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Revision 0

A STATISTICAL REVIEW OF DWPF LABORATORY DATA INCLUDING MEASURMENTS OF THE ARG-1 STANDARD FOR BATCHES 94 - 263

T. B. Edwards

November 2004

Statistical Consulting Section
Savannah River National Laboratory
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Prepared for the U.S. Department of Energy Under Contract Number DEAC09-96SR18500

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A STATISTICAL REVIEW OF DWPF LABORATORY DATA INCLUDING MEASURMENTS OF THE ARG-1 STANDARD FOR BATCHES 94 - 263

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EXECUTIVE SUMMARY

Measurements of calibration and bench standards as well as samples of ARG-1 that were performed by the DWPF Lab during the processing of batches 94 through 263 were provided to SCS for review. Three datasets, one associated with each of three preparation methods (Cold Chem, Mixed Acid, and Fusion) were included in the review.

The review conducted covered several areas of investigation. Biases in these measurements relative to the reference values for the standards including ARG-1 were estimated and found to be of no practical concern. Percent relative standard deviations for these data also were determined. Sources of variation in the measurements (i.e., batch-to-batch and within process batch) were estimated and compared. An investigation into evidence of instrument drift during a group of measurements representing a prototypical block was conducted for each preparation method using pairs of calibration and bench standards. No evidence of instrument drift at levels of practical concern was seen in these data. Also, the replicates of calibration standards at the beginning of each analytical block were found to be unnecessary.

The uncertainties of the measurements, which incorporated biases and precision errors, were computed for the calibration standards, bench standards, and ARG-1. The limits for these uncertainties were compared to the current, LIMS operating limits for the errors in the measurements of these standards. These comparisons may provide opportunities for revising the LIMS limits.

Comparisons between MFT and SME results were made for both the Mixed Acid and the Fusion prep methods. There was no evidence of differences (in either bias or precision) between the results for these two tanks for either of the two prep methods.

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LIST OF ACRONYMS

DWPF	Defense Waste Processing Facility
MFT	Melter Feed Tank
RSD	Relative Standard Deviation
SME	Slurry Mix Evaporator
SRAT	Sludge Receipt and Adjustment Tank
Std Dev	Standard Deviation
Prep	preparation
SRS	Savannah River Site
SCS	Statistical Consulting Section

1.0 INTRODUCTION AND BACKGROUND

The Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS) in Aiken, South Carolina, has been immobilizing high level radioactive waste (HLW) in borosilicate glass since 1996. Chemical composition analyses of the material being processed at the facility are among the measurements used by the DWPF to manage and control their operations and to ensure that they meet product specifications. These analyses, which include measurements of samples from the Sludge Receipt and Adjustment Tank (SRAT), the Slurry Mix Evaporator (SME), and (in the past) the Melter Feed Tank (MFT), are provided by the DWPF Laboratory (DWPF Lab) of Waste Laboratory Services. The DWPF Lab employs several standards to establish and monitor the comprehensive quality control program under which the process sample analyses are conducted.

Statistical reviews of data generated by this program have been conducted in the past. Measurements of process samples have been reviewed by Edwards ([1] and [2]). The most recent review of DWPF Lab measurements of the standards was conducted by Harris in 2000 [3], and that review covered data through process batch 93. The purpose of this report, which was initiated as part of the response to a Technical Task Request (TTR) issued by DWPF Process Engineering [4], is to conduct a statistical review of the measurements of the standards generated by the DWPF Lab during the processing of batches 94 through 263. The information in this review is intended to provide a basis for assessing the performance of the laboratory and for initiating potential improvement activities.

1.1 OVERVIEW OF DATA

The DWPF Lab, through their WG17 server on the SRS computer network, provided the measurement data for this analysis to the Statistical Consulting Section (SCS) of the Savannah River National Laboratory (SRNL). The measurements were grouped into three datasets, each related to the preparation method utilized for the samples being measured. The preparation/dissolution method(s) used was determined by the vessel being sampled, and samples from the SRAT, the SME, and the MFT were included in the data for this study. For the SRAT samples, there was only one preparation/dissolution method used and it was denoted as "Cold Chem." For the SME and MFT, two different dissolution methods were used. These were denoted as "Mixed Acid" and "Fusion." Thus, the data were organized into three datasets corresponding to these three preparation or prep methods: Cold Chem, Mixed Acid, and Fusion. For each of these datasets, measurements were provided in analytical sequence. The measurements related to a process batch, whether measurements of process samples or standards, were identified by the number of the process batch involved. Other measurements also were included in the datasets that were not part of the information reported for a process batch. The analyses of this study were initiated using all of the available data.

One of the standards utilized in each of the three datasets was the Analytical Reference Glass One (ARG-1). This was the standard of primary interest in this study. It is a powered glass that was prepared by Corning Glass and characterized by the Material Characterization Center (MCC) at Pacific Northwest National Laboratory (PNNL). Its reference composition is provided in Table 1-1 in both elemental and oxide weight percents (wt%'s). Also in Table 1-1 are the errors (as percentages) that the DWPF Lab utilizes as part of its quality control in the measurement of the ARG-1 standard. The limits for these errors are incorporated in the Laboratory Information Management System (LIMS) used by the DWPF Lab. If the measurements for one of the elements of this standard fall outside the permitted errors for the element, the measurements for that element are repeated for the block of samples being processed.

Table 1-1 Reference Composition of the ARG-1 Standard with LIMS Limits for Errors

Element	Weight Percent (wt%)	Oxide	Gravimetric Factor	Weight Percent (wt%)	Cold Chem +/- Error	Mixed Acid +/- Error	Fusion +/- Error
Aluminum (Al)	2.5	Al_2O_3	1.8895	4.7238	12	9	8
Boron (B)	2.69	B_2O_3	3.2199	8.6615	-	-	11
Calcium (Ca)	1.02	CaO	1.3992	1.4272	22	13	20
Chromium (Cr)	0.06	Cr_2O_3	1.4616	0.0877	35	35	35
Copper (Cu)	0.0001	CuO	1.2518	0.0001	-	-	-
Iron (Fe)	9.79	Fe_2O_3	1.4297	13.9968	15	8	8
Potassium (K)	2.25	K_2O	1.2046	2.7104	20	11	10
Lithium (Li)	1.49	Li_2O	2.1529	3.2078	15	8	8
Magnesium (Mg)	0.52	MgO	1.6581	0.8622	17	10	9
Manganese (Mn)	1.46	MnO	1.2912	1.8852	14	8	8
Sodium (Na)	8.53	Na_2O	1.3480	11.4984	15	13	-
Nickel (Ni)	0.83	NiO	1.2725	1.0562	15	9	10
Silicon (Si)	22.39	SiO_2	2.1393	47.8989	18	10	9
Titanium (Ti)	0.69	TiO_2	1.6680	1.1509	17	9	8
Uranium (U)	0	U_3O_8	1.1792	0.0000	-	-	-
Zirconium (ZrO)	0.1	ZrO_2	1.3508	0.1351	21	12	-

Other standards are also included in each of the three datasets. These include blanks, calibration standards, and bench standards. The standards in each datasets are identified during the discussion of the analytical protocols provided below.

1.1.1 Cold Chem (SRAT) Data

The Cold Chem method is used in the preparation of SRAT samples, and the typical protocol used to process a set of 6 SRAT samples is provided in Table 1-2. As indicated in this table, Calibration Standard C and Bench Standard C were not used for every process batch.

