Bahnhofstraße 14 // D-37181 Hardegsen // T +49 (0)5505 94098-0
Geschäftsführer: Ralf Klaus Blecher // Amtsgericht Göttingen HRB 130263
www.crb-gmbh.de // labor@crb-gmbh.de

RFA Ringversuch GeoPT 44A, England - CM-1, Carbonate Mudrock

Veranstalter des Ringversuchs:	International Association of Geoanalysts and Geostandards Newsletter - GeoPT44A
Ringversuchsmaterial:	CM-1, Carbonate Mudrock
RV geschlossen:	2018 – 7
Literatur:	Report - GeoPT44A Proficiency Testing Round 44A (Laborcode CRB = D46)

Hauptelemente [MA%]

	CRB	RV	1sRV	Z-Score
MgO	1,410	1,370	0,011	0,710
Al_2O_3	1,340	1,240	0,022	1,520
SiO_2	5,710	5,780	0,089	1,430
P_2O5	0,066	0,061	0,002	1,350
K_2O	0,230	0,219	0,010	0,100
CaO	50,600	50,180	0,532	0,380
TiO_2	0,050	0,045	0,002	1,740
Fe_2O_3tot	0,310	0,360	0,008	1,980
MnO	0,027	0,024	0,001	1,620
L.O.I. *	39,830	40,160	0,460	-0,360
TC *	11,290	11,290	0,170	0,000
CO_2*	40,200	39,900	0,432	0,290

Spurenelemente [µg/g]

	CRB	RV	1sRV	Z-Score
Sr	1024,00	1010,00	9,90	0,25

Legende

CRB: Ergebnisse CRB – **RV:** Ergebnisse Ringversuch -- **1s-RV:** Standardabweichung Ringversuch
Z-Score: Differenz des Messwertes vom Mittelwert des Ringversuchs -- ***** Wert nicht zertifiziert

Geo*PT*44A — AN INTERNATIONAL PROFICIENCY TEST FOR ANALYTICAL GEOCHEMISTRY LABORATORIES — REPORT ON ROUND 44A (Carbonate mudrock, CM-1) / January 2019

Peter C. Webb[1]*, Philip J. Potts[1], Michael Thompson[2] and Charles J. B. Gowing[3]

[1]Faculty of Science, Technology, Engineering and Mathematics, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK.

[2]School of Biological and Chemical Sciences, Birkbeck University of London, Malet Street, London WC1E 7HX, UK.

[3]British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, NG12 5GG, UK.

*Corresponding author, Peter Webb: e-mail geopt@macace.net

*Keywords: proficiency testing, quality assurance, Geo*PT, *Geo*PT*44A, Round 44A, CM-1, Carbonate mudrock*

Abstract

Results are presented for Round 44A of the International Association of Geoanalysts' Proficiency Testing programme for analytical geochemistry laboratories. The test material distributed in this round of Geo*PT* was the Carbonate mudrock, CM-1, supplied by the Central Geological Laboratory, Mongolia. In fact, this test material is a certified reference material, the limestone ML-3 (code IAG/CGL 020), renamed to ensure complete anonymity. In this report, the data contributed by 91 laboratories are listed, together with an assessment of consensus values, consequent *z*-scores and charts to show the distribution of contributed results and the overall performance of participating laboratories.

Introduction

This forty-fourth round of the international proficiency testing programme, Geo*PT*, was conducted in a similar manner to earlier rounds. The programme is designed to be part of the routine quality assurance procedures employed by analytical geochemistry laboratories. The programme is organised by the International Association of Geoanalysts and is conducted in accordance with a published protocol, recently revised (IAG, 2018). The overall aim of the programme is to provide participating laboratories with *z*-score information for their reported measurement results from which each can decide whether the quality of their data is satisfactory in relation both to their chosen fitness-for-purpose criteria and to the results submitted by other laboratories contributing to the round. In circumstances where *z*-scores are unsatisfactory, a participating laboratory is encouraged to investigate for unsuspected analytical bias and to take corrective action if this appears justified.

Steering Committee for Round 44A: P.C. Webb (results coordinator), M. Thompson (statistical advisor), P.J. Potts and C.J.B. Gowing (analytical advisors).

Timetable for Round 44A:
Distribution of sample: September 2018
Results submission deadline: 13th December 2018
Release of report: January 2019

Test Material details

Geo*PT*44A: The Carbonate mudrock test material, CM-1, is in fact, the certified reference material (CRM) known as Limestone ML-3 (coded IAG/CGL 020), obtained from the Central Geological Laboratory, Mongolia. Supplied in 100g portions, it was repackaged at BGS Keyworth, whereby portions were combined in pairs and divided 8 ways to provide 140 packets of test material. The test material had been evaluated for homogeneity as part of the IAG/CGL certification process, detailed on the Certificate of Analysis for IAG/CGL 020, ML-3 (Limestone). As a result, the sample was considered suitable for use in this proficiency test.

Submission of results

A total of 2922 results were submitted for Geo*PT*44A (CM-1) by 91 laboratories as listed in Table 1. Results from all laboratories submitting data were used to assess respective assigned values. Four laboratories reported values of '0' (i.e. zero) for this round contrary to our ongoing instructions. These values are excluded from consideration in the data assessment process. It is suspected that one laboratory reported C(org) in g/100g instead of mg/kg and two laboratories made the same form of error in submitting S data. We must remind analysts reporting results that measurements for these analytes and those of all trace constituents should be reported in mg/kg. Suspected invalid results cannot be altered or removed once they have been submitted and corresponding *z*-scores will be adversely affected.

Assigned values and results summary

Following procedures described in earlier rounds, and detailed fully in the Geo*PT* protocol (2018), robust statistical procedures were used to derive consensus values for measurands in this test sample: these consensus values being judged to be the best available estimates of the true composition. Values were assigned on the basis that: i) sufficient laboratories had contributed data for estimating a measurand, ii) visual assessment gave confidence that a substantial proportion of the results distribution was symmetrically disposed about the consensus, iii) the ratio of the uncertainty in the location estimate to the target precision is an acceptably small value, and iv) an evaluation of measurement results by procedure – including both methods of analysis and sample preparation – indicated no detectable procedural bias among measurement results from which the consensus was derived. Where these criteria are not fully met, values may be credited with 'provisional' rather than 'assigned' status.

These assessments also involve examining the distribution of results from barcharts of data contributed for each measurand (as presented in Figures 1 and 2), and from a variety of plots – permitting discrimination of data by procedure of analysis and sample preparation – as developed by Thomas Meisel using the Shiny App (*https://www.shinyapps.io*) linked to the statistical package 'R'. This enables us, when necessary, to refine the selection of consensus values by taking account of data distributions according to analytical procedure.

Many datasets were normally distributed, showing remarkable symmetry with relatively little dispersion of data, and consequently, in 13 cases, the robust mean was used to define an appropriate consensus value. However, for 25 datasets that were very slightly skewed, medians provided a more satisfactory estimator of consensus values. For 12 datasets that were more severely skewed, where the median did not provide a sufficiently symmetrical distribution of data about the consensus, a mode was preferred to estimate the location of the consensus.

Use of modes as location estimators helped to avoid bias due to asymmetric tailing in several datasets. In six cases, modes were sufficiently well defined by a consensus of results acquired by appropriate techniques to justify their designation as assigned values. Procedures used to determine modes mostly involved the estimation of the mass fraction corresponding to the maximum value of the kernel density distribution for the dataset as described by Thompson (2017) and a few using the Lientz mode (Lientz, 1969) as provided by the "modeest" package which runs in 'R' (*https://cran.r-project.org/web/packages/modeest/modeest.pdf*). Modes are suitably robust location estimators that can provide consensus values representing the most coherent part of a data distribution where data are symmetrically disposed, although the dataset as a whole may be asymmetric.

Analysis of data distributions took into account that the test material, being an impure limestone, contains very low mass fractions of many analytes, which has a number of consequences. In particular, measurement results for 'major' elements at low mass fractions are frequently reported with insufficient decimal places, creating a stepped or pixellated effect in barcharts and an artificial impression that results distributions could be multimodal. This effect has been illustrated previously in Thompson et al. (2015). In CM-1, for example, the TiO_2 data distribution has major steps at 0.04 and 0.05 g/100g (see Figure 1, p. 16) because many laboratories reported TiO_2 to only two decimal places. There are also smaller steps at increments of 0.001 g/100g, suggesting that provision of even more decimal places would be beneficial in programmes, such as proficiency tests, where evaluations of test material composition are undertaken. For TiO_2, this situation was to a large extent responsible for awarding a provisional rather than assigned status to the consensus value. Similar, but slightly less striking stepped effects are observed for MnO and K_2O data distributions. On account of very low mass fractions involved, similar effects are also apparent for some trace elements. For example, Tm was reported to only two decimal places by many laboratories, and hence there is an artificial impression of multiple modality in the results distribution, because of the numbers of results quoted as 0.04 and 0.05 mg/kg. We strongly recommend that results are presented to a minimum of three significant figures.

It is also necessary to take into account the consequences of inappropriate methods of analysis, which can bias the uncritical derivation of a consensus if unsophisticated statistical methods are employed. In Geo*PT* we aim to derive optimal consensus values using robust methods and expert judgement, as detailed in our operating protocol (IAG, 2018). Thus distributions of results involving variable but high values where the true value is close to the detection limit of the method are commonly observed, and due regard must be taken to minimise their effect when establishing a consensus. Sometimes, but not always, the reason for a high tail is because XRF data had been reported for mass fractions close to the detection limit for the technique. Some datasets feature low tails due to inadequate dissolution of refractory minerals by some acid digestion procedures, as is often the case for Hf and Zr, which was reported in Potts et al. (2015). These various considerations are particularly relevant for Ba, Ce, Cr, La, Pb, Sb, Sc, Sn, Ta, Th, W, Zn and Zr in CM-1, where an appropriate consensus judged to be optimal could be derived only through estimation of the mode. In many of these cases, only provisional status could be credited. For As, Cd, Co, Cu, Mo and Ni, an insufficient proportion of measurements contributed to the consensus and it was considered unsafe to recognise even a provisional value.

Table 2 lists assigned and provisional values for 11 major/minor components and 39 trace elements in Geo*PT*44A (CM-1). Barcharts for the 50 analytes of Geo*PT*44A that were judged to have satisfactory distributions for consensus values to be designated as assigned or provisional values are shown in Figure 1. These are: SiO_2, TiO_2*, Al_2O_3, Fe_2O_3T, MnO, MgO, CaO, K_2O, P_2O_5, CO_2*, LOI, Ba, Be, Bi*, C(tot), Ce, Cr*, Cs, Dy, Er, Eu, Ga, Gd, Hf*, Ho, La, Li, Lu, Nb, Nd, Pb, Pr, Rb, Sb, Sc*, Sm, Sn*, Sr, Ta, Tb, Th, Tl, Tm, U, V, W, Y, Yb, Zn* and Zr*. Of these, provisional values were given to the 9 analytes marked '*'. Instances of provisional status were recorded because either: i) a relatively small number of results (<15) contributed to the consensus, or ii) the results were unduly dispersed in relation to the target value, or iii) the distribution of results was significantly skewed.

Bar charts for the 15 analytes: Fe(II)O, Na_2O, H_2O^+, Ag, As, C(org), Cd, Cl, Co, Cu, F, Ge, Mo, Ni and S are plotted in Figure 2 for information only, as the data were either insufficient in number, or the distribution was too highly skewed or too variable for reliable determination of a consensus for the estimation of *z*-scores.

Z-score analysis

As in previous rounds, laboratories were invited to choose one of two performance standards against which their analytical results would be judged:

Data quality 1 for laboratories working to a 'pure geochemistry' standard of performance, where analytical results are designed for geochemical research and where care is taken to provide data of high precision and accuracy, sometimes at the expense of a reduced sample throughput rate. For Geo*PT*44A, 1374 results of data quality 1 were submitted.

Data quality 2 for laboratories working to an 'applied geochemistry' standard of performance, where, although precision and accuracy are still important, the main objective is to provide results on large numbers of samples collected, for example, as part of geochemical mapping projects or geochemical exploration programmes. For Geo*PT*44A, 1548 results of data quality 2 were submitted.

The target standard deviation (H_a) for each measurand assessed was calculated from a modified form of the Horwitz function as follows:

$$H_a = k.X_a^{0.8495}$$

Where X_a is the mass fraction of the element; the factor k = 0.01 for pure geochemistry laboratories and k = 0.02 for applied geochemistry laboratories.

Z-scores were calculated for each elemental measurement submitted by each laboratory from:

$$z = [X - X_a] / H_a$$

Where X is the contributed measurement result, X_a is the assigned value and H_a is the target standard deviation (all as mass fractions). *Z*-score values for results contributed to Geo*PT*44A are listed in Table 3. Results designated as data quality 1 are shown in bold: results of data quality 2 are shown underlined. *Z*-scores derived from provisional values are shown in italics. Participating laboratories are invited to assess their performance using the following criteria:–

Z-score results in the range $-2<z<2$ are considered to be 'satisfactory' (in the sense that no action is called for by the participant). If the *z*-score for any element falls outside this range, especially if it is outside the range $-3<z<3$, laboratories are advised to examine their procedures, and if necessary, take action to ensure that determinations are not subject to unsuspected analytical bias.

Overall performance

A summary of the overall performance of individual laboratories for this round is plotted in multiple *z*-score charts in Figure 3. In these charts, the *z*-score performance for each element is distinguished by symbols that make it easy to identify whether the results were satisfactory or gave *z*-scores that exceeded the action limits. This chart is designed to help individual laboratories judge their overall performance in this proficiency testing round. Participants should always review their *z*-scores in accordance with their own fitness-for-purpose criteria.

Participation in future rounds

The benefit from proficiency testing arises from regular participation and laboratories are invited to contribute to Round 45, the test sample for which will be distributed during March 2019.

Acknowledgements

The authors thank Cynthia Turner and Andrea Mills (BGS) for much-valued assistance in distributing this sample and Thomas Meisel for development of software which has greatly assisted the investigation of data according to analytical procedure and facilitated analysis of datasets involving modes derived according to Thompson (2017) and as provided in the package "modeest", which is available as an "R" package (https://cran.r-project.org/web/packages/modeest/modeest.pdf).

References

IAG (2018) Protocol for the operation of the Geo*PT* Proficiency testing scheme. International Association of Geoanalysts (Keyworth, UK), 18pp. http://www.geoanalyst.org/wp-content/uploads/2018/06/GeoPT-revised-protocol-2018.pdf.

Lientz (1969) On estimating points of local maxima and minima of density functions. Nonparametric Techniques in Statistical Inference (ed. M.L. Puri, Cambridge University Press, p.275-282.

Potts P.J., Webb P.C. and Thompson M. (2015) Bias in the determination of Zr, Y and rare earth element concentrations in selected silicate rocks by ICP-MS when using some routine acid dissolution procedures: Evidence from the Geo*PT* proficiency pesting programme, *Geostandards and Geoanalytical Research*, **39**, 3, 315-327.

Thompson M., Webb, P.C. and Potts P.J. (2015)

The Geo*PT* proficiency testing scheme for laboratories routinely analysing silicate rocks: a review of the operating protocol and proposals for its modification. *Geostandards and Geoanalytical Research*, **39**, 433-442.

Thompson, M. (2017) On the role of the mode as a location parameter for the results of proficiency tests in chemical measurement. *Anal. Methods*, **9**, p.5534-5540.

ADDENDUM
— AN IMPORTANT NOTICE TO ANALYSTS

Repeat warning to analysts regarding reporting of procedures involving ignition and fusion:

It is necessary to reiterate that in the ***Instructions for Analysts*** accompanying your samples, there were specific requests to provide **additional details** for procedures involving **fusion, sintering or ignition**, particularly LOI determinations. Specification of temperature is required for all forms of fusion and the end-point criterion for LOI determinations.

Our thanks to those who have already complied with this request, but it appears that in many cases it has been ignored. We would appreciate your cooperation in providing these details for future rounds, as it will assist in assessing data variations.

Note also, that a large number of laboratories are listing their procedure for determining LOI as the same as that employed for major elements, rather than providing separate, specific details. It is important to provide analytical procedural information that is appropriate for every analyte.

In addition it would help if details of gravimetric procedures were included under Analytical Technique details rather than under Sample Preparation details. For gravimetric analysis, other than drying, which should in any case be carried out according to our instructions, there is no other sample preparation involved.

Appendix 1

Publication status of proficiency testing reports. Previous reports are available for download from the IAG website (http://www.geoanalyst.org/).

Geo*PT*1
Thompson M., Potts P.J., Kane J.S. and Webb P.C. (1996)
Geo*PT*1. International proficiency test for analytical geochemistry laboratories - Report on round 1. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 20, 295-325.

Geo*PT*2
Thompson M., Potts P.J., Kane J.S., Webb P.C. and Watson, J.S. (1998)
Geo*PT*2. International proficiency test for analytical geochemistry laboratories - Report on round 2. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 22 127-156.

Geo*PT*3
Thompson M., Potts P.J., Kane J.S. and Chappell B.W. (1999a)
Geo*PT*3. International proficiency test for analytical geochemistry laboratories - Report on round 3. Geostandards Newsletter: The Journal of Geostandards and Geoanalysis, 23, 87-121.

Geo*PT*4
Thompson M., Potts P.J., Kane J.S., Webb P.C. and Watson J.S. (1999b)
Geo*PT*4. International proficiency test for analytical geochemistry laboratories - Report on round 4. Published in the electronic version of Geostandards Newsletter: The Journal of Geostandards and Geoanalysis (Summer 2000).

Geo*PT*5
Thompson M., Potts P.J., Kane J.S., and Wilson S. (1999c)
Geo*PT*5. International proficiency test for analytical geochemistry laboratories - Report on round 5. Published in the electronic version of Geostandards Newsletter: The Journal of Geostandards and Geoanalysis (Summer 2000).

Geo*PT*6
Potts P.J., Thompson M., Kane J.S., Webb P.C. and Carignan J. (2000)
GEO*PT*6 - an international proficiency test for analytical geochemistry laboratories - report on round 6 (OU-3: Nanhoron microgranite) and 6A (CAL-S: CRPG limestone). International Association of Geoanalysts: Unpublished report.

Geo*PT*7
Potts P.J., Thompson M., Kane J.S., and Petrov L.L. (2000)
GEO*PT*7 - an international proficiency test for analytical geochemistry laboratories - report on round 7 (GBPG-1 Garnet-biotite plagiogneiss). International Association of Geoanalysts: Unpublished report.

Geo*PT*8
Potts P.J., Thompson M., Kane J.S., Webb, P.C. and Watson J.S. (2000)
GEO*PT*8 - an international proficiency test for analytical geochemistry laboratories - report on round 8 / February 2001 (OU-4 Penmaenmawr microdiorite). International Association of Geoanalysts: Unpublished report.

Geo*PT*9
Potts P.J., Thompson M., Webb, P.C. and Watson J.S. (2001)
GEO*PT*9 - an international proficiency test for analytical geochemistry laboratories - report on round 9 / July 2001 (OU-6 Penrhyn slate). International Association of Geoanalysts: Unpublished report.

Geo*PT*10
Potts P.J., Thompson M., Webb, P.C., Watson J.S. and Wang Yimin (2001)
GEO*PT*10 - an international proficiency test for analytical geochemistry laboratories - report on round 10 / December 2001 (CH-1 Marine sediment). International Association of Geoanalysts: Unpublished report.

Geo*PT*11
Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Watson J.S. (2002)
GEO*PT*11 - an international proficiency test for analytical geochemistry laboratories - report on round 11 / July 2002 (OU-5 Leaton dolerite). International Association of Geoanalysts: Unpublished report.

Geo*PT*12
Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Batjargal B. (2003)
GEO*PT*12 - an international proficiency test for analytical geochemistry laboratories - report on round 12 / January 2003 (GAS Serpentinite). International Association of Geoanalysts: Unpublished report.

Geo*PT*13
Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Kaspar H.U. (2003)
GEO*PT*13 - an international proficiency test for analytical geochemistry laboratories - report on round 13 / July 2003 (Köln Loess). International Association of Geoanalysts: Unpublished report.

Geo*PT*14
Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and B. Batjargal (2004)
Geo*PT*14 - an international proficiency test for analytical geochemistry laboratories - report on round 14 / January 2004 (OShBO - alkaline granite). International Association of Geoanalysts: Unpublished report.

Geo*PT*15
Potts P.J., Thompson M., Chenery S.R., Webb, P.C. and Wang Yimin (2004)
Geo*PT*15 - an international proficiency test for analytical geochemistry laboratories - report on round 15 / June 2004 (Ocean floor sediment MSAN). International Association of Geoanalysts: Unpublished report.

Geo*PT*16
Potts P.J., Thompson M., Webb, P.C. and S.Wilson (2005)
Geo*PT*16 - an international proficiency test for analytical geochemistry laboratories - report on round 16 / February 2005 (Nevada basalt, BNV-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*17
Potts P.J., Thompson M., Webb, P.C. and J. Nicholas Walsh (2005)
Geo*PT*17 - an international proficiency test for analytical geochemistry laboratories - report on round 17 / July 2005 (Calcareous sandstone, OU-8). International Association of Geoanalysts: Unpublished report.

Geo*PT*18
Webb, P.C., Thompson M., Potts P.J. and L. Paul Bedard (2006)
Geo*PT*18 - an international proficiency test for analytical geochemistry laboratories - report on round 18 / Jan 2006 (Quartz Diorite, KPT-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*19
Webb, P.C., Thompson M., Potts P.J. and B. Batjargal (2006)
Geo*PT*19 - an international proficiency test for analytical geochemistry laboratories - report on round 19 / July 2006 (Gabbro, MGR-N). International Association of Geoanalysts: Unpublished report.

Geo*PT*20
Webb, P.C., Thompson M., Potts P.J. and M. Burnham (2007)
Geo*PT*20 - an international proficiency test for analytical geochemistry laboratories - report on round 20 / Jan 2007 (Ultramafic rock, OPY-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*21
Webb, P.C., Thompson M., Potts P.J. and B. Batjargal (2007)
Geo*PT*21 - an international proficiency test for analytical geochemistry laboratories - report on round 21 / July 2007 (Granite, MGT-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*22
Webb, P.C., Thompson, M., Potts, P.J. and Batjargal, B. (2008)
Geo*PT*22 - an international proficiency test for analytical geochemistry laboratories - report on round 22 / January 2008 (Basalt, MBL-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*23
Webb, P.C., Thompson, M., Potts, P.J., Watson, J.S. and Kriete, C. (2008)
Geo*PT*23 - an international proficiency test for analytical geochemistry laboratories - report on round 23 / September 2008 (Separation Lake pegmatite, OU-9) and 23A (Manganese nodule, FeMn-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*24
Webb, P.C., Thompson, M., Potts, P.J. and Watson, J.S. (2009)
Geo*PT*24 - an international proficiency test for analytical geochemistry laboratories - report on round 24 / January 2009 (Longmyndian greywacke, OU-10). International Association of Geoanalysts: Unpublished report.

Geo*PT*25
Webb, P.C., Thompson, M., Potts, P.J. and Enzweiler, J. (2009)
Geo*PT*25 - an international proficiency test for analytical geochemistry laboratories - report on round 25 / July 2009 (Basalt, HTP-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*26
Webb, P.C., Thompson, M., Potts, P.J. and Loubser, M. (2010)
Geo*PT*26 - an international proficiency test for analytical geochemistry laboratories - report on round 26 / January 2010 (Ordinary Portland cement, OPC-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*27
Webb, P.C., Thompson, M., Potts, P.J. and Batjargal, B. (2010)
Geo*PT*27 - an international proficiency test for analytical geochemistry laboratories - report on round 27 / July 2010 (Andesite, MGL-AND). International Association of Geoanalysts: Unpublished report.

Geo*PT*28
Webb, P.C., Thompson, M., Potts, P.J. and Wilson, S. (2011)
Geo*PT*28 - an international proficiency test for analytical geochemistry laboratories - report on round 28 / January 2011 (Shale, SBC-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*29
Webb, P.C., Thompson, M., Potts, P.J. and Wilson, S. (2011)
Geo*PT*29 - an international proficiency test for analytical geochemistry laboratories - report on round 29 / July 2011 (Nephelinite, NKT-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*30
Webb, P.C., Thompson, M., Potts, P.J., Long, D. and Batjargal, B. (2012)
Geo*PT*30 - an international proficiency test for analytical geochemistry laboratories - report on round 30 / January 2012 (Syenite, CG-2) and 30A (Limestone, ML-2). International Association of Geoanalysts: Unpublished report.

Geo*PT*31
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2012)
Geo*PT*31 - an international proficiency test for analytical geochemistry laboratories - report on round 31 / July 2012 (Modified river sediment, SdAR-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*32
Webb, P.C., Thompson, M., Potts, P.J and Webber, E. (2013)
Geo*PT*32 - an international proficiency test for analytical geochemistry laboratories - report on round 32 / January 2013 (Woodstock Basalt, WG-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*33
Webb, P.C., Thompson, M., Potts, P.J., Prusisz, B., and Young, K. (2013)
Geo*PT*33 - an international proficiency test for analytical geochemistry laboratories - report on round 33 / July-August 2013 (Ball Clay, DBC-1). International Association of Geoanalysts: Unpublished report.

Geo*PT*34
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2014)
Geo*PT*34 - an international proficiency test for analytical geochemistry laboratories - report on round 34 (Granite, GRI-1) / January 2014. International Association of Geoanalysts: Unpublished report.
Geo*PT*35
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2014)
Geo*PT*35 - an international proficiency test for analytical geochemistry laboratories - report on round 35 (Tonalite, TLM-1) / August 2014. International Association of Geoanalysts: Unpublished report.

Geo*PT*35A
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2014)
Geo*PT*35A - an international proficiency test for analytical geochemistry laboratories - report on round 35A (Metalliferous sediment, SdAR-H1) / August 2014. International Association of Geoanalysts: Unpublished report.

Geo*PT*36
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2015)
Geo*PT*36 - an international proficiency test for analytical geochemistry laboratories - report on round 36 (Gabbro, GSM-1) / January 2015. International Association of Geoanalysts: Unpublished report.

Geo*PT*36A
Webb, P.C., Thompson, M., Potts, P.J and Wilson, S. (2015)
Geo*PT*36A - an international proficiency test for analytical geochemistry laboratories - report on round 36A (Metal-rich sediment, SdAR-M2) / January 2015. International Association of Geoanalysts: Unpublished report.

Geo*PT*37
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Burnham, M. (2015)
Geo*PT*37 - an international proficiency test for analytical geochemistry laboratories - report on round 37 (Rhyolite, ORPT-1) / July 2015. International Association of Geoanalysts: Unpublished report.

Geo*PT*37A
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S. (2015)
Geo*PT*37A - an international proficiency test for analytical geochemistry laboratories - report on round 37A (Blended sediment, SdAR-L2) / July 2015. International Association of Geoanalysts: Unpublished report.

Geo*PT*38
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2016)
Geo*PT*38 - an international proficiency test for analytical geochemistry laboratories - report on round 38 (Gabbro, OU-7) / January 2016. International Association of Geoanalysts: Unpublished report.

Geo*PT*38A
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Meisel, T. (2016)
Geo*PT*38A - an international proficiency test for analytical geochemistry laboratories – special report on round 38A (Modified harzburgite, HARZ01) / June 2016. International Association of Geoanalysts: Unpublished report.

Geo*PT*39
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2016)
Geo*PT*39 - an international proficiency test for analytical geochemistry laboratories - report on round 39 (Syenite, SyMP-1) / July 2016. International Association of Geoanalysts: Unpublished report.

Geo*PT*39A
Webb, P.C., Thompson, M., Potts, P.J, and Gowing, C.J.B. (2016)
Geo*PT*39A - an international proficiency test for analytical geochemistry laboratories - report on round 39A (Nepheline syenite, MNS-1) / July 2016. International Association of Geoanalysts: Unpublished report.

Geo*PT*40
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2017)
Geo*PT*40 - an international proficiency test for analytical geochemistry laboratories - report on round 40 (Silty marine shale, ShWYO-1) / January 2017. International Association of Geoanalysts: Unpublished report.

Geo*PT*40A
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2017)
Geo*PT*40A - an international proficiency test for analytical geochemistry laboratories - report on round 40A (Calcareous organic-rich shale, ShTX-1) / January 2017. International Association of Geoanalysts: Unpublished report.

Geo*PT*41
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2017)
Geo*PT*41 - an international proficiency test for analytical geochemistry laboratories - report on round 41 (Andesite, ORA-1) / July 2017. International Association of Geoanalysts: Unpublished report.

Geo*PT*41A
Webb, P.C., Thompson, M., Potts, P.J, Gowing, C.J.B. and Wilson, S.A. (2017)
Geo*PT*41A - an international proficiency test for analytical geochemistry laboratories - report on round 41A (Mineralized stream sediment, SSCO-1) / July 2017. International Association of Geoanalysts: Unpublished report.

Geo*PT*42
Webb, P.C., Thompson, M., Potts, P.J., Gowing, C.J.B. and Burnham, M. (2018)
Geo*PT*42 – an international proficiency test for analytical geochemistry laboratories – report on round 42 (Queenston shale, QS-1) / January 2018. International Association of Geoanalysts: Unpublished report.

Geo*PT*43
Webb, P.C., Potts, P.J., Thompson, M. and Gowing, C.J.B. (2018)
Geo*PT*43 – an international proficiency test for analytical geochemistry laboratories – report on round 43 (Dolerite, ADS-1) / July 2018. International Association of Geoanalysts: Unpublished report.

