	Labcode	Cu mg/kg	Labcode	Cu mg/kg
31A	5.90	35A	2.17	40A	4.59	44A	5.10
31A	5.75	35A	2.03	40A	4.57	44A	5.50
31B	4.88	35B	2.24	40B	3.48	44B	4.50
31B	4.87	35B	2.53	40B	3.47	44B	4.50
32A	4.55	36A	3.88	41A	5.90	45A	4.19
32A	4.54	36A	3.87	41A	6.20	45A	4.16
32B	4.05	36B	5.56	41B	4.30	45B	2.81
32B	4.04	36B	5.57	41B	4.70	45B	2.80
33A	5.40	38A	5.14	42A	6.10		
33A	5.57	38A	5.05	42A	6.15		
33B	6.30	38B	5.19	42B	4.18		
33B	6.52	38B	5.05	42B	4.22		
34A	4.37	39A	4.30	43A	4.30		
34A	4.48	39A	4.40	43A	4.30		
34B	3.37	39B	4.30	43B	4.70		
34B	3.41	39B	4.20	43B	4.70		

Table 5.3 *Averaged eluate analysis data for Cu from MBA by EN 12457-2 (Part 2)*

Labcode	Cu mg/kg	Labcode	Cu mg/kg	Labcode	Cu mg/kg	Labcode	Cu mg/kg
31A	5.83	35A	2.10	40A	4.58	44A	5.30
31B	4.88	35B	2.39	40B	3.48	44B	4.50
32A	4.55	36A	3.88	41A	6.05	45A	4.18
32B	4.05	36B	5.57	41B	4.50	45B	2.81
33A	5.48	38A	5.10	42A	6.13		
33B	6.41	38B	5.12	42B	4.20		
34A	4.43	39A	4.35	43A	4.30		
34B	3.39	39B	4.25	43B	4.70		

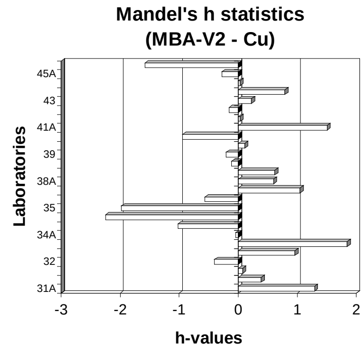
Full data set generated

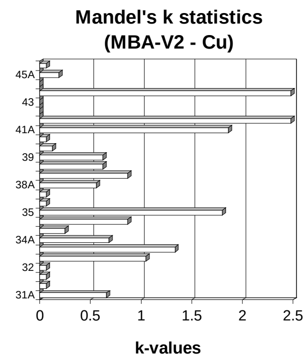
Reduced data set

Lab codes	EN 12457-2 MBA Cu mg/kg	Duplicate Eluate Analysis		Two fold leaching test	Overall average per lab
31A	5.900	31A	5.825	31AB	5.35
31A	5.750	31B	4.875	32AB	4.30
31B	4.880	32A	4.545	33AB	5.94
31B	4.870	32B	4.045	34AB	…
32A	4.550	33A	5.481		
32A	4.540	33B	6.408		
32B	4.050	34A	…		
32B	4.040	34B			
33A	5.396			s r,Test	
33A	5.565				
33B	6.300				
33B	6.515				
34A	…				
34A	…				
34B		s r,Anal			
		s R			

VALIDAT version: 1.1
Date: 23-feb-01

Sample: **MBA-V2**
Element: **Cu**



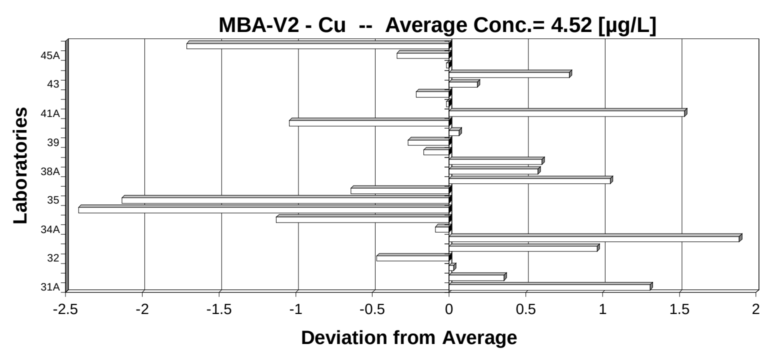


Mandel's statistics

	LAB	*Conc.*	*Stdev*	*N*	*h-mark*	*h*	*k*	*k-mark*
1	**31A**	5.825	0.150	2		1.29	0.66	
2	**31B**	4.875	0.010	2		0.39	0.06	
3	**32A**	4.545	0.010	2		0.08	0.06	
4	**32B**	4.045	0.010	2		-0.40	0.06	
5	**33A**	5.481	0.169	2		0.96	1.05	
6	**33B**	6.408	0.215	2		1.85	1.33	
7	**34A**	4.425	0.110	2		-0.04	0.68	
8	**34B**	3.390	0.040	2		-1.02	0.25	
9	**35A**	2.100	0.140	2	!	-2.25	0.87	
10	**35B**	2.385	0.290	2	!	-1.98	1.80	
11	**36A**	3.875	0.010	2		-0.56	0.06	
12	**36B**	5.565	0.010	2		1.04	0.06	
13	**38A**	5.095	0.090	2		0.60	0.56	
14	**38B**	5.120	0.140	2		0.62	0.87	
15	**39A**	4.350	0.100	2		-0.11	0.62	
16	**39B**	4.250	0.100	2		-0.21	0.62	
17	**40A**	4.580	0.020	2		0.11	0.12	
18	**40B**	3.475	0.010	2		-0.94	0.06	
19	**41A**	6.050	0.300	2		1.51	1.86	
20	**41B**	4.500	0.400	2		0.03	2.48	!!
21	**43A**	4.300		2		-0.16		
22	**43B**	4.700		2		0.22		
23	**44A**	5.300	0.400	2		0.79	2.48	!!
24	**44B**	4.500		2		0.03		
25	**45A**	4.175	0.030	2		-0.28	0.19	
26	**45B**	2.805	0.010	2		-1.58	0.06	
	Tot.Avg=	4.466	0.106 µg/L		*1%-level:*	2.43	(2.48)	
	Tot.std=	1.052	0.123		*5%-level:*	1.90	(1.94)	

RESULTS:	**Average =**	**4.516** *µg/L*		**± 1.02**		
Repeatability std.	**S_r =**	**0.091**	-->	2.02%	**r =**	0.26
Between lab std.dev.	**S_L =**	1.015				
Reproducibility std.	**S_R =**	**1.020**	-->	22.57%	**R =**	2.85

Remarks: *Robust analysis*

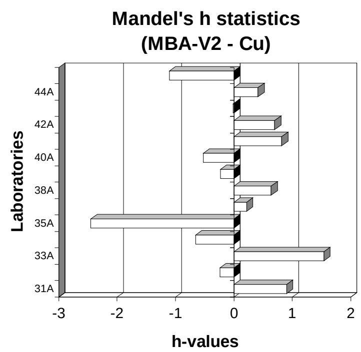


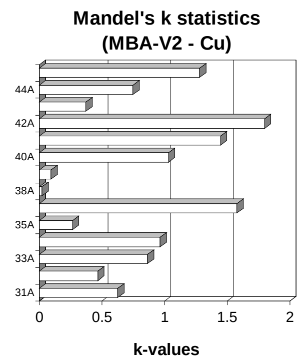
Robust Analysis **MBA-V2 - Cu**

Figure 5.1 *Robust statistics for Cu in MBA on EN 12457-2 (Part 2) using all raw data and eliminating the influence of the extremes points to evaluate $S_{r,Anal}$ and S_R. The Mandel statistics are not used as a decisive criterion to eliminate data in robust statistic, but provides insight in the individual data quality*

VALIDAT version: 1.1
Date: 23-feb-01

Sample: **MBA-V2**
Element: **Cu**

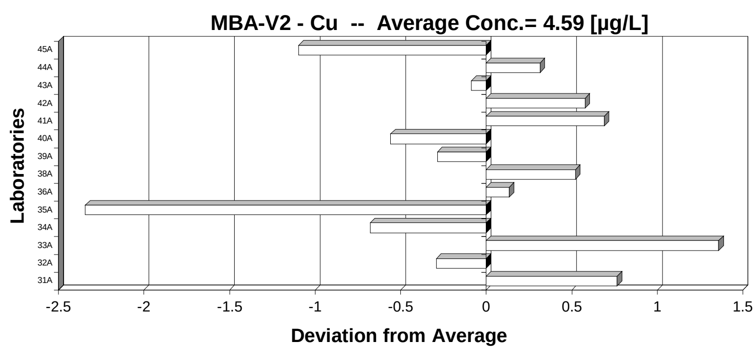




Mandel's statistics

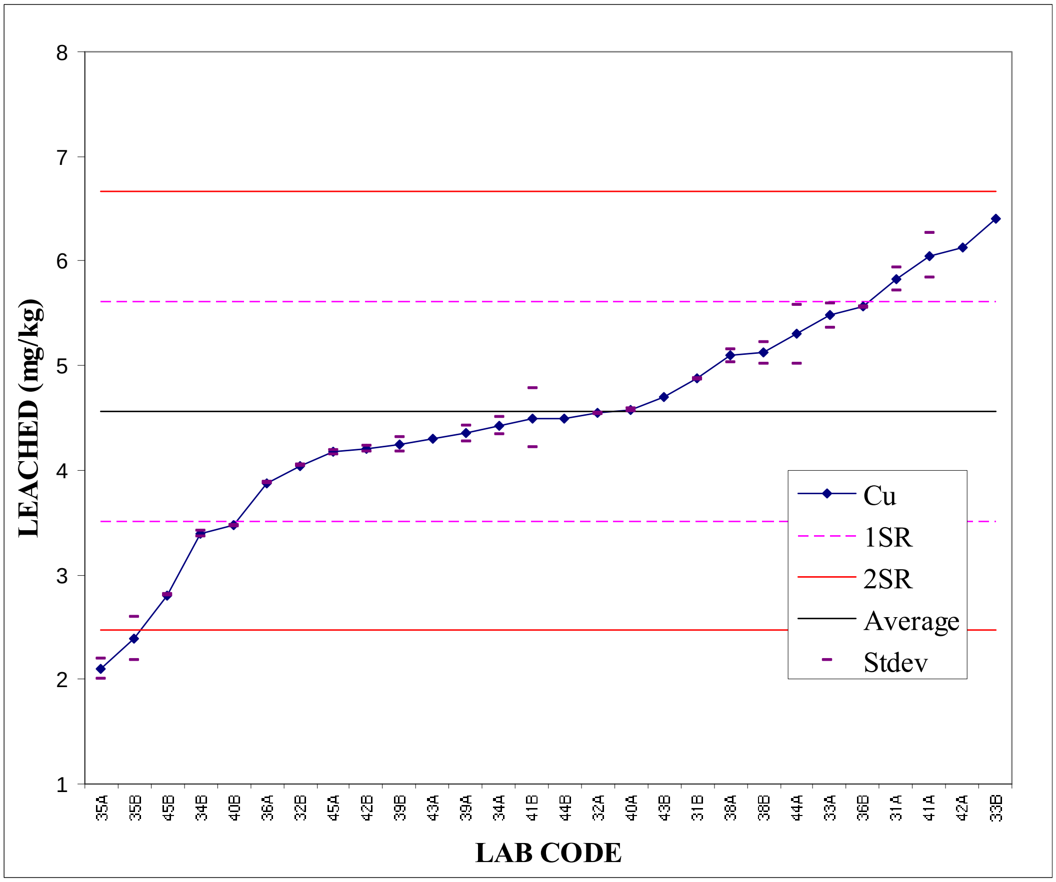
	LAB	*Conc.*	*Stdev*	*N*	*h-mark*	*h*	*k*	*k-mark*
1	**31A**	5.350	0.950	2		0.90	0.63	
2	**32A**	4.295	0.500	2		-0.24	0.47	
3	**33A**	5.944	0.927	2		1.54	0.87	
4	**34A**	3.908	1.035	2		-0.66	0.97	
5	**35A**	2.243	0.285	2	!!	-2.45	0.27	
6	**36A**	4.720	1.690	2		0.22	1.58	
7	**38A**	5.108	0.025	2		0.64	0.02	
8	**39A**	4.300	0.100	2		-0.23	0.09	
9	**40A**	4.028	1.105	2		-0.53	1.03	
10	**41A**	5.275	1.550	2		0.82	1.45	
11	**42A**	5.163	1.925	2		0.70	1.80	
12	**43A**	4.500	0.400	2		-0.02	0.37	
13	**44A**	4.900	0.800	2		0.41	0.75	
14	**45A**	3.490	1.370	2		-1.11	1.28	
	Tot.Avg=	4.516	0.904 µg/L		*1%-level:*	2.30	(2.39)	
	Tot.std=	0.928	0.594		*5%-level:*	1.85	(1.92)	

RESULTS:	**Average =**	**4.586** *µg/L*		**± 0.837**		
Repeatability std.	**S_r =**	**0.830**	-->	18.10%	**r =**	2.32
Between lab std.dev.	**S_L =**	0.596				
Reproducibility std.	**S_R =**	**1.022**	-->	22.29%	**R =**	2.86
Remarks:	*Robust analysis*					



Robust Analysis **MBA-V2 - Cu**

Figure 5.2 *Robust statistics for Cu in MBA on EN 12457-2 (Part 2) using averaged eluate analysis data per laboratory sample to evaluate $S_{r,Test}$. The Mandel statistics are not used as a decisive criterion to eliminate data in robust statistic, but provides insight in the individual data quality*



Sample	MBA	Average	4.57	mg/kg	Sr Anal	0.08	mg/kg	1.8	%		%
Test	EN 12457-2	STD	1.18	mg/kg	Sr Test	0.84	mg/kg	18.3	%	rtest	51
No labs	14				SR	1.04	mg/kg	23	%	R	64

Ruggedness testing		Homogeneity testing		Percolation test		pH stat (own pH)	
Average	4.6	Average	5.4		mg/kg	L/S=10	mg/kg
s_r	0.38	s_r (%)	10.6	L/S=10	4.45	pH 10.9	3.9
s_r (%)	8						

Figure 5.3 *Z-score for all laboratory samples with analytical uncertainty of eluate analysis on individual laboratory samples included. In the summary table the performance characteristics are summarised. In the graph the overall uncertainty S_R is indicated. These data can be compared with the ruggedness test data, taking into account the reproducibility limit of ± 1,0 mg/kg in this case : average 4.6 mg/kg with s_r 0.38 mg/kg (8%). With the percolation test data at L/S=10: 4.45 mg/kg and with the pH stat data at L/S=10 at the own pH of MBA (10.9): 3.9 mg/kg.*

Table 5.4 *Comparison of performance characteristics of EN 12457-2 (Part 2) for Cu in MBA based on random eluate data selection and averaged eluate analysis data*

		Random data	Averaged Eluate analysis
Ba	Average (mg/kg)	1.68	1.62
	$S_{r,Test}$ %	11.6	11.9
	S_R %	36	37
Cu	Average (mg/kg)	4.68	4.57
	$S_{r,Test}$ %	17.0	18.3
	S_R %	25	23
Mo	Average (mg/kg)	0.49	0.48
	$S_{r,Test}$ %	21.0	17.7
	S_R %	33	27
Sb	Average (mg/kg)	0.28	0.29
	$S_{r,Test}$ %	19.3	19.1
	S_R %	33	36
SO4 as S	Average (mg/kg)	1527	1517
	$S_{r,Test}$ %	15.6	15.6
	S_R %	40	39

7.4 Evaluation of repeatability

This section is aiming at determining typical value and observed ranges for repeatability and reproducibility standard deviations as derived from the statistical evaluation of the experimental validation results.

Table 5.5 *Summary of performance data for CHS, FCM, SEW and COS*

EN 12457-2			Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	Average						
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % [5)]
COS	As	4.69	3.7	29.3	10.4	82.0	11	3.4
COS	Pb	33.19	4.9	7.4	13.7	20.7	11	3.4
COS	Cd	19.71	3.9	16.6	10.9	46.5	11	4.1
COS	Ni	4.70	4.1	14.7	11.5	41.2	11	3.1
COS	Co	4.31	5.0	19.0	14.0	53.2	11	4.1
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % [5)]
SEW	TOC	31544	3.4	19.9	9.5	55.7	13	2.4
SEW	SO_4	505	25.7	25.7	72.0	72.0	13	2.8
SEW[4)]	NH_4	2882	11.4	51.0	31.9	143	13	2.0
SEW	Ni	2.5	8.7	14.5	24.4	40.6	13	3.0
SEW	Co	0.51	9.7	23.3	27.2	65.2	13	1.6
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % [5)]
CHS	Cr^{VI}	5320	3.0	13.7	8.4	38	11	1.8
CHS	F	6.2	4.1	34.7	11.5	97	7	3.1
CHS	Cr	5059	3.4	22.0	9.5	62	11	1.0
CHS	Cl	5390	9.8	25.2	27	71	11	2.1
CHS[1,2)]	Cd	0.029	*[- [6)]]*	73	*[- [6)]]*	204	3	
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % [5)]
FCM	Cl	2752	2.37	7.07	6.6	19.8	13	1.8
FCM	F	7.30	7.84	28.28	22	79	12	3.4
F0CM[1)]	NO_2	2.12	- [6)]	124	- [6)]	347	3	5.2
FCM	Ba	0.64	4.79	17.3	13.4	49	13	2.2
FCM	Cr^{VI}	11.46	4.20	23.7	11.8	66	13	1.6

[1)] Number of participating labs too low [2)] Analytical data too poor [3)] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [4)] Affected by biological activity [5)] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .[6)] Number of pairs of results too low

EN-12457 - 1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r, anal}$ % [3)]
COS	As	1.52	8.1	33.8	22.7	94.6	11	3.8
COS	Pb	6.62	4.9	20.9	13.7	58.5	11	2.0
COS	Cd	14.28	7.6	21.4	21.3	59.9	11	1.8
COS	Ni	3.72	7.9	18.4	22.1	51.5	11	1.7
COS	Co	3.45	6.2	25.3	17.4	70.8	11	1.5

[1)] Analytical data too poor [2)] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3)] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

The overall average of S_R for FCM, CHS, SEW and COS amounts to 22 ± 7.7 %.
In figure 5.4 the S_R values for COS are given for EN 12457- 1 and EN 12457 - 2.

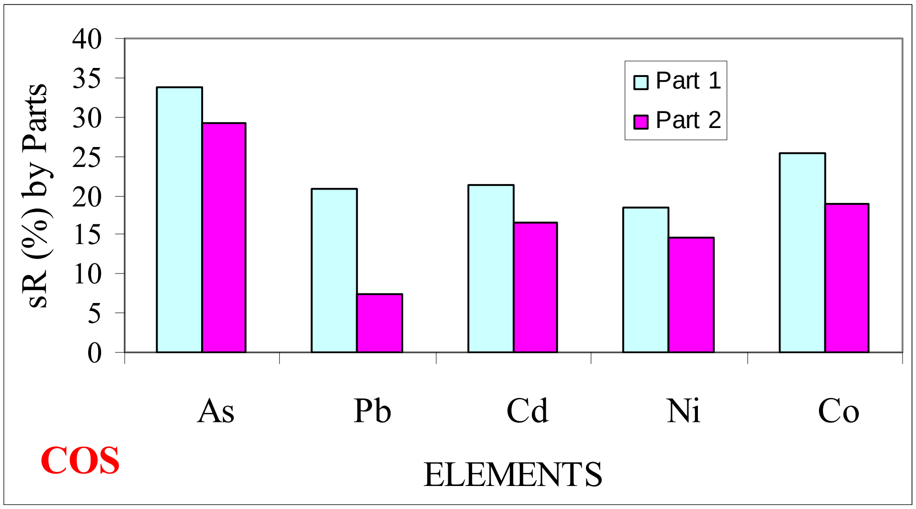


Figure 5.4 *Comparison of S_R values for COS by EN 12457-1 and EN 12457-2 (Part 1 and 2)*

EN 12457 -1 gives systematically slightly higher between laboratory variability as compared to EN 12457 - 2.

Table 5.6 *Summary of performance data for MBA*

EN-12457 - 1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r, anal}$ % [3)]
MBA	Mo	0.366	10.1	22.2	28.3	62.2	13	3.1
MBA	Sb	0.062	20.6	32.2	57.7	90.2	12	6.2
MBA	SO4	503	17.0	33.4	47.6	93.5	14	1.7
MBA	Ba	0.478	8.0	34.6	22.4	96.9	13	2.2
MBA	Cu	3.186	12.0	24.5	33.6	68.6	13	1.7

[1)] Analytical data too poor [2)] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3)] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

EN 12457-2			Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	Average						
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % [5)]
MBA	Mo	0.48	17.7	26.7	50	75	12	7.3
MBA	Sb	0.29	19.1	36.0	53	101	12	5.5
MBA	SO_4	1517	15.6	39.6	44	111	14	3.9
MBA	Ba	1.62	11.9	37.0	33	104	13	2.6
MBA	Cu	4.57	18.3	22.8	51	64	14	1.8

[1)] Number of participating labs too low [2)] Analytical data too poor [3)] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [4)] Affected by biological activity [5)] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .[6)] Number of pairs of results too low

EN 12457- 3/1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ %[3])
MBA	Mo	0.34	12.0	29.1	33.6	81.5	13	3.9
MBA [1])	Sb	0.05	13.7	39.7	38.4	111	12	11.7
MBA	SO_4	685	22.6	34.8	63.3	97	14	1.5
MBA	Ba	0.44	13.7	44.3	38.4	124	13	2.1
MBA	Cu	3.35	17.7	22.2	49.6	62.2	13	1.6

EN 12457 – 3/2		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	
MBA	Mo	0.51	13.0	30.8	36.4	86.2	12	
MBA	Sb	0.29	12.3	34.5	34.4	96.6	12	
MBA	SO_4	1482	15.1	38.4	42.3	108	14	
MBA	Ba	1.75	13.8	33.1	38.6	92.7	13	
MBA	Cu	4.66	17.2	22.9	48.2	64.1	14	

[1])Analytical data too poor [2]) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3]) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

EN 12457 - 4		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % [5])
MBA	Mo	0.43	9.3	17.0	26	48	13	7.0
MBA	Sb	0.30	17.1	44.2	48	124	12	5.5
MBA	SO4	1367	18.5	40.1	52	112	14	2.4
MBA	Ba	1.64	17.1	38.8	48	109	13	2.9
MBA	Cu	4.19	20.4	26.3	57	74	14	2.6

[1]) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R)[2]) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

The overall average S_R for MBA amounts to 32 ± 6.4 %.

In figure 5.5 the S_R values for MBA are given for EN 12457 - 1, EN 12457 - 2, EN 12457 - 3/1, EN 12457 - 3/2 and EN 12457 - 4.

EN 12457 - 3/1 shows slightly higher between laboratory variabilities for MBA as compared to EN 12457 - 1. For 4 out of 5 elements measured, EN 12457 - 4 gives systematically higher between laboratory variabilities in comparison with EN 12457 - 2.

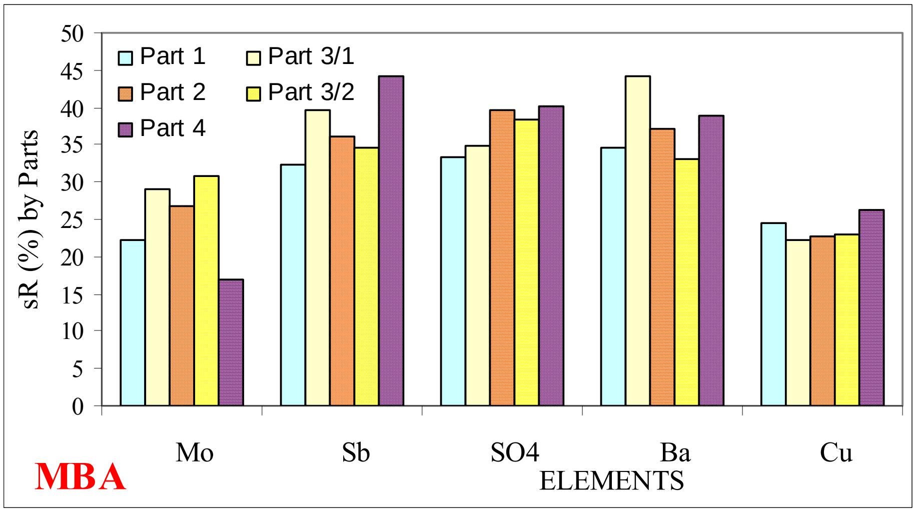


Figure 5.5 *Comparison of S_R values for MBA in the 4 Parts EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4*

Table 5.7 Summary of performance data for SBW.

EN-12457 - 1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,anal}$ % [3]
SBW	Ba	0.960	18.9	49.9	52.9	140	11	2.0
SBW[1])	Cu	0.061	41.2	111.2	115	311	10	3.7
SBW[2])	Mo	0.620	113.1	132.4	316	371	11	5.8
SBW	F	7.410	23.6	46.8	66.1	131	9	2.5
SBW[2])	Zn	4.552	61.4	67.5	172	189	11	2.2

[1] Analytical data too poor [2] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

EN 12457- 2			Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	Average						
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5]
SBW	Ba	7.20	34.82	50.69	97	142	11	3.6
SBW[2]	Cu	0.19	26.70	109.58	75	307	9	9.0
SBW[3]	Mo	1.12	77.28	106.39	216	298	11	3.1
SBW	F	17.50	5.10	45.49	14.3	127	9	3.4
SBW[3]	Zn	5.31	49.76	78.63	139	220	11	3.2

[1] Number of participating labs too low [2] Analytical data too poor [3] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [4] Affected by biological activity [5] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .[6] Number of pairs of results too low

EN 12457- 3/1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ %[3])
SBW	Ba	0.98	24.0	47.8	67	134	10	2.0
SBW [2])	Cu	0.104	77.2	98.1	216	275	9	3.1
SBW [2])	Mo	1.40	112	143	314	400	10	1.1
SBW	F	7.04	19.6	36.7	54.9	103	7	2.1
SBW [2])	Zn	5.50	97.7	97.7	274	274	10	2.2

EN 12457 – 3/2		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	
SBW	Ba	7.1	34.3	37.9	96	106	11	
SBW [2])	Cu	0.199	57.6	86.4	161	242	9	
SBW [2])	Mo	1.8	78.5	109.1	220	305	9	
SBW	F	18.4	4.9	42.4	13.7	119	9	
SBW [2])	Zn	6.8	77.9	85.4	218	239	10	

[1]) Analytical data too poor [2]) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3]) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

Table 5.8 *Summary of performance data for MES*

EN-12457 - 1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % [3])
MESc[1])	As	0.022	48.3	53.2	135	149	11	10.1
MESc	Sb	0.23	29.9	48.6	84	136	13	4.0
MESc	Ba	1.52	16.6	30.1	46	84	13	1.7
MESc	B	1.94	17.2	38.3	48	107	13	3.8
MESc[2])	Pb	0.35	54.4	79.5	152	223	12	3.1

[1]) Analytical data too poor [2]) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3]) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

EN 12457-2			Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	Average						
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % 5)
MESr 2,7)	As	0.047	38.4	39.7	108	111	10	10
MESr	Sb	0.76	30.9	34.9	87	98	13	2.2
MESr	Ba	6.20	8.4	26.1	24	73	13	1.9
MESr	B	1.96	15.3	31.0	43	87	12	3.6
MESr 3)	Pb	1.20	31.1	81.2	87	227	13	4.4
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % 5)
MES3)	As	0.087	51.0	83.5	143	234	11	3.4
MES	Sb	0.67	15.5	38.7	43	108	13	4.6
MES	Ba	6.2	17.9	27.9	50	78	13	1.7
MES	B	2.45	19.1	44.5	53	125	13	2.4
MES3)	Pb	1.36	36.7	55.1	103	154	13	3.4

1) Number of participating labs too low 2) Analytical data too poor 3) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) 4) Affected by biological activity 5) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study . 6) Number of pairs of results too low

EN 12457 - 4		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r,anal}$ % 5)
MESc3)	As	0.056	57	81	160	227	11	4.0
MES	Sb	0.45	31.2	54.0	87	151	13	5.0
MES	Ba	5.02	16.4	37.9	46	106	13	1.6
MES	B	1.56	18.3	37.4	51	105	13	4.7
MES3)	Pb	1.38	38.6	53.2	108	149	13	3.6

1) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) 2) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

The overall average S_R for MES and SBW amount to respectively 47 ± 13 % and 70 ± 29.

In figure 5.6 and 5.7 the S_R values for MES and SBW are given respectively for EN 12457 - 1, 2 and 4 and for EN 12457 - 1, 2 and EN 12457 - 3.

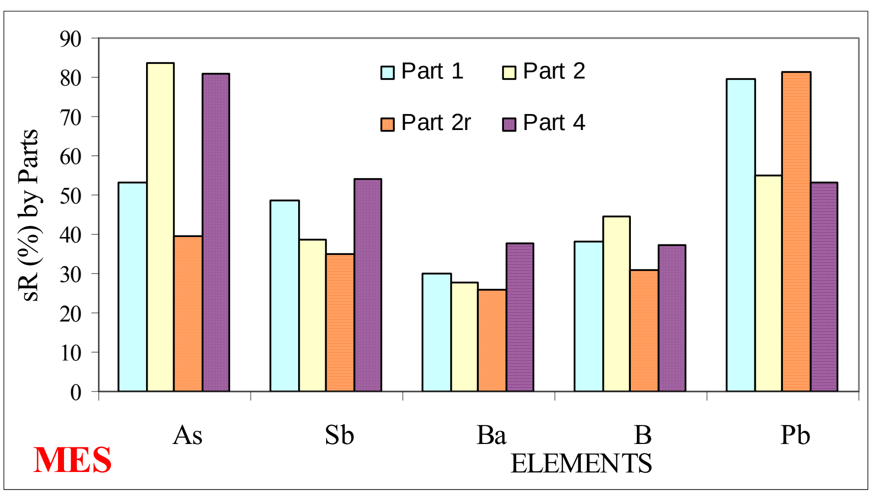


Figure 5.6 *Comparison of S_R values for MES in EN 12457-1, EN 12457-2, and EN 12457-4)*

The central size reduction has led to a systematically lower between laboratory variability for As, Sb and B. Size reduction can generally be expected to reduce variability. For Pb a significant increase in variability is noted. In this metallurgical slag, this may be attributed to a different (longer) exposure of Pb bullets embedded in the slag matrix after centralised size reduction. This may lead to different degrees of carbonation between centrally and size reduction by the individual laboratories. This inherent heterogeneity has been identified before for this type of matrix [4]. There may also be differences in the size reduction depending on the machine being used. The criteria for the size reduction in the standard are not specified in detail in terms of particle size reduction below the upper limit specified. This may result in differences in particle size distribution as obtained by individual laboratories.

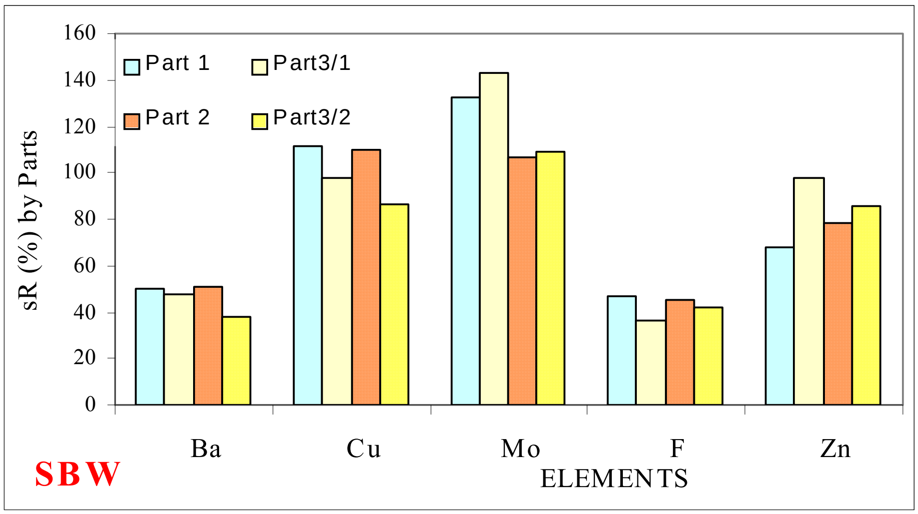


Figure 5.7 *Comparison of S_R values for SBW in EN 12457-1, EN 12457-2 and EN 12457-3.*

7.5 Comparison of the four Part EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4)

It must be underlined that the aim of the experimental validation study was to determine the performance criteria of the individual parts of the compliance leaching tests as specified in the four parts EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4). The aim was not to perform a thorough comparison of the four parts. Therefore, only a graphical presentation of test data obtained in the validation is provided in figure 5.8 - 5.9 – 5. 10 for the three common waste to the four parts (SBW, MBA and MES for 4 leached elements)

The data as obtained for the different parts have been sorted by EN 12457 - 2, since this part has been applied to all the seven selected wastes to be tested. The result of the chosen form of presentation is that EN 12457 - 2 curves look more regular than those of the other parts.
These curves follow a general similar trend at L/S = 10 and at L/S = 2. Such general trend and pattern are different for the different combinations of waste – leached component. But it is not possible to derive from the validation tests results a general conversion law that would convert the results obtained at L/S = 2 into results that would have been obtained at L/S = 10 or vice versa. This is due to the fact that a significantly different ratio of results at L/S = 10 over results at L/S = 2 are observed for the different combinations waste-leached component (such ratio being calculated either on the raw results or on the maximum values that can be attributed to the measured parameters).

7.6 Heterogeneity of laboratory samples

In the validation two laboratory samples were provided to all laboratories for each waste they were required to test. They were required to perform a single complete leaching test for each laboratory sample. In such an experiment, the variability of the laboratory samples is included and cannot be separated from the variability caused by the leaching test itself specified in the EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 standards. Consequently, the reproducibility limit and the repeatability limit presented in this report do not cover sampling but cover all activities carried out on the laboratory sample including its preparation from the primary field sample i.e. cover the variability of laboratory samples obtained in the same conditions as indicated in section 5 of ISO 5725-5. In table 5.9 the repeatability standard deviation for the test is given for all materials. These data illustrate the difference between the materials in terms of heterogeneity as the analytical uncertainties contribute relatively little to the overall uncertainty.

Table 5.9 *Summary of repeatability standard deviation for the 7 materials studied*

Material	Part	$s_{r,test}$ (%)	$s_{r,test}$ (%)	$s_{r,test}$ (%)	$s_{r,test}$ (%)	$s_{r,test}$ (%)
SEW		TOC	SO4	NH4	Ni	Co
	EN 12457 - 2	3	26	11	9	10
CHS		CrVI	F	Cr	Cl	Cd
	EN 12457 - 2	3	4	3	10	-
FCM		Cl	F	NO2	Ba	CrVI
	EN 12457 - 2	2	8	-	5	4
COS		As	Pb	Cd	Ni	Co
	EN 12457 - 1	8	5	8	8	6
	EN 12457 - 2	4	5	4	4	5
MBA		Mo	Sb	SO4	Ba	Cu
	EN 12457 - 1	10	21	17	8	12
	EN 12457 - 2	18	19	16	12	18
	EN 12457 - 3/1	12	14	23	14	18
	EN 12457 - 3/2	13	12	15	14	17
	EN 12457 - 4	9	17	19	17	20
SBW		Ba	Cu	Mo	F	Zn
	EN 12457 - 1	19	41	113	24	61
	EN 12457 - 2	35	27	77	5	50
	EN 12457 - 3/1	24	77	112	20	98
	EN 12457 - 3/2	34	58	79	4.9	78
MES		As	Sb	Ba	B	Pb
	EN 12457 - 1	48	30	17	17	54
	EN 12457 - 2	38	31	8	15	31
	EN 12457 - 2	51	16	18	19	37
	EN 12457 - 4	57	31	16	18	39

In two labs the individual laboratory samples of MES provided were tested and analysed (eluates) in duplicate. In table 5.10 the results are given. Sub-sampling from the same laboratory sample down to test portions does apparently not lead to very significant differences compared to the repeatability/reproducibility limits as obtained for MES in the validation of EN 12457-2 (See part 7). It clearly shows that a significant difference in pH exists between the four respective laboratory samples. Laboratory samples 15 and 28 are quite similar in all respects, whereas - in spite the fact that all laboratory sample were obtained in the same conditions from a unique large "field" sample - laboratory samples 12 and 25 are showing differences between them and with laboratory samples 15 and 28 for several elements (Ba, B, As, Pb). This is an indication of heterogeneity. It is also to be noted that Ba, B and As are well outside the calculated reproducibility range. Lead for laboratory sample 25, Ba, B and As for laboratory sample 12 as well as Boron for laboratory sample 25.

Table 5.10 *MES testing and analysis in duplicate (EN 12457-2).*

Lab No	25				sr %	sr %	sr %	PrEN12457		Minim.	Reproducibility	Max.
Lot	Lot 15	Lot 15	Lot 28	Lot 28	Lot 15	Lot 28	Lot 15,	sr%	sR%	value	limit at 95 %	value
pH	10.1	10.1	9.9	10			28,12,25			mg/kg	confidence*	mg/kg
Sb	62	53	70	68	9.2	2.2	6.4	30.9	34.9	52	103	***90***
Sb	61	52	71	68								
Ba	659	681	699	660	1.7	3.5	6.2	8.4	26.1	566	980	**1750**
Ba	660	676	707	664								
B	224	230	221	188	1.7	9.8	6.8	15.3	31	185	346	**1230**
B	221	223	221	185								
As	7.4	5.5	7.3	6.7	16.3	3.6	13.5	38.4	39.7	5.5	12	**18.5**
As	7.2	5.5	7.1	7.1								
Pb	227	232	198	196	1.5	1.3	4.3	31.1	81.2	71	232	***233***
Pb	224	230	202	198								

Lab No	9					
Lot	Lot 12	Lot 12	Lot 25	Lot 25	Lot 12	Lot 25
pH	7.2	7.16	7.76	7.78		
Sb	65	73	87	79	8.4	6.1
Sb	67	78	90	81		
Ba	***1681***	***1422***	661	566	9.9	9.8
Ba	***1750***	***1479***	691	579		
B	***1219***	***1080***	***878***	***772***	8.2	7.4
B	***1230***	***1048***	***877***	***772***		
As	***15.4***	***18.5***	9.4	5.5	9.3	25.0
As	***15.9***	***15.3***	8.7	6.3		
Pb	218	212	***77***	***71***	4.3	10.0
Pb	233	228	***90***	***80***		

* Reproducibility limit = Minimum + 2.8*sR*Minimum/100.

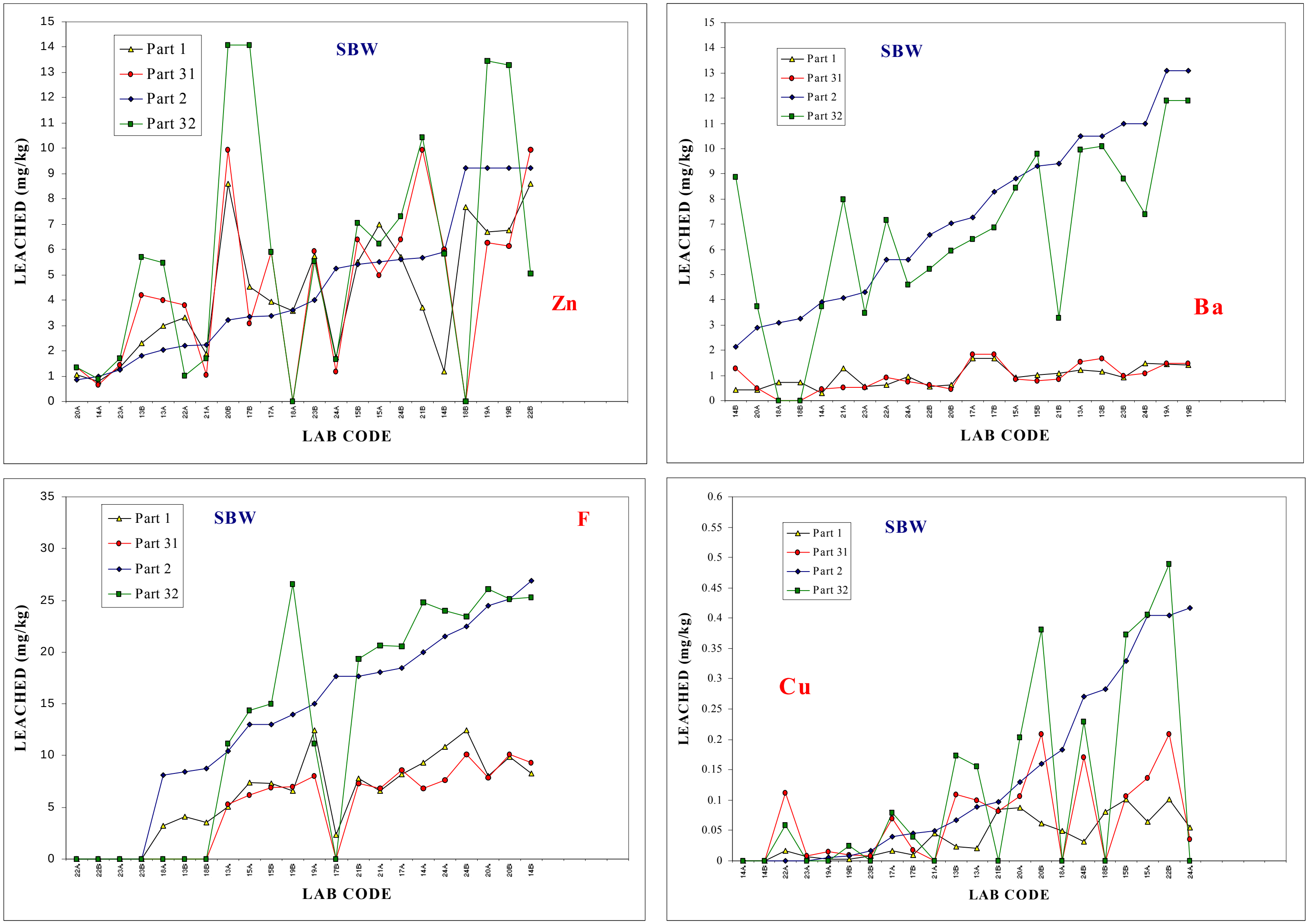


Figure 5.8 *Leached quantities of F, Zn, Ba and Cu from SBW for EN 12457-1, EN 12457-2 and EN 12457-3 as obtained by the different participants in the validation. Data of Parts are presented relative to results of EN 12457 - 2 (leads to artificially systematic data for EN 12457 - 2)*

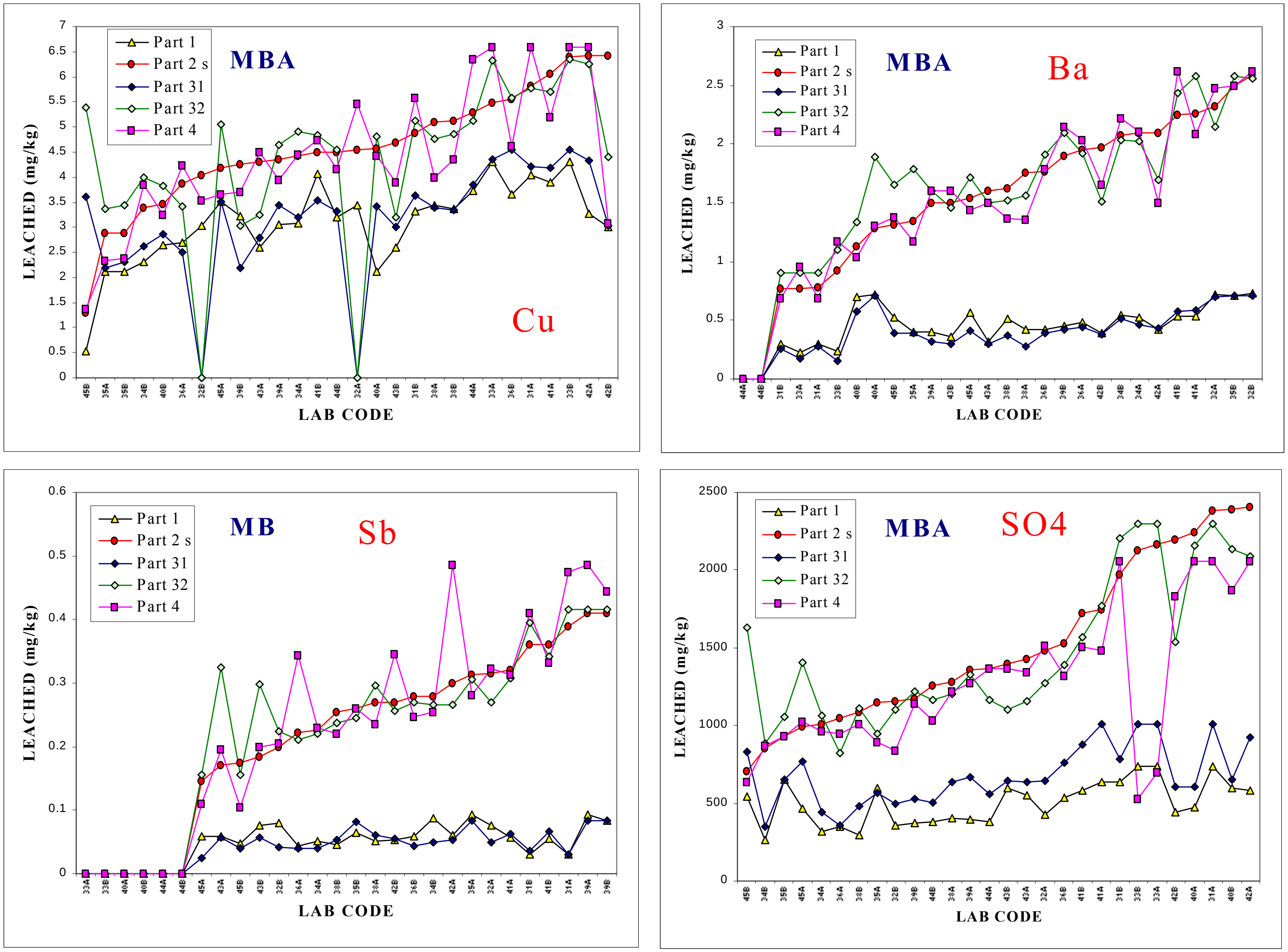


Figure 5.9 *Leached quantities of Cu, Ba, Sb and SO4 from MBA for EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 as obtained by the different participants in the validation. Data of Parts are presented relative to results of EN 12457 - 2 (leads to artificially systematic data for EN 12457 - 2)*

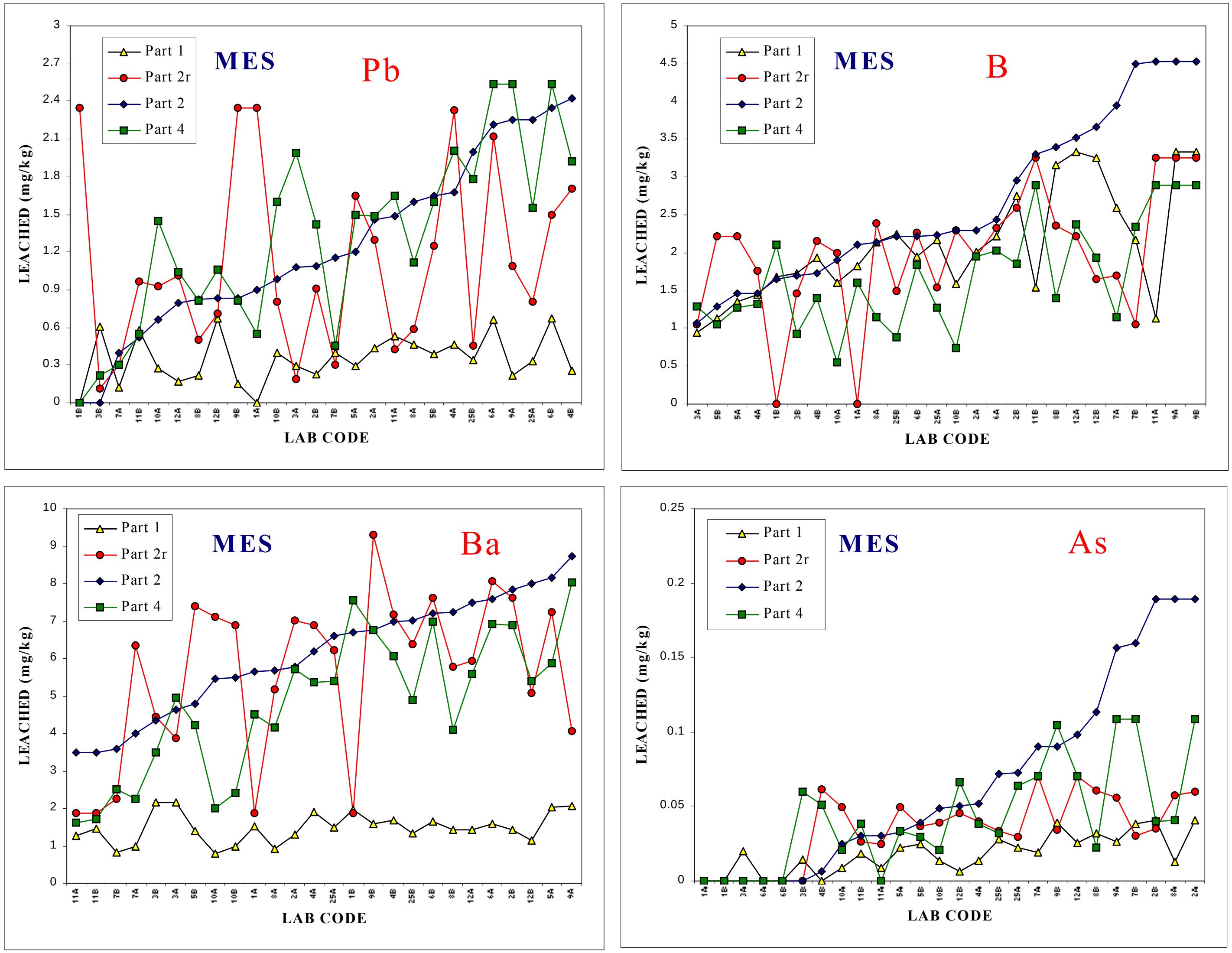


Figure 5.10 *Leached quantities of Pb, B, Ba and S as SO4 from MES for EN 12457-1, EN 12457-2 and EN 12457-4 as obtained by the different participants in the validation. Data of Parts are presented relative to results of EN 12457 - 2 (leads to artificially systematic data for EN 12457 - 2)*

8. DISCUSSION AND CONCLUSIONS

The repeatability and reproducibility for the four procedures in the standards EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 for the 7 different materials are given in Part 7. From these more general data performance characteristics can be derived, subject to several hypotheses. This is used as a basis for the performance characteristics chapter 8 of EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4. For 3 out of 7 materials the repeatability of EN 12457-2 is significantly less than for the others. This may be attributed to sample heterogeneity. For MBA this is a well-known phenomenon, which even after very rigorous homogenisation can not be eliminated [5,6]. This type of heterogeneity is inherent to waste and waste testing. In case of SBW, between laboratory variability may also be attributed to heterogeneity, which was not expected to occur for SBW as it is a very fine-grained dry powdery material that would be expected to be homogenised fairly easy.

In figures 5.11 and 5.12 the results of the between laboratory test variabilities ($s_{R,test}$) are shown relative to the within laboratory analytical variability for "heterogeneous" materials MES, SBW and to a lesser extent MBA and relatively homogeneous materials FCM, CHS, SEW and COS. There is a slight positive correlation, which may be expected. However, within this data set the analytical uncertainty does not have a very strong influence on the reproducibility.

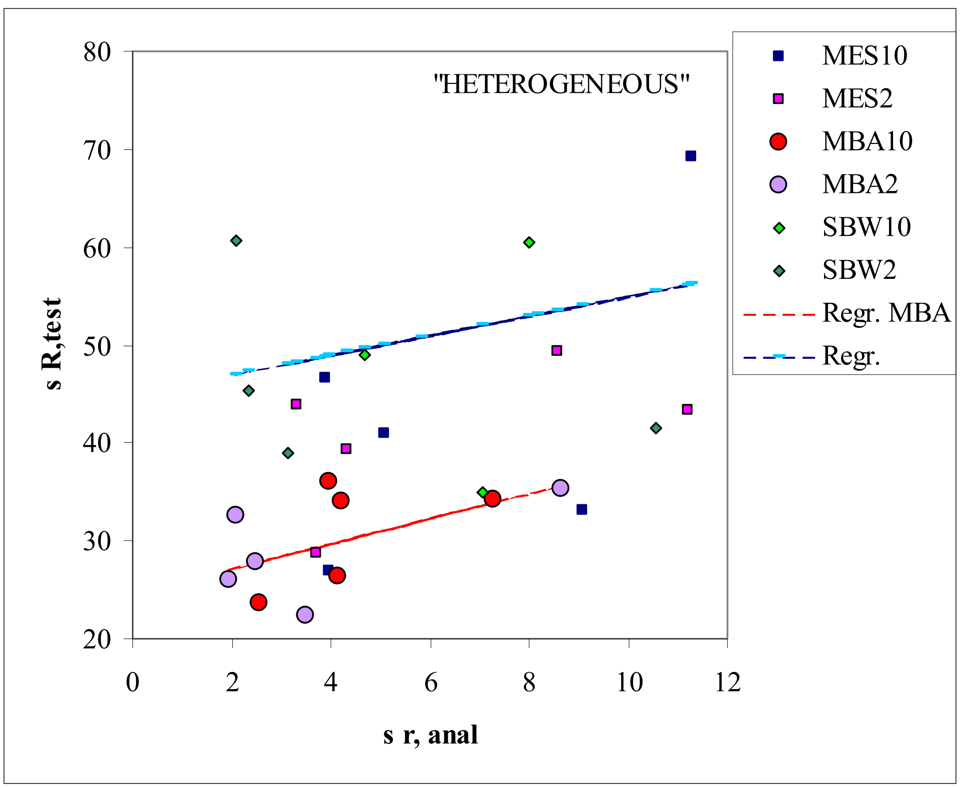


Figure 5.11 *Repeatability standard deviation for analysis ($s_{r,anal}$) versus the test reproducibility standard deviation ($s_{R,test}$) for MES, SBW en MBA.*

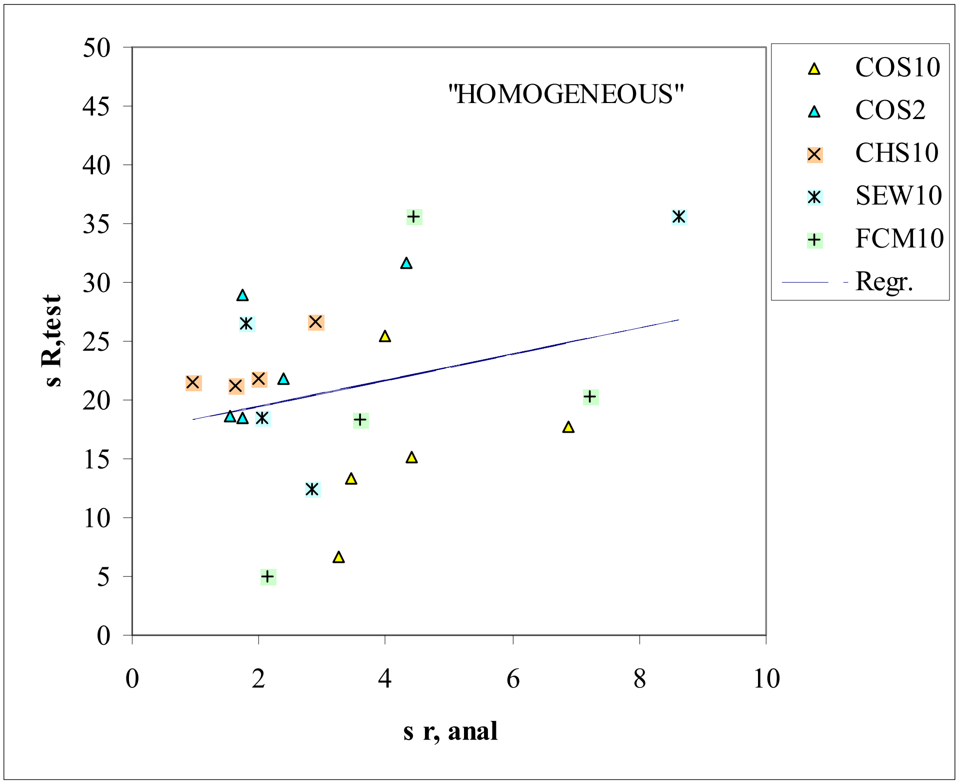


Figure 5.12 *Repeatability standard deviation for analysis ($s_{r,anal}$) versus the test reproducibility standard deviation ($s_{R,test}$) for FCM, COS, SEW en CHS.*

In figure 5.13 the within laboratory test variability ($s_{r,test}$ in %) is plotted against the test reprodicibility standard deviation ($s_{R,test}$ in %). This gives two different linear relationships depending on the level of uncertainty. At within laboratory test uncertainties to about 20 % a slope of about 2 – 2.5 is observed, which corresponds to the normal relationship between within and between lab variabilities in validation work. Beyond this point data may show a very high $s_{R,test}$ (reproducibility) at a reasonable $s_{r,test}$ level. This is indicative of systematic errors leading to an off set in the concentration level. Another relationship is noted for heterogeneous materials, where at extreme heterogeneity the within laboratory variability and the between laboratory variability become the same. Theoretically, full heterogeneity would lead to equal values for between and within laboratory variability.

Since the repeatability and reproducibility on a range of elements in four materials is good, the conclusion is that the leaching test as such is suitable and provides adequate results, provided the condition of sufficient level of sample homogeneity is fulfilled. To improve overall performance of the tests emphasis must be placed on means to minimize the effects of sample heterogeneity on repeatability and reproducibility.

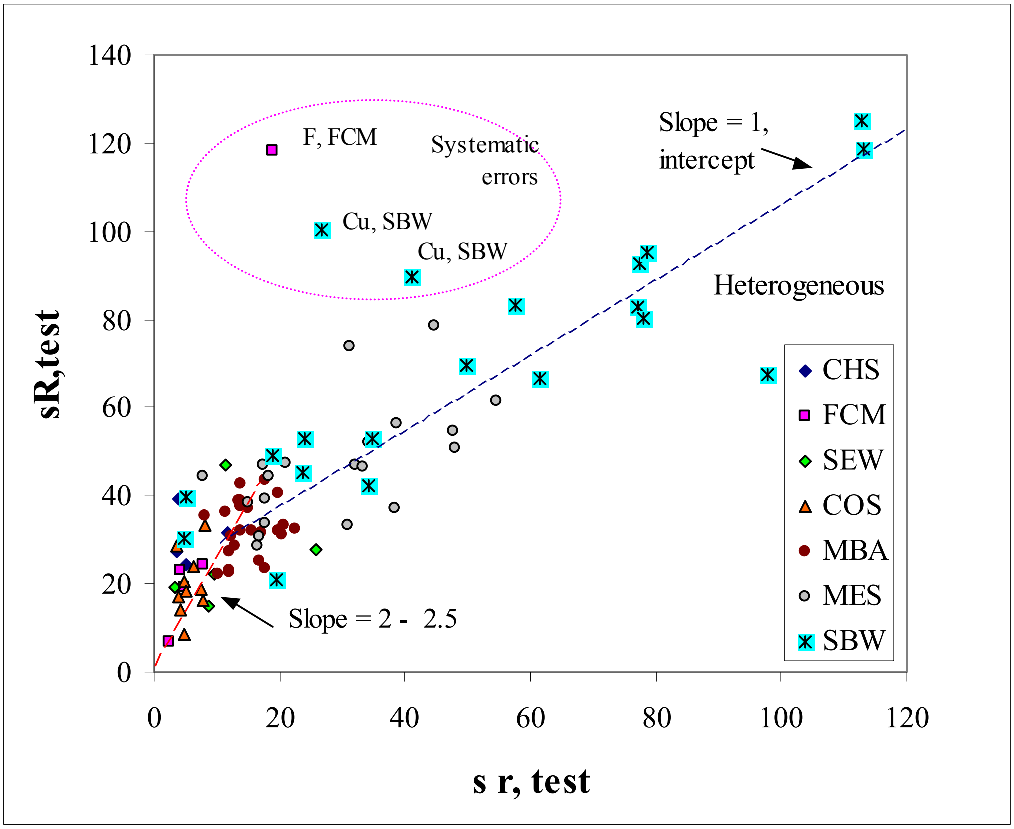


Figure 5.13 *Plot of the reproducibility standard deviation (sr,test) versus the repeatability standard deviation (s_R).*

The variability of NH_4 and TOC seems to be related to biological activity in SEW. As the biological activity increases, the NH_4 goes up and TOC decreases. This has also been observed in the ruggedness testing. In figure 5.15 a relationship between NH_4 and TOC is shown. For biologically active samples measures may be recommended to minimize the biological activity between sampling and measurement. In addition, for such samples the time between sampling and testing should be kept as short as possible.

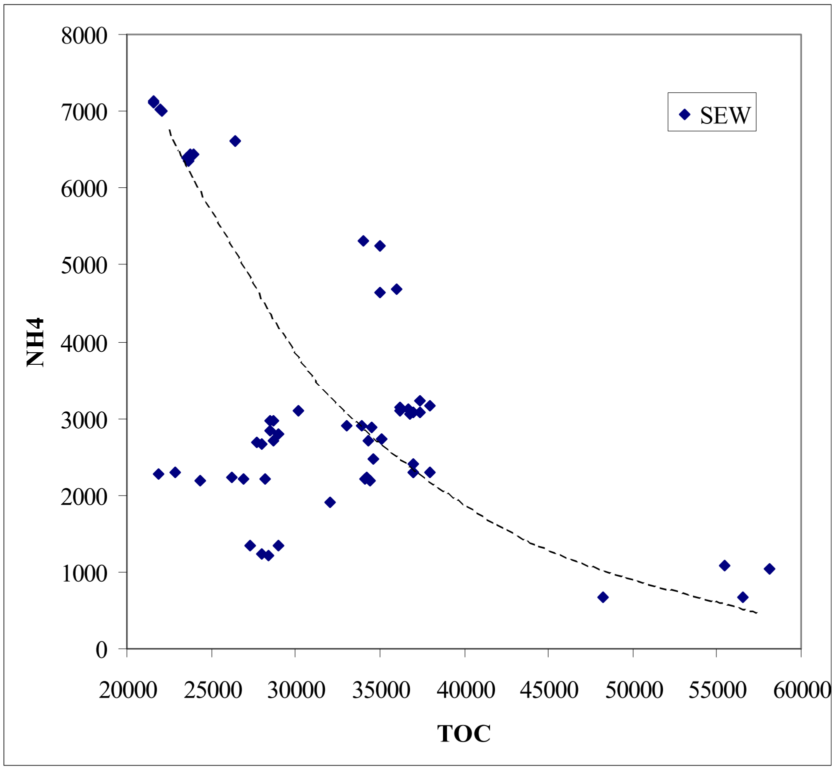


Figure 5.15 *Relationship between NH4 and TOC in SEW illustrating possible interference from biological activity in testing.*

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[3] ISO 5725-5 Accuracy (trueness and precision) of measurement methods and results. Part 5. ISO, 1998

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[5] Versluijs, C.W., Anthonissen, I.H. and Valentijn, E.A. Mammoet '85: Integrale evaluatie van deelonderzoeken. RIVM report 738504008. Bilthoven 1990.

[6] IAWG (International Ash Working Group; A.J.Chandler, T.T.Eighmy, J.Hartlen, O.Hjelmar, D.S.Kosson, S.E.Sawell, H.A.van der Sloot, J.Vehlow). 1997. Municipal Solid Waste Incinerator Residues . Studies in Environmental Science 67, Elsevier Science, Amsterdam, 974 pp.

[7] Uncertainty in Measurement (GUM)

APPENDIX I DATA REPORTING SHEETS

APPENDIX II Z SCORES FOR SPECIES WASTE COMBINATIONS INCLUDING REFERENCE TO CHARACTERIZATION LEACHING TESTS AND STANDARD ELUATE ANALYSIS PERFORMANCE DATA

APPENDIX I RAW DATA SHEETS

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	1						
Date experiment:	03-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	8	0.17502	2.16	20	cf test report
		2	19	0.17518	2.1	20	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 8	1	1	0.315	9.55	0.152	134	cf test report
Test on LOTnr: 19	2	1	0.325	9.51	0.156	116	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 8	1	1	Sb	1	110	50	NF EN ISO 11885
	1	1	Sb	2	120	50	NF EN ISO 11885
	1	1	Ba	1	760	10	NF EN ISO 11885
	1	1	Ba	2	760	10	NF EN ISO 11885
	1	1	B	1	910	10	NF EN ISO 11885
	1	1	B	2	920	10	NF EN ISO 11885
	1	1	As	1	<50	50	NF EN ISO 11885
	1	1	As	2	<50	50	NF EN ISO 11885
	1	1	Pb	1	<50	50	NF EN ISO 11885
	1	1	Pb	2	<50	50	NF EN ISO 11885
Test on LOTnr: 19	2	1	Sb	1	120	50	NF EN ISO 11885
	2	1	Sb	2	110	50	NF EN ISO 11885
	2	1	Ba	1	990	10	NF EN ISO 11885
	2	1	Ba	2	990	10	NF EN ISO 11885
	2	1	B	1	830	10	NF EN ISO 11885
	2	1	B	2	860	10	NF EN ISO 11885
	2	1	As	1	<50	50	NF EN ISO 11885
	2	1	As	2	<50	50	NF EN ISO 11885
	2	1	Pb	1	<50	50	NF EN ISO 11885
	2	1	Pb	2	<50	50	NF EN ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	1						
Date experiment:	03-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	8	0.08992	2.13	20	cf test report
		2	19	0.09014	2.21	20	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 8	1	1	0.86	9.2	0.0521	90	cf test report
Test on LOTnr: 19	2	1	0.87	9.05	0.0441	112	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 8	1	1	Sb	1	50	50	NF EN ISO 11885
	1	1	Sb	2	70	50	NF EN ISO 11885
	1	1	Ba	1	570	10	NF EN ISO 11885
	1	1	Ba	2	560	10	NF EN ISO 11885
	1	1	B	1	200	10	NF EN ISO 11885
	1	1	B	2	220	10	NF EN ISO 11885
	1	1	As	1	<50	50	NF EN ISO 11885
	1	1	As	2	<50	50	NF EN ISO 11885
	1	1	Pb	1	90	50	NF EN ISO 11885
	1	1	Pb	2	<50	50	NF EN ISO 11885
Test on LOTnr: 19	2	1	Sb	1	50	50	NF EN ISO 11885
	2	1	Sb	2	70	50	NF EN ISO 11885
	2	1	Ba	1	670	10	NF EN ISO 11885
	2	1	Ba	2	670	10	NF EN ISO 11885
	2	1	B	1	170	10	NF EN ISO 11885
	2	1	B	2	160	10	NF EN ISO 11885
	2	1	As	1	<50	50	NF EN ISO 11885
	2	1	As	2	<50	50	NF EN ISO 11885
	2	1	Pb	1	<50	50	NF EN ISO 11885
	2	1	Pb	2	<50	50	NF EN ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	1						
Date experiment:	03-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.08992	2.27	20	cf test report
		2	19	0.09037	2.02	20	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.885	9.29	0.0492	103	cf test report
Test on LOTnr: 19	**2**	1	0.885	9.3	0.0534	107	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Sb	1	<50	50	NF EN ISO 11885
	1	1	Sb	2	<50	50	NF EN ISO 11885
	1	1	Ba	1	450	10	NF EN ISO 11885
	1	1	Ba	2	450	10	NF EN ISO 11885
	1	1	B	1	160	10	NF EN ISO 11885
	1	1	B	2	160	10	NF EN ISO 11885
	1	1	As	1	<50	50	NF EN ISO 11885
	1	1	As	2	<50	50	NF EN ISO 11885
	1	1	Pb	1	60	50	NF EN ISO 11885
	1	1	Pb	2	50	50	NF EN ISO 11885
Test on LOTnr: 19	**2**	1	Sb	1	70	50	NF EN ISO 11885
	2	1	Sb	2	80	50	NF EN ISO 11885
	2	1	Ba	1	760	10	NF EN ISO 11885
	2	1	Ba	2	750	10	NF EN ISO 11885
	2	1	B	1	220	10	NF EN ISO 11885
	2	1	B	2	200	10	NF EN ISO 11885
	2	1	As	1	<50	50	NF EN ISO 11885
	2	1	As	2	<50	50	NF EN ISO 11885
	2	1	Pb	1	<50	50	NF EN ISO 11885
	2	1	Pb	2	<50	50	NF EN ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	1						
Date experiment:	08-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	2	0.0902	2.23	20	cf test report
		2	25	0.09016	2.22	21	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 2	**1**	1	0.885	9.17	0.0779	167	cf test report
Test on LOTnr: 25	**2**	1	0.89	9.17	0.0541	161	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 2	**1**	1	Sb	1	100	50	NF EN ISO 11885
	1	1	Sb	2	100	50	NF EN ISO 11885
	1	1	Ba	1	180	10	NF EN ISO 11885
	1	1	Ba	2	190	10	NF EN ISO 11885
	1	1	B	1	<50	10	NF EN ISO 11885
	1	1	B	2	<50	10	NF EN ISO 11885
	1	1	As	1	<50	50	NF EN ISO 11885
	1	1	As	2	<50	50	NF EN ISO 11885
	1	1	Pb	1	620	50	NF EN ISO 11885
	1	1	Pb	2	600	50	NF EN ISO 11885
Test on LOTnr: 25	**2**	1	Sb	1	80	50	NF EN ISO 11885
	2	1	Sb	2	90	50	NF EN ISO 11885
	2	1	Ba	1	180	10	NF EN ISO 11885
	2	1	Ba	2	170	10	NF EN ISO 11885
	2	1	B	1	<50	10	NF EN ISO 11885
	2	1	B	2	<50	10	NF EN ISO 11885
	2	1	As	1	<50	50	NF EN ISO 11885
	2	1	As	2	<50	50	NF EN ISO 11885
	2	1	Pb	1	670	50	NF EN ISO 11885
	2	1	Pb	2	710	50	NF EN ISO 11885

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	1						
Date experiment:	16-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.1513	0.68	20	cf test report
		2	29	0.13725	0.68	20	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.735	10.5	3	220	cf test report
Test on LOTnr: 29	**2**	1	0.755	10.45	2.97	170	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Cl	1	284000	1000	NF EN ISO 10304
	1	1	Cl	2	280000	1000	NF EN ISO 10304
	1	1	F	1	700	100	NF EN ISO 10304
	1	1	F	2	700	100	NF EN ISO 10304
	1	1	NO2	1	<300	300	NF EN ISO 10304
	1	1	NO2	2	<300	300	NF EN ISO 10304
	1	1	Ba	1	70	10	NF EN ISO 11885
	1	1	Ba	2	80	10	NF EN ISO 11885
	1	1	Cr(VI)	1	260	5	NF T 90-043
	1	1	Cr(VI)	2	260	5	NF T 90-043
Test on LOTnr: 29	**2**	1	Cl	1	287000	1000	NF EN ISO 10304
	2	1	Cl	2	283000	1000	NF EN ISO 10304
	2	1	F	1	700	100	NF EN ISO 10304
	2	1	F	2	700	100	NF EN ISO 10304
	2	1	NO2	1	<300	300	NF EN ISO 10304
	2	1	NO2	2	<300	300	NF EN ISO 10304
	2	1	Ba	1	80	10	NF EN ISO 11885
	2	1	Ba	2	80	10	NF EN ISO 11885
	2	1	Cr(VI)	1	275	5	NF T 90-043
	2	1	Cr(VI)	2	275	5	NF T 90-043

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	1						
Date experiment:	06-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.09931	0.7	20	cf test report
		2	14	0.10019	0.71	20	cf test report
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.68	7.18	2.42	276	cf test report
Test on LOTnr: 14	**2**	1	0.73	7.19	2.37	228	cf test report
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	TOC	1	2620000	1000000	NF EN 1484
	1	1	TOC	2	2820000	1000000	NF EN 1484
	1	1	SO4	1	46000	1000	NF EN ISO 10304
	1	1	SO4	2	50000	1000	NF EN ISO 10304
	1	1	NH4	1	223000	500	NF EN ISO11732
	1	1	NH4	2	222000	500	NF EN ISO11732
	1	1	Ni	1	250	10	NF EN ISO 11885
	1	1	Ni	2	260	10	NF EN ISO 11885
	1	1	Co	1	60	10	NF EN ISO 11885
	1	1	Co	2	60	10	NF EN ISO 11885
Test on LOTnr: 14	**2**	1	TOC	1	2430000	1000000	NF EN 1484
	2	1	TOC	2	2690000	1000000	NF EN 1484
	2	1	SO4	1	45000	1000	NF EN ISO 10304
	2	1	SO4	2	43000	1000	NF EN ISO 10304
	2	1	NH4	1	220000	500	NF EN ISO11732
	2	1	NH4	2	221000	500	NF EN ISO11732
	2	1	Ni	1	270	10	NF EN ISO 11885
	2	1	Ni	2	290	10	NF EN ISO 11885
	2	1	Co	1	60	10	NF EN ISO 11885
	2	1	Co	2	60	10	NF EN ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	2						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	17	0.175		22	
		2	29	0.175		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 17	**1**	1	0.35	10.4	0.245		
Test on LOTnr: 29	**2**	1	0.35	9.9	0.283		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 17	**1**	1	Sb	1	101	40	ICP
	1	1	Sb	2	106	40	ICP
	1	1	Ba	1	644	10	ICP
	1	1	Ba	2	646	10	ICP
	1	1	B	1	1020	100	ICP
	1	1	B	2	1000	100	ICP
	1	1	As	1	45	1	Hydride AAS
	1	1	As	2	40	1	Hydride AAS
	1	1	Pb	1	216	40	ICP
	1	1	Pb	2	219	40	ICP
Test on LOTnr: 29	**2**	1	Sb	1	171	40	ICP
	2	1	Sb	2	161	40	ICP
	2	1	Ba	1	715	10	ICP
	2	1	Ba	2	718	10	ICP
	2	1	B	1	1360	100	ICP
	2	1	B	2	1390	100	ICP
	2	1	As	1	35	1	Hydride AAS
	2	1	As	2	31	1	Hydride AAS
	2	1	Pb	1	115	40	ICP
	2	1	Pb	2	115	40	ICP

Laboratory code:	2						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	17	0.09		22	
		2	29	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 17	**1**	1	0.9	10.3	0.11		
Test on LOTnr: 29	**2**	1	0.9	10	0.094		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 17	**1**	1	Sb	1	101	40	ICP
	1	1	Sb	2	96	40	ICP
	1	1	Ba	1	580	10	ICP
	1	1	Ba	2	573	10	ICP
	1	1	B	1	230	100	ICP
	1	1	B	2	230	100	ICP
	1	1	As	1	42	1	Hydride AAS
	1	1	As	2	40	1	Hydride AAS
	1	1	Pb	1	149	40	ICP
	1	1	Pb	2	142	40	ICP
Test on LOTnr: 29	**2**	1	Sb	1	89	40	ICP
	2	1	Sb	2	84	40	ICP
	2	1	Ba	1	789	10	ICP
	2	1	Ba	2	782	10	ICP
	2	1	B	1	300	100	ICP
	2	1	B	2	290	100	ICP
	2	1	As	1	21	1	Hydride AAS
	2	1	As	2	22	1	Hydride AAS
	2	1	Pb	1	113	40	ICP
	2	1	Pb	2	104	40	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	2						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	17	0.09		22	
		2	29	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 17	1	1	0.9	10.3	0.099		
Test on LOTnr: 29	2	1	0.9	10.2	0.075		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 17	1	1	Sb	1	83	40	ICP
	1	1	Sb	2	83	40	ICP
	1	1	Ba	1	568	10	ICP
	1	1	Ba	2	576	10	ICP
	1	1	B	1	200	100	ICP
	1	1	B	2	190	100	ICP
	1	1	As	1	23	1	Hydride AAS
	1	1	As	2	22	1	Hydride AAS
	1	1	Pb	1	149	40	ICP
	1	1	Pb	2	149	40	ICP
Test on LOTnr: 29	2	1	Sb	1	54	40	ICP
	2	1	Sb	2	61	40	ICP
	2	1	Ba	1	687	10	ICP
	2	1	Ba	2	688	10	ICP
	2	1	B	1	190	100	ICP
	2	1	B	2	180	100	ICP
	2	1	As	1	3	1	Hydride AAS
	2	1	As	2	5	1	Hydride AAS
	2	1	Pb	1	145	40	ICP
	2	1	Pb	2	139	40	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	2						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	9	0.09		22	
		2	20	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 9	1	1	0.9	9.9	0.066		
Test on LOTnr: 20	2	1	0.9	9.8	0.075		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 9	1	1	Sb	1	65	40	ICP
	1	1	Sb	2	68	40	ICP
	1	1	Ba	1	707	10	ICP
	1	1	Ba	2	698	10	ICP
	1	1	B	1	190	100	ICP
	1	1	B	2	200	100	ICP
	1	1	As	1	5	1	Hydride AAS
	1	1	As	2	7	1	Hydride AAS
	1	1	Pb	1	128	40	ICP
	1	1	Pb	2	131	40	ICP
Test on LOTnr: 20	2	1	Sb	1	84	40	ICP
	2	1	Sb	2	80	40	ICP
	2	1	Ba	1	758	10	ICP
	2	1	Ba	2	763	10	ICP
	2	1	B	1	260	100	ICP
	2	1	B	2	260	100	ICP
	2	1	As	1	4	1	Hydride AAS
	2	1	As	2	3	1	Hydride AAS
	2	1	Pb	1	91	40	ICP
	2	1	Pb	2	90	40	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	SEW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	2						
Date experiment:	11-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.09		22	
		2	15	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.9	6.81	2.67		
Test on LOTnr: 15	2	1	0.9	6.84	2.64		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	TOC	1	3500000	10000	TOC
	1	1	TOC	2	3600000	10000	TOC
	1	1	SO4	1	50640	1000	IC
	1	1	SO4	2	49350	1000	IC
	1	1	NH4	1	463600	200	Photometry
	1	1	NH4	2	467500	200	Photometry
	1	1	Ni	1	300	10	ICP
	1	1	Ni	2	290	10	ICP
	1	1	Co	1	60	10	ICP
	1	1	Co	2	60	10	ICP
Test on LOTnr: 15	2	1	TOC	1	3500000	10000	TOC
	2	1	TOC	2	3400000	10000	TOC
	2	1	SO4	1	43440	1000	IC
	2	1	SO4	2	43410	1000	IC
	2	1	NH4	1	525400	200	Photometry
	2	1	NH4	2	530600	200	Photometry
	2	1	Ni	1	290	10	ICP
	2	1	Ni	2	280	10	ICP
	2	1	Co	1	60	10	ICP
	2	1	Co	2	50	10	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	2						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.09		22	
		2	18	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.9	11	3.2		
Test on LOTnr: 18	2	1	0.9	11.1	3.2		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	Cl	1	285000	1000	IC
	1	1	Cl	2	276000	1000	IC
	1	1	F	1	820	400	IC
	1	1	F	2	830	400	IC
	1	1	NO2	1	210	10	IC
	1	1	NO2	2	200	10	IC
	1	1	Ba	1	70	10	ICP
	1	1	Ba	2	60	10	ICP
	1	1	Cr(VI)	1	1105	10	Photometry
	1	1	Cr(VI)	2	1110	10	Photometry
Test on LOTnr: 18	2	1	Cl	1	286000	1000	IC
	2	1	Cl	2	289000	1000	IC
	2	1	F	1	820	400	IC
	2	1	F	2	850	400	IC
	2	1	NO2	1	180	10	IC
	2	1	NO2	2	190	10	IC
	2	1	Ba	1	60	10	ICP
	2	1	Ba	2	60	10	ICP
	2	1	Cr(VI)	1	1105	10	Photometry
	2	1	Cr(VI)	2	1108	10	Photometry

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	3						
Date experiment:	20-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	20				
		2	27				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 20	**1**	1	1	10.45	0,141(25°C)		
Test on LOTnr: 27	**2**	1	1	10.45	0,162(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 20	**1**	1	Sb	1	72	5	ISO 11885
	1	1	Sb	2	73	5	ISO 11885
	1	1	Ba	1	1277	1	ISO 11885
	1	1	Ba	2	1280	1	ISO 11885
	1	1	B	1	434	5	ISO 11885
	1	1	B	2	509	5	ISO 11885
	1	1	As	1	11	5	ISO 11885
	1	1	As	2	9	5	ISO 11885
	1	1	Pb	1	119	10	ISO 11885
	1	1	Pb	2	171	10	ISO 11885
Test on LOTnr: 27	**2**	1	Sb	1	48	5	ISO 11885
	2	1	Sb	2	39	5	ISO 11885
	2	1	Ba	1	1260	1	ISO 11885
	2	1	Ba	2	1220	1	ISO 11885
	2	1	B	1	876	5	ISO 11885
	2	1	B	2	850	5	ISO 11885
	2	1	As	1	7	5	ISO 11885
	2	1	As	2	7	5	ISO 11885
	2	1	Pb	1	302	10	ISO 11885
	2	1	Pb	2	301	10	ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	3						
Date experiment:	20-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	20				
		2	27				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 20	**1**	1	1	10.1	0,041(25°C)		
Test on LOTnr: 27	**2**	1	1	10	0,048(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 20	**1**	1	Sb	1	32	5	ISO 11885
	1	1	Sb	2	28	5	ISO 11885
	1	1	Ba	1	459	1	ISO 11885
	1	1	Ba	2	468	1	ISO 11885
	1	1	B	1	104	5	ISO 11885
	1	1	B	2	109	5	ISO 11885
	1	1	As	1	<5	5	ISO 11885
	1	1	As	2	<5	5	ISO 11885
	1	1	Pb	1	106	10	ISO 11885
	1	1	Pb	2	109	10	ISO 11885
Test on LOTnr: 27	**2**	1	Sb	1	32	5	ISO 11885
	2	1	Sb	2	31	5	ISO 11885
	2	1	Ba	1	440	1	ISO 11885
	2	1	Ba	2	432	1	ISO 11885
	2	1	B	1	169	5	ISO 11885
	2	1	B	2	171	5	ISO 11885
	2	1	As	1	<5	5	ISO 11885
	2	1	As	2	<5	5	ISO 11885
	2	1	Pb	1	<10	10	ISO 11885
	2	1	Pb	2	<10	10	ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**3**						
Date experiment:	21-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	20				
		2	27				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 20	**1**	1	1	10	0,041(25°C)		
Test on LOTnr: 27	**2**	1	1	10	0,052(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 20	**1**	1	Sb	1	20	5	ISO 11885
	1	1	Sb	2	18	5	ISO 11885
	1	1	Ba	1	518	1	ISO 11885
	1	1	Ba	2	471	1	ISO 11885
	1	1	B	1	142	5	ISO 11885
	1	1	B	2	117	5	ISO 11885
	1	1	As	1	<5	5	ISO 11885
	1	1	As	2	<5	5	ISO 11885
	1	1	Pb	1	137	10	ISO 11885
	1	1	Pb	2	260	10	ISO 11885
Test on LOTnr: 27	**2**	1	Sb	1	48	5	ISO 11885
	2	1	Sb	2	44	5	ISO 11885
	2	1	Ba	1	392	1	ISO 11885
	2	1	Ba	2	307	1	ISO 11885
	2	1	B	1	100	5	ISO 11885
	2	1	B	2	87	5	ISO 11885
	2	1	As	1	6	5	ISO 11885
	2	1	As	2	6	5	ISO 11885
	2	1	Pb	1	16	10	ISO 11885
	2	1	Pb	2	14	10	ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	3						
Date experiment:	25-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	7				
		2	16				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 7	**1**	1	1	9.9	0,042(25°C)		
Test on LOTnr: 16	**2**	1	1	9.8	0,044(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 7	**1**	1	Sb	1	43	5	ISO 11885
	1	1	Sb	2	43	5	ISO 11885
	1	1	Ba	1	380	1	ISO 11885
	1	1	Ba	2	394	1	ISO 11885
	1	1	B	1	98	5	ISO 11885
	1	1	B	2	101	5	ISO 11885
	1	1	As	1	<5	5	ISO 11885
	1	1	As	2	<5	5	ISO 11885
	1	1	Pb	1	23	10	ISO 11885
	1	1	Pb	2	15	10	ISO 11885
Test on LOTnr: 16	**2**	1	Sb	1	24	5	ISO 11885
	2	1	Sb	2	26	5	ISO 11885
	2	1	Ba	1	487	1	ISO 11885
	2	1	Ba	2	403	1	ISO 11885
	2	1	B	1	155	5	ISO 11885
	2	1	B	2	137	5	ISO 11885
	2	1	As	1	<5	5	ISO 11885
	2	1	As	2	<5	5	ISO 11885
	2	1	Pb	1	12	10	ISO 11885
	2	1	Pb	2	10	10	ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	SEW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	3						
Date experiment:	02-10-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	3				
		2	16				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 3	1	1	1	7.3	2,35(25°C)		
Test on LOTnr: 16	2	1	1	7.15	2,52(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 3	1	1	TOC	1	2730000	500	EN 1484
	1	1	TOC	2	2800000	500	EN 1484
	1	1	SO4	1	32100	500	ISO 10304-2
	1	1	SO4	2	19200	500	ISO 10304-2
	1	1	NH4	1	134000	1000	ISO 7150-1
	1	1	NH4	2	124000	1000	ISO 7150-1
	1	1	Ni	1	220	2	ISO 11885
	1	1	Ni	2	207	2	ISO 11885
	1	1	Co	1	50	2	ISO 11885
	1	1	Co	2	52	2	ISO 11885
Test on LOTnr: 16	2	1	TOC	1	2840000	500	EN 1484
	2	1	TOC	2	2900000	500	EN 1484
	2	1	SO4	1	39200	500	ISO 10304-2
	2	1	SO4	2	40200	500	ISO 10304-2
	2	1	NH4	1	122000	1000	ISO 7150-1
	2	1	NH4	2	134000	1000	ISO 7150-1
	2	1	Ni	1	245	2	ISO 11885
	2	1	Ni	2	252	2	ISO 11885
	2	1	Co	1	55	2	ISO 11885
	2	1	Co	2	55	2	ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	3						
Date experiment:	02-10-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	32				
		2	33				
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 32	1	1	1	11.4	2,73(25°C)		
Test on LOTnr: 33	2	1	1	11.1	2.74(25°C)		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 32	1	1	Cl	1	225400		ISO 10304-2
	1	1	Cl	2	219000		ISO 10304-2
	1	1	F	1	778	100	ISO 10359-1
	1	1	F	2	932	100	ISO 10359-1
	1	1	NO2	1	<50	50	EN 26777
	1	1	NO2	2	<50	50	EN 26777
	1	1	Ba	1	50	1	ISO 11885
	1	1	Ba	2	49	1	ISO 11885
	1	1	Cr(VI)	1	1090	50	ISO 11083
	1	1	Cr(VI)	2	1125	50	ISO 11083
Test on LOTnr: 33	2	1	Cl	1	217000		ISO 10304-2
	2	1	Cl	2	208000		ISO 10304-2
	2	1	F	1	798	100	ISO 10359-1
	2	1	F	2	732	100	ISO 10359-1
	2	1	NO2	1	<50	50	EN 26777
	2	1	NO2	2	<50	50	EN 26777
	2	1	Ba	1	49	1	ISO 11885
	2	1	Ba	2	50	1	ISO 11885
	2	1	Cr(VI)	1	1140	50	ISO 11083
	2	1	Cr(VI)	2	1145	50	ISO 11083

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	4						
Date experiment:	23-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.17505		23.1	
		2	14	0.17505		23.1	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.34995	10.18	0.17		
Test on LOTnr: 14	**2**	1	0.34995	10.55	0.285		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Sb	1	76.4	2	EAAS
	1	1	Sb	2	76.5	2	EAAS
	1	1	Ba	1	955	0.3	ICP-AES
	1	1	Ba	2	949	0.3	ICP-AES
	1	1	B	1	722	2	ICP-AES
	1	1	B	2	729	2	ICP-AES
	1	1	As	1	6.86	0.4	H-AAS
	1	1	As	2	6.68	0.4	H-AAS
	1	1	Pb	1	233	5	ICP-AES
	1	1	Pb	2	232	5	ICP-AES
Test on LOTnr: 14	**2**	1	Sb	1	<2	2	EAAS
	2	1	Sb	2	<2	2	EAAS
	2	1	Ba	1	844	0.3	ICP-AES
	2	1	Ba	2	846	0.3	ICP-AES
	2	1	B	1	951	2	ICP-AES
	2	1	B	2	977	2	ICP-AES
	2	1	As	1	<0,4	0.4	H-AAS
	2	1	As	2	<0,4	0.4	H-AAS
	2	1	Pb	1	12780	5	ICP-AES
	2	1	Pb	2	12660	5	ICP-AES

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	4						
Date experiment:	25-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.09003		23.4	
		2	14	0.09003		23.4	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.89997	9.99	0.0587		
Test on LOTnr: 14	**2**	1	0.89997	10.12	0.0698		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Sb	1	49.7	2	EAAS
	1	1	Sb	2	49.6	2	EAAS
	1	1	Ba	1	621	0.3	ICP-AES
	1	1	Ba	2	620	0.3	ICP-AES
	1	1	B	1	146	2	ICP-AES
	1	1	B	2	148	2	ICP-AES
	1	1	As	1	5.25	0.4	H-AAS
	1	1	As	2	5.1	0.4	H-AAS
	1	1	Pb	1	168	5	ICP-AES
	1	1	Pb	2	167	5	ICP-AES
Test on LOTnr: 14	**2**	1	Sb	1	<2	2	EAAS
	2	1	Sb	2	<2	2	EAAS
	2	1	Ba	1	698	0.3	ICP-AES
	2	1	Ba	2	702	0.3	ICP-AES
	2	1	B	1	175	2	ICP-AES
	2	1	B	2	172	2	ICP-AES
	2	1	As	1	0.63	0.4	H-AAS
	2	1	As	2	0.63	0.4	H-AAS
	2	1	Pb	1	487	5	ICP-AES
	2	1	Pb	2	480	5	ICP-AES

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**4**						
Date experiment:	25-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.09003		23.4	
		2	14	0.09003		23.4	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.89997	9.97	0.0514		
Test on LOTnr: 14	**2**	1	0.89997	10.01	0.0555		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Sb	1	24.8	2	EAAS
	1	1	Sb	2	27.8	2	EAAS
	1	1	Ba	1	539	0.3	ICP-AES
	1	1	Ba	2	534	0.3	ICP-AES
	1	1	B	1	134	2	ICP-AES
	1	1	B	2	131	2	ICP-AES
	1	1	As	1	3.74	0.4	H-AAS
	1	1	As	2	3.89	0.4	H-AAS
	1	1	Pb	1	202	5	ICP-AES
	1	1	Pb	2	200	5	ICP-AES
Test on LOTnr: 14	**2**	1	Sb	1	37.7	2	EAAS
	2	1	Sb	2	35.8	2	EAAS
	2	1	Ba	1	612	0.3	ICP-AES
	2	1	Ba	2	599	0.3	ICP-AES
	2	1	B	1	142	2	ICP-AES
	2	1	B	2	138	2	ICP-AES
	2	1	As	1	5.1	0.4	H-AAS
	2	1	As	2	5.17	0.4	H-AAS
	2	1	Pb	1	196	5	ICP-AES
	2	1	Pb	2	188	5	ICP-AES

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	4						
Date experiment:	25-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	18	0.09002		23.4	
		2	23	0.09003		23.4	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 18	**1**	1	0.89998	10.07	0.0578		
Test on LOTnr: 23	**2**	1	0.89997	10.17	0.0671		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 18	**1**	1	Sb	1	28.1	2	EAAS
	1	1	Sb	2	30.4	2	EAAS
	1	1	Ba	1	693	0.3	ICP-AES
	1	1	Ba	2	686	0.3	ICP-AES
	1	1	B	1	176	2	ICP-AES
	1	1	B	2	177	2	ICP-AES
	1	1	As	1	4.28	0.4	H-AAS
	1	1	As	2	3.65	0.4	H-AAS
	1	1	Pb	1	234	5	ICP-AES
	1	1	Pb	2	231	5	ICP-AES
Test on LOTnr: 23	**2**	1	Sb	1	72.2	2	EAAS
	2	1	Sb	2	71.8	2	EAAS
	2	1	Ba	1	723	0.3	ICP-AES
	2	1	Ba	2	712	0.3	ICP-AES
	2	1	B	1	220	2	ICP-AES
	2	1	B	2	210	2	ICP-AES
	2	1	As	1	6.05	0.4	H-AAS
	2	1	As	2	6.2	0.4	H-AAS
	2	1	Pb	1	174	5	ICP-AES
	2	1	Pb	2	166	5	ICP-AES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	SEW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	4						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	4	0.10018		22.2	
		2	4	0.10005		22.2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 4	1	1	0.88982	7.08	2.88		
Test on LOTnr: 4	2	1	0.88995	7.1	2.9		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 4	1	1	TOC	1	2896000	1000	COMBUSTION
	1	1	TOC	2	2874000	1000	COMBUSTION
	1	1	SO4	1	51.2	500	IC
	1	1	SO4	2	50.9	500	IC
	1	1	NH4	1	280600	100	SPECTROPHOTOMETRY
	1	1	NH4	2	270300	100	SPECTROPHOTOMETRY
	1	1	Ni	1	250	2	ICP-AES
	1	1	Ni	2	253	2	ICP-AES
	1	1	Co	1	56.4	0.7	ICP-AES
	1	1	Co	2	56.2	0.7	ICP-AES
Test on LOTnr: 4	2	1	TOC	1	2769000	1000	COMBUSTION
	2	1	TOC	2	2798000	1000	COMBUSTION
	2	1	SO4	1	51.4	500	IC
	2	1	SO4	2	50.8	500	IC
	2	1	NH4	1	269200	100	SPECTROPHOTOMETRY
	2	1	NH4	2	267300	100	SPECTROPHOTOMETRY
	2	1	Ni	1	255	2	ICP-AES
	2	1	Ni	2	259	2	ICP-AES
	2	1	Co	1	57.3	0.7	ICP-AES
	2	1	Co	2	56.3	0.7	ICP-AES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	4						
Date experiment:	29-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	13	0.1516		23.3	
		2	24	0.1518		23.3	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 13	1	1	0.8384	10.93	3.32		
Test on LOTnr: 24	2	1	0.8382	10.99	3.34		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 13	1	1	Cl	1	281000	200	IC
	1	1	Cl	2	287000	200	IC
	1	1	F	1	870	40	IC
	1	1	F	2	810	40	IC
	1	1	NO2	1	16.8	6	SPECTROPHOTOMETRY
	1	1	NO2	2	16.8	6	SPECTROPHOTOMETRY
	1	1	Ba	1	65.8	0.3	ICP-AES
	1	1	Ba	2	65.7	0.3	ICP-AES
	1	1	Cr(VI)	1	1100	20	SPECTROPHOTOMETRY
	1	1	Cr(VI)	2	1100	20	SPECTROPHOTOMETRY
Test on LOTnr: 24	2	1	Cl	1	280000	200	IC
	2	1	Cl	2	278000	200	IC
	2	1	F	1	830	40	IC
	2	1	F	2	810	40	IC
	2	1	NO2	1	16.8	6	SPECTROPHOTOMETRY
	2	1	NO2	2	16.4	6	SPECTROPHOTOMETRY
	2	1	Ba	1	65.9	0.3	ICP-AES
	2	1	Ba	2	65.5	0.3	ICP-AES
	2	1	Cr(VI)	1	1200	20	SPECTROPHOTOMETRY
	2	1	Cr(VI)	2	1200	20	SPECTROPHOTOMETRY

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	5						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.175		23	Temp. of Extraction. Wt. of sample taken
		2	22	0.175		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.318	9.35	0.127		Ref. temp. of pH & Cond. is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 22	2	1	0.32	9.85	0.138		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Sb	1	116	1	prEN 31969
	1	1	Sb	2	123	1	prEN 31969
	1	1	Ba	1	978	0.3	ICP/MS
	1	1	Ba	2	1060	0.3	ICP/MS
	1	1	B	1	656	1	ICP/MS
	1	1	B	2	703	1	ICP/MS
	1	1	As	1	11.3	0.5	prEN 31969
	1	1	As	2	11.3	0.5	prEN 31969
	1	1	Pb	1	150	50	ISO 8288
	1	1	Pb	2	140	50	ISO 8288
Test on LOTnr: 22	2	1	Sb	1	135	1	prEN 31969
	2	1	Sb	2	135	1	prEN 31969
	2	1	Ba	1	695	0.3	ICP/MS
	2	1	Ba	2	708	0.3	ICP/MS
	2	1	B	1	561	1	ICP/MS
	2	1	B	2	571	1	ICP/MS
	2	1	As	1	11.7	0.5	prEN 31969
	2	1	As	2	13	0.5	prEN 31969
	2	1	Pb	1	200	50	ISO 8288
	2	1	Pb	2	190	50	ISO 8288

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	5						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.09		23	Temp. of Extraction. Wt. of sample taken
		2	22	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.88	8.59	0.039		Ref. temp. of pH & Cond. is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 22	2	1	0.875	9.36	0.049		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Sb	1	46	1	prEN 31969
	1	1	Sb	2	45.3	1	prEN 31969
	1	1	Ba	1	811	0.3	ICP/MS
	1	1	Ba	2	823	0.3	ICP/MS
	1	1	B	1	142	1	ICP/MS
	1	1	B	2	150	1	ICP/MS
	1	1	As	1	3.35	0.5	prEN 31969
	1	1	As	2	3.24	0.5	prEN 31969
	1	1	Pb	1	120	50	ISO 8288
	1	1	Pb	2	120	50	ISO 8288
Test on LOTnr: 22	2	1	Sb	1	57.6	1	prEN 31969
	2	1	Sb	2	55.8	1	prEN 31969
	2	1	Ba	1	481	0.3	ICP/MS
	2	1	Ba	2	476	0.3	ICP/MS
	2	1	B	1	128	1	ICP/MS
	2	1	B	2	129	1	ICP/MS
	2	1	As	1	3.97	0.5	prEN 31969
	2	1	As	2	3.91	0.5	prEN 31969
	2	1	Pb	1	160	50	ISO 8288
	2	1	Pb	2	170	50	ISO 8288

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	5						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.09		23	Temp. of Extraction. Wt. of sample taken
		2	22	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.88	9.26	0.039		Ref. temp. of pH & Cond. is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 22	2	1	0.89	9.35	0.04		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Sb	1	35.4	1	prEN 31969
	1	1	Sb	2	33.9	1	prEN 31969
	1	1	Ba	1	587	0.3	ICP/MS
	1	1	Ba	2	587	0.3	ICP/MS
	1	1	B	1	126	1	ICP/MS
	1	1	B	2	128	1	ICP/MS
	1	1	As	1	3.36	0.5	prEN 31969
	1	1	As	2	3.29	0.5	prEN 31969
	1	1	Pb	1	150	50	ISO 8288
	1	1	Pb	2	150	50	ISO 8288
Test on LOTnr: 22	2	1	Sb	1	34.8	1	prEN 31969
	2	1	Sb	2	34.1	1	prEN 31969
	2	1	Ba	1	428	0.3	ICP/MS
	2	1	Ba	2	415	0.3	ICP/MS
	2	1	B	1	107	1	ICP/MS
	2	1	B	2	104	1	ICP/MS
	2	1	As	1	2.92	0.5	prEN 31969
	2	1	As	2	2.96	0.5	prEN 31969
	2	1	Pb	1	160	50	ISO 8288
	2	1	Pb	2	160	50	ISO 8288

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	5						
Date experiment:	09-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	6	0.09		23	Temp. of Extraction. Wt. of sample taken
		2	14	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 6	1	1	0.87	9.59	0.066		Ref. temp. of pH & Cond. is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 14	2	1	0.88	9.42	0.065		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 6	1	1	Sb	1	62.7	1	prEN 31969
	1	1	Sb	2	69.8	1	prEN 31969
	1	1	Ba	1	738	0.3	ICP/MS
	1	1	Ba	2	711	0.3	ICP/MS
	1	1	B	1	217	1	ICP/MS
	1	1	B	2	226	1	ICP/MS
	1	1	As	1	4.91	0.5	prEN 31969
	1	1	As	2	5.05	0.5	prEN 31969
	1	1	Pb	1	170	50	ISO 8288
	1	1	Pb	2	160	50	ISO 8288
Test on LOTnr: 14	2	1	Sb	1	94	1	prEN 31969
	2	1	Sb	2	89.4	1	prEN 31969
	2	1	Ba	1	744	0.3	ICP/MS
	2	1	Ba	2	737	0.3	ICP/MS
	2	1	B	1	224	1	ICP/MS
	2	1	B	2	218	1	ICP/MS
	2	1	As	1	3.65	0.5	prEN 31969
	2	1	As	2	3.62	0.5	prEN 31969
	2	1	Pb	1	130	50	ISO 8288
	2	1	Pb	2	120	50	ISO 8288

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	5						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.101		23	Temp. of Extraction. Wt. of sample taken
		2	18	0.0992		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.78	7.03	3.09		Ref. Temp. of pH & Cond. Is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 18	**2**	1	0.75	7.02	3.06	70	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	TOC	1	3396000	1000	PrEN 1484
	1	1	TOC	2	3454000	1000	PrEN 1484
	1	1	SO4	1	49200	200	EN ISO 10304-2
	1	1	SO4	2	51400	200	EN ISO 10304-2
	1	1	NH4	1	290000	50	PrEN 31732
	1	1	NH4	2	288000	50	PrEN 31732
	1	1	Ni	1	277	0.5	ICP/MS
	1	1	Ni	2	283	0.5	ICP/MS
	1	1	Co	1	57	1	ICP/MS
	1	1	Co	2	58	1	ICP/MS
Test on LOTnr: 18	**2**	1	TOC	1	3434000	1000	PrEN 1484
	2	1	TOC	2	3514000	1000	PrEN 1484
	2	1	SO4	1	57900	200	EN ISO 10304-2
	2	1	SO4	2	56700	200	EN ISO 10304-2
	2	1	NH4	1	272000	50	PrEN 31732
	2	1	NH4	2	274000	50	PrEN 31732
	2	1	Ni	1	245	0.5	ICP/MS
	2	1	Ni	2	246	0.5	ICP/MS
	2	1	Co	1	56	1	ICP/MS
	2	1	Co	2	56	1	ICP/MS

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	5						
Date experiment:	09-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.152		23	Temp. of Extraction. Wt. of sample taken
		2	21	0.158		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.79	10.86	3.34		Ref. Temp. of pH & Cond. Is 25 degrees C. Volume of filtered leachate
Test on LOTnr: 21	**2**	1	0.745	10.8	3.35		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Cl	1	296000	100	EN ISO 10304-2
	1	1	Cl	2	300000	100	EN ISO 10304-2
	1	1	F	1	620	10	EN ISO 10304-1
	1	1	F	2	590	10	EN ISO 10304-1
	1	1	NO2	1	<=10	10	PrEN 33395
	1	1	NO2	2	<=10	10	PrEN 33395
	1	1	Ba	1	64	0.3	ICP/MS
	1	1	Ba	2	65.5	0.3	ICP/MS
	1	1	Cr(VI)	1	1070	5	ISO 11083
	1	1	Cr(VI)	2	1140	5	ISO 11083
Test on LOTnr: 21	**2**	1	Cl	1	307000	100	EN ISO 10304-2
	2	1	Cl	2	305000	100	EN ISO 10304-2
	2	1	F	1	560	10	EN ISO 10304-1
	2	1	F	2	580	10	EN ISO 10304-1
	2	1	NO2	1	<=10	10	PrEN 33395
	2	1	NO2	2	<=10	10	PrEN 33395
	2	1	Ba	1	66	0.3	ICP/MS
	2	1	Ba	2	67.4	0.3	ICP/MS
	2	1	Cr(VI)	1	1240	5	ISO 11083
	2	1	Cr(VI)	2	1170	5	ISO 11083

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	6						
Date experiment:	30-aug						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	16			22	
		2	23			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 16	1	1	0.351	10,3 / 10,3	22,39 / 22,39		
Test on LOTnr: 23	2	1	0.351	10,4 / 10,4	21,30 / 21,41		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 16	1	1	Sb	1	61.8	<0,1	
	1	1	Sb	2	63.8		
	1	1	Ba	1	797	<0,2	
	1	1	Ba	2	793		
	1	1	B	1	1110	<10	
	1	1	B	2	1110		
	1	1	As	1	<1,07	<1	
	1	1	As	2	<1,0		
	1	1	Pb	1	331	<0,2	
	1	1	Pb	2	335		
Test on LOTnr: 23	2	1	Sb	1	58.4	<0,1	
	2	1	Sb	2	56.4		
	2	1	Ba	1	832	<0,2	
	2	1	Ba	2	834		
	2	1	B	1	977	<10	
	2	1	B	2	979		
	2	1	As	1	<1,11	<1	
	2	1	As	2	<1,15		
	2	1	Pb	1	498	<0,2	
	2	1	Pb	2	504		

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	6						
Date experiment:	31-aug.						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	16			22	
		2	23			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 16	1	1	0.9	10,1 / 10,1	7,23 / 7,24		
Test on LOTnr: 23	2	1	0.9	10,1 /10,1	7,54 / 7,55		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 16	1	1	Sb	1	43	<0,1	
	1	1	Sb	2	42.3		
	1	1	Ba	1	759	<0,2	
	1	1	Ba	2	761		
	1	1	B	1	246	<10	
	1	1	B	2	242		
	1	1	As	1	<1	<1	
	1	1	As	2	<1		
	1	1	Pb	1	221	<0,2	
	1	1	Pb	2	221		
Test on LOTnr: 23	2	1	Sb	1	56.3	<0,1	
	2	1	Sb	2	55.6		
	2	1	Ba	1	721	<0,2	
	2	1	Ba	2	720		
	2	1	B	1	223	<10	
	2	1	B	2	220		
	2	1	As	1	<1	<1	
	2	1	As	2	<1		
	2	1	Pb	1	236	<0,2	
	2	1	Pb	2	234		

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**6**						
Date experiment:	31-aug						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	16			22	
		2	23			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 16	**1**	1	0.9	10,1/ 10,1	7,95 / 7,97		
Test on LOTnr: 23	**2**	1	0.9	10,2 / 10,2	7,52 / 7,55		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 16	**1**	1	Sb	1	35.7	<0,1	
	1	1	Sb	2	35.5		
	1	1	Ba	1	691	<0,2	
	1	1	Ba	2	694		
	1	1	B	1	205	<10	
	1	1	B	2	201		
	1	1	As	1	<1,0	<1	
	1	1	As	2	<1,0		
	1	1	Pb	1	268	<0,2	
	1	1	Pb	2	265		
Test on LOTnr: 23	**2**	1	Sb	1	35.6	<0,1	
	2	1	Sb	2	34.7		
	2	1	Ba	1	697	<0,2	
	2	1	Ba	2	701		
	2	1	B	1	185	<10	
	2	1	B	2	184		
	2	1	As	1	<1,0	<1	
	2	1	As	2	<1,0		
	2	1	Pb	1	364	<0,2	
	2	1	Pb	2	370		

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	6						
Date experiment:	28-aug						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5			22	
		2	28			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.9	10 0 / 10,0	7,49 / 7,49		
Test on LOTnr: 28	**2**	1	0.9	9,7 / 9,7	7,15 / 7,15		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Sb	1	51.8	<0,1	
	1	1	Sb	2	51.3		
	1	1	Ba	1	806	<0,2	
	1	1	Ba	2	806		
	1	1	B	1	233	<10	
	1	1	B	2	232		
	1	1	As	1	<1	<1	
	1	1	As	2	<1		
	1	1	Pb	1	214	<0,2	
	1	1	Pb	2	210		
Test on LOTnr: 28	**2**	1	Sb	1	72.5	<0,1	
	2	1	Sb	2	73.7		
	2	1	Ba	1	765	<0,2	
	2	1	Ba	2	760		
	2	1	B	1	226	<10	
	2	1	B	2	226		
	2	1	As	1	<1	<1	
	2	1	As	2	<1		
	2	1	Pb	1	150	<0,2	
	2	1	Pb	2	149		

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	6						
Date experiment:	11-sep						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6			22	
		2	19			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.9	6,9 / 6,9	406 / 406		
Test on LOTnr: 19	**2**	1	0.9	6,9 / 6,9	329 / 330		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	TOC	1	3300000		
	1	1	TOC	2			
	1	1	SO4	1	71000		
	1	1	SO4	2			
	1	1	NH4	1	290000		
	1	1	NH4	2			
	1	1	Ni	1	184		
	1	1	Ni	2	210		
	1	1	Co	1	30.9		
	1	1	Co	2	32.1		
Test on LOTnr: 19	**2**	1	TOC	1	3200000		
	2	1	TOC	2			
	2	1	SO4	1	33000		
	2	1	SO4	2			
	2	1	NH4	1	190000		
	2	1	NH4	2			
	2	1	Ni	1	244		
	2	1	Ni	2	259		
	2	1	Co	1	43.5		
	2	1	Co	2	44.6		

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	6						
Date experiment:	28-aug						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10			22	
		2	25			22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	0.9	10,9 / 10,9	324,0 / 324,2		
Test on LOTnr: 25	**2**	1	0.9	10,9 / 10,9	326 / 327		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	Cl	1	270000	<1000	
	1	1	Cl	2	260000	<1000	
	1	1	F	1	570	<100	
	1	1	F	2	700	<100	
	1	1	NO2	1	80	<10	
	1	1	NO2	2	70	<10	
	1	1	Ba	1	76.6	<0,2	
	1	1	Ba	2	77	<0,2	
	1	1	Cr(VI)	1	1100	<20	
	1	1	Cr(VI)	2	1000	<20	
Test on LOTnr: 25	**2**	1	Cl	1	270000	<1000	
	2	1	Cl	2	270000	<1000	
	2	1	F	1	550	<100	
	2	1	F	2	550	<100	
	2	1	NO2	1	50	<10	
	2	1	NO2	2	40	<10	
	2	1	Ba	1	75.4	<0,2	
	2	1	Ba	2	75.5	<0,2	
	2	1	Cr(VI)	1	1200	<20	
	2	1	Cr(VI)	2	1200	<20	

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	7						
Date experiment:	21-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	3	0.175	1636		
		2	7	0.175	1645		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 3	1	1	0.35	9.2	0.19		
Test on LOTnr: 7	2	1	0.35	9.1	0.2		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 3	1	1	Sb	1	220	5	NF ISO 11885
	1	1	Sb	2	220	5	NF ISO 11885
	1	1	Ba	1	490	5	NF ISO 11885
	1	1	Ba	2	510	5	NF ISO 11885
	1	1	B	1	1250	10	NF ISO 11885
	1	1	B	2	1350	10	NF ISO 11885
	1	1	As	1	10	1	NF ISO 11969
	1	1	As	2	9	1	NF ISO 11969
	1	1	Pb	1	6	1	NF ISO 11885
	1	1	Pb	2	6	1	NF ISO 11885
Test on LOTnr: 7	2	1	Sb	1	280	5	NF ISO 11885
	2	1	Sb	2	240	5	NF ISO 11885
	2	1	Ba	1	410	5	NF ISO 11885
	2	1	Ba	2	410	5	NF ISO 11885
	2	1	B	1	1070	10	NF ISO 11885
	2	1	B	2	1100	10	NF ISO 11885
	2	1	As	1	19	1	NF ISO 11969
	2	1	As	2	19	1	NF ISO 11969
	2	1	Pb	1	20	1	NF ISO 11885
	2	1	Pb	2	20	1	NF ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	7						
Date experiment:	21-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	3	0.09	1636		
		2	7	0.09	1645		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 3	1	1	0.9	9	0.13		
Test on LOTnr: 7	2	1	0.9	9.3	0.1		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 3	1	1	Sb	1	100	5	NF ISO 11885
	1	1	Sb	2	130	5	NF ISO 11885
	1	1	Ba	1	430	5	NF ISO 11885
	1	1	Ba	2	370	5	NF ISO 11885
	1	1	B	1	420	10	NF ISO 11885
	1	1	B	2	370	10	NF ISO 11885
	1	1	As	1	9	1	NF ISO 11969
	1	1	As	2	9	1	NF ISO 11969
	1	1	Pb	1	40	1	NF ISO 11885
	1	1	Pb	2	40	1	NF ISO 11885
Test on LOTnr: 7	2	1	Sb	1	120	5	NF ISO 11885
	2	1	Sb	2	120	5	NF ISO 11885
	2	1	Ba	1	350	5	NF ISO 11885
	2	1	Ba	2	370	5	NF ISO 11885
	2	1	B	1	480	10	NF ISO 11885
	2	1	B	2	420	10	NF ISO 11885
	2	1	As	1	16	1	NF ISO 11969
	2	1	As	2	16	1	NF ISO 11969
	2	1	Pb	1	110	1	NF ISO 11885
	2	1	Pb	2	120	1	NF ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	4	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	7						
Date experiment:	21-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	3	0.09	1635		
		2	7	0.09	1615		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 3	1	1	0.9	9.05	0.05		
Test on LOTnr: 7	2	1	0.9	9.22	0.07		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 3	1	1	Sb	1	70	5	NF ISO 11885
	1	1	Sb	2	60	5	NF ISO 11885
	1	1	Ba	1	220	5	NF ISO 11885
	1	1	Ba	2	230	5	NF ISO 11885
	1	1	B	1	130	10	NF ISO 11885
	1	1	B	2	100	10	NF ISO 11885
	1	1	As	1	7	1	NF ISO 11969
	1	1	As	2	7	1	NF ISO 11969
	1	1	Pb	1	30	1	NF ISO 11885
	1	1	Pb	2	30	1	NF ISO 11885
Test on LOTnr: 7	2	1	Sb	1	110	5	NF ISO 11885
	2	1	Sb	2	100	5	NF ISO 11885
	2	1	Ba	1	240	5	NF ISO 11885
	2	1	Ba	2	260	5	NF ISO 11885
	2	1	B	1	270	10	NF ISO 11885
	2	1	B	2	200	10	NF ISO 11885
	2	1	As	1	14	1	NF ISO 11969
	2	1	As	2	13	1	NF ISO 11969
	2	1	Pb	1	40	1	NF ISO 11885
	2	1	Pb	2	50	1	NF ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	7						
Date experiment:	21-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.09	1629		
		2	21	0.09	1675		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	1	1	0.9	9.26	0.06		
Test on LOTnr: 21	2	1	0.9	8.8	0.04		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	1	1	Sb	1	110	5	NF ISO 11885
	1	1	Sb	2	110	5	NF ISO 11885
	1	1	Ba	1	640	5	NF ISO 11885
	1	1	Ba	2	630	5	NF ISO 11885
	1	1	B	1	170	10	NF ISO 11885
	1	1	B	2	170	10	NF ISO 11885
	1	1	As	1	8	1	NF ISO 11969
	1	1	As	2	7	1	NF ISO 11969
	1	1	Pb	1	30	1	NF ISO 11885
	1	1	Pb	2	30	1	NF ISO 11885
Test on LOTnr: 21	2	1	Sb	1	60	5	NF ISO 11885
	2	1	Sb	2	60	5	NF ISO 11885
	2	1	Ba	1	220	5	NF ISO 11885
	2	1	Ba	2	230	5	NF ISO 11885
	2	1	B	1	50	10	NF ISO 11885
	2	1	B	2	50	10	NF ISO 11885
	2	1	As	1	3	1	NF ISO 11969
	2	1	As	2	3	1	NF ISO 11969
	2	1	Pb	1	30	1	NF ISO 11885
	2	1	Pb	2	30	1	NF ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	7						
Date experiment:	05-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	7	0.098	639		
		2	20	0.1019	643		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 7	**1**	1	0.892	7.3	2.45		
Test on LOTnr: 20	**2**	1	0.888	7	2.57		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 7	**1**	1	TOC	1	2187000	100	NF 1484
	1	1	TOC	2	2282000	100	NF 1484
	1	1	SO4	1	32000	100	NF ISO 10304-2
	1	1	SO4	2	33000	100	NF ISO 10304-2
	1	1	NH4	1	227900	50	NF ISO 90-015
	1	1	NH4	2	230000	50	NF ISO 90-015
	1	1	Ni	1	230	1	NF ISO 11885
	1	1	Ni	2	230	1	NF ISO 11885
	1	1	Co	1	60	5	NF ISO 11885
	1	1	Co	2	60	5	NF ISO 11885
Test on LOTnr: 20	**2**	1	TOC	1	2646500	100	NF 1484
	2	1	TOC	2	2640500	100	NF 1484
	2	1	SO4	1	53000	100	NF ISO 10304-2
	2	1	SO4	2	52000	100	NF ISO 10304-2
	2	1	NH4	1	661900	50	NF ISO 90-015
	2	1	NH4	2	661500	50	NF ISO 90-015
	2	1	Ni	1	230	1	NF ISO 11885
	2	1	Ni	2	240	1	NF ISO 11885
	2	1	Co	1	40	5	NF ISO 11885
	2	1	Co	2	40	5	NF ISO 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	7						
Date experiment:	05-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.148	621		
		2	22	0.148	621		
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.842	10.5	3.02		
Test on LOTnr: 22	**2**	1	0.842	10.5	3.06		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Cl	1	250000	100	NF ISO 10304-2
	1	1	Cl	2	256000	100	NF ISO 10304-2
	1	1	F	1	200	100	NF ISO 10304-1
	1	1	F	2	200	100	NF ISO 10304-1
	1	1	NO2	1	120	100	NF ISO 10304-2
	1	1	NO2	2	120	100	NF ISO 10304-2
	1	1	Ba	1	100	5	NF ISO 11885
	1	1	Ba	2	80	5	NF ISO 11885
	1	1	Cr(VI)	1	1460	10	NF ISO 90-043
	1	1	Cr(VI)	2	1460	10	NF ISO 90-043
Test on LOTnr: 22	**2**	1	Cl	1	266000	100	NF ISO 10304-2
	2	1	Cl	2	280000	100	NF ISO 10304-2
	2	1	F	1	400	100	NF ISO 10304-1
	2	1	F	2	400	100	NF ISO 10304-1
	2	1	NO2	1	120	100	NF ISO 10304-2
	2	1	NO2	2	120	100	NF ISO 10304-2
	2	1	Ba	1	30	5	NF ISO 11885
	2	1	Ba	2	30	5	NF ISO 11885
	2	1	Cr(VI)	1	1480	10	NF ISO 90-043
	2	1	Cr(VI)	2	1480	10	NF ISO 90-043

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	8						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.175		21	
		2	24	0.174		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.35	11.11	0.379		
Test on LOTnr: 24	**2**	1	0.348	10.58	0.212		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Sb	1	14.38	0.9	NEN 6433
	1	1	Sb	2	14.44	0.9	NEN 6433
	1	1	Ba	1	461.86	10	NEN 6426
	1	1	Ba	2	468.5	10	NEN 6426
	1	1	Ba	1	1075	50	NEN 6426
	1	1	Ba	2	1070	50	NEN 6426
	1	1	As	1	6.5	2	NEN 6426
	1	1	As	2	6.46	2	NEN 6426
	1	1	Pb	1	230.94	5	NEN 6426
	1	1	Pb	2	235.64	5	NEN 6426
Test on LOTnr: 24	**2**	1	Sb	1	73.34	0.9	NEN 6433
	2	1	Sb	2	72.66	0.9	NEN 6433
	2	1	Ba	1	750.52	10	NEN 6426
	2	1	Ba	2	684.37	10	NEN 6426
	2	1	Ba	1	1576	50	NEN 6426
	2	1	Ba	2	1578	50	NEN 6426
	2	1	As	1	15.99	2	NEN 6426
	2	1	As	2	15.82	2	NEN 6426
	2	1	Pb	1	113.8	5	NEN 6426
	2	1	Pb	2	101.94	5	NEN 6426

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	8						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.0906		21	
		2	24	0.0909		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.906	10.74	152		
Test on LOTnr: 24	**2**	1	0.909	10.16	74		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Sb	1	69.95	0.9	NEN 6433
	1	1	Sb	2	70.8	0.9	NEN 6433
	1	1	Ba	1	586.6	10	NEN 6426
	1	1	Ba	2	549.18	10	NEN 6426
	1	1	Ba	1	214	50	NEN 6426
	1	1	Ba	2	214	50	NEN 6426
	1	1	As	1	20.08	2	NEN 6426
	1	1	As	2	20.77	2	NEN 6426
	1	1	Pb	1	161.55	5	NEN 6426
	1	1	Pb	2	157.65	5	NEN 6426
Test on LOTnr: 24	**2**	1	Sb	1	73.21	0.9	NEN 6433
	2	1	Sb	2	74.88	0.9	NEN 6433
	2	1	Ba	1	709.3	10	NEN 6426
	2	1	Ba	2	736.09	10	NEN 6426
	2	1	Ba	1	339	50	NEN 6426
	2	1	Ba	2	339	50	NEN 6426
	2	1	As	1	11.1	2	NEN 6426
	2	1	As	2	11.52	2	NEN 6426
	2	1	Pb	1	78.29	5	NEN 6426
	2	1	Pb	2	86.56	5	NEN 6426

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	8						
Date experiment:	01-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	5	0.092		21	
		2	24	0.092		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 5	1	1	0.92	10.22	52		
Test on LOTnr: 24	2	1	0.92	10.08	41		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 5	1	1	Sb	1	37.06	0.9	NEN 6433
	1	1	Sb	2	36.65	0.9	NEN 6433
	1	1	Ba	1	423.79	10	NEN 6426
	1	1	Ba	2	410.47	10	NEN 6426
	1	1	Ba	1	114	50	NEN 6426
	1	1	Ba	2	116	50	NEN 6426
	1	1	As	1	4.1	2	NEN 6426
	1	1	As	2	4	2	NEN 6426
	1	1	Pb	1	116.96	5	NEN 6426
	1	1	Pb	2	107.23	5	NEN 6426
Test on LOTnr: 24	2	1	Sb	1	21.83	0.9	NEN 6433
	2	1	Sb	2	21.38	0.9	NEN 6433
	2	1	Ba	1	433.63	10	NEN 6426
	2	1	Ba	2	382.4	10	NEN 6426
	2	1	Ba	1	139	50	NEN 6426
	2	1	Ba	2	140	50	NEN 6426
	2	1	As	1	2.226	2	NEN 6426
	2	1	As	2	2.23	2	NEN 6426
	2	1	Pb	1	85.65	5	NEN 6426
	2	1	Pb	2	76.3	5	NEN 6426

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	8						
Date experiment:	aug-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	15			21	
		2	19			21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 15	1	1		9.88	0.057		
Test on LOTnr: 19	2	1		9.83	0.061		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 15	1	1	Sb	1	65.09	0.9	NEN 6433
	1	1	Sb	2	64.89	0.9	NEN 6433
	1	1	Ba	1	528	10	NEN 6426
	1	1	Ba	2	504	10	NEN 6426
	1	1	Ba	1	240	50	NEN 6426
	1	1	Ba	2	239	50	NEN 6426
	1	1	As	1	5.65	2	NEN 6426
	1	1	As	2	5.81	2	NEN 6426
	1	1	Pb	1	60.47	5	NEN 6426
	1	1	Pb	2	56.21	5	NEN 6426
Test on LOTnr: 19	2	1	Sb	1	86.44	0.9	NEN 6433
	2	1	Sb	2	83.34	0.9	NEN 6433
	2	1	Ba	1	563	10	NEN 6426
	2	1	Ba	2	590	10	NEN 6426
	2	1	Ba	1	236	50	NEN 6426
	2	1	Ba	2	235	50	NEN 6426
	2	1	As	1	5.96	2	NEN 6426
	2	1	As	2	6.26	2	NEN 6426
	2	1	Pb	1	44.82	5	NEN 6426
	2	1	Pb	2	54.83	5	NEN 6426

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	8						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8			21	
		2	21			21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1		6.76	5.24		NH4 als N
Test on LOTnr: 21	**2**	1		6.86	4.6		NH4 als N
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	TOC	1	5810000	3000	NEN-EN 1484
	1	1	TOC	2	5549000	3000	NEN-EN 1484
	1	1	SO4	1	16497	100	ISO 10304-1
	1	1	SO4	2	16923	100	ISO 10304-1
	1	1	NH4	1	10425	10	NEN 6472
	1	1	NH4	2	10785	10	NEN 6472
	1	1	Ni	1	193.16	5	NEN 6426
	1	1	Ni	2	187.29	5	NEN 6426
	1	1	Co	1	31.758	5	NEN 6426
	1	1	Co	2	31.557	5	NEN 6426
Test on LOTnr: 21	**2**	1	TOC	1	5658500	3000	NEN-EN 1484
	2	1	TOC	2	4821300	3000	NEN-EN 1484
	2	1	SO4	1	72172	100	ISO 10304-1
	2	1	SO4	2	72084	100	ISO 10304-1
	2	1	NH4	1	66937	10	NEN 6472
	2	1	NH4	2	67296	10	NEN 6472
	2	1	Ni	1	218.25	5	NEN 6426
	2	1	Ni	2	220.14	5	NEN 6426
	2	1	Co	1	41.227	5	NEN 6426
	2	1	Co	2	40.014	5	NEN 6426

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	8						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15			21	
		2	9			21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1		11.15	3.29		resultaat nitriet als
Test on LOTnr: 9	**2**	1		11.11	3.26		idem
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Cl	1	271000	100	ISO 10304-1
	1	1	Cl	2	268000	100	ISO 10304-1
	1	1	F	1	538	50	ISO 10304-1
	1	1	F	2	534	50	ISO 10304-1
	1	1	NO2	1	0.1642	0.1642	ISO 10304-1
	1	1	NO2	2	0.1642	0.1642	ISO 10304-1
	1	1	Ba	1	59.901	10	NEN 6426
	1	1	Ba	2	59.93	10	NEN 6426
	1	1	Cr(VI)	1	1389	5	NEN 6485
	1	1	Cr(VI)	2	1398	5	NEN 6485
Test on LOTnr: 9	**2**	1	Cl	1	266000	100	ISO 10304-1
	2	1	Cl	2	266000	100	ISO 10304-1
	2	1	F	1	0.575	50	ISO 10304-1
	2	1	F	2	0.575	50	ISO 10304-1
	2	1	NO2	1	0.1642	0.1642	ISO 10304-1
	2	1	NO2	2	0.1642	0.1642	ISO 10304-1
	2	1	Ba	1	61.564	10	NEN 6426
	2	1	Ba	2	64.781	10	NEN 6426
	2	1	Cr(VI)	1	1430	5	NEN 6485
	2	1	Cr(VI)	2	1429	5	NEN 6485

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	9						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.175		23	
		2	12	0.175		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.35	8.4	0.252		
Test on LOTnr: 12	**2**	1	0.35	8.14	0.224		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Sb	1	193.5	2	ICP-OES
	1	1	Sb	2	193.1	2	ICP-OES
	1	1	Ba	1	1033	5	ICP-OES
	1	1	Ba	2	1023	5	ICP-OES
	1	1	B	1	2032	10	ICP-OES
	1	1	B	2	2069	10	ICP-OES
	1	1	As	1	14	0.1	ICP-OES
	1	1	As	2	12.5	0.1	ICP-OES
	1	1	Pb	1	108.7	2	ICP-OES
	1	1	Pb	2	110.6	2	ICP-OES
Test on LOTnr: 12	**2**	1	Sb	1	166.8	2	ICP-OES
	2	1	Sb	2	165.4	2	ICP-OES
	2	1	Ba	1	930.6	5	ICP-OES
	2	1	Ba	2	960.2	5	ICP-OES
	2	1	B	1	1885	10	ICP-OES
	2	1	B	2	1902	10	ICP-OES
	2	1	As	1	12.3	0.1	ICP-OES
	2	1	As	2	12.1	0.1	ICP-OES
	2	1	Pb	1	110.2	2	ICP-OES
	2	1	Pb	2	112.4	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	9						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.09		23	
		2	12	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.9	7.2	0.1128		
Test on LOTnr: 12	**2**	1	0.9	7.16	0.1049		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Sb	1	64.74	2	ICP-OES
	1	1	Sb	2	66.83	2	ICP-OES
	1	1	Ba	1	1681	5	ICP-OES
	1	1	Ba	2	1750	5	ICP-OES
	1	1	B	1	1219	10	ICP-OES
	1	1	B	2	1230	10	ICP-OES
	1	1	As	1	15.4	0.1	ICP-OES
	1	1	As	2	15.9	0.1	ICP-OES
	1	1	Pb	1	217.5	2	ICP-OES
	1	1	Pb	2	232.8	2	ICP-OES
Test on LOTnr: 12	**2**	1	Sb	1	72.86	2	ICP-OES
	2	1	Sb	2	78.08	2	ICP-OES
	2	1	Ba	1	1422	5	ICP-OES
	2	1	Ba	2	1479	5	ICP-OES
	2	1	B	1	1080	10	ICP-OES
	2	1	B	2	1048	10	ICP-OES
	2	1	As	1	18.5	0.1	ICP-OES
	2	1	As	2	15.3	0.1	ICP-OES
	2	1	Pb	1	211.5	2	ICP-OES
	2	1	Pb	2	228.3	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**9**						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.09		23	
		2	12	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.9	7.12	0.0895		
Test on LOTnr: 12	**2**	1	0.9	6.93	0.1028		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Sb	1	60.87	2	ICP-OES
	1	1	Sb	2	57.18	2	ICP-OES
	1	1	Ba	1	1382	5	ICP-OES
	1	1	Ba	2	1321	5	ICP-OES
	1	1	B	1	872	10	ICP-OES
	1	1	B	2	866	10	ICP-OES
	1	1	As	1	25.8	0.1	ICP-OES
	1	1	As	2	23.2	0.1	ICP-OES
	1	1	Pb	1	284.5	2	ICP-OES
	1	1	Pb	2	282.2	2	ICP-OES
Test on LOTnr: 12	**2**	1	Sb	1	88.19	2	ICP-OES
	2	1	Sb	2	92.05	2	ICP-OES
	2	1	Ba	1	1083	5	ICP-OES
	2	1	Ba	2	1124	5	ICP-OES
	2	1	B	1	860	10	ICP-OES
	2	1	B	2	863	10	ICP-OES
	2	1	As	1	30.5	0.1	ICP-OES
	2	1	As	2	34.2	0.1	ICP-OES
	2	1	Pb	1	280	2	ICP-OES
	2	1	Pb	2	300	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	9						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	25	0.175		23	
		2	25	0.175		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 25	**1**	1	0.35	7.81	0.1838		
Test on LOTnr: 25	**2**	1	0.35	7.94	0.1822		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 25	**1**	1	Sb	1	181.5	2	ICP-OES
	1	1	Sb	2	182.5	2	ICP-OES
	1	1	Ba	1	774.2	5	ICP-OES
	1	1	Ba	2	807.1	5	ICP-OES
	1	1	B	1	1848	10	ICP-OES
	1	1	B	2	1912	10	ICP-OES
	1	1	As	1	19.2	0.1	ICP-OES
	1	1	As	2	19.8	0.1	ICP-OES
	1	1	Pb	1	73.3	2	ICP-OES
	1	1	Pb	2	82.5	2	ICP-OES
Test on LOTnr: 25	**2**	1	Sb	1	181.1	2	ICP-OES
	2	1	Sb	2	180.6	2	ICP-OES
	2	1	Ba	1	769.9	5	ICP-OES
	2	1	Ba	2	781.2	5	ICP-OES
	2	1	B	1	1720	10	ICP-OES
	2	1	B	2	1719	10	ICP-OES
	2	1	As	1	14.9	0.1	ICP-OES
	2	1	As	2	15.6	0.1	ICP-OES
	2	1	Pb	1	73.1	2	ICP-OES
	2	1	Pb	2	82	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	9						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	25	0.09		23	
		2	25	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 25	**1**	1	0.9	7.76	0.0606		
Test on LOTnr: 25	**2**	1	0.9	7.78	0.065		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 25	**1**	1	Sb	1	86.61	2	ICP-OES
	1	1	Sb	2	89.6	2	ICP-OES
	1	1	Ba	1	660.7	5	ICP-OES
	1	1	Ba	2	691.1	5	ICP-OES
	1	1	B	1	878	10	ICP-OES
	1	1	B	2	877	10	ICP-OES
	1	1	As	1	9.4	0.1	ICP-OES
	1	1	As	2	8.7	0.1	ICP-OES
	1	1	Pb	1	76.8	2	ICP-OES
	1	1	Pb	2	90.3	2	ICP-OES
Test on LOTnr: 25	**2**	1	Sb	1	79.41	2	ICP-OES
	2	1	Sb	2	81.4	2	ICP-OES
	2	1	Ba	1	565.5	5	ICP-OES
	2	1	Ba	2	579	5	ICP-OES
	2	1	B	1	772	10	ICP-OES
	2	1	B	2	772	10	ICP-OES
	2	1	As	1	5.5	0.1	ICP-OES
	2	1	As	2	6.28	0.1	ICP-OES
	2	1	Pb	1	71.1	2	ICP-OES
	2	1	Pb	2	80.4	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**9**						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	25	0.09		23	
		2	25	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 25	**1**	1	0.9	7.9	0.0626		
Test on LOTnr: 25	**2**	1	0.9	7.82	0.0609		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 25	**1**	1	Sb	1	89.36	2	ICP-OES
	1	1	Sb	2	93.89	2	ICP-OES
	1	1	Ba	1	678.9	5	ICP-OES
	1	1	Ba	2	671.4	5	ICP-OES
	1	1	B	1	813	10	ICP-OES
	1	1	B	2	808	10	ICP-OES
	1	1	As	1	10.1	0.1	ICP-OES
	1	1	As	2	10.9	0.1	ICP-OES
	1	1	Pb	1	78.3	2	ICP-OES
	1	1	Pb	2	85.4	2	ICP-OES
Test on LOTnr: 25	**2**	1	Sb	1	78.43	2	ICP-OES
	2	1	Sb	2	80.4	2	ICP-OES
	2	1	Ba	1	578.1	5	ICP-OES
	2	1	Ba	2	575.9	5	ICP-OES
	2	1	B	1	731	10	ICP-OES
	2	1	B	2	707	10	ICP-OES
	2	1	As	1	8.6	0.1	ICP-OES
	2	1	As	2	8.6	0.1	ICP-OES
	2	1	Pb	1	85.6	2	ICP-OES
	2	1	Pb	2	94.8	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	9						
Date experiment:	31-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	1	0.09		23	
		2	1	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 1	1	1	0.9	8.04	0.0956		
Test on LOTnr: 1	2	1	0.9	8.16	0.1102		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 1	1	1	Sb	1	58.68	2	ICP-OES
	1	1	Sb	2	58.28	2	ICP-OES
	1	1	Ba	1	406.9	5	ICP-OES
	1	1	Ba	2	408.8	5	ICP-OES
	1	1	B	1	657	10	ICP-OES
	1	1	B	2	697	10	ICP-OES
	1	1	As	1	4.43	0.1	ICP-OES
	1	1	As	2	6.75	0.1	ICP-OES
	1	1	Pb	1	108.1	2	ICP-OES
	1	1	Pb	2	110.2	2	ICP-OES
Test on LOTnr: 1	2	1	Sb	1	64.83	2	ICP-OES
	2	1	Sb	2	72.92	2	ICP-OES
	2	1	Ba	1	415.5	5	ICP-OES
	2	1	Ba	2	427	5	ICP-OES
	2	1	B	1	646	10	ICP-OES
	2	1	B	2	640	10	ICP-OES
	2	1	As	1	4.04	0.1	ICP-OES
	2	1	As	2	6.25	0.1	ICP-OES
	2	1	Pb	1	108.4	2	ICP-OES
	2	1	Pb	2	119.1	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	9						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	4	0.09		23	
		2	4	0.09		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 4	1	1	0.9	7.66	0.0802		
Test on LOTnr: 4	2	1	0.9	7.76	0.0747		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 4	1	1	Sb	1	198.1	2	ICP-OES
	1	1	Sb	2	204.8	2	ICP-OES
	1	1	Ba	1	1055	5	ICP-OES
	1	1	Ba	2	1057	5	ICP-OES
	1	1	B	1	672	10	ICP-OES
	1	1	B	2	747	10	ICP-OES
	1	1	As	1	33.6	0.1	ICP-OES
	1	1	As	2	35.8	0.1	ICP-OES
	1	1	Pb	1	539.1	2	ICP-OES
	1	1	Pb	2	599.8	2	ICP-OES
Test on LOTnr: 4	2	1	Sb	1	195.1	2	ICP-OES
	2	1	Sb	2	203.1	2	ICP-OES
	2	1	Ba	1	983.4	5	ICP-OES
	2	1	Ba	2	1016	5	ICP-OES
	2	1	B	1	664	10	ICP-OES
	2	1	B	2	707	10	ICP-OES
	2	1	As	1	32.5	0.1	ICP-OES
	2	1	As	2	31	0.1	ICP-OES
	2	1	Pb	1	571.9	2	ICP-OES
	2	1	Pb	2	605.9	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	9						
Date experiment:	30-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	4	0.1507		23	
		2	4	0.1507		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 4	1	1	0.84	8.11	1.892		
Test on LOTnr: 4	2	1	0.84	8.1	1.939		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 4	1	1	Cl	1	280150	1000	SFA
	1	1	Cl	2	291160	1000	SFA
	1	1	F	1	890	10	SFA
	1	1	F	2	940	10	SFA
	1	1	NO2	1	29.57	10	SFA
	1	1	NO2	2	29.57	10	SFA
	1	1	Ba	1	70.1	5	ICP-OES
	1	1	Ba	2	68.7	5	ICP-OES
	1	1	Cr(VI)	1	1364	5	ICP-OES
	1	1	Cr(VI)	2	1375	5	ICP-OES
Test on LOTnr: 4	2	1	Cl	1	293260	1000	SFA
	2	1	Cl	2	287990	1000	SFA
	2	1	F	1	940	10	SFA
	2	1	F	2	910	10	SFA
	2	1	NO2	1	32.86	10	SFA
	2	1	NO2	2	46	10	SFA
	2	1	Ba	1	69.49	5	ICP-OES
	2	1	Ba	2	72.42	5	ICP-OES
	2	1	Cr(VI)	1	1464	5	Cr: ICP-OES
	2	1	Cr(VI)	2	1411	5	Cr: ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	9						
Date experiment:	30-08-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	19	0.1496		23	
		2	19	0.1496		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 19	1	1	0.84	8.04	2.41		
Test on LOTnr: 19	2	1	0.84	8.3	2.22		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 19	1	1	Cl	1	289590	1000	SFA
	1	1	Cl	2	286000	1000	SFA
	1	1	F	1	900	10	SFA
	1	1	F	2	960	10	SFA
	1	1	NO2	1	29.57	10	SFA
	1	1	NO2	2	26.28	10	SFA
	1	1	Ba	1	71.5	5	ICP-OES
	1	1	Ba	2	73.95	5	ICP-OES
	1	1	Cr(VI)	1	1403	5	Cr: ICP-OES
	1	1	Cr(VI)	2	1461	5	Cr: ICP-OES
Test on LOTnr: 19	2	1	Cl	1	281100	1000	SFA
	2	1	Cl	2	287580	1000	SFA
	2	1	F	1	1000	10	SFA
	2	1	F	2	1010	10	SFA
	2	1	NO2	1	32.86	10	SFA
	2	1	NO2	2	29.57	10	SFA
	2	1	Ba	1	73.6	5	ICP-OES
	2	1	Ba	2	77.4	5	ICP-OES
	2	1	Cr(VI)	1	1515	5	Cr: ICP-OES
	2	1	Cr(VI)	2	1479	5	Cr: ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	9						
Date experiment:	30-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.0998		23	
		2	9	0.0998		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.89	7.23	4.45		
Test on LOTnr: 9	**2**	1	0.89	7.52	4.79		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	TOC	1	2398000	10000	TOC-ANALYZER
	1	1	TOC	2	2380000	10000	TOC-ANALYZER
	1	1	SO4	1	106870	1000	SFA
	1	1	SO4	2	106360	1000	SFA
	1	1	NH4	1	643770	1000	SFA
	1	1	NH4	2	643963	1000	SFA
	1	1	Ni	1	272.6	5	ICP-OES
	1	1	Ni	2	262.3	5	ICP-OES
	1	1	Co	1	35.82	2	ICP-OES
	1	1	Co	2	35.62	2	ICP-OES
Test on LOTnr: 9	**2**	1	TOC	1	2353000	10000	TOC-ANALYZER
	2	1	TOC	2	2362000	10000	TOC-ANALYZER
	2	1	SO4	1	121220	1000	SFA
	2	1	SO4	2	96570	1000	SFA
	2	1	NH4	1	640093	1000	SFA
	2	1	NH4	2	635503	1000	SFA
	2	1	Ni	1	255.1	5	ICP-OES
	2	1	Ni	2	265.1	5	ICP-OES
	2	1	Co	1	33.61	2	ICP-OES
	2	1	Co	2	33.23	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	9						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	22	0.1012		23	
		2	22	0.1012		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 22	**1**	1	0.9	7.04	5.15		
Test on LOTnr: 22	**2**	1	0.9	7	5.12		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 22	**1**	1	TOC	1	2160000	10000	TOC-ANALYZER
	1	1	TOC	2	2155000	10000	TOC-ANALYZER
	1	1	SO4	1	60280	1000	SFA
	1	1	SO4	2	59270	1000	SFA
	1	1	NH4	1	711141	1000	SFA
	1	1	NH4	2	713931	1000	SFA
	1	1	Ni	1	210.9	5	ICP-OES
	1	1	Ni	2	222	5	ICP-OES
	1	1	Co	1	32.87	2	ICP-OES
	1	1	Co	2	32.92	2	ICP-OES
Test on LOTnr: 22	**2**	1	TOC	1	2202000	10000	TOC-ANALYZER
	2	1	TOC	2	2205000	10000	TOC-ANALYZER
	2	1	SO4	1	74460	1000	SFA
	2	1	SO4	2	62480	1000	SFA
	2	1	NH4	1	703388	1000	SFA
	2	1	NH4	2	699814	1000	SFA
	2	1	Ni	1	214.4	5	ICP-OES
	2	1	Ni	2	216.3	5	ICP-OES
	2	1	Co	1	34.71	2	ICP-OES
	2	1	Co	2	33.95	2	ICP-OES

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.175		22	
		2	30	0.175		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	0.35	9.0	0.17		
Test on LOTnr: 30	**2**	1	0.35	8.9	0.19		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Sb	1	130	5	ICP
	1	1	Sb	2	130	5	ICP
	1	1	Ba	1	390,000	10	ICP
	1	1	Ba	2	390,000	10	ICP
	1	1	B	1	800	30	ICP
	1	1	B	2	800	30	ICP
	1	1	As	1	4.6	2	ICP
	1	1	As	2	4.3	2	ICP
	1	1	Pb	1	140	1	ICP
	1	1	Pb	2	130	1	ICP
Test on LOTnr: 30	**2**	1	Sb	1	120	5	ICP
	2	1	Sb	2	130	5	ICP
	2	1	Ba	1	490,000	10	ICP
	2	1	Ba	2	490,000	10	ICP
	2	1	B	1	780	30	ICP
	2	1	B	2	810	30	ICP
	2	1	As	1	6.6	2	ICP
	2	1	As	2	6.8	2	ICP
	2	1	Pb	1	200	1	ICP
	2	1	Pb	2	200	1	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.09		22	
		2	30	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	0.9	8.3	0.074		
Test on LOTnr: 30	**2**	1	0.9	8.1	0.070		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Sb	1	67	5	ICP
	1	1	Sb	2	73	5	ICP
	1	1	Ba	1	560,000	10	ICP
	1	1	Ba	2	530,000	10	ICP
	1	1	B	1	190	30	ICP
	1	1	B	2	190	30	ICP
	1	1	As	1	2.4	2	ICP
	1	1	As	2	2.5	1	ICP
	1	1	Pb	1	67	1	ICP
	1	1	Pb	2	65	1	ICP
Test on LOTnr: 30	**2**	1	Sb	1	91	5	ICP
	2	1	Sb	2	84	5	ICP
	2	1	Ba	1	550,000	10	ICP
	2	1	Ba	2	550,000	10	ICP
	2	1	B	1	230	30	ICP
	2	1	B	2	230	30	ICP
	2	1	As	1	4.8	2	ICP
	2	1	As	2	4.9	1	ICP
	2	1	Pb	1	96	1	ICP
	2	1	Pb	2	100	1	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	11	0.09		22	
		2	30	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 11	1	1	0.9	8.5	0.042		
Test on LOTnr: 30	2	1	0.9	8.1	0.022		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 11	1	1	Sb	1	33	5	ICP
	1	1	Sb	2	28	5	ICP
	1	1	Ba	1	200,000	10	ICP
	1	1	Ba	2	200,000	10	ICP
	1	1	B	1	57	30	ICP
	1	1	B	2	53	30	ICP
	1	1	As	1	2	2	ICP
	1	1	As	2	2.2	2	ICP
	1	1	Pb	1	190	1	ICP
	1	1	Pb	2	100	1	ICP
Test on LOTnr: 30	2	1	Sb	1	29	5	ICP
	2	1	Sb	2	28	5	ICP
	2	1	Ba	1	240,000	10	ICP
	2	1	Ba	2	240,000	10	ICP
	2	1	B	1	77	30	ICP
	2	1	B	2	71	30	ICP
	2	1	As	1	2.2	2	ICP
	2	1	As	2	2	2	ICP
	2	1	Pb	1	160	1	ICP
	2	1	Pb	2	160	1	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESr	reduced size					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	13	0.09		22	
		2	22	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 13	1	1	0.90	7.9	0.064		
Test on LOTnr: 22	2	1	0.87	8.0	0.059		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 13	1	1	Sb	1	99	5	ICP
	1	1	Sb	2	99	5	ICP
	1	1	Ba	1	710,000	10	ICP
	1	1	Ba	2	710,000	10	ICP
	1	1	B	1	200	30	ICP
	1	1	B	2	200	30	ICP
	1	1	As	1	4.9	2	ICP
	1	1	As	2	5.0	2	ICP
	1	1	Pb	1	91	1	ICP
	1	1	Pb	2	94	1	ICP
Test on LOTnr: 22	2	1	Sb	1	100	5	ICP
	2	1	Sb	2	99	5	ICP
	2	1	Ba	1	690,000	10	ICP
	2	1	Ba	2	690,000	10	ICP
	2	1	B	1	240	30	ICP
	2	1	B	2	220	30	ICP
	2	1	As	1	3.5	2	ICP
	2	1	As	2	4.3	2	ICP
	2	1	Pb	1	83	1	ICP
	2	1	Pb	2	78	1	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.09		22	
		2	23	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	0.841	7	3		
Test on LOTnr: 23	**2**	1	0.840	7	3		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	TOC	1	3,800,000	100	prEn 1484
	1	1	TOC	2	3,700,000	100	prEn 1484
	1	1	SO4	1	53	1,000	IC
	1	1	SO4	2	49	1,000	IC
	1	1	NH4	1	230,000	10	photometry
	1	1	NH4	2	240,000	10	photometry
	1	1	Ni	1	320	1	ICP
	1	1	Ni	2	320	1	ICP
	1	1	Co	1	71	1	ICP
	1	1	Co	2	70	1	ICP
Test on LOTnr: 23	**2**	1	TOC	1	3,700,000	100	prEn 1484
	2	1	TOC	2	3,700,000	100	prEn 1484
	2	1	SO4	1	65	1,000	IC
	2	1	SO4	2	63	1,000	IC
	2	1	NH4	1	230,000	10	photometry
	2	1	NH4	2	230,000	10	photometry
	2	1	Ni	1	380	1	ICP
	2	1	Ni	2	310	1	ICP
	2	1	Co	1	95	1	ICP
	2	1	Co	2	95	1	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	10						
Date experiment:	27.09.2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	26	0.09		22	
		2	12	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 26	**1**	1	0.89	9.8	3.1		
Test on LOTnr: 12	**2**	1	0.89	9.6	3.1		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 26	**1**	1	Cl	1	273,000	1,000	IC
	1	1	Cl	2	277,000	1,000	IC
	1	1	F	1	<0,2	0.2	IC
	1	1	F	2	<0,2	0.2	IC
	1	1	NO2	1	<0,2	0.2	IC
	1	1	NO2	2	<0,2	0.2	IC
	1	1	Ba	1	54,000	10	ICP
	1	1	Ba	2	53,000	10	ICP
	1	1	Cr(VI)	1	92	10	photometry
	1	1	Cr(VI)	2	94	10	photometry
Test on LOTnr: 12	**2**	1	Cl	1	283,000	1,000	IC
	2	1	Cl	2	279,000	1,000	IC
	2	1	F	1	<0,2	0.2	IC
	2	1	F	2	<0,2	0.2	IC
	2	1	NO2	1	<0,2	0.2	IC
	2	1	NO2	2	<0,2	0.2	IC
	2	1	Ba	1	54,000	10	ICP
	2	1	Ba	2	53,000	10	ICP
	2	1	Cr(VI)	1	90	10	photometry
	2	1	Cr(VI)	2	89	10	photometry