Table 1-2 Protocol for SRAT Samples Prepared Using Cold Chem Method

Analytical Sequence	Description
IN35	Calibration Std A
IN35	Calibration Std A
IN36	Calibration Std B
IN36	Calibration Std B
IN38	Calibration Std C – used for some batches
IN38	Calibration Std C – used for some batches
IN32	Blank
ARGC	ARG-1 std
SRAT-1	SRAT sample # 1
SRAT-2	SRAT sample # 2
SRAT-3	SRAT sample # 3
SRAT-4	SRAT sample # 4
SRAT-5	SRAT sample # 5
SRAT-6	SRAT sample # 6
ARGC	ARG-1 std
IN32	Blank
IN33	Bench A Std
IN34	Bench B Std
IN39	Bench C Std – used for some batches

The reference values for each of the standards used to support the Cold Chem analyses are provided in Table 1-3. As the DWPF Lab processes a set of SRAT samples using this protocol, the measurements of the standards are assessed against an acceptance criterion: the measurements generated for the standards are expected to be no more that +/- 7% (the LIMS limits) from the reference values in this table.

Otherwise, the block of samples is considered to be in question, and the measurements of each element failing to meet this criterion are repeated.

Table 1-3 Reference Values (mg/L) for Cold Chem Calibration and Bench Standards

Seq	Al	B	Ca	Cr	Cu	Fe	K	Li	Mg	Mn	Na	Ni	Si	Ti	U	Zr
IN32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IN33	10	0	2	2	1	20	0	0	1	1	20	2	0	2	0	2
IN34	0	10	0	0	0	0	10	10	0	0	65	0	40	0	0	0
IN35	10	0	2	2	1	20	0	0	1	1	20	2	0	2	0	2
IN36	0	10	0	0	0	0	10	10	0	0	65	0	40	0	0	0
IN38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
IN39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0

Also, note that the pairs of standards: IN33 and IN35, IN34 and IN36, and IN38 and IN39, where one is a calibration standard and the other is a bench standard, provide opportunities to look for drift in the measurements over the course of an analytical block. More will be said on instrument drift in the sections that follow.

1.1.2 Mixed Acid (SME and MFT) Data

The Mixed Acid (MA) method is used in the preparation of SME and MFT samples, and the typical protocol used to process a set of 6 samples from either of these tanks is provided in Table 1-4.

Table 1-4 Protocol for SME and MFT Samples Prepared Using Mixed Acid Method

Analytical Sequence	Description
SM35	Calibration Std A
SM35	Calibration Std A
SM36	Calibration Std B
SM36	Calibration Std B
SM38	Calibration Std C
SM38	Calibration Std C
SM32	Blank
ARGB	ARG-1 std
SME or MFT-1	SME or MFT sample # 1
SME or MFT-2	SME or MFT sample # 2
SME or MFT--3	SME or MFT sample # 3
SME or MFT--4	SME or MFT sample # 4
SME or MFT--5	SME or MFT sample # 5
SME or MFT--6	SME or MFT sample # 6
ARGB	ARG-1 std
SM32	Blank
SM33	Bench A Std
SM34	Bench B Std
SM37	Bench C Std

The reference values for each of the standards used to support the Mixed Acid analyses are provided in Table 1-5. As the DWPF Lab processes a set of SME or MFT samples using this protocol, the measurements of the standards are assessed against an acceptance criterion: the measurements generated for the standards are expected to be no more that +/- 7% (the LIMS limits) from the reference values in this table. Otherwise, the block of samples is considered questionable, and the measurements of each element failing to meet this criterion are repeated. Note that the pairs SM33 and SM35, SM34 and SM36, and SM37 and SM38 may be used to investigate for potential instrument drift in the measurement of samples prepared using the Mixed Acid method.

Table 1-5 Reference Values (mg/L) for Mixed Acid Calibration and Bench Standards

Seq	Al	B	Ca	Cr	Cu	Fe	K	Li	Mg	Mn	Na	Ni	Si	Ti	U	Zr
SM32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SM33	0	0	1	1	1	0	5	2	1	0	32	1	20	0	0	0
SM34	2	0	0	0	0	10	0	0	0	2	5	0	0	1	0	1
SM35	0	0	1	1	1	0	5	2	1	0	32	1	20	0	0	0
SM36	2	0	0	0	0	10	0	0	0	2	5	0	0	1	0	1
SM37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
SM38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0

1.1.3 Fusion (SME and MFT) Data

The Fusion (F) method is used in the preparation of SME and MFT samples, and the typical protocol used to process a set of 6 samples from either of these tanks is provided in Table 1-6.

Table 1-6 Protocol for SME and MFT Samples Prepared Using the Fusion Method

Analytical Sequence	Description
SM53	Calibration Std A
SM53	Calibration Std A
SM54	Calibration Std B
SM54	Calibration Std B
SM55	Blank
ARGB	ARG-1 std
SME or MFT-1	SME or MFT sample # 1
SME or MFT-2	SME or MFT sample # 2
SME or MFT--3	SME or MFT sample # 3
SME or MFT--4	SME or MFT sample # 4
SME or MFT--5	SME or MFT sample # 5
SME or MFT--6	SME or MFT sample # 6
ARGB	ARG-1 std
SM55	Blank
SM51	Bench A Std
SM52	Bench B Std

The reference values for each of the standards used to support the Fusion analyses are provided in Table 1-7. As the DWPF Lab processes a set of SME or MFT samples using this protocol, the measurements of the standards are assessed against an acceptance criterion: the measurements generated for the standards are expected to be no more that +/- 7% (the LIMS limits) from the reference values in this table. Otherwise, the block of samples is considered questionable, and the measurements of each element failing to meet the criterion are repeated. Note that the pairs SM53 and SM51 and SM52 and SM54 may be used to investigate potential drift in the measurement of samples prepared using the Fusion method.

Table 1-7 Reference Values (mg/L) for Fusion Calibration and Bench Standards

Seq	Al	B	Ca	Cr	Cu	Fe	K	Li	Mg	Mn	Ni	Si	Ti
SM51	0	4	1	1	1	0	5	2	1	0	1	20	0
SM52	2	2	0	0	0	10	0	0	0	2	0	0	1
SM53	0	4	1	1	1	0	5	2	1	0	1	20	0
SM54	2	2	0	0	0	10	0	0	0	2	0	0	1
SM55	0	0	0	0	0	0	0	0	0	0	0	0	0

2.0 RESULTS

The information in Section 1 provides the framework for the data that are reviewed in this report. Most, but not all, of the measurement data were generated along with measurements that were reported for SRAT, SME, and MFT samples. A review of the measurements of these process samples is not in the scope of the analyses conducted in this report. However, the grouping of the standards data by process batch provides an opportunity to investigate and estimate the components or sources of variation in these data as well as to assess possible instrument drift over the block of measurements making up the batch. Drift in the measurements might be seen as a shift in the mean elemental value between a calibration standard and its corresponding bench standard, or it might be seen as less precision in a bench standard's measurements versus its corresponding calibration standard for an element. There also are opportunities to estimate bias in the elemental measurements of the standards. All of these aspects of the comparisons of the measurement data are discussed in this section. Each of the three major datasets, the Cold Chem, Mixed Acid, and Fusion measurements, is discussed in turn with the calibration and bench standard measurements being considered initially followed by an investigation of the ARG-1 data.

The statistical analyses were conducted using JMP Version 5.0 [5].

2.1 COLD CHEM RESULTS

Recall the analytical protocol (provided in Table 1-1) for SRAT samples analyzed by the Cold Chem prep method. In Section 2.1.1, the calibration and bench standards are investigated. All of the available data are initially explored with the measurements of the standards associated with the SRAT batches subsequently investigated. The elemental measurements for these standards are expressed as mg/L. Section 2.1.2 provides a discussion of the ARG-1 measurements generated under the Cold Chem prep. The ARG-1 measurements are expressed in elemental wt%.