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D1	D2	D4	D5	D6	D7	D10	D11	D13	D14	D15	D16	D18
SiO2	g 100g^{-1}		6.43	5.795	**5.152**	**5.91**	5.754	5.74	6.5		**5.62**	**5.76**		**5.7**
TiO2	g 100g^{-1}		0.04	0.044	**0.092**	**0.07**	0.047	0.06	0.05	0.043	**0.05**	**0.051**		**0.04**
Al2O3	g 100g^{-1}		4.27	1.233	**0.456**	**1.3**	1.17	1.19	1.21	1.21	**1.1**	**1.19**		**1.22**
Fe2O3T	g 100g^{-1}		0.422	0.362	**0.44**	**0.23**	0.359	0.37	0.29		**0.36**	**0.37**		**0.36**
Fe(II)O	g 100g^{-1}			0.16					0.3					
MnO	g 100g^{-1}	0.026	0.025	0.024	**0.02**	**0.03**	0.023	0.02	0.02	0.023	**0.023**	**0.023**		**0.03**
MgO	g 100g^{-1}			1.401	**1.12**	**1.39**	1.39	1.39	1.45	1.4	**1.37**	**1.34**		**1.51**
CaO	g 100g^{-1}		45.5	50.014	**56.1**	**49.8**	49.98	50.08	49.94	48.3	**51.1**	**49.88**		**50.05**
Na2O	g 100g^{-1}			0.216	**0.64**	**0.18**	0.232	0.27	0.3		**0.21**	**0.238**		**0.1**
K2O	g 100g^{-1}		0.225	0.224	**0.2**	**0.27**	0.21	0.22	0.21	0.31	**0.22**	**0.24**		**0.22**
P2O5	g 100g^{-1}			0.064	**0.035**	**0.06**	0.062	0.07	0.06		**0.07**	**0.062**		**0.06**
H2O+	g 100g^{-1}													
CO2	g 100g^{-1}		35.8				55.56							
LOI	g 100g^{-1}			40.102	**39.61**	**39.3**	40.64	40.48	40.15		**40.35**	**29.7**		**40.5**
Ag	mg kg^{-1}								0.036					
As	mg kg^{-1}					**5**			0.434		**12**	**0.54**		
Au	mg kg^{-1}													
B	mg kg^{-1}								1.209					
Ba	mg kg^{-1}	44	76.7		**230**		68.8	50.9	37.368	52.2		**51.4**	47.51	**49.7**
Be	mg kg^{-1}							0.648	0.406			**0.42**		**0.65**
Bi	mg kg^{-1}		4.4						0.031				0.046	**0.04**
Br	mg kg^{-1}		0.9											
C(org)	mg kg^{-1}						3844							
C(tot)	mg kg^{-1}						115000.000					**116300.000**		
Cd	mg kg^{-1}				**11**				0.017					**0.048**
Ce	mg kg^{-1}		13.6					6.23	4.665	5.94		**6.44**	4.5	**6.01**
Cl	mg kg^{-1}					**37**								
Co	mg kg^{-1}	2.12			**71.25**	**5**		2.33	2.766	1.84		**0.64**		**0.65**
Cr	mg kg^{-1}		16.4		**21.25**			5.58	4.102	6.09		**5.15**		**6.77**
Cs	mg kg^{-1}							1.14	1.463				2.02	**1.68**
Cu	mg kg^{-1}		37.1		**6**	**10**		8.84	1.303	1.2	**16**	**6.43**		**0.21**
Dy	mg kg^{-1}							0.52	0.421	0.51		**0.52**	0.44	**0.52**
Er	mg kg^{-1}							0.294	0.241	0.3		**0.32**	0.237	**0.29**
Eu	mg kg^{-1}							0.137	0.121			**0.16**	0.111	
F	mg kg^{-1}	407												
Ga	mg kg^{-1}	1.51	2.4					1.44	0.99			1.83		**1.7**
Gd	mg kg^{-1}							0.609	0.513	0.67		**0.64**	0.464	**0.61**
Ge	mg kg^{-1}							0.3	0.096					
Hf	mg kg^{-1}							0.388	0.197				0.17	**1.05**
Hg	mg kg^{-1}													
Ho	mg kg^{-1}							0.104	0.085	0.1		**0.11**	0.087	
I	mg kg^{-1}													
In	mg kg^{-1}													
Ir	mg kg^{-1}													
La	mg kg^{-1}		8.3					3.56	2.739	3.68		**3.8**	3.11	**3.68**
Li	mg kg^{-1}				**46.5**			12.8	9.367				11.54	**11**
Lu	mg kg^{-1}							0.041	0.034	0.04		**0.05**	0.028	
Mo	mg kg^{-1}								0.08				0.122	**0.4**
Nb	mg kg^{-1}							0.854	0.711		**4**		0.791	**0.77**
Nd	mg kg^{-1}							3.29	2.523	3.26		**3.38**	2.86	**3.26**
Ni	mg kg^{-1}	4	80.3			**9**		5.53	19.58			**1.82**		**13.4**
Pb	mg kg^{-1}	3.48	26.8		**140**	**1**		2.9	2.013	2.69		**2.94**	2.88	**3.51**
Pd	mg kg^{-1}					**162**								
Pr	mg kg^{-1}							0.809	0.646	0.84		**0.85**	0.733	**0.81**
Rb	mg kg^{-1}	12.56	14.8					7.76	13.498		**13**	12.49	12.87	**11.8**
Re	mg kg^{-1}													
S	mg kg^{-1}		4040		**320**									
Sb	mg kg^{-1}								0.145			**0.22**		**0.15**
Sc	mg kg^{-1}							1.07	1.833					**3.23**
Se	mg kg^{-1}								1.052			**0.32**		
Sm	mg kg^{-1}							0.64	0.49	0.61		**0.73**	0.536	**0.81**
Sn	mg kg^{-1}								0.444					**0.72**
Sr	mg kg^{-1}	954.920	1160		**281**			1071	905	1016	**1040**	944	1043	**979**
Ta	mg kg^{-1}							0.088	0.115				0.083	**0.36**
Tb	mg kg^{-1}							0.089	0.071	0.09		**0.1**	0.069	
Te	mg kg^{-1}					**3**			0.029					**0.31**
Th	mg kg^{-1}							0.664	0.565	0.77	**10**	**0.82**	0.42	**0.66**
Tl	mg kg^{-1}								0.061			**0.24**	0.083	**0.085**
Tm	mg kg^{-1}							0.043	0.035	0.05		**0.04**	0.035	
U	mg kg^{-1}							1	0.749	1.13		**1.27**	1.206	**1.11**
V	mg kg^{-1}	5.6				**2**		6.02	4.333	5.7		**5.68**		**5.83**
W	mg kg^{-1}		21.8		**332**				0.72					**0.59**
Y	mg kg^{-1}	3.26	3.4					3.7	2.675	3.35	**9**	**3.51**	2.79	**3.52**
Yb	mg kg^{-1}							0.272	0.223	0.25		**0.29**	0.219	**0.25**
Zn	mg kg^{-1}	5.48	9		**22**	**11**		9.3	4.794	11.1	**6**	**7.27**		**4.97**
Zr	mg kg^{-1}	15.8	18				170	16.3	6.158			9.01	6.4	**12.4**

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D19	D21	D22	D23	D24	D26	D28	D30	D31	D32	D33	D34	D35
SiO2	g 100g^{-1}	5.8	6.1	5.04	5.989	**5.96**	**5.802**	**6.03**	5.784	5.78	5.776	**5.83**	**5.71**	**4.93**
TiO2	g 100g^{-1}		0.055	0.046	0.127	**0.04**	**0.045**	**0.08**	0.047	0.043	0.067	**0.04**	0.05	**0.057**
Al2O3	g 100g^{-1}	1.15	1.4	0.99	1.272	**1.17**	**1.152**	**1.54**	1.145	1.15	0.941	**1.11**	**0.94**	**1.12**
Fe2O3T	g 100g^{-1}	0.342	0.45	0.35	0.59	**0.35**	**0.356**	**0.55**	0.364	0.36	0.474	**0.33**	**0.52**	**0.398**
Fe(II)O	g 100g^{-1}													
MnO	g 100g^{-1}	0.024	0.023	0.025	0.026	**0.02**	**0.025**	**0.04**	0.025	0.026	0.031	**0.02**	**0.03**	**0.024**
MgO	g 100g^{-1}	1.3	1.48	1.18	1.453	**1.4**	**1.328**	**1.71**	1.318	1.45	1.34	**1.36**	**1.42**	**1.363**
CaO	g 100g^{-1}	50.6	49.5	44.76	49.956	**50.08**	**50.225**	**51.31**	50.26	51.15	51.044	**51.03**	**49.53**	**52.119**
Na2O	g 100g^{-1}	0.281	0.24	0.18	0.157	**0.22**	**0.224**	**0.38**	0.211	0.22	0.137	**0.19**	0.17	**0.168**
K2O	g 100g^{-1}	0.231	0.23	0.2	0.206	**0.24**	**0.232**	**0.28**	0.210	0.199	0.203	**0.22**	**0.2**	**0.248**
P2O5	g 100g^{-1}	0.068	0.055	0.05	0.072	**0.07**	**0.063**	**0.05**	0.062	0.058	0.061	**0.06**	0.06	**0.069**
H2O+	g 100g^{-1}												**0.19**	
CO2	g 100g^{-1}	40.81	39.6											
LOI	g 100g^{-1}	40.54	40.2	**39.39**		**40.42**	**39.91**	**37.83**	40.41	39.4	39.875	**40.59**	**39.86**	**39.325**
Ag	mg kg^{-1}											**0.001**		**0.044**
As	mg kg^{-1}				0.606							**0.77**		**1.02**
Au	mg kg^{-1}													
B	mg kg^{-1}													
Ba	mg kg^{-1}	52.9	52		54.289	**87**	66.9			49		**67.8**	84	**53.53**
Be	mg kg^{-1}	0.5	0.51		0.803							**0.71**		
Bi	mg kg^{-1}		0.05		0.041							**0.047**		**0.068**
Br	mg kg^{-1}					**5**								
C(org)	mg kg^{-1}	1700							3490					
C(tot)	mg kg^{-1}	113200.000	113100.000		114700.000				118000.000					
Cd	mg kg^{-1}		0.02		0.022							**0.021**		**0.087**
Ce	mg kg^{-1}	6.9	6.5		6.735	**70**				5.81		**6.71**	13	**5.598**
Cl	mg kg^{-1}													
Co	mg kg^{-1}		1.4		0.676	**3**		**61**			3	**0.75**		
Cr	mg kg^{-1}		29		8.319	**12**						**10.2**		**1.3**
Cs	mg kg^{-1}				2.355			**2.02**				**2.15**		**2.716**
Cu	mg kg^{-1}		1.2		1.01	**21**				13		**1.08**		**1.07**
Dy	mg kg^{-1}	0.52	0.55		0.573			**0.59**		0.54		**0.557**		**0.422**
Er	mg kg^{-1}	0.26	0.31		0.327			**0.37**		0.31		**0.317**		
Eu	mg kg^{-1}	0.14	0.14		0.12			**0.08**		0.14		**0.149**		**0.125**
F	mg kg^{-1}		400			**262**								
Ga	mg kg^{-1}	1.6	1.47		1.405	**5**		**3.64**				**1.5**		**0.4**
Gd	mg kg^{-1}	0.59	0.64		0.69			**0.8**		0.6		**0.64**		**0.603**
Ge	mg kg^{-1}				0.292			**0.45**						
Hf	mg kg^{-1}	0.16			0.362			**1.79**				**0.255**		**0.461**
Hg	mg kg^{-1}													
Ho	mg kg^{-1}	0.09	0.11		0.105			**0.12**		0.11		**0.108**		**0.099**
I	mg kg^{-1}													
In	mg kg^{-1}													
Ir	mg kg^{-1}													
La	mg kg^{-1}	4.1	3.8		4.029	**9**		**6.03**		3.51		**4.04**		**3.03**
Li	mg kg^{-1}	10.9	10.4		8.793							**12.1**		
Lu	mg kg^{-1}	0.03	0.039		0.036			**0.11**		0.04		**0.044**		**0.033**
Mo	mg kg^{-1}		0.1									**0.07**		**0.24**
Nb	mg kg^{-1}	0.8						**1**				**0.87**	1	**0.971**
Nd	mg kg^{-1}	2.9	3.53		3.275	**5**		**4.34**		2.92		**3.61**		**2.925**
Ni	mg kg^{-1}				1.793	**10**		**1.5**				**2.02**		**8.83**
Pb	mg kg^{-1}		2.97		2.312	**5**		**5**			7	**2.9**		**4.162**
Pd	mg kg^{-1}													
Pr	mg kg^{-1}	0.76	0.87		0.839			**1.28**		0.81		**0.92**		**0.783**
Rb	mg kg^{-1}	12.8	11.3		13.157	**17**	11	**10**		16	10	**13.4**	13	**14.05**
Re	mg kg^{-1}													
S	mg kg^{-1}				100							**0.002**		
Sb	mg kg^{-1}	0.23	0.49		0.226							**0.23**		**0.405**
Sc	mg kg^{-1}		0.59		0.655	**33**		**3**		0.7		**0.9**		
Se	mg kg^{-1}													
Sm	mg kg^{-1}	0.62	0.69		0.604			**0.88**				**0.69**		**0.636**
Sn	mg kg^{-1}		0.63		0.829					0.9		**0.59**		**1.363**
Sr	mg kg^{-1}	1012	1007		1014	**1393**	937.3	**791**	1026	1019	978	**1173**	**960**	**1030.300**
Ta	mg kg^{-1}							**0.9**				**0.09**		**0.099**
Tb	mg kg^{-1}	0.08	0.092		0.091			**0.14**		0.09		**0.097**		**0.086**
Te	mg kg^{-1}													
Th	mg kg^{-1}	0.6	0.77		0.867			**1.65**				**0.7**		**0.76**
Tl	mg kg^{-1}	0.07	0.084									**0.07**		**0.225**
Tm	mg kg^{-1}	0.04	0.045		0.051			**0.05**		0.04		**0.04**		**0.033**
U	mg kg^{-1}	1.2	0.99		1.308			**1.36**				**1.22**		**1.192**
V	mg kg^{-1}		4.9		5.815	**8**		**5**				**6.5**		**5.7**
W	mg kg^{-1}				0.938							**0.84**		
Y	mg kg^{-1}	3.3			3.863	**4**		**3.87**		3.05	7.5	**3.86**	6	**3.41**
Yb	mg kg^{-1}	0.23	0.288		0.309			**0.28**		0.28		**0.282**		**0.28**
Zn	mg kg^{-1}	8.1			4.919	**8**	9.4	**2**			10.5	**11.5**		**9.5**
Zr	mg kg^{-1}	14.8	58		21.355	**17**	23	**48**		21	32	**39.2**	19	**15.02**

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D36	D38	D39	D40	D41	D42	D43	D44	D45	D46	D47	D49	D50
SiO2	g 100g^{-1}		5.809	5.372	**7.16**	6.14	**5.24**	**5.82**	**5.74**	6.03	5.71	5.69	**5.93**	**5.765**
TiO2	g 100g^{-1}		0.045	0.041	**0.04**		**0.07**	**0.03**	**0.046**	0.039	0.05	0.04	**0.043**	**0.045**
Al2O3	g 100g^{-1}	**1.01**	1.138	0.992	**1.02**	1.16	**1.07**	**1.02**	**1.13**	1.09	1.34	1.25	**1.18**	**1.127**
Fe2O3T	g 100g^{-1}	**0.385**	0.365	0.382	**0.4**	0.353	**0.353**	**0.33**	**0.35**	0.31	0.31	0.37	**0.36**	**0.361**
Fe(II)O	g 100g^{-1}		0.2				**0.075**						**0.071**	
MnO	g 100g^{-1}	**0.023**	0.027	0.026	**0.03**		**0.035**	**0.02**	**0.024**	0.022	0.027	0.02	**0.024**	**0.024**
MgO	g 100g^{-1}	**1.21**	1.368	1.143	**1.68**	1.304	**1.302**	**1.29**	**1.35**	1.326	1.41	1.34	**1.42**	**1.373**
CaO	g 100g^{-1}	**44.89**	49.6	51.011	**49.15**	49.639	**50.36**	**50.99**	**50.57**	49.44	50.6	50.65	**50.51**	**49.758**
Na2O	g 100g^{-1}		0.208	0.161	**0.8**	0.227	**0.21**	**0.21**	**0.13**	0.21	0.23	0.17	**0.27**	**0.194**
K2O	g 100g^{-1}		0.203	0.217	**0.31**		**0.215**	**0.23**	**0.23**	0.21	0.22	0.21	**0.23**	**0.197**
P2O5	g 100g^{-1}		0.063	0.063	**0.12**		**0.054**	**0.06**	**0.059**	0.06	0.066	0.06		**0.061**
H2O+	g 100g^{-1}		0.5									1	**0.3**	
CO2	g 100g^{-1}		41.8				**40.9**			41.405	40.2			
LOI	g 100g^{-1}		40.59	40.24		40.33	**40.48**	40.17	**39.93**		39.83	40.03	**39.95**	**40.4**
Ag	mg kg^{-1}			4.1										
As	mg kg^{-1}	**1.54**	2.7										**1.85**	
Au	mg kg^{-1}													
B	mg kg^{-1}												**3.698**	
Ba	mg kg^{-1}	**50.86**	53.44	40.3	**130**	50.68	422	**40.7**	**53**	46			**48.7**	**50.24**
Be	mg kg^{-1}		0.43										**0.55**	
Bi	mg kg^{-1}													
Br	mg kg^{-1}													
C(org)	mg kg^{-1}		0.08				**400**				3307			
C(tot)	mg kg^{-1}		111000.000	117000.000			**112020.000**				112908.000		**108271.000**	
Cd	mg kg^{-1}			7.2									**0.03**	
Ce	mg kg^{-1}	**5.71**	6.1	24.9	**5**	5.72		**28.9**	**6.34**				**5.68**	**6.1**
Cl	mg kg^{-1}		51					80						
Co	mg kg^{-1}	**1.48**	1.4	2									**0.59**	**1.1**
Cr	mg kg^{-1}	**5.52**		7.6				**6.7**	**5**				**5.6**	
Cs	mg kg^{-1}	**2**	2.2	7.7		1.21		**16.1**	**2.06**				**1.75**	**2.096**
Cu	mg kg^{-1}	**0.649**	1.438	4.4					**6**					
Dy	mg kg^{-1}	**0.521**	0.54						**0.62**				**0.487**	**0.549**
Er	mg kg^{-1}	**0.292**	0.25						**0.31**				**0.263**	**0.316**
Eu	mg kg^{-1}	**0.133**	0.14						**0.14**				**0.132**	**0.145**
F	mg kg^{-1}		310				**901**	245					**413**	
Ga	mg kg^{-1}	**1.44**	1.35			1.4		**5.1**	**2**				**1.46**	**0.74**
Gd	mg kg^{-1}	**0.633**	0.62						**0.63**				**0.512**	**0.626**
Ge	mg kg^{-1}												**0.28**	
Hf	mg kg^{-1}	**0.231**							**0.43**				**0.35**	
Hg	mg kg^{-1}												**1.521**	
Ho	mg kg^{-1}	**0.1**	0.11						**0.12**				**0.101**	**0.111**
I	mg kg^{-1}													
In	mg kg^{-1}													
Ir	mg kg^{-1}													
La	mg kg^{-1}	**3.51**	3.8	6.5	**3**			**7.4**	**3.81**				**3.43**	**3.54**
Li	mg kg^{-1}		10.2		**11**								**8.013**	
Lu	mg kg^{-1}	**0.04**											**0.038**	**0.043**
Mo	mg kg^{-1}	**0.062**		1.1										
Nb	mg kg^{-1}	**0.835**							**0.89**				**0.7**	**1.293**
Nd	mg kg^{-1}	**3.18**	3.2	10.7	**3**	3.08		**7.5**	**3.44**				**2.96**	**3.32**
Ni	mg kg^{-1}	**15.51**	7	1.7					**2**					
Pb	mg kg^{-1}	**2.86**	2.96			2.18		**2.7**	**2.75**				**2.65**	**3.1**
Pd	mg kg^{-1}													
Pr	mg kg^{-1}	**0.805**	0.87						**0.89**				**0.757**	**0.818**
Rb	mg kg^{-1}	**11.06**	11.9	12.4		11		**12.5**	**12.1**				**11.3**	**12.43**
Re	mg kg^{-1}													
S	mg kg^{-1}			60							32	1800		
Sb	mg kg^{-1}		0.5											
Sc	mg kg^{-1}	**1.002**							**2**				**0.65**	**1.39**
Se	mg kg^{-1}													
Sm	mg kg^{-1}	**0.6**	0.7						**0.72**				**0.61**	**0.672**
Sn	mg kg^{-1}		1.22					**1.4**					**0.8**	**0.6**
Sr	mg kg^{-1}	**976.6**	1015	918.3	**986**	1012.960	**1004**	**932.4**	**1100**		1024	1100	**1006**	**985**
Ta	mg kg^{-1}	**0.081**						**2.5**	**0.1**				**0.09**	**0.095**
Tb	mg kg^{-1}	**0.093**	0.09						**0.1**				**0.079**	**0.09**
Te	mg kg^{-1}			1.8										
Th	mg kg^{-1}	**0.702**	0.7	3					**0.78**				**0.64**	**0.78**
Tl	mg kg^{-1}	**0.073**												
Tm	mg kg^{-1}	**0.043**							**0.05**				**0.039**	**0.047**
U	mg kg^{-1}	**1.05**	1.01	4.6		0.95		**3.9**	**1.16**				**1.05**	**1.171**
V	mg kg^{-1}	**5.44**	6	2.8				**7.3**	**9**				**6.2**	**6.6**
W	mg kg^{-1}		1.11					**1.9**					**0.87**	**0.772**
Y	mg kg^{-1}	**3.61**	3.5	4.1	**3**			**3.9**	**3.86**				**3.23**	**3.5**
Yb	mg kg^{-1}	**0.258**	0.3	1					**0.29**				**0.256**	**0.289**
Zn	mg kg^{-1}	**5.3**	6	7	**17**	6.36		**19**	**7**				**8.4**	
Zr	mg kg^{-1}	**8.22**	19.8	8.8	**26**	13.98		**24.1**	**16**	13			**13.9**	

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D51	D54	D55	D56	D57	D58	D59	D60	D61	D63	D64	D65	D66
SiO2	g 100g^{-1}	**5.65**	2.76	**5.77**	**6.077**	5.76		**5.94**	5.87	5.58	**5.58**			**5.28**
TiO2	g 100g^{-1}	**0.07**	0.05	**0.04**	**0.04**	0.05	0.042	**0.046**	0.04	0.043	**0.05**		**0.044**	**0.027**
Al2O3	g 100g^{-1}	**1.78**	0.81	**1.16**	**1.198**	1.11	1.2	**1.152**	1.12	1.119	**1.08**			**0.97**
Fe2O3T	g 100g^{-1}	**0.39**	0.38	**0.34**	**0.368**	0.34	0.359	**0.302**	0.36	0.319	**0.32**			**0.38**
Fe(II)O	g 100g^{-1}	**0.15**												
MnO	g 100g^{-1}	**0.025**	0.03	**0.03**	**0.024**	0.021	0.025	**0.022**	0.02	0.022	**0.025**		**0.025**	**0.03**
MgO	g 100g^{-1}	**1.14**	1.55	**1.53**	**1.458**	1.34	1.317	**1.375**	1.37	1.283	**1.36**			**1.27**
CaO	g 100g^{-1}	**48.34**	50.04	**50.69**	**50.843**	49.83	51.694	**50.213**	50.39	48.43	**50.63**			**48.2**
Na2O	g 100g^{-1}	**0.16**	0.02	**0.15**		0.22	0.22	**0.227**	0.21	0.226	**0.1**			**0.15**
K2O	g 100g^{-1}	**0.24**	0.19	**0.22**		0.23	0.229	**0.223**	0.22	0.216	**0.22**			**0.19**
P2O5	g 100g^{-1}	**0.12**	0.05	**0.06**	**0.067**	0.06	0.066	**0.062**	0.064	0.061	**0.064**			**0.061**
H2O+	g 100g^{-1}	**0.27**												**0.032**
CO2	g 100g^{-1}	**39.14**		**40.2**										**37.2**
LOI	g 100g^{-1}	**39.42**		**40.57**	**39.79**	40.22		**40.295**	40.37	39.62	**40.23**			**44.8**
Ag	mg kg^{-1}						0.006							**0.011**
As	mg kg^{-1}		1				0.594		2.3	1.154	**1.08**	**0.42**		**1.4**
Au	mg kg^{-1}													**0.035**
B	mg kg^{-1}										5.15			
Ba	mg kg^{-1}		82	**19**	**49.046**		50.282	**51.11**	52	46.42	**88.7**	**49.2**	**50.8**	**48.7**
Be	mg kg^{-1}				**0.594**		0.466	**0.64**	0.6		0.82		**0.61**	**0.394**
Bi	mg kg^{-1}						0.054							**0.025**
Br	mg kg^{-1}													
C(org)	mg kg^{-1}													**4180**
C(tot)	mg kg^{-1}								125700.000					**106000.000**
Cd	mg kg^{-1}						0.016		0.06		0.05			**0.03**
Ce	mg kg^{-1}		6		**5.974**		6.092	**6.14**	6.2	7.374	**10.6**	**6.19**	**6.09**	**7.94**
Cl	mg kg^{-1}		80											
Co	mg kg^{-1}		3.5		**0.264**		0.641	**1.56**	0.8	0.652	**0.81**		**1.01**	**0.712**
Cr	mg kg^{-1}		44		**6.107**		4.99	**5.52**	7	6.742	**8.8**		**5.37**	**4.61**
Cs	mg kg^{-1}				**2.011**		2.118	**2.06**	2.1		**2.84**	**1.94**	**2**	**1.85**
Cu	mg kg^{-1}			**13**	**1.328**		0.83	**1.13**	1	6.985	**2.17**		**1.07**	**1.62**
Dy	mg kg^{-1}				**0.499**		0.527	**0.55**	0.5	0.632	**0.97**	**0.545**	**0.55**	**0.51**
Er	mg kg^{-1}				**0.286**		0.286	**0.31**	0.3	0.416	**0.54**	**0.324**	**0.3**	**0.283**
Eu	mg kg^{-1}				**0.137**		0.136	**0.15**	0.2	0.166	**0.25**	**0.137**	**0.14**	**0.141**
F	mg kg^{-1}													
Ga	mg kg^{-1}		2		**1.422**		1.342	**1.59**	1.6		**2.51**		**1.47**	**1.26**
Gd	mg kg^{-1}				**0.593**		0.575	**0.58**	0.6	0.673	**1.12**	**0.626**	**0.62**	**0.562**
Ge	mg kg^{-1}								0.3					
Hf	mg kg^{-1}		4		**0.359**		0.231	**0.38**	0.6		**0.31**	**0.269**	**0.39**	**0.412**
Hg	mg kg^{-1}													**3.42**
Ho	mg kg^{-1}				**0.103**		0.105	**0.11**	0.1	0.125	**0.19**	**0.108**	**0.11**	**0.098**
I	mg kg^{-1}													
In	mg kg^{-1}													**0.008**
Ir	mg kg^{-1}													
La	mg kg^{-1}		10		**3.635**		3.585	**3.67**	3.8	3.866	**6.53**	**3.65**	**3.7**	**3.49**
Li	mg kg^{-1}				**10.158**		11.11	**10.17**	10.3		**16.91**		**9.53**	**9.88**
Lu	mg kg^{-1}				**0.043**		0.035	**0.05**		0.075	**0.06**	**0.043**	**0.042**	**0.05**
Mo	mg kg^{-1}				**0.152**		0.085	**0.11**	0.6	0.298	0.16		**0.11**	**0.171**
Nb	mg kg^{-1}		3		**0.685**		0.789	**0.92**	1.2	1.28	**2.57**		**0.9**	**0.849**
Nd	mg kg^{-1}				**3.311**		3.39	**3.32**	3.8		**5.94**	**3.26**	**3.34**	**3.16**
Ni	mg kg^{-1}		3	**10**	**6.07**		1.806	**5.9**	2	22.77	**2.02**		**3.46**	**2.34**
Pb	mg kg^{-1}		2		**3.185**		2.898	**2.83**	3	3.89	**4.44**	**2.53**	**2.97**	**3.88**
Pd	mg kg^{-1}													
Pr	mg kg^{-1}				**0.835**		0.818	**0.84**	0.8	0.898	**1.51**	**0.845**	**0.84**	**0.787**
Rb	mg kg^{-1}		15	**13**	**10.728**		11.748	**12.68**	12.1		**20**	**10.9**	**11.8**	**10.7**
Re	mg kg^{-1}													
S	mg kg^{-1}	**761**					24							
Sb	mg kg^{-1}		17				0.252		0.3		0.41			**0.139**
Sc	mg kg^{-1}							**0.72**		3.883	**1.23**		**0.79**	**0.521**
Se	mg kg^{-1}						0.022							
Sm	mg kg^{-1}				**0.641**		0.632	**0.67**	0.7	0.773	**1.14**	**0.605**	**0.66**	**0.574**
Sn	mg kg^{-1}						0.577	**0.66**	0.6	1.415	**1.26**		**0.71**	**2.02**
Sr	mg kg^{-1}		994	**1002**	**1037.200**	1069	972.650	**1077.840**	1094	992.490	**987**	**952**	**1057**	**970**
Ta	mg kg^{-1}				**0.089**		0.104	**0.09**	0.1		**0.19**		**0.09**	**0.098**
Tb	mg kg^{-1}				**0.09**		0.089	**0.1**			**0.17**	**0.094**	**0.093**	
Te	mg kg^{-1}													**0.013**
Th	mg kg^{-1}		4		**0.835**		0.679	**0.72**	0.75	1.43	**1.13**	**0.769**	**0.72**	**1.66**
Tl	mg kg^{-1}						0.081	**0.09**	0.09				**0.102**	**0.06**
Tm	mg kg^{-1}				**0.042**		0.041	**0.05**		0.05	**0.08**	**0.045**	**0.043**	**0.039**
U	mg kg^{-1}			**17**	**1.082**		1.255	**1.21**	1.3	1.039	**1.48**	**1.26**	**1.26**	**1.26**
V	mg kg^{-1}		14		**5.343**		5.69	**5.95**	6	6.72	**9.7**		**6.27**	
W	mg kg^{-1}						0.827		0.9					**8.22**
Y	mg kg^{-1}		5		**3.346**		3.382	**3.78**	4.1	3.683	**6.16**	**3.18**	**3.71**	**2.99**
Yb	mg kg^{-1}				**0.277**		0.254	**0.28**	0.2	0.407	**0.48**	**0.272**	**0.28**	**0.236**
Zn	mg kg^{-1}		7	**8**			6.3	**6.17**	7		**8.41**		**6.33**	**2.2**
Zr	mg kg^{-1}		27	**49**	**10.421**		6.04	**15.11**	17	15.25	**10.98**	**8.54**	**15.3**	**6.33**