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	11						
Date experiment:	08-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	4	0.175		22.3	
		2	19	0.175		22.5	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 4	1	1	0.321	9.5	0.15		
Test on LOTnr: 19	2	1	0.323	9.4	0.139		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 4	1	1	Sb	1	84	5	ICP - ISO/DIS 11885
	1	1	Sb	2	84	5	ICP - ISO/DIS 11885
	1	1	B	1	725	7	ICP - ISO/DIS 11885
	1	1	B	2	538	7	ICP - ISO/DIS 11885
	1	1	Ba	1	555	0.01	ICP - ISO/DIS 11885
	1	1	Ba	2	580	0.01	ICP - ISO/DIS 11885
	1	1	As	1	2.9	3	ICP - ISO/DIS 11885
	1	1	As	2	5.9	3	ICP - ISO/DIS 11885
	1	1	Pb	1	25	1	ICP - ISO/DIS 11885
	1	1	Pb	2	28	1	ICP - ISO/DIS 11885
Test on LOTnr: 19	2	1	Sb	1	143	5	ICP - ISO/DIS 11885
	2	1	Sb	2	144	5	ICP - ISO/DIS 11885
	2	1	B	1	843	7	ICP - ISO/DIS 11885
	2	1	B	2	628	7	ICP - ISO/DIS 11885
	2	1	Ba	1	760	0.01	ICP - ISO/DIS 11885
	2	1	Ba	2	784	0.01	ICP - ISO/DIS 11885
	2	1	As	1	9.8	3	ICP - ISO/DIS 11885
	2	1	As	2	8.2	3	ICP - ISO/DIS 11885
	2	1	Pb	1	30	1	ICP - ISO/DIS 11885
	2	1	Pb	2	28	1	ICP - ISO/DIS 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	MESc	coarse					
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	11						
Date experiment:	08-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	4	0.090		22.4	
		2	19	0.082		22.5	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 4	1	1	0.879	9.6	0.062		
Test on LOTnr: 19	2	1	0.81	9.6	0.049		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 4	1	1	Sb	1	53	5	ICP - ISO/DIS 11885
	1	1	Sb	2	50	5	ICP - ISO/DIS 11885
	1	1	B	1	262	7	ICP - ISO/DIS 11885
	1	1	B	2	214	7	ICP - ISO/DIS 11885
	1	1	Ba	1	532	0.01	ICP - ISO/DIS 11885
	1	1	Ba	2	543	0.01	ICP - ISO/DIS 11885
	1	1	As	1	2.8	3	ICP - ISO/DIS 11885
	1	1	As	2	3.3	3	ICP - ISO/DIS 11885
	1	1	Pb	1	152	1	ICP - ISO/DIS 11885
	1	1	Pb	2	145	1	ICP - ISO/DIS 11885
Test on LOTnr: 19	2	1	Sb	1	28	5	ICP - ISO/DIS 11885
	2	1	Sb	2	28	5	ICP - ISO/DIS 11885
	2	1	B	1	164	7	ICP - ISO/DIS 11885
	2	1	B	2	144	7	ICP - ISO/DIS 11885
	2	1	Ba	1	327	0.01	ICP - ISO/DIS 11885
	2	1	Ba	2	332	0.01	ICP - ISO/DIS 11885
	2	1	As	1	3.2	3	ICP - ISO/DIS 11885
	2	1	As	2	2.8	3	ICP - ISO/DIS 11885
	2	1	Pb	1	53	1	ICP - ISO/DIS 11885
	2	1	Pb	2	52	1	ICP - ISO/DIS 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**11**						
Date experiment:	08-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4	0.090		22.4	
		2	19	0.086		22.5	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	**1**	1	0.88	9.5	0.048		
Test on LOTnr: 19	**2**	1	0.844	9.4	0.043		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	**1**	1	Sb	1	22	5	ICP - ISO/DIS 11885
	1	1	Sb	2	20	5	ICP - ISO/DIS 11885
	1	1	B	1	153	7	ICP - ISO/DIS 11885
	1	1	B	2	136	7	ICP - ISO/DIS 11885
	1	1	Ba	1	446	0.01	ICP - ISO/DIS 11885
	1	1	Ba	2	452	0.01	ICP - ISO/DIS 11885
	1	1	As	1	< 3	3	ICP - ISO/DIS 11885
	1	1	As	2	< 3	3	ICP - ISO/DIS 11885
	1	1	Pb	1	165	1	ICP - ISO/DIS 11885
	1	1	Pb	2	164	1	ICP - ISO/DIS 11885
Test on LOTnr: 19	**2**	1	Sb	1	35	5	ICP - ISO/DIS 11885
	2	1	Sb	2	35	5	ICP - ISO/DIS 11885
	2	1	B	1	180	7	ICP - ISO/DIS 11885
	2	1	B	2	162	7	ICP - ISO/DIS 11885
	2	1	Ba	1	403	0.01	ICP - ISO/DIS 11885
	2	1	Ba	2	405	0.01	ICP - ISO/DIS 11885
	2	1	As	1	3.8	3	ICP - ISO/DIS 11885
	2	1	As	2	3.9	3	ICP - ISO/DIS 11885
	2	1	Pb	1	55	1	ICP - ISO/DIS 11885
	2	1	Pb	2	54	1	ICP - ISO/DIS 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	11						
Date experiment:	06-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.090		22.2	
		2	27	0.090		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	0.888	9.27	0.077		
Test on LOTnr: 27	**2**	1	0.892	9.21	0.052		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	Sb	1	51	5	ICP - ISO/DIS 11885
	1	1	Sb	2	52	5	ICP - ISO/DIS 11885
	1	1	B	1	177	7	ICP - ISO/DIS 11885
	1	1	B	2	155	7	ICP - ISO/DIS 11885
	1	1	Ba	1	661	0.01	ICP - ISO/DIS 11885
	1	1	Ba	2	698	0.01	ICP - ISO/DIS 11885
	1	1	As	1	2.4	3	ICP - ISO/DIS 11885
	1	1	As	2	2.5	3	ICP - ISO/DIS 11885
	1	1	Pb	1	42	1	ICP - ISO/DIS 11885
	1	1	Pb	2	43	1	ICP - ISO/DIS 11885
Test on LOTnr: 27	**2**	1	Sb	1	81	5	ICP - ISO/DIS 11885
	2	1	Sb	2	79	5	ICP - ISO/DIS 11885
	2	1	B	1	175	7	ICP - ISO/DIS 11885
	2	1	B	2	152	7	ICP - ISO/DIS 11885
	2	1	Ba	1	747	0.01	ICP - ISO/DIS 11885
	2	1	Ba	2	787	0.01	ICP - ISO/DIS 11885
	2	1	As	1	1.7	3	ICP - ISO/DIS 11885
	2	1	As	2	3.5	3	ICP - ISO/DIS 11885
	2	1	Pb	1	95	1	ICP - ISO/DIS 11885
	2	1	Pb	2	98	1	ICP - ISO/DIS 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**SEW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	11						
Date experiment:	06-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.0991		21.6	
		2	24	0.0985		20.8	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	0.215	6.87	2.94		
Test on LOTnr: 24	**2**	1	0.502	7.03	3.02		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	TOC	1	3465000	0.01	Pr EN 1484
	1	1	TOC	2	3439000	0.01	Pr EN 1484
	1	1	SO4	1	48500	30	ISO 10304-1
	1	1	SO4	2	51600	30	ISO 10304-1
	1	1	NH4	1	247000	500	
	1	1	NH4	2	220000	500	
	1	1	Ni	1	239	1	ICP - ISO/DIS 11885
	1	1	Ni	2	225	1	ICP - ISO/DIS 11885
	1	1	Co	1	52	0.4	ICP - ISO/DIS 11885
	1	1	Co	2	49	0.4	ICP - ISO/DIS 11885
Test on LOTnr: 24	**2**	1	TOC	1	3418000	0.01	Pr EN 1484
	2	1	TOC	2	3408000	0.01	Pr EN 1484
	2	1	SO4	1	49300	30	ISO 10304-1
	2	1	SO4	2	41900	30	ISO 10304-1
	2	1	NH4	1	223000	500	
	2	1	NH4	2	221000	500	
	2	1	Ni	1	214	1	ICP - ISO/DIS 11885
	2	1	Ni	2	207	1	ICP - ISO/DIS 11885
	2	1	Co	1	49	0.4	ICP - ISO/DIS 11885
	2	1	Co	2	47	0.4	ICP - ISO/DIS 11885

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**FCM**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	11						
Date experiment:	06-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	28	0.1478		22.1	
		2	16	0.1481		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 28	**1**	1	0.792	10.3	3.26		
Test on LOTnr: 16	**2**	1	0.746	10.8	3.18		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 28	**1**	1	Cl	1	269200	30	ISO 10304-1
	1	1	Cl	2	266800	30	ISO 10304-1
	1	1	F	1	770	30	ISO 10304-1
	1	1	F	2	780	30	ISO 10304-1
	1	1	NO2	1	540	10	ISO 10304-1
	1	1	NO2	2	570	10	ISO 10304-1
	1	1	Ba	1	74	0.01	ICP - ISO/DIS 11885
	1	1	Ba	2	73	0.01	ICP - ISO/DIS 11885
	1	1	Cr(VI)	1	142	5	ISO 11083:1994
	1	1	Cr(VI)	2	142	5	ISO 11083:1994
Test on LOTnr: 16	**2**	1	Cl	1	257800	30	ISO 10304-1
	2	1	Cl	2	256700	30	ISO 10304-1
	2	1	F	1	700	30	ISO 10304-1
	2	1	F	2	700	30	ISO 10304-1
	2	1	NO2	1	380	10	ISO 10304-1
	2	1	NO2	2	350	10	ISO 10304-1
	2	1	Ba	1	63	0.01	ICP - ISO/DIS 11885
	2	1	Ba	2	61	0.01	ICP - ISO/DIS 11885
	2	1	Cr(VI)	1	131	5	ISO 11083:1994
	2	1	Cr(VI)	2	135	5	ISO 11083:1994

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	12						
Date experiment:	28-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.35		22	
		2	13	0.35		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.67	9.98	0.228		
Test on LOTnr: 13	**2**	1	0.675	10.6	0.302		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Sb	1	116	1.6	ICP
	1	1	Sb	2	124	1.6	ICP
	1	1	Ba	1	731	2.7	ICP
	1	1	Ba	2	708	2.7	ICP
	1	1	B	1	1850	4.5	ICP
	1	1	B	2	1860	4.5	ICP
	1	1	As	1	12.9	0.12	Hydrid AAS
	1	1	As	2	12.8	0.12	Hydrid AAS
	1	1	Pb	1	80	5	ICP
	1	1	Pb	2	87	5	ICP
Test on LOTnr: 13	**2**	1	Sb	1	14.9	1.6	ICP
	2	1	Sb	2	14.8	1.6	ICP
	2	1	Ba	1	571	2.7	ICP
	2	1	Ba	2	570	2.7	ICP
	2	1	B	1	1620	4.5	ICP
	2	1	B	2	1640	4.5	ICP
	2	1	As	1	3.31	0.12	Hydrid AAS
	2	1	As	2	2.87	0.12	Hydrid AAS
	2	1	Pb	1	342	5	ICP
	2	1	Pb	2	393	5	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	12						
Date experiment:	28-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.09		22	
		2	13	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.86	9.92	0.076		
Test on LOTnr: 13	**2**	1	0.8	9.97	0.088		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Sb	1	96.5	1.6	ICP
	1	1	Sb	2	95.4	1.6	ICP
	1	1	Ba	1	748	2.7	ICP
	1	1	Ba	2	748	2.7	ICP
	1	1	B	1	357	4.5	ICP
	1	1	B	2	347	4.5	ICP
	1	1	As	1	9.74	0.12	Hydrid AAS
	1	1	As	2	9.86	0.12	Hydrid AAS
	1	1	Pb	1	81	5	ICP
	1	1	Pb	2	78	5	ICP
Test on LOTnr: 13	**2**	1	Sb	1	63.8	1.6	ICP
	2	1	Sb	2	82.7	1.6	ICP
	2	1	Ba	1	802	2.7	ICP
	2	1	Ba	2	795	2.7	ICP
	2	1	B	1	368	4.5	ICP
	2	1	B	2	364	4.5	ICP
	2	1	As	1	4.96	0.12	Hydrid AAS
	2	1	As	2	5.03	0.12	Hydrid AAS
	2	1	Pb	1	83	5	ICP
	2	1	Pb	2	82.7	5	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESc**	**coarse**					
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	12						
Date experiment:	28-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.09		22	
		2	13	0.09		22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.89	10.05	0.072		
Test on LOTnr: 13	**2**	1	0.89	10.04	0.066		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Sb	1	45.1	1.6	ICP
	1	1	Sb	2	45.7	1.6	ICP
	1	1	Ba	1	554	2.7	ICP
	1	1	Ba	2	565	2.7	ICP
	1	1	B	1	238	4.5	ICP
	1	1	B	2	237	4.5	ICP
	1	1	As	1	7.12	0.12	Hydrid AAS
	1	1	As	2	6.99	0.12	Hydrid AAS
	1	1	Pb	1	106	5	ICP
	1	1	Pb	2	102	5	ICP
Test on LOTnr: 13	**2**	1	Sb	1	60.6	1.6	ICP
	2	1	Sb	2	60.6	1.6	ICP
	2	1	Ba	1	542	2.7	ICP
	2	1	Ba	2	536	2.7	ICP
	2	1	B	1	194	4.5	ICP
	2	1	B	2	194	4.5	ICP
	2	1	As	1	6.86	0.12	Hydrid AAS
	2	1	As	2	6.46	0.12	Hydrid AAS
	2	1	Pb	1	112	5	ICP
	2	1	Pb	2	99.1	5	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	12						
Date experiment:	28-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	24	0.09			
		2	30	0.09			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 24	**1**	1	0.88	9.96	0.065		
Test on LOTnr: 30	**2**	1	0.875	9.57	0.062		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 24	**1**	1	Sb	1	97.7	1.6	ICP
	1	1	Sb	2	99.8	1.6	ICP
	1	1	Ba	1	607	2.7	ICP
	1	1	Ba	2	581	2.7	ICP
	1	1	B	1	219	4.5	ICP
	1	1	B	2	223	4.5	ICP
	1	1	As	1	10.2	0.12	Hydrid AAS
	1	1	As	2	10.2	0.12	Hydrid AAS
	1	1	Pb	1	107	5	ICP
	1	1	Pb	2	96.2	5	ICP
Test on LOTnr: 30	**2**	1	Sb	1	74	1.6	ICP
	2	1	Sb	2	73.2	1.6	ICP
	2	1	Ba	1	511	2.7	ICP
	2	1	Ba	2	506	2.7	ICP
	2	1	B	1	165	4.5	ICP
	2	1	B	2	166	4.5	ICP
	2	1	As	1	4.5	0.12	Hydrid AAS
	2	1	As	2	4.66	0.12	Hydrid AAS
	2	1	Pb	1	70.8	5	ICP
	2	1	Pb	2	71.8	5	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	SEW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	12						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	12	0.099		21	
		2	25	0.099		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 12	1	1	0.5	7.1	2.7		
Test on LOTnr: 25	2	1	0.42	7.13	2.8		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 12	1	1	TOC	1	2870000	500	TOC
	1	1	TOC	2	2850000	500	TOC
	1	1	SO4	1	690000	600	IC
	1	1	SO4	2	678000	600	IC
	1	1	NH4	1	296700	20	Photometry
	1	1	NH4	2	283800	20	Photometry
	1	1	Ni	1	234	2.2	ICP
	1	1	Ni	2	235	2.2	ICP
	1	1	Co	1	51.4	2.2	ICP
	1	1	Co	2	50.9	2.2	ICP
Test on LOTnr: 25	2	1	TOC	1	3015000	500	TOC
	2	1	TOC	2	2850000	500	TOC
	2	1	SO4	1	645000	600	IC
	2	1	SO4	2	658000	600	IC
	2	1	NH4	1	309600	20	Photometry
	2	1	NH4	2	296700	20	Photometry
	2	1	Ni	1	216	2.2	ICP
	2	1	Ni	2	224	2.2	ICP
	2	1	Co	1	49.9	2.2	ICP
	2	1	Co	2	50.4	2.2	ICP

V: Intercomparison/Validation							CLUSTER 2
Samplecode:	FCM						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	12						
Date experiment:	04-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	14	0.127		21	
		2	27	0.127		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 14	1	1	0.78	10.95	3.08		
Test on LOTnr: 27	2	1	0.79	10.93	3.04		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 14	1	1	Cl	1	247000	20000	IC
	1	1	Cl	2	279000	20000	IC
	1	1	F	1	1630	1500	IC (delution necessary!)
	1	1	F	2	1890	1500	IC (delution necessary!)
	1	1	NO2	1	840	295	IC (delution necessary!)
	1	1	NO2	2	531	295	IC (delution necessary!)
	1	1	Ba	1	48.4	2.7	ICP
	1	1	Ba	2	50.3	2.7	ICP
	1	1	Cr(VI)	1	690	30	Photometry (Test Kit)
	1	1	Cr(VI)	2	690	30	Photometry (Test Kit)
Test on LOTnr: 27	2	1	Cl	1	243000	20000	IC
	2	1	Cl	2	248000	20000	IC
	2	1	F	1	1300	1500	IC (delution necessary!)
	2	1	F	2	1520	1500	IC (delution necessary!)
	2	1	NO2	1	554	295	IC (delution necessary!)
	2	1	NO2	2	574	295	IC (delution necessary!)
	2	1	Ba	1	49.3	2.7	ICP
	2	1	Ba	2	50.2	2.7	ICP
	2	1	Cr(VI)	1	680	30	Photometry (Test Kit)
	2	1	Cr(VI)	2	690	30	Photometry (Test Kit)

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	13						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	19	0.1973		26	
		2	22	0.2002		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 19	**1**	1	0.35	4.1	5.82		
Test on LOTnr: 22	**2**	1	0.35	4.1	5.89		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 19	**1**	1	As	1	1200	23	EN ISO 11885(E22)
	1	1	As	2	1200	23	EN ISO 11885(E22)
	1	1	Pb	1	3400	17	EN ISO 11885(E22)
	1	1	Pb	2	3400	17	EN ISO 11885(E22)
	1	1	Cd	1	8000	1.3	EN ISO 11885(E22)
	1	1	Cd	2	8000	1.3	EN ISO 11885(E22)
	1	1	Ni	1	2100	2.7	EN ISO 11885(E22)
	1	1	Ni	2	2100	2.7	EN ISO 11885(E22)
	1	1	Co	1	2000	3	EN ISO 11885(E22)
	1	1	Co	2	2000	3	EN ISO 11885(E22)
Test on LOTnr: 22	**2**	1	As	1	1300	23	EN ISO 11885(E22)
	2	1	As	2	1300	23	EN ISO 11885(E22)
	2	1	Pb	1	3200	17	EN ISO 11885(E22)
	2	1	Pb	2	3200	17	EN ISO 11885(E22)
	2	1	Cd	1	8200	1.3	EN ISO 11885(E22)
	2	1	Cd	2	8300	1.3	EN ISO 11885(E22)
	2	1	Ni	1	2200	2.7	EN ISO 11885(E22)
	2	1	Ni	2	2200	2.7	EN ISO 11885(E22)
	2	1	Co	1	2100	3	EN ISO 11885(E22)
	2	1	Co	2	2100	3	EN ISO 11885(E22)

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	13						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	19	0.1015		28	
		2	22	0.103		28	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 19	**1**	1	0.9	4.1	3.15		
Test on LOTnr: 22	**2**	1	0.9	4.1	3.16		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 19	**1**	1	As	1	660	23	EN ISO 11885(E22)
	1	1	As	2	790	23	EN ISO 11885(E22)
	1	1	Pb	1	3000	17	EN ISO 11885(E22)
	1	1	Pb	2	3000	17	EN ISO 11885(E22)
	1	1	Cd	1	2200	1.3	EN ISO 11885(E22)
	1	1	Cd	2	2200	1.3	EN ISO 11885(E22)
	1	1	Ni	1	560	2.7	EN ISO 11885(E22)
	1	1	Ni	2	570	2.7	EN ISO 11885(E22)
	1	1	Co	1	530	3	EN ISO 11885(E22)
	1	1	Co	2	540	3	EN ISO 11885(E22)
Test on LOTnr: 22	**2**	1	As	1	690	23	EN ISO 11885(E22)
	2	1	As	2	750	23	EN ISO 11885(E22)
	2	1	Pb	1	3200	17	EN ISO 11885(E22)
	2	1	Pb	2	3400	17	EN ISO 11885(E22)
	2	1	Cd	1	2100	1.3	EN ISO 11885(E22)
	2	1	Cd	2	2200	1.3	EN ISO 11885(E22)
	2	1	Ni	1	530	2.7	EN ISO 11885(E22)
	2	1	Ni	2	580	2.7	EN ISO 11885(E22)
	2	1	Co	1	520	3	EN ISO 11885(E22)
	2	1	Co	2	540	3	EN ISO 11885(E22)

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	13						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.1769		25	
		2	13	0.1771		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.35	6.5	1.61		
Test on LOTnr: 13	**2**	1	0.35	6.5	1.6		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	620		EN ISO 11885 (E22)
	1	1	Ba	2	610		EN ISO 11885 (E22)
	1	1	Cu	1	9.2	1.3	EN ISO 11885 (E22)
	1	1	Cu	2	11	1.3	EN ISO 11885 (E22)
	1	1	Mo	1	87	4	EN ISO 11885 (E22)
	1	1	Mo	2	82	4	EN ISO 11885 (E22)
	1	1	F	1	2580	33	DIN 38405 T4
	1	1	F	2	2480	33	DIN 38405 T4
	1	1	Zn	1	1500	3	EN ISO 11885 (E22)
	1	1	Zn	2	1500	3	EN ISO 11885 (E22)
Test on LOTnr: 13	**2**	1	Ba	1	560		EN ISO 11885 (E22)
	2	1	Ba	2	580		EN ISO 11885 (E22)
	2	1	Cu	1	11	1.3	EN ISO 11885 (E22)
	2	1	Cu	2	12	1.3	EN ISO 11885 (E22)
	2	1	Mo	1	82	4	EN ISO 11885 (E22)
	2	1	Mo	2	87	4	EN ISO 11885 (E22)
	2	1	F	1	2050	33	DIN 38405 T4
	2	1	F	2	2040	33	DIN 38405 T4
	2	1	Zn	1	1100	3	EN ISO 11885 (E22)
	2	1	Zn	2	1200	3	EN ISO 11885 (E22)

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	13						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.091		23	
		2	13	0.0911		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.9	6.9	0.48		
Test on LOTnr: 13	**2**	1	0.9	7	0.48		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	1100		EN ISO 11885(E22)
	1	1	Ba	2	1000		EN ISO 11885(E22)
	1	1	Cu	1	9.1	1.3	EN ISO 11885(E22)
	1	1	Cu	2	8.6	1.3	EN ISO 11885(E22)
	1	1	Mo	1	21	4	EN ISO 11885(E22)
	1	1	Mo	2	20	4	EN ISO 11885(E22)
	1	1	F	1	1040	33	DIN 38405 T4
	1	1	F	2	0.091	33	DIN 38405 T4
	1	1	Zn	1	210	3	EN ISO 11885(E22)
	1	1	Zn	2	200	3	EN ISO 11885(E22)
Test on LOTnr: 13	**2**	1	Ba	1	1100		EN ISO 11885(E22)
	2	1	Ba	2	1000		EN ISO 11885(E22)
	2	1	Cu	1	6.4	1.3	EN ISO 11885(E22)
	2	1	Cu	2	7	1.3	EN ISO 11885(E22)
	2	1	Mo	1	21	4	EN ISO 11885(E22)
	2	1	Mo	2	19	4	EN ISO 11885(E22)
	2	1	F	1	860	33	DIN 38405 T4
	2	1	F	2	830	33	DIN 38405 T4
	2	1	Zn	1	190	3	EN ISO 11885(E22)
	2	1	Zn	2	170	3	EN ISO 11885(E22)

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	3	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	13						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.1769		24	
		2	13	0.1771		24	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.35	6.5	1.44		
	1	2	0.35	7	0.33		
Test on LOTnr: 13	**2**	1	0.35	6.5	1.41		
	2	2	0.35	7	0.31		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	750		EN ISO 11885(E22)
	1	1	Ba	2	800		EN ISO 11885(E22)
	1	2	Ba	1	1000		EN ISO 11885(E22)
	1	2	Ba	2	1100		EN ISO 11885(E22)
	1	1	Cu	1	47	1.3	EN ISO 11885(E22)
	1	1	Cu	2	53	1.3	EN ISO 11885(E22)
	1	2	Cu	1	6.3	1.3	EN ISO 11885(E22)
	1	2	Cu	2	7.8	1.3	EN ISO 11885(E22)
	1	1	Mo	1	83	4	EN ISO 11885(E22)
	1	1	Mo	2	91	4	EN ISO 11885(E22)
	1	2	Mo	1	19	4	EN ISO 11885(E22)
	1	2	Mo	2	17	4	EN ISO 11885(E22)
	1	1	F	1	2270	33	DIN 38405 T4
	1	1	F	2	2220	33	DIN 38405 T4
	1	2	F	1	690	33	DIN 38405 T4
	1	2	F	2	640	33	DIN 38405 T4
	1	1	Zn	1	1900	3	EN ISO 11885(E22)
	1	1	Zn	2	2100	3	EN ISO 11885(E22)
	1	2	Zn	1	180	3	EN ISO 11885(E22)
	1	2	Zn	2	200	3	EN ISO 11885(E22)
Test on LOTnr: 13	**2**	1	Ba	1	650		EN ISO 11885(E22)
	2	1	Ba	2	620		EN ISO 11885(E22)
	2	2	Ba	1	950		EN ISO 11885(E22)
	2	2	Ba	2	960		EN ISO 11885(E22)
	2	1	Cu	1	30	1.3	EN ISO 11885(E22)
	2	1	Cu	2	28	1.3	EN ISO 11885(E22)
	2	2	Cu	1	4.3	1.3	EN ISO 11885(E22)
	2	2	Cu	2	4.5	1.3	EN ISO 11885(E22)
	2	1	Mo	1	75	4	EN ISO 11885(E22)
	2	1	Mo	2	74	4	EN ISO 11885(E22)
	2	2	Mo	1	16	4	EN ISO 11885(E22)
	2	2	Mo	2	17	4	EN ISO 11885(E22)
	2	1	F	1	1900	33	DIN 38405 T4
	2	1	F	2	1900	33	DIN 38405 T4
	2	2	F	1	590	33	DIN 38405 T4
	2	2	F	2	580	33	DIN 38405 T4
	2	1	Zn	1	1700	3	EN ISO 11885(E22)
	2	1	Zn	2	1600	3	EN ISO 11885(E22)
	2	2	Zn	1	170	3	EN ISO 11885(E22)
	2	2	Zn	2	170	3	EN ISO 11885(E22)

V: Intercomparison/Validation

CLUSTER 3

Samplecode: **SBW**
Test code: **1** *CEN TC292 EN 12457-1 (LS=2)*

Laboratory code: 13
Date experiment:

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	1	0.1769		25	
2	13	0.1771		25	

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.35	6.5	1.61		
Test on LOTnr: 13	**2**	1	0.35	6.5	1.6		

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	620	0.03	DIN 38406-29
	1	1	Ba	2	660	0.03	DIN 38406-29
	1	1	Cu	1	9	0.1	DIN 38406-29
	1	1	Cu	2	9.3	0.1	DIN 38406-29
	1	1	Mo	1	77	0.03	DIN 38406-29
	1	1	Mo	2	78	0.03	DIN 38406-29
	1	1	F	1			
	1	1	F	2			
	1	1	Zn	1	1400	0.3	DIN 38406-29
	1	1	Zn	2	1400	0.3	DIN 38406-29
Test on LOTnr: 13	**2**	1	Ba	1	600	0.03	DIN 38406-29
	2	1	Ba	2	610	0.03	DIN 38406-29
	2	1	Cu	1	12	0.1	DIN 38406-29
	2	1	Cu	2	12	0.1	DIN 38406-29
	2	1	Mo	1	78	0.03	DIN 38406-29
	2	1	Mo	2	80	0.03	DIN 38406-29
	2	1	F	1			
	2	1	F	2			
	2	1	Zn	1	1200	0.3	DIN 38406-29
	2	1	Zn	2	1200	0.3	DIN 38406-29

V: Intercomparison/Validation

CLUSTER 3

Samplecode: **SBW**
Test code: **2** *CEN TC292 EN 12457-2 (LS=10)*

Laboratory code: 13
Date experiment:

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	1	0.091		23	
2	13	0.0911		23	

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.9	6.9	0.48		
Test on LOTnr: 13	**2**	1	0.9	7	0.48		

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	1100	0.03	DIN 38406-29
	1	1	Ba	2	1100	0.03	DIN 38406-29
	1	1	Cu	1	9.2	0.1	DIN 38406-29
	1	1	Cu	2	9.1	0.1	DIN 38406-29
	1	1	Mo	1	22	0.03	DIN 38406-29
	1	1	Mo	2	22	0.03	DIN 38406-29
	1	1	F	1			
	1	1	F	2			
	1	1	Zn	1	210	0.3	DIN 38406-29
	1	1	Zn	2	210	0.3	DIN 38406-29
Test on LOTnr: 13	**2**	1	Ba	1	1000	0.03	DIN 38406-29
	2	1	Ba	2	1100	0.03	DIN 38406-29
	2	1	Cu	1	6.7	0.1	DIN 38406-29
	2	1	Cu	2	6.5	0.1	DIN 38406-29
	2	1	Mo	1	21	0.03	DIN 38406-29
	2	1	Mo	2	20	0.03	DIN 38406-29
	2	1	F	1			
	2	1	F	2			
	2	1	Zn	1	190	0.3	DIN 38406-29
	2	1	Zn	2	190	0.3	DIN 38406-29

V: Intercomparison/Validation

CLUSTER 3

Samplecode: **SBW**
Test code: **3** *CEN TC292 EN 12457-3 (LS=2 & LS=8)*

Laboratory code: 13
Date experiment:

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	1	0.1769		24	
2	13	0.1771		24	

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.35	6.5	1.44		
	1	2	0.35	7	0.33		
Test on LOTnr: 13	**2**	1	0.35	6.5	1.41		
	2	2	0.35	7	0.31		

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	840	0.03	DIN 38406-29
	1	1	Ba	2	850	0.03	DIN 38406-29
	1	2	Ba	1	1000	0.03	DIN 38406-29
	1	2	Ba	2	1100	0.03	DIN 38406-29
	1	1	Cu	1	54	0.1	DIN 38406-29
	1	1	Cu	2	55	0.1	DIN 38406-29
	1	2	Cu	1	7.4	0.1	DIN 38406-29
	1	2	Cu	2	9.1	0.1	DIN 38406-29
	1	1	Mo	1	92	0.03	DIN 38406-29
	1	1	Mo	2	94	0.03	DIN 38406-29
	1	2	Mo	1	19	0.03	DIN 38406-29
	1	2	Mo	2	19	0.03	DIN 38406-29
	1	1	F	1			
	1	1	F	2			
	1	2	F	1			
	1	2	F	2			
	1	1	Zn	1	2100	0.3	DIN 38406-29
	1	1	Zn	2	2100	0.3	DIN 38406-29
	1	2	Zn	1	190	0.3	DIN 38406-29
	1	2	Zn	2	200	0.3	DIN 38406-29
Test on LOTnr: 13	**2**	1	Ba	1	790	0.03	DIN 38406-29
	2	1	Ba	2	780	0.03	DIN 38406-29
	2	2	Ba	1	1100	0.03	DIN 38406-29
	2	2	Ba	2	1000	0.03	DIN 38406-29
	2	1	Cu	1	38	0.1	DIN 38406-29
	2	1	Cu	2	37	0.1	DIN 38406-29
	2	2	Cu	1	6.8	0.1	DIN 38406-29
	2	2	Cu	2	6.8	0.1	DIN 38406-29
	2	1	Mo	1	85	0.03	DIN 38406-29
	2	1	Mo	2	88	0.03	DIN 38406-29
	2	2	Mo	1	18	0.03	DIN 38406-29
	2	2	Mo	2	18	0.03	DIN 38406-29
	2	1	F	1			
	2	1	F	2			
	2	2	F	1			
	2	2	F	2			
	2	1	Zn	1	2000	0.3	DIN 38406-29
	2	1	Zn	2	1900	0.3	DIN 38406-29
	2	2	Zn	1	190	0.3	DIN 38406-29
	2	2	Zn	2	180	0.3	DIN 38406-29

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	14						
Date experiment:	21-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.213	793.3	23.5	
		2	15	0.2142	806.7	23.5	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.2	4.07	5.34	167.8	
Test on LOTnr: 15	**2**	1	0.22	4.02	5.41	170.4	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	As	1	652	2	AAHG
	1	1	As	2	648	2	
	1	1	Pb	1	4160	200	ICP-AES
	1	1	Pb	2	4140	200	
	1	1	Cd	1	8690	10	ICP-AES
	1	1	Cd	2	8650	10	
	1	1	Ni	1	2400	100	ICP-AES
	1	1	Ni	2	2330	100	
	1	1	Co	1	2260	10	ICP-AES
	1	1	Co	2	2230	10	
Test on LOTnr: 15	**2**	1	As	1	662	2	AAHG
	2	1	As	2	671	2	
	2	1	Pb	1	3790	200	ICP-AES
	2	1	Pb	2	3900	200	
	2	1	Cd	1	7930	10	ICP-AES
	2	1	Cd	2	8060	10	
	2	1	Ni	1	2260	100	ICP-AES
	2	1	Ni	2	2260	100	
	2	1	Co	1	2120	10	ICP-AES
	2	1	Co	2	2170	10	

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	14						
Date experiment:	21-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.1139	793.3	23.5	
		2	15	0.1111	806.7	23.5	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.845	4.21	2.84	159.3	
Test on LOTnr: 15	**2**	1	0.815	4.19	2.87	161	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	As	1	426	2	AAHG
	1	1	As	2	427	2	
	1	1	Pb	1	3850	200	ICP-AES
	1	1	Pb	2	3560	200	
	1	1	Cd	1	2460	10	ICP-AES
	1	1	Cd	2	2350	10	
	1	1	Ni	1	597	100	ICP-AES
	1	1	Ni	2	605	100	
	1	1	Co	1	518	10	ICP-AES
	1	1	Co	2	499	10	
Test on LOTnr: 15	**2**	1	As	1	417	2	AAHG
	2	1	As	2	434	2	
	2	1	Pb	1	3060	200	ICP-AES
	2	1	Pb	2	3210	200	
	2	1	Cd	1	1880	10	ICP-AES
	2	1	Cd	2	2040	10	
	2	1	Ni	1	512	100	ICP-AES
	2	1	Ni	2	460	100	
	2	1	Co	1	427	10	ICP-AES
	2	1	Co	2	465	10	

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	14						
Date experiment:	13-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.1767	1406	25	
		2	14	0.1785	1566	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.27	8.08	2.28	-61.5	
Test on LOTnr: 14	2	1	0.285	8.28	1.98	-72.5	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	Ba	1	140	10	ICP-AES
	1	1	Ba	2	140		
	1	1	Cu	1	<20	20	ICP-AES
	1	1	Cu	2	<20		
	1	1	Mo	1	170	100	ICP-AES
	1	1	Mo	2	130		
	1	1	F	1	4600	100	Potentiometry ISE
	1	1	F	2	4700		
	1	1	Zn	1	390	10	ICP-AES
	1	1	Zn	2	390		
Test on LOTnr: 14	2	1	Ba	1	210	10	ICP-AES
	2	1	Ba	2	220		
	2	1	Cu	1	<20	20	ICP-AES
	2	1	Cu	2	<20		
	2	1	Mo	1	120	100	ICP-AES
	2	1	Mo	2	160		
	2	1	F	1	4200	100	Potentiometry ISE
	2	1	F	2	4100		
	2	1	Zn	1	580	10	ICP-AES
	2	1	Zn	2	600		

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	14						
Date experiment:	11-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.0909	1406	26	
		2	14	0.0918	1566	26	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.795	8.22	0.685	-65.6	
Test on LOTnr: 14	2	1	0.68	8.36	0.661	-75.5	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	Ba	1	390	10	ICP-AES
	1	1	Ba	2	390		
	1	1	Cu	1	<20	20	ICP-AES
	1	1	Cu	2	<20		
	1	1	Mo	1	130	100	ICP-AES
	1	1	Mo	2	100		
	1	1	F	1	2000	100	Potentiometry ISE
	1	1	F	2	2000		
	1	1	Zn	1	100	10	ICP-AES
	1	1	Zn	2	100		
Test on LOTnr: 14	2	1	Ba	1	210	10	ICP-AES
	2	1	Ba	2	220		
	2	1	Cu	1	<20	20	ICP-AES
	2	1	Cu	2	<20		
	2	1	Mo	1	120	100	ICP-AES
	2	1	Mo	2	160		
	2	1	F	1	4200	100	Potentiometry ISE
	2	1	F	2	4100		
	2	1	Zn	1	580	10	ICP-AES
	2	1	Zn	2	600		

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	14						
Date experiment:	14-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	2	0.1766	1406	26	
		2	14	0.1785	1566	26	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 2	**1**	1	0.3	8.06	2.14	-60.4	
	1	2	1.355	8.6	0.437	-91.2	
Test on LOTnr: 14	**2**	1	0.295	8.65	1.91	-94	
	2	2	1.37	8.64	0.41	-93	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 2	**1**	1	Ba	1	230	10	ICP-AES
	1	1	Ba	2	220		
	1	2	Ba	1	410		
	1	2	Ba	2	400		
	1	1	Cu	1	<20	20	ICP-AES
	1	1	Cu	2	<20		
	1	2	Cu	1	<20		
	1	2	Cu	2	<20		
	1	1	Mo	1	250	100	ICP-AES
	1	1	Mo	2	240		
	1	2	Mo	1	<100		
	1	2	Mo	2	<100		
	1	1	F	1	3400	100	Potentiometry ISE
	1	1	F	2	3400		
	1	2	F	1	2300		
	1	2	F	2	2300		
	1	1	Zn	1	330	10	ICP-AES
	1	1	Zn	2	330		
	1	2	Zn	1	40		
	1	2	Zn	2	40		
Test on LOTnr: 14	**2**	1	Ba	1	640	10	ICP-AES
	2	1	Ba	2	630		
	2	2	Ba	1	920		
	2	2	Ba	2	960		
	2	1	Cu	1	80	20	ICP-AES
	2	1	Cu	2	90		
	2	2	Cu	1	<20		
	2	2	Cu	2	<20		
	2	1	Mo	1	1320	100	ICP-AES
	2	1	Mo	2	1360		
	2	2	Mo	1	100		
	2	2	Mo	2	100		
	2	1	F	1	4700	100	Potentiometry ISE
	2	1	F	2	4600		
	2	2	F	1	2100		
	2	2	F	2	2100		
	2	1	Zn	1	3000	10	ICP-AES
	2	1	Zn	2	3020		
	2	2	Zn	1	100		
	2	2	Zn	2	90		

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	15						
Date experiment:	00-09-20						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	7	0.205		23	
		2	4	0.208		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 7	1	1	0.3	4.11	6.05		
Test on LOTnr: 4	2	1	0.3	4.12	6.19		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 7	1	1	As	1	560	2	DIN EN ISO 11969
	1	1	As	2	560	2	DIN EN ISO 11969
	1	1	Pb	1	1700	5	DIN EN ISO 11885
	1	1	Pb	2	1600	5	DIN EN ISO 11885
	1	1	Cd	1	7400	0.5	DIN EN ISO 11885
	1	1	Cd	2	7400	0.5	DIN EN ISO 11885
	1	1	Ni	1	2000	5	DIN EN ISO 11885
	1	1	Ni	2	2000	5	DIN EN ISO 11885
	1	1	Co	1	1900	5	DIN EN ISO 11885
	1	1	Co	2	1900	5	DIN EN ISO 11885
Test on LOTnr: 4	2	1	As	1	530	2	DIN EN ISO 11969
	2	1	As	2	470	2	DIN EN ISO 11969
	2	1	Pb	1	1800	5	DIN EN ISO 11885
	2	1	Pb	2	1800	5	DIN EN ISO 11885
	2	1	Cd	1	7900	0.5	DIN EN ISO 11885
	2	1	Cd	2	7900	0.5	DIN EN ISO 11885
	2	1	Ni	1	1800	5	DIN EN ISO 11885
	2	1	Ni	2	1800	5	DIN EN ISO 11885
	2	1	Co	1	1800	5	DIN EN ISO 11885
	2	1	Co	2	1800	5	DIN EN ISO 11885

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	15						
Date experiment:	00-09-20						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	7	0.094		23	
		2	4	0.095		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 7	1	1	0.8	4.27	3.13		
Test on LOTnr: 4	2	1	0.8	4.3	3.14		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 7	1	1	As	1	410	2	DIN EN ISO 11969
	1	1	As	2	410	2	DIN EN ISO 11969
	1	1	Pb	1	3500	5	DIN EN ISO 11885
	1	1	Pb	2	3500	5	DIN EN ISO 11885
	1	1	Cd	1	1900	0.5	DIN EN ISO 11885
	1	1	Cd	2	2000	0.5	DIN EN ISO 11885
	1	1	Ni	1	490	5	DIN EN ISO 11885
	1	1	Ni	2	490	5	DIN EN ISO 11885
	1	1	Co	1	440	5	DIN EN ISO 11885
	1	1	Co	2	450	5	DIN EN ISO 11885
Test on LOTnr: 4	2	1	As	1	400	2	DIN EN ISO 11969
	2	1	As	2	360	2	DIN EN ISO 11969
	2	1	Pb	1	3600	5	DIN EN ISO 11885
	2	1	Pb	2	3700	5	DIN EN ISO 11885
	2	1	Cd	1	2000	0.5	DIN EN ISO 11885
	2	1	Cd	2	2000	0.5	DIN EN ISO 11885
	2	1	Ni	1	510	5	DIN EN ISO 11885
	2	1	Ni	2	510	5	DIN EN ISO 11885
	2	1	Co	1	490	5	DIN EN ISO 11885
	2	1	Co	2	470	5	DIN EN ISO 11885

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	15						
Date experiment:	00-09-20						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	15	0.177		23	
		2	3	0.176		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 15	1	1	0.3	6.48	1.578		
Test on LOTnr: 3	2	1	0.3	6.48	1.577		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 15	1	1	Ba	1	460	0.5	DIN EN ISO 11885
	1	1	Ba	2	460	0.5	DIN EN ISO 11885
	1	1	Cu	1	32	1	DIN EN ISO 11885
	1	1	Cu	2	32	1	DIN EN ISO 11885
	1	1	Mo	1	49	1	DIN EN ISO 11885
	1	1	Mo	2	46	1	DIN EN ISO 11885
	1	1	F	1	3600	50	DIN EN ISO 10304
	1	1	F	2	3800	50	DIN EN ISO 10304
	1	1	Zn	1	3500	5	DIN EN ISO 11885
	1	1	Zn	2	3500	5	DIN EN ISO 11885
Test on LOTnr: 3	2	1	Ba	1	510	0.5	DIN EN ISO 11885
	2	1	Ba	2	500	0.5	DIN EN ISO 11885
	2	1	Cu	1	310	1	DIN EN ISO 11885
	2	1	Cu	2	67	1	DIN EN ISO 11885
	2	1	Mo	1	52	1	DIN EN ISO 11885
	2	1	Mo	2	48	1	DIN EN ISO 11885
	2	1	F	1	3800	50	DIN EN ISO 10304
	2	1	F	2	3500	50	DIN EN ISO 10304
	2	1	Zn	1	2800	5	DIN EN ISO 11885
	2	1	Zn	2	2700	5	DIN EN ISO 11885

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	15						
Date experiment:	00-09-20						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	15	0.081		23	
		2	3	0.101		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 15	1	1	0.8	6.8	0.461		
Test on LOTnr: 3	2	1	1	6.75	0.462		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 15	1	1	Ba	1	760	0.5	DIN EN ISO 11885
	1	1	Ba	2	1000	0.5	DIN EN ISO 11885
	1	1	Cu	1	42	1	DIN EN ISO 11885
	1	1	Cu	2	39	1	DIN EN ISO 11885
	1	1	Mo	1	8	1	DIN EN ISO 11885
	1	1	Mo	2	9	1	DIN EN ISO 11885
	1	1	F	1	1300	50	DIN EN ISO 10304
	1	1	F	2	1300	50	DIN EN ISO 10304
	1	1	Zn	1	700	5	DIN EN ISO 11885
	1	1	Zn	2	400	5	DIN EN ISO 11885
Test on LOTnr: 3	2	1	Ba	1	1100	0.5	DIN EN ISO 11885
	2	1	Ba	2	760	0.5	DIN EN ISO 11885
	2	1	Cu	1	27	1	DIN EN ISO 11885
	2	1	Cu	2	39	1	DIN EN ISO 11885
	2	1	Mo	1	13	1	DIN EN ISO 11885
	2	1	Mo	2	10	1	DIN EN ISO 11885
	2	1	F	1	1300	50	DIN EN ISO 10304
	2	1	F	2	1300	50	DIN EN ISO 10304
	2	1	Zn	1	450	5	DIN EN ISO 11885
	2	1	Zn	2	630	5	DIN EN ISO 11885

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	15						
Date experiment:	00-09-20						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.177		23	
		2	3	0.176		23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.3	6.54	1.349		
	1	2	1.41	7.06	0.314		PE-Container
Test on LOTnr: 3	**2**	1	0.3	6.56	1.352		
	2	2	1.41	7.04	0.299		PE-Container
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Ba	1	420	0.5	DIN EN ISO 11885
	1	1	Ba	2	430	0.5	DIN EN ISO 11885
	1	2	Ba	1	960	0.5	DIN EN ISO 11885
	1	2	Ba	2	900	0.5	DIN EN ISO 11885
	1	1	Cu	1	67	1	DIN EN ISO 11885
	1	1	Cu	2	69	1	DIN EN ISO 11885
	1	2	Cu	1	31	1	DIN EN ISO 11885
	1	2	Cu	2	39	1	DIN EN ISO 11885
	1	1	Mo	1	52	1	DIN EN ISO 11885
	1	1	Mo	2	56	1	DIN EN ISO 11885
	1	2	Mo	1	6	1	DIN EN ISO 11885
	1	2	Mo	2	5	1	DIN EN ISO 11885
	1	1	F	1	3100	50	DIN EN ISO 10304
	1	1	F	2	3100	50	DIN EN ISO 10304
	1	2	F	1	1100	50	DIN EN ISO 10304
	1	2	F	2	1100	50	DIN EN ISO 10304
	1	1	Zn	1	2500	5	DIN EN ISO 11885
	1	1	Zn	2	2500	5	DIN EN ISO 11885
	1	2	Zn	1	210	5	DIN EN ISO 11885
	1	2	Zn	2	270	5	DIN EN ISO 11885
Test on LOTnr: 3	**2**	1	Ba	1	390	0.5	DIN EN ISO 11885
	2	1	Ba	2	400	0.5	DIN EN ISO 11885
	2	2	Ba	1	1100	0.5	DIN EN ISO 11885
	2	2	Ba	2	1100	0.5	DIN EN ISO 11885
	2	1	Cu	1	54	1	DIN EN ISO 11885
	2	1	Cu	2	53	1	DIN EN ISO 11885
	2	2	Cu	1	31	1	DIN EN ISO 11885
	2	2	Cu	2	37	1	DIN EN ISO 11885
	2	1	Mo	1	54	1	DIN EN ISO 11885
	2	1	Mo	2	53	1	DIN EN ISO 11885
	2	2	Mo	1	3	1	DIN EN ISO 11885
	2	2	Mo	2	9	1	DIN EN ISO 11885
	2	1	F	1	3800	50	DIN EN ISO 10304
	2	1	F	2	3100	50	DIN EN ISO 10304
	2	2	F	1	1100	50	DIN EN ISO 10304
	2	2	F	2	1100	50	DIN EN ISO 10304
	2	1	Zn	1	3500	5	DIN EN ISO 11885
	2	1	Zn	2	2900	5	DIN EN ISO 11885
	2	2	Zn	1	230	5	DIN EN ISO 11885
	2	2	Zn	2	160	5	DIN EN ISO 11885

HEADER

Sample Code	3COS C2#13
Test Code	2
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	13
Lot nr	C2
Weight kg	0.1084
dens	-
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	13
FRC Nr	1
Volume in l	0.800
pH	4.13
cond mS/cm	3.15
remarks	Concentration of As,Cd,Pb is to high for our routine method (AAS) - the r

CONC. PARAMETERS

LST Nr	13				
FRC Nr	1				
Element	As	Pb	Cd	Ni	Co
Dupl an	1	1	1	1	1
Conc	545	3280	2070	463	458
Dupl an	2	2	2	2	2
Conc	559	3590	2350	446	436
DTL	-	-	-	10	10
anal meth	icp-oes	icp-oes	icp-oes	icp-oes	icp-oes

HEADER

Sample Code	3COS C2#13
Test Code	1
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	13
Lot nr	C2
Weight kg	0.2108
dens	-
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	13
FRC Nr	1
Volume in l	0.230
pH	3.92
cond mS/cm	6.12
remarks	Concentration of As,Cd,Pb is to high for our routine method (AAS) - the r

CONC. PARAMETERS

LST Nr	13				
FRC Nr	1				
Element	As	Pb	Cd	Ni	Co
Dupl an	1	1	1	1	1
Conc	910	4310	7710	1975	1981
Dupl an	2	2	2	2	2
Conc	1000	4230	7530	1905	1907
DTL	-	-	-	10	10
anal meth	icp-oes	icp-oes	icp-oes	icp-oes	icp-oes

HEADER

Sample Code	3COS C2#21
Test Code	1
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	21
Lot nr	C2
Weight kg	0.2108
dens	-
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	21
FRC Nr	1
Volume in l	0.246
pH	3.9
cond mS/cm	6.12
remarks	Concentration of As,Cd,Pb is to high for our routine method (AAS) - the r

CONC. PARAMETERS

LST Nr	21				
FRC Nr	1				
Element	As	Pb	Cd	Ni	Co
Dupl an	1	1	1	1	1
Conc	1037	4520	8240	1946	1928
Dupl an	2	2	2	2	2
Conc	1160	4260	7840	1915	1903
DTL	-	-	-	10	10
anal meth	icp-oes	icp-oes	icp-oes	icp-oes	icp-oes

HEADER

Sample Code	3COS C2#21
Test Code	2
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	21
Lot nr	C2
Weight kg	0.1084
dens	-
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	21
FRC Nr	1
Volume in l	0.810
pH	4.11
cond mS/cm	3.14
remarks	Concentration of As,Cd,Pb is to high for our routine method (AAS) - the r

CONC. PARAMETERS

LST Nr	21				
FRC Nr	1				
Element	As	Pb	Cd	Ni	Co
Dupl an	1	1	1	1	1
Conc	606	3460	2360	531	519
Dupl an	2	2	2	2	2
Conc	624	3590	2550	484	457
DTL	-	-	-	10	10
anal meth	icp-oes	icp-oes	icp-oes	icp-oes	icp-oes

HEADER

Sample Code	3-SBW-C-05
Test Code	1
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr		5
Lot nr	C	
Weight kg		176.4
temp		25
testremarks	-	

FRACTION PARAMETERS

LST Nr		5
FRC Nr		1
Volume in l		0.260
pH		6.55
cond mS/cm		1.711
remarks	-	

CONC. PARAMETERS

LST Nr		5				
FRC Nr		1				
	Element	Ba	Cu	Mo	F	Zn
	Dupl an	1	1	1	1	1
	Conc	1379	8	49	3640	1944
	Dupl an	2	2		2	2
	Conc	1510	8		4530	1998
DTL		5	5	50	10	10
anal meth		icp-oes	icp-oes	icp-oes	electrode	icp-oes

HEADER

Sample Code	3-SBW-C-05
Test Code	2
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr		5
Lot nr	C	
Weight		0.0907
temp		25
testremarks	-	

FRACTION PARAMETERS

LST Nr		5
FRC Nr		1
Volume in l		0.870
pH		6.75
cond mS/cm		0.478
remarks	-	

CONC. PARAMETERS

LST Nr		5				
FRC Nr		1				
	Element	Ba	Cu	Mo	F	Zn
	Dupl an	1	1	1	1	1
	Conc	679	5	<50	1620	343
	Dupl an	2	2	2	2	2
	Conc	773	3	<50	2080	332
DTL		5	5	50	10	10
anal meth		icp-oes	icp-oes	icp-oes	electrode	icp-oes

HEADER

Sample Code	3-SBW-C-05
Test Code	3
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	5
Lot nr	C
Weight	176.4
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	5
FRC Nr	1
Volume in l	0.273
pH	6.4
cond mS/cm	1.58
remarks	-

CONC. PARAMETERS

LST Nr	5				
FRC Nr	1				
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	1183	32	71	4200	2896
Dupl an	2	2		2	2
Conc	1252	38		4350	3019
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

FRACTION PARAMETERS

LST Nr	5
FRC Nr	2
Volume in l	1309
pH	7.12
cond mS/cm	0.279
remarks	-

CONC. PARAMETERS

LST Nr	5				
FRC Nr	2				
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	498	4	<50	1450	121
Dupl an	2	2		2	2
Conc	558	1		1780	120
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

HEADER

Sample Code	3-SBW-C-17
Test Code	1
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	17
Lot nr	C
Weight	0.176
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	17
FRC Nr	C
Volume in l	265
pH	6.7
cond mS/cm	1.732
remarks	-

CONC. PARAMETERS

LST Nr	17				
FRC Nr	1				
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	1580	6	<50	318	2278
Dupl an	2	2		2	2
Conc	1694	3		379	2254
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

HEADER

Sample Code	3-SBW-C-17
Test Code	2
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	17
Lot nr	C
Weight	90.7
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	17
FRC Nr	1
Volume in l	0.873
pH	6.7
cond mS/cm	0.471
remarks	-

CONC. PARAMETERS

LST Nr	17				
FRC Nr	1				
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	780	6	<50	1590	338
Dupl an	2	2	2	2	2
Conc	875	3	<50	1940	334
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

HEADER

Sample Code	3-SBW-C-17
Test Code	3
Lab Code	17
Date experiment	-

SAMPLE PARAMETERS

LST nr	17
Lot nr	C
Weight	176.4
temp	25
testremarks	-

FRACTION PARAMETERS

LST Nr	17
FRC Nr	1
Volume in l	0.312
pH	6.35
cond mS/cm	1.441
remarks	-

CONC. PARAMETERS

LST Nr	17				
FRC Nr	1				
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	1220	9	66	4270	2834
Dupl an	2	2			2
Conc	1296	9			2897
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

CONC. PARAMETERS

LST Nr					
FRC Nr					
Element	Ba	Cu	Mo	F	Zn
Dupl an	1	1	1	1	1
Conc	544	4	<50	1300	102
Dupl an	2	2		2	2
Conc	607	2		1800	97
DTL	5	5	50	10	10
anal meth	icp-oes	icp-oes	icp-oes	electrode	icp-oes

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	18						
Date experiment:	16-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.20135		23.8	
		2	20	0.20128		23.4	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.3247	3.89	4.43		
Test on LOTnr: 20	**2**	1	0.3248	3.79	5.28		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	As	1	668	0.2	HG-AAS
	1	1	As	2	679	0.2	HG-AAS
	1	1	Pb	1	2578	0.2	ET-AAS
	1	1	Pb	2	2586	0.2	ET-AAS
	1	1	Cd	1	4436	0.02	ET-AAS
	1	1	Cd	2	4333	0.02	ET-AAS
	1	1	Ni	1	1190	1	ET-AAS
	1	1	Ni	2	1165	1	ET-AAS
	1	1	Co	1	1194	0.6	ET-AAS
	1	1	Co	2	1222	0.6	ET-AAS
Test on LOTnr: 20	**2**	1	As	1	737	0.2	HG-AAS
	2	1	As	2	758	0.2	HG-AAS
	2	1	Pb	1	2793	0.2	ET-AAS
	2	1	Pb	2	2671	0.2	ET-AAS
	2	1	Cd	1	6264	0.02	ET-AAS
	2	1	Cd	2	5860	0.02	ET-AAS
	2	1	Ni	1	1746	1	ET-AAS
	2	1	Ni	2	1774	1	ET-AAS
	2	1	Co	1	1684	0.6	ET-AAS
	2	1	Co	2	1639	0.6	ET-AAS

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	18						
Date experiment:	16-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.10357		24.6	
		2	20	0.10351		26.2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.8892	4.11	2.77		
Test on LOTnr: 20	**2**	1	0.8892	3.92	2.76		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	As	1	403	0.2	HG-AAS
	1	1	As	2	410	0.2	HG-AAS
	1	1	Pb	1	2601	0.2	ET-AAS
	1	1	Pb	2	2445	0.2	ET-AAS
	1	1	Cd	1	1540	0.02	ET-AAS
	1	1	Cd	2	1467	0.02	ET-AAS
	1	1	Ni	1	385	1	ET-AAS
	1	1	Ni	2	375	1	ET-AAS
	1	1	Co	1	404	0.6	ET-AAS
	1	1	Co	2	400	0.6	ET-AAS
Test on LOTnr: 20	**2**	1	As	1	397	0.2	HG-AAS
	2	1	As	2	390	0.2	HG-AAS
	2	1	Pb	1	2522	0.2	ET-AAS
	2	1	Pb	2	2480	0.2	ET-AAS
	2	1	Cd	1	1537	0.02	ET-AAS
	2	1	Cd	2	1504	0.02	ET-AAS
	2	1	Ni	1	387	1	ET-AAS
	2	1	Ni	2	361	1	ET-AAS
	2	1	Co	1	416	0.6	ET-AAS
	2	1	Co	2	406	0.6	ET-AAS

V: Intercomparison/Validation

CLUSTER 3

Samplecode: **COS**
Test code: **3** *CEN TC292 EN 12457-3 (LS=2 & LS=8)*

Laboratory code: 18
Date experiment: 16-08-00

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMAR
-	-	*kg*	*kg/m3*	*°C*	-
1	8	0.20132		26.9	
2	20	0.20134		26.2	

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.3247	3.61	5.17		
	1	2	1.3781	4.01	1.77		
Test on LOTnr: 20	**2**	1	0.3248	3.72	4.93		
	2	2	1.3779	4.08	1.68		

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	As	1	789	0.2	HG-AAS
	1	1	As	2	771	0.2	HG-AAS
	1	2	As	1	278	0.2	HG-AAS
	1	2	As	2	282	0.2	HG-AAS
	1	1	Pb	1	2746	0.2	ET-AAS
	1	1	Pb	2	2679	0.2	ET-AAS
	1	2	Pb	1	2491	0.2	ET-AAS
	1	2	Pb	2	2518	0.2	ET-AAS
	1	1	Cd	1	5553	0.02	ET-AAS
	1	1	Cd	2	5516	0.02	ET-AAS
	1	2	Cd	1	971	0.02	ET-AAS
	1	2	Cd	2	916	0.02	ET-AAS
	1	1	Ni	1	1632	1	ET-AAS
	1	1	Ni	2	1766	1	ET-AAS
	1	2	Ni	1	248	1	ET-AAS
	1	2	Ni	2	244	1	ET-AAS
	1	1	Co	1	1551	0.6	ET-AAS
	1	1	Co	2	1616	0.6	ET-AAS
	1	2	Co	1	235	0.6	ET-AAS
	1	2	Co	2	235	0.6	ET-AAS
Test on LOTnr: 20	**2**	1	As	1	758	0.2	HG-AAS
	2	1	As	2	744	0.2	HG-AAS
	2	2	As	1	276	0.2	HG-AAS
	2	2	As	2	284	0.2	HG-AAS
	2	1	Pb	1	2882	0.2	ET-AAS
	2	1	Pb	2	2660	0.2	ET-AAS
	2	2	Pb	1	2502	0.2	ET-AAS
	2	2	Pb	2	2492	0.2	ET-AAS
	2	1	Cd	1	4916	0.02	ET-AAS
	2	1	Cd	2	5015	0.02	ET-AAS
	2	2	Cd	1	926	0.02	ET-AAS
	2	2	Cd	2	920	0.02	ET-AAS
	2	1	Ni	1	1653	1	ET-AAS
	2	1	Ni	2	1471	1	ET-AAS
	2	2	Ni	1	216	1	ET-AAS
	2	2	Ni	2	231	1	ET-AAS
	2	1	Co	1	1422	0.6	ET-AAS
	2	1	Co	2	1435	0.6	ET-AAS
	2	2	Co	1	229	0.6	ET-AAS
	2	2	Co	2	242	0.6	ET-AAS

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	18						
Date experiment:	14-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.175		23.5	
		2	18	0.17501		23.9	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.3511	5.8	1.03		
Test on LOTnr: 18	**2**	1	0.3511	6.73	0.936		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Ba	1	370	2	ET-AAS
	1	1	Ba	2	362	2	ET-AAS
	1	1	Cu	1	25	0.2	ET-AAS
	1	1	Cu	2	24.2	0.2	ET-AAS
	1	1	Mo	1	333	0.6	ET-AAS
	1	1	Mo	2	326	0.6	ET-AAS
	1	1	F	1	1620	10	F-electr.
	1	1	F	2	1620	10	F-electr.
	1	1	Zn	1	1850	4	F-AAS
	1	1	Zn	2	1720	4	F-AAS
Test on LOTnr: 18	**2**	1	Ba	1	365	2	ET-AAS
	2	1	Ba	2	371	2	ET-AAS
	2	1	Cu	1	40.6	0.2	ET-AAS
	2	1	Cu	2	40.1	0.2	ET-AAS
	2	1	Mo	1	752	0.6	ET-AAS
	2	1	Mo	2	789	0.6	ET-AAS
	2	1	F	1	1770	10	F-electr.
	2	1	F	2	1780	10	F-electr.
	2	1	Zn	1	3810	4	F-AAS
	2	1	Zn	2	3860	4	F-AAS

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	18						
Date experiment:	14-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	6	0.08996		24.3	
		2	18	0.09		24.4	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 6	**1**	1	0.9027	6.29	0.399		
Test on LOTnr: 18	**2**	1	0.9027	6.45	0.383		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 6	**1**	1	Ba	1	304	2	ET-AAS
	1	1	Ba	2	313	2	ET-AAS
	1	1	Cu	1	18.5	0.2	ET-AAS
	1	1	Cu	2	18.2	0.2	ET-AAS
	1	1	Mo	1	163	0.6	ET-AAS
	1	1	Mo	2	178	0.6	ET-AAS
	1	1	F	1	803	10	F-electr.
	1	1	F	2	819	10	F-electr.
	1	1	Zn	1	358	4	F-AAS
	1	1	Zn	2	366	4	F-AAS
Test on LOTnr: 18	**2**	1	Ba	1	311	2	ET-AAS
	2	1	Ba	2	338	2	ET-AAS
	2	1	Cu	1	28.3	0.2	ET-AAS
	2	1	Cu	2	28.4	0.2	ET-AAS
	2	1	Mo	1	331	0.6	ET-AAS
	2	1	Mo	2	344	0.6	ET-AAS
	2	1	F	1	881	10	F-electr.
	2	1	F	2	876	10	F-electr.
	2	1	Zn	1	1430	4	F-AAS
	2	1	Zn	2	1420	4	F-AAS

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:							
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1					
		2					
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
	1	1					
	1	2					
	2	1					
	2	2					
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
	1	1	Ba	1			
	1	1	Ba	2			
	1	2	Ba	1			
	1	2	Ba	2			
	1	1	Cu	1			
	1	1	Cu	2			
	1	2	Cu	1			
	1	2	Cu	2			
	1	1	Mo	1			
	1	1	Mo	2			
	1	2	Mo	1			
	1	2	Mo	2			
	1	1	F	1			
	1	1	F	2			
	1	2	F	1			
	1	2	F	2			
	1	1	Zn	1			
	1	1	Zn	2			
	1	2	Zn	1			
	1	2	Zn	2			
	2	1	Ba	1			
	2	1	Ba	2			
	2	2	Ba	1			
	2	2	Ba	2			
	2	1	Cu	1			
	2	1	Cu	2			
	2	2	Cu	1			
	2	2	Cu	2			
	2	1	Mo	1			
	2	1	Mo	2			
	2	2	Mo	1			
	2	2	Mo	2			
	2	1	F	1			
	2	1	F	2			
	2	2	F	1			
	2	2	F	2			
	2	1	Zn	1			
	2	1	Zn	2			
	2	2	Zn	1			
	2	2	Zn	2			

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	19						
Date experiment:	6092000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	5	0.17514		21	
		2	17	0.17642		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 5	1	1	0.09478	4.17	4.94		
Test on LOTnr: 17	2	1	0.09236	4.09	5.24		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 5	1	1	As	1	524	10	ICP
	1	1	As	2	518	10	ICP
	1	1	Pb	1	3252	3	ICP
	1	1	Pb	2	3281	3	ICP
	1	1	Cd	1	5646	2	ICP
	1	1	Cd	2	5614	2	ICP
	1	1	Ni	1	1598	3	ICP
	1	1	Ni	2	1615	3	ICP
	1	1	Co	1	599	5	ICP
	1	1	Co	2	600	5	ICP
Test on LOTnr: 17	2	1	As	1	555	10	ICP
	2	1	As	2	547	10	ICP
	2	1	Pb	1	3433	3	ICP
	2	1	Pb	2	3446	3	ICP
	2	1	Cd	1	5994	2	ICP
	2	1	Cd	2	6043	2	ICP
	2	1	Ni	1	1715	3	ICP
	2	1	Ni	2	1734	3	ICP
	2	1	Co	1	667	5	ICP
	2	1	Co	2	665	5	ICP

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	19						
Date experiment:	6092000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	5	0.09142		21	
		2	17	0.09008		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 5	1	1	0.53286	4.28	2.98		
Test on LOTnr: 17	2	1	0.62968	4.25	2.95		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 5	1	1	As	1	330	10	ICP
	1	1	As	2	325	10	ICP
	1	1	Pb	1	3181	3	ICP
	1	1	Pb	2	3200	3	ICP
	1	1	Cd	1	1651	2	ICP
	1	1	Cd	2	1629	2	ICP
	1	1	Ni	1	451	3	ICP
	1	1	Ni	2	447	3	ICP
	1	1	Co	1	244	5	ICP
	1	1	Co	2	371	5	ICP
Test on LOTnr: 17	2	1	As	1	339	10	ICP
	2	1	As	2	320	10	ICP
	2	1	Pb	1	3230	3	ICP
	2	1	Pb	2	3249	3	ICP
	2	1	Cd	1	1629	2	ICP
	2	1	Cd	2	1613	2	ICP
	2	1	Ni	1	451	3	ICP
	2	1	Ni	2	465	3	ICP
	2	1	Co	1	239	5	ICP
	2	1	Co	2	349	5	ICP

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	19						
Date experiment:	9092000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	7	0.17485		21	
		2	19	0.17539		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 7	1	1	0.2662	6.7	1.55		
Test on LOTnr: 19	2	1	0.26778	6.7	1.52		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 7	1	1	Ba	1	722	6	ICP
	1	1	Ba	2	724	6	ICP
	1	1	Cu	1	1	0.5	GFAAS
	1	1	Cu	2	1.2	0.5	GFAAS
	1	1	Mo	1	82	4	ICP
	1	1	Mo	2	83	4	ICP
	1	1	F	1	6700		IC
	1	1	F	2			IC
	1	1	Zn	1	3334	15	ICP
	1	1	Zn	2	3366	15	ICP
Test on LOTnr: 19	2	1	Ba	1	727	6	ICP
	2	1	Ba	2	689	6	ICP
	2	1	Cu	1	1	0.5	GFAAS
	2	1	Cu	2	1.6	0.5	GFAAS
	2	1	Mo	1	89	4	ICP
	2	1	Mo	2	93	4	ICP
	2	1	F	1	3300		IC
	2	1	F	2			IC
	2	1	Zn	1	3513	15	ICP
	2	1	Zn	2	3262	15	ICP

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	19						
Date experiment:	9092000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	7	0.09241		21	
		2	19	0.08973		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 7	1	1	0.84547	7.1	0.465		
Test on LOTnr: 19	2	1	0.84359	7	0.448		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 7	1	1	Ba	1	1501	6	ICP
	1	1	Ba	2	1506	6	ICP
	1	1	Cu	1	-	0.5	GFAAS
	1	1	Cu	2	0.6	0.5	GFAAS
	1	1	Mo	1	14	4	ICP
	1	1	Mo	2	12	4	ICP
	1	1	F	1	1500		IC
	1	1	F	2			IC
	1	1	Zn	1	953	15	ICP
	1	1	Zn	2	950	15	ICP
Test on LOTnr: 19	2	1	Ba	1	1419	6	ICP
	2	1	Ba	2	1389	6	ICP
	2	1	Cu	1	-	0.5	GFAAS
	2	1	Cu	2	0.8	0.5	GFAAS
	2	1	Mo	1	13	4	ICP
	2	1	Mo	2	12	4	ICP
	2	1	F	1	1400		IC
	2	1	F	2			IC
	2	1	Zn	1	830	15	ICP
	2	1	Zn	2	1409	15	ICP

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	19						
Date experiment:	9092000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	7	0.17515		21	
		2	19	0.1753		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 7	**1**	1	0.28764	6.91	1.39		
	1	2	0.8505	7.2	0.293		
Test on LOTnr: 19	**2**	1	0.26567	7.05	1.33		
	2	2	0.88993	7.2	0.292		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 7	**1**	1	Ba	1	739	6	ICP
	1	1	Ba	2	743	6	ICP
	1	2	Ba	1	1357	6	ICP
	1	2	Ba	2	1353	6	ICP
	1	1	Cu	1	6.6	0.5	GFAAS
	1	1	Cu	2	8	0.5	GFAAS
	1	2	Cu	1	-	0.5	GFAAS
	1	2	Cu	2	-	0.5	GFAAS
	1	1	Mo	1	84	4	ICP
	1	1	Mo	2	82	4	ICP
	1	2	Mo	1	21	4	ICP
	1	2	Mo	2	21	4	ICP
	1	1	F	1	4000		IC
	1	1	F	2			IC
	1	2	F	1	100		IC
	1	2	F	2			IC
	1	1	Zn	1	3323	10	ICP
	1	1	Zn	2	2941	10	ICP
	1	2	Zn	1	1030	10	ICP
	1	2	Zn	2	996	10	ICP
Test on LOTnr: 19	**2**	1	Ba	1	735	6	ICP
	2	1	Ba	2	747	6	ICP
	2	2	Ba	1	1402	6	ICP
	2	2	Ba	2	1410	6	ICP
	2	1	Cu	1	3.7	0.5	GFAAS
	2	1	Cu	2	6.3	0.5	GFAAS
	2	2	Cu	1	1.5	0.5	GFAAS
	2	2	Cu	2	2.4	0.5	GFAAS
	2	1	Mo	1	85	4	ICP
	2	1	Mo	2	83	4	ICP
	2	2	Mo	1	20	4	ICP
	2	2	Mo	2	22	4	ICP
	2	1	F	1	3500		IC
	2	1	F	2			IC
	2	2	F	1	2500		IC
	2	2	F	2			IC
	2	1	Zn	1	3077	10	ICP
	2	1	Zn	2	3073	10	ICP
	2	2	Zn	1	969	10	ICP
	2	2	Zn	2	1045	10	ICP

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	20						
Date experiment:	10-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	3	0.21328		21	0,17502 DS
		2	11	0.21153		21	0,175 DS
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 3	**1**	1	0.3118	4.81	6.02	261	
Test on LOTnr: 11	**2**	1	0.3135	4.83	5.7	264	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 3	**1**	1	As	1	668	10	ICP-AES
	1	1	As	2	656	10	ICP-AES
	1	1	Pb	1	4190	10	ICP-AES
	1	1	Pb	2	4190	10	ICP-AES
	1	1	Cd	1	8390	2.5	ICP-AES
	1	1	Cd	2	8520	2.5	ICP-AES
	1	1	Ni	1	2070	5	ICP-AES
	1	1	Ni	2	2050	5	ICP-AES
	1	1	Co	1	1970	5	ICP-AES
	1	1	Co	2	1960	5	ICP-AES
Test on LOTnr: 11	**2**	1	As	1	561	10	ICP-AES
	2	1	As	2	596	10	ICP-AES
	2	1	Pb	1	3590	10	ICP-AES
	2	1	Pb	2	3540	10	ICP-AES
	2	1	Cd	1	7700	2.5	ICP-AES
	2	1	Cd	2	7690	2.5	ICP-AES
	2	1	Ni	1	1850	5	ICP-AES
	2	1	Ni	2	1840	5	ICP-AES
	2	1	Co	1	1820	5	ICP-AES
	2	1	Co	2	1810	5	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	20						
Date experiment:	16-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	3	0.10968		21	0,090 DS
		2	11	0.10879		21	0,090 DS
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 3	**1**	1	0.8803	5.02	3.12	268	
Test on LOTnr: 11	**2**	1	0.8812	4.98	3.14	269	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 3	**1**	1	As	1	410	10	ICP-AES
	1	1	As	2	411	10	ICP-AES
	1	1	Pb	1	3280	10	ICP-AES
	1	1	Pb	2	3420	10	ICP-AES
	1	1	Cd	1	2140	2.5	ICP-AES
	1	1	Cd	2	2150	2.5	ICP-AES
	1	1	Ni	1	486	5	ICP-AES
	1	1	Ni	2	492	5	ICP-AES
	1	1	Co	1	463	5	ICP-AES
	1	1	Co	2	470	5	ICP-AES
Test on LOTnr: 11	**2**	1	As	1	387	10	ICP-AES
	2	1	As	2	383	10	ICP-AES
	2	1	Pb	1	3510	10	ICP-AES
	2	1	Pb	2	3430	10	ICP-AES
	2	1	Cd	1	2150	2.5	ICP-AES
	2	1	Cd	2	2140	2.5	ICP-AES
	2	1	Ni	1	498	5	ICP-AES
	2	1	Ni	2	502	5	ICP-AES
	2	1	Co	1	488	5	ICP-AES
	2	1	Co	2	493	5	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	20						
Date experiment:	12-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.08865		21	0,08754 DS
		2	20	0.08894		21	0,08759 DS
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.174	8.77	2.209		
Test on LOTnr: 20	**2**	1	0.1738	8.67	2.147		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Ba	1	207	5	ICP-AES
	1	1	Ba	2	206	5	ICP-AES
	1	1	Cu	1	45	5	ICP-AES
	1	1	Cu	2	42	5	ICP-AES
	1	1	Mo	1	70	5	ICP-AES
	1	1	Mo	2	69	5	ICP-AES
	1	1	F	1	3920	200	FIA
	1	1	F	2	4130	200	FIA
	1	1	Zn	1	530	10	ICP-AES
	1	1	Zn	2	525	10	ICP-AES
Test on LOTnr: 20	**2**	1	Ba	1	318	5	ICP-AES
	2	1	Ba	2	312	5	ICP-AES
	2	1	Cu	1	31	5	ICP-AES
	2	1	Cu	2	31	5	ICP-AES
	2	1	Mo	1	2370	5	ICP-AES
	2	1	Mo	2	2320	5	ICP-AES
	2	1	F	1	4890	200	FIA
	2	1	F	2	4980	200	FIA
	2	1	Zn	1	4910	10	ICP-AES
	2	1	Zn	2	4890	10	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	20						
Date experiment:	11-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.09114		21	0,090 DS
		2	20	0.09141		21	0,09002 DS
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.8989	9.03	0.635	-467	slight gas evolution
Test on LOTnr: 20	**2**	1	0.8988	8.96	0.608	-299	slight gas evolution
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Ba	1	289	5	ICP-AES
	1	1	Ba	2	287	5	ICP-AES
	1	1	Cu	1	13	5	ICP-AES
	1	1	Cu	2	13	5	ICP-AES
	1	1	Mo	1	45	5	ICP-AES
	1	1	Mo	2	45	5	ICP-AES
	1	1	F	1	2390	200	FIA
	1	1	F	2	2500	200	FIA
	1	1	Zn	1	86	10	ICP-AES
	1	1	Zn	2	85	10	ICP-AES
Test on LOTnr: 20	**2**	1	Ba	1	694	5	ICP-AES
	2	1	Ba	2	712	5	ICP-AES
	2	1	Cu	1	14	5	ICP-AES
	2	1	Cu	2	18	5	ICP-AES
	2	1	Mo	1	209	5	ICP-AES
	2	1	Mo	2	211	5	ICP-AES
	2	1	F	1	2520	200	FIA
	2	1	F	2	2500	200	FIA
	2	1	Zn	1	320	10	ICP-AES
	2	1	Zn	2	323	10	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	20						
Date experiment:	05-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.17722			0,175 DS
		2	20	0.1777			0,175 DS
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.3478	8.61	2.095	-291	0.28907
	1	2	1.3978	9.39	0.309	-453	volume after filtr. st
Test on LOTnr: 20	**2**	1	0.3473	8.99	1.959	-214	0.29502
	2	2	1.3973	9.28	0.2911	-154	volume after filtr. st
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Ba	1	241	5	ICP-AES
	1	1	Ba	2	242		
	1	2	Ba	1	399		
	1	2	Ba	2	401		
	1	1	Cu	1	53	5	ICP-AES
	1	1	Cu	2	53		
	1	2	Cu	1	14		
	1	2	Cu	2	14		
	1	1	Mo	1	487	5	ICP-AES
	1	1	Mo	2	475		
	1	2	Mo	1	59		
	1	2	Mo	2	54		
	1	1	F	1	3820	200	
	1	1	F	2	4080		
	1	2	F	1	2380		
	1	2	F	2	2300		
	1	1	Zn	1	677	10	ICP-AES
	1	1	Zn	2	659		
	1	2	Zn	1	32		
	1	2	Zn	2	25		
Test on LOTnr: 20	**2**	1	Ba	1	231	5	ICP-AES
	2	1	Ba	2	230		
	2	2	Ba	1	664		
	2	2	Ba	2	668		
	2	1	Cu	1	135	5	ICP-AES
	2	1	Cu	2	136		
	2	2	Cu	1	19		
	2	2	Cu	2	19		
	2	1	Mo	1	3160	5	ICP-AES
	2	1	Mo	2	3160		
	2	2	Mo	1	206		
	2	2	Mo	2	206		
	2	1	F	1	5020	200	FIA
	2	1	F	2	5090		
	2	2	F	1	2000		
	2	2	F	2	2030		
	2	1	Zn	1	9630	10	ICP-AES
	2	1	Zn	2	9600		
	2	2	Zn	1	166		
	2	2	Zn	2	164		

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	21						
Date experiment:							
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.211		21	
		2	24	0.21		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.314	4	5.99		
Test on LOTnr: 24	2	1	0.315	4	5.7		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	As	1	818	0.5	Hydr.-AAS
	1	1	As	2	778	0.5	Hydr.-AAS
	1	1	Pb	1	3359	100	ICP-AES
	1	1	Pb	2	3488	100	ICP-AES
	1	1	Cd	1	7912	10	ICP-AES
	1	1	Cd	2	8094	10	ICP-AES
	1	1	Ni	1	2026	35	ICP-AES
	1	1	Ni	2	2119	35	ICP-AES
	1	1	Co	1	1956	20	ICP-AES
	1	1	Co	2	2049	20	ICP-AES
Test on LOTnr: 24	2	1	As	1	800	0.5	Hydr.-AAS
	2	1	As	2	753	0.5	Hydr.-AAS
	2	1	Pb	1	3096	100	ICP-AES
	2	1	Pb	2	3371	100	ICP-AES
	2	1	Cd	1	7018	10	ICP-AES
	2	1	Cd	2	7321	10	ICP-AES
	2	1	Ni	1	1899	35	ICP-AES
	2	1	Ni	2	1940	35	ICP-AES
	2	1	Co	1	1849	20	ICP-AES
	2	1	Co	2	1899	20	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	COS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	21						
Date experiment:							
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.108		21	
		2	24	0.108		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.881	4	3.15		
Test on LOTnr: 24	2	1	0.882	4	3.17		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	As	1	528	0.5	Hydr.-AAS
	1	1	As	2	521	0.5	Hydr.-AAS
	1	1	Pb	1	3438	100	ICP-AES
	1	1	Pb	2	3331	100	ICP-AES
	1	1	Cd	1	2082	10	ICP-AES
	1	1	Cd	2	2192	10	ICP-AES
	1	1	Ni	1	480	35	ICP-AES
	1	1	Ni	2	495	35	ICP-AES
	1	1	Co	1	462	20	ICP-AES
	1	1	Co	2	473	20	ICP-AES
Test on LOTnr: 24	2	1	As	1	506	0.5	Hydr.-AAS
	2	1	As	2	507	0.5	Hydr.-AAS
	2	1	Pb	1	3195	100	ICP-AES
	2	1	Pb	2	3352	100	ICP-AES
	2	1	Cd	1	2023	10	ICP-AES
	2	1	Cd	2	2130	10	ICP-AES
	2	1	Ni	1	492	35	ICP-AES
	2	1	Ni	2	490	35	ICP-AES
	2	1	Co	1	487	20	ICP-AES
	2	1	Co	2	475	20	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	21						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.176		21	
		2	21	0.176		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.349	7	1.95		gas evolution
Test on LOTnr: 21	**2**	1	0.349	7	1.69		gas evolution
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	638	1	ICP-AES
	1	1	Ba	2	635	1	ICP-AES
	1	1	Cu	1	23.1	2	ICP-AES
	1	1	Cu	2	22.5	2	ICP-AES
	1	1	Mo	1	175	2	ICP-AES
	1	1	Mo	2	174	2	ICP-AES
	1	1	F	1	3300	100	IC
	1	1	F	2	3270	100	IC
	1	1	Zn	1	931	2	ICP-AES
	1	1	Zn	2	932	2	ICP-AES
Test on LOTnr: 21	**2**	1	Ba	1	537	1	ICP-AES
	2	1	Ba	2	538	1	ICP-AES
	2	1	Cu	1	42.5	2	ICP-AES
	2	1	Cu	2	41.9	2	ICP-AES
	2	1	Mo	1	142	2	ICP-AES
	2	1	Mo	2	143	2	ICP-AES
	2	1	F	1	3930	100	IC
	2	1	F	2	3860	100	IC
	2	1	Zn	1	1840	2	ICP-AES
	2	1	Zn	2	1860	2	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	21						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.091		21	
		2	21	0.091		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.899	6	0.59		gas evolution
Test on LOTnr: 21	**2**	1	0.899	6	0.5		gas evolution
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	408	1	ICP-AES
	1	1	Ba	2	408	1	ICP-AES
	1	1	Cu	1	5	2	ICP-AES
	1	1	Cu	2	4.8	2	ICP-AES
	1	1	Mo	1	68.8	2	ICP-AES
	1	1	Mo	2	67.8	2	ICP-AES
	1	1	F	1	1820	100	IC
	1	1	F	2	1800	100	IC
	1	1	Zn	1	221	2	ICP-AES
	1	1	Zn	2	223	2	ICP-AES
Test on LOTnr: 21	**2**	1	Ba	1	941	1	ICP-AES
	2	1	Ba	2	938	1	ICP-AES
	2	1	Cu	1	9.8	2	ICP-AES
	2	1	Cu	2	9.6	2	ICP-AES
	2	1	Mo	1	125	2	ICP-AES
	2	1	Mo	2	123	2	ICP-AES
	2	1	F	1	1780	100	IC
	2	1	F	2	1750	100	IC
	2	1	Zn	1	565	2	ICP-AES
	2	1	Zn	2	568	2	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	21						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.176		21	
		2	21	0.176		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.348	7	1.93		gas evolution
	1	2	1.398	6	0.3		gas evolution
Test on LOTnr: 21	**2**	1	0.348	7	1.54		gas evolution
	2	2	1.398	7	0.29		gas evolution
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	261	1	ICP-AES
	1	1	Ba	2	262	1	ICP-AES
	1	2	Ba	1	930	1	ICP-AES
	1	2	Ba	2	934	1	ICP-AES
	1	1	Cu	1	< 2	2	ICP-AES
	1	1	Cu	2	< 2	2	ICP-AES
	1	2	Cu	1	2.3	2	ICP-AES
	1	2	Cu	2	2.6	2	ICP-AES
	1	1	Mo	1	117	2	ICP-AES
	1	1	Mo	2	118	2	ICP-AES
	1	2	Mo	1	59.4	2	ICP-AES
	1	2	Mo	2	60.1	2	ICP-AES
	1	1	F	1	3430	100	IC
	1	1	F	2	3410	100	IC
	1	2	F	1	1780	100	IC
	1	2	F	2	1670	100	IC
	1	1	Zn	1	530	2	ICP-AES
	1	1	Zn	2	536	2	ICP-AES
	1	2	Zn	1	79.3	2	ICP-AES
	1	2	Zn	2	81.5	2	ICP-AES
Test on LOTnr: 21	**2**	1	Ba	1	432	1	ICP-AES
	2	1	Ba	2	431	1	ICP-AES
	2	2	Ba	1	305	1	ICP-AES
	2	2	Ba	2	304	1	ICP-AES
	2	1	Cu	1	40.9	2	ICP-AES
	2	1	Cu	2	40.5	2	ICP-AES
	2	2	Cu	1	< 2	2	ICP-AES
	2	2	Cu	2	< 2	2	ICP-AES
	2	1	Mo	1	987	2	ICP-AES
	2	1	Mo	2	983	2	ICP-AES
	2	2	Mo	1	42.5	2	ICP-AES
	2	2	Mo	2	41.9	2	ICP-AES
	2	1	F	1	3710	100	IC
	2	1	F	2	3620	100	IC
	2	2	F	1	1480	100	IC
	2	2	F	2	1530	100	IC
	2	1	Zn	1	5000	2	ICP-AES
	2	1	Zn	2	5030	2	ICP-AES
	2	2	Zn	1	64.5	2	ICP-AES
	2	2	Zn	2	66	2	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	22						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.2103		25	
		2	23	0.2115		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.283	4.97	4.77		
Test on LOTnr: 23	**2**	1	0.288	5	4.05		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	As	1	995	20	ICP-OES
	1	1	As	2	1042	20	ICP-OES
	1	1	Pb	1	2899	10	ICP-OES
	1	1	Pb	2	2954	10	ICP-OES
	1	1	Cd	1	4830	1	ICP-OES
	1	1	Cd	2	5790	1	ICP-OES
	1	1	Ni	1	1337	5	ICP-OES
	1	1	Ni	2	1399	5	ICP-OES
	1	1	Co	1	1118	1	ICP-OES
	1	1	Co	2	1223	1	ICP-OES
Test on LOTnr: 23	**2**	1	As	1	783	20	ICP-OES
	2	1	As	2	831	20	ICP-OES
	2	1	Pb	1	2853	10	ICP-OES
	2	1	Pb	2	2795	10	ICP-OES
	2	1	Cd	1	4042	1	ICP-OES
	2	1	Cd	2	4341	1	ICP-OES
	2	1	Ni	1	1003	5	ICP-OES
	2	1	Ni	2	1006	5	ICP-OES
	2	1	Co	1	870	1	ICP-OES
	2	1	Co	2	883	1	ICP-OES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	22						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.1087		25	
		2	23	0.1094		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.79	5.28	2.74		
Test on LOTnr: 23	**2**	1	0.73	5.13	2.8		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	As	1	568	20	ICP-OES
	1	1	As	2	596	20	ICP-OES
	1	1	Pb	1	3600	10	ICP-OES
	1	1	Pb	2	3699	10	ICP-OES
	1	1	Cd	1	1451	1	ICP-OES
	1	1	Cd	2	1613	1	ICP-OES
	1	1	Ni	1	343	5	ICP-OES
	1	1	Ni	2	367	5	ICP-OES
	1	1	Co	1	283	1	ICP-OES
	1	1	Co	2	299	1	ICP-OES
Test on LOTnr: 23	**2**	1	As	1	563	20	ICP-OES
	2	1	As	2	618	20	ICP-OES
	2	1	Pb	1	3261	10	ICP-OES
	2	1	Pb	2	3430	10	ICP-OES
	2	1	Cd	1	1612	1	ICP-OES
	2	1	Cd	2	1903	1	ICP-OES
	2	1	Ni	1	378	5	ICP-OES
	2	1	Ni	2	386	5	ICP-OES
	2	1	Co	1	315	1	ICP-OES
	2	1	Co	2	321	1	ICP-OES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	22						
Date experiment:							
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.1756		25	
		2	22	0.1753		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.285	6.71	2.2		
Test on LOTnr: 22	2	1	0.275	7.42	1.99		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Ba	1	324	5	ICP-OES
	1	1	Ba	2	315	5	ICP-OES
	1	1	Cu	1	9	5	ICP-OES
	1	1	Cu	2	8	5	ICP-OES
	1	1	Mo	1	2060	10	ICP-OES
	1	1	Mo	2	2052	10	ICP-OES
	1	1	F	1			IC
	1	1	F	2			IC
	1	1	Zn	1	1631	10	ICP-OES
	1	1	Zn	2	1678	10	ICP-OES
Test on LOTnr: 22	2	1	Ba	1	277	5	ICP-OES
	2	1	Ba	2	268	5	ICP-OES
	2	1	Cu	1	206	5	ICP-OES
	2	1	Cu	2	200	5	ICP-OES
	2	1	Mo	1	2899	10	ICP-OES
	2	1	Mo	2	2708	10	ICP-OES
	2	1	F	1			IC
	2	1	F	2			IC
	2	1	Zn	1	12060	10	ICP-OES
	2	1	Zn	2	12170	10	ICP-OES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	SBW						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	22						
Date experiment:							
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.0905		25	
		2	22	0.0908		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.865	6.59	0.6		
Test on LOTnr: 22	2	1	0.875	7.32	0.49		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Ba	1	555	5	ICP-OES
	1	1	Ba	2	565	5	ICP-OES
	1	1	Cu	1	0	5	ICP-OES
	1	1	Cu	2	0	5	ICP-OES
	1	1	Mo	1	213	10	ICP-OES
	1	1	Mo	2	214	10	ICP-OES
	1	1	F	1			IC
	1	1	F	2			IC
	1	1	Zn	1	213	10	ICP-OES
	1	1	Zn	2	224	10	ICP-OES
Test on LOTnr: 22	2	1	Ba	1	661	5	ICP-OES
	2	1	Ba	2	652	5	ICP-OES
	2	1	Cu	1	42	5	ICP-OES
	2	1	Cu	2	39	5	ICP-OES
	2	1	Mo	1	704	10	ICP-OES
	2	1	Mo	2	654	10	ICP-OES
	2	1	F	1			IC
	2	1	F	2			IC
	2	1	Zn	1	2149	10	ICP-OES
	2	1	Zn	2	2174	10	ICP-OES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	22						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.8755		25	
		2	22	0.8751		25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	0.145	7.91	1.92		
	1	2	0.9	7.59	0.3		
Test on LOTnr: 22	**2**	1	0.15	8.28	1.77		
	2	2	0.91	7.9	0.23		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	Ba	1	449	5	ICP-OES
	1	1	Ba	2	469	5	ICP-OES
	1	2	Ba	1	714	5	ICP-OES
	1	2	Ba	2	731	5	ICP-OES
	1	1	Cu	1	56	5	ICP-OES
	1	1	Cu	2	56	5	ICP-OES
	1	2	Cu	1	5	5	ICP-OES
	1	2	Cu	2	5	5	ICP-OES
	1	1	Mo	1	1610	10	ICP-OES
	1	1	Mo	2	1744	10	ICP-OES
	1	2	Mo	1	103	10	ICP-OES
	1	2	Mo	2	110	10	ICP-OES
	1	1	F	1			IC
	1	1	F	2			IC
	1	2	F	1			IC
	1	2	F	2			IC
	1	1	Zn	1	1883	10	ICP-OES
	1	1	Zn	2	1914	10	ICP-OES
	1	2	Zn	1	61	10	ICP-OES
	1	2	Zn	2	81	10	ICP-OES
Test on LOTnr: 22	**2**	1	Ba	1	312	5	ICP-OES
	2	1	Ba	2	318	5	ICP-OES
	2	2	Ba	1	521	5	ICP-OES
	2	2	Ba	2	529	5	ICP-OES
	2	1	Cu	1	687	5	ICP-OES
	2	1	Cu	2	680	5	ICP-OES
	2	2	Cu	1	38	5	ICP-OES
	2	2	Cu	2	38	5	ICP-OES
	2	1	Mo	1	3040	10	ICP-OES
	2	1	Mo	2	3132	10	ICP-OES
	2	2	Mo	1	184	10	ICP-OES
	2	2	Mo	2	186	10	ICP-OES
	2	1	F	1			IC
	2	1	F	2			IC
	2	2	F	1			IC
	2	2	F	2			IC
	2	1	Zn	1	9954	10	ICP-OES
	2	1	Zn	2	9850	10	ICP-OES
	2	2	Zn	1	334	10	ICP-OES
	2	2	Zn	2	353	10	ICP-OES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	23						
Date experiment:	4/9 2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.1752		23+/-2	
		2	16	0.1751		23+/-2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	Ca. 0.27	3.97	5.11		Volume added: 0.350
Test on LOTnr: 16	**2**	1	Ca. 0.27	3.96	5.21		Volume added: 0.350
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	As	1	1010	0.5	GF-AAS
	1	1	As	2	918	0.5	GF-AAS
	1	1	Pb	1	3460	10	ICP-AES
	1	1	Pb	2	3390	10	ICP-AES
	1	1	Cd	1	6390	2	ICP-AES
	1	1	Cd	2	6360	2	ICP-AES
	1	1	Ni	1	1600	10	ICP-AES
	1	1	Ni	2	1640	10	ICP-AES
	1	1	Co	1	1560	3	ICP-AES
	1	1	Co	2	1570	3	ICP-AES
Test on LOTnr: 16	**2**	1	As	1	983	0.5	GF-AAS
	2	1	As	2	929	0.5	GF-AAS
	2	1	Pb	1	3470	10	ICP-AES
	2	1	Pb	2	3430	10	ICP-AES
	2	1	Cd	1	6530	2	ICP-AES
	2	1	Cd	2	6400	2	ICP-AES
	2	1	Ni	1	1740	10	ICP-AES
	2	1	Ni	2	1670	10	ICP-AES
	2	1	Co	1	1630	3	ICP-AES
	2	1	Co	2	1600	3	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	23						
Date experiment:	4/9 2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.0903		23+/-2	
		2	16	0.0908		23+/-2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	Ca. 0.850	4.17	2.98		Volume added: 0.900
Test on LOTnr: 16	**2**	1	Ca. 0.850	4.14	3.01		Volume added: 0.900
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	As	1	606	0.5	GF-AAS
	1	1	As	2	546	0.5	GF-AAS
	1	1	Pb	1	3450	10	ICP-AES
	1	1	Pb	2	3300	10	ICP-AES
	1	1	Cd	1	1750	2	ICP-AES
	1	1	Cd	2	1750	2	ICP-AES
	1	1	Ni	1	473	10	ICP-AES
	1	1	Ni	2	448	10	ICP-AES
	1	1	Co	1	393	3	ICP-AES
	1	1	Co	2	382	3	ICP-AES
Test on LOTnr: 16	**2**	1	As	1	542	0.5	GF-AAS
	2	1	As	2	524	0.5	GF-AAS
	2	1	Pb	1	3520	10	ICP-AES
	2	1	Pb	2	3300	10	ICP-AES
	2	1	Cd	1	1800	2	ICP-AES
	2	1	Cd	2	1720	2	ICP-AES
	2	1	Ni	1	457	10	ICP-AES
	2	1	Ni	2	425	10	ICP-AES
	2	1	Co	1	406	3	ICP-AES
	2	1	Co	2	384	3	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	23						
Date experiment:	4/9 2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.1748		23+/-2	
		2	23	0.1753		23+/-2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	Ca. 0.29	7.82	2.08		Volume added: 0.350
Test on LOTnr: 23	**2**	1	Ca. 0.29	8.07	1.95		Volume added: 0.350
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Ba	1	275	3	ICP-AES
	1	1	Ba	2	274	3	ICP-AES
	1	1	Cu	1	3.56	1	GF-AAS
	1	1	Cu	2	3.81	1	GF-AAS
	1	1	Mo	1	64.1	2	ICP-AES
	1	1	Mo	2	63.4	2	ICP-AES
	1	1	F	1			
	1	1	F	2			
	1	1	Zn	1	655	10	ICP-AES
	1	1	Zn	2	697	10	ICP-AES
Test on LOTnr: 23	**2**	1	Ba	1	471	3	ICP-AES
	2	1	Ba	2	452	3	ICP-AES
	2	1	Cu	1	3.89	1	GF-AAS
	2	1	Cu	2	4.21	1	GF-AAS
	2	1	Mo	1	688	2	ICP-AES
	2	1	Mo	2	730	2	ICP-AES
	2	1	F	1			
	2	1	F	2			
	2	1	Zn	1	2890	10	ICP-AES
	2	1	Zn	2	2840	10	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	23						
Date experiment:	4/9 2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.0904		23+/-2	
		2	23	0.0901		23+/-2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	Ca. 0.870	8.13	0.573		Volume added: 0.900
Test on LOTnr: 23	**2**	1	Ca. 0.870	8.19	0.539		Volume added: 0.900
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Ba	1	437	3	ICP-AES
	1	1	Ba	2	425	3	ICP-AES
	1	1	Cu	1	<1	1	GF-AAS
	1	1	Cu	2	<1	1	GF-AAS
	1	1	Mo	1	45.1	2	ICP-AES
	1	1	Mo	2	39.3	2	ICP-AES
	1	1	F	1			
	1	1	F	2			
	1	1	Zn	1	123	10	ICP-AES
	1	1	Zn	2	127	10	ICP-AES
Test on LOTnr: 23	**2**	1	Ba	1	1110	3	ICP-AES
	2	1	Ba	2	1090	3	ICP-AES
	2	1	Cu	1	1.81	1	GF-AAS
	2	1	Cu	2	1.59	1	GF-AAS
	2	1	Mo	1	152	2	ICP-AES
	2	1	Mo	2	151	2	ICP-AES
	2	1	F	1			
	2	1	F	2			
	2	1	Zn	1	399	10	ICP-AES
	2	1	Zn	2	404	10	ICP-AES

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	23						
Date experiment:	4/9 2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11			23+/-2	
		2	23			23+/-2	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	Ca. 0.29	7.95	2.02		Volume added: 0.350
	1	2	Ca. 1.330	8.23	0.279		Volume added: 1.40
Test on LOTnr: 23	**2**	1	Ca. 0.29	8.05	1.91		Volume added: 0.350
	2	2	Ca. 1.330	8.42	0.256		Volume added: 1.40
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Ba	1	263	3	ICP-AES
	1	1	Ba	2	254	3	ICP-AES
	1	2	Ba	1	370	3	ICP-AES
	1	2	Ba	2	361	3	ICP-AES
	1	1	Cu	1	4.36	1	GF-AAS
	1	1	Cu	2	4.12	1	GF-AAS
	1	2	Cu	1	<1	1	GF-AAS
	1	2	Cu	2	<1	1	GF-AAS
	1	1	Mo	1	75.5	2	ICP-AES
	1	1	Mo	2	67.6	2	ICP-AES
	1	2	Mo	1	58.9	2	ICP-AES
	1	2	Mo	2	54.1	2	ICP-AES
	1	1	F	1			
	1	1	F	2			
	1	2	F	1			
	1	2	F	2			
	1	1	Zn	1	732	10	ICP-AES
	1	1	Zn	2	719	10	ICP-AES
	1	2	Zn	1	59.1	10	ICP-AES
	1	2	Zn	2	62.8	10	ICP-AES
Test on LOTnr: 23	**2**	1	Ba	1	510	3	ICP-AES
	2	1	Ba	2	490	3	ICP-AES
	2	2	Ba	1	974	3	ICP-AES
	2	2	Ba	2	943	3	ICP-AES
	2	1	Cu	1	4.12	1	GF-AAS
	2	1	Cu	2	3.89	1	GF-AAS
	2	2	Cu	1	<1	1	GF-AAS
	2	2	Cu	2	<1	1	GF-AAS
	2	1	Mo	1	664	2	ICP-AES
	2	1	Mo	2	651	2	ICP-AES
	2	2	Mo	1	99.6	2	ICP-AES
	2	2	Mo	2	101	2	ICP-AES
	2	1	F	1			
	2	1	F	2			
	2	2	F	1			
	2	2	F	2			
	2	1	Zn	1	3000	10	ICP-AES
	2	1	Zn	2	2930	10	ICP-AES
	2	2	Zn	1	72.2	10	ICP-AES
	2	2	Zn	2	76.5	10	ICP-AES

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**COS**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	24						
Date experiment:	07-09-00						
	Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.17502		20	
		2	18	0.175915		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.31255	4.27	5915		
Test on LOTnr: 18	**2**	1	0.31564	4.52	5490		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	As	1	480	1	NVN 7323
	1	1	As	2	490	1	NVN 7323
	1	1	Pb	1	2900	10	NVN 7322
	1	1	Pb	2	2800	10	NVN 7322
	1	1	Cd	1	8700	0.5	NVN 7322
	1	1	Cd	2	8800	0.5	NVN 7322
	1	1	Ni	1	2000	5	NVN 7322
	1	1	Ni	2	2000	5	NVN 7322
	1	1	Co	1	1900	5	NVN 7322
	1	1	Co	2	1900	5	NVN 7322
Test on LOTnr: 18	**2**	1	As	1	460	1	NVN 7323
	2	1	As	2	460	1	NVN 7323
	2	1	Pb	1	3000	10	NVN 7322
	2	1	Pb	2	3200	10	NVN 7322
	2	1	Cd	1	8300	0.5	NVN 7322
	2	1	Cd	2	8300	0.5	NVN 7322
	2	1	Ni	1	2000	5	NVN 7322
	2	1	Ni	2	2200	5	NVN 7322
	2	1	Co	1	1900	5	NVN 7322
	2	1	Co	2	2100	5	NVN 7322

V: Intercomparison/Validation							**CLUSTER 3**
Samplecode:	**COS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	24						
Date experiment:	14-09-00						
	Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.09085		20	
		2	18	0.09113		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.88904	5.10	3280		
Test on LOTnr: 18	**2**	1	0.89256	4.41	2925		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	As	1	300	1	NVN 7323
	1	1	As	2	300	1	NVN 7323
	1	1	Pb	1	2800	10	NVN 7322
	1	1	Pb	2	3000	10	NVN 7322
	1	1	Cd	1	2200	0.5	NVN 7322
	1	1	Cd	2	2200	0.5	NVN 7322
	1	1	Ni	1	430	5	NVN 7322
	1	1	Ni	2	440	5	NVN 7322
	1	1	Co	1	390	5	NVN 7322
	1	1	Co	2	430	5	NVN 7322
Test on LOTnr: 18	**2**	1	As	1	290	1	NVN 7323
	2	1	As	2	290	1	NVN 7323
	2	1	Pb	1	3200	10	NVN 7322
	2	1	Pb	2	3200	10	NVN 7322
	2	1	Cd	1	2200	0.5	NVN 7322
	2	1	Cd	2	2300	0.5	NVN 7322
	2	1	Ni	1	460	5	NVN 7322
	2	1	Ni	2	470	5	NVN 7322
	2	1	Co	1	450	5	NVN 7322
	2	1	Co	2	440	5	NVN 7322

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	24						
Date experiment:	13-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.17494		20	
		2	24	0.17425		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.34776	7.93	1825		
Test on LOTnr: 24	**2**	1	0.34559	8.14	1655		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Ba	1	470	5	NVN 7322
	1	1	Ba	2	470	5	NVN 7322
	1	1	Cu	1	27	5	NVN 7322
	1	1	Cu	2	27	5	NVN 7322
	1	1	Mo	1	74	2.5	NVN 7322
	1	1	Mo	2	69	2.5	NVN 7322
	1	1	F	1	5400	100	NEN 6589
	1	1	F	2	5400	100	NEN 6589
	1	1	Zn	1	870	20	NVN 7322
	1	1	Zn	2	870	20	NVN 7322
Test on LOTnr: 24	**2**	1	Ba	1	730		NVN 7322
	2	1	Ba	2	760		NVN 7322
	2	1	Cu	1	16		NVN 7322
	2	1	Cu	2	16		NVN 7322
	2	1	Mo	1	520		NVN 7322
	2	1	Mo	2	530		NVN 7322
	2	1	F	1	6600		NEN 6589
	2	1	F	2	6600		NEN 6589
	2	1	Zn	1	2800		NVN 7322
	2	1	Zn	2	2900		NVN 7322

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	24						
Date experiment:	13-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.09011		20	
		2	24	0.08977		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.90001	8.39	680		
Test on LOTnr: 24	**2**	1	0.89620	7.68	605		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Ba	1	560		NVN 7322
	1	1	Ba	2	560		NVN 7322
	1	1	Cu	1	98		NVN 7322
	1	1	Cu	2	100		NVN 7322
	1	1	Mo	1	54		NVN 7322
	1	1	Mo	2	53		NVN 7322
	1	1	F	1	2200		NEN 6589
	1	1	F	2	2100		NEN 6589
	1	1	Zn	1	500		NVN 7322
	1	1	Zn	2	550		NVN 7322
Test on LOTnr: 24	**2**	1	Ba	1	1100		NVN 7322
	2	1	Ba	2	1100		NVN 7322
	2	1	Cu	1	27		NVN 7322
	2	1	Cu	2	27		NVN 7322
	2	1	Mo	1	170		NVN 7322
	2	1	Mo	2	170		NVN 7322
	2	1	F	1	2200		NEN 6589
	2	1	F	2	2300		NEN 6589
	2	1	Zn	1	540		NVN 7322
	2	1	Zn	2	580		NVN 7322

V: Intercomparison/Validation							CLUSTER 3
Samplecode:	**SBW**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	24						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.17498		20	
		2	24	0.17470		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.34783	7.55	1975		
	1	2	1.39771	8.4	345		
Test on LOTnr: 24	**2**	1	0.34649	7.96	1745		
	2	2	1.39469	8.05	263		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Ba	1	380	5	NVN 7322
	1	1	Ba	2	390	5	NVN 7322
	1	2	Ba	1	480	5	NVN 7322
	1	2	Ba	2	480	5	NVN 7322
	1	1	Cu	1	18	5	NVN 7322
	1	1	Cu	2	18	5	NVN 7322
	1	2	Cu	1	<5	5	NVN 7322
	1	2	Cu	2	<5	5	NVN 7322
	1	1	Mo	1	610	2.5	NVN 7322
	1	1	Mo	2	620	2.5	NVN 7322
	1	2	Mo	1	86	2.5	NVN 7322
	1	2	Mo	2	80	2.5	NVN 7322
	1	1	F	1	3800	100	NEN 6589
	1	1	F	2	3800	100	NEN 6589
	1	2	F	1	2000	100	NEN 6589
	1	2	F	2	2100	100	NEN 6589
	1	1	Zn	1	580	20	NVN 7322
	1	1	Zn	2	590	20	NVN 7322
	1	2	Zn	1	65	20	NVN 7322
	1	2	Zn	2	65	20	NVN 7322
Test on LOTnr: 24	**2**	1	Ba	1	540	5	NVN 7322
	2	1	Ba	2	550	5	NVN 7322
	2	2	Ba	1	800	5	NVN 7322
	2	2	Ba	2	780	5	NVN 7322
	2	1	Cu	1	86	5	NVN 7322
	2	1	Cu	2	85	5	NVN 7322
	2	2	Cu	1	7.6	5	NVN 7322
	2	2	Cu	2	7.2	5	NVN 7322
	2	1	Mo	1	1900	2.5	NVN 7322
	2	1	Mo	2	1900	2.5	NVN 7322
	2	2	Mo	1	170	2.5	NVN 7322
	2	2	Mo	2	150	2.5	NVN 7322
	2	1	F	1	5300	100	NEN 6589
	2	1	F	2	5400	100	NEN 6589
	2	2	F	1	1600	100	NEN 6589
	2	2	F	2	1600	100	NEN 6589
	2	1	Zn	1	3200	20	NVN 7322
	2	1	Zn	2	3200	20	NVN 7322
	2	2	Zn	1	120	20	NVN 7322
	2	2	Zn	2	120	20	NVN 7322

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	25						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.10	-	23	-
		2	15	0.10	-	23	-
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.18	10.3	0.14	-	-
Test on LOTnr: 15	**2**	1	0.18	10.3	0.17	-	-
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Sb	1	70	0.3	ICP-MS
	1	1	Sb	2	70		
	1	1	Ba	1	743	0.2	ICP-MS
	1	1	Ba	2	738		
	1	1	B	1	1072	3	ICP-MS
	1	1	B	2	1097		
	1	1	As	1	11.1	0.1	ICP-MS
	1	1	As	2	11.2		
	1	1	Pb	1	171	0.1	ICP-MS
	1	1	Pb	2	164		
Test on LOTnr: 15	**2**	1	Sb	1	62	0.3	ICP-MS
	2	1	Sb	2	62		
	2	1	Ba	1	849	0.2	ICP-MS
	2	1	Ba	2	850		
	2	1	B	1	979	3	ICP-MS
	2	1	B	2	1005		
	2	1	As	1	8.1	0.1	ICP-MS
	2	1	As	2	8.6		
	2	1	Pb	1	247	0.1	ICP-MS
	2	1	Pb	2	245		

V: Intercomparison/Validation							**CLUSTER 2**
Samplecode:	**MESc**	**coarse**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	25						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.10	-	23	-
		2	15	0.10	-	23	-
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.98	10.1	0.06	-	-
Test on LOTnr: 15	**2**	1	0.98	10.1	0.06	-	-
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Sb	1	62	0.3	ICP-MS
	1	1	Sb	2	61		
	1	1	Ba	1	659	0.2	ICP-MS
	1	1	Ba	2	660		
	1	1	B	1	224	3	ICP-MS
	1	1	B	2	221		
	1	1	As	1	7.4	0.1	ICP-MS
	1	1	As	2	7.2		
	1	1	Pb	1	227	0.1	ICP-MS
	1	1	Pb	2	224		
Test on LOTnr: 15	**2**	1	Sb	1	53	0.3	ICP-MS
	2	1	Sb	2	52		
	2	1	Ba	1	681	0.2	ICP-MS
	2	1	Ba	2	676		
	2	1	B	1	230	3	ICP-MS
	2	1	B	2	223		
	2	1	As	1	5.5	0.1	ICP-MS
	2	1	As	2	5.5		
	2	1	Pb	1	232	0.1	ICP-MS
	2	1	Pb	2	230		

V: Intercomparison/Validation

CLUSTER 2

Samplecode:	**MESc**	**coarse**				
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*				
Laboratory code:	**25**					
Date experiment:	17-07-00					

Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
	-	-	*kg*	*kg/m3*	*°C*	-
	1	15	0.10	-	23	-
	2	15	0.10	-	23	-

Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.98	10.0	0.05	-	-
Test on LOTnr: 15	**2**	1	0.99	9.9	0.04	-	-

Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Sb	1	47	0.3	ICP-MS
	1	1	Sb	2	47		
	1	1	Ba	1	541	0.2	ICP-MS
	1	1	Ba	2	540		
	1	1	B	1	127	3	ICP-MS
	1	1	B	2	127		
	1	1	As	1	6.4	0.1	ICP-MS
	1	1	As	2	6.4		
	1	1	Pb	1	156	0.1	ICP-MS
	1	1	Pb	2	154		
Test on LOTnr: 15	**2**	1	Sb	1	33	0.3	ICP-MS
	2	1	Sb	2	36		
	2	1	Ba	1	466	0.2	ICP-MS
	2	1	Ba	2	471		
	2	1	B	1	104	3	ICP-MS
	2	1	B	2	105		
	2	1	As	1	3.8	0.1	ICP-MS
	2	1	As	2	3.9		
	2	1	Pb	1	166	0.1	ICP-MS
	2	1	Pb	2	164		

V: Intercomparison/Validation

CLUSTER 2

Samplecode:	**MESc**	**coarse**
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*
Laboratory code:	25	
Date experiment:	17-07-00	

Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMAR
	-	-	*kg*	*kg/m3*	*°C*	-
	1	1	0.10	-	23	-
	2	1	0.10	-	23	-

Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	0.18	9.8	0.17	-	-
Test on LOTnr: 1	**2**	1	0.18	9.9	0.18	-	-

Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Sb	1	126	0.3	ICP-MS
	1	1	Sb	2	128		
	1	1	Ba	1	664	0.2	ICP-MS
	1	1	Ba	2	674		
	1	1	B	1	1111	3	ICP-MS
	1	1	B	2	1135		
	1	1	As	1	14.0	0.1	ICP-MS
	1	1	As	2	13.9		
	1	1	Pb	1	173	0.1	ICP-MS
	1	1	Pb	2	168		
Test on LOTnr: 1	**2**	1	Sb	1	130	0.3	ICP-MS
	2	1	Sb	2	128		
	2	1	Ba	1	665	0.2	ICP-MS
	2	1	Ba	2	655		
	2	1	B	1	1179	3	ICP-MS
	2	1	B	2	1168		
	2	1	As	1	14.5	0.1	ICP-MS
	2	1	As	2	14.6		
	2	1	Pb	1	157	0.1	ICP-MS
	2	1	Pb	2	157		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **MESc** **coarse**
Test code: **2** *CEN TC292 EN 12457-1 (LS=2)*

Laboratory code: 25
Date experiment: 17-07-00

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	28	0.10	-	23	-
2	28	0.10	-	23	-

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 28	**1**	1	0.99	9.9	0.06	-	-
Test on LOTnr: 28	**2**	1	0.99	10.0	0.06	-	-

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 28	**1**	1	Sb	1	70	0.3	ICP-MS
	1	1	Sb	2	71		
	1	1	Ba	1	699	0.2	ICP-MS
	1	1	Ba	2	707		
	1	1	B	1	221	3	ICP-MS
	1	1	B	2	221		
	1	1	As	1	7.3	0.1	ICP-MS
	1	1	As	2	7.1		
	1	1	Pb	1	198	0.1	ICP-MS
	1	1	Pb	2	202		
Test on LOTnr: 28	**2**	1	Sb	1	68	0.3	ICP-MS
	2	1	Sb	2	68		
	2	1	Ba	1	660	0.2	ICP-MS
	2	1	Ba	2	664		
	2	1	B	1	188	3	ICP-MS
	2	1	B	2	185		
	2	1	As	1	6.7	0.1	ICP-MS
	2	1	As	2	7.1		
	2	1	Pb	1	196	0.1	ICP-MS
	2	1	Pb	2	198		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **MESc** **coarse**
Test code: **4** *CEN TC292 EN 12457-1 (LS=2)*

Laboratory code: 25
Date experiment: 17-07-00

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	28	0.10	-	23	-
2	28	0.10	-	23	-

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 28	**1**	1	0.99	9.9	0.04	-	-
Test on LOTnr: 28	**2**	1	0.99	10.0	0.05	-	-

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 28	**1**	1	Sb	1	42	0.3	ICP-MS
	1	1	Sb	2	42		
	1	1	Ba	1	487	0.2	ICP-MS
	1	1	Ba	2	488		
	1	1	B	1	91	3	ICP-MS
	1	1	B	2	86		
	1	1	As	1	3.2	0.1	ICP-MS
	1	1	As	2	3.2		
	1	1	Pb	1	179	0.1	ICP-MS
	1	1	Pb	2	177		
Test on LOTnr: 28	**2**	1	Sb	1	57	0.3	ICP-MS
	2	1	Sb	2	58		
	2	1	Ba	1	593	0.2	ICP-MS
	2	1	Ba	2	593		
	2	1	B	1	130	3	ICP-MS
	2	1	B	2	129		
	2	1	As	1	5.9	0.1	ICP-MS
	2	1	As	2	6.0		
	2	1	Pb	1	196	0.1	ICP-MS
	2	1	Pb	2	194		

V: Intercomparison/Validation

CLUSTER 2

Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	25						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	3	0.10	-	23	-
		2	3	0.10	-	23	-
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 3	**1**	1	0.99	9.7	0.04	-	-
Test on LOTnr: 3	**2**	1	0.99	9.7	0.04	-	-
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 3	**1**	1	Sb	1	51	0.3	ICP-MS
	1	1	Sb	2	51		
	1	1	Ba	1	617	0.2	ICP-MS
	1	1	Ba	2	628		
	1	1	B	1	152	3	ICP-MS
	1	1	B	2	157		
	1	1	As	1	3.0	0.1	ICP-MS
	1	1	As	2	2.9		
	1	1	Pb	1	80	0.1	ICP-MS
	1	1	Pb	2	81		
Test on LOTnr: 3	**2**	1	Sb	1	51	0.3	ICP-MS
	2	1	Sb	2	49		
	2	1	Ba	1	615	0.2	ICP-MS
	2	1	Ba	2	606		
	2	1	B	1	159	3	ICP-MS
	2	1	B	2	155		
	2	1	As	1	2.9	0.1	ICP-MS
	2	1	As	2	2.7		
	2	1	Pb	1	129	0.1	ICP-MS
	2	1	Pb	2	126		

V: Intercomparison/Validation

CLUSTER 2

Samplecode:	**MESr**	**reduced size**					
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	25						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	29	0.10	-	23	-
		2	29	0.10	-	23	-
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 29	**1**	1	0.98	9.6	0.05	-	-
Test on LOTnr: 29	**2**	1	0.99	9.5	0.05	-	-
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 29	**1**	1	Sb	1	80	0.3	ICP-MS
	1	1	Sb	2	79		
	1	1	Ba	1	642	0.2	ICP-MS
	1	1	Ba	2	637		
	1	1	B	1	150	3	ICP-MS
	1	1	B	2	149		
	1	1	As	1	3.6	0.1	ICP-MS
	1	1	As	2	3.1		
	1	1	Pb	1	46	0.1	ICP-MS
	1	1	Pb	2	45		
Test on LOTnr: 29	**2**	1	Sb	1	77	0.3	ICP-MS
	2	1	Sb	2	76		
	2	1	Ba	1	641	0.2	ICP-MS
	2	1	Ba	2	642		
	2	1	B	1	139	3	ICP-MS
	2	1	B	2	137		
	2	1	As	1	3.0	0.1	ICP-MS
	2	1	As	2	2.8		
	2	1	Pb	1	84	0.1	ICP-MS
	2	1	Pb	2	83		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **SEW**
Test code: **2** *CEN TC292 EN 12457-2 (LS=10)*

Laboratory code: 25
Date experiment: 06-09-00

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	13	0.11	-	23	-
2	13	0.11	-	23	-

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 13	**1**	1	0.21	7.2	3.2	-	-
Test on LOTnr: 13	**2**	1	0.21	7.2	3.1	-	-

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 13	**1**	1	TOC	1	3666000	1000	as DOC IR-Detekt.
	1	1	TOC	2	3743000		
	1	1	SO4	1	51000	100	IC
	1	1	SO4	2	49600		
	1	1	NH4	1	312000	50	gassensitive Electrode
	1	1	NH4	2	323000		
	1	1	Ni	1	284	1	ICP-MS
	1	1	Ni	2	288		
	1	1	Co	1	59	0.1	ICP-MS
	1	1	Co	2	57		
Test on LOTnr: 13	**2**	1	TOC	1	3676000	1000	as DOC IR-Detekt.
	2	1	TOC	2	3617000		
	2	1	SO4	1	48400	100	IC
	2	1	SO4	2	50100		
	2	1	NH4	1	306000	50	gassensitive Electrode
	2	1	NH4	2	311000		
	2	1	Ni	1	274	1	ICP-MS
	2	1	Ni	2	266		
	2	1	Co	1	56	0.1	ICP-MS
	2	1	Co	2	57		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **SEW**
Test code: **2** *CEN TC292 EN 12457-2 (LS=10)*

Laboratory code: 25
Date experiment: 06-09-00

Test/Sample parameters:

LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
-	-	*kg*	*kg/m3*	*°C*	-
1	26	0.11	-	23	-
2	26	0.11	-	23	-

Fraction parameters:

	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 26	**1**	1	0.21	7.2	3.1	-	-
Test on LOTnr: 26	**2**	1	0.21	7.2	3.0	-	-

Conc. parameters:

	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 26	**1**	1	TOC	1	3795000	1000	as DOC IR-Detekt.
	1	1	TOC	2	3695000		
	1	1	SO4	1	56000	100	IC
	1	1	SO4	2	57900		
	1	1	NH4	1	317000	50	gassensitive Electrode
	1	1	NH4	2	307000		
	1	1	Ni	1	264	1	ICP-MS
	1	1	Ni	2	270		
	1	1	Co	1	58	0.1	ICP-MS
	1	1	Co	2	61		
Test on LOTnr: 26	**2**	1	TOC	1	3738000	1000	as DOC IR-Detekt.
	2	1	TOC	2	3618000		
	2	1	SO4	1	65300	100	IC
	2	1	SO4	2	59900		
	2	1	NH4	1	308000	50	gassensitive Electrode
	2	1	NH4	2	314000		
	2	1	Ni	1	268	1	ICP-MS
	2	1	Ni	2	273		
	2	1	Co	1	61	0.1	ICP-MS
	2	1	Co	2	60		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **FCM**
Test code: **2** *CEN TC292 EN 12457-2 (LS=10)*

Laboratory code: 25
Date experiment: 26-08-00

Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
	-	-	*kg*	*kg/m3*	*°C*	-
	1	30	0.145	-	23	-
	2	30	0.145	-	23	-

Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 30	**1**	1	0.92	10.7	3.3	-	-
Test on LOTnr: 30	**2**	1	0.8	10.7	3.2	-	-

Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 30	**1**	1	Cl	1	295600	10	IC
	1	1	Cl	2	309700		
	1	1	F	1	820	10	ISE
	1	1	F	2	820		
	1	1	NO2	1	<20	20	IC
	1	1	NO2	2	<20		
	1	1	Ba	1	76	0.1	ICP-MS
	1	1	Ba	2	73		
	1	1	Cr(VI)	1	1250	2.5	Photometry
	1	1	Cr(VI)	2	1160		
Test on LOTnr: 30	**2**	1	Cl	1	283900	10	IC
	2	1	Cl	2	280300		
	2	1	F	1	840	10	ISE
	2	1	F	2	830		
	2	1	NO2	1	<20	20	IC
	2	1	NO2	2	<20		
	2	1	Ba	1	76	0.1	ICP-MS
	2	1	Ba	2	77		
	2	1	Cr(VI)	1	1250	2.5	Photometry
	2	1	Cr(VI)	2	880		

V: Intercomparison/Validation

CLUSTER 2

Samplecode: **FCM**
Test code: **2** *CEN TC292 EN 12457-2 (LS=10)*

Laboratory code: 25
Date experiment: 26-08-00

Test/Sample parameters:	LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
	-	-	*kg*	*kg/m3*	*°C*	-
	1	40	0.110	-	23	-
	2	40	0.110	-	23	-

Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 40	**1**	1	0.88	10.4	3.2	-	-
Test on LOTnr: 40	**2**	1	0.86	10.4	3.1	-	-

Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 40	**1**	1	Cl	1	298300	10	IC
	1	1	Cl	2	297000		
	1	1	F	1	1450	10	ISE
	1	1	F	2	1470		
	1	1	NO2	1	<20	20	IC
	1	1	NO2	2	<20		
	1	1	Ba	1	75	0.1	ICP-MS
	1	1	Ba	2	84		
	1	1	Cr(VI)	1	1080	2.5	Photometry
	1	1	Cr(VI)	2	1260		
Test on LOTnr: 40	**2**	1	Cl	1	280200	10	IC
	2	1	Cl	2	288400		
	2	1	F	1	1390	10	ISE
	2	1	F	2	1440		
	2	1	NO2	1	<20	20	IC
	2	1	NO2	2	<20		
	2	1	Ba	1	79	0.1	ICP-MS
	2	1	Ba	2	80		
	2	1	Cr(VI)	1	790	2.5	Photometry
	2	1	Cr(VI)	2	1000		

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	31						
Date experiment:	11-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	179.6	n.d.	23	dry res. : 98,51 %
		2	16	172.6	n.d.	23	dry res. : 98,69 %
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	n.d.	10.42	5.84		
Test on LOTnr: 16	**2**	1	n.d.	10.48	5.64		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	148	10	ICP
eluate 00CT271	**1**	1	Ba	2	148	10	ICP
	1	1	Cu	1	2005	5	ICP
	1	1	Cu	2	2027	5	ICP
	1	1	Mo	1	191	10	ICP
	1	1	Mo	2	193	10	ICP
	1	1	Sb	1	11	10	ICP
	1	1	Sb	2	11	10	ICP
	1	1	SO4	1	397000	500	cei
	1	1	SO4	2	399000	500	cei
Test on LOTnr: 16	**2**	1	Ba	1	151	10	ICP
eluate 00CT270	**2**	1	Ba	2	152	10	ICP
	2	1	Cu	1	1659	5	ICP
	2	1	Cu	2	1671	5	ICP
	2	1	Mo	1	170	10	ICP
	2	1	Mo	2	176	10	ICP
	2	1	Sb	1	10	10	ICP
	2	1	Sb	2	8	10	ICP
	2	1	SO4	1	320000	500	cei
	2	1	SO4	2	319000	500	cei

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	31						
Date experiment:	11-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.0913	n.d.	22.3	dry res. : 98,51 %
		2	16	0.09401	n.d.	22.3	dry res. : 98,69 %
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	n.d.	10.75	1.82		
Test on LOTnr: 16	**2**	1	n.d.	10.97	1.78		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	78	10	ICP
eluate 00CT273	**1**	1	Ba	2	79	10	ICP
	1	1	Cu	1	590	5	ICP
	1	1	Cu	2	575	5	ICP
	1	1	Mo	1	41	10	ICP
	1	1	Mo	2	43	10	ICP
	1	1	Sb	1	39	10	ICP
	1	1	Sb	2	39	10	ICP
	1	1	SO4	1	233000	500	cei
	1	1	SO4	2	243000	500	cei
Test on LOTnr: 16	**2**	1	Ba	1	50	10	ICP
eluate 00CT272	**2**	1	Ba	2	49	10	ICP
	2	1	Cu	1	488	5	ICP
	2	1	Cu	2	487	5	ICP
	2	1	Mo	1	51	10	ICP
	2	1	Mo	2	59	10	ICP
	2	1	Sb	1	36	10	ICP
	2	1	Sb	2	36	10	ICP
	2	1	SO4	1	200000	500	cei
	2	1	SO4	2	195000	500	cei

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	3	CEN TC292 EN 12457-3 (LS=2 & LS=8)					
Laboratory code:	31						
Date experiment:	10-08-02						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	1	0.1745	n.d.	23	dry res. : 98,51 %
		2	16	0.172	n.d.	23	dry res. : 98,69 %
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 1	1	1	0.3	10.31	5.78		
	1	2	n.d.	10.54	0.982		
Test on LOTnr: 16	2	1	0.31	10.38	5.57		
	2	2	n.d.	10.59	0.936		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 1	1	1	Ba	1	139	10	ICP
eluate FRC_NR 1 :00CT275	1	1	Ba	2	138	10	ICP
eluate FRC_NR 2 :00CT277	1	2	Ba	1	67	10	ICP
	1	2	Ba	2	68	10	ICP
	1	1	Cu	1	2080	5	ICP
	1	1	Cu	2	2125	5	ICP
	1	2	Cu	1	251	5	ICP
	1	2	Cu	2	253	5	ICP
	1	1	Mo	1	116	10	ICP
	1	1	Mo	2	119	10	ICP
	1	2	Mo	1	26	10	ICP
	1	2	Mo	2	25	10	ICP
	1	1	Sb	1	12	10	ICP
	1	1	Sb	2	19	10	ICP
	1	2	Sb	1	57	10	ICP
	1	2	Sb	2	51	10	ICP
	1	1	SO4	1	527000	500	cei
	1	1	SO4	2	542000	500	cei
	1	2	SO4	1	203000	500	cei
	1	2	SO4	2	202000	500	cei
Test on LOTnr: 16	2	1	Ba	1	128	10	ICP
eluate FRC_NR 1 :00CT274	2	1	Ba	2	129	10	ICP
eluate FRC_NR 2 :00CT276	2	2	Ba	1	56	10	ICP
	2	2	Ba	2	55	10	ICP
	2	1	Cu	1	1820	5	ICP
	2	1	Cu	2	1818	5	ICP
	2	2	Cu	1	236	5	ICP
	2	2	Cu	2	230	5	ICP
	2	1	Mo	1	128	10	ICP
	2	1	Mo	2	116	10	ICP
	2	2	Mo	1	28	10	ICP
	2	2	Mo	2	28	10	ICP
	2	1	Sb	1	22	10	ICP
	2	1	Sb	2	15	10	ICP
	2	2	Sb	1	46	10	ICP
	2	2	Sb	2	42	10	ICP
	2	1	SO4	1	393000	500	cei
	2	1	SO4	2	395000	500	cei
	2	2	SO4	1	179000	500	cei
	2	2	SO4	2	188000	500	cei

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	31						
Date experiment:	03-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	1	0.09072	n.d.	23.1	dry res. : 98,51 %
		2	16	0.09179	n.d.	23.1	dry res. : 98,69 %
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 1	**1**	1	n.d.	10.7	1.88		
Test on LOTnr: 16	**2**	1	n.d.	10.7	1.72		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 1	**1**	1	Ba	1	61	10	ICP
eluate 00CT279	**1**	1	Ba	2	61	10	ICP
	1	1	Cu	1	685	5	ICP
	1	1	Cu	2	681	5	ICP
	1	1	Mo	1	46	10	ICP
	1	1	Mo	2	46	10	ICP
	1	1	Sb	1	48	10	ICP
	1	1	Sb	2	47	10	ICP
	1	1	SO4	1	264000	500	cei
	1	1	SO4	2	262000	500	cei
Test on LOTnr: 16	**2**	1	Ba	1	45	10	ICP
eluate 00CT278	**2**	1	Ba	2	48	10	ICP
	2	1	Cu	1	547	5	ICP
	2	1	Cu	2	567	5	ICP
	2	1	Mo	1	44	10	ICP
	2	1	Mo	2	43	10	ICP
	2	1	Sb	1	40	10	ICP
	2	1	Sb	2	42	10	ICP
	2	1	SO4	1	211000	500	cei
	2	1	SO4	2	223000	500	cei

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	31						
Date experiment:	10-08-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	230.24		22	dry matter : 39,09 %
		2	24	232.5		22	dry mat,: 38,71 %
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	n.d.	9.06	43.2		
Test on LOTnr: 24	**2**	1	n.d.	8.94	43.6		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	F	1	<1000	1000	cei
eluate 00CT280	**1**	1	F	2	<1000	1000	cei
	1	1	Cr(VI)	1	494000	20	colorimetrie
	1	1	Cr(VI)	2	529000	20	colorimetrie
	1	1	Cr	1	432710	10	ICP
	1	1	Cr	2	436049	10	ICP
	1	1	Cl	1	621000	100	cei
	1	1	Cl	2	616000	100	cei
	1	1	Cd	1	6	2	ICP
	1	1	Cd	2	4	2	ICP
Test on LOTnr: 24	**2**	1	F	1	<1000	1000	cei
eluate 00CT281	**2**	1	F	2	<1000	1000	cei
	2	1	Cr(VI)	1	494000	20	colorimetrie
	2	1	Cr(VI)	2	521000	20	colorimetrie
	2	1	Cr	1	425067	10	ICP
	2	1	Cr	2	425571	10	ICP
	2	1	Cl	1	539000	100	cei
	2	1	Cl	2	564000	100	cei
	2	1	Cd	1	3	2	ICP
	2	1	Cd	2	2	2	ICP

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	32						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	2	0.3	1415	20	Kg recu 3.869
		2	17	0.3	1469	20	Kg recu 4.699
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 2	**1**	1	0.53	10.94	2.34 à 25°		
Test on LOTnr: 17	**2**	1	0.53	11.02	2.67 à 25°		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 2	**1**	1	Ba	1	356	5	ISO 11885
	1	1	Ba	2	359	5	ISO 11885
	1	1	Cu	1	1720	2	ISO 11885
	1	1	Cu	2	1720	2	ISO 11885
	1	1	Mo	1	175	2	ISO 11885
	1	1	Mo	2	183	2	ISO 11885
	1	1	Sb	1	38	1	HYBRIDE AAS
	1	1	Sb	2	38	1	HYBRIDE AAS
	1	1	SO4	1	217000	200	ISO 10304.2
	1	1	SO4	2	213000	200	ISO 10304.2
Test on LOTnr: 17	**2**	1	Ba	1	389	5	ISO 11885
	2	1	Ba	2	375	5	ISO 11885
	2	1	Cu	1	1510	2	ISO 11885
	2	1	Cu	2	1510	2	ISO 11885
	2	1	Mo	1	162	2	ISO 11885
	2	1	Mo	2	163	2	ISO 11885
	2	1	Sb	1	39	1	HYBRIDE AAS
	2	1	Sb	2	40	1	HYBRIDE AAS
	2	1	SO4	1	179000	200	ISO 10304.2
	2	1	SO4	2	176000	200	ISO 10304.2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	32						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	2	0.1	1415	20	Kg recu 3.869
		2	17	0.1	1469	20	Kg recu 4.699
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 2	**1**	1	0.98	11.13	1.139 à 25°		
Test on LOTnr: 17	**2**	1	0.985	11.29	1.231à 25°		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 2	**1**	1	Ba	1	233	5	ISO 11885
	1	1	Ba	2	232	5	ISO 11885
	1	1	Cu	1	455	2	ISO 11885
	1	1	Cu	2	454	2	ISO 11885
	1	1	Mo	1	45	2	ISO 11885
	1	1	Mo	2	37	2	ISO 11885
	1	1	Sb	1	32	1	HYBRIDE AAS
	1	1	Sb	2	31	1	HYBRIDE AAS
	1	1	SO4	1	149000	200	ISO 10304.2
	1	1	SO4	2	147000	200	ISO 10304.2
Test on LOTnr: 17	**2**	1	Ba	1	272	5	ISO 11885
	2	1	Ba	2	272	5	ISO 11885
	2	1	Cu	1	405	2	ISO 11885
	2	1	Cu	2	404	2	ISO 11885
	2	1	Mo	1	47	2	ISO 11885
	2	1	Mo	2	42	2	ISO 11885
	2	1	Sb	1	20	1	HYBRIDE AAS
	2	1	Sb	2	20	1	HYBRIDE AAS
	2	1	SO4	1	116000	200	ISO 10304.2
	2	1	SO4	2	115000	200	ISO 10304.2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	32						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	2	0.2	1415	20	Kg recu 3.869
		2	17	0.2	1469	20	Kg recu 4.699
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 2	**1**	1	0.35	10.92	2.11 à 25°		
	1	2	1.58	11.14	0.718 à 25°		
Test on LOTnr: 17	**2**	1	0.345	10.66	2.37 à 25°		
	2	2	1.6	11.28	0.789 à 25°		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 2	**1**	1	Ba	1	353	5	ISO 11885
	1	1	Ba	2	350	5	ISO 11885
	1	2	Ba	1	186	5	ISO 11885
	1	2	Ba	2	185	5	ISO 11885
	1	1	Cu	1	1860	2	ISO 11885
	1	1	Cu	2	1860	2	ISO 11885
	1	2	Cu	1	231	2	ISO 11885
	1	2	Cu	2	225	2	ISO 11885
	1	1	Mo	1	155	2	ISO 11885
	1	1	Mo	2	154	2	ISO 11885
	1	2	Mo	1	21	2	ISO 11885
	1	2	Mo	2	20	2	ISO 11885
	1	1	Sb	1	24.3	1	HYBRIDE AAS
	1	1	Sb	2	24.6	1	HYBRIDE AAS
	1	2	Sb	1	27.7	1	HYBRIDE AAS
	1	2	Sb	2	27.4	1	HYBRIDE AAS
	1	1	SO4	1	320000	200	ISO 10304.2
	1	1	SO4	2	321000	200	ISO 10304.2
	1	2	SO4	1	87000	200	ISO 10304.2
	1	2	SO4	2	87000	200	ISO 10304.2
Test on LOTnr: 17	**2**	1	Ba	1	401	5	ISO 11885
	2	1	Ba	2	394	5	ISO 11885
	2	2	Ba	1	226	5	ISO 11885
	2	2	Ba	2	226	5	ISO 11885
	2	1	Cu	1	1420	2	ISO 11885
	2	1	Cu	2	1400	2	ISO 11885
	2	2	Cu	1	214	2	ISO 11885
	2	2	Cu	2	211	2	ISO 11885
	2	1	Mo	1	146	2	ISO 11885
	2	1	Mo	2	143	2	ISO 11885
	2	2	Mo	1	34	2	ISO 11885
	2	2	Mo	2	24	2	ISO 11885
	2	1	Sb	1	20.8	1	HYBRIDE AAS
	2	1	Sb	2	20.6	1	HYBRIDE AAS
	2	2	Sb	1	22.7	1	HYBRIDE AAS
	2	2	Sb	2	22.6	1	HYBRIDE AAS
	2	1	SO4	1	253000	200	ISO 10304.2
	2	1	SO4	2	246000	200	ISO 10304.2
	2	2	SO4	1	81000	200	ISO 10304.2
	2	2	SO4	2	81000	200	ISO 10304.2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	32						
Date experiment:	17-07-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	2	0.1	1415	20	Kg recu 3.869
		2	17	0.1	1469	20	Kg recu 4.699
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 2	1	1	0.98	11.35	1.267 à 25°		
Test on LOTnr: 17	2	1	0.98	11.36	1.158 à 25°		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 2	1	1	Ba	1	247	5	ISO 11885
	1	1	Ba	2	249	5	ISO 11885
	1	1	Cu	1	543	2	ISO 11885
	1	1	Cu	2	547	2	ISO 11885
	1	1	Mo	1	42	2	ISO 11885
	1	1	Mo	2	37	2	ISO 11885
	1	1	Sb	1	32.3	1	HYBRIDE AAS
	1	1	Sb	2	32.4	1	HYBRIDE AAS
	1	1	SO4	1	150000	200	ISO 10304.2
	1	1	SO4	2	153000	200	ISO 10304.2
Test on LOTnr: 17	2	1	Ba	1	263	5	ISO 11885
	2	1	Ba	2	264	5	ISO 11885
	2	1	Cu	1	354	2	ISO 11885
	2	1	Cu	2	355	2	ISO 11885
	2	1	Mo	1	36	2	ISO 11885
	2	1	Mo	2	37	2	ISO 11885
	2	1	Sb	1	20.4	1	HYBRIDE AAS
	2	1	Sb	2	20.7	1	HYBRIDE AAS
	2	1	SO4	1	84000	200	ISO 10304.2
	2	1	SO4	2	84000	200	ISO 10304.2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	CHS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	32						
Date experiment:	26-07-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	1	0.508	1.254	20	LS=2
		2	8	0.485	1.32	20	LS=2
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 1	1	1	0.134	8.05	10.89 à 25°		
Test on LOTnr: 8	2	1	0.154	8.13	10.80 à 25°		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 1	1	1	F	1	1260	50	ISO 10304.1
	1	1	F	2	1260	50	ISO 10304.1
	1	1	Cr(VI)	1	2100000	20	NF T90043
	1	1	Cr(VI)	2	2100000	20	NF T90043
	1	1	Cr	1	2106000	30	ISO 11885
	1	1	Cr	2	2122000	30	ISO 11885
	1	1	Cl	1	2280000	200	ISO 10304.2
	1	1	Cl	2	2360000	200	ISO 10304.2
	1	1	Cd	1	<5	5	ISO 11885
	1	1	Cd	2	<5	5	ISO 11885
Test on LOTnr: 8	2	1	F	1	1340	50	ISO 10304.1
	2	1	F	2	1260	50	ISO 10304.1
	2	1	Cr(VI)	1	2000000	20	NF T90043
	2	1	Cr(VI)	2	2050000	20	NF T90043
	2	1	Cr	1	2137000	30	ISO 11885
	2	1	Cr	2	2123000	30	ISO 11885
	2	1	Cl	1	2541000	200	ISO 10304.2
	2	1	Cl	2	2480000	200	ISO 10304.2
	2	1	Cd	1	<5	5	ISO 11885
	2	1	Cd	2	<5	5	ISO 11885

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	33						
Date experiment:	12oct-24oct						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	18	0.178		21	
		2	3	0.178		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 18	1	1	0.2	9.33	7.01		
Test on LOTnr: 3	2	1	0.2	9.59	6.13		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 18	1	1	Ba	1	93.99		
	1	1	Ba	2	97.53		
	1	1	Cu	1	2216		
	1	1	Cu	2	2309		
	1	1	Mo	1	270.8		
	1	1	Mo	2	291.2		
	1	1	Sb	1			
	1	1	Sb	2			
	1	1	SO4	1	697		
	1	1	SO4	2			
Test on LOTnr: 3	2	1	Ba	1	115.1		
	2	1	Ba	2	120.1		
	2	1	Cu	1	2381		
	2	1	Cu	2	2423		
	2	1	Mo	1	255.1		
	2	1	Mo	2	259.7		
	2	1	Sb	1			
	2	1	Sb	2			
	2	1	SO4	1	528		
	2	1	SO4	2			

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	33						
Date experiment:	12oct-24oct						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	18	0.178		19	
		2	3	0.178		19	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 18	1	1	0.25	9.69	1.64		
Test on LOTnr: 3	2	1	0.25	10.24	1.69		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 18	1	1	Ba	1	72.1		
	1	1	Ba	2	76.63		
	1	1	Cu	1	539.6		
	1	1	Cu	2	556.5		
	1	1	Mo	1	41.9		
	1	1	Mo	2	77.3		
	1	1	Sb	1			
	1	1	Sb	2			
	1	1	SO4	1	217		
	1	1	SO4	2			
Test on LOTnr: 3	2	1	Ba	1	89.74		
	2	1	Ba	2	95.29		
	2	1	Cu	1	630		
	2	1	Cu	2	651.5		
	2	1	Mo	1	79.14		
	2	1	Mo	2	84.17		
	2	1	Sb	1			
	2	1	Sb	2			
	2	1	SO4	1	213		
	2	1	SO4	2			

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	33						
Date experiment:	12oct-24oct						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	18	0.178		20	
		2	3	0.178		20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 18	**1**	1	0.34	9.58	6.45		
	1	2	0.3	10.25	0.68		
Test on LOTnr: 3	**2**	1	0.34	9.54	6.04		
	2	2	0.3	10.45	0.713		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 18	**1**	1	Ba	1	85.09		
	1	1	Ba	2	87.06		
	1	2	Ba	1	75.66		
	1	2	Ba	2	78.77		
	1	1	Cu	1	2151		
	1	1	Cu	2	2202		
	1	2	Cu	1	267.9		
	1	2	Cu	2	268.3		
	1	1	Mo	1	224.4		
	1	1	Mo	2	239.9		
	1	2	Mo	1	41.25		
	1	2	Mo	2	57.2		
	1	1	Sb	1			
	1	1	Sb	2			
	1	2	Sb	1			
	1	2	Sb	2			
	1	1	SO4	1	912		
	1	1	SO4	2			
	1	2	SO4	1	251		
	1	2	SO4	2			
Test on LOTnr: 3	**2**	1	Ba	1	76.16		
	2	1	Ba	2	77.11		
	2	2	Ba	1	113.7		
	2	2	Ba	2	120.9		
	2	1	Cu	1	2329		
	2	1	Cu	2	2386		
	2	2	Cu	1	277.6		
	2	2	Cu	2	274.7		
	2	1	Mo	1	234.6		
	2	1	Mo	2	236.9		
	2	2	Mo	1	40.24		
	2	2	Mo	2	31.49		
	2	1	Sb	1			
	2	1	Sb	2			
	2	2	Sb	1			
	2	2	Sb	2			
	2	1	SO4	1	778		
	2	1	SO4	2			
	2	2	SO4	1	202		
	2	2	SO4	2			

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**33**						
Date experiment:	10oct-24oct						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	18	0.178		19	
		2	3	0.178		19	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 18	**1**	1	0.3	9.63	1.31		
Test on LOTnr: 3	**2**	1	0.3	10.27	1.29		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 18	**1**	1	Ba	1	63.8		
	1	1	Ba	2	63.96		
	1	1	Cu	1	300.5		
	1	1	Cu	2	292.5		
	1	1	Mo	1	44.6		
	1	1	Mo	2	51.2		
	1	1	Sb	1			
	1	1	Sb	2			
	1	1	SO4	1	165		
	1	1	SO4	2			
Test on LOTnr: 3	**2**	1	Ba	1	129.2		
	2	1	Ba	2	127.9		
	2	1	Cu	1	418.3		
	2	1	Cu	2	413.6		
	2	1	Mo	1	46.59		
	2	1	Mo	2	50.08		
	2	1	Sb	1			
	2	1	Sb	2			
	2	1	SO4	1	175	5	
	2	1	SO4	2			

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	33						
Date experiment:	10oct-24oct						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	14	0.454		19	
		2	2	0.457		19	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 14	**1**	1	0.5	9.25	43.8		
Test on LOTnr: 2	**2**	1	0.25	8.97	38.5		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 14	**1**	1	F	1			
	1	1	F	2			
	1	1	Cr(VI)	1	650000	1	
	1	1	Cr(VI)	2			
	1	1	Cr	1	443000		
	1	1	Cr	2	501000		
	1	1	Cl	1	780		
	1	1	Cl	2			
	1	1	Cd	1	5.8		
	1	1	Cd	2	5.14		
Test on LOTnr: 2	**2**	1	F	1			
	2	1	F	2			
	2	1	Cr(VI)	1	560000		
	2	1	Cr(VI)	2			
	2	1	Cr	1	397000		
	2	1	Cr	2	433000		
	2	1	Cl	1	674	5	
	2	1	Cl	2			
	2	1	Cd	1	3.8		
	2	1	Cd	2	4		

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	34						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4			25	
		2	19			25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	1	1	0.2	11.06	5.09		
Test on LOTnr: 19	2	1	0.2	10.91	4.69		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	1	1	Ba	1	258	5	ICP-OES
	1	1	Ba	2	261	5	ICP-OES
	1	1	Cu	1	1524	5	ICP-OES
	1	1	Cu	2	1550	5	ICP-OES
	1	1	Mo	1	195	10	ICP-OES
	1	1	Mo	2	193	10	ICP-OES
	1	1	Sb	1	25	5	ICP-OES/USN
	1	1	Sb	2	27	5	ICP-OES/USN
	1	1	SO4	1	160000	200	IC
	1	1	SO4	2	159600	200	IC
Test on LOTnr: 19	2	1	Ba	1	265	5	ICP-OES
	2	1	Ba	2	280	5	ICP-OES
	2	1	Cu	1	1143	5	ICP-OES
	2	1	Cu	2	1167	5	ICP-OES
	2	1	Mo	1	147	10	ICP-OES
	2	1	Mo	2	130	10	ICP-OES
	2	1	Sb	1	43	5	ICP-OES/USN
	2	1	Sb	2	45	5	ICP-OES/USN
	2	1	SO4	1	128200	200	IC
	2	1	SO4	2	129900	200	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	34						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4			25	
		2	19			25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	1	1	0.25	10.54	1.63		
Test on LOTnr: 19	2	1	0.25	10.46	1.51		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	1	1	Ba	1	197	5	ICP-OES
	1	1	Ba	2	222	5	ICP-OES
	1	1	Cu	1	437	5	ICP-OES
	1	1	Cu	2	448	5	ICP-OES
	1	1	Mo	1	59	10	ICP-OES
	1	1	Mo	2	60	10	ICP-OES
	1	1	Sb	1	23	5	ICP-OES/USN
	1	1	Sb	2	22	5	ICP-OES/USN
	1	1	SO4	1	100700	200	IC
	1	1	SO4	2	100500	200	IC
Test on LOTnr: 19	2	1	Ba	1	202	5	ICP-OES
	2	1	Ba	2	213	5	ICP-OES
	2	1	Cu	1	337	5	ICP-OES
	2	1	Cu	2	341	5	ICP-OES
	2	1	Mo	1	40	10	ICP-OES
	2	1	Mo	2	44	10	ICP-OES
	2	1	Sb	1	28	5	ICP-OES/USN
	2	1	Sb	2	28	5	ICP-OES/USN
	2	1	SO4	1	85000	200	IC
	2	1	SO4	2	85400	200	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	34						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4			25	
		2	19			25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	**1**	1	0.2	11.22	5.02		
	1	2	0.2	11.22	0.971		
Test on LOTnr: 19	**2**	1	0.2	11.21	4.91		
	2	2	0.2	11.09	0.944		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	**1**	1	Ba	1	225	5	ICP-OES
	1	1	Ba	2	235	5	ICP-OES
	1	2	Ba	1	194	5	ICP-OES
	1	2	Ba	2	196	5	ICP-OES
	1	1	Cu	1	1597	5	ICP-OES
	1	1	Cu	2	1602	5	ICP-OES
	1	2	Cu	1	218	5	ICP-OES
	1	2	Cu	2	211	5	ICP-OES
	1	1	Mo	1	314	10	ICP-OES
	1	1	Mo	2	330	10	ICP-OES
	1	2	Mo	1	33	10	ICP-OES
	1	2	Mo	2	31	10	ICP-OES
	1	1	Sb	1	20	5	ICP-OES/USN
	1	1	Sb	2	20	5	ICP-OES/USN
	1	2	Sb	1	22	5	ICP-OES/USN
	1	2	Sb	2	23	5	ICP-OES/USN
	1	1	SO4	1	220800	200	IC
	1	1	SO4	2	220100	200	IC
	1	2	SO4	1	77900	200	IC
	1	2	SO4	2	77800	200	IC
Test on LOTnr: 19	**2**	1	Ba	1	252	5	ICP-OES
	2	1	Ba	2	265	5	ICP-OES
	2	2	Ba	1	190	5	ICP-OES
	2	2	Ba	2	190	5	ICP-OES
	2	1	Cu	1	1293	5	ICP-OES
	2	1	Cu	2	1321	5	ICP-OES
	2	2	Cu	1	172	5	ICP-OES
	2	2	Cu	2	171	5	ICP-OES
	2	1	Mo	1	164	10	ICP-OES
	2	1	Mo	2	153	10	ICP-OES
	2	2	Mo	1	26	10	ICP-OES
	2	2	Mo	2	22	10	ICP-OES
	2	1	Sb	1	24	5	ICP-OES/USN
	2	1	Sb	2	25	5	ICP-OES/USN
	2	2	Sb	1	25	5	ICP-OES/USN
	2	2	Sb	2	29	5	ICP-OES/USN
	2	1	SO4	1	170100	200	IC
	2	1	SO4	2	169300	200	IC
	2	2	SO4	1	68600	200	IC
	2	2	SO4	2	68400	200	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**34**						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4			25	
		2	19			25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	**1**	1	0.25	10.62	1.57		
Test on LOTnr: 19	**2**	1	0.25	10.76	1.55		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	**1**	1	Ba	1	205	5	ICP-OES
	1	1	Ba	2	217	5	ICP-OES
	1	1	Cu	1	455	5	ICP-OES
	1	1	Cu	2	434	5	ICP-OES
	1	1	Mo	1	45	10	ICP-OES
	1	1	Mo	2	43	10	ICP-OES
	1	1	Sb	1	22	5	ICP-OES/USN
	1	1	Sb	2	24	5	ICP-OES/USN
	1	1	SO4	1	96500	200	IC
	1	1	SO4	2	96000	200	IC
Test on LOTnr: 19	**2**	1	Ba	1	219	5	ICP-OES
	2	1	Ba	2	225	5	ICP-OES
	2	1	Cu	1	383	5	ICP-OES
	2	1	Cu	2	385	5	ICP-OES
	2	1	Mo	1	41	10	ICP-OES
	2	1	Mo	2	39	10	ICP-OES
	2	1	Sb	1	25	5	ICP-OES/USN
	2	1	Sb	2	26	5	ICP-OES/USN
	2	1	SO4	1	86800	200	IC
	2	1	SO4	2	86900	200	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	34						
Date experiment:	18-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	21			25	
		2	10			25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 21	**1**	1	0.2	9.64	38		
Test on LOTnr: 10	**2**	1	0.2	10.08	37.7		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 21	**1**	1	F	1	500	100	ISE
	1	1	F	2	520	100	ISE
	1	1	Cr(VI)	1	519400	5	IC
	1	1	Cr(VI)	2	544500	5	IC
	1	1	Cr	1	468000	10	ICP-OES
	1	1	Cr	2	461400	10	ICP-OES
	1	1	Cl	1	502200	200	IC
	1	1	Cl	2	494900	200	IC
	1	1	Cd	1	0	1	ICP-OES
	1	1	Cd	2	0	1	ICP-OES
Test on LOTnr: 10	**2**	1	F	1	600	100	ISE
	2	1	F	2	550	100	ISE
	2	1	Cr(VI)	1	539100	5	IC
	2	1	Cr(VI)	2	541000	5	IC
	2	1	Cr	1	507500	10	ICP-OES
	2	1	Cr	2	503000	10	ICP-OES
	2	1	Cl	1	595100	200	IC
	2	1	Cl	2	607400	200	IC
	2	1	Cd	1	0	1	ICP-OES
	2	1	Cd	2	0	1	ICP-OES

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	35						
Date experiment:	04.09.00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.1	2.2	25	
		2	20	0.1	2.24	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.2	10.03	5.2		
Test on LOTnr: 20	**2**	1	0.2	10.21	4.82		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Ba	1	202	0.01	ICP-MS
	1	1	Ba	2	198		ICP-MS
	1	1	Cu	1	1070	0.01	ICP-MS
	1	1	Cu	2	1020		ICP-MS
	1	1	Mo	1	122	0.01	ICP-MS
	1	1	Mo	2	123		ICP-MS
	1	1	Sb	1	45.7	0.01	ICP-MS
	1	1	Sb	2	47.5		ICP-MS
	1	1	SO4	1	315	2000	fotometric
	1	1	SO4	2	280		fotometric
Test on LOTnr: 20	**2**	1	Ba	1	377	0.01	ICP-MS
	2	1	Ba	2	330		ICP-MS
	2	1	Cu	1	961	0.01	ICP-MS
	2	1	Cu	2	1070		ICP-MS
	2	1	Mo	1	102	0.01	ICP-MS
	2	1	Mo	2	112		ICP-MS
	2	1	Sb	1	33.8	0.01	ICP-MS
	2	1	Sb	2	30.8		ICP-MS
	2	1	SO4	1	355	2000	fotometric
	2	1	SO4	2	295		fotometric

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	35						
Date experiment:	04.09.00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.1	2.2	25	
		2	20	0.1	2.24	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	1	10.71	1.279		
Test on LOTnr: 20	**2**	1	1	10.71	1.25		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Ba	1	131	0.01	ICP-MS
	1	1	Ba	2	138		ICP-MS
	1	1	Cu	1	217	0.01	ICP-MS
	1	1	Cu	2	203		ICP-MS
	1	1	Mo	1	18.4	0.01	ICP-MS
	1	1	Mo	2	18.7		ICP-MS
	1	1	Sb	1	31.7	0.01	ICP-MS
	1	1	Sb	2	31.1		ICP-MS
	1	1	SO4	1	120	2000	fotometric
	1	1	SO4	2	110		fotometric
Test on LOTnr: 20	**2**	1	Ba	1	236	0.01	ICP-MS
	2	1	Ba	2	263		ICP-MS
	2	1	Cu	1	224	0.01	ICP-MS
	2	1	Cu	2	253		ICP-MS
	2	1	Mo	1	20.6	0.01	ICP-MS
	2	1	Mo	2	22.1		ICP-MS
	2	1	Sb	1	25.4	0.01	ICP-MS
	2	1	Sb	2	26.8		ICP-MS
	2	1	SO4	1	96	2000	fotometric
	2	1	SO4	2	91		fotometric