2.1.1 Cold Chem Calibration and Bench Standards

Exhibit A1 in the Appendix provides time plots in the form of control charts of the elemental measurements of each of the calibration and bench standards used as part of the Cold Chem protocol. These measurement are in mg/L, the displays are in analytical sequence by element for each of the standards. The plotted values represented by an "×" are measurements that were not associated with a particular process batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistencies in precision.

Exhibit A2 provides histograms and descriptive statistics for all of these data. The means and reference values for the standards are given in Table 2-1 as are values of the % relative difference (% Rel Diff) for the active elements (i.e., those present in the standard). Note that all of the % relative differences (or % biases) of the measured versus reference values are less than 1.5% except for the U measurements for IN39, which show a 2.2% relative bias.

Table 2-1 All Measurements (mg/L) for Cold Chem Calibration & Bench Standards Means & Relative Bias

		IN32	IN33	IN34	IN35	IN36	IN38	IN39
Element	N Rows	484	432	420	932	894	302	142
Al (mg/L)	Mean	0.02	9.90	0.01	9.97	0.02	0.02	0.02
	Ref Value	0	10	0	10	0	0	0
	% Rel Diff		-1.0%		-0.3%			
B (mg/L)	Mean	0.00	-0.01	10.01	0.00	10.05	0.00	0.00
	Ref Value	0	0	10	0	10	0	0
	% Rel Diff			0.1%		0.5%		
Ca (mg/L)	Mean	0.11	1.99	0.08	1.99	0.08	0.29	0.29
	Ref Value	0	2	0	2	0	0	0
	% Rel Diff		-0.5%		-0.3%			
Cr (mg/L)	Mean	0.00	1.98	0.00	2.00	0.00	0.03	0.03
	Ref Value	0	2	0	2	0	0	0
	% Rel Diff		-0.8%		0.0%			
Cu (mg/L)	Mean	0.00	0.99	0.00	1.00	0.00	0.02	0.02
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.5%		0.5%			
Fe (mg/L)	Mean	0.00	19.84	0.03	19.97	0.01	0.00	0.01
	Ref Value	0	20	0	20	0	0	0
	% Rel Diff		-0.8%		-0.1%			
K (mg/L)	Mean	0.04	0.00	9.90	0.02	9.93	-0.02	-0.02
	Ref Value	0	0	10	0	10	0	0
	% Rel Diff			-1.0%		-0.7%		
Li (mg/L)	Mean	0.00	0.00	9.94	0.00	9.97	0.00	0.00
	Ref Value	0	0	10	0	10	0	0
	% Rel Diff			-0.6%		-0.3%		
Mg (mg/L)	Mean	0.00	1.00	0.01	1.01	0.01	0.00	0.00
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		0.3%		0.9%			
Mn (mg/L)	Mean	0.00	0.99	0.01	1.00	0.01	0.00	0.00
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.7%		0.0%			
Na (mg/L)	Mean	0.03	19.83	65.70	19.94	65.82	0.40	0.40
	Ref Value	0	20	65	20	65	0	0
	% Rel Diff		-0.8%	1.1%	-0.3%	1.3%		
Ni (mg/L)	Mean	0.00	1.97	0.00	1.99	0.00	0.00	0.00
	Ref Value	0	2	0	2	0	0	0
	% Rel Diff		-1.5%		-0.7%			
Si (mg/L)	Mean	-0.09	-0.37	39.95	-0.70	40.23	-0.04	0.19
	Ref Value	0	0	40	0	40	0	0
	% Rel Diff			-0.1%		0.6%		
Ti (mg/L)	Mean	0.00	1.98	0.00	1.99	0.00	0.00	0.00
	Ref Value	0	2	0	2	0	0	0
	% Rel Diff		-1.1%		-0.4%			
U (mg/L)	Mean	0.13	0.08	0.05	0.14	0.06	9.84	9.78
	Ref Value	0	0	0	0	0	10	10
	% Rel Diff						-1.6%	-2.2%
Zr (mg/L)	Mean	0.00	2.00	0.01	2.02	0.01	0.00	0.00
	Ref Value	0	2	0	2	0	0	0
	%RSD		0.1%		0.8%			

The means and standard deviations for these data appear in Table 2-2. Also, in this table are values for the percent relative standard deviation (%RSD), which is the ratio of the standard deviation to the mean expressed as a percentage, for elements present in the standard. RSD is also called the coefficient of variation (CV). Even with no screening of the data for outliers, note that the %RSDs are all less than or equal to 2.4%.

Table 2-2 All Measurements (mg/L) for Cold Chem Calibration and Bench Standards

		IN32	IN33	IN34	IN35	IN36	IN38	IN39
Element	N Rows	484	432	420	932	894	302	142
Al (mg/L)	Mean	0.02	9.90	0.01	9.97	0.02	0.02	0.02
	Std Dev	0.042	0.148	0.068	0.130	0.199	0.029	0.031
	%RSD		1.5%		1.3%			
B (mg/L)	Mean	0.00	-0.01	10.01	0.00	10.05	0.00	0.00
	Std Dev	0.031	0.032	0.142	0.032	0.120	0.031	0.031
	%RSD			1.4%		1.2%		
Ca (mg/L)	Mean	0.11	1.99	0.08	1.99	0.08	0.29	0.29
	Std Dev	0.108	0.047	0.082	0.043	0.097	0.354	0.385
	%RSD		2.4%		2.2%			
Cr (mg/L)	Mean	0.00	1.98	0.00	2.00	0.00	0.03	0.03
	Std Dev	0.007	0.032	0.003	0.029	0.003	0.006	0.006
	%RSD		1.6%		1.4%			
Cu (mg/L)	Mean	0.00	0.99	0.00	1.00	0.00	0.02	0.02
	Std Dev	0.004	0.017	0.005	0.014	0.004	0.010	0.010
	%RSD		1.7%		1.4%			
Fe (mg/L)	Mean	0.00	19.84	0.03	19.97	0.01	0.00	0.01
	Std Dev	0.073	0.303	0.298	0.260	0.058	0.035	0.031
	%RSD		1.5%		1.3%			
K (mg/L)	Mean	0.04	0.00	9.90	0.02	9.93	-0.02	-0.02
	Std Dev	0.062	0.064	0.137	0.066	0.125	0.072	0.078
	%RSD			1.4%		1.3%		
Li (mg/L)	Mean	0.00	0.00	9.94	0.00	9.97	0.00	0.00
	Std Dev	0.002	0.003	0.125	0.003	0.113	0.005	0.006
	%RSD			1.3%		1.1%		
Mg (mg/L)	Mean	0.00	1.00	0.01	1.01	0.01	0.00	0.00
	Std Dev	0.005	0.024	0.021	0.023	0.020	0.003	0.003
	%RSD		2.4%		2.3%			
Mn (mg/L)	Mean	0.00	0.99	0.01	1.00	0.01	0.00	0.00
	Std Dev	0.010	0.017	0.028	0.016	0.027	0.002	0.002
	%RSD		1.7%		1.6%			
Na (mg/L)	Mean	0.03	19.83	65.70	19.94	65.82	0.40	0.40
	Std Dev	0.103	0.364	1.560	0.346	2.484	0.953	0.927
	%RSD		1.8%	2.4%	1.7%	3.8%		
Ni (mg/L)	Mean	0.00	1.97	0.00	1.99	0.00	0.00	0.00
	Std Dev	0.009	0.036	0.008	0.034	0.008	0.010	0.010
	%RSD		1.8%		1.7%			
Si (mg/L)	Mean	-0.09	-0.37	39.95	-0.70	40.23	-0.04	0.19
	Std Dev	0.505	0.742	0.846	1.009	0.792	1.155	1.271
	%RSD			2.1%		2.0%		
Ti (mg/L)	Mean	0.00	1.98	0.00	1.99	0.00	0.00	0.00
	Std Dev	0.002	0.031	0.004	0.027	0.004	0.002	0.002
	%RSD		1.6%		1.3%			
U (mg/L)	Mean	0.13	0.08	0.05	0.14	0.06	9.84	9.78
	Std Dev	0.177	0.186	0.178	0.719	0.166	0.170	0.195
	%RSD						1.7%	2.0%
Zr (mg/L)	Mean	0.00	2.00	0.01	2.02	0.01	0.00	0.00
	Std Dev	0.004	0.040	0.023	0.037	0.023	0.003	0.003
	%RSD		2.0%		1.8%			