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D67	D70	D71	D72	D73	D74	D75	D76	D77	D78	D79	D80	D82
SiO2	g 100g^{-1}	6.21	**59.19**	**5.65**	3.28	5.901	4.693		**6.08**	5.8	5.72	**5.79**	5.853	5.758
TiO2	g 100g^{-1}	0.04	**0.05**	**0.088**	0.032	0.044	0.115		**0.04**			**0.041**		0.043
Al2O3	g 100g^{-1}	1.23	**1.19**	**1.18**	0.92	1.154	1.024		**1.16**	1.15	1.12	**1.12**		1.097
Fe2O3T	g 100g^{-1}	0.37	**0.39**	**0.44**	0.236	0.364	0.906		**0.37**	0.32	0.34	**0.35**		0.389
Fe(II)O	g 100g^{-1}			**0.15**										
MnO	g 100g^{-1}	0.02	**0.02**	**0.021**	0.017	0.025			**0.02**			**0.024**		0.024
MgO	g 100g^{-1}	1.41	**1.38**	**1.48**	0.911	1.391	1.215		**1.93**	1.36	1.38	**1.31**		1.375
CaO	g 100g^{-1}	47.45	**49.68**	**49.86**	29.99	50.43	51.67		**48.75**	50.2	50.8	**50.16**		50.471
Na2O	g 100g^{-1}	0.24	**0.2**	**0.285**	0.145	0.186			**0.18**	0.23	0.2	**0.216**		0.226
K2O	g 100g^{-1}	0.24	**0.23**	**0.214**	0.134	0.209	0.13		**0.25**	0.21	0.21	**0.219**		0.222
P2O5	g 100g^{-1}	0.06	**0.05**	**0.053**	0.041	0.065	0.047		**0.07**	0.06	0.059	**0.062**		0.052
H2O+	g 100g^{-1}										0.22			0.17
CO2	g 100g^{-1}			**39.68**	24.14									
LOI	g 100g^{-1}	40.55	**40.53**	**0.96**	40.129	40.03	40.156		**40.26**	40.6	40.3	**40.61**	39.18	40.47
Ag	mg kg^{-1}			**0.023**		0.062			**0.01**					
As	mg kg^{-1}		**2**	**1.58**		1.658								
Au	mg kg^{-1}													
B	mg kg^{-1}													
Ba	mg kg^{-1}	74.91	**74**	**66.9**		61.11	42.085	**53.372**	**53.1**		54.6			54.9
Be	mg kg^{-1}	0.7		**0.61**		0.559	1.269	**0.41**	**0.6**		0.48			
Bi	mg kg^{-1}													0.9
Br	mg kg^{-1}													
C(org)	mg kg^{-1}													
C(tot)	mg kg^{-1}		**111300.000**									**113000.000**		
Cd	mg kg^{-1}			**0.19**			1.788	**0.115**	**0.01**					
Ce	mg kg^{-1}	6.2	**27**	**4.38**		6.66	5.884	**6.551**	**6.44**		5.49			8.1
Cl	mg kg^{-1}			**135**										
Co	mg kg^{-1}	1.2	**3**	**1.375**		1.423	3.001	**2.74**	**2.17**		0.559			
Cr	mg kg^{-1}	6.8	**9**	**6.51**		9.626	3.327	**4.65**	**8.79**					12.5
Cs	mg kg^{-1}	1.9	**12**			2.405		**1.92**	**2.17**		2.02			2.6
Cu	mg kg^{-1}	3.5	**5**	**0.995**	107	11.5	4.193	**2.46**	**1.26**		1.26			
Dy	mg kg^{-1}	0.5		**0.45**		0.557	0.549	**0.419**	**0.55**		0.508			
Er	mg kg^{-1}	0.3		**0.32**		0.328	0.310	**0.196**	**0.31**					
Eu	mg kg^{-1}	0.1		**0.36**		0.151	0.152		**0.15**		0.128			
F	mg kg^{-1}			**670**									427	
Ga	mg kg^{-1}	1.5				1.773	2.236	**1.81**	**1.33**		1.39			1.2
Gd	mg kg^{-1}	0.6		**0.44**		0.698	0.683	**0.436**	**0.66**		0.56			
Ge	mg kg^{-1}					0.318								
Hf	mg kg^{-1}	0.5		**4.26**		0.35		**0.181**	**0.4**		0.178			
Hg	mg kg^{-1}													
Ho	mg kg^{-1}	0.1		**0.1**		0.112	0.109		**0.11**		0.094			
I	mg kg^{-1}													
In	mg kg^{-1}													
Ir	mg kg^{-1}													
La	mg kg^{-1}	4	**5**	**2.68**		4.036	3.542	**5.518**	**4.04**		3.41			4.3
Li	mg kg^{-1}			**20**				**12.199**			11.1			
Lu	mg kg^{-1}	0.04				0.042	0.031		**0.05**					
Mo	mg kg^{-1}	0.2					0.746		**0.18**					1
Nb	mg kg^{-1}	1				0.929		**0.87**	**0.99**		0.835			
Nd	mg kg^{-1}	3.4	**11**	**2.31**		3.676	3.262	**3.3**	**3.52**		3.19			7.8
Ni	mg kg^{-1}	4.5	**2**	**9.19**	17	6.888	3.7	**24.5**	**21.3**		1.77			2.1
Pb	mg kg^{-1}	1.1	**13**	**1.4**		3.851		**4.84**	**3.11**		2.78			3.5
Pd	mg kg^{-1}													
Pr	mg kg^{-1}	0.9		**0.91**		0.889	0.807	**0.795**	**0.9**		0.761			
Rb	mg kg^{-1}	11.7	**15**	**8.97**		11.17	3.846		**11.6**		11.35			10.7
Re	mg kg^{-1}													
S	mg kg^{-1}			**29.3**		0.043								
Sb	mg kg^{-1}				297	0.657		**0.23**	**0.75**					
Sc	mg kg^{-1}	0.65		**1.27**					**1.72**		0.67			
Se	mg kg^{-1}			**0.4**			3.141							
Sm	mg kg^{-1}	0.6	**1**	**0.43**		0.694	0.562	**0.616**	**0.68**		0.674			
Sn	mg kg^{-1}	1.3		**0.55**	57	0.806			**0.78**					0.8
Sr	mg kg^{-1}	975.310	**952**	**975**	573	1070.496	735.4		**1084**		1115			958
Ta	mg kg^{-1}	0.8		**0.21**		0.104			**0.12**					
Tb	mg kg^{-1}	0.1		**0.08**		0.097	0.082		**0.11**		0.083			
Te	mg kg^{-1}													
Th	mg kg^{-1}	0.8	**3**	**0.797**			0.809		**0.76**		0.647			2.2
Tl	mg kg^{-1}	0.1						**0.73**						
Tm	mg kg^{-1}	0.1		**0.04**		0.045	0.05		**0.05**					
U	mg kg^{-1}	1.1	**4**	**1.08**		1.408	1.106	**1.46**	**1.15**		1.1			
V	mg kg^{-1}	7.7	**6**	**3.82**		15.1	0.021		**6.51**		5.1			2.4
W	mg kg^{-1}	1.2	**6**	**2.59**		2.06		**0.83**			0.812			
Y	mg kg^{-1}	3.6	**4**	**4.15**		2.8	3.545		**3.81**		3.29			4.6
Yb	mg kg^{-1}	0.3		**0.17**		0.298	0.243	**3.364**	**0.29**		0.249			
Zn	mg kg^{-1}	9.05	**10**	**13.28**		12.6	2.612	**7.779**	**5.6**		6.8			6.5
Zr	mg kg^{-1}	17.28	**12**			11.07		**5.155**	**15.8**		18			19.1

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D83	D84	D85	D86	D87	D89	D90	D91	D92	D94	D95	D96	D97
SiO2	g 100g^{-1}	4.35	5.76	**6.3**	6.007	5.71	5.632	5.81	5.744	5.53	**5.82**	5.7		4.88
TiO2	g 100g^{-1}		0.047	**0.041**	0.046	0.05	0.033		0.025	0.041	**0.059**	0.04	**0.057**	0.052
Al2O3	g 100g^{-1}	0.97	1.13	**1.1**	1.131	1.12	0.799	1.09	1.125	1.08	**1.19**	1.15	**1.13**	1.23
Fe2O3T	g 100g^{-1}	0.44	0.35	**0.676**	0.355	0.36	0.808	0.35	0.354	0.36	**0.469**	0.4	**0.369**	0.417
Fe(II)O	g 100g^{-1}								0.16					
MnO	g 100g^{-1}		0.022	**0.024**	0.021	0.03	0.026		0.024	0.025	**0.029**	0.028	**0.025**	0.023
MgO	g 100g^{-1}	1.63	1.4	**1.429**	1.373	1.33	1.432	1.36	1.346	1.41	**1.488**	1.3	**1.48**	1.23
CaO	g 100g^{-1}	50.82	50.36	**49.93**	50.02	50.4	48.703	50.56	50.327	47.54	**50.164**	48.78	**49.4**	53.1
Na2O	g 100g^{-1}			**0.233**	0.145	0.19	0.297	0.22	0.201	0.23	**0.239**		**0.222**	0.222
K2O	g 100g^{-1}		0.17	**0.251**	0.167	0.22	0.264	0.25	0.215	0.2	**0.232**	0.2	**0.222**	0.24
P2O5	g 100g^{-1}		0.059	**0.032**	0.028	0.07	0.067	0.071	0.059	0.063	**0.051**	0.065		0.050
H2O+	g 100g^{-1}								0.357					
CO2	g 100g^{-1}						40.63					39.8		
LOI	g 100g^{-1}	40.3	40.34	**39.71**	40.49	40.25	38.37	39.8	40.447	40.1	**40.16**	39.66		38.36
Ag	mg kg^{-1}					0.002	2.194							
As	mg kg^{-1}			**0.714**		0.2	10.716			3	**4**		**0.64**	
Au	mg kg^{-1}													
B	mg kg^{-1}													
Ba	mg kg^{-1}			**51.96**		49	57.474		52.48		**44**	51	**58**	
Be	mg kg^{-1}			**0.464**		0.63	0.561		0.452			0.49		
Bi	mg kg^{-1}					0.05	0.973							
Br	mg kg^{-1}									3				
C(org)	mg kg^{-1}													
C(tot)	mg kg^{-1}				113143.000	112000.000	110806.600	113000.000	112932.000					
Cd	mg kg^{-1}			**0.016**		0.02	1.963		0.017					
Ce	mg kg^{-1}			**6.03**		6.56	7.099		6.168	19	**11**	6.9	**6.4**	
Cl	mg kg^{-1}										**49**			
Co	mg kg^{-1}			**1.322**		0.9	2.869		0.656		**3**	0.65	**0.63**	
Cr	mg kg^{-1}			**5.683**		10	17.296		5.7			7	**5.5**	
Cs	mg kg^{-1}			**2.045**		2	2.317		1.999		**30**	2.01	**2.08**	
Cu	mg kg^{-1}			**1.712**		1.14	198.099				**5**	0.8		
Dy	mg kg^{-1}			**0.513**		0.55	0.726		0.511			0.5	**0.86**	
Er	mg kg^{-1}			**0.29**		0.35	0.425		0.296			0.295		
Eu	mg kg^{-1}			**0.136**		0.13	0.621		0.139			0.144	**0.139**	
F	mg kg^{-1}										**581**			
Ga	mg kg^{-1}			**1.398**		1.63	2.064		1.338			1.6	**1.3**	
Gd	mg kg^{-1}			**0.59**		0.69	0.600		0.599			0.58		
Ge	mg kg^{-1}						0.886							
Hf	mg kg^{-1}			**0.394**		0.2	0.497		0.37			0.39	**0.39**	
Hg	mg kg^{-1}													
Ho	mg kg^{-1}			**0.106**		0.11	0.291		0.106			0.106		
I	mg kg^{-1}													
In	mg kg^{-1}						0.281		0.006					
Ir	mg kg^{-1}						0.109							
La	mg kg^{-1}			**3.579**		3.87	3.371		3.621		**2**	3.9	**3.61**	
Li	mg kg^{-1}			**10.36**		9.5	40.368		8.88			10.1		
Lu	mg kg^{-1}			**0.04**		0.04	0.282		0.042			0.043	**0.041**	
Mo	mg kg^{-1}					0.11	1.060		0.091		**4**	0.1		
Nb	mg kg^{-1}			**0.888**		0.831	1.160		0.783	4		0.84		
Nd	mg kg^{-1}			**3.243**		3.5	3.251		3.464		**5**	3.3	**2.6**	
Ni	mg kg^{-1}			**8.587**		1.9	26.158		1.71	3	**4**	1.9		
Pb	mg kg^{-1}			**2.717**		2.85	10.948		2.677		**3**	2.84		
Pd	mg kg^{-1}													
Pr	mg kg^{-1}			**0.839**		0.93	1.337		0.86			0.85		
Rb	mg kg^{-1}			**11.7**		11.4	13.482		11.22	13	**16**	11.7	**11.9**	
Re	mg kg^{-1}													
S	mg kg^{-1}						40.48							31.3
Sb	mg kg^{-1}			**0.228**		0.24	1.762		0.207			0.26	**0.24**	
Sc	mg kg^{-1}			**0.896**		0.7	0.965				**69**	0.71	**0.655**	
Se	mg kg^{-1}					1								
Sm	mg kg^{-1}			**0.626**		0.64	0.685		0.636			0.65	**0.61**	
Sn	mg kg^{-1}			**0.775**		0.7	3.279		0.57					
Sr	mg kg^{-1}			**1034.900**		1120	1066.673		1046.580	872	**969**	1040	**1120**	113
Ta	mg kg^{-1}			**0.086**		0.1	0.332		0.082				**0.09**	
Tb	mg kg^{-1}			**0.088**		0.09	0.453		0.091			0.086	**0.082**	
Te	mg kg^{-1}													
Th	mg kg^{-1}			**0.715**		0.72	0.710		0.68		**9**	0.67	**0.75**	
Tl	mg kg^{-1}			**0.085**		0.084			0.078			0.079		
Tm	mg kg^{-1}			**0.043**		0.05	0.335		0.042			0.044		
U	mg kg^{-1}			**1.301**		1.22	2.177		0.952	7	**3**	1.15	**1.1**	
V	mg kg^{-1}			**5.551**		13	10.037		5.84			5.5	**6.9**	
W	mg kg^{-1}			**0.739**		0.9	8.870		0.922			0.79	**0.76**	
Y	mg kg^{-1}			**3.385**		3.5	2.142		3.631		**3**	3.3		
Yb	mg kg^{-1}			**0.271**		0.27	0.399		0.267			0.28	**0.279**	
Zn	mg kg^{-1}			**6.498**		7	388.923		7.37	11	**9**		**6.7**	
Zr	mg kg^{-1}			**15.6**		18	8.710		13.3	86	**26**	15.8		38.4

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 1 - GeoPT44A Contributed data for Carbonate mudrock, CM-1. 12/12/2018

Lab Code		D99	D100	D102	D103	D105	D106	D107	D108	D110	D111	D112	D113	D114
SiO2	g 100g^{-1}	**5.93**	8.41	5.75		5.8	**5.79**	6.24	5.71	6.09	4.303	5.34	**5.6**	**6.01**
TiO2	g 100g^{-1}	**0.04**	0.073	0.04		0.04	**0.034**	0.053	0.045		0.049	0.039	**0.04**	**0.041**
Al2O3	g 100g^{-1}	**1.11**	1.57	1.15		1.22	**1.08**	1.21	1.22	1.195	0.954	1.26	**1.1**	**1.11**
Fe2O3T	g 100g^{-1}	**0.36**	0.99	0.34		0.42	**0.31**	0.303	0.36	0.355	0.36	0.356	**0.33**	**0.39**
Fe(II)O	g 100g^{-1}													**0.12**
MnO	g 100g^{-1}		0.01	0.025		0.02	**0.024**	0.027	0.021		0.022	0.011	**0.03**	**0.027**
MgO	g 100g^{-1}	**1.26**	0.502	1.35		1.39	**1.28**	1.43	1.43	1.405	1.624	1.35	**1.33**	**1.38**
CaO	g 100g^{-1}	**49.8**	48.73	49.98		50.22	**51.33**	49.2	51.17	51	52.497	50.74	**50.7**	**50.81**
Na2O	g 100g^{-1}	**0.21**	0.013	0.11		0.2	**0.18**	0.202	0.251	0.073	0.17	0.25	**0.13**	**0.15**
K2O	g 100g^{-1}	**0.18**	0.443	0.22		0.22	**0.21**	0.238	0.229	0.155	0.203	0.195	**0.18**	**0.22**
P2O5	g 100g^{-1}	**0.05**	0.073	0.058		0.07	**0.073**	0.074	0.077	0.072	0.039	0.058	**0.12**	**0.065**
H2O+	g 100g^{-1}	**0.28**												
CO2	g 100g^{-1}											39.8		
LOI	g 100g^{-1}	**40.45**	39.67			39.94	**40.4**	40.4		39.75	39.646	40.1	**40.4**	**40**
Ag	mg kg^{-1}													
As	mg kg^{-1}											0.91	**0.8**	
Au	mg kg^{-1}													
B	mg kg^{-1}										19			
Ba	mg kg^{-1}		30		**53.16**	17	**50.94**			53.566		51.97	**53.8**	**56**
Be	mg kg^{-1}						**0.538**							
Bi	mg kg^{-1}													
Br	mg kg^{-1}													
C(org)	mg kg^{-1}											3760		
C(tot)	mg kg^{-1}	**112300.000**							112700.000	106491.000		113000.000		
Cd	mg kg^{-1}									0.045				
Ce	mg kg^{-1}		12		**5.89**	28	**6.044**			6.123		6.2	**6.25**	**5.6**
Cl	mg kg^{-1}										55			
Co	mg kg^{-1}						**0.524**			2.979		0.703	**0.8**	
Cr	mg kg^{-1}		13			2	**5.26**			5.395	25	6.3	**7.8**	**17**
Cs	mg kg^{-1}				**2.07**		**2.094**			2.021			**1.19**	**1.91**
Cu	mg kg^{-1}		37				**0.833**			5.265			**3.1**	**6**
Dy	mg kg^{-1}				**0.49**		**0.518**			0.547		0.52	**0.77**	**0.44**
Er	mg kg^{-1}				**0.29**		**0.296**			0.338		0.33	**0.32**	**0.27**
Eu	mg kg^{-1}				**0.14**		**0.136**			0.173		0.14	**0.14**	**0.13**
F	mg kg^{-1}										116	466		**1008**
Ga	mg kg^{-1}				**1.49**	2	**1.315**			1.647		1.62	**1.42**	
Gd	mg kg^{-1}				**0.62**		**0.615**			0.74		0.66	**0.64**	**0.51**
Ge	mg kg^{-1}											0.49	**0.41**	
Hf	mg kg^{-1}				**0.38**		**0.232**						**0.43**	**0.24**
Hg	mg kg^{-1}													
Ho	mg kg^{-1}				**0.11**		**0.106**			0.11		0.104	**0.11**	**0.1**
I	mg kg^{-1}													
In	mg kg^{-1}									0.007				
Ir	mg kg^{-1}													
La	mg kg^{-1}		14		**3.62**	10	**3.547**			3.623		3.72	**3.87**	**3.5**
Li	mg kg^{-1}						**10.561**					11.4		
Lu	mg kg^{-1}				**0.04**		**0.04**			0.044		0.039		**0.04**
Mo	mg kg^{-1}						**0.226**							
Nb	mg kg^{-1}				**0.84**	1	**0.842**					0.87	**0.84**	**0.82**
Nd	mg kg^{-1}				**3.33**		**3.244**			3.359		3.31	**3.54**	**3.03**
Ni	mg kg^{-1}		26			1	**0.89**			21.622				**10**
Pb	mg kg^{-1}					8	**2.666**			4.138		2.44	**1.93**	**2.54**
Pd	mg kg^{-1}													
Pr	mg kg^{-1}				**0.82**		**0.841**			0.924		0.834	**0.88**	**0.81**
Rb	mg kg^{-1}		9		**11.26**	14	**11.35**			11.604	11	12.7	**7.4**	**7**
Re	mg kg^{-1}													
S	mg kg^{-1}		2974								35.2			
Sb	mg kg^{-1}											0.22		
Sc	mg kg^{-1}				**0.81**	9	**0.633**			0.35			**0.8**	**91**
Se	mg kg^{-1}													
Sm	mg kg^{-1}				**0.65**		**0.63**			0.691		0.65		**0.59**
Sn	mg kg^{-1}				**0.83**								**0.7**	
Sr	mg kg^{-1}		914		**1040.320**	1029	**997.4**			1008	956	1048	**1110**	**1150**
Ta	mg kg^{-1}				**0.09**		**0.088**							0.07
Tb	mg kg^{-1}				**0.09**		**0.089**			0.115		0.091		**0.08**
Te	mg kg^{-1}													
Th	mg kg^{-1}				**0.68**		**0.745**			0.802		0.58	**0.74**	**0.65**
Tl	mg kg^{-1}									0.089		0.079		
Tm	mg kg^{-1}				**0.04**					0.043		0.042		**0.04**
U	mg kg^{-1}				**1.21**	1	**1.215**			1.384		1.28	**1.27**	**1.22**
V	mg kg^{-1}					12	**5.316**					6.27	**5.8**	
W	mg kg^{-1}				**0.81**								**0.77**	0.81
Y	mg kg^{-1}		5		**3.61**	2	**3.399**			3.957		3.4	**3.69**	**6**
Yb	mg kg^{-1}				**0.27**		**0.269**			0.283		0.267	**0.3**	**0.26**
Zn	mg kg^{-1}		76			11				6.804	10		**7.1**	**13**
Zr	mg kg^{-1}		80	103	**13.54**	9	**7.615**					16.8	**16.2**	**31**

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2

Table 2 - GeoPT44A Assigned values and statistical summary for Carbonate mudrock, CM-1.

	Assigned Value	Uncertainty of assigned value	Horwitz Target Value	Uncertainty/ Target	Number of reported results	Robust Mean of results	Robust SD of results	Median of results	Status of consensus value	Type of consensus value
	X_a	sdm	H_a	sdm/H_a	n					
	g 100g⁻¹	g 100g⁻¹	g 100g⁻¹			g 100g⁻¹	g 100g⁻¹	g 100g⁻¹		
SiO2	5.776	0.03126	0.08872	0.3523	81	5.776	0.2813	5.776	Assigned	Robust Mean
TiO2	0.045	0.0008448	0.001435	0.5886	77	0.04608	0.00862	0.045	Provisional	Median
Al2O3	1.138	0.01039	0.02232	0.4653	84	1.138	0.09519	1.141	Assigned	Robust Mean
Fe2O3T	0.36	0.003255	0.008397	0.3876	83	0.3682	0.04243	0.36	Assigned	Median
MnO	0.02425	0.0004237	0.0008488	0.4992	78	0.02425	0.003742	0.024	Assigned	Robust Mean
MgO	1.373	0.007649	0.02618	0.2921	83	1.371	0.08567	1.373	Assigned	Median
CaO	50.18	0.08905	0.5567	0.16	84	50.12	0.9713	50.18	Assigned	Median
K2O	0.2189	0.002346	0.005502	0.4265	80	0.2189	0.02099	0.22	Assigned	Robust Mean
P2O5	0.061	0.0008448	0.001859	0.4545	77	0.0615	0.008475	0.061	Assigned	Median
CO2	39.93	0.4009	0.4585	0.8744	16	39.93	1.604	40	Provisional	Robust Mean
LOI	40.16	0.05127	0.4608	0.1113	74	40.09	0.445	40.16	Assigned	Median
	mg kg⁻¹	mg kg⁻¹	mg kg⁻¹			mg kg⁻¹	mg kg⁻¹	mg kg⁻¹		
Ba	52	0.5517	2.295	0.2404	65	54	10.24	52	Assigned	Median
Be	0.5615	0.02188	0.04899	0.4467	30	0.5615	0.1199	0.56	Assigned	Robust Mean
Bi	0.047	0.004499	0.005956	0.7553	13	0.05925	0.03123	0.05	Provisional	Mode
C(tot)	112900	490.6	1568	0.3129	24	112900	2403	113000	Assigned	Robust Mean
Ce	6.2	0.08879	0.3768	0.2356	59	6.577	1.155	6.2	Assigned	Median
Cr	5.68	0.244	0.3498	0.6976	48	7.626	3.574	6.721	Provisional	Mode
Cs	2.045	0.02826	0.1469	0.1924	43	2.084	0.2953	2.045	Assigned	Median
Dy	0.5291	0.006988	0.04658	0.15	46	0.5291	0.0474	0.5205	Assigned	Robust Mean
Er	0.304	0.004521	0.02909	0.1554	43	0.304	0.02965	0.3	Assigned	Robust Mean
Eu	0.14	0.001809	0.01505	0.1202	43	0.1406	0.01396	0.14	Assigned	Median
Ga	1.5	0.03417	0.1129	0.3027	47	1.582	0.3378	1.5	Assigned	Median
Gd	0.6157	0.008607	0.05298	0.1625	45	0.6157	0.05773	0.615	Assigned	Robust Mean
Hf	0.39	0.015	0.03594	0.4173	37	0.3608	0.1412	0.38	Provisional	Mode
Ho	0.1062	0.001053	0.01191	0.08844	43	0.1062	0.006904	0.106	Assigned	Robust Mean
La	3.7	0.03928	0.243	0.1616	57	3.833	0.5697	3.7	Assigned	Median
Li	10.56	0.231	0.5924	0.3899	29	10.84	1.503	10.56	Assigned	Median
Lu	0.0405	0.0006013	0.005248	0.1146	38	0.04168	0.006375	0.0405	Assigned	Median
Nb	0.84	0.00754	0.06897	0.1093	40	0.9207	0.1628	0.87	Assigned	Mode
Nd	3.31	0.03136	0.2211	0.1418	53	3.345	0.344	3.31	Assigned	Median
Pb	2.855	0.0646	0.195	0.3313	54	3.186	1.022	2.92	Assigned	Mode
Pr	0.84	0.007735	0.06897	0.1122	45	0.8433	0.05902	0.84	Assigned	Median
Rb	11.8	0.1695	0.651	0.2603	62	12.01	1.562	11.8	Assigned	Median
Sb	0.23	0.00297	0.02295	0.1294	25	0.3396	0.196	0.24	Assigned	Mode
Sc	0.7051	0.0411	0.05944	0.6914	34	1.237	0.8124	0.898	Provisional	Mode
Sm	0.6505	0.009009	0.05551	0.1623	45	0.6505	0.06044	0.641	Assigned	Robust Mean
Sn	0.7	0.0637	0.05908	1.078	30	0.8962	0.3705	0.79	Provisional	Mode
Sr	1010	8.421	28.51	0.2953	73	1010	71.95	1008	Assigned	Robust Mean
Ta	0.09	0.0015	0.01034	0.145	31	0.1052	0.02693	0.098	Assigned	Mode
Tb	0.09	0.001289	0.01034	0.1247	40	0.09094	0.008906	0.09	Assigned	Median
Th	0.7279	0.0233	0.06107	0.3815	49	0.7756	0.1458	0.75	Assigned	Mode
Tl	0.084	0.001897	0.009754	0.1944	22	0.08499	0.01497	0.084	Assigned	Median
Tm	0.043	0.0007215	0.005522	0.1307	38	0.04429	0.005775	0.043	Assigned	Median
U	1.21	0.0224	0.09404	0.2382	53	1.22	0.1861	1.21	Assigned	Median
V	5.895	0.1333	0.361	0.3694	46	6.105	1.497	5.895	Assigned	Median
W	0.827	0.02549	0.06806	0.3746	28	1.262	0.765	0.885	Assigned	Mode
Y	3.572	0.05626	0.2359	0.2385	58	3.613	0.5213	3.572	Assigned	Median
Yb	0.279	0.004109	0.02704	0.1519	47	0.2748	0.02789	0.279	Assigned	Median
Zn	7	0.404	0.4177	0.9671	56	8.231	2.951	7.575	Provisional	Mode
Zr	15.9	0.9433	0.8387	1.125	62	17.63	9.039	15.9	Provisional	Median