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	35						
Date experiment:	04. 09. 00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.1	2.2	25	
		2	20	0.1	2.24	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.2	9.79	5.18		back volume 0,16
	1	2	0.8	10.64	0.812		back volume 0,78
Test on LOTnr: 20	**2**	1	0.2	9.9	4.56		back volume 0,16
	2	2	0.8	10.7	0.717		back volume 0,78
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Ba	1	190	0.01	ICP-MS
	1	1	Ba	2	202		ICP-MS
	1	2	Ba	1	170		ICP-MS
	1	2	Ba	2	178		ICP-MS
	1	1	Cu	1	1130	0.01	ICP-MS
	1	1	Cu	2	1010		ICP-MS
	1	2	Cu	1	137		ICP-MS
	1	2	Cu	2	168		ICP-MS
	1	1	Mo	1	109	0.01	ICP-MS
	1	1	Mo	2	110		ICP-MS
	1	2	Mo	1	15.3		ICP-MS
	1	2	Mo	2	17.9		ICP-MS
	1	1	Sb	1	53.8	0.01	ICP-MS
	1	1	Sb	2	51.2		ICP-MS
	1	2	Sb	1	24.4		ICP-MS
	1	2	Sb	2	25.8		ICP-MS
	1	1	SO4	1	295	2000	fotometric
	1	1	SO4	2	275		fotometric
	1	2	SO4	1	47		fotometric
	1	2	SO4	2	48		fotometric
Test on LOTnr: 20	**2**	1	Ba	1	387	0.01	ICP-MS
	2	1	Ba	2	390		ICP-MS
	2	2	Ba	1	235		ICP-MS
	2	2	Ba	2	229		ICP-MS
	2	1	Cu	1	1110	0.01	ICP-MS
	2	1	Cu	2	1190		ICP-MS
	2	2	Cu	1	142		ICP-MS
	2	2	Cu	2	141		ICP-MS
	2	1	Mo	1	97.8	0.01	ICP-MS
	2	1	Mo	2	113		ICP-MS
	2	2	Mo	1	13.3		ICP-MS
	2	2	Mo	2	16.9		ICP-MS
	2	1	Sb	1	40.6	0.01	ICP-MS
	2	1	Sb	2	41.6		ICP-MS
	2	2	Sb	1	21.5		ICP-MS
	2	2	Sb	2	19		ICP-MS
	2	1	SO4	1	325	2000	fotometric
	2	1	SO4	2	330		fotometric
	2	2	SO4	1	49		fotometric
	2	2	SO4	2	51		fotometric

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**35**						
Date experiment:	04.09.00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.1	2.2	25	
		2	20	0.1	2.24	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	1	10.85	1.3		
Test on LOTnr: 20	**2**	1	1	10.71	1.279		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	Ba	1	114	0.01	ICP-MS
	1	1	Ba	2	120		ICP-MS
	1	1	Cu	1	215	0.01	ICP-MS
	1	1	Cu	2	234		ICP-MS
	1	1	Mo	1	19	0.01	ICP-MS
	1	1	Mo	2	21.5		ICP-MS
	1	1	Sb	1	28.8	0.01	ICP-MS
	1	1	Sb	2	27.4		ICP-MS
	1	1	SO4	1	86000	2000	fotometric
	1	1	SO4	2	92000		fotometric
Test on LOTnr: 20	**2**	1	Ba	1	236	0.01	ICP-MS
	2	1	Ba	2	263		ICP-MS
	2	1	Cu	1	224	0.01	ICP-MS
	2	1	Cu	2	253		ICP-MS
	2	1	Mo	1	20.6	0.01	ICP-MS
	2	1	Mo	2	22.1		ICP-MS
	2	1	Sb	1	25.4	0.01	ICP-MS
	2	1	Sb	2	26.8		ICP-MS
	2	1	SO4	1	96000	2000	fotometric
	2	1	SO4	2	91000		fotometric

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	35						
Date experiment:	04.09.00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	4	0.02	1.36	25	
		2	31	0.02	1.38	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 4	**1**	1	0.072	9.38	40		
Test on LOTnr: 31	**2**	1	0.072	9.17	40.7		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 4	**1**	1	F	1	530	50	ION selected electr.
	1	1	F	2	540		ION selected electr.
	1	1	Cr(VI)	1	542000	10	fotometric
	1	1	Cr(VI)	2	543000		fotometric
	1	1	Cr	1	543500	0.01	ICP-MS
	1	1	Cr	2	542500		ICP-MS
	1	1	Cl	1	641000	1000	Titr.
	1	1	Cl	2	641000		Titr.
	1	1	Cd	1	<0,1	0.01	ICP-MS
	1	1	Cd	2	<0,1		ICP-MS
Test on LOTnr: 31	**2**	1	F	1	530	50	ION selected electr.
	2	1	F	2	540		ION selected electr.
	2	1	Cr(VI)	1	489000	10	fotometric
	2	1	Cr(VI)	2	499000		fotometric
	2	1	Cr	1	506000	0.01	ICP-MS
	2	1	Cr	2	518000		ICP-MS
	2	1	Cl	1	528000	1000	Titr.
	2	1	Cl	2	528000		Titr.
	2	1	Cd	1	<0,1	0.01	ICP-MS
	2	1	Cd	2	<0,1		ICP-MS

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	36						
Date experiment:	11-10-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	21	0.17996	1346	22	
		2	6	0.1772	1352	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 21	**1**	1	0.27	10.58	5.12		leak bottle during extraction
Test on LOTnr: 6	**2**	1	0.295	10.49	5.5		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 21	**1**	1	Ba	1	242	5	ICP-OES
	1	1	Ba	2	240	5	ICP-OES
	1	1	Cu	1	1349	2	ICP-OES
	1	1	Cu	2	1344	2	ICP-OES
	1	1	Mo	1	147	2	ICP-OES
	1	1	Mo	2	145	2	ICP-OES
	1	1	Sb	1	23.5	1	H-AAS
	1	1	Sb	2	20	1	H-AAS
	1	1	SO4	1	173965	250	IC
	1	1	SO4	2	174350	250	IC
Test on LOTnr: 6	**2**	1	Ba	1	213	5	ICP-OES
	2	1	Ba	2	212	5	ICP-OES
	2	1	Cu	1	1826	2	ICP-OES
	2	1	Cu	2	1822	2	ICP-OES
	2	1	Mo	1	182	2	ICP-OES
	2	1	Mo	2	180	2	ICP-OES
	2	1	Sb	1	30.4	1	H-AAS
	2	1	Sb	2	29.2	1	H-AAS
	2	1	SO4	1	267160	250	IC
	2	1	SO4	2	268150	250	IC

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	36						
Date experiment:	04-10-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	21	0.0926	1381	23	
		2	6	0.0911	1333	23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 21	**1**	1	0.81	10.27	1.518		
Test on LOTnr: 6	**2**	1	0.86	10.5	1.7		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 21	**1**	1	Ba	1	193	5	ICP-OES
	1	1	Ba	2	197	5	ICP-OES
	1	1	Cu	1	388	2	ICP-OES
	1	1	Cu	2	387	2	ICP-OES
	1	1	Mo	1	42.6	2	ICP-OES
	1	1	Mo	2	43.9	2	ICP-OES
	1	1	Sb	1	23.9	1	H-AAS
	1	1	Sb	2	20.7	1	H-AAS
	1	1	SO4	1	105230	250	IC
	1	1	SO4	2	104610	250	IC
Test on LOTnr: 6	**2**	1	Ba	1	177	5	ICP-OES
	2	1	Ba	2	177	5	ICP-OES
	2	1	Cu	1	556	2	ICP-OES
	2	1	Cu	2	557	2	ICP-OES
	2	1	Mo	1	55.2	2	ICP-OES
	2	1	Mo	2	55.3	2	ICP-OES
	2	1	Sb	1	28.8	1	H-AAS
	2	1	Sb	2	27	1	H-AAS
	2	1	SO4	1	153960	250	IC
	2	1	SO4	2	151345	250	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	36						
Date experiment:	11-10-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	21	0.17996	1346	22	
		2	6	0.1772	1352	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 21	**1**	1	0.295	10.55	4.63		
	1	2	1.37	10.75	0.843		
Test on LOTnr: 6	**2**	1	0.245	10.46	6.18		leak bottle during extraction
	2	2	1.35	10.97	0.948		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 21	**1**	1	Ba	1	222	5	ICP-OES
	1	1	Ba	2	224	5	ICP-OES
	1	2	Ba	1	186	5	ICP-OES
	1	2	Ba	2	187	5	ICP-OES
	1	1	Cu	1	1247	2	ICP-OES
	1	1	Cu	2	1248	2	ICP-OES
	1	2	Cu	1	179	2	ICP-OES
	1	2	Cu	2	179	2	ICP-OES
	1	1	Mo	1	140	2	ICP-OES
	1	1	Mo	2	140	2	ICP-OES
	1	2	Mo	1	22.2	2	ICP-OES
	1	2	Mo	2	22.5	2	ICP-OES
	1	1	Sb	1	19.8	1	H-AAS
	1	1	Sb	2	19.6	1	H-AAS
	1	2	Sb	1	21.8	1	H-AAS
	1	2	Sb	2	20.7	1	H-AAS
	1	1	SO4	1	177875	250	IC
	1	1	SO4	2	178955	250	IC
	1	2	SO4	1	66260	250	IC
	1	2	SO4	2	64350	250	IC
Test on LOTnr: 6	**2**	1	Ba	1	192	5	ICP-OES
	2	1	Ba	2	194	5	ICP-OES
	2	2	Ba	1	191	5	ICP-OES
	2	2	Ba	2	190	5	ICP-OES
	2	1	Cu	1	2296	2	ICP-OES
	2	1	Cu	2	2292	2	ICP-OES
	2	2	Cu	1	251	2	ICP-OES
	2	2	Cu	2	246	2	ICP-OES
	2	1	Mo	1	204	2	ICP-OES
	2	1	Mo	2	202	2	ICP-OES
	2	2	Mo	1	23.5	2	ICP-OES
	2	2	Mo	2	23.4	2	ICP-OES
	2	1	Sb	1	23.4	1	H-AAS
	2	1	Sb	2	19.5	1	H-AAS
	2	2	Sb	1	29	1	H-AAS
	2	2	Sb	2	26.8	1	H-AAS
	2	1	SO4	1	379440	250	IC
	2	1	SO4	2	379760	250	IC
	2	2	SO4	1	98030	250	IC
	2	2	SO4	2	94570	250	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	36						
Date experiment:	04-10-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	21	0.0926	1381	23	
		2	6	0.0911	1333	23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 21	1	1	0.805	10.64	1.59		
Test on LOTnr: 6	2	1	0.87	10.5	1.56		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 21	1	1	Ba	1	201	5	ICP-OES
	1	1	Ba	2	206	5	ICP-OES
	1	1	Cu	1	418	2	ICP-OES
	1	1	Cu	2	431	2	ICP-OES
	1	1	Mo	1	44.4	2	ICP-OES
	1	1	Mo	2	46.1	2	ICP-OES
	1	1	Sb	1	31.3	1	H-AAS
	1	1	Sb	2	37.4	1	H-AAS
	1	1	SO4	1	96400	250	IC
	1	1	SO4	2	93490	250	IC
Test on LOTnr: 6	2	1	Ba	1	179	5	ICP-OES
	2	1	Ba	2	178	5	ICP-OES
	2	1	Cu	1	464	2	ICP-OES
	2	1	Cu	2	460	2	ICP-OES
	2	1	Mo	1	42.4	2	ICP-OES
	2	1	Mo	2	41.9	2	ICP-OES
	2	1	Sb	1	25	1	H-AAS
	2	1	Sb	2	24.4	1	H-AAS
	2	1	SO4	1	130260	250	IC
	2	1	SO4	2	134435	250	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	CHS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	36						
Date experiment:	09-10-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	6	0.2506		21	
		2	17	0.2531		21	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 6	1	1	0.76	9.59	39.3		
Test on LOTnr: 17	2	1	0.75	9.64	40.2		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 6	1	1	F	1			
	1	1	F	2			
	1	1	Cr(VI)	1	599495	20	UV/VIS-Spec.
	1	1	Cr(VI)	2	607554	20	UV/VIS-Spec.
	1	1	Cr	1	655422	20	ICP-OES
	1	1	Cr	2	663035	20	ICP-OES
	1	1	Cl	1			
	1	1	Cl	2			
	1	1	Cd	1	< 5	5	ICP-OES
	1	1	Cd	2	< 5	5	ICP-OES
Test on LOTnr: 17	2	1	F	1			
	2	1	F	2			
	2	1	Cr(VI)	1	580325	20	UV/VIS-Spec.
	2	1	Cr(VI)	2	642719	20	UV/VIS-Spec.
	2	1	Cr	1	658550	20	ICP-OES
	2	1	Cr	2	661077	20	ICP-OES
	2	1	Cl	1			
	2	1	Cl	2			
	2	1	Cd	1	< 5	5	ICP-OES
	2	1	Cd	2	< 5	5	ICP-OES

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	38						
Date experiment:	04/09/2000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	8	0.179	1600	22	data on density are
		2	23	0.181	1600	22	only rough estimate
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 8	1	1	0.32	10.79	5.69		
Test on LOTnr: 23	2	1	0.32	10.95	6.35		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 8	1	1	Ba	1	204	0.1	ISO 11885
	1	1	Ba	2	217	0.1	ISO 11885
	1	1	Cu	1	1760	1.3	ISO 11885
	1	1	Cu	2	1680	1.3	ISO 11885
	1	1	Mo	1	181	1.1	ISO 11885
	1	1	Mo	2	190	1.1	ISO 11885
	1	1	Sb	1	27	1.8	ISO 11885
	1	1	Sb	2	25	1.8	ISO 11885
	1	1	SO4	1	198600	5000	ISO 9280
	1	1	SO4	2	201900	5000	ISO 9280
Test on LOTnr: 23	2	1	Ba	1	254	0.1	ISO 11885
	2	1	Ba	2	257	0.1	ISO 11885
	2	1	Cu	1	1720	1.3	ISO 11885
	2	1	Cu	2	1650	1.3	ISO 11885
	2	1	Mo	1	181	1.1	ISO 11885
	2	1	Mo	2	192	1.1	ISO 11885
	2	1	Sb	1	23	1.8	ISO 11885
	2	1	Sb	2	22	1.8	ISO 11885
	2	1	SO4	1	149800	5000	ISO 9280
	2	1	SO4	2	144900	5000	ISO 9280

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	38						
Date experiment:	04/09/2000						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	8	0.092	1600	22	data on density are
		2	23	0.093	1600	22	only rough estimate
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 8	1	1	0.88	11.2	1.85		
Test on LOTnr: 23	2	1	0.88	11.29	1.94		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 8	1	1	Ba	1	170	0.1	ISO 11885
	1	1	Ba	2	182	0.1	ISO 11885
	1	1	Cu	1	514	1.3	ISO 11885
	1	1	Cu	2	505	1.3	ISO 11885
	1	1	Mo	1	54	1.1	ISO 11885
	1	1	Mo	2	57	1.1	ISO 11885
	1	1	Sb	1	28	1.8	ISO 11885
	1	1	Sb	2	26	1.8	ISO 11885
	1	1	SO4	1	129000	5000	ISO 9280
	1	1	SO4	2	126800	5000	ISO 9280
Test on LOTnr: 23	2	1	Ba	1	158	0.1	ISO 11885
	2	1	Ba	2	166	0.1	ISO 11885
	2	1	Cu	1	519	1.3	ISO 11885
	2	1	Cu	2	505	1.3	ISO 11885
	2	1	Mo	1	57	1.1	ISO 11885
	2	1	Mo	2	60	1.1	ISO 11885
	2	1	Sb	1	26	1.8	ISO 11885
	2	1	Sb	2	25	1.8	ISO 11885
	2	1	SO4	1	104800	5000	ISO 9280
	2	1	SO4	2	112200	5000	ISO 9280

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	38						
Date experiment:	07/09/2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.179	1600	23	data on density are
		2	23	0.181	1600	23	only rough estimate
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.32	9.95	5.67		
	1	2	1.385	11.22	0.99		
Test on LOTnr: 23	**2**	1	0.32	10.43	5.76		
	2	2	1.385	11.19	0.99		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Ba	1	135	0.1	ISO 11885
	1	1	Ba	2	138	0.1	ISO 11885
	1	2	Ba	1	157	0.1	ISO 11885
	1	2	Ba	2	165	0.1	ISO 11885
	1	1	Cu	1	1719	1.3	ISO 11885
	1	1	Cu	2	1680	1.3	ISO 11885
	1	2	Cu	1	219	1.3	ISO 11885
	1	2	Cu	2	206	1.3	ISO 11885
	1	1	Mo	1	158	1.1	ISO 11885
	1	1	Mo	2	165	1.1	ISO 11885
	1	2	Mo	1	30	1.1	ISO 11885
	1	2	Mo	2	33	1.1	ISO 11885
	1	1	Sb	1	31	1.8	ISO 11885
	1	1	Sb	2	29	1.8	ISO 11885
	1	2	Sb	1	29	1.8	ISO 11885
	1	2	Sb	2	30	1.8	ISO 11885
	1	1	SO4	1	314500	5000	ISO 9280
	1	1	SO4	2	319400	5000	ISO 9280
	1	2	SO4	1	80300	5000	ISO 9280
	1	2	SO4	2	74500	5000	ISO 9280
Test on LOTnr: 23	**2**	1	Ba	1	183	0.1	ISO 11885
	2	1	Ba	2	190	0.1	ISO 11885
	2	2	Ba	1	140	0.1	ISO 11885
	2	2	Ba	2	150	0.1	ISO 11885
	2	1	Cu	1	1694	1.3	ISO 11885
	2	1	Cu	2	1654	1.3	ISO 11885
	2	2	Cu	1	237	1.3	ISO 11885
	2	2	Cu	2	219	1.3	ISO 11885
	2	1	Mo	1	169	1.1	ISO 11885
	2	1	Mo	2	173	1.1	ISO 11885
	2	2	Mo	1	44	1.1	ISO 11885
	2	2	Mo	2	41	1.1	ISO 11885
	2	1	Sb	1	28	1.8	ISO 11885
	2	1	Sb	2	26	1.8	ISO 11885
	2	2	Sb	1	22	1.8	ISO 11885
	2	2	Sb	2	24	1.8	ISO 11885
	2	1	SO4	1	242400	5000	ISO 9280
	2	1	SO4	2	240800	5000	ISO 9180
	2	2	SO4	1	81300	5000	ISO 9280
	2	2	SO4	2	84000	5000	ISO 9280

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**38**						
Date experiment:	04/09/2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	8	0.092	1500	22	data on density are
		2	23	0.093	1500	22	only rough estimate
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 8	**1**	1	0.88	11.19	1.67		
Test on LOTnr: 23	**2**	1	0.88	11.23	1.79		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 8	**1**	1	Ba	1	130	0.1	ISO 11885
	1	1	Ba	2	142	0.1	ISO 11885
	1	1	Cu	1	407	1.3	ISO 11885
	1	1	Cu	2	393	1.3	ISO 11885
	1	1	Mo	1	47	1.1	ISO 11885
	1	1	Mo	2	52	1.1	ISO 11885
	1	1	Sb	1	24	1.8	ISO 11885
	1	1	Sb	2	23	1.8	ISO 11885
	1	1	SO4	1	121600	5000	ISO 9280
	1	1	SO4	2	122700	5000	ISO 9280
Test on LOTnr: 23	**2**	1	Ba	1	131	0.1	ISO 11885
	2	1	Ba	2	143	0.1	ISO 11885
	2	1	Cu	1	439	1.3	ISO 11885
	2	1	Cu	2	434	1.3	ISO 11885
	2	1	Mo	1	39	1.1	ISO 11885
	2	1	Mo	2	46	1.1	ISO 11885
	2	1	Sb	1	21	1.8	ISO 11885
	2	1	Sb	2	23	1.8	ISO 11885
	2	1	SO4	1	99000	5000	ISO 9280
	2	1	SO4	2	102900	5000	ISO 9280

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	38						
Date experiment:	28/08/2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	13	0.215	1300	25	data on density are
		2	29	0.221	1250	25	only rough estimate
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 13	**1**	1	0.785	9.51	39.3		
Test on LOTnr: 29	**2**	1	0.79	9.27	40.1		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 13	**1**	1	F	1	610	20	ISO 10359-1
	1	1	F	2	630	20	ISO 10359-1
	1	1	Cr(VI)	1	534000	50	ISO 11083
	1	1	Cr(VI)	2	536000	50	ISO 11083
	1	1	Cr	1	531000	2.5	ISO 11885
	1	1	Cr	2	535000	2.5	ISO 11885
	1	1	Cl	1	570000	1000	ISO 9297
	1	1	Cl	2	566000	1000	ISO 9297
	1	1	Cd	1	4	0.3	ISO 11885
	1	1	Cd	2	3	0.3	ISO 11885
Test on LOTnr: 29	**2**	1	F	1	595	20	ISO 10359-1
	2	1	F	2	580	20	ISO 10359-1
	2	1	Cr(VI)	1	516000	50	ISO 11083
	2	1	Cr(VI)	2	511000	50	ISO 11083
	2	1	Cr	1	510000	2.5	ISO 11885
	2	1	Cr	2	510000	2.5	ISO 11885
	2	1	Cl	1	504000	1000	ISO 9297
	2	1	Cl	2	506000	1000	ISO 9297
	2	1	Cd	1	4	0.3	ISO 11885
	2	1	Cd	2	3	0.3	ISO 11885

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	39						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.175		22	laboratory temp.
		2	24	0.178			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.279	10.81	4.31	20	temp.for cond.data
Test on LOTnr: 24	**2**	1	0.283	10.76	4.81		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	200		ICP
	1	1	Ba	2	200		ICP
	1	1	Cu	1	1530		ICP
	1	1	Cu	2	1530		ICP
	1	1	Mo	1	150		ICP
	1	1	Mo	2	140		ICP
	1	1	Sb	1	54		ICP
	1	1	Sb	2	54		ICP
	1	1	SO4	1	198600		IC
	1	1	SO4	2	198300		IC
Test on LOTnr: 24	**2**	1	Ba	1	230		ICP
	2	1	Ba	2	220		ICP
	2	1	Cu	1	1620		ICP
	2	1	Cu	2	1600		ICP
	2	1	Mo	1	160		ICP
	2	1	Mo	2	150		ICP
	2	1	Sb	1	39		ICP
	2	1	Sb	2	45		ICP
	2	1	SO4	1	185900		IC
	2	1	SO4	2	187200		IC

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	39						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.089			
		2	24	0.088			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.863	10.93	1.542		
Test on LOTnr: 24	**2**	1	0.849	10.95	1.320		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	150		
	1	1	Ba	2	150		
	1	1	Cu	1	430		
	1	1	Cu	2	440		
	1	1	Mo	1	47		
	1	1	Mo	2	41		
	1	1	Sb	1	58		
	1	1	Sb	2	66		
	1	1	SO4	1	137600		
	1	1	SO4	2	134200		
Test on LOTnr: 24	**2**	1	Ba	1	190		
	2	1	Ba	2	190		
	2	1	Cu	1	430		
	2	1	Cu	2	420		
	2	1	Mo	1	41		
	2	1	Mo	2	41		
	2	1	Sb	1	47		
	2	1	Sb	2	48		
	2	1	SO4	1	116800		
	2	1	SO4	2	117800		

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	39						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.174			
		2	24	0.175			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.292	10.89	4.11		
	1	2	1.352	10.82	0.867		
Test on LOTnr: 24	**2**	1	0.295	10.82	4.27		
	2	2	1.398	10.87	0.883		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	160		
	1	1	Ba	2	160		
	1	2	Ba	1	160		
	1	2	Ba	2	160		
	1	1	Cu	1	1740		
	1	1	Cu	2	1710		
	1	2	Cu	1	210		
	1	2	Cu	2	210		
	1	1	Mo	1	150		
	1	1	Mo	2	140		
	1	2	Mo	1	19		
	1	2	Mo	2	20		
	1	1	Sb	1	38		
	1	1	Sb	2	47		
	1	2	Sb	1	56		
	1	2	Sb	2	47		
	1	1	SO4	1	333200		
	1	1	SO4	2	333000		
	1	2	SO4	1	92650		
	1	2	SO4	2	91300		
Test on LOTnr: 24	**2**	1	Ba	1	210		
	2	1	Ba	2	210		
	2	2	Ba	1	210		
	2	2	Ba	2	210		
	2	1	Cu	1	710		
	2	1	Cu	2	710		
	2	2	Cu	1	180		
	2	2	Cu	2	180		
	2	1	Mo	1	91		
	2	1	Mo	2	92		
	2	2	Mo	1	27		
	2	2	Mo	2	24		
	2	1	Sb	1	54		
	2	1	Sb	2	47		
	2	2	Sb	1	52		
	2	2	Sb	2	46		
	2	1	SO4	1	262700		
	2	1	SO4	2	263600		
	2	2	SO4	1	93200		
	2	2	SO4	2	92800		

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**39**						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0.090			
		2	24	0.088			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.871	10.72	1.444		
Test on LOTnr: 24	**2**	1	0.844	10.64	1.469		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	Ba	1	160		
	1	1	Ba	2	160		
	1	1	Cu	1	400		
	1	1	Cu	2	390		
	1	1	Mo	1	42		
	1	1	Mo	2	41		
	1	1	Sb	1	54		
	1	1	Sb	2	48		
	1	1	SO4	1	128800		
	1	1	SO4	2	126600		
Test on LOTnr: 24	**2**	1	Ba	1	210		
	2	1	Ba	2	220		
	2	1	Cu	1	360		
	2	1	Cu	2	380		
	2	1	Mo	1	40		
	2	1	Mo	2	38		
	2	1	Sb	1	43		
	2	1	Sb	2	46		
	2	1	SO4	1	114200		
	2	1	SO4	2	113900		

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	39						
Date experiment:							
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	5	0.091			
		2	7	0.089			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 5	**1**	1	0.850	8.71	0.0287		
Test on LOTnr: 7	**2**	1	0.833	9.59	0.0286		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 5	**1**	1	F	1	370		Electrode
	1	1	F	2	330		Electrode
	1	1	Cr(VI)	1	364000		Photometry
	1	1	Cr(VI)	2	365000		Photometry
	1	1	Cr	1	372000		ICP
	1	1	Cr	2	374000		ICP
	1	1	Cl	1	386000		IC
	1	1	Cl	2	369000		IC
	1	1	Cd	1	<5		ICP
	1	1	Cd	2	<5		ICP
Test on LOTnr: 7	**2**	1	F	1	290		Electrode
	2	1	F	2	330		Electrode
	2	1	Cr(VI)	1	344000		Photometry
	2	1	Cr(VI)	2	350000		Photometry
	2	1	Cr	1	350000		ICP
	2	1	Cr	2	353000		ICP
	2	1	Cl	1	360000		IC
	2	1	Cl	2	353000		IC
	2	1	Cd	1	<5		ICP
	2	1	Cd	2	<5		ICP

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	40						
Date experiment:	24-jul						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.20473			
		2	25	0.20323			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	0.36	10.85	4.64		
Test on LOTnr: 25	2	1	0.36	10.74	4.58		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Ba	1	360	3	ICP
	1	1	Ba	2	360	3	ICP
	1	1	Cu	1	355	10	ICP
	1	1	Cu	2	349	10	ICP
	1	1	Mo	1	164	30	ICP
	1	1	Mo	2	165	30	ICP
	1	1	Sb	1	< 100	100	ICP
	1	1	Sb	2	< 100	100	ICP
	1	1	SO4	1	240,000	1,000	IC
	1	1	SO4	2	234,000	1,000	IC
Test on LOTnr: 25	2	1	Ba	1	351	3	ICP
	2	1	Ba	2	343	3	ICP
	2	1	Cu	1	1322	10	ICP
	2	1	Cu	2	1319	10	ICP
	2	1	Mo	1	161	30	ICP
	2	1	Mo	2	154	30	ICP
	2	1	Sb	1	< 100	100	ICP
	2	1	Sb	2	< 100	100	ICP
	2	1	SO4	1	288,000	1,000	IC
	2	1	SO4	2	308,000	1,000	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	40						
Date experiment:	24-jul						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	10	0.17914			
		2	25	0.17783			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 10	1	1	1.705	10.89	1.599		
Test on LOTnr: 25	2	1	1.71	10.76	1.454		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 10	1	1	Ba	1	129	3	ICP
	1	1	Ba	2	127	3	ICP
	1	1	Cu	1	459	10	ICP
	1	1	Cu	2	457	10	ICP
	1	1	Mo	1	48	30	ICP
	1	1	Mo	2	51	30	ICP
	1	1	Sb	1	< 100	100	ICP
	1	1	Sb	2	< 100	100	ICP
	1	1	SO4	1	218,000	1,000	IC
	1	1	SO4	2	230,000	1,000	IC
Test on LOTnr: 25	2	1	Ba	1	112	3	ICP
	2	1	Ba	2	114	3	ICP
	2	1	Cu	1	348	10	ICP
	2	1	Cu	2	347	10	ICP
	2	1	Mo	1	37	30	ICP
	2	1	Mo	2	47	30	ICP
	2	1	Sb	1	< 100	100	ICP
	2	1	Sb	2	< 100	100	ICP
	2	1	SO4	1	218,000	1,000	IC
	2	1	SO4	2	260,000	1,000	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	40						
Date experiment:	24-jul						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.17914			
		2	25	0.17783			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	0.3	10.9	4.84		
	1	2	1.4	11.02	0.921		
Test on LOTnr: 25	**2**	1	3.2	10.7	4.66		
	2	2	1.4	10.85	0.814		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	Ba	1	404	3	ICP
	1	1	Ba	2	410	3	ICP
	1	2	Ba	1	144	3	ICP
	1	2	Ba	2	143	3	ICP
	1	1	Cu	1	1704	10	ICP
	1	1	Cu	2	1723	10	ICP
	1	2	Cu	1	226	10	ICP
	1	2	Cu	2	219	10	ICP
	1	1	Mo	1	156	30	ICP
	1	1	Mo	2	149	30	ICP
	1	2	Mo	1	25	30	ICP
	1	2	Mo	2	22	30	ICP
	1	1	Sb	1	< 100	100	ICP
	1	1	Sb	2	< 100	100	ICP
	1	2	Sb	1	< 100	100	ICP
	1	2	Sb	2	< 100	100	ICP
	1	1	SO4	1	296,000	1,000	IC
	1	1	SO4	2	313,000	1,000	IC
	1	2	SO4	1	200,000	1,000	IC
	1	2	SO4	2	194,000	1,000	IC
Test on LOTnr: 25	**2**	1	Ba	1	289	3	ICP
	2	1	Ba	2	290	3	ICP
	2	2	Ba	1	101	3	ICP
	2	2	Ba	2	101	3	ICP
	2	1	Cu	1	1436	10	ICP
	2	1	Cu	2	1436	10	ICP
	2	2	Cu	1	158	10	ICP
	2	2	Cu	2	163	10	ICP
	2	1	Mo	1	148	30	ICP
	2	1	Mo	2	143	30	ICP
	2	2	Mo	1	23	30	ICP
	2	2	Mo	2	18	30	ICP
	2	1	Sb	1	< 100	100	ICP
	2	1	Sb	2	< 100	100	ICP
	2	2	Sb	1	< 100	100	ICP
	2	2	Sb	2	< 100	100	ICP
	2	1	SO4	1	323,000	1,000	IC
	2	1	SO4	2	331,000	1,000	IC
	2	2	SO4	1	191,000	1,000	IC
	2	2	SO4	2	188,000	1,000	IC

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**40**						
Date experiment:	24-jul						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	10	0.17914			
		2	25	0.17783			
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 10	**1**	1	1.71	10.9	4.84		
Test on LOTnr: 25	**2**	1	1.72	10.7	4.66		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 10	**1**	1	Ba	1	130	3	ICP
	1	1	Ba	2	130	3	ICP
	1	1	Cu	1	445	10	ICP
	1	1	Cu	2	441	10	ICP
	1	1	Mo	1	44	30	ICP
	1	1	Mo	2	44	30	ICP
	1	1	Sb	1	< 100	100	ICP
	1	1	Sb	2	< 100	100	ICP
	1	1	SO4	1	224,000	1,000	IC
	1	1	SO4	2	220,000	1,000	IC
Test on LOTnr: 25	**2**	1	Ba	1	104	3	ICP
	2	1	Ba	2	103	3	ICP
	2	1	Cu	1	326	10	ICP
	2	1	Cu	2	325	10	ICP
	2	1	Mo	1	40	30	ICP
	2	1	Mo	2	41	30	ICP
	2	1	Sb	1	< 100	100	ICP
	2	1	Sb	2	< 100	100	ICP
	2	1	SO4	1	186,000	1,000	IC
	2	1	SO4	2	189,000	1,000	IC

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	40						
Date experiment:	24-jul						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	26	0.50314			LS 2
		2	27	0.5284			LS 2
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 26	**1**	1	0.176	8.38	121		
Test on LOTnr: 27	**2**	1	0.198	8.4	116		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 26	**1**	1	F	1	< 500	500	IC
	1	1	F	2	< 500	500	IC
	1	1	Cr(VI)	1	2,075,000	50	Photometry
	1	1	Cr(VI)	2	2,075,000	50	Photometry
	1	1	Cr	1	2,078,000	10	ICP
	1	1	Cr	2	2,082,000	10	ICP
	1	1	Cl	1	2,295,000	1,000	IC
	1	1	Cl	2	2,319,000	1,000	IC
	1	1	Cd	1	< 5	5	ICP
	1	1	Cd	2	< 5	5	ICP
Test on LOTnr: 27	**2**	1	F	1	< 500	500	IC
	2	1	F	2	< 500	500	IC
	2	1	Cr(VI)	1	2,213,000	50	Photometry
	2	1	Cr(VI)	2	2,213,000	50	Photometry
	2	1	Cr	1	2,225,000	10	ICP
	2	1	Cr	2	2,225,000	10	ICP
	2	1	Cl	1	2,638,000	1,000	IC
	2	1	Cl	2	2,618,000	1,000	IC
	2	1	Cd	1	< 5	5	ICP
	2	1	Cd	2	< 5	5	ICP

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	41						
Date experiment:	07-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	11	0.175	1592	24	
		2	26	0.175	1543	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 11	1	1	0.296	11.22	5.75		
Test on LOTnr: 26	2	1	0.27	11.1	5.9		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 11	1	1	Ba	1	288	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Ba	2	242	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Cu	1	1920	2	Atomic absorption spectrometry
	1	1	Cu	2	1970	2	Atomic absorption spectrometry
	1	1	Mo	1	258	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Mo	2	253.2	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Sb	1	29	2	Hydride Atomic absorption spectrometry
	1	1	Sb	2	28.5	2	Hydride Atomic absorption spectrometry
	1	1	SO4	1	320000	80	Ion chromatography
	1	1	SO4	2	317000	80	Ion chromatography
Test on LOTnr: 26	2	1	Ba	1	276	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Ba	2	258.8	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Cu	1	1990	2	Atomic absorption spectrometry
	2	1	Cu	2	2070	2	Atomic absorption spectrometry
	2	1	Mo	1	232	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Mo	2	226	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Sb	1	30	2	Hydride Atomic absorption spectrometry
	2	1	Sb	2	25.5	2	Hydride Atomic absorption spectrometry
	2	1	SO4	1	279000	80	Ion chromatography
	2	1	SO4	2	306000	80	Ion chromatography

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	41						
Date experiment:	08-09-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	11	0.09	1592	23	
		2	26	0.09	1543	24	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 11	1	1	0.836	11.38	1.84		
Test on LOTnr: 26	2	1	0.85	11.3	1.74		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 11	1	1	Ba	1	234.4	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Ba	2	218.4	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Cu	1	590	2	Atomic absorption spectrometry
	1	1	Cu	2	620	2	Atomic absorption spectrometry
	1	1	Mo	1	99.6	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Mo	2	86.8	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Sb	1	34	2	Hydride Atomic absorption spectrometry
	1	1	Sb	2	30	2	Hydride Atomic absorption spectrometry
	1	1	SO4	1	184000	80	Ion chromatography
	1	1	SO4	2	165000	80	Ion chromatography
Test on LOTnr: 26	2	1	Ba	1	235.6	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Ba	2	213.6	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Cu	1	430	2	Atomic absorption spectrometry
	2	1	Cu	2	470	2	Atomic absorption spectrometry
	2	1	Mo	1	67.6	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Mo	2	61	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Sb	1	37.5	2	Hydride Atomic absorption spectrometry
	2	1	Sb	2	34.5	2	Hydride Atomic absorption spectrometry
	2	1	SO4	1	171000	80	Ion chromatography
	2	1	SO4	2	174000	80	Ion chromatography

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	41						
Date experiment:	11-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.175	1592	23	
		2	26	0.175	1543	23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	0.292	11.14	5.83		
	1	2	1.36	11.11	0.99		
Test on LOTnr: 26	**2**	1	0.293	11.12	5.8		
	2	2	1.36	11.29	0.95		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Ba	1	309.2	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Ba	2	272	5	Atomic absorption spectrometry -Grafite Furnace
	1	2	Ba	1	260.4	5	Atomic absorption spectrometry -Grafite Furnace
	1	2	Ba	2	267.6	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Cu	1	2060	2	Atomic absorption spectrometry
	1	1	Cu	2	2130	2	Atomic absorption spectrometry
	1	2	Cu	1	250	2	Atomic absorption spectrometry
	1	2	Cu	2	280	2	Atomic absorption spectrometry
	1	1	Mo	1	226.8	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Mo	2	219.6	2	Atomic absorption spectrometry -Grafite Furnace
	1	2	Mo	1	40.9	2	Atomic absorption spectrometry -Grafite Furnace
	1	2	Mo	2	40.3	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Sb	1	32	2	Hydride Atomic absorption spectrometry
	1	1	Sb	2	30	2	Hydride Atomic absorption spectrometry
	1	2	Sb	1	28.5	2	Hydride Atomic absorption spectrometry
	1	2	Sb	2	33	2	Hydride Atomic absorption spectrometry
	1	1	SO4	1	587000	80	Ion chromatography
	1	1	SO4	2	588000	80	Ion chromatography
	1	2	SO4	1	103000	80	Ion chromatography
	1	2	SO4	2	86000	80	Ion chromatography
Test on LOTnr: 26	**2**	1	Ba	1	279.6	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Ba	2	293.2	5	Atomic absorption spectrometry -Grafite Furnace
	2	2	Ba	1	247.6	5	Atomic absorption spectrometry -Grafite Furnace
	2	2	Ba	2	222	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Cu	1	1730	2	Atomic absorption spectrometry
	2	1	Cu	2	1800	2	Atomic absorption spectrometry
	2	2	Cu	1	210	2	Atomic absorption spectrometry
	2	2	Cu	2	240	2	Atomic absorption spectrometry
	2	1	Mo	1	190.8	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Mo	2	210.4	2	Atomic absorption spectrometry -Grafite Furnace
	2	2	Mo	1	33.6	2	Atomic absorption spectrometry -Grafite Furnace
	2	2	Mo	2	33.4	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Sb	1	34	2	Hydride Atomic absorption spectrometry
	2	1	Sb	2	32.5	2	Hydride Atomic absorption spectrometry
	2	2	Sb	1	35	2	Hydride Atomic absorption spectrometry
	2	2	Sb	2	33.5	2	Hydride Atomic absorption spectrometry
	2	1	SO4	1	441000	80	Ion chromatography
	2	1	SO4	2	438000	80	Ion chromatography
	2	2	SO4	1	94000	80	Ion chromatography
	2	2	SO4	2	106000	80	Ion chromatography

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**41**						
Date experiment:	08-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	11	0.09	1624	24	
		2	26	0.09	1649	24	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 11	**1**	1	0.846	11.49	1.72		
Test on LOTnr: 26	**2**	1	0.86	11.48	1.8		
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 11	**1**	1	Ba	1	221.6	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Ba	2	195.2	5	Atomic absorption spectrometry -Grafite Furnace
	1	1	Cu	1	500	2	Atomic absorption spectrometry
	1	1	Cu	2	540	2	Atomic absorption spectrometry
	1	1	Mo	1	52	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Mo	2	46.8	2	Atomic absorption spectrometry -Grafite Furnace
	1	1	Sb	1	33	2	Hydride Atomic absorption spectrometry
	1	1	Sb	2	29.5	2	Hydride Atomic absorption spectrometry
	1	1	SO4	1	152000	80	Ion chromatography
	1	1	SO4	2	145000	80	Ion chromatography
Test on LOTnr: 26	**2**	1	Ba	1	311	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Ba	2	223.2	5	Atomic absorption spectrometry -Grafite Furnace
	2	1	Cu	1	450	2	Atomic absorption spectrometry
	2	1	Cu	2	500	2	Atomic absorption spectrometry
	2	1	Mo	1	46.8	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Mo	2	48.2	2	Atomic absorption spectrometry -Grafite Furnace
	2	1	Sb	1	33.5	2	Hydride Atomic absorption spectrometry
	2	1	Sb	2	33	2	Hydride Atomic absorption spectrometry
	2	1	SO4	1	151000	80	Ion chromatography
	2	1	SO4	2	150000	80	Ion chromatography

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	41						
Date experiment:	07-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	20	0.227	1300	22	
		2	30	0.227	1320	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 20	**1**	1	740	10.34	45.4		The liquid/solid separation was accomplished through centrifugation
Test on LOTnr: 30	**2**	1	768	10.34	42.6		The liquid/solid separation was accomplished through centrifugation
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 20	**1**	1	F	1	< 80000	80	Ion chromatography *
	1	1	F	2	< 80000	80	Ion chromatography *
	1	1	Cr(VI)	1	545000	50	Photometry
	1	1	Cr(VI)	2	535000	50	Photometry
	1	1	Cr	1	560000	200	Atomic absorption spectrometry
	1	1	Cr	2	560000	200	Atomic absorption spectrometry
	1	1	Cl	1	431000	80	Ion chromatography
	1	1	Cl	2	544000	80	Ion chromatography
	1	1	Cd	1	< 5	5	Atomic absorption spectrometry
	1	1	Cd	2	< 5	5	Atomic absorption spectrometry
Test on LOTnr: 30	**2**	1	F	1	<80000	80	Ion chromatography
	2	1	F	2	<80000	80	Ion chromatography
	2	1	Cr(VI)	1	558000	50	Photometry
	2	1	Cr(VI)	2	530000	50	Photometry
	2	1	Cr	1	570000	200	Atomic absorption spectrometry
	2	1	Cr	2	570000	200	Atomic absorption spectrometry
	2	1	Cl	1	372000	80	Ion chromatography
	2	1	Cl	2	431000	80	Ion chromatography
	2	1	Cd	1	<5	5	Atomic absorption spectrometry
	2	1	Cd	2	<5	5	Atomic absorption spectrometry
		* REMARK: Due to the high concentrations of chlorides and also nitrates, the sample required a strong dilution (500 or even 1000 times)					
		prior to the analysis. This didn't allow for detection of fluorides, which were present at much lower					

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	42						
Date experiment:	27-07-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	12	0.175	1330	22	
		2	27	0.175	1330	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 12	1	1	0.35	10.2	5.66		EH was not determined
Test on LOTnr: 27	2	1	0.35	10.6	5.11		EH was not determined
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 12	1	1	Ba	1	210	5	ISO/DIS 11885
	1	1	Ba	2	210	5	ISO/DIS 11885
	1	1	Cu	1	1638	10	ISO/DIS 11885
	1	1	Cu	2	1638	10	ISO/DIS 11885
	1	1	Mo	1	229	10	ISO/DIS 11885
	1	1	Mo	2	225	10	ISO/DIS 11885
	1	1	Sb	1	30	1	ISO 11969
	1	1	Sb	2	30	1	ISO 11969
	1	1	SO4	1	295000	100	ISO 10304
	1	1	SO4	2	289000	100	ISO 10304
Test on LOTnr: 27	2	1	Ba	1	197	5	ISO/DIS 11885
	2	1	Ba	2	198	5	ISO/DIS 11885
	2	1	Cu	1	1504	10	ISO/DIS 11885
	2	1	Cu	2	1502	10	ISO/DIS 11885
	2	1	Mo	1	193	10	ISO/DIS 11885
	2	1	Mo	2	195	10	ISO/DIS 11885
	2	1	Sb	1	27	1	ISO 11969
	2	1	Sb	2	27	1	ISO 11969
	2	1	SO4	1	216000	100	ISO 10304
	2	1	SO4	2	224000	100	ISO 10304

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	42						
Date experiment:	27-07-00						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	12	0.09	1330	22	
		2	27	0.09	1330	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 12	1	1	0.9	10.7	2.04		EH was not determined
Test on LOTnr: 27	2	1	0.9	10.9	1.74		EH was not determined
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 12	1	1	Ba	1	143	5	ISO/DIS 11885
	1	1	Ba	2	144	5	ISO/DIS 11885
	1	1	Cu	1	610	10	ISO/DIS 11885
	1	1	Cu	2	615	10	ISO/DIS 11885
	1	1	Mo	1	57	10	ISO/DIS 11885
	1	1	Mo	2	56	10	ISO/DIS 11885
	1	1	Sb	1	39	1	ISO 11969
	1	1	Sb	2	39	1	ISO 11969
	1	1	SO4	1	312000	100	ISO 10304
	1	1	SO4	2	295000	100	ISO 10304
Test on LOTnr: 27	2	1	Ba	1	133	5	ISO/DIS 11885
	2	1	Ba	2	134	5	ISO/DIS 11885
	2	1	Cu	1	418	10	ISO/DIS 11885
	2	1	Cu	2	422	10	ISO/DIS 11885
	2	1	Mo	1	43	10	ISO/DIS 11885
	2	1	Mo	2	47	10	ISO/DIS 11885
	2	1	Sb	1	34	1	ISO 11969
	2	1	Sb	2	34	1	ISO 11969
	2	1	SO4	1	218000	100	ISO 10304
	2	1	SO4	2	208000	100	ISO 10304

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	42						
Date experiment:	27-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.175	1330	22	
		2	27	0.175	1330	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.35	10.4	5.82		EH was not determined
	1	2	1.4	10.8	1.02		EH was not determined
Test on LOTnr: 27	**2**	1	0.35	10.7	4.95		EH was not determined
	2	2	1.4	11	0.97		EH was not determined
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Ba	1	200	5	ISO/DIS 11885
	1	1	Ba	2	227	5	ISO/DIS 11885
	1	2	Ba	1	158	5	ISO/DIS 11885
	1	2	Ba	2	159	5	ISO/DIS 11885
	1	1	Cu	1	2160	10	ISO/DIS 11885
	1	1	Cu	2	2159	10	ISO/DIS 11885
	1	2	Cu	1	242	10	ISO/DIS 11885
	1	2	Cu	2	244	10	ISO/DIS 11885
	1	1	Mo	1	217	10	ISO/DIS 11885
	1	1	Mo	2	213	10	ISO/DIS 11885
	1	2	Mo	1	21	10	ISO/DIS 11885
	1	2	Mo	2	24	10	ISO/DIS 11885
	1	1	Sb	1	27	1	ISO 11969
	1	1	Sb	2	27	1	ISO 11969
	1	2	Sb	1	26	1	ISO 11969
	1	2	Sb	2	27	1	ISO 11969
	1	1	SO4	1	464000	100	ISO 10304
	1	1	SO4	2	461000	100	ISO 10304
	1	2	SO4	1	147000	100	ISO 10304
	1	2	SO4	2	144000	100	ISO 10304
Test on LOTnr: 27	**2**	1	Ba	1	190	5	ISO/DIS 11885
	2	1	Ba	2	190	5	ISO/DIS 11885
	2	2	Ba	1	142	5	ISO/DIS 11885
	2	2	Ba	2	141	5	ISO/DIS 11885
	2	1	Cu	1	1518	10	ISO/DIS 11885
	2	1	Cu	2	1514	10	ISO/DIS 11885
	2	2	Cu	1	172	10	ISO/DIS 11885
	2	2	Cu	2	172	10	ISO/DIS 11885
	2	1	Mo	1	185	10	ISO/DIS 11885
	2	1	Mo	2	185	10	ISO/DIS 11885
	2	2	Mo	1	17	10	ISO/DIS 11885
	2	2	Mo	2	15	10	ISO/DIS 11885
	2	1	Sb	1	28	1	ISO 11969
	2	1	Sb	2	28	1	ISO 11969
	2	2	Sb	1	25	1	ISO 11969
	2	2	Sb	2	25	1	ISO 11969
	2	1	SO4	1	301000	100	ISO 10304
	2	1	SO4	2	308000	100	ISO 10304
	2	2	SO4	1	115000	100	ISO 10304
	2	2	SO4	2	117000	100	ISO 10304

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**42**						
Date experiment:	27-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	12	0.09	1390	22	
		2	27	0.09	1400	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 12	**1**	1	0.9	10.7	1.98		EH was not determined
Test on LOTnr: 27	**2**	1	0.9	10.7	1.49		EH was not determined
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 12	**1**	1	Ba	1	150	5	ISO/DIS 11885
	1	1	Ba	2	149	5	ISO/DIS 11885
	1	1	Cu	1	813	10	ISO/DIS 11885
	1	1	Cu	2	811	10	ISO/DIS 11885
	1	1	Mo	1	67	10	ISO/DIS 11885
	1	1	Mo	2	61	10	ISO/DIS 11885
	1	1	Sb	1	50	1	ISO 11969
	1	1	Sb	2	50	1	ISO 11969
	1	1	SO4	1	308000	100	ISO 10304
	1	1	SO4	2	315000	100	ISO 10304
Test on LOTnr: 27	**2**	1	Ba	1	168	5	ISO/DIS 11885
	2	1	Ba	2	163	5	ISO/DIS 11885
	2	1	Cu	1	313	10	ISO/DIS 11885
	2	1	Cu	2	305	10	ISO/DIS 11885
	2	1	Mo	1	40	10	ISO/DIS 11885
	2	1	Mo	2	35	10	ISO/DIS 11885
	2	1	Sb	1	33	1	ISO 11969
	2	1	Sb	2	36	1	ISO 11969
	2	1	SO4	1	182000	100	ISO 10304
	2	1	SO4	2	185000	100	ISO 10304

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	42						
Date experiment:	27-07-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	19	0.09	0.013	22	F- was analysed with french standard by potentiometry
		2	23	0.09	0.013	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 19	**1**	1	0.85	9.3	49.5		EH was not determined
Test on LOTnr: 23	**2**	1	0.855	9.5	47.2		EH was not determined
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 19	**1**	1	F	1	700	100	NF T 90 004
	1	1	F	2	700	100	NF T 90 004
	1	1	Cr(VI)	1	602000	10	ISO 11083
	1	1	Cr(VI)	2	596000	10	ISO 11083
	1	1	Cr	1	568800	10	ISO/DIS 11885
	1	1	Cr	2	558800	10	ISO/DIS 11885
	1	1	Cl	1	641000	100	ISO 10304
	1	1	Cl	2	638000	100	ISO 10304
	1	1	Cd	1	< 5	5	ISO/DIS 11885
	1	1	Cd	2	< 5	5	ISO/DIS 11885
Test on LOTnr: 23	**2**	1	F	1	700	100	NF T 90 004
	2	1	F	2	700	100	NF T 90 004
	2	1	Cr(VI)	1	568000	10	ISO 11083
	2	1	Cr(VI)	2	572000	10	ISO 11083
	2	1	Cr	1	540500	10	ISO/DIS 11885
	2	1	Cr	2	553700	10	ISO/DIS 11885
	2	1	Cl	1	649000	100	ISO 10304
	2	1	Cl	2	636000	100	ISO 10304
	2	1	Cd	1	< 5	5	ISO/DIS 11885
	2	1	Cd	2	< 5	5	ISO/DIS 11885

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	43						
Date experiment:	12-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	13	0,10453*		22-24,5	*dry content 98,6%
		2	13	0,10455*		22-24,5	*dry content 98,6%
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 13	**1**	1	0.20744	9.686	4.54	266	double filter
Test on LOTnr: 13	**2**	1	0.20503	9.569	4.58	283	double filter
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 13	**1**	1	Ba	1	160	10	ICP-AES
	1	1	Ba	2	160	10	ICP-AES
	1	1	Cu	1	1300	10	ICP-AES
	1	1	Cu	2	1300	10	ICP-AES
	1	1	Mo	1	150	10	ICP-AES
	1	1	Mo	2	150	10	ICP-AES
	1	1	Sb	1	28	5	GFAAS
	1	1	Sb	2	31	5	GFAAS
	1	1	SO4	1	277000	100	IC
	1	1	SO4	2	276000	100	IC
Test on LOTnr: 13	**2**	1	Ba	1	180	10	ICP-AES
	2	1	Ba	2	180	10	ICP-AES
	2	1	Cu	1	1300	10	ICP-AES
	2	1	Cu	2	1300	10	ICP-AES
	2	1	Mo	1	160	10	ICP-AES
	2	1	Mo	2	160	10	ICP-AES
	2	1	Sb	1	38	5	GFAAS
	2	1	Sb	2	37	5	GFAAS
	2	1	SO4	1	297000	100	IC
	2	1	SO4	2	297000	100	IC

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	43						
Date experiment:	13-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	13	0,08143*		23,5-23,8	*dry content 98,6%
		2	13	0,08225*		23,5-23,8	*dry content 98,6%
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 13	**1**	1	0.80191	10.643	1.484	288	
Test on LOTnr: 13	**2**	1	0.80975	10.774	1.505	304	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 13	**1**	1	Ba	1	160	10	ICP-AES
	1	1	Ba	2	160	10	ICP-AES
	1	1	Cu	1	430	10	ICP-AES
	1	1	Cu	2	430	10	ICP-AES
	1	1	Mo	1	48	10	ICP-AES
	1	1	Mo	2	49	10	ICP-AES
	1	1	Sb	1	18	5	GFAAS
	1	1	Sb	2	16	5	GFAAS
	1	1	SO4	1	143000	100	IC
	1	1	SO4	2	142000	100	IC
Test on LOTnr: 13	**2**	1	Ba	1	150	10	ICP-AES
	2	1	Ba	2	150	10	ICP-AES
	2	1	Cu	1	470	10	ICP-AES
	2	1	Cu	2	470	10	ICP-AES
	2	1	Mo	1	48	10	ICP-AES
	2	1	Mo	2	48	10	ICP-AES
	2	1	Sb	1	18	5	GFAAS
	2	1	Sb	2	19	5	GFAAS
	2	1	SO4	1	140000	100	IC
	2	1	SO4	2	140000	100	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	43						
Date experiment:	12-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	13	0,20434*		22,5-24,5	*dry content 98,6%
		2	13	0,2064*		22,5-24,5	*dry content 98,6%
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 13	**1**	1	0.2044	10.416	4.51	385	
	1	2	0.80801	10.977	0.763	175	
Test on LOTnr: 13	**2**	1	0.2064	10.452	4.56	365	
	2	2	0.82995	10.921	0.768	161	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 13	**1**	1	Ba	1	150	10	ICP-AES
	1	1	Ba	2	150	10	ICP-AES
	1	2	Ba	1	150	10	ICP-AES
	1	2	Ba	2	150	10	ICP-AES
	1	1	Cu	1	1400	10	ICP-AES
	1	1	Cu	2	1400	10	ICP-AES
	1	2	Cu	1	210	10	ICP-AES
	1	2	Cu	2	200	10	ICP-AES
	1	1	Mo	1	140	10	ICP-AES
	1	1	Mo	2	140	10	ICP-AES
	1	2	Mo	1	21	10	ICP-AES
	1	2	Mo	2	21	10	ICP-AES
	1	1	Sb	1	30	5	*GFAAS*
	1	1	Sb	2	27	5	*GFAAS*
	1	2	Sb	1	33	5	*GFAAS*
	1	2	Sb	2	33	5	*GFAAS*
	1	1	SO4	1	318000	100	IC
	1	1	SO4	2	320000	100	IC
	1	2	SO4	1	93000	100	IC
	1	2	SO4	2	93000	100	IC
Test on LOTnr: 13	**2**	1	Ba	1	150	10	ICP-AES
	2	1	Ba	2	150	10	ICP-AES
	2	2	Ba	1	150	10	ICP-AES
	2	2	Ba	2	140	10	ICP-AES
	2	1	Cu	1	1500	10	ICP-AES
	2	1	Cu	2	1500	10	ICP-AES
	2	2	Cu	1	190	10	ICP-AES
	2	2	Cu	2	190	10	ICP-AES
	2	1	Mo	1	140	10	ICP-AES
	2	1	Mo	2	150	10	ICP-AES
	2	2	Mo	1	25	10	ICP-AES
	2	2	Mo	2	23	10	ICP-AES
	2	1	Sb	1	30	5	*GFAAS*
	2	1	Sb	2	27	5	*GFAAS*
	2	2	Sb	1	32	5	*GFAAS*
	2	2	Sb	2	28	5	*GFAAS*
	2	1	SO4	1	319000	100	IC
	2	1	SO4	2	326000	100	IC
	2	2	SO4	1	87000	100	IC
	2	2	SO4	2	87000	100	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	43						
Date experiment:	13-09-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	28	0,08903*		23,5-23,8	*dry content 98,9%
		2	28	0,08705*		23,5-23,8	*dry content 98,9%
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 28	**1**	1	0.87952	11.081	1.5	170	
Test on LOTnr: 28	**2**	1	0.86137	10.479	1.389	103	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 28	**1**	1	Ba	1	150	10	ICP-AES
	1	1	Ba	2	150	10	ICP-AES
	1	1	Cu	1	450	10	ICP-AES
	1	1	Cu	2	450	10	ICP-AES
	1	1	Mo	1	44	10	ICP-AES
	1	1	Mo	2	42	10	ICP-AES
	1	1	Sb	1	19	5	GFAAS
	1	1	Sb	2	20	5	GFAAS
	1	1	SO4	1	135000	100	IC
	1	1	SO4	2	134000	100	IC
Test on LOTnr: 28	**2**	1	Ba	1	160	10	ICP-AES
	2	1	Ba	2	160	10	ICP-AES
	2	1	Cu	1	390	10	ICP-AES
	2	1	Cu	2	390	10	ICP-AES
	2	1	Mo	1	42	10	ICP-AES
	2	1	Mo	2	42	10	ICP-AES
	2	1	Sb	1	20	5	GFAAS
	2	1	Sb	2	20	5	GFAAS
	2	1	SO4	1	136000	100	IC
	2	1	SO4	2	137000	100	IC

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	43						
Date experiment:	5.-6.9.2000						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	9	0,24395*		23.5	*dry content 39,42%
		2	32	0,24242*		23.5	*dry content 39,34%
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 9	**1**	1	0.81422	9.693	39	387	
Test on LOTnr: 32	**2**	1	0.80909	9.368	38.2	385	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 9	**1**	1	F	1	730	100	ISE
	1	1	F	2	700	100	ISE
	1	1	Cr(VI)	1	580000	50	calorimeter
	1	1	Cr(VI)	2	580000	50	calorimeter
	1	1	Cr	1	560000	200	FAAS
	1	1	Cr	2	560000	200	FAAS
	1	1	Cl	1	560000	100	IC
	1	1	Cl	2	560000	100	IC
	1	1	Cd	1	< 2	2	GFAAS
	1	1	Cd	2	< 2	2	GFAAS
Test on LOTnr: 32	**2**	1	F	1	690	100	ISE
	2	1	F	2	680	100	ISE
	2	1	Cr(VI)	1	580000	50	calorimeter
	2	1	Cr(VI)	2	590000	50	calorimeter
	2	1	Cr	1	560000	200	FAAS
	2	1	Cr	2	540000	200	FAAS
	2	1	Cl	1	540000	100	IC
	2	1	Cl	2	540000	100	IC
	2	1	Cd	1	< 2	2	GFAAS
	2	1	Cd	2	< 2	2	GFAAS

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	1	CEN TC292 EN 12457-1 (LS=2)					
Laboratory code:	44						
Date experiment:	00/07/26-00/09/08						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	14	1.78E-01	---	23	
		2	29	1.78E-01	---	23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 14	1	1	2.89E-01	10.95	5.59	---	
Test on LOTnr: 29	2	1	2.87E-01	10.93	5.02	---	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 14	1	1	Ba	1	---	---	---
	1	1	Ba	2	---	---	---
	1	1	Cu	1	1.85E+03	1.00E+01	AAS (flame)
	1	1	Cu	2	1.89E+03	1.00E+01	AAS (flame)
	1	1	Mo	1	2.20E+02	3.00E+01	AAS (flame)
	1	1	Mo	2	2.00E+02	3.00E+01	AAS (flame)
	1	1	Sb	1	---	---	---
	1	1	Sb	2	---	---	---
	1	1	SO4	1	1.94E+05	3.00E+03	Capillary Electrophoresis
	1	1	SO4	2	1.87E+05	3.00E+03	Capillary Electrophoresis
Test on LOTnr: 29	2	1	Ba	1	---	---	---
	2	1	Ba	2	---	---	---
	2	1	Cu	1	1.59E+03	1.00E+01	AAS (flame)
	2	1	Cu	2	1.60E+03	1.00E+01	AAS (flame)
	2	1	Mo	1	1.90E+02	3.00E+01	AAS (flame)
	2	1	Mo	2	1.70E+02	3.00E+01	AAS (flame)
	2	1	Sb	1	---	---	---
	2	1	Sb	2	---	---	---
	2	1	SO4	1	1.88E+05	3.00E+03	Capillary Electrophoresis
	2	1	SO4	2	1.92E+05	3.00E+03	Capillary Electrophoresis

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	44						
Date experiment:	00/08/07-00/09/08						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	14	9.17E-02	---	25	
		2	29	9.17E-02	---	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 14	1	1	8.56E-01	11.04	1.801	---	
Test on LOTnr: 29	2	1	8.47E-01	11.06	1.711	---	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 14	1	1	Ba	1	---	---	---
	1	1	Ba	2	---	---	---
	1	1	Cu	1	5.10E+02	1.00E+01	AAS (flame)
	1	1	Cu	2	5.50E+02	1.00E+01	AAS (flame)
	1	1	Mo	1	4.00E+01	3.00E+01	AAS (flame)
	1	1	Mo	2	4.00E+01	3.00E+01	AAS (flame)
	1	1	Sb	1	---	---	---
	1	1	Sb	2	---	---	---
	1	1	SO4	1	1.24E+05	1.00E+04	Capillary Electrophoresis
	1	1	SO4	2	1.50E+05	1.00E+04	Capillary Electrophoresis
Test on LOTnr: 29	2	1	Ba	1	---	--	--
	2	1	Ba	2	---	--	--
	2	1	Cu	1	4.50E+02	1.00E+01	AAS (flame)
	2	1	Cu	2	4.50E+02	1.00E+01	AAS (flame)
	2	1	Mo	1	4.00E+01	3.00E+01	AAS (flame)
	2	1	Mo	2	4.00E+01	3.00E+01	AAS (flame)
	2	1	Sb	1	---	---	---
	2	1	Sb	2	---	---	---
	2	1	SO4	1	1.26E+05	3.00E+03	Capillary Electrophoresis
	2	1	SO4	2	1.26E+05	3.00E+03	Capillary Electrophoresis

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	44						
Date experiment:	00/08/09-00/09/14						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	14	0.1784	---	25	
		2	29	0.1874	---	25	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 14	**1**	1	2.83E-01	10.75	5.3	---	
	1	2	1.38E+00	11.1	1.028	---	
Test on LOTnr: 29	**2**	1	2.82E-01	10.88	4.96	---	
	2	2	1.38E+00	11.24	1.072	---	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 14	**1**	1	Ba	1	---	---	---
	1	1	Ba	2	---	---	---
	1	2	Ba	1	---	---	---
	1	2	Ba	2	---	---	---
	1	1	Cu	1	2.00E+03	1.00E+01	AAS (flame)
	1	1	Cu	2	1.85E+03	1.00E+01	AAS (flame)
	1	2	Cu	1	2.70E+02	1.00E+01	AAS (flame)
	1	2	Cu	2	2.40E+02	1.00E+01	AAS (flame)
	1	1	Mo	1	1.70E+02	3.00E+01	AAS (flame)
	1	1	Mo	2	1.60E+02	3.00E+01	AAS (flame)
	1	2	Mo	1	<DTL	3.00E+01	AAS (flame)
	1	2	Mo	2	<DTL	3.00E+01	AAS (flame)
	1	1	Sb	1	---	---	---
	1	1	Sb	2	---	---	---
	1	2	Sb	1	---	---	---
	1	2	Sb	2	---	---	---
	1	1	SO4	1	2.85E+05	6.00E+03	Capillary Electrophoresis
	1	1	SO4	2	2.77E+05	6.00E+03	Capillary Electrophoresis
	1	2	SO4	1	8.70E+04	6.00E+03	Capillary Electrophoresis
	1	2	SO4	2	8.60E+04	6.00E+03	Capillary Electrophoresis
Test on LOTnr: 29	**2**	1	Ba	1	---	---	---
	2	1	Ba	2	---	---	---
	2	2	Ba	1	---	---	---
	2	2	Ba	2	---	---	---
	2	1	Cu	1	1.66E+03	1.00E+01	AAS (flame)
	2	1	Cu	2	1.66E+03	1.00E+01	AAS (flame)
	2	2	Cu	1	2.30E+02	1.00E+01	AAS (flame)
	2	2	Cu	2	2.40E+02	1.00E+01	AAS (flame)
	2	1	Mo	1	1.40E+02	3.00E+01	AAS (flame)
	2	1	Mo	2	2.00E+02	3.00E+01	AAS (flame)
	2	2	Mo	1	<DTL	3.00E+01	AAS (flame)
	2	2	Mo	2	<DTL	3.00E+01	AAS (flame)
	2	1	Sb	1	---	---	---
	2	1	Sb	2	---	---	---
	2	2	Sb	1	---	---	---
	2	2	Sb	2	---	---	---
	2	1	SO4	1	2.45E+05	6.00E+03	Capillary Electrophoresis
	2	1	SO4	2	2.58E+05	6.00E+03	Capillary Electrophoresis
	2	2	SO4	1	9.40E+04	6.00E+03	Capillary Electrophoresis
	2	2	SO4	2	9.00E+04	6.00E+03	Capillary Electrophoresis

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	MBA						
Test code:	4	CEN TC292 EN 12457-4 (LS=10, 10mm)					
Laboratory code:	44						
Date experiment:	00/08/16-00/09/14						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	14	0.0917	---	23	
		2	29	0.0917	---	23	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 14	1	1	8.49E-01	11.09	1.915	---	
Test on LOTnr: 29	2	1	8.65E-01	11.24	1.621	---	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 14	1	1	Ba	1	---	---	---
	1	1	Ba	2	---	---	---
	1	1	Cu	1	6.50E+02	1.00E+01	AAS (flame)
	1	1	Cu	2	6.20E+02	1.00E+01	AAS (flame)
	1	1	Mo	1	6.00E+01	3.00E+01	AAS (flame)
	1	1	Mo	2	7.00E+01	3.00E+01	AAS (flame)
	1	1	Sb	1	---	---	---
	1	1	Sb	2	---	---	---
	1	1	SO4	1	1.34E+05	3.00E+03	Capillary Electrophoresis
	1	1	SO4	2	1.40E+05	3.00E+03	Capillary Electrophoresis
Test on LOTnr: 29	2	1	Ba	1	---	---	---
	2	1	Ba	2	---	---	---
	2	1	Cu	1	3.90E+02	1.00E+01	AAS (flame)
	2	1	Cu	2	4.40E+02	1.00E+01	AAS (flame)
	2	1	Mo	1	6.00E+01	3.00E+01	AAS (flame)
	2	1	Mo	2	5.00E+01	3.00E+01	AAS (flame)
	2	1	Sb	1	---	---	---
	2	1	Sb	2	---	---	---
	2	1	SO4	1	9.40E+04	3.00E+03	Capillary Electrophoresis
	2	1	SO4	2	1.12E+05	3.00E+03	Capillary Electrophoresis

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	CHS						
Test code:	2	CEN TC292 EN 12457-2 (LS=10)					
Laboratory code:	44						
Date experiment:	00/08/28-00/09/14						
Test/Sample parameters:		LST_nr	LOT_NR	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	kg	kg/m3	°C	-
		1	16	0.1845	---	22	
		2	25	0.1845	---	22	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	Liter	-	mS/cm	mV	-
Test on LOTnr: 16	1	1	7.88E-01	9.96	47.2	---	
Test on LOTnr: 25	2	1	8.06E-01	9.97	47	---	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	µg/L	µg/L	-
Test on LOTnr: 16	1	1	F	1	<DTL	3.00E+04	Capillary Electrophoresis
	1	1	F	2	<DTL	3.00E+04	Capillary Electrophoresis
	1	1	Cr(VI)	1	---	---	---
	1	1	Cr(VI)	2	---	---	---
	1	1	Cr	1	6.23E+05	2.00E+01	AAS (flame)
	1	1	Cr	2	6.25E+05	2.00E+01	AAS (flame)
	1	1	Cl	1	6.47E+05	2.00E+01	Capillary Electrophoresis
	1	1	Cl	2	6.19E+05	2.00E+01	Capillary Electrophoresis
	1	1	Cd	1	<DTL	2.00E+00	AAS (flame)
	1	1	Cd	2	<DTL	2.00E+00	AAS (flame)
Test on LOTnr: 25	2	1	F	1	<DTL	3.00E+04	Capillary Electrophoresis
	2	1	F	2	<DTL	3.00E+04	Capillary Electrophoresis
	2	1	Cr(VI)	1	---	---	---
	2	1	Cr(VI)	2	---	---	---
	2	1	Cr	1	6.25E+05	2.00E+01	AAS (flame)
	2	1	Cr	2	6.24E+05	2.00E+01	AAS (flame)
	2	1	Cl	1	6.14E+05	2.00E+01	Capillary Electrophoresis
	2	1	Cl	2	6.09E+05	2.00E+01	Capillary Electrophoresis
	2	1	Cd	1	<DTL	2.00E+00	AAS (flame)
	2	1	Cd	2	<DTL	2.00E+00	AAS (flame)

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**1**	*CEN TC292 EN 12457-1 (LS=2)*					
Laboratory code:	45						
Date experiment:	17-jul-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.1009	n.a.	20	vochtgehalte (105°C) 1.11w
		2	30	0.1019	n.a.	20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	199.56	10.67	5.45	n.a.	
Test on LOTnr: 30	**2**	1	201.53	10.64	5.47	n.a.	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Ba	1	0.281	0.006	NEN 6426
	1	1	Ba	2	0.281	0.006	NEN 6426
	1	1	Cu	1	1.73	0.015	NEN 6426
	1	1	Cu	2	1.79	0.015	NEN 6426
	1	1	Mo	1	0.224	0.15	NEN 6426
	1	1	Mo	2	0.223	0.15	NEN 6426
	1	1	Sb	1	0.024	0.1	NEN 6426
	1	1	Sb	2	0.034	0.1	NEN 6426
	1	1	SO4	1	233	0.01	NEN 3106-2 / ISO 10304-2
	1	1	SO4	2	230	0.01	NEN 3106-2 / ISO 10304-2
Test on LOTnr: 30	**2**	1	Ba	1	0.26	0.006	NEN 6426
	2	1	Ba	2	0.26	0.006	NEN 6426
	2	1	Cu	1	1.88	0.015	NEN 6426
	2	1	Cu	2	1.89	0.015	NEN 6426
	2	1	Mo	1	0.199	0.15	NEN 6426
	2	1	Mo	2	0.206	0.15	NEN 6426
	2	1	Sb	1	0.019	0.1	NEN 6426
	2	1	Sb	2	0.029	0.1	NEN 6426
	2	1	SO4	1	263	0.01	NEN 3106-2 / ISO 10304-2
	2	1	SO4	2	279	0.01	NEN 3106-2 / ISO 10304-2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	45						
Date experiment:	17-jul-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.0974	n.a.	20	
		2	30	0.102	n.a.	20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.9632	11.41	1.597	n.a.	
Test on LOTnr: 30	**2**	1	1.00866	11.15	1.211	n.a.	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Ba	1	0.154	0.006	NEN 6426
	1	1	Ba	2	0.155	0.006	NEN 6426
	1	1	Cu	1	0.419	0.015	NEN 6426
	1	1	Cu	2	0.416	0.015	NEN 6426
	1	1	Mo	1	0.042	0.15	NEN 6426
	1	1	Mo	2	0.037	0.15	NEN 6426
	1	1	Sb	1	0.007	0.1	NEN 6426
	1	1	Sb	2	0.021	0.1	NEN 6426
	1	1	SO4	1	93	0.01	NEN 3106-2 / ISO 10304-2
	1	1	SO4	2	106	0.01	NEN 3106-2 / ISO 10304-2
Test on LOTnr: 30	**2**	1	Ba	1	0.132	0.006	NEN 6426
	2	1	Ba	2	0.13	0.006	NEN 6426
	2	1	Cu	1	0.281	0.015	NEN 6426
	2	1	Cu	2	0.28	0.015	NEN 6426
	2	1	Mo	1	0.03	0.15	NEN 6426
	2	1	Mo	2	0.027	0.15	NEN 6426
	2	1	Sb	1	0.007	0.1	NEN 6426
	2	1	Sb	2	0.028	0.1	NEN 6426
	2	1	SO4	1	72	0.01	NEN 3106-2 / ISO 10304-2
	2	1	SO4	2	70	0.01	NEN 3106-2 / ISO 10304-2

V: Intercomparison/Validation							CLUSTER 1
Samplecode:	**MBA**						
Test code:	**3**	*CEN TC292 EN 12457-3 (LS=2 & LS=8)*					
Laboratory code:	45						
Date experiment:	19-jul-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.1048	n.a.	20	
		2	30	0.0966	n.a.	20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	0.20727	10.97	4.8	n.a.	
	1	2	0.82908	11.31	0.927	n.a.	
Test on LOTnr: 30	**2**	1	0.19105	10.6	5.57	n.a.	
	2	2	0.76421	10.99	0.955	n.a.	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Ba	1	0.205	0.006	NEN 6426
	1	1	Ba	2	0.207	0.006	NEN 6426
	1	2	Ba	1	0.165	0.015	NEN 6426
	1	2	Ba	2	0.16	0.015	NEN 6426
	1	1	Cu	1	1.75	0.15	NEN 6426
	1	1	Cu	2	1.77	0.15	NEN 6426
	1	2	Cu	1	0.201	0.1	NEN 6426
	1	2	Cu	2	0.191	0.1	NEN 6426
	1	1	Mo	1	0.194	0.006	NEN 6426
	1	1	Mo	2	0.196	0.006	NEN 6426
	1	2	Mo	1	0.021	0.015	NEN 6426
	1	2	Mo	2	0.018	0.015	NEN 6426
	1	1	Sb	1	0.017	0.15	NEN 6426
	1	1	Sb	2	0.007	0.15	NEN 6426
	1	2	Sb	1	0.012	0.1	NEN 6426
	1	2	Sb	2	0.009	0.1	NEN 6426
	1	1	SO4	1	373	0.01	NEN 3106-2 / ISO 10304-2
	1	1	SO4	2	392	0.01	NEN 3106-2 / ISO 10304-2
	1	2	SO4	1	84	0.01	NEN 3106-2 / ISO 10304-2
	1	2	SO4	2	78	0.01	NEN 3106-2 / ISO 10304-2
Test on LOTnr: 30	**2**	1	Ba	1	0.198	0.006	NEN 6426
	2	1	Ba	2	0.192	0.006	NEN 6426
	2	2	Ba	1	0.157	0.015	NEN 6426
	2	2	Ba	2	0.159	0.015	NEN 6426
	2	1	Cu	1	1.82	0.15	NEN 6426
	2	1	Cu	2	1.79	0.15	NEN 6426
	2	2	Cu	1	0.23	0.1	NEN 6426
	2	2	Cu	2	0.225	0.1	NEN 6426
	2	1	Mo	1	0.161	0.006	NEN 6426
	2	1	Mo	2	0.163	0.006	NEN 6426
	2	2	Mo	1	0.018	0.015	NEN 6426
	2	2	Mo	2	0.014	0.015	NEN 6426
	2	1	Sb	1	0.025	0.15	NEN 6426
	2	1	Sb	2	0.014	0.15	NEN 6426
	2	2	Sb	1	0.012	0.1	NEN 6426
	2	2	Sb	2	0.004	0.1	NEN 6426
	2	1	SO4	1	420	0.01	NEN 3106-2 / ISO 10304-2
	2	1	SO4	2	411	0.01	NEN 3106-2 / ISO 10304-2
	2	2	SO4	1	100	0.01	NEN 3106-2 / ISO 10304-2
	2	2	SO4	2	102	0.01	NEN 3106-2 / ISO 10304-2

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**MBA**						
Test code:	**4**	*CEN TC292 EN 12457-4 (LS=10, 10mm)*					
Laboratory code:	**45**						
Date experiment:	17-jul-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	15	0.1047	n.a.	20	
		2	30	0.1044	n.a.	20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 15	**1**	1	1.2617	11.25	1.348	n.a.	
Test on LOTnr: 30	**2**	1	1.03239	11.18	1.236	n.a.	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 15	**1**	1	Ba	1	0.145	0.006	NEN 6426
	1	1	Ba	2	0.142	0.006	NEN 6426
	1	1	Cu	1	0.364	0.015	NEN 6426
	1	1	Cu	2	0.365	0.015	NEN 6426
	1	1	Mo	1	0.032	0.15	NEN 6426
	1	1	Mo	2	0.033	0.15	NEN 6426
	1	1	Sb	1	0.009	0.1	NEN 6426
	1	1	Sb	2	0.013	0.1	NEN 6426
	1	1	SO4	1	112	0.01	NEN 3106-2 / ISO 10304-2
	1	1	SO4	2	93	0.01	NEN 3106-2 / ISO 10304-2
Test on LOTnr: 30	**2**	1	Ba	1	0.138	0.006	NEN 6426
	2	1	Ba	2	0.137	0.006	NEN 6426
	2	1	Cu	1	0.304	0.015	NEN 6426
	2	1	Cu	2	0.303	0.015	NEN 6426
	2	1	Mo	1	0.018	0.15	NEN 6426
	2	1	Mo	2	0.024	0.15	NEN 6426
	2	1	Sb	1	0.012	0.1	NEN 6426
	2	1	Sb	2	0.001	0.1	NEN 6426
	2	1	SO4	1	64	0.01	NEN 3106-2 / ISO 10304-2
	2	1	SO4	2	63	0.01	NEN 3106-2 / ISO 10304-2

V: Intercomparison/Validation							**CLUSTER 1**
Samplecode:	**CHS**						
Test code:	**2**	*CEN TC292 EN 12457-2 (LS=10)*					
Laboratory code:	45						
Date experiment:	24-jul-00						
Test/Sample parameters:		LST_nr	**LOT_NR**	WEIGHT	DENS	TEMP	TEST_REMARKS
		-	-	*kg*	*kg/m3*	*°C*	-
		1	22	258.5	n.a.	20	vochtg. (105°C) = 62.1wt%
		2	22	258.5	n.a.	20	
Fraction parameters:	LST_nr	FRC_NR	VOLUME	pH	COND	EH	REMARKS
	-	-	*Liter*	-	*mS/cm*	*mV*	-
Test on LOTnr: 22	**1**	1	0.899	10.09	24.8	n.a.	
Test on LOTnr: 22	**2**	1	0.906	10.11	24.3	n.a.	
Conc. parameters:	LST_nr	FRC_NR	ELEMENT	DUPL_AN	CONC	DTL	ANAL_METH
	-	-	-	-	*µg/L*	*µg/L*	-
Test on LOTnr: 22	**1**	1	F	1	n.d.	0.01	NEN 3106-2 / ISO 10304-2
	1	1	F	2	n.d.	0.01	NEN 3106-2 / ISO 10304-2
	1	1	Cr(VI)	1	257	0.04	NEN 6485
	1	1	Cr(VI)	2	250	0.04	NEN 6485
	1	1	Cr	1	288	0.014	ISO/DIS 11885
	1	1	Cr	2	285	0.014	ISO/DIS 11885
	1	1	Cl	1	324	0.025	NEN 3106-2 / ISO 10304-2
	1	1	Cl	2	345	0.025	NEN 3106-2 / ISO 10304-2
	1	1	Cd	1	0.001	0.015	ISO/DIS 11885
	1	1	Cd	2	0.001	0.015	ISO/DIS 11885
Test on LOTnr: 22	**2**	1	F	1	n.d.	0.01	NEN 3106-2 / ISO 10304-2
	2	1	F	2	n.d.	0.01	NEN 3106-2 / ISO 10304-2
	2	1	Cr(VI)	1	245	0.04	NEN 6485
	2	1	Cr(VI)	2	245	0.04	NEN 6485
	2	1	Cr	1	278	0.014	ISO/DIS 11885
	2	1	Cr	2	274	0.014	ISO/DIS 11885
	2	1	Cl	1	337	0.025	NEN 3106-2 / ISO 10304-2
	2	1	Cl	2	320	0.025	NEN 3106-2 / ISO 10304-2
	2	1	Cd	1	0	0.015	ISO/DIS 11885
	2	1	Cd	2	0.002	0.015	ISO/DIS 11885

CHS **EN 12457 - 2**

F		Cr(VI)		Cr		Cl		Cd	
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
31A	9.6	31A	4940	31A	4327	31A	6210	31A	0.06
31A		31A	5290	31A	4360	31A	6160	31A	0.04
31B	9.8	31B	4940	31B	4251	31B	5390	31B	0.03
31B		31B	5210	31B	4256	31B	5640	31B	0.02
33A		33A	6500	33A	4430	33A	7800	33A	
33A		33A		33A	5010	33A		33A	
33B		33B	5600	33B	3970	33B	6740	33B	
33B		33B		33B	4330	33B		33B	0.04
34A	5.0	34A	5194	34A	4680	34A	5022	34A	
34A	5.2	34A	5445	34A	4614	34A	4949	34A	
34B	6.0	34B	5391	34B	5075	34B	5951	34B	
34B	5.5	34B	5410	34B	5030	34B	6074	34B	
35A	5.3	35A	5420	35A	5435	35A	6410	35A	
35A	5.4	35A	5430	35A	5425	35A	6410	35A	
35B	5.3	35B	4890	35B	5060	35B	5280	35B	
35B	5.4	35B	4990	35B	5180	35B	5280	35B	
36A		36A	5995	36A	6554	36A		36A	
36A		36A	6076	36A	6630	36A		36A	
36B		36B	5803	36B	6586	36B		36B	
36B		36B	6427	36B	6611	36B		36B	
38A	6.1	38A	5340	38A	5310	38A	5700	38A	
38A	6.3	38A	5360	38A	5350	38A	5660	38A	
38B	6.0	38B	5160	38B	5100	38B	5040	38B	
38B	5.8	38B	5110	38B	5100	38B	5060	38B	
39A	3.7	39A	3640	39A	3720	39A	3860	39A	
39A	3.3	39A	3650	39A	3740	39A	3690	39A	
39B	2.9	39B	3440	39B	3500	39B	3600	39B	
39B	3.3	39B	3500	39B	3530	39B	3530	39B	
41A		41A	5450	41A	5600	41A	4310	41A	
41A		41A	5350	41A	5600	41A	5440	41A	
41B		41B	5580	41B	5700	41B	3720	41B	
41B		41B	5300	41B	5700	41B	4310	41B	
42A	7.0	42A	6020	42A	5688	42A	6410	42A	
42A	7.0	42A	5960	42A	5588	42A	6380	42A	
42B	7.0	42B	5680	42B	5405	42B	6490	42B	
42B	7.0	42B	5720	42B	5537	42B	6360	42B	
43A	7.3	43A	5800	43A	5600	43A	5600	43A	
43A	7.0	43A	5800	43A	5600	43A	5600	43A	
43B	6.9	43B	5800	43B	5600	43B	5400	43B	
43B	6.8	43B	5900	43B	5400	43B	5400	43B	
44A		44A		44A	6230	44A	6470	44A	
44A		44A		44A	6250	44A	6190	44A	
44B		44B		44B	6250	44B	6140	44B	
44B		44B		44B	6240	44B	6090	44B	
45A		45A	2570	45A	2880	45A	3240	45A	0.01
45A		45A	2500	45A	2850	45A	3450	45A	0.01
45B		45B	2450	45B	2780	45B	3370	45B	0.00
45B		45B	2450	45B	2740	45B	3200	45B	0.02
	F		Cr(VI)		Cr		Cl		Cd
gem	5.99		5059		5008		5310		0.026
std	1.66		1089		1053		1145		0.019
%	27.7		21.5		21.0		21.6		73.5

COS EN 12457 - 1 **COS E**

	As		Pb		Cd		Ni		Co	
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode
13A	2.400	13A	6.80	13A	16.0	13A	4.20	13A	4.00	13A
13A	2.400	13A	6.80	13A	16.0	13A	4.20	13A	4.00	13A
13B	2.600	13B	6.40	13B	16.4	13B	4.40	13B	4.20	13B
13B	2.600	13B	6.40	13B	16.6	13B	4.40	13B	4.20	13B
14A	1.304	14A	8.32	14A	17.4	14A	4.80	14A	4.52	14A
14A	1.296	14A	8.28	14A	17.3	14A	4.66	14A	4.46	14A
14B	1.324	14B	7.58	14B	15.9	14B	4.52	14B	4.24	14B
14B	1.342	14B	7.80	14B	16.1	14B	4.52	14B	4.34	14B
15A	1.120	15A	3.40	15A	14.8	15A	4.00	15A	3.80	15A
15A	1.120	15A	3.20	15A	14.8	15A	4.00	15A	3.80	15A
15B	1.060	15B	3.60	15B	15.8	15B	3.60	15B	3.60	15B
15B	0.940	15B	3.60	15B	15.8	15B	3.60	15B	3.60	15B
17A	1.820	17A	8.62	17A	15.4	17A	3.95	17A	3.96	17A
17A	2.000	17A	8.46	17A	15.1	17A	3.81	17A	3.81	17A
17B	2.074	17B	9.04	17B	16.5	17B	3.89	17B	3.86	17B
17B	2.320	17B	8.52	17B	15.7	17B	3.83	17B	3.81	17B
18A	1.336	18A	5.16	18A	8.9	18A	2.38	18A	2.39	18A
18A	1.358	18A	5.17	18A	8.7	18A	2.33	18A	2.44	18A
18B	1.474	18B	5.59	18B	12.5	18B	3.49	18B	3.37	18B
18B	1.516	18B	5.34	18B	11.7	18B	3.55	18B	3.28	18B
19A	1.048	19A	6.50	19A	11.3	19A	3.20	19A	1.20	19A
19A	1.036	19A	6.56	19A	11.2	19A	3.23	19A	1.20	19A
19B	1.110	19B	6.87	19B	12.0	19B	3.43	19B	1.33	19B
19B	1.094	19B	6.89	19B	12.1	19B	3.47	19B	1.33	19B
20A	1.336	20A	8.38	20A	16.8	20A	4.14	20A	3.94	20A
20A	1.312	20A	8.38	20A	17.0	20A	4.10	20A	3.92	20A
20B	1.122	20B	7.18	20B	15.4	20B	3.70	20B	3.64	20B
20B	1.192	20B	7.08	20B	15.4	20B	3.68	20B	3.62	20B
21A	1.636	21A	6.72	21A	15.8	21A	4.05	21A	3.91	21A
21A	1.556	21A	6.98	21A	16.2	21A	4.24	21A	4.10	21A
21B	1.600	21B	6.19	21B	14.0	21B	3.80	21B	3.70	21B
21B	1.506	21B	6.74	21B	14.6	21B	3.88	21B	3.80	21B
22A	1.990	22A	5.80	22A	9.7	22A	2.67	22A	2.24	22A
22A	2.084	22A	5.91	22A	11.6	22A	2.80	22A	2.45	22A
22B	1.566	22B	5.71	22B	8.1	22B	2.01	22B	1.74	22B
22B	1.662	22B	5.59	22B	8.7	22B	2.01	22B	1.77	22B
23A	2.020	23A	6.92	23A	12.8	23A	3.20	23A	3.12	23A
23A	1.836	23A	6.78	23A	12.7	23A	3.28	23A	3.14	23A
23B	1.966	23B	6.94	23B	13.1	23B	3.48	23B	3.26	23B
23B	1.858	23B	6.86	23B	12.8	23B	3.34	23B	3.20	23B
24A	0.960	24A	5.80	24A	17.4	24A	4.00	24A	3.80	24A
24A	0.980	24A	5.60	24A	17.6	24A	4.00	24A	3.80	24A
24B	0.920	24B	6.00	24B	16.6	24B	4.00	24B	3.80	24B
24B	0.920	24B	6.40	24B	16.6	24B	4.40	24B	4.20	24B
	As		Pb		Cd		Ni		Co	
gem	1.539		6.519		14.244		3.687		3.361	gem
std	0.481		1.402		2.701		0.670		0.941	std
%	31.3		21.5		19.0		18.2		28.0	%

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As		Pb		Cd		Ni		Co
mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
6.600	13A	30.000	13A	22.000	13A	5.600	13A	5.300
7.900	13A	30.000	13A	22.000	13A	5.700	13A	5.400
6.900	13B	32.000	13B	21.000	13B	5.300	13B	5.200
7.500	13B	34.000	13B	22.000	13B	5.800	13B	5.400
4.260	14A	38.500	14A	24.600	14A	5.970	14A	5.180
4.270	14A	35.600	14A	23.500	14A	6.050	14A	4.990
4.170	14B	30.600	14B	18.800	14B	5.120	14B	4.270
4.340	14B	32.100	14B	20.400	14B	4.600	14B	4.650
4.100	15A	35.000	15A	19.000	15A	4.900	15A	4.400
4.100	15A	35.000	15A	20.000	15A	4.900	15A	4.500
4.000	15B	36.000	15B	20.000	15B	5.100	15B	4.900
3.600	15B	37.000	15B	20.000	15B	5.100	15B	4.700
5.450	17A	32.800	17A	20.700	17A	4.630	17A	4.580
5.590	17A	35.900	17A	23.500	17A	4.460	17A	4.360
6.060	17B	34.600	17B	23.600	17B	5.310	17B	5.190
6.240	17B	35.900	17B	25.500	17B	4.840	17B	4.570
4.030	18A	26.010	18A	15.400	18A	3.850	18A	4.040
4.100	18A	24.450	18A	14.670	18A	3.750	18A	4.000
3.970	18B	25.220	18B	15.370	18B	3.870	18B	4.160
3.900	18B	24.800	18B	15.040	18B	3.610	18B	4.060
3.300	19A	31.810	19A	16.510	19A	4.510	19A	2.440
3.250	19A	32.000	19A	16.290	19A	4.470	19A	3.710
3.390	19B	32.300	19B	16.290	19B	4.510	19B	2.390
3.200	19B	32.490	19B	16.130	19B	4.650	19B	3.490
4.100	20A	32.800	20A	21.400	20A	4.860	20A	4.630
4.110	20A	34.200	20A	21.500	20A	4.920	20A	4.700
3.870	20B	35.100	20B	21.500	20B	4.980	20B	4.880
3.830	20B	34.300	20B	21.400	20B	5.020	20B	4.930
5.280	21A	34.380	21A	20.820	21A	4.800	21A	4.620
5.210	21A	33.310	21A	21.920	21A	4.950	21A	4.730
5.060	21B	31.950	21B	20.230	21B	4.920	21B	4.870
5.070	21B	33.520	21B	21.300	21B	4.900	21B	4.750
5.680	22A	36.000	22A	14.510	22A	3.430	22A	2.830
5.960	22A	36.990	22A	16.130	22A	3.670	22A	2.990
5.630	22B	32.610	22B	16.120	22B	3.780	22B	3.150
6.180	22B	34.300	22B	19.030	22B	3.860	22B	3.210
6.060	23A	34.500	23A	17.500	23A	4.730	23A	3.930
5.460	23A	33.000	23A	17.500	23A	4.480	23A	3.820
5.420	23B	35.200	23B	18.000	23B	4.570	23B	4.060
5.240	23B	33.000	23B	17.200	23B	4.250	23B	3.840
3.000	24A	28.000	24A	22.000	24A	4.300	24A	3.900
3.000	24A	30.000	24A	22.000	24A	4.400	24A	4.300
2.900	24B	32.000	24B	22.000	24B	4.600	24B	4.500
2.900	24B	32.000	24B	23.000	24B	4.700	24B	4.400
As		Pb		Cd		Ni		Co
4.731		32.755		19.713		4.698		4.294
1.270		3.224		2.944		0.622		0.755
26.9		9.8		14.9		13.2		17.6

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Labcode	Cl mg/kg	Labcode	F mg/kg	Labcode	NO2 mg/kg	Labcode	Ba mg/kg	Labcode	Cr(VI) mg/kg
1A	2840	1A	7.00	1A		1A	0.700	1A	2.600
1A	2800	1A	7.00	1A		1A	0.800	1A	2.600
1B	2870	1B	7.00	1B		1B	0.800	1B	2.750
1B	2830	1B	7.00	1B		1B	0.800	1B	2.750
2A	2850	2A	8.20	2A	2.10	2A	0.700	2A	11.050
2A	2760	2A	8.30	2A	2.00	2A	0.600	2A	11.100
2B	2860	2B	8.20	2B	1.80	2B	0.600	2B	11.050
2B	2890	2B	8.50	2B	1.90	2B	0.600	2B	11.080
3A	2254	3A	7.78	3A		3A	0.500	3A	10.900
3A	2190	3A	9.32	3A		3A	0.490	3A	11.250
3B	2170	3B	7.98	3B		3B	0.490	3B	11.400
3B	2080	3B	7.32	3B		3B	0.500	3B	11.450
4A	2810	4A	8.70	4A	0.17	4A	0.658	4A	11.000
4A	2870	4A	8.10	4A	0.17	4A	0.657	4A	11.000
4B	2800	4B	8.30	4B	0.17	4B	0.659	4B	12.000
4B	2780	4B	8.10	4B	0.16	4B	0.655	4B	12.000
5A	2960	5A	6.20	5A		5A	0.640	5A	10.700
5A	3000	5A	5.90	5A		5A	0.655	5A	11.400
5B	3070	5B	5.60	5B		5B	0.660	5B	12.400
5B	3050	5B	5.80	5B		5B	0.674	5B	11.700
6A	2700	6A	5.70	6A	0.80	6A	0.766	6A	11.000
6A	2600	6A	7.00	6A	0.70	6A	0.770	6A	10.000
6B	2700	6B	5.50	6B	0.50	6B	0.754	6B	12.000
6B	2700	6B	5.50	6B	0.40	6B	0.755	6B	12.000
7A	2500	7A	2.00	7A	1.20	7A	1.000	7A	14.600
7A	2560	7A	2.00	7A	1.20	7A	0.800	7A	14.600
7B	2660	7B	4.00	7B	1.20	7B	0.300	7B	14.800
7B	2800	7B	4.00	7B	1.20	7B	0.300	7B	14.800
8A	2710	8A	5.38	8A		8A	0.599	8A	13.890
8A	2680	8A	5.34	8A		8A	0.599	8A	13.980
8B	2660	8B	5.75	8B		8B	0.616	8B	14.300
8B	2660	8B	5.75	8B		8B	0.648	8B	14.290
9A	2802	9A	8.90	9A	0.30	9A	0.701	9A	13.640
9A	2912	9A	9.40	9A	0.30	9A	0.687	9A	13.750
9AB	2933	9AB	9.40	9AB	0.33	9AB	0.695	9AB	14.640
9AB	2880	9AB	9.10	9AB	0.46	9AB	0.724	9AB	14.110
9B	2896	9B	9.00	9B	0.30	9B	0.715	9B	14.030
9B	2860	9B	9.60	9B	0.26	9B	0.740	9B	14.610
9BB	2811	9BB	10.00	9BB	0.33	9BB	0.736	9BB	15.150
9BB	2876	9BB	10.10	9BB	0.30	9BB	0.774	9BB	14.790
10A	2730	10A		10A		10A	0.540	10A	9.200
10A	2770	10A		10A		10A	0.530	10A	9.400
10B	2830	10B		10B		10B	0.540	10B	9.000
10B	2790	10B		10B		10B	0.530	10B	8.900
11A	2692	11A	7.70	11A	5.40	11A	0.740	11A	14.200
11A	2668	11A	7.80	11A	5.70	11A	0.730	11A	14.200
11B	2578	11B	7.00	11B	3.80	11B	0.630	11B	13.100
11B	2567	11B	7.00	11B	3.50	11B	0.610	11B	13.500
12A	2470	12A		12A	8.40	12A	0.484	12A	6.900
12A	2790	12A		12A	5.31	12A	0.503	12A	6.900
12B	2430	12B		12B	5.54	12B	0.493	12B	6.800
12B	2480	12B		12B	5.74	12B	0.502	12B	6.900
25A	2956	25A	8.200	25A		25A	0.760	25A	12.500
25A	3097	25A	8.200	25A		25A	0.730	25A	11.600
25AB	2839	25AB	8.400	25AB		25AB	0.760	25AB	12.500
25AB	2803	25AB	8.300	25AB		25AB	0.770	25AB	8.800
25B	2983	25B	14.5	25B		25B	0.750	25B	10.800
25B	2970	25B	14.7	25B		25B	0.840	25B	12.600
25BB	2802	25BB	13.9	25BB		25BB	0.790	25BB	7.900

25BB	2884	25BB	14.4	25BB		25BB	0.800	25BB	10.000
gem	2746.02		7.77		1.93		0.66		11.21
std	212.55		2.63		2.24		0.13		3.20
%	7.74		33.87		116.34		19.38		28.53

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	TOC		SO4		NH4		Ni		Co
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
1A	26200	1A	460.00	1A	2230	1A	2.500	1A	0.600
1A	28200	1A	500.00	1A	2220	1A	2.600	1A	0.600
1B	24300	1B	450.00	1B	2200	1B	2.700	1B	0.600
1B	26900	1B	430.00	1B	2210	1B	2.900	1B	0.600
2A	35000	2A	506.40	2A	4636	2A	3.000	2A	0.600
2A	36000	2A	493.50	2A	4675	2A	2.900	2A	0.600
2B	35000	2B	434.40	2B	5254	2B	2.900	2B	0.600
2B	34000	2B	434.10	2B	5306	2B	2.800	2B	0.500
3A	27300	3A	321.00	3A	1340	3A	2.200	3A	0.500
3A	28000	3A	192.00	3A	1240	3A	2.070	3A	0.520
3B	28400	3B	392.00	3B	1220	3B	2.450	3B	0.550
3B	29000	3B	402.00	3B	1340	3B	2.520	3B	0.550
4A	28960	4A	512.00	4A	2806	4A	2.500	4A	0.564
4A	28740	4A	509.00	4A	2703	4A	2.530	4A	0.562
4B	27690	4B	514.00	4B	2692	4B	2.550	4B	0.573
4B	27980	4B	508.00	4B	2673	4B	2.590	4B	0.563
5A	33960	5A	492.00	5A	2900	5A	2.770	5A	0.570
5A	34540	5A	514.00	5A	2880	5A	2.830	5A	0.580
5B	34340	5B	579.00	5B	2720	5B	2.450	5B	0.560
5B	35140	5B	567.00	5B	2740	5B	2.460	5B	0.560
6A	33000	6A	710.00	6A	2900	6A	1.840	6A	0.309
6A		6A		6A		6A	2.100	6A	0.321
6B	32000	6B	330.00	6B	1900	6B	2.440	6B	0.435
6B		6B		6B		6B	2.590	6B	0.446
7A	21870	7A	320.00	7A	2279	7A	2.300	7A	0.600
7A	22820	7A	330.00	7A	2300	7A	2.300	7A	0.600
7B	26465	7B	530.00	7B	6619	7B	2.300	7B	0.400
7B	26405	7B	520.00	7B	6615	7B	2.400	7B	0.400
8A	58100	8A	165	8A	1043	8A	1.932	8A	0.318
8A	55490	8A	169	8A	1079	8A	1.873	8A	0.316
8B	56585	8B	722	8B	669	8B	2.183	8B	0.412
8B	48213	8B	721	8B	673	8B	2.201	8B	0.400
9A	23980	9A	1068.7	9A	6438	9A	2.726	9A	0.358
9A	23800	9A	1063.6	9A	6440	9A	2.623	9A	0.356
9AB	23530	9AB	1212.2	9AB	6401	9AB	2.551	9AB	0.336
9AB	23620	9AB	965.70	9AB	6355	9AB	2.651	9AB	0.332
9B	21600	9B	602.80	9B	7111	9B	2.109	9B	0.329
9B	21550	9B	592.70	9B	7139	9B	2.220	9B	0.329
9BB	22020	9BB	744.60	9BB	7034	9BB	2.144	9BB	0.347
9BB	22050	9BB	624.80	9BB	6998	9BB	2.163	9BB	0.340
10A	38000	10A	530.00	10A	2300	10A	3.200	10A	0.710
10A	37000	10A	490.00	10A	2400	10A	3.200	10A	0.700
10B	37000	10B	650.00	10B	2300	10B	3.800	10B	0.950
10B	37000	10B	630.00	10B	2300	10B	3.100	10B	0.950
11A	34650	11A	485.00	11A	2470	11A	2.390	11A	0.520
11A	34390	11A	516.00	11A	2200	11A	2.250	11A	0.490
11B	34180	11B	493.00	11B	2230	11B	2.140	11B	0.490
11B	34080	11B	419.00	11B	2210	11B	2.070	11B	0.470
12A	28700	12A	690.00	12A	2967	12A	2.340	12A	0.514
12A	28500	12A	678.00	12A	2838	12A	2.350	12A	0.509
12B	30150	12B	645.00	12B	3096	12B	2.160	12B	0.499
12B	28500	12B	658.00	12B	2967	12B	2.240	12B	0.504
25A	36660	25A	510.00	25A	3120	25A	2.840	25A	0.590
25A	37430	25A	496.00	25A	3230	25A	2.880	25A	0.570
25AB	36760	25AB	484.00	25AB	3060	25AB	2.740	25AB	0.560
25AB	36170	25AB	501.00	25AB	3110	25AB	2.660	25AB	0.570
25B	37950	25B	560.00	25B	3170	25B	2.640	25B	0.580
25B	36950	25B	579.00	25B	3070	25B	2.700	25B	0.610
25BB	37380	25BB	653.00	25BB	3080	25BB	2.680	25BB	0.610

25BB	36180	25BB	599.00	25BB	3140	25BB	2.730	25BB	0.600
	TOC		SO4		NH4		Ni		Co
gem	32248		549.45		3297		2.52		0.52
std	8075		194.45		1822		0.36		0.13
%	25.04		35.39		55.25		14.33		25.80

SBW **EN 12457-1**

	Ba		Cu		Mo		F		Zn
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
13A	1.240	13A	0.018	13A	0.174	13A	5.160	13A	3.000
13A	1.220	13A	0.022	13A	0.164	13A	4.960	13A	3.000
13B	1.120	13B	0.022	13B	0.164	13B	4.100	13B	2.200
13B	1.160	13B	0.024	13B	0.174	13B	4.080	13B	2.400
13AB	1.240	13AB	0.018	13AB	0.154	13AB		13AB	2.800
13AB	1.320	13AB	0.019	13AB	0.156	13AB		13AB	2.800
13BB	1.200	13BB	0.024	13BB	0.156	13BB		13BB	2.400
13BB	1.220	13BB	0.024	13BB	0.160	13BB		13BB	2.400
14A	0.280	14A		14A	0.340	14A	9.200	14A	0.780
14A	0.280	14A		14A	0.260	14A	9.400	14A	0.780
14B	0.420	14B		14B	0.240	14B	8.400	14B	1.160
14B	0.440	14B		14B	0.320	14B	8.200	14B	1.200
15A	0.920	15A	0.064	15A	0.098	15A	7.200	15A	7.000
15A	0.920	15A	0.064	15A	0.092	15A	7.600	15A	7.000
15B	1.020	15B	0.620	15B	0.104	15B	7.600	15B	5.600
15B	1.000	15B	0.134	15B	0.096	15B	7.000	15B	5.400
17A	2.758	17A	0.016	17A	0.098	17A	7.280	17A	3.888
17A	3.020	17A	0.016	17A		17A	9.060	17A	3.996
17B	3.160	17B	0.012	17B		17B	0.636	17B	4.556
17B	3.388	17B	0.006	17B		17B	0.758	17B	4.508
18A	0.740	18A	0.050	18A	0.666	18A	3.240	18A	3.700
18A	0.724	18A	0.048	18A	0.652	18A	3.240	18A	3.440
18B	0.730	18B	0.081	18B	1.504	18B	3.540	18B	7.620
18B	0.742	18B	0.080	18B	1.578	18B	3.560	18B	7.720
19A	1.444	19A	0.002	19A	0.164	19A	13.400	19A	6.668
19A	1.448	19A	0.002	19A	0.166	19A		19A	6.732
19B	1.454	19B	0.002	19B	0.178	19B	6.600	19B	7.026
19B	1.378	19B	0.003	19B	0.186	19B		19B	6.524
20A	0.414	20A	0.090	20A	0.140	20A	7.840	20A	1.060
20A	0.412	20A	0.084	20A	0.138	20A	8.260	20A	1.050
20B	0.636	20B	0.062	20B	4.740	20B	9.780	20B	9.820
20B	0.624	20B	0.062	20B	4.640	20B	9.960	20B	9.780
21A	1.276	21A	0.046	21A	0.350	21A	6.600	21A	1.862
21A	1.270	21A	0.045	21A	0.348	21A	6.540	21A	1.864
21B	1.074	21B	0.085	21B	0.284	21B	7.860	21B	3.680
21B	1.076	21B	0.084	21B	0.286	21B	7.720	21B	3.720
22A	0.648	22A	0.018	22A	4.120	22A		22A	3.262
22A	0.630	22A	0.016	22A	4.104	22A		22A	3.356
22B	0.554	22B	0.412	22B	5.798	22B		22B	24.120
22B	0.536	22B	0.400	22B	5.416	22B		22B	24.340
23A	0.550	23A	0.007	23A	0.128	23A		23A	1.310
23A	0.548	23A	0.008	23A	0.127	23A		23A	1.394
23B	0.942	23B	0.008	23B	1.376	23B		23B	5.780
23B	0.904	23B	0.008	23B	1.460	23B		23B	5.680
24A	0.940	24A	0.054	24A	0.148	24A	10.800	24A	1.740
24A	0.940	24A	0.054	24A	0.138	24A	10.800	24A	1.740
24B	1.460	24B	0.032	24B	1.040	24B	13.200	24B	5.600
24B	1.520	24B	0.032	24B	1.060	24B	13.200	24B	5.800

	Ba		Cu		Mo		F		
gem	1.103		0.068		0.975		7.258		4.860
std	0.697		0.119		1.589		3.210		4.720
%	63.236		176.0		162.9		44.233		97.126

SBW **EN 12457-2**

	Ba		Cu		Mo		F		Zn
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
13A	11.000	13A	0.091	13A	0.210	13A	10.400	13A	2.100
13A	10.000	13A	0.086	13A	0.200	13A		13A	2.000
13B	11.000	13B	0.064	13B	0.210	13B	8.600	13B	1.900
13B	10.000	13B	0.070	13B	0.190	13B	8.300	13B	1.700
13AB	11.000	13AB	0.092	13AB	0.220	13AB		13AB	2.100
13AB	11.000	13AB	0.091	13AB	0.220	13AB		13AB	2.100
13BB	10.000	13BB	0.067	13BB	0.210	13BB		13BB	1.900
13BB	11.000	13BB	0.065	13BB	0.200	13BB		13BB	1.900
14A	3.900	14A		14A	1.300	14A	20.000	14A	1.000
14A	3.900	14A		14A	1.000	14A	20.000	14A	1.000
14B	2.100	14B		14B	1.200	14B	42.0	14B	5.800
14B	2.200	14B		14B	1.600	14B	41.0	14B	6.000
15A	7.600	15A	0.420	15A	0.080	15A	13.000	15A	7.000
15A	10.000	15A	0.390	15A	0.090	15A	13.000	15A	4.000
15B	11.000	15B	0.270	15B	0.130	15B	13.000	15B	4.500
15B	7.600	15B	0.390	15B	0.100	15B	13.000	15B	6.300
17A	6.790	17A	0.050	17A		17A	16.200	17A	3.430
17A	7.730	17A	0.030	17A		17A	20.800	17A	3.320
17B	7.800	17B	0.060	17B		17B	15.900	17B	3.380
17B	8.750	17B	0.030	17B		17B	19.400	17B	3.340
18A	3.040	18A	0.185	18A	1.630	18A	8.030	18A	3.580
18A	3.130	18A	0.182	18A	1.780	18A	8.190	18A	3.660
18B	3.110	18B	0.283	18B	3.310	18B	8.810	18B	14.300
18B	3.380	18B	0.284	18B	3.440	18B	8.760	18B	14.200
19A	15.01	19A		19A	0.140	19A	15.000	19A	9.530
19A	15.06	19A	0.006	19A	0.120	19A		19A	9.500
19B	14.19	19B		19B	0.130	19B	14.000	19B	8.300
19B	13.89	19B	0.008	19B	0.120	19B		19B	14.090
20A	2.890	20A	0.130	20A	0.450	20A	23.900	20A	0.860
20A	2.870	20A	0.130	20A	0.450	20A	25.000	20A	0.850
20B	6.940	20B	0.140	20B	2.090	20B	25.200	20B	3.200
20B	7.120	20B	0.180	20B	2.110	20B	25.000	20B	3.230
21A	4.080	21A	0.050	21A	0.688	21A	18.200	21A	2.210
21A	4.080	21A	0.048	21A	0.678	21A	18.000	21A	2.230
21B	9.410	21B	0.098	21B	1.250	21B	17.800	21B	5.650
21B	9.380	21B	0.096	21B	1.230	21B	17.500	21B	5.680
22A	5.550	22A		22A	2.130	22A		22A	2.130
22A	5.650	22A		22A	2.140	22A		22A	2.240
22B	6.610	22B	0.420	22B	7.040	22B		22B	21.490
22B	6.520	22B	0.390	22B	6.540	22B		22B	21.740
23A	4.370	23A		23A	0.451	23A		23A	1.230
23A	4.250	23A		23A	0.393	23A		23A	1.270
23B	11.100	23B	0.018	23B	1.520	23B		23B	3.990
23B	10.900	23B	0.016	23B	1.510	23B		23B	4.040
24A	5.600	24A	0.980	24A	0.540	24A	22.000	24A	5.000
24A	5.600	24A	1.000	24A	0.530	24A	21.000	24A	5.500
24B	11.000	24B	0.270	24B	1.700	24B	22.000	24B	5.400
24B	11.000	24B	0.270	24B	1.700	24B	23.000	24B	5.800
	Ba		Cu		Mo		F		Zn

gem	7.710	0.196	1.204	18.060	5.118
std	3.619	0.228	1.509	8.124	4.816
%	46.9	116.3	125.4	45.0	94.1

SBW **EN 12457-3**

	Ba			Cu			Mo	
Labcode	LS=2	LS=2+8	Labcode	LS=2	LS=2+8	Labcode	LS=2	LS=2+8
13A	1.500	9.505	13A	0.094	0.144	13A	0.166	0.317
13A	1.600	10.407	13A	0.106	0.167	13A	0.182	0.316
13A	1.300	8.906	13A	0.060	0.094	13A	0.150	0.148
13A	1.240	8.928	13A	0.056	0.091	13A	0.148	0.277
13B	1.680	9.683	13B	0.108	0.166	13B	0.184	0.334
13B	1.700	10.506	13B	0.110	0.182	13B	0.188	0.338
13B	1.580	10.387	13B	0.076	0.130	13B	0.170	0.176
13B	1.560	9.565	13B	0.074	0.128	13B	0.176	0.313
14A	0.460	3.794	14A			14A	0.500	
14A	0.440	3.703	14A			14A	0.480	
14B	1.280	8.724	14B	0.160		14B	2.640	2.720
14B	1.260	9.055	14B	0.180		14B	2.720	3.072
15A	0.840	8.685	15A	0.134	0.371	15A	0.104	0.138
15A	0.860	8.199	15A	0.138	0.441	15A	0.112	0.137
15B	0.780	9.797	15B	0.108	0.349	15B	0.108	0.106
15B	0.800	9.807	15B	0.106	0.397	15B	0.106	0.116
17A	2.366	6.040	17A	0.064	0.083	17A	0.142	
17A	2.504	6.807	17A	0.076	0.075	17A		
17B	2.440	6.486	17B	0.018	0.048	17B	0.132	
17B	2.592	7.289	17B	0.018	0.032	17B		
18A	0.798	3.478	18A	0.049	0.380	18A	0.902	2.094
18A	0.670	3.166	18A	0.051	0.382	18A	0.952	2.072
18B	0.790	3.182	18B	0.091	0.872	18B	1.212	1.194
18B	0.696	3.288	18B	0.088	0.851	18B	1.194	4.468
19A	1.478	12.51	19A	0.013		19A	0.168	0.313
19A	1.486	12.54	19A	0.016		19A	0.164	0.301
19B	1.470	12.88	19B	0.007	0.019	19B	0.170	0.166
19B	1.494	13.03	19B	0.013	0.030	19B	0.166	0.306
20A	0.482	3.73	20A	0.106	0.204	20A	0.974	1.288
20A	0.484	3.746	20A	0.106	0.205	20A	0.950	1.239
20B	0.462	5.934	20B	0.270	0.379	20B	6.320	6.320
20B	0.460	5.953	20B	0.272	0.384	20B	6.320	6.879
21A	0.522	7.977	21A			21A	0.234	0.708
21A	0.524	8.011	21A			21A	0.236	0.715
21B	0.864	3.301	21B	0.082		21B	1.974	1.966
21B	0.862	3.291	21B	0.081		21B	1.966	2.293
22A	0.898	7.096	22A	0.112	0.058	22A	3.220	1.280
22A	0.938	7.265	22A	0.112	0.059	22A	3.488	1.380
22B	0.624	5.175	22B	1.374	0.487	22B	6.080	6.264
22B	0.636	5.254	22B	1.360	0.490	22B	6.264	2.313
23A	0.526	3.523	23A	0.009		23A	0.151	0.617
23A	0.508	3.433	23A	0.008		23A	0.135	0.563
23B	1.020	8.971	23B	0.008		23B	1.328	1.302
23B	0.980	8.679	23B	0.008		23B	1.302	1.931
24A	0.760	4.601	24A	0.036		24A	1.220	1.902
24A	0.780	4.621	24A	0.036		24A	1.240	1.871
24B	1.080	7.483	24B	0.172	0.232	24B	3.800	3.800
24B	1.100	7.344	24B	0.170	0.226	24B	3.800	5.139

	Ba			Cu			Mo	
av	1.087	7.203		0.144	0.255		1.399	1.647
stdev	0.571	2.919		0.277	0.216		1.848	1.826
%	52.5	40.5		193	85		132	111

SBW **EN 12457-3**

	F			Zn	
Labcode	LS=2	LS=2+8	Labcode	LS=2	LS=2+8
13A	4.540	10.026	13A	3.800	5.203
13A	4.440	9.523	13A	4.200	5.755
13A	3.800	8.492	13A	4.727	4.727
13A	3.800	8.409	13A	4.526	4.526
13B			13B	4.200	5.679
13B			13B	4.200	5.755
13B			13B	5.481	5.481
13B			13B	5.199	5.199
14A	6.800	24.869	14A	0.660	0.893
14A	6.800	24.818	14A	0.660	0.879
14B	9.400	25.417	14B	5.926	5.926
14B	9.200	25.132	14B	5.742	5.742
15A	6.200	14.390	15A	5.000	5.981
15A	6.200	14.409	15A	5.000	6.501
15B	7.600	15.576	15B	7.842	7.842
15B	6.200	14.409	15B	6.270	6.270
17A	8.400	18.756	17A	5.792	5.505
17A	8.700	22.346	17A	6.038	6.327
17B			17B	25.97	25.966
17B			17B	27.03	27.030
18A	2.582	8.118	18A	1.352	3.048
18A	2.570	8.106	18A	1.322	2.842
18B	2.280	9.528	18B	19.500	19.500
18B	2.272	9.496	18B	19.194	19.194
19A	8.000	7.401	19A	6.646	14.031
19A			19A	5.882	12.858
19B	7.000	26.558	19B	13.119	13.119
19B			19B	13.472	13.472
20A	7.640	26.149	20A	1.354	1.372
20A	8.160	25.955	20A	1.318	1.303
20B	10.040	24.927	20B	17.099	17.099
20B	10.180	25.380	20B	17.306	17.306
21A	6.860	21.063	21A	1.060	1.684
21A	6.820	20.140	21A	1.072	1.714
21B	7.420	19.209	21B	10.404	10.404
21B	7.240	19.433	21B	10.475	10.475
22A			22A	3.766	0.912
22A			22A	3.828	1.124
22B			22B	4.933	4.933
22B			22B	5.158	5.158
23A			23A	1.464	1.706
23A			23A	1.438	1.715
23B			23B	5.574	5.574
23B			23B	5.494	5.494
24A	7.600	23.578	24A	1.160	1.674
24A	7.600	24.372	24A	1.180	1.691
24B	10.600	23.355	24B	7.323	7.323
24B	10.800	23.537	24B	7.309	7.309

	F			Zn	

gem	6.805	18.215		6.822	7.317
std	2.436	6.923		6.330	6.380
%	35.8	38.0		92.8	87.2

MBA **EN 12457-1**

	Ba		Cu		Mo		Sb		SO4
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
31A	0.296	31A	4.010	31A	0.382	31A	0.022	31A	794
31A	0.296	31A	4.054	31A	0.386	31A	0.022	31A	798
31B	0.302	31B	3.318	31B	0.339	31B	0.020	31B	640
31B	0.304	31B	3.342	31B	0.351	31B	0.016	31B	638
32A	0.712	32A	3.440	32A	0.350	32A	0.076	32A	434
32A	0.718	32A	3.440	32A	0.366	32A	0.076	32A	426
32B	0.778	32B	3.020	32B	0.324	32B	0.078	32B	358
32B	0.750	32B	3.020	32B	0.326	32B	0.080	32B	352
33A	0.188	33A	4.432	33A	0.542	33A		33A	1394
33A	0.195	33A	4.618	33A	0.582	33A		33A	
33B	0.230	33B	4.762	33B	0.510	33B		33B	1056
33B	0.240	33B	4.846	33B	0.519	33B		33B	
34A	0.516	34A	3.048	34A	0.390	34A	0.050	34A	320
34A	0.522	34A	3.100	34A	0.386	34A	0.054	34A	319
34B	0.530	34B	2.286	34B	0.294	34B	0.086	34B	256
34B	0.560	34B	2.334	34B	0.260	34B	0.090	34B	260
35A	0.404	35A	2.140	35A	0.244	35A	0.091	35A	630
35A	0.396	35A	2.040	35A	0.246	35A	0.095	35A	560
35B	0.754	35B	1.922	35B	0.204	35B	0.068	35B	710
35B	0.660	35B	2.140	35B	0.224	35B	0.062	35B	590
36A	0.484	36A	2.698	36A	0.294	36A	0.047	36A	348
36A	0.480	36A	2.688	36A	0.290	36A	0.040	36A	349
36B	0.426	36B	3.652	36B	0.364	36B	0.061	36B	534
36B	0.424	36B	3.644	36B	0.360	36B	0.058	36B	536
38A	0.408	38A	3.520	38A	0.362	38A	0.054	38A	397
38A	0.434	38A	3.360	38A	0.380	38A	0.050	38A	404
38B	0.508	38B	3.440	38B	0.362	38B	0.046	38B	300
38B	0.514	38B	3.300	38B	0.384	38B	0.044	38B	290
39A	0.400	39A	3.060	39A	0.300	39A	0.108	39A	397
39A	0.400	39A	3.060	39A	0.280	39A	0.108	39A	397
39B	0.460	39B	3.240	39B	0.320	39B	0.078	39B	372
39B	0.440	39B	3.200	39B	0.300	39B	0.090	39B	374
40A	0.720	40A	0.710	40A	0.328	40A		40A	480
40A	0.720	40A	0.698	40A	0.330	40A		40A	468
40B	0.702	40B	2.644	40B	0.322	40B		40B	576
40B	0.686	40B	2.638	40B	0.308	40B		40B	616
41A	0.576	41A	3.840	41A	0.516	41A	0.058	41A	640
41A	0.484	41A	3.940	41A	0.506	41A	0.057	41A	634
41B	0.552	41B	3.980	41B	0.464	41B	0.060	41B	558
41B	0.518	41B	4.140	41B	0.452	41B	0.051	41B	612
42A	0.420	42A	3.276	42A	0.458	42A	0.060	42A	590
42A	0.420	42A	3.276	42A	0.450	42A	0.060	42A	578
42B	0.394	42B	3.008	42B	0.386	42B	0.054	42B	432
42B	0.380	42B	3.004	42B	0.390	42B	0.054	42B	448
43A	0.320	43A	2.600	43A	0.300	43A	0.056	43A	554
43A	0.320	43A	2.600	43A	0.300	43A	0.062	43A	552
43B	0.360	43B	2.600	43B	0.320	43B	0.076	43B	594
43B	0.360	43B	2.600	43B	0.320	43B	0.074	43B	594
44A		44A	3.700	44A	0.440	44A		44A	388
44A		44A	3.780	44A	0.400	44A		44A	374
44B		44B	3.180	44B	0.380	44B		44B	376
44B		44B	3.200	44B	0.340	44B		44B	384
45A	0.562	45A	3.460	45A	0.448	45A	0.048	45A	466
45A	0.562	45A	3.580	45A	0.446	45A	0.068	45A	460
45B	0.520	45B	3.760	45B	0.398	45B	0.038	45B	526
45B	0.520	45B	3.780	45B	0.412	45B	0.058	45B	558

	Ba	Cu	Mo	Sb	SO4
gem	0.541	3.645	0.426	0.053	502.50

std	0.153	0.818	0.082	0.022	194.71
%	28.29	22.43	19.26	40.57	38.75

MBA **EN 12457-2**

	Ba		Cu		Mo		Sb		SO4
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
31A	0.780	31A	5.900	31A	0.410	31A	0.390	31A	2330
31A	0.790	31A	5.750	31A	0.430	31A	0.390	31A	2430
31B	0.500	31B	4.880	31B	0.510	31B	0.360	31B	2000
31B	0.490	31B	4.870	31B	0.590	31B	0.360	31B	1950
32A	2.330	32A	4.550	32A	0.450	32A	0.320	32A	1490
32A	2.320	32A	4.540	32A	0.370	32A	0.310	32A	1470
32B	2.720	32B	4.050	32B	0.470	32B	0.200	32B	1160
32B	2.720	32B	4.040	32B	0.420	32B	0.200	32B	1150
33A	0.721	33A	5.396	33A	0.419	33A		33A	2170
33A	0.766	33A	5.565	33A	0.773	33A		33A	
33B	0.897	33B	6.300	33B	0.791	33B		33B	2130
33B	0.953	33B	6.515	33B	0.842	33B		33B	
34A	1.970	34A	4.370	34A	0.590	34A	0.230	34A	1007
34A	2.220	34A	4.480	34A	0.600	34A	0.220	34A	1005
34B	2.020	34B	3.370	34B	0.400	34B	0.280	34B	850
34B	2.130	34B	3.410	34B	0.440	34B	0.280	34B	854
35A	1.310	35A	2.170	35A	0.184	35A	0.317	35A	1200
35A	1.380	35A	2.030	35A	0.187	35A	0.311	35A	1100
35B	2.360	35B	2.240	35B	0.206	35B	0.254	35B	960
35B	2.630	35B	2.530	35B	0.221	35B	0.268	35B	910
36A	1.930	36A	3.880	36A	0.426	36A	0.239	36A	1052
36A	1.970	36A	3.870	36A	0.439	36A	0.207	36A	1046
36B	1.770	36B	5.560	36B	0.552	36B	0.288	36B	1540
36B	1.770	36B	5.570	36B	0.553	36B	0.270	36B	1513
38A	1.700	38A	5.140	38A	0.540	38A	0.280	38A	1290
38A	1.820	38A	5.050	38A	0.570	38A	0.260	38A	1268
38B	1.580	38B	5.190	38B	0.570	38B	0.260	38B	1048
38B	1.660	38B	5.050	38B	0.600	38B	0.250	38B	1122
39A	1.500	39A	4.300	39A	0.470	39A	0.580	39A	1376
39A	1.500	39A	4.400	39A	0.410	39A	0.660	39A	1342
39B	1.900	39B	4.300	39B	0.410	39B	0.470	39B	1168
39B	1.900	39B	4.200	39B	0.410	39B	0.480	39B	1178
40A	1.290	40A	4.590	40A	0.480	40A		40A	2180
40A	1.270	40A	4.570	40A	0.510	40A		40A	2300
40B	1.120	40B	3.480	40B	0.370	40B		40B	2180
40B	1.140	40B	3.470	40B	0.470	40B		40B	2600
41A	2.344	41A	5.900	41A	0.996	41A	0.340	41A	1840
41A	2.184	41A	6.200	41A	0.868	41A	0.300	41A	1650
41B	2.356	41B	4.300	41B	0.676	41B	0.375	41B	1710
41B	2.136	41B	4.700	41B	0.610	41B	0.345	41B	1740
42A	1.43	42A	6.100	42A	0.570	42A	0.390	42A	3120
42A	1.44	42A	6.150	42A	0.560	42A	0.390	42A	2950
42B	1.330	42B	4.180	42B	0.430	42B	0.340	42B	2180
42B	1.340	42B	4.220	42B	0.470	42B	0.340	42B	2080
43A	1.600	43A	4.300	43A	0.480	43A	0.180	43A	1430
43A	1.600	43A	4.300	43A	0.490	43A	0.160	43A	1420
43B	1.500	43B	4.700	43B	0.480	43B	0.180	43B	1400
43B	1.500	43B	4.700	43B	0.480	43B	0.190	43B	1400
44A		44A	5.100	44A	0.400	44A		44A	1240
44A		44A	5.500	44A	0.400	44A		44A	1500
44B		44B	4.500	44B	0.400	44B		44B	1260
44B		44B	4.500	44B	0.400	44B		44B	1260
45A	1.540	45A	4.190	45A	0.420	45A	0.07	45A	930
45A	1.550	45A	4.160	45A	0.370	45A	0.21	45A	1060
45B	1.320	45B	2.810	45B	0.300	45B	0.07	45B	720
45B	1.300	45B	2.800	45B	0.270	45B	0.28	45B	700

	Ba	Cu	Mo	Sb	SO4
gem	1.428	3.490	0.340	0.158	852.500

std	0.556	1.054	0.159	0.113	565.028
%	39.0	30.2	46.7	71.9	66.3

MBA **EN 12457-4**

	Ba		Cu		Mo		Sb		SO4
Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg	Labcode	mg/kg
31A	0.610	31A	6.850	31A	0.460	31A	0.480	31A	2640
31A	0.610	31A	6.810	31A	0.460	31A	0.470	31A	2620
31B	0.450	31B	5.470	31B	0.440	31B	0.400	31B	2110
31B	0.480	31B	5.670	31B	0.430	31B	0.420	31B	2230
32A	2.470	32A	5.430	32A	0.420	32A	0.323	32A	1500
32A	2.490	32A	5.470	32A	0.370	32A	0.324	32A	1530
32B	2.630	32B	3.540	32B	0.360	32B	0.204	32B	840
32B	2.640	32B	3.550	32B	0.370	32B	0.207	32B	840
33A	0.638	33A	3.005	33A	0.446	33A		33A	1650
33A	0.640	33A	2.925	33A	0.512	33A		33A	
33B	1.292	33B	4.183	33B	0.466	33B		33B	1750
33B	1.279	33B	4.136	33B	0.501	33B		33B	
34A	2.050	34A	4.550	34A	0.450	34A	0.220	34A	965
34A	2.170	34A	4.340	34A	0.430	34A	0.240	34A	960
34B	2.190	34B	3.830	34B	0.410	34B	0.250	34B	868
34B	2.250	34B	3.850	34B	0.390	34B	0.260	34B	869
35A	1.140	35A	2.150	35A	0.190	35A	0.288	35A	860
35A	1.200	35A	2.340	35A	0.215	35A	0.274	35A	920
35B	2.360	35B	2.240	35B	0.206	35B	0.254	35B	960
35B	2.630	35B	2.530	35B	0.221	35B	0.268	35B	910
36A	2.010	36A	4.180	36A	0.444	36A	0.313	36A	964
36A	2.060	36A	4.310	36A	0.461	36A	0.374	36A	935
36B	1.790	36B	4.640	36B	0.424	36B	0.250	36B	1303
36B	1.780	36B	4.600	36B	0.419	36B	0.244	36B	1344
38A	1.300	38A	4.070	38A	0.470	38A	0.240	38A	1216
38A	1.420	38A	3.930	38A	0.520	38A	0.230	38A	1227
38B	1.310	38B	4.390	38B	0.390	38B	0.210	38B	990
38B	1.430	38B	4.340	38B	0.460	38B	0.230	38B	1029
39A	1.600	39A	4.000	39A	0.420	39A	0.540	39A	1288
39A	1.600	39A	3.900	39A	0.410	39A	0.480	39A	1266
39B	2.100	39B	3.600	39B	0.400	39B	0.430	39B	1142
39B	2.200	39B	3.800	39B	0.380	39B	0.460	39B	1139
40A	1.300	40A	4.450	40A	0.440	40A		40A	2240
40A	1.300	40A	4.410	40A	0.440	40A		40A	2200
40B	1.040	40B	3.260	40B	0.400	40B		40B	1860
40B	1.030	40B	3.250	40B	0.410	40B		40B	1890
41A	2.216	41A	5.000	41A	0.520	41A	0.330	41A	1520
41A	1.952	41A	5.400	41A	0.468	41A	0.295	41A	1450
41B	3.110	41B	4.500	41B	0.468	41B	0.335	41B	1510
41B	2.232	41B	5.000	41B	0.482	41B	0.330	41B	1500
42A	1.500	42A	8.130	42A	0.670	42A	0.500	42A	3080
42A	1.490	42A	8.110	42A	0.610	42A	0.500	42A	3150
42B	1.680	42B	3.130	42B	0.400	42B	0.330	42B	1820
42B	1.630	42B	3.050	42B	0.350	42B	0.360	42B	1850
43A	1.500	43A	4.500	43A	0.440	43A	0.190	43A	1350
43A	1.500	43A	4.500	43A	0.420	43A	0.200	43A	1340
43B	1.600	43B	3.900	43B	0.420	43B	0.200	43B	1360
43B	1.600	43B	3.900	43B	0.420	43B	0.200	43B	1370
44A		44A	6.500	44A	0.600	44A		44A	1340
44A		44A	6.200	44A	0.700	44A		44A	1400
44B		44B	3.900	44B	0.600	44B		44B	940
44B		44B	4.400	44B	0.500	44B		44B	1120
45A	1.450	45A	3.640	45A	0.320	45A	0.09	45A	1120
45A	1.420	45A	3.650	45A	0.330	45A	0.13	45A	930
45B	1.380	45B	3.040	45B	0.180	45B	0.12	45B	640
45B	1.370	45B	3.030	45B	0.240	45B	0.1	45B	630

	Ba		Cu		Mo		Sb		SO4
gem	1.637		4.312		0.425		0.298		1416

std	0.611	1.285	0.106	0.114	579
%	37.3	29.8	24.9	38.4	40.9

MBA **EN 12457-3**

	Ba			Cu			Mo	
	LS=2	LS=2+8		LS=2	LS=2+8		LS=2	LS=2+8
31A	0.278	0.794	31A	4.160	5.654	31A	0.232	0.415
31A	0.276	0.806	31A	4.250	5.904	31A	0.238	0.419
31B	0.256	0.684	31B	3.640	5.083	31B	0.256	0.452
31B	0.258	0.683	31B	3.636	5.162	31B	0.232	0.439
32A	0.706	2.152	32A	3.720	5.161	32A	0.310	0.445
32A	0.700	2.135	32A	3.720	5.070	32A	0.308	0.431
32B	0.802	2.566	32B	2.840	4.251	32B	0.292	0.536
32B	0.788	2.550	32B	2.800	4.161	32B	0.286	0.445
33A	0.170	0.775	33A	4.302	6.276	33A	0.449	0.762
33A	0.174	0.804	33A	4.404	6.377	33A	0.480	0.921
33B	0.152	1.065	33B	4.658	6.694	33B	0.469	0.774
33B	0.154	1.125	33B	4.772	6.780	33B	0.474	0.707
34A	0.450	2.002	34A	3.194	4.938	34A	0.628	0.892
34A	0.470	2.038	34A	3.204	4.892	34A	0.660	0.908
34B	0.504	2.024	34B	2.586	3.962	34B	0.328	0.536
34B	0.530	2.050	34B	2.642	4.010	34B	0.306	0.482
35A	0.380	1.740	35A	2.260	3.356	35A	0.218	0.340
35A	0.404	1.828	35A	2.020	3.364	35A	0.220	0.363
35B	0.774	2.654	35B	2.220	3.356	35B	0.196	0.302
35B	0.780	2.612	35B	2.380	3.508	35B	0.226	0.361
36A	0.444	1.919	36A	2.494	3.541	36A	0.280	0.415
36A	0.448	1.921	36A	2.496	3.268	36A	0.280	0.387
36B	0.384	1.912	36B	4.592	5.862	36B	0.408	0.531
36B	0.388	1.906	36B	4.584	5.289	36B	0.404	0.481
38A	0.270	1.531	38A	3.438	4.872	38A	0.316	0.529
38A	0.276	1.602	38A	3.360	4.666	38A	0.330	0.563
38B	0.366	1.477	38B	3.388	4.975	38B	0.338	0.663
38B	0.380	1.571	38B	3.308	4.727	38B	0.346	0.643
39A	0.320	1.600	39A	3.480	4.668	39A	0.300	0.410
39A	0.320	1.600	39A	3.420	4.629	39A	0.280	0.402
39B	0.420	2.100	39B	1.420	2.689	39B	0.182	0.377
39B	0.420	2.100	39B	1.420	2.693	39B	0.184	0.355
40A	0.808	1.875	40A	3.408	4.735	40A	0.312	0.469
40A	0.820	1.910	40A	3.446	4.896	40A	0.298	0.449
40B	0.578	1.325	40B	2.872	3.720	40B	0.296	0.439
40B	0.580	1.350	40B	2.872	3.921	40B	0.286	0.405
41A	0.618	2.685	41A	4.120	5.520	41A	0.454	0.719
41A	0.544	2.683	41A	4.260	5.897	41A	0.439	0.703
41B	0.559	2.529	41B	3.460	4.636	41B	0.382	0.598
41B	0.586	2.339	41B	3.600	5.012	41B	0.421	0.630
42A	0.400	1.664	42A	4.320	6.256	42A	0.434	0.602
42A	0.454	1.726	42A	4.318	6.270	42A	0.426	0.618
42B	0.380	1.516	42B	3.036	4.412	42B	0.370	0.506
42B	0.380	1.508	42B	3.028	4.404	42B	0.370	0.490
43A	0.300	1.500	43A	2.800	3.290	43A	0.280	0.329
43A	0.300	1.500	43A	2.800	3.200	43A	0.280	0.329
43B	0.300	1.500	43B	3.000	3.210	43B	0.280	0.365
43B	0.300	1.410	43B	3.000	3.210	43B	0.300	0.357
44A			44A	4.000	5.441	44A	0.340	
44A			44A	3.700	4.823	44A	0.320	
44B			44B	3.320	4.566	44B	0.280	
44B			44B	3.320	4.537	44B	0.400	
45A	0.410	1.729	45A	3.500	5.074	45A	0.388	0.552
45A	0.414	1.693	45A	3.540	5.033	45A	0.392	0.532
45B	0.396	1.651	45B	3.640	5.445	45B	0.322	0.463
45B	0.384	1.655	45B	3.580	5.345	45B	0.326	0.435
gem	0.441	1.732		3.353	4.691		0.337	0.513
std	0.180	0.531		0.765	1.025		0.097	0.154

%	40.8	30.6		22.8	21.8		28.8	29.9	

MBA **EN 12457-3**

	Sb			SO4	
	LS=2	LS=2+8		LS=2	LS=2+8
31A	0.024	0.493	31A	1054	2587
31A	0.038	0.452	31A	1084	2633
31B	0.044	0.419	31B	786	2158
31B	0.030	0.371	31B	790	2253
32A	0.049	0.271	32A	640	1278
32A	0.049	0.269	32A	642	1274
32B	0.042	0.224	32B	506	1111
32B	0.041	0.223	32B	492	1095
33A			33A	1824	3773
33A			33A		
33B			33B	1556	3120
33B			33B		
34A	0.040	0.216	34A	441.6	1065
34A	0.040	0.224	34A	440.2	1063
34B	0.048	0.248	34B	340.2	889
34B	0.050	0.282	34B	338.6	886
35A	0.108	0.303	35A	590	966
35A	0.102	0.309	35A	550	934
35B	0.081	0.253	35B	650	1042
35B	0.083	0.235	35B	660	1068
36A	0.040	0.215	36A	355.75	846
36A	0.039	0.205	36A	357.91	802
36B	0.047	0.281	36B	758.88	1442
36B	0.039	0.258	36B	759.52	1340
38A	0.062	0.294	38A	629	1222
38A	0.058	0.298	38A	638.8	1178
38B	0.056	0.231	38B	484.8	1101
38B	0.052	0.244	38B	481.6	1117
39A	0.076	0.530	39A	666.4	1330
39A	0.094	0.470	39A	666	1320
39B	0.108	0.523	39B	525.4	1216
39B	0.094	0.462	39B	527.2	1216
40A			40A	592	2161
40A			40A	626	2154
40B			40B	646	2131
40B			40B	662	2137
41A	0.064	0.291	41A	1174	1838
41A	0.060	0.325	41A	1176	1700
41B	0.068	0.348	41B	882	1519
41B	0.065	0.333	41B	876	1616
42A	0.054	0.262	42A	928	2104
42A	0.054	0.270	42A	922	2074
42B	0.056	0.256	42B	602	1522
42B	0.056	0.256	42B	616	1552
43A	0.060	0.327	43A	636	1155
43A	0.054	0.324	43A	640	1157
43B	0.060	0.318	43B	638	1102
43B	0.054	0.279	43B	652	1109
44A			44A	570	1184
44A			44A	554	1147
44B			44B	490	1179
44B			44B	516	1153
45A	0.034	0.129889	45A	746	1412
45A	0.014	0.086045	45A	784	1401
45B	0.05	0.145711	45B	840	1633
45B	0.028	0.059777	45B	822	1631
	0.056	0.291		700.48	1501.74
	0.022	0.104		276.15	599.37

38.4	35.7		39.4	39.9

MBA **EN 12457-4**

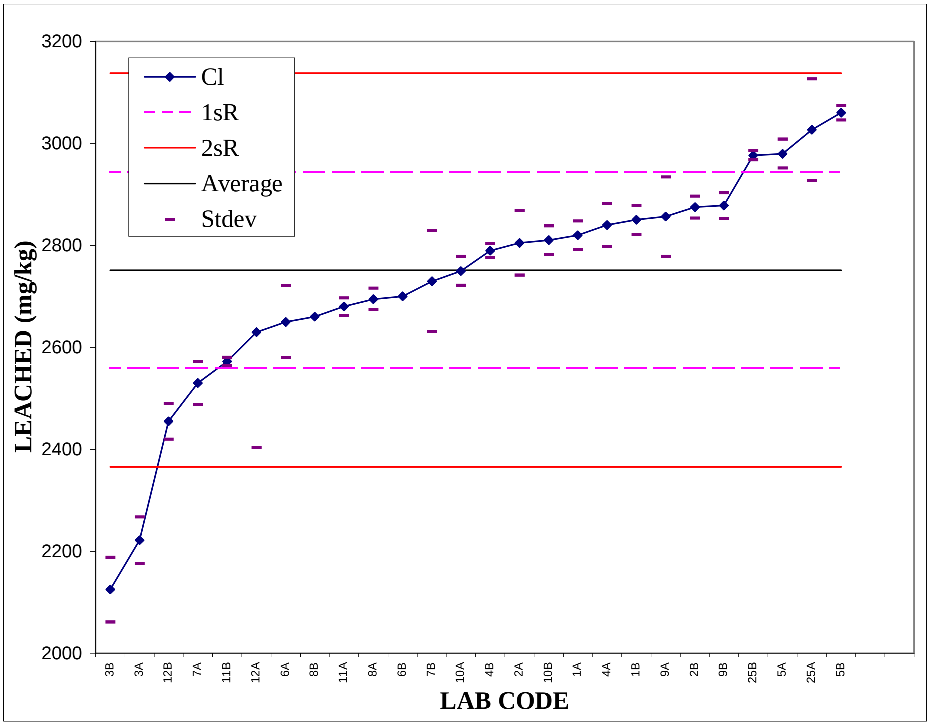
	Ba		Cu		Mo		Sb		SO4
31A	0.610	31A	6.850	31A	0.460	31A	0.480	31A	2640
31A	0.610	31A	6.810	31A	0.460	31A	0.470	31A	2620
31B	0.450	31B	5.470	31B	0.440	31B	0.400	31B	2110
31B	0.480	31B	5.670	31B	0.430	31B	0.420	31B	2230
32A	2.470	32A	5.430	32A	0.420	32A	0.323	32A	1500
32A	2.490	32A	5.470	32A	0.370	32A	0.324	32A	1530
32B	2.630	32B	3.540	32B	0.360	32B	0.204	32B	840
32B	2.640	32B	3.550	32B	0.370	32B	0.207	32B	840
33A	0.638	33A	3.005	33A	0.446	33A		33A	1650
33A	0.640	33A	2.925	33A	0.512	33A		33A	
33B	1.292	33B	4.183	33B	0.466	33B		33B	1750
33B	1.279	33B	4.136	33B	0.501	33B		33B	
34A	2.050	34A	4.550	34A	0.450	34A	0.220	34A	965
34A	2.170	34A	4.340	34A	0.430	34A	0.240	34A	960
34B	2.190	34B	3.830	34B	0.410	34B	0.250	34B	868
34B	2.250	34B	3.850	34B	0.390	34B	0.260	34B	869
35A	1.140	35A	2.150	35A	0.190	35A	0.288	35A	860
35A	1.200	35A	2.340	35A	0.215	35A	0.274	35A	920
35B	2.360	35B	2.240	35B	0.206	35B	0.254	35B	960
35B	2.630	35B	2.530	35B	0.221	35B	0.268	35B	910
36A	2.010	36A	4.180	36A	0.444	36A	0.313	36A	964
36A	2.060	36A	4.310	36A	0.461	36A	0.374	36A	935
36B	1.790	36B	4.640	36B	0.424	36B	0.250	36B	1303
36B	1.780	36B	4.600	36B	0.419	36B	0.244	36B	1344
38A	1.300	38A	4.070	38A	0.470	38A	0.240	38A	1216
38A	1.420	38A	3.930	38A	0.520	38A	0.230	38A	1227
38B	1.310	38B	4.390	38B	0.390	38B	0.210	38B	990
38B	1.430	38B	4.340	38B	0.460	38B	0.230	38B	1029
39A	1.600	39A	4.000	39A	0.420	39A	0.540	39A	1288
39A	1.600	39A	3.900	39A	0.410	39A	0.480	39A	1266
39B	2.100	39B	3.600	39B	0.400	39B	0.430	39B	1142
39B	2.200	39B	3.800	39B	0.380	39B	0.460	39B	1139
40A	1.300	40A	4.450	40A	0.440	40A		40A	2240
40A	1.300	40A	4.410	40A	0.440	40A		40A	2200
40B	1.040	40B	3.260	40B	0.400	40B		40B	1860
40B	1.030	40B	3.250	40B	0.410	40B		40B	1890
41A	2.216	41A	5.000	41A	0.520	41A	0.330	41A	1520
41A	1.952	41A	5.400	41A	0.468	41A	0.295	41A	1450
41B	3.110	41B	4.500	41B	0.468	41B	0.335	41B	1510
41B	2.232	41B	5.000	41B	0.482	41B	0.330	41B	1500
42A	1.500	42A	8.130	42A	0.670	42A	0.500	42A	3080
42A	1.490	42A	8.110	42A	0.610	42A	0.500	42A	3150
42B	1.680	42B	3.130	42B	0.400	42B	0.330	42B	1820
42B	1.630	42B	3.050	42B	0.350	42B	0.360	42B	1850
43A	1.500	43A	4.500	43A	0.440	43A	0.190	43A	1350
43A	1.500	43A	4.500	43A	0.420	43A	0.200	43A	1340
43B	1.600	43B	3.900	43B	0.420	43B	0.200	43B	1360
43B	1.600	43B	3.900	43B	0.420	43B	0.200	43B	1370
44A		44A	6.500	44A	0.600	44A		44A	1340
44A		44A	6.200	44A	0.700	44A		44A	1400
44B		44B	3.900	44B	0.600	44B		44B	940
44B		44B	4.400	44B	0.500	44B		44B	1120
45A	1.450	45A	3.640	45A	0.320	45A	0.09	45A	1120
45A	1.420	45A	3.650	45A	0.330	45A	0.13	45A	930
45B	1.380	45B	3.040	45B	0.180	45B	0.12	45B	640
45B	1.370	45B	3.030	45B	0.240	45B	0.1	45B	630
	Ba		Cu		Mo		Sb		SO4
gem	1.637		4.312		0.425		0.298		1416
std	0.611		1.285		0.106		0.114		579

%	37.30	29.80	24.86	38.45	40.89

MES **EN 12457-1**

Labcode	Sb mg/kg	Labcode	Ba mg/kg	Labcode	B mg/kg	Labcode	As mg/kg	Labcode	Pb mg/kg
1A	0.220	1A	1.520	1A	1.820	1A		1A	
1A	0.240	1A	1.520	1A	1.840	1A		1A	
1B	0.240	1B	1.980	1B	1.660	1B		1B	
1B	0.220	1B	1.980	1B	1.720	1B		1B	
2A	0.202	2A	1.288	2A	2.040	2A	0.090	2A	0.432
2A	0.212	2A	1.292	2A	2.000	2A	0.080	2A	0.438
2B	0.342	2B	1.430	2B	2.720	2B	0.070	2B	0.230
2B	0.322	2B	1.436	2B	2.780	2B	0.062	2B	0.230
3A	0.144	3A	2.554	3A	0.868	3A	0.022	3A	0.238
3A	0.146	3A	2.560	3A	1.018	3A	0.018	3A	0.342
3B	0.096	3B	2.520	3B	1.752	3B	0.014	3B	0.604
3B	0.078	3B	2.440	3B	1.700	3B	0.014	3B	0.602
4A	0.153	4A	1.910	4A	1.444	4A	0.014	4A	0.466
4A	0.153	4A	1.898	4A	1.458	4A	0.013	4A	0.464
4B		4B	1.688	4B	1.902	4B		4B	25.560
4B		4B	1.692	4B	1.954	4B		4B	25.320
5A	0.232	5A	1.956	5A	1.312	5A	0.023	5A	0.300
5A	0.246	5A	2.120	5A	1.406	5A	0.023	5A	0.280
5B	0.270	5B	1.390	5B	1.122	5B	0.023	5B	0.400
5B	0.270	5B	1.416	5B	1.142	5B	0.026	5B	0.380
6A	0.124	6A	1.594	6A	2.220	6A		6A	0.662
6A	0.128	6A	1.586	6A	2.220	6A		6A	0.670
6B	0.117	6B	1.664	6B	1.954	6B		6B	0.996
6B	0.113	6B	1.668	6B	1.958	6B		6B	1.008
7A	0.440	7A	0.980	7A	2.500	7A	0.020	7A	0.012
7A	0.440	7A	1.020	7A	2.700	7A	0.018	7A	0.012
7B	0.560	7B	0.820	7B	2.140	7B	0.038	7B	0.040
7B	0.480	7B	0.820	7B	2.200	7B	0.038	7B	0.040
8A	0.288	8A	0.924	8A	2.150	8A	0.013	8A	0.462
8A	0.289	8A	0.937	8A	2.140	8A	0.013	8A	0.471
8B	0.147	8B	1.501	8B	3.152	8B	0.032	8B	0.228
8B	0.145	8B	1.369	8B	3.156	8B	0.032	8B	0.204
9A	0.387	9A	2.066	9A	4.064	9A	0.028	9A	0.217
9A	0.386	9A	2.046	9A	4.138	9A	0.025	9A	0.221
9A	0.334	9A	1.861	9A	3.770	9A	0.025	9A	0.220
9A	0.331	9A	1.920	9A	3.804	9A	0.024	9A	0.225
9B	0.363	9B	1.548	9B	3.696	9B	0.038	9B	0.147
9B	0.365	9B	1.614	9B	3.824	9B	0.040	9B	0.165
9B	0.362	9B	1.540	9B	3.440	9B	0.030	9B	0.146
9B	0.361	9B	1.562	9B	3.438	9B	0.031	9B	0.164
10A	0.260	10A	0.780	10A	1.600	10A	0.009	10A	0.280
10A	0.260	10A	0.780	10A	1.600	10A	0.009	10A	0.260
10B	0.240	10B	0.980	10B	1.560	10B	0.013	10B	0.400
10B	0.260	10B	0.980	10B	1.620	10B	0.014	10B	0.400
11A	0.168	11A	1.110	11A	1.450	11A	0.006	11A	0.050
11A	0.168	11A	1.160	11A	1.076	11A	0.012	11A	0.056
11B	0.286	11B	1.520	11B	1.686	11B	0.020	11B	0.060
11B	0.288	11B	1.568	11B	1.256	11B	0.016	11B	0.056
12A	0.232	12A	1.462	12A	3.700	12A	0.026	12A	0.160
12A	0.248	12A	1.416	12A	3.720	12A	0.026	12A	0.174
12B	0.030	12B	1.142	12B	3.240	12B	0.007	12B	0.684
12B	0.030	12B	1.140	12B	3.280	12B	0.006	12B	0.786
25A	0.140	25A	1.486	25A	2.144	25A	0.022	25A	0.342
25A	0.140	25A	1.476	25A	2.194	25A	0.022	25A	0.328
25AB	0.124	25AB	1.698	25AB	1.958	25AB	0.016	25A	0.494
25AB	0.124	25AB	1.700	25AB	2.010	25AB	0.017	25A	0.490
25B	0.252	25B	1.328	25B	2.222	25B	0.028	25B	0.346
25B	0.256	25B	1.348	25B	2.270	25B	0.028	25B	0.336
25BB	0.260	25BB	1.330	25BB	2.358	25BB	0.029	25B	0.314

Sample	**FCM**	Average	2752	mg/kg	Sr Anal	49	mg/kg	1.8	%		%
Test	**EN 12457-2**	STD	190	mg/kg	Sr Test	65	mg/kg	2.4	%	rtest	6.6
No labs	13				SR	193	mg/kg	7	%	R	19.8



RUGGEDNESS

Average	2880
Sr	49
Sr (%)	2

Percolation test

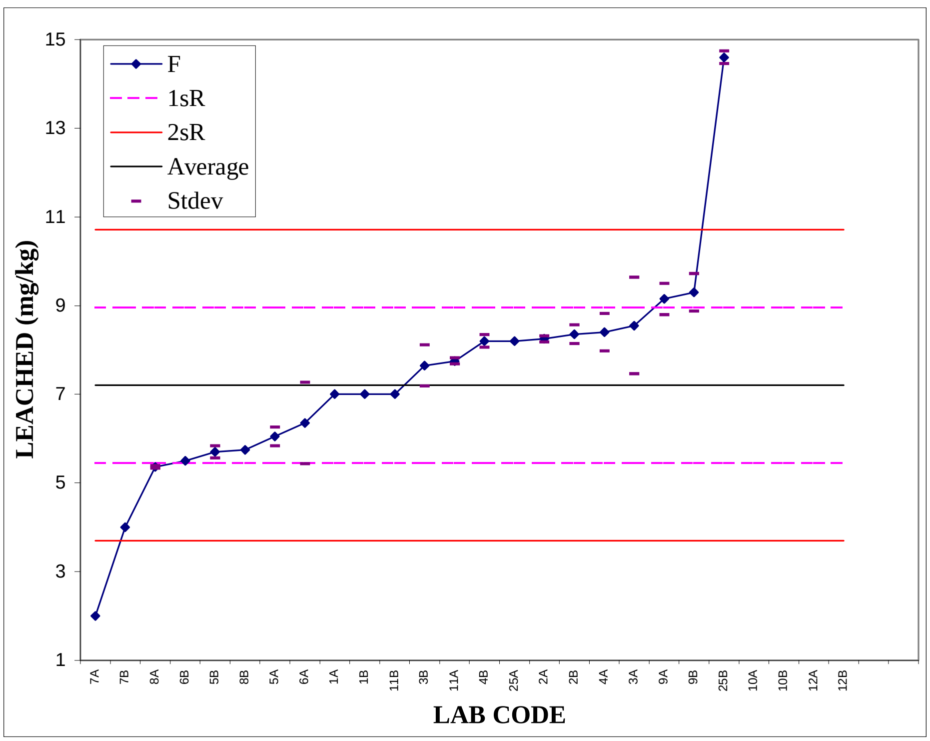
	mg/kg
L/S=10	1918

pH stat (own pH)
pH 10.99

Eluate analysis val.