Table 2-3 provides the same type of summary information, but this time for only those measurements of the standards that were reported as part of the information for a process batch. For these data, the largest %RSD is that for Na (2.6%) for the IN34 standard.

Table 2-3 Measurements (mg/L) for Cold Chem Calibration and Bench Standards Reported in a Batch

		IN32	IN33	IN34	IN35	IN36	IN38	IN39
Element	N Rows	344	180	177	370	366	120	60
Al (mg/L)	Mean	0.02	9.89	0.00	9.98	0.00	0.02	0.02
	Std Dev	0.031	0.150	0.030	0.141	0.023	0.025	0.025
	%RSD		1.5%		1.4%			
B (mg/L)	Mean	0.00	-0.01	10.01	0.00	10.05	0.00	0.00
	Std Dev	0.035	0.038	0.136	0.038	0.110	0.037	0.036
	%RSD			1.4%		1.1%		
Ca (mg/L)	Mean	0.12	1.99	0.09	2.00	0.09	0.24	0.26
	Std Dev	0.111	0.043	0.069	0.046	0.092	0.215	0.238
	%RSD		2.2%		2.3%			
Cr (mg/L)	Mean	0.00	1.98	0.00	2.00	0.00	0.03	0.03
	Std Dev	0.006	0.032	0.003	0.030	0.003	0.004	0.005
	%RSD		1.6%		1.5%			
Cu (mg/L)	Mean	0.00	0.99	0.00	1.00	0.00	0.02	0.02
	Std Dev	0.004	0.018	0.005	0.016	0.004	0.012	0.013
	%RSD		1.8%		1.6%			
Fe (mg/L)	Mean	0.00	19.82	0.01	19.98	0.01	0.00	0.01
	Std Dev	0.080	0.305	0.050	0.277	0.048	0.029	0.020
	%RSD		1.5%		1.4%			
K (mg/L)	Mean	0.04	0.00	9.90	0.02	9.94	-0.02	-0.03
	Std Dev	0.066	0.060	0.144	0.075	0.120	0.064	0.067
	%RSD			1.5%		1.2%		
Li (mg/L)	Mean	0.00	0.00	9.94	0.00	9.97	0.00	0.00
	Std Dev	0.002	0.002	0.126	0.004	0.109	0.005	0.005
	%RSD			1.3%		1.1%		
Mg (mg/L)	Mean	0.00	1.00	0.01	1.01	0.01	0.00	0.00
	Std Dev	0.005	0.024	0.016	0.023	0.016	0.002	0.003
	%RSD		2.4%		2.2%			
Mn (mg/L)	Mean	0.00	0.99	0.01	1.00	0.01	0.00	0.00
	Std Dev	0.011	0.017	0.021	0.016	0.021	0.001	0.001
	%RSD		1.7%		1.6%			
Na (mg/L)	Mean	0.02	19.86	65.93	19.98	66.13	0.49	0.50
	Std Dev	0.087	0.366	1.731	0.365	1.619	1.045	1.048
	%RSD		1.8%	2.6%	1.8%	2.4%		
Ni (mg/L)	Mean	0.00	1.97	0.00	1.99	0.00	0.00	0.00
	Std Dev	0.008	0.037	0.007	0.034	0.007	0.007	0.008
	%RSD		1.9%		1.7%			
Si (mg/L)	Mean	-0.08	-0.27	40.01	-0.60	40.32	0.02	0.28
	Std Dev	0.526	0.514	0.747	0.480	0.724	0.913	0.920
	%RSD			1.9%		1.8%		
Ti (mg/L)	Mean	0.00	1.97	0.00	1.99	0.00	0.00	0.00
	Std Dev	0.002	0.033	0.004	0.029	0.004	0.002	0.002
	%RSD		1.7%		1.5%			
U (mg/L)	Mean	0.11	0.06	0.03	0.12	0.06	9.86	9.81
	Std Dev	0.186	0.179	0.179	0.277	0.150	0.165	0.206
	%RSD						1.7%	2.1%
Zr (mg/L)	Mean	0.00	2.00	0.01	2.02	0.01	0.00	0.00
	Std Dev	0.005	0.040	0.030	0.039	0.030	0.003	0.003
	%RSD		2.0%		1.9%			

Exhibit A3 in the Appendix provides an investigation into sources of variation for the standards with replicate measurements for each batch of SRAT analyses. The results are summarized in Table 2-4, which shows that the batch-to-batch contribution to the variation is usually larger than the within batch contribution for all of the standards except IN32.