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D1	D2	D4	D5	D6	D7	D10	D11	D13	D14	D15	D16	D18
SiO2	*	3.69	0.11	**-7.03**	**1.51**	-0.12	-0.20	4.08	*	**-1.76**	**-0.18**	*	**-0.86**
TiO2	*	*-1.74*	*-0.35*	***32.75***	***17.42***	*0.70*	*5.23*	*1.74*	*-0.70*	***3.48***	***4.18***	*	***-3.48***
Al2O3	*	70.15	2.13	**-30.55**	**7.26**	0.72	1.16	1.61	1.61	**-1.70**	**2.33**	*	**3.67**
Fe2O3T	*	3.69	0.12	**9.53**	**-15.48**	-0.06	0.60	-4.17	*	**0.00**	**1.19**	*	**0.00**
MnO	0.95	0.38	-0.15	**-5.00**	**6.78**	-0.74	-2.50	-2.50	-0.74	**-1.47**	**-1.47**	*	**6.78**
MgO	*	*	0.53	**-9.66**	**0.65**	0.32	0.32	1.47	0.52	**-0.11**	**-1.26**	*	**5.23**
CaO	*	-4.20	-0.15	**10.63**	**-0.69**	-0.18	-0.09	-0.22	-1.69	**1.65**	**-0.54**	*	**-0.24**
K2O	*	0.56	0.47	**-3.43**	**9.29**	-0.81	0.10	-0.81	8.28	**0.20**	**3.84**	*	**0.20**
P2O5	*	*	0.81	**-13.99**	**-0.54**	0.27	2.42	-0.27	*	**4.84**	**0.54**	*	**-0.54**
CO2	*	*-4.50*	*	*	*	*17.05*	*	*	*	*	*	*	*
LOI	*	*	-0.07	**-1.20**	**-1.88**	0.52	0.34	-0.02	*	**0.40**	**-22.71**	*	**0.73**
Ba	-1.74	5.38	*	**77.57**	*	3.66	-0.24	-3.19	0.04	*	**-0.26**	-0.98	**-1.00**
Be	*	*	*	*	*	*	0.88	-1.59	*	*	**-2.89**	*	**1.81**
Bi	*	*365.44*	*	*	*	*	*	*-1.34*	*	*	*	*-0.08*	***-1.18***
C(tot)	*	*	*	*	*	0.67	*	*	*	*	**2.16**	*	*
Ce	*	9.82	*	*	*	*	0.04	-2.04	-0.34	*	**0.64**	-2.26	**-0.50**
Cr	*	*15.32*	*	***44.51***	*	*	*-0.14*	*-2.26*	*0.59*	*	***-1.52***	*	***3.12***
Cs	*	*	*	*	*	*	-3.08	-1.98	*	*	*	-0.09	**-2.49**
Dy	*	*	*	*	*	*	-0.10	-1.16	-0.21	*	**-0.20**	-0.96	**-0.20**
Er	*	*	*	*	*	*	-0.17	-1.08	-0.07	*	**0.55**	-1.15	**-0.48**
Eu	*	*	*	*	*	*	-0.10	-0.63	*	*	**1.33**	-0.96	*
Ga	0.04	3.99	*	*	*	*	-0.27	-2.26	*	*	1.46	*	**1.77**
Gd	*	*	*	*	*	*	-0.06	-0.97	0.51	*	**0.46**	-1.43	**-0.11**
Hf	*	*	*	*	*	*	*-0.03*	*-2.68*	*	*	*	*-3.06*	***18.36***
Ho	*	*	*	*	*	*	-0.09	-0.89	-0.26	*	**0.32**	-0.81	*
La	*	9.46	*	*	*	*	-0.29	-1.98	-0.04	*	**0.41**	-1.21	**-0.08**
Li	*	*	*	**60.66**	*	*	1.89	-1.01	*	*	*	0.83	**0.74**
Lu	*	*	*	*	*	*	0.05	-0.62	-0.05	*	**1.81**	-1.19	*
Nb	*	*	*	*	*	*	0.10	-0.94	*	**45.82**	*	-0.36	**-1.01**
Nd	*	*	*	*	*	*	-0.05	-1.78	-0.11	*	**0.32**	-1.02	**-0.23**
Pb	1.60	61.40	*	**703.30**	**-9.51**	*	0.12	-2.16	-0.42	*	**0.44**	0.06	**3.36**
Pr	*	*	*	*	*	*	-0.22	-1.41	0.00	*	**0.14**	-0.78	**-0.43**
Rb	0.58	2.30	*	*	*	*	-3.10	1.30	*	**1.84**	0.53	0.82	**0.00**
Sb	*	*	*	*	*	*	*	-1.85	*	*	**-0.44**	*	**-3.49**
Sc	*	*	*	*	*	*	*3.07*	*9.49*	*	*	*	*	***42.48***
Sm	*	*	*	*	*	*	-0.09	-1.45	-0.37	*	**1.43**	-1.03	**2.87**
Sn	*	*	*	*	*	*	*	*-2.17*	*	*	*	*	***0.34***
Sr	-0.96	2.64	*	**-25.56**	*	*	1.07	-1.84	0.11	**1.06**	-1.15	0.58	**-1.08**
Ta	*	*	*	*	*	*	-0.10	1.21	*	*	*	-0.34	**26.11**
Tb	*	*	*	*	*	*	-0.05	-0.92	0.00	*	**0.97**	-1.02	*
Th	*	*	*	*	*	*	-0.52	-1.33	0.34	**151.83**	**1.51**	-2.52	**-1.11**
Tl	*	*	*	*	*	*	*	-1.18	*	*	**15.99**	-0.05	**0.10**
Tm	*	*	*	*	*	*	0.00	-0.72	0.63	*	**-0.54**	-0.72	*
U	*	*	*	*	*	*	-1.12	-2.45	-0.43	*	**0.64**	-0.02	**-1.06**
V	-0.41	*	*	*	**-10.79**	*	0.17	-2.16	-0.27	*	**-0.60**	*	**-0.18**
W	*	154.07	*	**4865.57**	*	*	*	-0.79	*	*	*	*	**-3.48**
Y	-0.66	-0.37	*	*	*	*	0.27	-1.90	-0.47	**23.01**	**-0.26**	-1.66	**-0.22**
Yb	*	*	*	*	*	*	-0.13	-1.04	-0.54	*	**0.41**	-1.11	**-1.07**
Zn	*-1.82*	*2.39*	*	***35.91***	***9.58***	*	*2.75*	*-2.64*	*4.91*	***-2.39***	***0.65***	*	***-4.86***
Zr	*-0.06*	*1.25*	*	*	*	*91.87*	*0.24*	*-5.81*	*	*	*-4.11*	*-5.66*	***-4.17***

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D19	D21	D22	D23	D24	D26	D28	D30	D31	D32	D33	D34	D35
SiO2	0.14	1.83	-4.15	1.20	2.07	0.29	2.86	0.05	0.02	0.00	0.61	-0.74	-9.53
TiO2	*	3.48	0.35	28.57	-3.48	0.00	24.39	0.73	-0.70	7.66	-3.48	1.74	8.22
Al2O3	0.27	5.87	-3.32	3.00	1.43	0.63	18.01	0.16	0.27	-4.41	-1.26	-8.87	-0.81
Fe2O3T	-1.07	5.36	-0.60	13.70	-1.19	-0.48	22.63	0.21	0.00	6.79	-3.57	19.06	4.53
MnO	-0.15	-0.62	0.44	1.03	-5.00	0.89	18.56	0.27	1.03	3.98	-5.00	6.78	-0.41
MgO	-1.39	2.04	-3.69	1.53	1.03	-1.72	12.87	-1.05	1.47	-0.63	-0.50	1.80	-0.38
CaO	0.38	-0.61	-4.87	-0.20	-0.18	0.08	2.03	0.07	0.87	0.77	1.52	-1.17	3.48
K2O	1.10	1.01	-1.72	-1.17	3.84	2.39	11.11	-0.85	-1.81	-1.44	0.20	-3.43	5.29
P2O5	1.88	-1.61	-2.96	2.96	4.84	1.08	-5.92	0.35	-0.81	0.00	-0.54	-0.27	4.09
CO2	0.96	-0.36	*	*	*	*	*	*	*	*	*	*	*
LOI	0.41	0.04	-1.68	*	0.55	-0.55	-5.07	0.27	-0.83	-0.31	0.92	-0.66	-1.82
Ba	0.20	0.00	*	0.50	15.25	3.25	*	*	-0.65	*	6.89	6.97	0.67
Be	-0.63	-0.53	*	2.46	*	*	*	*	*	*	3.03	*	*
Bi	*	0.25	*	-0.50	*	*	*	*	*	*	0.00	*	3.53
C(tot)	0.09	0.06	*	0.57	*	*	*	1.62	*	*	*	*	*
Ce	0.93	0.40	*	0.71	169.31	*	*	*	-0.52	*	1.35	9.02	-1.60
Cr	*	33.33	*	3.77	18.07	*	*	*	*	*	12.92	*	-12.52
Cs	*	*	*	1.06	*	*	-0.17	*	*	*	0.71	*	4.57
Dy	-0.10	0.22	*	0.47	*	*	1.31	*	0.12	*	0.60	*	-2.30
Er	-0.76	0.10	*	0.40	*	*	2.27	*	0.10	*	0.45	*	*
Eu	0.00	0.00	*	-0.66	*	*	-3.99	*	0.00	*	0.60	*	-1.00
Ga	0.44	-0.13	*	-0.42	31.01	*	18.96	*	*	*	0.00	*	-9.75
Gd	-0.24	0.23	*	0.70	*	*	3.48	*	-0.15	*	0.46	*	-0.24
Hf	-3.20	*	*	-0.39	*	*	38.95	*	*	*	-3.76	*	1.98
Ho	-0.68	0.16	*	-0.05	*	*	1.16	*	0.16	*	0.15	*	-0.61
La	0.82	0.21	*	0.68	21.81	*	9.59	*	-0.39	*	1.40	*	-2.76
Li	0.29	-0.14	*	-1.49	*	*	*	*	*	*	2.60	*	*
Lu	-1.00	-0.14	*	-0.43	*	*	13.24	*	-0.05	*	0.67	*	-1.43
Nb	-0.29	*	*	*	*	*	2.32	*	*	*	0.43	1.16	1.90
Nd	-0.93	0.50	*	-0.08	7.64	*	4.66	*	-0.88	*	1.36	*	-1.74
Pb	*	0.29	*	-1.39	11.00	*	11.00	*	*	10.63	0.23	*	6.70
Pr	-0.58	0.22	*	-0.01	*	*	6.38	*	-0.22	*	1.16	*	-0.83
Rb	0.77	-0.38	*	1.04	7.99	-0.61	-2.77	*	3.23	-1.38	2.46	0.92	3.46
Sb	0.00	5.66	*	-0.09	*	*	*	*	*	*	0.00	*	7.63
Sc	*	-0.97	*	-0.42	543.31	*	38.61	*	-0.04	*	3.28	*	*
Sm	-0.27	0.36	*	-0.42	*	*	4.13	*	*	*	0.71	*	-0.26
Sn	*	-0.59	*	1.09	*	*	*	*	1.69	*	-1.86	*	11.22
Sr	0.04	-0.05	*	0.08	13.44	-1.27	-7.67	0.29	0.16	-0.56	5.73	-1.74	0.72
Ta	*	*	*	*	*	*	78.32	*	*	*	0.00	*	0.87
Tb	-0.48	0.10	*	0.05	*	*	4.83	*	0.00	*	0.68	*	-0.39
Th	-1.05	0.34	*	1.14	*	*	15.10	*	*	*	-0.46	*	0.53
Tl	-0.72	0.00	*	*	*	*	*	*	*	*	-1.44	*	14.46
Tm	-0.27	0.18	*	0.72	*	*	1.27	*	-0.27	*	-0.54	*	-1.81
U	-0.05	-1.17	*	0.52	*	*	1.60	*	*	*	0.11	*	-0.19
V	*	-1.38	*	-0.11	5.83	*	-2.48	*	*	*	1.68	*	-0.54
W	*	*	*	0.82	*	*	*	*	*	*	0.19	*	*
Y	-0.58	*	*	0.62	1.81	*	1.26	*	-1.11	8.32	1.22	5.14	-0.69
Yb	-0.91	0.17	*	0.55	*	*	0.04	*	0.02	*	0.11	*	0.04
Zn	1.32	*	*	-2.49	2.39	2.87	-11.97	*	*	4.19	10.77	*	5.98
Zr	-0.66	25.10	*	3.25	1.31	4.23	38.28	*	3.04	9.60	27.78	1.85	-1.05

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D36	D38	D39	D40	D41	D42	D43	D44	D45	D46	D47	D49	D50
SiO2	*	0.19	-2.28	**15.60**	2.05	**-6.04**	**0.50**	**-0.40**	1.43	-0.37	-0.48	**1.74**	**-0.12**
TiO2	*	*0.00*	*-1.39*	***-3.48***	*	***17.42***	***-10.45***	***0.70***	*-2.09*	*1.74*	*-1.74*	***-1.39***	***0.28***
Al2O3	**-5.74**	-0.00	-3.27	**-5.29**	0.49	**-3.05**	**-5.29**	**-0.36**	-1.08	4.52	2.51	**1.88**	**-0.49**
Fe2O3T	**2.98**	0.30	1.31	**4.76**	-0.42	**-0.83**	**-3.57**	**-1.19**	-2.98	-2.98	0.60	**0.00**	**0.12**
MnO	**-1.47**	1.62	1.03	**6.78**	*	**12.08**	**-5.00**	**-0.29**	-1.32	1.62	-2.50	**-0.29**	**-0.29**
MgO	**-6.23**	-0.10	-4.39	**11.73**	-1.32	**-2.71**	**-3.17**	**-0.88**	-0.90	0.71	-0.63	**1.80**	**0.00**
CaO	**-9.51**	-0.52	0.74	**-1.85**	-0.49	**0.32**	**1.45**	**0.70**	-0.67	0.38	0.42	**0.59**	**-0.76**
K2O	*	-1.44	-0.17	**16.56**	*	**-0.70**	**2.02**	**2.02**	-0.81	0.10	-0.81	**2.02**	**-3.98**
P2O5	*	0.54	0.54	**31.75**	*	**-3.71**	**-0.54**	**-1.08**	-0.27	1.35	-0.27	*	**0.00**
CO2	*	*2.04*	*	*	*	***2.12***	*	*	*1.61*	*0.29*	*	*	*
LOI	*	0.46	0.08	*	0.18	**0.68**	0.01	**-0.51**	*	-0.36	-0.15	**-0.47**	**0.51**
Ba	**-0.50**	0.31	-2.55	**33.99**	-0.29	80.62	**-4.92**	**0.44**	-1.31	*	*	**-1.44**	**-0.77**
Be	*	-1.34	*	*	*	*	*	*	*	*	*	**-0.24**	*
Bi	*	*	*	*	*	*	*	*	*	*	*	*	*
C(tot)	*	-0.61	1.30	*	*	**-0.57**	*	*	*	-0.00	*	**-2.96**	*
Ce	**-1.30**	-0.13	24.81	**-3.18**	-0.64	*	**60.24**	**0.37**	*	*	*	**-1.38**	**-0.27**
Cr	***-0.46***	*	*2.74*	*	*	*	***2.92***	***-1.94***	*	*	*	***-0.23***	*
Cs	**-0.31**	0.53	19.25	*	-2.84	*	**95.70**	**0.10**	*	*	*	**-2.01**	**0.35**
Dy	**-0.17**	0.12	*	*	*	*	*	**1.95**	*	*	*	**-0.90**	**0.43**
Er	**-0.41**	-0.93	*	*	*	*	*	**0.21**	*	*	*	**-1.41**	**0.41**
Eu	**-0.47**	0.00	*	*	*	*	*	**0.00**	*	*	*	**-0.53**	**0.33**
Ga	**-0.53**	-0.66	*	*	-0.44	*	**31.89**	**4.43**	*	*	*	**-0.35**	**-6.73**
Gd	**0.33**	0.04	*	*	*	*	*	**0.27**	*	*	*	**-1.96**	**0.19**
Hf	***-4.42***	*	*	*	*	*	*	***1.11***	*	*	*	***-1.11***	*
Ho	**-0.52**	0.16	*	*	*	*	*	**1.16**	*	*	*	**-0.44**	**0.40**
La	**-0.78**	0.21	5.76	**-2.88**	*	*	**15.22**	**0.45**	*	*	*	**-1.11**	**-0.66**
Li	*	-0.30	*	**0.74**	*	*	*	*	*	*	*	**-4.30**	*
Lu	**-0.10**	*	*	*	*	*	*	*	*	*	*	**-0.48**	**0.48**
Nb	**-0.07**	*	*	*	*	*	*	**0.72**	*	*	*	**-2.03**	**6.57**
Nd	**-0.59**	-0.25	16.71	**-1.40**	-0.52	*	**18.95**	**0.59**	*	*	*	**-1.58**	**0.05**
Pb	**0.03**	0.27	*	*	-1.73	*	**-0.79**	**-0.54**	*	*	*	**-1.05**	**1.26**
Pr	**-0.51**	0.22	*	*	*	*	*	**0.72**	*	*	*	**-1.20**	**-0.32**
Rb	**-1.14**	0.08	0.46	*	-0.61	*	**1.08**	**0.46**	*	*	*	**-0.77**	**0.97**
Sb	*	5.88	*	*	*	*	*	*	*	*	*	*	*
Sc	***4.99***	*	*	*	*	*	*	***21.78***	*	*	*	***-0.93***	***11.52***
Sm	**-0.91**	0.45	*	*	*	*	*	**1.25**	*	*	*	**-0.73**	**0.39**
Sn	*	*4.40*	*	*	*	*	***11.85***	*	*	*	*	***1.69***	***-1.69***
Sr	**-1.16**	0.09	-1.60	**-0.83**	0.06	**-0.20**	**-2.71**	**3.17**	*	0.25	1.58	**-0.13**	**-0.87**
Ta	**-0.87**	*	*	*	*	*	**233.02**	**0.97**	*	*	*	**0.00**	**0.48**
Tb	**0.29**	0.00	*	*	*	*	*	**0.97**	*	*	*	**-1.06**	**0.00**
Th	**-0.42**	-0.23	18.60	*	*	*	*	**0.85**	*	*	*	**-1.44**	**0.85**
Tl	**-1.13**	*	*	*	*	*	*	*	*	*	*	*	*
Tm	**0.00**	*	*	*	*	*	*	**1.27**	*	*	*	**-0.78**	**0.72**
U	**-1.70**	-1.06	18.02	*	-1.38	*	**28.60**	**-0.53**	*	*	*	**-1.70**	**-0.41**
V	**-1.26**	0.15	-4.29	*	*	*	**3.89**	**8.60**	*	*	*	**0.84**	**1.95**
W	*	2.08	*	*	*	*	**15.76**	*	*	*	*	**0.63**	**-0.81**
Y	**0.16**	-0.15	1.12	**-2.43**	*	*	**1.39**	**1.22**	*	*	*	**-1.45**	**-0.31**
Yb	**-0.78**	0.39	13.33	*	*	*	*	**0.41**	*	*	*	**-0.85**	**0.37**
Zn	***-4.07***	*-1.20*	*0.00*	***23.94***	*-0.77*	*	***28.73***	***0.00***	*	*	*	***3.35***	*
Zr	***-9.16***	*2.33*	*-4.23*	***12.04***	*-1.14*	*	***9.78***	***0.12***	*-1.73*	*	*	***-2.38***	*

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D51	D54	D55	D56	D57	D58	D59	D60	D61	D63	D64	D65	D66
SiO2	**-1.42**	-17.00	**-0.07**	**3.39**	-0.09	*	**1.85**	0.53	-1.10	**-2.21**	*	*	**-5.59**
TiO2	***17.42***	*1.74*	***-3.48***	***-3.48***	*1.74*	*-1.05*	***0.70***	*-1.74*	*-0.63*	***3.48***	*	***-0.70***	***-12.54***
Al2O3	**28.76**	-7.35	**0.98**	**2.69**	-0.63	1.39	**0.60**	-0.40	-0.43	**-2.60**	*	*	**-7.53**
Fe2O3T	**3.57**	1.19	**-2.38**	**0.95**	-1.19	-0.06	**-6.91**	0.00	-2.44	**-4.76**	*	*	**2.38**
MnO	**0.89**	3.39	**6.78**	**-0.29**	-1.91	0.44	**-2.35**	-2.50	-1.32	**0.89**	*	**0.89**	**6.78**
MgO	**-8.90**	3.38	**6.00**	**3.25**	-0.63	-1.07	**0.07**	-0.06	-1.72	**-0.50**	*	*	**-3.93**
CaO	**-3.31**	-0.13	**0.91**	**1.19**	-0.32	1.36	**0.06**	0.19	-1.57	**0.80**	*	*	**-3.56**
K2O	**3.84**	-2.62	**0.20**	*	1.01	0.92	**0.75**	0.10	-0.26	**0.20**	*	*	**-5.25**
P2O5	**31.75**	-2.96	**-0.54**	**3.23**	-0.27	1.35	**0.54**	0.81	-0.05	**1.61**	*	*	**0.00**
CO2	***-1.72***	*	***0.59***	*	*	*	*	*	*	*	*	*	***-5.95***
LOI	**-1.62**	*	**0.88**	**-0.81**	0.06	*	**0.28**	0.22	-0.59	**0.14**	*	*	**10.06**
Ba	*	6.54	**-14.38**	**-1.29**	*	-0.37	**-0.39**	0.00	-1.22	**15.99**	**-1.22**	**-0.52**	**-1.44**
Be	*	*	*	**0.66**	*	-0.98	**1.60**	0.39	*	2.64	*	**0.99**	**-3.42**
Bi	*	*	*	*	*	*0.59*	*	*	*	*	*	*	***-3.69***
C(tot)	*	*	*	*	*	*	*	4.08	*	*	*	*	**-4.41**
Ce	*	-0.27	*	**-0.60**	*	-0.14	**-0.16**	0.00	1.56	**11.68**	**-0.03**	**-0.29**	**4.62**
Cr	*	*54.77*	*	***1.22***	*	*-0.99*	***-0.46***	*1.89*	*1.52*	***8.92***	*	***-0.89***	***-3.06***
Cs	*	*	*	**-0.23**	*	0.25	**0.10**	0.19	*	**5.41**	**-0.71**	**-0.31**	**-1.33**
Dy	*	*	*	**-0.65**	*	-0.02	**0.45**	-0.31	1.10	**9.47**	**0.34**	**0.45**	**-0.41**
Er	*	*	*	**-0.62**	*	-0.31	**0.21**	-0.07	1.93	**8.11**	**0.69**	**-0.14**	**-0.72**
Eu	*	*	*	**-0.20**	*	-0.13	**0.66**	1.99	0.86	**7.31**	**-0.20**	**0.00**	**0.07**
Ga	*	2.21	*	**-0.69**	*	-0.70	**0.80**	0.44	*	**8.95**	*	**-0.27**	**-2.13**
Gd	*	*	*	**-0.43**	*	-0.38	**-0.67**	-0.15	0.54	**9.52**	**0.19**	**0.08**	**-1.01**
Hf	*	*50.22*	*	***-0.86***	*	*-2.21*	***-0.28***	*2.92*	*	***-2.23***	***-3.37***	***0.00***	***0.61***
Ho	*	*	*	**-0.27**	*	-0.05	**0.32**	-0.26	0.79	**7.04**	**0.15**	**0.32**	**-0.69**
La	*	12.96	*	**-0.27**	*	-0.24	**-0.12**	0.21	0.34	**11.64**	**-0.21**	**0.00**	**-0.86**
Li	*	*	*	**-0.68**	*	0.46	**-0.66**	-0.22	*	**10.72**	*	**-1.74**	**-1.15**
Lu	*	*	*	**0.48**	*	-0.52	**1.81**	*	3.29	**3.72**	**0.50**	**0.29**	**1.81**
Nb	*	15.66	*	**-2.25**	*	-0.37	**1.16**	2.61	3.19	**25.08**	*	**0.87**	**0.13**
Nd	*	*	*	**0.00**	*	0.18	**0.05**	1.11	*	**11.89**	**-0.23**	**0.14**	**-0.68**
Pb	*	-2.19	*	**1.69**	*	0.11	**-0.13**	0.37	2.65	**8.13**	**-1.67**	**0.59**	**5.26**
Pr	*	*	*	**-0.07**	*	-0.16	**0.00**	-0.29	0.42	**9.71**	**0.07**	**0.00**	**-0.77**
Rb	*	2.46	**1.84**	**-1.65**	*	-0.04	**1.35**	0.23	*	**12.60**	**-1.38**	**0.00**	**-1.69**
Sb	*	365.36	*	*	*	0.48	*	1.53	*	3.92	*	*	**-3.97**
Sc	*	*	*	*	*	*	***0.25***	*	*26.73*	***8.83***	*	***1.43***	***-3.10***
Sm	*	*	*	**-0.17**	*	-0.17	**0.35**	0.45	1.10	**8.82**	**-0.82**	**0.17**	**-1.38**
Sn	*	*	*	*	*	*-1.04*	***-0.68***	*-0.85*	*6.05*	***9.48***	*	***0.17***	***22.34***
Sr	*	-0.28	**-0.27**	**0.96**	1.04	-0.65	**2.39**	1.48	-0.30	**-0.80**	**-2.02**	**1.66**	**-1.39**
Ta	*	*	*	**-0.10**	*	0.68	**0.00**	0.48	*	**9.67**	*	**0.00**	**0.77**
Tb	*	*	*	**0.00**	*	-0.05	**0.97**	*	*	**7.74**	**0.34**	**0.29**	*
Th	*	26.79	*	**1.75**	*	-0.40	**-0.13**	0.18	5.75	**6.58**	**0.67**	**-0.13**	**15.26**
Tl	*	*	*	*	*	-0.15	**0.62**	0.31	*	*	*	**1.85**	**-2.46**
Tm	*	*	*	**-0.18**	*	-0.18	**1.27**	*	0.63	**6.70**	**0.40**	**0.00**	**-0.72**
U	*	*	**167.90**	**-1.36**	*	0.24	**0.00**	0.48	-0.91	**2.87**	**0.53**	**0.53**	**0.53**
V	*	11.23	*	**-1.53**	*	-0.28	**0.15**	0.15	1.14	**10.54**	*	**1.04**	*
W	*	*	*	*	*	0.00	*	0.54	*	*	*	*	**108.62**
Y	*	3.03	*	**-0.96**	*	-0.40	**0.88**	1.12	0.23	**10.97**	**-1.66**	**0.58**	**-2.47**
Yb	*	*	*	**-0.07**	*	-0.46	**0.04**	-1.46	2.37	**7.43**	**-0.26**	**0.04**	**-1.59**
Zn	*	*0.00*	***2.39***	*	*	*-0.84*	***-1.99***	*0.00*	*	***3.38***	*	***-1.60***	***-11.49***
Zr	*	*6.62*	***39.47***	***-6.53***	*	*-5.88*	***-0.94***	*0.66*	*-0.39*	***-5.87***	***-8.78***	***-0.72***	***-11.41***

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D67	D70	D71	D72	D73	D74	D75	D76	D77	D78	D79	D80	D82
SiO2	2.45	**602.05**	**-1.42**	-14.07	0.70	-6.10	*	**3.43**	0.14	-0.32	**0.16**	0.43	-0.10
TiO2	*-1.74*	***3.48***	***29.96***	*-4.46*	*-0.42*	*24.39*	*	***-3.48***	*	*	***-2.79***	*	*-0.70*
Al2O3	2.06	**2.33**	**1.88**	-4.88	0.36	-2.55	*	**0.98**	0.27	-0.40	**-0.81**	*	-0.92
Fe2O3T	0.60	**3.57**	**9.53**	-7.38	0.24	32.51	*	**1.19**	-2.38	-1.19	**-1.19**	*	1.73
MnO	-2.50	**-5.00**	**-3.83**	-4.51	0.21	*	*	**-5.00**	*	*	**-0.29**	*	-0.15
MgO	0.71	**0.27**	**4.09**	-8.82	0.34	-3.02	*	**21.28**	-0.25	0.13	**-2.41**	*	0.04
CaO	-2.45	**-0.90**	**-0.58**	-18.13	0.22	1.34	*	**-2.57**	0.02	0.56	**-0.04**	*	0.26
K2O	1.92	**2.02**	**-0.89**	-7.71	-0.90	-8.08	*	**5.66**	-0.81	-0.81	**0.02**	*	0.28
P2O5	-0.27	**-5.92**	**-4.30**	-5.43	1.18	-3.77	*	**4.84**	-0.27	-0.54	**0.54**	*	-2.42
CO2	*	*	***-0.54***	*-17.22*	*	*	*	*	*	*	*	*	*
LOI	0.42	**0.79**	**-85.08**	-0.04	-0.15	-0.01	*	**0.21**	0.47	0.15	**0.97**	-1.07	0.33
Ba	4.99	**9.59**	**6.49**	*	1.98	-2.16	**0.60**	**0.48**	*	0.57	*	*	0.63
Be	1.41	*	**0.99**	*	-0.03	7.22	**-3.09**	**0.79**	*	-0.83	*	*	*
Bi	*	*	*	*	*	*	*	*	*	*	*	*	*71.61*
C(tot)	*	**-1.03**	*	*	*	*	*	*	*	*	**0.06**	*	*
Ce	0.00	**55.20**	**-4.83**	*	0.61	-0.42	**0.93**	**0.64**	*	-0.94	*	*	2.52
Cr	*1.60*	***9.49***	***2.37***	*	*5.64*	*-3.36*	***-2.94***	***8.89***	*	*	*	*	*9.75*
Cs	-0.49	**67.78**	*	*	1.23	*	**-0.85**	**0.85**	*	-0.09	*	*	1.89
Dy	-0.31	*	**-1.70**	*	0.30	0.21	**-2.36**	**0.45**	*	-0.23	*	*	*
Er	-0.07	*	**0.55**	*	0.41	0.10	**-3.71**	**0.21**	*	*	*	*	*
Eu	-1.33	*	**14.61**	*	0.37	0.40	*	**0.66**	*	-0.40	*	*	*
Ga	0.00	*	*	*	1.21	3.26	**2.75**	**-1.51**	*	-0.49	*	*	-1.33
Gd	-0.15	*	**-3.32**	*	0.78	0.64	**-3.39**	**0.84**	*	-0.53	*	*	*
Hf	*1.53*	*	***107.67***	*	*-0.56*	*	***-5.81***	***0.28***	*	*-2.95*	*	*	*
Ho	-0.26	*	**-0.52**	*	0.24	0.12	*	**0.32**	*	-0.51	*	*	*
La	0.62	**5.35**	**-4.20**	*	0.69	-0.33	**7.48**	**1.40**	*	-0.60	*	*	1.23
Li	*	*	**15.93**	*	*	*	**2.76**	*	*	0.45	*	*	*
Lu	-0.05	*	*	*	0.14	-0.91	*	**1.81**	*	*	*	*	*
Nb	1.16	*	*	*	0.65	*	**0.43**	**2.17**	*	-0.04	*	*	*
Nd	0.20	**34.78**	**-4.52**	*	0.83	-0.11	**-0.05**	**0.95**	*	-0.27	*	*	10.15
Pb	-4.50	**52.03**	**-7.46**	*	2.55	*	**10.18**	**1.31**	*	-0.19	*	*	1.65
Pr	0.43	*	**1.01**	*	0.36	-0.24	**-0.65**	**0.87**	*	-0.57	*	*	*
Rb	-0.08	**4.92**	**-4.35**	*	-0.48	-6.11	*	**-0.31**	*	-0.35	*	*	-0.84
Sb	*	*	*	6465.50	9.30	*	**0.00**	**22.66**	*	*	*	*	*
Sc	*-0.46*	*	***9.50***	*	*	*	*	***17.07***	*	*-0.30*	*	*	*
Sm	-0.46	**6.30**	**-3.97**	*	0.39	-0.80	**-0.62**	**0.53**	*	0.21	*	*	*
Sn	*5.08*	*	***-2.54***	*476.51*	*0.90*	*	*	***1.35***	*	*	*	*	*0.85*
Sr	-0.60	**-2.02**	**-1.22**	-7.66	1.07	-4.81	*	**2.61**	*	1.85	*	*	-0.91
Ta	34.32	*	**11.60**	*	0.68	*	*	**2.90**	*	*	*	*	*
Tb	0.48	*	**-0.97**	*	0.34	-0.39	*	**1.93**	*	-0.34	*	*	*
Th	0.59	**37.20**	**1.13**	*	*	0.66	*	**0.53**	*	-0.66	*	*	12.05
Tl	0.82	*	*	*	*	*	**66.23**	*	*	*	*	*	*
Tm	5.16	*	**-0.54**	*	0.18	0.63	*	**1.27**	*	*	*	*	*
U	-0.58	**29.67**	**-1.38**	*	1.05	-0.55	**2.66**	**-0.64**	*	-0.58	*	*	*
V	2.50	**0.29**	**-5.75**	*	12.75	-8.14	*	**1.70**	*	-1.10	*	*	-4.84
W	2.74	**76.00**	**25.90**	*	9.06	*	**0.04**	*	*	-0.11	*	*	*
Y	0.06	**1.81**	**2.45**	*	-1.64	-0.06	*	**1.01**	*	-0.60	*	*	2.18
Yb	0.39	*	**-4.03**	*	0.35	-0.67	**114.08**	**0.41**	*	-0.55	*	*	*
Zn	*2.45*	***7.18***	***15.03***	*	*6.70*	*-5.25*	***1.86***	***-3.35***	*	*-0.24*	*	*	*-0.60*
Zr	*0.82*	***-4.65***	*	*	*-2.88*	*	***-12.81***	***-0.12***	*	*1.25*	*	*	*1.91*