Conc. (mg/l)	292
Sr Anal(%)	1.78
Conc. (mg/l)	20
Sr Anal(%)	4.96
Conc. (mg/l)	92
Sr Anal(%)	3.75

Sample	**FCM**	Average	7.30	mg/kg	Sr Anal	0.25	mg/kg	3.4	%		%
Test	EN 12457-2	STD	1.75	mg/kg	Sr Test	0.572	mg/kg	7.8	%	rtest	22
No labs	12				SR	2.04	mg/kg	28	%	R	79



RUGGEDNESS

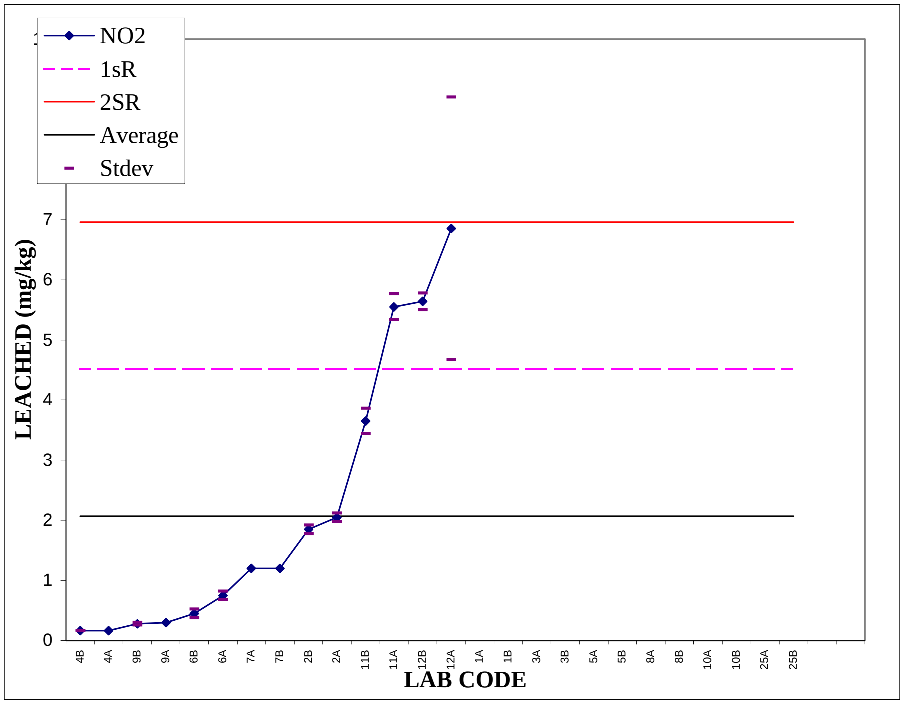
Average	10
Sr	0.29
Sr (%)	3

Eluate analysis val.

Conc. (mg/l)	0.709
Sr Anal(%)	3.25
Conc. (mg/l)	7.66
Sr Anal(%)	2.1

Statistic   ROBUST   ISO 5725 Part 5

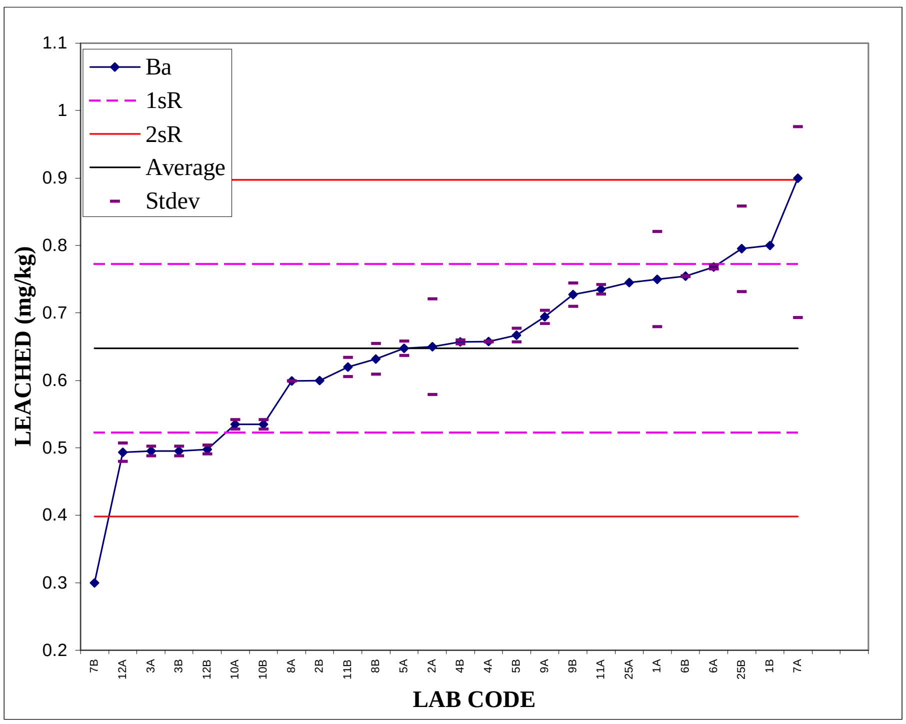
Sample	**FCM**	Average	2.07	mg/kg	Sr Anal	0.11	mg/kg	5.2	%		%
Test	EN 12457-2	STD	2.44	mg/kg	Sr Test	0.391	mg/kg	18.9	%	rtest	53
No labs	3				SR	2.44	mg/kg	124	%	R	347



RUGGEDNESS
Average 0.43
Sr 0.054
Sr (%) 13

Eluate analysis val.
Conc. (mg/ 0.016
Sr Anal(%) 3.4
Conc. (mg/ 4.25
Sr Anal(%) 6.6
Conc. (mg/ 0.145
Sr Anal(%) 2.9

Sample	**FCM**	Average	0.65	mg/kg	Sr Anal	0.01	mg/kg	2.2	%		%
Test	EN 12457-2	STD	0.12	mg/kg	Sr Test	0.031	mg/kg	4.8	%	rtest	13.4
No labs	13				SR	0.12	mg/kg	17	%	R	49



RUGGEDNESS
Average 0.51
Sr 0.03
Sr (%) 6

Percolation test
mg/kg
L/S=10 0.72

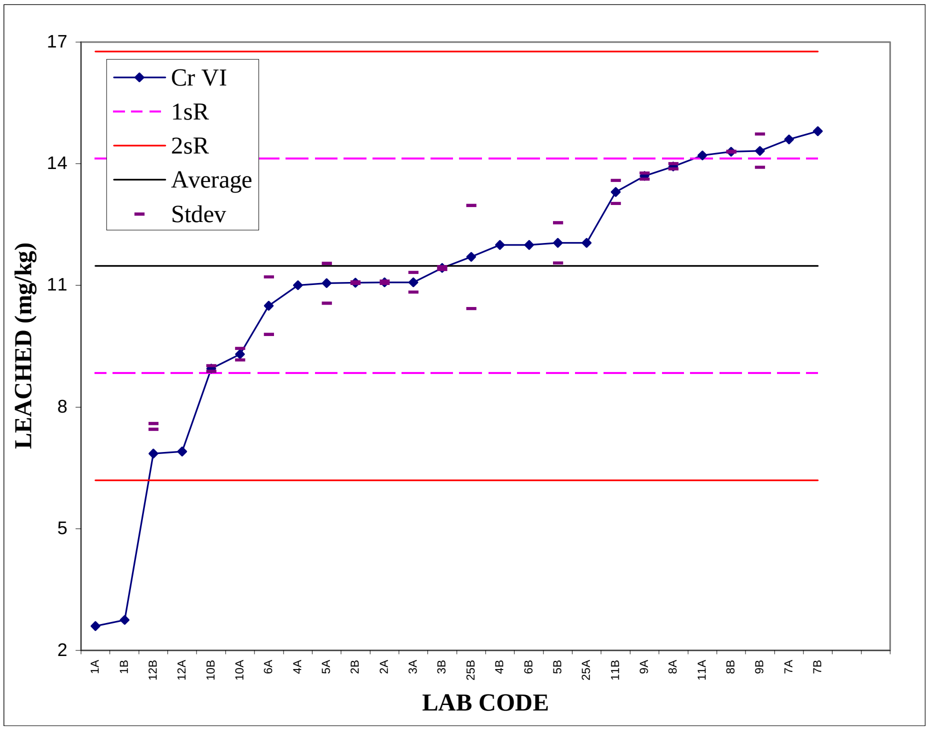
pH stat (own pH)
L/S=10 mg/kg
pH 10.99 0.9

STE
Conc. (mg/ 0.0266
Sr Anal(%) 3.6
SR Anal(% 11

Eluate analysis val.
Conc. (mg/ 0.0579
Sr Anal(%) 4.18
Conc. (mg/ 0.0804
Sr Anal(%) 1.88
Conc. (mg/ 0.0271
Sr Anal(%) 3.95

Statistic ROBUST ISO 5725 Part 5

Sample	**FCM**	Average	11.5	mg/kg	Sr Anal	0.2	mg/kg	1.6	%		%
Test	EN 12457-2	STD	2.6	mg/kg	Sr Test	0.482	mg/kg	4.2	%	rtest	11.8
No labs	13				SR	2.6	mg/kg	23	%	R	66



RUGGEDNESS
Average 12
Sr 0.6
Sr (%) 5

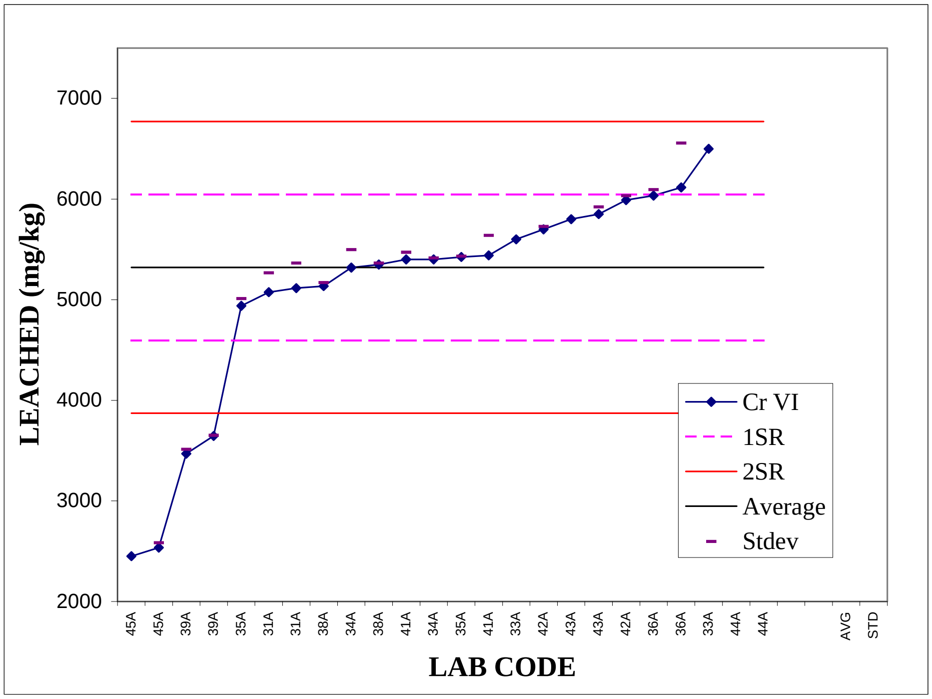
Percolation test
mg/kg
L/S=10 9.36

pH stat (own pH)
L/S=10 mg/kg
pH 10.99 11.8

STE
Conc. (mg/ 0.083
Sr Anal(%) 3
SR Anal(% 8.9

Eluate analysis val.
Conc. (mg/ 1150
Sr Anal(%) 0.77
Conc. (mg/ 0.108
Sr Anal(%) 2.16

Sample	**CHS**	Average	5320	mg/kg	Sr Anal	85	mg/kg	1.8	%		%
Test	**EN 12457-2**	STD	1343	mg/kg	Sr Test	160	mg/kg	3.0	%	rtest	8.4
No labs	11				SR	729	mg/kg	14	%	R	38



Percolation test

	mg/kg
L/S=10	6000

pH stat (own pH)

L/S=10	mg/kg
pH 9.9	5940

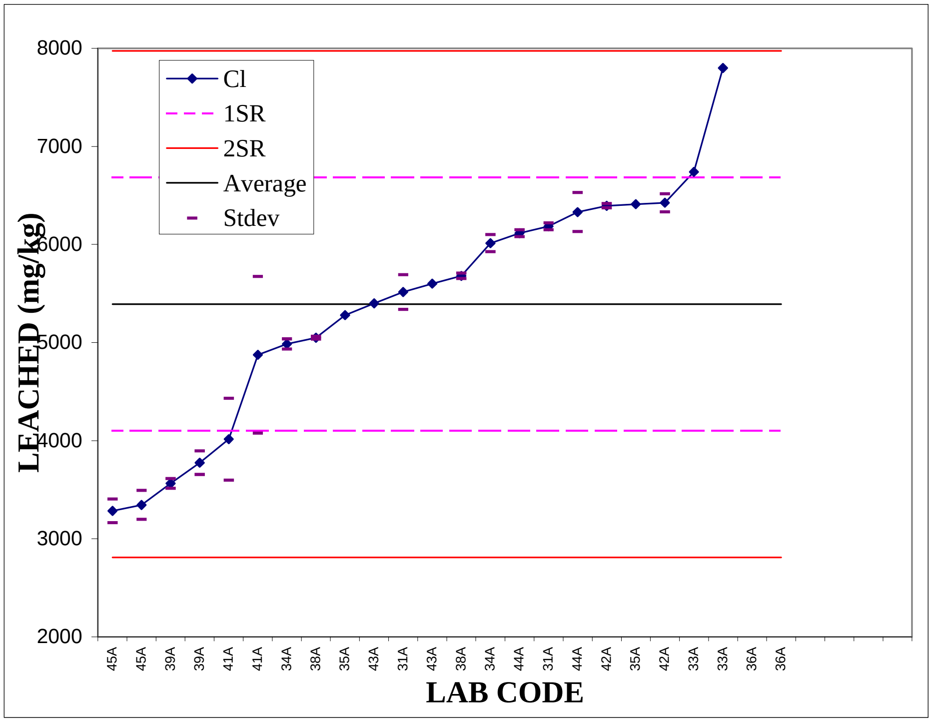
STE

Conc. (mg/l)	0.083
Sr Anal(%)	3
SR Anal(%)	8.9

Eluate analysis val.

Conc. (mg/l)	1150
Sr Anal(%)	0.77
Conc. (mg/l)	0.108
Sr Anal(%)	2.16

Sample	**CHS**	Average	5390	mg/kg	Sr Anal	146	mg/kg	2.1	%		%
Test	**EN 12457-2**	STD	1856	mg/kg	Sr Test	528	mg/kg	9.8	%	rtest	27
No labs	11				SR	1358	mg/kg	25	%	R	71

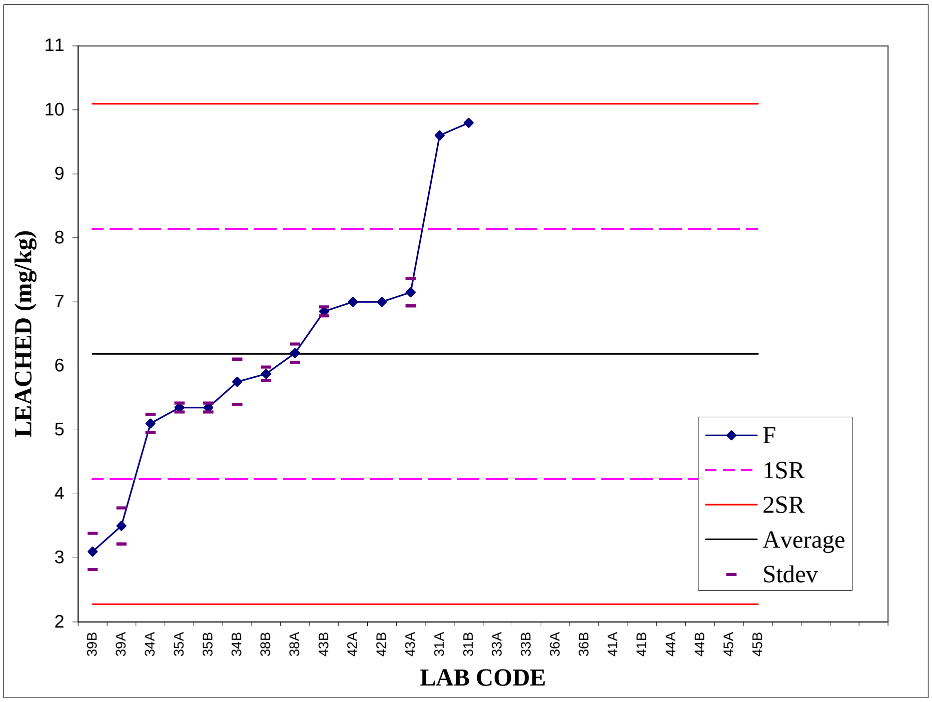


Eluate analysis val.

Conc. (mg/l)	292
Sr Anal(%)	1.78
Conc. (mg/l)	20
Sr Anal(%)	4.96
Conc. (mg/l)	92
Sr Anal(%)	3.75

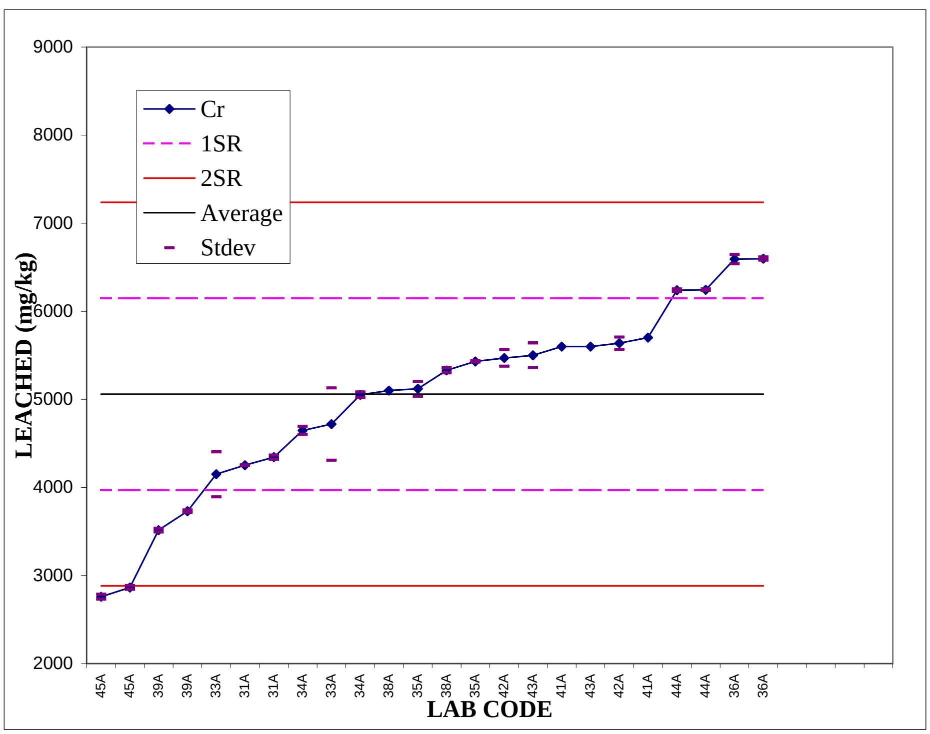
Statistic ROBUST ISO 5725 Part 5

Sample	**CHS**	Average	6.2	mg/kg	Sr Anal	0.21	mg/kg	3.1	%		%
Test	**EN 12457-2**	STD	2.7	mg/kg	Sr Test	0.3	mg/kg	4.1	%	rtest	11.5
No labs	7				SR	2.7	mg/kg	35	%	R	97



Eluate analysis val.
Conc. (mg/l) 0.709
Sr Anal(%) 3.25
Conc. (mg/l) 7.66
Sr Anal(%) 2.1

Sample	**CHS**	Average	5059	mg/kg	Sr Anal	57	mg/kg	1.1	%		%
Test	EN 12457-2	STD	1473	mg/kg	Sr Test	172	mg/kg	3.4	%	rtest	9.5
No labs	12				SR	1473	mg/kg	22	%	R	62



Percolation test
L/S=10 6000

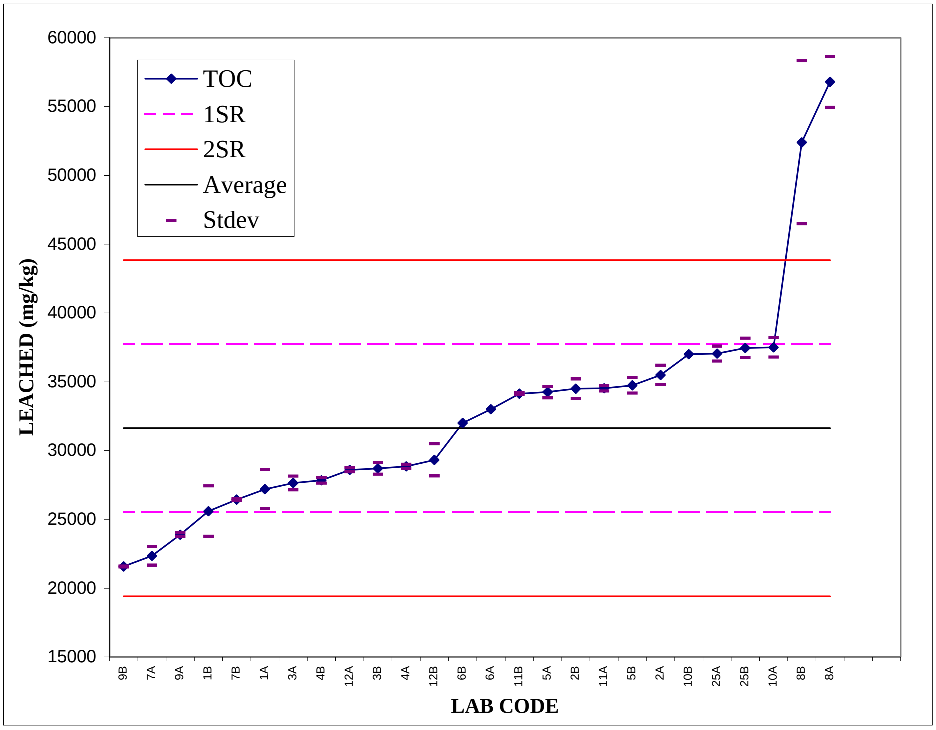
pH stat (own pH)
pH 9.9 5940

STE
Conc. (mg/l) 0.083
Sr Anal(%) 3
SR Anal(%) 8.9

Eluate analysis val.
Conc. (mg/l) 1150
Sr Anal(%) 0.77
Conc. (mg/l) 0.108
Sr Anal(%) 2.16

Statistic ROBUST ISO 5725 Part 5

Sample	**SEW**	Average	31544	mg/kg	Sr Anal	753	mg/kg	2.4	%		%
Test	**EN 12457-2**	STD	6087	mg/kg	Sr Test	1072	mg/kg	3.4	%	rtest	9.5
No labs	13				SR	6110	mg/kg	20	%	R	55.7



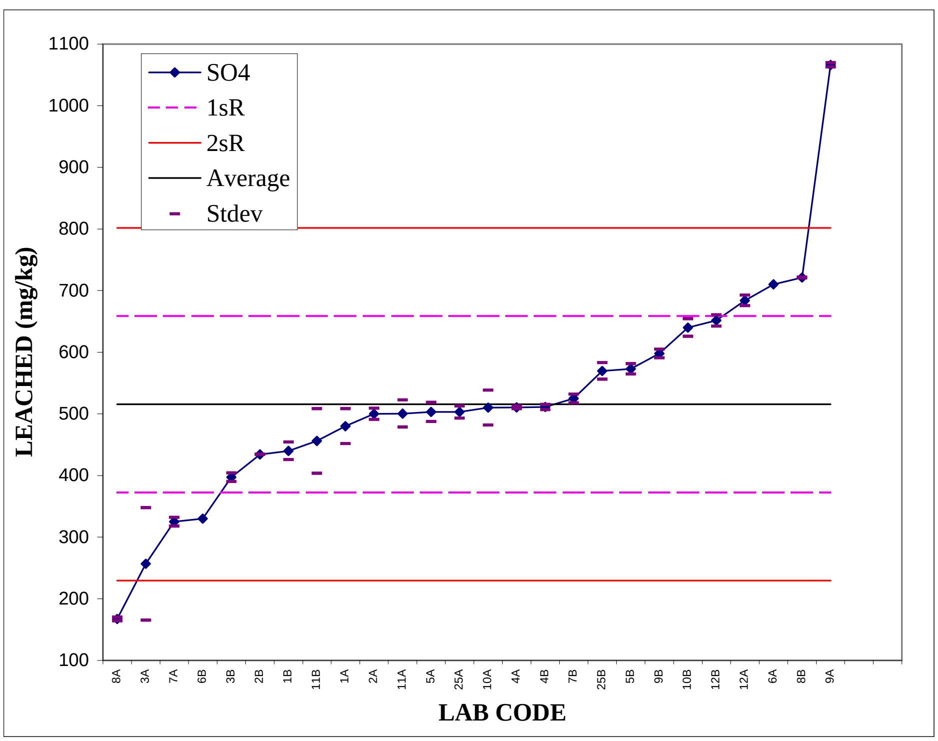
Percolation test
mg/kg
L/S=10 50534

pH stat (own pH)
L/S=10 mg/kg
pH 7 31905

Eluate analysis val.
Conc. (mg/l) 16.3
Sr Anal(%) 1.82
Conc. (mg/l) 1560
Sr Anal(%) 2.58

Statistic ROBUST ISO 5725 Part 5

Sample	**SEW**	Average	505	mg/kg	Sr Anal	15	mg/kg	2.8	%		%
Test	EN 12457-2	STD	143	mg/kg	Sr Test	130	mg/kg	25.7	%	rtest	72
No labs	13				SR	130	mg/kg	26	%	R	72



Percolation test
mg/kg
L/S=10 2710

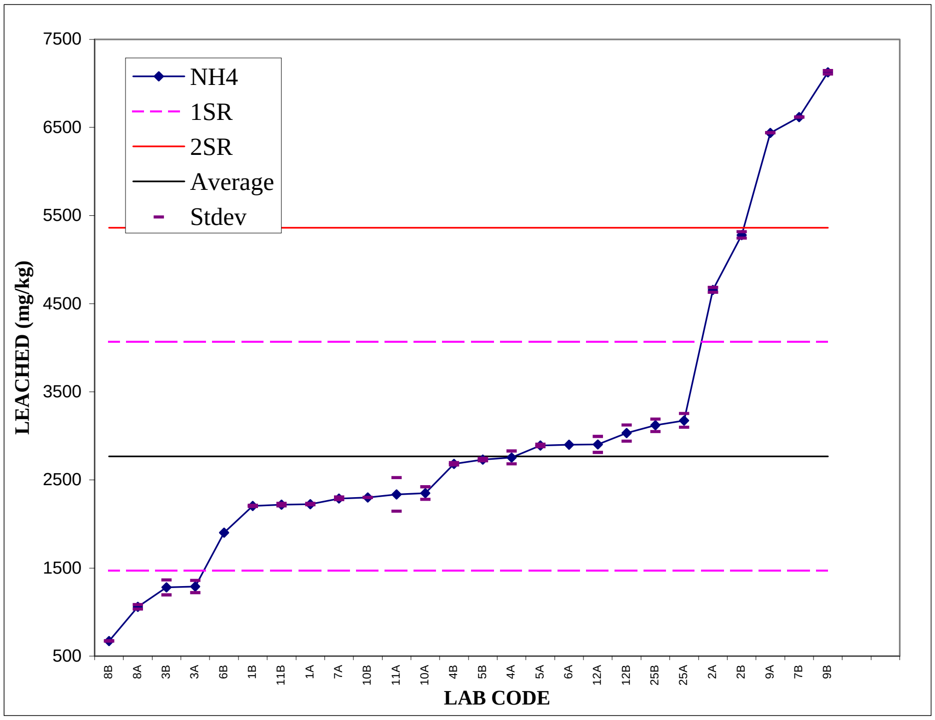
pH stat (own pH)
L/S=10 mg/kg
pH 7 3851

STE
Conc. (mg/l) 52.06
Sr Anal(%) 2.8
SR Anal(%) 11

Eluate analysis val.
Conc. (mg/l) 1350
Sr Anal(%) 1.37
Conc. (mg/l) 108
Sr Anal(%) 2.34
Conc. (mg/l) 54
Sr Anal(%) 2.98

Statistic ROBUST ISO 5725 Part 5

Sample	**SEW**	Average	2882	mg/kg	Sr Anal	56	mg/kg	2.0	%		%
Test	EN 12457-2	STD	1297	mg/kg	Sr Test	329	mg/kg	11.4	%	rtest	31.9
No labs	13				SR	1297	mg/kg	51	%	R	143

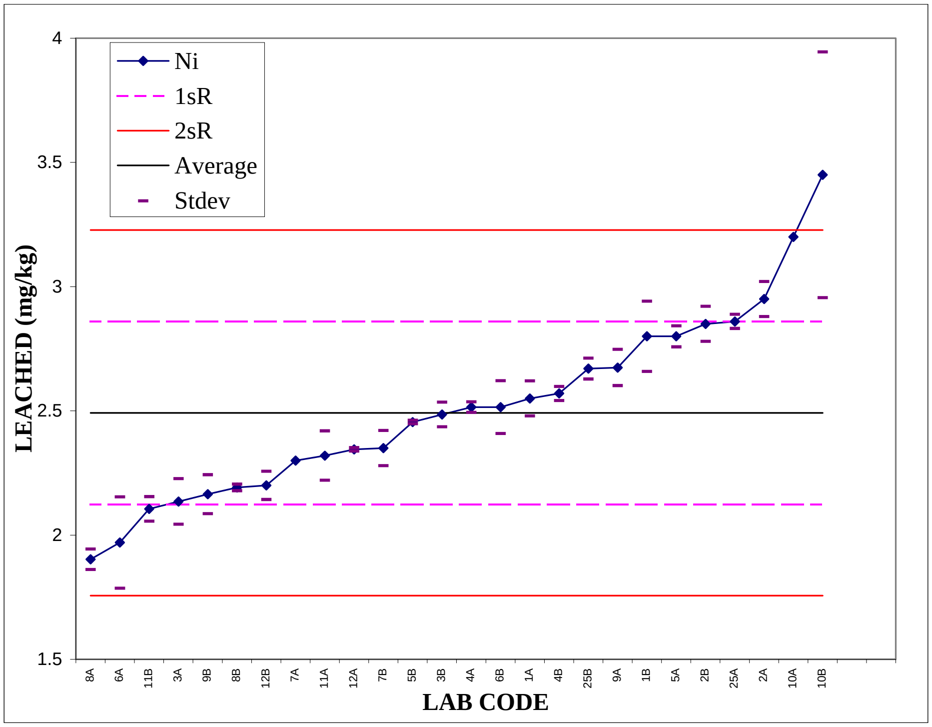


Eluate analysis val.

Conc. (mg/l)	401
Sr Anal(%)	1.44
Conc. (mg/l)	0.248
Sr Anal(%)	5.22

Statistic ROBUST ISO 5725 Part 5

Sample	**SEW**	Average	2.49	mg/kg	Sr Anal	0.08	mg/kg	3.0	%		%
Test	EN 12457-2	STD	0.36	mg/kg	Sr Test	0.217	mg/kg	8.7	%	rtest	24.4
No labs	13				SR	0.37	mg/kg	15	%	R	40.6



Percolation test

	mg/kg
L/S=10	1.83

pH stat (own pH)

L/S=10	mg/kg
pH 7	2.47

STE

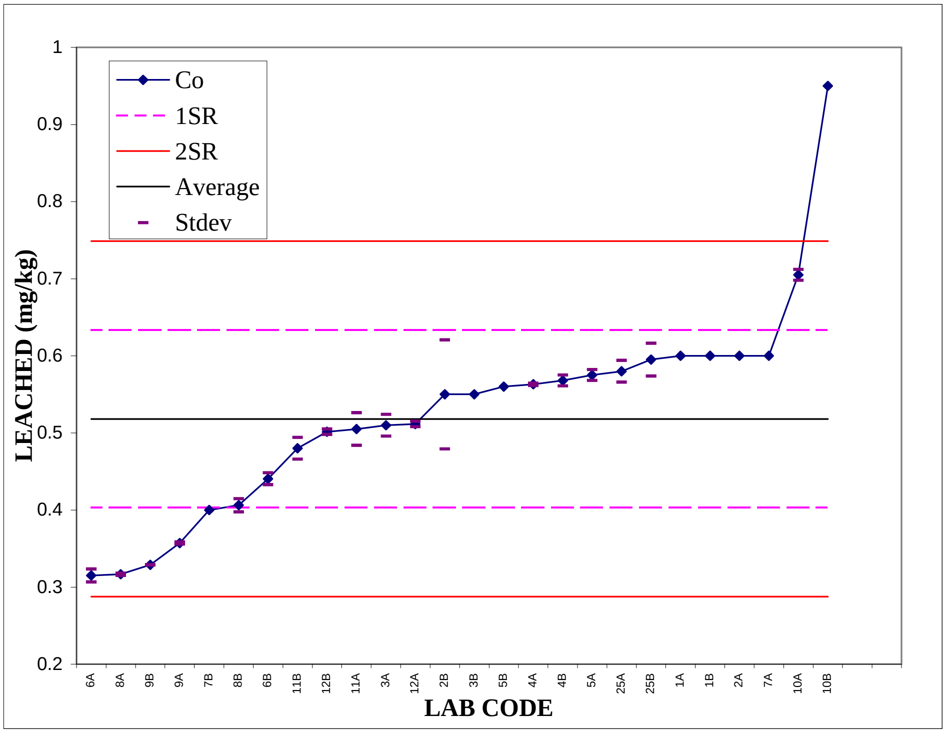
Conc. (mg/l)	0.013
Sr Anal(%)	11.9
SR Anal(%)	27

Eluate analysis val.

Conc. (mg/l)	0.049
Sr Anal(%)	2.9
Conc. (mg/l)	0.117
Sr Anal(%)	4.72
Conc. (mg/l)	0.019
Sr Anal(%)	5.9
Conc. (mg/l)	0.013
Sr Anal(%)	6.23

Statistic ROBUST ISO 5725 Part 5

Sample	**SEW**	Average	0.51	mg/kg	Sr Anal	0.01	mg/kg	1.6	%		%
Test	EN 12457-2	STD	0.12	mg/kg	Sr Test	0.049	mg/kg	9.7	%	rtest	27.2
No labs	13				SR	0.12	mg/kg	23	%	R	65.2



Percolation test

	mg/kg
L/S=10	0.43

pH stat (own pH)

L/S=10	mg/kg
pH 7	0.56

STE

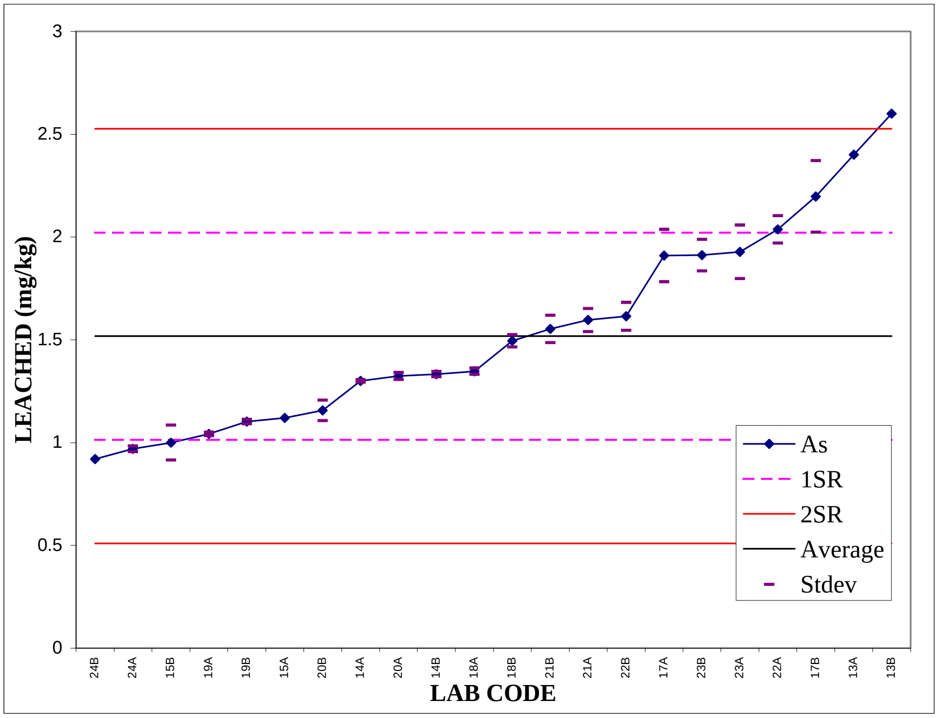
Conc. (mg/l)	0.006
Sr Anal(%)	11.4
SR Anal(%)	22

Eluate analysis val.

Conc. (mg/l)	0.0744
Sr Anal(%)	1.9
Conc. (mg/l)	5.85
Sr Anal(%)	7.21

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	1.52	mg/kg	Sr Anal	0.06	mg/kg	3.8	%		%
Test	**EN 12457-1**	STD	0.50	mg/kg	Sr Test	0.12	mg/kg	8.1	%	rtest	22.7
No labs	11				SR	0.50	mg/kg	33	%	R	94.6



Percolation test

	mg/kg
L/S=2	1.12

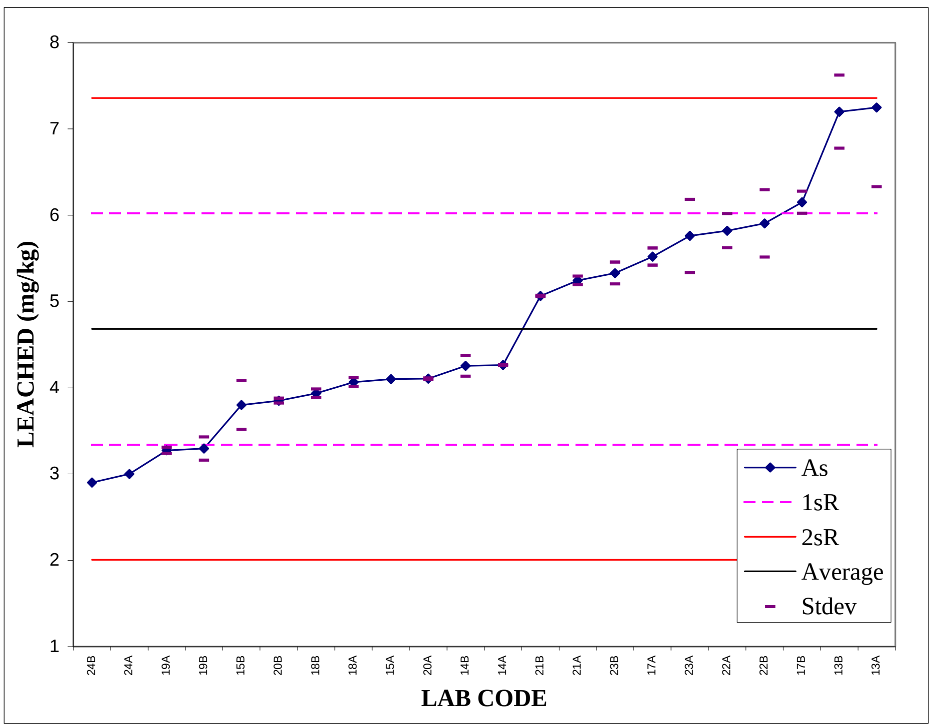
STE

Conc. (mg/l)	0.001
Sr Anal(%)	6.7
SR Anal(%)	100

Eluate analysis val.

Conc. (mg/l)	0.0174
Sr Anal(%)	5.32
Conc. (mg/l)	0.139
Sr Anal(%)	7.66
Conc. (mg/l)	0.0109
Sr Anal(%)	112.8

Sample	**COS**	Average	4.68	mg/kg	Sr Anal	0.16	mg/kg	3.4	%		%
Test	**EN 12457-2**	STD	1.33	mg/kg	Sr Test	0.17	mg/kg	3.7	%	rtest	29.3
No labs	11				SR	1.34	mg/kg	29	%	R	82



RUGGEDNESS

Average	6.4
Sr	0.2
Sr (%)	7

Percolation test

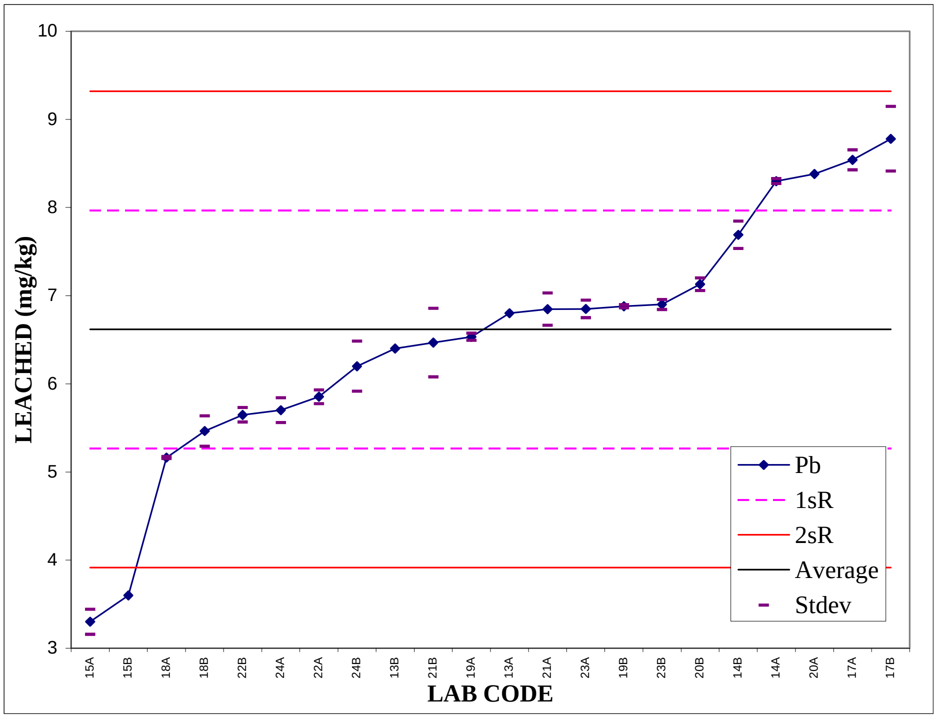
	mg/kg
L/S=10	4.4

pH stat (own pH)

L/S=10	mg/kg
pH 4.5	3.21

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	6.62	mg/kg	Sr Anal	0.13	mg/kg	2.0	%		%
Test	**EN 12457-1**	STD	1.35	mg/kg	Sr Test	0.32	mg/kg	4.9	%	rtest	13.7
No labs	11				SR	1.35	mg/kg	20	%	R	58.5



Percolation test

	mg/kg
L/S=2	5.68

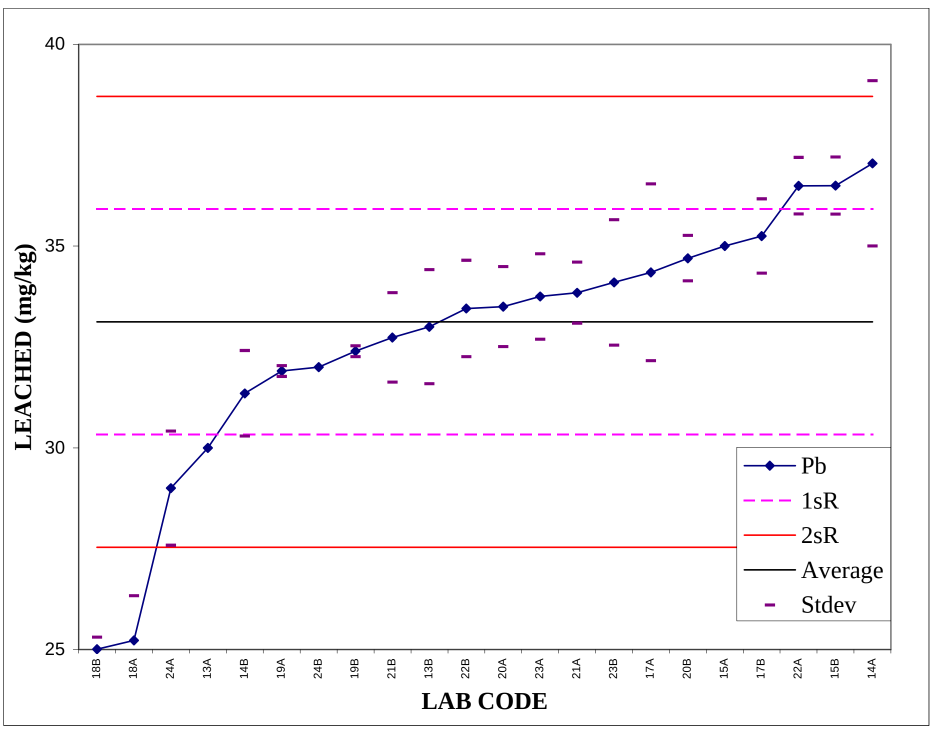
STE

Conc. (mg/l)	0.404
Sr Anal(%)	3.4
SR Anal(%)	8

Eluate analysis val.

Conc. (mg/l)	0.326
Sr Anal(%)	2.39
Conc. (mg/l)	0.0138
Sr Anal(%)	5.29
Conc. (mg/l)	0.0147
Sr Anal(%)	5.57
Conc. (mg/l)	0.076
Sr Anal(%)	4.21

Sample	**COS**	Average	33.12	mg/kg	Sr Anal	1.13	mg/kg	3.4	%		%
Test	**EN 12457-2**	STD	2.68	mg/kg	Sr Test	1.62	mg/kg	4.9	%	rtest	13.7
No labs	11				SR	2.79	mg/kg	7.4	%	R	20.7



RUGGEDNESS

Average	25
Sr	0.29
Sr (%)	2

Percolation test

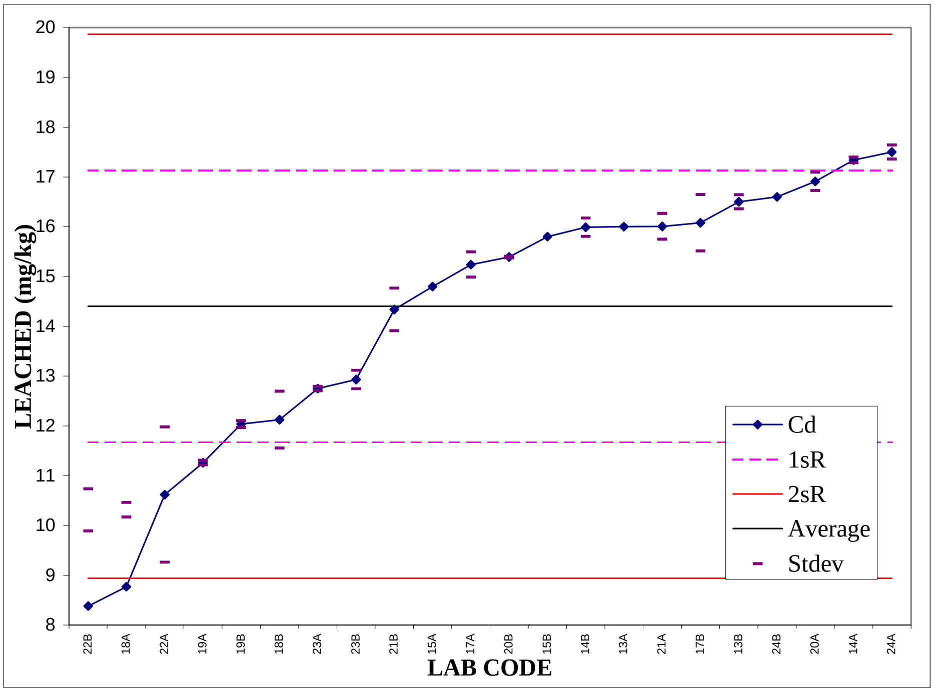
	mg/kg
L/S=10	25.8

pH stat (own pH)

L/S=10	mg/kg
pH 4.5	34.8

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	14.28	mg/kg	Sr Anal	0.25	mg/kg	1.8	%		%
Test	EN 12457-1	STD	2.73	mg/kg	Sr Test	1.09	mg/kg	7.6	%	rtest	21.3
No labs	11				SR	2.73	mg/kg	21	%	R	59.9

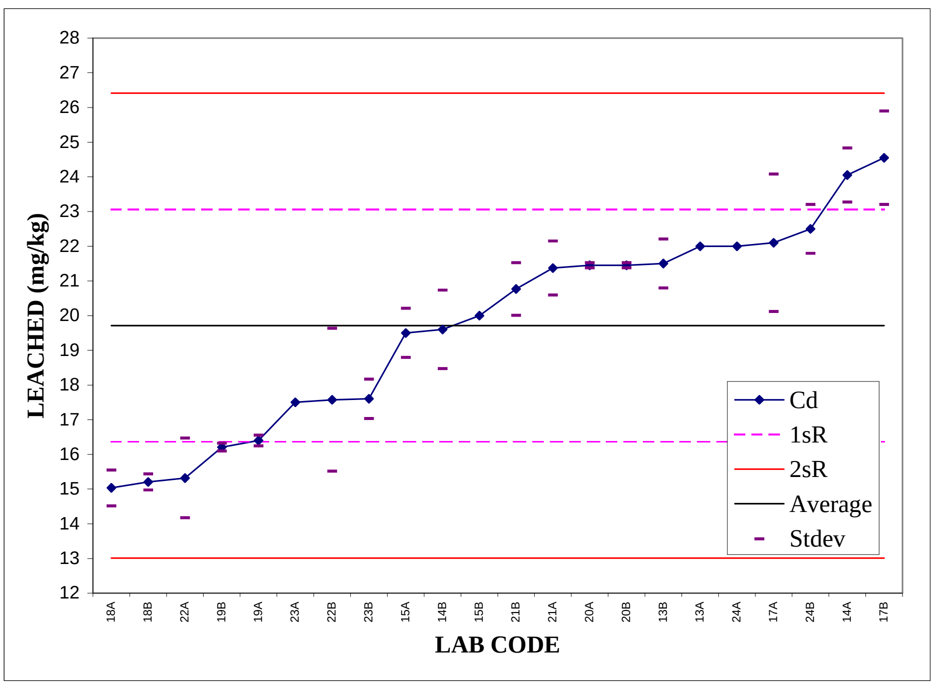


Percolation test
L/S=2 17.2

STE
Conc. (mg/l) 0.013
Sr Anal(%) 11.9
SR Anal(%) 27

Eluate analysis val.
Conc. (mg/l) 0.049
Sr Anal(%) 2.9
Conc. (mg/l) 0.117
Sr Anal(%) 4.72
Conc. (mg/l) 0.019
Sr Anal(%) 5.9
Conc. (mg/l) 0.013
Sr Anal(%) 6.23

Sample	**COS**	Average	19.71	mg/kg	Sr Anal	0.80	mg/kg	4.1	%		%
Test	**EN 12457-2**	STD	3.30	mg/kg	Sr Test	0.77	mg/kg	3.9	%	rtest	10.9
No labs	11				SR	3.35	mg/kg	16.6	%	R	46.5



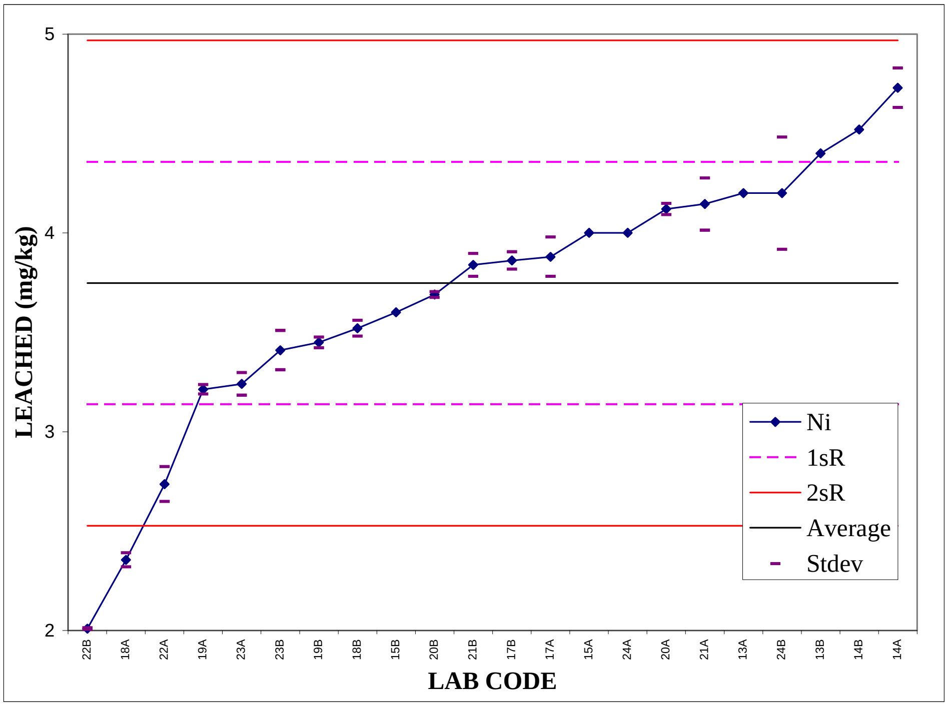
RUGGEDNESS
Average 13
Sr 0.25
Sr (%) 4

Percolation test
mg/kg
L/S=10 23.3

pH stat (own pH)
L/S=10 mg/kg
pH 4.5 18.1

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	3.72	mg/kg	Sr Anal	0.06	mg/kg	1.7	%		%
Test	**EN 12457-1**	STD	0.61	mg/kg	Sr Test	0.29	mg/kg	7.9	%	rtest	22.1
No labs	11				SR	0.65	mg/kg	18	%	R	51.5



Percolation test

	mg/kg
L/S=2	3.76

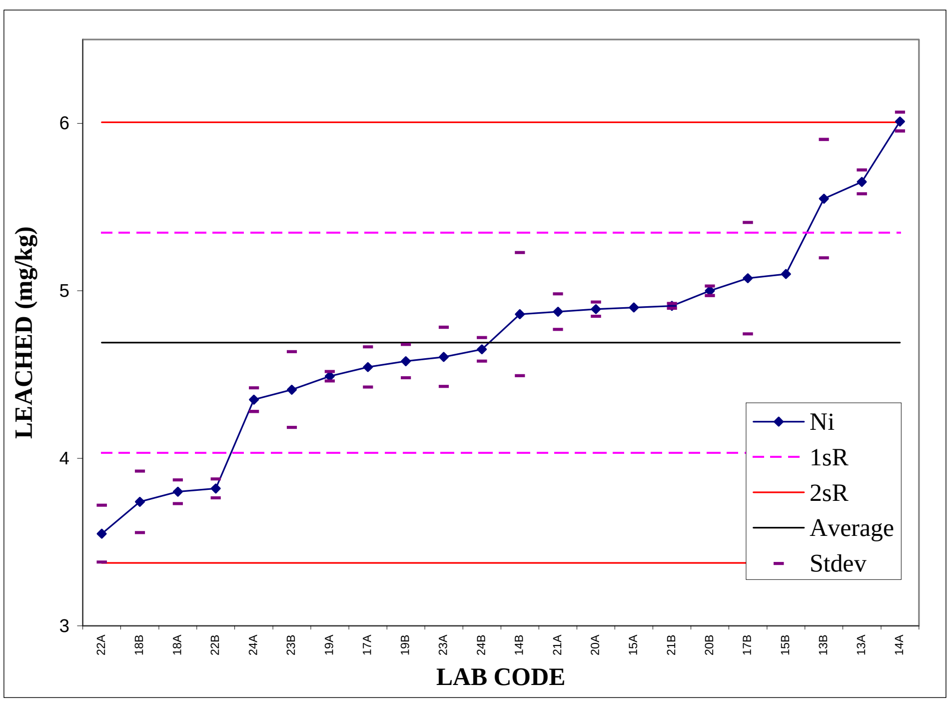
STE

Conc. (mg/l)	0.013
Sr Anal(%)	11.9
SR Anal(%)	27

Eluate analysis val.

Conc. (mg/l)	0.049
Sr Anal(%)	2.9
Conc. (mg/l)	0.117
Sr Anal(%)	4.72
Conc. (mg/l)	0.019
Sr Anal(%)	5.9
Conc. (mg/l)	0.013
Sr Anal(%)	6.23

Sample	**COS**	Average	4.7	mg/kg	Sr Anal	0.14	mg/kg	3.1	%		%
Test	**EN 12457-2**	STD	0.65	mg/kg	Sr Test	0.19	mg/kg	4.1	%	rtest	11.5
No labs	11				SR	0.66	mg/kg	15	%	R	41.2



RUGGEDNESS

Average	3.1
Sr	0.02
Sr (%)	5

Percolation test

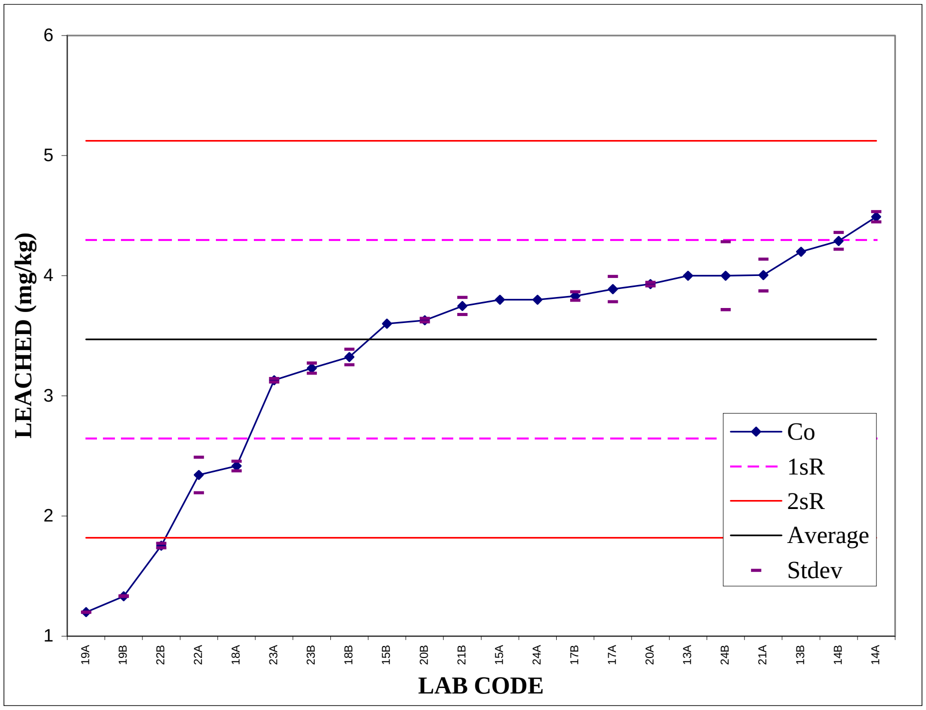
	mg/kg
L/S=10	4.44

pH stat (own pH)

L/S=10	mg/kg
pH 4.5	4.04

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	3.45	mg/kg	Sr Anal	0.05	mg/kg	1.5	%		%
Test	**EN 12457-1**	STD	0.83	mg/kg	Sr Test	0.21	mg/kg	6.2	%	rtest	17.4
No labs	11				SR	0.83	mg/kg	25	%	R	70.8



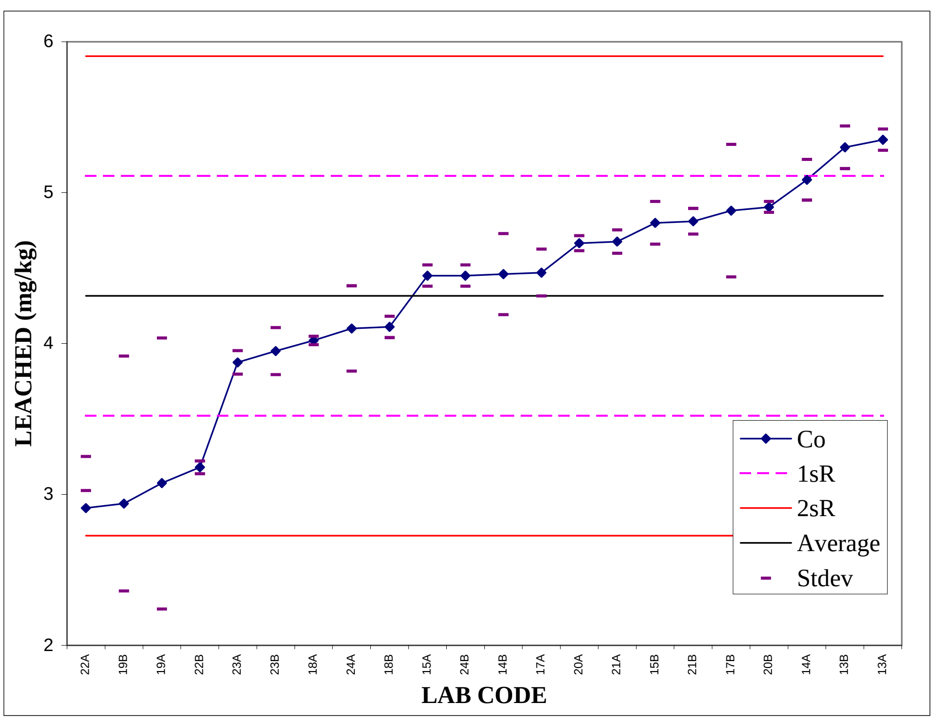
Percolation test
mg/kg
L/S=1 3.7

STE
Conc. (mg/l) 0.006
Sr Anal(%) 11.4
SR Anal(%) 22

Eluate analysis val.
Conc. (mg/l) 0.0744
Sr Anal(%) 1.9
Conc. (mg/l) 5.85
Sr Anal(%) 7.21

Statistic ROBUST ISO 5725 Part 5

Sample	**COS**	Average	4.32	mg/kg	Sr Anal	0.18	mg/kg	4.1	%		%
Test	**EN 12457-2**	STD	0.78	mg/kg	Sr Test	0.22	mg/kg	5.0	%	rtest	14
No labs	11				SR	0.79	mg/kg	19	%	R	53.2



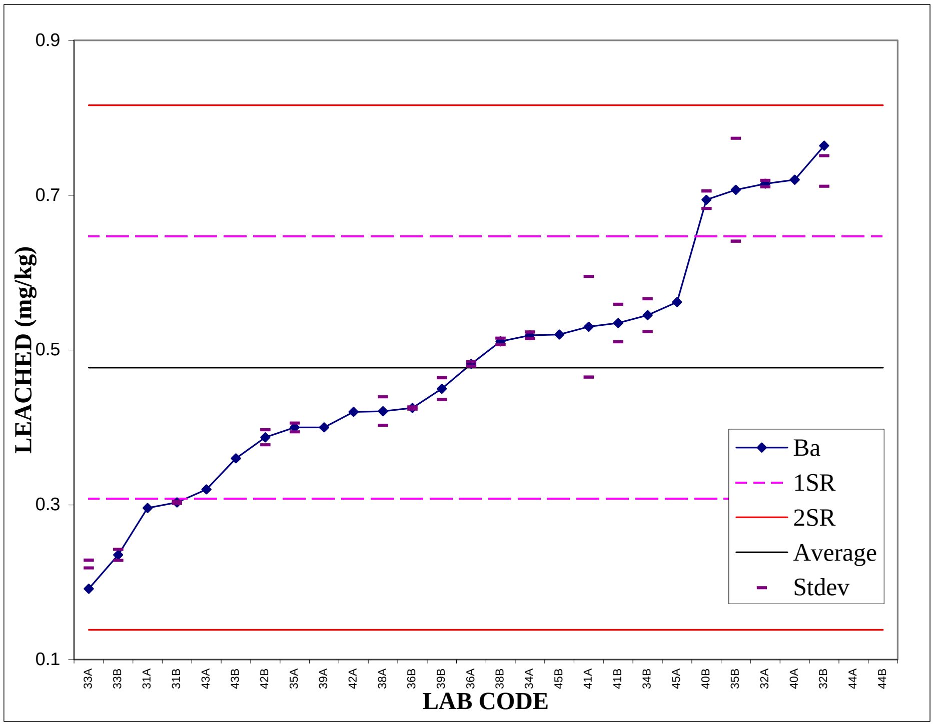
RUGGEDNESS
Average 2.9
Sr 0.013
Sr (%) 4

Percolation test
mg/kg
L/S=10 4.21

pH stat (own pH)
L/S=10 mg/kg
pH 4.5 3.91

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.48	mg/kg	Sr Anal	0.011	mg/kg	2.2	%		%
Test	**EN 12457-1**	STD	0.17	mg/kg	Sr Test	0.038	mg/kg	8.0	%	rtest	22.4
No labs	13				SR	0.17	mg/kg	35	%	R	96.6



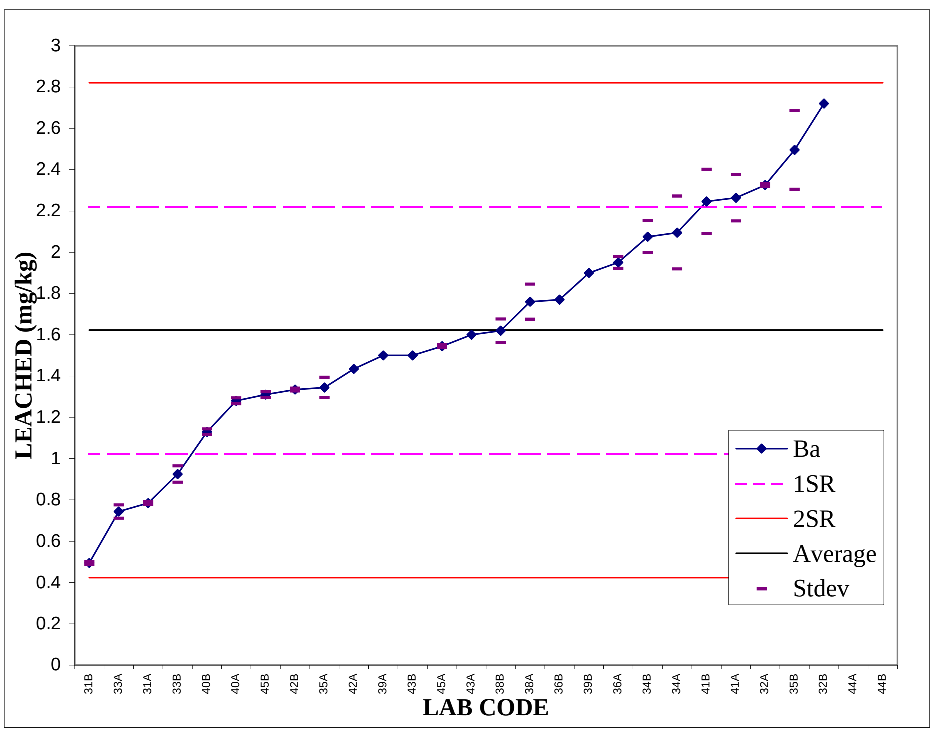
RUGGEDNESS
Average 0.48
Sr 0.01
Sr (%) 2

Percolation test
mg/kg
L/S=1 0.39

STE
Conc. (mg/l) 0.0266
Sr Anal(%) 3.6
SR Anal(%) 11

Eluate analysis val.
Conc. (mg/l) 0.0579
Sr Anal(%) 4.18
Conc. (mg/l) 0.0804
Sr Anal(%) 1.88
Conc. (mg/l) 0.0271
Sr Anal(%) 3.95

Sample	**MBA**	Average	1.62	mg/kg	Sr Anal	0.04	mg/kg	2.6	%		%
Test	**EN 12457-2**	STD	0.61	mg/kg	Sr Test	0.193	mg/kg	11.9	%	rtest	33
No of labs	13				SR	0.61	mg/kg	37	%	R	104



RUGGEDNESS
Average 1.5
Sr 0.098
Sr (%) 7

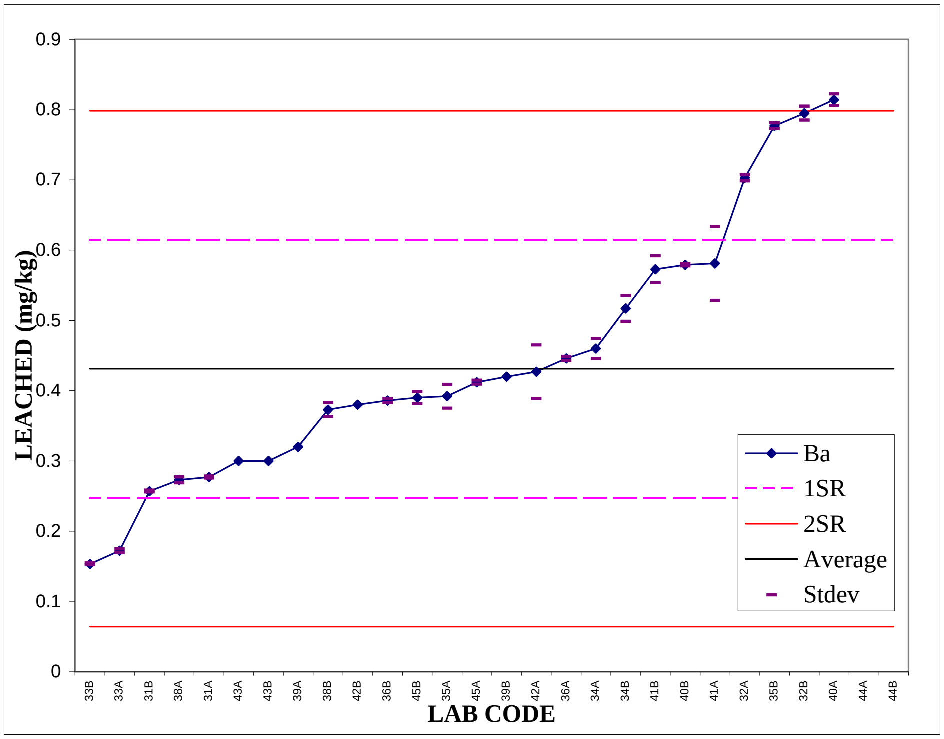
Homogeneity
Average 1.16
Sr(%) 6.9

Percolation test
mg/kg
L/S=10 1.93

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 1.5

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.44	mg/kg	Sr Anal	0.01	mg/kg	2.1	%		%
Test	**EN 12457-3/1**	STD	0.18	mg/kg	Sr Test	0.061	mg/kg	14	%	rtest	38.4
No labs	13				SR	0.18	mg/kg	44	%	R	124



RUGGEDNESS

Average	0.31
Sr Test	0.022
Sr Test (%)	7

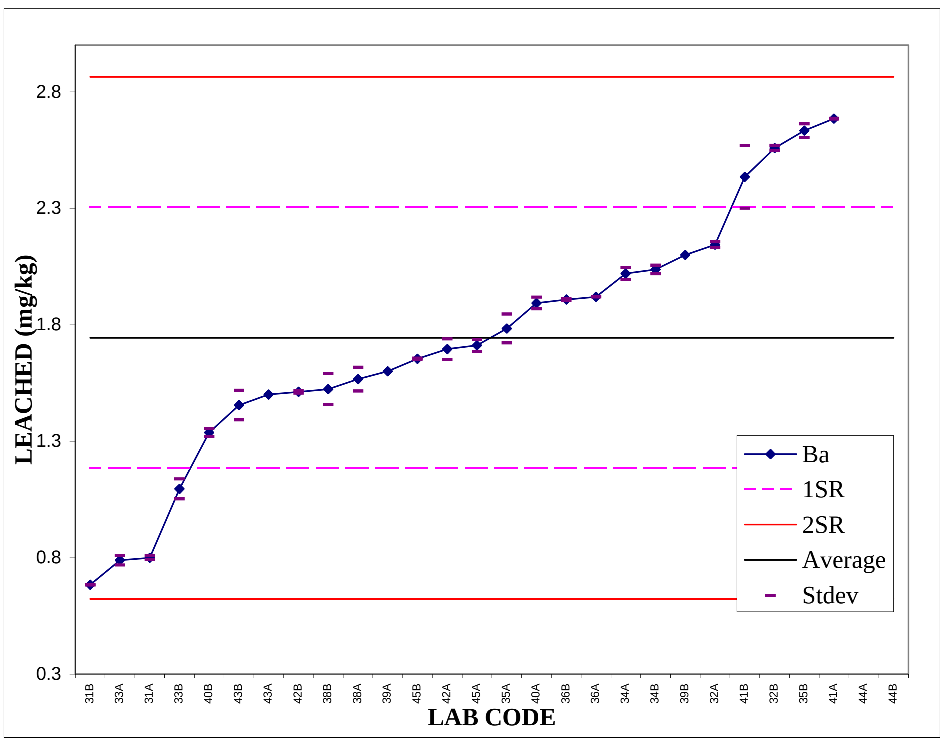
Percolation test

	mg/kg
L/S=1	0.39

STE

Conc. (mg/l)	26.6
Sr Anal(%)	3.6
SR Anal(%)	11

Sample	**MBA**	Average	1.75	mg/kg	Sr Anal	0.03	mg/kg	1.8	%		%
Test	**EN 12457-3/2**	STD	0.56	mg/kg	Sr Test	0.24	mg/kg	13.8	%	rtest	38.6
No of labs	13				SR	0.56	mg/kg	33	%	R	92.7



RUGGEDNESS

Average	1.38
Sr	0.14
Sr (%)	10

Percolation test

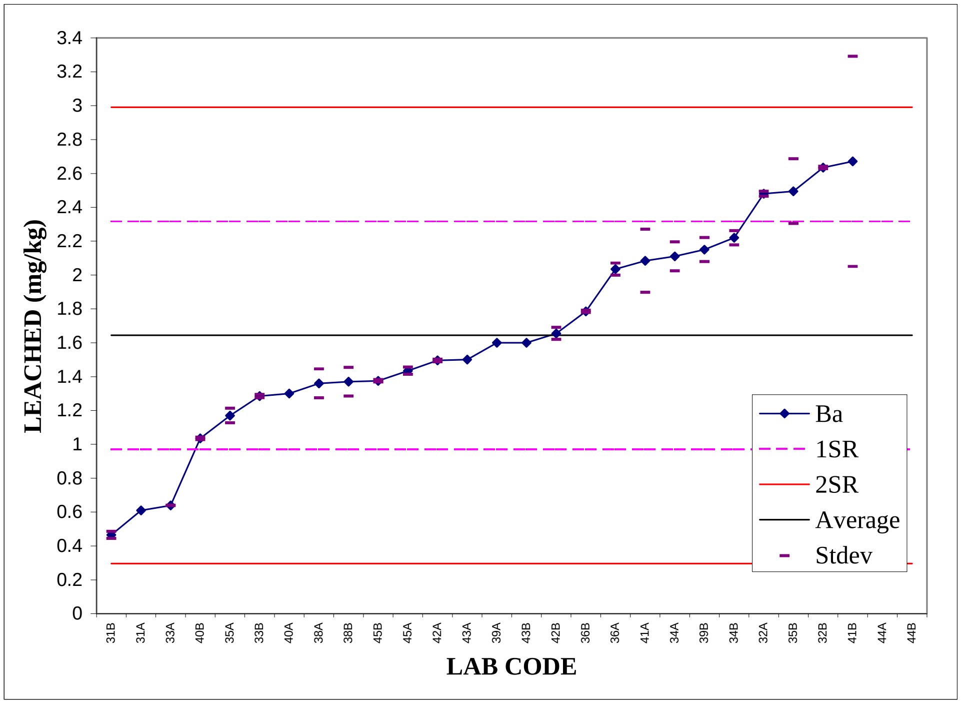
	mg/kg
L/S=10	1.93

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	1.5

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	1.64	mg/kg	Sr Anal	0.05	mg/kg	2.9	%		%
Test	**EN 12457-4**	STD	0.64	mg/kg	Sr Test	0.28	mg/kg	17	%	rtest	48
No labs	13				SR	0.64	mg/kg	39	%	R	109



RUGGEDNESS

Average	1.6
Sr	0.087
Sr (%)	5

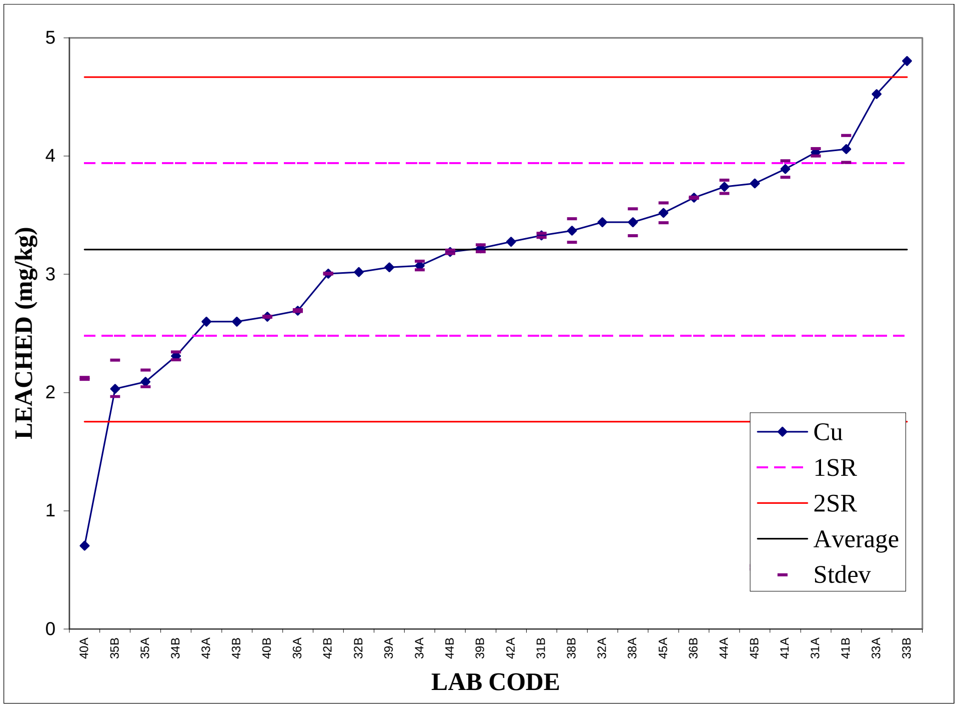
Percolation test

	mg/kg
L/S=10	1.93

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	1.5

Sample	**MBA**	Average	3.19	mg/kg	Sr Anal	0.05	mg/kg	1.7	%			%
Test	**EN 12457-1**	STD	0.73	mg/kg	Sr Test	0.38	mg/kg	12.0	%		rtest	33.6
No labs	14				SR	0.73	mg/kg	25	%		R	68.6



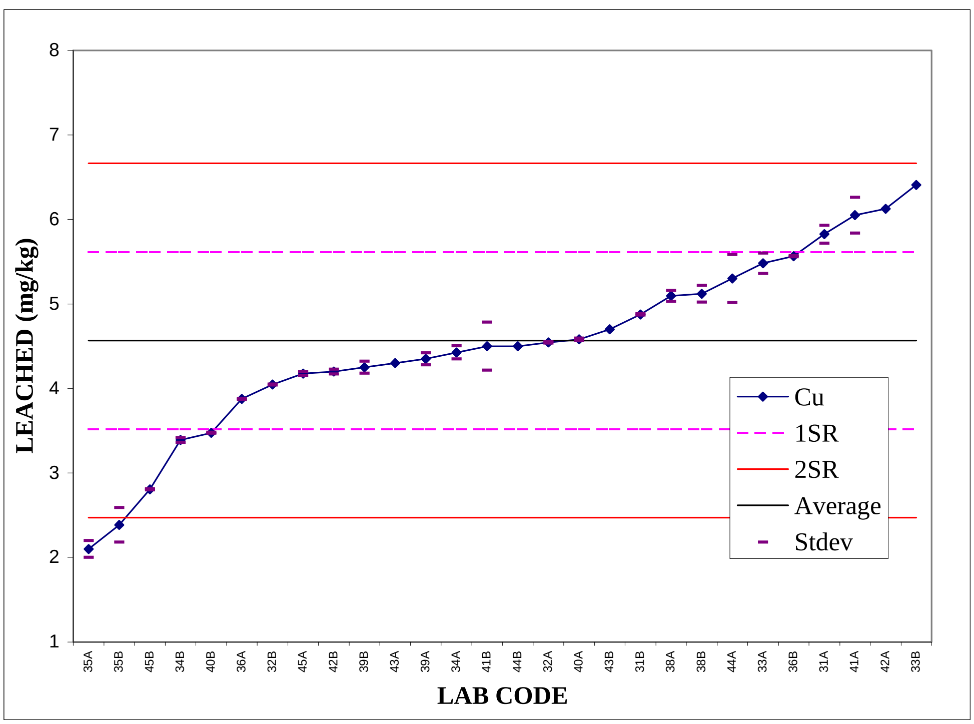
RUGGEDNESS
Average 3.6
Sr 0.2
Sr (%) 6

Percolation test
mg/kg
L/S=2 3.49

STE
Conc. (mg/l) 0.0062
Sr Anal(%) 11.2
SR Anal(%) 26

Eluate analysis val.
Conc. (mg/l) 0.363
Sr Anal(%) 0.66
Conc. (mg/l) 0.102
Sr Anal(%) 4.2
Conc. (mg/l) 0.0192
Sr Anal(%) 6.35
Conc. (mg/l) 0.0077
Sr Anal(%) 15

Sample	**MBA**	Average	4.57	mg/kg	Sr Anal	0.08	mg/kg	1.8	%			%
Test	**EN 12457-2**	STD	1.18	mg/kg	Sr Test	0.84	mg/kg	18.3	%		rtest	51
No labs	14				SR	1.04	mg/kg	23	%		R	64



RUGGEDNESS
Average 4.6
Sr 0.38
Sr (%) 8

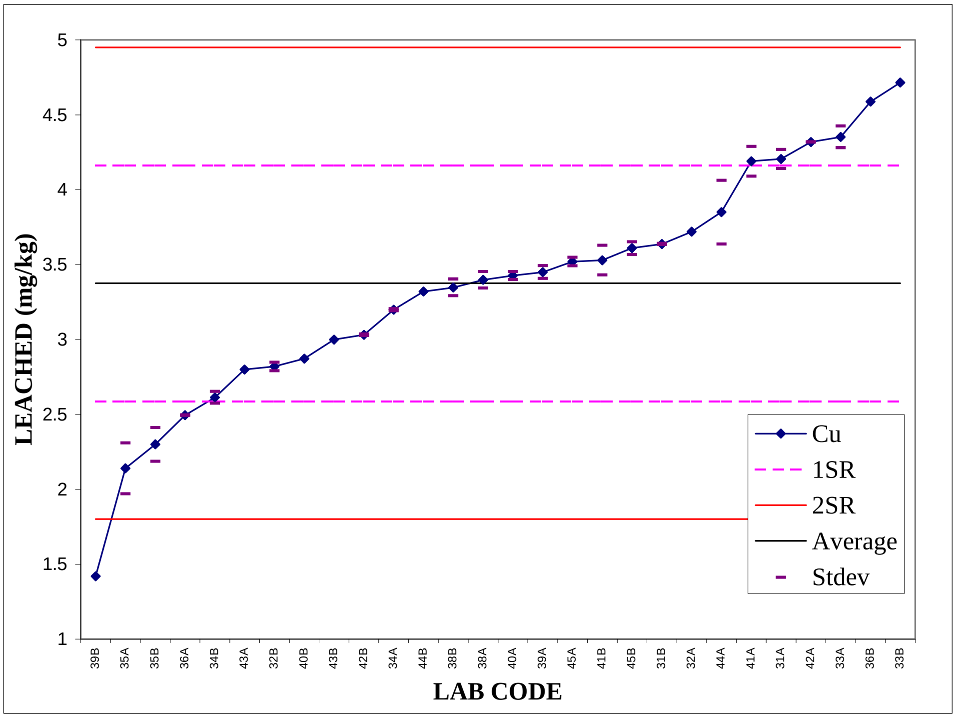
Homogeneity
Average 5.4
Sr (%) 10.6

Percolation test
mg/kg
L/S=10 4.45

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 3.9

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	3.35	mg/kg	Sr Anal	0.06	mg/kg	1.6	%		%
Test	**EN 12457-3/1**	STD	0.79	mg/kg	Sr Test	0.59	mg/kg	17.7	%	rtest	49.6
No labs	13				SR	0.79	mg/kg	22	%	R	62.2



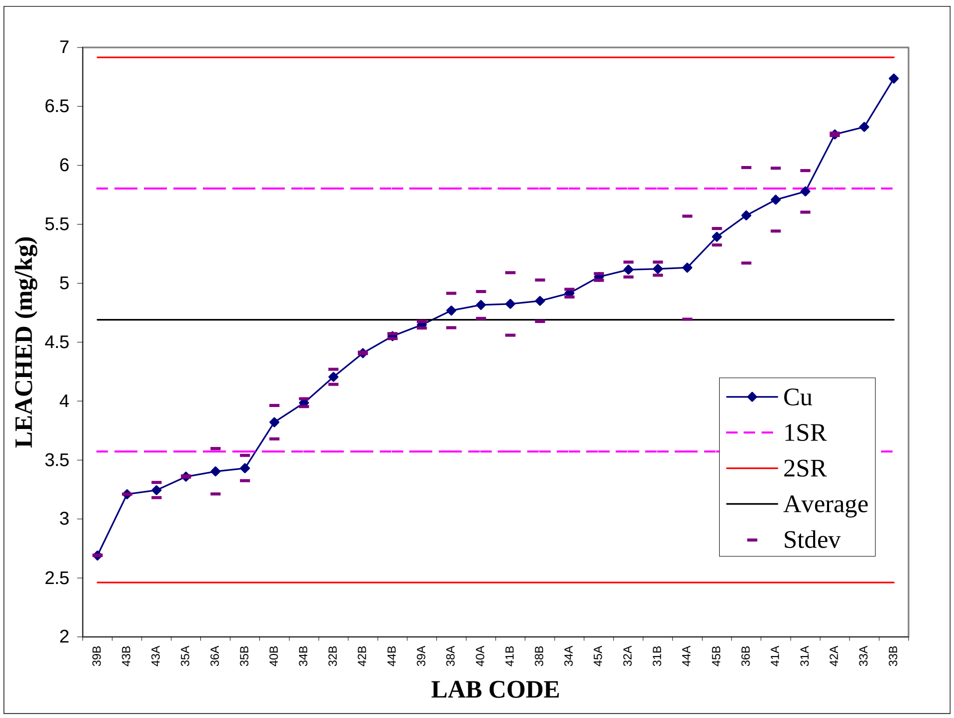
RUGGEDNESS

Average	3.9
Sr	0.58
Sr (%)	15

Percolation test

	mg/kg
L/S=1	3.49

Sample	**MBA**	Average	4.66	mg/kg	Sr Anal	0.13	mg/kg	2.7	%		%
Test	**EN 12457-3/2**	STD	1.11	mg/kg	Sr Test	0.80	mg/kg	17.2	%	rtest	48.2
No labs	13				SR	1.11	mg/kg	23	%	R	64.1



RUGGEDNESS

Average	4.9
Sr	0.68
Sr (%)	14

Percolation test

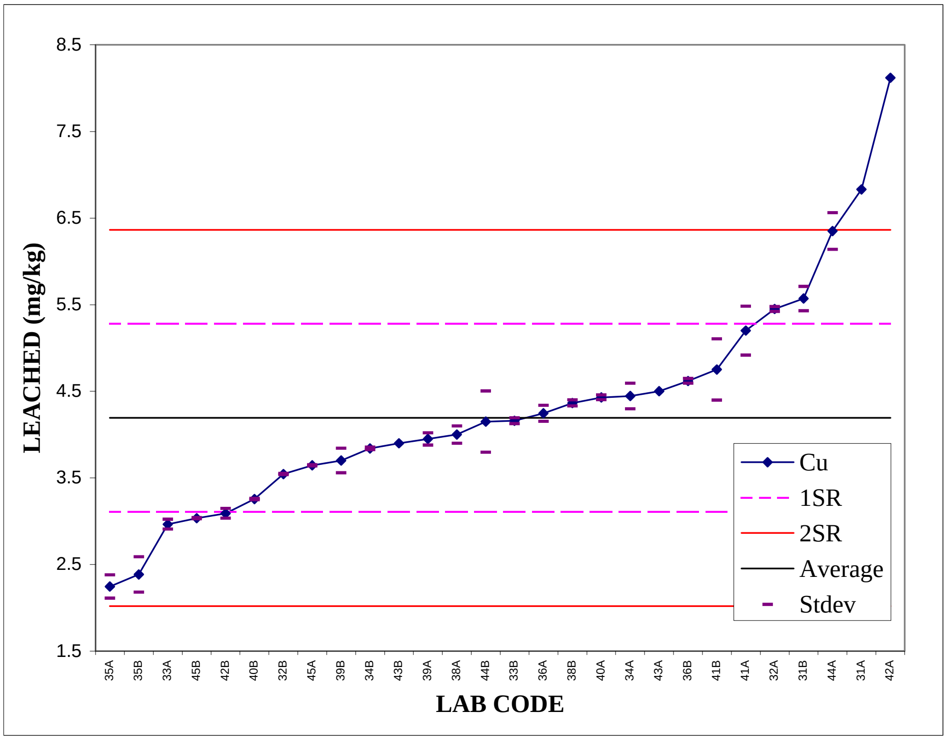
	mg/kg
L/S=10	4.45

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	3.9

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	4.19	mg/kg	Sr Anal	0.14	mg/kg	2.6	%		%
Test	**EN 12457-4**	STD	1.42		Sr Test	0.85	mg/kg	20.4	%	rtest	57
No labs	14			mg/kg	SR	1.42	mg/kg	26	%	R	74



RUGGEDNESS

Average	4.3
Sr	0.49
Sr (%)	11

Percolation test

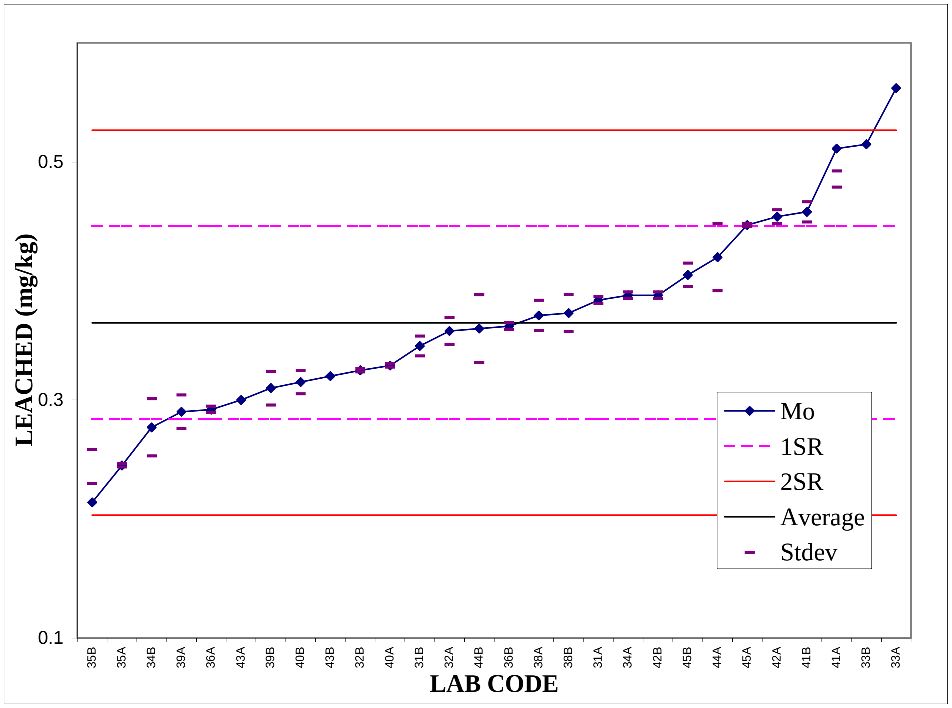
	mg/kg
L/S=10	4.45

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	3.9

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.37	mg/kg	Sr Anal	0.011	mg/kg	3.1	%		%
Test	**EN 12457-1**	STD	0.08	mg/kg	Sr Test	0.037	mg/kg	10.1	%	rtest	28.3
No labs	14				SR	0.081	mg/kg	22	%	R	62.2



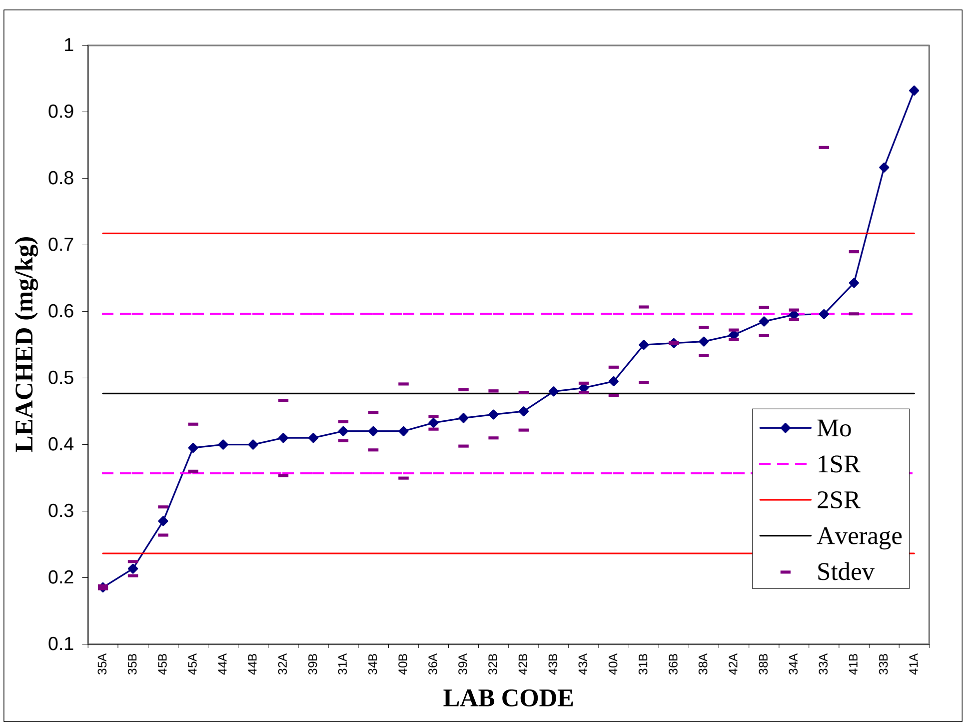
RUGGEDNESS
Average 0.36
Sr 0.019
Sr (%) 5

Percolation test
mg/kg
L/S=2 0.37

STE
Conc. (mg/l) 0.235
Sr Anal(%) 2.9
SR Anal(%) 6

Eluate analysis val.
Conc. (mg/l) 0.467
Sr Anal(%) 3.2
Conc. (mg/l) 0.07
Sr Anal(%) 5.27

Sample	**MBA**	Average	0.48	mg/kg	Sr Anal	0.03	mg/kg	7.3	%		%
Test	**EN 12457-2**	STD	0.15	mg/kg	Sr Test	0.086	mg/kg	17.7	%	rtest	50
No labs	14				SR	0.129	mg/kg	27	%	R	75



RUGGEDNESS
Average 0.54
Sr 0.021
Sr (%) 4

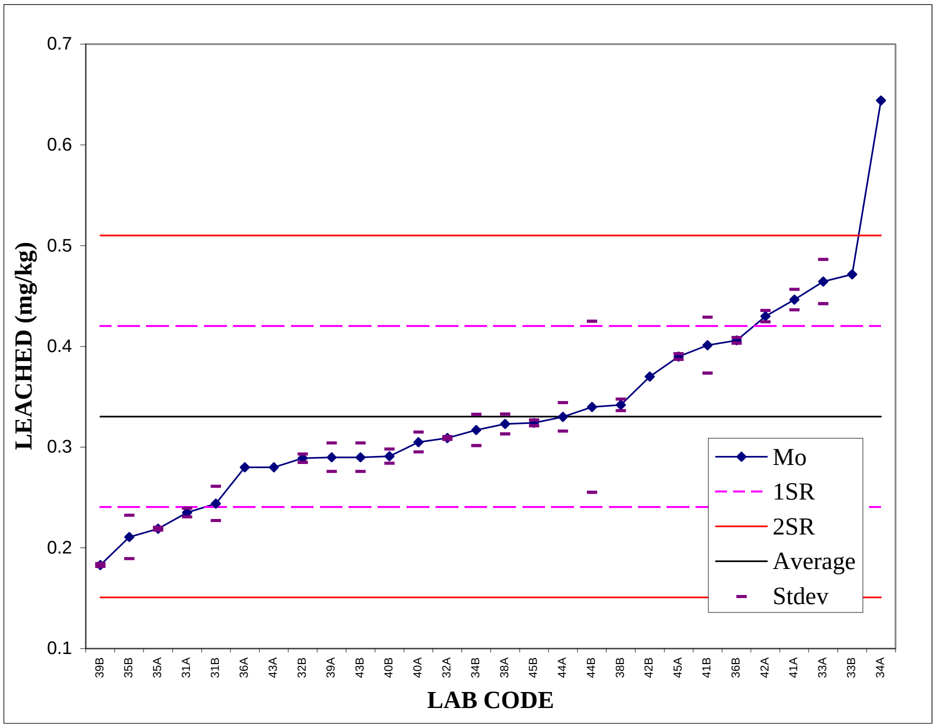
Homogeneity
Average 0.47
Sr (%) 14.5

Percolation test
mg/kg
L/S=10 0.52

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 0.66

Statistic ROBUST ISO 5725 Part 5

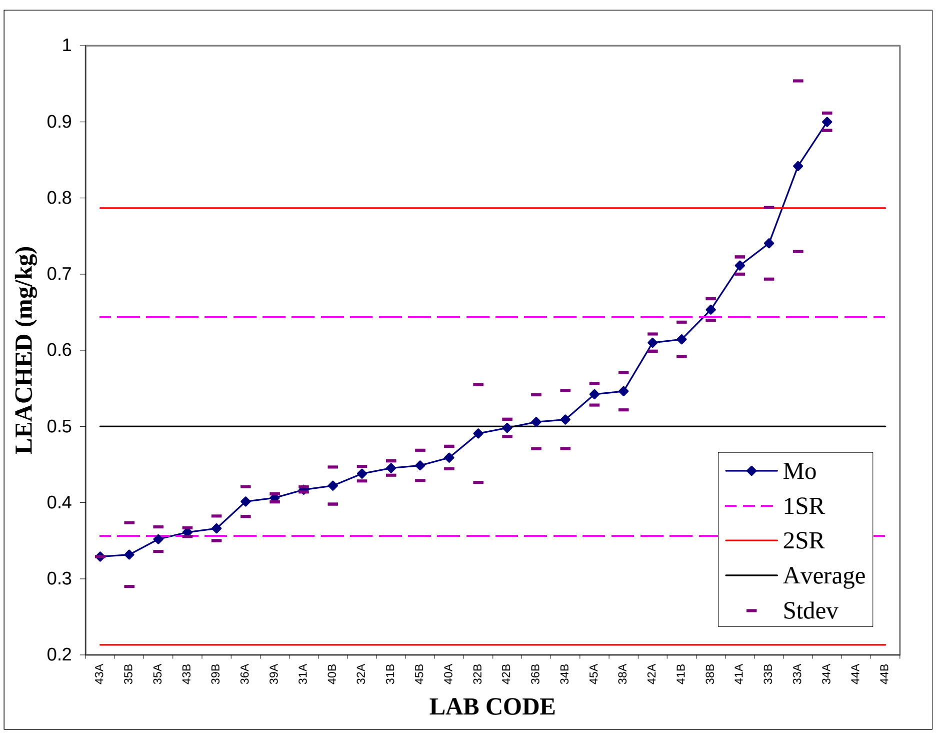
Sample	**MBA**	Average	0.34	mg/kg	Sr Anal	0.01	mg/kg	3.9	%		%
Test	**EN 12457-3/1**	STD	0.09	mg/kg	Sr Test	0.041	mg/kg	12.0	%	rtest	33.6
No labs	13				SR	0.09	mg/kg	29	%	R	81.5



RUGGEDNESS
Average 0.33
Sr 0.066
Sr (%) 20

Percolation test
mg/kg
L/S=2 0.37

Sample	**MBA**	Average	0.51	mg/kg	Sr Anal	0.026	mg/kg	5.1	%		%
Test	**EN 12457-3/2**	STD	0.14	mg/kg	Sr Test	0.066	mg/kg	13.0	%	rtest	36.4
No labs	12				SR	0.14	mg/kg	31	%	R	86.2



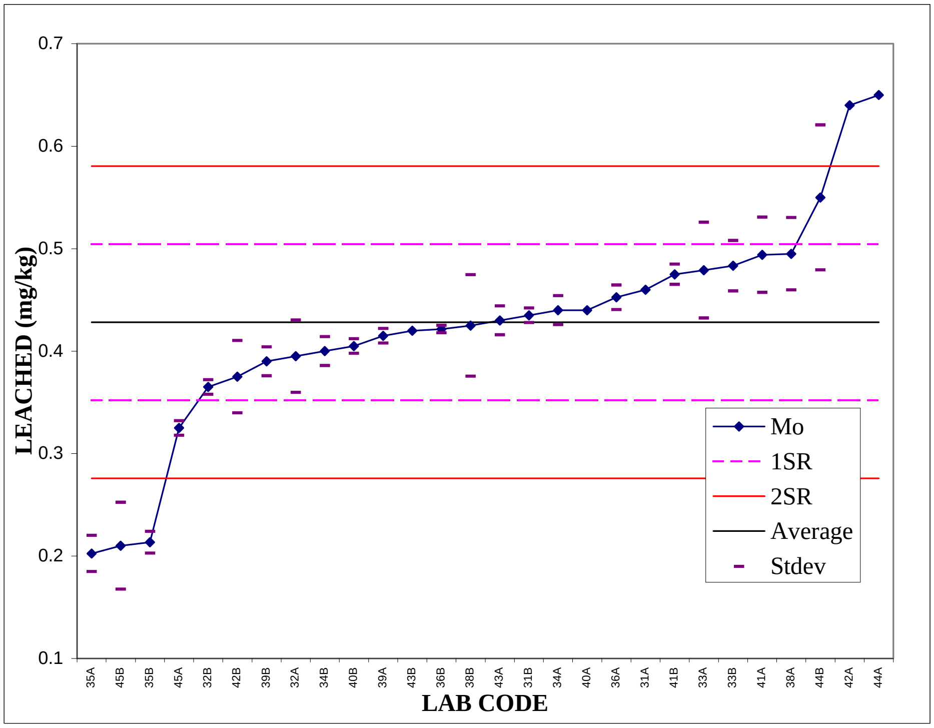
RUGGEDNESS
Average 0.43
Sr 0.092
Sr (%) 21

Percolation test
mg/kg
L/S=10 0.52

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 0.66

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.43	mg/kg	Sr Anal	0.03	mg/kg	7.0	%		%
Test	**EN 12457-4**	STD	0.10	mg/kg	Sr Test	0.040	mg/kg	9.3	%	rtest	26
No labs	14				SR	0.10	mg/kg	17	%	R	48



RUGGEDNESS

Average	0.45
Sr	0.061
Sr (%)	13

Percolation test

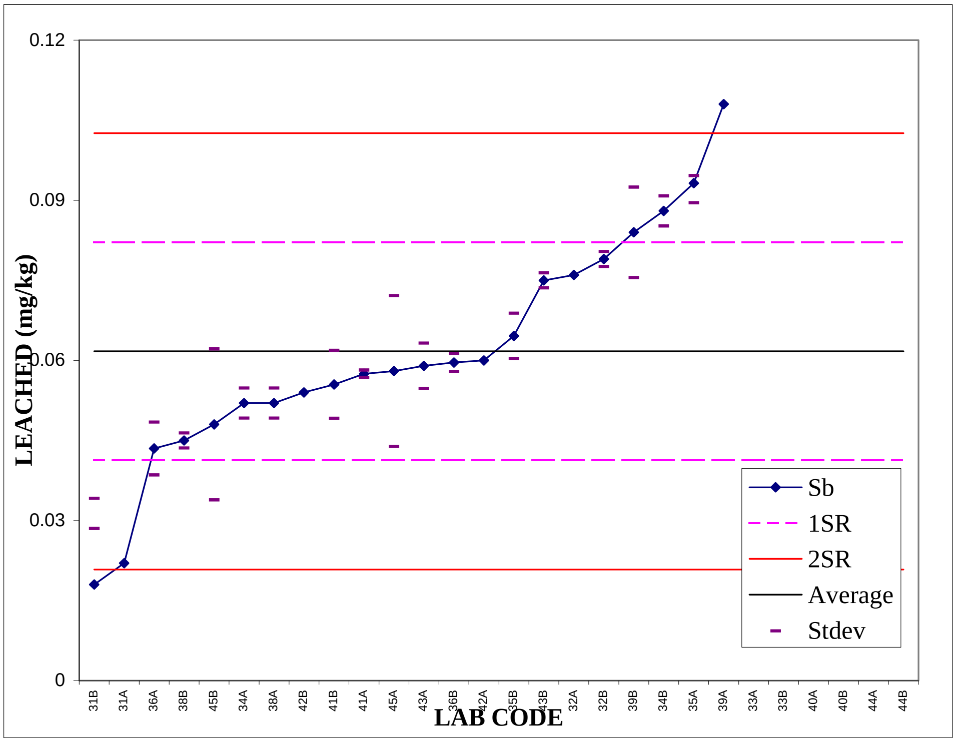
	mg/kg
L/S=10	0.52

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	0.66

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.062	mg/kg	Sr Anal	0.004	mg/kg	6.2	%		%
Test	**EN 12457-1**	STD	0.020	mg/kg	SrTest	0.013	mg/kg	20.6	%	rtest	57.7
No labs	11				SR	0.020	mg/kg	32	%	R	90.2



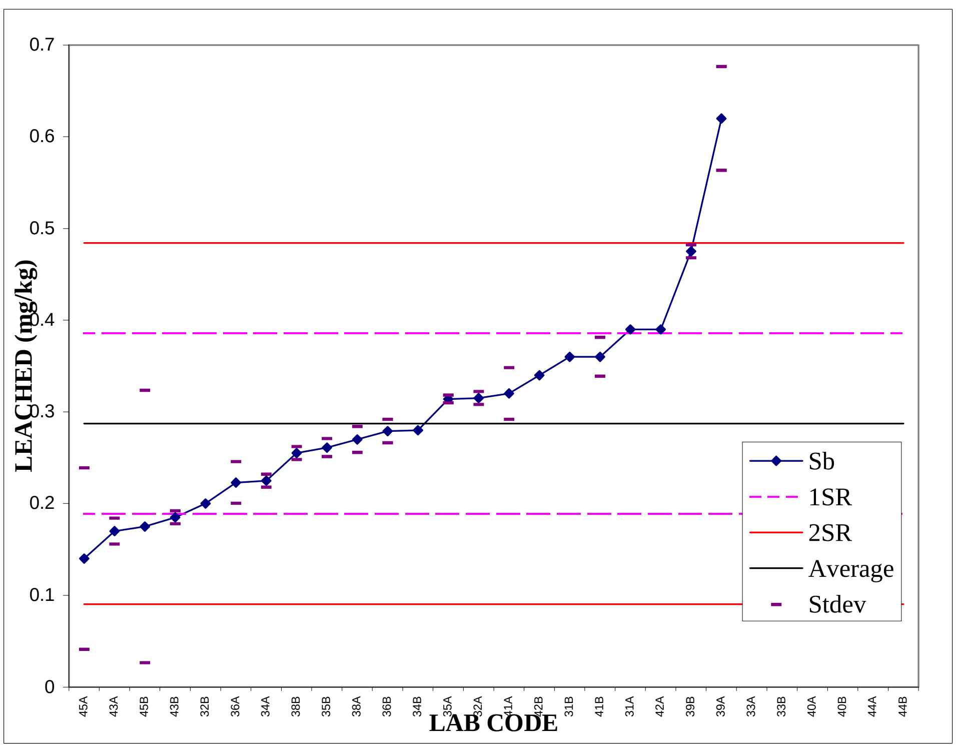
RUGGEDNESS
Average 0.057
Sr 0.0059
Sr (%) 10

Percolation test
mg/kg
L/S=2 0.059

STE
Conc. (mg/l) 0.0066
Sr Anal(%) 20
SR Anal(%) 30

Eluate analysis val.
Conc. (mg/l) 0.05
Sr Anal(%) 4.03

Sample	**MBA**	Average	0.29	mg/kg	Sr Anal	0.02	mg/kg	5.5	%		%
Test	**EN 12457-2**	STD	0.09	mg/kg	SrTest	0.055	mg/kg	19.1	%	rtest	53
No labs	**12**				SR	0.104	mg/kg	36	%	R	101



RUGGEDNESS
Average 0.44
Sr 0.09
Sr (%) 20

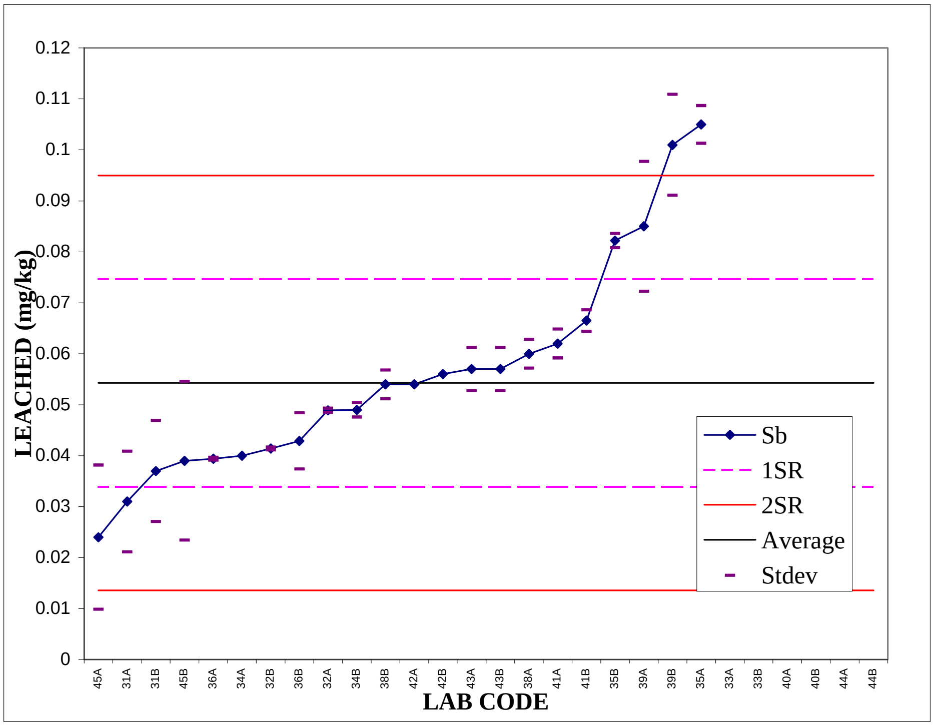
Homogeneity
Average 0.31
Sr (%) 11.7

Percolation test
mg/kg
L/S=10 0.22

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 0.53

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.054	mg/kg	Sr Anal	0.006	mg/kg	11.7	%		%
Test	**EN 12457-3/1**	STD	0.020	mg/kg	Sr Test	0.007	mg/kg	13.7	%	rtest	38.4
No labs	11				SR	0.020	mg/kg	40	%	R	111



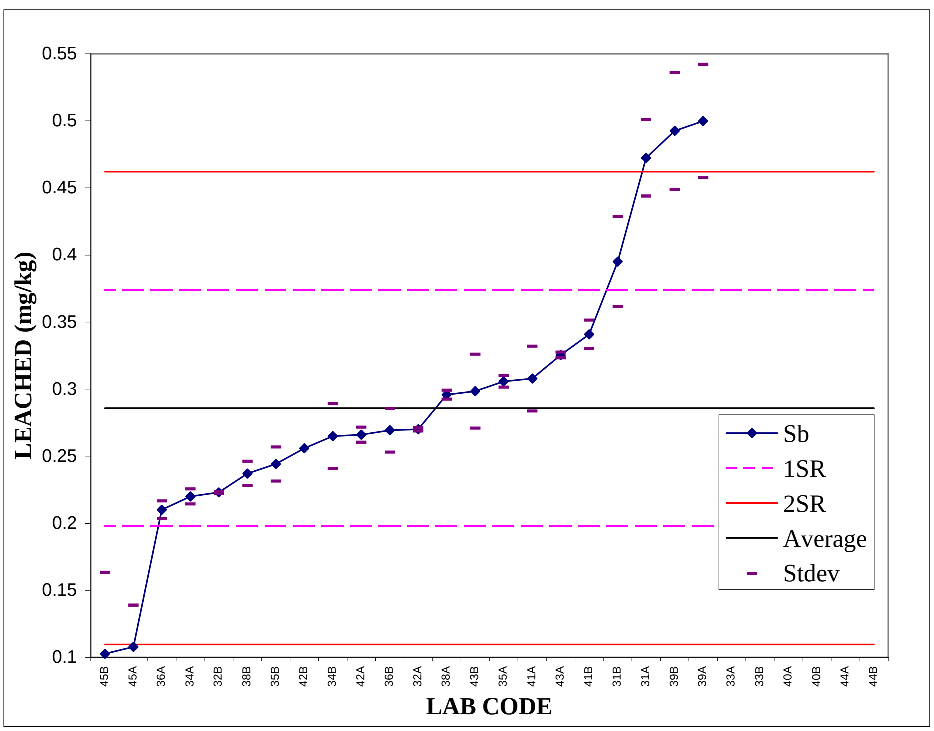
RUGGEDNESS

Average	0.044
Sr	0.006
Sr (%)	14

Percolation test

	mg/kg
L/S=1	0.059

Sample	**MBA**	Average	0.29	mg/kg	Sr Anal	0.023	mg/kg	8.2	%		%
Test	**EN 12457-3/2**	STD	0.087	mg/kg	SrTest	0.035	mg/kg	12.3	%	rtest	34.4
No labs	12				SR	0.088	mg/kg	35	%	R	96.6



RUGGEDNESS

Average	0.255
Sr	0.016
Sr (%)	6

Percolation test

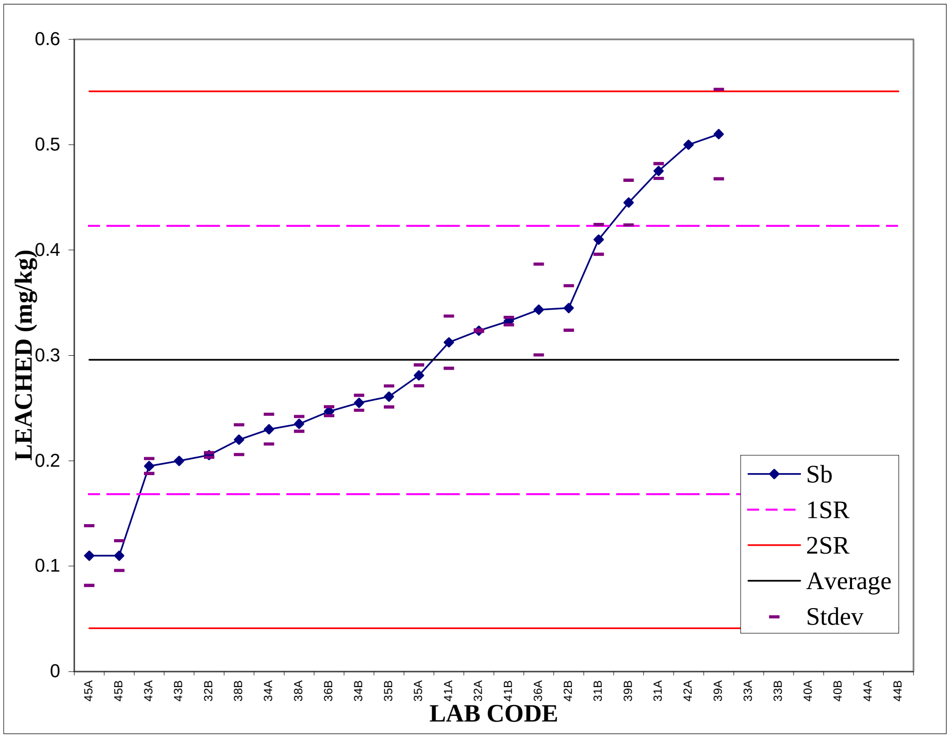
	mg/kg
L/S=10	0.22

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	0.53

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	0.30	mg/kg	Sr Anal	0.02	mg/kg	5.5	%		%
Test	**EN 12457-4**	STD	0.13	mg/kg	SrTest	0.051	mg/kg	17.1	%	rtest	48
No labs	11				SR	0.13	mg/kg	44	%	R	124



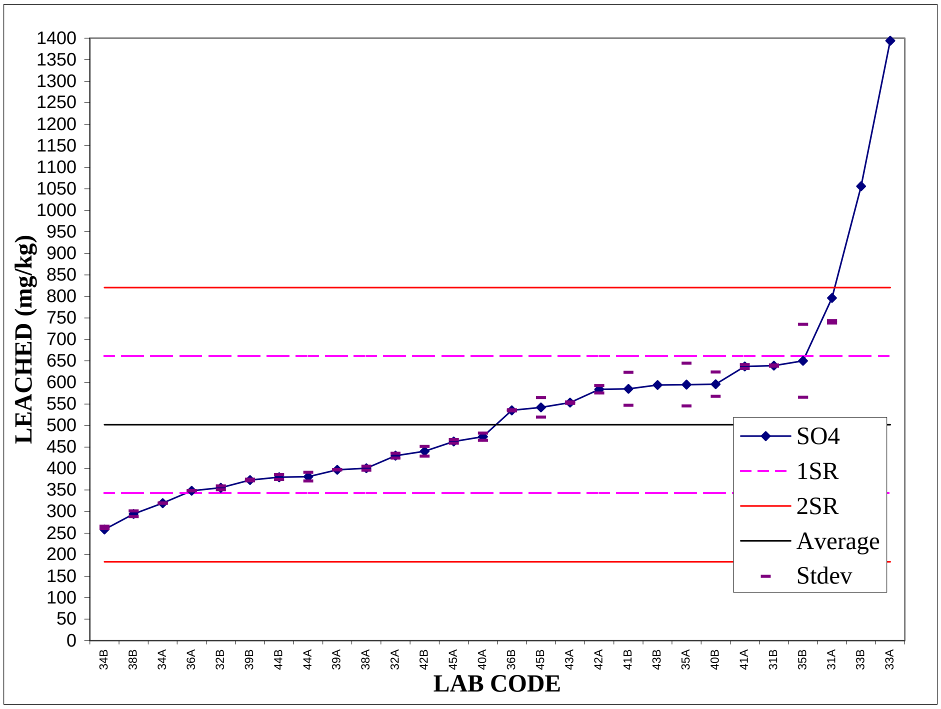
RUGGEDNESS
Average 0.29
Sr 0.036
Sr (%) 13

Percolation test
mg/kg
L/S=10 0.22

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 0.53

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	502	mg/kg	Sr Anal	8.49	mg/kg	1.7	%		%
Test	**EN 12457-1**	STD	159	mg/kg	SrTest	85.06	mg/kg	17.0	%	rtest	47.6
No labs	14				SR	159.28	mg/kg	33	%	R	93.5



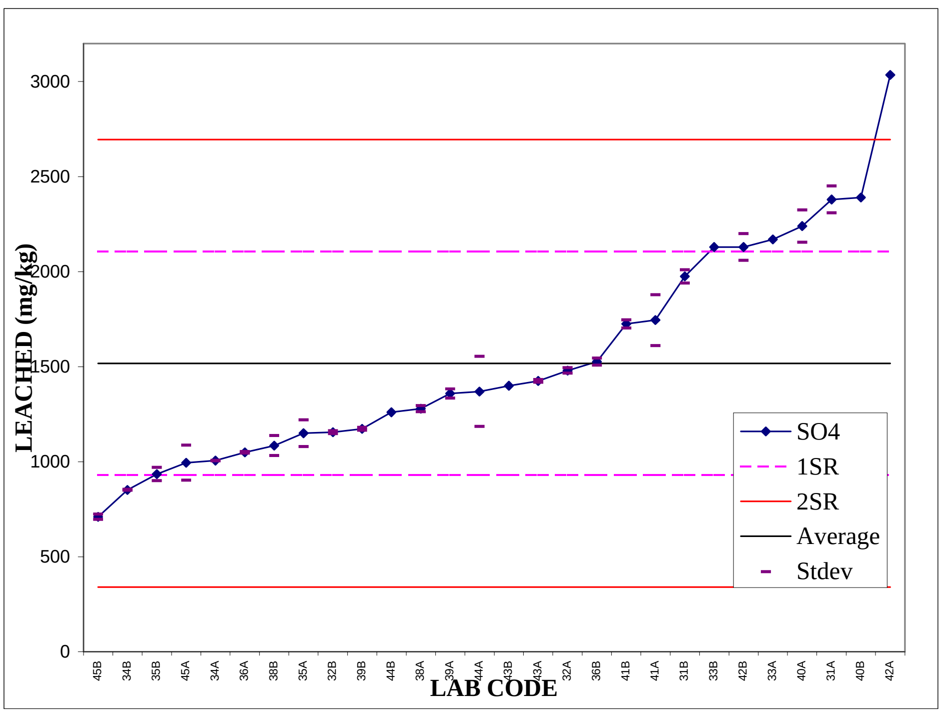
RUGGEDNESS
Average 348
Sr 14
Sr (%) 4

Percolation test
mg/kg
L/S=1 202

STE
Conc. (mg/ 52.06
Sr Anal(% 2.8
SR Anal(% 11

Eluate analysis val.
Conc. (mg/ 1350
Sr Anal(% 1.37
Conc. (mg/ 108
Sr Anal(% 2.34
Conc. (mg/ 54
Sr Anal(% 2.98

Sample	**MBA**	Average	1517	mg/kg	Sr Anal	52	mg/kg	3.9	%		%
Test	**EN 12457-2**	STD	591	mg/kg	SrTest	237	mg/kg	15.6	%	rtest	44
No labs	14				SR	593	mg/kg	39	%	R	111



RUGGEDNESS
Average 1795
Sr 91
Sr (%) 5

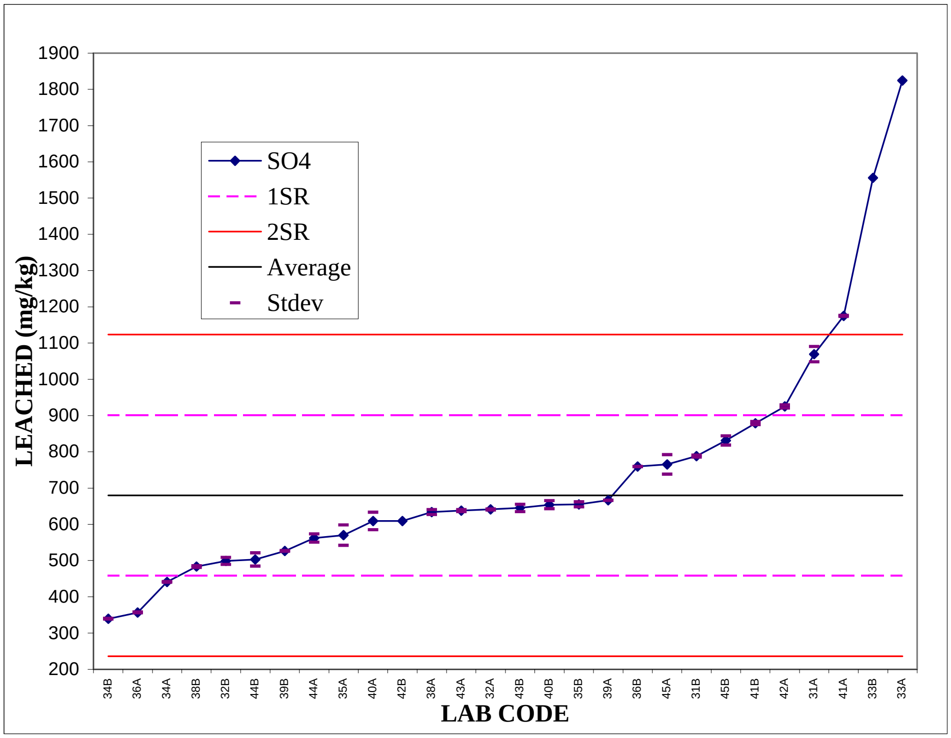
Homogeneity
Average 936
Sr (%) 13.2

Percolation test
mg/kg
L/S=10 552

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 2070

Statistic ROBUST ISO 5725 Part 5

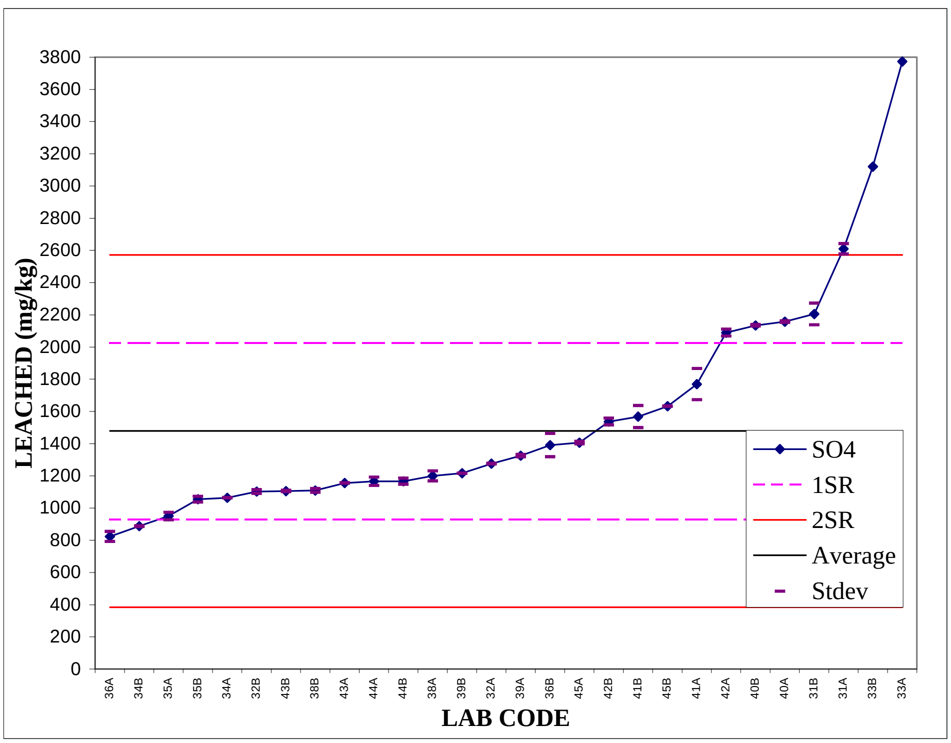
Sample	**MBA**	Average	685	mg/kg	Sr Anal	10.4	mg/kg	1.5	%		%
Test	**EN 12457-3/1**	STD	222	mg/kg	SrTest	155	mg/kg	22.6	%	rtest	63.3
No labs	14				SR	238	mg/kg	35	%	R	97



RUGGEDNESS
Average 746
Sr 140
Sr (%) 19

Percolation test
mg/kg
L/S=1 202

Sample	**MBA**	Average	1482	mg/kg	Sr Anal	23.9	mg/kg	1.6	%		%
Test	**EN 12457-3/2**	STD	547	mg/kg	SrTest	224	mg/kg	15.1	%	rtest	42.3
No labs	14				SR	547	mg/kg	38	%	R	108



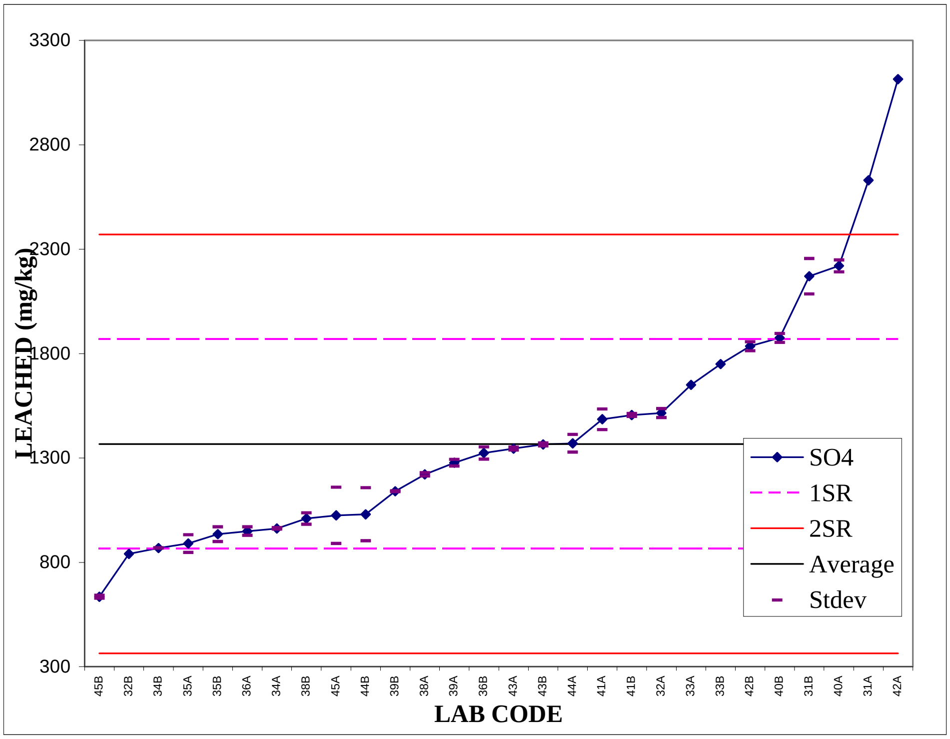
RUGGEDNESS
Average 1383
Sr 188
Sr (%) 14

Percolation test
mg/kg
L/S=10 552

pH stat (own pH)
L/S=10 mg/kg
pH 10.9 2070

Statistic ROBUST ISO 5725 Part 5

Sample	**MBA**	Average	1367	mg/kg	Sr Anal	33.0	mg/kg	2.4	%		%
Test	**EN 12457-4**	STD	519	mg/kg	SrTest	253	mg/kg	18.5	%	rtest	52
No labs	14				SR	548	mg/kg	40	%	R	112



RUGGEDNESS

Average	1512
Sr	75
Sr (%)	5

Percolation test

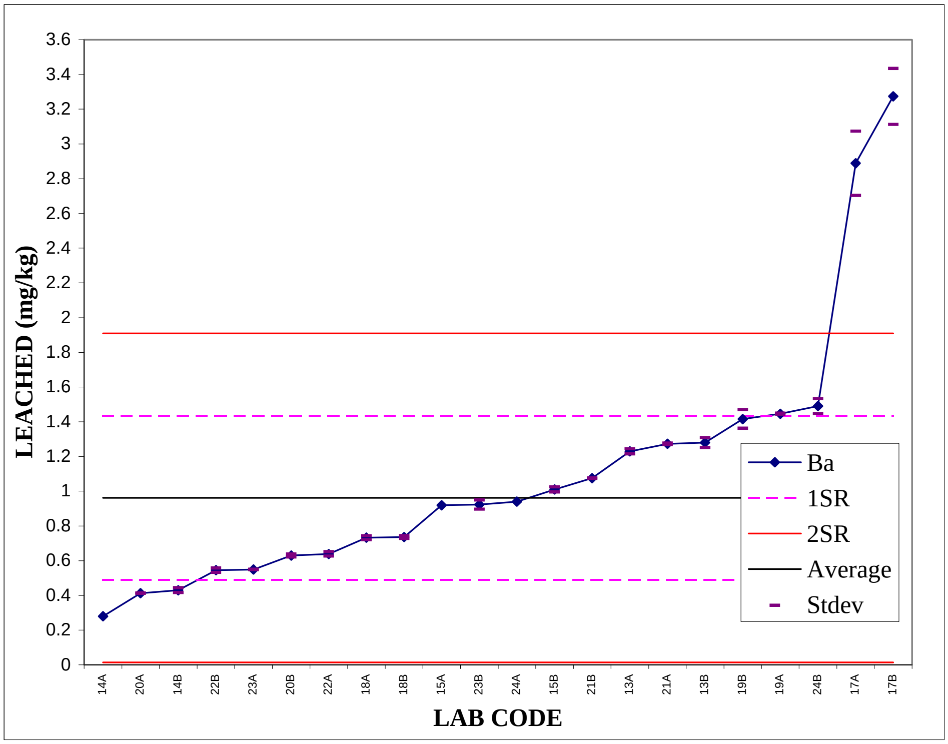
	mg/kg
L/S=10	552

pH stat (own pH)

L/S=10	mg/kg
pH 10.9	2070

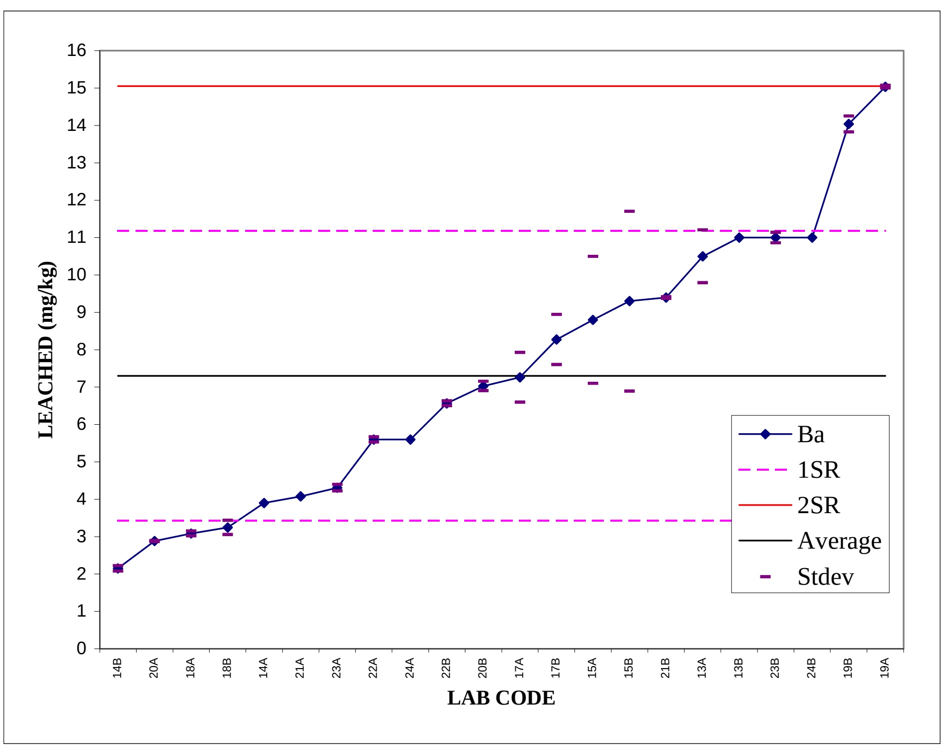
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	0.96	mg/kg	Sr Anal	0.02	mg/kg	2.0	%		%
Test	**EN 12457-1**	STD	0.47	mg/kg	Sr Test	0.18	mg/kg	18.9	%	rtest	52.9
No labs	11				SR	0.47	mg/kg	49	%	R	140



Percolation test
mg/kg
L/S=1 0.96

Sample	**SBW**	Average	7.20	mg/kg	Sr Anal	0.27	mg/kg	3.6	%		%
Test	**EN 12457-2**	STD	3.87	mg/kg	Sr Test	2.51	mg/kg	34.8	%	rtest	97
No labs	11				SR	3.87	mg/kg	50	%	R	142



Percolation test
mg/kg
L/S=10 9.64

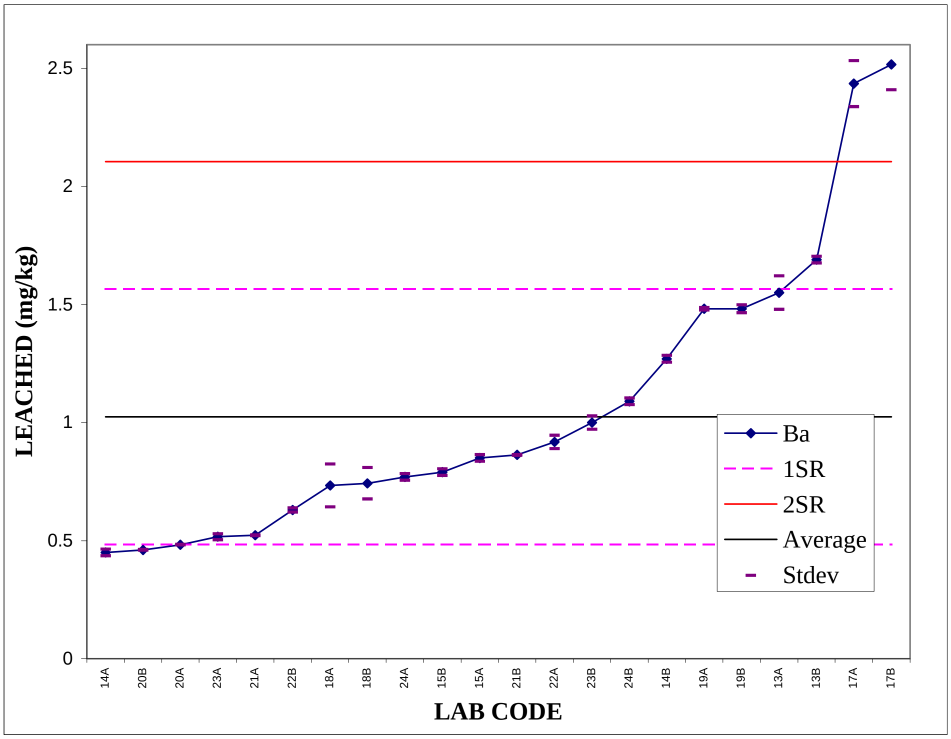
pH stat (own pH)
L/S=10 mg/kg
pH 8.1 1.04

STE
Conc. (mg/l) 0.0266
Sr Anal(%) 3.6
SR Anal(%) 11

Eluate analysis val.
Conc. (mg/l) 0.0579
Sr Anal(%) 4.18
Conc. (mg/l) 0.0804
Sr Anal(%) 1.88
Conc. (mg/l) 0.0271
Sr Anal(%) 3.95

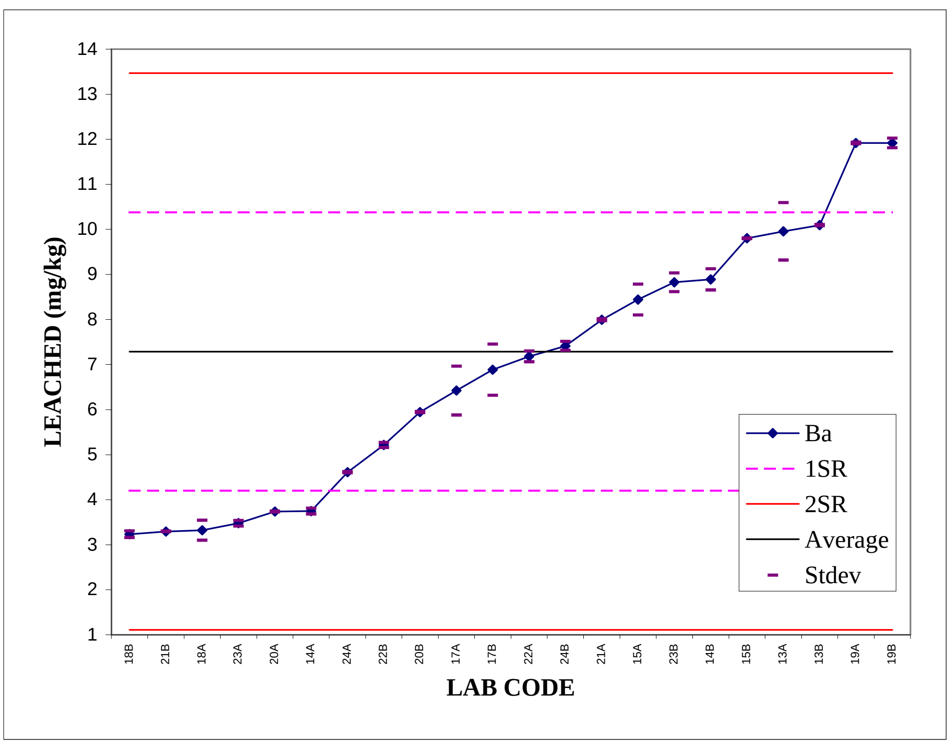
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	0.98	mg/kg	Sr Anal	0.02	mg/kg	2.0	%		%
Test	**EN 12457-3/1**	STD	0.54	mg/kg	Sr Test	0.23	mg/kg	24.0	%	rtest	67
No labs	10				SR	0.54	mg/kg	48	%	R	134



Percolation test
mg/kg
L/S=1 0.96

Sample	**SBW**	Average	7.10	mg/kg	Sr Anal	0.21	mg/kg	2.9	%		%
Test	**EN 12457-3/2**	STD	3.09	mg/kg	Sr Test	2.44	mg/kg	34.3	%	rtest	96
No labs	10				SR	3.09	mg/kg	38	%	R	106

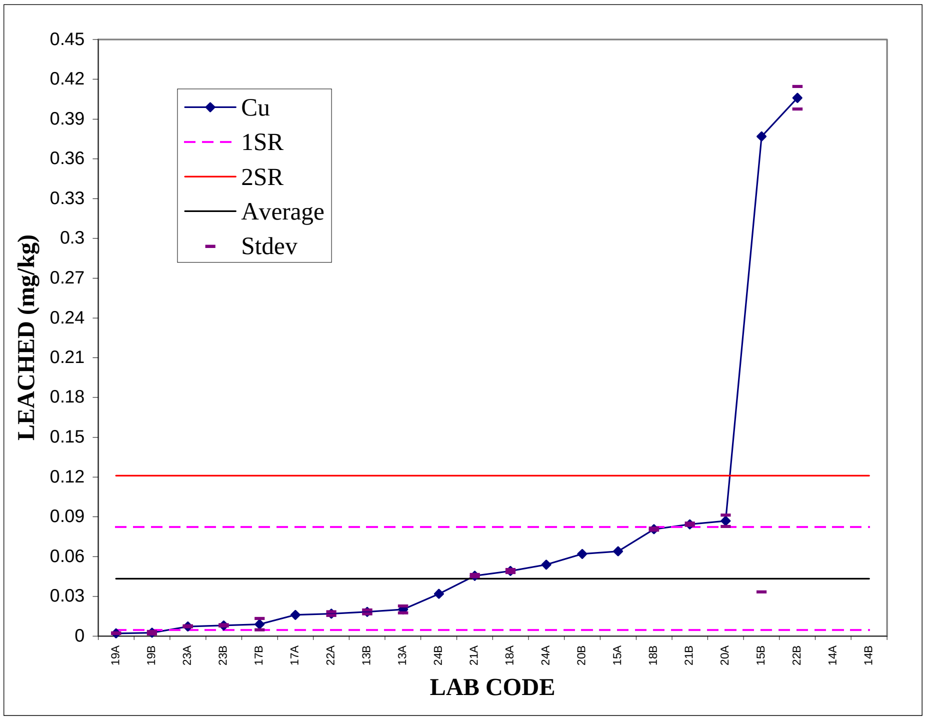


Percolation test
mg/kg
L/S=10 9.64

pH stat (own pH)
L/S=10 mg/kg
pH 8.1 1.04

Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	0.06	mg/kg	Sr Anal	0.002	mg/kg	3.7	%		%
Test	**EN 12457-1**	STD	0.04	mg/kg	Sr Test	0.025	mg/kg	41.2	%	rtest	115
No labs	10				SR	0.039	mg/kg	111	%	R	311



Percolation test

	mg/kg
L/S=1	0.05

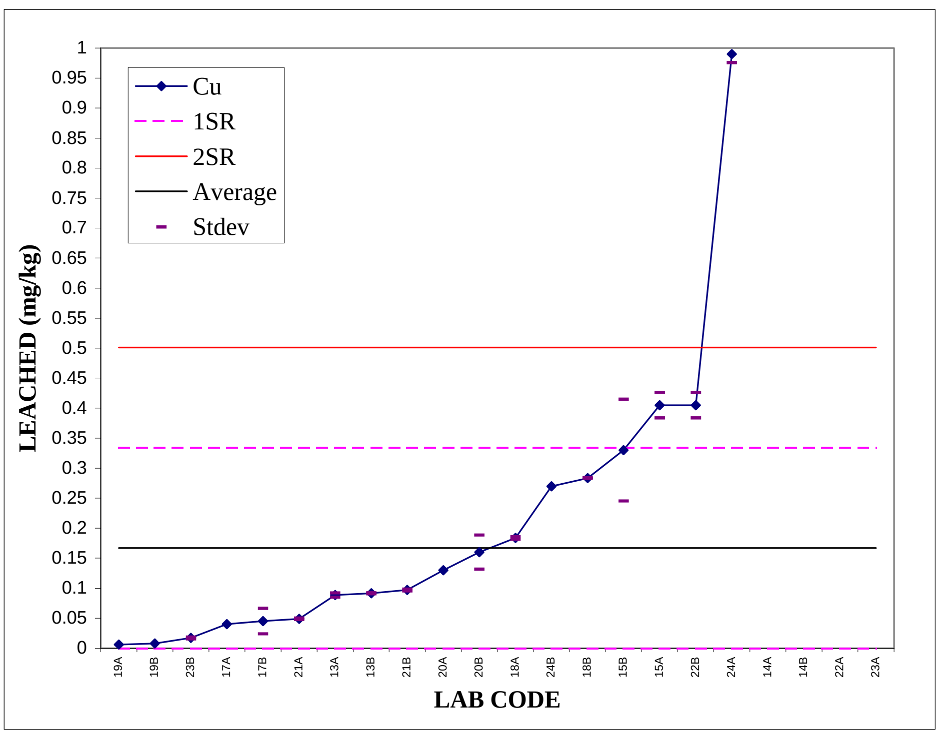
STE

Conc. (mg/l)	0.0062
Sr Anal(%)	11.2
SR Anal(%)	26

Eluate analysis val.

Conc. (mg/l)	0.363
Sr Anal(%)	0.66
Conc. (mg/l)	0.102
Sr Anal(%)	4.2
Conc. (mg/l)	0.0192
Sr Anal(%)	6.35
Conc. (mg/l)	0.00766
Sr Anal(%)	15

Sample	**SBW**	Average	0.19	mg/kg	Sr Anal	0.015	mg/kg	9.0	%		%
Test	**EN 12457-2**	STD	0.17	mg/kg	Sr Test	0.051	mg/kg	26.7	%	rtest	75
No labs	9				SR	0.167	mg/kg	109	%	R	307



Percolation test

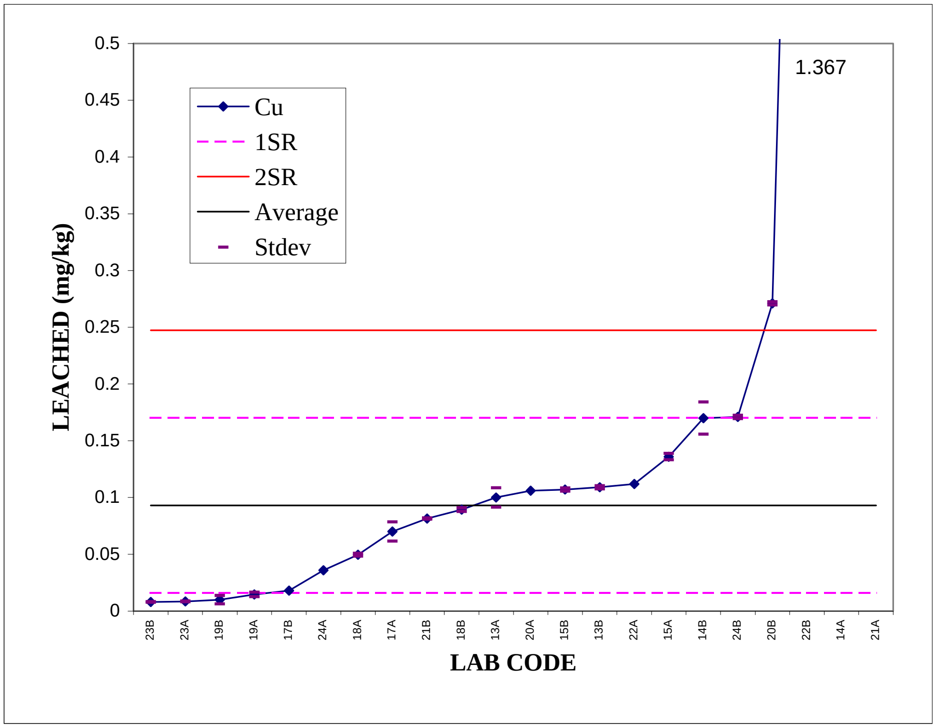
	mg/kg
L/S=10	0.13

pH stat (own pH)

L/S=10	mg/kg
pH 8.1	0.053

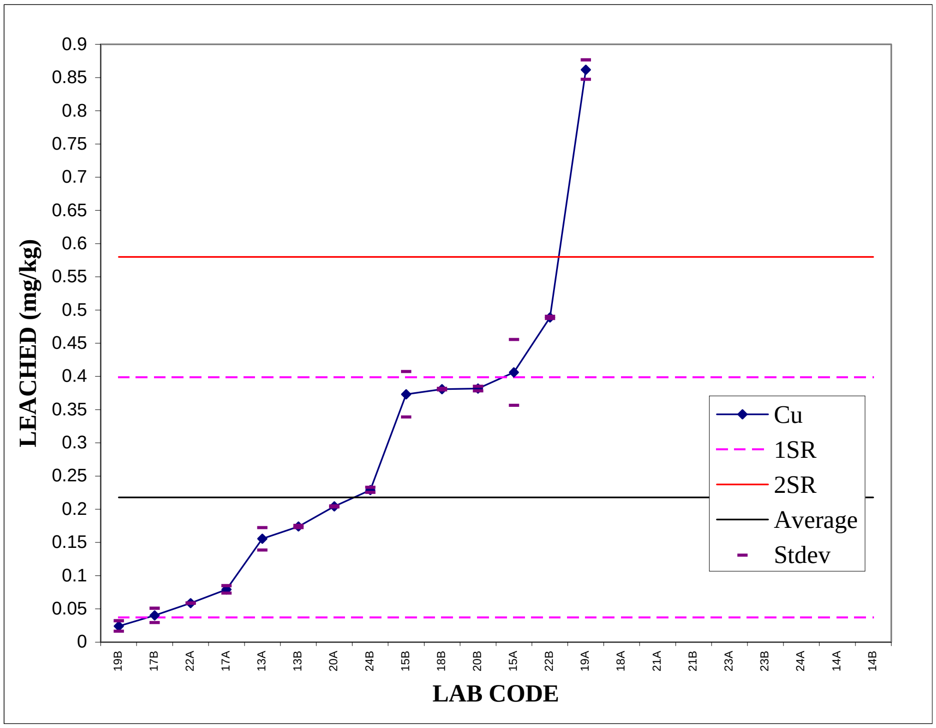
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	0.10	mg/kg	Sr Anal	0.003	mg/kg	3.1	%		%
Test	**EN 12457-3/1**	STD	0.08	mg/kg	Sr Test	0.080	mg/kg	77.2	%	rtest	216
No labs	9				SR	0.077	mg/kg	98	%	R	275



Percolation test
L/S=1 0.05

Sample	**SBW**	Average	0.20	mg/kg	Sr Anal	0.012	mg/kg	5.5	%		%
Test	**EN 12457-3/2**	STD	0.18	mg/kg	Sr Test	0.115	mg/kg	58	%	rtest	161
No labs	6				SR	0.181	mg/kg	86	%	R	242

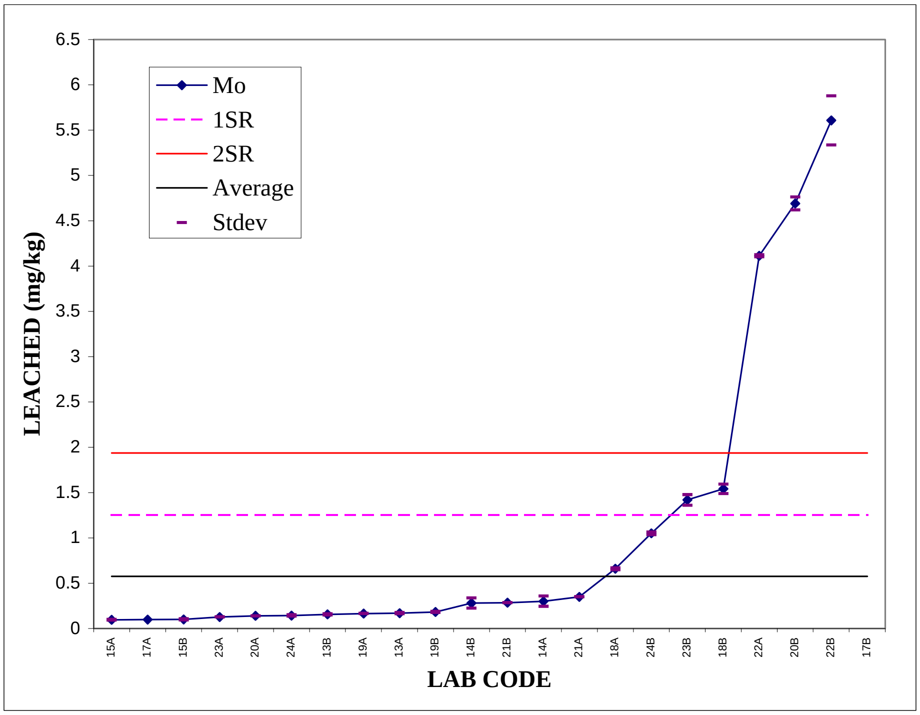


Percolation test
L/S=10 0.13

pH stat (own pH)
pH 8.1 0.053

Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	0.62	mg/kg	Sr Anal	0.033	mg/kg	5.8	%		%
Test	**EN 12457-1**	STD	0.68	mg/kg	Sr Test	0.701	mg/kg	113.0	%	rtest	316
No labs	11				SR	0.681	mg/kg	132	%	R	371



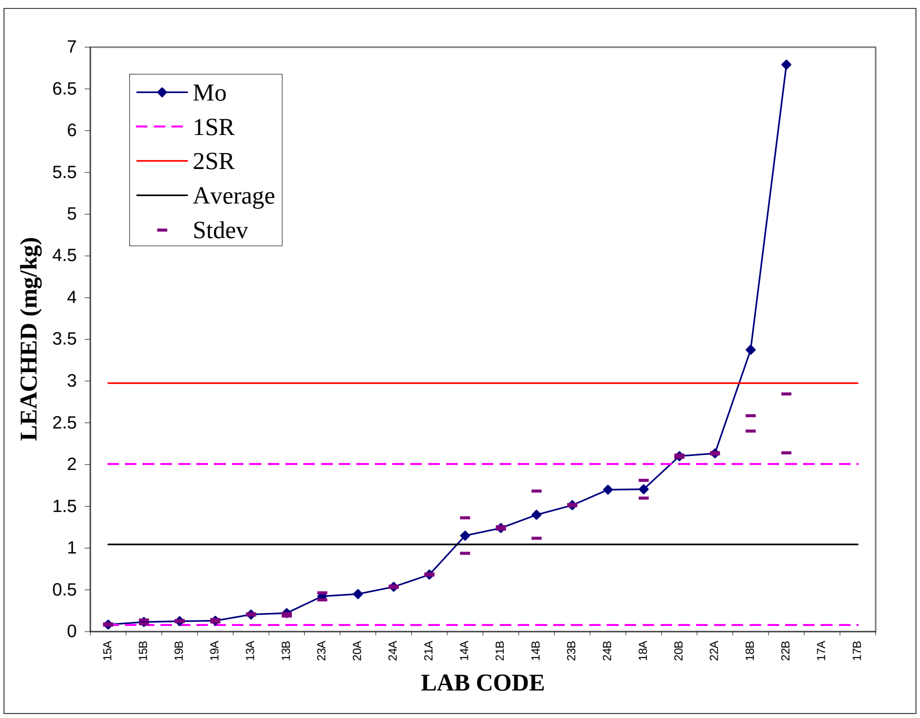
STE

Conc. (mg/l)	0.235
Sr Anal(%)	2.9
SR Anal(%)	6

Eluate analysis val.