Table 2-4 Variance Components and Percent Contribution by Standard for Cold Chem

		Components of Variance				% of Variance			
Element		IN32	IN35	IN36	IN38	IN32	IN35	IN36	IN38
Al (mg/L)	Batch-to-batch	0.000299	0.016965	0.000493	0.000633	31.2%	85.2%	95.2%	98.6%
	Residual	0.000659	0.002947	0.000025	0.000009	68.8%	14.8%	4.8%	1.4%
	Total	0.000958	0.019912	0.000518	0.000642				
B (mg/L)	Batch-to-batch	0.001074	0.001393	0.009086	0.001342	89.6%	94.1%	75.1%	98.2%
	Residual	0.000125	0.000088	0.003010	0.000025	10.4%	5.9%	24.9%	1.8%
	Total	0.001199	0.001481	0.012096	0.001367				
Ca (mg/L)	Batch-to-batch	0.010481	0.001878	0.007691	0.046479	84.6%	87.2%	91.2%	100.0%
	Residual	0.001902	0.000275	0.000741	0.000019	15.4%	12.8%	8.8%	0.0%
	Total	0.012383	0.002153	0.008432	0.046498				
Cr (mg/L)	Batch-to-batch	0.000010	0.000747	0.000006	0.000019	24.4%	84.1%	75.0%	96.4%
	Residual	0.000031	0.000141	0.000002	0.000001	75.6%	15.9%	25.0%	3.6%
	Total	0.000041	0.000888	0.000008	0.000020				
Cu (mg/L)	Batch-to-batch	0.000013	0.000208	0.000012	0.000148	76.5%	83.5%	92.3%	99.5%
	Residual	0.000004	0.000041	0.000001	0.000001	23.5%	16.5%	7.7%	0.5%
	Total	0.000017	0.000249	0.000013	0.000149				
Fe (mg/L)	Batch-to-batch	0.001963	0.063345	0.002277	0.000875	30.5%	82.6%	99.6%	99.9%
	Residual	0.004475	0.013354	0.000009	0.000001	69.5%	17.4%	0.4%	0.1%
	Total	0.006438	0.076699	0.002286	0.000876				
K (mg/L)	Batch-to-batch	0.002230	0.002630	0.011662	0.003819	51.5%	46.9%	80.2%	93.2%
	Residual	0.002100	0.002982	0.002877	0.000280	48.5%	53.1%	19.8%	6.8%
	Total	0.004330	0.005612	0.014539	0.004099				
Li (mg/L)	Batch-to-batch	0.000003	0.000006	0.009523	0.000019	60.0%	42.9%	80.3%	95.0%
	Residual	0.000002	0.000008	0.002334	0.000001	40.0%	57.1%	19.7%	5.0%
	Total	0.000005	0.000014	0.011857	0.000020				
Mg (mg/L)	Batch-to-batch	0.000006	0.000442	0.000257	0.000006	27.3%	86.0%	99.9%	99.9%
	Residual	0.000016	0.000072	0.000000	0.000000	72.7%	14.0%	0.1%	0.1%
	Total	0.000022	0.000514	0.000257	0.000006				
Mn (mg/L)	Batch-to-batch	0.000001	0.000230	0.000461	0.000001	0.7%	85.5%	99.9%	97.6%
	Residual	0.000126	0.000039	0.000000	0.000000	99.3%	14.5%	0.1%	2.4%
	Total	0.000127	0.000269	0.000461	0.000001				
Na (mg/L)	Batch-to-batch	0.001589	0.120675	2.491725	1.101650	20.9%	90.1%	94.7%	100.0%
	Residual	0.006006	0.013223	0.138330	0.000060	79.1%	9.9%	5.3%	0.0%
	Total	0.007595	0.133898	2.630055	1.101710				
Ni (mg/L)	Batch-to-batch	0.000031	0.000870	0.000033	0.000039	44.9%	73.5%	58.9%	72.2%
	Residual	0.000038	0.000313	0.000023	0.000015	55.1%	26.5%	41.1%	27.8%
	Total	0.000069	0.001183	0.000056	0.000054				
Si (mg/L)	Batch-to-batch	0.246320	0.225288	0.482651	0.816861	88.9%	97.4%	91.8%	97.3%
	Residual	0.030616	0.006131	0.043309	0.022892	11.1%	2.6%	8.2%	2.7%
	Total	0.276936	0.231419	0.525960	0.839753				
Ti (mg/L)	Batch-to-batch	0.000002	0.000710	0.000018	0.000003	69.7%	84.4%	97.8%	94.0%
	Residual	0.000001	0.000131	0.000000	0.000000	30.3%	15.6%	2.2%	6.0%
	Total	0.000003	0.000841	0.000018	0.000003				
U (mg/L)	Batch-to-batch	0.025843	0.025468	0.019956	0.024381	74.6%	33.1%	88.3%	88.5%
	Residual	0.008816	0.051482	0.002644	0.003165	25.4%	66.9%	11.7%	11.5%
	Total	0.034659	0.076950	0.022600	0.027546				
Zr (mg/L)	Batch-to-batch	0.000020	0.001389	0.000917	0.000006	95.2%	90.8%	99.9%	96.9%
	Residual	0.000001	0.000140	0.000001	0.000000	4.8%	9.2%	0.1%	3.1%
	Total	0.000021	0.001529	0.000918	0.000006				

As mentioned earlier, attempts were made during this data analysis to investigate for possible instrument drift. Comparisons between IN35 (Calibration Standard A) and IN33 (Bench Standard A) provide some insight into this possible problem for the Cold Chem data. Exhibit A4 in the Appendix presents a paired comparison between the measurements for these standards across the SRAT batches. The average of the two IN35 measurements was compared to the IN33 measurement for each batch. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., Al, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Ti, and Zr) except Ca. Table 2-5 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 1.25%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SRAT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-5 Insights into Instrument Drift by Comparisons of IN35 vs IN33 for Cold Chem

	Bench A	Cal A	
	IN33	IN35	%
N Rows	173	173	Diff
Mean(Al (mg/L))	9.8813	9.9783	-0.97%
Mean(B (mg/L))	-0.0119	-0.0035	
Mean(Ca (mg/L))	1.9938	1.9985	-0.23%
Mean(Cr (mg/L))	1.9820	2.0023	-1.01%
Mean(Cu (mg/L))	0.9926	1.0049	-1.23%
Mean(Fe (mg/L))	19.8142	19.9818	-0.84%
Mean(K (mg/L))	0.0027	0.0195	
Mean(Li (mg/L))	0.0007	0.0015	
Mean(Mg (mg/L))	1.0019	1.0099	-0.79%
Mean(Mn (mg/L))	0.9910	1.0013	-1.03%
Mean(Na (mg/L))	19.8535	19.9922	-0.69%
Mean(Ni (mg/L))	1.9680	1.9869	-0.95%
Mean(Si (mg/L))	-0.2732	-0.6047	
Mean(Ti (mg/L))	1.9722	1.9894	-0.87%
Mean(U (mg/L))	0.0646	0.1213	
Mean(Zr (mg/L))	1.9991	2.0171	-0.89%
Std Dev(Al (mg/L))	0.1464	0.1335	
Std Dev(B (mg/L))	0.0381	0.0385	
Std Dev(Ca (mg/L))	0.0426	0.0444	
Std Dev(Cr (mg/L))	0.0315	0.0286	
Std Dev(Cu (mg/L))	0.0177	0.0150	
Std Dev(Fe (mg/L))	0.2973	0.2617	
Std Dev(K (mg/L))	0.0580	0.0627	
Std Dev(Li (mg/L))	0.0023	0.0032	
Std Dev(Mg (mg/L))	0.0241	0.0217	
Std Dev(Mn (mg/L))	0.0164	0.0158	
Std Dev(Na (mg/L))	0.3634	0.3534	
Std Dev(Ni (mg/L))	0.0352	0.0321	
Std Dev(Si (mg/L))	0.5221	0.4882	
Std Dev(Ti (mg/L))	0.0326	0.0279	
Std Dev(U (mg/L))	0.1707	0.2245	
Std Dev(Zr (mg/L))	0.0401	0.0379	

Comparisons between IN34 (Bench Standard B) and IN36 (Calibration Standard B) also provide some insight into the possible problem of instrument drift for the Cold Chem data. Exhibit A5 in the Appendix presents a paired comparison between the measurements for these standards across the SRAT batches.