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

Lab Code	D83	D84	D85	D86	D87	D89	D90	D91	D92	D94	D95	D96	D97
SiO2	-8.04	-0.09	**5.91**	1.30	-0.37	-0.81	0.19	-0.18	-1.39	**0.50**	-0.43	*	-5.05
TiO2	*	*0.70*	***-2.79***	*0.35*	*1.74*	*-4.18*	*	*-6.83*	*-1.39*	***9.75***	*-1.74*	***8.15***	*2.30*
Al2O3	-3.76	-0.18	**-1.70**	-0.16	-0.40	-7.59	-1.08	-0.29	-1.30	**2.33**	0.27	**-0.36**	2.06
Fe2O3T	4.76	-0.60	**37.63**	-0.30	0.00	26.66	-0.60	-0.39	0.00	**12.92**	2.38	**1.07**	3.39
MnO	*	-1.32	**-0.29**	-1.91	3.39	0.91	*	-0.15	0.44	**5.13**	2.21	**0.89**	-0.56
MgO	4.91	0.52	**2.14**	0.00	-0.82	1.12	-0.25	-0.52	0.71	**4.39**	-1.39	**4.09**	-2.73
CaO	0.57	0.16	**-0.45**	-0.15	0.20	-1.33	0.34	0.13	-2.37	**-0.03**	-1.26	**-1.40**	2.62
K2O	*	-4.44	**5.84**	-4.71	0.10	4.10	2.83	-0.32	-1.72	**2.39**	-1.72	**0.57**	1.92
P2O5	*	-0.54	**-15.60**	-8.88	2.42	1.56	2.69	-0.59	0.54	**-5.38**	1.08	*	-3.01
CO2	*	*	*	*	*	*0.76*	*	*	*	*	*-0.14*	*	*
LOI	0.15	0.19	**-0.99**	0.35	0.09	-1.95	-0.40	0.31	-0.07	**-0.01**	-0.55	*	-1.96
Ba	*	*	**-0.02**	*	-0.65	1.19	*	0.10	*	**-3.49**	-0.22	**2.61**	*
Be	*	*	**-1.99**	*	0.70	-0.00	*	-1.12	*	*	-0.73	*	*
Bi	*	*	*	*	*0.25*	*77.72*	*	*	*	*	*	*	*
C(tot)	*	*	*	0.07	-0.29	-0.67	0.03	0.01	*	*	*	*	*
Ce	*	*	**-0.45**	*	0.48	1.19	*	-0.04	16.98	**12.74**	0.93	**0.53**	*
Cr	*	*	***0.01***	*	*6.17*	*16.60*	*	*0.03*	*	*	*1.89*	***-0.51***	*
Cs	*	*	**0.00**	*	-0.15	0.93	*	-0.16	*	**190.34**	-0.12	**0.24**	*
Dy	*	*	**-0.35**	*	0.22	2.12	*	-0.20	*	*	-0.31	**7.10**	*
Er	*	*	**-0.48**	*	0.79	2.08	*	-0.14	*	*	-0.15	*	*
Eu	*	*	**-0.27**	*	-0.33	15.97	*	-0.04	*	*	0.13	**-0.07**	*
Ga	*	*	**-0.90**	*	0.58	2.50	*	-0.72	*	*	0.44	**-1.77**	*
Gd	*	*	**-0.49**	*	0.70	-0.15	*	-0.15	*	*	-0.34	*	*
Hf	*	*	***0.11***	*	*-2.64*	*1.48*	*	*-0.28*	*	*	*0.00*	***0.00***	*
Ho	*	*	**-0.02**	*	0.16	7.78	*	-0.01	*	*	-0.01	*	*
La	*	*	**-0.50**	*	0.35	-0.68	*	-0.16	*	**-6.99**	0.41	**-0.37**	*
Li	*	*	**-0.34**	*	-0.90	25.16	*	-1.42	*	*	-0.39	*	*
Lu	*	*	**-0.10**	*	-0.05	23.00	*	0.17	*	*	0.24	**0.10**	*
Nb	*	*	**0.70**	*	-0.07	2.32	*	-0.42	22.91	*	0.00	*	*
Nd	*	*	**-0.30**	*	0.43	-0.13	*	0.35	*	**7.64**	-0.02	**-3.21**	*
Pb	*	*	**-0.71**	*	-0.01	20.75	*	-0.46	*	**0.74**	-0.04	*	*
Pr	*	*	**-0.01**	*	0.65	3.60	*	0.14	*	*	0.07	*	*
Rb	*	*	**-0.15**	*	-0.31	1.29	*	-0.45	0.92	**6.45**	-0.08	**0.15**	*
Sb	*	*	**-0.09**	*	0.22	33.38	*	-0.50	*	*	0.65	**0.44**	*
Sc	*	*	***3.21***	*	*-0.04*	*2.18*	*	*	*	***1148.95***	*0.04*	***-0.84***	*
Sm	*	*	**-0.44**	*	-0.09	0.31	*	-0.13	*	*	-0.00	**-0.73**	*
Sn	*	*	***1.27***	*	*0.00*	*21.83*	*	*-1.10*	*	*	*	*	*
Sr	*	*	**0.88**	*	1.93	1.00	*	0.65	-2.41	**-1.43**	0.53	**3.87**	-15.72
Ta	*	*	**-0.39**	*	0.48	11.72	*	-0.40	*	*	*	**0.00**	*
Tb	*	*	**-0.19**	*	0.00	17.56	*	0.03	*	*	-0.19	**-0.77**	*
Th	*	*	**-0.21**	*	-0.06	-0.15	*	-0.39	*	**135.45**	-0.47	**0.36**	*
Tl	*	*	**0.10**	*	0.00	*	*	-0.29	*	*	-0.26	*	*
Tm	*	*	**0.00**	*	0.63	26.40	*	-0.05	*	*	0.09	*	*
U	*	*	**0.97**	*	0.05	5.14	*	-1.37	30.78	**19.03**	-0.32	**-1.17**	*
V	*	*	**-0.95**	*	9.84	5.74	*	-0.08	*	*	-0.55	**2.78**	*
W	*	*	**-1.29**	*	0.54	59.08	*	0.70	*	*	-0.27	**-0.98**	*
Y	*	*	**-0.79**	*	-0.15	-3.03	*	0.12	*	**-2.43**	-0.58	*	*
Yb	*	*	**-0.30**	*	-0.17	2.23	*	-0.23	*	*	0.02	**0.00**	*
Zn	*	*	***-1.20***	*	*0.00*	*457.13*	*	*0.44*	*4.79*	***4.79***	*	***-0.72***	*
Zr	*	*	***-0.36***	*	*1.25*	*-4.29*	*	*-1.55*	*41.79*	***12.04***	*-0.06*	*	*13.41*

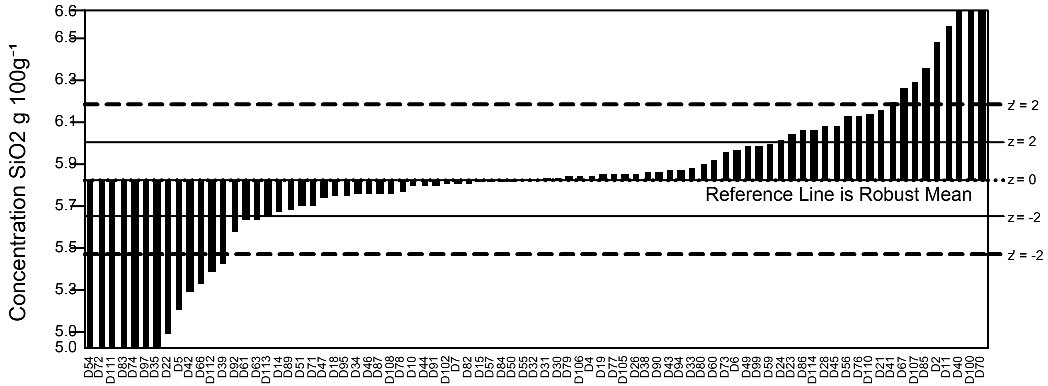
Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - *Entries in italics* are derived from Provisional Values.

Table 3 - GeoPT44A Z-scores for Carbonate mudrock, CM-1. 12/12/2018

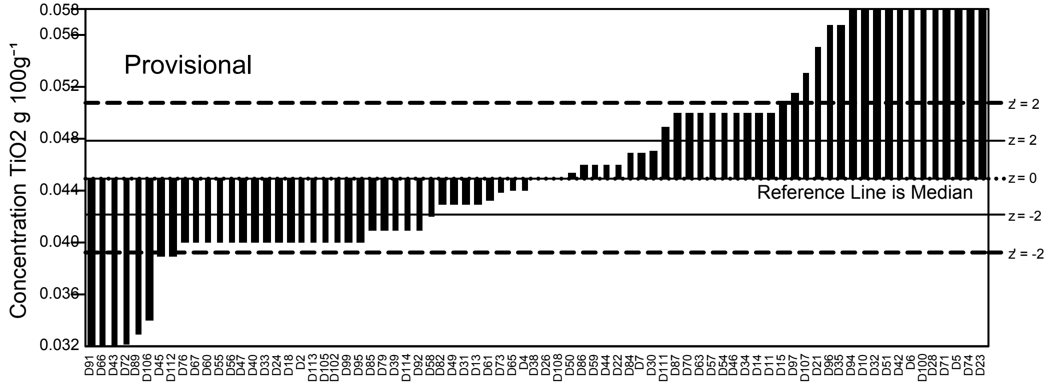
Lab Code	D99	D100	D102	D103	D105	D106	D107	D108	D110	D111	D112	D113	D114
SiO2	**1.74**	14.84	-0.15	*	0.14	**0.16**	2.62	-0.37	1.77	-8.30	-2.46	**-1.98**	**2.64**
TiO2	**_-3.48_**	_9.75_	_-1.74_	*	_-1.74_	**_-7.66_**	_2.79_	_0.00_	*	_1.39_	_-2.09_	**_-3.48_**	**_-2.79_**
Al2O3	**-1.26**	9.68	0.27	*	1.84	**-2.60**	1.61	1.84	1.28	-4.12	2.73	**-1.70**	**-1.26**
Fe2O3T	**0.00**	37.51	-1.19	*	3.57	**-5.95**	-3.39	0.00	-0.30	0.00	-0.24	**-3.57**	**3.57**
MnO	*	-8.39	0.44	*	-2.50	**-0.29**	1.62	-1.91	*	-1.32	-7.80	**6.78**	**3.24**
MgO	**-4.32**	-16.63	-0.44	*	0.32	**-3.55**	1.09	1.09	0.61	4.79	-0.44	**-1.64**	**0.27**
CaO	**-0.69**	-1.30	-0.18	*	0.03	**2.06**	-0.88	0.89	0.73	2.08	0.50	**0.93**	**1.13**
K2O	**-7.07**	20.37	0.10	*	0.10	**-1.61**	1.74	0.92	-5.80	-1.44	-2.17	**-7.07**	**0.20**
P2O5	**-5.92**	3.23	-0.81	*	2.42	**6.46**	3.50	4.30	2.96	-5.84	-0.81	**31.75**	**2.15**
CO2	*	*	*	*	*	*	*	*	*	*	_-0.14_	*	*
LOI	**0.62**	-0.54	*	*	-0.24	**0.51**	0.25	*	-0.45	-0.56	-0.07	**0.51**	**-0.36**
Ba	*	-4.79	*	**0.51**	-7.63	**-0.46**	*	*	0.34	*	-0.01	**0.78**	**1.74**
Be	*	*	*	*	*	**-0.48**	*	*	*	*	*	*	*
Bi	*	*	*	*	*	*	*	*	*	*	*	*	*
C(tot)	**-0.39**	*	*	*	*	*	*	-0.07	-2.05	*	0.03	*	*
Ce	*	7.70	*	**-0.82**	28.93	**-0.41**	*	*	-0.10	*	0.00	**0.13**	**-1.59**
Cr	*	_10.46_	*	*	_-5.26_	**_-1.20_**	*	*	_-0.41_	_27.62_	_0.89_	**_6.06_**	**_32.36_**
Cs	*	*	*	**0.17**	*	**0.33**	*	*	-0.08	*	*	**-5.82**	**-0.92**
Dy	*	*	*	**-0.84**	*	**-0.24**	*	*	0.19	*	-0.10	**5.17**	**-1.91**
Er	*	*	*	**-0.48**	*	**-0.27**	*	*	0.58	*	0.45	**0.55**	**-1.17**
Eu	*	*	*	**0.00**	*	**-0.27**	*	*	1.10	*	0.00	**0.00**	**-0.66**
Ga	*	*	*	**-0.09**	2.21	**-1.64**	*	*	0.65	*	0.53	**-0.71**	*
Gd	*	*	*	**0.08**	*	**-0.01**	*	*	1.17	*	0.42	**0.46**	**-2.00**
Hf	*	*	*	**_-0.28_**	*	**_-4.40_**	*	*	*	*	*	**_1.11_**	**_-4.17_**
Ho	*	*	*	**0.32**	*	**-0.02**	*	*	0.16	*	-0.09	**0.32**	**-0.52**
La	*	21.19	*	**-0.33**	12.96	**-0.63**	*	*	-0.16	*	0.04	**0.70**	**-0.82**
Li	*	*	*	*	*	**0.00**	*	*	*	*	0.71	*	*
Lu	*	*	*	**-0.10**	*	**-0.10**	*	*	0.33	*	-0.14	*	**-0.10**
Nb	*	*	*	**0.00**	1.16	**0.03**	*	*	*	*	0.22	**0.00**	**-0.29**
Nd	*	*	*	**0.09**	*	**-0.30**	*	*	0.11	*	0.00	**1.04**	**-1.27**
Pb	*	*	*	*	13.19	**-0.97**	*	*	3.29	*	-1.06	**-4.74**	**-1.62**
Pr	*	*	*	**-0.29**	*	**0.01**	*	*	0.61	*	-0.04	**0.58**	**-0.43**
Rb	*	-2.15	*	**-0.83**	1.69	**-0.69**	*	*	-0.15	-0.61	0.69	**-6.76**	**-7.37**
Sb	*	*	*	*	*	*	*	*	*	*	-0.22	*	*
Sc	*	*	*	**_1.76_**	_69.77_	**_-1.21_**	*	*	_-2.99_	*	*	**_1.60_**	**_1519.06_**
Sm	*	*	*	**-0.01**	*	**-0.37**	*	*	0.36	*	-0.00	*	**-1.09**
Sn	*	*	*	**_2.20_**	*	*	*	*	*	*	*	**_0.00_**	*
Sr	*	-1.68	*	**1.07**	0.34	**-0.43**	*	*	-0.03	-0.94	0.67	**3.52**	**4.92**
Ta	*	*	*	**0.00**	*	**-0.19**	*	*	*	*	*	*	-0.97
Tb	*	*	*	**0.00**	*	**-0.10**	*	*	1.21	*	0.05	*	**-0.97**
Th	*	*	*	**-0.78**	*	**0.28**	*	*	0.61	*	-1.21	**0.20**	**-1.28**
Tl	*	*	*	*	*	*	*	*	0.26	*	-0.26	*	*
Tm	*	*	*	**-0.54**	*	*	*	*	0.00	*	-0.09	*	**-0.54**
U	*	*	*	**0.00**	-1.12	**0.05**	*	*	0.93	*	0.37	**0.64**	**0.11**
V	*	*	*	*	8.46	**-1.60**	*	*	*	*	0.52	**-0.26**	*
W	*	*	*	**-0.25**	*	*	*	*	*	*	*	**-0.84**	-0.12
Y	*	3.03	*	**0.16**	-3.33	**-0.74**	*	*	0.81	*	-0.37	**0.50**	**10.29**
Yb	*	*	*	**-0.33**	*	**-0.37**	*	*	0.07	*	-0.22	**0.78**	**-0.70**
Zn	*	_82.59_	*	*	_4.79_	*	*	*	_-0.23_	_3.59_	*	**_0.24_**	**_14.36_**
Zr	*	_38.22_	_51.93_	**_-2.81_**	_-4.11_	**_-9.88_**	*	*	*	*	_0.54_	**_0.36_**	**_18.00_**

Bold entries are Data Quality 1 - Underlined entries are Data Quality 2 - _Entries in italics_ are derived from Provisional Values.