Conc. (mg/l)	0.467
Sr Anal(%)	3.2
Conc. (mg/l)	0.07
Sr Anal(%)	5.27

Sample	**SBW**	Average	1.12	mg/kg	Sr Anal	0.033	mg/kg	3.1	%		%
Test	**EN 12457-2**	STD	0.97	mg/kg	Sr Test	0.866	mg/kg	77.3	%	rtest	216
No labs	10				SR	0.966	mg/kg	106	%	R	298



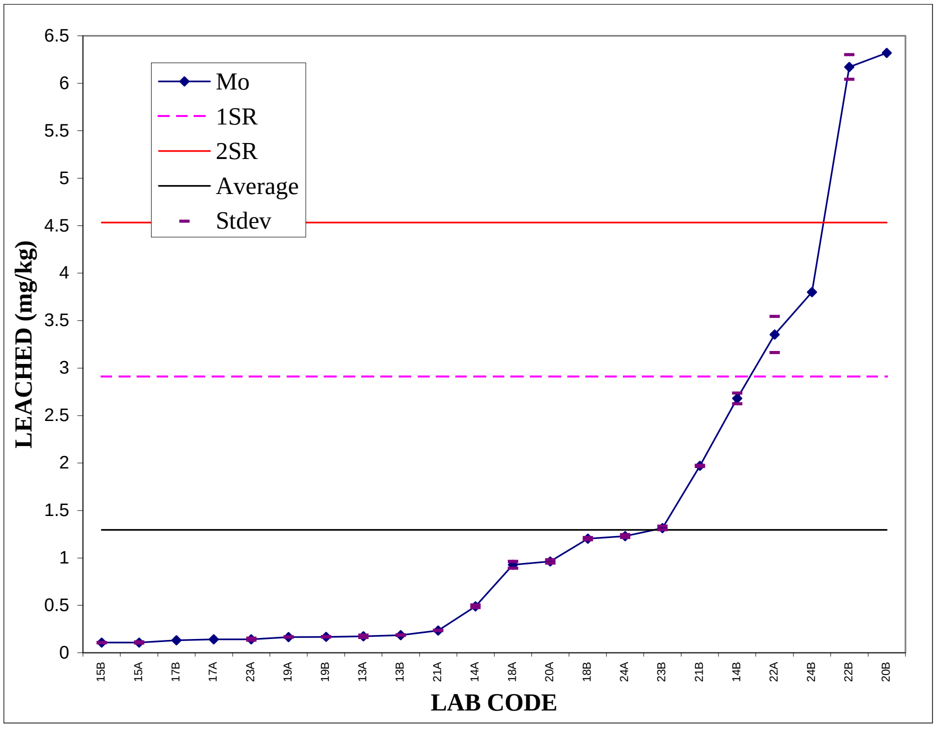
Percolation test

	mg/kg
L/S=10	0.95

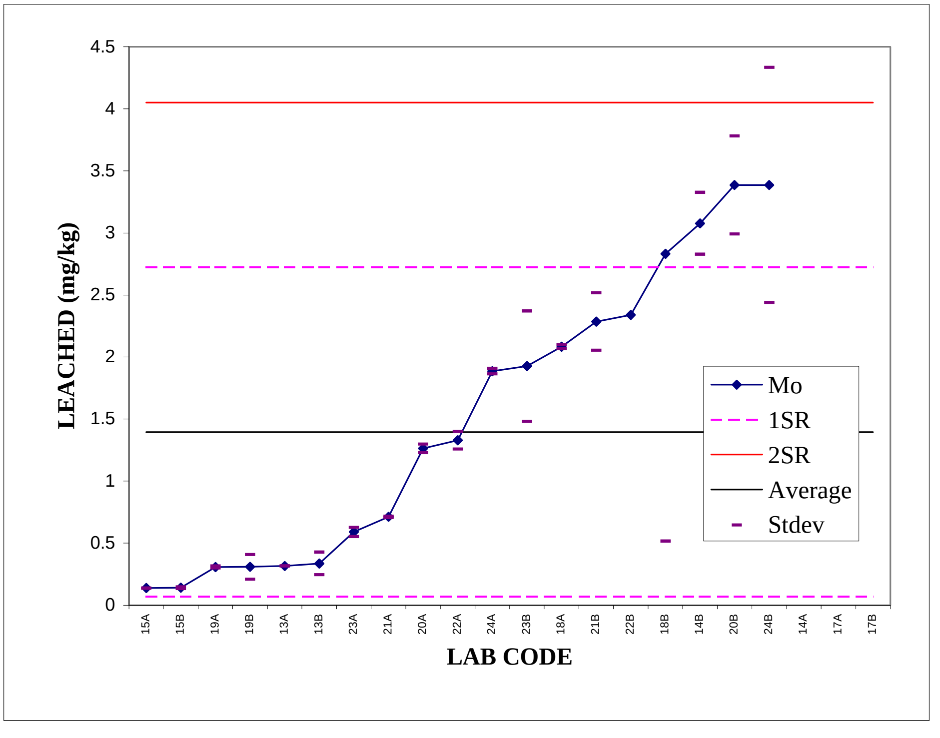
pH stat (own pH)
pH 8.1

Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	1.40	mg/kg	Sr Anal	0.014	mg/kg	1.1	%		%
Test	**EN 12457-3/1**	STD	1.62	mg/kg	Sr Test	1.568	mg/kg	112.0	%	rtest	314
No labs	10				SR	1.619	mg/kg	143	%	R	400



Sample	**SBW**	Average	1.80	mg/kg	Sr Anal	0.031	mg/kg	2.2	%		%
Test	**EN 12457-3/2**	STD	1.33	mg/kg	Sr Test	1.413	mg/kg	78.5	%	rtest	220
No labs	9				SR	1.327	mg/kg	109	%	R	305

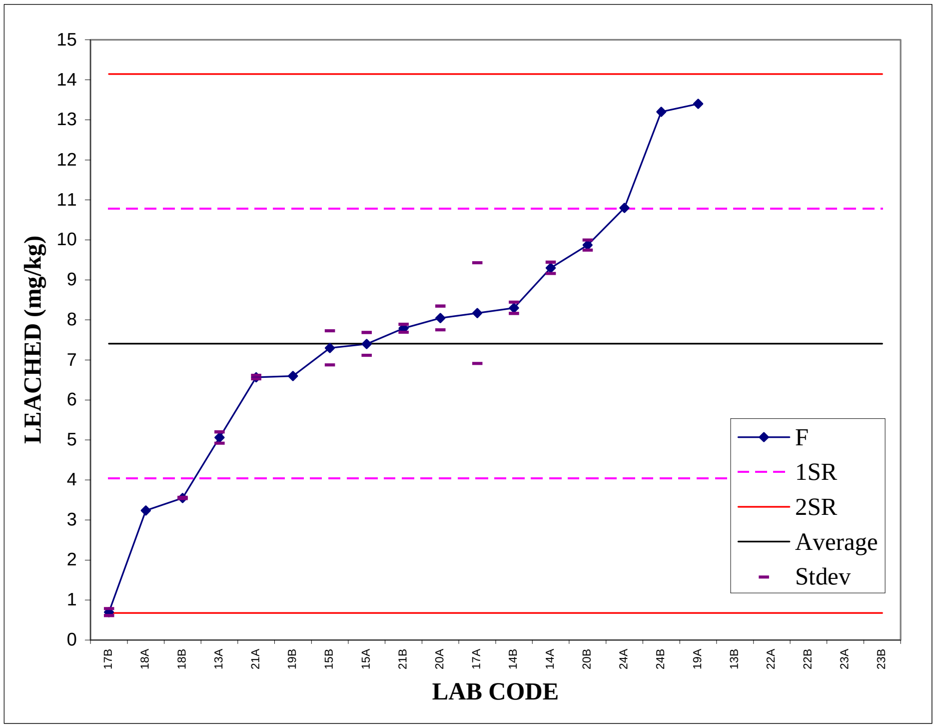


Percolation test
mg/kg
L/S=10 0.95

pH stat (own pH)
pH 8.1

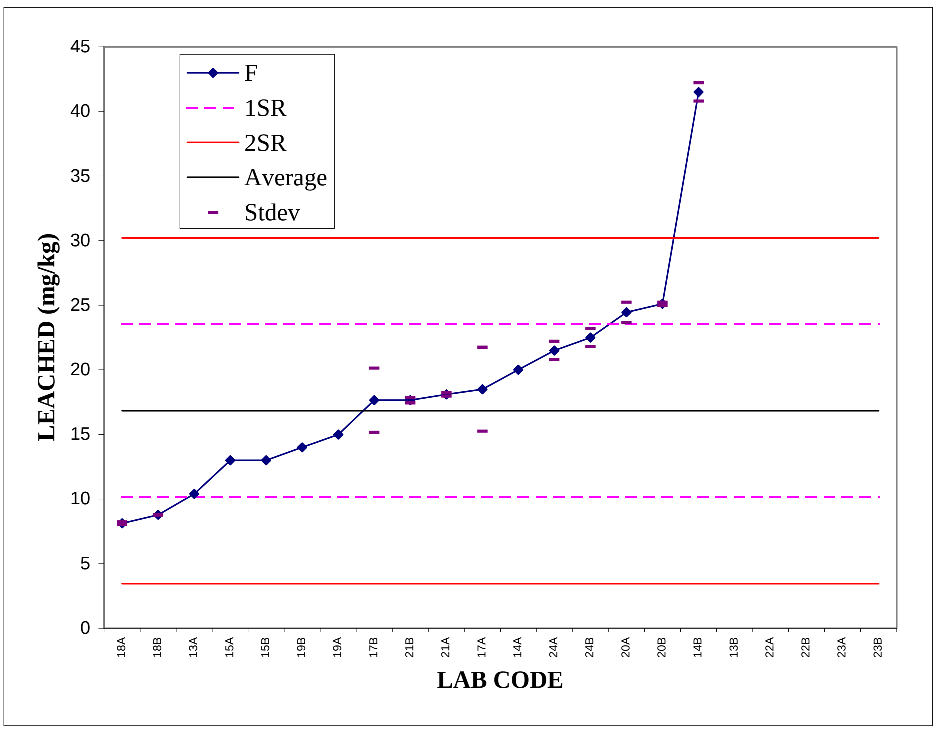
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	7.41	mg/kg	Sr Anal	0.18	mg/kg	2.5	%		%
Test	**EN 12457-1**	STD	3.36	mg/kg	Sr Test	1.75	mg/kg	23.6	%	rtest	66
No labs	9				SR	3.37	mg/kg	47	%	R	131



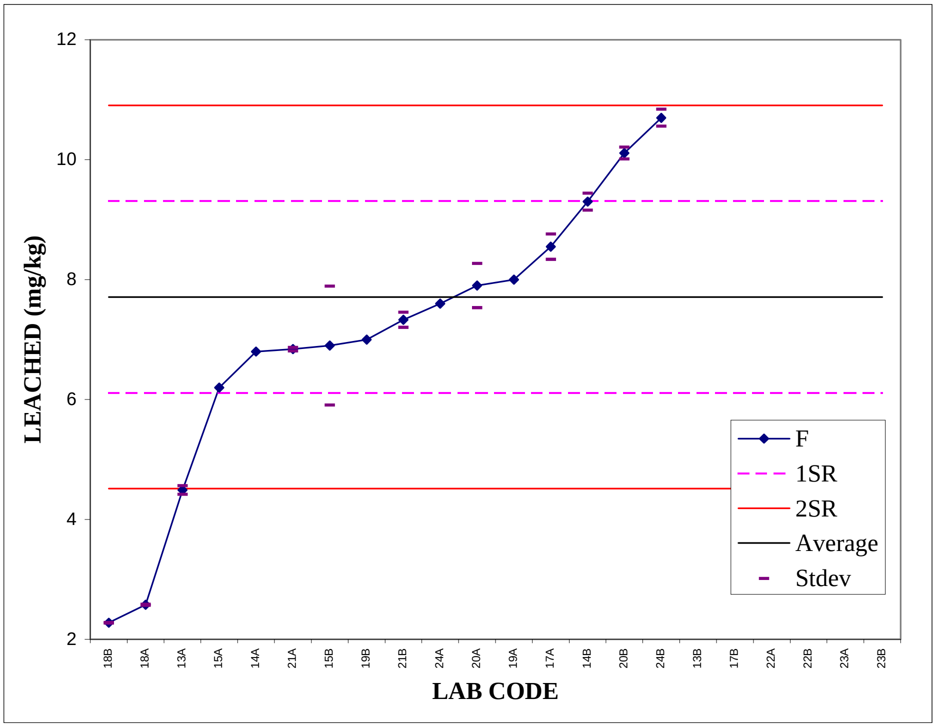
Eluate analysis val.	
Conc. (mg/	0.709
Sr Anal(%)	3.25
Conc. (mg/	7.66
Sr Anal(%)	2.1

Sample	**SBW**	Average	17.50	mg/kg	Sr Anal	0.56	mg/kg	3.4	%		%
Test	**EN 12457-2**	STD	6.68	mg/kg	Sr Test	0.9	mg/kg	5.2	%	rtest	14.3
No labs	9				SR	6.69	mg/kg	46	%	R	127

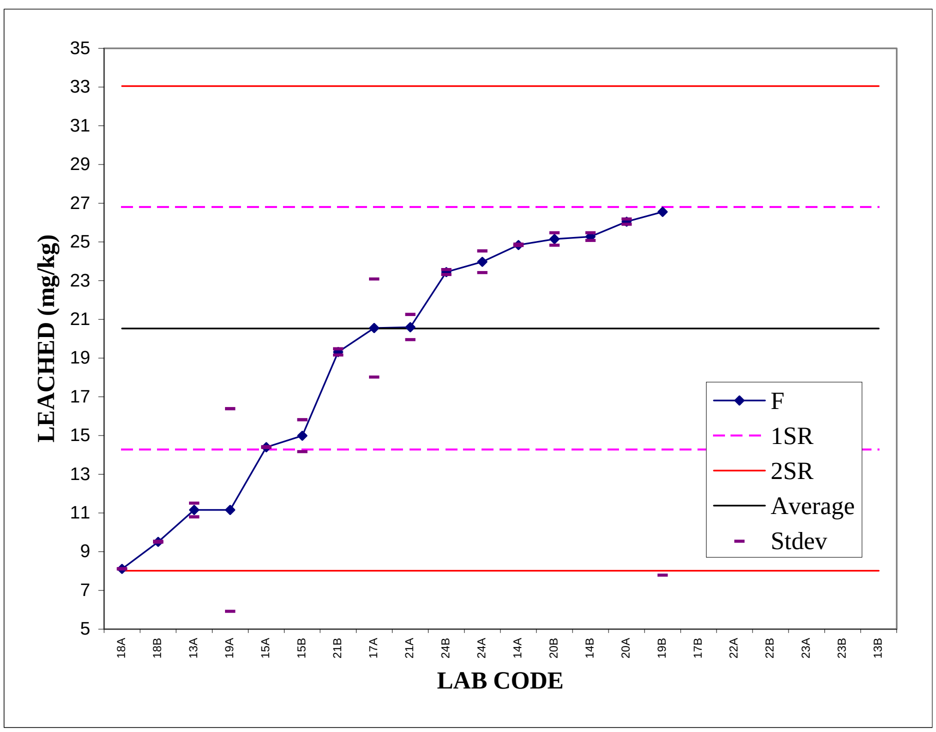


Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	7.10	mg/kg	Sr Anal	0.16	mg/kg	2.1	%		%
Test	**EN 12457-3/1**	STD	1.59	mg/kg	Sr Test	1.39	mg/kg	19.6	%	rtest	54.9
No labs	7				SR	1.60	mg/kg	37	%	R	103

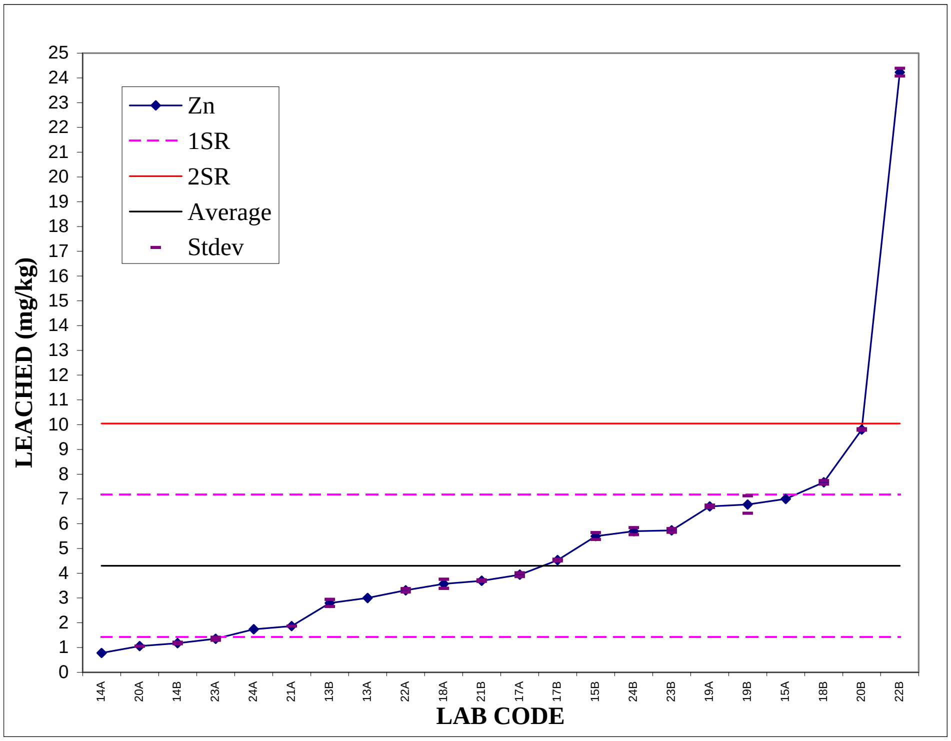


Sample	**SBW**	Average	18.40	mg/kg	Sr Anal	0.48	mg/kg	2.4	%		%
Test	**EN 12457-3/2**	STD	6.25	mg/kg	Sr Test	0.90	mg/kg	4.9	%	rtest	13.7
No labs	7				SR	6.26	mg/kg	42	%	R	119



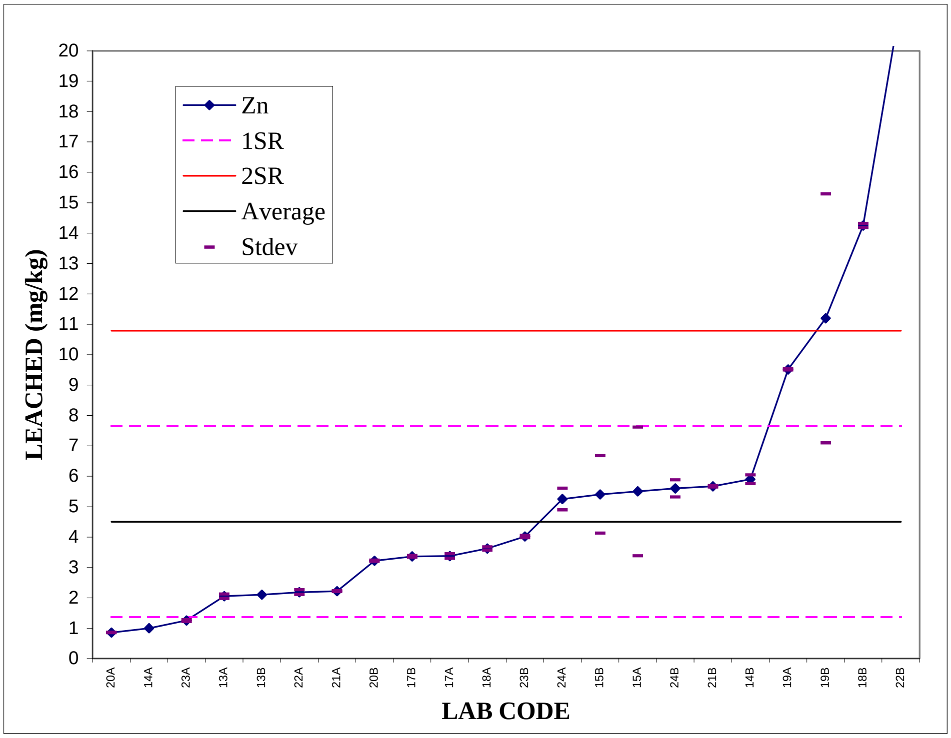
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	4.55	mg/kg	Sr Anal	0.09	mg/kg	2.2	%		%
Test	**EN 12457-1**	STD	2.87	mg/kg	Sr Test	2.79	mg/kg	61.4	%	rtest	172
No labs	11				SR	2.87	mg/kg	68	%	R	189



Percolation test
mg/kg
L/S=1 4.61

Sample	**SBW**	Average	5.31	mg/kg	Sr Anal	0.15	mg/kg	3.2	%		%
Test	**EN 12457-2**	STD	3.14	mg/kg	Sr Test	2.64	mg/kg	49.8	%	rtest	139
No labs	11				SR	3.14	mg/kg	79	%	R	220

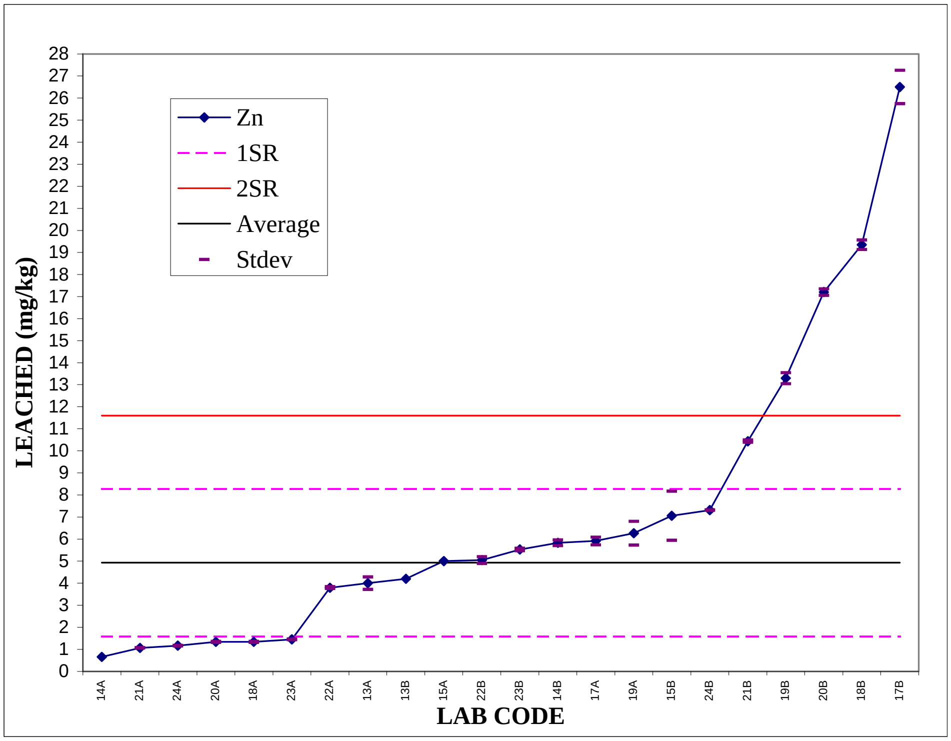


Percolation test
mg/kg
L/S=10 4.97

pH stat (own pH)
pH 8.1

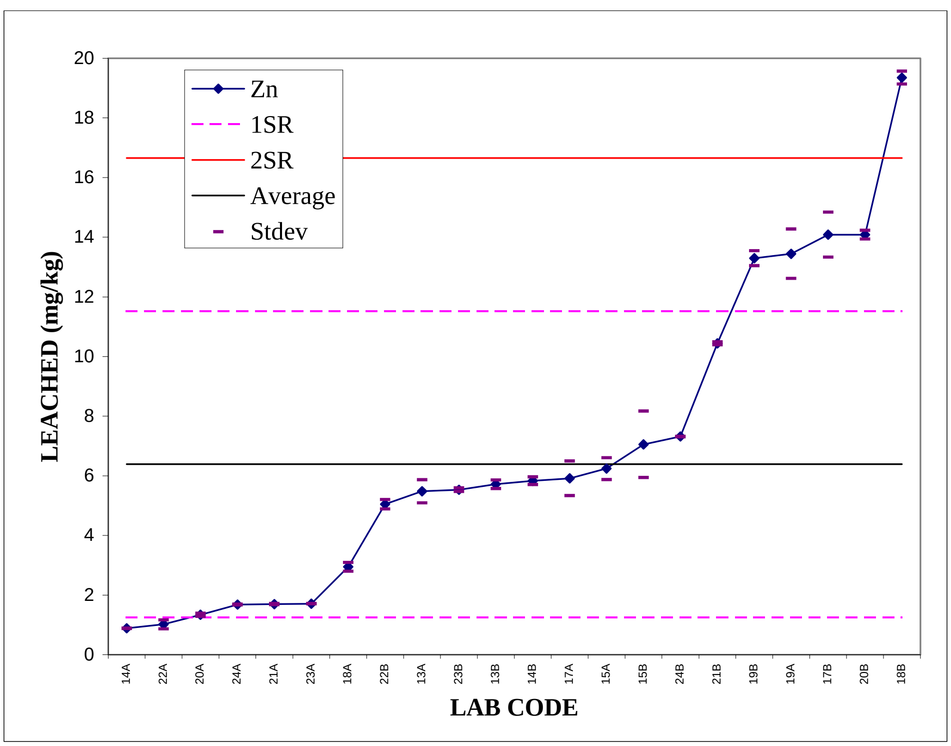
Statistic ROBUST ISO 5725 Part 5

Sample	**SBW**	Average	5.50	mg/kg	Sr Anal	0.11	mg/kg	2.2	%			%
Test	**EN 12457-3/1**	STD	3.33	mg/kg	Sr Test	5.37	mg/kg	97.6	%	rtest		274
No labs	10				SR	5.37	mg/kg	97.6	%	R		274



Percolation test
mg/kg
L/S=1 4.61

Sample	**SBW**	Average	6.82	mg/kg	Sr Anal	0.28	mg/kg	4.3	%			%
Test	**EN 12457-3/2**	STD	5.13	mg/kg	Sr Test	5.31	mg/kg	77.9	%	rtest		218
No labs	10				SR	5.13	mg/kg	85	%	R		239

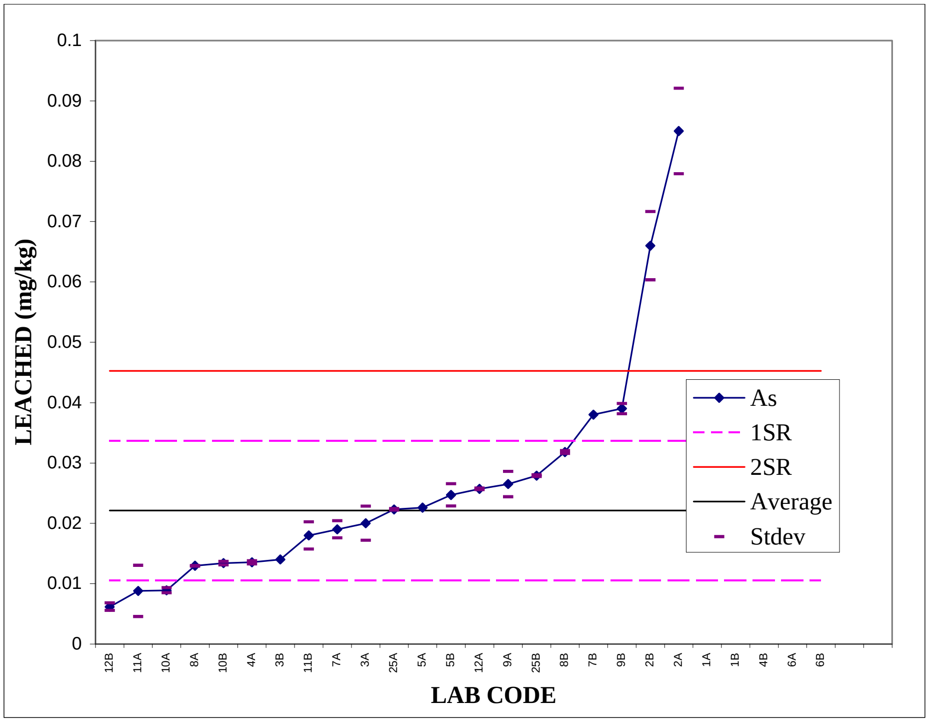


Percolation test
mg/kg
L/S=10 4.97

pH stat (own pH)
pH 8.1

Statistic ROBUST ISO 5725 Part 5

Sample	**MES**	Average	0.023	mg/kg	Sr Anal	0.0016	mg/kg	10.1	%		%
Test	**EN 12457-1**	STD	0.012	mg/kg	Sr Test	0.011	mg/kg	48.3	%	rtest	135
No labs	11				SR	0.0124	mg/kg	53	%	R	149



Percolation test

	mg/kg
L/S=2	0.031

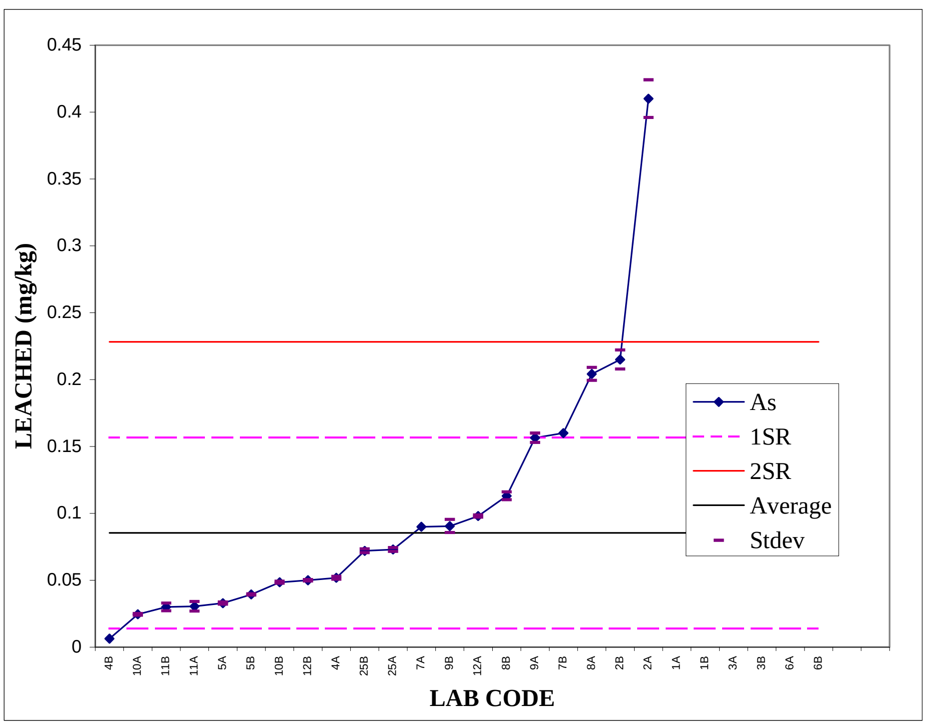
STE

Conc. (mg/l)	0.001
Sr Anal(%)	6.7
SR Anal(%)	100

Eluate analysis val.

Conc. (mg/l)	0.0174
Sr Anal(%)	5.32
Conc. (mg/l)	0.139
Sr Anal(%)	7.66
Conc. (mg/l)	0.0109
Sr Anal(%)	112.8

Sample	**MES**	Average	0.087	mg/kg	Sr Anal	0.0029	mg/kg	3.4	%		%
Test	**EN 12457-2**	STD	0.068	mg/kg	Sr Test	0.044	mg/kg	51.0	%	rtest	143
No labs	11				SR	0.0683	mg/kg	84	%	R	234



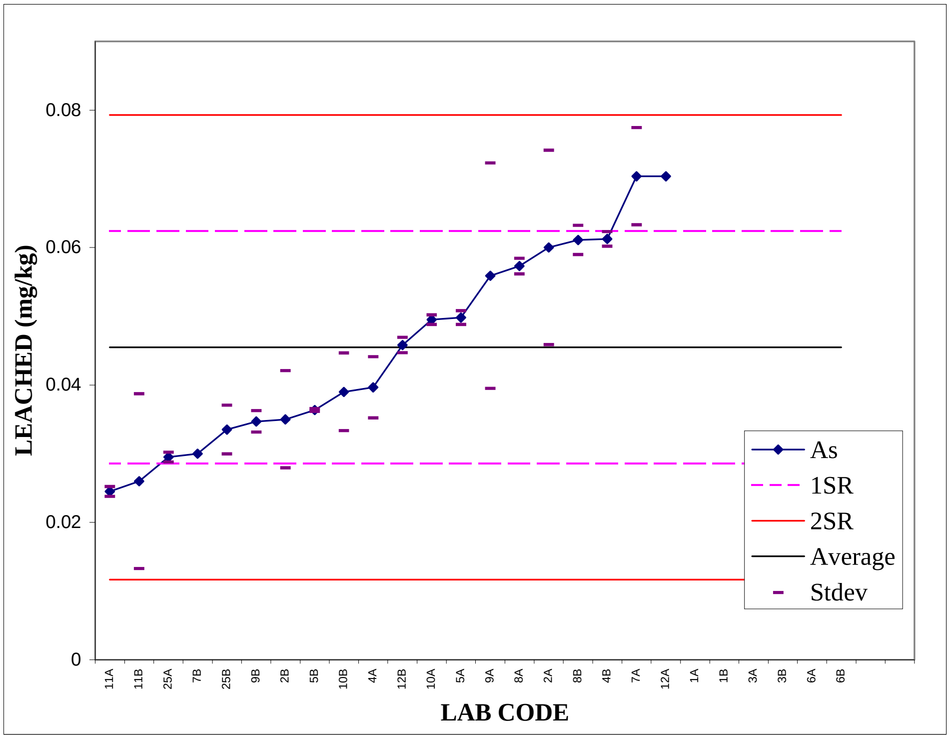
Percolation test

	mg/kg
L/S=10	0.18

pH stat (own pH)
pH 8.5

Statistic ROBUST ISO 5725 Part 5

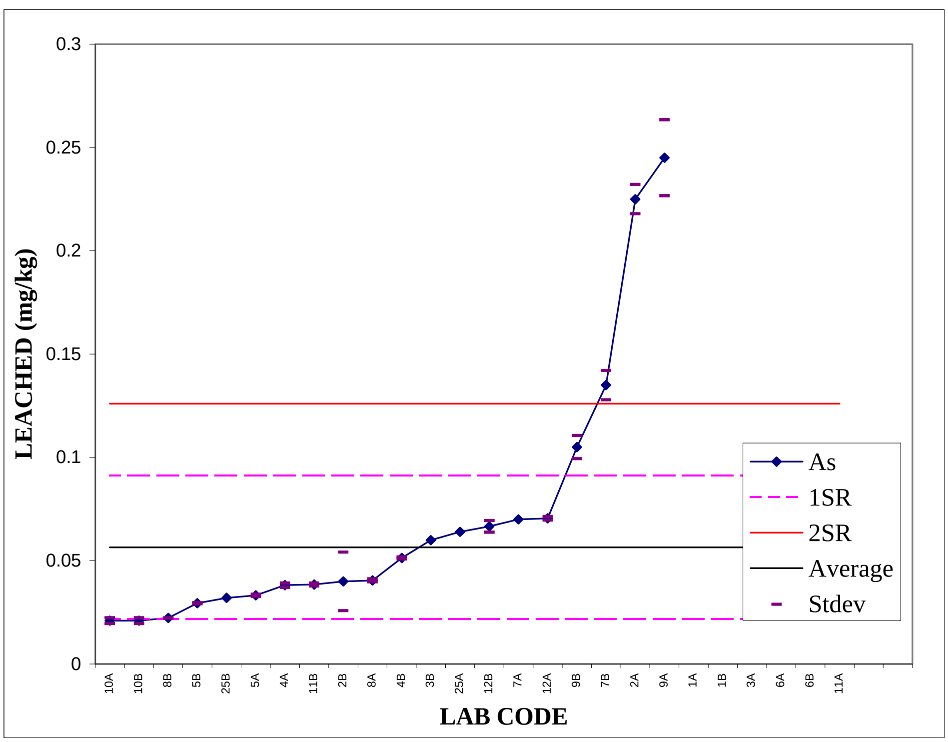
Sample	**MESr**	Average	0.047	mg/kg	Sr Anal	0.0046	mg/kg	10.0	%		%
Test	**EN 12457-2**	STD	0.017	mg/kg	Sr Test	0.018	mg/kg	38.4	%	rtest	108
No labs	11				SR	0.0169	mg/kg	40	%	R	111



Percolation test
mg/kg
L/S=10 0.18

pH stat (own pH)
pH 8.5

Sample	**MES**	Average	0.056	mg/kg	Sr Anal	0.0022	mg/kg	4.0	%		%
Test	**EN 12457-4**	STD	0.035	mg/kg	Sr Test	0.0322	mg/kg	57.0	%	rtest	160
No labs	11				SR	0.0457	mg/kg	81	%	R	227

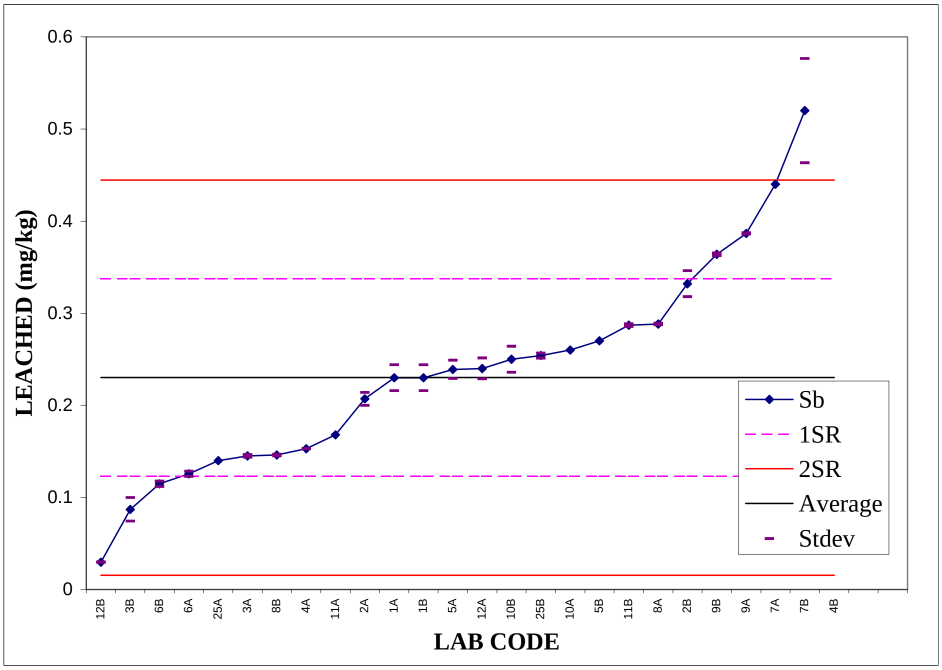


Percolation test
mg/kg
L/S=10 0.18

pH stat (own pH)
pH 8.5

Statistic ROBUST ISO 5725 Part 5

Sample	**MES**	Average	0.23	mg/kg	Sr Anal	0.008	mg/kg	4.0	%		%
Test	**EN 12457-1**	STD	0.109	mg/kg	Sr Test	0.067	mg/kg	29.2	%	rtest	84
No labs	13				SR	0.109	mg/kg	49	%	R	136

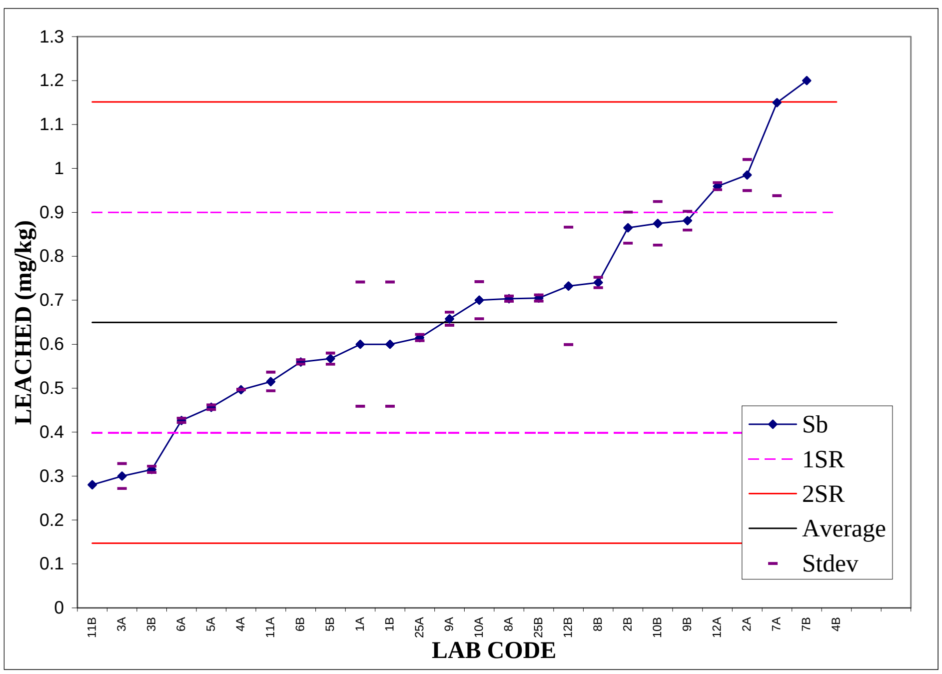


Percolation test
mg/kg
L/S=2 0.35

STE
Conc. (mg/l) 0.00656
Sr Anal(%) 20
SR Anal(%) 30

Eluate analysis val.
Conc. (mg/l) 0.05
Sr Anal(%) 4.03

Sample	**MES**	Average	0.665	mg/kg	Sr Anal	0.031	mg/kg	4.6	%		%
Test	**EN 12457-2**	STD	0.255	mg/kg	Sr Test	0.10	mg/kg	15.5	%	rtest	43
No labs	13				SR	0.256	mg/kg	39	%	R	108

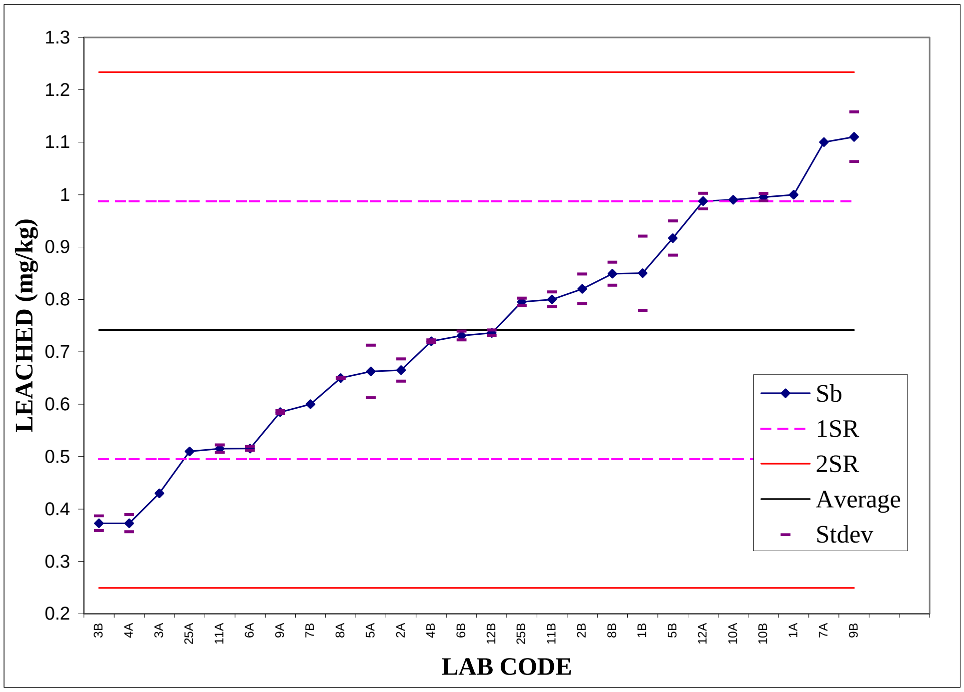


Percolation test
mg/kg
L/S=10 0.7

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.77

Statistic ROBUST ISO 5725 Part 5

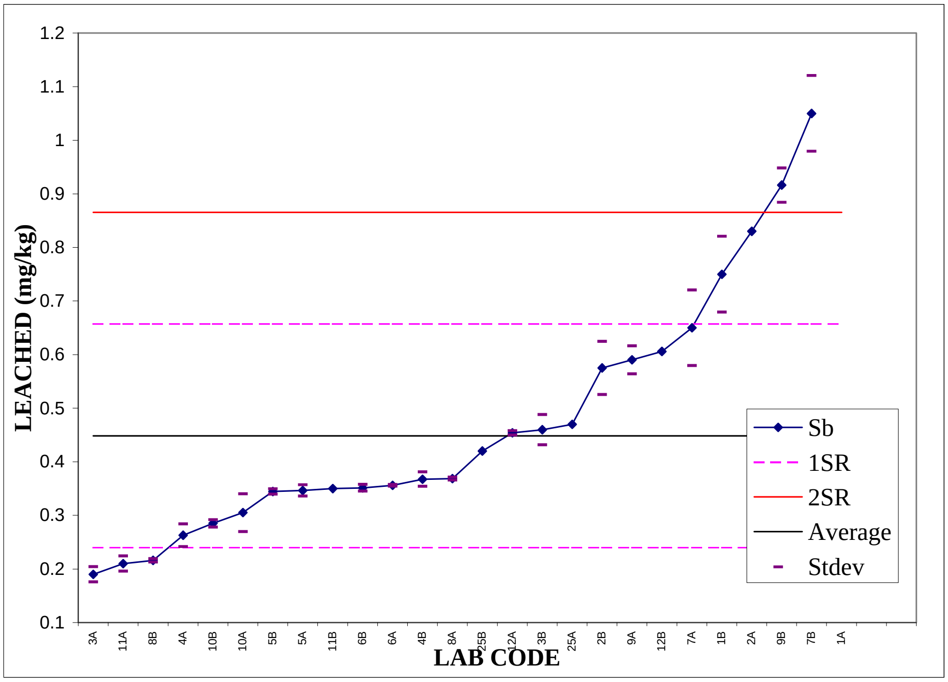
Sample	**MESr**	Average	0.760	mg/kg	Sr Anal	0.016	mg/kg	2.2	%		%
Test	**EN 12457-2**	STD	0.246	mg/kg	Sr Test	0.23	mg/kg	30.9	%	rtest	87
No labs	13				SR	0.246	mg/kg	35	%	R	98



Percolation test
mg/kg
L/S=10 0.7

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.77

Sample	**MES**	Average	0.45	mg/kg	Sr Anal	0.023	mg/kg	5.0	%		%
Test	**EN 12457-4**	STD	0.21	mg/kg	Sr Test	0.14	mg/kg	31.2	%	rtest	87
No labs	13				SR	0.209	mg/kg	54	%	R	151

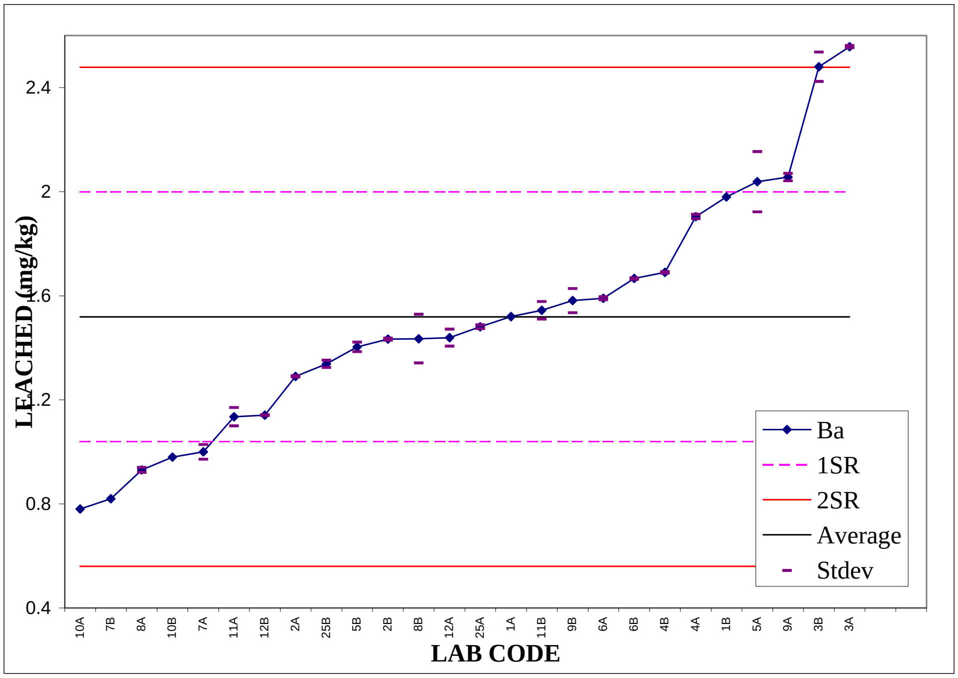


Percolation test
mg/kg
L/S=10 0.7

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.77

Statistic ROBUST ISO 5725 Part 5

Sample	**MES**	Average	1.52	mg/kg	Sr Anal	0.02	mg/kg	1.7	%		%
Test	**EN 12457-1**	STD	0.46	mg/kg	Sr Test	0.25	mg/kg	16.6	%	rtest	46
No labs	13				SR	0.46	mg/kg	30	%	R	84



Percolation test

	mg/kg
L/S=2	1.6

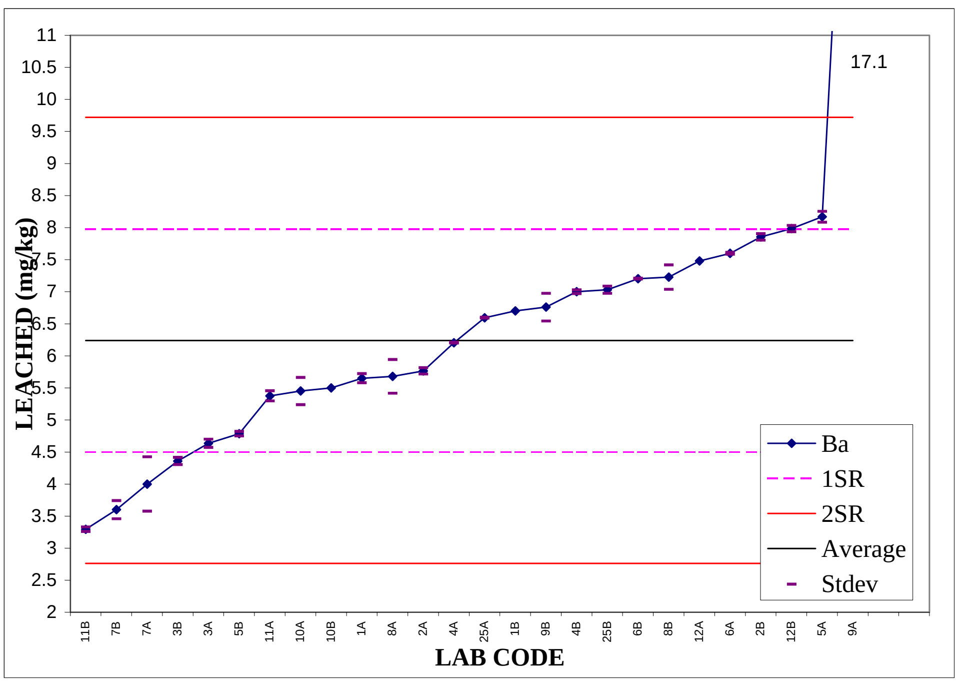
STE

Conc. (mg/l)	0.0266
Sr Anal(%)	3.6
SR Anal(%)	11

Eluate analysis val.

Conc. (mg/l)	0.0579
Sr Anal(%)	4.18
Conc. (mg/l)	0.0804
Sr Anal(%)	1.88
Conc. (mg/l)	0.0271
Sr Anal(%)	3.95

Sample	**MES**	Average	6.11	mg/kg	Sr Anal	0.14	mg/kg	1.7	%		%
Test	**EN 12457-2**	STD	1.75	mg/kg	Sr Test	1.09	mg/kg	17.9	%	rtest	50
No labs	13				SR	1.76	mg/kg	28	%	R	78



Percolation test

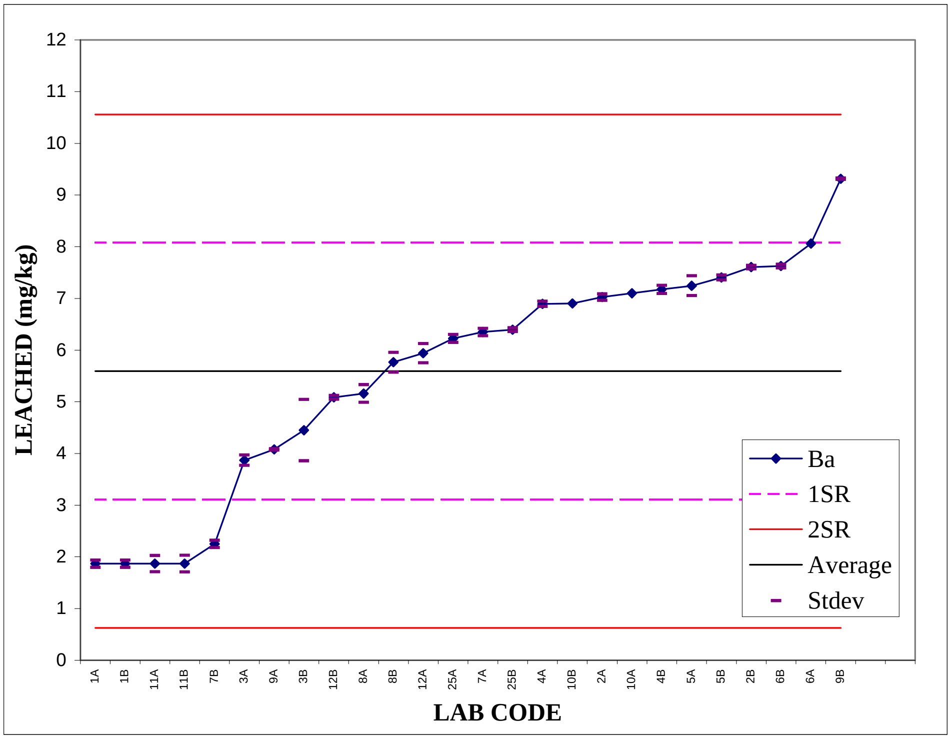
	mg/kg
L/S=10	6.8

pH stat (own pH)

L/S=10	mg/kg
pH 8.5	5.8

Statistic ROBUST ISO 5725 Part 5

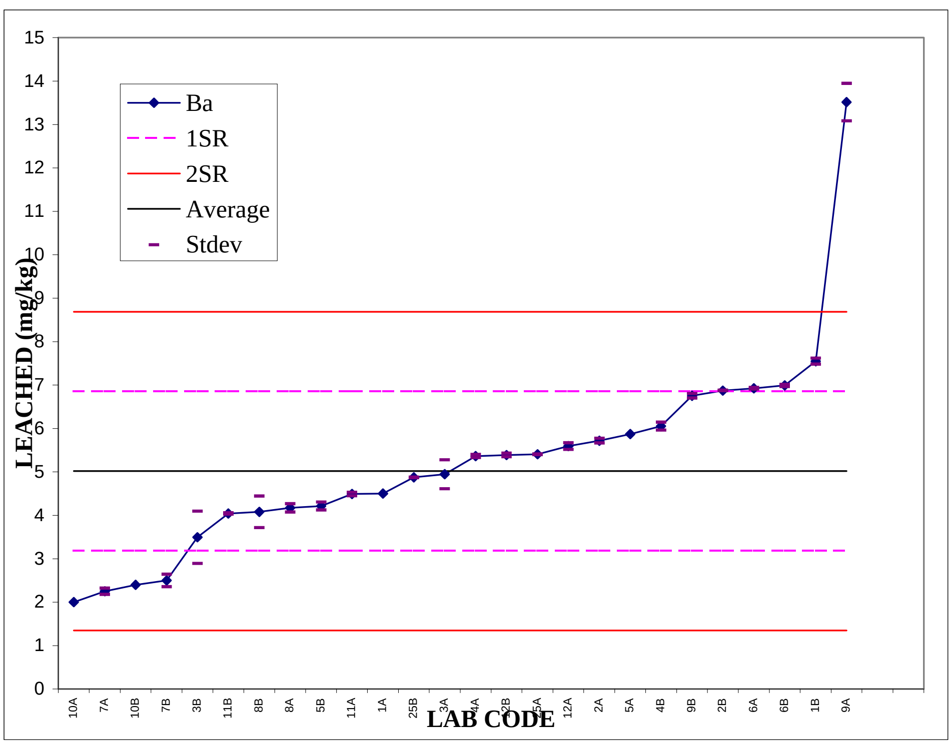
Sample	**MESr**	Average	6.20	mg/kg	Sr Anal	0.11	mg/kg	1.9	%		%
Test	**EN 12457-2**	STD	2.48	mg/kg	Sr Test	0.52	mg/kg	8.4	%	rtest	24
No labs	13				SR	2.48	mg/kg	26	%	R	73



Percolation test
mg/kg
L/S=10 6.8

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 5.8

Sample	**MES**	Average	5.02	mg/kg	Sr Anal	0.10	mg/kg	1.6	%		%
Test	**EN 12457-4**	STD	2.14	mg/kg	Sr Test	0.82	mg/kg	16.4	%	rtest	46
No labs	13				SR	2.14	mg/kg	38	%	R	106

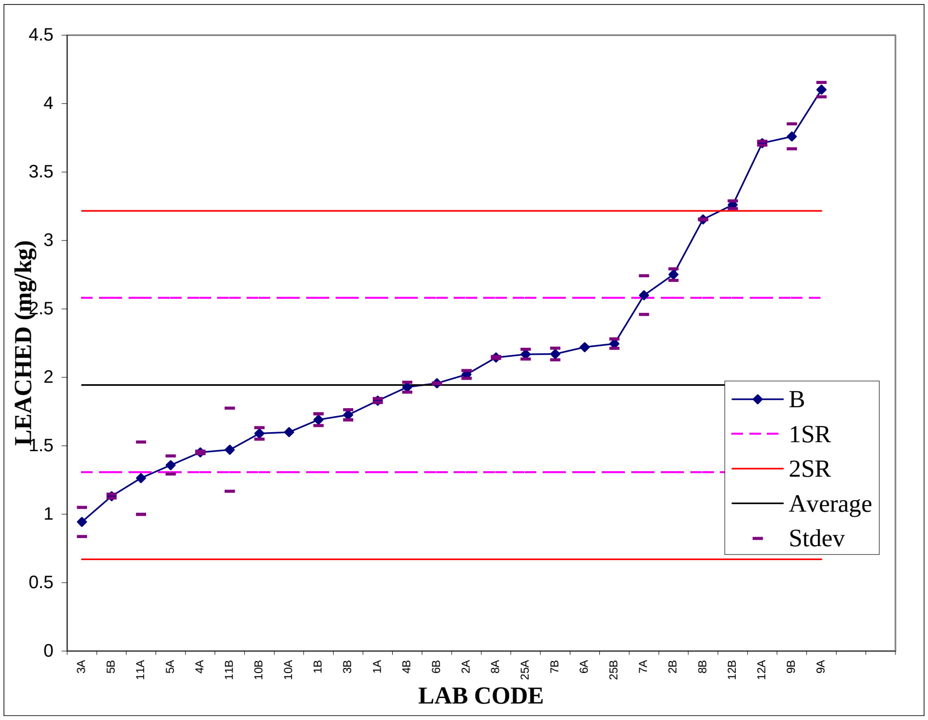


Percolation test
mg/kg
L/S=10 6.8

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 5.8

Statistic ROBUST ISO 5725 Part 5

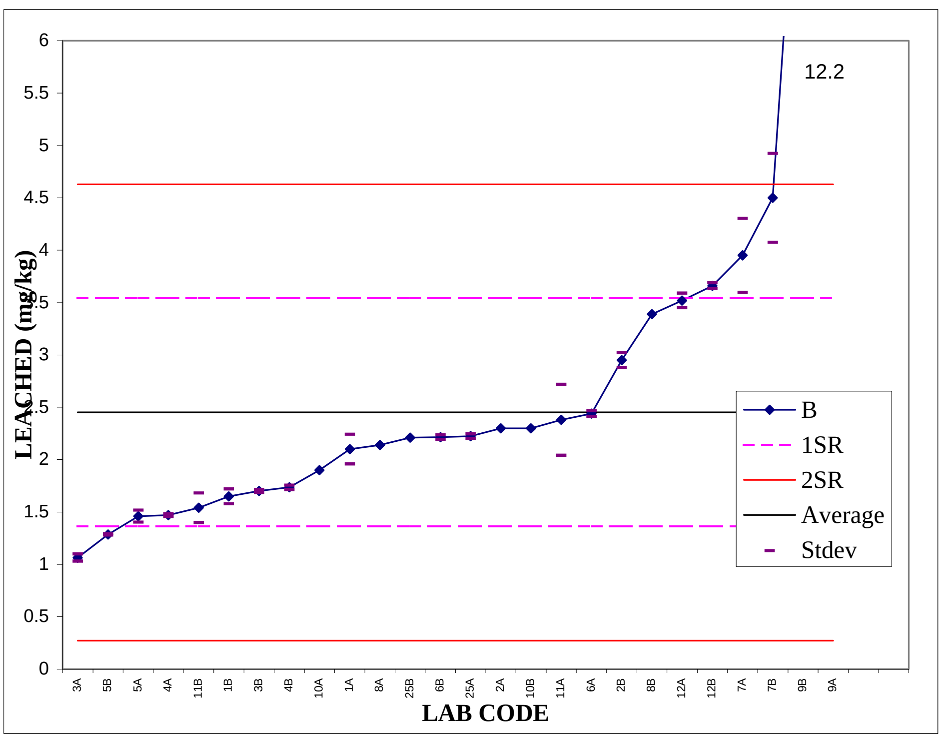
Sample	**MES**	Average	1.94	mg/kg	Sr Anal	0.04	mg/kg	3.8	%		%
Test	**EN 12457-1**	STD	0.82	mg/kg	Sr Test	0.33	mg/kg	17.2	%	rtest	48
No labs	13				SR	0.82	mg/kg	38	%	R	107



Percolation test
mg/kg
L/S=2 2.45

STE
Conc. (mg/l) 1.196
Sr Anal(%) 2.4
SR Anal(%) 7

Sample	**MES**	Average	2.45	mg/kg	Sr Anal	0.05	mg/kg	2.4	%		%
Test	**EN 12457-2**	STD	1.25	mg/kg	Sr Test	0.47	mg/kg	19.1	%	rtest	53
No labs	13				SR	1.25	mg/kg	45	%	R	125

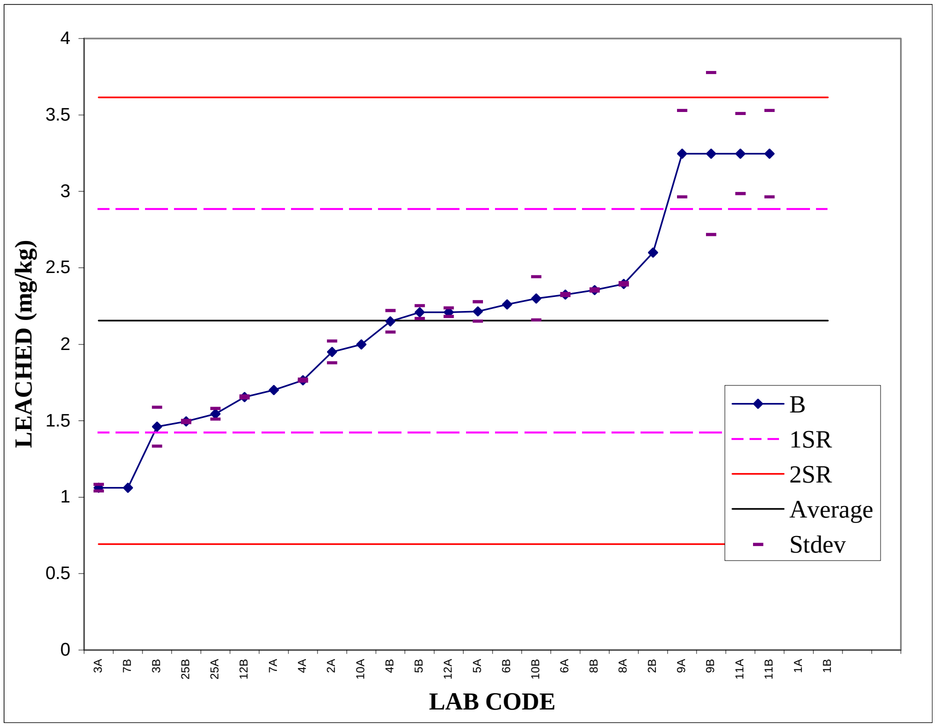


Percolation test
mg/kg
L/S=10 3.94

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 3.4

Statistic ROBUST ISO 5725 Part 5

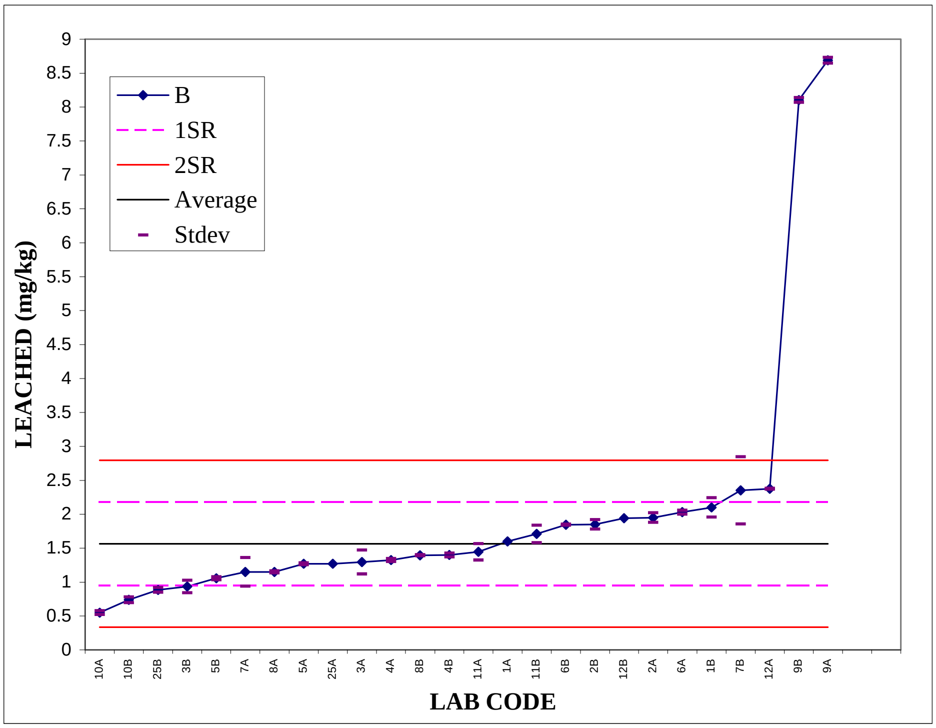
Sample	**MESr**	Average	1.96	mg/kg	Sr Anal	0.07	mg/kg	3.6	%		%
Test	**EN 12457-2**	STD	0.73	mg/kg	Sr Test	0.30	mg/kg	15.3	%	rtest	43
No labs	12				SR	0.61	mg/kg	31	%	R	87



Percolation test
mg/kg
L/S=10 3.94

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 3.4

Sample	**MES**	Average	1.56	mg/kg	Sr Anal	0.05	mg/kg	4.7	%		%
Test	**EN 12457-4**	STD	0.80	mg/kg	Sr Test	0.29	mg/kg	18.3	%	rtest	51
No labs	13				SR	0.58	mg/kg	37	%	R	105

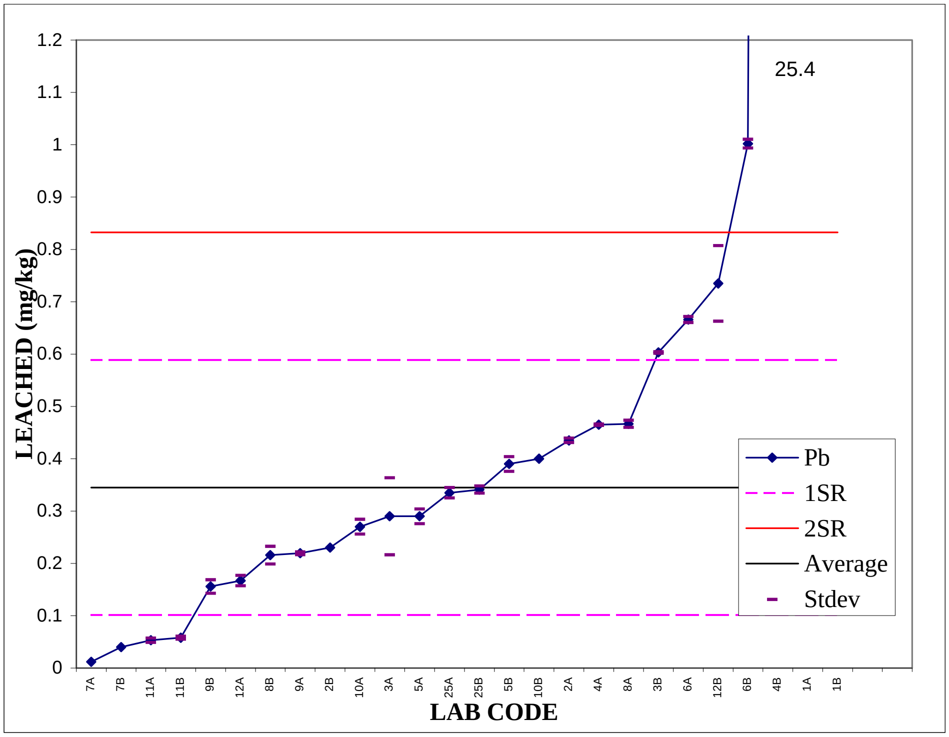


Percolation test
mg/kg
L/S=10 3.94

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 3.4

Statistic ROBUST ISO 5725 Part 5

Sample	**MES**	Average	0.35	mg/kg	Sr Anal	0.013	mg/kg	3.1	%		%
Test	**EN 12457-1**	STD	0.19	mg/kg	Sr Test	0.19	mg/kg	54.4	%	rtest	152
No labs	12				SR	0.194	mg/kg	80	%	R	223

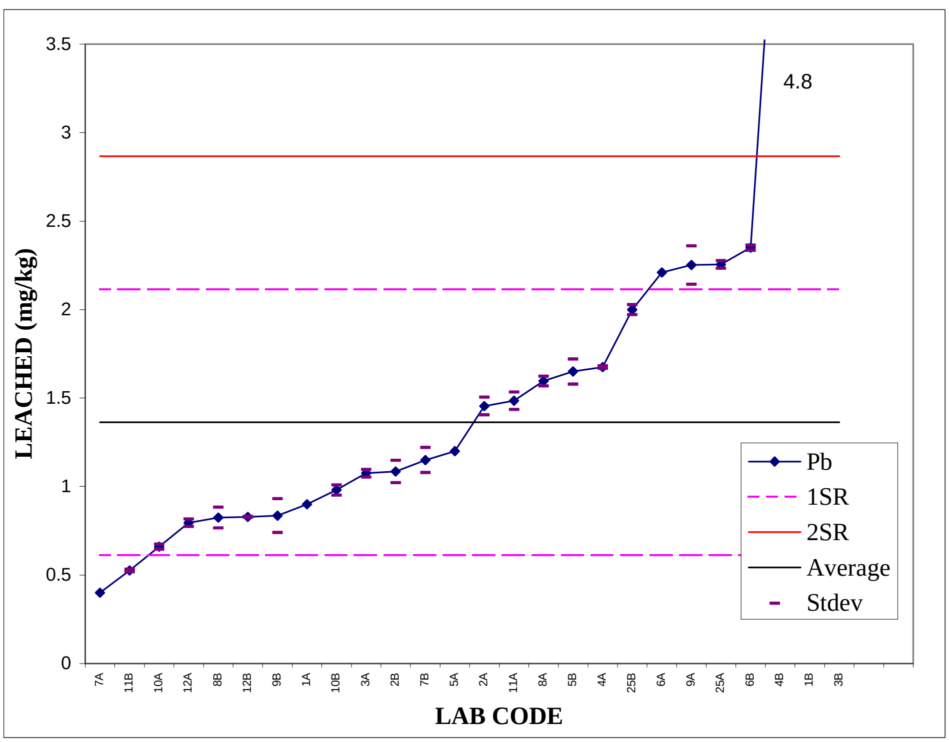


Percolation test
mg/kg
L/S=2 0.02

STE
Conc. (mg/l) 0.404
Sr Anal(%) 3.4
SR Anal(%) 8

Eluate analysis val.
Conc. (mg/l) 0.326
Sr Anal(%) 2.39
Conc. (mg/l) 0.0138
Sr Anal(%) 5.29
Conc. (mg/l) 0.0147
Sr Anal(%) 5.57
Conc. (mg/l) 0.076
Sr Anal(%) 4.21

Sample	**MES**	Average	1.36	mg/kg	Sr Anal	0.046	mg/kg	3.4	%		%
Test	**EN 12457-2**	STD	0.71	mg/kg	Sr Test	0.50	mg/kg	36.7	%	rtest	103
No labs	12				SR	0.75	mg/kg	55	%	R	154

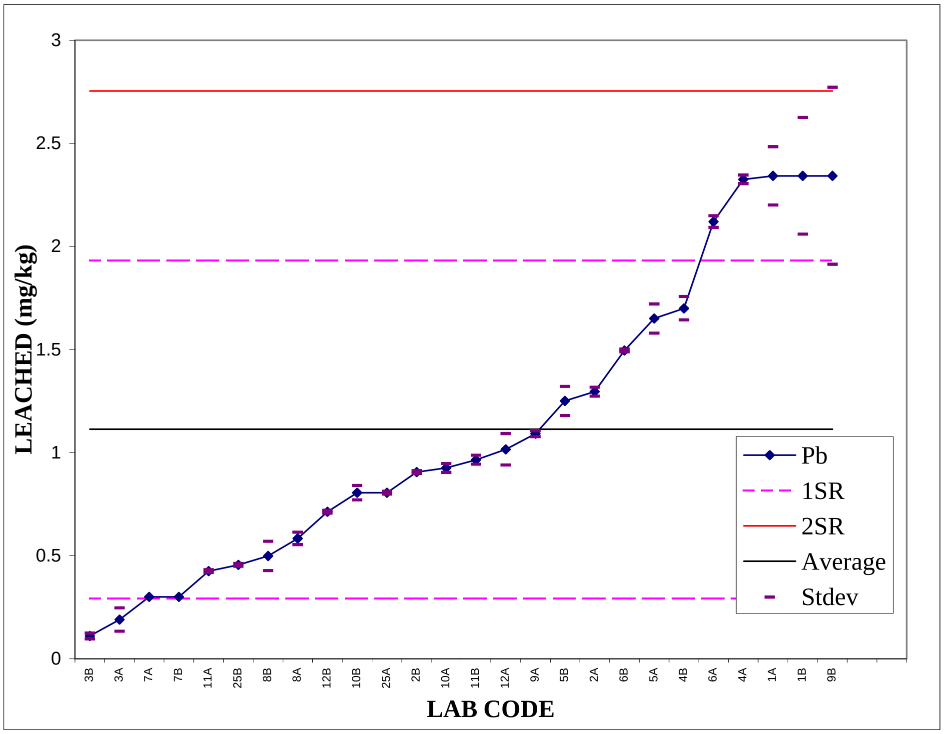


Percolation test
mg/kg
L/S=10 0.16

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.054

Statistic ROBUST ISO 5725 Part 5

Sample	**MESr**	Average	1.20	mg/kg	Sr Anal	0.049	mg/kg	4.4	%		%
Test	**EN 12457-2**	STD	0.82	mg/kg	Sr Test	0.37	mg/kg	31.1	%	rtest	87
No labs	13				SR	0.97	mg/kg	81	%	R	227

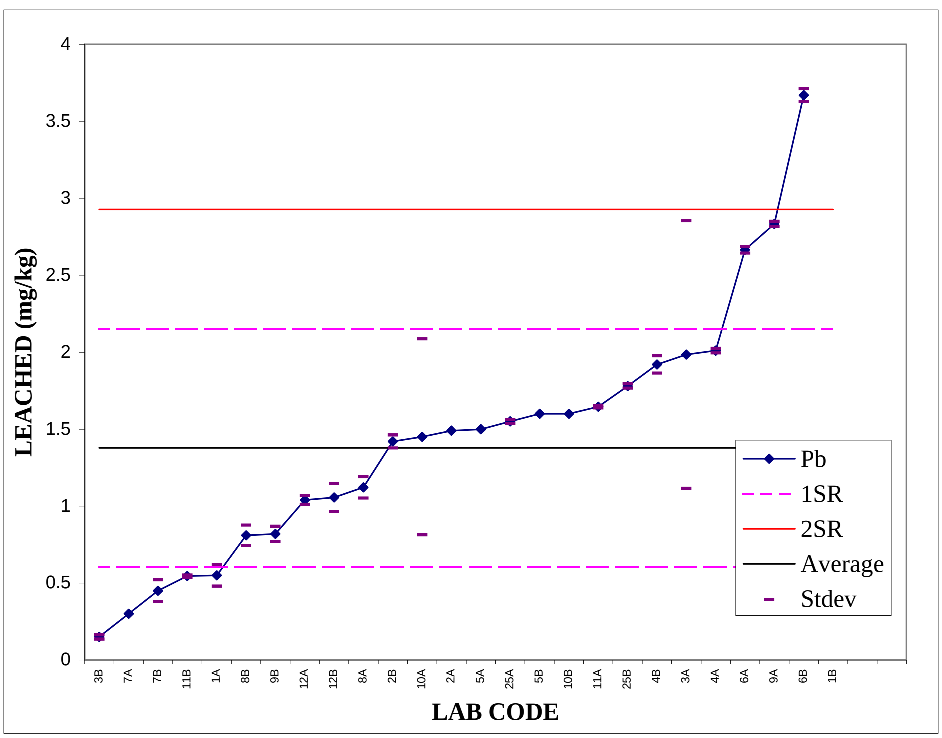


Percolation test
mg/kg
L/S=10 0.16

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.054

STE
Conc. (mg/l) 0.404
Sr Anal(%) 3.4
SR Anal(%) 8

Sample	**MES**	Average	1.38	mg/kg	Sr Anal	0.049	mg/kg	3.6	%		%
Test	**EN 12457-4**	STD	0.77	mg/kg	Sr Test	0.53	mg/kg	38.6	%	rtest	108
No labs	13				SR	0.76	mg/kg	53	%	R	149



Percolation test
mg/kg
L/S=10 0.16

pH stat (own pH)
L/S=10 mg/kg
pH 8.5 0.054

Statistic ROBUST ISO 5725 Part 5

December 2001 ECN-C-01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 6. Analytical performance evaluation

CONTENTS

1. INTRODUCTION

The analytical performance is a crucial factor in assessing the results of a leaching test. In the eluate validation program information is generated on the various methods specified by CEN TC 292 WG3. Here it is important to illustrate relationships between the relative standard deviation as observed in duplicate analysis of a single eluate. The concentration level at which measurements are carried out needs to be factored in when judging the outcome of test results. A complicating aspect in this context is the degree to which for an unknown sample matrix effects and interferences play a role. For a given analytical method (here ICP AES) a performance graph can be described, in which such interference can be readily identified on test results.

2. MATERIALS AND METHODS

Over a period of two years duplicate analysis of a wide range of solutions submitted for analysis at the analytical laboratory at ECN (NL) were collected in the framework of Good laboratory Practice and laboratory performance standards required by accreditation. In addition, duplicate analyses on tests were carried in the framework of the EU project “Technical work in support of the Network Harmonization of Leaching Extraction Tests (SMT4-CT96-2066). These data have been plotted in figure 1 for a selection of elements. A characteristic curve develops, in which as concentration decreases the relative standard deviation increases. Data from the validation work (see part 5) are inserted to illustrate the consistency of the analytical performance of a specific method. The broken vertical lines represent the assumed analytical sensitivity based on instrument specified detection limits. Obviously, in clear solutions much better performance can be reached as shown in the case of Pb, where measurements are given well below the specified instrument performance. Matrices rich in organic matter, which may lead to significant matrix effects are recognized by a shift in the curve to the right (figure 2).
In figure 3 some additional elements are given. Horizontal cut-off lines at 10 % and 30 % relative standard deviation could be seen as limit of determination and limit of detection respectively. The results of the standard eluate analysis are inserted as well as data from the various waste eluates studied in the eluate analysis validation program.

3. CONCLUSIONS

The manner of data presentation as shown in figure 1 based in incidental duplicate analysis in the regular performance of analysis on a wide range of solutions allows the generation of an instrument performance characteristic. This allows interferences to be identified fairly easily and also allows a better assessment of realistic limits of determination and limits of detection. Any point well to the right of the cluster of data points is suspect of either sample heterogeneity or interferences. Further evaluation of this type of data seems useful for quality control.

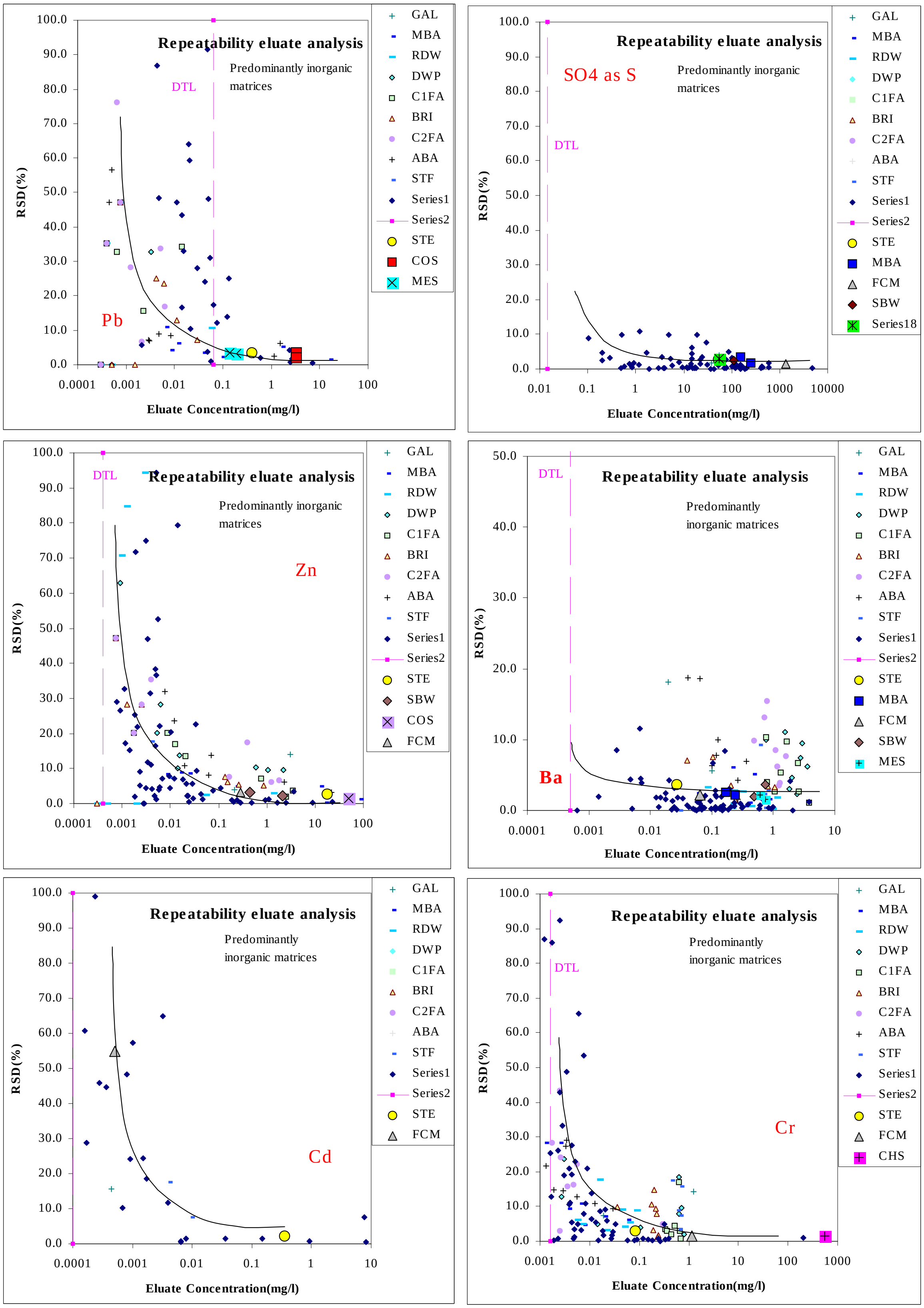


Figure 1 *Analytical performance data for ICP based on duplicate analysis of eluates*

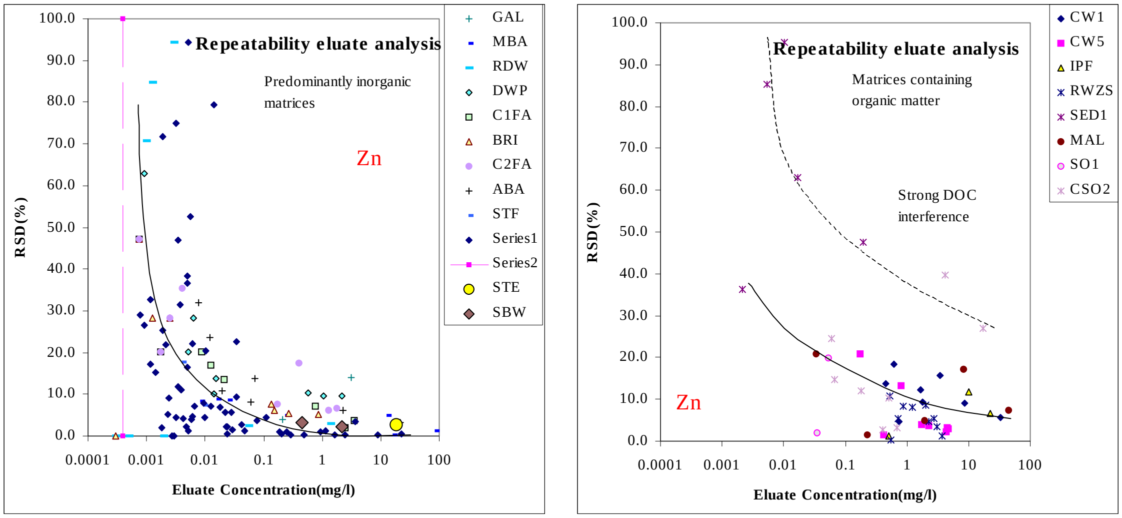


Figure 2 *Analytical performance data for ICP based on duplicate analysis of eluates illustrating the difference in repeatability due to matrix interferences.*

Explanation of sample codes:
GAL - Galvanic sludge
MBA - MSWI bottom ash
RDW - Construction and demolition waste
DWP - drinking water pipe (concrete)
C1FA - Portland cement mortar
BRI - Sintered brick
C2FA - Blast furnace slag cement
ABA - Asphalt concrete
STF - cement stabilized MSWI fly ash
CW1 - compost from integral household waste
CW 5 - Compost from source separation of putricibles
IPF - sewage sludge urban
RWZS - sewage sludge rural
SED 1 - lake sediment
MAL - Contaminated river harbour sediment
SO1 - natural top soil
CSO2 - heavily sewage sludge amended soil

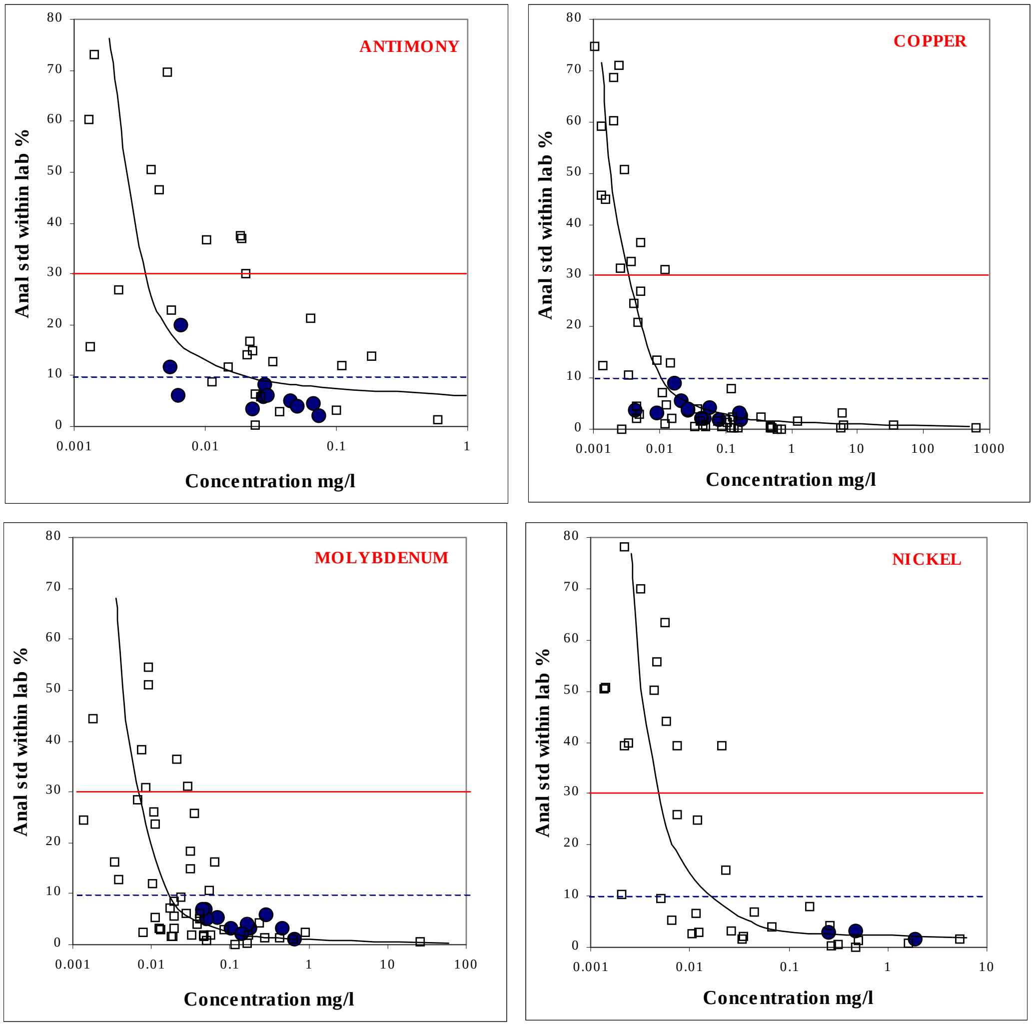


Figure 3 *Analytical performance data for ICP based on duplicate analysis of eluates. Open symbols ECN data; Closed symbols: validation study.*

December 2001 ECN-C-01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 7. Performance characteristics of EN 12457 1-4

CONTENTS

1. INTRODUCTION

In this section the results of the validation are translated in performance characteristics of the respective parts of standard EN 12457-1, EN 12457-2, EN 12457-3 and EN 12457-4 in accordance with CEN / TC 292 WG 2.

2. PERFORMANCE CHARACTERISTICS EN 12457-1 (PART 1)

This information will form chapter 8 of EN 12457-1.

2.1 Objective of the validation

In a European wide validation study according to ISO 5725-5, the performance characteristics of the compliance leaching tests EN 12457 part 1 for inorganic components were established. The uncertainty in the end result of a leaching test is composed of contributions from:
- the origin of the material (variation in production processes);
- the method of sampling in the field (differences in representativeness);
- the sample pretreatment (reduction of the field sample into laboratory sample(s) and preparation of the test portion from the laboratory sample before the leaching test);
- the leaching test itself and the experimental parameter variations as allowed by the tolerances;
- the chemical analysis (uncertainty in the determination of concentration in the eluates).

In the interlaboratory exercise to establish the uncertainty of the compliance leaching test, the contributions of the first two items listed above were not included. The results of the validation study are relevant to all activities carried out on the laboratory sample including its preparation from the primary field sample.

2.2 Validation study

The validation of part 1 was carried out with 11 - 14 European laboratories on four types of waste materials for Part 1. One of the wastes was tested according to all parts of EN 12457. The wastes selected for the validation were chosen such as to represent as broad a range of wastes as possible, as the standard is intended for general use on waste. In the validation work all the wastes were tested for part 2. On the other parts only a selection from these 7 wastes were tested (detailed information can be found in the final report on the Validation study mentioned in annex C of the standard Bibliography).

In the validation study the following starting points were used:

- The laboratory samples were all taken from one large batch of the different wastes according to the normal practice. The normal size reduction and the normal repeated mixing were carried out as needed to obtain representative laboratory samples from the large batch sample. However in the case of metallurgical slag, a separate laboratory sample was provided to assess the difference between size reduction down to 4 mm performed in the laboratory and size reduction down to 4 mm performed in the course of the preparation of the laboratory samples.

- The experimental plan was designed by CEN/TC 292 WG 2 on the basis of each laboratory being given two laboratory samples of each waste to be tested. This is in accordance with ISO 5725-5 section 5 dedicated to heterogeneous material (e.g. sand or aggregate samples etc.). However, in order to verify the contribution of the analysis of the eluate to the overall variability of the leaching test, the participating laboratories were asked to perform a single complete leaching test on each laboratory sample and to analyse the eluates in duplicate.

- The wastes examined cover all the grain size classes to which the compliance leaching test applies: powdered wastes and sludges (0 µm to about 125 µm), fine-grained materials (0 mm to 4 mm) and coarse-grained materials (0 mm to greater than 4 mm) after the required size reduction.

- Not only was testing carried out on familiar waste/component combinations (where considerable experience with the testing procedure has already been reported in the technical literature) but also on less familiar and potentially difficult waste-component combinations. Wastes were chosen in this latter category where it was expected that one or more of the requirements would not be easily fulfilled (for example heterogeneity in metallurgical slag, biological instability of sewage sludge). These combinations were applied in the validation trial to give insight into the level of uncertainty that might arise for these matrices.

Table 2.1 provides a list of the waste types chosen for testing and the selected components.

Table 2.1: Wastes types tested and components analysed in the validation of EN 12457 Part 1.

Grain size class	Waste type tested and European Waste Catalogue (EWC) reference number		Components analysed [1)]
Powder/sludge	Contaminated soil (COS)	EWC 17 05 03	As*, Pb*, Co, Cd, Ni
	Sand blasting waste (SBW)	EWC 12 01 16	Ba, Cu*, Mo*, F, Zn
Coarse-grained	Incinerator bottom ash (MBA)	EWC 19 01 11	Ba, Cu, Mo, Sb, SO4
	Metallurgical slag (MES)	EWC 10 04 01	Sb, Ba, B, As , Pb

1) The components marked with * were analysed but were not included in the determination of the test performance characteristics for reasons justified in Table 2.

2.3 Validation results

The statistical evaluation was conducted according to ISO 5725-5 section 6 providing "robust methods for data analysis": The average values, the repeatability standard deviation ($s_{r\ test}$) and the reproducibility standard deviation (s_R) were obtained (Table 2.2). In order to compare and contrast the contribution of the analysis of the eluate to the overall uncertainty in the leaching test, Table 2 lists the repeatability standard deviation for the eluate analysis $s_{r,anal}$ as obtained in the validation study.

The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions: The tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The repeatability limit was calculated using the relationship: $r_{test} = f\sqrt{2} * s_{r,test}$ with the critical range factor f = 2.

For instance, for the second line of table 2.2, the repeatability limit around a measurement result of 0.23 mg Sb/kg is ± 0,19 mg Sb/kg (i.e. ±84 % of 0.23)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. The value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also, this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). However it may be necessary to use a larger value for f in situation as described below in Sections 2.3 and 2.4.

The reproducibility is determined as an interval around a measurement result (i.e. "reproducibility limit") and corresponding to the maximum difference that can be expected (with a 95% statistical confidence) between this measurement result and another measurement result, both obtained in accordance with all the requirements of the present standard by two different laboratories using their own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The reproducibility limit was calculated using the relationship: $R = f\sqrt{2} * s_R$ with the critical range factor f = 2.

For instance the second line of table 2.2, the reproducibility limit around a measurement result of 0.23 mg Sb/kg is ± 0.31 mg Sb/kg (i.e. ±136 % of 0.23)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. This value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the dispersion limit is equal to $k \cdot s_R$ with the usual value k = 2, resulting in a dispersion limit lower than the reproducibility limit (i.e. a ratio of $\sqrt{2}$). However it may be necessary to use a larger value $f\sqrt{2}$ (or k) in situation as described below in Sections 2.3 and 2.4.

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program.
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important (as indicated in section 6.1.3 of ISO 5725-5).

However in the case of heterogeneous materials, the concept of a distinction between “poor” and “good” laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results.

Consequently, in case of relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in tables 2.2 and 2.4 (this means that the value chosen for the critical range factor f is larger than 2 as well as for the extension factor k for dispersion).This is because the extreme results may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples.

Table 2.2 Results of the validation studies of EN 12457-1

EN-12457 - 1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % 3)
MESc1)	As	0.022	48.3	53.2	135	149	11	10.1
MESc	Sb	0.23	29.9	48.6	84	136	13	4.0
MESc	Ba	1.52	16.6	30.1	46	84	13	1.7
MESc	B	1.94	17.2	38.3	48	107	13	3.8
MESc2)	Pb	0.35	54.4	79.5	152	223	12	3.1
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % 3)
SBW	Ba	0.960	18.9	49.9	52.9	140	11	2.0
SBW1)	Cu	0.061	41.2	111.2	115	311	10	3.7
SBW2)	Mo	0.620	113.1	132.4	316	371	11	5.8
SBW	F	7.410	23.6	46.8	66.1	131	9	2.5
SBW2)	Zn	4.552	61.4	67.5	172	189	11	2.2
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % 3)
MBA	Mo	0.366	10.1	22.2	28.3	62.2	13	3.1
MBA	Sb	0.062	20.6	32.2	57.7	90.2	12	6.2
MBA	SO4	503	17.0	33.4	47.6	93.5	14	1.7
MBA	Ba	0.478	8.0	34.6	22.4	96.9	13	2.2
MBA	Cu	3.186	12.0	24.5	33.6	68.6	13	1.7
Sample	Element	mg/kg	$s_{r,,test}$%	s_R%	r_{test} %	R %	N	$s_{r,\ anal}$ % 3)
COS	As	1.52	8.1	33.8	22.7	94.6	11	3.8
COS	Pb	6.62	4.9	20.9	13.7	58.5	11	2.0
COS	Cd	14.28	7.6	21.4	21.3	59.9	11	1.8
COS	Ni	3.72	7.9	18.4	22.1	51.5	11	1.7
COS	Co	3.45	6.2	25.3	17.4	70.8	11	1.5

1) Analytical data too poor 2) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) 3) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

NOTE For comparison, the performance of the Standard Eluate analysis is given in table 2.3 for components measured with an analytical within laboratory variability of better than 10 %. This Standard Eluate was prepared especially for the validation of the leaching test.

Table 2.3 - Typical value and range of standard deviation for the analysis of a standard eluate

Analysis of the standard eluate	median	minimum	maximum
Repeatability standard deviation s_r %	2.9 %	2 %	9 %
Reproducibility standard deviation s_R %	7.7 %	6 %	23 %

2.4 Summary of the performance characteristics evaluation.

The validation data have been evaluated. Table 2.4 gives the resulting typical values for repeatability and reproducibility limits as well as their observed ranges. These values have been obtained by taking the median value of all waste – materials combinations after elimination of values marked in Table 2.2.

Table 2.4 - Typical values and observed ranges of the repeatability and reproducibility limits

The reproducibility limit provides a determination of the differences (positive and negative) that can be found (with a 95 % statistical confidence) between a single test result obtained by a laboratory using its own facilities and another test result obtained by another laboratory using its own facilities, both test results being obtained under the following conditions: The tests are performed in accordance with all the requirements of the present standard and the two laboratory samples are obtained from the same primary field sample and prepared under identical procedures. Conversely, the repeatability limit refers to measurements obtained from the same laboratory, all other conditions being identical. The reproducibility limit and the repeatability limit do not cover sampling but cover all activities carried out on the laboratory sample including its preparation from the primary field sample.

For instance if the typical value of 82 % is selected for the reproducibility limit of a test result result of 5.4 mg / kg, the result is given as follows with its reproducibility limit at 95% statistical confidence: 5.4 mg / kg ± 4.9 mg / kg (i.e. ± 90 % of 5.4) .

Results of the validation of the compliance leaching test EN 12457- 1	Typical value	Observed range
Repeatability limit, r	34 %	14 % - 85%
Reproducibility limit, R	90 %	50 % - 140 %

NOTE 1 The above results refer to the difference that may be found between two test results performed on two laboratory samples obtained under the same conditions. In the case reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the above typical reproducibility values and observed reproducibility ranges should be divided by √2 to obtain the corresponding typical dispersion limit and its observed range (cf. the detailed note of Section 2.3). In the example of Sb in MES, the result and its dispersion limit is 0.23 mg/kg ± 0.22 mg/kg (i.e. 2* sR % = 96 % of 0.23). This mean that with a 95 % statistical confidence, the values reasonably attributable to the measured parameter are larger than 0.23 - 0.22 mg/kg and lower than 0.23 + 0.22 mg/kg

NOTE 2 The repeatability limit (r) and the reproducibility limit (R) as given in Table 2.2 and in this table are indicative values of the attainable precision if the compliance leaching test is performed in accordance with this standard EN 12457 Part 1.

NOTE 3 For wastes with a leaching behaviour strongly influenced by the pH in the pH range that occurs in the compliance leaching test, a greater uncertainty shall be taken into account, since the material heterogeneity may induce pH differences between laboratory samples as well as between test portions.

NOTE 4 A limited number of wastes and parameters were tested. Consequently, for other wastes and parameters, performance characteristics may fall outside the limits as derived from the validation of the compliance leaching test EN 12457-1. The repeatability and reproducibility limits given for Part 1 can not be compared with those of other parts due to the fact that dissimilar waste-component combinations were measured.

NOTE 5 In particular for relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in this Section, since the extreme results were not taken into account in the statistical evaluation of the test data as described in Section 2.3.

NOTE 6 The above typical values and observed ranges also corresponds to the usual critical range factor of 2 (and for dispersion calculation to the usual extension factor k = 2 recommended in the Guide to the expression of Uncertainty in Measurement). However it may be necessary to use a larger value for f (or for k) in situations as described above in notes 4 and 5 as well as in Section 2.3. In such case the above typical values and observed ranges should be multiplied by a factor of f / 2 where f is the selected critical range factor for the considered case and 2 is the critical range factor used to determine the above typical values and observed ranges

3. PERFORMANCE CHARACTERISTICS EN 12457-2 (PART 2)

This information will form chapter 8 of EN 12457-2.

3.1 Objective of the validation

In a European wide validation study according to ISO 5725-5, the performance characteristics of the compliance leaching tests EN 12457 part 2 for inorganic components were established. The uncertainty in the end result of a leaching test is composed of contributions from:

- the origin of the material (variation in production processes);
- the method of sampling in the field (differences in representativeness);
- the sample pretreatment (reduction of the field sample into laboratory sample(s) and preparation of the test portion from the laboratory sample before the leaching test);
- the leaching test itself and the experimental parameter variations as allowed by the tolerances;
- the chemical analysis (uncertainty in the determination of concentration in the eluates).

In the interlaboratory exercise to establish the uncertainty of the compliance leaching test, the contributions of the first two items listed above were not included. The results of the validation study are relevant to all activities carried out on the laboratory sample including its preparation from the primary field sample.

3.2 Validation study

The validation of part 2 was carried out with 12 - 14 European laboratories on seven types of waste materials for Part 2. One of the wastes was tested according to all parts of EN 12457. The wastes selected for the validation were chosen such as to represent as broad a range of wastes as possible, as the standard is intended for general use on waste. In the validation work on the other parts a selection from these 7 wastes were tested (detailed information can be found in the final report on the Validation study mentioned in annex C of the standard Bibliography).

In the validation study the following starting points were used:

- The laboratory samples were all taken from one large batch of the different wastes according to the normal practice. The normal size reduction and the normal repeated mixing were carried out as needed to obtain representative laboratory samples from the large batch sample. However in the case of metallurgical slag, a separate laboratory sample was provided to assess the difference between size reduction down to 4 mm performed in the laboratory and size reduction down to 4 mm performed in the course of the preparation of the laboratory samples.

- The experimental plan was designed by CEN/TC 292 WG 2 on the basis of each laboratory being given two laboratory samples of each waste to be tested. This is in accordance with ISO 5725-5 section 5 dedicated to heterogeneous material (e.g. sand or aggregate samples etc.). However, in order to verify the contribution of the analysis of the eluate to the overall variability of the leaching test, the participating laboratories were asked to perform a single complete leaching test on each laboratory sample and to analyse the eluates in duplicate.

- The wastes examined cover all the grain size classes to which the compliance leaching test applies: powdered wastes and sludges (0 µm to about 125 µm), fine-grained materials (0 mm to 4 mm) and coarse-grained materials (0 mm to greater than 4 mm) after the required size reduction.

- Not only was testing carried out on familiar waste/component combinations (where considerable experience with the testing procedure has already been reported in the technical literature) but also on less familiar and potentially difficult waste-component combinations. Wastes were chosen in this latter category where it was expected that one or more of the requirements would not be easily fulfilled (for example heterogeneity in metallurgical slag, biological instability of sewage sludge). These combinations were applied in the validation trial to give insight into the level of uncertainty that might arise for these matrices.

Table 3.1 provides a list of the waste types chosen for testing and the selected components.

Table 3.1 - Wastes types tested and components analysed in the validation of EN 12457 Part 2.

Grain size class	Waste type tested and European Waste Catalogue (EWC) reference number		Components analysed [1)]
Powder/sludge	MSWI Filtercake (FCM)	EWC 19 01 05	F, Cl, NO2*, Ba, Cr VI
	Sewage sludge (SEW)	EWC 19 08 05	Co, Ni, NH4*, TOC, SO4
	Contaminated soil (COS)	EWC 17 05 03	As, Pb, Co, Cd, Ni
	Chemical sludge (CHS)	EWC 06 05 02	Cr VI, Cr, F*, Cl, Cd*
Coarse-grained	Sand blasting waste (SBW)	EWC 12 01 16	Ba, Cu*, Mo F, Zn
	Incinerator bottom ash (MBA)	EWC 19 01 11	Ba, Cu, Mo, Sb, SO4
	Metallurgical slag (MES)	EWC 10 04 01	Sb, Ba, B, As* , Pb
1) The components marked with * were analysed but were not included in the determination of the test performance characteristics for reasons justified in Table 2.			

3.3 Validation results

The statistical evaluation was conducted according to ISO 5725-5 section 6 providing "robust methods for data analysis": The average values, the repeatability standard deviation ($s_{r\ test}$) and the reproducibility standard deviation (s_R) were obtained (Table 3.2). In order to compare and contrast the contribution of the analysis of the eluate to the overall uncertainty in the leaching test, Table 2 lists the repeatability standard deviation for the eluate analysis $s_{r,anal}$ as obtained in the validation study.

The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions : The tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The repeatability limit was calculated using the relationship : $r_{test} = f\sqrt{2} * s_{r,test}$ with the critical range factor f = 2.

For instance, for the first line of table 3.2, the repeatability limit around a measurement result of 4,69 mg As/kg is ± 0,49 mg As/kg (i.e. ±10,4 % of 4,69)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. The value $f = 2$ used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also, this value $f = 2$ corresponds to the usual value $k = 2$ of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). However it may be necessary to use a larger value for f in situation as described below in Sections 3.3 and 3.4.

The reproducibility is determined as an interval around a measurement result (i.e. "reproducibility limit") and corresponding to the maximum difference that can be expected (with a 95% statistical confidence) between this measurement result and another measurement result, both obtained in accordance with all the requirements of the present standard by two different laboratories using their own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The reproducibility limit was calculated using the relationship : $R = f\sqrt{2} * s_R$ with the critical range factor $f = 2$.

For instance the first line of table 3.2, the reproducibility limit around a measurement result of 4,69 mg As/kg is ± 3,85 mg As/kg (i.e. ±82,0 % of 4,69)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. This value $f = 2$ used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also this value $f = 2$ corresponds to the usual value $k = 2$ of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the dispersion limit is equal to $k \cdot s_R$ with the usual value $k = 2$, resulting in a dispersion limit lower than the reproducibility limit (i.e. a ratio of $\sqrt{2}$). However it may be necessary to use a larger value $f\sqrt{2}$ (or k) in situation as described below in Sections 3.3 and 3.4.

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important (as indicated in section 6.1.3 of ISO 5725-5).

However in the case of heterogeneous materials, the concept of a distinction between "poor" and "good" laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results

Consequently, in case of relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in tables 3.2 and 3.4 (this means that the value chosen for the critical range factor f is larger than 2 as well as for the extension factor k for dispersion). This is because the extreme results may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples.

Table 3.2 - Results of the validation studies of EN 12457-2

EN 12457-2		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element							
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
COS	As	4.69	3.7	29.3	10.4	82.0	11	3.4
COS	Pb	33.19	4.9	7.4	13.7	20.7	11	3.4
COS	Cd	19.71	3.9	16.6	10.9	46.5	11	4.1
COS	Ni	4.70	4.1	14.7	11.5	41.2	11	3.1
COS	Co	4.31	5.0	19.0	14.0	53.2	11	4.1
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
SEW	TOC	31544	3.4	19.9	9.5	55.7	13	2.4
SEW	SO_4	505	25.7	25.7	72.0	72.0	13	2.8
SEW[4)]	NH_4	2882	11.4	51.0	31.9	143	13	2.0
SEW	Ni	2.5	8.7	14.5	24.4	40.6	13	3.0
SEW	Co	0.51	9.7	23.3	27.2	65.2	13	1.6
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
CHS	Cr^{VI}	5320	3.0	13.7	8.4	38	11	1.8
CHS	F	6.2	4.1	34.7	11.5	97	7	3.1
CHS	Cr	5059	3.4	22.0	9.5	62	11	1.0
CHS	Cl	5390	9.8	25.2	27	71	11	2.1
CHS[1,2)]	Cd	0.029	*[- [6)]]*	73	*[- [6)]]*	204	3	
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
FCM	Cl	2752	2.37	7.07	6.6	19.8	13	1.8
FCM	F	7.30	7.84	28.28	22	79	12	3.4
FCM[1)]	NO_2	2.12	- [6)]	124	- [6)]	347	3	5.2
FCM	Ba	0.64	4.79	17.3	13.4	49	13	2.2
FCM	Cr^{VI}	11.46	4.20	23.7	11.8	66	13	1.6
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
MBA	Mo	0.48	17.7	26.7	50	75	12	7.3
MBA	Sb	0.29	19.1	36.0	53	101	12	5.5
MBA	SO_4	1517	15.6	39.6	44	111	14	3.9
MBA	Ba	1.62	11.9	37.0	33	104	13	2.6
MBA	Cu	4.57	18.3	22.8	51	64	14	1.8
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
MESr [2,7)]	As	0.047	38.4	39.7	108	111	10	10
MESr	Sb	0.76	30.9	34.9	87	98	13	2.2
MESr	Ba	6.20	8.4	26.1	24	73	13	1.9
MESr	B	1.96	15.3	31.0	43	87	12	3.6
MESr [3)]	Pb	1.20	31.1	81.2	87	227	13	4.4
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
MES[3)]	As	0.087	51.0	83.5	143	234	11	3.4
MES	Sb	0.67	15.5	38.7	43	108	13	4.6
MES	Ba	6.2	17.9	27.9	50	78	13	1.7
MES	B	2.45	19.1	44.5	53	125	13	2.4
MES[3)]	Pb	1.36	36.7	55.1	103	154	13	3.4
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r,anal}$ % [5)]
SBW	Ba	7.20	34.82	50.69	97	142	11	3.6
SBW[2)]	Cu	0.19	26.70	109.58	75	307	9	9.0
SBW[3)]	Mo	1.12	77.28	106.39	216	298	11	3.1
SBW	F	17.50	5.10	45.49	14.3	127	9	3.4
SBW[3)]	Zn	5.31	49.76	78.63	139	220	11	3.2

[1] Number of participating labs too low [2] Analytical data too poor [3] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [4] Affected by biological activity [5] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .[6] Number of pairs of results too low

NOTE For comparison, the performance of the Standard Eluate analysis is given in table 3.3 for species measured with an analytical within laboratory variability of better than 10 % This standard eluate was prepared especially for the validation of the leaching test.

Table 3.3 - Typical value and range of standard deviation for the analysis of a standard eluate

Analysis of the standard eluate	median	minimum	maximum
Repeatability standard deviation s_r %	2.9 %	2 %	9 %
Reproducibility standard deviation s_R %	7.7 %	6 %	23 %

3.4 Summary of the performance characteristics evaluation

The validation data have been evaluated. This table 3.4 gives the resulting typical values for repeatability and reproducibility limits as well as their observed ranges. The typical value is derived from the data in table 3.2 by taking the median value and eliminating data as indicated in table 3.3 and rounding the numbers.

Table 3.4 - Typical values and observed ranges of the repeatability and reproducibility limits

The reproducibility limit provides a determination of the differences (positive and negative) that can be found with a 95 % statistical confidence between a single measurement result obtained by a laboratory using its own facilities and another measurement result obtained by another laboratory using its own facilities, the two measurements being performed in accordance with all the requirements of the present standard and the two laboratory samples being obtained in the same conditions from the same primary field sample. Conversely, the repeatability limit refers to measurements obtained from the same laboratory, all other conditions being identical. . The reproducibility limit and the repeatability limit do not cover sampling but cover all aspects from the receipt of the laboratory sample onwards. For instance if the typical value of 82 % is selected for the reproducibility limit of a measurement result of 545 mg / kg, the result is given as follows with its reproducibility limit at 95% statistical confidence: 545 mg / kg ± 447 mg / kg (i.e. ± 82 % of 545) .		
Results of the validation of the compliance leaching test EN 12457- 2	Typical value	Observed range
Repeatability limit r	24 %	7 % - 100 %
Reproducibility limit *R*	72 %	20 % - 160 %

NOTE 1 The above results refer to the difference that may be found between two measurement results performed on two laboratory samples obtained in the same conditions. In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the above typical reproducibility values and observed reproducibility ranges should be divided by $\sqrt{2}$ to obtain the corresponding typical dispersion limit and its observed range (cf. the detailed note of article 3.3). In the example of As in COS, the result and its dispersion limit is 4.69 mg/kg ± 2.74 mg/kg (i.e. 2*sR = 58.6% of 4.69). This mean that with a 95 % statistical confidence, the values reasonably attributable to the measured parameter are larger than 4.69-2.74 mg/kg and lower than 4.69+2.74 mg/kg.

NOTE 2 The repeatability limit (r) and the reproducibility limit (R) as given in table 3.2 and in this table are indicative values of the attainable precision if the compliance leaching test is performed in accordance with this standard EN 12457 Part 2.

NOTE 3 For wastes with a leaching behaviour strongly influenced by the pH in the pH range that occurs in the compliance leaching test, a greater uncertainty shall be taken into account, since the material heterogeneity may induce pH differences between laboratory samples as well as between test portions.

NOTE 4 A limited number of wastes and parameters were tested. Consequently, for other wastes and parameters, performance characteristics may fall outside the limits as derived from the validation of the compliance leaching test EN 12457-2. The repeatability and reproducibility limits given for Part 1 can not be compared with those of other parts due to the fact that not the same waste-component combinations were measured.

NOTE 5 In particular for relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in this chapter, since the extreme results were not taken into account in the statistical evaluation of the test data as described in article 3.3.

NOTE 6 The above typical values and observed ranges corresponds also to the usual critical range factor of 2 (and for dispersion calculation to the usual extension factor k = 2 recommended in the Guide to the expression of Uncertainty in Measurement). However it may be necessary to use a larger value for f (or for k) in situations as described above in notes 4 and 5 as well as in article 3.3. In such case the above typical values and observed ranges should be multiplied by a factor of f / 2 where f is the selected critical range factor for the considered case and 2 is the critical range factor used to determine the above typical values and observed ranges.

4. PERFORMANCE CHARACTERISTICS EN 12457-3 (PART 3)

This information will form chapter 8 of EN 12457-3.

4.1 Objective of the validation

In a European wide validation study according to ISO 5725-5, the performance characteristics of the compliance leaching tests EN 12457 part 3 for inorganic components were established. The uncertainty in the end result of a leaching test is composed of contributions from:
- the origin of the material (variation in production processes);
- the method of sampling in the field (differences in representativeness);
- the sample pretreatment (reduction of the field sample into laboratory sample(s) and preparation of the test portion from the laboratory sample before the leaching test);
- the leaching test itself and the experimental parameter variations as allowed by the tolerances;
- the chemical analysis (uncertainty in the determination of concentration in the eluates).

In the interlaboratory exercise to establish the uncertainty of the compliance leaching test, the contributions of the first two items listed above were not included. The results of the validation study are relevant to all activities carried out on the laboratory sample including its preparation from the primary field sample.

4.2 Validation study

The validation of part 3 was carried out with 11 - 14 European laboratories on two types of waste materials. One of the seven wastes was tested according to all parts of EN 12457. The wastes selected for the validation were chosen such as to represent as broad a range of wastes as possible, as the standard is intended for general use on waste. In the validation work all the wastes were tested for part 2. On the other parts only a selection from these 7 wastes were tested (detailed information can be found in the final report on the Validation study mentioned in annex C of the standard Bibliography).

In the validation study the following starting points were used:

- The laboratory samples were all taken from one large batch of the different wastes according to the normal practice. The normal size reduction and the normal repeated mixing were carried out as needed to obtain representative laboratory samples from the large batch sample. However in the case of metallurgical slag, a separate laboratory sample was provided to assess the difference between size reduction down to 4 mm performed in the laboratory and size reduction down to 4 mm performed in the course of the preparation of the laboratory samples.

- The experimental plan was designed by CEN/TC 292 WG 2 on the basis of each laboratory being given two laboratory samples of each waste to be tested. This is in accordance with ISO 5725-5 section 5 dedicated to heterogeneous material (e.g. sand or aggregate samples etc.). However, in order to verify the contribution of the analysis of the eluate to the overall variability of the leaching test, the participating laboratories were asked to perform a single complete leaching test on each laboratory sample and to analyse the eluates in duplicate.

- The wastes examined cover all the grain size classes to which the compliance leaching test applies: powdered wastes and sludges (0 µm to about 125 µm), fine-grained materials (0 mm to 4 mm) and coarse-grained materials (0 mm to greater than 4 mm) after the required size reduction.

- Not only was testing carried out on familiar waste/component combinations (where considerable experience with the testing procedure has already been reported in the technical literature) but also on less familiar and potentially difficult waste-component combinations. Wastes were chosen in this latter category where it was expected that one or more of the requirements would not be easily fulfilled (for example heterogeneity in metallurgical slag, biological instability of sewage sludge). These combinations were applied in the validation trial to give insight into the level of uncertainty that might arise for these matrices.

Table 4.1 provides a list of the waste types chosen for testing and the selected components.

Table 4.1: Wastes types tested and components analysed in the validation of EN 12457 Part 3.

Grain size class	Waste type tested and European Waste Catalogue (EWC) reference number	Components analysed [1)]
Powder/sludge	Sand blasting waste (SBW) EWC 12 01 16	Ba, Cu*, Mo* F, Zn*
Coarse-grained	Incinerator bottom ash (MBA) EWC 19 01 11	Ba, Cu, Mo, Sb*, SO4
1) The components marked with * were analysed but were not included in the determination of the test performance characteristics for reasons justified in Table 2.		

4.3 Validation results

The statistical evaluation was conducted according to ISO 5725-5 section 6 providing "robust methods for data analysis" : The average values, the repeatability standard deviation ($s_{r\ test}$) and the reproducibility standard deviation (s_R) were obtained (Table 4.2 and table 4.3). In order to compare and contrast the contribution of the analysis of the eluate to the overall uncertainty in the leaching test, Table 2 lists the repeatability standard deviation for the eluate analysis $s_{r,anal}$ as obtained in the validation study.

The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions : The tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The repeatability limit was calculated using the relationship : $r_{test} = f\sqrt{2} * s_{r,test}$ with the critical range factor f = 2.

For instance, for the first line of table 4.2, the repeatability limit around a measurement result of 0.98 mg Ba/kg is ± 0,66 mg Ba/kg (i.e. ±67 % of 0.98)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. The value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also, this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). However it may be necessary to use a larger value for f in situation as described below in Sections 4.3 and 4.4.

The reproducibility is determined as an interval around a measurement result (i.e. "reproducibility limit") and corresponding to the maximum difference that can be expected (with a 95% statistical confidence) between this measurement result and another measurement result, both obtained in accordance with all the requirements of the present standard by two different laboratories using their own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The reproducibility limit was calculated using the relationship: $R = f\sqrt{2} * s_R$ with the critical range factor f = 2.

For instance the first line of table 4.2, the reproducibility limit around a measurement result of 0.98 mg Ba/kg is ± 1.32 mg Ba/kg (i.e. ±134 % of 0.98)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. This value f = 2 used in the factor $f\sqrt{2}$ corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the dispersion limit is equal to $k \cdot s_R$ with the usual value k = 2, resulting in a dispersion limit lower than the reproducibility limit (i.e. a ratio of $\sqrt{2}$). However it may be necessary to use a larger value $f\sqrt{2}$ (or f) in situation as described below in Sections 4.3 and 4.4.

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important (as indicated in section 6.1.3 of ISO 5725-5).

However in the case of heterogeneous materials, the concept of a distinction between “poor” and “good” laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results

Consequently, in case of relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in tables 4.2-A, 4.2-B and 4.4 (this means that the value chosen for the critical range factor f is larger than 2 as well as for the extension factor k for dispersion). This is because the extreme results may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples.
The analytical performance data for the second fraction are not given, as the analytical data for the second fraction can not be related to the cumulative leached quantity.

Table 4.2-A Results of the validation studies of EN 12457-3/1

EN 12457- 3/1		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test}%	R %	N	$s_{r,\,anal}$ %$^{3)}$
SBW	Ba	0.98	24.0	47.8	67	134	10	2.0
SBW [2])	Cu	0.104	77.2	98.1	216	275	9	3.1
SBW [2])	Mo	1.40	112	143	314	400	10	1.1
SBW	F	7.04	19.6	36.7	54.9	103	7	2.1
SBW [2])	Zn	5.50	97.7	97.7	274	274	10	2.2
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test}	R	N	$s_{r,\,anal}$ %$^{3)}$
MBA	Mo	0.34	12.0	29.1	33.6	81.5	13	3.9
MBA [1])	Sb	0.05	13.7	39.7	38.4	111	12	11.7
MBA	SO_4	685	22.6	34.8	63.3	97	14	1.5
MBA	Ba	0.44	13.7	44.3	38.4	124	13	2.1
MBA	Cu	3.35	17.7	22.2	49.6	62.2	13	1.6

Table 4.2-B Results of the validation studies of EN 12457-3/2

EN 12457 – 3/2		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test}%	R %	N	
SBW	Ba	7.1	34.3	37.9	96	106	11	
SBW [2])	Cu	0.199	57.6	86.4	161	242	9	
SBW [2])	Mo	1.8	78.5	109.1	220	305	9	
SBW	F	18.4	4.9	42.4	13.7	119	9	
SBW [2])	Zn	6.8	77.9	85.4	218	239	10	
Sample	Element	AVG	$s_{r,test}$%	s_R%	r_{test}	R		
MBA	Mo	0.51	13.0	30.8	36.4	86.2	12	
MBA	Sb	0.29	12.3	34.5	34.4	96.6	12	
MBA	SO_4	1482	15.1	38.4	42.3	108	14	
MBA	Ba	1.75	13.8	33.1	38.6	92.7	13	
MBA	Cu	4.66	17.2	22.9	48.2	64.1	14	

[1]) Analytical data too poor [2]) Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [3]) The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .

NOTE For comparison, the performance of the Standard Eluate analysis is given in table 4.3 for species measured with an analytical within laboratory variability of better than 10 % This standard eluate was prepared especially for the validation of the leaching test.

Table 4.3 - Typical value and range of standard deviation for the analysis of a standard eluate

Analysis of the standard eluate	median	minimum	maximum
Repeatability standard deviation sr %	2.9 %	2 %	9 %
Reproducibility standard deviation sR %	7.7 %	6 %	23 %

4.4 Summary of the performance characteristics evaluation

The validation data have been evaluated. This table 4.4 gives the resulting typical values for repeatability and reproducibility limits as well as their observed ranges. These values have been obtained by taking the median value of all waste – materials combinations after elimination of values marked in table 4.2.

Table 4.4 - Typical values and observed ranges of the repeatability and reproducibility limits

The reproducibility limit provides a determination of the differences (positive and negative) that can be found with a 95 % statistical confidence between a single measurement result obtained by a laboratory using its own facilities and another measurement result obtained by another laboratory using its own facilities, the two measurements being performed in accordance with all the requirements of the present standard and the two laboratory samples being obtained in the same conditions from the same primary field sample. Conversely, the repeatability limit refers to measurements obtained from the same laboratory, all other conditions being identical. . The reproducibility limit and the repeatability limit do not cover sampling but cover all aspects from the receipt of the laboratory sample onwards.

For instance if the typical value of 100 % is selected for the reproducibility limit of a measurement result of 5.4 mg / kg, the result is given as follows with its reproducibility limit at 95% statistical confidence: 5.4 mg / kg ± 5.4 mg / kg (i.e. ± 100 % of 5.4) .

Results of the validation of the compliance leaching test EN 12457- 3/1	Typical value	Observed range
Repeatability limit r	50 %	30 % - 70 %
Reproducibility limit *R*	100 %	60 % - 130 %
Results of the validation of the compliance leaching test EN 12457- 3/2	Typical value	Observed range
Repeatability limit r	40 %	15 % - 95 %
Reproducibility limit *R*	100 %	65 % - 120 %

NOTE 1 The above results refer to the difference that may be found between two measurement results performed on two laboratory samples obtained in the same conditions. In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the above typical reproducibility values and observed reproducibility ranges should be divided by √2 to obtain the corresponding typical dispersion limit and its observed range (cf. the detailed note of article 8.3). In the example of Ba in SBW, the result and its dispersion limit is 0.98 mg/kg ± 0.94 mg/kg (i.e. 2*sR % = 96% of 0.98). This mean that with a 95 % statistical confidence, the values reasonably attributable to the measured parameter are larger than 0.98 - 0.94 mg/kg and lower than 0.98 + 0.94316 mg/kg

NOTE 2 The repeatability limit (r) and the reproducibility limit (R) as given in table 4.2-A, 4.2-B and in this table are indicative values of the attainable precision if the compliance leaching test is performed in accordance with this standard EN 12457 Part 3.

NOTE 3 For wastes with a leaching behaviour strongly influenced by the pH in the pH range that occurs in the compliance leaching test, a greater uncertainty shall be taken into account, since the material heterogeneity may induce pH differences between laboratory samples as well as between test portions.

NOTE 4 A limited number of wastes and parameters were tested. Consequently, for other wastes and parameters, performance characteristics may fall outside the limits as derived from the validation of the compliance leaching test EN 12457-3. The repeatability and reproducibility limits given for Part 1 can not be compared with those of other parts due to the fact that not the same waste-component combinations were measured.

NOTE 5 In particular for relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in this chapter , since the extreme results were not taken into account in the statistical evaluation of the test data as described in article 4.3.

NOTE 6 The above typical values and observed ranges corresponds also to the usual critical range factor of 2 (and for dispersion calculation to the usual extension factor k = 2 recommended in the Guide to the expression of Uncertainty in Measurement). However it may be necessary to use a larger value for f (or for k) in situations as described above in notes 4 and 5 as well as in article 4.3. In such case the above typical values and observed ranges should be multiplied by a factor of f / 2 where f is the selected critical range factor for the considered case and 2 is the critical range factor used to determine the above typical values and observed ranges

5. PERFORMANCE CHARACTERISTICS EN 12457-4 (PART 4)

This information will form chapter 8 of EN 12457-4.

5.1 Objective of the validation

In a European wide validation study according to ISO 5725-5, the performance characteristics of the compliance leaching tests EN 12457 part 4 for inorganic components were established. The uncertainty in the end result of a leaching test is composed of contributions from:
- the origin of the material (variation in production processes);
- the method of sampling in the field (differences in representativeness);
- the sample pretreatment (reduction of the field sample into laboratory sample(s) and preparation of the test portion from the laboratory sample before the leaching test);
- the leaching test itself and the experimental parameter variations as allowed by the tolerances;
- the chemical analysis (uncertainty in the determination of concentration in the eluates).

In the interlaboratory exercise to establish the uncertainty of the compliance leaching test, the contributions of the first two items listed above were not included. The results of the validation study are relevant to all activities carried out on the laboratory sample including its preparation from the primary field sample.

5.2 Validation study

The validation of part 4 was carried out with 11 - 14 European laboratories on two types of waste materials. One of the seven wastes was tested according to all parts of EN 12457. The wastes selected for the validation were chosen such as to represent as broad a range of wastes as possible, as the standard is intended for general use on waste. In the validation work all the waste were tested for part 2. Because all materials tested using Part 2 also fit with the requirement of particle size specified in Part 4, the data obtained for Part 2 have been included in the statistical evaluation of Part 4. On the other parts only a selection from these 7 wastes were tested (detailed information can be found in the final report on the Validation study mentioned in annex C of the standard Bibliography).

In the validation study the following starting points were used:

- The laboratory samples were all taken from one large batch of the different wastes according to the normal practice. The normal size reduction and the normal repeated mixing were carried out as needed to obtain representative laboratory samples from the large batch sample. However in the case of metallurgical slag, a separate laboratory sample was provided to assess the difference between size reduction down to 4 mm performed in the laboratory and size reduction down to 4 mm performed in the course of the preparation of the laboratory samples.

- The experimental plan was designed by CEN/TC 292 WG 2 on the basis of each laboratory being given two laboratory samples of each waste to be tested. This is in accordance with ISO 5725-5 section 5 dedicated to heterogeneous material (e.g. sand or aggregate samples etc.). However, in order to verify the contribution of the analysis of the eluate to the overall variability of the leaching test, the participating laboratories were asked to perform a single complete leaching test on each laboratory sample and to analyse the eluates in duplicate.

- The wastes examined cover all the grain size classes to which the compliance leaching test applies: powdered wastes and sludges (0 µm to about 125 µm), fine-grained materials (0 mm to 4 mm) and coarse-grained materials (0 mm to 10 mm) after the required size reduction.

- Not only was testing carried out on familiar waste/component combinations (where considerable experience with the testing procedure has already been reported in the technical literature) but also on less familiar and potentially difficult waste-component combinations. Wastes were chosen in this latter category where it was expected that one or more of the requirements would not be easily fulfilled (for example heterogeneity in metallurgical slag, biological instability of sewage sludge). These combinations were applied in the validation trial to give insight into the level of uncertainty that might arise for these matrices.

Table 5.1 provides a list of the waste types chosen for testing and the selected components.

Table 5.1: Wastes types tested and components analysed in the validation of EN 12457-4.

Grain size class	Waste type tested and European Waste Catalogue (EWC) reference number		Components analysed [1)]
Powder/sludge	MSWI Filtercake (FCM)	EWC 19 01 05	F, Cl, NO2*, Ba, Cr VI
	Sewage sludge (SEW)	EWC 19 08 05	Co, Ni, NH4*, TOC, SO4
	Contaminated soil (COS)	EWC 17 05 03	As, Pb, Co, Cd, Ni
	Chemical sludge (CHS)	EWC 06 05 02	Cr VI, Cr, F*, Cl, Cd*
	Sand blasting waste (SBW)	EWC 12 01 16	Ba, Cu*, Mo F, Zn
Coarse-grained	Incinerator bottom ash (MBA)	EWC 19 01 11	Ba, Cu, Mo, Sb, SO4
	Metallurgical slag (MES)	EWC 10 04 01	Sb, Ba, B, As* , Pb*

1) The components marked with * were analysed but were not included in the determination of the test performance characteristics for reasons justified in Table 2.

5.3 Validation results

The statistical evaluation was conducted according to ISO 5725-5 section 6 providing "robust methods for data analysis" : The average values, the repeatability standard deviation ($s_{r\ test}$) and the reproducibility standard deviation (s_R) were obtained (Table 5.2). In order to compare and contrast the contribution of the analysis of the eluate to the overall uncertainty in the leaching test, Table 2 lists the repeatability standard deviation for the eluate analysis $s_{r,anal}$ as obtained in the validation study.

The repeatability is determined as an interval around a measurement result (i.e. "repeatability limit"). This interval corresponds to the maximum difference that can be expected (with a 95% statistical confidence) between one test result and another, both test results being obtained under the following conditions : The tests are performed in accordance with all the requirements of the present standard by the same laboratory using its own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.
The repeatability limit was calculated using the relationship: $r_{test} = f\sqrt{2} * s_{r,test}$ with the critical range factor f = 2.

For instance, for the first line of table 5.2, the repeatability limit around a measurement result of 0.43 mg Mo/kg is ± 0.11 mg Mo/kg (i.e. ± 26 % of 0.43)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. The value f = 2 used in the factor f√2 corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also, this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement (GUM). However it may be necessary to use a larger value for f in situation as described below in Sections 5.3 and 5.4.

The reproducibility is determined as an interval around a measurement result (i.e. "reproducibility limit") and corresponding to the maximum difference that can be expected (with a 95% statistical confidence) between this measurement result and another measurement result, both obtained in accordance with all the requirements of the present standard by two different laboratories using their own facilities and testing laboratory samples obtained from the same primary field sample and prepared under identical procedures.

The reproducibility limit was calculated using the relationship : $R = f\sqrt{2} * s_R$ with the critical range factor f = 2.

For instance the first line of table 5.2, the reproducibility limit around a measurement result of 0.43 mg Mo/kg is ± 0.21 mg Mo/kg (i.e. ± 48 % of 0.43)

NOTE The above relationship refers to the difference that may be found between two measurement results performed each on two laboratory samples obtained under the same conditions. This value f = 2 used in the factor f√2 corresponds to the theoretical factor of 1,96 for a pure normal distribution at 95 % statistical confidence. Also this value f = 2 corresponds to the usual value k = 2 of the extension factor recommended in the Guide to the expression of Uncertainty in Measurement(GUM). In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the dispersion limit is equal to $k \cdot s_R$ with the usual value k = 2, resulting in a dispersion limit lower than the reproducibility limit (i.e. a ratio of √2). However it may be necessary to use a larger value f√2 (or k) in situation as described below in Sections 5.3 and 5.4.

The statistical evaluation of section 6 of ISO 5725-5 relies, among others, on two basic principles:

- a quasi normal distribution for the differences calculated for each pair of results : this is not generally the case in the validation program
- an assumption that the extreme results are given by "poor quality" laboratories and, consequently, the robust method calculates the repeatability and the reproducibility on the basis of the "good quality" laboratories without being influenced by the results of the "poor quality" laboratories. In addition it is assumed that the group of such extreme values is not too important (as indicated in section 6.1.3 of ISO 5725-5).

However in the case of heterogeneous materials, the concept of a distinction between “poor” and “good” laboratories includes not only the quality of operation of the laboratory in accordance with the applied standardised method, but also the heterogeneity between the laboratory samples. The consequence is that each and every laboratory has the same chance of receiving a laboratory sample that produces extreme results.

Consequently, in case of relatively heterogeneous materials, the repeatability and the reproducibility limits may be larger than the values given in tables 5.2 and 5.4 (this means that the value chosen for the critical range factor f is larger than 2 as well as for the extension factor k for dispersion). This is because the extreme results may have been obtained in accordance with the present standard and/or be caused by the variability within or in between the laboratory samples.

Table 5.2 Results of the validation studies of EN 12457- 4

EN 12457 - 4		Average	Repeatability standard deviation	Reproducibility standard deviation	Repeatability limit (comparing two measurements)	Reproducibility limit (comparing two measurements)	Number of labs	Eluate analysis repeatability standard deviation
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r, anal}$ % 5)
MBA	Mo	0.43	9.3	17.0	26	48	13	7.0
MBA	Sb	0.30	17.1	44.2	48	124	12	5.5
MBA	SO4	1367	18.5	40.1	52	112	14	2.4
MBA	Ba	1.64	17.1	38.8	48	109	13	2.9
MBA	Cu	4.19	20.4	26.3	57	74	14	2.6
Sample	Element	mg/kg	$s_{r,test}$%	s_R%	r_{test} %	R %	N	$s_{r, anal}$ % 5)
MESc3)	As	0.056	57	81	160	227	11	4.0
MES	Sb	0.45	31.2	54.0	87	151	13	5.0
MES	Ba	5.02	16.4	37.9	46	106	13	1.6
MES	B	1.56	18.3	37.4	51	105	13	4.7
MES3)	Pb	1.38	38.6	53.2	108	149	13	3.6
Code		mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
COS	As	4.69	3.7	29.3	10.4	82.0	11	3.4
COS	Pb	33.19	4.9	7.4	13.7	20.7	11	3.4
COS	Cd	19.71	3.9	16.6	10.9	46.5	11	4.1
COS	Ni	4.70	4.1	14.7	11.5	41.2	11	3.1
COS	Co	4.31	5.0	19.0	14.0	53.2	11	4.1
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
SEW	TOC	31544	3.4	19.9	9.5	55.7	13	2.4
SEW	SO_4	505	25.7	25.7	72.0	72.0	13	2.8
SEW4)	NH_4	2882	11.4	51.0	31.9	143	13	2.0
SEW	Ni	2.5	8.7	14.5	24.4	40.6	13	3.0
SEW	Co	0.51	9.7	23.3	27.2	65.2	13	1.6
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
CHS	Cr^{VI}	5320	3.0	13.7	8.4	38	11	1.8
CHS	F	6.2	4.1	34.7	11.5	97	7	3.1
CHS	Cr	5059	3.4	22.0	9.5	62	11	1.0
CHS	Cl	5390	9.8	25.2	27	71	11	2.1
CHS1,2)	Cd	0.029	[- 6)]	73	[- 6)]	204	3	
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
FCM	Cl	2752	2.37	7.07	6.6	19.8	13	1.8
FCM	F	7.30	7.84	28.28	22	79	12	3.4
FCM1)	NO_2	2.12	- 6)	124	- 6)	347	3	5.2
FCM	Ba	0.64	4.79	17.3	13.4	49	13	2.2
FCM	Cr^{VI}	11.46	4.20	23.7	11.8	66	13	1.6
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
MESr 2,7)	As	0.047	38.4	39.7	108	111	10	10
MESr	Sb	0.76	30.9	34.9	87	98	13	2.2
MESr	Ba	6.20	8.4	26.1	24	73	13	1.9
MESr	B	1.96	15.3	31.0	43	87	12	3.6
MESr 3)	Pb	1.20	31.1	81.2	87	227	13	4.4
Sample	Element	mg/kg	$s_{r,test}$ %	s_R %	r_{test} %	R %	N	$s_{r, anal}$ % 5)
SBW	Ba	7.20	34.82	50.69	97	142	11	3.6
SBW2)	Cu	0.19	26.70	109.58	75	307	9	9.0
SBW3)	Mo	1.12	77.28	106.39	216	298	11	3.1
SBW	F	17.50	5.10	45.49	14.3	127	9	3.4
SBW3)	Zn	5.31	49.76	78.63	139	220	11	3.2

[1)] Too low number of labs [2)] Too poor analytical data [3)] Obvious heterogeneity (low $s_{r,Anal}$, very high and/or equal $s_{r,Test}$ and s_R) [4)] Affected by biological activity [5)] The repeatability standard deviation of the eluate analysis as obtained in the validation of EN 12457 is consistent with the repeatability standard deviation obtained in the eluate analysis validation study .[6)] Too low number of pairs of results [7)] MESr – sample size reduced centrally by the sample dispatching laboratory as opposed to size reduction by participating laboratories according to the standard.

NOTE For comparison, the performance of the Standard Eluate analysis is given in table 5.3 for species measured with an analytical within laboratory variability of better than 10 % This standard eluate was prepared especially for the validation of the leaching test.

Table 5.3 - Typical value and range of standard deviation for the analysis of a standard eluate

Analysis of the standard eluate	median	minimum	maximum
Repeatability standard deviation s_r %	2.9	2 %	9 %
Reproducibility standard deviation s_R %	7.7	6 %	23 %

5.4 Summary of the performance characteristics evaluation

The validation data have been evaluated. This table 5.4 gives the resulting typical values for repeatability and reproducibility limits as well as their observed ranges. These values have been obtained by taking the median value of all waste – materials combinations after elimination of values marked in table 5.2.

Table 5.4 - Typical values and observed ranges of the repeatability and reproducibility limits

The reproducibility limit provides a determination of the differences (positive and negative) that can be found with a 95 % statistical confidence between a single measurement result obtained by a laboratory using its own facilities and another measurement result obtained by another laboratory using its own facilities, the two measurements being performed in accordance with all the requirements of the present standard and the two laboratory samples being obtained in the same conditions from the same primary field sample. Conversely, the repeatability limit refers to measurements obtained from the same laboratory, all other conditions being identical. . The reproducibility limit and the repeatability limit do not cover sampling but cover all aspects from the receipt of the laboratory sample onwards.

For instance, if the typical value of 77 % is selected for the reproducibility limit of a measurement result of 5.4 mg / kg, the result is given as follows with its reproducibility limit at 95% statistical confidence: 5.4 mg / kg ± 4.2 mg / kg (i.e. ± 77 % of 5.4).

Results of the validation of the compliance leaching test EN 12457- 2	Typical value	Observed range
Repeatability limit r	24 %	7 % - 100 %
Reproducibility limit *R*	72 %	20 % - 150 %

NOTE 1 The above results refer to the difference that may be found between two measurement results performed on two laboratory samples obtained in the same conditions. In the case when reference is made to the dispersion of the values that could reasonably be attributed to the parameter being measured, the above typical reproducibility values and observed reproducibility ranges should be divided by $\sqrt{2}$ to obtain the corresponding typical dispersion limit and its observed range (cf. the detailed note of article 5.3). In the example of Mo in MBA, the result and its dispersion limit is 0.43 mg/kg ± 0.14 mg/kg (i.e. 2*sR% = 34% of 0.43). This mean that with a 95 % statistical confidence, the values reasonably attributable to the measured parameter are larger than 0.43 – 0.14 mg/kg and lower than 0.43 + 0.14 mg/kg

NOTE 2 The repeatability limit (r) and the reproducibility limit (R) as given in table 5.2 and in this table are indicative values of the attainable precision if the compliance leaching test is performed in accordance with this standard EN 12457 Part 4.

NOTE 3 For wastes with a leaching behaviour strongly influenced by the pH in the pH range that occurs in the compliance leaching test, a greater uncertainty shall be taken into account, since the material heterogeneity may induce pH differences between laboratory samples as well as between test portions.

NOTE 4 A limited number of wastes and parameters were tested. Consequently, for other wastes and parameters, performance characteristics may fall outside the limits as derived from the validation of the compliance leaching test EN 12457-4. The repeatability and reproducibility limits given for Part 1 can not be compared with those of other parts due to the fact that not the same waste-component combinations were measured.

NOTE 5 In particular for relatively heterogeneous materials the repeatability and the reproducibility limits may be larger than the values given in this chapter , since the extreme results were not taken into account in the statistical evaluation of the test data as described in article 5.3. In particular, reproducibility limits may be larger than the values given in chapter 5 due to differences in particle size distribution within the specified upper limit for the standard.

NOTE 6 The above typical values and observed ranges corresponds also to the usual critical range factor of 2 (and for dispersion calculation to the usual extension factor k = 2 recommended in the Guide to the expression of Uncertainty in Measurement). However it may be necessary to use a larger value f in situations as described above in notes 4 and 5 as well as in article 5.3. In such case the above typical values and observed ranges should be multiplied by a factor of f / 2 where f is the selected critical range factor for the considered case and 2 is the critical range factor used to determine the above typical values and observed ranges

6. OBSERVATIONS

Rule of thumb for validation work: About a factor of 2 - 2.5 can be found generally between within lab and between lab variability.

Equal and high within test and between lab variability on leaching test results in a waste-component combination with low analytical uncertainty points at heterogeneity for a specific component.

As no waste materials is available as a standard reference material, the study was carried out on real wastes coming from industrial processes and prepared to be representative of real laboratory samples arising from primary sampling procedures. In this manner the results can be used directly to assess performance characteristics of the leaching test described in EN 12457.

Since the repeatability standard deviation and reproducibility standard deviation on a range of elements in four materials is quite acceptable, the conclusion is that the leaching test as such is suitable and provides adequate performance.

A waste may be homogeneous for some and heterogeneous for other constituents. It may also be heterogeneous for composition and homogeneous in leaching. For instance, Pb in MSWI bottom ash is heterogeneous in Pb composition (See part 3), but it is homogeneous in Mg. Also Cu is heterogeneous in composition and much more homogeneous in leaching.

In case of a high between laboratory variability (S_R), which exceeds the within laboratory test variability (Sr Test) significantly (more than a factor 3 – 4) and the within laboratory variability for eluate analysis is good, this can point at systematic errors in concentration level determination by participants.

The aspect of sample heterogeneity in waste samples is an inherent issue, which needs to be factored in when the data are used for decision making and judgements of acceptability.

Validation of CEN/TC 292 leaching tests and eluate analysis methods EN 12457 part 1 - 4, EN 13370 and EN 12506 in co-operation with CEN/TC 308

Part 8. Statistical evaluation of the Eluate analysis methods

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Table of Contents

1. INTRODUCTION

Within the European standardisation committee CEN/TC292 “Characterisation of Waste” two standards were developed for the analysis of waste eluates on the basis of existing international and European standards for the determination of the corresponding parameters in water:

- prEN 13370: Determination of Ammonium-N, AOX, conductivity, Hg, phenol index, TOC, CN^- easy liberatable, F^- and
- ENV 12506: Determination of pH, As, Cd, Cr(VI), Cu, Ni, Pb, Zn, Cl^-, NO_2^-, SO_4^-.

These standards are urgently needed as important tools for controlling limit values in waste eluates as regulated by the European Landfill Directive.

To get information on the repeatability and the reproducibility of the analytical methods and to support their validation, the German Federal Environmental Agency was charged by CEN/TC292 to carry out an intercomparison study on validation of eluate analysis methods listed in prEN 13370 and ENV 12506. This report summarises the results of this study.

2. TEST MATERIALS

To test the analytical procedures on a proper number of eluates, four different materials (contaminated soil, sewage sludge, sand blasting waste, MSWI filter cake) were considered to produce bulk amounts of waste eluates. Additionally, three synthetic solutions were prepared. The producers of the eluates/solutions are listed in Table 1.

The analytical procedures cited in prEN 13370 and ENV 12506 require a couple of conservation methods to stabilise samples until analysis depending on what parameter is to be analysed for. Since it was impossible to produce waste eluates using all the different conservating agents and methods according to the corresponding standards for water analysis, the CEN/TC292 ad hoc Working Group on Validation decided to use only two conservation methods:

- addition of HNO_3 to a pH of about 2 (for subsequent metal analysis) and
- no conservation at all but storage of the eluates at 4°C in the dark (for the analysis of all other parameters).

The waste eluates and synthetic solutions were delivered to the Laboratory for Water Analysis at the German Federal Environmental Agency as bulk solutions or bottled ready for shipment. Bulk eluates stabilised with HNO_3 were filled into polyethylene bottles and non-stabilised samples into glass bottles. Table 2 shows the different procedural steps which were carried out before distribution of the samples to the participants.

Due to additional cooling of samples with small pieces of dry ice and low ambient temperature during transport most of the glass bottles arrived cracked at the laboratories. Therefore, subsitutes for broken sample bottles were distributed (see Table 3). Due to the restricted volumes of eluates that remained after the first sample dispatch, not all samples could be replaced with new ones and in some cases the volume of the subsitituted samples had to be decreased. The participants were asked to adjust test portions in such a way that as much parameters as possible could be analysed for in the required number of replicates.

Table 1: Producers of waste and synthetic eluates for the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506)

Material	***Code***	***Producer***
Eluate of contaminated soil	COS	DHI – Water & Environment Agern Allé 11 2970 Hørsholm DENMARK
Eluate of a flyash-filtercake	FFC	INERIS, Direction des Risques Chroniques – Chimie de l'Environnement B.P. N° 2 60550 Verneuil-en-Halatte FRANCE
Eluate of sewage sludge	SEW	NÖ Umweltschutzanstalt Südstadt Zentrum 4 2344 Enzersdorf AUSTRIA
Eluate of sand blasting waste	SBW	City Analytical Services plc 3 Fairfield Court Wheler Road CV3 4LA Coventry UNITED KINGDOM
Synthetic Eluate 1 Synthetic Eluate 2 Synthetic Eluate 3	SYN1 SYN2 SYN3	Soil & Waste Research, Dep. of Fuel Cells, Conversion & Environment ECN P.O. Box 1 1755 ZG Petten THE NETHERLANDS

Table 2: Handling of waste and synthetic eluates in the Laboratory for Water Analysis before distribution to the participants of the interlaboratory study

Eluate	***Received from the producer***	***Operations before sample dispatch***
COS	HNO_3 stabilised in PE bottles HNO_3 stabilised in glass bottles non stabilised in glass bottles	Distribution as received from DHI
FFC	non stabilised in glass bottles HNO_3 stabilised in glass bottles	Filtration due to precipitation in some bottles, Re-bottling Re-bottling
SEW	HNO_3 stabilised in PE canister non stabilised in PE canister	1:1 Dilution necessary, Bottling Bottling
SBW	non stabilised in glass bottles HNO_3 stabilised in glass bottles	Filtration due to precipitation in some bottles, Re-bottling Filtration due to precipitation in some bottles, Re-bottling
SYN1	HNO_3 stabilised in PE canister non stabilised in PE canister	Bottling 1:1.6 Dilution necessary, Bottling
SYN2	HNO_3 stabilised in PE canister non stabilised in PE canister	Bottling 1:1.2 Dilution necessary, Bottling
SYN3	HNO_3 stabilised in PE canister	Bottling

3. INTERCOMPARISON STUDY

3.1. Organisation

The objective of the intercomparison study was to support the validation of 13 analytical procedures for the determination of 32 parameters in waste eluates according to prEN 13370 and ENV 12506. After a Europe-wide request, 40 laboratories were selected to participate in this validation exercise (Annex 1). The waste and synthetic eluate samples were distributed according to the elaborated testing scheme (Annex 2) to get an adequate number of results for a reliable statistical evaluation without disproportional effort for each participant.