The average of the two IN36 measurements was compared to the IN34 measurement for each batch. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., B, K, Li, Na, and Si). Table 2-6 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 1.0%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SRAT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-6 Insights into Instrument Drift by Comparisons of IN36 vs IN34 for Cold Chem

	Bench B	Cal B	
	IN34	IN36	%
N Rows	172	172	Diff
Mean(Al (mg/L))	0.0006	0.0051	
Mean(B (mg/L))	10.0074	10.0553	-0.48%
Mean(Ca (mg/L))	0.0877	0.0873	
Mean(Cr (mg/L))	0.0006	0.0009	
Mean(Cu (mg/L))	-0.0002	0.0003	
Mean(Fe (mg/L))	0.0114	0.0086	
Mean(K (mg/L))	9.8971	9.9359	-0.39%
Mean(Li (mg/L))	9.9393	9.9740	-0.35%
Mean(Mg (mg/L))	0.0054	0.0050	
Mean(Mn (mg/L))	0.0066	0.0064	
Mean(Na (mg/L))	65.9269	66.1319	-0.31%
Mean(Ni (mg/L))	0.0008	0.0006	
Mean(Si (mg/L))	40.0109	40.3450	-0.83%
Mean(Ti (mg/L))	0.0025	0.0027	
Mean(U (mg/L))	0.0347	0.0659	
Mean(Zr (mg/L))	0.0096	0.0096	
Std Dev(Al (mg/L))	0.0299	0.0230	
Std Dev(B (mg/L))	0.1375	0.1034	
Std Dev(Ca (mg/L))	0.0686	0.0913	
Std Dev(Cr (mg/L))	0.0031	0.0027	
Std Dev(Cu (mg/L))	0.0046	0.0037	
Std Dev(Fe (mg/L))	0.0508	0.0485	
Std Dev(K (mg/L))	0.1439	0.1159	
Std Dev(Li (mg/L))	0.1260	0.1053	
Std Dev(Mg (mg/L))	0.0162	0.0160	
Std Dev(Mn (mg/L))	0.0214	0.0214	
Std Dev(Na (mg/L))	1.7407	1.6068	
Std Dev(Ni (mg/L))	0.0071	0.0066	
Std Dev(Si (mg/L))	0.7504	0.6954	
Std Dev(Ti (mg/L))	0.0044	0.0043	
Std Dev(U (mg/L))	0.1734	0.1477	
Std Dev(Zr (mg/L))	0.0302	0.0303	

Finally, comparisons between IN38 (Bench Standard C) and IN39 (Calibration Standard C) provide some insight into the possible problem of instrument drift for the Cold Chem data. Exhibit A6 in the Appendix presents a paired comparison between the measurements for these standards across the SRAT batches. The average of the two IN39 measurements was compared to the IN38 measurement for each batch. U is the only active element for this pair of standards, and the mean difference between the two standards was found to be statistically significant at the 5% level. Table 2-7 provides summary information for these measurements. This table reveals that although statistically significant, the % difference for U was only

0.53%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SRAT batches are also provided in this table, and a review of these statistics shows that the standard deviation for U for the bench standard is actually smaller than the U standard deviation for the corresponding calibration standard.

Table 2-7 Insights into Instrument Drift by Comparisons of IN39 vs IN38 for Cold Chem

	IN38 (Bench C)	IN39 (Cal C)	%
N Rows	59	59	Diff
Mean(Al (mg/L))	0.0204	0.0207	
Mean(B (mg/L))	0.0013	-0.0025	
Mean(Ca (mg/L))	0.2387	0.2551	
Mean(Cr (mg/L))	0.0280	0.0272	
Mean(Cu (mg/L))	0.0237	0.0234	
Mean(Fe (mg/L))	0.0044	0.0098	
Mean(K (mg/L))	-0.0227	-0.0317	
Mean(Li (mg/L))	0.0016	0.0019	
Mean(Mg (mg/L))	0.0017	0.0022	
Mean(Mn (mg/L))	0.0021	0.0025	
Mean(Na (mg/L))	0.4935	0.5075	
Mean(Ni (mg/L))	0.0038	0.0033	
Mean(Si (mg/L))	0.0420	0.2809	
Mean(Ti (mg/L))	0.0003	0.0001	
Mean(U (mg/L))	9.8575	9.8052	0.53%
Mean(Zr (mg/L))	0.0012	0.0010	
Std Dev(Al (mg/L))	0.0250	0.0252	
Std Dev(B (mg/L))	0.0371	0.0357	
Std Dev(Ca (mg/L))	0.2167	0.2398	
Std Dev(Cr (mg/L))	0.0044	0.0045	
Std Dev(Cu (mg/L))	0.0123	0.0132	
Std Dev(Fe (mg/L))	0.0181	0.0205	
Std Dev(K (mg/L))	0.0634	0.0678	
Std Dev(Li (mg/L))	0.0045	0.0049	
Std Dev(Mg (mg/L))	0.0024	0.0027	
Std Dev(Mn (mg/L))	0.0007	0.0015	
Std Dev(Na (mg/L))	1.0566	1.0552	
Std Dev(Ni (mg/L))	0.0069	0.0080	
Std Dev(Si (mg/L))	0.8987	0.9276	
Std Dev(Ti (mg/L))	0.0017	0.0019	
Std Dev(U (mg/L))	0.1625	0.2077	
Std Dev(Zr (mg/L))	0.0026	0.0027	

Thus, the review of the Cold Chem bench and calibration standard measurements gives no indication of any instrument drift of practical concern over the course of the block of Cold Chem measurements needed to process a SRAT batch. The results presented in Table 2-1 through Table 2-7 also provide an opportunity to address one additional question regarding the calibration standards: Are the replicate measurements of IN35, IN36, and IN38 at the beginning of each Cold Chem block worthwhile as a feature of the quality assurance of this analytical process? In Table 2-4 note that the within batch (residual) variances for these calibrations standards are typically smaller than the between batch (batch-to-batch) variances, while the standard deviations of Table 2-5 through Table 2-7 suggest that the batch to batch variances of the calibration standards are comparable to the batch-to-batch variances of the bench standards. Thus, these results indicate that there is no practical drift in the precision of these measurements over a Cold Chem block and that the replicate measurements of the calibration standards at the beginning of the Cold Chem block are not needed.

2.1.2 Cold Chem ARG-1 Results

Exhibit A7 in the Appendix provides time plots in the form of control charts of the elemental measurements of the ARG-1 standard glass under the Cold Chem protocol. These measurements are in elemental weight percent (wt%), and the displays are in analytical sequence. The plotted values represented by an "×" are measurements that were not associated with a particular process batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistencies in precision.

Exhibit A8 in the Appendix provides histograms and descriptive statistics for all of the ARG-1 data while Exhibit A9 in the Appendix provides the same information for the ARG-1 results associated with a SRAT batch. The reference values and the means for both groups of ARG-1 measurements are given in Table 2-8. The % relative difference (% Rel Diff) for each element for each group is also provided. Note that all of the % relative differences (or % biases) of the measured versus reference values for all of the major oxides (those in concentrations greater than 0.5 wt%) are negative except for Ca. Also, the largest bias for these major oxides is that of Al. Also, the standard deviations and percent relative standard deviations (% Rel Std Dev's) are presented in this table. All of these %RSD's are less than 5% (for the major elements) except for the 8.5% RSD for Ca.

Table 2-8 ARG-1 Results for Cold Chem Samples

		All of the Available Data (n = 480)				Data Associated with SRAT Batches (n = 323)			
Element	Ref Value	Mean wt%	% Rel Diff	Std Dev	% Rel Std Dev	Mean wt%	% Rel Diff	Std Dev	% Rel Std Dev
Al (wt%)	2.5	2.347	-6.11%	0.126	5.37%	2.357	-5.72%	0.083	3.54%
B (wt%)	2.69	2.629	-2.25%	0.089	3.38%	2.635	-2.03%	0.094	3.58%
Ca (wt%)	1.02	1.030	0.97%	0.109	10.54%	1.040	1.93%	0.088	8.51%
Cr (wt%)	0.06	0.068	13.28%	0.003	4.96%	0.068	12.84%	0.003	4.70%
Cu (wt%)	0.0001	0.005		0.003		0.004		0.003	
Fe (wt%)	9.79	9.675	-1.18%	0.286	2.96%	9.667	-1.26%	0.286	2.96%
K (wt%)	2.25	2.242	-0.35%	0.074	3.30%	2.238	-0.53%	0.075	3.34%
Li (wt%)	1.49	1.478	-0.80%	0.052	3.53%	1.483	-0.47%	0.047	3.20%
Mg (wt%)	0.52	0.492	-5.47%	0.045	9.13%	0.497	-4.46%	0.024	4.86%
Mn (wt%)	1.46	1.430	-2.06%	0.044	3.06%	1.428	-2.17%	0.042	2.94%
Na (wt%)	8.53	8.419	-1.30%	0.292	3.47%	8.438	-1.08%	0.288	3.41%
Ni (wt%)	0.83	0.817	-1.61%	0.025	3.09%	0.815	-1.78%	0.026	3.13%
Si (wt%)	22.39	22.088	-1.35%	0.793	3.59%	22.162	-1.02%	0.816	3.68%
Ti (wt%)	0.69	0.683	-1.07%	0.020	2.95%	0.681	-1.27%	0.020	2.97%
U (wt%)	0	0.111		0.122		0.096		0.132	
Zr (wt%)	0.1	0.105	4.62%	0.005	4.84%	0.104	4.39%	0.005	4.78%