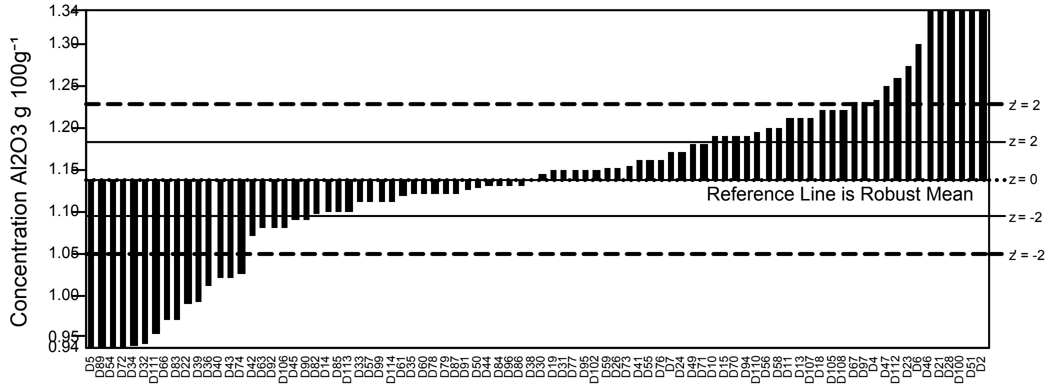
GeoPT44A - Barchart for SiO2



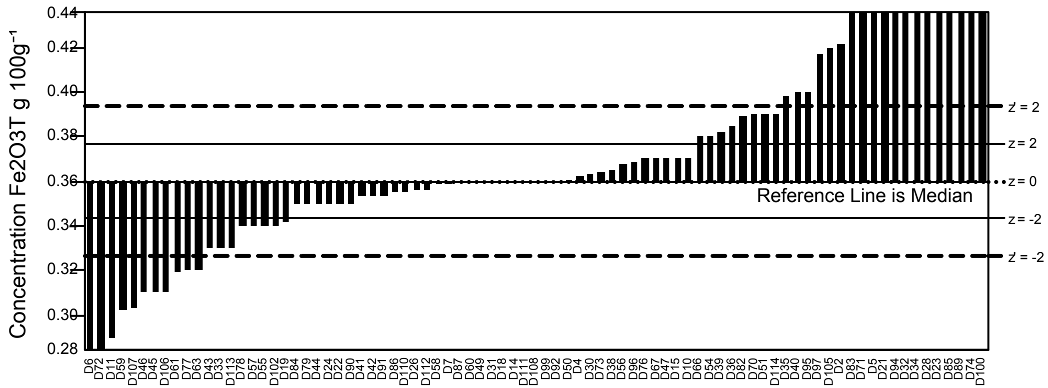
GeoPT44A - Barchart for TiO2



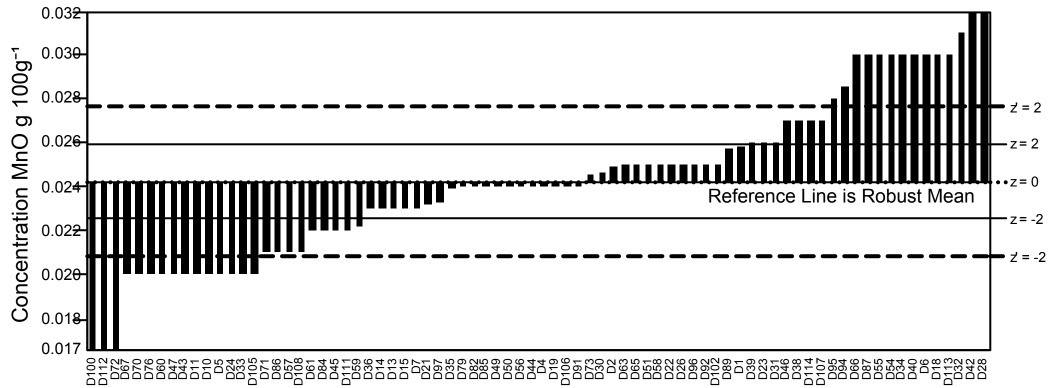
GeoPT44A - Barchart for Al2O3



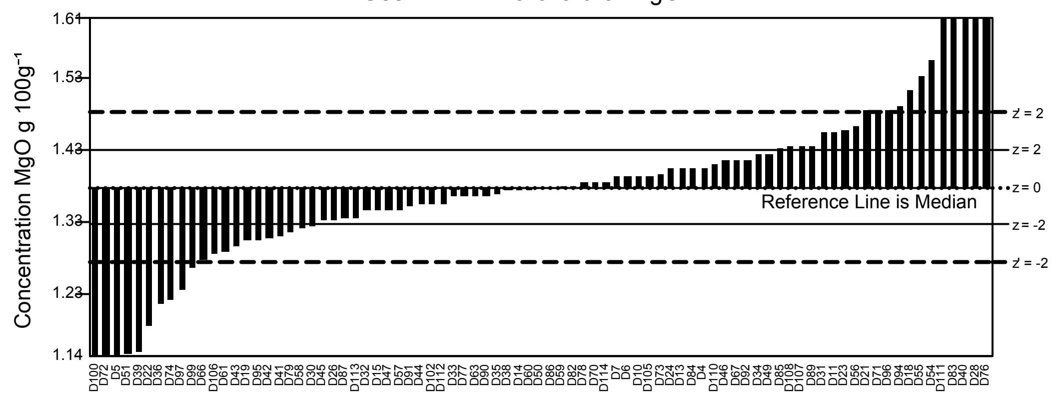
GeoPT44A - Barchart for Fe2O3T



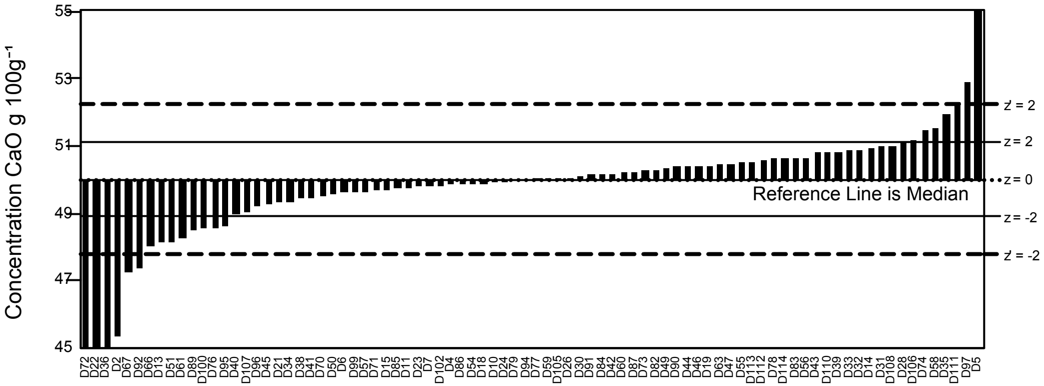
GeoPT44A - Barchart for MnO



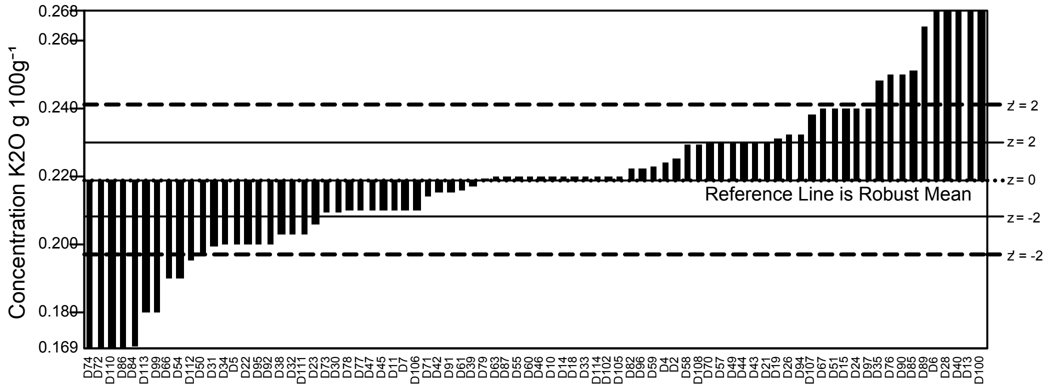
GeoPT44A - Barchart for MgO



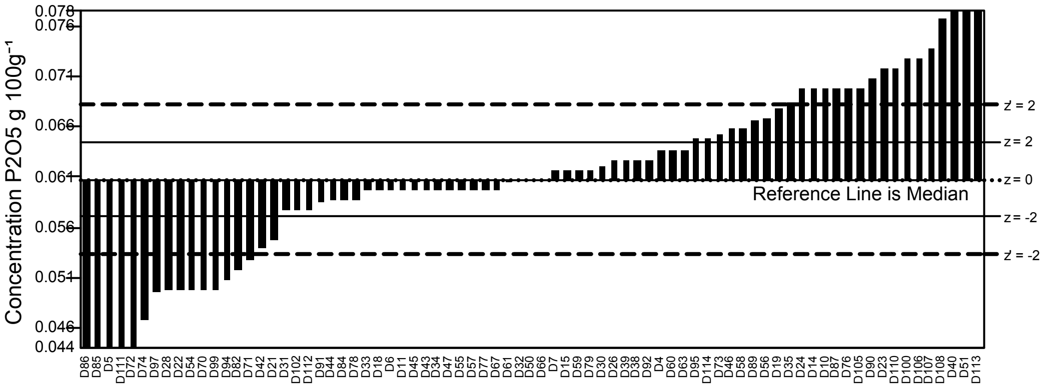
GeoPT44A - Barchart for CaO



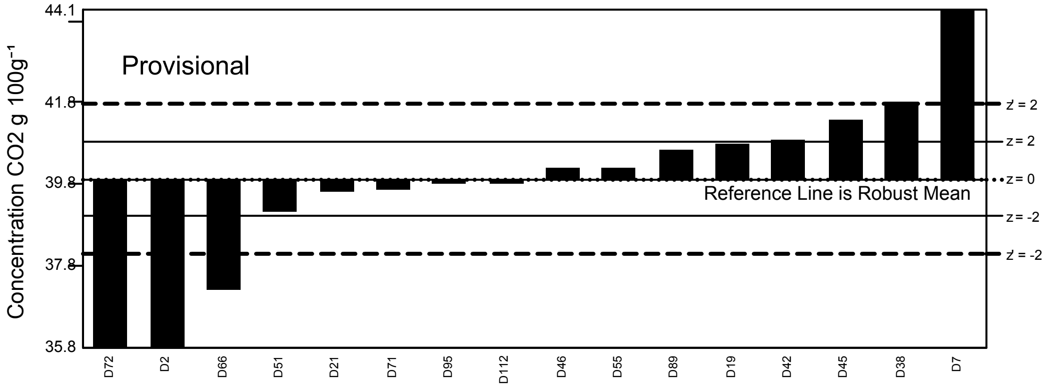
GeoPT44A - Barchart for K2O



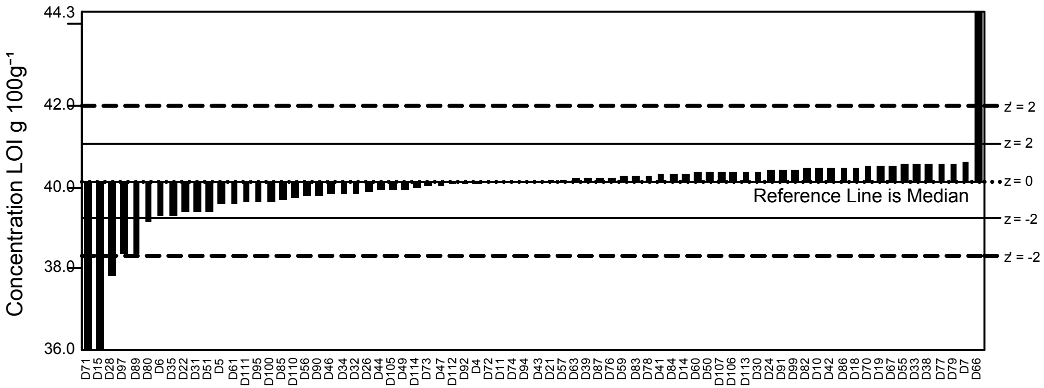
GeoPT44A - Barchart for P2O5



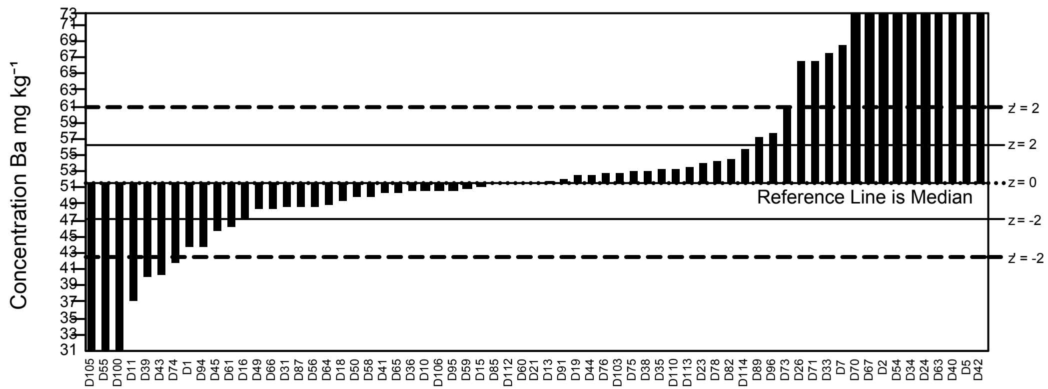
GeoPT44A - Barchart for CO2



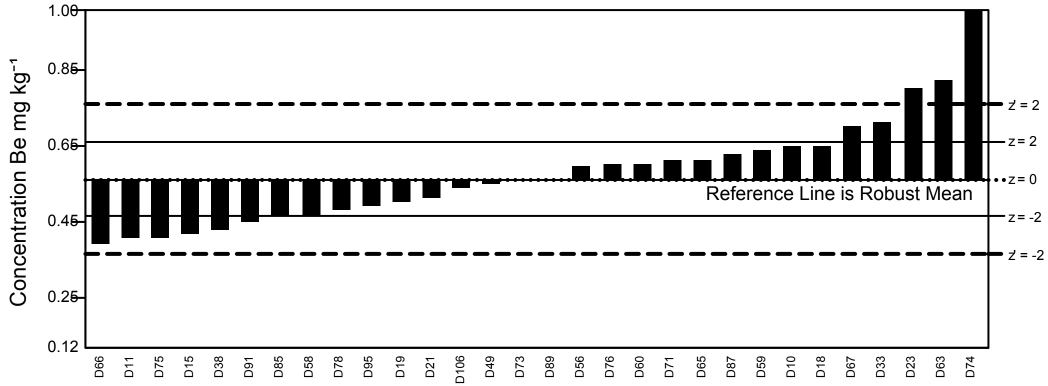
GeoPT44A - Barchart for LOI



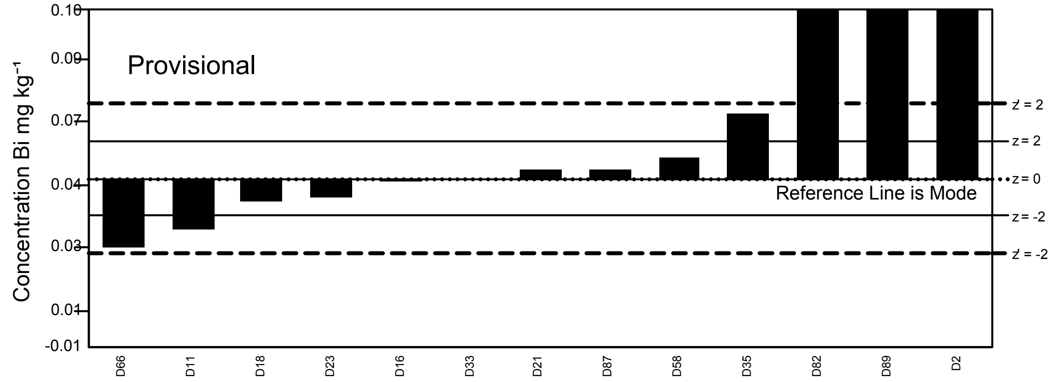
GeoPT44A - Barchart for Ba



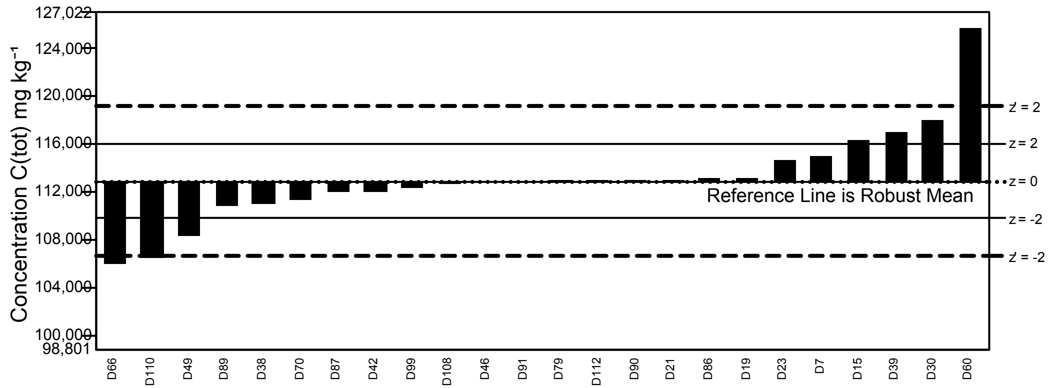
GeoPT44A - Barchart for Be



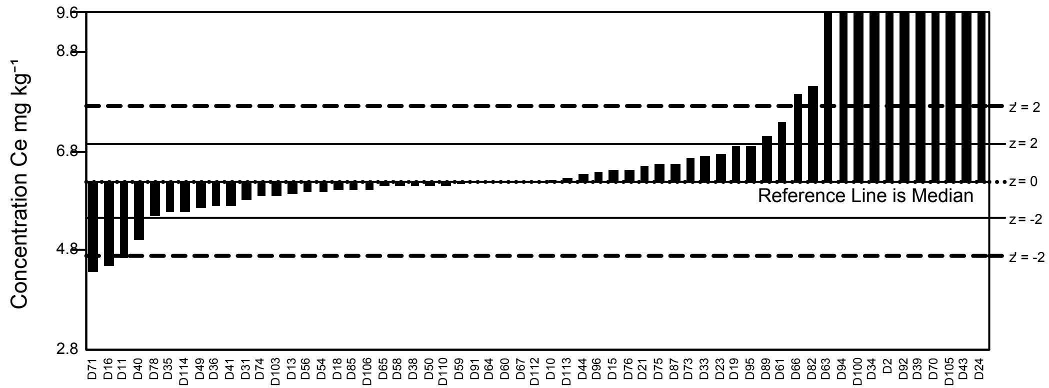
GeoPT44A - Barchart for Bi



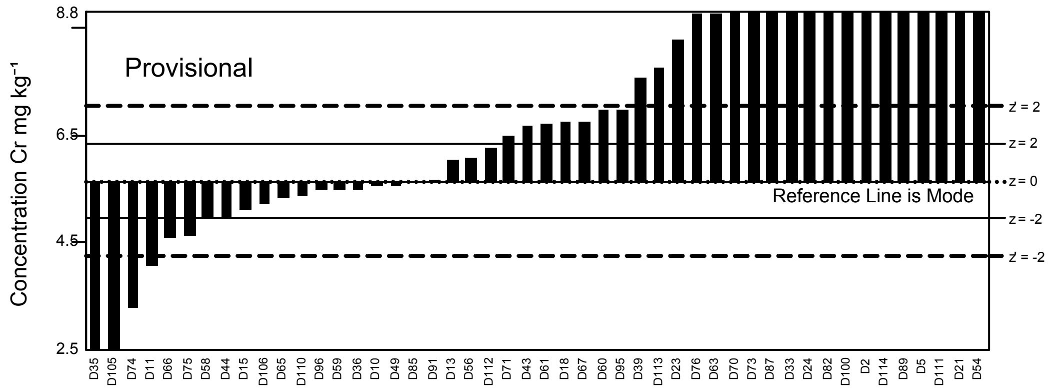
GeoPT44A - Barchart for C(tot)



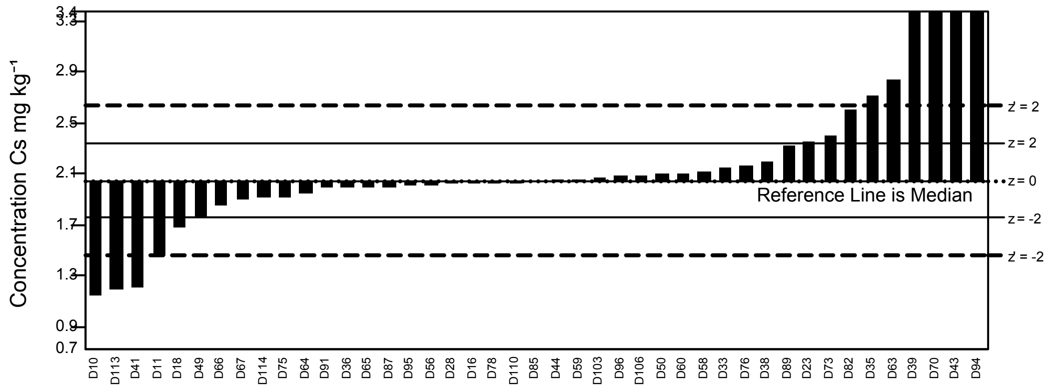
GeoPT44A - Barchart for Ce

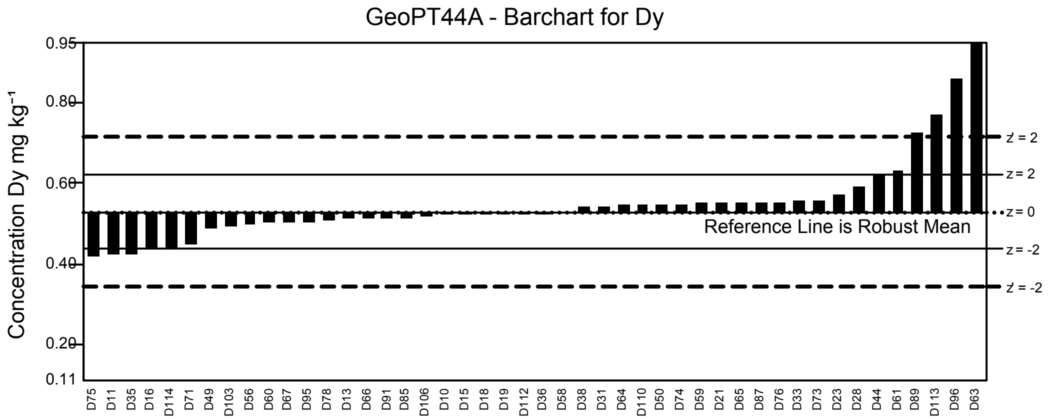


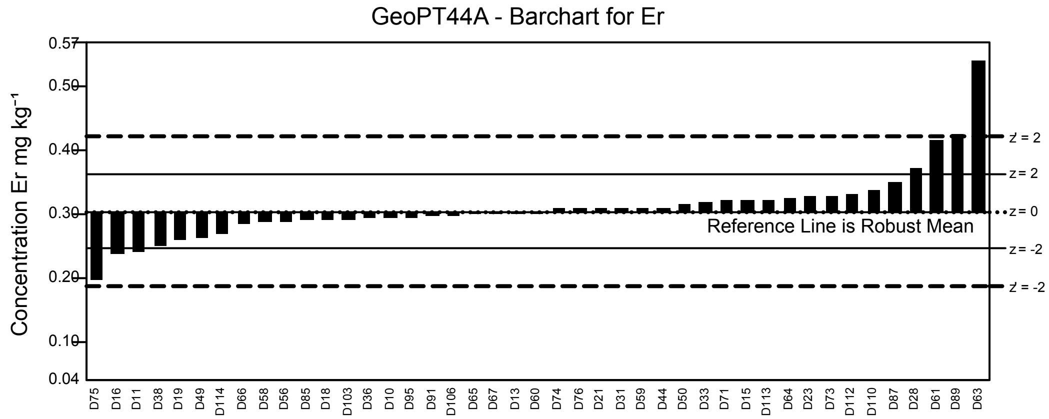
GeoPT44A - Barchart for Cr

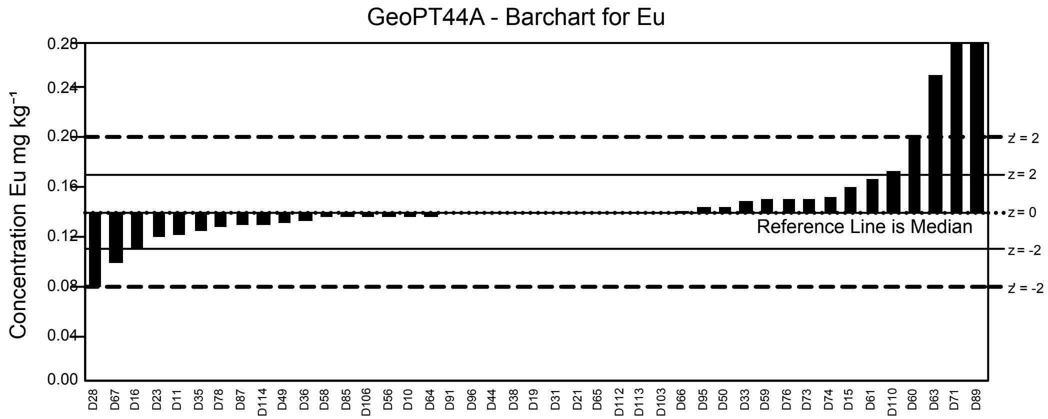


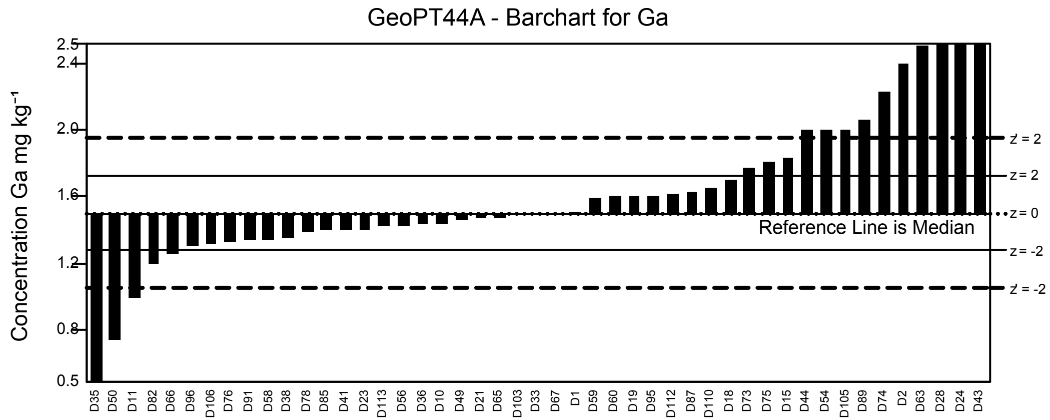
GeoPT44A - Barchart for Cs

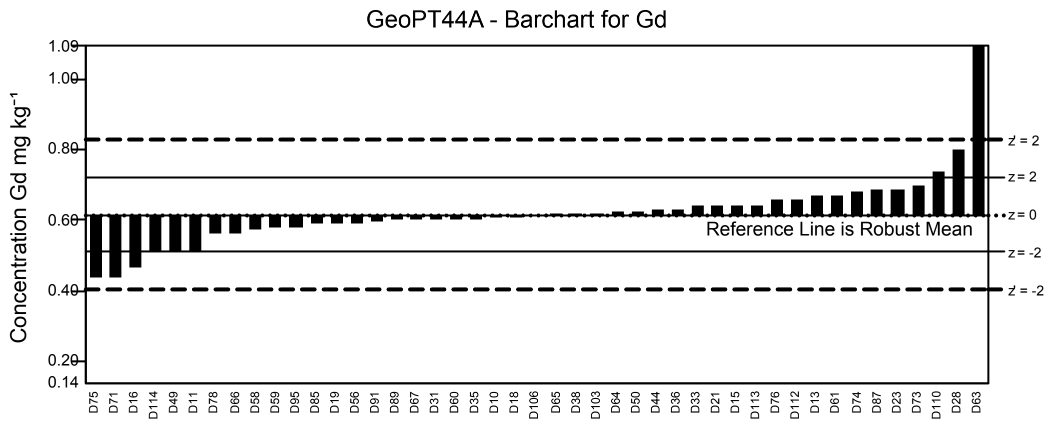


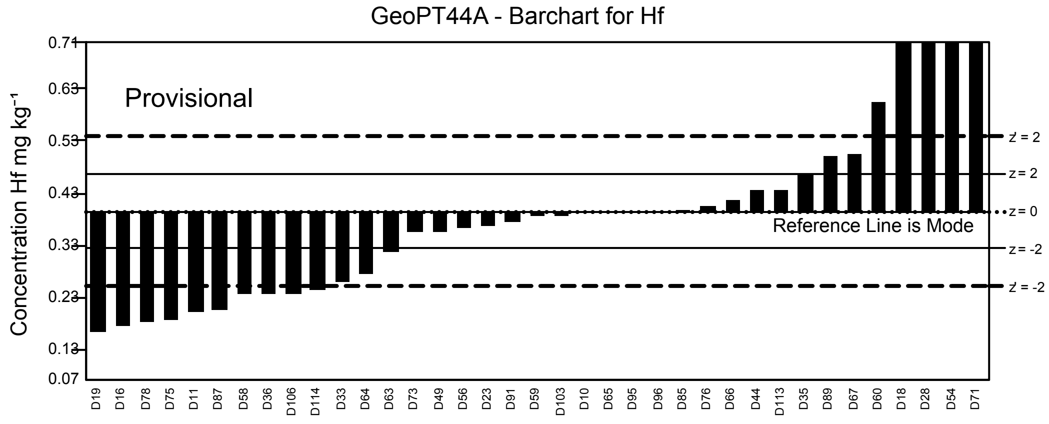

GeoPT44A - Barchart for Dy
Concentration Dy mg kg⁻¹
Reference Line is Robust Mean


GeoPT44A - Barchart for Er
Concentration Er mg kg⁻¹
Reference Line is Robust Mean

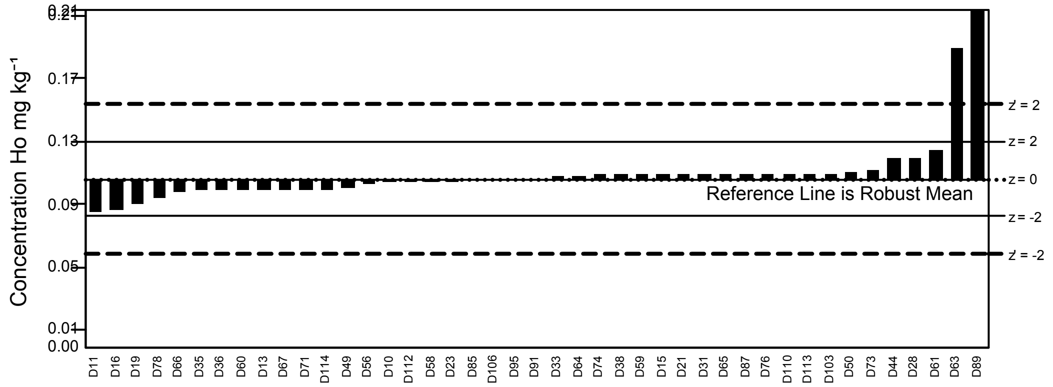

GeoPT44A - Barchart for Eu
Concentration Eu mg kg⁻¹
Reference Line is Median


GeoPT44A - Barchart for Ga
Concentration Ga mg kg⁻¹
Reference Line is Median

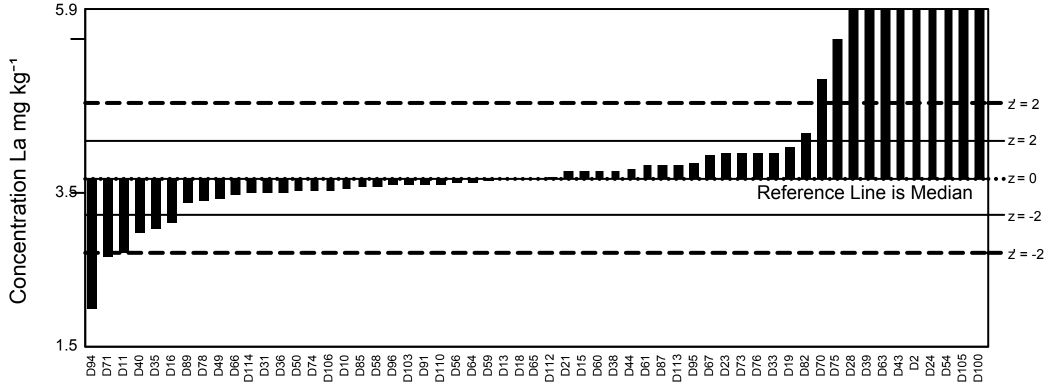

GeoPT44A - Barchart for Gd
Concentration Gd mg kg⁻¹
Reference Line is Robust Mean


GeoPT44A - Barchart for Hf
Concentration Hf mg kg⁻¹
Provisional
Reference Line is Mode