The real waste and synthetic eluate samples were sent off to all participating laboratories within 24 hours. Data report sheets (see Annex 3 for an example) were distributed by e-mail. Results of 37 laboratories were returned to the organiser. A summary of the time course of the exercise is given in Table 3.

Table 3: Time course of the interlaboratory study on validation of methods for eluate analysis according to prEN 13370 and ENV 12506

Date	Action	Responsibility
2000	• Request for participation in the interlaboratory study	CEN/TC292
December 2000	• Closing the list of participants	Organiser
December 2000 / January 2001	• Bottling of eluate samples	Organiser
24 January 2001	• Distribution of data report sheets by e-mail • Information on date of sample dispatch	Organiser
19 February 2001	• Dispatch of the samples to the participating laboratories	Organiser
February 2001	• Acknowledgement of the receipt of the complete set of samples	Participating laboratories
27 February 2001	• Dispatch of substitutes for damaged samples	Organiser
15 March 2001	• Return of analytical results to the organiser	Participating laboratories
March/April 2001	• Statistical evaluation of results	Organiser
14 May 2001	• Presentation of preliminary results to CEN/TC292 WG3	Organiser
May 2001	• Final report	Organiser

3.2. Analytical Procedure

The participants were requested to carry out all determinations in triplicate and according to the standards listed in prEN 13370 and ENV 12506. Additionally, some other analytical procedures were included in the validation exercise. Table 4 shows the parameters which were to be determined in the waste and synthetic eluates, and the corresponding international or European standards to be applied.

Table 4: Parameters to be determined and analytical procedures to be used in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506)

Parameter	Code	Instrument / Method	Standards
AOX	AOX	AOX-Analyser	EN 1485
Arsenic	As	Hydride AAS, ICP	EN 11969, ISO 11885
Barium	Ba	ICP	ISO 11885
Beryllium	Be	ICP	ISO 11885
Cadmium	Cd	AAS, ICP	ISO 8288, ISO 11885
Chloride	Cl	IC, Titration	EN ISO 10304-2, ISO 9207
Cyanide	CN	Photometry, FIA	ISO6703-2, ISO/DIS 14403
Cobalt	Co	ICP	ISO 11885
Conductivity	Cond	Electrode	EN 27888
Chromium	Cr	ICP	ISO 11885
Chromium(VI)	Cr(VI)	Photometry	ISO 11083
Copper	Cu	AAS, ICP	ISO 8288, ISO 11885
Fluoride	F	IC, Electrode	EN ISO 10304-1, ISO 10359-1
Mercury	Hg	CV-AAS	EN 1483
Molybdenum	Mo	ICP	ISO 11885
Ammonium	NH4	Photometry, FIA	ISO7150-1, EN ISO 11732
Nickel	Ni	AAS, ICP	ISO 8288, ISO 11885
Nitrite	NO2	Photometry, IC, FIA	EN 26777, EN ISO 10304-2, EN ISO 13395
Nitrate	NO3	IC, FIA	EN ISO 10304-2, EN ISO 13395
Phosphorus	P	ICP	ISO 11885
Lead	Pb	AAS, ICP	ISO 8288, ISO 11885
pH	pH	Electrode	ISO 10523
Phenol index	PI	Photometry, FIA	ISO 6439, ISO 14402
Sulphur	S	ICP	ISO 11885
Antimony	Sb	Hydride AAS	EN 11969
Selenium	Se	Hydride AAS	EN 11969
Sulphate	SO4	IC	EN ISO 10304-2
TOC	TOC	TOC-Analyser	EN 1484
Total Nitrogen	Tot N		?
Total Phosphorus	Tot P		?
Vanadium	V	ICP	ISO 11885
Zinc	Zn	AAS, ICP	ISO 8288, ISO 11885

3.3. Data Assessment

The data assessment followed the ISO 5725-2 protocol implemented in the software package PROLAB2000 (Dr. Uhlig, quo data, Dresden, Germany), which is routinely used at the Laboratory for Water Analysis for data evaluation in laboratory proficiency tests and method validation studies.

Table 5 displays the measures taken to ensure a reliable performance of the data evaluation. The original data of all participants are given in Annex 4.

Table 5: Measures and actions taken to ensure reliable performance of the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506)

Action	Laboratory
Assignment of laboratory codes before sample dispatch to keep full confidentiality of the results	**LAB01** – **LAB41**
Cancelling participation due to time constraints, technical or other problems	**LAB08, LAB10, LAB36**
Elimination of results due to a serious deviation in the analytical procedure (ICP-MS instead of ICP or AAS)	**LAB11**
Correction of results due to obviously unit errors or incorrect data reporting (i.e. mg N/l instaed of mg NH_4/l)	**LAB04** (AOX, SEW) **LAB04** (NH4 - FIA, SYN2) **LAB04** (NO_2 - FIA, SYN2) **LAB04** (NH4 - FIA, SEW) **LAB05** (AOX, SEW) **LAB07** (S – ICP, COS) **LAB12** (S – ICP, COS) **LAB19** (Zn – AAS, COS) **LAB19** (Cr(VI) – Photometry, FFC) **LAB19** (TOC, SEW) **LAB23** (AOX, SEW) **LAB23** (Cr(VI) – Photometry, SYN1) **LAB24** (S – ICP, COS) **LAB24** (S – ICP, SEW) **LAB24** (S – ICP, SYN3) **LAB27** (AOX, SEW) **LAB28** (AOX, SEW) **LAB30** (Tot N, SEW) **LAB35** (Zn – AAS, COS) **LAB35** (Cr(VI) – Photometry, FFC)
Generation of an Excel spreadsheet (ORGDAT.CSV) containing all analytical results	Laboratory for Water Analysis
Export of all data into PROLAB2000 for statistical evaluation of the results	Laboratory for Water Analysis

According to ISO 5725-2, all data sets were checked for outliers using Grubb’s and Cochran’s test statistics before repeatabilities and reproducibilities of the analytical procedures were calculated. The following types of outliers were rejected:

Type A: individual within laboratory outlier,

Type B: between laboratory outlier (deviation of the laboratory’s mean from the overall mean),

Type C: between laboratory outlier (deviation of the within laboratory standard deviation from the overall mean of the within laboratory standard deviations).

After elimination of outliers, the within laboratory means, the within laboratory standard deviations and the coefficients of variation (repeatability and reproducibility) were calculated.

Graphical presentations of the analytical results obtained for the waste eluates COS, FFC, SEW and SBW as well as for the synthetic eluates SYN1, SYN2 and SYN3 are given in Annex 5 together with relevant statistical parameters of the data evaluation. Outliers are indicated with the above mentioned letters.

3.4. Results

Tables 6-12 summarise the overall statistics of the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) for each sample (COS, FFC, SEW, SBW, SYN1, SYN2, SYN3). More than 90% of the calculated relative repeatabilities are below 10%, whereas about 75% of the reproducibilities are below 40%. These results indicate that most of the tested analytical procedures can be used with adequate precision for the determination of relevant parameters in waste eluates. Bad reproducibilities were probably caused by concentration levels near the determination limit (e.g. NO_3^-, Ion Chromatography, ISO 10304, FFC, SEW), high concentrations of interfering substances in the eluates (e.g. CN^-, Photometry, ISO 6703, SEW) or insufficient quality of some of the participating laboratories in performing the analysis (e.g. Pb, AAS, ISO 8288, SYN1, SYN2).

Annex 6 contains a summarising graphical presentation of the results of the the interlaboratory study on validation of methods for eluate analysis as cited in prEN 13370 and ENV 12506. This annex allows the evaluation of the reproducibilities of the analytical procedures in the investigated real waste and synthetic eluates and a comparison of the performance of different methods for the same parameter.

Table 6: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Synthetic Eluate 1 (SYN1)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
Cd - AAS	ISO 8288	µg/l	8	24	-	35.5	9.05	17.61
CN - FIA	ISO 14403	mg/l	7	22	-	0.175	4.08	49.62
CN - Photometry	ISO 6703	mg/l	4	11	4	0.209	0.36	26.74
Conduct. - Electrode	EN 27888	µS/cm	11	31	6	353	1.49	4.92
Cr(VI) - Photometry	ISO 11083	mg/l	9	27	3	0.108	2.16	35.98
Cu - AAS	ISO 8288	µg/l	8	24	-	19.2	6.35	15.2
Ni - AAS	ISO 8288	µg/l	7	21	-	19	5.91	16.35
Pb - AAS	ISO 8288	µg/l	8	24	-	13.8	5.29	59.14
pH - Electrode	ISO 10523	-	13	37	3	6.68	1.22	9.46
Zn - AAS	ISO 8288	µg/l	8	24	-	748	1.96	4.34

*S_r - relative repeatability; **S_R - relative reproducibility

Table 7: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Contaminated Soil Eluate (COS)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
AOX - Analyser	EN 1485	µg/l	13	38	4	27.8	8.75	27.8
As - Hydride AAS	EN 11969	µg/l	13	39	-	17.4	5.32	33.9
As - ICP	ISO 11885	µg/l	11	33	3	20.6	4.76	28.1
Cd - AAS	ISO 8288	µg/l	8	24	-	208	3.57	7.02
Cd - ICP	ISO 11885	µg/l	17	51	-	207	2.28	6.5
Co - ICP	ISO 11885	µg/l	14	42	6	74.4	1.9	15.9
Conduct. - Electrode	EN 27888	µS/cm	11	30	6	2450	0.3	8.48
Cu - AAS	ISO 8288	µg/l	8	23	1	363	0.66	5.01
Cu - ICP	ISO 11885	µg/l	16	48	3	358	1.67	7.94
Ni - AAS	ISO 8288	µg/l	7	21	-	49.4	3.14	3.38
Ni - ICP	ISO 11885	µg/l	14	41	6	49.3	2.91	9.68
P - ICP	ISO 11885	µg/l	8	24	-	46.4	12.81	78.44
Pb - AAS	ISO 8288	µg/l	8	24	-	326	2.39	15
Pb - ICP	ISO 11885	µg/l	16	48	3	324	2.16	6.13
pH - Electrode	ISO 10523	-	12	32	6	6.14	0.41	4.68
S - ICP	ISO 11885	µg/l	8	24	6	451000	1.85	9.9
Sb - Hydride AAS	EN 11969	µg/l	12	35	1	50.2	4.03	85.6
Se - Hydride AAS	EN 11969	µg/l	10	30	3	36	4.35	68.6
TOC - Analyser	EN 1484	mg/l	13	39	6	16.3	1.82	9.42
Tot P		mg/l	5	16	-	0.043	12.4	65.7
Zn - AAS	ISO 8288	µg/l	8	24	-	49500	1.58	7.21
Zn - ICP	ISO 11885	µg/l	16	48	3	49600	1.45	8.17

*S_r - relative repeatability; **S_R - relative reproducibility

Table 8: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Flyash-Filtercake Eluate (FFC)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
Ba - ICP	ISO 11885	µg/l	16	47	-	57.9	4.18	11.8
Cl - IC	ISO 10304	mg/l	12	37	-	292	1.78	29.1
Cl - Titration	ISO 9207	mg/l	8	23	3	279	0.93	3.83
Conduct. - Electrode	EN 27888	µS/cm	12	33	-	2880	0.47	8.34
Cr - ICP	ISO 11885	µg/l	15	45	3	1140	2.07	8.88
Cr(VI) - Photometry	ISO 11083	µg/l	8	24	6	1150	0.77	11.51
F - Electrode	ISO 10359	mg/l	7	21	6	0.709	3.25	12.15
F – IC	ISO 10304	mg/l	7	20	4	0.629	1.35	19.52
Mo - ICP	ISO 11885	µg/l	15	44	3	467	3.19	14.32
NO2 - FIA	ISO 13395	mg/l	5	15	-	0.016	3.41	54.92
NO2 - IC	ISO 10304	mg/l	2	6	-	0.035	20.2	26.08
NO2 - Photometry	EN 26777	mg/l	8	24	-	0.029	4.66	65.93
NO3 - FIA	ISO 13395	mg/l	4	13	-	0.11	7.85	98.01
NO3 - IC	ISO 10304	mg/l	4	13	-	0.205	4.84	88.22
pH - Electrode	ISO 10523	-	10	26	9	9.98	1.24	4.23
SO4 - IC	ISO 10304	mg/l	11	34	3	1350	1.37	6.35
Tot N		mg/l	3	9	3	1.42	18.47	117.5
Zn - ICP	ISO 11885	µg/l	16	48	-	281	3.16	13.42

*S_r - relative repeatability; **S_R - relative reproducibility

Table 9: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Sandblasting Waste Eluate (SBW)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
Ba - ICP	ISO 11885	µg/l	15	44	3	80.4	1.88	12.59
Cl - IC	ISO 10304	mg/l	11	33	3	20.2	4.96	10.87
Cl - Titration	ISO 9207	mg/l	8	24	-	22	6.27	12.84
Conduct. - Electrode	EN 27888	µS/cm	11	31	2	530	0.4	4.43
Cu - ICP	ISO 11885	µg/l	15	45	3	102	4.21	12.17
F - Electrode	ISO 10359	mg/l	10	30	-	7.66	0.78	12.91
F - IC	ISO 10304	mg/l	11	33	-	7.42	2.06	16.57
pH - Electrode	ISO 10523	-	13	35	-	6.99	0.79	2.54
Phenol index - FIA	ISO 14402	mg/l	5	17	-	0.081	3.2	52.33
Phenol index - Photometry	ISO 6439	mg/l	8	24	-	0.246	7.62	38.6
SO4 - IC	ISO 10304	mg/l	9	27	9	108	2.34	2.72
Zn - ICP	ISO 11885	µg/l	16	48	-	260	2.79	10.02

*S_r - relative repeatability; **S_R - relative reproducibility

Table 10: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Sewage Sludge Eluate (SEW)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
AOX - Analyser	EN 1485	mg/l	11	32	7	0.153	7.16	39.95
As - Hydride AAS	EN 11969	µg/l	12	36	6	15.2	5.2	51.38
As - ICP	ISO 11885	µg/l	11	33	6	139	7.66	19.38
Cl - IC	ISO 10304	mg/l	13	40	-	92.2	3.75	20.26
CN - Photometry	ISO 6703	mg/l	4	11	-	0.034	6.42	136.7
Conduct. - Electrode	EN 27888	µS/cm	10	28	9	3530	0.33	13.3
Hg - CV-AAS	EN 1483	µg/l	5	15	-	0.752	15.43	88.36
NH4 - FIA	ISO 11732	mg/l	11	34	-	401	1.44	20.28
NH4 - Photometry	ISO 7150	mg/l	10	30	3	360	2.23	42.11
Ni - ICP	ISO 11885	µg/l	16	48	-	117	4.72	9.8
NO2 - IC	ISO 10304	mg/l	4	12	-	4.25	6.62	110.2
NO2 - Photometry	EN 26777	mg/l	6	18	-	0.042	7.85	81.33
NO3 - FIA	ISO 13395	mg/l	2	6	-	0.294	1.94	3.22
NO3 - IC	ISO 10304	mg/l	6	17	3	1.54	3.71	95.89
P - ICP	ISO 11885	µg/l	11	33	6	22100	1.55	5.29
pH - Electrode	ISO 10523	-	12	34	6	6.29	0.76	5.34
S - ICP	ISO 11885	µg/l	7	20	9	62700	0.88	2.5
Se - Hydride AAS	EN 11969	µg/l	6	18	3	11.5	3.97	87.71
SO4 - IC	ISO 10304	mg/l	12	37	-	53.9	2.98	15.75
TOC - Analyser	EN 1484	mg/l	13	41	6	1560	2.58	6.39
Tot N		mg/l	10	32	9	730	0.72	6.38
Tot P		mg/l	11	35	3	24.3	2.81	48.58

*S_r - relative repeatability; **S_R - relative reproducibility

Table 11: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Synthetic Eluate 2 (SYN2)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
Cd - AAS	ISO 8288	µg/l	6	18	6	32.3	3.81	14.18
CN - FIA	ISO 14403	mg/l	5	16	4	0.047	5.45	36.22
CN - Photometry	ISO 6703	mg/l	5	15	3	0.041	3.98	12.75
Conduct. - Electrode	EN 27888	µS/cm	13	36	-	478	0.61	4.51
Cu - AAS	ISO 8288	µg/l	6	18	6	19.7	5.05	12.39
Hg - CV-AAS	EN 1483	µg/l	11	33	3	6.25	2.1	21.8
NH4 - FIA	ISO 11732	mg/l	8	26	6	0.248	5.22	27.17
NH4 - Photometry	ISO 7150	mg/l	9	27	6	0.223	3.26	8.31
Ni - AAS	ISO 8288	µg/l	7	21	-	19.5	4.93	12.25
NO2 - FIA	ISO 13395	mg/l	9	26	7	0.132	0.98	37.17
NO2 - IC	ISO 10304	mg/l	8	24	3	0.138	6.88	31.56
NO2 - Photometry	EN 26777	mg/l	10	30	-	0.145	2.9	23.46
Pb - AAS	ISO 8288	µg/l	7	21	3	14.7	5.57	60.25
pH - Electrode	ISO 10523	-	13	35	3	6.94	0.78	3.13
Phenol index - FIA	ISO 14402	mg/l	6	18	-	0.067	4.16	24.5
Phenol index - Photometry	ISO 6439	mg/l	4	12	6	0.071	1.3	23.37
Zn - AAS	ISO 8288	µg/l	8	24	-	807	1.84	7.15

*S_r - relative repeatability; **S_R - relative reproducibility

Table 12: Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370/ENV 12506) – *Synthetic Eluate 3 (SYN3)*

Parameter	Standard	Units	Number of			Mean	S_r*	S_R**
			Labs	Values	Outliers		[%]	[%]
As - ICP	ISO 11885	µg/l	3	7	-	10.9	112.8	130.3
Ba - ICP	ISO 11885	µg/l	15	42	1	27.1	3.95	12.85
Be - ICP	ISO 11885	µg/l	4	10	-	1.39	1.06	145.1
Cd - ICP	ISO 11885	µg/l	14	42	6	365	2.01	8.09
Co - ICP	ISO 11885	µg/l	9	27	3	5.85	7.21	9.3
Cr - ICP	ISO 11885	µg/l	15	45	3	81.8	4.18	8.53
Cu - ICP	ISO 11885	µg/l	10	30	5	7.66	14.98	16.75
Mo - ICP	ISO 11885	µg/l	14	41	3	70.3	5.27	16.05
Ni - ICP	ISO 11885	µg/l	11	32	3	13.3	6.23	17.22
P - ICP	ISO 11885	mg/l	4	12	-	91.7	10.27	86.76
Pb - ICP	ISO 11885	µg/l	14	41	4	75.9	4.21	21.17
S - ICP	ISO 11885	µg/l	9	27	3	50500	1.48	7.62
V - ICP	ISO 11885	µg/l	12	34	4	24.9	5.71	18.49
Zn - ICP	ISO 11885	µg/l	16	47	-	18600	3.31	8.9

*S_r - relative repeatability; **S_R - relative reproducibility

Annex 1

List of participants in alphabetical order

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Annex 2

Sample distribution list

Sample volumes which were distributed to the participants in the Interlaboratory Study on Validation of Methods for Eluate Analysis according to prEN 13370 and ENV 12506

Eluat	COS	COS	COS	FFC	FFC	SBW	SBW	SEW	SEW	SYN1	SYN1	SYN2	SYN2	SYN3
Conservation	HNO_3	HNO_3	none	HNO_3	none	HNO_3	none	HNO_3	none	HNO_3	none	HNO_3	none	HNO_3
LAB01	250		250	100	100	100	100	100	100		100		100	250
LAB02		500			500		100	500	500		100		100	
LAB03	250			100	250	100	100	100	250				250	250
LAB04	250	500	250	100	500	100	250	1000	500		100		250	250
LAB05	250	500	250	100	250	100	250	500	250		250		250	250
LAB06		500			200		100	1000	250		100		100	
LAB07	250	500			1000		1000	500	1000		1000	100	1000	250
LAB08	250		250	100	100	100	100	100	100	100	100	100	100	250
LAB09	250		250	100	100	100	100	100	100		100		100	250
LAB10					1000		1000		1000		1000		1000	
LAB11	250	500			1000		1000	500	1000	100	1000	250	1000	
LAB12	250	500	250	100	200	100	250	500	250		250		250	250
LAB14	250	500			1000		1000	500	1000	250	1000	250	1000	250
LAB15	250		250	100	500	100	500	100	250	100	100	100	250	250
LAB16	250				200		500	250	100	100		250	100	250
LAB17					100				100		100		100	
LAB18	250	500	250	100	250	100	250	500	250		100		250	250
LAB19	250	500			1000		1000	500	1000	100	1000	250	1000	
LAB20		500			200		100	1000	250		100		100	
LAB21	250	500		100	250	100	500	500	250				100	250
LAB22	250				1000		1000	250	1000		1000	100	1000	
LAB23		500			1000		500	1000	1000		1000		1000	
LAB24	250	500			1000		1000	500	1000		1000	100	1000	250
LAB25	250		250	100	100	100	100	100	100		100		100	250
LAB26					100		100		100				100	
LAB27	250	500	250	100	100	100	100	500	100		100	100	100	250
LAB28	250	500	250	100	250	100	250	500	250		100	100	250	250
LAB29					100		100		100				100	
LAB30	250	500	250	100	200	100	100	250	250		100		100	250
LAB31	250		250	100	200	100	500	100	250		250		250	250
LAB32	250				100		100		100	100		100	100	
LAB33	250				1000		1000	100	1000	100	1000	100	1000	
LAB34	250	500	250	100	500	100	250	1000	500		100		250	250
LAB35	250	500			1000		1000	1000	1000	100	1000	250	1000	
LAB36					100		100		100		100		100	
LAB37	250	500			1000		1000	500	1000	250	1000	250	1000	
LAB38					100		100		100				100	
LAB39	250		250	100	1000	100	100	100	1000		1000		1000	250
LAB40	250	500			200		100	1000	250	100	100	250	100	250
LAB41	250	500			1000		1000	500	1000	100	1000	250	1000	

Annex 3

Example for a data report sheet

CEN/TC 292 Validation of Methods for Eluate Analysis **Intercomparison Exercise**

Data transmission sheet

Laboratory Address: ....
....
....
....
....

Fon: ....

Fax: ....

e-mail: ....

Laboratory Code:

–

Date of Analysis: ....

Person responsible
for the test: ....

Remarks: ....
....
....
....
....

Signature: ....

COS - Contaminated Soil Eluate									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Hydride AAS	As	EN 11969	HNO3, pH = 2		µg/l				
Hydride AAS	Sb	EN 11969	HNO3, pH = 2		µg/l				
Hydride AAS	Se	EN 11969	HNO3, pH = 2		µg/l				
AAS	Cd	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Cu	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Ni	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Pb	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Zn	ISO 8288	HNO3, pH = 2		µg/l				
ICP	P	ISO 11885	HNO3, pH = 2		µg/l				
ICP	S	ISO 11885	HNO3, pH = 2		µg/l				
AOX-analyser	AOX	EN 1485	HNO3, pH = 2		µg/l				

FFC - Fly Ash Filtercake Eluate									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Photometry	Cr(VI)	ISO 11083	none, cold		µg/l				
Photometry	NO2	EN 26777	none, cold		mg/l				
Electrode	F	ISO 10359	none, cold		mg/l				
Titration	Cl	ISO 9207	none, cold		mg/l				

SEW - Sewage Sludge Eluate									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Photometry	NO2	EN 26777	none, cold		mg/l				
Photometry	NH4	ISO 7150	none, cold		mg/l				
Photometry	CN	ISO 6703	none, cold		mg/l				
Hydride AAS	As	EN 11969	HNO3, pH = 2		µg/l				
Hydride AAS	Se	EN 11969	HNO3, pH = 2		µg/l				
CV-AAS	Hg	EN 1483	HNO3, pH = 2		µg/l				
ICP	P	ISO 11885	HNO3, pH = 2		µg/l				

ICP	S	ISO 11885	HNO3, pH = 2		µg/l				
AOX-analyser	AOX	EN 1485	HNO3, pH = 2		mg/l				

SBW - Sand Blasting Waste Eluate									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Photometry	Phenol index	ISO 6439	none, cold		mg/l				
Electrode	F	ISO 10359	none, cold		mg/l				
Titration	Cl	ISO 9207	none, cold		mg/l				

SYN3 - Synthetic Eluate 3									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
ICP	P	ISO 11885	HNO3, pH = 2		µg/l				
ICP	S	ISO 11885	HNO3, pH = 2		µg/l				

SYN1 - Synthetic Eluate 1									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Photometry	Cr(VI)	ISO 11083	none, cold		mg/l				
Photometry	CN	ISO 6703	none, cold		mg/l				
AAS	Cd	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Cu	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Ni	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Pb	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Zn	ISO 8288	HNO3, pH = 2		µg/l				

SYN2 - Synthetic Eluate 2									
Please use 3 significant figures for the analytical results !						Analytical Results Table			
							Replicates		
Method	**Parameter**	**Standard**	**Conservation**		**Units**		**1**	**2**	**3**
Photometry	NO2	EN 26777	none, cold		mg/l				
Photometry	NH4	ISO 7150	none, cold		mg/l				
Photometry	Phenol index	ISO 6439	none, cold		mg/l				
Photometry	CN	ISO 6703	none, cold		mg/l				
CV-AAS	Hg	EN 1483	HNO3, pH = 2		µg/l				
AAS	Cd	ISO 8288	HNO3, pH = 2		µg/l				

AAS	Cu	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Ni	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Pb	ISO 8288	HNO3, pH = 2		µg/l				
AAS	Zn	ISO 8288	HNO3, pH = 2		µg/l				

Annex 4

Original data

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB01	COS	As - ICP	ISO 11885	µg/l					<50
LAB01	COS	Cd - ICP	ISO 11885	µg/l	194	193	194		
LAB01	COS	Co - ICP	ISO 11885	µg/l	100	100	100		
LAB01	COS	Conduct. - Electrode	EN 27888	µS/cm	2570	2570	2560		
LAB01	COS	Cu - ICP	ISO 11885	µg/l	390	390	390		
LAB01	COS	Ni - ICP	ISO 11885	µg/l	50	50	50		
LAB01	COS	P - ICP	ISO 11885	µg/l					<500
LAB01	COS	Pb - ICP	ISO 11885	µg/l	320	310	310		
LAB01	COS	pH - Electrode	ISO 10523	-	5.95	6	6		
LAB01	COS	S - ICP	ISO 11885	µg/l	443900	440500	440100		
LAB01	COS	Zn - ICP	ISO 11885	µg/l	48360	49190	50480		
LAB01	FFC	Ba - ICP	ISO 11885	µg/l	60	60	60		
LAB01	FFC	Conduct. - Electrode	EN 27888	µS/cm	3010	3000	2990		
LAB01	FFC	Cr - ICP	ISO 11885	µg/l	1250	1280	1270		
LAB01	FFC	Mo - ICP	ISO 11885	µg/l	650	570	540		
LAB01	FFC	pH - Electrode	ISO 10523	-	9.95	9.85	9.8		
LAB01	FFC	Zn - ICP	ISO 11885	µg/l	270	280	270		
LAB01	SBW	Ba - ICP	ISO 11885	µg/l	90	90	90		
LAB01	SBW	Conduct. - Electrode	EN 27888	µS/cm	535	538	537		
LAB01	SBW	Cu - ICP	ISO 11885	µg/l	370	360	370		
LAB01	SBW	pH - Electrode	ISO 10523	-	6.65	6.75	6.8		
LAB01	SBW	Zn - ICP	ISO 11885	µg/l	250	250	250		
LAB01	SEW	As - ICP	ISO 11885	µg/l	159	173	170		
LAB01	SEW	Conduct. - Electrode	EN 27888	µS/cm	3950	3940	3920		
LAB01	SEW	Ni - ICP	ISO 11885	µg/l	120	130	120		
LAB01	SEW	P - ICP	ISO 11885	µg/l	23200	23400	22400		
LAB01	SEW	pH - Electrode	ISO 10523	-	6.75	6.85	6.9		
LAB01	SEW	S - ICP	ISO 11885	µg/l	62050	60310	61590		
LAB01	SYN1	Conduct. - Electrode	EN 27888	µS/cm	360	360	360		
LAB01	SYN1	pH - Electrode	ISO 10523	-	6.7	7.05	7		
LAB01	SYN2	Conduct. - Electrode	EN 27888	µS/cm	488	486	484		
LAB01	SYN2	pH - Electrode	ISO 10523	-	6.8	6.9	6.9		
LAB01	SYN3	As - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Ba - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Be - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Cd - ICP	ISO 11885	µg/l	349	348	345		
LAB01	SYN3	Co - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Cr - ICP	ISO 11885	µg/l	80	80	80		
LAB01	SYN3	Cu - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Mo - ICP	ISO 11885	µg/l	60	70	70		
LAB01	SYN3	Ni - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	P - ICP	ISO 11885	µg/l					< 500
LAB01	SYN3	Pb - ICP	ISO 11885	µg/l	80	80	80		
LAB01	SYN3	S - ICP	ISO 11885	µg/l	49830	50620	50140		
LAB01	SYN3	V - ICP	ISO 11885	µg/l					< 50
LAB01	SYN3	Zn - ICP	ISO 11885	µg/l	17420	17210	17220		
LAB02	COS	AOX - Analyser	EN 1485	µg/l					AOX
LAB02	COS	TOC - Analyser	EN 1484	mg/l	15.3	15.4	15.5		
LAB02	COS	Tot P - ?	EN 1189	mg/l					< 0.10
LAB02	FFC	Cl - IC	ISO 10304	mg/l	276	275	275		
LAB02	FFC	F - Electrode	ISO 10359	mg/l	0.762	0.768	0.760		
LAB02	FFC	F - IC	ISO 10304	mg/l	0.680	0.660	0.650		
LAB02	FFC	NO2 - IC	ISO 10304	mg/l	0.050	0.04	0.030		< 0.050
LAB02	FFC	NO3 - IC	ISO 10304	mg/l	0.070	0.070	0.040		< 0.1
LAB02	FFC	SO4 - IC	ISO 10304	mg/l	1280	1280	1280		
LAB02	FFC	Tot N - ?		mg/l					< 5
LAB02	SBW	Cl - IC	ISO 10304	mg/l	19.6	19.4	19.6		
LAB02	SBW	F - Electrode	ISO 10359	mg/l	7.25	7.28	7.29		
LAB02	SBW	F - IC	ISO 10304	mg/l	6.91	7.00	6.89		
LAB02	SBW	SO4 - IC	ISO 10304	mg/l	109	108	108		
LAB02	SEW	AOX - Analyser	EN 1485	mg/l	0.07	0.057	0.087		< 1.6
LAB02	SEW	Cl - IC	ISO 10304	mg/l	98.3	97.7	96.7		
LAB02	SEW	NH4 - FIA	ISO 11732	mg/l	353	352	355		
LAB02	SEW	NO2 - IC	ISO 10304	mg/l					< 1
LAB02	SEW	NO3 - IC	ISO 10304	mg/l					< 1
LAB02	SEW	SO4 - IC	ISO 10304	mg/l	55.6	55.4	55.4		
LAB02	SEW	TOC - Analyser	EN 1484	mg/l	1550	1550	1560		
LAB02	SEW	Tot N - ?		mg/l	742	736	736		
LAB02	SEW	Tot P - ?	EN 1189	mg/l	21.3	21.5	21.5		
LAB02	SYN1	CN - FIA	ISO 14403	mg/l	0.020	0.020	0.019		CN total
LAB02	SYN2	CN - FIA	ISO 14403	mg/l	0.228	0.203	0.198		CN total
LAB02	SYN2	NH4 - FIA	ISO 11732	mg/l	0.353	0.352	0.354		NH4-N
LAB02	SYN2	NO2 - IC	ISO 10304	mg/l	0.170	0.180	0.180		
LAB03	COS	As - ICP	ISO 11885	µg/l	34.8	32.5	34.1		
LAB03	COS	Cd - ICP	ISO 11885	µg/l	195	199	204		
LAB03	COS	Co - ICP	ISO 11885	µg/l	70	70	70		
LAB03	COS	Cu - ICP	ISO 11885	µg/l	322	327	337		

LAB03	COS	Ni - ICP	ISO 11885	µg/l	52	51	50		
LAB03	COS	P - ICP	ISO 11885	µg/l	8.65	8.32	8.7		
LAB03	COS	Pb - ICP	ISO 11885	µg/l	505	498	503		
LAB03	COS	S - ICP	ISO 11885	µg/l	34100	35200	35600		
LAB03	COS	Zn - ICP	ISO 11885	µg/l	50400	51500	52300		

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB03	FFC	Ba - ICP	ISO 11885	µg/l	67.3	66.8	67.8		
LAB03	FFC	Cl - IC	ISO 10304	mg/l	238	237	237		
LAB03	FFC	Cr - ICP	ISO 11885	µg/l	1140	1150	1150		
LAB03	FFC	F - IC	ISO 10304	mg/l	2.11	2.16	2.17		
LAB03	FFC	Mo - ICP	ISO 11885	µg/l	445	444	442		
LAB03	FFC	NO2 - FIA	ISO 13395	mg/l	0.0095	0.0076	0.0086		
LAB03	FFC	NO3 - FIA	ISO 13395	mg/l	0.0605	0.0613	0.0613		
LAB03	FFC	SO4 - IC	ISO 10304	mg/l	1328	1320	1307		
LAB03	FFC	Zn - ICP	ISO 11885	µg/l	260	261	260		
LAB03	SBW	Ba - ICP	ISO 11885	µg/l	81	81	80.3		
LAB03	SBW	Cl - IC	ISO 10304	mg/l	18.9	19.6	19.5		
LAB03	SBW	Cu - ICP	ISO 11885	µg/l	89	90	88		
LAB03	SBW	F - IC	ISO 10304	mg/l	9.76	9.45	9.47		
LAB03	SBW	SO4 - IC	ISO 10304	mg/l	108	106	116		
LAB03	SBW	Zn - ICP	ISO 11885	µg/l	223	232	227		
LAB03	SEW	As - ICP	ISO 11885	µg/l	195	208	194		
LAB03	SEW	Cl - IC	ISO 10304	mg/l	45.8	46.9	44.8		
LAB03	SEW	NH4 - FIA	ISO 11732	mg/l	260	260	263		
LAB03	SEW	Ni - ICP	ISO 11885	µg/l	123	124	126		
LAB03	SEW	NO3 - FIA	ISO 13395	mg/l	0.279	0.293	0.293		
LAB03	SEW	NO3 - IC	ISO 10304	mg/l	1.83	1.83	1.87		
LAB03	SEW	P - ICP	ISO 11885	µg/l	20000	19900	21300		
LAB03	SEW	S - ICP	ISO 11885	µg/l	48000	47600	51200		
LAB03	SEW	SO4 - IC	ISO 10304	mg/l	32.1	33.2	31.5		
LAB03	SYN2	NH4 - FIA	ISO 11732	mg/l	0.257	0.261	0.281		
LAB03	SYN2	NO2 - FIA	ISO 13395	mg/l	0.138	0.136	0.138		
LAB03	SYN3	As - ICP	ISO 11885	µg/l	1.52	1.51	1.46		
LAB03	SYN3	Ba - ICP	ISO 11885	µg/l	30	31.5	30.6		
LAB03	SYN3	Be - ICP	ISO 11885	µg/l	0.065	0.058	0.065		
LAB03	SYN3	Cd - ICP	ISO 11885	µg/l	370	376	375		
LAB03	SYN3	Co - ICP	ISO 11885	µg/l	5.89	5.98	6.25		
LAB03	SYN3	Cr - ICP	ISO 11885	µg/l	83	82	83		
LAB03	SYN3	Cu - ICP	ISO 11885	µg/l	8.7	7.61	7.9		
LAB03	SYN3	Mo - ICP	ISO 11885	µg/l	80.3	82.1	81.9		
LAB03	SYN3	Ni - ICP	ISO 11885	µg/l	17.4	17.6	17.3		
LAB03	SYN3	P - ICP	ISO 11885	µg/l	14.7	15.2	15.3		
LAB03	SYN3	Pb - ICP	ISO 11885	µg/l	93.9	91.6	92.8		
LAB03	SYN3	S - ICP	ISO 11885	µg/l	41500	42100	41800		
LAB03	SYN3	V - ICP	ISO 11885	µg/l	28.3	29	28.7		
LAB03	SYN3	Zn - ICP	ISO 11885	µg/l	17400	17600	17400		
LAB04	COS	AOX - Analyser	EN 1485	µg/l	42.7	42.5	47.6		
LAB04	COS	As - ICP	ISO 11885	µg/l	13.3	13.6	13.4		
LAB04	COS	Cd - ICP	ISO 11885	µg/l	200	196	196		
LAB04	COS	Co - ICP	ISO 11885	µg/l	68	69.7	69.2		
LAB04	COS	Conduct. - Electrode	EN 27888	µS/cm	2595				25°C
LAB04	COS	Cu - ICP	ISO 11885	µg/l	343	345	340		
LAB04	COS	Ni - ICP	ISO 11885	µg/l	49.7	48.1	50.2		
LAB04	COS	P - ICP	ISO 11885	µg/l					<50
LAB04	COS	Pb - ICP	ISO 11885	µg/l	292	296	293		
LAB04	COS	pH - Electrode	ISO 10523	-	5.8				not enough sample
LAB04	COS	S - ICP	ISO 11885	µg/l	426000	438000	428000		
LAB04	COS	TOC - Analyser	EN 1484	mg/l	19	19.3	19		
LAB04	COS	Tot P - ?	?	mg/l					
LAB04	COS	Zn - ICP	ISO 11885	µg/l	48900	48500	48500		
LAB04	FFC	Ba - ICP	ISO 11885	µg/l	53.2	53.5	54.7		
LAB04	FFC	Conduct. - Electrode	EN 27888	µS/cm	2889				25°C
LAB04	FFC	Cr - ICP	ISO 11885	µg/l	1110	1070	1110		
LAB04	FFC	Mo - ICP	ISO 11885	µg/l	428	435			
LAB04	FFC	NO2 - FIA	ISO 13395	mg/l					< 0.02 mg N/l
LAB04	FFC	NO2 - IC	ISO 10304	mg/l					
LAB04	FFC	NO3 - FIA	ISO 13395	mg/l					< 0.76 mg N/l
LAB04	FFC	pH - Electrode	ISO 10523	-	10.7				not enough sample
LAB04	FFC	Tot N - ?	Kj-N+NO3N	mg/l					< 1
LAB04	FFC	Zn - ICP	ISO 11885	µg/l	266	269	250		
LAB04	SBW	Ba - ICP	ISO 11885	µg/l	76	72.07			
LAB04	SBW	Conduct. - Electrode	EN 27888	µS/cm	532				25 °C
LAB04	SBW	Cu - ICP	ISO 11885	µg/l	95.5	93.4	90.9		
LAB04	SBW	pH - Electrode	ISO 10523	-	6.7				not enough sample
LAB04	SBW	Zn - ICP	ISO 11885	µg/l	237	235	227		
LAB04	SEW	AOX - Analyser	EN 1485	mg/l	0.266	0.314	0.235		corr. (/1000)
LAB04	SEW	As - ICP	ISO 11885	µg/l	127	127	110		
LAB04	SEW	Conduct. - Electrode	EN 27888	µS/cm	3705				not enough sample
LAB04	SEW	NH4 - FIA	ISO 11732	mg/l	442	449			corr. (mg NH4/l)
LAB04	SEW	Ni - ICP	ISO 11885	µg/l	114	111	123		
LAB04	SEW	NO3 - FIA	ISO 13395	mg/l					< 0.76 mg N/l
LAB04	SEW	P - ICP	ISO 11885	µg/l	20000	20200			

LAB04	SEW	pH - Electrode	ISO 10523	-	6.1				not enough sample
LAB04	SEW	S - ICP	ISO 11885	µg/l	64800	63500			
LAB04	SEW	TOC - Analyser	EN 1484	mg/l	1710	1680	1690		
LAB04	SEW	Tot N - ?	Kj-N+NO3N	mg/l	725	712	712		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB04	SYN1	Conduct. - Electrode	EN 27888	µS/cm	365				25 °C
LAB04	SYN1	pH - Electrode	ISO 10523	-	6.1				not enough sample
LAB04	SYN2	Conduct. - Electrode	EN 27888	µS/cm	493				25 °C
LAB04	SYN2	NH4 - FIA	ISO 11732	mg/l	55	55.4	58.9		corr. (mg NH4/l)
LAB04	SYN2	NO2 - FIA	ISO 13395	mg/l	0.221	0.221	0.31		corr. (mg NO3/l)
LAB04	SYN2	pH - Electrode	ISO 10523	-	6.3				not enough sample
LAB04	SYN3	As - ICP	ISO 11885	µg/l					< 5
LAB04	SYN3	Ba - ICP	ISO 11885	µg/l	27	29.8	25.6		
LAB04	SYN3	Be - ICP	ISO 11885	µg/l					< 5
LAB04	SYN3	Cd - ICP	ISO 11885	µg/l	351	341	338		
LAB04	SYN3	Co - ICP	ISO 11885	µg/l	5.5	5	5.2		
LAB04	SYN3	Cr - ICP	ISO 11885	µg/l	79.4	78.2	77.4		
LAB04	SYN3	Cu - ICP	ISO 11885	µg/l	7.49	8.02	7.21		
LAB04	SYN3	Mo - ICP	ISO 11885	µg/l	70.8	71.5			
LAB04	SYN3	Ni - ICP	ISO 11885	µg/l	13.3	12.8	12.2		
LAB04	SYN3	P - ICP	ISO 11885	µg/l					< 50
LAB04	SYN3	Pb - ICP	ISO 11885	µg/l	80.4	77.6	77		
LAB04	SYN3	S - ICP	ISO 11885	µg/l	50200	49600	49200		
LAB04	SYN3	V - ICP	ISO 11885	µg/l	23.3	24			
LAB04	SYN3	Zn - ICP	ISO 11885	µg/l	17600	17500			
LAB05	COS	AOX - Analyser	EN 1485	µg/l	24	25	25		
LAB05	COS	As - ICP	ISO 11885	µg/l	19.5	18.9	20.8		
LAB05	COS	Cd - ICP	ISO 11885	µg/l	212	212	215		
LAB05	COS	Co - ICP	ISO 11885	µg/l	75.7	76.1	76.1		
LAB05	COS	Conduct. - Electrode	EN 27888	µS/cm	2570	2570	2570		
LAB05	COS	Cu - ICP	ISO 11885	µg/l	339	340	339		
LAB05	COS	Ni - ICP	ISO 11885	µg/l	55.9	56	55.8		
LAB05	COS	P - ICP	ISO 11885	µg/l	110	120	120		
LAB05	COS	Pb - ICP	ISO 11885	µg/l	341	343	340		
LAB05	COS	pH - Electrode	ISO 10523	-	6.07	6.02	6.05		
LAB05	COS	S - ICP	ISO 11885	µg/l	445000	448000	422000		
LAB05	COS	Tot P - ?	?	mg/l	0.076	0.085	0.085		
LAB05	COS	Zn - ICP	ISO 11885	µg/l	48100	48400	48500		
LAB05	FFC	Ba - ICP	ISO 11885	µg/l	55.4	60	56.6		
LAB05	FFC	Conduct. - Electrode	EN 27888	µS/cm	2990	2990	2990		
LAB05	FFC	Cr - ICP	ISO 11885	µg/l	1140	1140	1150		
LAB05	FFC	F - Electrode	ISO 10359	mg/l	2	1.95	2		
LAB05	FFC	Mo - ICP	ISO 11885	µg/l	412	455	436		
LAB05	FFC	NO2 - FIA	ISO 13395	mg/l	0.03	0.03	0.03		
LAB05	FFC	pH - Electrode	ISO 10523	-	9.56	9.53	9.52		
LAB05	FFC	Tot N - ?	?	mg/l					< 1.00
LAB05	FFC	Zn - ICP	ISO 11885	µg/l	278	271	279		
LAB05	SBW	Ba - ICP	ISO 11885	µg/l	79.3	80.3	79.6		
LAB05	SBW	Conduct. - Electrode	EN 27888	µS/cm	527	527	527		
LAB05	SBW	Cu - ICP	ISO 11885	µg/l	94.4	95.6	95.2		
LAB05	SBW	F - Electrode	ISO 10359	mg/l	8.4	8.6	8.5		
LAB05	SBW	pH - Electrode	ISO 10523	-	7.08	7.07	7.08		
LAB05	SBW	Phenol index - FIA	ISO 14402	mg/l	0.074	0.08	0.084		
LAB05	SBW	Zn - ICP	ISO 11885	µg/l	257	259	255		
LAB05	SEW	AOX - Analyser	EN 1485	mg/l	0.18	0.18	0.19		corr. (/1000)
LAB05	SEW	As - ICP	ISO 11885	µg/l	121	121	123		
LAB05	SEW	Conduct. - Electrode	EN 27888	µS/cm	3510	3510	3510		
LAB05	SEW	NH4 - FIA	ISO 11732	mg/l	435	430	441		
LAB05	SEW	Ni - ICP	ISO 11885	µg/l	124	123	123		
LAB05	SEW	P - ICP	ISO 11885	µg/l	20900	21100	21000		
LAB05	SEW	pH - Electrode	ISO 10523	-	6.23	6.25	6.27		
LAB05	SEW	S - ICP	ISO 11885	µg/l	63400	64200	64300		
LAB05	SEW	Tot N - ?	?	mg/l	654	670	660		
LAB05	SEW	Tot P - ?	?	mg/l	27.7	24.4	25.7		
LAB05	SYN1	CN - FIA	ISO 14403	mg/l	0.165	0.155	0.158		
LAB05	SYN1	Conduct. - Electrode	EN 27888	µS/cm	356	356	356		
LAB05	SYN1	pH - Electrode	ISO 10523	-	6.97	6.99	6.97		
LAB05	SYN2	CN - FIA	ISO 14403	mg/l	0.036	0.036			
LAB05	SYN2	Conduct. - Electrode	EN 27888	µS/cm	482	483	482		
LAB05	SYN2	NH4 - FIA	ISO 11732	mg/l	0.238	0.221	0.22		
LAB05	SYN2	NO2 - FIA	ISO 13395	mg/l	0.18	0.169	0.186		
LAB05	SYN2	pH - Electrode	ISO 10523	-	6.99	7.02	6.98		
LAB05	SYN2	Phenol index - FIA	ISO 14402	mg/l	0.086	0.08	0.084		
LAB05	SYN3	As - ICP	ISO 11885	µg/l					< 5.00
LAB05	SYN3	Ba - ICP	ISO 11885	µg/l	27.1	26.8	26.8		
LAB05	SYN3	Be - ICP	ISO 11885	µg/l	0.49	0.54	0.52		
LAB05	SYN3	Cd - ICP	ISO 11885	µg/l	359	356	356		
LAB05	SYN3	Co - ICP	ISO 11885	µg/l	6	5.9	5.8		
LAB05	SYN3	Cr - ICP	ISO 11885	µg/l	79.8	78.8	78.8		
LAB05	SYN3	Cu - ICP	ISO 11885	µg/l	7.3	7	6.8		

LAB05	SYN3	Mo - ICP	ISO 11885	µg/l	67.2	67.6	68.1		
LAB05	SYN3	Ni - ICP	ISO 11885	µg/l	15.8	15.5	15.7		
LAB05	SYN3	P - ICP	ISO 11885	µg/l	200	190	200		
LAB05	SYN3	Pb - ICP	ISO 11885	µg/l	77.4	77.3	77.8		
LAB05	SYN3	S - ICP	ISO 11885	µg/l	49600	52700	51700		
LAB05	SYN3	V - ICP	ISO 11885	µg/l	23.3	23	23.1		
LAB05	SYN3	Zn - ICP	ISO 11885	µg/l	17400	17300	17300		
LAB06	COS	AOX - Analyser	EN 1485	µg/l	130	140	150	130	
LAB06	COS	TOC - Analyser	EN 1484	mg/l	15.3	15.1	15.2	15.7	
LAB06	COS	Tot P - ?	?	mg/l					< 0.1

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB06	FFC	Cl - IC	ISO 10304	mg/l	286	286	286		
LAB06	FFC	F - IC	ISO 10304	mg/l	0.611	0.602	0.619		
LAB06	FFC	NO2 - FIA	ISO 13395	mg/l					< 0.01
LAB06	FFC	NO2 - IC	ISO 10304	mg/l					< 0.01
LAB06	FFC	NO3 - FIA	ISO 13395	mg/l					< 0.1
LAB06	FFC	NO3 - IC	ISO 10304	mg/l					< 0.1
LAB06	FFC	SO4 - IC	ISO 10304	mg/l	1423	1425	1420		
LAB06	FFC	Tot N - ?	?	mg/l	0.42	0.84	0		
LAB06	SBW	Cl - IC	ISO 10304	mg/l	23	24.5	21.4		
LAB06	SBW	F - IC	ISO 10304	mg/l	8.39	8.42	8.36		
LAB06	SBW	SO4 - IC	ISO 10304	mg/l	106	106	105		
LAB06	SEW	AOX - Analyser	EN 1485	mg/l	1.2	1.27	1.15	1.18	
LAB06	SEW	Cl - IC	ISO 10304	mg/l	109	115	111	102	
LAB06	SEW	NH4 - FIA	ISO 11732	mg/l	277	272	276	282	
LAB06	SEW	NO2 - IC	ISO 10304	mg/l					< 0.01
LAB06	SEW	NO3 - FIA	ISO 13395	mg/l					< 0.01
LAB06	SEW	NO3 - IC	ISO 10304	mg/l	0.197	0.201	0.198	0.192	
LAB06	SEW	SO4 - IC	ISO 10304	mg/l	65.8	65	66.7	65.6	
LAB06	SEW	TOC - Analyser	EN 1484	mg/l	1530	1531	1533	1521	
LAB06	SEW	Tot N - ?	?	mg/l	744	737	748	748	
LAB06	SEW	Tot P - ?	?	mg/l	11.2	11.2	11.2	11.2	
LAB06	SYN1	CN - FIA	ISO 14403	mg/l	0.219	0.235	0.205		
LAB06	SYN2	CN - FIA	ISO 14403	mg/l	0.042	0.043	0.041	0.041	
LAB06	SYN2	NH4 - FIA	ISO 11732	mg/l	0.2	0.2	0.19	0.21	
LAB06	SYN2	NO2 - FIA	ISO 13395	mg/l	0.049	0.05	0.048	0.049	
LAB06	SYN2	NO2 - IC	ISO 10304	mg/l	0.053	0.073	0.032		
LAB07	COS	As - Hydride AAS	EN 11969	µg/l	21.6	22	21.9		
LAB07	COS	P - ICP	ISO 11885	µg/l					<150
LAB07	COS	S - ICP	ISO 11885	µg/l	436000	435000	432000		corr. (*1000)
LAB07	COS	Sb - Hydride AAS	EN 11969	µg/l	50	50.3	50.3		
LAB07	COS	Se - Hydride AAS	EN 11969	µg/l	61.7	60.9	61.6		
LAB07	FFC	Cl - IC	ISO 10304	mg/l	253.4	254	247		
LAB07	FFC	F - IC	ISO 10304	mg/l	0.76	0.76	0.74		
LAB07	FFC	NO2 - IC	ISO 10304	mg/l					< 0.1
LAB07	FFC	NO3 - IC	ISO 10304	mg/l					< 0.1
LAB07	FFC	SO4 - IC	ISO 10304	mg/l	1423	1374	1253		
LAB07	SBW	Cl - IC	ISO 10304	mg/l	20.6	20.7	20		
LAB07	SBW	F - IC	ISO 10304	mg/l	8.3	7.9	7.8		
LAB07	SBW	SO4 - IC	ISO 10304	mg/l	104.2	113	105.5		
LAB07	SEW	As - Hydride AAS	EN 11969	µg/l	26.8	26.2	25.8		
LAB07	SEW	Cl - IC	ISO 10304	mg/l	89	91.2	89.4		
LAB07	SEW	Hg - CV-AAS	EN 1483	µg/l					< 1
LAB07	SEW	P - ICP	ISO 11885	µg/l	23000	23200	23100		
LAB07	SEW	S - ICP	ISO 11885	µg/l	62700	62700	62500		
LAB07	SEW	Se - Hydride AAS	EN 11969	µg/l	8.1	7.8	8.3		
LAB07	SEW	SO4 - IC	ISO 10304	mg/l	55	49.9	47.7		
LAB07	SYN2	Hg - CV-AAS	EN 1483	µg/l					<1
LAB07	SYN3	P - ICP	ISO 11885	µg/l					< 150
LAB07	SYN3	S - ICP	ISO 11885	µg/l	53200	53000	53400		
LAB09	COS	As - ICP	ISO 11885	µg/l	16.7	19.3	17.8		
LAB09	COS	Cd - ICP	ISO 11885	µg/l	199	196	199		
LAB09	COS	Co - ICP	ISO 11885	µg/l	101	100	89		
LAB09	COS	Cu - ICP	ISO 11885	µg/l	362	352	355		
LAB09	COS	Ni - ICP	ISO 11885	µg/l	57		53		
LAB09	COS	Pb - ICP	ISO 11885	µg/l	358	337	336		
LAB09	COS	pH - Electrode	ISO 10523	-	6.52	6.58	6.52		
LAB09	COS	Zn - ICP	ISO 11885	µg/l	50290	49340	49270		
LAB09	FFC	Ba - ICP	ISO 11885	µg/l	51	51	51		
LAB09	FFC	Cr - ICP	ISO 11885	µg/l	1168	1177	1168		
LAB09	FFC	Mo - ICP	ISO 11885	µg/l	465	470	472		
LAB09	FFC	pH - Electrode	ISO 10523	-	10.25	10.27	10.27		
LAB09	FFC	Zn - ICP	ISO 11885	µg/l	360	364	363		
LAB09	SBW	Ba - ICP	ISO 11885	µg/l	66	68	67		
LAB09	SBW	Cu - ICP	ISO 11885	µg/l	96	95	95		
LAB09	SBW	pH - Electrode	ISO 10523	-	7.5	7.33	7.33		
LAB09	SBW	Zn - ICP	ISO 11885	µg/l	275	276	278		
LAB09	SEW	As - ICP	ISO 11885	µg/l	11.8	12.9	13.4		
LAB09	SEW	Ni - ICP	ISO 11885	µg/l	119	118	116		
LAB09	SEW	pH - Electrode	ISO 10523	-	5.93	5.92	5.93		
LAB09	SYN1	pH - Electrode	ISO 10523	-	7.52	7.51	7.48		
LAB09	SYN2	pH - Electrode	ISO 10523	-	5.05	5.2	5.35		
LAB09	SYN3	As - ICP	ISO 11885	µg/l					< 5.5
LAB09	SYN3	Ba - ICP	ISO 11885	µg/l	23	24	23		
LAB09	SYN3	Cd - ICP	ISO 11885	µg/l	346	343	343		

LAB09	SYN3	Co - ICP	ISO 11885	µg/l	37	26	20		
LAB09	SYN3	Cr - ICP	ISO 11885	µg/l	157	211	124		
LAB09	SYN3	Cu - ICP	ISO 11885	µg/l	5	9	6		
LAB09	SYN3	Mo - ICP	ISO 11885	µg/l	154	168	162		
LAB09	SYN3	Ni - ICP	ISO 11885	µg/l	14	12	24		
LAB09	SYN3	Pb - ICP	ISO 11885	µg/l	81	22	52		
LAB09	SYN3	V - ICP	ISO 11885	µg/l	20	30	30		
LAB09	SYN3	Zn - ICP	ISO 11885	µg/l	18460	18320	18290		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB11	COS	AOX - Analyser	EN 1485	µg/l	29.2	32.6	29		
LAB11	COS	As - Hydride AAS	EN 11969	µg/l	19.5	19.7	19.8		
LAB11	COS	Cd - ICP	ISO 11855	µg/l	189	193	192		
LAB11	COS	Cu - ICP	ISO 11855	µg/l	416	412	413		
LAB11	COS	Ni - ICP-MS	DIN 38406-29	µg/l	25.4	25.1	25.4		
LAB11	COS	Pb - ICP	ISO 11855	µg/l	317	325	323		
LAB11	COS	Sb - Hydride AAS	EN 11969	µg/l	47.7	49.5	50		
LAB11	COS	Se - Hydride AAS	EN 11969	µg/l	14.7	15.4	15.7		
LAB11	COS	TOC - Analyser	EN 1484	mg/l	17.4	17.5	17.7		
LAB11	COS	Zn - ICP	ISO 11855	µg/l	44600	45500	45200		
LAB11	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	899	888	904		
LAB11	FFC	NO2 - Photometry	EN 26777	mg/l	0.013	0.013	0.013		
LAB11	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.14	0.17	0.14		
LAB11	SEW	AOX - Analyser	EN 1485	mg/l					< 0.65
LAB11	SEW	As - Hydride AAS	EN 11969	µg/l	6.2	6.3	6.2		
LAB11	SEW	CN - Photometry	ISO 6703	mg/l					< 0.006
LAB11	SEW	Hg - CV-AAS	EN 1483	µg/l					< 1
LAB11	SEW	NH4 - Photometry	ISO 7150	mg/l	337.5	338.2	340.1		
LAB11	SEW	NO2 - Photometry	EN 26777	mg/l	0.096	0.096	0.096		
LAB11	SEW	Se - Hydride AAS	EN 11969	µg/l					< 2
LAB11	SEW	TOC - Analyser	EN 1484	mg/l	1460	1500	1500		
LAB11	SYN1	Cd - ICP-MS	DIN 38406-29	µg/l	16.6	16.4	16.9		
LAB11	SYN1	CN - Photometry	ISO 6703	mg/l					SAMPLE DAMAGED
LAB11	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l					SAMPLE DAMAGED
LAB11	SYN1	Cu - ICP-MS	DIN 38406-29	µg/l	10.6	10.3	10.5		
LAB11	SYN1	Ni - ICP-MS	DIN 38406-29	µg/l	10	10.2	10.1		
LAB11	SYN1	Pb - ICP-MS	DIN 38406-29	µg/l	8.2	8.4	8.3		
LAB11	SYN1	Zn - ICP	ISO 11885	µg/l	870	810	860		
LAB11	SYN2	Cd - ICP-MS	DIN 38406-29	µg/l	15.6	16	16.7		
LAB11	SYN2	CN - Photometry	ISO 6703	mg/l	0.036	0.036	0.036		
LAB11	SYN2	Cu - ICP-MS	DIN 38406-29	µg/l	12.3	11.8	11.6		
LAB11	SYN2	Hg - CV-AAS	EN 1483	µg/l	2.8	2.9	2.8		
LAB11	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.256	0.249	0.254		
LAB11	SYN2	Ni - ICP-MS	DIN 38406-29	µg/l	11.7	10.2	10.3		
LAB11	SYN2	NO2 - Photometry	EN 26777	mg/l	0.145	0.147	0.146		
LAB11	SYN2	Pb - ICP-MS	DIN 38406-29	µg/l	10.5	10.4	10.8		
LAB11	SYN2	Phenol index - Photometry	ISO 6439	mg/l					No sample anymore
LAB11	SYN2	Zn - ICP	ISO 11885	µg/l	830	830	830		
LAB12	COS	AOX - Analyser	EN 1485	µg/l	25	25	26		
LAB12	COS	As - ICP	ISO 11885	µg/l	22	24	25		
LAB12	COS	Cd - ICP	ISO 11885	µg/l	212	215	220		
LAB12	COS	Co - ICP	ISO 11885	µg/l	65	70	76		
LAB12	COS	Conduct. - Electrode	EN 27888	µS/cm	2460	2468	2474		
LAB12	COS	Cu - ICP	ISO 11885	µg/l	375	390	390		
LAB12	COS	Ni - ICP	ISO 11885	µg/l	48	50	51		
LAB12	COS	P - ICP	ISO 11885	µg/l	36	40	45		
LAB12	COS	Pb - ICP	ISO 11885	µg/l	295	300	310		
LAB12	COS	pH - Electrode	ISO 10523	-	6.01	6.1	6.3		
LAB12	COS	S - ICP	ISO 11885	µg/l	450000	470000	480000		corr. (*1000)
LAB12	COS	TOC - Analyser	EN 1484	mg/l	16.6	17.1	17.6		
LAB12	COS	Zn - ICP	ISO 11885	µg/l	56500	57000	57100		
LAB12	FFC	Ba - ICP	ISO 11885	µg/l	49	50	52		
LAB12	FFC	Cr - ICP	ISO 11885	µg/l	1140	1170	1190		
LAB12	FFC	Mo - ICP	ISO 11885	µg/l	580	620	630		
LAB12	FFC	Zn - ICP	ISO 11885	µg/l	260	270	274		
LAB12	SBW	Ba - ICP	ISO 11885	µg/l	65	65	69		
LAB12	SBW	Cu - ICP	ISO 11885	µg/l	101	110	103		
LAB12	SBW	Zn - ICP	ISO 11885	µg/l	243	256	269		
LAB12	SEW	AOX - Analyser	EN 1485	mg/l	0.145	0.148	0.149		
LAB12	SEW	As - ICP	ISO 11885	µg/l	130	150	160		
LAB12	SEW	Cl - IC	ISO 10304	mg/l	92.7	95.4	95.8		
LAB12	SEW	Conduct. - Electrode	EN 27888	µS/cm	3400	3430	3450		
LAB12	SEW	Ni - ICP	ISO 11885	µg/l	109	120	113		
LAB12	SEW	NO3 - IC	ISO 10304	mg/l	4.3	5.3	5.4		
LAB12	SEW	P - ICP	ISO 11885	µg/l	21600	22000	22200		
LAB12	SEW	pH - Electrode	ISO 10523	-	6.1	6.16	6.9		
LAB12	SEW	S - ICP	ISO 11885	µg/l	60000	66000	70000		
LAB12	SEW	SO4 - IC	ISO 10304	mg/l	53	54	56		
LAB12	SEW	TOC - Analyser	EN 1484	mg/l	1735	1765	1866		
LAB12	SYN1	CN - FIA	ISO 14403	mg/l	0.3	0.31	0.32		
LAB12	SYN1	Conduct. - Electrode	EN 27888	µS/cm	344	351	358		
LAB12	SYN1	pH - Electrode	ISO 10523	-	6.97	7.06	7.14		
LAB12	SYN2	CN - FIA	ISO 14403	mg/l	0.07	0.08	0.08		

LAB12	SYN2	Conduct. - Electrode	EN 27888	µS/cm	474	476	481		
LAB12	SYN2	NO2 - IC	ISO 10304	mg/l	0.16	0.17	0.18		
LAB12	SYN2	pH - Electrode	ISO 10523	-	6.9	6.95	7.03		
LAB12	SYN2	Phenol index - FIA	ISO 14402	mg/l	0.07	0.07	0.08		

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB12	SYN3	As - ICP	ISO 11885	µg/l					< 5
LAB12	SYN3	Ba - ICP	ISO 11885	µg/l	18	20	21		
LAB12	SYN3	Be - ICP	ISO 11885	µg/l	4	4	4		
LAB12	SYN3	Cd - ICP	ISO 11885	µg/l	358	365	366		
LAB12	SYN3	Co - ICP	ISO 11885	µg/l					< 5
LAB12	SYN3	Cr - ICP	ISO 11885	µg/l	78	80	81		
LAB12	SYN3	Cu - ICP	ISO 11885	µg/l	8	9	9		
LAB12	SYN3	Mo - ICP	ISO 11885	µg/l	58	71	75		
LAB12	SYN3	Ni - ICP	ISO 11885	µg/l					< 5
LAB12	SYN3	P - ICP	ISO 11885	µg/l					< 5
LAB12	SYN3	Pb - ICP	ISO 11885	µg/l	32	40	43		
LAB12	SYN3	S - ICP	ISO 11885	µg/l	54900	55000	55400		
LAB12	SYN3	V - ICP	ISO 11885	µg/l					< 5
LAB12	SYN3	Zn - ICP	ISO 11885	µg/l	20000	20300	20600		
LAB14	COS	AOX - Analyser	EN 1485	µg/l	15	18	16		
LAB14	COS	As - Hydride AAS	EN 11969	µg/l	11.5	11	10.9		
LAB14	COS	Cd - AAS	ISO 8288	µg/l	205	203	206		ETAAS
LAB14	COS	Cu - AAS	ISO 8288	µg/l	353	356	358		ETAAS
LAB14	COS	Ni - AAS	ISO 8288	µg/l	51.1	51.7	50.9		ETAAS
LAB14	COS	P - ICP	ISO 11885	µg/l	61	72	79		near determ.-limit
LAB14	COS	Pb - AAS	ISO 8288	µg/l	353	357	354		ETAAS
LAB14	COS	S - ICP	ISO 11885	µg/l	424400	424200	423800		
LAB14	COS	Sb - Hydride AAS	EN 11969	µg/l	48.4	47.8	49.1		
LAB14	COS	Se - Hydride AAS	EN 11969	µg/l	16.7	16.1	16.8		
LAB14	COS	Zn - AAS	ISO 8288	µg/l	51600	51700	52000		
LAB14	FFC	Cl - Titration	ISO 9207	mg/l	261.4	260.3	261.4		
LAB14	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1085	1099	1095		
LAB14	FFC	F - Electrode	ISO 10359	mg/l	0.799	0.806	0.802		
LAB14	FFC	NO2 - Photometry	EN 26777	mg/l	0.049	0.049	0.051		
LAB14	SBW	Cl - Titration	ISO 9207	mg/l	19.8	19.6	19.9		
LAB14	SBW	F - Electrode	ISO 10359	mg/l	7.25	7.28	7.31		filtered solution
LAB14	SEW	AOX - Analyser	EN 1485	mg/l	0.063	0.066	0.067		
			TOC-value at 1000 mg/L higher then allowed (100 mg/l), but dilution was not possible; due to low AOX value						
LAB14	SEW	As - Hydride AAS	EN 11969	µg/l	14.4	16	15.8		
LAB14	SEW	CN - Photometry	ISO 6703	mg/l	0.0015	0.0015	el-CN; no sample volume for 3rd value remaining		
LAB14	SEW	Hg - CV-AAS	EN 1483	µg/l	0.05	0.08	0.06		
			To increase the sensivity: amalgam technique with LECO AMA 254 was used						
LAB14	SEW	NH4 - Photometry	ISO 7150	mg/l	458	451	443		
LAB14	SEW	NO2 - Photometry	EN 26777	mg/l	addition of NO2 to the sample results to recovery rate < 10%				
LAB14	SEW	P - ICP	ISO 11885	µg/l	22050	22090	22220		
LAB14	SEW	S - ICP	ISO 11885	µg/l	63600	63260	63890		
LAB14	SEW	Se - Hydride AAS	EN 11969	µg/l	2.85	2.43	2.81		
LAB14	SYN1	Cd - AAS	ISO 8288	µg/l	34.3	34.5	33.1		ETAAS
LAB14	SYN1	CN - Photometry	ISO 6703	mg/l	0.202	0.208	0.198		el-CN
LAB14	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.101	0.099	0.101		
LAB14	SYN1	Cu - AAS	ISO 8288	µg/l	19.3	19.8	19.5		ETAAS
LAB14	SYN1	Ni - AAS	ISO 8288	µg/l	20.8	20.3	20.1		ETAAS
LAB14	SYN1	Pb - AAS	ISO 8288	µg/l	18.9	18.6	18.7		ETAAS
LAB14	SYN1	Zn - AAS	ISO 8288	µg/l	744	750	748		flame
LAB14	SYN2	Cd - AAS	ISO 8288	µg/l	31.7	31.2	32.8		ETAAS
LAB14	SYN2	CN - Photometry	ISO 6703	mg/l	0.04	0.04	0.036		el-CN
LAB14	SYN2	Cu - AAS	ISO 8288	µg/l	19.8	19.7	19.8		ETAAS
LAB14	SYN2	Hg - CV-AAS	EN 1483	µg/l	6.79	6.83	6.88		CV-AAS
LAB14	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.211	0.208	0.214		
LAB14	SYN2	Ni - AAS	ISO 8288	µg/l	20.1	20	20.3		ETAAS
LAB14	SYN2	NO2 - Photometry	EN 26777	mg/l	0.143	0.143	0.142		
LAB14	SYN2	Pb - AAS	ISO 8288	µg/l	19.9	20.3	20.2		ETAAS
LAB14	SYN2	Zn - AAS	ISO 8288	µg/l	798	792	798		flame
LAB14	SYN3	P - ICP	ISO 11885	µg/l					< 30
LAB14	SYN3	S - ICP	ISO 11885	µg/l	49690	49780	49600		
LAB15	COS	As - ICP	ISO 11885	µg/l	14	16	15		
LAB15	COS	Cd - AAS	ISO 8288	µg/l	187	187	181		
LAB15	COS	Cd - ICP	ISO 11885	µg/l	210	213	207		
LAB15	COS	Co - ICP	ISO 11885	µg/l	67	70	72		
LAB15	COS	Conduct. - Electrode	EN 27888	µS/cm	1960	1960	1960		
LAB15	COS	Cu - AAS	ISO 8288	µg/l	349	346	350		
LAB15	COS	Cu - ICP	ISO 11885	µg/l	340	347	348		
LAB15	COS	Ni - AAS	ISO 8288	µg/l	48.8	49.6	46.2		
LAB15	COS	Ni - ICP	ISO 11885	µg/l	47	50	53		
LAB15	COS	Pb - AAS	ISO 8288	µg/l	204	219	228		
LAB15	COS	Pb - ICP	ISO 11885	µg/l	326	348	331		
LAB15	COS	pH - Electrode	ISO 10523	-	6.1	6.1	6.1		
LAB15	COS	Zn - AAS	ISO 8288	µg/l	51420	51280	51560		
LAB15	COS	Zn - ICP	ISO 11885	µg/l	51500	52000	51700		

LAB15	FFC	Ba - ICP	ISO 11885	µg/l	58	60	61		
LAB15	FFC	Cl - IC	ISO 10304	mg/l	273	272	274		
LAB15	FFC	Cl - Titration	ISO 9207	mg/l	290	285	280		
LAB15	FFC	Conduct. - Electrode	EN 27888	µS/cm	3100	3100	3100		
LAB15	FFC	Cr - ICP	ISO 11885	µg/l	1210	1200	1260		
LAB15	FFC	F - Electrode	ISO 10359	mg/l	0.6	0.5	0.6		
LAB15	FFC	F - IC	ISO 10304	mg/l	0.383	0.385	0.391		
LAB15	FFC	Mo - ICP	ISO 11885	µg/l	420	420	435		
LAB15	FFC	NO2 - IC	ISO 10304	mg/l	0.03	0.03	0.03		
LAB15	FFC	NO3 - IC	ISO 10304	mg/l					< 1
LAB15	FFC	pH - Electrode	ISO 10523	-	10.8	10.8	10.8		
LAB15	FFC	SO4 - IC	ISO 10304	mg/l	1351	1343	1346		
LAB15	FFC	Zn - ICP	ISO 11885	µg/l	300	305	310		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB15	SBW	Ba - ICP	ISO 11885	µg/l	75	80	85		
LAB15	SBW	Cl - IC	ISO 10304	mg/l	19.2	19.3	19.3		
LAB15	SBW	Cl - Titration	ISO 9207	mg/l	18	19	23		
LAB15	SBW	Conduct. - Electrode	EN 27888	µS/cm	560	560	560		
LAB15	SBW	Cu - ICP	ISO 11885	µg/l	100	90	110		
LAB15	SBW	F - Electrode	ISO 10359	mg/l	7.2	7.2	7.2		
LAB15	SBW	F - IC	ISO 10304	mg/l	7.66	7.69	7.73		
LAB15	SBW	pH - Electrode	ISO 10523	-	6.8	6.8	6.8		
LAB15	SBW	SO4 - IC	ISO 10304	mg/l	109	107	106		
LAB15	SBW	Zn - ICP	ISO 11885	µg/l	300	280	280		
LAB15	SEW	As - ICP	ISO 11885	µg/l	130	130	145		
LAB15	SEW	Cl - IC	ISO 10304	mg/l	78.2	78.5	78.5		
LAB15	SEW	Conduct. - Electrode	EN 27888	µS/cm	2460	2460	2460		
LAB15	SEW	Ni - ICP	ISO 11885	µg/l	120	130	120		
LAB15	SEW	NO2 - IC	ISO 10304	mg/l	0.05	0.05	0.05		
LAB15	SEW	NO3 - IC	ISO 10304	mg/l					< 1
LAB15	SEW	pH - Electrode	ISO 10523	-	6.4	6.4	6.4		
LAB15	SEW	SO4 - IC	ISO 10304	mg/l	48.6	48.5	48.4		
LAB15	SYN1	Cd - AAS	ISO 8288	µg/l	26.3	27.5	27		
LAB15	SYN1	Conduct. - Electrode	EN 27888	µS/cm	320	320	320		
LAB15	SYN1	Cu - AAS	ISO 8288	µg/l	20.5	19.2	19.4		
LAB15	SYN1	Ni - AAS	ISO 8288	µg/l	19	18.5	19.1		
LAB15	SYN1	Pb - AAS	ISO 8288	µg/l	19.1	19.5	19.9		
LAB15	SYN1	pH - Electrode	ISO 10523	-	6.7	6.7	6.7		
LAB15	SYN1	Zn - AAS	ISO 8288	µg/l	720	730	731		
LAB15	SYN2	Cd - AAS	ISO 8288	µg/l	28.1	28.3	27.8		
LAB15	SYN2	Conduct. - Electrode	EN 27888	µS/cm	450	450	450		
LAB15	SYN2	Cu - AAS	ISO 8288	µg/l	37.8	27.4	21		
LAB15	SYN2	Ni - AAS	ISO 8288	µg/l	19.7	19.9	19.6		
LAB15	SYN2	NO2 - IC	ISO 10304	mg/l	0.12	0.12	0.12		
LAB15	SYN2	Pb - AAS	ISO 8288	µg/l	22	20.3	20.4		
LAB15	SYN2	pH - Electrode	ISO 10523	-	6.9	6.9	6.9		
LAB15	SYN2	Zn - AAS	ISO 8288	µg/l	760	780	791		
LAB15	SYN3	As - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Ba - ICP	ISO 11885	µg/l	29	29	32		
LAB15	SYN3	Be - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Cd - ICP	ISO 11885	µg/l	410	390	420		
LAB15	SYN3	Co - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Cr - ICP	ISO 11885	µg/l	100	90	90		
LAB15	SYN3	Cu - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Mo - ICP	ISO 11885	µg/l	60	65	70		
LAB15	SYN3	Ni - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Pb - ICP	ISO 11885	µg/l	80	100	100		
LAB15	SYN3	V - ICP	ISO 11885	µg/l					< 10
LAB15	SYN3	Zn - ICP	ISO 11885	µg/l	21200	20700	21500		
LAB16	COS	As - Hydride AAS	EN 11969	µg/l					< 2
LAB16	COS	Cd - AAS	ISO 8288	µg/l	192	195	213		
LAB16	COS	Cu - AAS	ISO 8288	µg/l	329	329	332		
LAB16	COS	Ni - AAS	ISO 8288	µg/l					< 50
LAB16	COS	P - ICP	ISO 11885	µg/l					< 200
LAB16	COS	Pb - AAS	ISO 8288	µg/l	305	314	314		
LAB16	COS	Sb - Hydride AAS	EN 11969	µg/l	114	107	107		
LAB16	COS	Se - Hydride AAS	EN 11969	µg/l					< 2
LAB16	COS	Zn - AAS	ISO 8288	µg/l	50800	52500	53500		
LAB16	FFC	Cl - Titration	ISO 9207	mg/l	180	180	190		
LAB16	FFC	F - Electrode	ISO 10359	mg/l	0.72	0.71	0.72		
LAB16	FFC	NO2 - FIA	ISO 13395	mg/l	0.02	0.02	0.02		
LAB16	FFC	NO3 - FIA	ISO 13395	mg/l					< 0.3
LAB16	SBW	Cl - Titration	ISO 9207	mg/l	19	19	19		
LAB16	SBW	F - Electrode	ISO 10359	mg/l	7.3	7.4	7.4		
LAB16	SEW	As - Hydride AAS	EN 11969	µg/l	32.5	34.6	32.5		
LAB16	SEW	Hg - CV-AAS	EN 1483	µg/l					Foaming
LAB16	SEW	NH4 - FIA	ISO 11732	mg/l	418	430	439		
LAB16	SEW	NO3 - FIA	ISO 13395	mg/l	0.3	0.3	0.3		
LAB16	SEW	P - ICP	ISO 11885	µg/l	20200	24000	21000		
LAB16	SEW	Se - Hydride AAS	EN 11969	µg/l	20	20	20		
LAB16	SYN1	Cd - AAS	ISO 8288	µg/l	32	32.4	29.9		
LAB16	SYN1	Cu - AAS	ISO 8288	µg/l	13	13	14		
LAB16	SYN1	Ni - AAS	ISO 8288	µg/l					< 50
LAB16	SYN1	Pb - AAS	ISO 8288	µg/l	4.5	4.77	4.79		
LAB16	SYN1	Zn - AAS	ISO 8288	µg/l	688	688	688		
LAB16	SYN2	Cd - AAS	ISO 8288	µg/l	26	26	26		
LAB16	SYN2	Cu - AAS	ISO 8288	µg/l	20.4	20.1	18.1		

LAB16	SYN2	Hg - CV-AAS	EN 1483	µg/l	7.23	7.23	7.25		
LAB16	SYN2	NH4 - FIA	ISO 11732	mg/l	0.35	0.35	0.35		
LAB16	SYN2	Ni - AAS	ISO 8288	µg/l					< 50
LAB16	SYN2	NO2 - FIA	ISO 13395	mg/l	0.14	0.14	0.14		
LAB16	SYN2	Pb - AAS	ISO 8288	µg/l	4.5	4.55	4.6		
LAB16	SYN2	Zn - AAS	ISO 8288	µg/l	688	688	688		
LAB16	SYN3	P - ICP	ISO 11885	µg/l					< 200
LAB17	FFC	NO2 - FIA	ISO 13395	mg/l	0.016	0.015	0.015		
LAB17	FFC	NO3 - FIA	ISO 13395	mg/l	0.057	0.058	0.058		
LAB17	SEW	NH4 - FIA	ISO 11732	mg/l	503	509	523		
LAB17	SYN2	NH4 - FIA	ISO 11732	mg/l	0.188	0.184	0.2		
LAB17	SYN2	NO2 - FIA	ISO 13395	mg/l	0.153	0.159	0.159		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB18	COS	As - ICP	ISO 11885	µg/l	18	19	18		
LAB18	COS	Cd - ICP	ISO 11885	µg/l	218	212	207		
LAB18	COS	Co - ICP	ISO 11885	µg/l	71	67	72		
LAB18	COS	Conduct. - Electrode	EN 27888	µS/cm	2590	2600	2600		
LAB18	COS	Cu - ICP	ISO 11885	µg/l	326	338	334		
LAB18	COS	Ni - ICP	ISO 11885	µg/l	48	49	51		
LAB18	COS	P - ICP	ISO 11885	µg/l	27	28	30		
LAB18	COS	Pb - ICP	ISO 11885	µg/l	312	320	324		
LAB18	COS	pH - Electrode	ISO 10523	-	5.99	6	6		
LAB18	COS	TOC - Analyser	EN 1484	mg/l	17.9	18.2	18.6		
LAB18	COS	Zn - ICP	ISO 11885	µg/l	46200	46700	46400		
LAB18	FFC	Ba - ICP	ISO 11885	µg/l	45	45	49		
LAB18	FFC	Cl - Titration	ISO 9207	mg/l	277	286	282		
LAB18	FFC	Conduct. - Electrode	EN 27888	µS/cm	3030	3010	3010		
LAB18	FFC	Cr - ICP	ISO 11885	µg/l	997	1010	925		
LAB18	FFC	F - Electrode	ISO 10359	mg/l	0.678	0.68	0.68		
LAB18	FFC	Mo - ICP	ISO 11885	µg/l	383	374	377		
LAB18	FFC	NO3 - FIA	ISO 13395	mg/l					< 1.00
LAB18	FFC	pH - Electrode	ISO 10523	-	7.66	7.64	7.69		
LAB18	FFC	Zn - ICP	ISO 11885	µg/l	256	249	243		
LAB18	SBW	Ba - ICP	ISO 11885	µg/l	83	82	86		
LAB18	SBW	Cl - Titration	ISO 9207	mg/l	21.3	22.4	21.9		
LAB18	SBW	Conduct. - Electrode	EN 27888	µS/cm	557	555	559		
LAB18	SBW	Cu - ICP	ISO 11885	µg/l	100	103	101		
LAB18	SBW	F - Electrode	ISO 10359	mg/l	7.3	7.3	7.3		
LAB18	SBW	pH - Electrode	ISO 10523	-	6.99	7	6.99		
LAB18	SBW	Phenol index - FIA	ISO 14402	mg/l	0.0706	0.0747	0.0696		
LAB18	SBW	Zn - ICP	ISO 11885	µg/l	243	247	236		
LAB18	SEW	As - ICP	ISO 11885	µg/l	12	12	13		
LAB18	SEW	Conduct. - Electrode	EN 27888	µS/cm	4060	4040	4040		
LAB18	SEW	Ni - ICP	ISO 11885	µg/l	104	104	106		
LAB18	SEW	NO3 - FIA	ISO 13395	mg/l					< 1.00
LAB18	SEW	P - ICP	ISO 11885	µg/l	22000	21600	21500		
LAB18	SEW	pH - Electrode	ISO 10523	-	6.17	6.18	6.18		
LAB18	SEW	TOC - Analyser	EN 1484	mg/l	3030	2980	2910		
LAB18	SYN1	Conduct. - Electrode	EN 27888	µS/cm	364	365	365		
LAB18	SYN1	pH - Electrode	ISO 10523	-	6.92	6.92	6.9		
LAB18	SYN2	Conduct. - Electrode	EN 27888	µS/cm	510	508	518		
LAB18	SYN2	pH - Electrode	ISO 10523	-	7.06	7.12	7.13		
LAB18	SYN2	Phenol index - FIA	ISO 14402	mg/l	0.074	0.074	0.0739		
LAB18	SYN3	As - ICP	ISO 11885	µg/l					< 1.00
LAB18	SYN3	Ba - ICP	ISO 11885	µg/l	26	28	27		
LAB18	SYN3	Be - ICP	ISO 11885	µg/l			0.2		< 0.200
LAB18	SYN3	Cd - ICP	ISO 11885	µg/l	383	398	404		
LAB18	SYN3	Co - ICP	ISO 11885	µg/l	7	7	6		
LAB18	SYN3	Cr - ICP	ISO 11885	µg/l	87	84	90		
LAB18	SYN3	Cu - ICP	ISO 11885	µg/l	8	8	7		
LAB18	SYN3	Mo - ICP	ISO 11885	µg/l	49	47	44		
LAB18	SYN3	Ni - ICP	ISO 11885	µg/l	13	11	11		
LAB18	SYN3	P - ICP	ISO 11885	µg/l	104	101	110		
LAB18	SYN3	Pb - ICP	ISO 11885	µg/l	80	81	79		
LAB18	SYN3	V - ICP	ISO 11885	µg/l	16	16	16		
LAB18	SYN3	Zn - ICP	ISO 11885	µg/l	19400	19800	18500		
LAB19	COS	As - Hydride AAS	EN 11969	µg/l	22.9	26.8	24.8		
LAB19	COS	Cd - AAS	ISO 8288	µg/l	217	231	229		
LAB19	COS	Cu - AAS	ISO 8288	µg/l	373	376	377		
LAB19	COS	Ni - AAS	ISO 8288	µg/l	50	49.9	50.9		
LAB19	COS	Pb - AAS	ISO 8288	µg/l	368	386	372		
LAB19	COS	Sb - Hydride AAS	EN 11969	µg/l	9.8	11.5	10.5		
LAB19	COS	Se - Hydride AAS	EN 11969	µg/l	28.2	31.5	30.7		
LAB19	COS	TOC - Analyser	EN 1484	mg/l	15.8	15.5	15.3		
LAB19	COS	Zn - AAS	ISO 8288	µg/l	51700	51900	49100		corr. (*1000)
LAB19	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1200	1210	1210		corr. (*1000)
LAB19	FFC	NO2 - Photometry	EN 26777	mg/l	0.024	0.024	0.024		
LAB19	FFC	Tot N - ?	ISO 11905	mg/l	3.4	3.44	3.15		
LAB19	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.212	0.212	0.214		
LAB19	SEW	As - Hydride AAS	EN 11969	µg/l	19.3	17.1	20.2		
LAB19	SEW	CN - Photometry	ISO 6703	mg/l	0.014	0.012	0.013		
LAB19	SEW	NH4 - Photometry	ISO 7150	mg/l	439	436	434		
LAB19	SEW	TOC - Analyser	EN 1484	mg/l	1465	1470	1480		corr. (*1000)
LAB19	SEW	Tot N - ?	ISO 11905	mg/l	740	751	745		
LAB19	SEW	Tot P - ?	EN 1189	mg/l	25.4	26	26.3		

LAB19	SYN1	Cd - AAS	ISO 8288	µg/l	35.8	36.3	36.9		
LAB19	SYN1	CN - Photometry	ISO 6703	mg/l	0.175	0.175	0.175		
LAB19	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.088	0.088	0.088		
LAB19	SYN1	Cu - AAS	ISO 8288	µg/l	19.8	20.5	19.4		
LAB19	SYN1	Ni - AAS	ISO 8288	µg/l	22.6	23.8	21.5		
LAB19	SYN1	Pb - AAS	ISO 8288	µg/l	21.6	21	22.7		
LAB19	SYN1	Zn - AAS	ISO 8288	µg/l	774	779	776		
LAB19	SYN2	Cd - AAS	ISO 8288	µg/l	36.3	37.8	37.2		
LAB19	SYN2	CN - Photometry	ISO 6703	mg/l	0.041	0.043	0.043		
LAB19	SYN2	Cu - AAS	ISO 8288	µg/l	21.7	20.1	21.3		
LAB19	SYN2	Hg - CV-AAS	EN 1483	µg/l	5.5	5.4	5		
LAB19	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.224	0.218	0.228		
LAB19	SYN2	Ni - AAS	ISO 8288	µg/l	23.1	22.2	22.7		
LAB19	SYN2	NO2 - Photometry	EN 26777	mg/l	0.16	0.16	0.159		
LAB19	SYN2	Pb - AAS	ISO 8288	µg/l	24.3	25	23.8		
LAB19	SYN2	Phenol index - Photometry	ISO 6439	mg/l	0.075	0.075	0.077		
LAB19	SYN2	Zn - AAS	ISO 8288	µg/l	858	845	842		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB20	COS	AOX - Analyser	EN 1485	µg/l	23.1	17.3	16.9		
LAB20	COS	TOC - Analyser	EN 1484	mg/l	15.8	15.7			
LAB20	FFC	NO2 - FIA	ISO 13395	mg/l	0.008	0.009	0.008		
LAB20	FFC	NO3 - FIA	ISO 13395	mg/l	0.037	0.011	0.033		
LAB20	FFC	Tot N - ?	?	mg/l					
LAB20	SBW	Phenol index - FIA	ISO 14402	mg/l	0.14	0.141	0.144		
LAB20	SEW	AOX - Analyser	EN 1485	mg/l	0.183	0.165	0.176		
LAB20	SEW	NO3 - FIA	ISO 13395	mg/l					< 0.2
LAB20	SEW	TOC - Analyser	EN 1484	mg/l	1440	1440	1460		
LAB20	SEW	Tot N - ?	?	mg/l	385	443	401		
LAB20	SEW	Tot P - ?	?	mg/l	11	11.8	11.8		
LAB20	SYN1	CN - FIA	ISO 14403	mg/l	0.131	0.138	0.14		
LAB21	COS	As - ICP	ISO 11885	µg/l	50	60	40		
LAB21	COS	Cd - ICP	ISO 11885	µg/l	180	180	170		
LAB21	COS	Co - ICP	ISO 11885	µg/l	70	70	70		
LAB21	COS	Cu - ICP	ISO 11885	µg/l	330	330	320		
LAB21	COS	Ni - ICP	ISO 11885	µg/l	40	40	40		
LAB21	COS	P - ICP	ISO 11885	µg/l	60	80	60		
LAB21	COS	Pb - ICP	ISO 11885	µg/l	290	290	290		
LAB21	COS	TOC - Analyser	EN 1484	mg/l	17	17.1	17		
LAB21	COS	Tot P - ?	?	mg/l					< 0.1
LAB21	COS	Zn - ICP	ISO 11885	µg/l	44700	44400	42500		
LAB21	FFC	Ba - ICP	ISO 11885	µg/l	50	50	60		
LAB21	FFC	Cr - ICP	ISO 11885	µg/l	970	960	990		
LAB21	FFC	Mo - ICP	ISO 11885	µg/l	435	445	435		
LAB21	FFC	NO2 - FIA	ISO 13395	mg/l					< 0.06
LAB21	FFC	NO3 - FIA	ISO 13395	mg/l					< 2.0
LAB21	FFC	Tot N - ?	?	mg/l					< 0.5
LAB21	FFC	Zn - ICP	ISO 11885	µg/l	210	220	220		
LAB21	SBW	Ba - ICP	ISO 11885	µg/l	70	70	70		
LAB21	SBW	Cu - ICP	ISO 11885	µg/l	110	110	110		
LAB21	SBW	F - Electrode	ISO 10359	mg/l	9.22	9.2	9.2		
LAB21	SBW	Zn - ICP	ISO 11885	µg/l	250	260	250		
LAB21	SEW	As - ICP	ISO 11885	µg/l	110	135	130		
LAB21	SEW	NH4 - FIA	ISO 11732	mg/l	481	486	483		
LAB21	SEW	Ni - ICP	ISO 11885	µg/l	110	110	100		
LAB21	SEW	NO3 - FIA	ISO 13395	mg/l					< 2.0
LAB21	SEW	P - ICP	ISO 11885	µg/l	27900	28400	28300		
LAB21	SEW	TOC - Analyser	EN 1484	mg/l	1572	1637	1621		
LAB21	SEW	Tot N - ?	?	mg/l	680	692	690		
LAB21	SEW	Tot P - ?	?	mg/l	12.3	12.2	12.1		
LAB21	SYN2	NH4 - FIA	ISO 11732	mg/l	5.7	5.72	5.77		
LAB21	SYN2	NO2 - FIA	ISO 13395	mg/l	0.13	0.13	0.13		
LAB21	SYN3	As - ICP	ISO 11885	µg/l	40	10	10		
LAB21	SYN3	Ba - ICP	ISO 11885	µg/l	20	30	30		
LAB21	SYN3	Be - ICP	ISO 11885	µg/l					< 2
LAB21	SYN3	Cd - ICP	ISO 11885	µg/l	325	325	325		
LAB21	SYN3	Co - ICP	ISO 11885	µg/l					< 10
LAB21	SYN3	Cr - ICP	ISO 11885	µg/l	80	80	70		
LAB21	SYN3	Cu - ICP	ISO 11885	µg/l		30	20		< 10
LAB21	SYN3	Mo - ICP	ISO 11885	µg/l	90	90	90		
LAB21	SYN3	Ni - ICP	ISO 11885	µg/l	10	10	10		
LAB21	SYN3	P - ICP	ISO 11885	µg/l	70	40	40		
LAB21	SYN3	Pb - ICP	ISO 11885	µg/l	80	70	70		
LAB21	SYN3	V - ICP	ISO 11885	µg/l	30	30	30		
LAB21	SYN3	Zn - ICP	ISO 11885	µg/l	16900	17100	16900		
LAB22	COS	As - Hydride AAS	EN 11969	µg/l	16.4	16.2	15.8		
LAB22	COS	Sb - Hydride AAS	EN 11969	µg/l	35.4	35.2	33.4		
LAB22	COS	Se - Hydride AAS	EN 11969	µg/l	53.8	54.6	57.3		
LAB22	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	2280	2313	2420		
LAB22	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.35	0.38	0.4		
LAB22	SEW	As - Hydride AAS	EN 11969	µg/l	10.6	10.7	10.5		
LAB22	SEW	Hg - CV-AAS	EN 1483	µg/l	1.21	1.03	0.94		
LAB22	SEW	NH4 - Photometry	ISO 7150	mg/l	734	661	651		
LAB22	SEW	Se - Hydride AAS	EN 11969	µg/l	6.33	5.59	5.82		
LAB22	SYN1	CN - Photometry	ISO 6703	mg/l	0.28	0.31	0.31		
LAB22	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.21	0.21	0.2		
LAB22	SYN2	CN - Photometry	ISO 6703	mg/l	0.05	0.04	0.03		
LAB22	SYN2	Hg - CV-AAS	EN 1483	µg/l	7.48	7.6	7.67		
LAB22	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.24	0.25	0.23		
LAB22	SYN2	NO2 - Photometry	EN 26777	mg/l	0.15	0.16	0.16		

LAB23	COS	AOX - Analyser	EN 1485	µg/l	33.8	33.3	33.6		
LAB23	COS	TOC - Analyser	EN 1484	mg/l	13.2	13.2	13.4		
LAB23	COS	Tot P - ?	?	mg/l	0.016	0.016	0.016		
LAB23	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	90	90	90		
LAB23	FFC	NO2 - Photometry	EN 26777	mg/l	0.02	0.02	0.02		
LAB23	SEW	AOX - Analyser	EN 1485	µg/l	0.157	0.155	0.156		corr. (/1000)
LAB23	SEW	CN - Photometry	ISO 6703	mg/l					
LAB23	SEW	NH4 - Photometry	ISO 7150	mg/l	0.06	0.06	0.06		
LAB23	SEW	NO2 - Photometry	EN 26777	mg/l	0.05	0.05	0.05		
LAB23	SEW	TOC - Analyser	EN 1484	mg/l	2250	2220	2240		
LAB23	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	1.2	1.2	1.2		corr. (/1000)
LAB23	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.23	0.23	0.23		
LAB23	SYN2	NO2 - Photometry	EN 26777	mg/l	0.14	0.14	0.14		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB24	COS	AOX - Analyser	EN 1485	µg/l	30	30	30		
LAB24	COS	As - Hydride AAS	EN 11969	µg/l	24	24	22		
LAB24	COS	S - ICP	ISO 11885	µg/l	553000	556000	556000		als SO4
LAB24	COS	Sb - Hydride AAS	EN 11969	µg/l	50	53	59		
LAB24	COS	Se - Hydride AAS	EN 11969	µg/l	57	58	53		
LAB24	COS	TOC - Analyser	EN 1484	mg/l	24.5	23	20.2		
LAB24	COS	Tot P - ?	?	mg/l					< 0.1
LAB24	FFC	Cl - Titration	ISO 9207	mg/l	271	270	273		
LAB24	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1220	1230	1250		
LAB24	FFC	F - Electrode	ISO 10359	mg/l	0.64	0.65	0.66		
LAB24	FFC	NO2 - FIA	ISO 13395	mg/l					<0.06
LAB24	FFC	NO3 - FIA	ISO 13395	mg/l					< 2
LAB24	FFC	Tot N - ?	?	mg/l	336	282	291		
LAB24	SBW	Cl - Titration	ISO 9207	mg/l	20.2	20.3	23.6		
LAB24	SBW	F - Electrode	ISO 10359	mg/l	5.86	5.86	5.94		
LAB24	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.103	0.116	0.105		
LAB24	SEW	AOX - Analyser	EN 1485	mg/l	0.14	0.15	0.13		
LAB24	SEW	As - Hydride AAS	EN 11969	µg/l	17	15	16		
LAB24	SEW	Hg - CV-AAS	EN 1483	µg/l					< 1
LAB24	SEW	NH4 - FIA	ISO 11732	mg/l	453.5	437.7	441.8		
LAB24	SEW	NH4 - Photometry	ISO 7150	mg/l	520	530	530		
LAB24	SEW	NO3 - FIA	ISO 13395	mg/l					< 2
LAB24	SEW	S - ICP	ISO 11885	µg/l	60000	60000	60300		corr. (µg S/l)
LAB24	SEW	Se - Hydride AAS	EN 11969	µg/l					< 10
LAB24	SEW	TOC - Analyser	EN 1484	mg/l	1575	1575	1625		
LAB24	SEW	Tot N - ?	?	mg/l	362	369	352		
LAB24	SEW	Tot P - ?	?	mg/l	26.3	26.4	25.9		
LAB24	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.11	0.11	0.11		
LAB24	SYN2	Hg - CV-AAS	EN 1483	µg/l	7	7	7		
LAB24	SYN2	NH4 - FIA	ISO 11732	mg/l					< 0.5
LAB24	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.21	0.22	0.22		
LAB24	SYN2	NO2 - FIA	ISO 13395	mg/l	0.16	0.19	0.18		
LAB24	SYN2	Phenol index - Photometry	ISO 6439	mg/l	0.049	0.049	0.051		
LAB24	SYN3	P - ICP	ISO 11885	µg/l					< 10
LAB24	SYN3	S - ICP	ISO 11885	µg/l	50000	50300	50000		corr. (µg S/l)
LAB25	COS	As - ICP-MS		µg/l	23.7	23.3	23.7		
LAB25	COS	Cd - ICP	ISO 11885	µg/l	224	220	218		
LAB25	COS	Co - ICP	ISO 11885	µg/l	102	102	96.7		
LAB25	COS	Conduct. - Electrode	EN 27888	µS/cm	2236	2210	2239		
LAB25	COS	Cu - ICP	ISO 11885	µg/l	373	363	369		
LAB25	COS	Ni - ICP	ISO 11885	µg/l	72.6	62.6	60.4		
LAB25	COS	Pb - ICP	ISO 11885	µg/l	363	354	367		
LAB25	COS	pH - Electrode	ISO 10523	-	6.05	6.03	6.03		
LAB25	COS	Zn - ICP	ISO 11885	µg/l	51600	51300	51600		
LAB25	FFC	Ba - ICP	ISO 11885	µg/l	67.6	67.5	68.8		
LAB25	FFC	Conduct. - Electrode	EN 27888	µS/cm	2639	2645	2599		
LAB25	FFC	Cr - ICP	ISO 11885	µg/l	1220	1310	1260		
LAB25	FFC	Mo - ICP	ISO 11885	µg/l	509	538	494		
LAB25	FFC	pH - Electrode	ISO 10523	-	9.91	9.9	9.87		
LAB25	FFC	Zn - ICP	ISO 11885	µg/l	290	283	286		
LAB25	SBW	Ba - ICP	ISO 11885	µg/l	83.3	83.7	83.1		
LAB25	SBW	Conduct. - Electrode	EN 27888	µS/cm	475	481	478		
LAB25	SBW	Cu - ICP	ISO 11885	µg/l	76	75	84.4		
LAB25	SBW	pH - Electrode	ISO 10523	-	6.99	6.99	7.01		
LAB25	SBW	Zn - ICP	ISO 11885	µg/l	281	277	264		
LAB25	SEW	As - ICP-MS		µg/l	129	124	125		
LAB25	SEW	Conduct. - Electrode	EN 27888	µS/cm	3086	3001	3121		
LAB25	SEW	Ni - ICP	ISO 11885	µg/l	140	138	119		
LAB25	SEW	pH - Electrode	ISO 10523	-	6.12	6.11	6.12		
LAB25	SYN1	Conduct. - Electrode	EN 27888	µS/cm	325	328	331		
LAB25	SYN1	pH - Electrode	ISO 10523	-	7.08	7.07	7.03		
LAB25	SYN2	Conduct. - Electrode	EN 27888	µS/cm	436	436	440		
LAB25	SYN2	pH - Electrode	ISO 10523	-	7.01	7.01	7		
LAB25	SYN3	As - ICP-MS		µg/l					< 2
LAB25	SYN3	Ba - ICP	ISO 11885	µg/l	26.2	26.3	24.4		
LAB25	SYN3	Be - ICP	ISO 11885	µg/l					< 50
LAB25	SYN3	Cd - ICP	ISO 11885	µg/l	316	320	321		
LAB25	SYN3	Co - ICP	ISO 11885	µg/l					< 2
LAB25	SYN3	Cr - ICP	ISO 11885	µg/l	90	84.3	86.2		
LAB25	SYN3	Cu - ICP	ISO 11885	µg/l	7.4	7.5	7.2		
LAB25	SYN3	Mo - ICP	ISO 11885	µg/l					< 25

LAB25	SYN3	Ni - ICP	ISO 11885	µg/l					< 30
LAB25	SYN3	Pb - ICP	ISO 11885	µg/l					< 30
LAB25	SYN3	V - ICP	ISO 11885	µg/l	208	207	208		
LAB25	SYN3	Zn - ICP	ISO 11885	µg/l	16300	16400	16400		
LAB26	FFC	Cl - IC	ISO 10304	mg/l	143.3	142.7	141.9		
LAB26	FFC	F - IC	ISO 10304	mg/l	0.61	0.61	0.71		
LAB26	FFC	NO2 - IC	ISO 10304	mg/l					<2
LAB26	FFC	NO3 - IC	ISO 10304	mg/l					< 2
LAB26	FFC	SO4 - IC	ISO 10304	mg/l	1334	1329	1352		
LAB26	SBW	Cl - IC	ISO 10304	mg/l	17.98	14.25	14.07		
LAB26	SBW	F - IC	ISO 10304	mg/l	4.77	4.48	4.3		
LAB26	SBW	SO4 - IC	ISO 10304	mg/l	75.85	75.82	73.13		
LAB26	SEW	Cl - IC	ISO 10304	mg/l	117.7	107	118.2		
LAB26	SEW	NO2 - IC	ISO 10304	mg/l	10.74	10.38	10.69		
LAB26	SEW	NO3 - IC	ISO 10304	mg/l					< 2
LAB26	SEW	SO4 - IC	ISO 10304	mg/l	51.9	50.7	55		
LAB26	SYN2	NO2 - IC	ISO 10304	mg/l					< 2

Lab	Eluate	Parameter/Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB27	COS	AOX - Analyser	EN 1485	µg/l	30	33	35		
LAB27	COS	As - Hydride AAS	EN 11969	µg/l	24	23	25		wet digestion
LAB27	COS	Cd - ICP	ISO 11885	µg/l	227	211	217		
LAB27	COS	Co - ICP	ISO 11885	µg/l	74	75	75		
LAB27	COS	Conduct. - Electrode	EN 27888	µS/cm	2570	2580	2560		
LAB27	COS	Cu - ICP	ISO 11885	µg/l	1070	1030	1100		
LAB27	COS	Ni - ICP	ISO 11885	µg/l	189	195	200		
LAB27	COS	P - ICP	ISO 11885	µg/l	24	20	25		
LAB27	COS	Pb - ICP	ISO 11885	µg/l	330	335	325		
LAB27	COS	pH - Electrode	ISO 10523	-	5.76	5.78	5.75		
LAB27	COS	S - ICP	ISO 11885	µg/l	415000	417000	430000		
LAB27	COS	Sb - Hydride AAS	EN 11969	µg/l	54	53	52		wet digestion
LAB27	COS	Se - Hydride AAS	EN 11969	µg/l	59	65	60		wet digestion
LAB27	COS	Zn - ICP	ISO 11885	µg/l	55000	52300	53100		
LAB27	FFC	Ba - ICP	ISO 11885	µg/l	65	60	59		
LAB27	FFC	Conduct. - Electrode	EN 27888	µS/cm	3010	3010	3000		
LAB27	FFC	Cr - ICP	ISO 11885	µg/l	1020	998	1010		
LAB27	FFC	Mo - ICP	ISO 11885	µg/l	402	412	401		
LAB27	FFC	pH - Electrode	ISO 10523	-	9.85	9.87	9.78		
LAB27	FFC	Zn - ICP	ISO 11885	µg/l	253	272	280		
LAB27	SBW	Ba - ICP	ISO 11885	µg/l	85	82	86		
LAB27	SBW	Conduct. - Electrode	EN 27888	µS/cm	533	536	533		
LAB27	SBW	Cu - ICP	ISO 11885	µg/l	111	105	98		
LAB27	SBW	pH - Electrode	ISO 10523	-	6.89	6.96	7.06		
LAB27	SBW	Zn - ICP	ISO 11885	µg/l	264	258	253		
LAB27	SEW	AOX - Analyser	EN 1485	mg/l	0.31	0.28	0.27		corr. (/1000)
LAB27	SEW	As - Hydride AAS	EN 11969	µg/l	99	100	97		wet digestion
LAB27	SEW	Conduct. - Electrode	EN 27888	µS/cm	3630	3640	3630		
LAB27	SEW	Hg - CV-AAS	EN 1483	µg/l					< 0.2
LAB27	SEW	Ni - ICP	ISO 11885	µg/l	117	112	108		
LAB27	SEW	P - ICP	ISO 11885	µg/l	23500	23100	23000		
LAB27	SEW	pH - Electrode	ISO 10523	-	6.1	6.11	6.12		
LAB27	SEW	S - ICP	ISO 11885	µg/l	62900	63000	64000		
LAB27	SEW	Se - Hydride AAS	EN 11969	µg/l	28	29	27		wet digestion
LAB27	SYN1	Conduct. - Electrode	EN 27888	µS/cm	360	360	358		
LAB27	SYN1	pH - Electrode	ISO 10523	-	6.71	6.76	6.69		
LAB27	SYN2	Conduct. - Electrode	EN 27888	µS/cm	486	488	488		
LAB27	SYN2	Hg - CV-AAS	EN 1483	µg/l	6.2	6.2	6.2		
LAB27	SYN2	pH - Electrode	ISO 10523	-	6.78	6.75	6.86		
LAB27	SYN3	Ba - ICP	ISO 11885	µg/l	26	24	25		
LAB27	SYN3	Be - ICP	ISO 11885	µg/l					< 2
LAB27	SYN3	Cd - ICP	ISO 11885	µg/l	346	367	355		
LAB27	SYN3	Co - ICP	ISO 11885	µg/l	5	5	6		
LAB27	SYN3	Cr - ICP	ISO 11885	µg/l	76	80	84		
LAB27	SYN3	Cu - ICP	ISO 11885	µg/l	12	15	13		
LAB27	SYN3	Mo - ICP	ISO 11885	µg/l	53	59	60		
LAB27	SYN3	Ni - ICP	ISO 11885	µg/l	15	13	16		
LAB27	SYN3	Pb - ICP	ISO 11885	µg/l	45	54	50		
LAB27	SYN3	S - ICP	ISO 11885	µg/l	53300	52300	55000		
LAB27	SYN3	V - ICP	ISO 11885	µg/l	18	22	21		
LAB27	SYN3	Zn - ICP	ISO 11885	µg/l	16500	17100	18100		
LAB28	COS	AOX - Analyser	EN 1485	µg/l	34.9	33.2			
LAB28	COS	As - Hydride AAS	EN 11969	µg/l	18.9	18.7	18.6		
LAB28	COS	Cd - ICP	ISO 11885	µg/l	223	228	229		
LAB28	COS	Co - ICP	ISO 11885	µg/l	73.5	72.8	72		
LAB28	COS	Conduct. - Electrode	EN 27888	µS/cm	2560	2560			
LAB28	COS	Cu - ICP	ISO 11885	µg/l	392	380	377		
LAB28	COS	Ni - ICP	ISO 11885	µg/l	52	50	50.9		
LAB28	COS	Pb - ICP	ISO 11885	µg/l	341	334	348		
LAB28	COS	pH - Electrode	ISO 10523	-	6.32				
LAB28	COS	Sb - Hydride AAS	EN 11969	µg/l	55.4	56.8	59.5		
LAB28	COS	Se - Hydride AAS	EN 11969	µg/l	57	56.6	57.5		
LAB28	COS	Zn - ICP	ISO 11885	µg/l	53000	53000	53000		
LAB28	FFC	Ba - ICP	ISO 11885	µg/l	58.5	59.9			
LAB28	FFC	Cl - Titration	ISO 9207	mg/l	279	279			
LAB28	FFC	Conduct. - Electrode	EN 27888	µS/cm	3010	3020			
LAB28	FFC	Cr - ICP	ISO 11885	µg/l	1200	1190	1180		
LAB28	FFC	F - Electrode	ISO 10359	mg/l	0.77	0.797	0.794		
LAB28	FFC	Mo - ICP	ISO 11885	µg/l	443	442	439		
LAB28	FFC	NO2 - FIA	ISO 13395	mg/l					<0.1

LAB28	FFC	NO3 - FIA	ISO 13395	mg/l					< 0.45
LAB28	FFC	pH - Electrode	ISO 10523	-	9.74				
LAB28	FFC	Zn - ICP	ISO 11885	µg/l	327	336	338		
LAB28	SBW	Ba - ICP	ISO 11885	µg/l	76.1	77.3	74.2		
LAB28	SBW	Conduct. - Electrode	EN 27888	µS/cm	539	529			
LAB28	SBW	Cu - ICP	ISO 11885	µg/l	110	108	110		
LAB28	SBW	F - Electrode	ISO 10359	mg/l	7.41	7.56	7.68		
LAB28	SBW	pH - Electrode	ISO 10523	-	7.04				
LAB28	SBW	Zn - ICP	ISO 11885	µg/l	285	281	282		
LAB28	SEW	AOX - Analyser	EN 1485	mg/l	0.169	0.201			corr. (/1000)
LAB28	SEW	As - Hydride AAS	EN 11969	µg/l	14.8	14.9	14.9		
LAB28	SEW	Conduct. - Electrode	EN 27888	µS/cm	3610	3620	3800		
LAB28	SEW	Hg - CV-AAS	EN 1483	µg/l					< 0.2
LAB28	SEW	NH4 - FIA	ISO 11732	mg/l	392	384	391		
LAB28	SEW	Ni - ICP	ISO 11885	µg/l	121	123	119		
LAB28	SEW	NO3 - FIA	ISO 13395	mg/l					< 0.45
LAB28	SEW	pH - Electrode	ISO 10523	-	6.13	6.18	6.11		
LAB28	SEW	Se - Hydride AAS	EN 11969	µg/l	4.65	4.62	4.58		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB28	SYN1	Conduct. - Electrode	EN 27888	µS/cm	380	380	362		
LAB28	SYN1	pH - Electrode	ISO 10523	-	5.29	5.45	5.33		
LAB28	SYN2	Conduct. - Electrode	EN 27888	µS/cm	489	479			
LAB28	SYN2	Hg - CV-AAS	EN 1483	µg/l	7	7.18	7.06		
LAB28	SYN2	NH4 - FIA	ISO 11732	mg/l	0.26	0.21	0.27		
LAB28	SYN2	NO2 - FIA	ISO 13395	mg/l	0.15	0.15	0.15		
LAB28	SYN2	pH - Electrode	ISO 10523	-	7.75				
LAB28	SYN3	Ba - ICP	ISO 11885	µg/l	25.9	25.8	24.7		
LAB28	SYN3	Be - ICP	ISO 11885	µg/l					< 0.15
LAB28	SYN3	Cd - ICP	ISO 11885	µg/l	394	401	416		
LAB28	SYN3	Co - ICP	ISO 11885	µg/l	6.4	5.2	6.2		
LAB28	SYN3	Cr - ICP	ISO 11885	µg/l	82	80.1	79.5		
LAB28	SYN3	Cu - ICP	ISO 11885	µg/l	10.5	6.9	10.2		
LAB28	SYN3	Mo - ICP	ISO 11885	µg/l	65.2	67.6	67.9		
LAB28	SYN3	Ni - ICP	ISO 11885	µg/l	13.9	12.1	13.9		
LAB28	SYN3	Pb - ICP	ISO 11885	µg/l	81	79.1	79		
LAB28	SYN3	V - ICP	ISO 11885	µg/l	27.3	23.2	23.2		
LAB28	SYN3	Zn - ICP	ISO 11885	µg/l	19400	19200	19000		
LAB29	FFC	Cl - IC	ISO 10304	mg/l	400	400	400		
LAB29	FFC	F - IC	ISO 10304	mg/l	0.722	0.729	0.724		
LAB29	FFC	NO3 - IC	ISO 10304	mg/l	0.03	0.03	0.029		
LAB29	FFC	SO4 - IC	ISO 10304	mg/l	1450	1480	1410		
LAB29	SBW	Cl - IC	ISO 10304	mg/l	20.6	20.5	20.7		
LAB29	SBW	F - IC	ISO 10304	mg/l	7.43	7.43	7.45		
LAB29	SBW	SO4 - IC	ISO 10304	mg/l	112	112	112		
LAB29	SEW	Cl - IC	ISO 10304	mg/l	100	101	101		
LAB29	SEW	NO2 - IC	ISO 10304	mg/l	1.54	1.5	1.56		
LAB29	SEW	NO3 - IC	ISO 10304	mg/l	1.95	1.97	1.93		
LAB29	SEW	SO4 - IC	ISO 10304	mg/l	55.3	55.1	55.6		
LAB29	SYN2	NO2 - IC	ISO 10304	mg/l	0.103	0.104	0.103		
LAB30	COS	As - ICP	ISO 11885	µg/l	19.2	18.8	18.5		
LAB30	COS	Cd - ICP	ISO 11885	µg/l	214	213	213		
LAB30	COS	Co - ICP	ISO 11885	µg/l	55.6	56.2	57.5		
LAB30	COS	Conduct. - Electrode	EN 27888	µS/cm	11300	10600	10600		
LAB30	COS	Cu - ICP	ISO 11885	µg/l	318	315	322		
LAB30	COS	Ni - ICP	ISO 11885	µg/l	39	38.8	39.1		
LAB30	COS	Pb - ICP	ISO 11885	µg/l	321	312	315		
LAB30	COS	pH - Electrode	ISO 10523	-	1.79	1.77	1.79		
LAB30	COS	Tot P - ?	?	mg/l					< 0.5
LAB30	COS	Zn - ICP	ISO 11885	µg/l	51800	52300	51800		
LAB30	FFC	Ba - ICP	ISO 11885	µg/l	58.1	52.9	51.1		
LAB30	FFC	Conduct. - Electrode	EN 27888	µS/cm	2490	2500	2540		
LAB30	FFC	Cr - ICP	ISO 11885	µg/l	1230	1220	1240		
LAB30	FFC	Mo - ICP	ISO 11885	µg/l	578	597	608		
LAB30	FFC	pH - Electrode	ISO 10523	-	9.87	9.57	9.52		
LAB30	FFC	Tot N - ?	?	mg/l					< 1
LAB30	FFC	Zn - ICP	ISO 11885	µg/l	233	232	246		
LAB30	SBW	Ba - ICP	ISO 11885	µg/l	77.2	80	77.6		
LAB30	SBW	Conduct. - Electrode	EN 27888	µS/cm	512	516	518		
LAB30	SBW	Cu - ICP	ISO 11885	µg/l	99	95.1	97.3		
LAB30	SBW	pH - Electrode	ISO 10523	-	6.98	7.1	7.13		
LAB30	SBW	Zn - ICP	ISO 11885	µg/l	200	212	212		
LAB30	SEW	As - ICP	ISO 11885	µg/l	105	110	103		
LAB30	SEW	Conduct. - Electrode	EN 27888	µS/cm	3510	4120	4140		
LAB30	SEW	Ni - ICP	ISO 11885	µg/l	84.3	93.1	89.7		
LAB30	SEW	pH - Electrode	ISO 10523	-	6.09	6.27	6.28		
LAB30	SEW	Tot N - ?	?	mg/l	649	699	687		R1 corr.
LAB30	SEW	Tot P - ?	?	mg/l	22.2	24	27.4		
LAB30	SYN1	Conduct. - Electrode	EN 27888	µS/cm	337	354	356		
LAB30	SYN1	pH - Electrode	ISO 10523	-	5.09	6.6	6.58		
LAB30	SYN2	Conduct. - Electrode	EN 27888	µS/cm	461	461	464		
LAB30	SYN2	pH - Electrode	ISO 10523	-	6.93	7.13	7.16		
LAB30	SYN3	As - ICP	ISO 11885	µg/l	11.5				< 10
LAB30	SYN3	Ba - ICP	ISO 11885	µg/l			22.1		< 20
LAB30	SYN3	Be - ICP	ISO 11885	µg/l					< 3
LAB30	SYN3	Cd - ICP	ISO 11885	µg/l	362	370	371		
LAB30	SYN3	Co - ICP	ISO 11885	µg/l					< 20
LAB30	SYN3	Cr - ICP	ISO 11885	µg/l	75	71.4	74.8		
LAB30	SYN3	Cu - ICP	ISO 11885	µg/l					< 10

LAB30	SYN3	Mo - ICP	ISO 11885	µg/l	77.4	78.5	72.3		
LAB30	SYN3	Ni - ICP	ISO 11885	µg/l	<10	10.1	11.3		
LAB30	SYN3	Pb - ICP	ISO 11885	µg/l	69.1	74.5	73.1		
LAB30	SYN3	V - ICP	ISO 11885	µg/l	22.8	23	23		
LAB30	SYN3	Zn - ICP	ISO 11885	µg/l	19000	18800	19200		
LAB31	COS	As - ICP	ISO 11885	µg/l	22.6	23.6	25		
LAB31	COS	Cd - ICP	ISO 11885	µg/l	208	217	210		
LAB31	COS	Co - ICP	ISO 11885	µg/l	70.4	69.8	71.9		
LAB31	COS	Conduct. - Electrode	EN 27888	µS/cm	2570	2560	2570		
LAB31	COS	Cu - ICP	ISO 11885	µg/l	394	386	402		
LAB31	COS	Ni - ICP	ISO 11885	µg/l	50.3	49.6	50.5		
LAB31	COS	Pb - ICP	ISO 11885	µg/l	324	329	338		
LAB31	COS	pH - Electrode	ISO 10523	-	6.04	6.08	6.09		
LAB31	COS	Zn - ICP	ISO 11885	µg/l	52300	53200	50500		

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB31	FFC	Ba - ICP	ISO 11885	µg/l	54.2	56.2	59.6		
LAB31	FFC	Cl - IC	ISO 10304	mg/l	293	272	288		
LAB31	FFC	Conduct. - Electrode	EN 27888	µS/cm	3000	2980	2990		
LAB31	FFC	Cr - ICP	ISO 11885	µg/l	1130	1160	1170		
LAB31	FFC	Mo - ICP	ISO 11885	µg/l	422	472	482		
LAB31	FFC	NO2 - IC	ISO 10304	mg/l					< 0.1
LAB31	FFC	NO3 - IC	ISO 10304	mg/l					< 1
LAB31	FFC	pH - Electrode	ISO 10523	-	10.1	9.92	9.55		
LAB31	FFC	SO4 - IC	ISO 10304	mg/l	1370	1340	1360		
LAB31	FFC	Zn - ICP	ISO 11885	µg/l	293	321	325		
LAB31	SBW	Ba - ICP	ISO 11885	µg/l	86	83.5	80.3		
LAB31	SBW	Cl - IC	ISO 10304	mg/l	21.4	21.9	21		
LAB31	SBW	Conduct. - Electrode	EN 27888	µS/cm	538	538	538		
LAB31	SBW	Cu - ICP	ISO 11885	µg/l	130	122	122		
LAB31	SBW	pH - Electrode	ISO 10523	-	6.86	6.91	6.94		
LAB31	SBW	Phenol index - FIA	phenol index could not be measured by manual spectrophot. method due to lack of sample (normally 500 ml)						
LAB31	SBW	SO4 - IC	ISO 10304	mg/l	106	107	104		
LAB31	SBW	Zn - ICP	ISO 11885	µg/l	313	307	302		
LAB31	SEW	As - ICP	ISO 11885	µg/l	139	146	142		
LAB31	SEW	Cl - IC	ISO 10304	mg/l	92.1	87.2	99		
LAB31	SEW	Conduct. - Electrode	EN 27888	µS/cm	3910	3910	3920		
LAB31	SEW	Ni - ICP	ISO 11885	µg/l	117	118	129		
LAB31	SEW	NO2 - IC	ISO 10304	mg/l	nitrite and nitrate were unstable in sample SEW (spikes were not recovered)				
LAB31	SEW	NO3 - IC	ISO 10304	mg/l	nitrite and nitrate were unstable in sample SEW (spikes were not recovered)				
LAB31	SEW	pH – Electrode	ISO 10523	-	6.96	6.98	7.1		
LAB31	SEW	SO4 – IC	ISO 10304	mg/l	53.8	51.4	54.2		
LAB31	SYN1	CN – FIA	ISO 14403	mg/l	0.205	0.21	0.21		
LAB31	SYN1	Conduct. – Electrode	EN 27888	µS/cm	368	366	368		
LAB31	SYN1	pH – Electrode	ISO 10523	-	6.94	6.94	6.87		
LAB31	SYN2	CN – FIA	ISO 14403	mg/l	0.0447	0.0441	0.0451		
LAB31	SYN2	Conduct. – Electrode	EN 27888	µS/cm	491	492	492		
LAB31	SYN2	NO2 – IC	ISO 10304	mg/l	0.15	0.16	0.15		
LAB31	SYN2	pH – Electrode	ISO 10523	-	6.95	7.02	7.06		
LAB31	SYN2	Phenol index – FIA	phenol index could not be measured by manual spectrophot. method due to lack of sample (normally 500 ml)						
LAB31	SYN3	As – ICP	ISO 11885	µg/l					< 10
LAB31	SYN3	Ba – ICP	ISO 11885	µg/l	29.2	28.5	27.2		
LAB31	SYN3	Be – ICP	ISO 11885	µg/l					< 2
LAB31	SYN3	Cd – ICP	ISO 11885	µg/l	393	425	364		
LAB31	SYN3	Co – ICP	ISO 11885	µg/l	6.24	5.71	5.8		
LAB31	SYN3	Cr – ICP	ISO 11885	µg/l	91.9	92.9	86.1		
LAB31	SYN3	Cu – ICP	ISO 11885	µg/l	7.1	6.85	10.1		
LAB31	SYN3	Mo – ICP	ISO 11885	µg/l	78.6	80.8	75.2		
LAB31	SYN3	Ni – ICP	ISO 11885	µg/l	14	13.8	13.3		
LAB31	SYN3	Pb – ICP	ISO 11885	µg/l	89.2	92.5	86.8		
LAB31	SYN3	V – ICP	ISO 11885	µg/l	27.1	28.5	26.1		
LAB31	SYN3	Zn – ICP	ISO 11885	µg/l	21400	22200	19500		
LAB32	FFC	Cl – IC	ISO 10304	mg/l	254	254	251		
LAB32	FFC	NO2 – IC	ISO 10304	mg/l					< 1.00
LAB32	FFC	NO3 – IC	ISO 10304	mg/l					< 0.100
LAB32	FFC	SO4 – IC	ISO 10304	mg/l	1148	1137	1146		
LAB32	SBW	Cl – IC	ISO 10304	mg/l	20.5	20.6	20.1		
LAB32	SBW	F – IC	ISO 10304	mg/l	7.5	7.49	7.5		
LAB32	SBW	SO4 – IC	ISO 10304	mg/l	107	108	106		
LAB32	SEW	Cl – IC	ISO 10304	mg/l	110	114	109		
LAB32	SEW	NO3 – IC	ISO 10304	mg/l					< 1.00
LAB32	SYN2	NO2 – IC	ISO 10304	mg/l	0.147	0.161	0.166		
LAB33	COS	As – Hydride AAS	EN 11969	µg/l	8.63	7.57	6.43		
LAB33	COS	Cd – AAS	ISO 8288	µg/l	217	232	210		
LAB33	COS	Cu – AAS	ISO 8288	µg/l	384	383	378		
LAB33	COS	Ni – AAS	ISO 8288	µg/l	50.1	49.2	49.3		
LAB33	COS	Pb – AAS	ISO 8288	µg/l	308	328	332		
LAB33	COS	Sb – Hydride AAS	EN 11969	µg/l	3.06	2.77	2.06		
LAB33	COS	Se – Hydride AAS	EN 11969	µg/l	3.2	3.26	3.44		
LAB33	COS	Zn – AAS	ISO 8288	µg/l	43700	44200	43500		
LAB33	FFC	Cl – Titration	ISO 9207	mg/l	294	296	297		
LAB33	FFC	Cr(VI) – Photometry	ISO 11083	µg/l	1270	1280	1270		
LAB33	FFC	F – Electrode	ISO 10359	mg/l	4.5	5	5.5		
LAB33	FFC	NO2 – Photometry	EN 26777	mg/l	0.0202	0.0179	0.0174		
LAB33	SBW	Cl – Titration	ISO 9207	mg/l	24.5	24.5	24.5		

LAB33	SBW	F – Electrode	ISO 10359	mg/l	9	9	9		
LAB33	SBW	Phenol index – Photometry	ISO 6439	mg/l	0.33	0.35	0.31		
LAB33	SEW	As – Hydride AAS	EN 11969	µg/l	7.86	9.73	8.97		
LAB33	SEW	NH4 – Photometry	ISO 7150	mg/l	245	244	222		
LAB33	SEW	NO2 – Photometry	EN 26777	mg/l	0.00516	0.00401	0.00516		
LAB33	SEW	Se – Hydride AAS	EN 11969	µg/l					< 0.91
LAB33	SYN1	Cd – AAS	ISO 8288	µg/l	32.2	39.8	27		
LAB33	SYN1	Cr(VI) – Photometry	ISO 11083	mg/l	0.092	0.092	0.096		
LAB33	SYN1	Cu – AAS	ISO 8288	µg/l	21	19.8	20.2		
LAB33	SYN1	Ni – AAS	ISO 8288	µg/l	16.3	18.2	13.4		
LAB33	SYN1	Pb – AAS	ISO 8288	µg/l	3.19	2.75	3.24		
LAB33	SYN1	Zn – AAS	ISO 8288	µg/l	767	769	775		
LAB33	SYN2	Cd – AAS	ISO 8288	µg/l	49.7	32.5	31.4		
LAB33	SYN2	Cu – AAS	ISO 8288	µg/l	18	18.2	15.3		
LAB33	SYN2	NH4 – Photometry	ISO 7150	mg/l	0.248	0.234	0.189		
LAB33	SYN2	Ni – AAS	ISO 8288	µg/l	19.1	20.8	17.4		
LAB33	SYN2	NO2 – Photometry	EN 26777	mg/l	0.0723	0.07	0.062		
LAB33	SYN2	Pb – AAS	ISO 8288	µg/l	4.56	5.28	5.95		
LAB33	SYN2	Phenol index – Photometry	ISO 6439	mg/l	0.0678	0.0685	0.069		
LAB33	SYN2	Zn – AAS	ISO 8288	µg/l	852	821	824		

Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB34	COS	As - ICP	ISO 11885	µg/l	16	18	17		
LAB34	COS	Cd - ICP	ISO 11885	µg/l	187	205	208		
LAB34	COS	Co - ICP	ISO 11885	µg/l	71	72	73		
LAB34	COS	Conduct. - Electrode	EN 27888	µS/cm	369	358	363		
LAB34	COS	Cu - ICP	ISO 11885	µg/l	360	340	360		
LAB34	COS	Ni - ICP	ISO 11885	µg/l	48	52	52		
LAB34	COS	Pb - ICP	ISO 11885	µg/l	309	326	332		
LAB34	COS	pH - Electrode	ISO 10523	-	6.75	6.7	6.8		
LAB34	COS	S - ICP	ISO 11885	µg/l	17900	16800	18000		
LAB34	COS	Tot P - ?	?	mg/l					< 0.1
LAB34	COS	Zn - ICP	ISO 11885	µg/l	57200	61900	52300		
LAB34	FFC	Ba - ICP	ISO 11885	µg/l	60	60	60		
LAB34	FFC	Cl - IC	ISO 10304	mg/l	283	284	275		
LAB34	FFC	Conduct. - Electrode	EN 27888	µS/cm	3028	3041	3014		
LAB34	FFC	Cr - ICP	ISO 11885	µg/l	1334	1400	1235		
LAB34	FFC	Mo - ICP	ISO 11885	µg/l	518	505	510		
LAB34	FFC	NO3 - IC	ISO 10304	mg/l					< 10
LAB34	FFC	pH - Electrode	ISO 10523	-	9.75	9	10.25		
LAB34	FFC	SO4 - IC	ISO 10304	mg/l	1433	1431	1478		
LAB34	FFC	Tot N - ?	?	mg/l					< 2.0
LAB34	FFC	Zn - ICP	ISO 11885	µg/l	310	320	310		
LAB34	SBW	Ba - ICP	ISO 11885	µg/l	80	80	80		
LAB34	SBW	Cl - IC	ISO 10304	mg/l	3	3	3		
LAB34	SBW	Conduct. - Electrode	EN 27888	µS/cm	542	542	538		
LAB34	SBW	Cu - ICP	ISO 11885	µg/l	110	120	120		
LAB34	SBW	F - IC	ISO 10304	mg/l	6.6	6.9	7		
LAB34	SBW	pH - Electrode	ISO 10523	-	7	6.95	6.9		
LAB34	SBW	SO4 - IC	ISO 10304	mg/l	37	37	37		
LAB34	SBW	Zn - ICP	ISO 11885	µg/l	270	300	290		
LAB34	SEW	As - ICP	ISO 11885	µg/l	123	136	123		
LAB34	SEW	Cl - IC	ISO 10304	mg/l	66	68	76		
LAB34	SEW	Conduct. - Electrode	EN 27888	µS/cm	3550	3574	3566		
LAB34	SEW	Ni - ICP	ISO 11885	µg/l	117	131	115		
LAB34	SEW	NO2 - IC	ISO 10304	mg/l					< 0.05
LAB34	SEW	NO3 - IC	ISO 10304	mg/l	4	4	4		
LAB34	SEW	pH - Electrode	ISO 10523	-	6.4	7.05	6.25		
LAB34	SEW	S - ICP	ISO 11885	µg/l	2490	2660	2530		
LAB34	SEW	SO4 - IC	ISO 10304	mg/l	58	61	63		
LAB34	SEW	Tot N - ?	?	mg/l	740	742	739		
LAB34	SEW	Tot P - ?	?	mg/l	44.5	44.8	44.6		
LAB34	SYN1	Conduct. - Electrode	EN 27888	µS/cm	242	246	232		
LAB34	SYN1	pH - Electrode	ISO 10523	-	6.8	6.85	6.55		
LAB34	SYN2	Conduct. - Electrode	EN 27888	µS/cm	499	505	498		
LAB34	SYN2	NO2 - IC	ISO 10304	mg/l					< 0.05
LAB34	SYN2	pH - Electrode	ISO 10523	-	6.8	6.8	6.75		
LAB34	SYN3	As - ICP	ISO 11885	µg/l					< 5
LAB34	SYN3	Ba - ICP	ISO 11885	µg/l	30	30	30		
LAB34	SYN3	Cd - ICP	ISO 11885	µg/l	380	426	405		
LAB34	SYN3	Co - ICP	ISO 11885	µg/l	6	6	6		
LAB34	SYN3	Cr - ICP	ISO 11885	µg/l	86	92	89		
LAB34	SYN3	Cu - ICP	ISO 11885	µg/l					< 20
LAB34	SYN3	Mo - ICP	ISO 11885	µg/l	82	80	79		
LAB34	SYN3	Ni - ICP	ISO 11885	µg/l	14	15	14		
LAB34	SYN3	P - ICP	ISO 11885	µg/l					< 10
LAB34	SYN3	Pb - ICP	ISO 11885	µg/l	85	90	87		
LAB34	SYN3	S - ICP	ISO 11885	µg/l	2090	2180	2090		
LAB34	SYN3	V - ICP	ISO 11885	µg/l	31	31	30		
LAB34	SYN3	Zn - ICP	ISO 11885	µg/l	20800	22500	19600		
LAB35	COS	AOX - Analyser	EN 1485	µg/l	20	25	30		
LAB35	COS	As - Hydride AAS	EN 11969	µg/l	20.39	17.46	18.64		
LAB35	COS	Cd - AAS	ISO 8288	µg/l	206	207	206		
LAB35	COS	Cu - AAS	ISO 8288	µg/l	374	373	376		
LAB35	COS	Ni - AAS	ISO 8288	µg/l	50.15	47.56	48.04		
LAB35	COS	Pb - AAS	ISO 8288	µg/l	358	351	354		
LAB35	COS	Sb - Hydride AAS	EN 11969	µg/l	171	236	171		
LAB35	COS	Se - Hydride AAS	EN 11969	µg/l	700	667	773		
LAB35	COS	TOC - Analyser	EN 1484	mg/l	16.2	17.07	17.2		
LAB35	COS	Tot P - ?	?	mg/l	0.058	0.08	0.064		

LAB35	COS	Zn - AAS	ISO 8288	µg/l	50280	50750	50940		corr. (*1000)
LAB35	FFC	Cl - IC	ISO 10304	mg/l	297	308	291		
LAB35	FFC	Cl - Titration	ISO 9207	mg/l	283.1	282.2	282.3		
LAB35	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1250	1260	1270		corr. (*1000)
LAB35	FFC	F - IC	ISO 10304	mg/l	0.65	0.65	0.65		
LAB35	FFC	NO2 - IC	ISO 10304	mg/l					< 0.1
LAB35	FFC	NO2 - Photometry	EN 26777	mg/l	0.068	0.066	0.07		
LAB35	FFC	NO3 - IC	ISO 10304	mg/l	0.41	0.42	0.42		
LAB35	FFC	SO4 - IC	ISO 10304	mg/l	1359	1350	1295		
LAB35	FFC	Tot N - ?	?	mg/l	0.57	0.53	0.43		
LAB35	SBW	Cl - IC	ISO 10304	mg/l	21.29	24.8	22.54		
LAB35	SBW	Cl - Titration	ISO 9207	mg/l	22.89	22.69	22.52		
LAB35	SBW	F - IC	ISO 10304	mg/l	7.58	7.28	7.35		
LAB35	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.2	0.25	0.22		
LAB35	SBW	SO4 - IC	ISO 10304	mg/l	122	123	118		

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB35	SEW	AOX - Analyser	EN 1485	mg/l	0.13	0.12	0.125		
LAB35	SEW	As - Hydride AAS	EN 11969	µg/l	151	148	155		
LAB35	SEW	Cl - IC	ISO 10304	mg/l	96.8	96.1	96.5		
LAB35	SEW	CN - Photometry	ISO 6703	mg/l	0.095	0.098	0.102		
LAB35	SEW	Hg - CV-AAS	EN 1483	µg/l	1.64	1.6	1.52		
LAB35	SEW	NH4 - Photometry	ISO 7150	mg/l	397	415	380		
LAB35	SEW	NO2 - IC	ISO 10304	mg/l					< 0.1
LAB35	SEW	NO2 - Photometry	EN 26777	mg/l	0.05	0.06	0.05		
LAB35	SEW	NO3 - IC	ISO 10304	mg/l	0.68	0.43	0.49		
LAB35	SEW	Se - Hydride AAS	EN 11969	µg/l	489	560	606		
LAB35	SEW	SO4 - IC	ISO 10304	mg/l	61.7	60.6	60.1		
LAB35	SEW	TOC - Analyser	EN 1484	mg/l	1466	1600	1550		
LAB35	SEW	Tot N - ?	?	mg/l	707	698	710		
LAB35	SEW	Tot P - ?	?	mg/l	29.86	29.88	29.35		
LAB35	SYN1	Cd - AAS	ISO 8288	µg/l	39.81	40.41	40.55		R2 corr.
LAB35	SYN1	CN - Photometry	ISO 6703	mg/l	0.189	0.188	0.19		
LAB35	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.097	0.092	0.096		
LAB35	SYN1	Cu - AAS	ISO 8288	µg/l	21.44	16.61	19.3		
LAB35	SYN1	Ni - AAS	ISO 8288	µg/l	14.62	15.16	15.17		
LAB35	SYN1	Pb - AAS	ISO 8288	µg/l	19.27	20.62	19.68		
LAB35	SYN1	Zn - AAS	ISO 8288	µg/l	732	758	793		
LAB35	SYN2	Cd - AAS	ISO 8288	µg/l	35.58	36.2	32.59		
LAB35	SYN2	CN - Photometry	ISO 6703	mg/l	0.04	0.042	0.037		
LAB35	SYN2	Cu - AAS	ISO 8288	µg/l	17.74	16.17	17.9		
LAB35	SYN2	Hg - CV-AAS	EN 1483	µg/l	5.34	5.28	5.24		
LAB35	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.214	0.212	0.214		
LAB35	SYN2	Ni - AAS	ISO 8288	µg/l	17.74	16.18	16.82		
LAB35	SYN2	NO2 - IC	ISO 10304	mg/l	0.62	0.63	0.61		
LAB35	SYN2	NO2 - Photometry	EN 26777	mg/l	0.128	0.128	0.127		
LAB35	SYN2	Pb - AAS	ISO 8288	µg/l	24.21	23.13	33.92		
LAB35	SYN2	Phenol index - Photometry	ISO 6439	mg/l	0.081	0.083	0.075		
LAB35	SYN2	Zn - AAS	ISO 8288	µg/l	897	854	865		
LAB37	COS	As - Hydride AAS	EN 11969	µg/l	8.2	7	6.14		
LAB37	COS	Cd - AAS	ISO 8288	µg/l	215	231	216		
LAB37	COS	Cu - AAS	ISO 8288	µg/l	381	375	375		
LAB37	COS	Ni - AAS	ISO 8288	µg/l	49.2	51.2	47.2		
LAB37	COS	Pb - AAS	ISO 8288	µg/l	338	342	337		
LAB37	COS	Sb - Hydride AAS	EN 11969	µg/l	1.96	2.55	1.76		
LAB37	COS	Se - Hydride AAS	EN 11969	µg/l	3.61	3.49	3.68		
LAB37	COS	TOC - Analyser	EN 1484	mg/l	22.2	18.8	18.7		
LAB37	COS	Tot P - ?	?	mg/l	0.0298	0.0295	0.0298		
LAB37	COS	Zn - AAS	ISO 8288	µg/l	43900	43800	44300		
LAB37	FFC	Cl - Titration	ISO 9207	mg/l	274	275	275		
LAB37	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1180	1190	1180		
LAB37	FFC	NO2 - Photometry	EN 26777	mg/l	0.0214	0.019	0.0181		
LAB37	FFC	Tot N - ?	?	mg/l					< 1.12
LAB37	SBW	Cl - Titration	ISO 9207	mg/l	29	25.5	25.5		
LAB37	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.31	0.33	0.35		
LAB37	SEW	As - Hydride AAS	EN 11969	µg/l	8.42	9	8.73		
LAB37	SEW	CN - Photometry	ISO 6703	mg/l					
LAB37	SEW	Hg - CV-AAS	EN 1483	µg/l	0.903	1.18	0.766		
LAB37	SEW	NH4 - Photometry	ISO 7150	mg/l	489	485	482		
LAB37	SEW	NO2 - Photometry	EN 26777	mg/l	0.00516	0.00516	0.00401		
LAB37	SEW	Se - Hydride AAS	EN 11969	µg/l					< 0.91
LAB37	SEW	TOC - Analyser	EN 1484	mg/l	1570	1390	1440		
LAB37	SEW	Tot N - ?	?	mg/l	701	706	706		
LAB37	SEW	Tot P - ?	?	mg/l	45.2	44	46.6		
LAB37	SYN1	Cd - AAS	ISO 8288	µg/l	37.1	42.1	29.9		
LAB37	SYN1	CN - Photometry	ISO 6703	mg/l					
LAB37	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.111	0.111	0.113		
LAB37	SYN1	Cu - AAS	ISO 8288	µg/l	21.1	17.9	17.1		
LAB37	SYN1	Ni - AAS	ISO 8288	µg/l	17.2	18.8	17.1		
LAB37	SYN1	Pb - AAS	ISO 8288	µg/l	3.21	5.19	4.96		
LAB37	SYN1	Zn - AAS	ISO 8288	µg/l	800	760	765		
LAB37	SYN2	Cd - AAS	ISO 8288	µg/l	35.3	34.2	38.1		
LAB37	SYN2	Cu - AAS	ISO 8288	µg/l	20.1	24.8	12.6		
LAB37	SYN2	Hg - CV-AAS	EN 1483	µg/l	7.94	7.31	6.46		

LAB37	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.182	0.185	0.21		
LAB37	SYN2	Ni - AAS	ISO 8288	µg/l	17.1	16.2	16.2		
LAB37	SYN2	NO2 - Photometry	EN 26777	mg/l	0.152	0.15	0.159		
LAB37	SYN2	Pb - AAS	ISO 8288	µg/l	6.27	6.85	5.78		
LAB37	SYN2	Phenol index - Photometry	ISO 6439	mg/l	0.025	0.0685	0.0386		
LAB37	SYN2	Zn - AAS	ISO 8288	µg/l	821	817	817		
LAB38	SBW	Cl - IC	ISO 10304	mg/l	19.8	19.9	19.8		
LAB38	SBW	F - IC	ISO 10304	mg/l	7.27	7.25	7.54		
LAB38	SBW	SO4 - IC	ISO 10304	mg/l	106	107	106		
LAB38	SEW	Cl - IC	ISO 10304	mg/l	91.9	92.1	92.3		
LAB38	SEW	NO2 - IC	ISO 10304	mg/l	4.48	4.56	5.43		
LAB38	SEW	NO3 - IC	ISO 10304	mg/l			0.46		< 0.4
LAB38	SEW	SO4 - IC	ISO 10304	mg/l	53.4	53.2	53.4		
LAB38	SYN2	NO2 - IC	ISO 10304	mg/l	0.17	0.16	0.17		

Lab	Eluate	Parameter / Methode	Standard	Units	R1	R2	R3	R4	Remarks
LAB39	COS	As - ICP	ISO 11885	µg/l	26	25	26		
LAB39	COS	Cd - ICP	ISO 11885	µg/l	221	219	213		
LAB39	COS	Co - ICP	ISO 11885	µg/l	70	70	69		
LAB39	COS	Conduct. - Electrode	EN 27888	µS/cm	2365	2367	2364		
LAB39	COS	Cu - ICP	ISO 11885	µg/l	348	349	354		
LAB39	COS	Ni - ICP	ISO 11885	µg/l	52	52	50		
LAB39	COS	P - ICP	ISO 11885	µg/l	18	19	15		
LAB39	COS	Pb - ICP	ISO 11885	µg/l	320	316	313		
LAB39	COS	pH - Electrode	ISO 10523	-	6.2	6.22	6.2		
LAB39	COS	Zn - ICP	ISO 11885	µg/l	40700	41200	41100		
LAB39	FFC	Ba - ICP	ISO 11885	µg/l	72	69	66		
LAB39	FFC	Conduct. - Electrode	EN 27888	µS/cm	2409	2411	2408		
LAB39	FFC	Cr - ICP	ISO 11885	µg/l	1000	1050	1020		
LAB39	FFC	Cr(VI) - Photometry	ISO 11083	µg/l	1015	1027	1030		
LAB39	FFC	Mo - ICP	ISO 11885	µg/l	430	444	438		
LAB39	FFC	NO2 - Photometry	EN 26777	mg/l	0.023	0.019	0.02		
LAB39	FFC	pH - Electrode	ISO 10523	-	7.12	7.12	7.14		
LAB39	FFC	Zn - ICP	ISO 11885	µg/l	258	259	289		
LAB39	SBW	Ba - ICP	ISO 11885	µg/l	106	107	108		
LAB39	SBW	Conduct. - Electrode	EN 27888	µS/cm	512	515	508		
LAB39	SBW	Cu - ICP	ISO 11885	µg/l	114	122	115		
LAB39	SBW	pH - Electrode	ISO 10523	-	7.06	7.04	7.06		
LAB39	SBW	Zn - ICP	ISO 11885	µg/l	267	267	268		
LAB39	SEW	As - ICP	ISO 11885	µg/l	115	155	150		
LAB39	SEW	Conduct. - Electrode	EN 27888	µS/cm	3234	3235	3237		
LAB39	SEW	NH4 - Photometry	ISO 7150	mg/l	406.1	391.9	394.2		
LAB39	SEW	Ni - ICP	ISO 11885	µg/l	126	134	128		
LAB39	SEW	P - ICP	ISO 11885	µg/l	21700	22200	22200		
LAB39	SEW	pH - Electrode	ISO 10523	-	6.02	6.03	6.02		
LAB39	SYN1	Conduct. - Electrode	EN 27888	µS/cm	3265	3266	3265		
LAB39	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.086	0.086	0.087		
LAB39	SYN1	pH - Electrode	ISO 10523	-	5.5	5.5	5.5		
LAB39	SYN2	Conduct. - Electrode	EN 27888	µS/cm	462	461	464		
LAB39	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.11	0.1	0.11		
LAB39	SYN2	NO2 - Photometry	EN 26777	mg/l	0.144	0.151	0.154		
LAB39	SYN2	pH - Electrode	ISO 10523	-	6.8	6.8	6.8		
LAB39	SYN3	As - ICP	ISO 11885	µg/l					< 10
LAB39	SYN3	Ba - ICP	ISO 11885	µg/l	32	32	32		
LAB39	SYN3	Be - ICP	ISO 11885	µg/l					< 1
LAB39	SYN3	Cd - ICP	ISO 11885	µg/l	412	402	399		
LAB39	SYN3	Co - ICP	ISO 11885	µg/l	6	6	5		
LAB39	SYN3	Cr - ICP	ISO 11885	µg/l	63	71	76		
LAB39	SYN3	Cu - ICP	ISO 11885	µg/l	6	6	7		
LAB39	SYN3	Mo - ICP	ISO 11885	µg/l	71	69	68		
LAB39	SYN3	Ni - ICP	ISO 11885	µg/l	11	11	13		
LAB39	SYN3	P - ICP	ISO 11885	µg/l					< 70
LAB39	SYN3	Pb - ICP	ISO 11885	µg/l	66	73	75		
LAB39	SYN3	V - ICP	ISO 11885	µg/l	27	21	22		
LAB39	SYN3	Zn - ICP	ISO 11885	µg/l	17700	18800	18700		
LAB40	COS	AOX - Analyser	EN 1485	mg/l	19	19	23		
LAB40	COS	As - Hydride AAS	EN 11969	mg/l	18.7	18.5	17.9		
LAB40	COS	P - ICP	ISO 11885	mg/l					< 70
LAB40	COS	TOC - Analyser	EN 1484	mg/l		15.3	15.6	15.4	
LAB40	COS	Tot P - ?		mg/l	0.029	0.027	0.026	0.026	
LAB40	FFC	Cl - IC	ISO 10304	mg/l	459	471	474	458	
LAB40	FFC	NO2 - FIA	ISO 13395	mg/l					< 0.07
LAB40	FFC	NO2 - IC	ISO 10304-1,2	mg/l					< 0.01
LAB40	FFC	NO3 - FIA	ISO 13395	mg/l	0.26	0.24	0.25	0.24	
LAB40	FFC	NO3 - IC	ISO 10304	mg/l	0.285	0.275	0.29	0.295	
LAB40	FFC	SO4 - IC	ISO 10304	mg/l	1360	1360	1370	1340	
LAB40	FFC	Tot N - ?	EN 12260	mg/l					< 1
LAB40	SEW	AOX - Analyser	EN 1485	mg/l					n.n. außerhalb der Norm
LAB40	SEW	As - Hydride AAS	EN 11969	mg/l	12.7	12.7	11.6		
LAB40	SEW	Hg - CV-AAS	EN 1483	mg/l	0.1	0.1	0.1		
LAB40	SEW	NH4 - FIA	ISO 11732	mg/l	425	425	426	424	
LAB40	SEW	NO3 - FIA	ISO 13395	mg/l					< 0.2
LAB40	SEW	P - ICP	ISO 11885	mg/l	23600	23400	23500	23800	

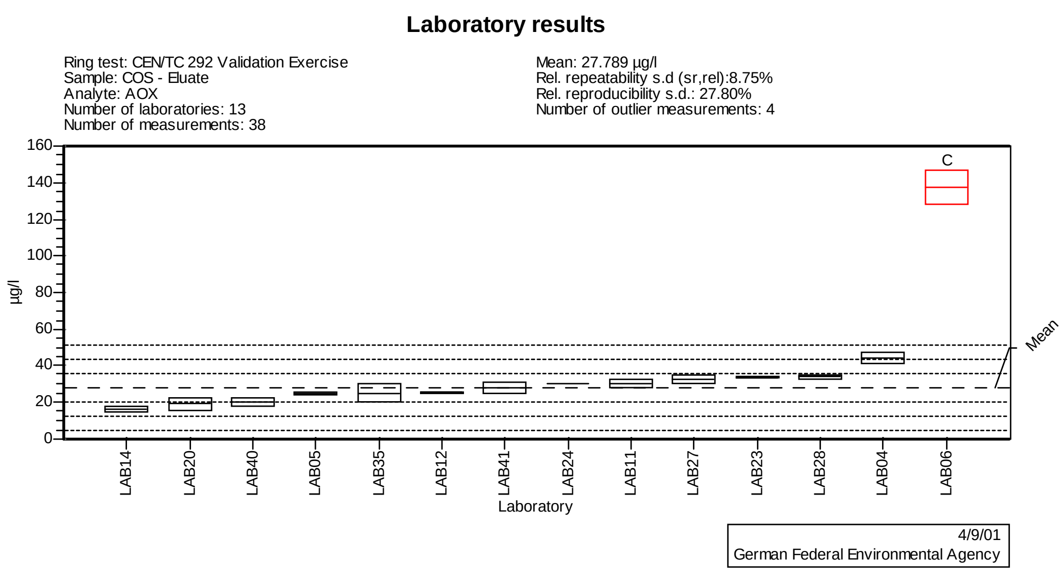
LAB40	SEW	TOC - Analyser	EN 1484	mg/l	1559	1565	1553	1560	
LAB40	SEW	Tot N - ?	EN 12260	mg/l	824	828	822	825	
LAB40	SEW	Tot P - ?		mg/l	18.4	19.4	19.6	19.6	
LAB40	SYN1	CN - FIA	ISO 14403	mg/l	0.174	0.174	0.173	0.174	
LAB40	SYN2	CN - FIA	ISO 14403	mg/l	0.035	0.036	0.035	0.036	
LAB40	SYN2	Hg - CV-AAS	EN 1483	mg/l	7	7	7		
LAB40	SYN2	NH4 - FIA	ISO 11732	mg/l	0.19	0.19	0.19	0.18	
LAB40	SYN2	NO2 - FIA	ISO 13395	mg/l	0.15	0.15	0.15	0.15	
LAB40D	SBW	Phenol index - FIA	ISO 14402	mg/l	0.025	0.027	0.027	0.028	dest.
LAB40D	SYN2	Phenol index - FIA	ISO 14402	mg/l	0.059	0.058	0.06	0.059	dest.
LAB40E	SBW	Phenol index - FIA	ISO 14402	mg/l	0.099	0.101	0.1	0.099	extr.
LAB40E	SYN2	Phenol index - FIA	ISO 14402	mg/l	0.069	0.066	0.068	0.066	extr.
LAB41	COS	AOX - Analyser	EN 1485	µg/l	25.8	26.3	31.2		
LAB41	COS	As - Hydride AAS	EN 11969	µg/l	14.9	15.4	15.6		
LAB41	COS	Cd - AAS	ISO 8288	µg/l	200	210	200		
LAB41	COS	Cu - AAS	ISO 8288	µg/l	360	360	380		
LAB41	COS	Ni - AAS	ISO 8288	µg/l	45.7	51	48.8		
LAB41	COS	Pb - AAS	ISO 8288	µg/l	340	330	340		
LAB41	COS	TOC - Analyser	EN 1484	mg/l	15.4	16.3	15.7		
LAB41	COS	Zn - AAS	ISO 8288	µg/l	52000	51000	51500		