Exhibit A10 in the Appendix provides an investigation into sources of variation for the replicated ARG-1 measurements within each block of SRAT analyses. The results are summarized in Table 2-9. For most of the major elements, the variation within a batch is comparable to the variation between the batches for these data.

Table 2-9 Components of Variation for ARG-1 Results for Cold Chem Samples

	Mean	Variance			% Variance		%RSD	%RSD	%RSD
Element	wt%	Batch	Residual	Total	% Batch	% Residual	Batch	Residual	Total
Al (wt%)	2.356	0.001801	0.005295	0.007096	25.38%	74.62%	1.80%	3.09%	3.58%
B (wt%)	2.634	0.003657	0.005411	0.009068	40.33%	59.67%	2.30%	2.79%	3.61%
Ca (wt%)	1.039	0.004858	0.002965	0.007823	62.10%	37.90%	6.71%	5.24%	8.52%
Cr (wt%)	0.068	0.000004	0.000006	0.000010	40.00%	60.00%	2.96%	3.62%	4.67%
Cu (wt%)	0.004	0.000009	0.000001	0.000010	90.00%	10.00%	69.17%	23.06%	72.91%
Fe (wt%)	9.661	0.013305	0.067327	0.080632	16.50%	83.50%	1.19%	2.69%	2.94%
K (wt%)	2.238	0.001781	0.003892	0.005673	31.39%	68.61%	1.89%	2.79%	3.37%
Li (wt%)	1.483	0.000684	0.001619	0.002303	29.70%	70.30%	1.76%	2.71%	3.24%
Mg (wt%)	0.497	0.000250	0.000351	0.000601	41.60%	58.40%	3.18%	3.77%	4.94%
Mn (wt%)	1.427	0.000271	0.001474	0.001745	15.53%	84.47%	1.15%	2.69%	2.93%
Na (wt%)	8.435	0.017106	0.066766	0.083872	20.40%	79.60%	1.55%	3.06%	3.43%
Ni (wt%)	0.814	0.001210	0.000514	0.001724	70.19%	29.81%	4.27%	2.78%	5.10%
Si (wt%)	22.160	0.274867	0.404762	0.679629	40.44%	59.56%	2.37%	2.87%	3.72%
Ti (wt%)	0.681	0.000073	0.000327	0.000400	18.25%	81.75%	1.26%	2.66%	2.94%
U (wt%)	0.098	0.015337	0.001946	0.017283	88.74%	11.26%	126.13%	44.93%	133.89%
Zr (wt%)	0.104	0.000014	0.000010	0.000024	58.33%	41.67%	3.59%	3.03%	4.69%

2.2 MIXED ACID RESULTS

Recall the analytical protocol (provided in Table 1-4) for SME and MFT samples analyzed by the Mixed Acid prep method. In Section 2.2.1, the calibration and bench standards are investigated. All of the available data are initially explored with the measurements of the standards associated with the SME and MFT batches subsequently investigated. The elemental measurements for these standards are expressed as mg/L. Section 2.2.2 provides a discussion of the ARG-1 measurements generated under the Mixed Acid prep. The ARG-1 measurements are expressed in elemental wt%.

2.2.1 Mixed Acid Calibration and Bench Standards

Exhibit A11 in the Appendix provides time plots in the form of control charts of the elemental measurements of each of the calibration and bench standards used as part of the Mixed Acid protocol for both SME and MFT samples. These measurement are in mg/L, the displays are in analytical sequence by element for each of the standards. The plotted values represented by an "×" are measurements that were not associated with a particular process batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistency precision.

Exhibit A12 provides histograms and descriptive statistics for all of these data. The means and reference values for the standards are given in Table 2-10. The % relative differences (% Rel Diff) of these measurements are also in this table; note that even without any screening of the data the largest % Rel Diff is only 3.4%.

Table 2-10 Means & Relative Biases for All Measurements (mg/L) for Mixed Acid Calibration & Bench Standards

		SM32	SM33	SM34	SM35	SM36	SM37	SM38
Element	N Rows	687	508	509	1104	1098	702	1176
Al (mg/L)	Mean	0.01	0.01	1.97	0.01	1.99	0.03	0.05
	Ref Value	0	0	2	0	2	0	0
	% Rel Diff			-1.3%		-0.7%		
Ca (mg/L)	Mean	0.01	1.00	0.02	1.01	0.01	0.26	0.26
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.2%		0.8%			
Cr (mg/L)	Mean	0.00	0.99	0.00	1.00	0.00	0.03	0.03
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.6%		0.5%			
Cu (mg/L)	Mean	0.00	1.00	0.00	1.00	0.00	0.02	0.02
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.4%		0.4%			
Fe (mg/L)	Mean	0.01	-0.01	9.90	-0.01	9.94	0.01	0.00
	Ref Value	0	0	10	0	10	0	0
	% Rel Diff			-1.0%		-0.6%		
K (mg/L)	Mean	0.06	4.92	0.01	4.98	0.01	-0.01	0.00
	Ref Value	0	5	0	5	0	0	0
	% Rel Diff		-1.6%		-0.4%			
Li (mg/L)	Mean	0.00	1.98	0.01	1.99	0.01	0.00	0.00
	Ref Value	0	2	0	2	0	0	0
	% Rel Diff		-1.2%		-0.4%			
Mg (mg/L)	Mean	0.00	1.01	0.00	1.02	0.00	0.00	0.00
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		0.7%		1.6%			
Mn (mg/L)	Mean	0.00	0.00	1.97	0.00	1.98	0.00	0.00
	Ref Value	0	0	2	0	2	0	0
	% Rel Diff			-1.5%		-0.9%		
Na (mg/L)	Mean	0.01	32.80	4.90	33.10	4.92	0.08	0.09
	Ref Value	0	32	5	32	5	0	0
	% Rel Diff		2.5%	-1.9%	3.4%	-1.6%		
Ni (mg/L)	Mean	0.01	1.00	0.01	1.01	0.01	0.00	0.00
	Ref Value	0	1	0	1	0	0	0
	% Rel Diff		-0.4%		0.6%			
Si (mg/L)	Mean	0.09	20.27	0.09	20.43	0.09	0.30	0.13
	Ref Value	0	20	0	20	0	0	0
	% Rel Diff		1.3%		2.1%			
Ti (mg/L)	Mean	0.01	0.00	0.99	0.00	1.00	0.00	0.00
	Ref Value	0	0	1	0	1	0	0
	% Rel Diff			-0.7%		-0.3%		
U (mg/L)	Mean	0.18	0.04	0.06	0.11	0.09	9.86	9.93
	Ref Value	0	0	0	0	0	10	10
	% Rel Diff						-1.4%	-0.7%
Zr (mg/L)	Mean	-0.01	-0.01	0.98	-0.01	0.98	0.00	0.00
	Ref Value	0	0	1	0	1	0	0
	% Rel Diff			-2.2%		-1.8%		

The % relative standard deviations (% RSDs) were computed from the means and standard deviations of Exhibit A12 and these data are provided in Table 2-11. Note that all of the %RSDs are less than or equal to 3.1% even without any screening of the data.