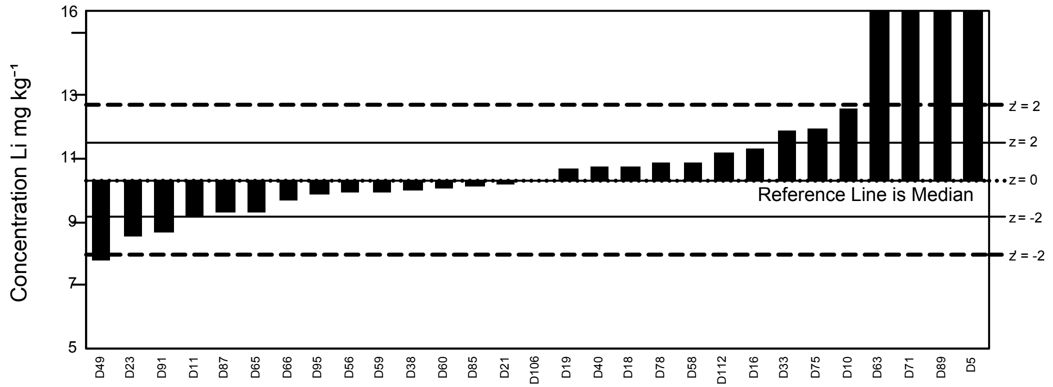
GeoPT44A - Barchart for Ho



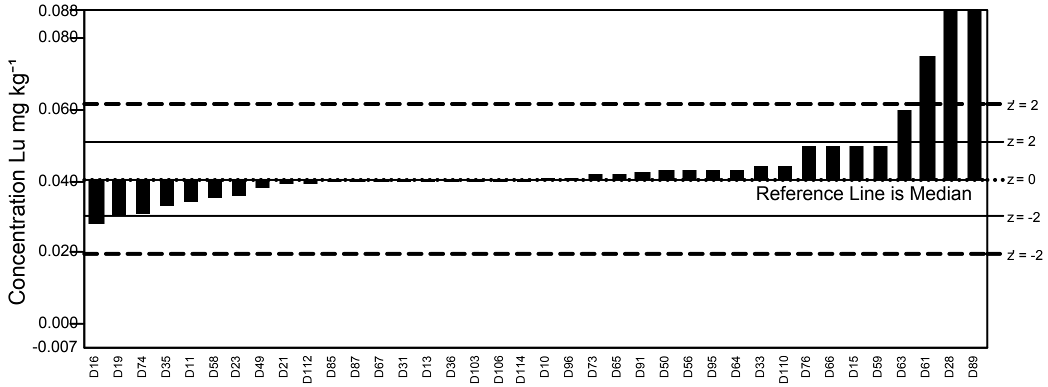
GeoPT44A - Barchart for La



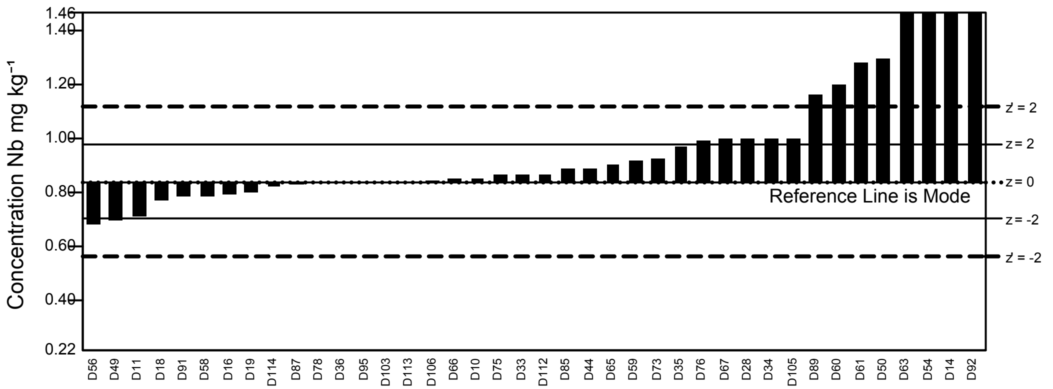
GeoPT44A - Barchart for Li



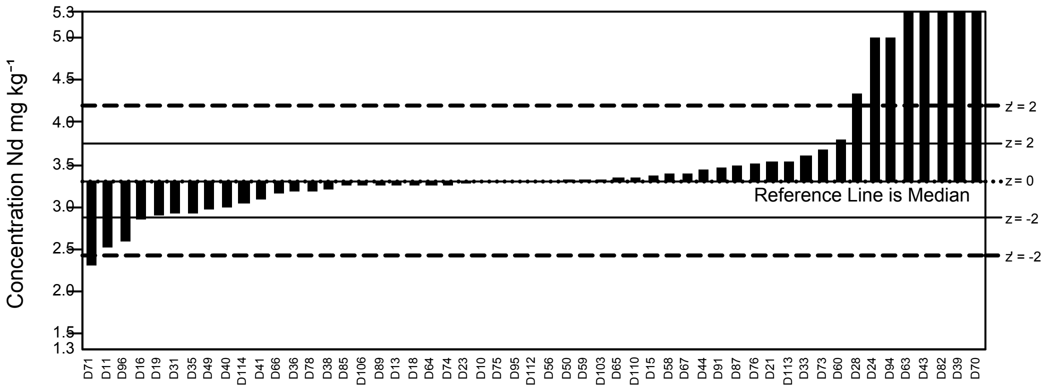
GeoPT44A - Barchart for Lu



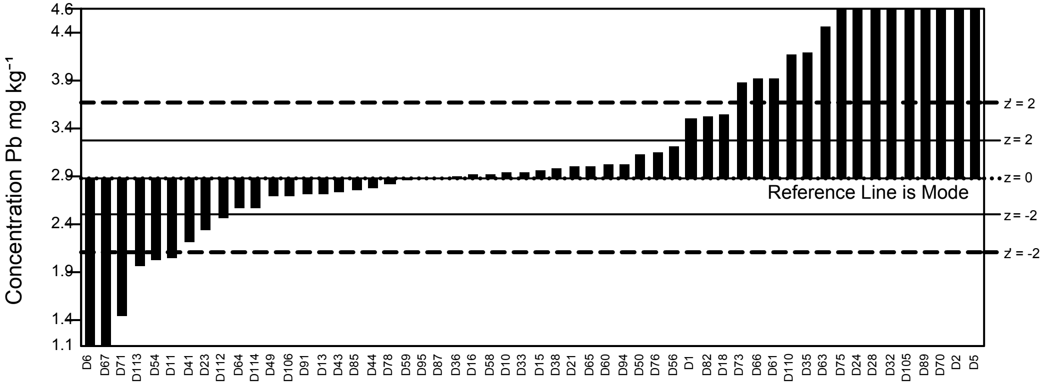
GeoPT44A - Barchart for Nb



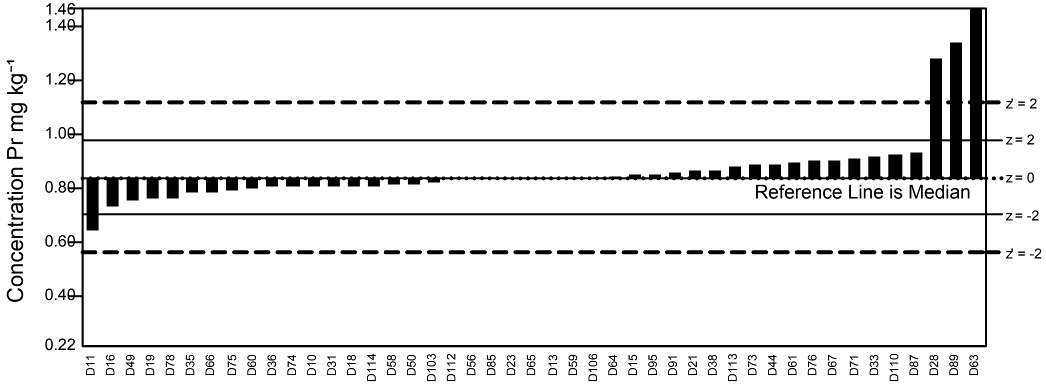
GeoPT44A - Barchart for Nd



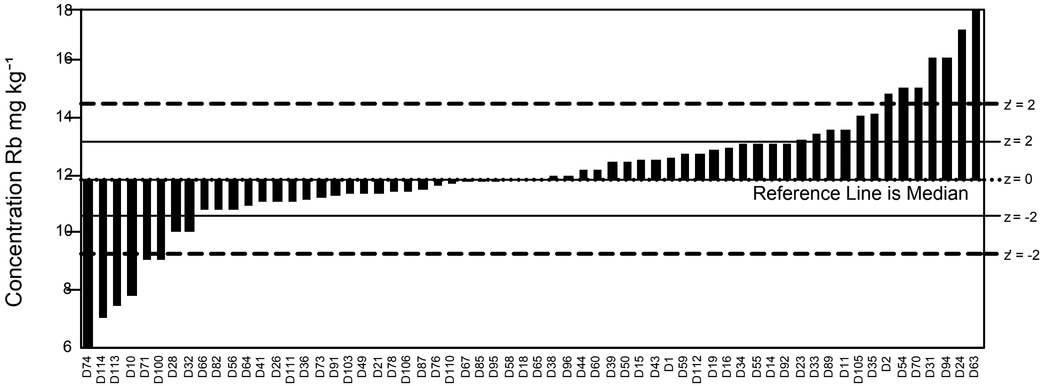
GeoPT44A - Barchart for Pb



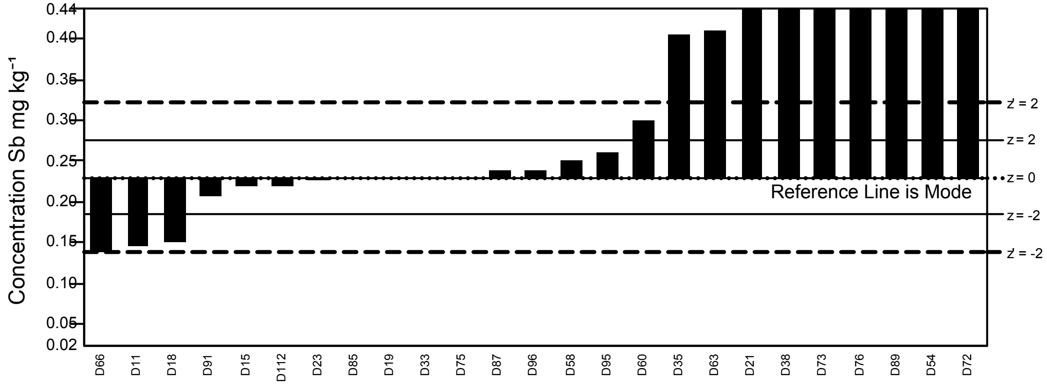
GeoPT44A - Barchart for Pr



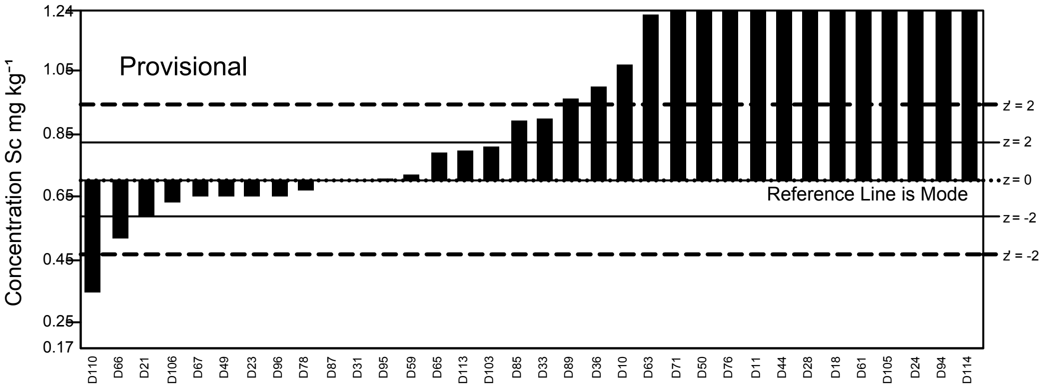
GeoPT44A - Barchart for Rb



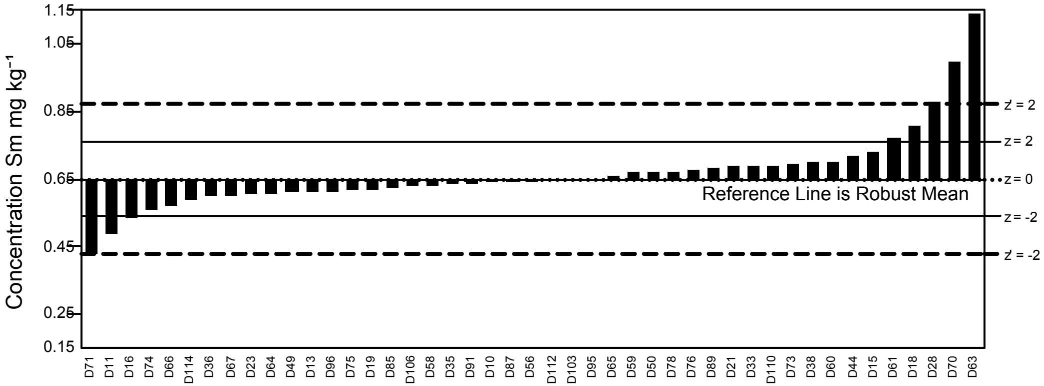
GeoPT44A - Barchart for Sb



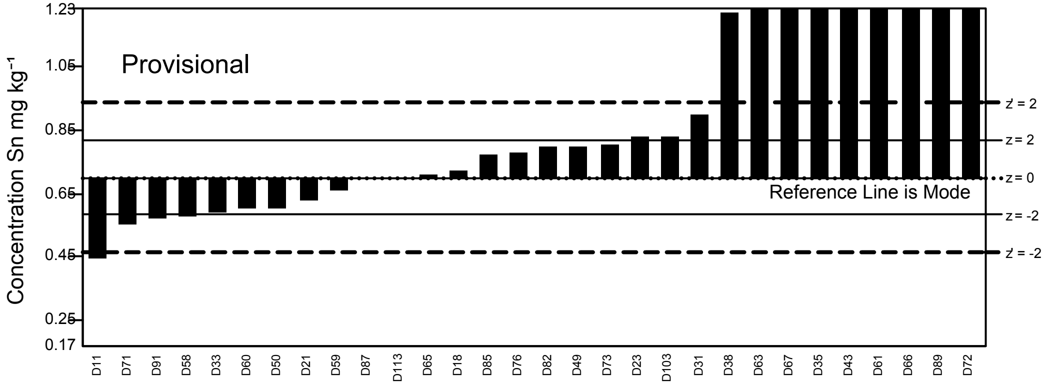
GeoPT44A - Barchart for Sc



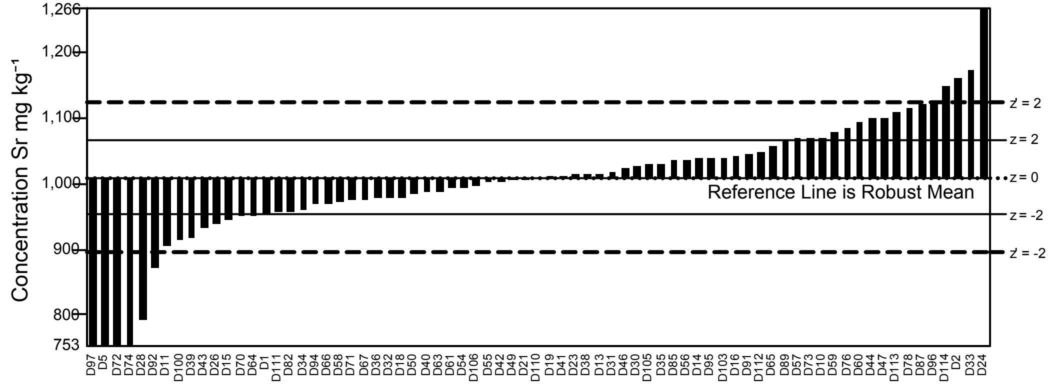
GeoPT44A - Barchart for Sm



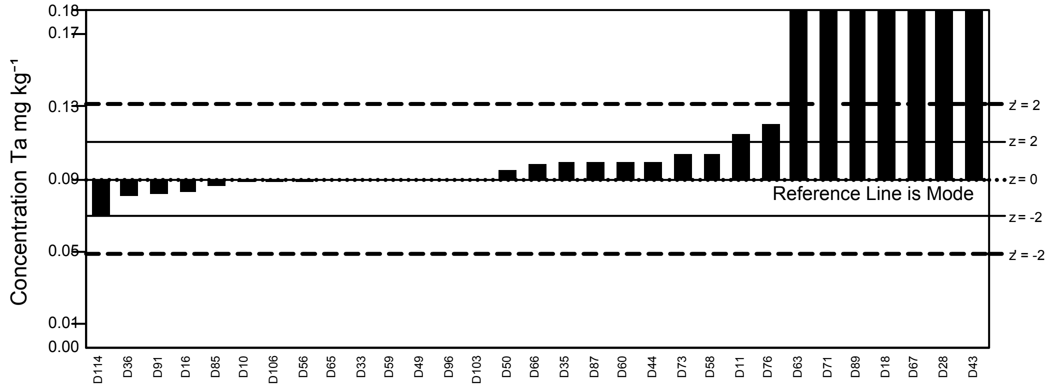
GeoPT44A - Barchart for Sn



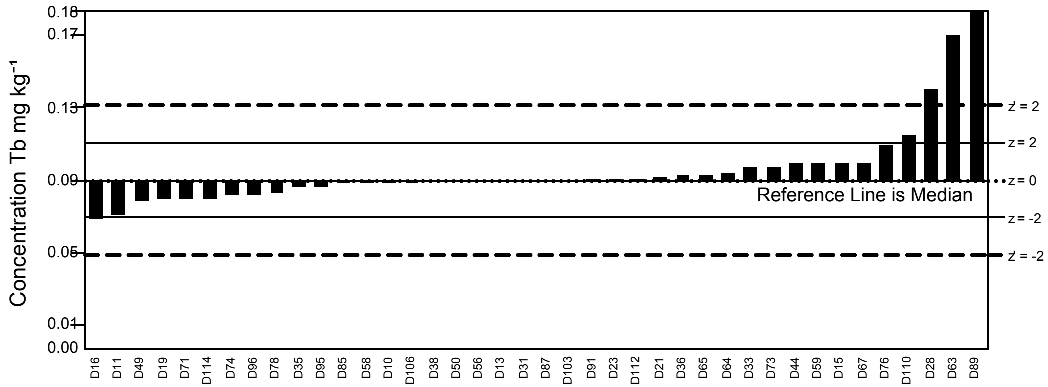
GeoPT44A - Barchart for Sr



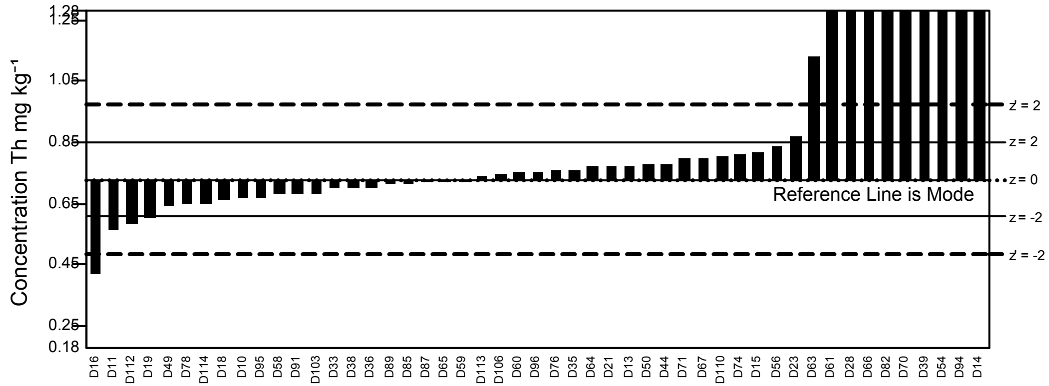
GeoPT44A - Barchart for Ta



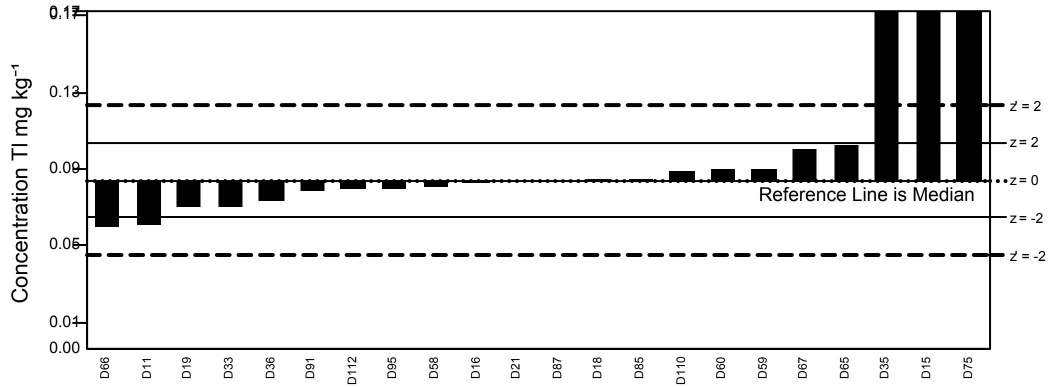
GeoPT44A - Barchart for Tb

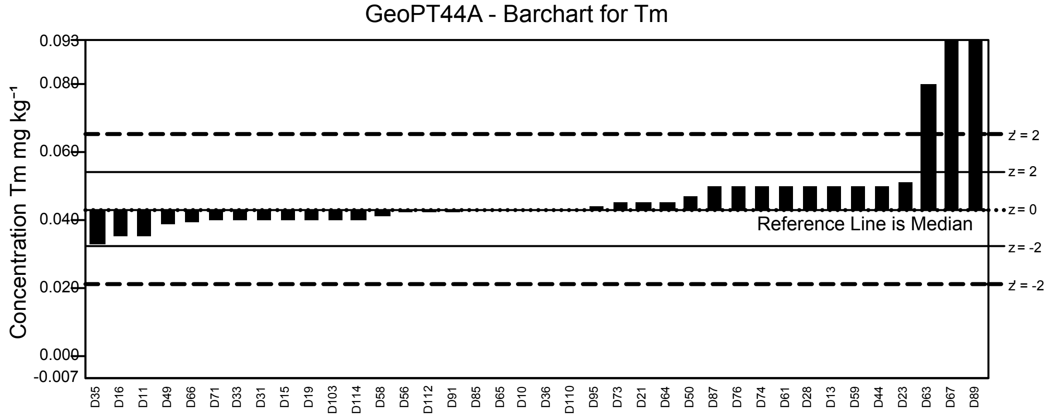


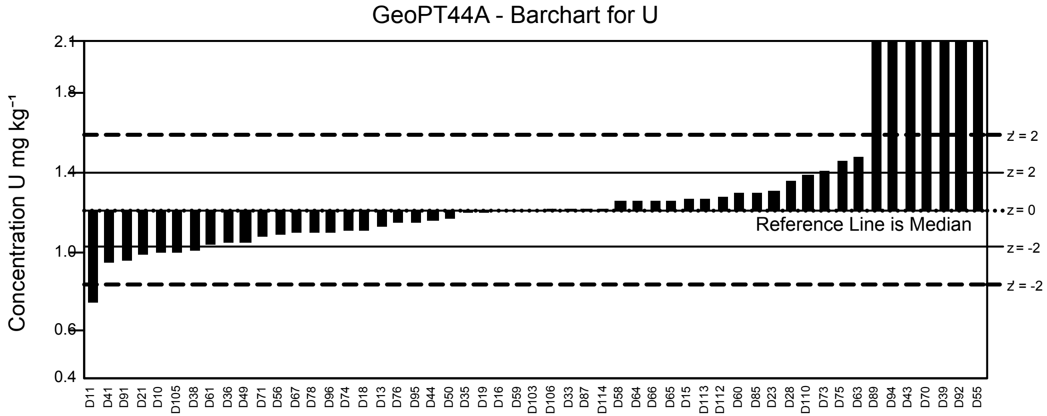
GeoPT44A - Barchart for Th

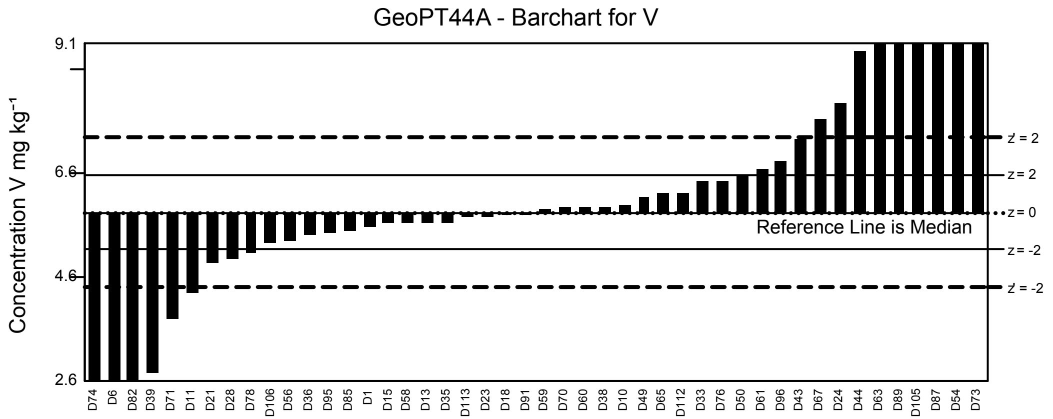


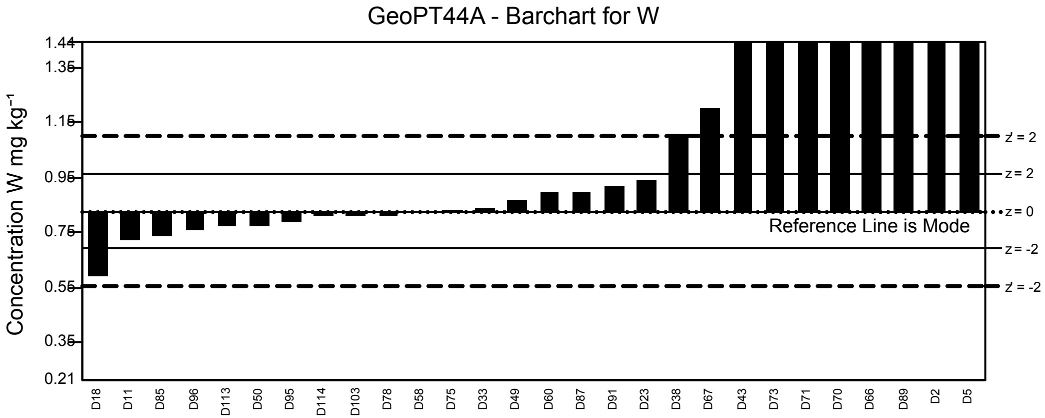
GeoPT44A - Barchart for Tl

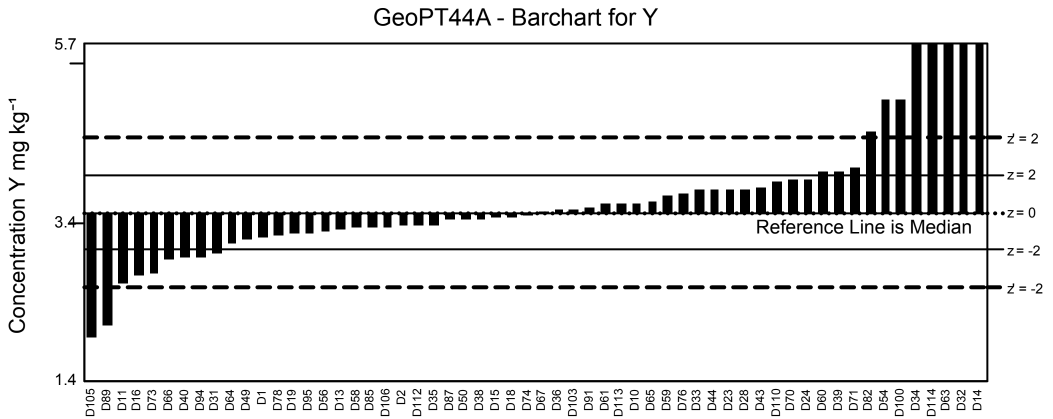


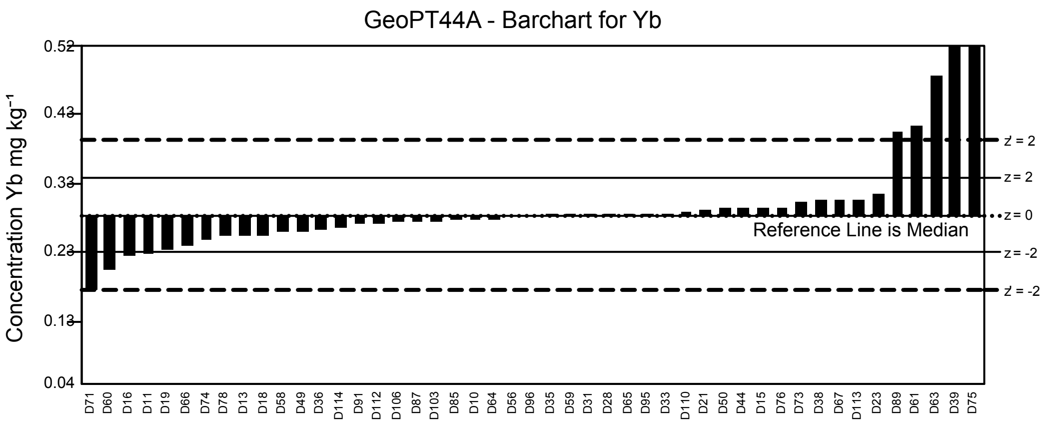

GeoPT44A - Barchart for Tm
Concentration Tm mg kg⁻¹
Reference Line is Median

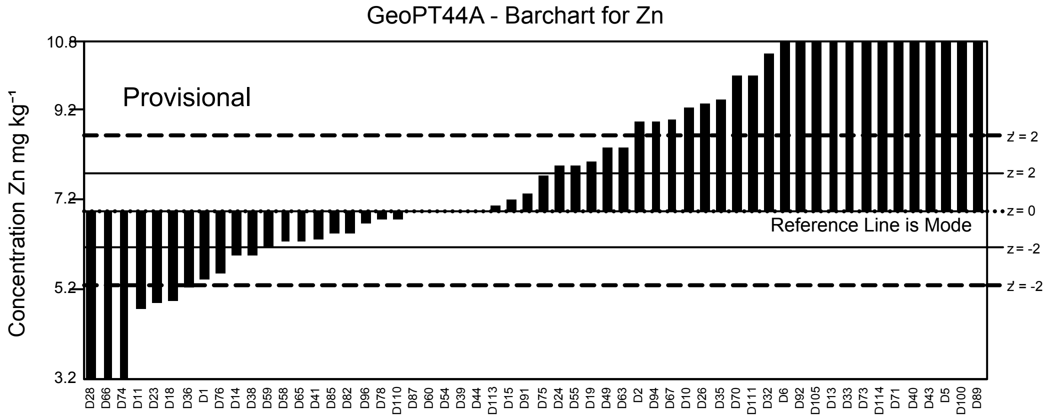

GeoPT44A - Barchart for U
Concentration U mg kg⁻¹
Reference Line is Median


GeoPT44A - Barchart for V
Concentration V mg kg⁻¹
Reference Line is Median


GeoPT44A - Barchart for W
Concentration W mg kg⁻¹
Reference Line is Mode


GeoPT44A - Barchart for Y
Concentration Y mg kg⁻¹
Reference Line is Median


GeoPT44A - Barchart for Yb
Concentration Yb mg kg⁻¹
Reference Line is Median



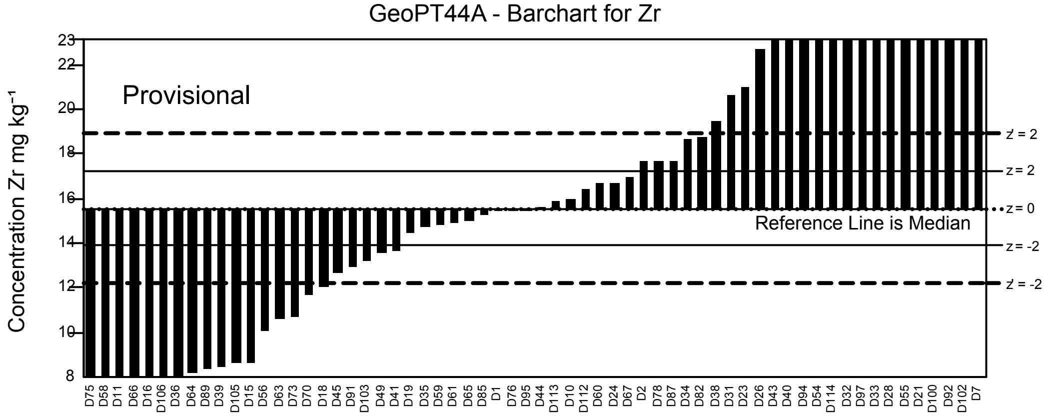
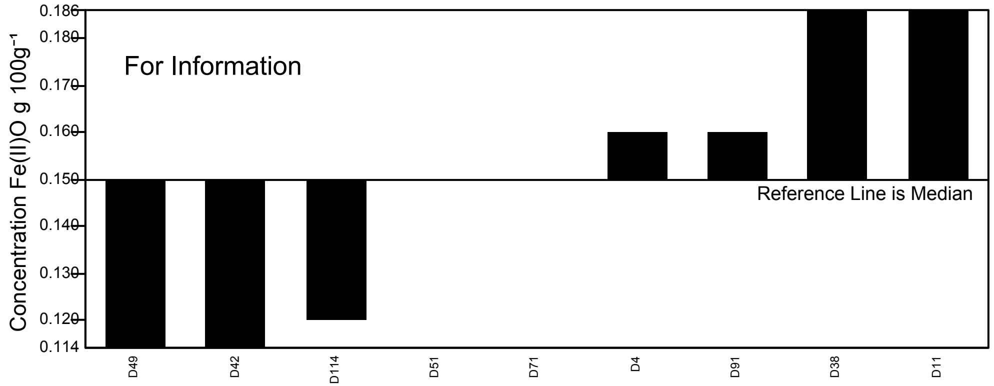
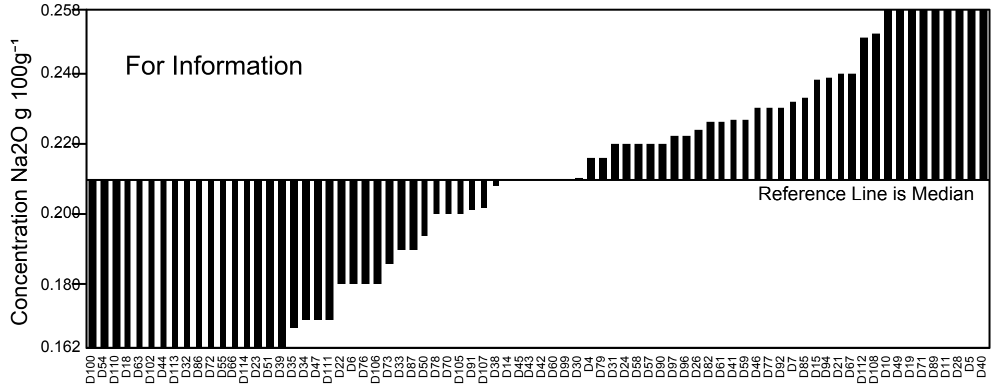


Figure 1: GeoPT44A - Carbonate mudrock, CM-1. Data distribution charts for elements for which values were assigned or provisional values given for guidance. Horizontal lines show the limits for -2<z<2 for pure geochemistry labs (solid lines) and -2<z'<2 for applied geochemistry labs (pecked lines).

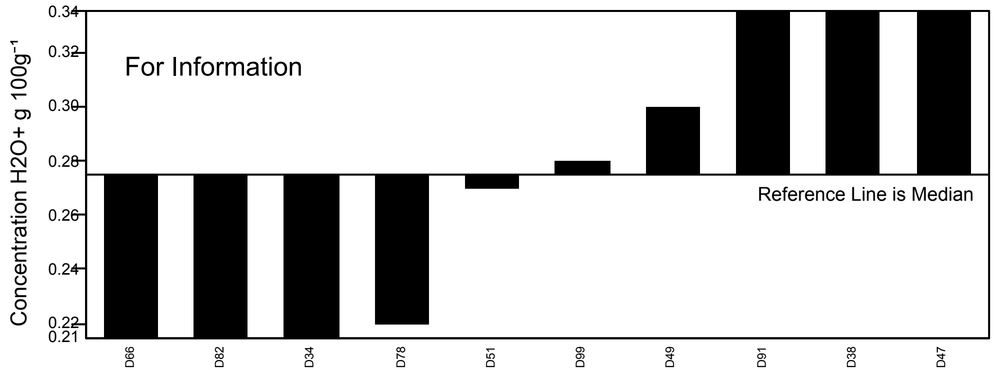
GeoPT44A - Barchart for Fe(II)O



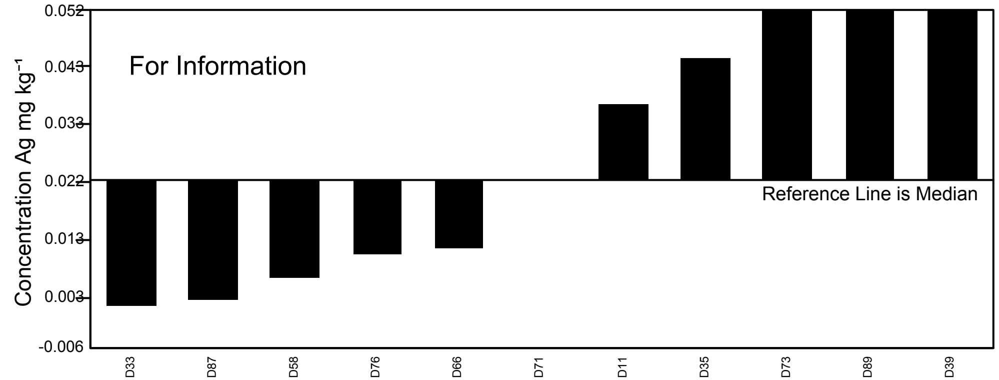
GeoPT44A - Barchart for Na2O



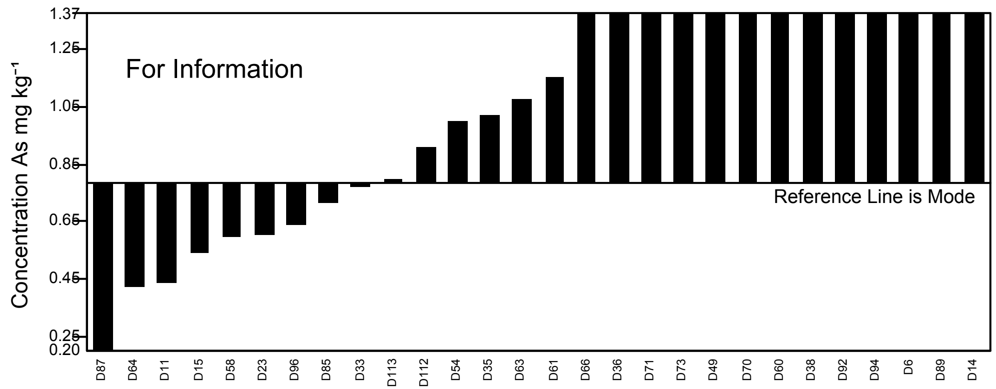
GeoPT44A - Barchart for H2O+



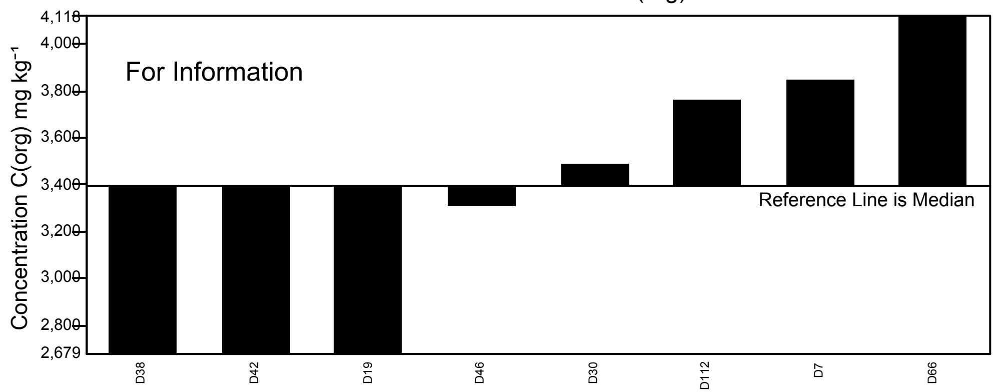
GeoPT44A - Barchart for Ag



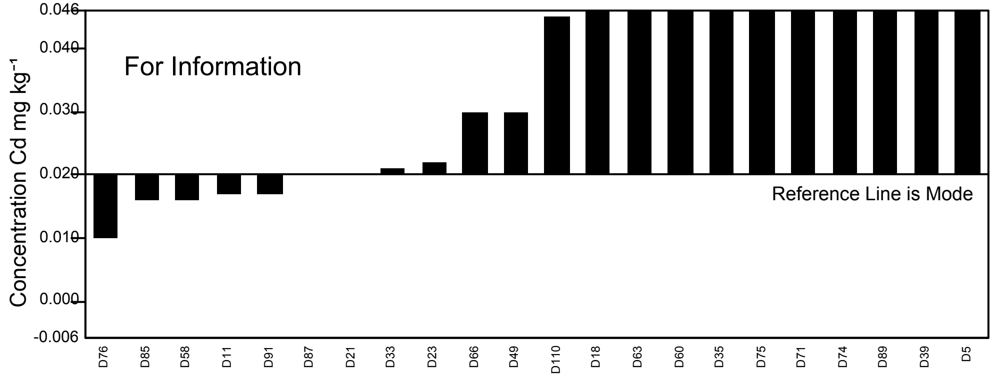
GeoPT44A - Barchart for As



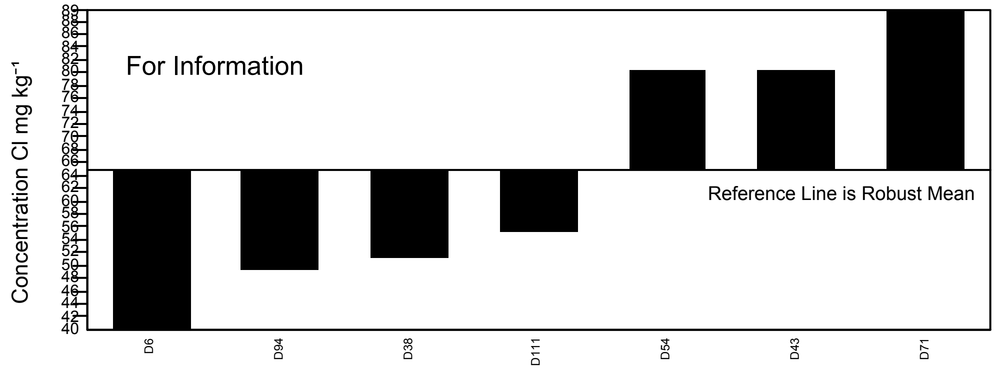
GeoPT44A - Barchart for C(org)