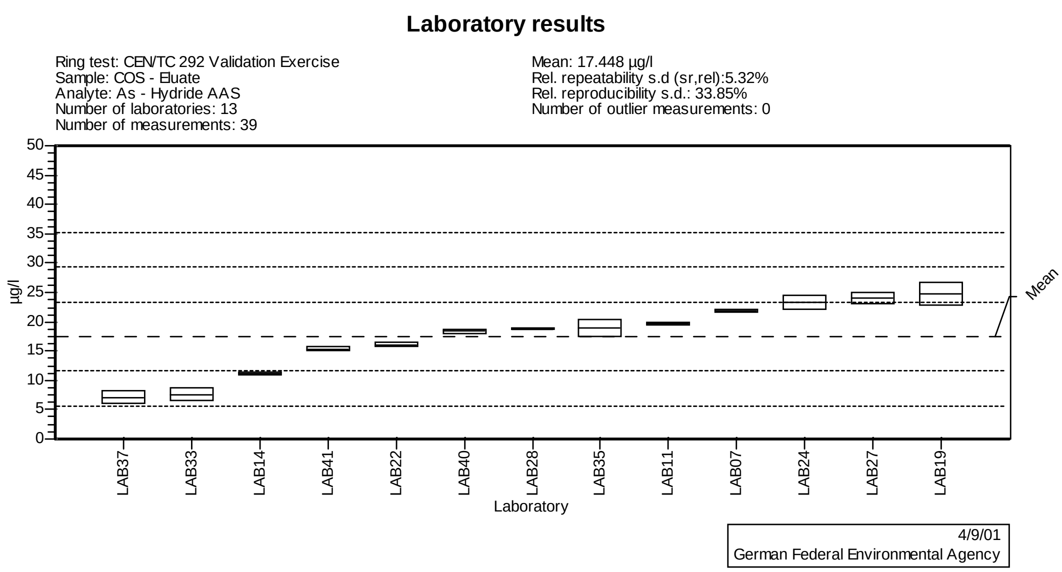
Lab	**Eluate**	**Parameter / Methode**	**Standard**	Units	**R1**	**R2**	**R3**	**R4**	**Remarks**
LAB41	SBW	Phenol index - Photometry	ISO 6439	mg/l	0.222	0.222	0.256		
LAB41	SEW	AOX - Analyser	EN 1485	mg/l	0.167	0.15	0.151		
LAB41	SEW	As - Hydride AAS	EN 11969	µg/l	11.3	11.6	11		
LAB41	SEW	CN - Photometry	ISO 6703	mg/l	0.0127	0.0121	0.00941		
LAB41	SEW	NH4 - Photometry	ISO 7150	mg/l	330	330	330		
LAB41	SEW	NO2 - Photometry	EN 26777	mg/l	0.0495	0.0387	0.047		
LAB41	SEW	TOC - Analyser	EN 1484	mg/l	1550	1480	1550		
LAB41	SYN1	Cd - AAS	ISO 8288	µg/l	45.8	46.1	45		
LAB41	SYN1	CN - Photometry	ISO 6703	mg/l	0.197	0.196	0.195		
LAB41	SYN1	Cr(VI) - Photometry	ISO 11083	mg/l	0.0774	0.0779	0.0779		
LAB41	SYN1	Cu - AAS	ISO 8288	µg/l	23.4	23.1	23.1		
LAB41	SYN1	Ni - AAS	ISO 8288	µg/l	22.6	22.6	21.5		
LAB41	SYN1	Pb - AAS	ISO 8288	µg/l	18.1	17.9	20.2		
LAB41	SYN1	Zn - AAS	ISO 8288	µg/l	740	720	750		
LAB41	SYN2	Cd - AAS	ISO 8288	µg/l	43.1	42.9	35.6		
LAB41	SYN2	CN - Photometry	ISO 6703	mg/l	0.0488	0.0501	0.0491		
LAB41	SYN2	Cu - AAS	ISO 8288	µg/l	23.6	23	23		
LAB41	SYN2	Hg - CV-AAS	EN 1483	µg/l	6.7	6.3	6.1		
LAB41	SYN2	NH4 - Photometry	ISO 7150	mg/l	0.217	0.232	0.224		
LAB41	SYN2	Ni - AAS	ISO 8288	µg/l	22.8	19.8	22.1		
LAB41	SYN2	NO2 - Photometry	EN 26777	mg/l	0.208	0.211	0.196		
LAB41	SYN2	Pb - AAS	ISO 8288	µg/l	19.7	21	22.9		
LAB41	SYN2	Phenol index - Photometry	ISO 6439	mg/l	0.089	0.089	0.09		
LAB41	SYN2	Zn - AAS	ISO 8288	µg/l	830	800	850		

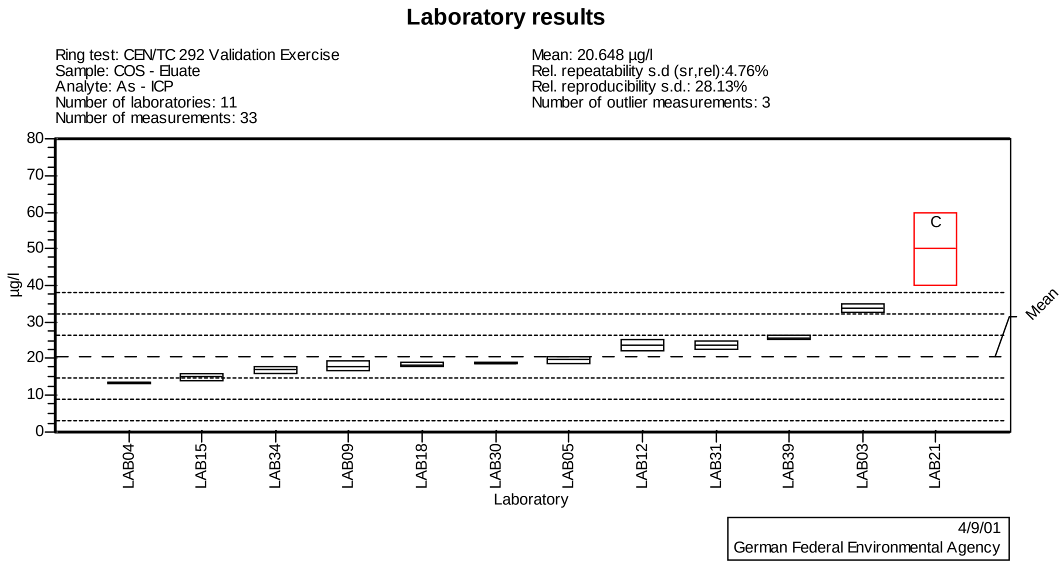
Annex 5

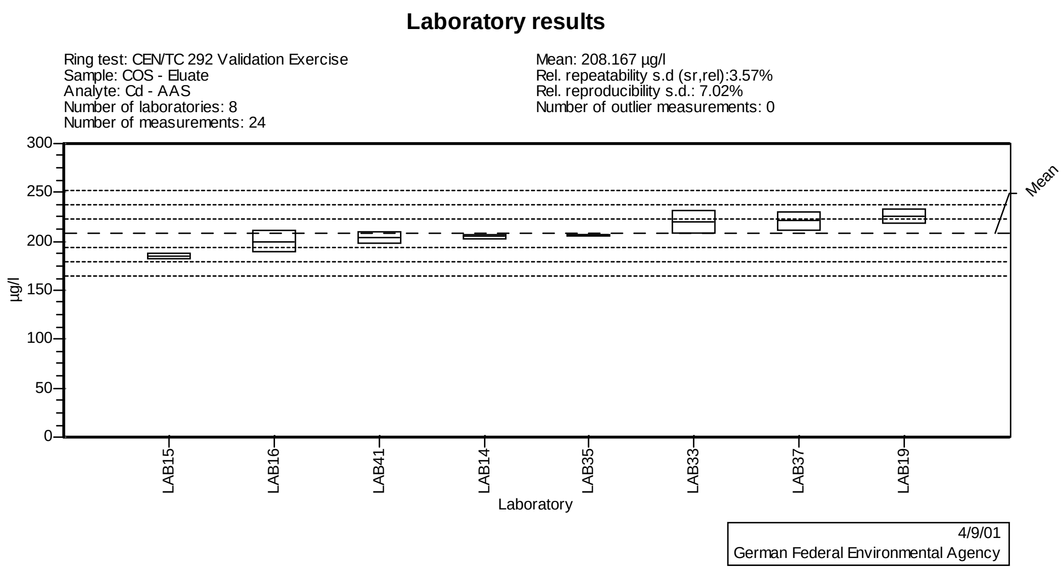
Statistical evaluation of the data

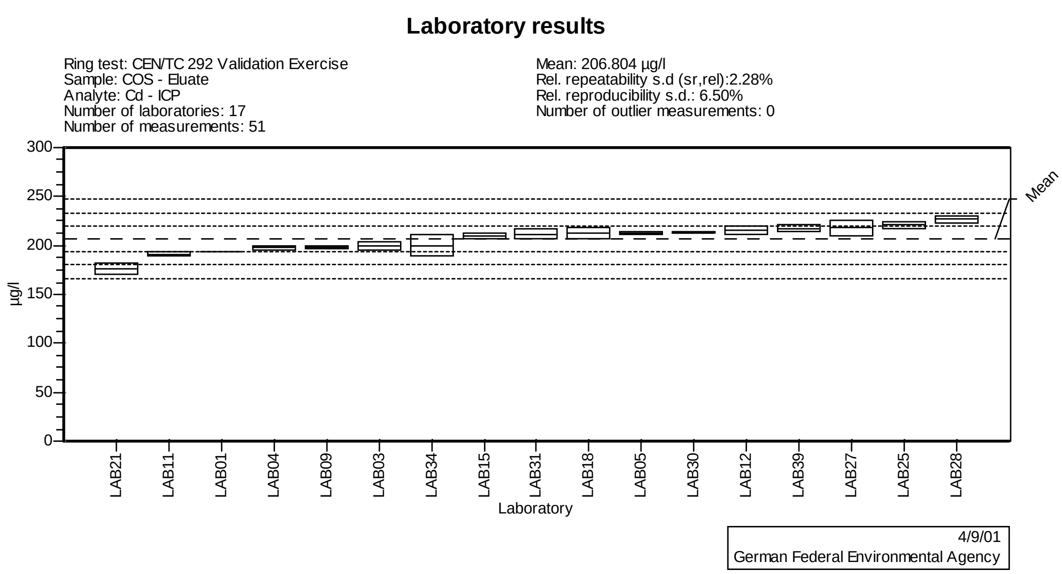
(COS, FFC, SEW, SBW, SYN1, SYN2, SYN3)

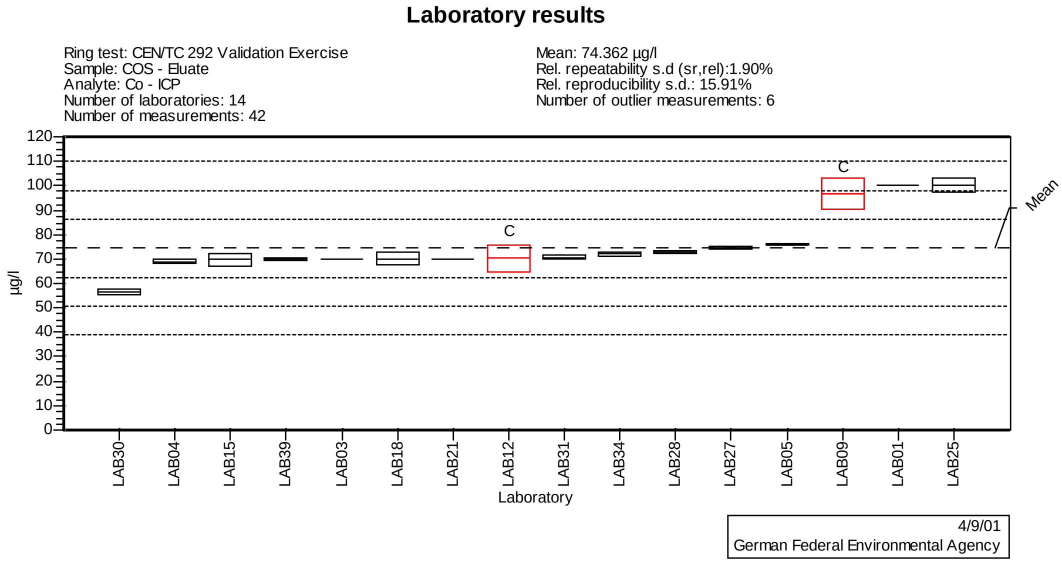

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: AOX
Number of laboratories: 13
Number of measurements: 38
Mean: 27.789 µg/l
Rel. repeatability s.d (sr,rel):8.75%
Rel. reproducibility s.d.: 27.80%
Number of outlier measurements: 4
µg/l
C
Mean
LAB14
LAB20
LAB40
LAB05
LAB35
LAB12
LAB41
LAB24
LAB11
LAB27
LAB23
LAB28
LAB04
LAB06
Laboratory
4/9/01
German Federal Environmental Agency

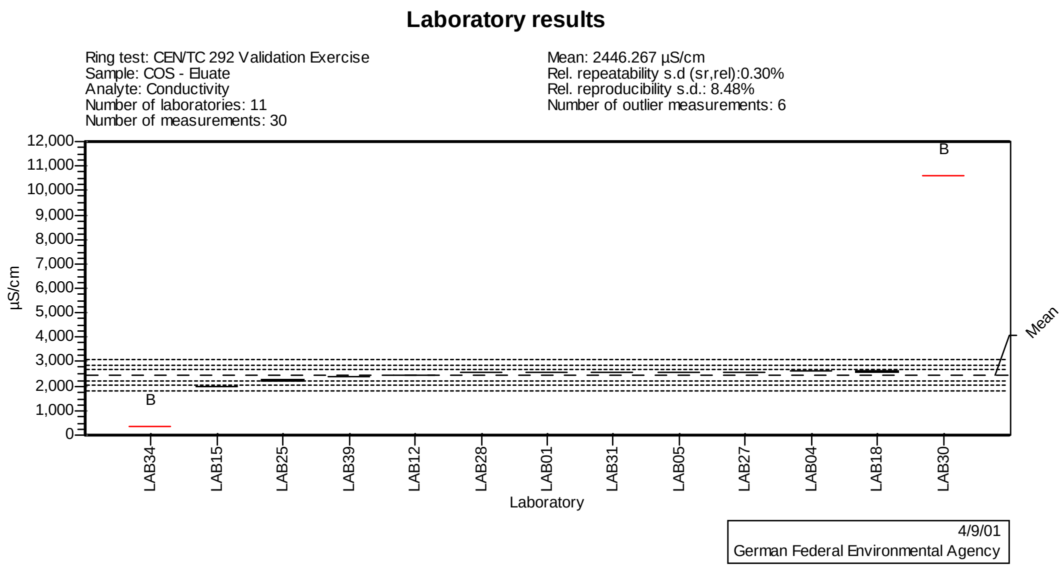

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: As - Hydride AAS
Number of laboratories: 13
Number of measurements: 39
Mean: 17.448 µg/l
Rel. repeatability s.d (sr,rel):5.32%
Rel. reproducibility s.d.: 33.85%
Number of outlier measurements: 0
µg/l
Mean
LAB37
LAB33
LAB14
LAB41
LAB22
LAB40
LAB28
LAB35
LAB11
LAB07
LAB24
LAB27
LAB19
Laboratory
4/9/01
German Federal Environmental Agency

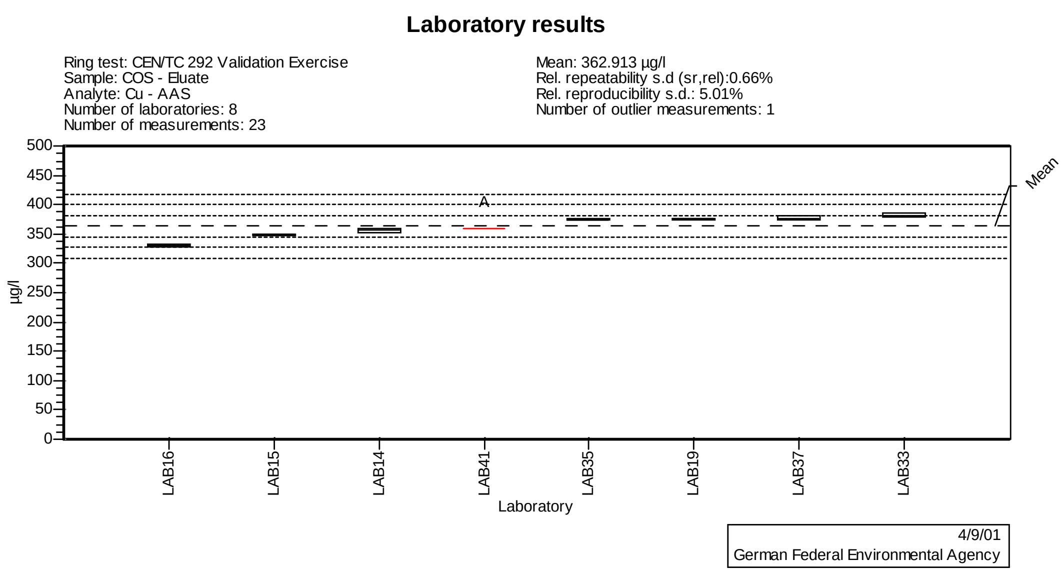

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: As - ICP
Number of laboratories: 11
Number of measurements: 33
Mean: 20.648 µg/l
Rel. repeatability s.d (sr,rel):4.76%
Rel. reproducibility s.d.: 28.13%
Number of outlier measurements: 3
µg/l
0
10
20
30
40
50
60
70
80
C
Mean
LAB04
LAB15
LAB34
LAB09
LAB18
LAB30
LAB05
LAB12
LAB31
LAB39
LAB03
LAB21
Laboratory
4/9/01
German Federal Environmental Agency

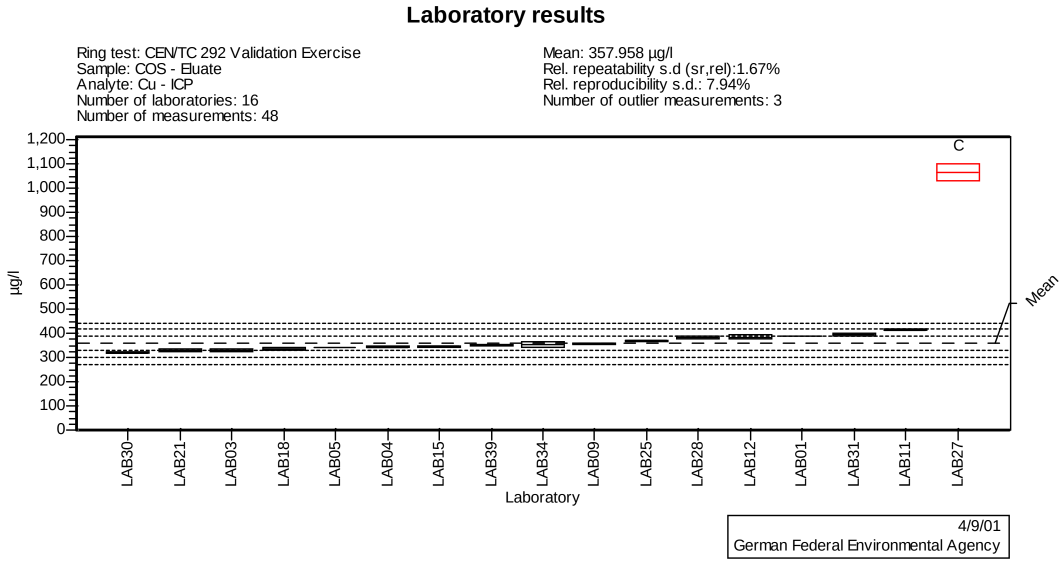

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Cd - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 208.167 µg/l
Rel. repeatability s.d (sr,rel):3.57%
Rel. reproducibility s.d.: 7.02%
Number of outlier measurements: 0
µg/l
0
50
100
150
200
250
300
Mean
LAB15
LAB16
LAB41
LAB14
LAB35
LAB33
LAB37
LAB19
Laboratory
4/9/01
German Federal Environmental Agency

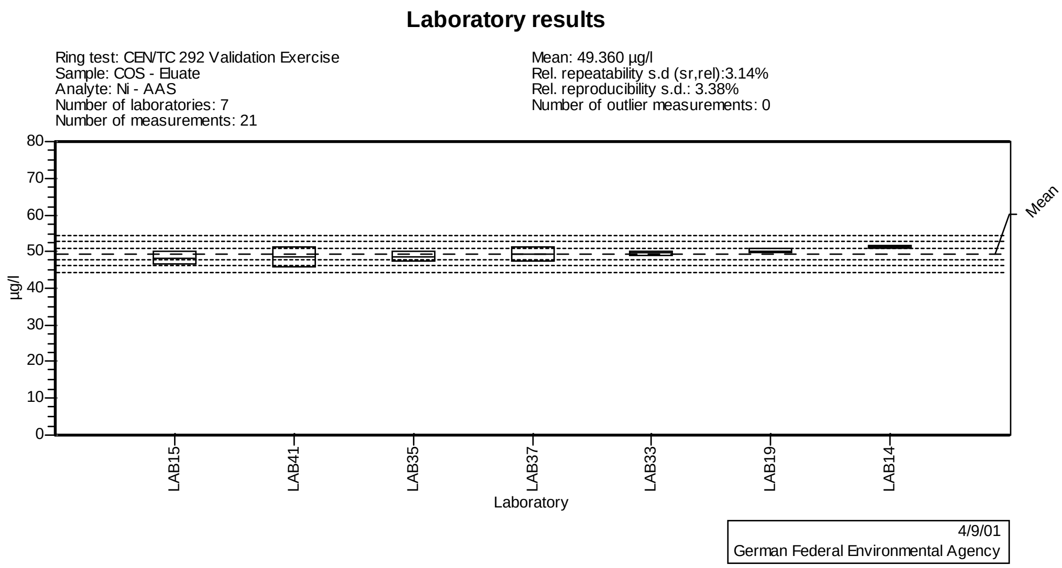

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Cd - ICP
Number of laboratories: 17
Number of measurements: 51
Mean: 206.804 µg/l
Rel. repeatability s.d (sr,rel):2.28%
Rel. reproducibility s.d.: 6.50%
Number of outlier measurements: 0
µg/l
0
50
100
150
200
250
300
Mean
LAB21
LAB11
LAB01
LAB04
LAB09
LAB03
LAB34
LAB15
LAB31
LAB18
LAB05
LAB30
LAB12
LAB39
LAB27
LAB25
LAB28
Laboratory
4/9/01
German Federal Environmental Agency

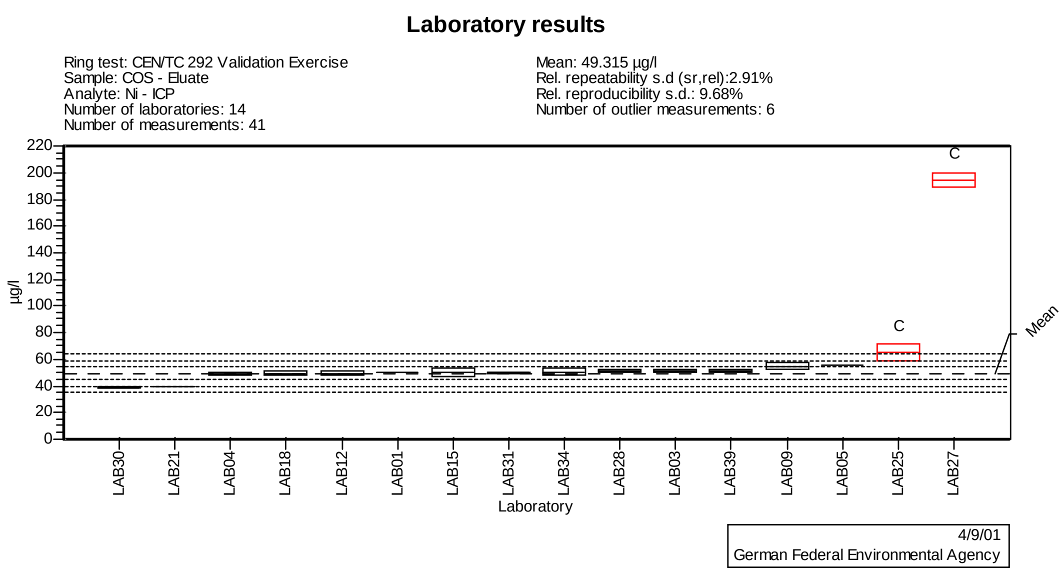

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Co - ICP
Number of laboratories: 14
Number of measurements: 42
Mean: 74.362 µg/l
Rel. repeatability s.d (sr,rel):1.90%
Rel. reproducibility s.d.: 15.91%
Number of outlier measurements: 6
µg/l
Laboratory
LAB30 LAB04 LAB15 LAB39 LAB03 LAB18 LAB21 LAB12 LAB31 LAB34 LAB28 LAB27 LAB05 LAB09 LAB01 LAB25
Mean
4/9/01
German Federal Environmental Agency

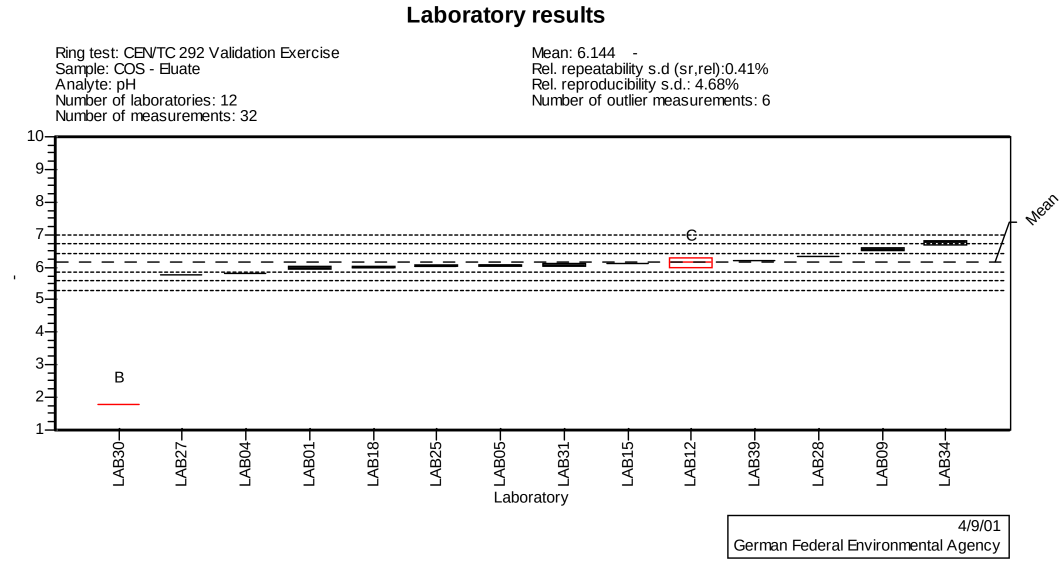

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Conductivity
Number of laboratories: 11
Number of measurements: 30
Mean: 2446.267 µS/cm
Rel. repeatability s.d (sr,rel):0.30%
Rel. reproducibility s.d.: 8.48%
Number of outlier measurements: 6
µS/cm
Laboratory
LAB34 LAB15 LAB25 LAB39 LAB12 LAB28 LAB01 LAB31 LAB05 LAB27 LAB04 LAB18 LAB30
Mean
4/9/01
German Federal Environmental Agency

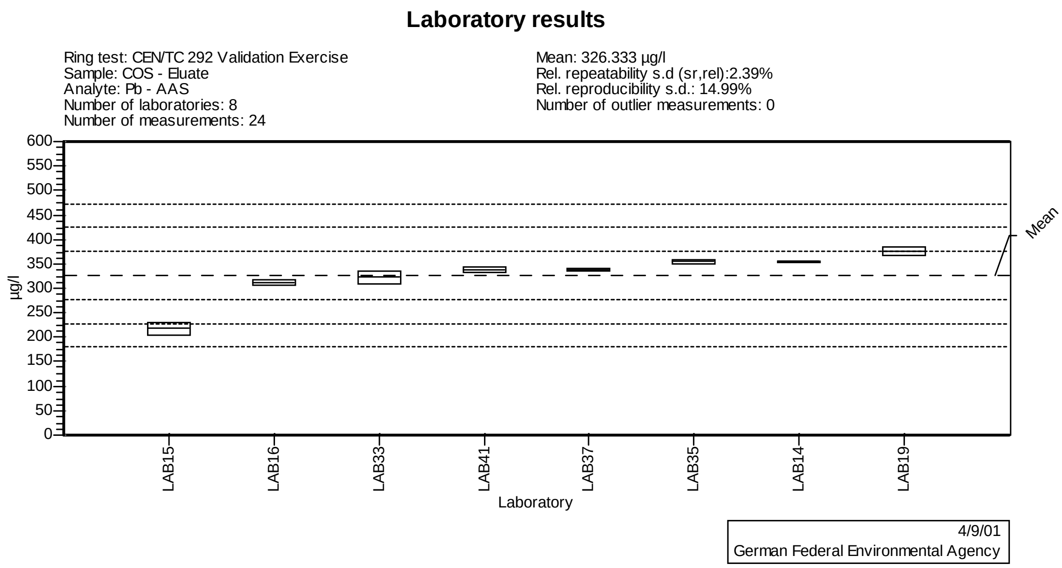

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Cu - AAS
Number of laboratories: 8
Number of measurements: 23
Mean: 362.913 µg/l
Rel. repeatability s.d (sr,rel):0.66%
Rel. reproducibility s.d.: 5.01%
Number of outlier measurements: 1
µg/l
Laboratory
LAB16 LAB15 LAB14 LAB41 LAB35 LAB19 LAB37 LAB33
Mean
4/9/01
German Federal Environmental Agency

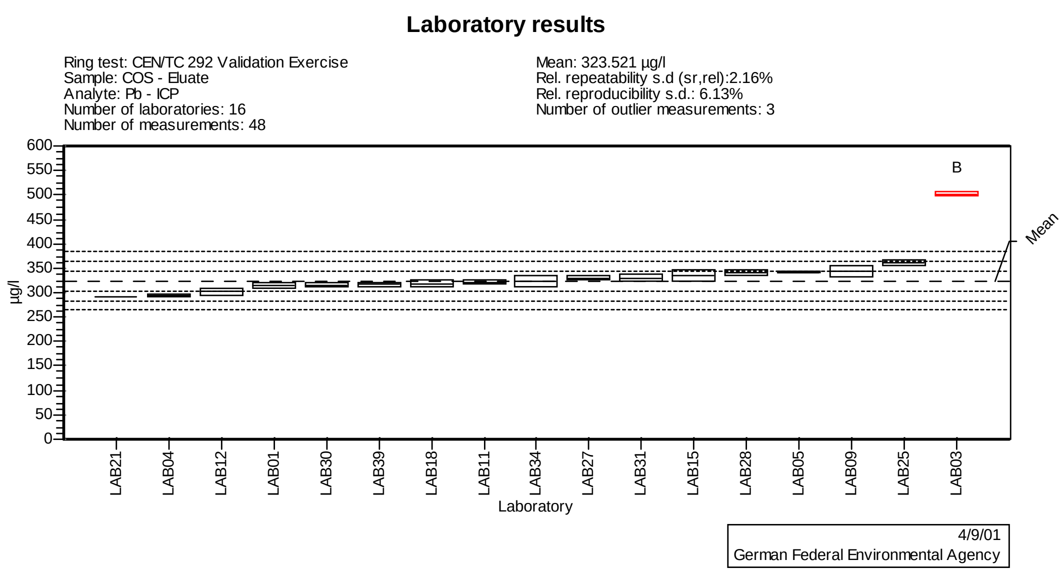

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Cu - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 357.958 µg/l
Rel. repeatability s.d (sr,rel):1.67%
Rel. reproducibility s.d.: 7.94%
Number of outlier measurements: 3
µg/l
Mean
C
LAB30 LAB21 LAB03 LAB18 LAB05 LAB04 LAB15 LAB39 LAB34 LAB09 LAB25 LAB28 LAB12 LAB01 LAB31 LAB11 LAB27
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Ni - AAS
Number of laboratories: 7
Number of measurements: 21
Mean: 49.360 µg/l
Rel. repeatability s.d (sr,rel):3.14%
Rel. reproducibility s.d.: 3.38%
Number of outlier measurements: 0
µg/l
Mean
LAB15 LAB41 LAB35 LAB37 LAB33 LAB19 LAB14
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Ni - ICP
Number of laboratories: 14
Number of measurements: 41
Mean: 49.315 µg/l
Rel. repeatability s.d (sr,rel):2.91%
Rel. reproducibility s.d.: 9.68%
Number of outlier measurements: 6
µg/l
Mean
C
C
LAB30 LAB21 LAB04 LAB18 LAB12 LAB01 LAB15 LAB31 LAB34 LAB28 LAB03 LAB39 LAB09 LAB05 LAB25 LAB27
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: pH
Number of laboratories: 12
Number of measurements: 32
Mean: 6.144 -
Rel. repeatability s.d (sr,rel):0.41%
Rel. reproducibility s.d.: 4.68%
Number of outlier measurements: 6
Mean
B
C
LAB30 LAB27 LAB04 LAB01 LAB18 LAB25 LAB05 LAB31 LAB15 LAB12 LAB39 LAB28 LAB09 LAB34
Laboratory
4/9/01
German Federal Environmental Agency

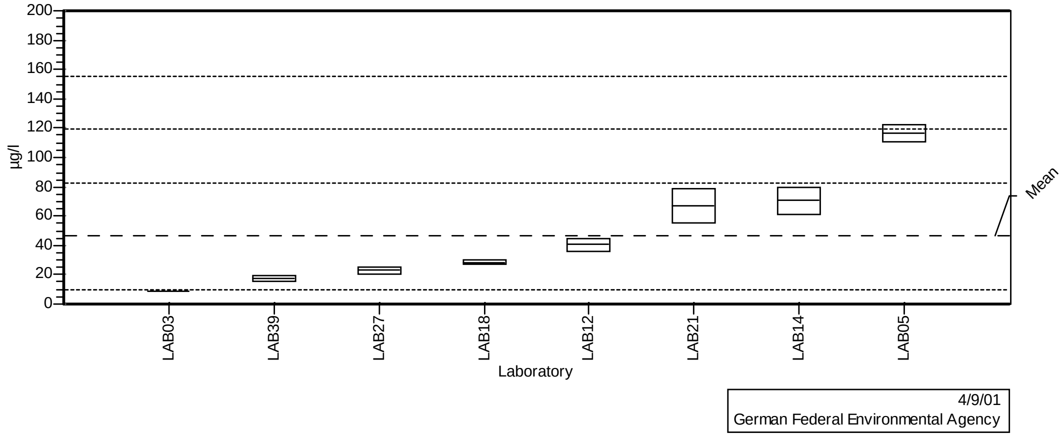

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Pb - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 326.333 µg/l
Rel. repeatability s.d (sr,rel):2.39%
Rel. reproducibility s.d.: 14.99%
Number of outlier measurements: 0
µg/l
Mean
LAB15 LAB16 LAB33 LAB41 LAB37 LAB35 LAB14 LAB19
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Pb - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 323.521 µg/l
Rel. repeatability s.d (sr,rel):2.16%
Rel. reproducibility s.d.: 6.13%
Number of outlier measurements: 3
µg/l
Mean
B
LAB21 LAB04 LAB12 LAB01 LAB30 LAB39 LAB18 LAB11 LAB34 LAB27 LAB31 LAB15 LAB28 LAB05 LAB09 LAB25 LAB03
Laboratory
4/9/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: P - ICP
Number of laboratories: 8
Number of measurements: 24

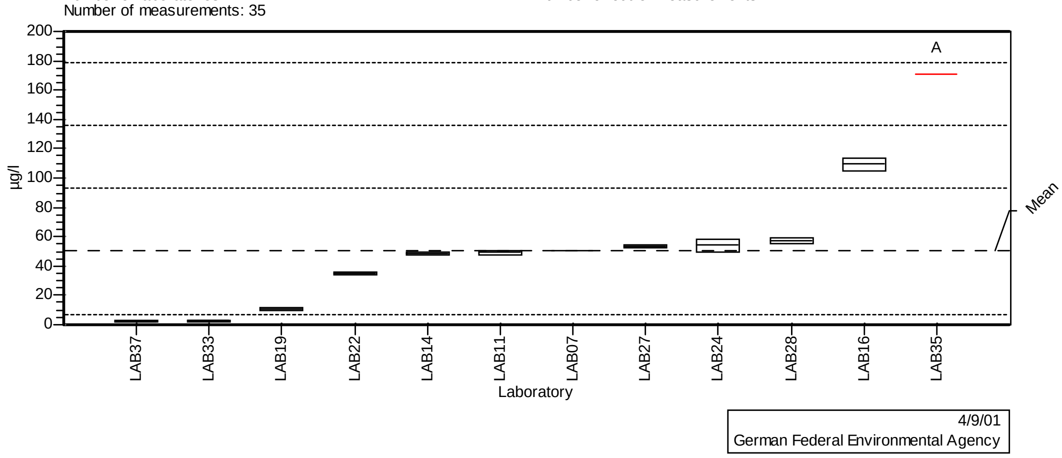
Mean: 46.445 µg/l
Rel. repeatability s.d (sr,rel):12.81%
Rel. reproducibility s.d.: 78.44%
Number of outlier measurements: 0



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Sb - Hydride AAS
Number of laboratories: 12
Number of measurements: 35

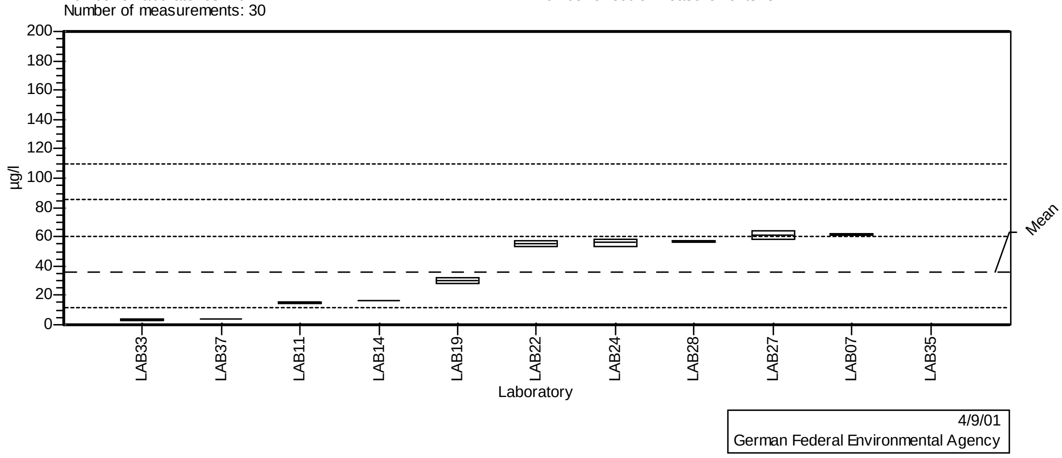
Mean: 50.165 µg/l
Rel. repeatability s.d (sr,rel):4.03%
Rel. reproducibility s.d.: 85.63%
Number of outlier measurements: 1

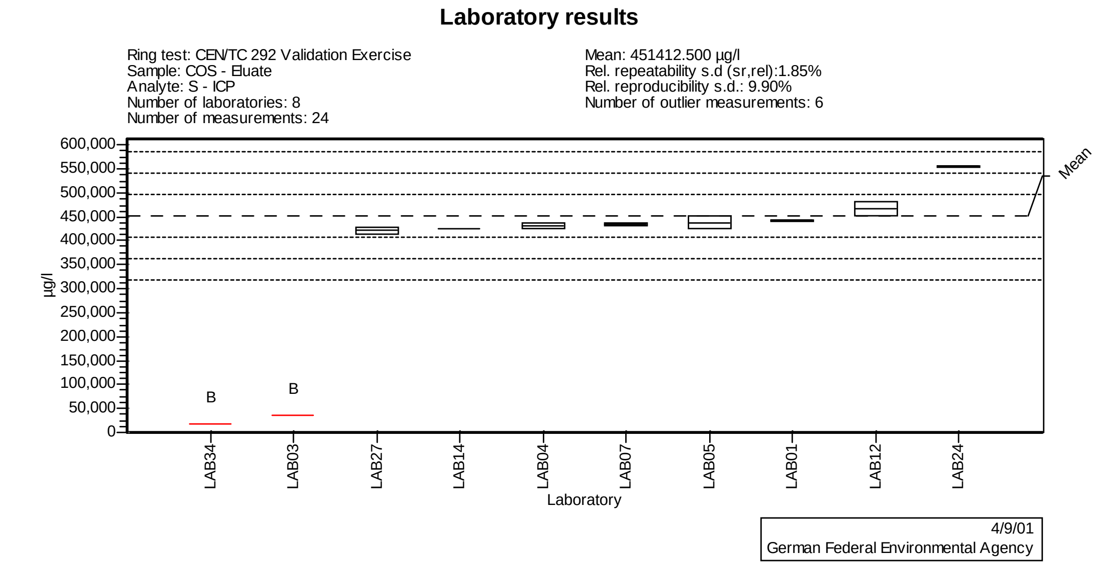


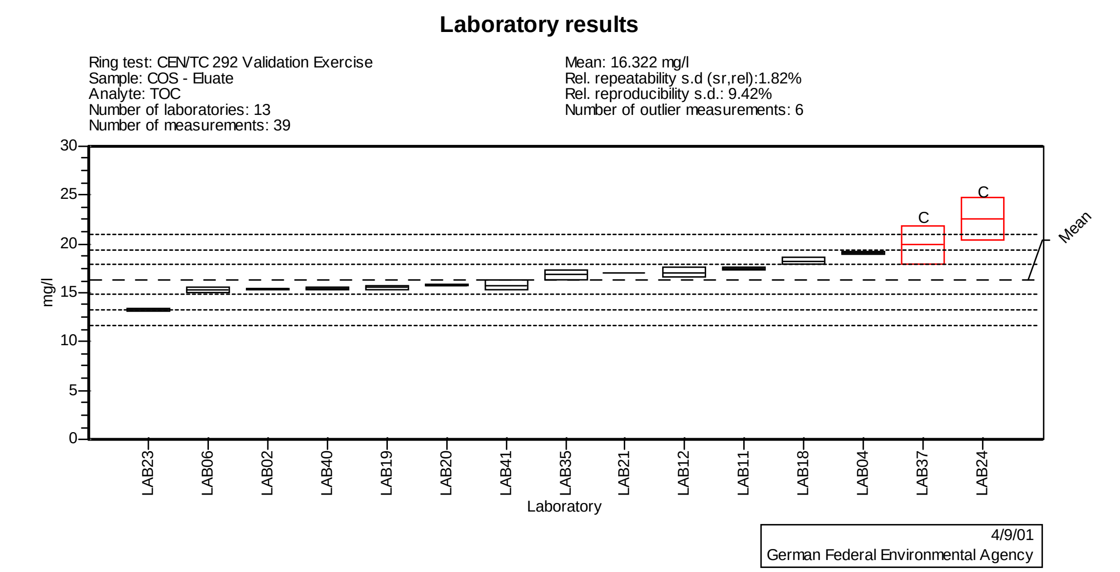
Laboratory results

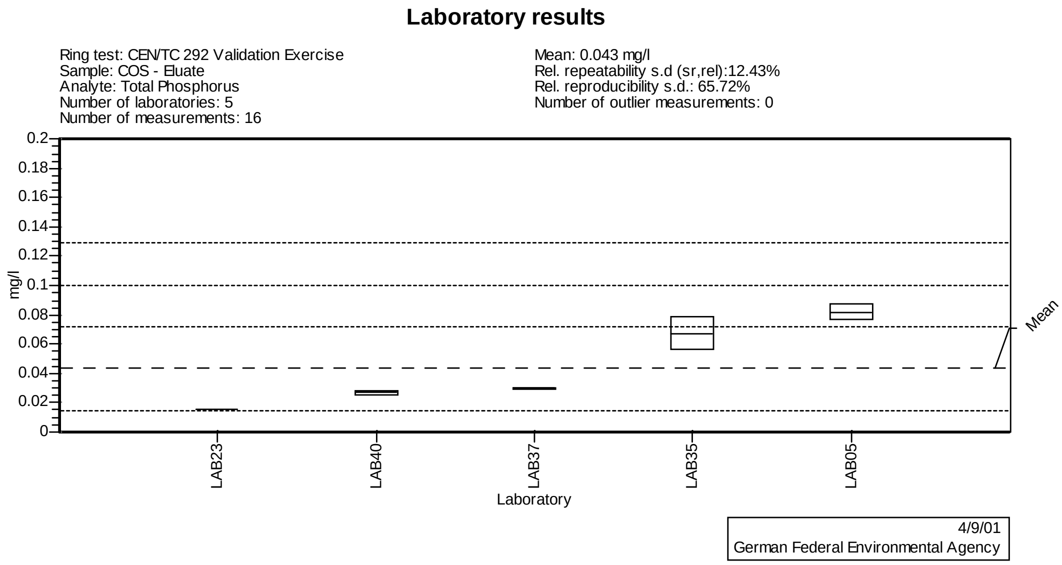
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Se - Hydride AAS
Number of laboratories: 10
Number of measurements: 30

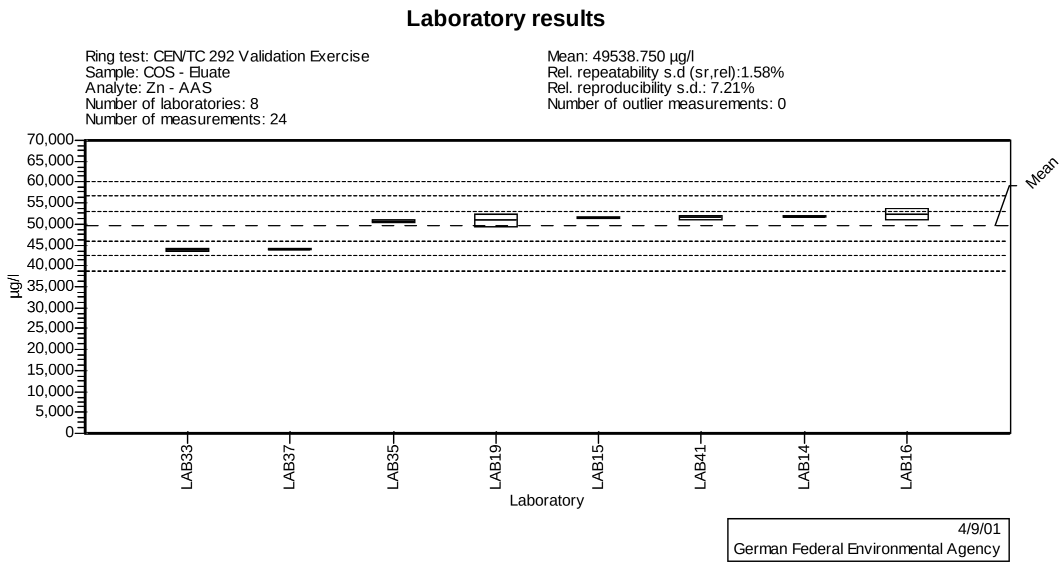
Mean: 35.983 µg/l
Rel. repeatability s.d (sr,rel):4.35%
Rel. reproducibility s.d.: 68.56%
Number of outlier measurements: 3

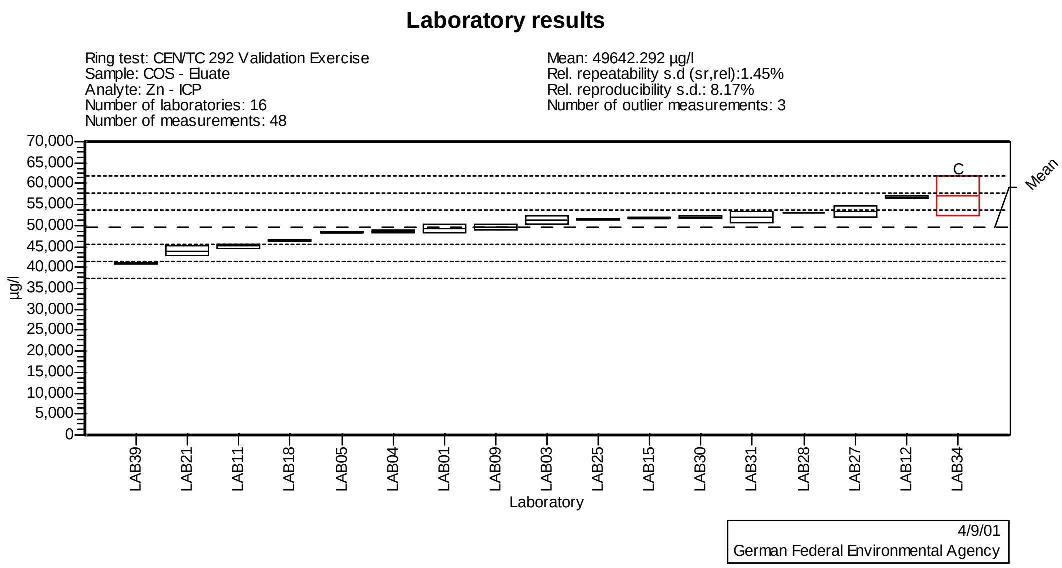


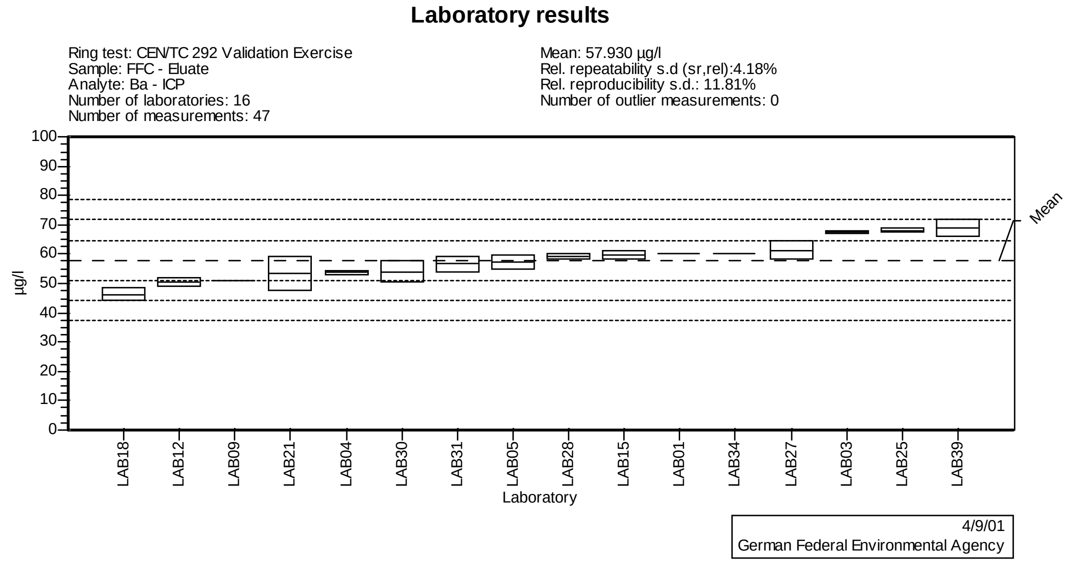

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: S - ICP
Number of laboratories: 8
Number of measurements: 24
Mean: 451412.500 µg/l
Rel. repeatability s.d (sr,rel):1.85%
Rel. reproducibility s.d.: 9.90%
Number of outlier measurements: 6
µg/l
Laboratory
LAB34
LAB03
LAB27
LAB14
LAB04
LAB07
LAB05
LAB01
LAB12
LAB24
B
B
Mean
4/9/01
German Federal Environmental Agency

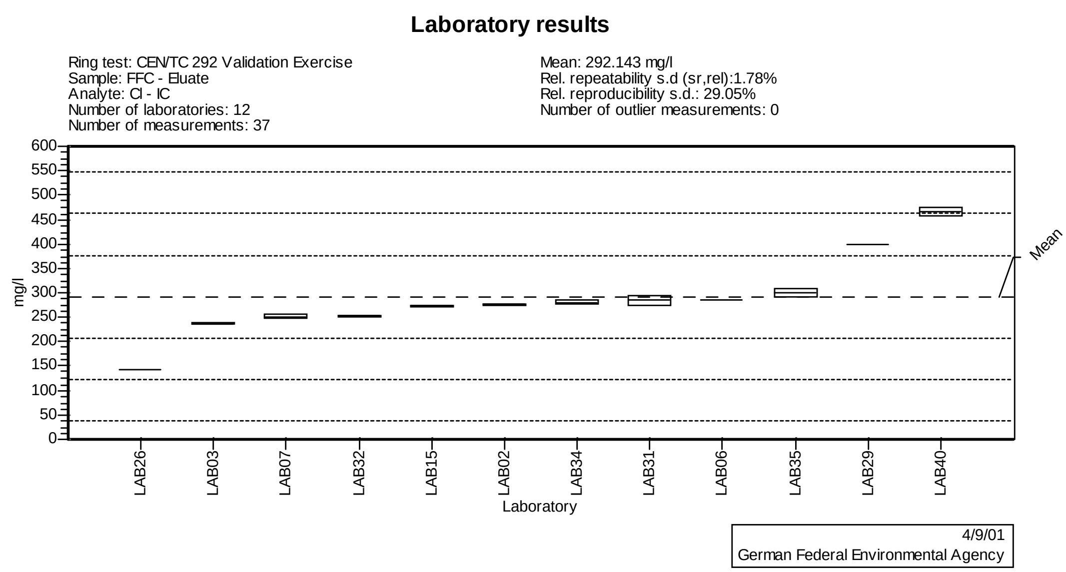

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: TOC
Number of laboratories: 13
Number of measurements: 39
Mean: 16.322 mg/l
Rel. repeatability s.d (sr,rel):1.82%
Rel. reproducibility s.d.: 9.42%
Number of outlier measurements: 6
mg/l
Laboratory
LAB23
LAB06
LAB02
LAB40
LAB19
LAB20
LAB41
LAB35
LAB21
LAB12
LAB11
LAB18
LAB04
LAB37
LAB24
C
C
Mean
4/9/01
German Federal Environmental Agency

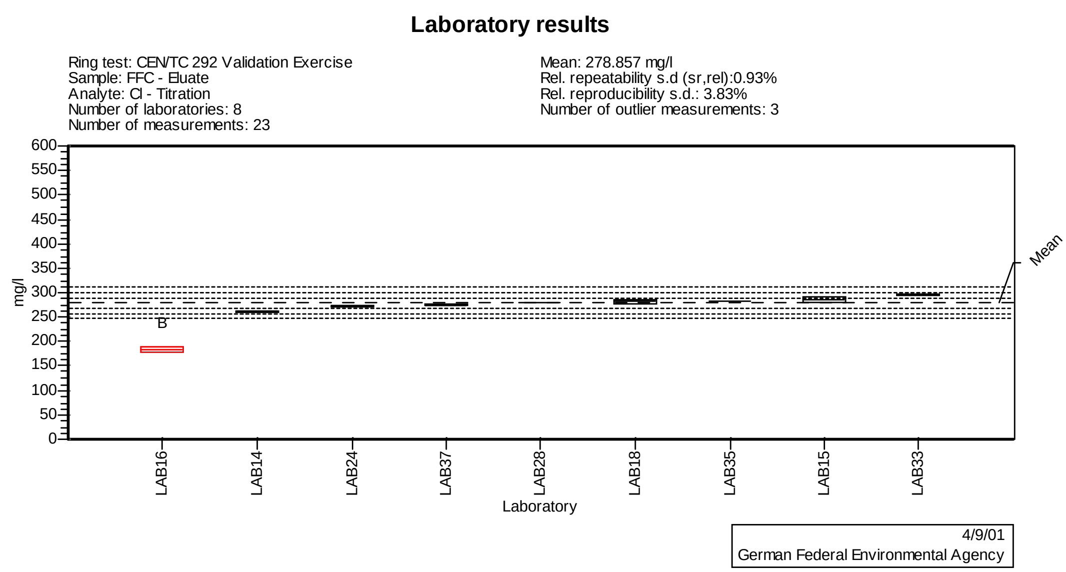

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Total Phosphorus
Number of laboratories: 5
Number of measurements: 16
Mean: 0.043 mg/l
Rel. repeatability s.d (sr,rel):12.43%
Rel. reproducibility s.d.: 65.72%
Number of outlier measurements: 0
mg/l
Mean
LAB23
LAB40
LAB37
LAB35
LAB05
Laboratory
4/9/01
German Federal Environmental Agency

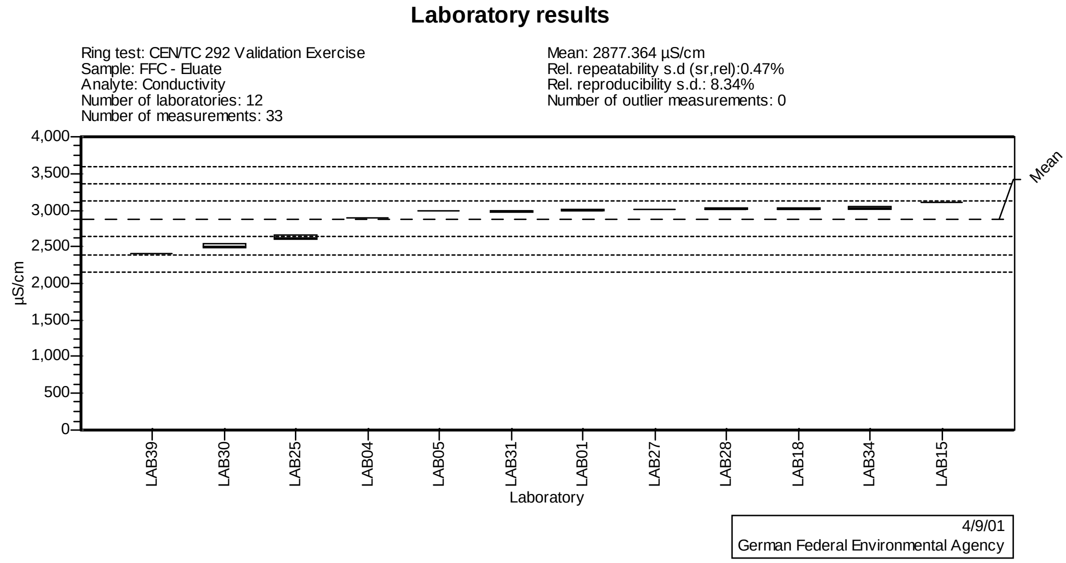

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Zn - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 49538.750 µg/l
Rel. repeatability s.d (sr,rel):1.58%
Rel. reproducibility s.d.: 7.21%
Number of outlier measurements: 0
µg/l
Mean
LAB33
LAB37
LAB35
LAB19
LAB15
LAB41
LAB14
LAB16
Laboratory
4/9/01
German Federal Environmental Agency

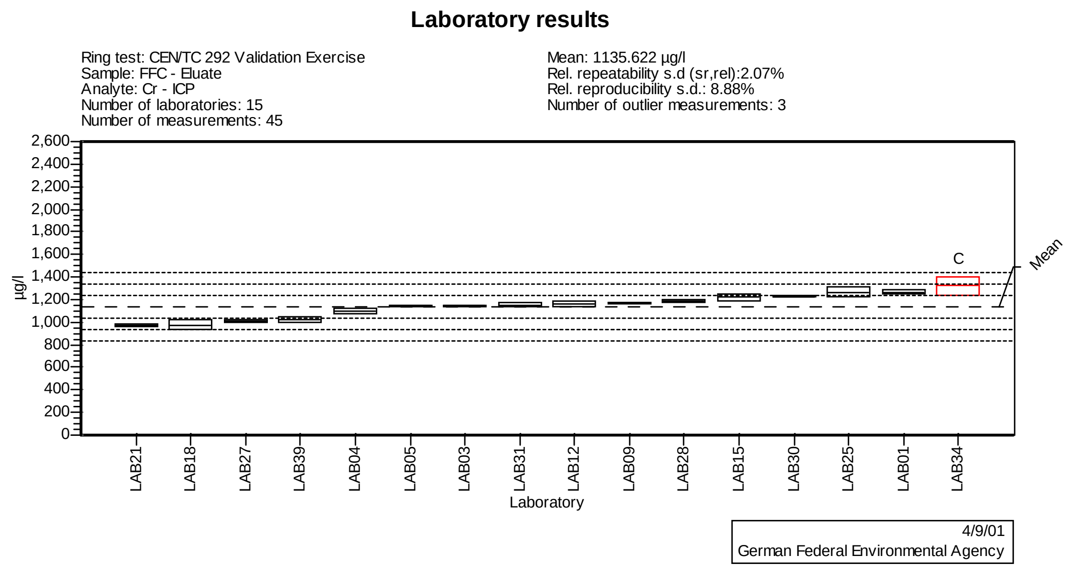

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: COS - Eluate
Analyte: Zn - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 49642.292 µg/l
Rel. repeatability s.d (sr,rel):1.45%
Rel. reproducibility s.d.: 8.17%
Number of outlier measurements: 3
µg/l
C
Mean
LAB39
LAB21
LAB11
LAB18
LAB05
LAB04
LAB01
LAB09
LAB03
LAB25
LAB15
LAB30
LAB31
LAB28
LAB27
LAB12
LAB34
Laboratory
4/9/01
German Federal Environmental Agency

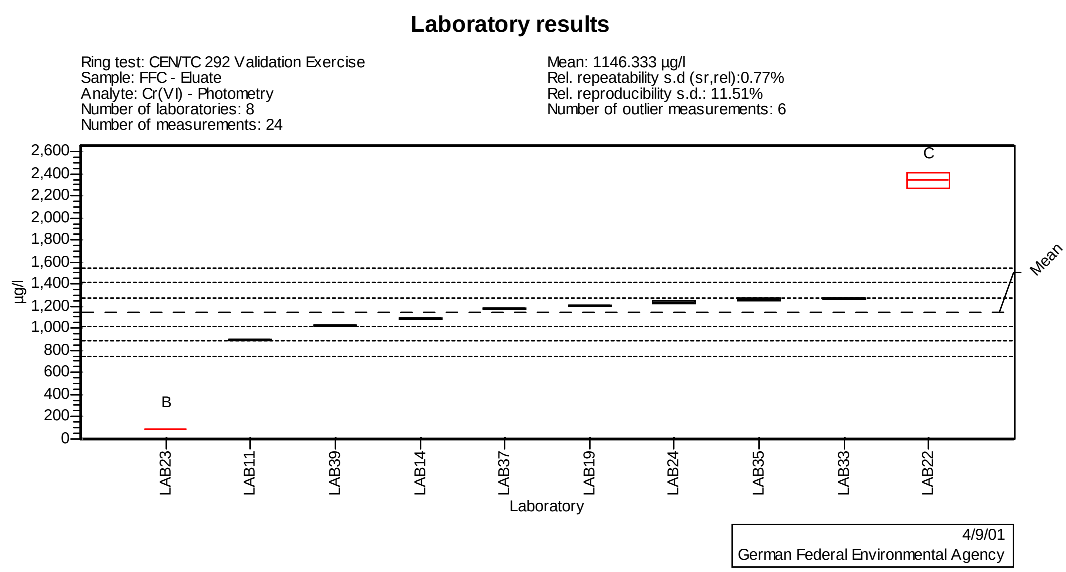

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Ba - ICP
Number of laboratories: 16
Number of measurements: 47
Mean: 57.930 µg/l
Rel. repeatability s.d (sr,rel):4.18%
Rel. reproducibility s.d.: 11.81%
Number of outlier measurements: 0
µg/l
Mean
LAB18 LAB12 LAB09 LAB21 LAB04 LAB30 LAB31 LAB05 LAB28 LAB15 LAB01 LAB34 LAB27 LAB03 LAB25 LAB39
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Cl - IC
Number of laboratories: 12
Number of measurements: 37
Mean: 292.143 mg/l
Rel. repeatability s.d (sr,rel):1.78%
Rel. reproducibility s.d.: 29.05%
Number of outlier measurements: 0
mg/l
Mean
LAB26 LAB03 LAB07 LAB32 LAB15 LAB02 LAB34 LAB31 LAB06 LAB35 LAB29 LAB40
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Cl - Titration
Number of laboratories: 8
Number of measurements: 23
Mean: 278.857 mg/l
Rel. repeatability s.d (sr,rel):0.93%
Rel. reproducibility s.d.: 3.83%
Number of outlier measurements: 3
mg/l
Mean
B
LAB16 LAB14 LAB24 LAB37 LAB28 LAB18 LAB35 LAB15 LAB33
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Conductivity
Number of laboratories: 12
Number of measurements: 33
Mean: 2877.364 µS/cm
Rel. repeatability s.d (sr,rel):0.47%
Rel. reproducibility s.d.: 8.34%
Number of outlier measurements: 0
µS/cm
Mean
LAB39 LAB30 LAB25 LAB04 LAB05 LAB31 LAB01 LAB27 LAB28 LAB18 LAB34 LAB15
Laboratory
4/9/01
German Federal Environmental Agency

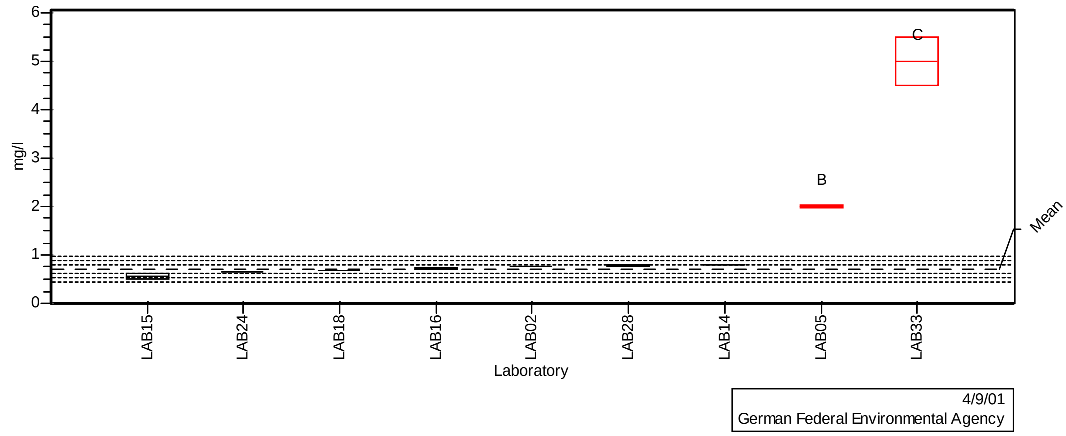

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Cr - ICP
Number of laboratories: 15
Number of measurements: 45
Mean: 1135.622 µg/l
Rel. repeatability s.d (sr,rel):2.07%
Rel. reproducibility s.d.: 8.88%
Number of outlier measurements: 3
µg/l
Mean
C
LAB21 LAB18 LAB27 LAB39 LAB04 LAB05 LAB03 LAB31 LAB12 LAB09 LAB28 LAB15 LAB30 LAB25 LAB01 LAB34
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Cr(VI) - Photometry
Number of laboratories: 8
Number of measurements: 24
Mean: 1146.333 µg/l
Rel. repeatability s.d (sr,rel):0.77%
Rel. reproducibility s.d.: 11.51%
Number of outlier measurements: 6
µg/l
Mean
B
C
LAB23 LAB11 LAB39 LAB14 LAB37 LAB19 LAB24 LAB35 LAB33 LAB22
Laboratory
4/9/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: F - Electrode
Number of laboratories: 7
Number of measurements: 21

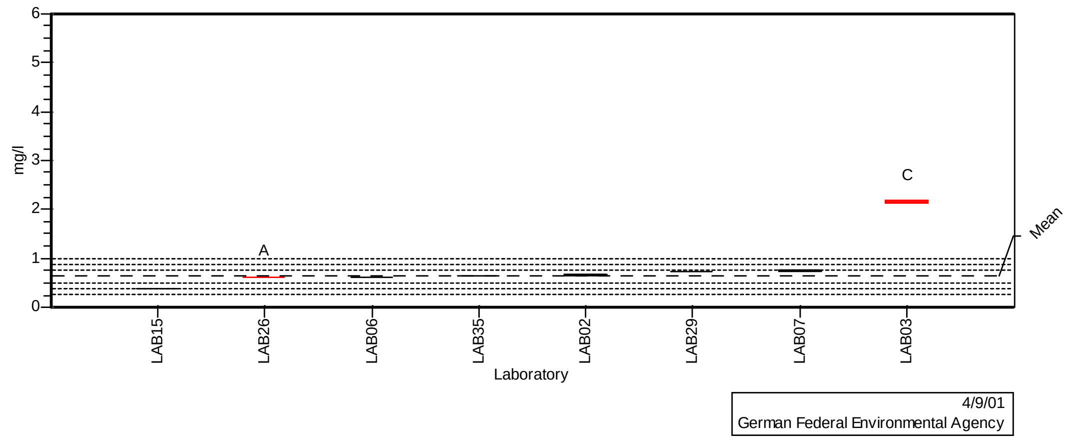
Mean: 0.709 mg/l
Rel. repeatability s.d (sr,rel):3.25%
Rel. reproducibility s.d.: 12.15%
Number of outlier measurements: 6



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: F - IC
Number of laboratories: 7
Number of measurements: 20

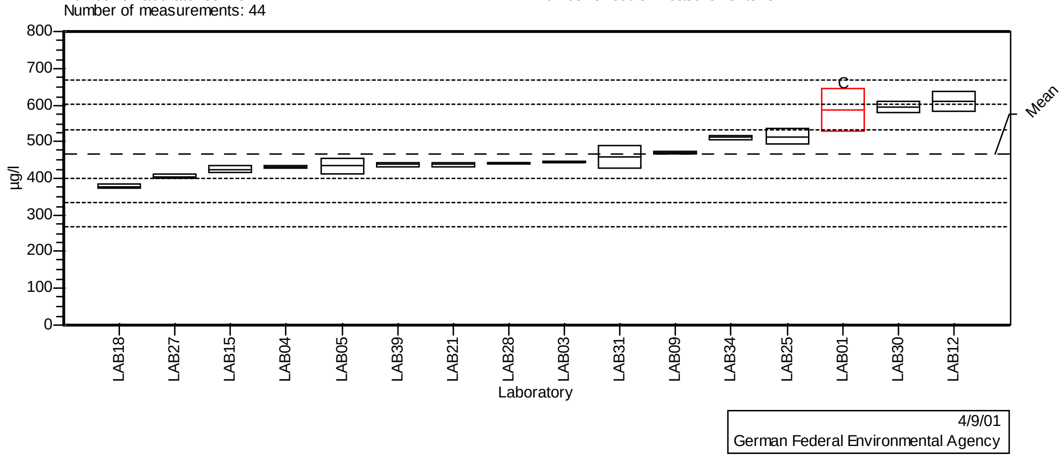
Mean: 0.629 mg/l
Rel. repeatability s.d (sr,rel):1.35%
Rel. reproducibility s.d.: 19.52%
Number of outlier measurements: 4

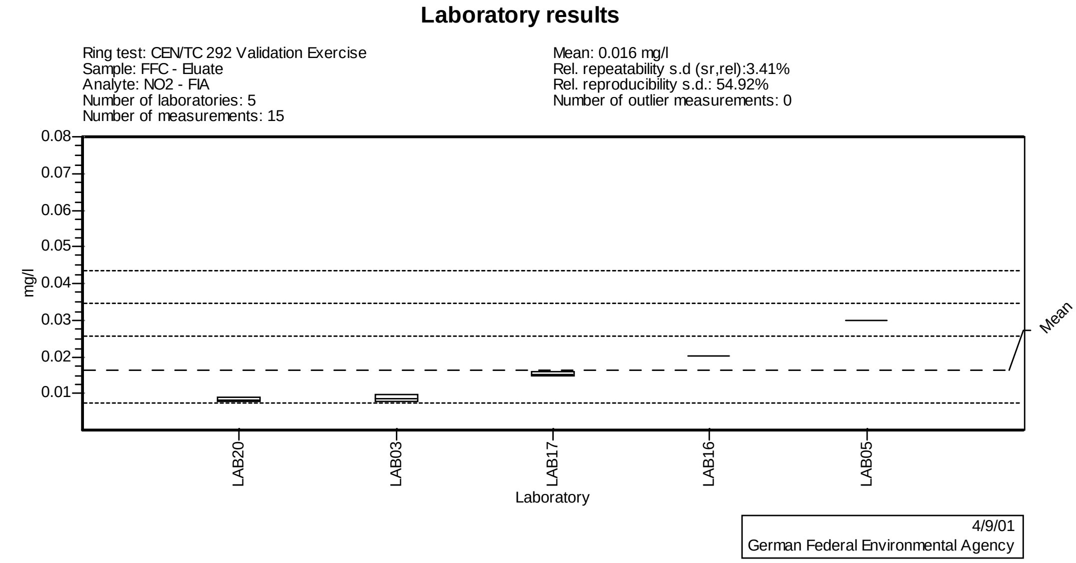


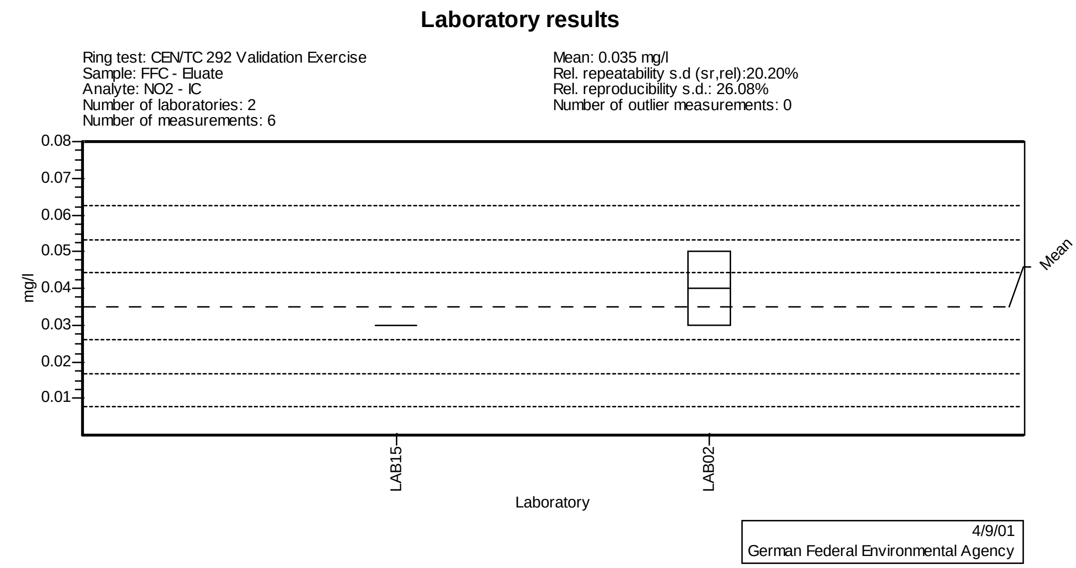
Laboratory results

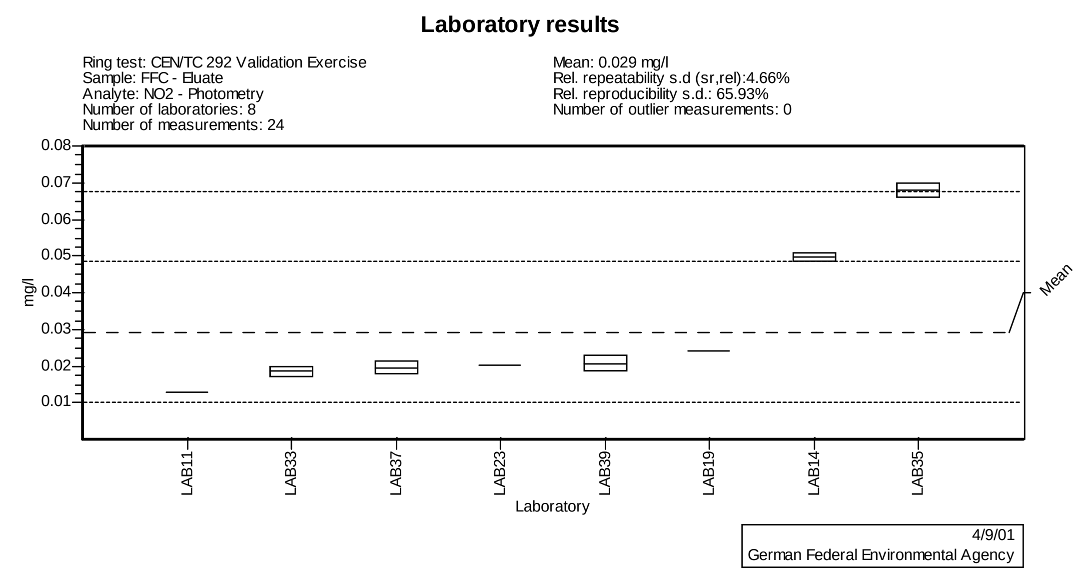
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Mo - ICP
Number of laboratories: 15
Number of measurements: 44

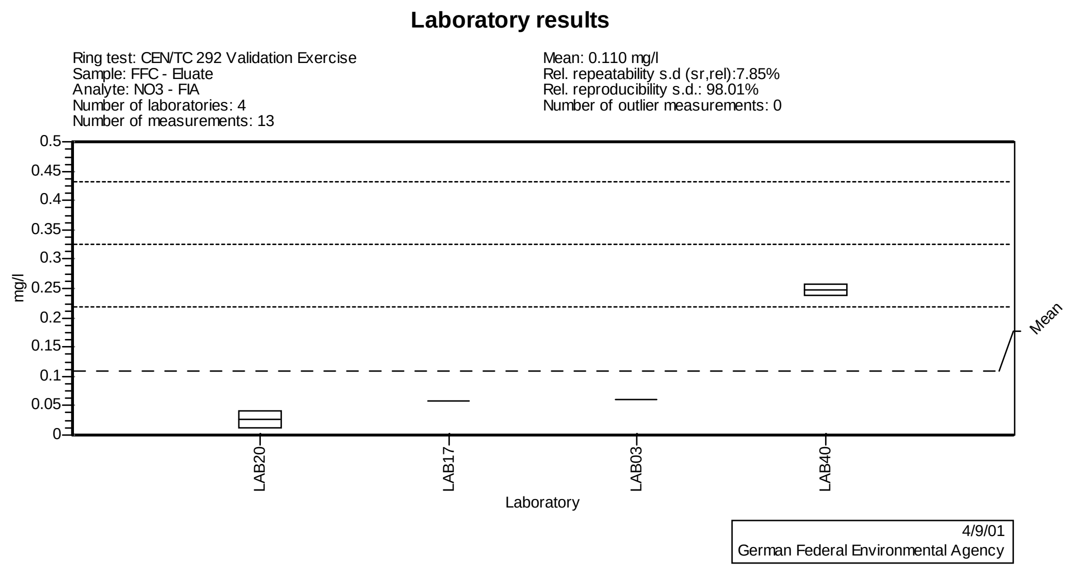
Mean: 466.864 µg/l
Rel. repeatability s.d (sr,rel):3.19%
Rel. reproducibility s.d.: 14.32%
Number of outlier measurements: 3

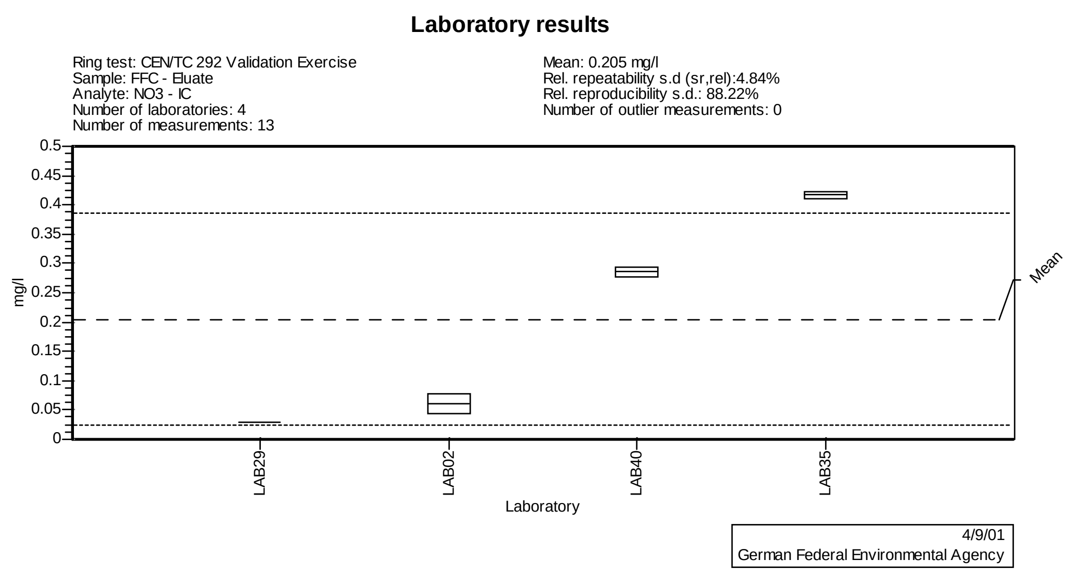


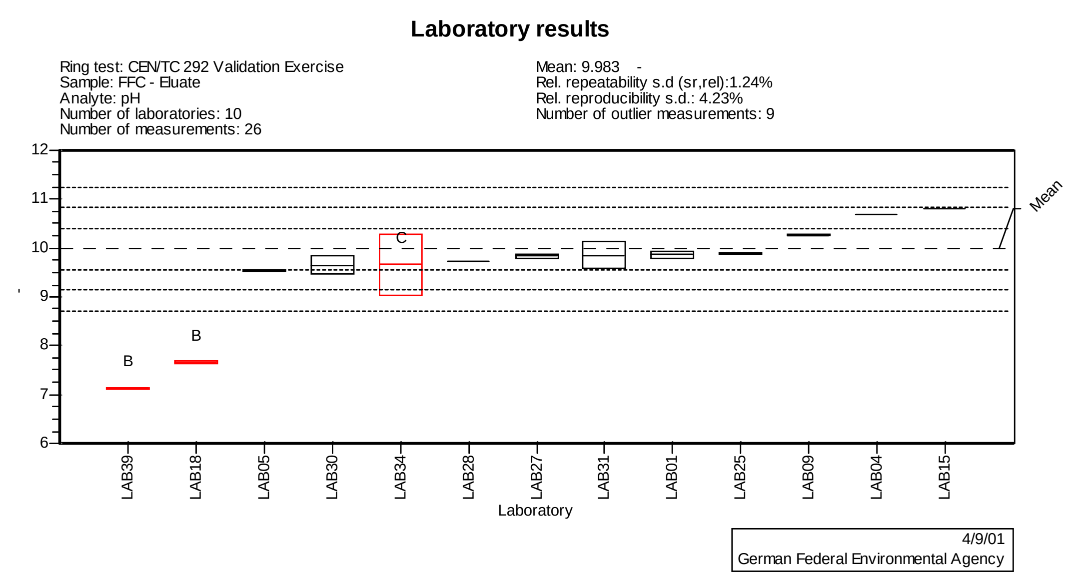

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: NO2 - FIA
Number of laboratories: 5
Number of measurements: 15
Mean: 0.016 mg/l
Rel. repeatability s.d (sr,rel):3.41%
Rel. reproducibility s.d.: 54.92%
Number of outlier measurements: 0
mg/l
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
Mean
LAB20
LAB03
LAB17
LAB16
LAB05
Laboratory
4/9/01
German Federal Environmental Agency

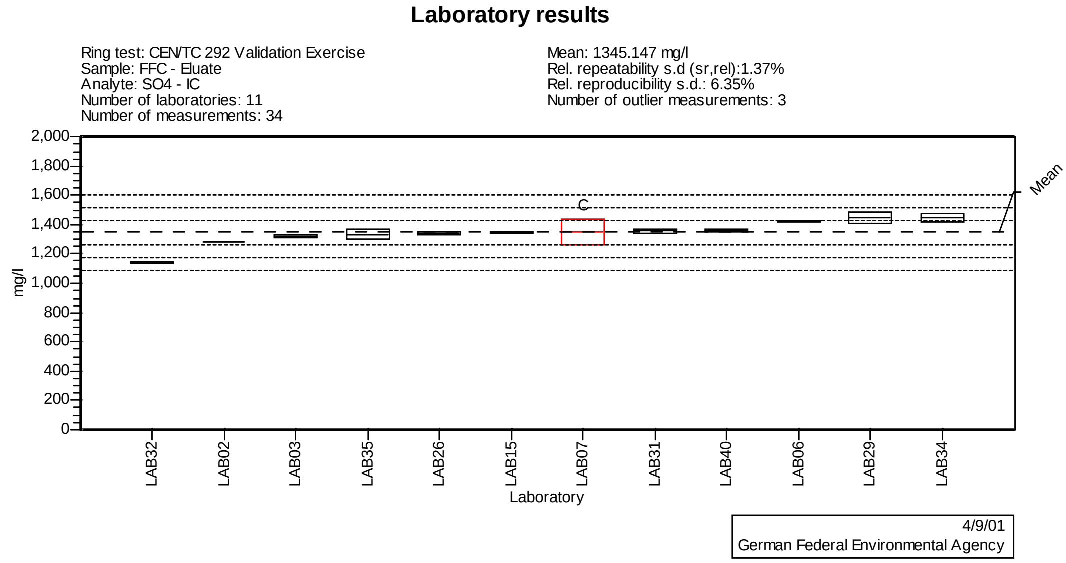

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: NO2 - IC
Number of laboratories: 2
Number of measurements: 6
Mean: 0.035 mg/l
Rel. repeatability s.d (sr,rel):20.20%
Rel. reproducibility s.d.: 26.08%
Number of outlier measurements: 0
mg/l
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
Mean
LAB15
LAB02
Laboratory
4/9/01
German Federal Environmental Agency

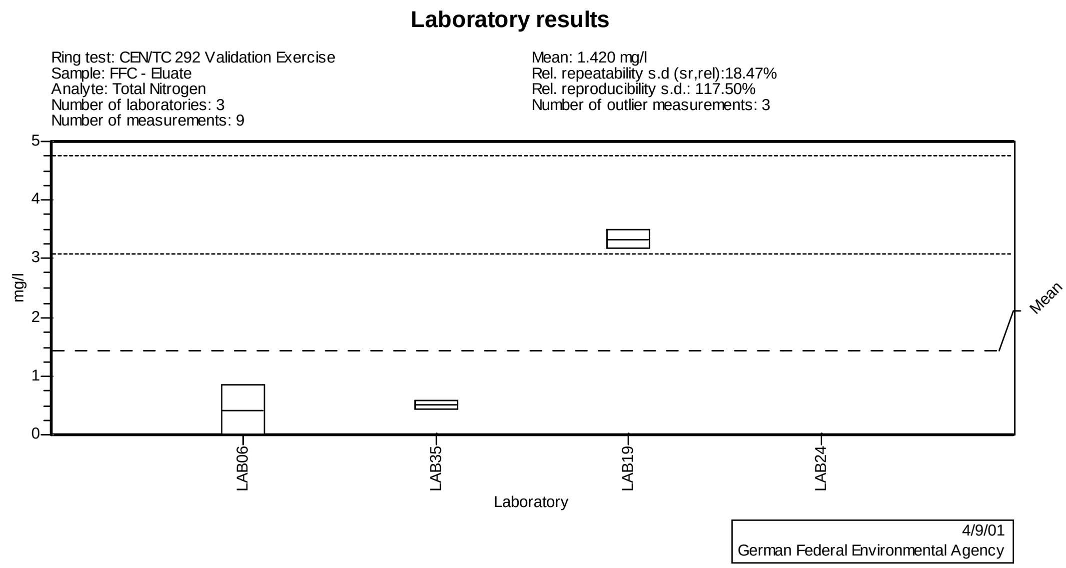

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: NO2 - Photometry
Number of laboratories: 8
Number of measurements: 24
Mean: 0.029 mg/l
Rel. repeatability s.d (sr,rel):4.66%
Rel. reproducibility s.d.: 65.93%
Number of outlier measurements: 0
mg/l
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
Mean
LAB11
LAB33
LAB37
LAB23
LAB39
LAB19
LAB14
LAB35
Laboratory
4/9/01
German Federal Environmental Agency

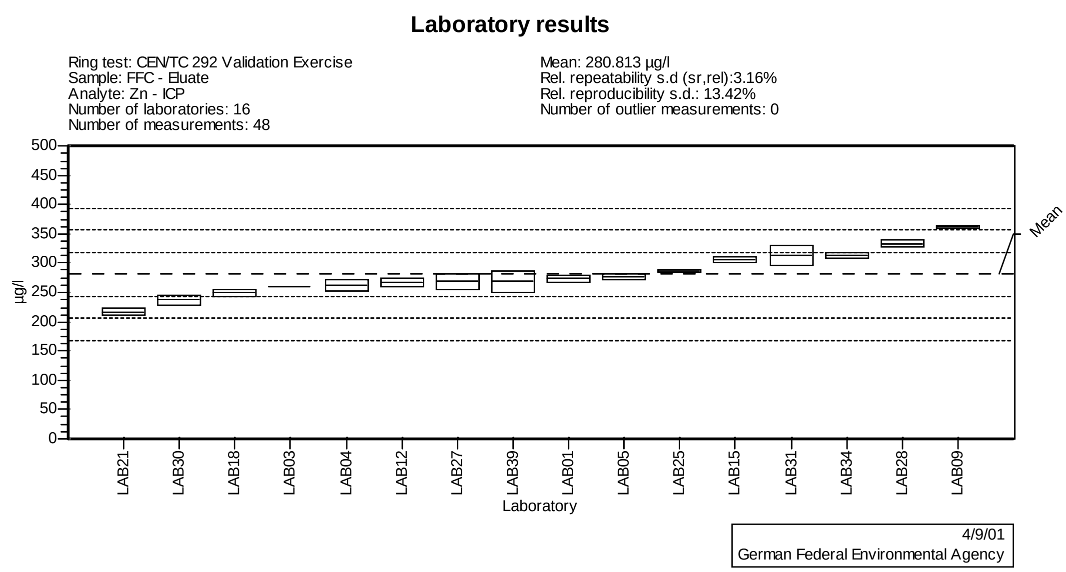

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: NO3 - FIA
Number of laboratories: 4
Number of measurements: 13
Mean: 0.110 mg/l
Rel. repeatability s.d (sr,rel):7.85%
Rel. reproducibility s.d.: 98.01%
Number of outlier measurements: 0
mg/l
Mean
LAB20
LAB17
LAB03
LAB40
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: NO3 - IC
Number of laboratories: 4
Number of measurements: 13
Mean: 0.205 mg/l
Rel. repeatability s.d (sr,rel):4.84%
Rel. reproducibility s.d.: 88.22%
Number of outlier measurements: 0
mg/l
Mean
LAB29
LAB02
LAB40
LAB35
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: pH
Number of laboratories: 10
Number of measurements: 26
Mean: 9.983 -
Rel. repeatability s.d (sr,rel):1.24%
Rel. reproducibility s.d.: 4.23%
Number of outlier measurements: 9
Mean
B
B
C
LAB39
LAB18
LAB05
LAB30
LAB34
LAB28
LAB27
LAB31
LAB01
LAB25
LAB09
LAB04
LAB15
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: SO4 - IC
Number of laboratories: 11
Number of measurements: 34
Mean: 1345.147 mg/l
Rel. repeatability s.d (sr,rel):1.37%
Rel. reproducibility s.d.: 6.35%
Number of outlier measurements: 3
mg/l
Mean
C
LAB32 LAB02 LAB03 LAB35 LAB26 LAB15 LAB07 LAB31 LAB40 LAB06 LAB29 LAB34
Laboratory
4/9/01
German Federal Environmental Agency

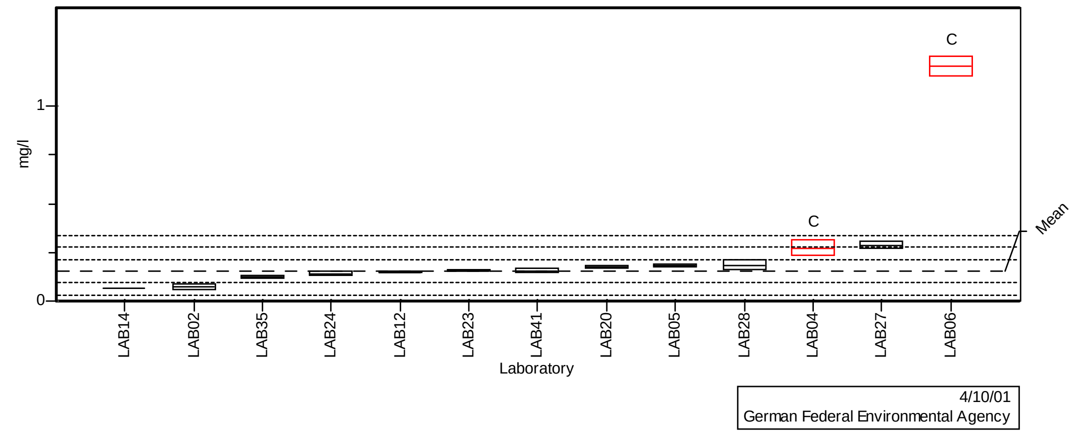

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Total Nitrogen
Number of laboratories: 3
Number of measurements: 9
Mean: 1.420 mg/l
Rel. repeatability s.d (sr,rel):18.47%
Rel. reproducibility s.d.: 117.50%
Number of outlier measurements: 3
mg/l
Mean
LAB06 LAB35 LAB19 LAB24
Laboratory
4/9/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: FFC - Eluate
Analyte: Zn - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 280.813 µg/l
Rel. repeatability s.d (sr,rel):3.16%
Rel. reproducibility s.d.: 13.42%
Number of outlier measurements: 0
µg/l
Mean
LAB21 LAB30 LAB18 LAB03 LAB04 LAB12 LAB27 LAB39 LAB01 LAB05 LAB25 LAB15 LAB31 LAB34 LAB28 LAB09
Laboratory
4/9/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: AOX
Number of laboratories: 11
Number of measurements: 32

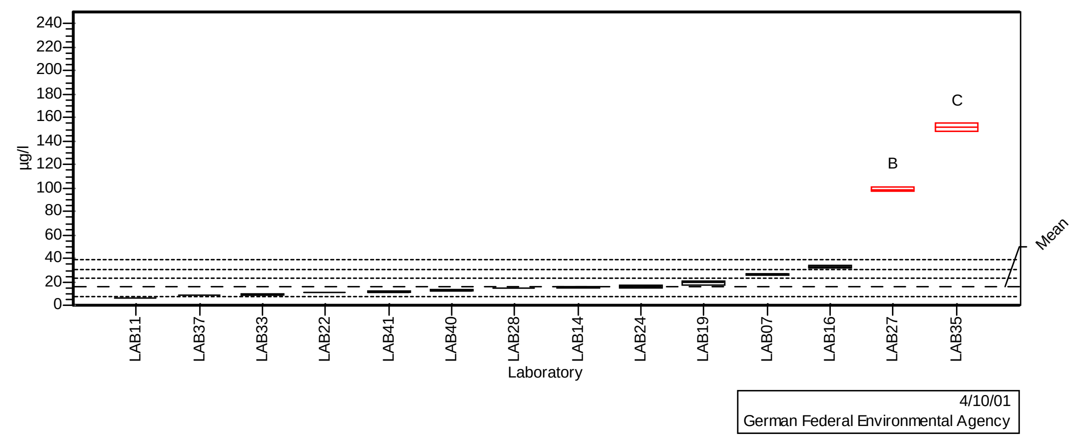
Mean: 0.153 mg/l
Rel. repeatability s.d (sr,rel):7.16%
Rel. reproducibility s.d.: 39.95%
Number of outlier measurements: 7



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: As - Hydride AAS
Number of laboratories: 12
Number of measurements: 36

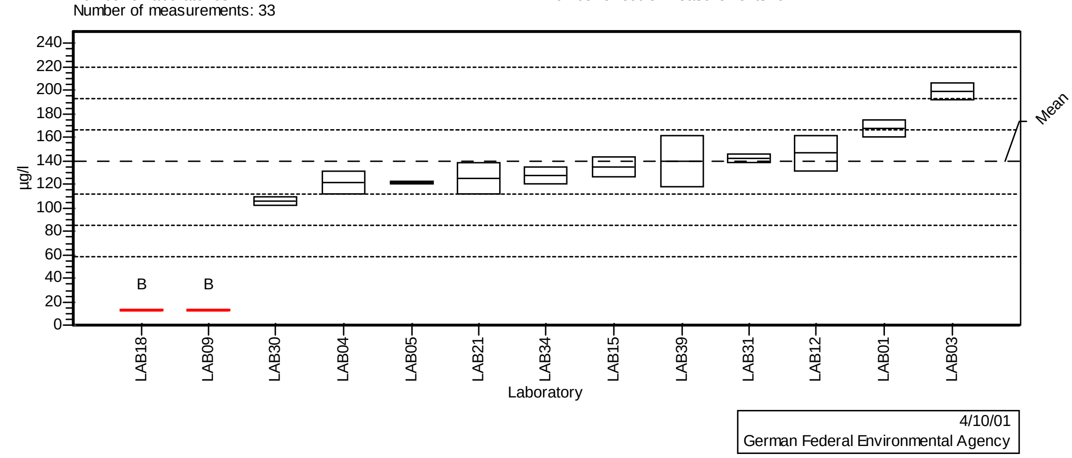
Mean: 15.220 µg/l
Rel. repeatability s.d (sr,rel):5.20%
Rel. reproducibility s.d.: 51.38%
Number of outlier measurements: 6

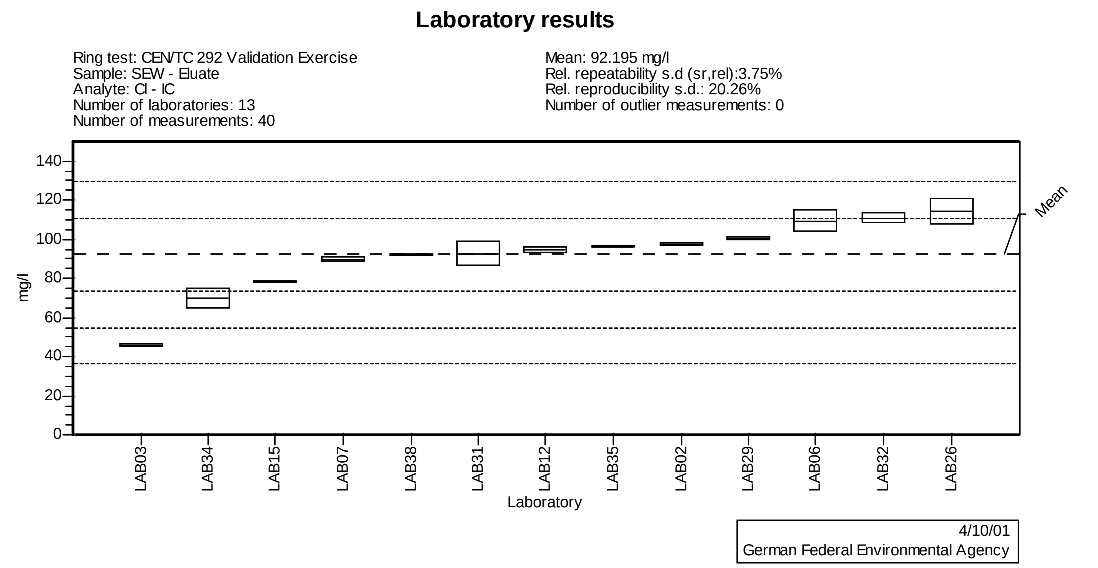


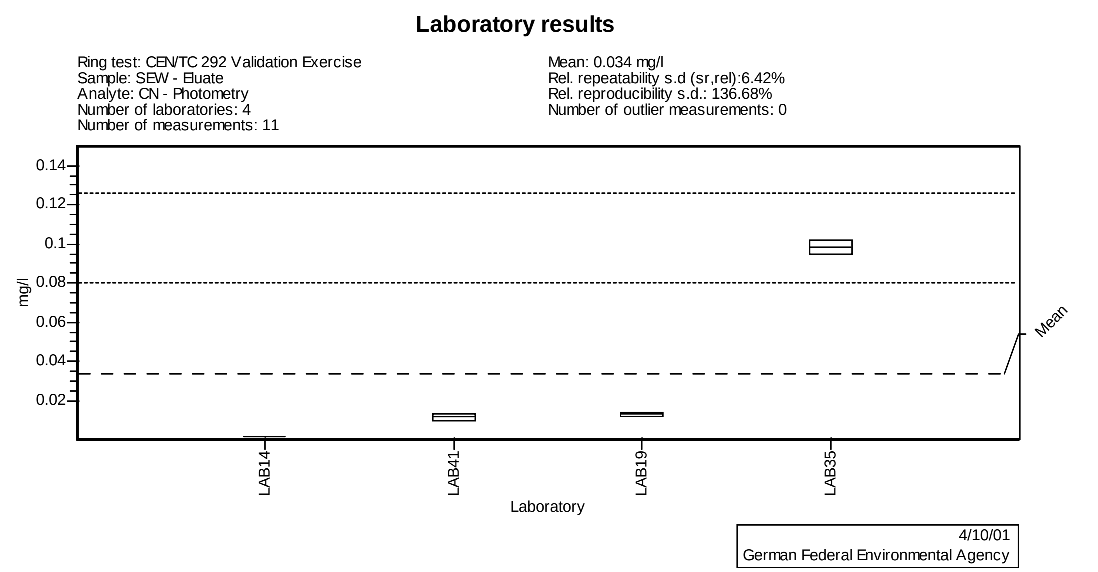
Laboratory results

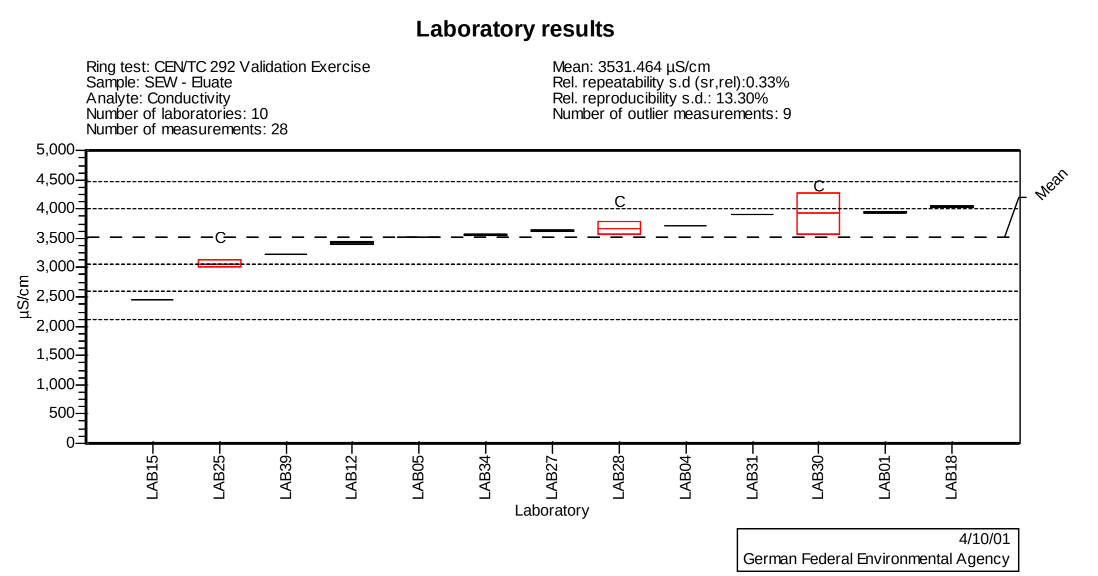
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: As - ICP
Number of laboratories: 11
Number of measurements: 33

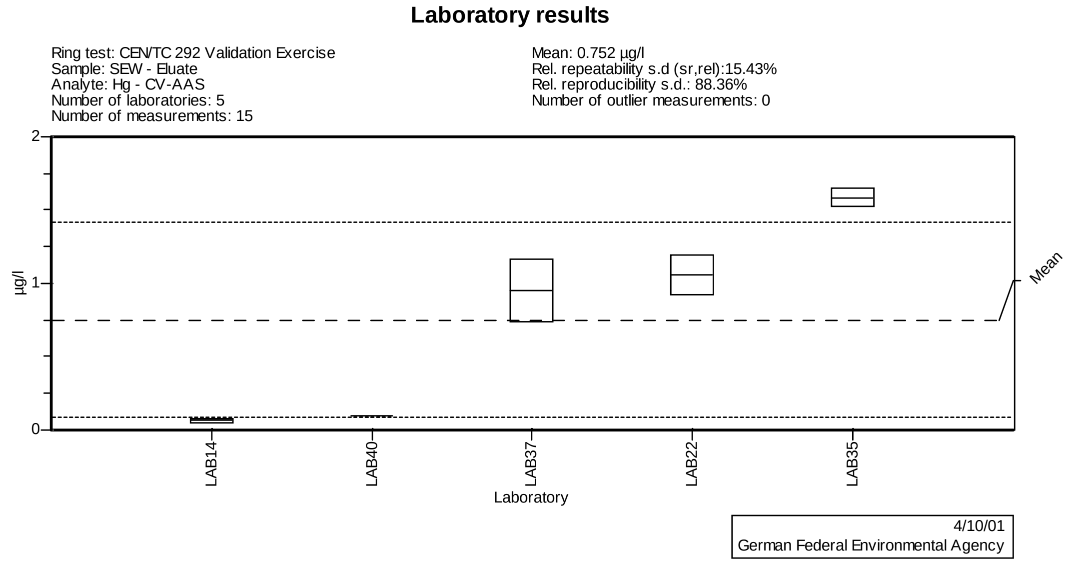
Mean: 139.242 µg/l
Rel. repeatability s.d (sr,rel):7.66%
Rel. reproducibility s.d.: 19.38%
Number of outlier measurements: 6

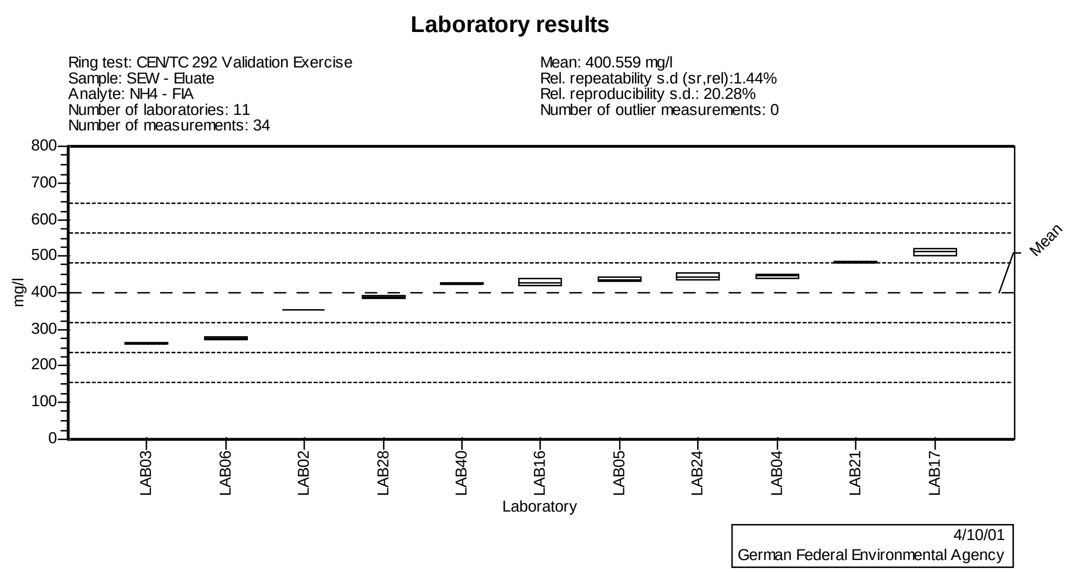


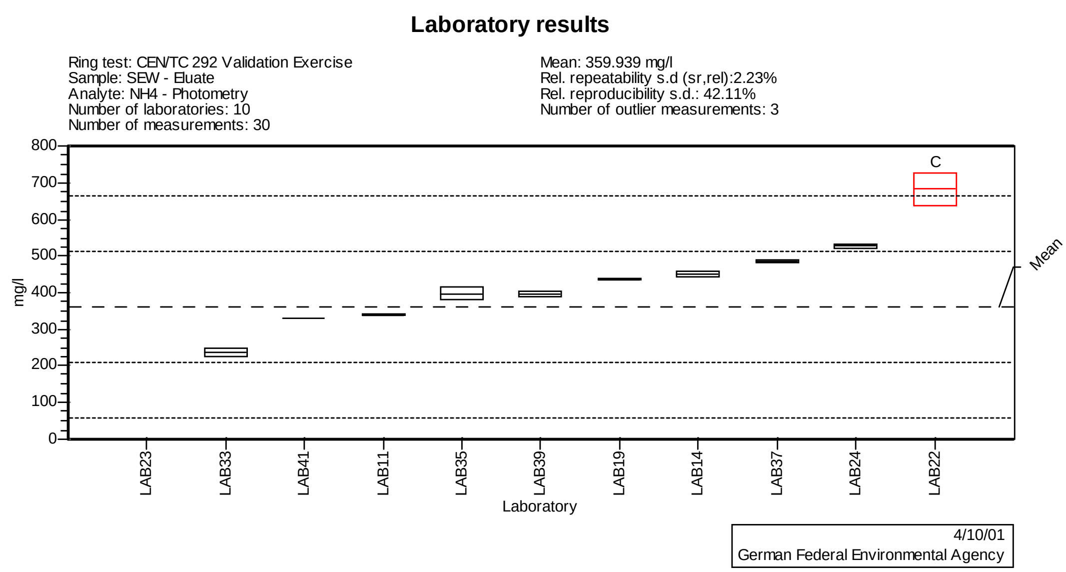

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Cl - IC
Number of laboratories: 13
Number of measurements: 40
Mean: 92.195 mg/l
Rel. repeatability s.d (sr,rel):3.75%
Rel. reproducibility s.d.: 20.26%
Number of outlier measurements: 0
mg/l
Mean
LAB03 LAB34 LAB15 LAB07 LAB38 LAB31 LAB12 LAB35 LAB02 LAB29 LAB06 LAB32 LAB26
Laboratory
4/10/01
German Federal Environmental Agency

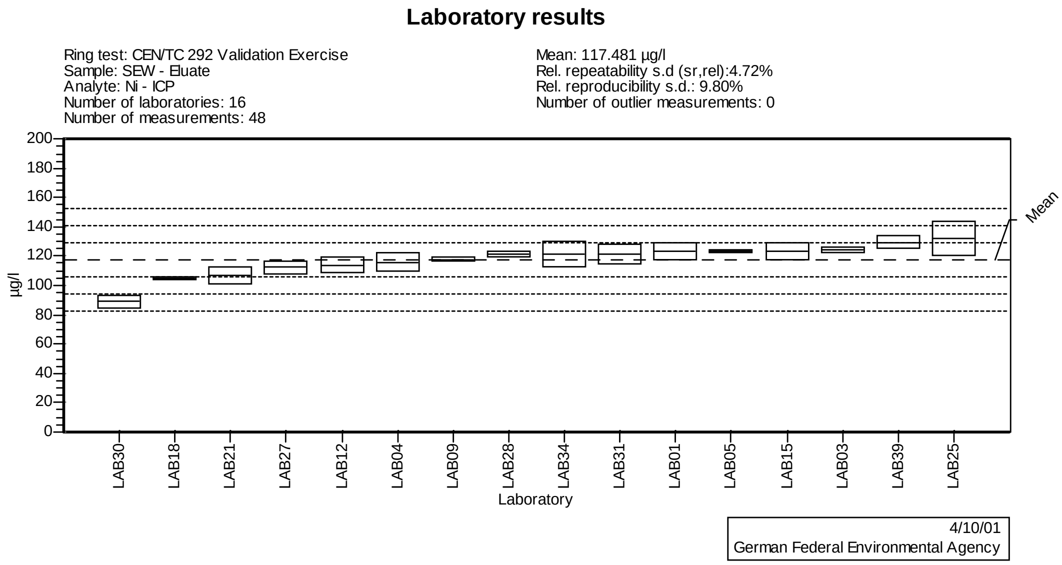

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: CN - Photometry
Number of laboratories: 4
Number of measurements: 11
Mean: 0.034 mg/l
Rel. repeatability s.d (sr,rel):6.42%
Rel. reproducibility s.d.: 136.68%
Number of outlier measurements: 0
mg/l
Mean
LAB14 LAB41 LAB19 LAB35
Laboratory
4/10/01
German Federal Environmental Agency

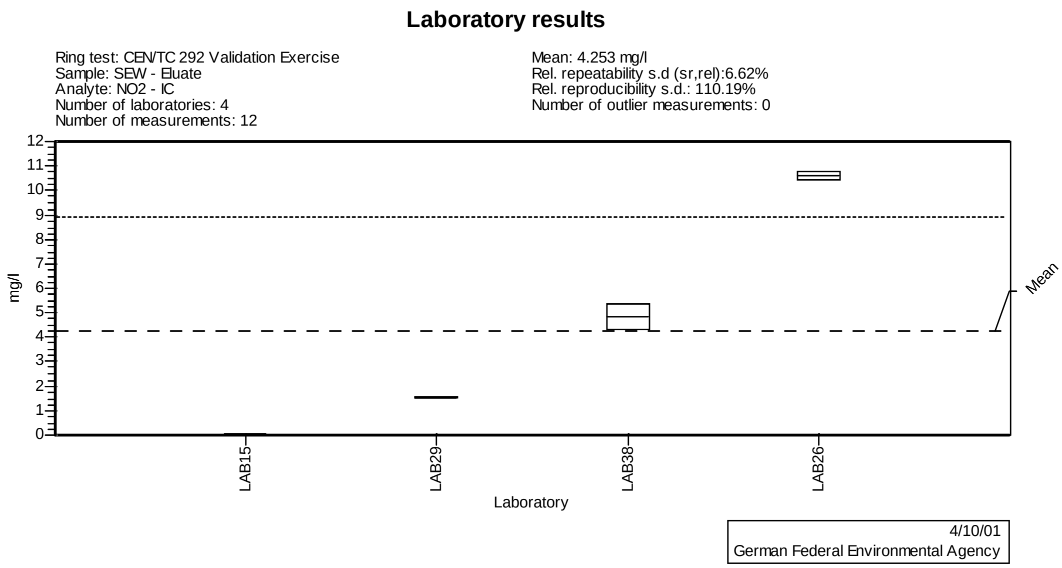

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Conductivity
Number of laboratories: 10
Number of measurements: 28
Mean: 3531.464 µS/cm
Rel. repeatability s.d (sr,rel):0.33%
Rel. reproducibility s.d.: 13.30%
Number of outlier measurements: 9
µS/cm
Mean
LAB15 LAB25 LAB39 LAB12 LAB05 LAB34 LAB27 LAB28 LAB04 LAB31 LAB30 LAB01 LAB18
Laboratory
4/10/01
German Federal Environmental Agency

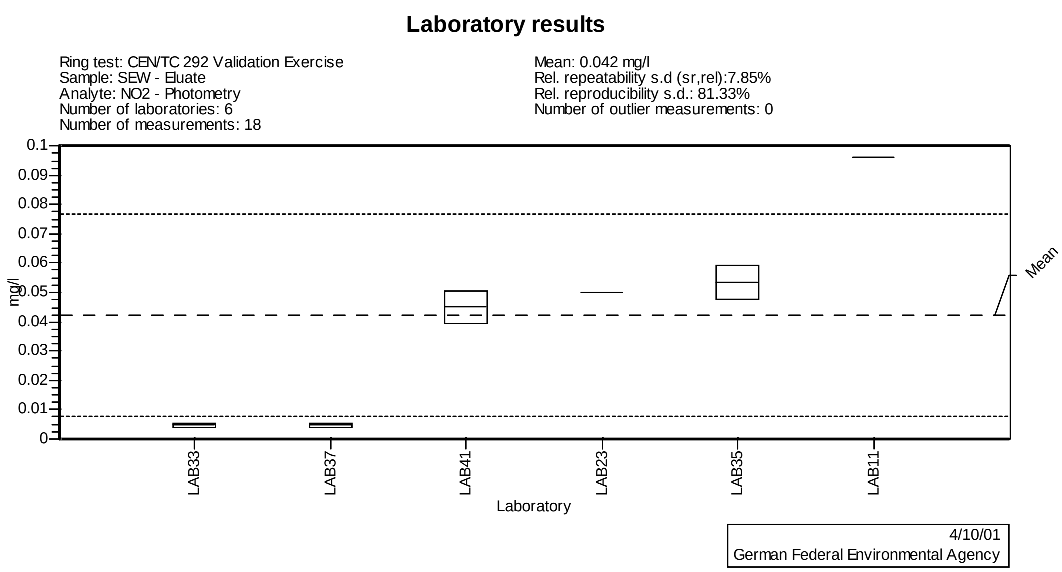

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Hg - CV-AAS
Number of laboratories: 5
Number of measurements: 15
Mean: 0.752 µg/l
Rel. repeatability s.d (sr,rel):15.43%
Rel. reproducibility s.d.: 88.36%
Number of outlier measurements: 0
µg/l
2
1
0
Mean
LAB14
LAB40
LAB37
LAB22
LAB35
Laboratory
4/10/01
German Federal Environmental Agency

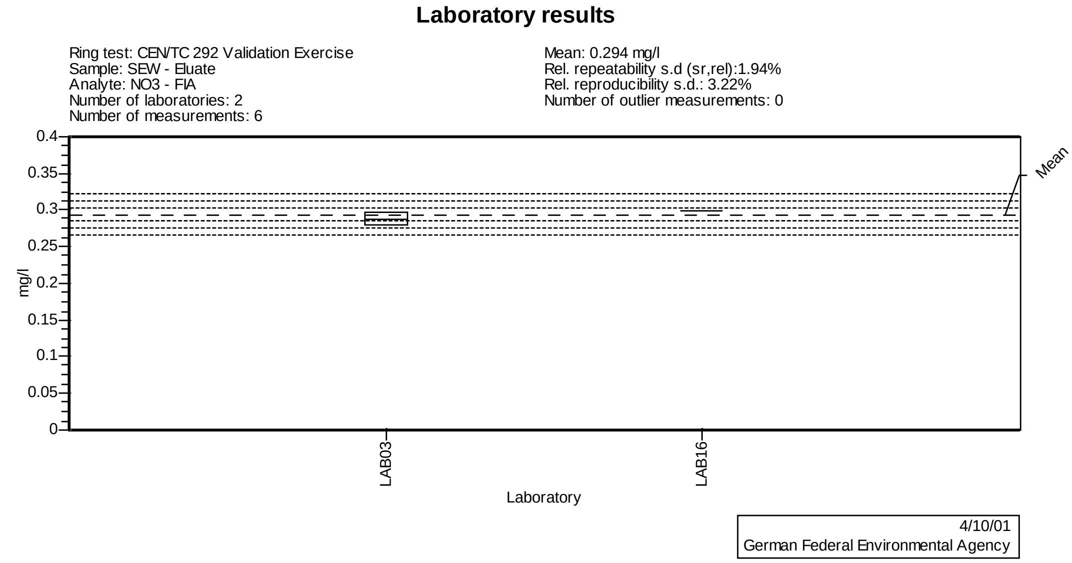

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NH4 - FIA
Number of laboratories: 11
Number of measurements: 34
Mean: 400.559 mg/l
Rel. repeatability s.d (sr,rel):1.44%
Rel. reproducibility s.d.: 20.28%
Number of outlier measurements: 0
mg/l
800
700
600
500
400
300
200
100
0
Mean
LAB03
LAB06
LAB02
LAB28
LAB40
LAB16
LAB05
LAB24
LAB04
LAB21
LAB17
Laboratory
4/10/01
German Federal Environmental Agency

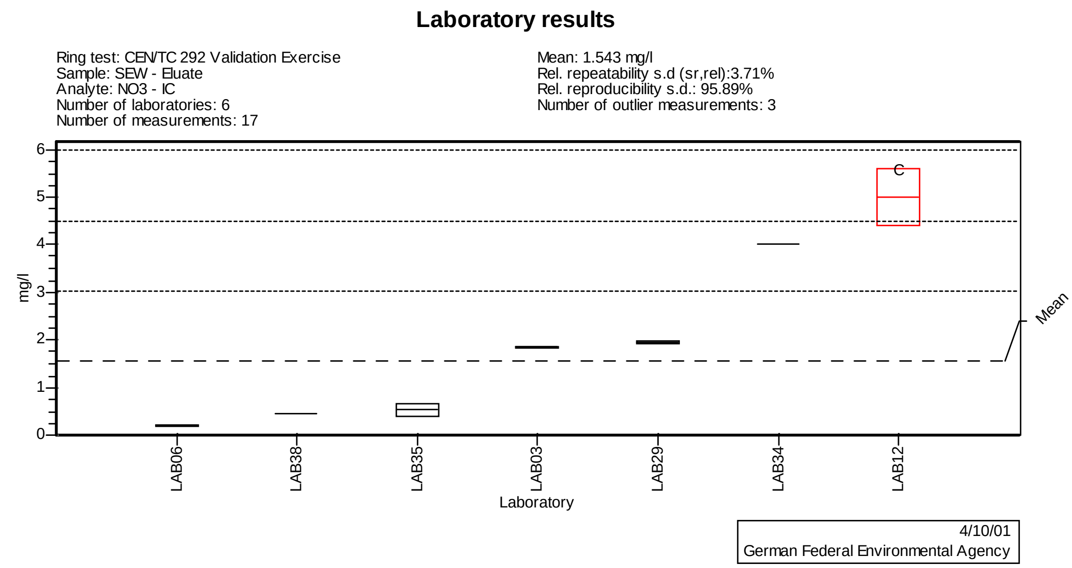

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NH4 - Photometry
Number of laboratories: 10
Number of measurements: 30
Mean: 359.939 mg/l
Rel. repeatability s.d (sr,rel):2.23%
Rel. reproducibility s.d.: 42.11%
Number of outlier measurements: 3
mg/l
800
700
600
500
400
300
200
100
0
C
Mean
LAB23
LAB33
LAB41
LAB11
LAB35
LAB39
LAB19
LAB14
LAB37
LAB24
LAB22
Laboratory
4/10/01
German Federal Environmental Agency

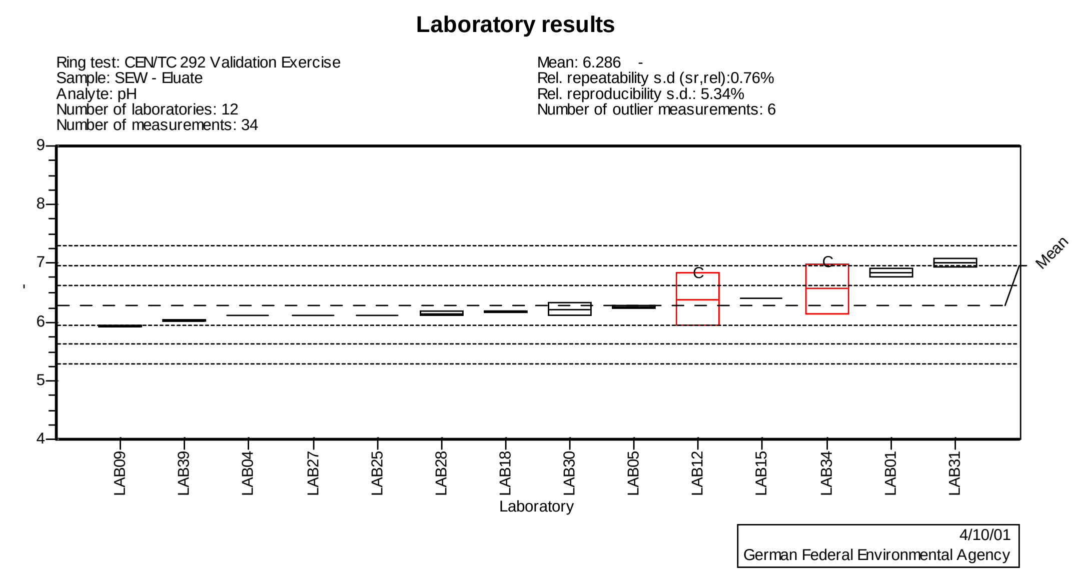

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Ni - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 117.481 µg/l
Rel. repeatability s.d (sr,rel):4.72%
Rel. reproducibility s.d.: 9.80%
Number of outlier measurements: 0
µg/l
Mean
LAB30
LAB18
LAB21
LAB27
LAB12
LAB04
LAB09
LAB28
LAB34
LAB31
LAB01
LAB05
LAB15
LAB03
LAB39
LAB25
Laboratory
4/10/01
German Federal Environmental Agency

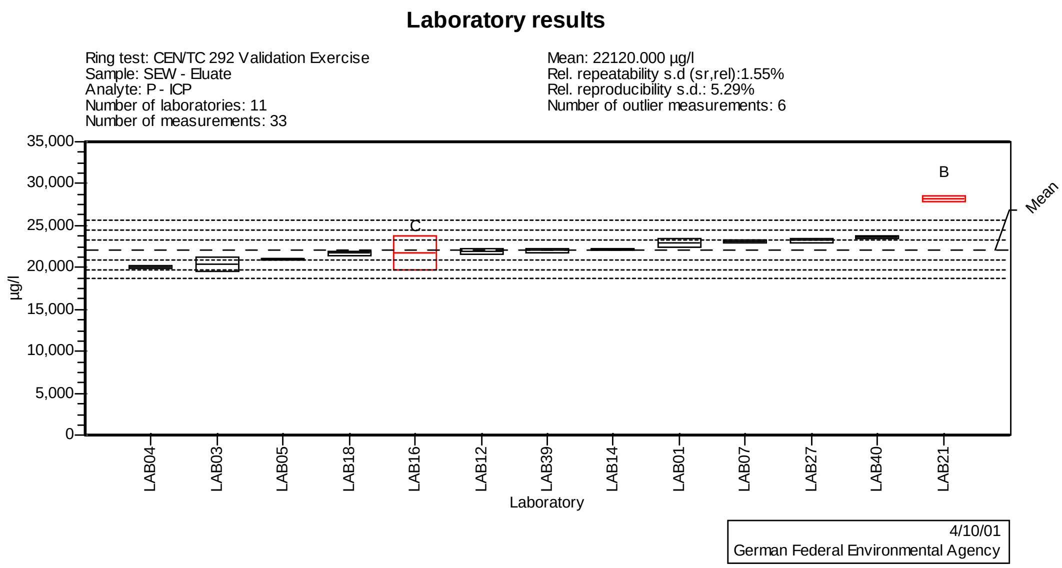

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NO2 - IC
Number of laboratories: 4
Number of measurements: 12
Mean: 4.253 mg/l
Rel. repeatability s.d (sr,rel):6.62%
Rel. reproducibility s.d.: 110.19%
Number of outlier measurements: 0
mg/l
Mean
LAB15
LAB29
LAB38
LAB26
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NO2 - Photometry
Number of laboratories: 6
Number of measurements: 18
Mean: 0.042 mg/l
Rel. repeatability s.d (sr,rel):7.85%
Rel. reproducibility s.d.: 81.33%
Number of outlier measurements: 0
mg/l
Mean
LAB33
LAB37
LAB41
LAB23
LAB35
LAB11
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NO3 - FIA
Number of laboratories: 2
Number of measurements: 6
Mean: 0.294 mg/l
Rel. repeatability s.d (sr,rel):1.94%
Rel. reproducibility s.d.: 3.22%
Number of outlier measurements: 0
mg/l
Mean
LAB03
LAB16
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: NO3 - IC
Number of laboratories: 6
Number of measurements: 17
Mean: 1.543 mg/l
Rel. repeatability s.d (sr,rel):3.71%
Rel. reproducibility s.d.: 95.89%
Number of outlier measurements: 3
mg/l
Mean
C
LAB06
LAB38
LAB35
LAB03
LAB29
LAB34
LAB12
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: pH
Number of laboratories: 12
Number of measurements: 34
Mean: 6.286 -
Rel. repeatability s.d (sr,rel):0.76%
Rel. reproducibility s.d.: 5.34%
Number of outlier measurements: 6
Mean
C
C
LAB09
LAB39
LAB04
LAB27
LAB25
LAB28
LAB18
LAB30
LAB05
LAB12
LAB15
LAB34
LAB01
LAB31
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: P - ICP
Number of laboratories: 11
Number of measurements: 33
Mean: 22120.000 µg/l
Rel. repeatability s.d (sr,rel):1.55%
Rel. reproducibility s.d.: 5.29%
Number of outlier measurements: 6
µg/l
Laboratory
LAB04 LAB03 LAB05 LAB18 LAB16 LAB12 LAB39 LAB14 LAB01 LAB07 LAB27 LAB40 LAB21
Mean
4/10/01
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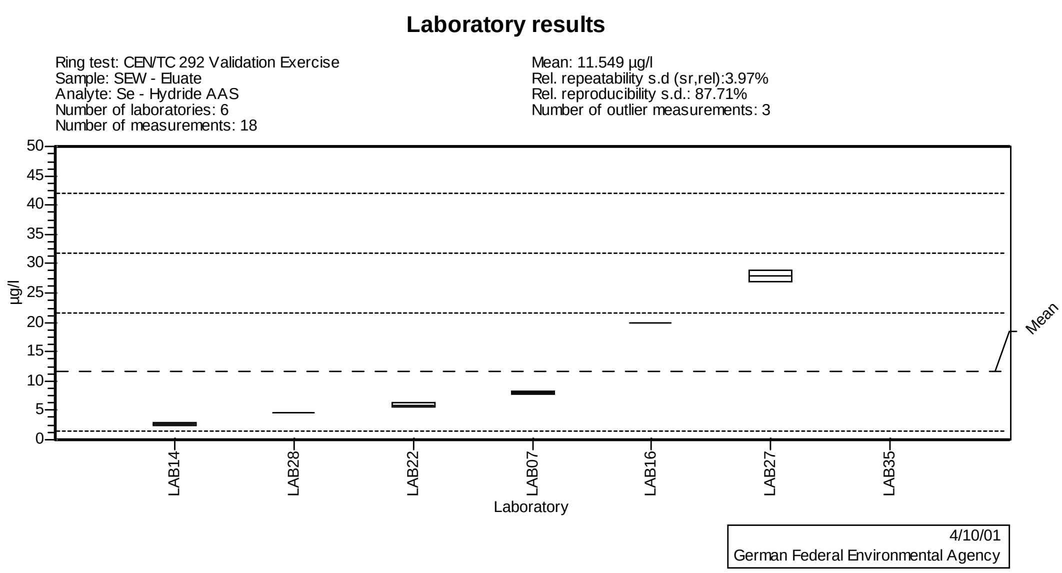
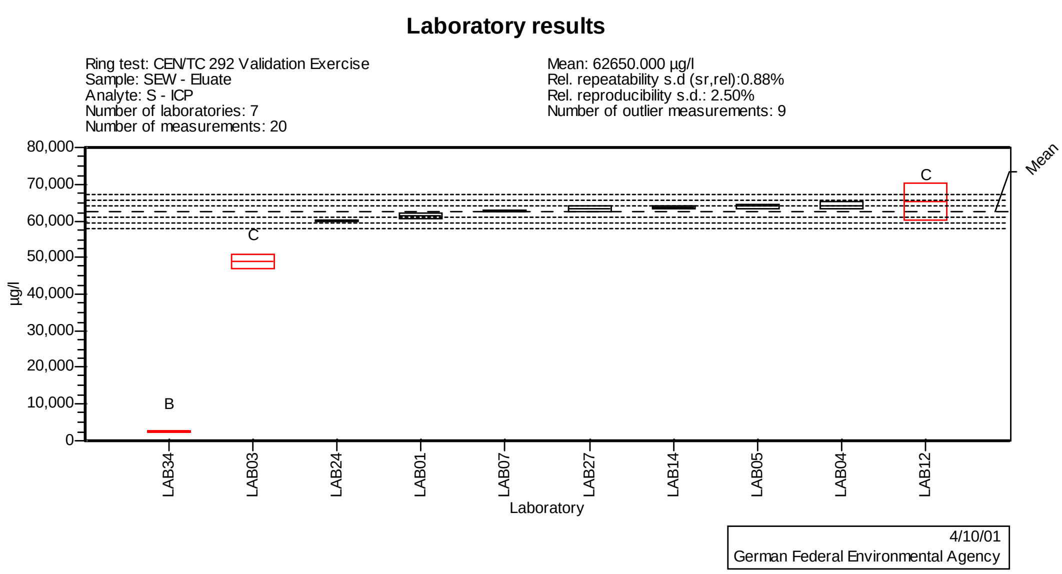
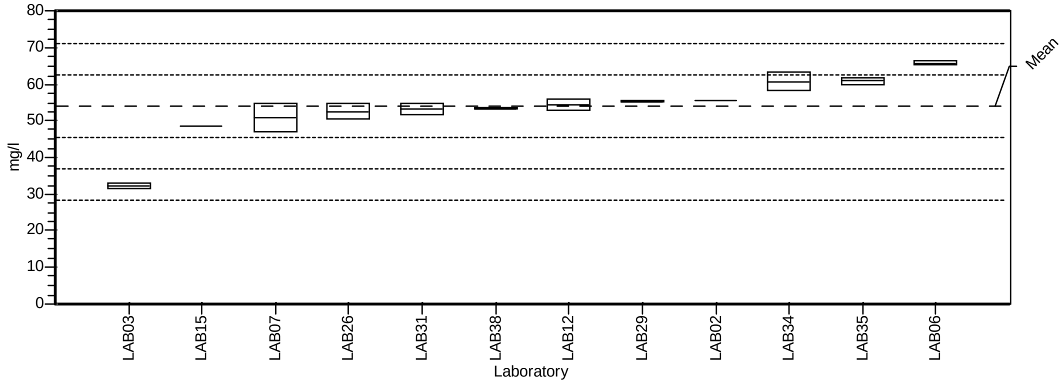

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Se - Hydride AAS
Number of laboratories: 6
Number of measurements: 18
Mean: 11.549 µg/l
Rel. repeatability s.d (sr,rel):3.97%
Rel. reproducibility s.d.: 87.71%
Number of outlier measurements: 3
µg/l
Laboratory
LAB14 LAB28 LAB22 LAB07 LAB16 LAB27 LAB35
Mean
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: S - ICP
Number of laboratories: 7
Number of measurements: 20
Mean: 62650.000 µg/l
Rel. repeatability s.d (sr,rel):0.88%
Rel. reproducibility s.d.: 2.50%
Number of outlier measurements: 9
µg/l
Laboratory
LAB34 LAB03 LAB24 LAB01 LAB07 LAB27 LAB14 LAB05 LAB04 LAB12
Mean
4/10/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: SO4 - IC
Number of laboratories: 12
Number of measurements: 37

Mean: 53.914 mg/l
Rel. repeatability s.d (sr,rel):2.98%
Rel. reproducibility s.d.: 15.75%
Number of outlier measurements: 0



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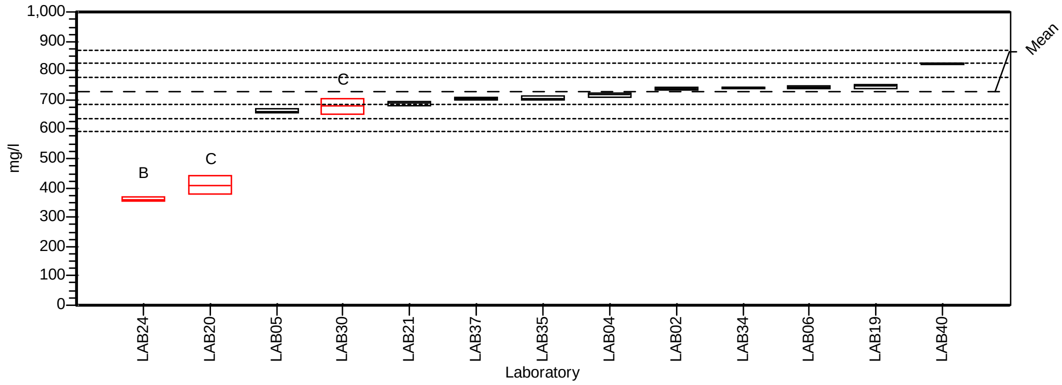
Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Total Nitrogen
Number of laboratories: 10
Number of measurements: 32

Mean: 730.313 mg/l
Rel. repeatability s.d (sr,rel):0.72%
Rel. reproducibility s.d.: 6.38%
Number of outlier measurements: 9



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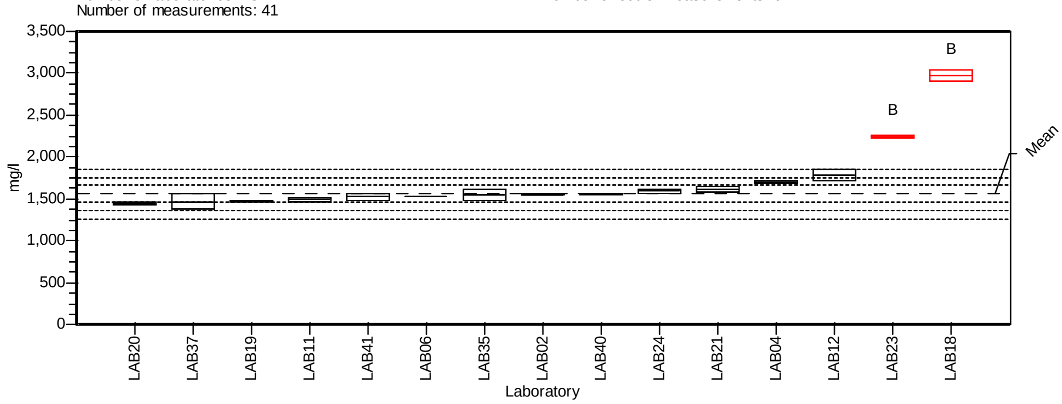
Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: TOC
Number of laboratories: 13
Number of measurements: 41

Mean: 1557.902 mg/l
Rel. repeatability s.d (sr,rel):2.58%
Rel. reproducibility s.d.: 6.39%
Number of outlier measurements: 6



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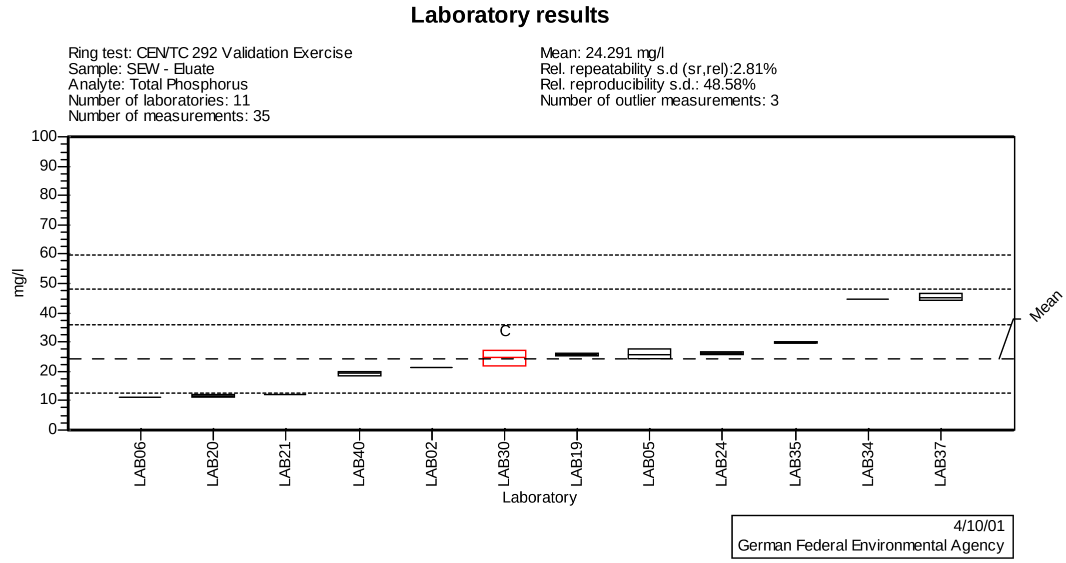
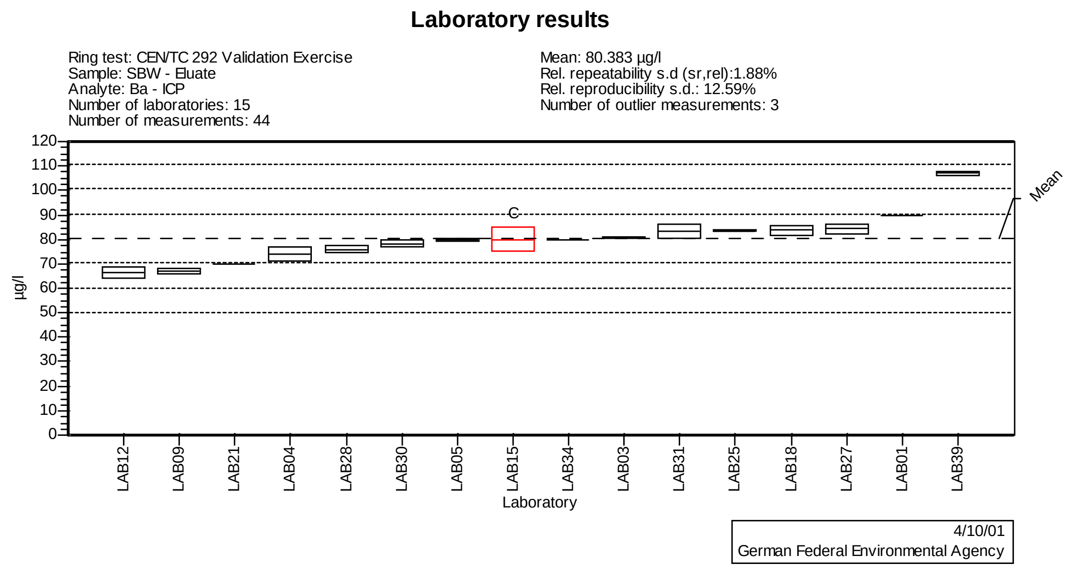
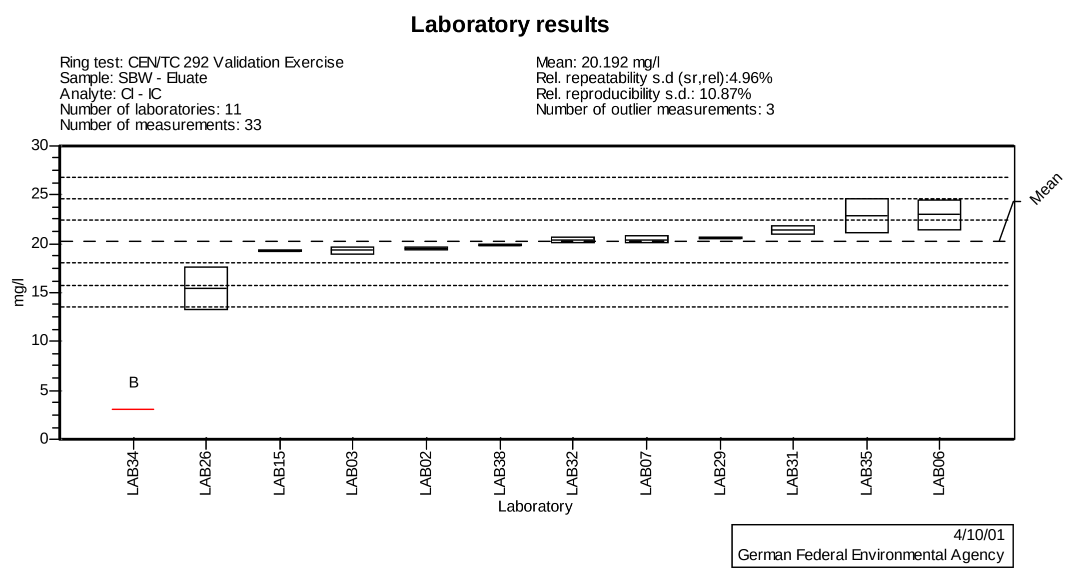
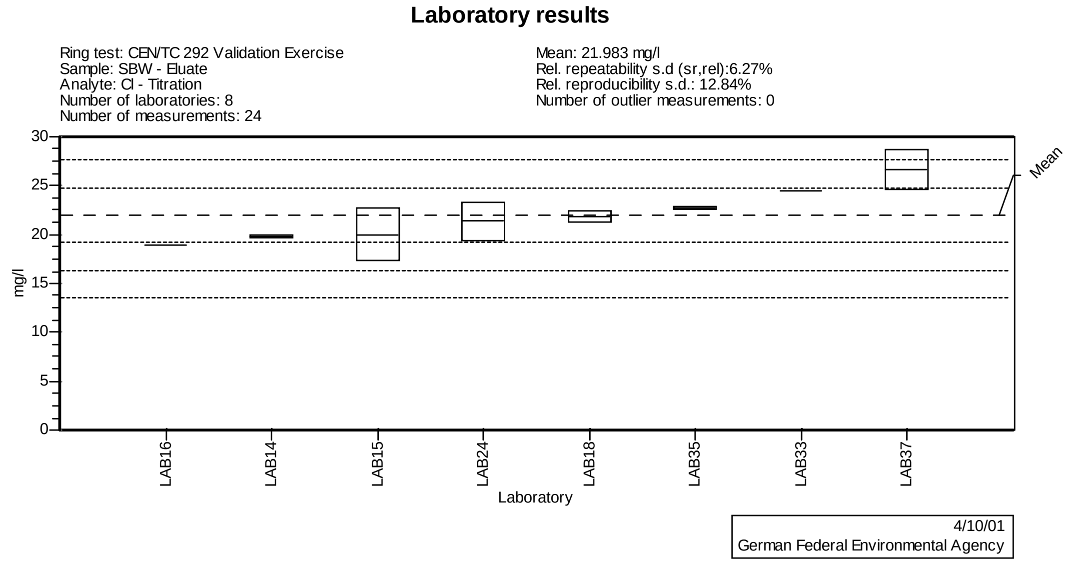
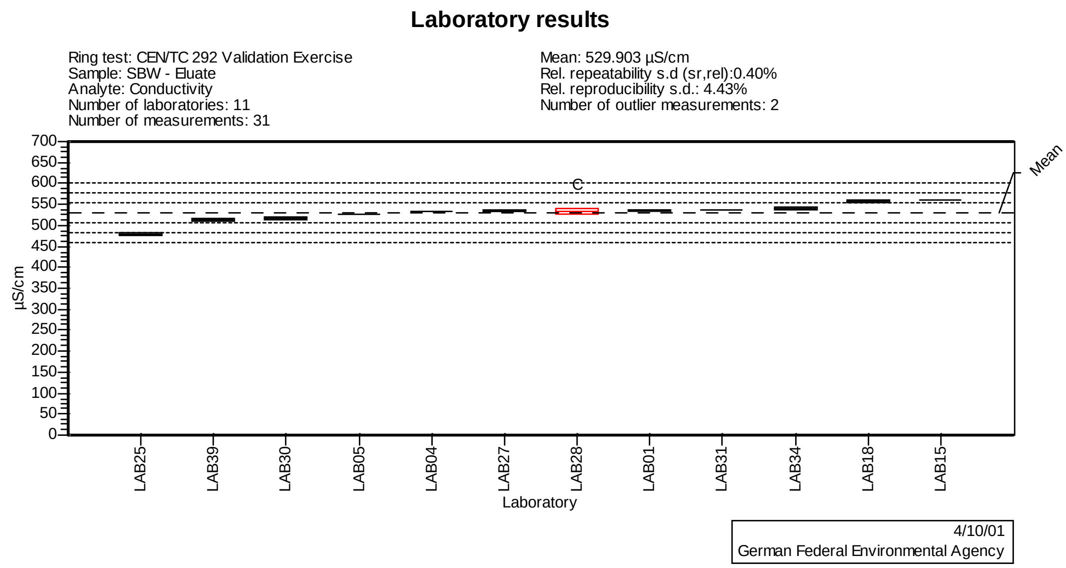
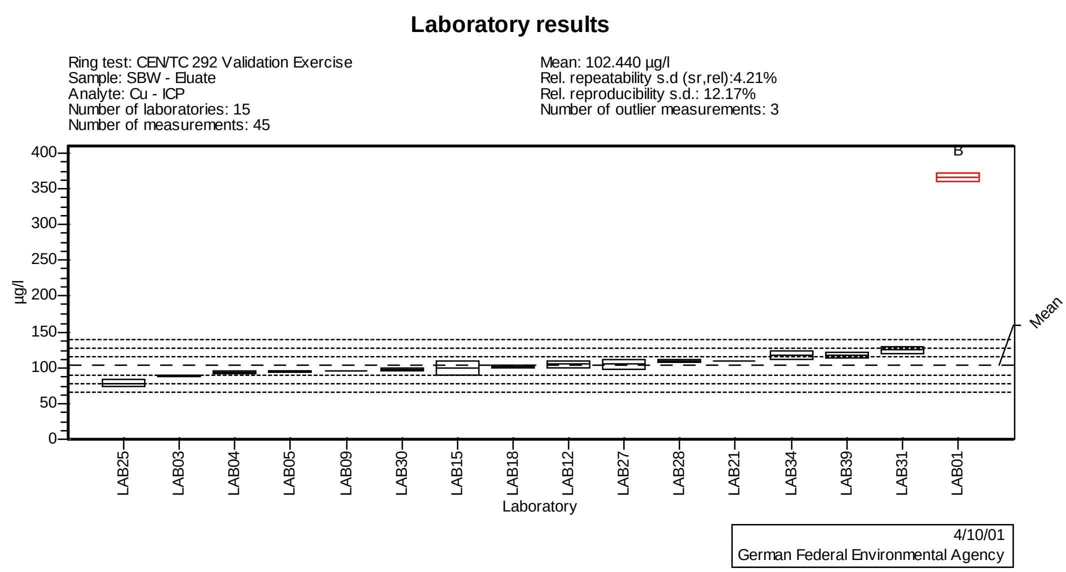

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SEW - Eluate
Analyte: Total Phosphorus
Number of laboratories: 11
Number of measurements: 35
Mean: 24.291 mg/l
Rel. repeatability s.d (sr,rel):2.81%
Rel. reproducibility s.d.: 48.58%
Number of outlier measurements: 3
mg/l
Mean
C
LAB06 LAB20 LAB21 LAB40 LAB02 LAB30 LAB19 LAB05 LAB24 LAB35 LAB34 LAB37
Laboratory
4/10/01
German Federal Environmental Agency

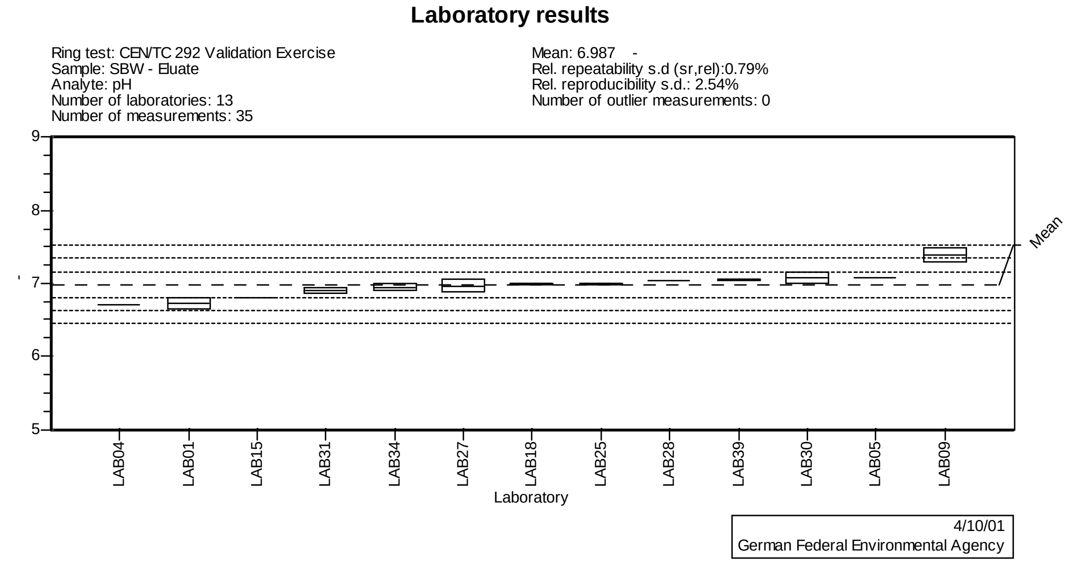

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Ba - ICP
Number of laboratories: 15
Number of measurements: 44
Mean: 80.383 µg/l
Rel. repeatability s.d (sr,rel):1.88%
Rel. reproducibility s.d.: 12.59%
Number of outlier measurements: 3
µg/l
Mean
C
LAB12 LAB09 LAB21 LAB04 LAB28 LAB30 LAB05 LAB15 LAB34 LAB03 LAB31 LAB25 LAB18 LAB27 LAB01 LAB39
Laboratory
4/10/01
German Federal Environmental Agency

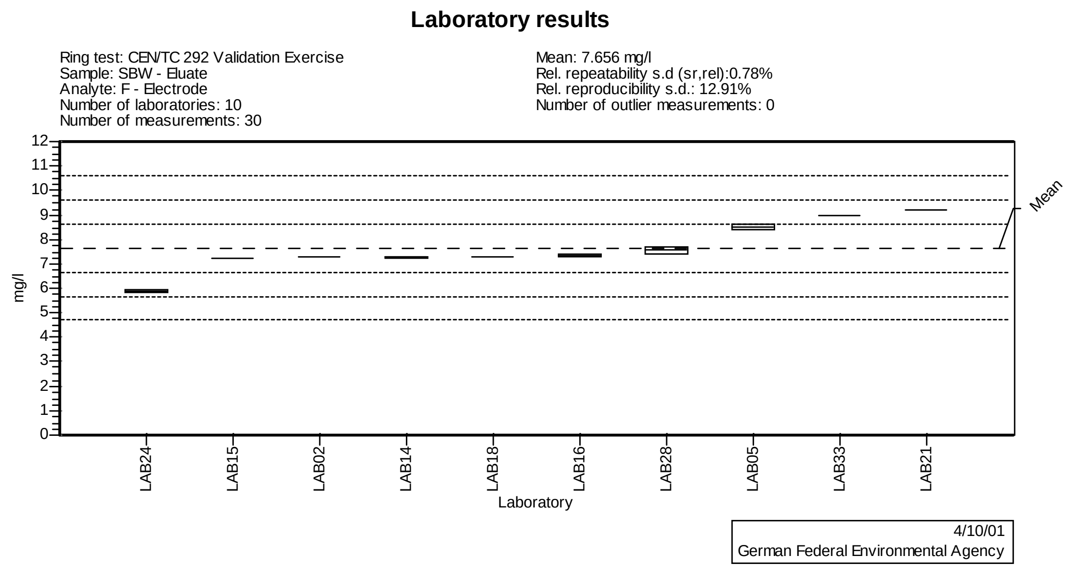

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Cl - IC
Number of laboratories: 11
Number of measurements: 33
Mean: 20.192 mg/l
Rel. repeatability s.d (sr,rel):4.96%
Rel. reproducibility s.d.: 10.87%
Number of outlier measurements: 3
mg/l
Mean
B
LAB34 LAB26 LAB15 LAB03 LAB02 LAB38 LAB32 LAB07 LAB29 LAB31 LAB35 LAB06
Laboratory
4/10/01
German Federal Environmental Agency

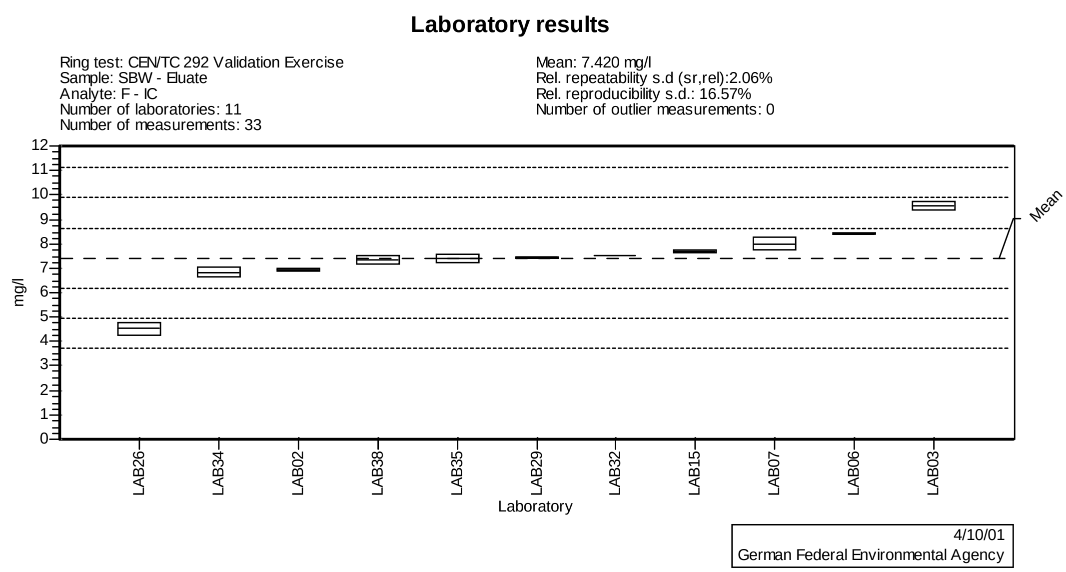

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Cl - Titration
Number of laboratories: 8
Number of measurements: 24
Mean: 21.983 mg/l
Rel. repeatability s.d (sr,rel):6.27%
Rel. reproducibility s.d.: 12.84%
Number of outlier measurements: 0
mg/l
Mean
LAB16
LAB14
LAB15
LAB24
LAB18
LAB35
LAB33
LAB37
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Conductivity
Number of laboratories: 11
Number of measurements: 31
Mean: 529.903 µS/cm
Rel. repeatability s.d (sr,rel):0.40%
Rel. reproducibility s.d.: 4.43%
Number of outlier measurements: 2
µS/cm
Mean
C
LAB25
LAB39
LAB30
LAB05
LAB04
LAB27
LAB28
LAB01
LAB31
LAB34
LAB18
LAB15
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Cu - ICP
Number of laboratories: 15
Number of measurements: 45
Mean: 102.440 µg/l
Rel. repeatability s.d (sr,rel):4.21%
Rel. reproducibility s.d.: 12.17%
Number of outlier measurements: 3
µg/l
Mean
B
LAB25
LAB03
LAB04
LAB05
LAB09
LAB30
LAB15
LAB18
LAB12
LAB27
LAB28
LAB21
LAB34
LAB39
LAB31
LAB01
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: pH
Number of laboratories: 13
Number of measurements: 35
Mean: 6.987 -
Rel. repeatability s.d (sr,rel):0.79%
Rel. reproducibility s.d.: 2.54%
Number of outlier measurements: 0
Mean
LAB04 LAB01 LAB15 LAB31 LAB34 LAB27 LAB18 LAB25 LAB28 LAB39 LAB30 LAB05 LAB09
Laboratory
4/10/01
German Federal Environmental Agency

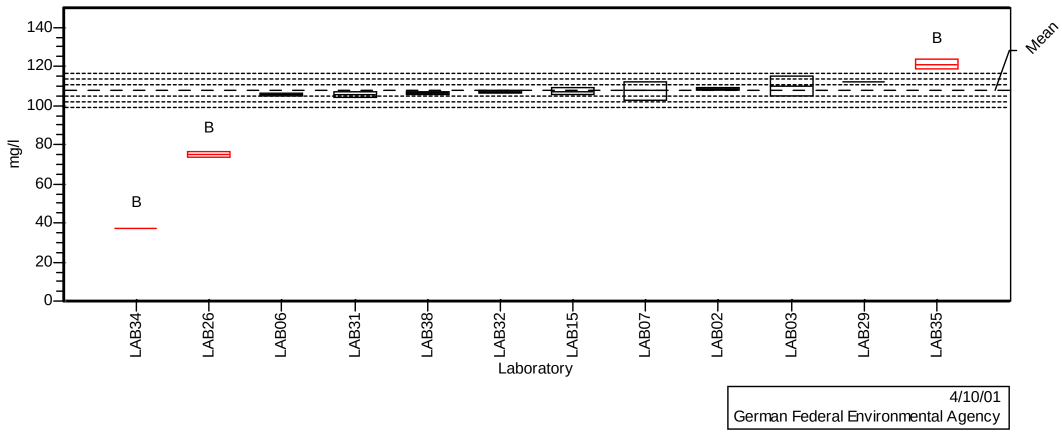

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: F - Electrode
Number of laboratories: 10
Number of measurements: 30
Mean: 7.656 mg/l
Rel. repeatability s.d (sr,rel):0.78%
Rel. reproducibility s.d.: 12.91%
Number of outlier measurements: 0
mg/l
Mean
LAB24 LAB15 LAB02 LAB14 LAB18 LAB16 LAB28 LAB05 LAB33 LAB21
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: F - IC
Number of laboratories: 11
Number of measurements: 33
Mean: 7.420 mg/l
Rel. repeatability s.d (sr,rel):2.06%
Rel. reproducibility s.d.: 16.57%
Number of outlier measurements: 0
mg/l
Mean
LAB26 LAB34 LAB02 LAB38 LAB35 LAB29 LAB32 LAB15 LAB07 LAB06 LAB03
Laboratory
4/10/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: SO4 - IC
Number of laboratories: 9
Number of measurements: 27

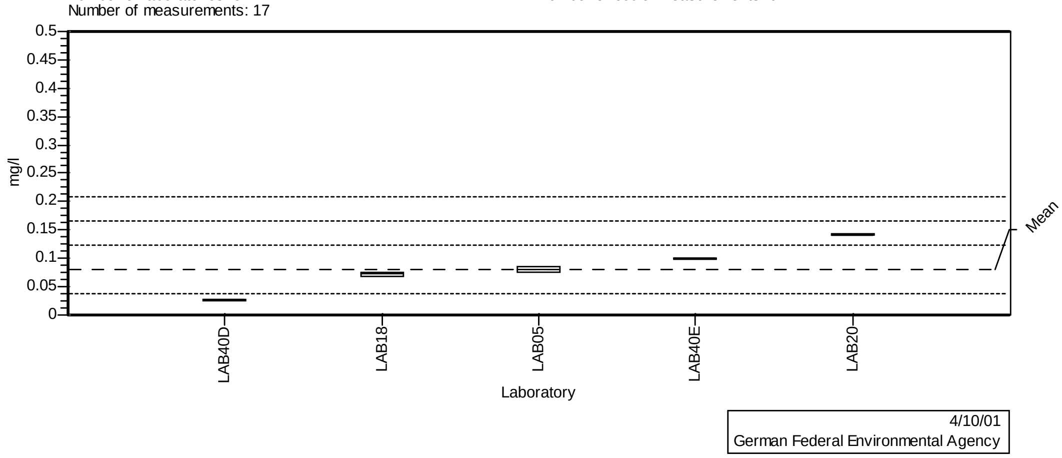
Mean: 107.767 mg/l
Rel. repeatability s.d (sr,rel):2.34%
Rel. reproducibility s.d.: 2.72%
Number of outlier measurements: 9



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Phenol Index - FIA
Number of laboratories: 5
Number of measurements: 17

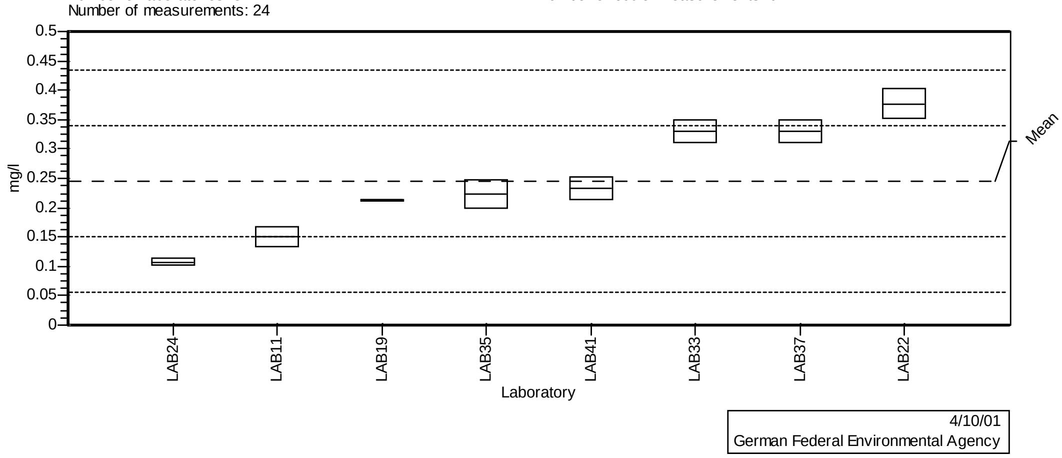
Mean: 0.081 mg/l
Rel. repeatability s.d (sr,rel):3.20%
Rel. reproducibility s.d.: 52.33%
Number of outlier measurements: 0

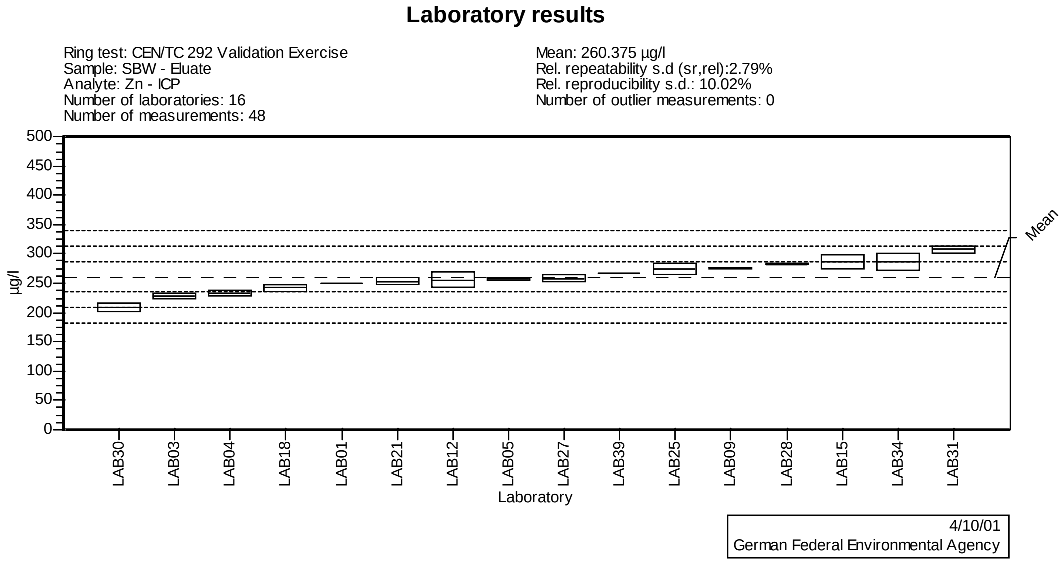


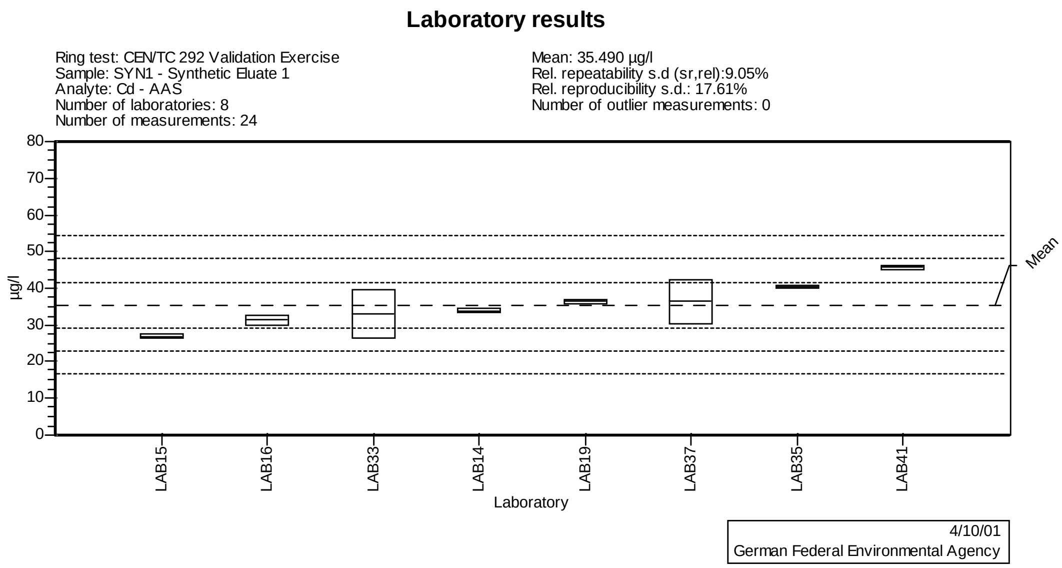
Laboratory results

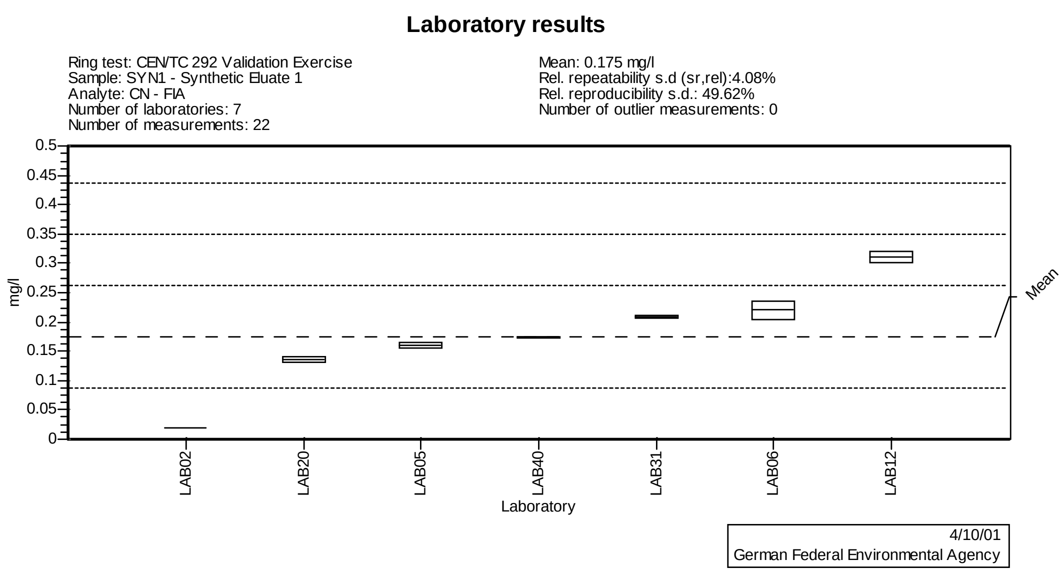
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Phenol Index - Photometry
Number of laboratories: 8
Number of measurements: 24

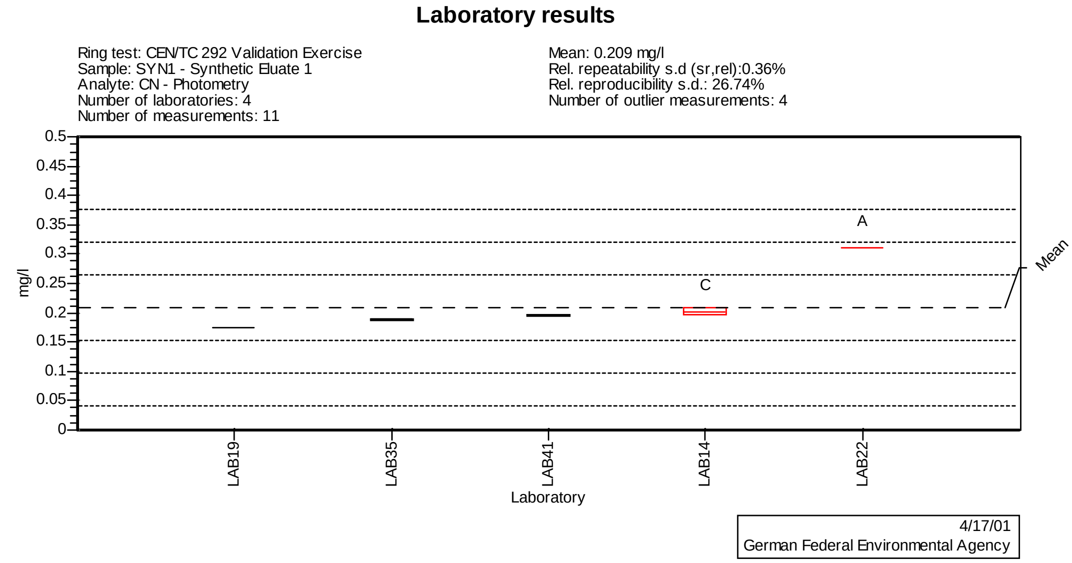
Mean: 0.246 mg/l
Rel. repeatability s.d (sr,rel):7.62%
Rel. reproducibility s.d.: 38.60%
Number of outlier measurements: 0

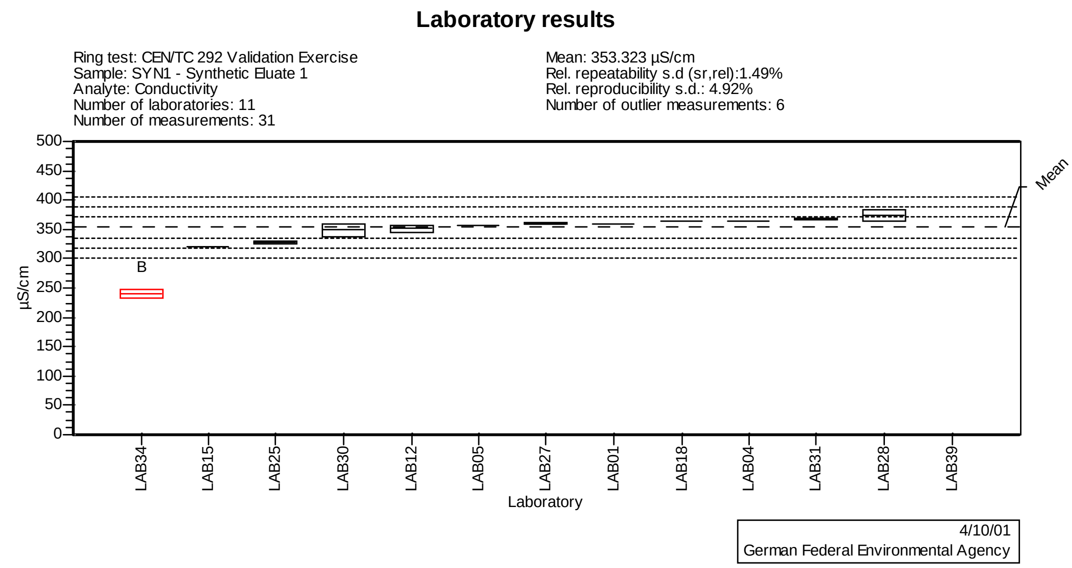


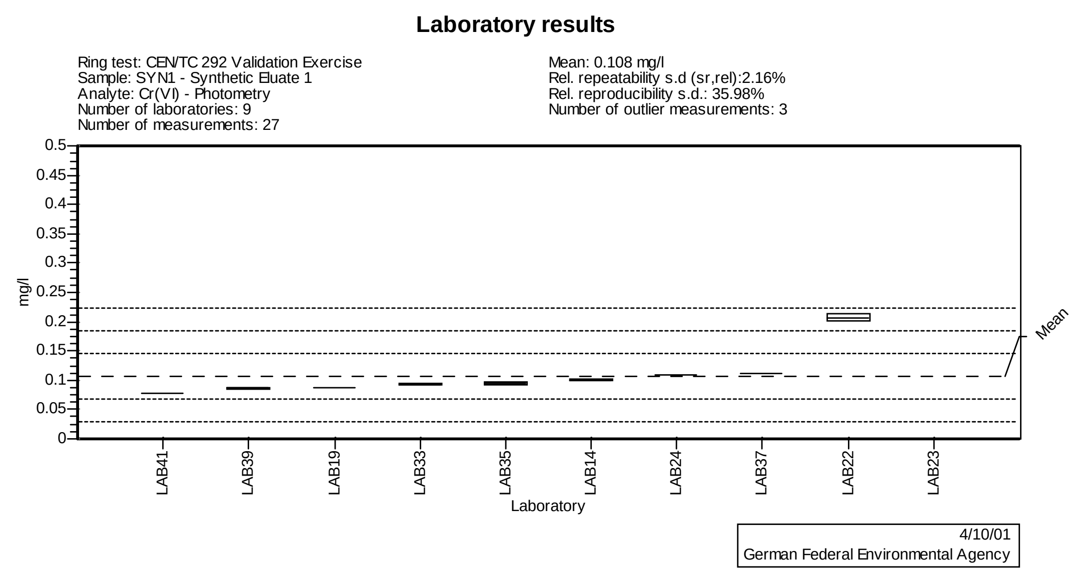

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SBW - Eluate
Analyte: Zn - ICP
Number of laboratories: 16
Number of measurements: 48
Mean: 260.375 µg/l
Rel. repeatability s.d (sr,rel):2.79%
Rel. reproducibility s.d.: 10.02%
Number of outlier measurements: 0
µg/l
Mean
LAB30 LAB03 LAB04 LAB18 LAB01 LAB21 LAB12 LAB05 LAB27 LAB39 LAB25 LAB09 LAB28 LAB15 LAB34 LAB31
Laboratory
4/10/01
German Federal Environmental Agency

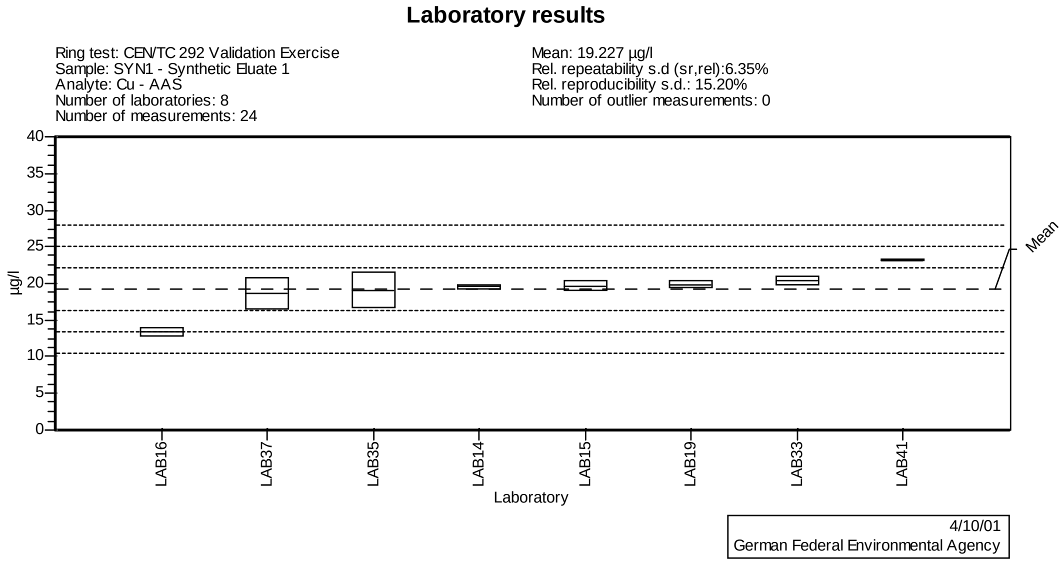

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Cd - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 35.490 µg/l
Rel. repeatability s.d (sr,rel):9.05%
Rel. reproducibility s.d.: 17.61%
Number of outlier measurements: 0
µg/l
Mean
LAB15 LAB16 LAB33 LAB14 LAB19 LAB37 LAB35 LAB41
Laboratory
4/10/01
German Federal Environmental Agency

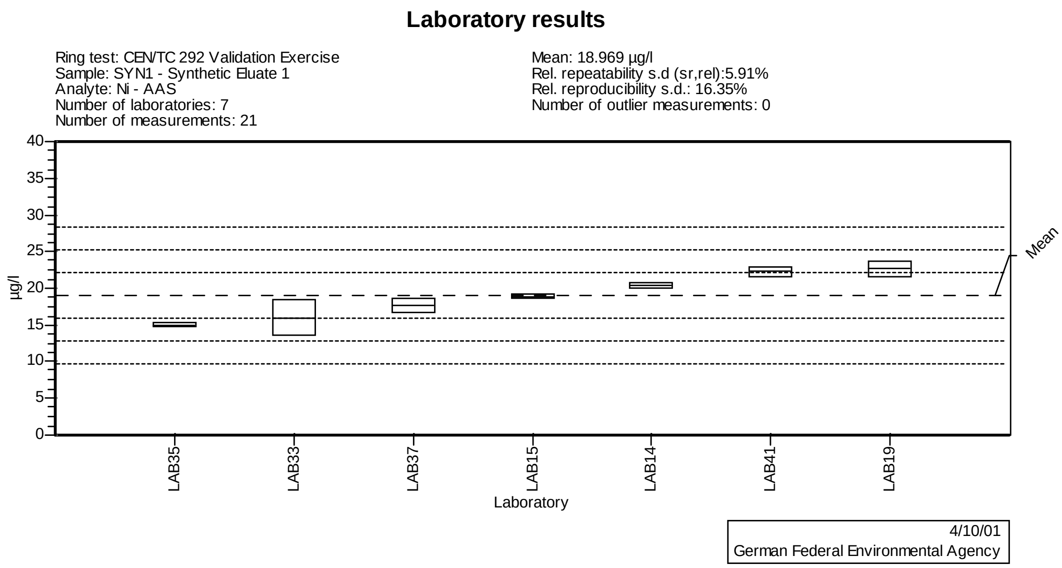

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: CN - FIA
Number of laboratories: 7
Number of measurements: 22
Mean: 0.175 mg/l
Rel. repeatability s.d (sr,rel):4.08%
Rel. reproducibility s.d.: 49.62%
Number of outlier measurements: 0
mg/l
Mean
LAB02 LAB20 LAB05 LAB40 LAB31 LAB06 LAB12
Laboratory
4/10/01
German Federal Environmental Agency

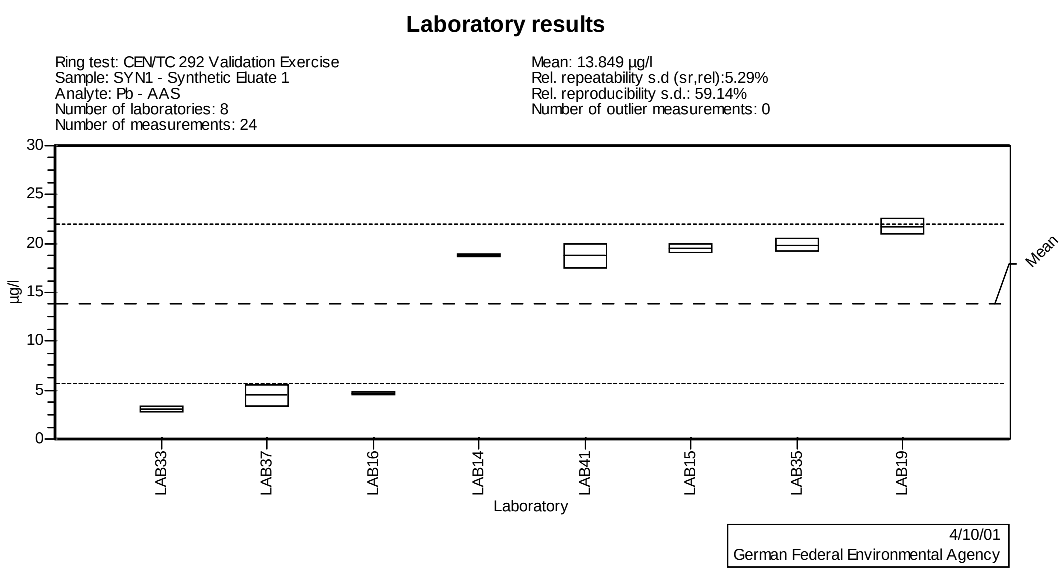

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: CN - Photometry
Number of laboratories: 4
Number of measurements: 11
Mean: 0.209 mg/l
Rel. repeatability s.d (sr,rel):0.36%
Rel. reproducibility s.d.: 26.74%
Number of outlier measurements: 4
mg/l
Mean
A
C
LAB19
LAB35
LAB41
LAB14
LAB22
Laboratory
4/17/01
German Federal Environmental Agency

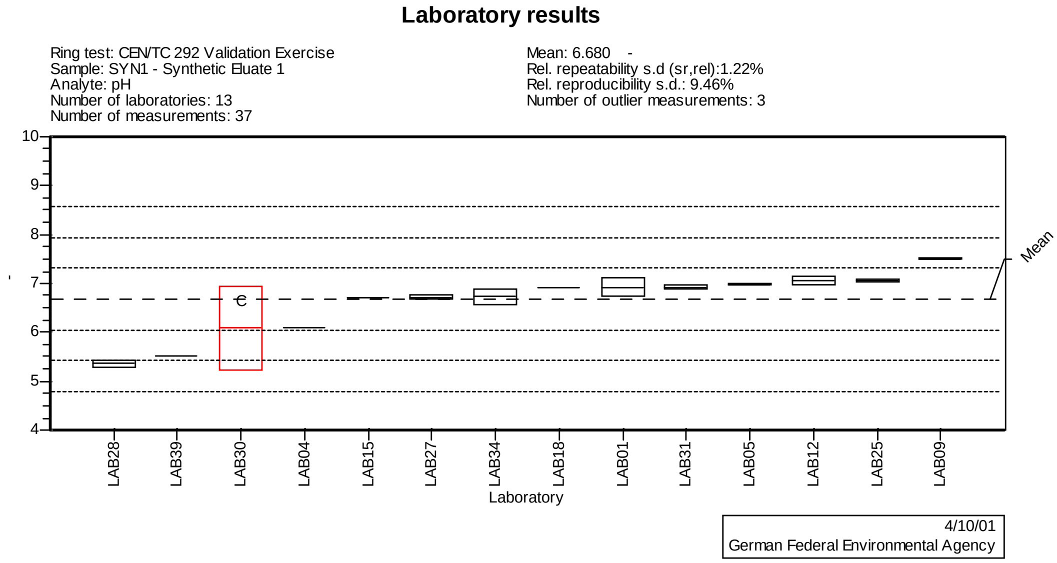

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Conductivity
Number of laboratories: 11
Number of measurements: 31
Mean: 353.323 µS/cm
Rel. repeatability s.d (sr,rel):1.49%
Rel. reproducibility s.d.: 4.92%
Number of outlier measurements: 6
µS/cm
Mean
B
LAB34
LAB15
LAB25
LAB30
LAB12
LAB05
LAB27
LAB01
LAB18
LAB04
LAB31
LAB28
LAB39
Laboratory
4/10/01
German Federal Environmental Agency

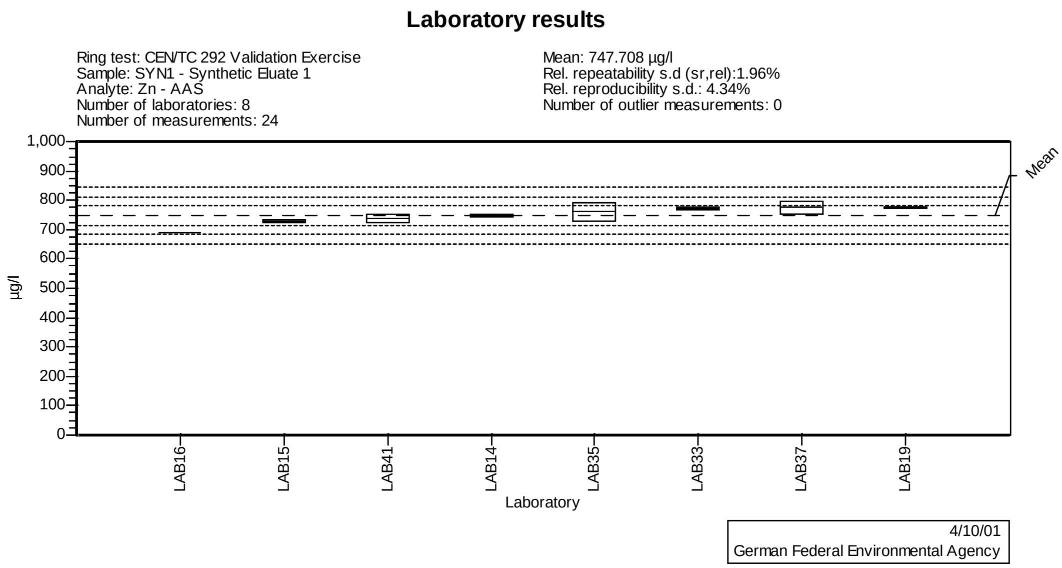

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Cr(VI) - Photometry
Number of laboratories: 9
Number of measurements: 27
Mean: 0.108 mg/l
Rel. repeatability s.d (sr,rel):2.16%
Rel. reproducibility s.d.: 35.98%
Number of outlier measurements: 3
mg/l
Mean
LAB41
LAB39
LAB19
LAB33
LAB35
LAB14
LAB24
LAB37
LAB22
LAB23
Laboratory
4/10/01
German Federal Environmental Agency

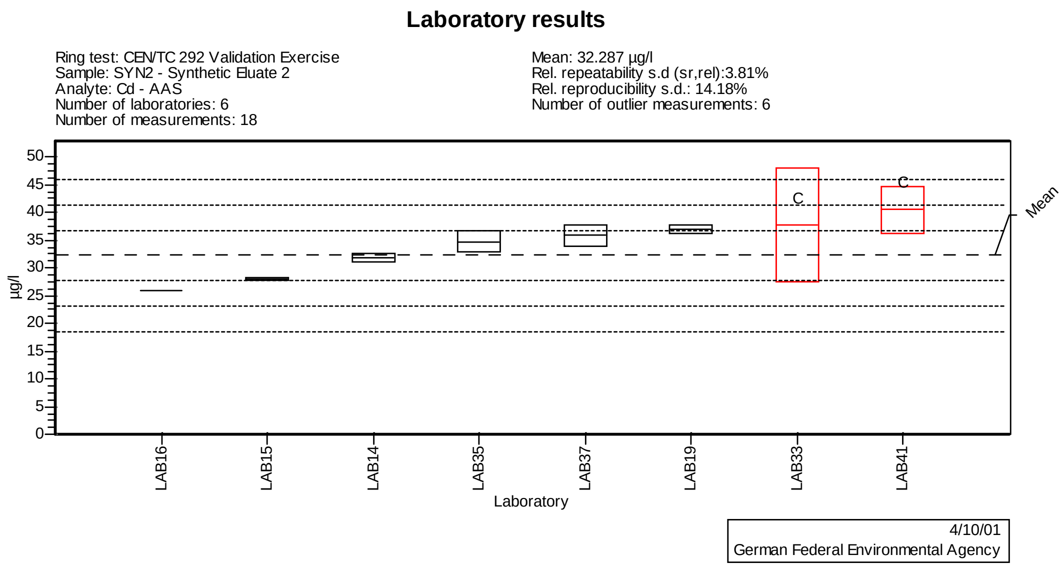

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Cu - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 19.227 µg/l
Rel. repeatability s.d (sr,rel):6.35%
Rel. reproducibility s.d.: 15.20%
Number of outlier measurements: 0
µg/l
0
5
10
15
20
25
30
35
40
Mean
LAB16
LAB37
LAB35
LAB14
LAB15
LAB19
LAB33
LAB41
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Ni - AAS
Number of laboratories: 7
Number of measurements: 21
Mean: 18.969 µg/l
Rel. repeatability s.d (sr,rel):5.91%
Rel. reproducibility s.d.: 16.35%
Number of outlier measurements: 0
µg/l
0
5
10
15
20
25
30
35
40
Mean
LAB35
LAB33
LAB37
LAB15
LAB14
LAB41
LAB19
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Pb - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 13.849 µg/l
Rel. repeatability s.d (sr,rel):5.29%
Rel. reproducibility s.d.: 59.14%
Number of outlier measurements: 0
µg/l
0
5
10
15
20
25
30
Mean
LAB33
LAB37
LAB16
LAB14
LAB41
LAB15
LAB35
LAB19
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: pH
Number of laboratories: 13
Number of measurements: 37
Mean: 6.680 -
Rel. repeatability s.d (sr,rel):1.22%
Rel. reproducibility s.d.: 9.46%
Number of outlier measurements: 3
Mean
LAB28
LAB39
LAB30
LAB04
LAB15
LAB27
LAB34
LAB18
LAB01
LAB31
LAB05
LAB12
LAB25
LAB09
Laboratory
4/10/01
German Federal Environmental Agency

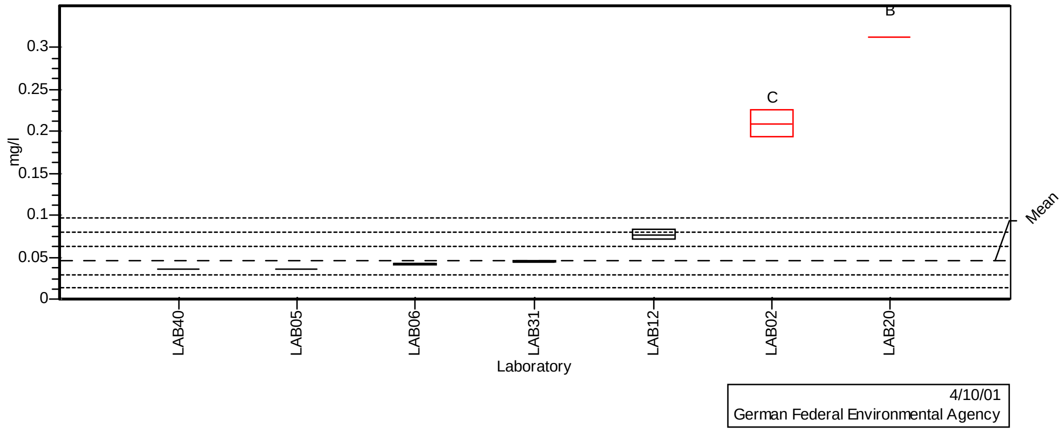

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN1 - Synthetic Eluate 1
Analyte: Zn - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 747.708 µg/l
Rel. repeatability s.d (sr,rel):1.96%
Rel. reproducibility s.d.: 4.34%
Number of outlier measurements: 0
µg/l
Mean
LAB16
LAB15
LAB41
LAB14
LAB35
LAB33
LAB37
LAB19
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Cd - AAS
Number of laboratories: 6
Number of measurements: 18
Mean: 32.287 µg/l
Rel. repeatability s.d (sr,rel):3.81%
Rel. reproducibility s.d.: 14.18%
Number of outlier measurements: 6
µg/l
Mean
LAB16
LAB15
LAB14
LAB35
LAB37
LAB19
LAB33
LAB41
Laboratory
4/10/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: CN - FIA
Number of laboratories: 5
Number of measurements: 16

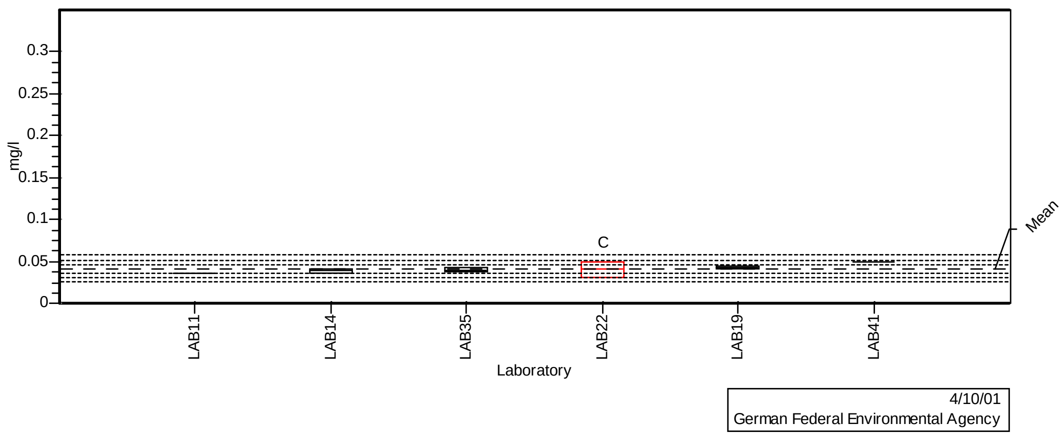
Mean: 0.047 mg/l
Rel. repeatability s.d (sr,rel):5.45%
Rel. reproducibility s.d.: 36.22%
Number of outlier measurements: 4



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: CN - Photometry
Number of laboratories: 5
Number of measurements: 15

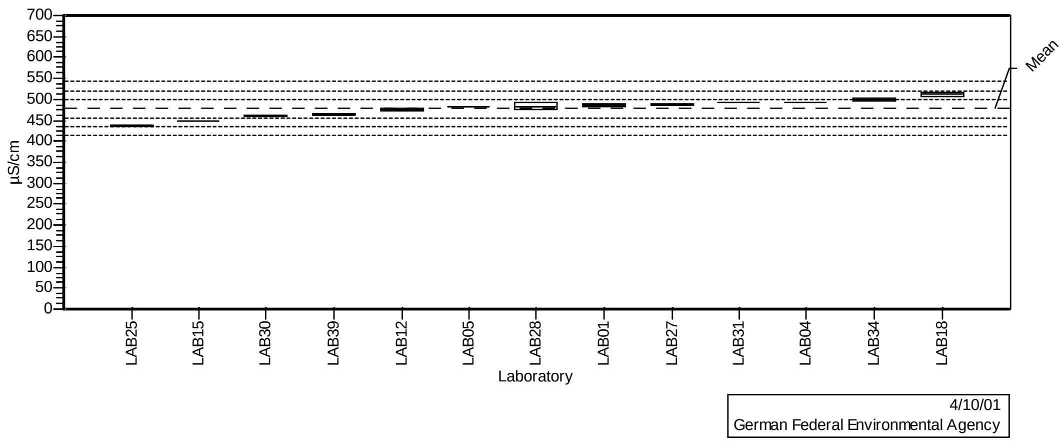
Mean: 0.041 mg/l
Rel. repeatability s.d (sr,rel):3.98%
Rel. reproducibility s.d.: 12.75%
Number of outlier measurements: 3

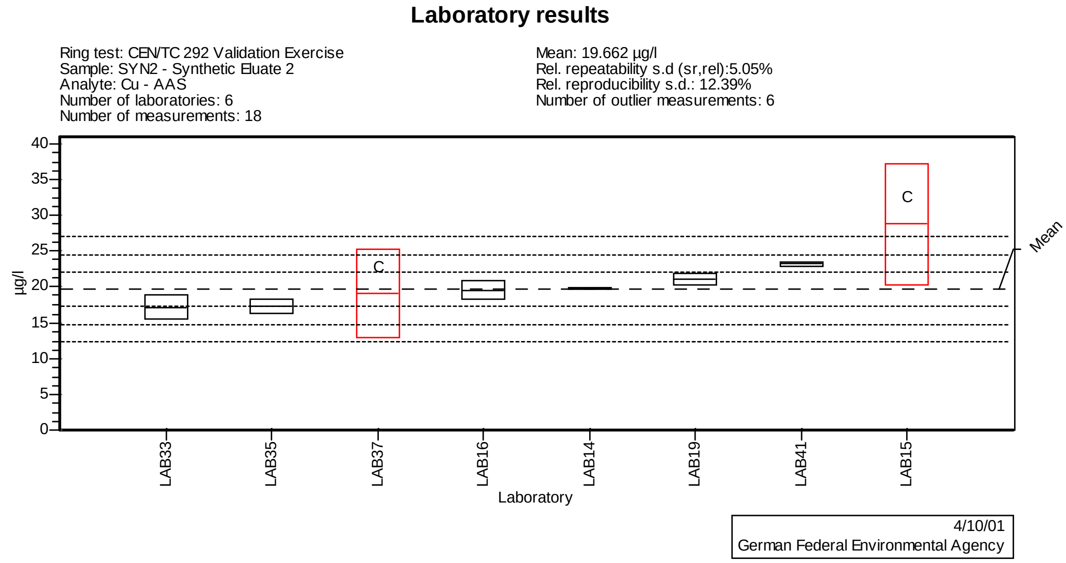


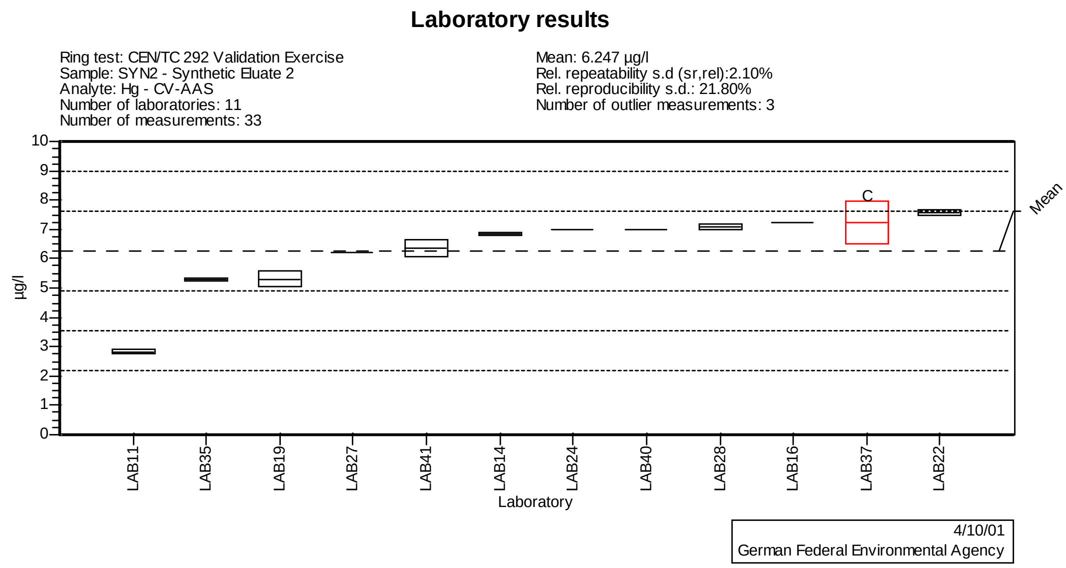
Laboratory results

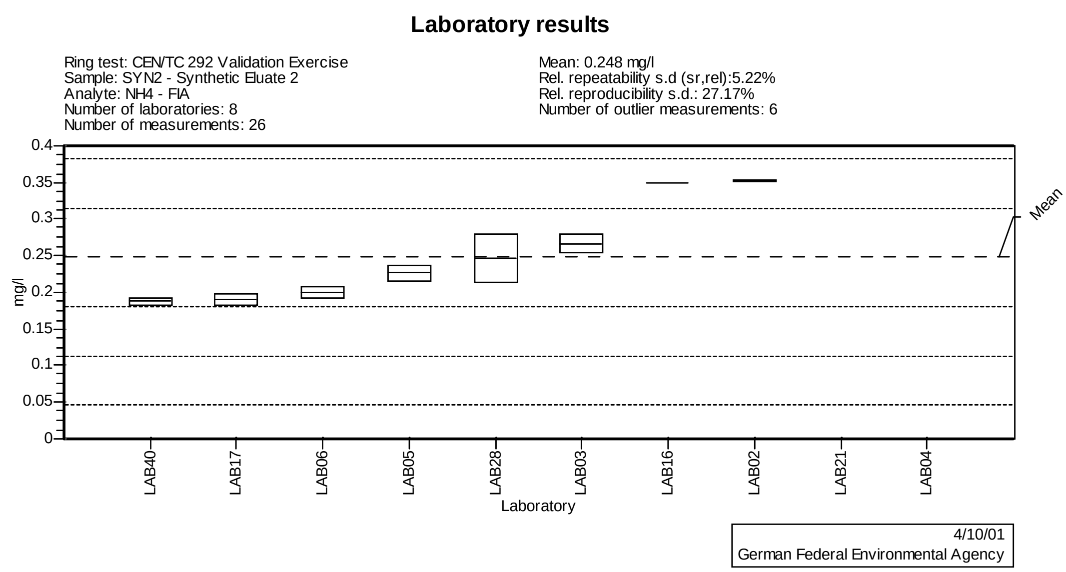
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Conductivity
Number of laboratories: 13
Number of measurements: 36

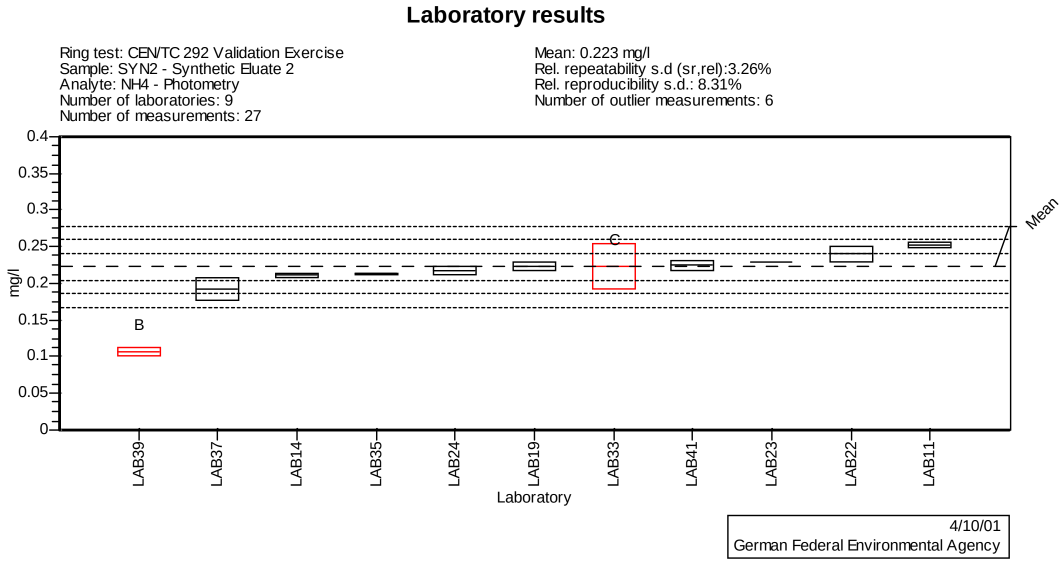
Mean: 477.972 µS/cm
Rel. repeatability s.d (sr,rel):0.61%
Rel. reproducibility s.d.: 4.51%
Number of outlier measurements: 0

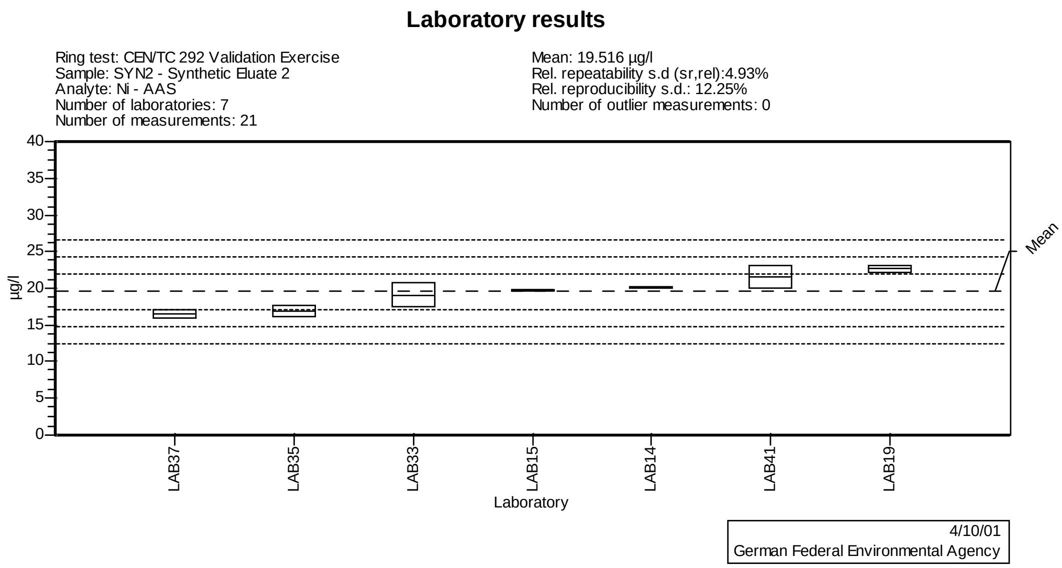


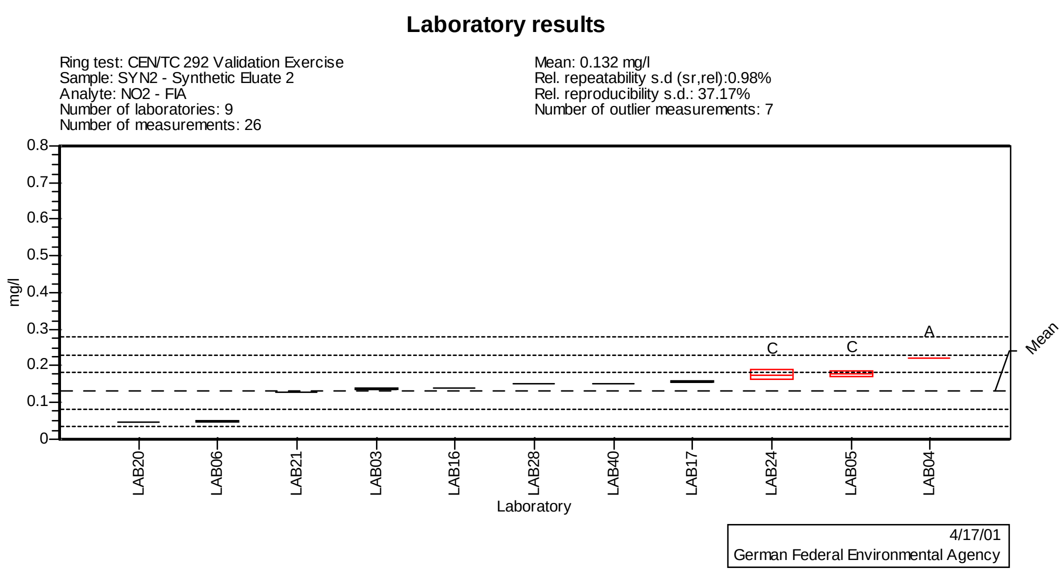

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Cu - AAS
Number of laboratories: 6
Number of measurements: 18
Mean: 19.662 µg/l
Rel. repeatability s.d (sr,rel):5.05%
Rel. reproducibility s.d.: 12.39%
Number of outlier measurements: 6
µg/l
Laboratory
LAB33
LAB35
LAB37
LAB16
LAB14
LAB19
LAB41
LAB15
Mean
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Hg - CV-AAS
Number of laboratories: 11
Number of measurements: 33
Mean: 6.247 µg/l
Rel. repeatability s.d (sr,rel):2.10%
Rel. reproducibility s.d.: 21.80%
Number of outlier measurements: 3
µg/l
Laboratory
LAB11
LAB35
LAB19
LAB27
LAB41
LAB14
LAB24
LAB40
LAB28
LAB16
LAB37
LAB22
Mean
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: NH4 - FIA
Number of laboratories: 8
Number of measurements: 26
Mean: 0.248 mg/l
Rel. repeatability s.d (sr,rel):5.22%
Rel. reproducibility s.d.: 27.17%
Number of outlier measurements: 6
mg/l
Laboratory
LAB40
LAB17
LAB06
LAB05
LAB28
LAB03
LAB16
LAB02
LAB21
LAB04
Mean
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: NH4 - Photometry
Number of laboratories: 9
Number of measurements: 27
Mean: 0.223 mg/l
Rel. repeatability s.d (sr,rel):3.26%
Rel. reproducibility s.d.: 8.31%
Number of outlier measurements: 6
mg/l
Mean
B
C
LAB39 LAB37 LAB14 LAB35 LAB24 LAB19 LAB33 LAB41 LAB23 LAB22 LAB11
Laboratory
4/10/01
German Federal Environmental Agency

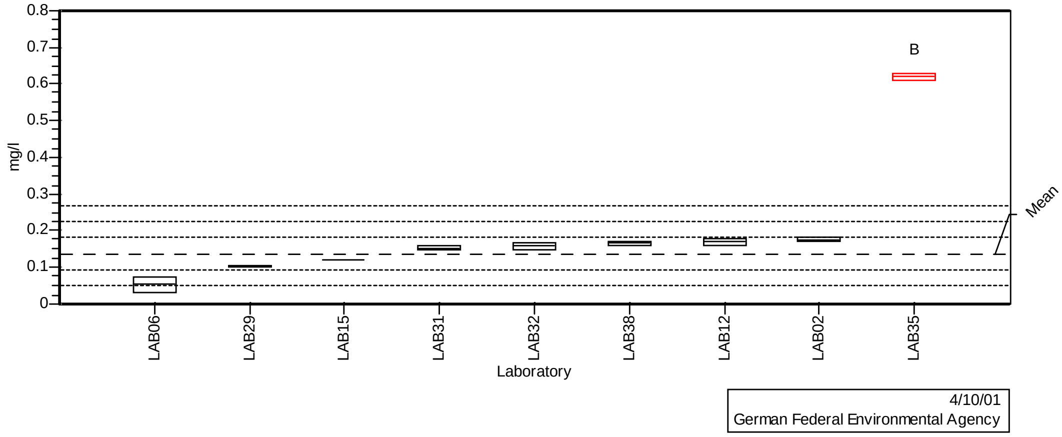

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Ni - AAS
Number of laboratories: 7
Number of measurements: 21
Mean: 19.516 µg/l
Rel. repeatability s.d (sr,rel):4.93%
Rel. reproducibility s.d.: 12.25%
Number of outlier measurements: 0
µg/l
Mean
LAB37 LAB35 LAB33 LAB15 LAB14 LAB41 LAB19
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: NO2 - FIA
Number of laboratories: 9
Number of measurements: 26
Mean: 0.132 mg/l
Rel. repeatability s.d (sr,rel):0.98%
Rel. reproducibility s.d.: 37.17%
Number of outlier measurements: 7
mg/l
Mean
C
C
A
LAB20 LAB06 LAB21 LAB03 LAB16 LAB28 LAB40 LAB17 LAB24 LAB05 LAB04
Laboratory
4/17/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: NO2 - IC
Number of laboratories: 8
Number of measurements: 24

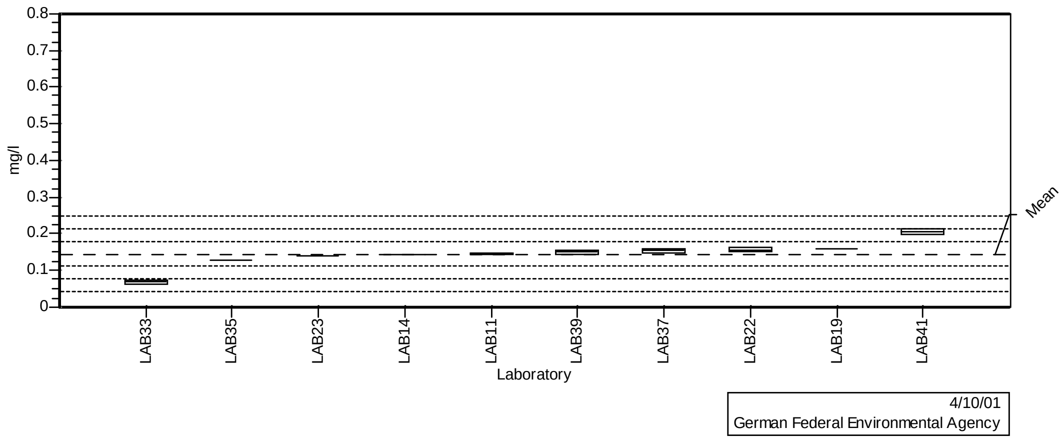
Mean: 0.138 mg/l
Rel. repeatability s.d (sr,rel):6.88%
Rel. reproducibility s.d.: 31.56%
Number of outlier measurements: 3



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: NO2 - Photometry
Number of laboratories: 10
Number of measurements: 30

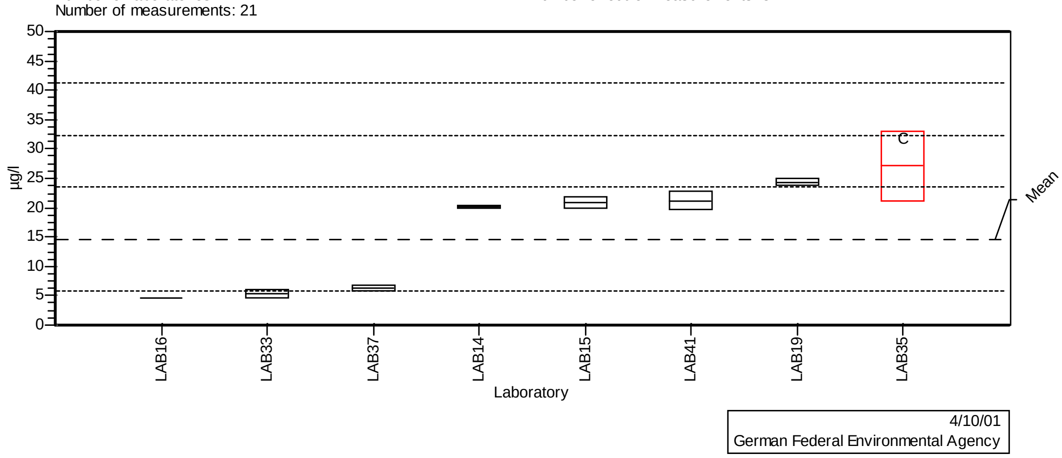
Mean: 0.145 mg/l
Rel. repeatability s.d (sr,rel):2.90%
Rel. reproducibility s.d.: 23.46%
Number of outlier measurements: 0

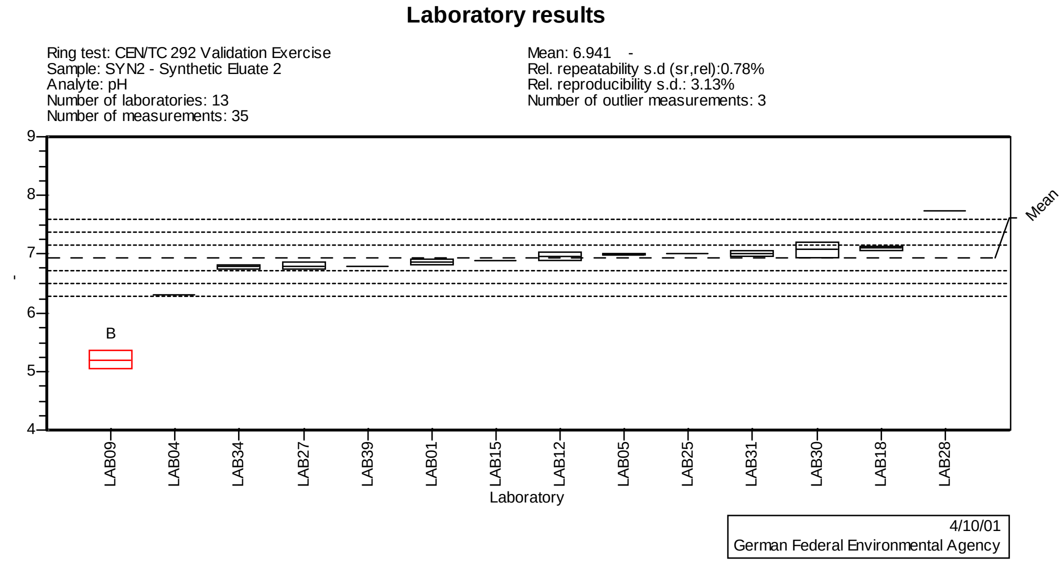


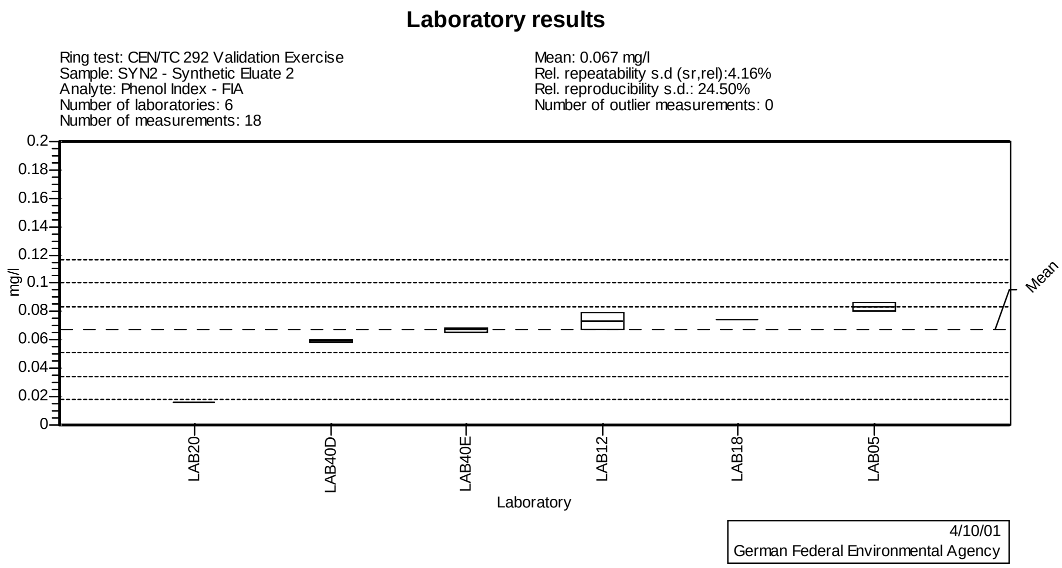
Laboratory results

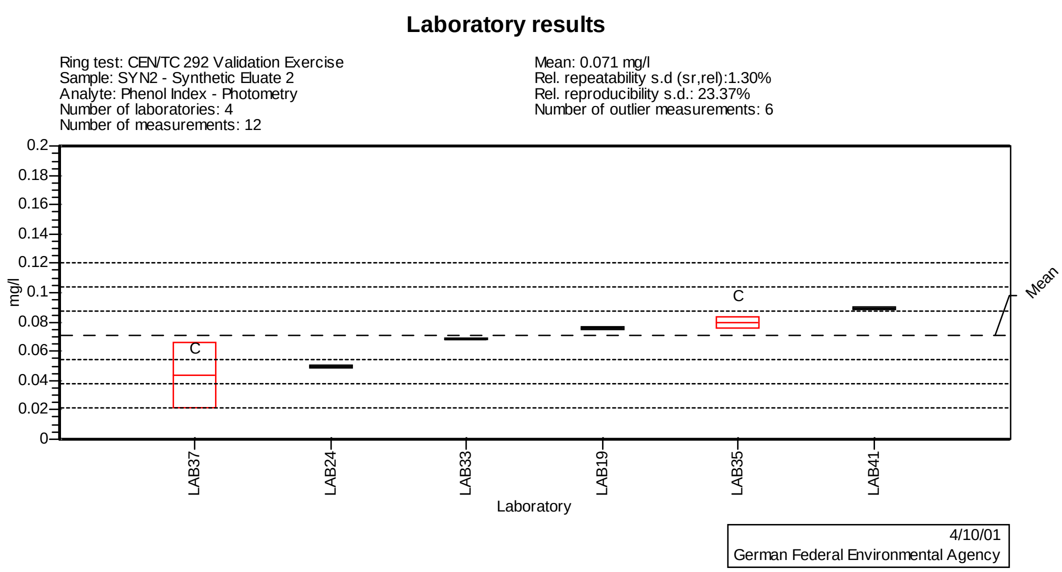
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Pb - AAS
Number of laboratories: 7
Number of measurements: 21

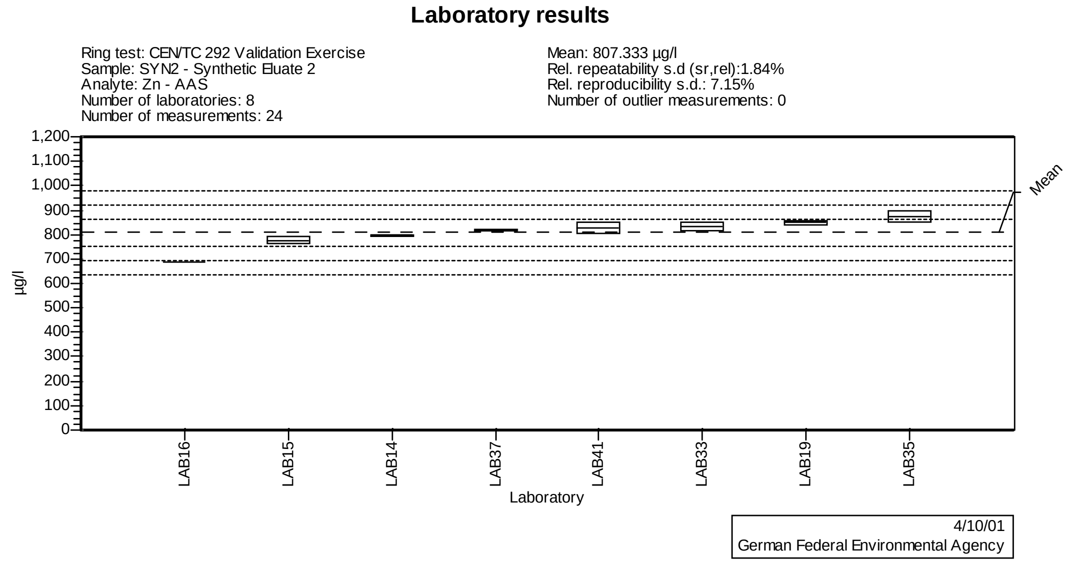
Mean: 14.673 µg/l
Rel. repeatability s.d (sr,rel):5.57%
Rel. reproducibility s.d.: 60.25%
Number of outlier measurements: 3

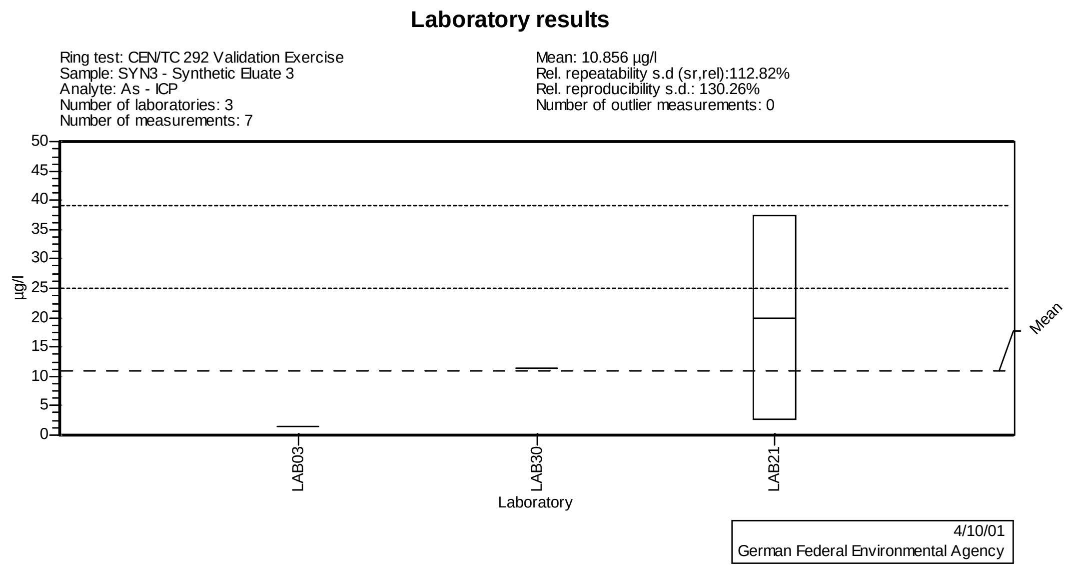


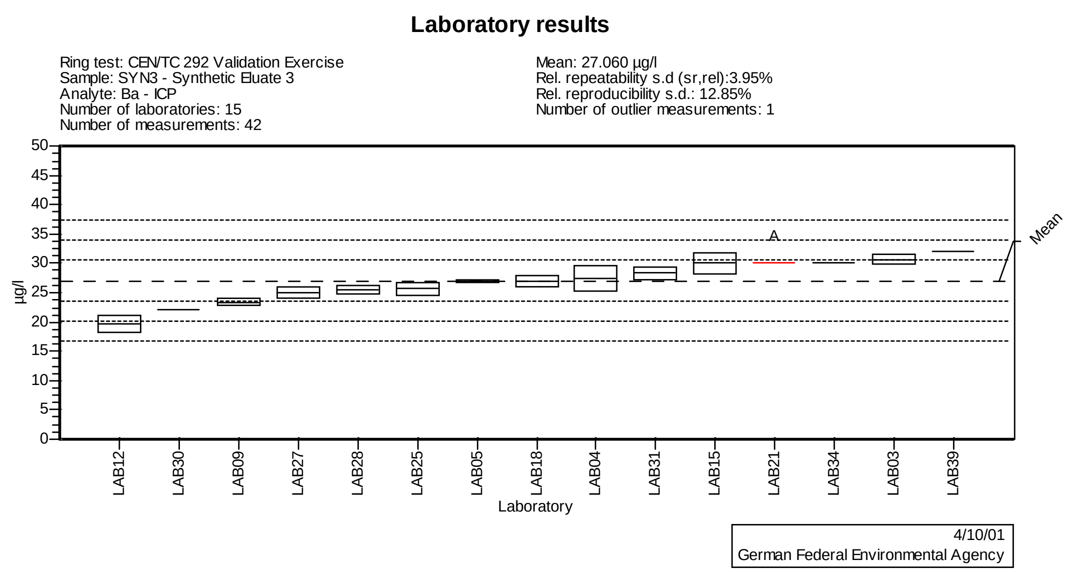

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: pH
Number of laboratories: 13
Number of measurements: 35
Mean: 6.941 -
Rel. repeatability s.d (sr,rel):0.78%
Rel. reproducibility s.d.: 3.13%
Number of outlier measurements: 3
B
Mean
LAB09
LAB04
LAB34
LAB27
LAB39
LAB01
LAB15
LAB12
LAB05
LAB25
LAB31
LAB30
LAB18
LAB28
Laboratory
4/10/01
German Federal Environmental Agency

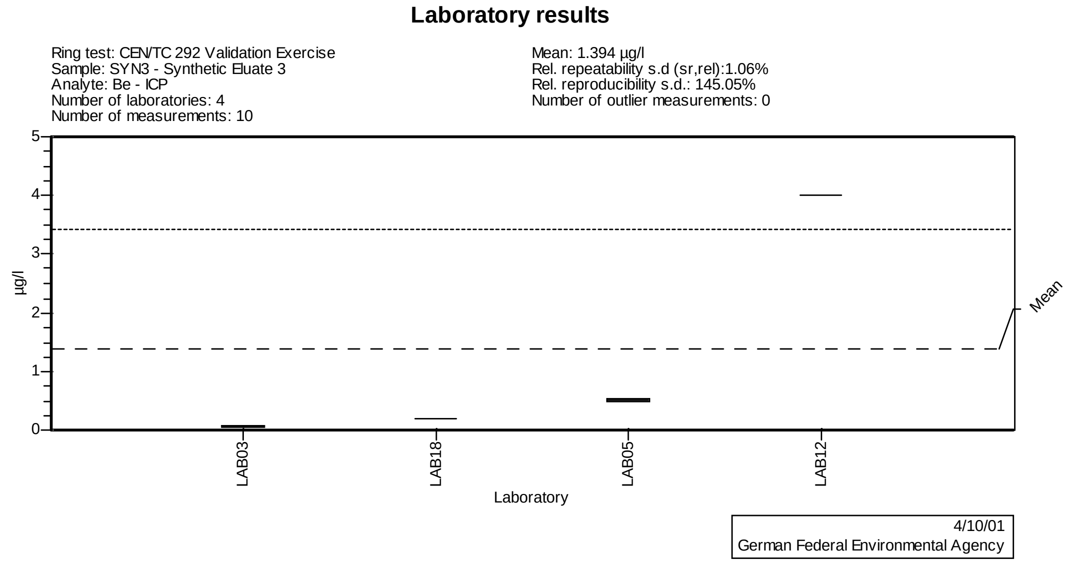

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Phenol Index - FIA
Number of laboratories: 6
Number of measurements: 18
Mean: 0.067 mg/l
Rel. repeatability s.d (sr,rel):4.16%
Rel. reproducibility s.d.: 24.50%
Number of outlier measurements: 0
mg/l
Mean
LAB20
LAB40D
LAB40E
LAB12
LAB18
LAB05
Laboratory
4/10/01
German Federal Environmental Agency

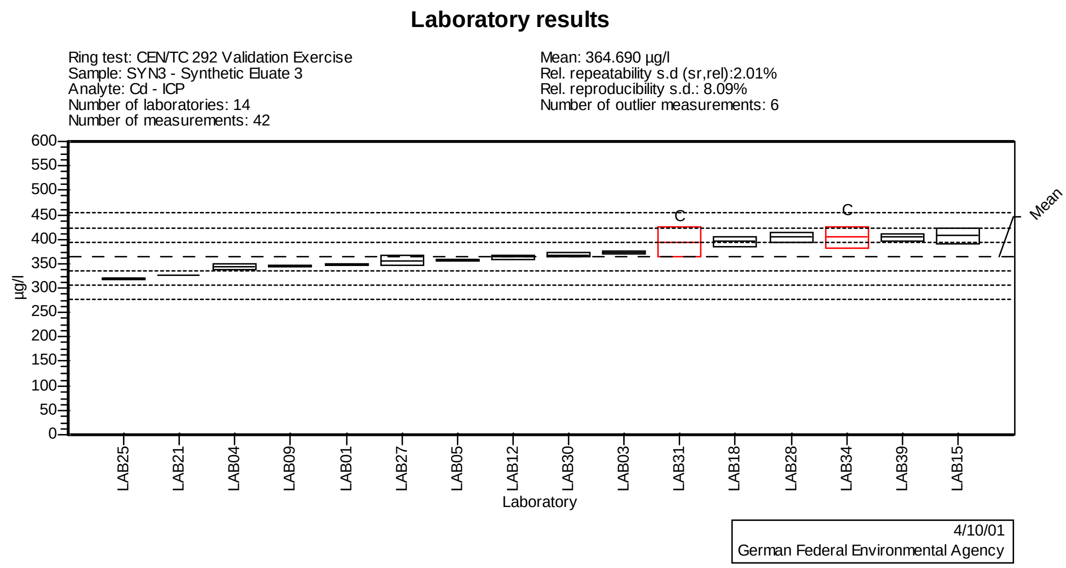

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Phenol Index - Photometry
Number of laboratories: 4
Number of measurements: 12
Mean: 0.071 mg/l
Rel. repeatability s.d (sr,rel):1.30%
Rel. reproducibility s.d.: 23.37%
Number of outlier measurements: 6
mg/l
C
C
Mean
LAB37
LAB24
LAB33
LAB19
LAB35
LAB41
Laboratory
4/10/01
German Federal Environmental Agency

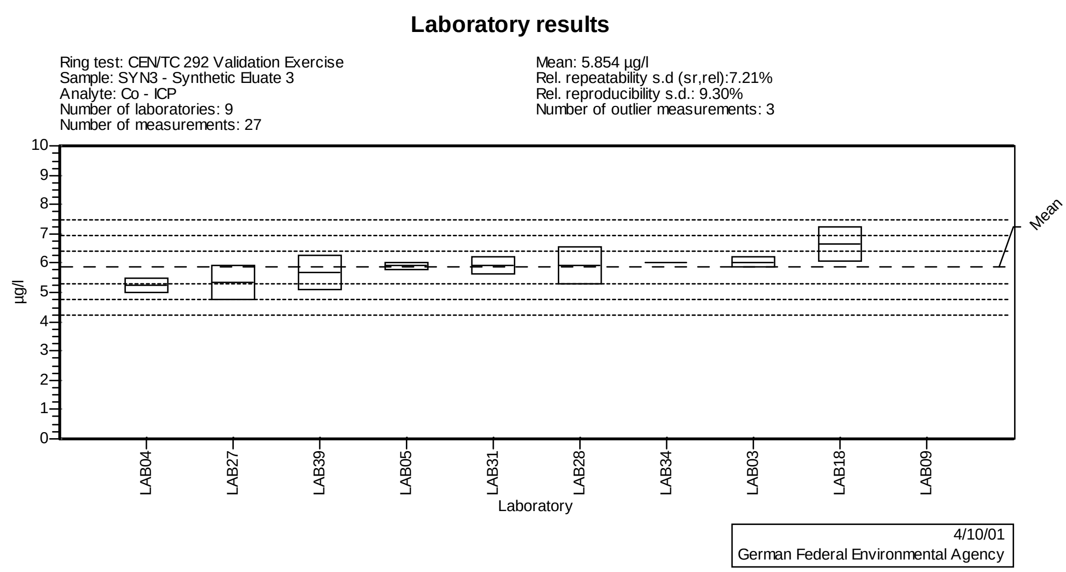

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN2 - Synthetic Eluate 2
Analyte: Zn - AAS
Number of laboratories: 8
Number of measurements: 24
Mean: 807.333 µg/l
Rel. repeatability s.d (sr,rel):1.84%
Rel. reproducibility s.d.: 7.15%
Number of outlier measurements: 0
µg/l
Mean
LAB16
LAB15
LAB14
LAB37
LAB41
LAB33
LAB19
LAB35
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: As - ICP
Number of laboratories: 3
Number of measurements: 7
Mean: 10.856 µg/l
Rel. repeatability s.d (sr,rel):112.82%
Rel. reproducibility s.d.: 130.26%
Number of outlier measurements: 0
µg/l
Mean
LAB03
LAB30
LAB21
Laboratory
4/10/01
German Federal Environmental Agency

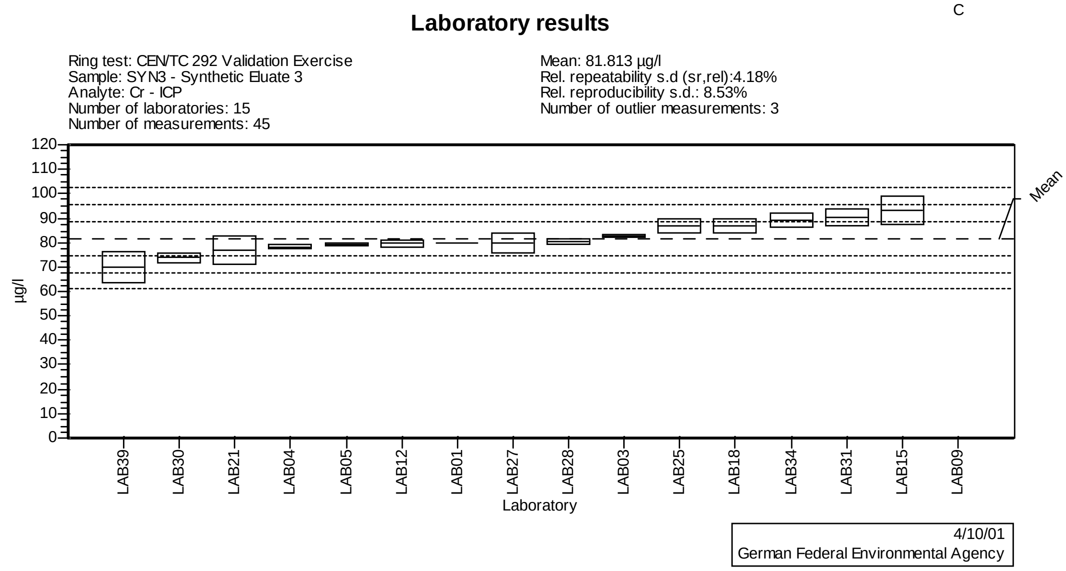

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Ba - ICP
Number of laboratories: 15
Number of measurements: 42
Mean: 27.060 µg/l
Rel. repeatability s.d (sr,rel):3.95%
Rel. reproducibility s.d.: 12.85%
Number of outlier measurements: 1
µg/l
Mean
A
LAB12
LAB30
LAB09
LAB27
LAB28
LAB25
LAB05
LAB18
LAB04
LAB31
LAB15
LAB21
LAB34
LAB03
LAB39
Laboratory
4/10/01
German Federal Environmental Agency

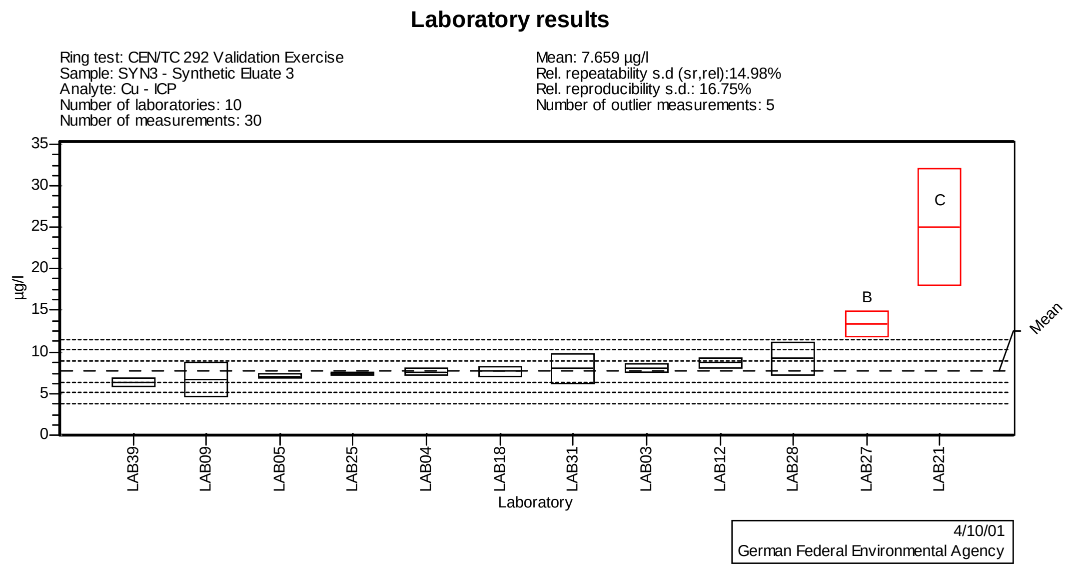

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Be - ICP
Number of laboratories: 4
Number of measurements: 10
Mean: 1.394 µg/l
Rel. repeatability s.d (sr,rel):1.06%
Rel. reproducibility s.d.: 145.05%
Number of outlier measurements: 0
µg/l
Mean
LAB03
LAB18
LAB05
LAB12
Laboratory
4/10/01
German Federal Environmental Agency

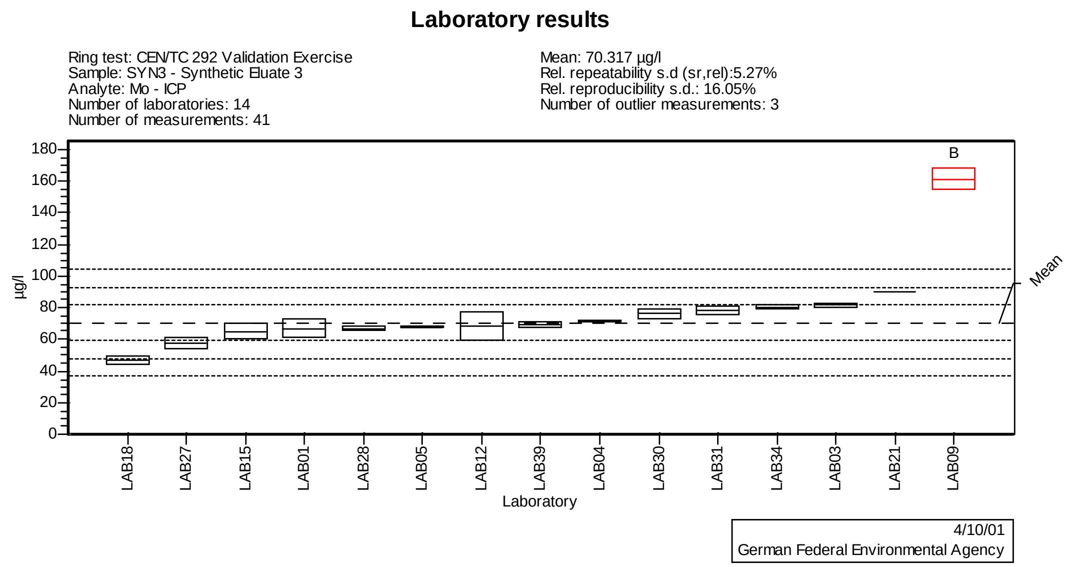

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Cd - ICP
Number of laboratories: 14
Number of measurements: 42
Mean: 364.690 µg/l
Rel. repeatability s.d (sr,rel):2.01%
Rel. reproducibility s.d.: 8.09%
Number of outlier measurements: 6
µg/l
Mean
LAB25
LAB21
LAB04
LAB09
LAB01
LAB27
LAB05
LAB12
LAB30
LAB03
LAB31
LAB18
LAB28
LAB34
LAB39
LAB15
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Co - ICP
Number of laboratories: 9
Number of measurements: 27
Mean: 5.854 µg/l
Rel. repeatability s.d (sr,rel):7.21%
Rel. reproducibility s.d.: 9.30%
Number of outlier measurements: 3
µg/l
Mean
LAB04
LAB27
LAB39
LAB05
LAB31
LAB28
LAB34
LAB03
LAB18
LAB09
Laboratory
4/10/01
German Federal Environmental Agency

C


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Cr - ICP
Number of laboratories: 15
Number of measurements: 45
Mean: 81.813 µg/l
Rel. repeatability s.d (sr,rel):4.18%
Rel. reproducibility s.d.: 8.53%
Number of outlier measurements: 3
µg/l
Mean
LAB39
LAB30
LAB21
LAB04
LAB05
LAB12
LAB01
LAB27
LAB28
LAB03
LAB25
LAB18
LAB34
LAB31
LAB15
LAB09
Laboratory
4/10/01
German Federal Environmental Agency

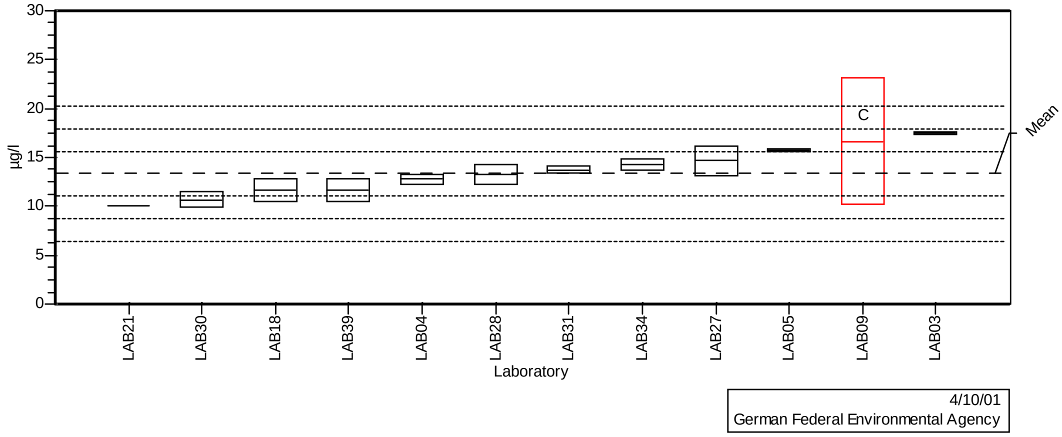

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Cu - ICP
Number of laboratories: 10
Number of measurements: 30
Mean: 7.659 µg/l
Rel. repeatability s.d (sr,rel):14.98%
Rel. reproducibility s.d.: 16.75%
Number of outlier measurements: 5
µg/l
C
B
Mean
LAB39
LAB09
LAB05
LAB25
LAB04
LAB18
LAB31
LAB03
LAB12
LAB28
LAB27
LAB21
Laboratory
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Mo - ICP
Number of laboratories: 14
Number of measurements: 41
Mean: 70.317 µg/l
Rel. repeatability s.d (sr,rel):5.27%
Rel. reproducibility s.d.: 16.05%
Number of outlier measurements: 3
µg/l
B
Mean
LAB18
LAB27
LAB15
LAB01
LAB28
LAB05
LAB12
LAB39
LAB04
LAB30
LAB31
LAB34
LAB03
LAB21
LAB09
Laboratory
4/10/01
German Federal Environmental Agency

Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Ni - ICP
Number of laboratories: 11
Number of measurements: 32

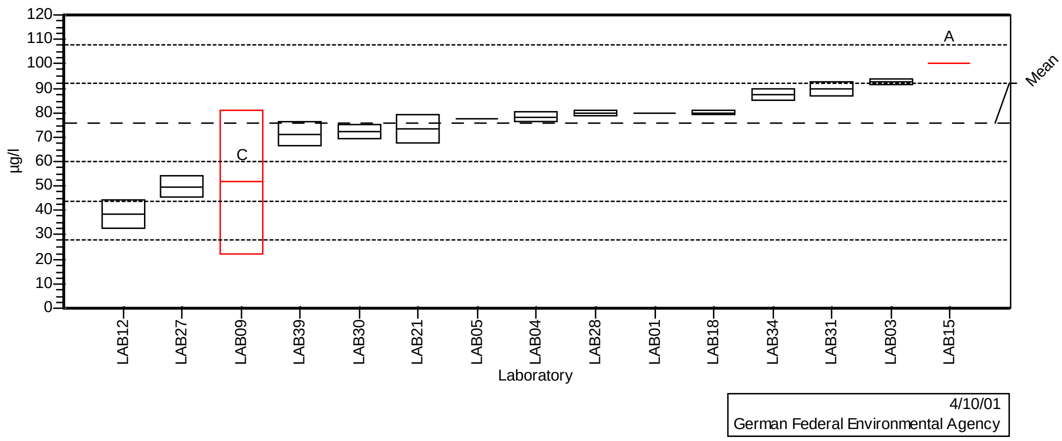
Mean: 13.344 µg/l
Rel. repeatability s.d (sr,rel):6.23%
Rel. reproducibility s.d.: 17.22%
Number of outlier measurements: 3



Laboratory results

Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Pb - ICP
Number of laboratories: 14
Number of measurements: 41

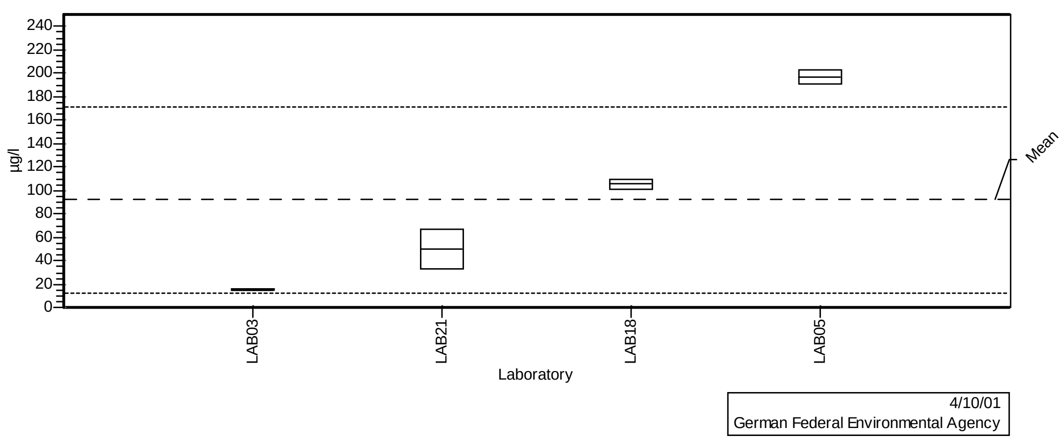
Mean: 75.856 µg/l
Rel. repeatability s.d (sr,rel):4.21%
Rel. reproducibility s.d.: 21.17%
Number of outlier measurements: 4

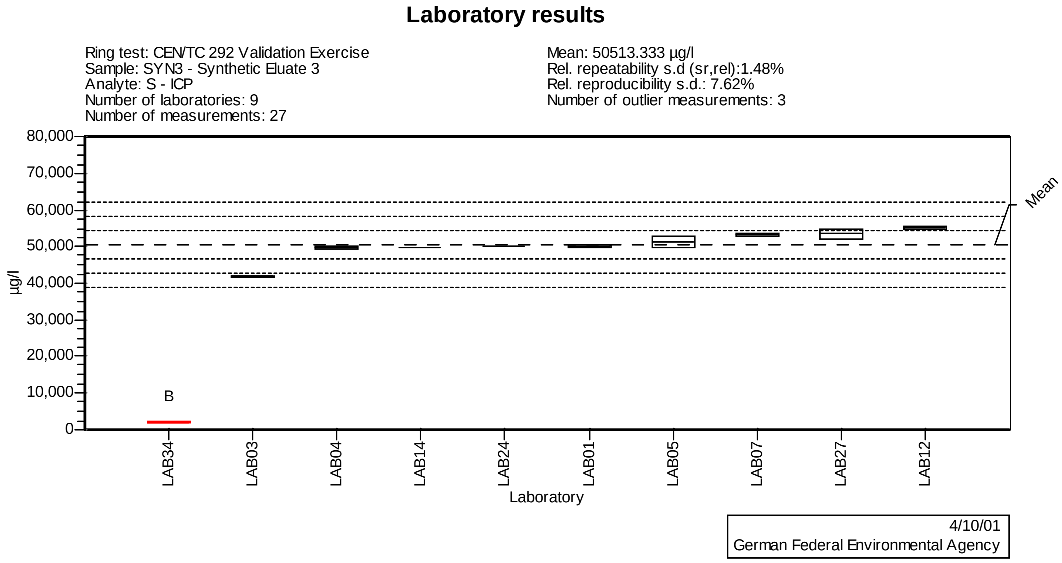


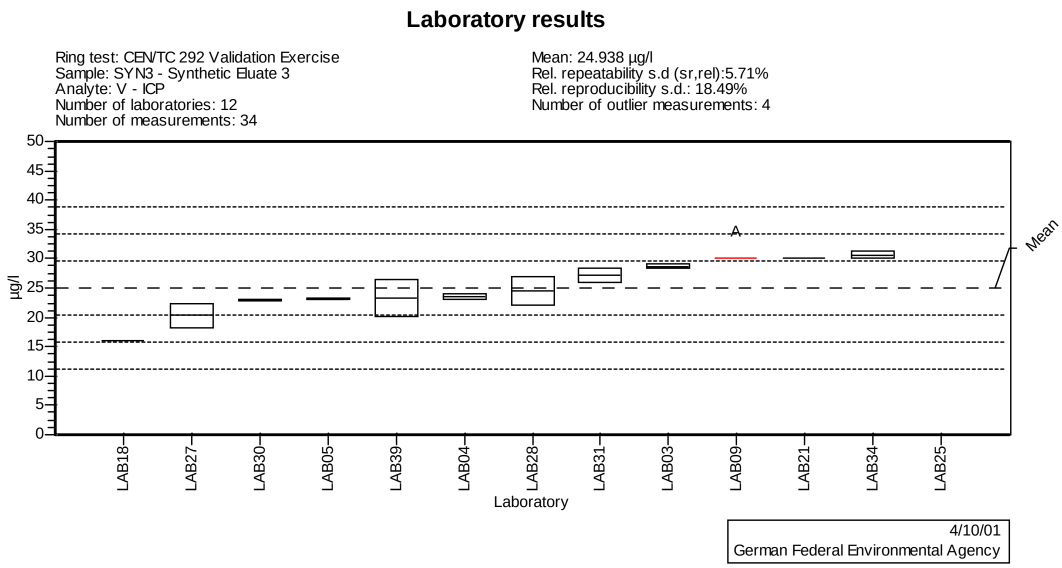
Laboratory results

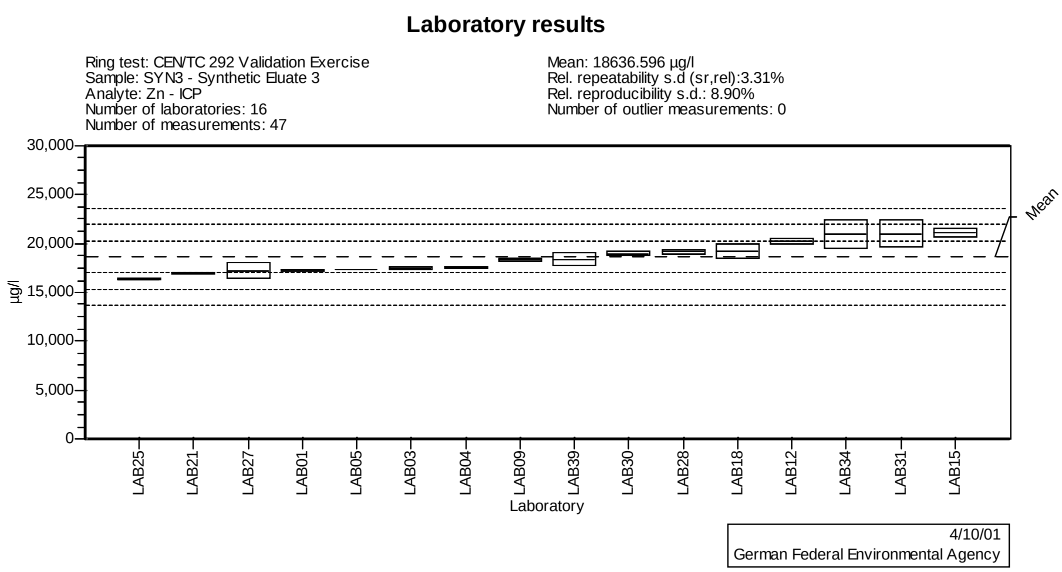
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: P - ICP
Number of laboratories: 4
Number of measurements: 12

Mean: 91.683 µg/l
Rel. repeatability s.d (sr,rel):10.27%
Rel. reproducibility s.d.: 86.76%
Number of outlier measurements: 0



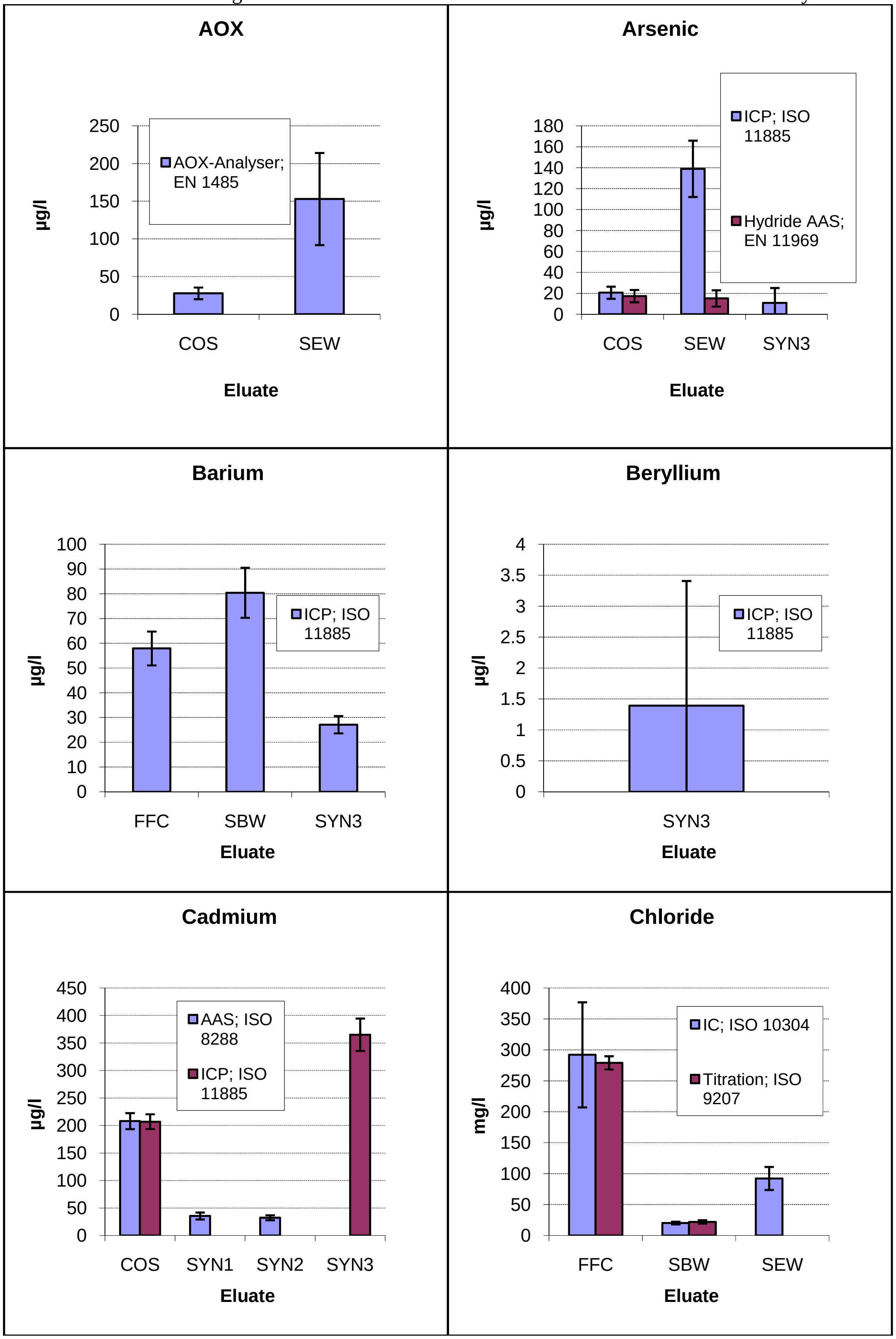

Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: S - ICP
Number of laboratories: 9
Number of measurements: 27
Mean: 50513.333 µg/l
Rel. repeatability s.d (sr,rel):1.48%
Rel. reproducibility s.d.: 7.62%
Number of outlier measurements: 3
µg/l
Laboratory
Mean
B
LAB34 LAB03 LAB04 LAB14 LAB24 LAB01 LAB05 LAB07 LAB27 LAB12
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: V - ICP
Number of laboratories: 12
Number of measurements: 34
Mean: 24.938 µg/l
Rel. repeatability s.d (sr,rel):5.71%
Rel. reproducibility s.d.: 18.49%
Number of outlier measurements: 4
µg/l
Laboratory
Mean
A
LAB18 LAB27 LAB30 LAB05 LAB39 LAB04 LAB28 LAB31 LAB03 LAB09 LAB21 LAB34 LAB25
4/10/01
German Federal Environmental Agency


Laboratory results
Ring test: CEN/TC 292 Validation Exercise
Sample: SYN3 - Synthetic Eluate 3
Analyte: Zn - ICP
Number of laboratories: 16
Number of measurements: 47
Mean: 18636.596 µg/l
Rel. repeatability s.d (sr,rel):3.31%
Rel. reproducibility s.d.: 8.90%
Number of outlier measurements: 0
µg/l
Laboratory
Mean
LAB25 LAB21 LAB27 LAB01 LAB05 LAB03 LAB04 LAB09 LAB39 LAB30 LAB28 LAB18 LAB12 LAB34 LAB31 LAB15
4/10/01
German Federal Environmental Agency

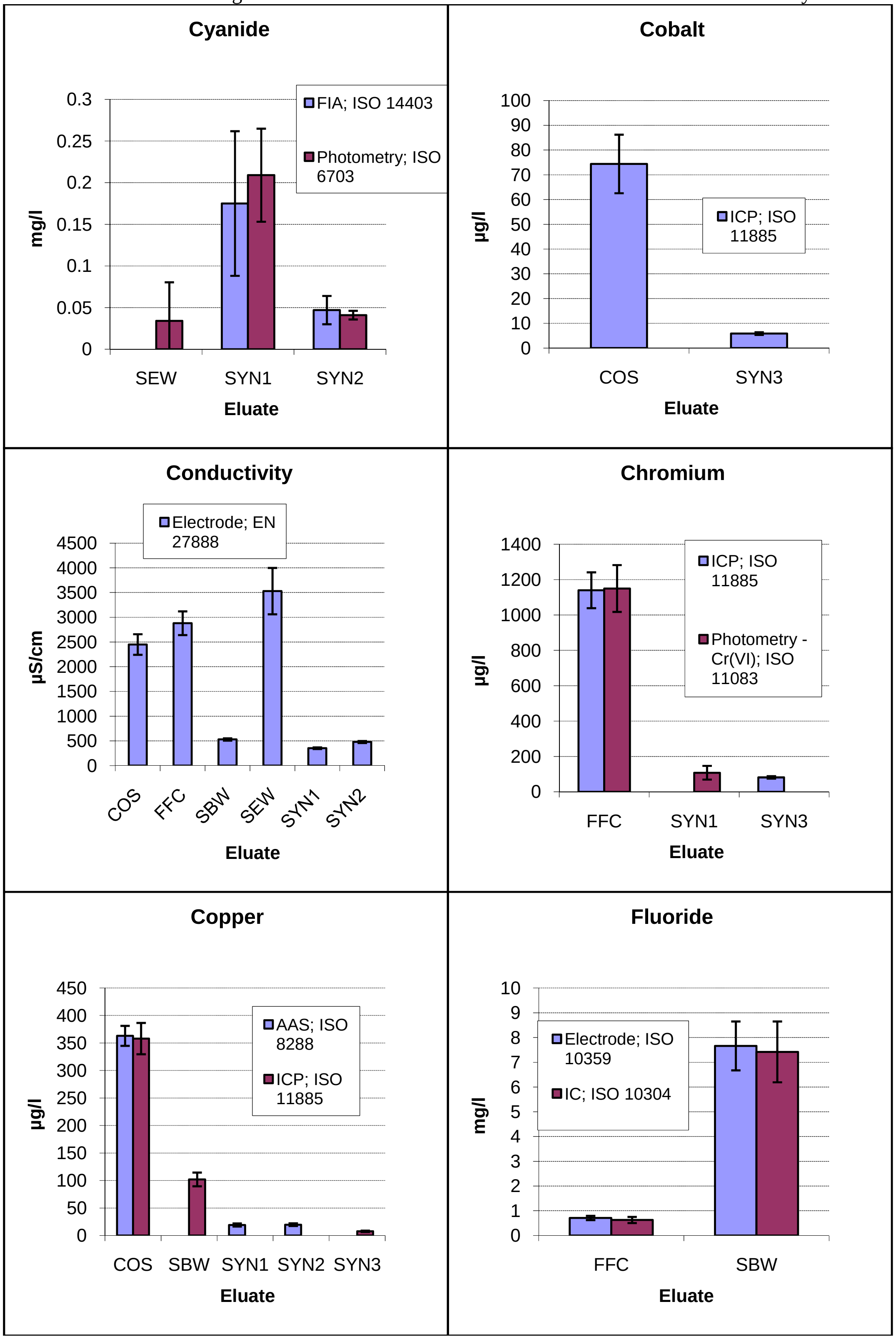
Annex 6

Graphical summary



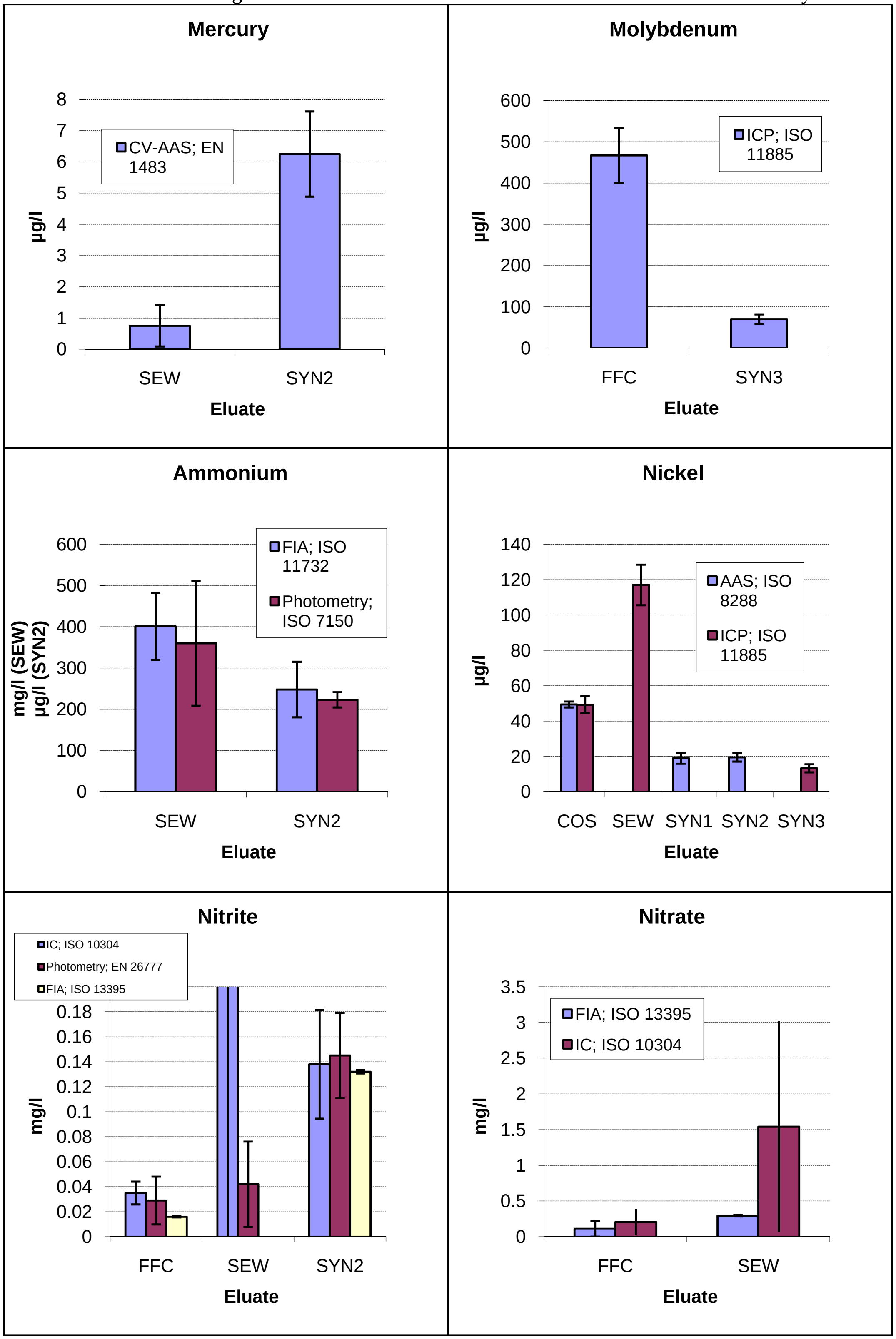
Results of the CEN/TC292 exercise on validation of methods for the analysis of waste eluates.

Columns represent the overall means of the different methods, error bars correspond to plus/minus between laboratory standard deviation.



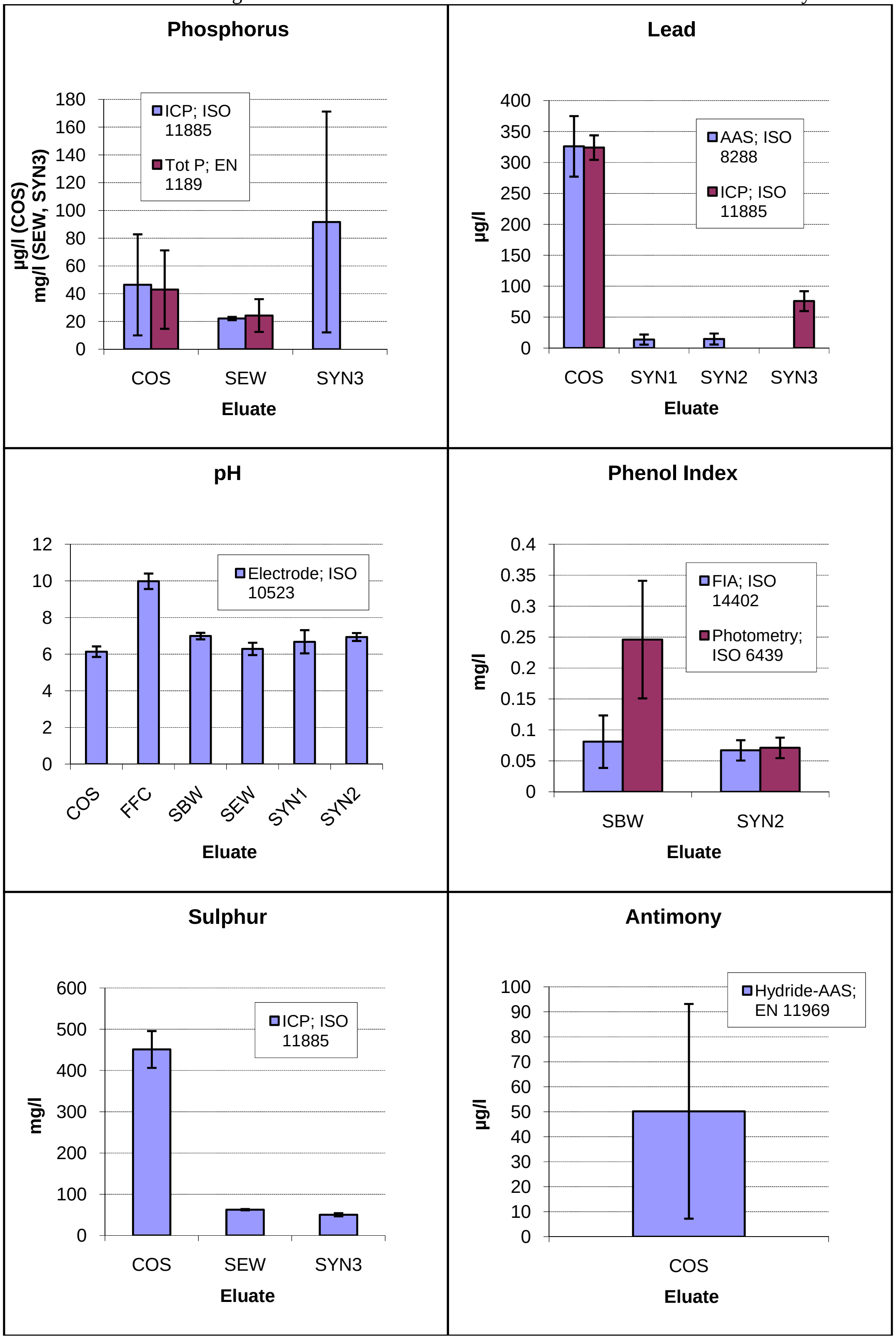
Results of the CEN/TC292 exercise on validation of methods for the analysis of waste eluates.

Columns represent the overall means of the different methods, error bars correspond to plus/minus between laboratory standard deviation.



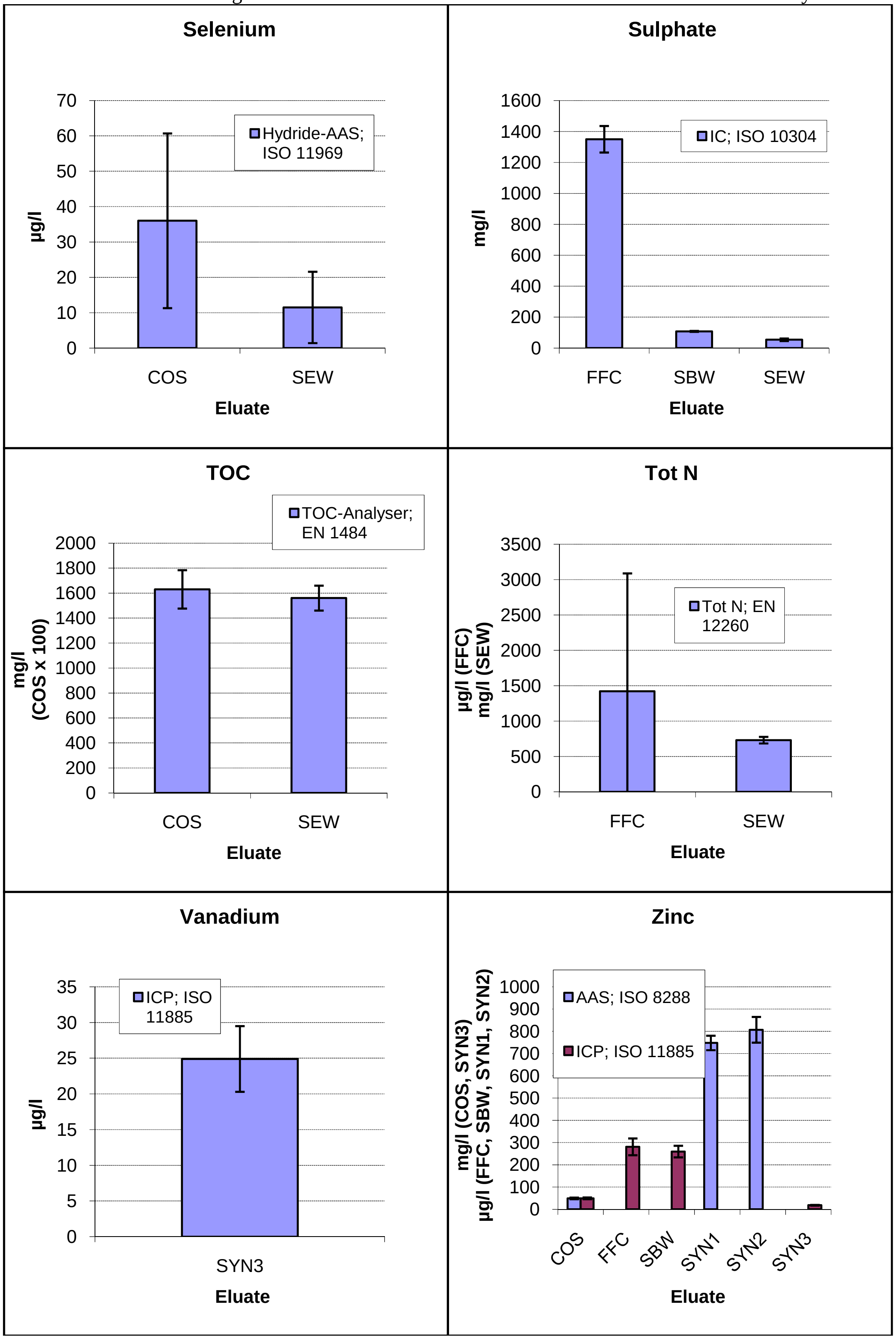
Results of the CEN/TC292 exercise on validation of methods for the analysis of waste eluates.

Columns represent the overall means of the different methods, error bars correspond to plus/minus between laboratory standard deviation.



Results of the CEN/TC292 exercise on validation of methods for the analysis of waste eluates.

Columns represent the overall means of the different methods, error bars correspond to plus/minus between laboratory standard deviation.



Results of the CEN/TC292 exercise on validation of methods for the analysis of waste eluates.

Columns represent the overall means of the different methods, error bars correspond to plus/minus between laboratory standard deviation.

December 2001 ECN-C--01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

Part 9. Performance characteristics of EN 12506 and EN 13370

CONTENTS

1. INTRODUCTION

In this section the results of the validation are translated in performance characteristics of the standards EN 12506and EN 13370 in accordance with CEN / TC 292 WG 3. The performance characteristics are placed in the informative Annex A of the standard.

2. PERFORMANCE CHARACTERISTICS PREN 12506

During 1999 - 2001 a project for validation of this standard has been organised and carried out. The validation included an interlaboratory study for evaluation of performance characteristics of methods included in this standard (reproducibility and repeatability).

2.1 Interlaboratory study

The purpose of the validation trial was to check the suitability of the cited standards for analysis of waste eluates.
The study was not focused on performance characteristics of the analytical methods as they have been validated by ISO or CEN on different water matrices.

2.2 Selection of laboratories

A questionnaire has been circulated by all CEN/TC292/WG3 and WG2 members to collect a list of interested European laboratories. 41 laboratories gave their availability to participate to the inter-laboratory trial. All of them were asked to declare that they fulfil the minimum requirements to carry out the analyses according to the standards. According to ISO 5725 series no selection has been made in advance on the basis of the supposed "ability" of laboratories, their certifications, etc: it's therefore possible to assume that participating laboratories are a rather good "sample" of "normal" European laboratories.

2.3 Selection of samples

To test the analytical procedures on a proper number of eluates, four different materials were considered to produce bulk amounts of waste eluates.

- contaminated soil (COS)
- sewage sludge(SEW)
- sand blasting waste (SBW)
- fly ash filter cake from municipal solid waste incinerator (FFC)

Additionally, three synthetic solutions were prepared (SYN1, SYN2 and SYN3).
The analytical procedures mentioned in the cited standards require different conservation methods. Since it was impossible to produce waste eluates using all the different conservating agents and methods according to the corresponding standards, it was decided to use only two conservation methods:

- addition of HNO_3 to a pH of about 2
- no conservation agents but storage of the eluates at 4°C in the dark.

The waste eluates and synthetic solutions stabilised with HNO_3 were filled into polyethylene bottles and other samples into glass bottles. Table 9.1 shows the different conservation procedures as mentioned in the standards and used in this trial.

2.4 Validation scope

In this trial not all parameter/method combinations were validated in the different samples. In table A.1 an overview is given of the validation scope.
The parameter/method combinations marked with an **x** in table 9.1 were successfully validated. A remark is given in table 9.1 for those parameter/method combinations where the validation was not successful, because:

- The element concentrations in some samples did not match the working range for the analytical method.
- The number of participants and/or the number of results was too low.

– Matrix dependent interference.

In the other cases no validation study was performed.

Complimentary some of these standards have been validated by ISO on waste water.

Table 9.1 *Validated parameter/method/sample combinations*

Parameter	Standard	Prescribed conservation in standard	Used Conservation in trial	COS	FFC	SBW	SEW	SYN1	SYN2	SYN3	Validated by ISO on waste water
As	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x			x			3)	x
As	EN ISO 11969	HCl pH 2	HNO_3 pH 2	x			2)				
Ba	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2		x	x				x	
Cd	ISO 8288	HNO_3 pH 2	HNO_3 pH 2	x				x	x		
Cd	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x						x	
Cl^-	ISO 9297	None, 4 °C	None, 4 °C		x	x					x
Cl^-	EN ISO 10304-1 EN ISO 10304-2	None, 4 °C	None, 4 °C		x	x	x				x
Co	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x						x	
Cr	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2		x					x	
Cr(Vl)	ISO 11083	Buffer pH 7	None, 4 °C		x			x			x
Cu	ISO 8288	HNO_3 pH 2	HNO_3 pH 2	x				x	x		
Cu	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x		x				x	
Mo	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2		x					x	
Ni	ISO 8288	HNO_3 pH 2	HNO_3 pH 2	x				x	x		
Ni	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x			x			x	
NO_2^-	EN 26777	None, 4 °C within 24 hrs	None, 4 °C		x		1)		x		x
NO_2^-	EN ISO 10304-1 EN ISO 10304-2	None, 4 °C immediate analysis	None, 4 °C		3)		3)		x		x
NO_2^-	EN ISO 13395	None, 4 °C immediate analysis	None, 4 °C		3)				x		x
Pb	ISO 8288	HNO_3 pH 2	HNO_3 pH 2	x				x	x		
Pb	ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x						x	
pH	ISO 10523	None, immediate analysis	None, 4 °C	x	x	x	x	x	x		
Total S	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x			x			x	
SO_4^{2-}	EN ISO 10304-1 EN ISO 10304-2	None, 4 °C	None, 4 °C		x	x	x				x
V	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2							x	
Zn	ISO 8288	HNO_3 pH 2	HNO_3 pH 2	x				x	x		
Zn	EN ISO 11885	HNO_3 pH 2	HNO_3 pH 2	x	x	x				x	

1) Validation failed because coloured solutions can not be analysed by this method (see chapter 6).

2) Validation failed because of matrix interference or conservation problems (EN ISO 11969, see chapter 7).

3) Validation failed because less than 6 labs and /or 18 valid results were available.

2.5 Results and statistics

The data from the validation have been assessed according to ISO 5725-2. Further the results have been filtered by acceptance criteria.
This report shows the tested parameter; the accepted combination of method, parameter and sample; and the results and statistics.
Results from rejected combinations of methods, parameter and samples are not shown in the result tables.
The acceptance criterion was:

- Minimum number of laboratories: 6
- Minimum number of results (outliers excluded): 18

For a given parameter and where available F-test on the sR and t-test for the means have been run for comparing alternative methods at the 99 % confidence interval. Where one of the tests failed a remark is given in the tables.

Table 9.2 *Results of the in the interlaboratory study on validation of methods for eluate analysis– Contaminated Soil Eluate (COS)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
As - Hydride AAS	EN ISO 11969	µg/l	13	13	39	39	-	17.4	0,92	5,90	5.32	33.9	Sample stabilised with HNO_3, HCl is prescribed
As - ICP	EN ISO 11885	µg/l	12	11	36	33	3	20.6	0,98	5,79	4.76	28.1	
Cd - ICP	EN ISO 11885	µg/l	17	17	51	51	-	207	4,72	13,5	2.28	6.5	
Cd - AAS	ISO 8288	µg/l	8	8	24	24	-	208	7,42	14,6	3.57	7.02	
Co - ICP	EN ISO 11885	µg/l	16	14	48	42	6	74.4	1,41	11,8	1.9	15.9	
Cu - ICP	EN ISO 11885	µg/l	17	16	51	48	3	358	5,98	28,4	1.67	7.94	
Cu - AAS	ISO 8288	µg/l	8	8	24	23	1	363	2,40	18,2	0.66	5.01	
Ni - ICP	EN ISO 11885	µg/l	16	14	47	41	6	49.3	1,43	4,77	2.91	9.68	F-test failed
Ni - AAS	ISO 8288	µg/l	7	7	21	21	-	49.4	1,55	1,67	3.14	3.38	F-test failed
Pb - ICP	EN ISO 11885	µg/l	17	16	51	48	3	324	7,00	19,9	2.16	6.13	F-test failed
Pb - AAS	ISO 8288	µg/l	8	8	24	24	-	326	7,79	48,9	2.39	15	F-test failed
pH - Electrode	EN ISO 10523	-	13	12	38	32	6	6.14	0,025	0,287	0.41	4.68	
Total S - ICP	EN ISO 11885	µg/l	10	8	30	24	6	451000	8344	44649	1.85	9.9	
Zn - ICP	EN ISO 11885	µg/l	17	16	51	48	3	49600	719	4052	1.45	8.17	
Zn - AAS	ISO 8288	µg/l	8	8	24	24	-	49500	782	3569	1.58	7.21	

S_r relative repeatability

S_R relative reproducibility

Table 9.3 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Sewage Sludge Eluate (SEW)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
As - ICP	EN ISO 11885	µg/l	13	11	39	33	6	139	10,6	26,9	7.66	19.38	
Cl - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	13	13	40	40	-	92.2	3,45	18,7	3.75	20.26	
Ni - ICP	EN ISO 11885	µg/l	16	16	48	48	-	117	5,52	11,5	4.72	9.8	
pH - Electrode	ISO 10523	-	14	12	40	34	6	6.29	0,048	0,34	0.76	5.34	
SO_4 - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	12	12	37	37	-	53.9	1,61	8,49	2.98	15.75	
Total S - ICP	EN ISO 11885	µg/l	10	7	29	20	9	62700	552	1568	0.88	2.5	

Table 9.4 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Sandblasting Waste Eluate (SBW)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Ba - ICP	EN ISO 11885	µg/l	16	15	47	44	3	80.4	1,51	10,1	1.88	12.59	
Cl - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	12	11	36	33	3	20.2	1,00	2,20	4.96	10.87	
Cl - Titration	ISO 9297	mg/l	8	8	24	24	-	22	1,38	2,82	6.27	12.84	
Cu - ICP	EN ISO 11885	µg/l	16	15	48	45	3	102	4,29	12,4	4.21	12.17	
pH - Electrode	ISO 10523	-	13	13	35	35	-	6.99	0,055	0,18	0.79	2.54	
SO_4 - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	12	9	36	27	9	108	2,53	2,94	2.34	2.72	
Zn - ICP	EN ISO 11885	µg/l	16	16	48	48	-	260	7,25	26,1	2.79	10.02	

Table 9.5 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Flyash-Filtercake Eluate (FFC)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Ba - ICP	EN ISO 11885	µg/l	16	16	47	47	-	57.9	2,42	6,83	4.18	11.8	
Cl - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	12	12	37	37	-	292	5,2	85	1.78	29.1	F-test failed
Cl - Titration	ISO 9297	mg/l	9	8	26	23	3	279	2,59	10, 7	0.93	3.83	F-test failed
Cr - ICP	EN ISO 11885	µg/l	16	15	48	45	3	1140	23,6	101	2.07	8.88	
Cr(VI) - Photometry	ISO 11083	µg/l	10	8	30	24	6	1150	8,86	132	0.77	11.51	
Mo - ICP	EN ISO 11885	µg/l	16	15	47	44	3	467	14,9	66,8	3.19	14.32	
NO_2 - Photometry	EN 26777	mg/l	8	8	24	24	-	0.029	0,0014	0,019	4.66	65.93	

pH - Electrode	ISO 10523	-	13	10	35	26	9	9.98	0,12	0,42	1.24	4.23	
SO_4 - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	13	12	37	34	3	1350	18,5	85,7	1.37	6.35	
Zn - ICP	EN ISO 11885	µg/l	16	16	48	48	-	281	8,88	37,7	3.16	13.42	

Table 9.6 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Synthetic Eluate 1 (SYN1)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Cd - AAS	ISO 8288	µg/l	8	8	24	24	-	35.5	3,21	6,25	9.05	17.61	
Cr(VI) - Photometry	ISO 11083	mg/l	10	9	30	27	3	0.108	0,0023	0,039	2.16	35.98	
Cu - AAS	ISO 8288	µg/l	8	8	24	24	-	19.2	1,22	2,92	6.35	15.2	
Ni - AAS	ISO 8288	µg/l	7	7	21	21	-	19	1,12	3,11	5.91	16.35	
Pb - AAS	ISO 8288	µg/l	8	8	24	24	-	13.8	0,73	8,16	5.29	59.14	Close to the detection limit
pH - Electrode	ISO 10523	-	14	13	40	37	3	6.68	0,081	0,63	1.22	9.46	
Zn - AAS	ISO 8288	µg/l	8	8	24	24	-	748	14,7	32,5	1.96	4.34	

Table 9.7 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Synthetic Eluate 2 (SYN2)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Cd - AAS	ISO 8288	µg/l	8	6	24	18	6	32.3	1,23	4,58	3.81	14.18	
Cu - AAS	ISO 8288	µg/l	8	6	24	18	6	19.7	0,99	2,44	5.05	12.39	
Ni - AAS	ISO 8288	µg/l	7	7	21	21	-	19.5	0,96	2,39	4.93	12.25	
NO_2 - FIA/CFA	EN ISO 13395	mg/l	11	9	33	26	7	0.132	0,001	0,049	0.98	37.17	
NO_2 - IC	EN ISO 10304-1 EN ISO 10304-2	mg/l	9	8	27	24	3	0.138	0,009	0,044	6.88	31.56	
NO2 - Photometry	EN 26777	mg/l	10	10	30	30	-	0.145	0,004	0,034	2.9	23.46	
Pb - AAS	ISO 8288	µg/l	8	7	24	21	3	14.7	0,82	8,86	5.57	60.25	Close to the detection limit
pH - Electrode	ISO 10523	-	14	13	38	35	3	6.94	0,054	0,22	0.78	3.13	
Zn - AAS	ISO 8288	µg/l	8	8	24	24	-	807	14,8	57,7	1.84	7.15	

Table 9.8 *Results of the in the interlaboratory study on validation of methods for eluate analysis – Synthetic Eluate 3 (SYN3)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Ba - ICP	EN ISO 11885	µg/l	15	15	42	41	1	27.1	1,07	3,48	3.95	12.8	
Cd - ICP	EN ISO 11885	µg/l	16	14	48	42	6	365	7,34	29,5	2.01	8.09	
Co - ICP	EN ISO 11885	µg/l	10	9	27	24	3	5.85	0,42	0,54	7.21	9.3	
Cr - ICP	EN ISO 11885	µg/l	16	15	45	42	3	81.8	3,42	6,98	4.18	8.53	
Cu - ICP	EN ISO 11885	µg/l	12	10	35	30	5	7.66	1,15	1,28	14.98	16.75	
Mo - ICP	EN ISO 11885	µg/l	15	14	41	38	3	70.3	3,70	11,3	5.27	16.05	
Ni - ICP	EN ISO 11885	µg/l	12	11	35	32	3	13.3	0,83	2,29	6.23	17.2	
Pb - ICP	EN ISO 11885	µg/l	15	14	45	41	4	75.9	3,20	16,1	4.21	21.2	
S - ICP	EN ISO 11885	µg/l	10	9	27	24	3	50500	747	3848	1.48	7.62	
V - ICP	EN ISO 11885	µg/l	13	12	34	30	4	24.9	1,42	4,60	5.71	18.49	
Zn - ICP	EN ISO 11885	µg/l	16	16	47	47	-	18600	616	1655	3.31	8.9	

2.6 Conclusion

The validation of this standard was performed on a selection of waste and synthetic eluates. For some parameters different analytical methods were validated.

For most methods validation data are available for at least two eluates per parameter. In the case of As (EN ISO 11969), NO_2 (EN ISO 10304-1, EN ISO 10304-2 and EN ISO 13395) and V (EN ISO 11885) only one matrix was validated.

In any case, for the analyses of a given parameter within a specific matrix, it is the responsibility of the laboratory to choose the appropriate analytical method depending on the expected interference and concentration range as mentioned in the according standards.

There is no international standard on equivalence testing between alternative physical or chemical methods available. However based on the F-test and the t-test for means (used are the s_R values) there is a realistic chance to prove equivalence between the following method/matrix combinations:

- for COS: As-AAS (EN 11969), As-ICP (EN ISO 11885),
  Cd-ICP (EN ISO 11885), Cd-AAS (ISO 8288),
  Cu-ICP (EN ISO 11885), Cu-AAS (ISO 8288),
  Zn-ICP (EN ISO 11885), Zn-AAS (ISO 8288)
- for SBW Cl-IC (EN ISO 10304-1, EN ISO 10304-2), Cl-Titration (ISO 9297)
- for SYN2 NO_2-FIA/CFA (EN ISO 13395), NO_2-IC (EN ISO 10304-1, EN ISO 10304-2),
  NO_2-Photometry (EN 26777).

3. PERFORMANCE CHARACTERISTICS PREN 13370

During 1999 - 2001 a project for validation of this standard has been organised and carried out. The validation included an interlaboratory study for evaluation of performance characteristics of methods included in this standard (reproducibility and repeatability).

3.1 Interlaboratory study

The purpose of the validation trial was to check the suitability of the cited standards for analysis of waste eluates.
The study was not focused on performance characteristics of the analytical methods as they have been validated by ISO or CEN on different water matrices.

3.2 Selection of laboratories

A questionnaire has been circulated by all CEN/TC292/WG3 and WG 2 members to collect a list of interested European laboratories. 41 laboratories gave their availability to participate to the inter-laboratory trial. All of them were asked to declare that they fulfil the minimum requirements to carry out the analyses according to the standards. According to ISO 5725 series no selection has been made in advance on the basis of the supposed "ability" of laboratories, their certifications, etc: it's therefore possible to assume that participating laboratories are a rather good "sample" of "normal" European laboratories.

3.3 Selection of samples

To test the analytical procedures on a proper number of eluates, four different materials were considered to produce bulk amounts of waste eluates.

- contaminated soil (COS)
- sewage sludge(SEW)
- sand blasting waste (SBW)
- fly ash filter cake from municipal solid waste incinerator (FFC)

Additionally, two synthetic solutions were prepared (SYN1, SYN2).
The analytical procedures mentioned in the cited standards require different conservation methods. Since it was impossible to produce waste eluates using all the different conservating agents and methods according to the corresponding standards, it was decided to use only two conservation methods:

- addition of HNO_3 to a pH of about 2
- no conservation agents but storage of the eluates at 4°C in the dark.

The waste eluates and synthetic solutions stabilised with HNO_3 were filled into polyethylene bottles and other samples into glass bottles. Table 9.9 shows the different conservation procedures as mentioned in the standards and used in this trial.

3.4 Validation scope

In this trial not all parameter/method combinations were validated in the different samples. In table A.1 an overview is given of the validation scope.
The parameter/method combinations marked with an **x** in table 9.9 were successfully validated. A remark is given in table 9.9 for those parameter/method combinations where the validation was not successful, because:

- The number of participants and/or the number of results was too low.
- Matrix dependent interference.

In the other cases no validation study was performed.
Complimentary some of these standards have been validated by ISO on waste water.

Table 9.9 *Validated parameter/method/sample combinations*

Parameter	Standard	Prescribed conservation in standard	Used Conservation in trial	COS	FFC	SBW	SEW	SYN1	SYN2	Validated by ISO on waste water
Ammonium-NH_4	ISO 7150-1	Immediateanalysis or H_2SO_4 pH 2	None, 4 °C				x		x	
Ammonium-NH_4	EN ISO 11732	Immediateanalysis or H_2SO_4 pH 2	None, 4 °C				x		x	x
AOX	EN 1485	HNO_3 pH 2	HNO_3 pH 2	x			x			x
Conductivity	EN 27888	None, 4 °C	None, 4 °C	x	x	x	x	x	x	x
Hg	EN 1483	$K_2Cr_2O_7$ pH 1	HNO_3 pH 2				[1])		x	x
Phenol index	ISO 6439	H_3PO_4 $CuSO_4$ pH 4	None, 4 °C			x			[1])	
Phenol index	ISO/FDIS 14402	Immediateanalysis or H_2SO_4 pH 2	None, 4 °C			[1])			x	x
TOC	EN 1484	H_3PO_4 pH 2	HNO_3 pH 2	x			x			x
Cyanide easily liberatable	ISO 6703-2	NaOH pH 8	None, 4 °C				[1]) [2])	[1])	x	
Cyanide easily liberatable	ISO/FDIS 14403	NaOH pH 12	None, 4 °C					x	[1])	x
F-	EN ISO 10304-1	None, 4 °C	None, 4 °C		x	x				
F-	ISO 10359-1	None, 4 °C	None, 4 °C		x	x				

Remark
[1]) Validation failed because less than 6 labs and/or 18 valid results were available.
[2]) Validation failed because coloured solutions cannot be analysed by this method (see Chapter 6).

3.5 Results and statistics

The data from the validation have been assessed according to ISO 5725-2. Further the results have been filtered by acceptance criteria.
This report shows the tested parameter; the accepted combination of method, parameter and sample; and the results and statistics.
Results from rejected combinations of methods, parameter and samples are not shown in the result tables.
The acceptance criterion was:

– Minimum number of laboratories: 6
– Minimum number of results (outliers excluded): 18

For a given parameter and where available F-test on the sR and t-test for the means have been run for comparing alternative methods at the 99 % confidence interval. Where one of the tests failed a remark is given in the tables.

Table 9.10 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Contaminated Soil Eluate (COS)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
AOX	EN 1485	µg/l	14	13	42	38	4	27.8	2,43	7,73	8.75	27.8	
Conductivity	EN 27888	µS/cm	12	11	36	30	6	2450	7,35	207,8	0.3	8.48	
TOC	EN 1484	mg/l	15	13	45	39	6	16.3	0,30	1,54	1.82	9.42	

S_r relative repeatability
S_R relative reproducibility

Table 9.11 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Sewage Sludge Eluate (SEW)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
AOX	EN 1485	mg/l	13	11	39	32	7	0.153	0,011	0,061	7.16	39.95	
Conductivity	EN 27888	µS/cm	13	10	37	28	9	3530	11,6	469	0.33	13.3	
NH_4 – FIA/CFA	ISO EN 11732	mg/l	11	11	34	34	-	401	5,77	81,3	1.44	20.28	F-test failed
NH_4 - Photometry	ISO 7150-1	mg/l	11	10	33	30	3	360	8,03	152	2.23	42.11	F-test failed
TOC	EN 1484	mg/l	15	13	47	41	6	1560	40,3	99,7	2.58	6.39	

Table 9.12 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Sandblasting Waste Eluate (SBW)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Conductivity	EN 27888	µS/cm	12	11	33	31	2	530	2,12	23,5	0.4	4.43	
F - Electrode	ISO 10359-1	mg/l	10	10	30	30	-	7.66	0,060	0,99	0.78	12.91	
F - IC	EN ISO 10304-1	mg/l	11	11	33	33	-	7.42	0,153	1,23	2.06	16.57	
Phenol index - Photometry	ISO 6439	mg/l	8	8	24	24	-	0.246	0,0187	0,095	7.62	38.6	

Table 9.13 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Flyash-Filtercake Eluate (FFC)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
Conduct. electrode	EN 27888	µS/cm	12	12	33	33	-	2880	13,5	240	0.47	8.34	
F - Electrode	ISO 10359-1	mg/l	9	9	27	21	6	0.709	0,023	0,086	3.25	12.15	
F – IC	EN ISO 10304-1	mg/l	8	7	24	20	4	0.629	0,0085	0,123	1.35	19.52	

Table 9.14 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Synthetic Eluate 1 (SYN1)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
CN – CFA	ISO/FDIS 14403	mg/l	7	7	22	22	-	0.175	0,0071	0,087	4.08	49.62	
Conductivity	EN 27888	µS/cm	13	11	37	31	6	353	5,26	17,4	1.49	4.92	

Table 9.15 *Results of the in the interlaboratory study on validation of methods for eluate analysis (prEN 13370) – Synthetic Eluate 2 (SYN2)*

Parameter	Standard	Units	Number of					Mean	s_r	s_R	S_r	S_R	Remarks
			Labs total	Labs accepted	Values total	Values accepted	Outliers				%	%	
CN - Photometry	ISO 6703-2	mg/l	6	6	18	18	-	0.041	0,003	0,006	6.7	13.7	
Conductivity	EN 27888	µS/cm	13	13	36	36	-	478	2,92	21,6	0.61	4.51	
Hg - CV-AAS	EN 1483	µg/l	12	11	36	33	3	6.25	0,13	1,36	2.1	21.8	
NH_4 – FIA/CFA	EN ISO 11732	mg/l	10	8	32	26	6	0.248	0,013	0,067	5.22	27.17	F-test failed
NH_4 - Photometry	ISO 7150-1	mg/l	11	9	33	27	6	0.223	0,007	0,019	3.26	8.31	F-test failed
Phenol index – FIA/CFA	ISO/FDIS 14402	mg/l	6	6	18	18	-	0.067	0,0028	0,016	4.16	24.5	

3.6 Conclusion

The validation of this standard was performed on a selection of waste and synthetic eluates. For some parameters different analytical methods were validated.

For some methods validation data are available for at least two eluates per parameter. In the case of Hg (EN 1483), CN- (ISO 6703-2, ISO/FDIS 14403), phenol index (ISO 6439, ISO/FDIS 14402) only one matrix was validated.

For the analyses of a given parameter within a specific matrix, it is the responsibility of the laboratory to choose the appropriate analytical method depending on the expected interference and concentration range as mentioned in the according standards.

There is no international standard on equivalence testing between alternative physical or chemical methods available. However based on the F-test and the t-test for means (used are the s_R values) there is a realistic chance to prove equivalence between the following method/matrix combinations:

- for SBW F-electrode (ISO 10359-1), F-IC (EN ISO 10304-1),
- for FFC F-electrode (ISO 10359-1), F-IC (EN ISO 10304-1).

4. OBSERVATIONS

Rule of thumb for validation work: About a factor of 2 - 2.5 can be found generally between within lab and between lab variability. This also applies here for the eluate analysis validation. Sometimes, higher values are observed, when the within laboratory variability is very low (< 2%).

In case of a high between laboratory variability (s_R), which exceeds the within laboratory variability (s_r) significantly (more than a factor 3 – 4), this points at systematic errors in concentration level determination among participants.

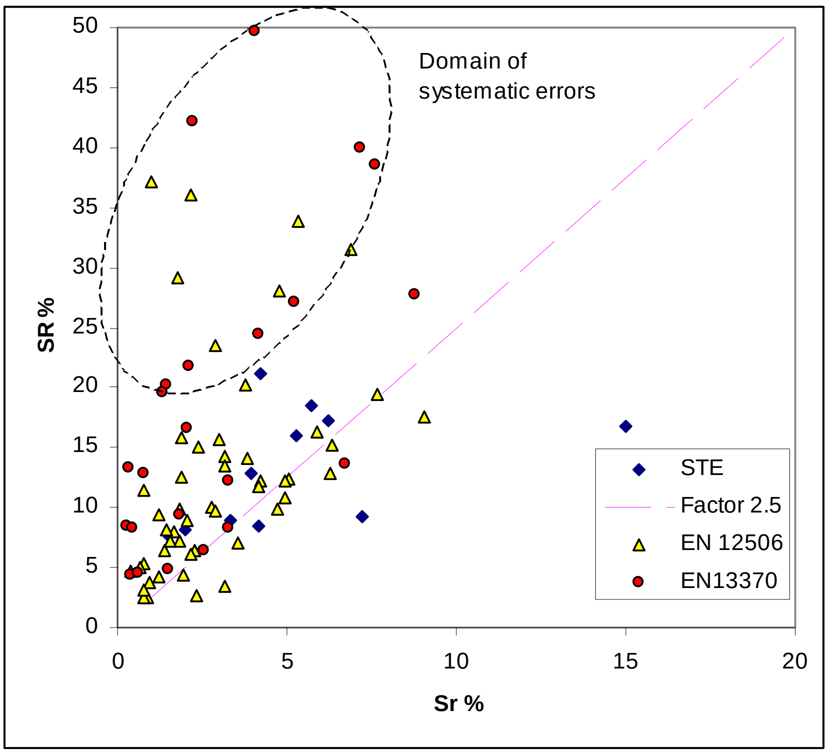


Figure 9.1 *Relationship between within and between laboratory variability illustrating the normal relationship and the possible occurrence of systematic errors in the concentration level determination among participants*

December 2001 ECN-C--01-117

VALIDATION OF CEN/TC 292 LEACHING TESTS AND ELUATE ANALYSIS METHODS PrEN 12457-1 TO 4, ENV 13370 AND ENV 12506 IN CO-OPERATION WITH CEN/TC308

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