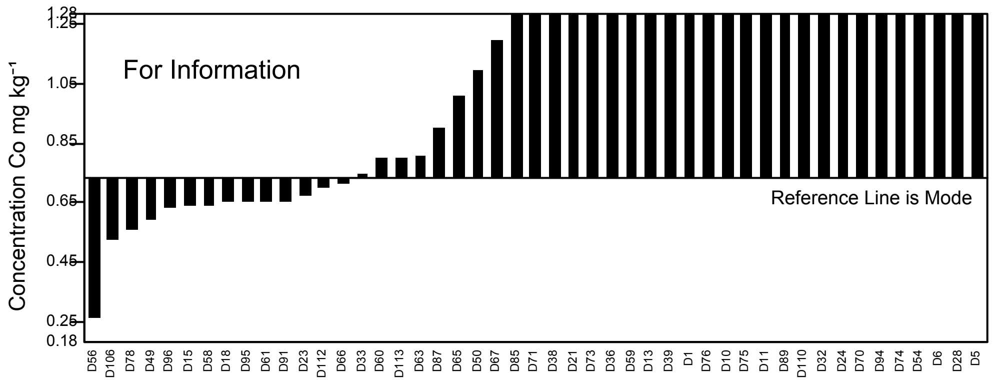
GeoPT44A - Barchart for Cd



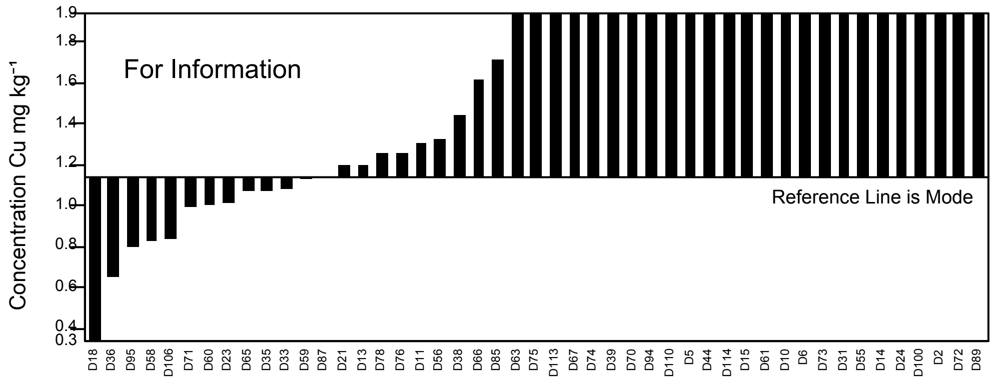
GeoPT44A - Barchart for Cl



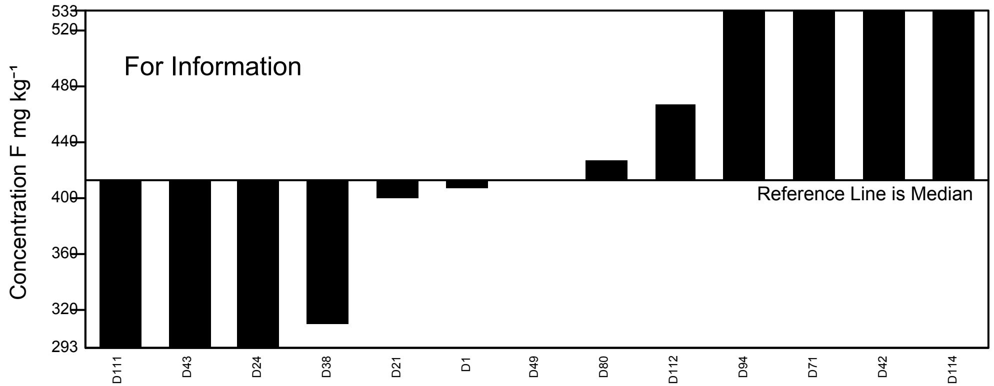
GeoPT44A - Barchart for Co



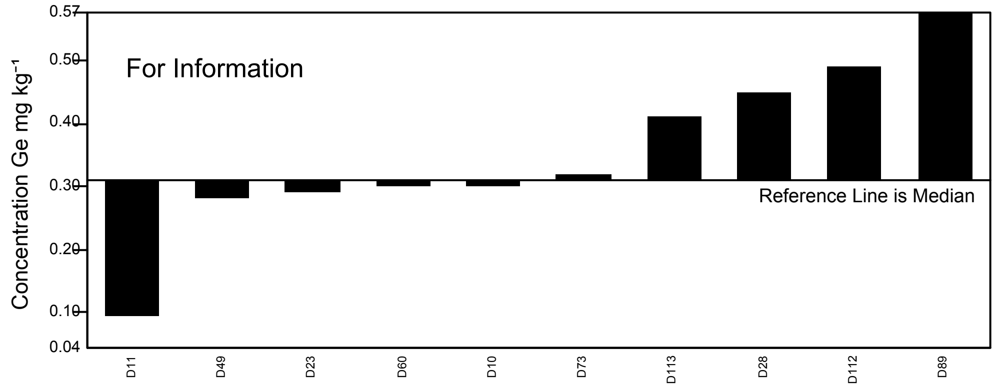
GeoPT44A - Barchart for Cu

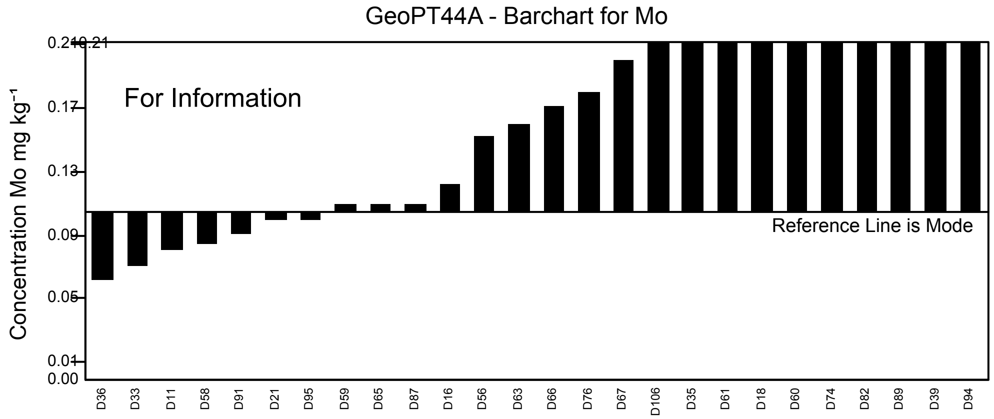


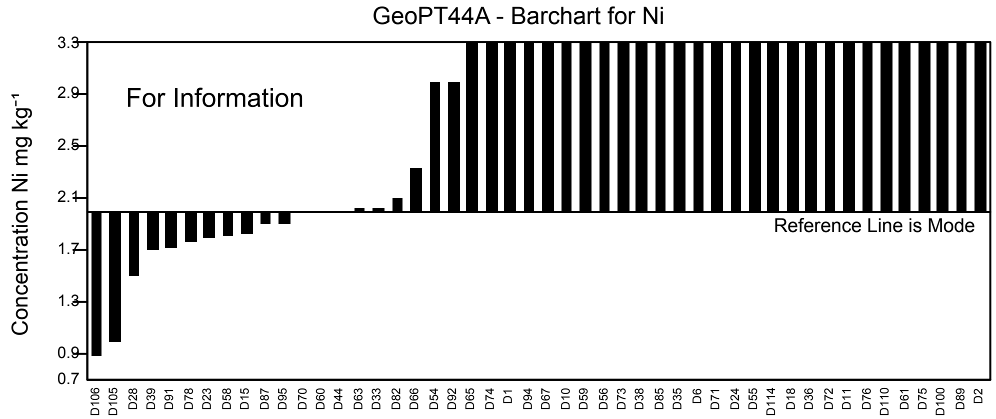
GeoPT44A - Barchart for F



GeoPT44A - Barchart for Ge







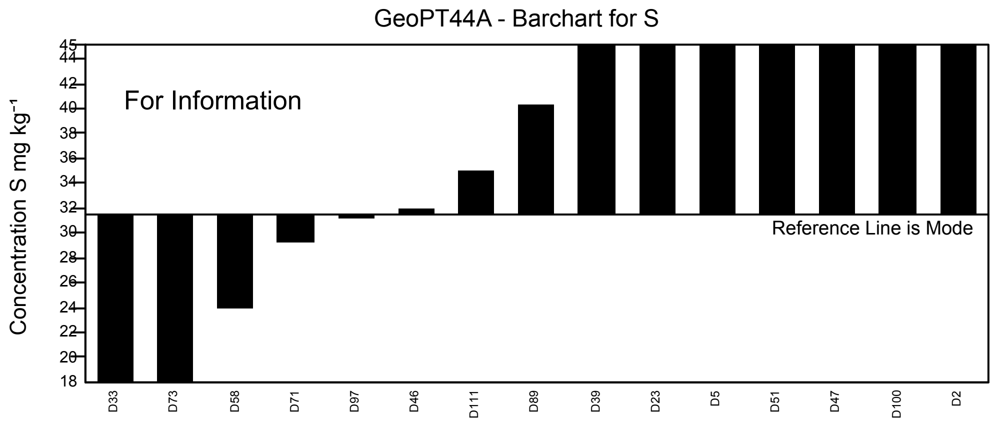
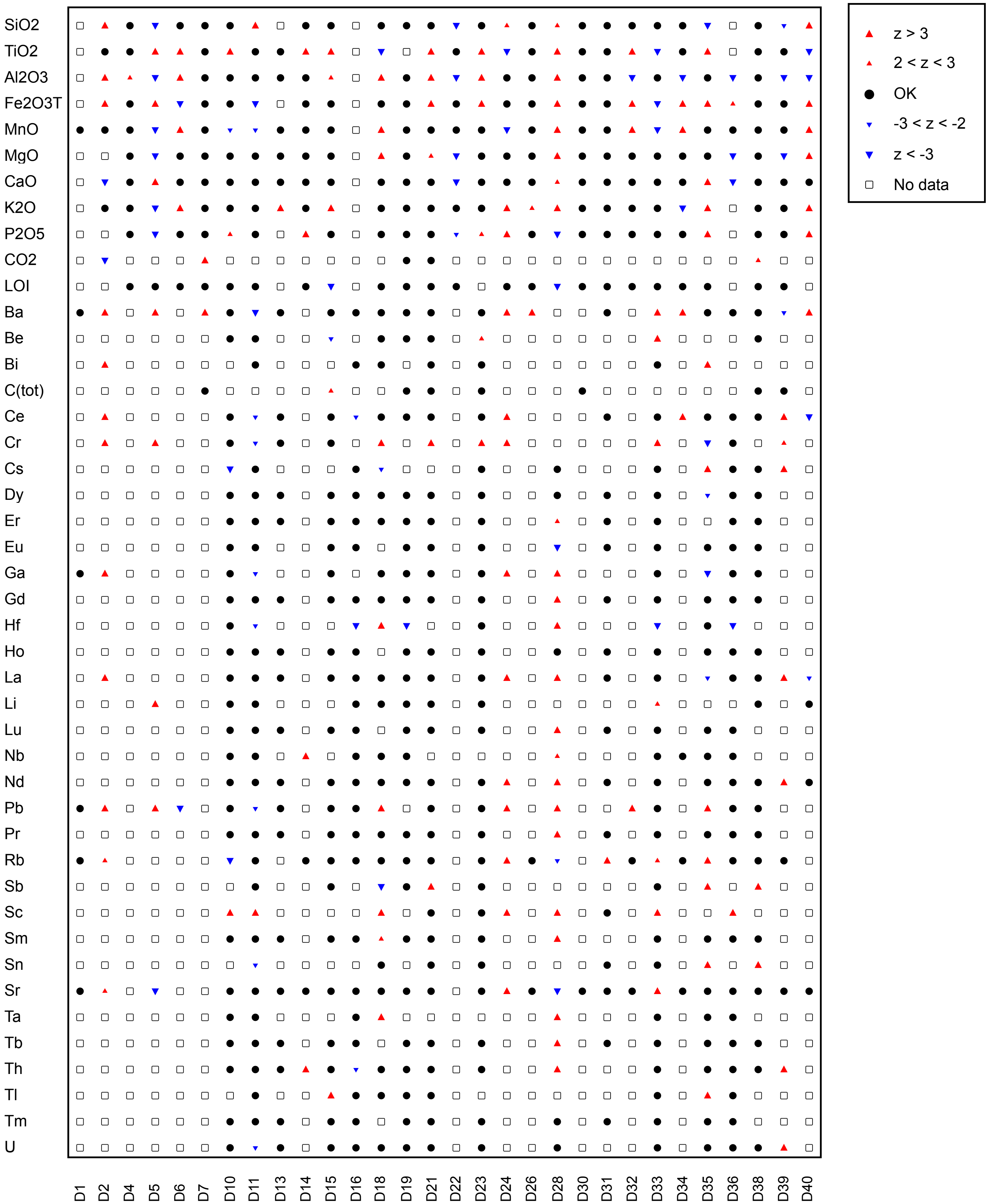


Figure 2: GeoPT44A - Carbonate mudrock, CM-1. Data distribution charts provided for information only for elements for which values could not be assigned.

Multiple Z-Score Chart for GeoPT44A



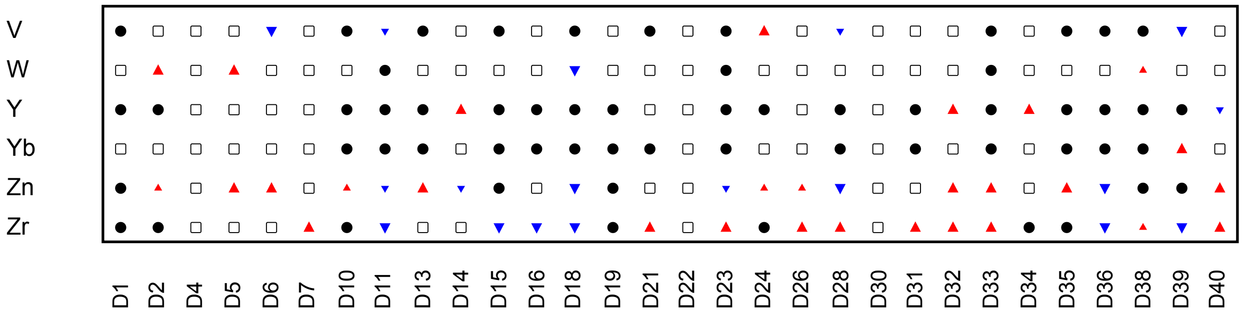
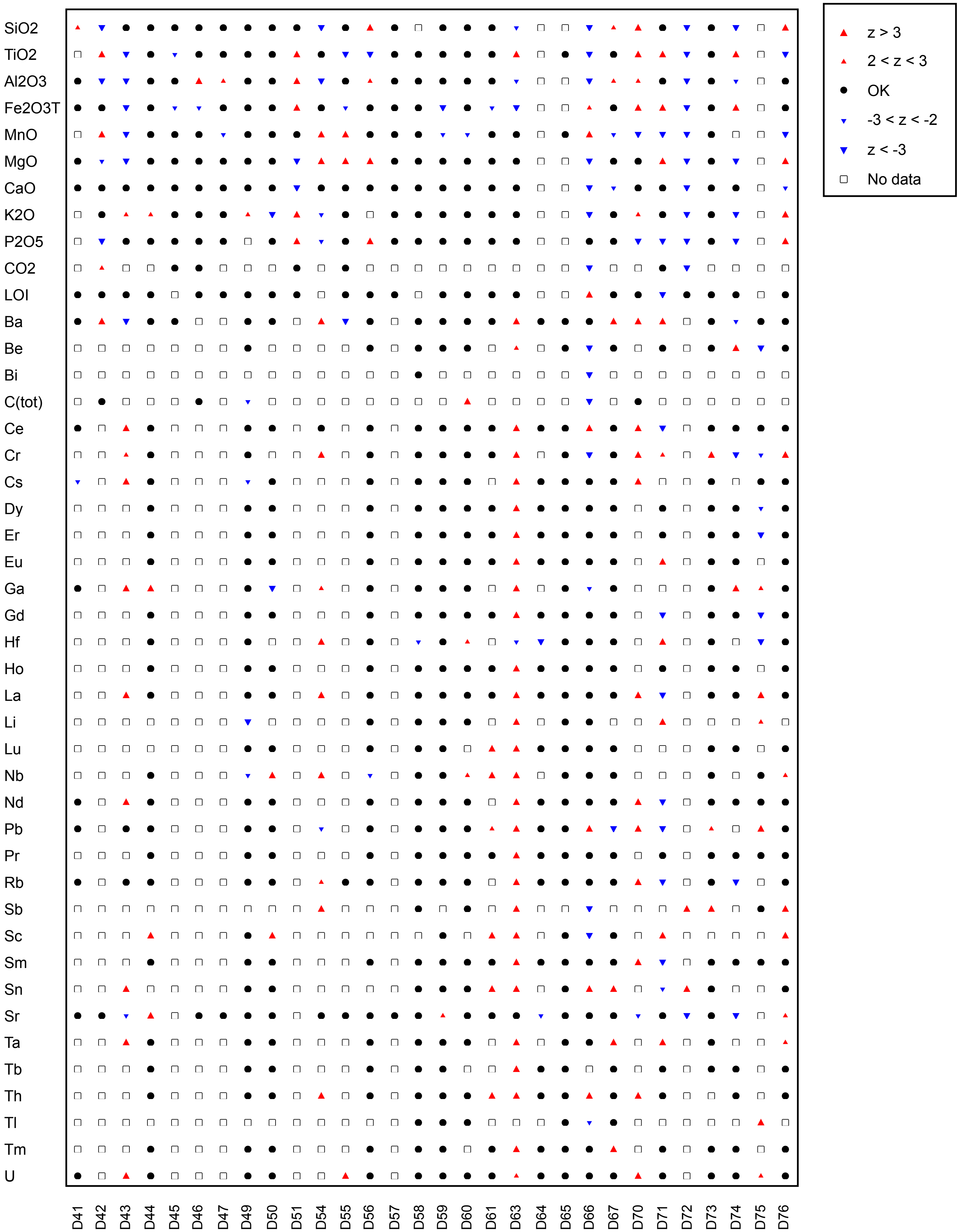


Figure 3: GeoPT44A - Carbonate mudrock, CM-1. Multiple z-score charts for laboratories participating in the GeoPT44 A round. Symbols indicate whether or not an elemental result complies with the -2<z<+2 criteria (see key).

Multiple Z-Score Chart for GeoPT44A



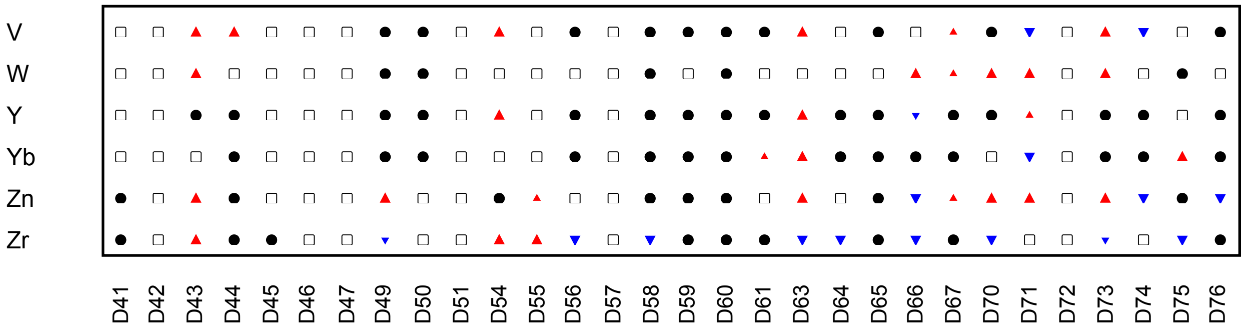
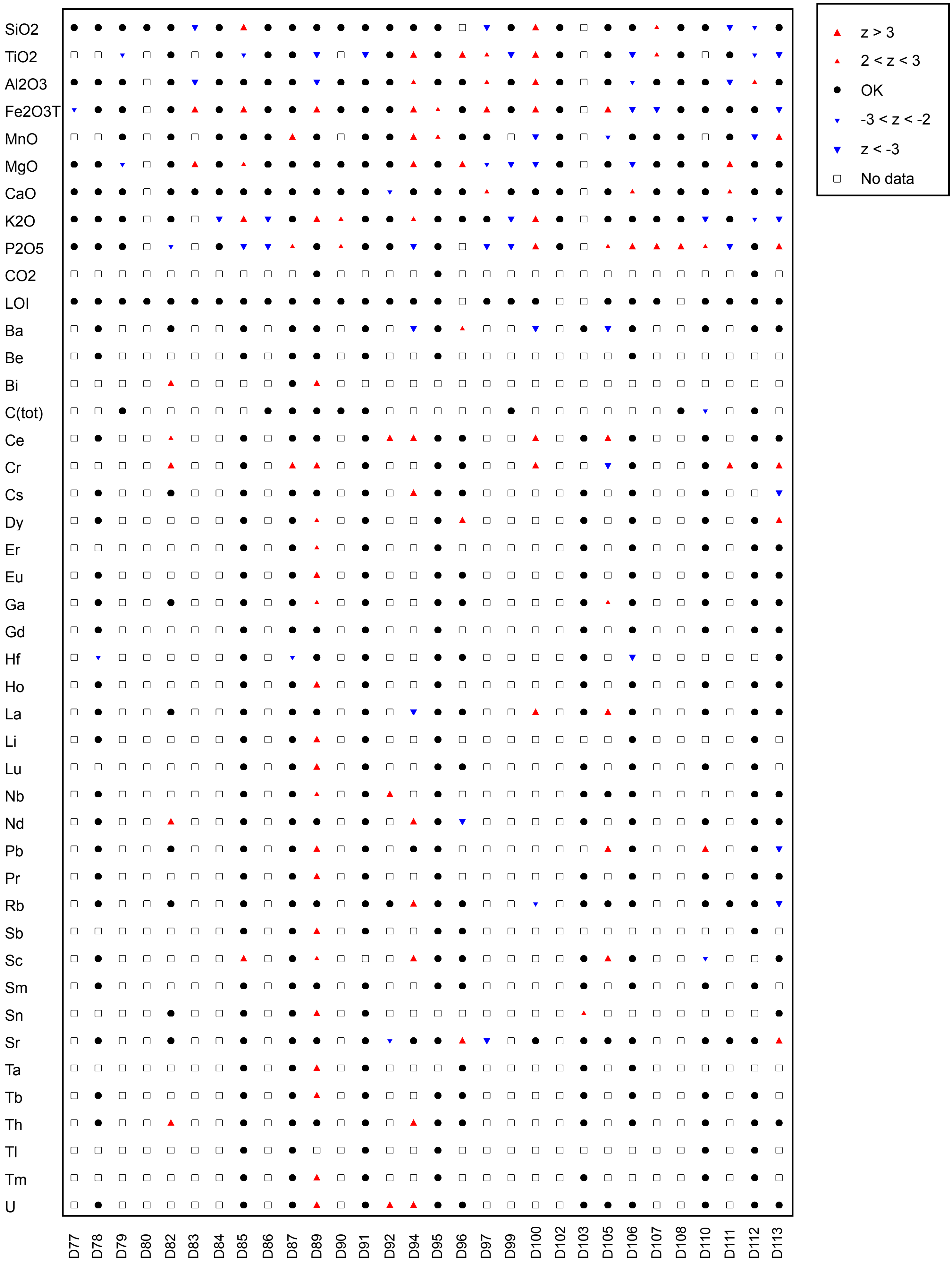


Figure 3: GeoPT44A - Carbonate mudrock, CM-1. Multiple z-score charts for laboratories participating in the GeoPT44 A round. Symbols indicate whether or not an elemental result complies with the -2<z<+2 criteria (see key).

Multiple Z-Score Chart for GeoPT44A



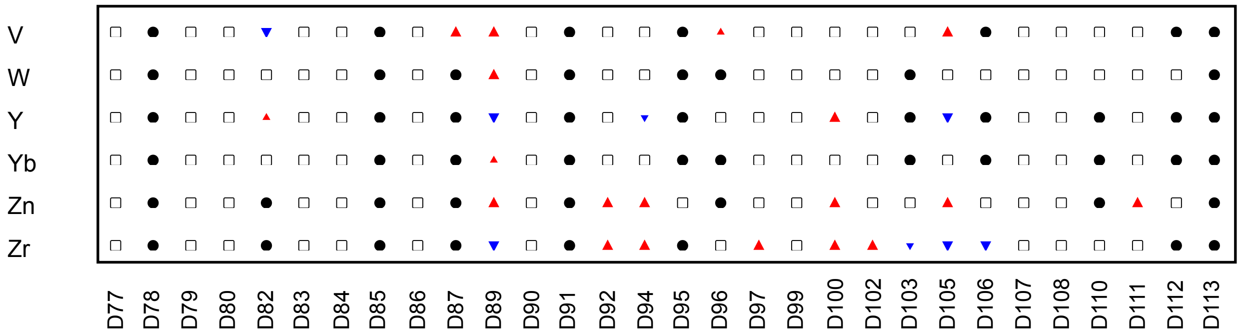


Figure 3: GeoPT44A - Carbonate mudrock, CM-1. Multiple z-score charts for laboratories participating in the GeoPT44 A round. Symbols indicate whether or not an elemental result complies with the -2<z<+2 criteria (see key).

Multiple Z-Score Chart for GeoPT44A

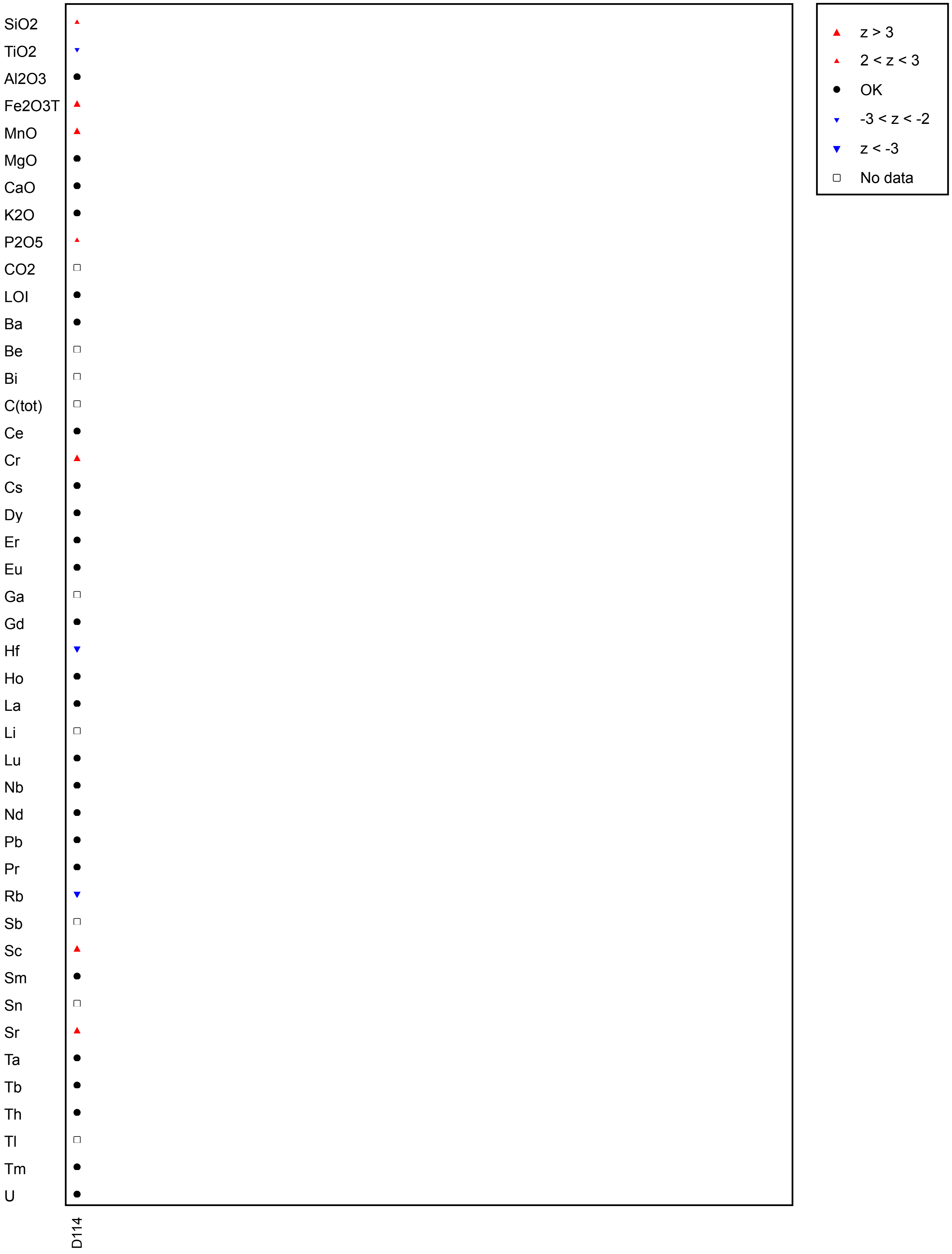


Figure 3: GeoPT44A - Carbonate mudrock, CM-1. Multiple z-score charts for laboratories participating in the GeoPT44 A round. Symbols indicate whether or not an elemental result complies with the -2<z<+2 criteria (see key).