Table 2-11 Descriptive Statistics for All Mixed Acid Calibration and Bench Standard Measurements

		SM32	SM33	SM34	SM35	SM36	SM37	SM38
Element	N Rows	687	508	509	1104	1098	702	1176
Al (mg/L)	Mean	0.01	0.01	1.97	0.01	1.99	0.03	0.05
	Std Dev	0.050	0.232	0.032	0.225	0.031	0.042	0.107
	%RSD			1.6%		1.6%		
Ca (mg/L)	Mean	0.01	1.00	0.02	1.01	0.01	0.26	0.26
	Std Dev	0.053	0.026	0.065	0.025	0.045	0.339	0.320
	%RSD		2.6%		2.5%			
Cr (mg/L)	Mean	0.00	0.99	0.00	1.00	0.00	0.03	0.03
	Std Dev	0.007	0.019	0.003	0.019	0.003	0.014	0.010
	%RSD		1.9%		1.9%			
Cu (mg/L)	Mean	0.00	1.00	0.00	1.00	0.00	0.02	0.02
	Std Dev	0.004	0.015	0.007	0.015	0.011	0.027	0.027
	%RSD		1.5%		1.5%			
Fe (mg/L)	Mean	0.01	-0.01	9.90	-0.01	9.94	0.01	0.00
	Std Dev	0.078	0.023	0.159	0.024	0.147	0.341	0.037
	%RSD			1.6%		1.5%		
K (mg/L)	Mean	0.06	4.92	0.01	4.98	0.01	-0.01	0.00
	Std Dev	0.083	0.088	0.062	0.091	0.061	0.057	0.058
	%RSD		1.8%		1.8%			
Li (mg/L)	Mean	0.00	1.98	0.01	1.99	0.01	0.00	0.00
	Std Dev	0.003	0.031	0.019	0.031	0.092	0.003	0.002
	%RSD		1.6%		1.6%			
Mg (mg/L)	Mean	0.00	1.01	0.00	1.02	0.00	0.00	0.00
	Std Dev	0.005	0.025	0.010	0.022	0.008	0.007	0.005
	%RSD		2.5%		2.2%			
Mn (mg/L)	Mean	0.00	0.00	1.97	0.00	1.98	0.00	0.00
	Std Dev	0.010	0.002	0.035	0.002	0.033	0.006	0.001
	%RSD			1.8%		1.7%		
Na (mg/L)	Mean	0.01	32.80	4.90	33.10	4.92	0.08	0.09
	Std Dev	0.184	1.023	0.107	0.994	0.103	0.450	0.493
	%RSD		3.1%	2.2%	3.0%	2.1%		
Ni (mg/L)	Mean	0.01	1.00	0.01	1.01	0.01	0.00	0.00
	Std Dev	0.012	0.018	0.008	0.018	0.008	0.008	0.008
	%RSD		1.9%		1.8%			
Si (mg/L)	Mean	0.09	20.27	0.09	20.43	0.09	0.30	0.13
	Std Dev	0.589	0.476	0.434	0.432	0.373	0.607	0.525
	%RSD		2.3%		2.1%			
Ti (mg/L)	Mean	0.01	0.00	0.99	0.00	1.00	0.00	0.00
	Std Dev	0.025	0.001	0.018	0.001	0.018	0.002	0.002
	%RSD			1.8%		1.8%		
U (mg/L)	Mean	0.18	0.04	0.06	0.11	0.09	9.86	9.93
	Std Dev	0.187	0.149	0.148	0.337	0.338	0.216	0.202
	%RSD						2.2%	2.0%
Zr (mg/L)	Mean	-0.01	-0.01	0.98	-0.01	0.98	0.00	0.00
	Std Dev	0.016	0.015	0.014	0.016	0.014	0.014	0.015
	%RSD			1.5%		1.4%		

Table 2-12 provides the same type of summary information, but this time for only those measurements of the calibration and bench standards that were reported as part of the information for a process (SME or MFT) batch. Note that the largest %RSD is only 3.1% for these data.

Table 2-12 Descriptive Statistics for Mixed Acid Calibration and Bench Standards in a Process Batch

		SM32	SM33	SM34	SM35	SM36	SM37	SM38
Element	N Rows	619	319	324	640	642	334	640
Al (mg/L)	Mean	0.011	0.015	1.972	0.021	1.986	0.044	0.054
	Std Dev	0.050	0.292	0.030	0.295	0.028	0.019	0.136
	%RSD			1.5%		1.4%		
Ca (mg/L)	Mean	0.013	0.996	0.020	1.010	0.014	0.281	0.277
	Std Dev	0.052	0.026	0.071	0.024	0.050	0.360	0.350
	%RSD		2.6%		2.4%			
Cr (mg/L)	Mean	0.004	0.994	0.002	1.006	0.002	0.028	0.029
	Std Dev	0.007	0.019	0.003	0.017	0.002	0.005	0.005
	%RSD		1.9%		1.7%			
Cu (mg/L)	Mean	0.002	0.996	0.002	1.004	0.002	0.020	0.021
	Std Dev	0.004	0.014	0.003	0.014	0.003	0.037	0.033
	%RSD		1.4%		1.4%			
Fe (mg/L)	Mean	0.004	-0.007	9.897	-0.009	9.940	-0.005	-0.006
	Std Dev	0.056	0.022	0.143	0.024	0.126	0.024	0.025
	%RSD			1.4%		1.3%		
K (mg/L)	Mean	0.059	4.912	0.008	4.986	0.015	-0.006	0.003
	Std Dev	0.078	0.083	0.052	0.084	0.053	0.051	0.048
	%RSD		1.7%		1.7%			
Li (mg/L)	Mean	0.003	1.971	0.007	1.993	0.011	0.001	0.001
	Std Dev	0.003	0.028	0.020	0.031	0.120	0.002	0.002
	%RSD		1.4%		1.6%			
Mg (mg/L)	Mean	0.001	1.007	0.003	1.017	0.003	0.005	0.005
	Std Dev	0.005	0.023	0.012	0.021	0.008	0.005	0.005
	%RSD		2.3%		2.1%			
Mn (mg/L)	Mean	0.001	0.000	1.969	0.000	1.980	0.002	0.001
	Std Dev	0.010	0.002	0.033	0.002	0.030	0.001	0.001
	%RSD			1.7%		1.5%		
Na (mg/L)	Mean	0.013	32.702	4.906	33.050	4.921	0.115	0.117
	Std Dev	0.191	0.999	0.103	0.916	0.097	0.544	0.556
	%RSD		3.1%	2.1%	2.8%	2.0%		
Ni (mg/L)	Mean	0.005	0.995	0.009	1.007	0.009	0.002	0.002
	Std Dev	0.012	0.017	0.008	0.018	0.008	0.008	0.008
	%RSD		1.7%		1.8%			
Si (mg/L)	Mean	0.088	20.257	0.121	20.458	0.105	0.427	0.172
	Std Dev	0.567	0.481	0.469	0.411	0.377	0.646	0.577
	%RSD		2.4%		2.0%			
Ti (mg/L)	Mean	0.014	0.000	0.993	0.001	0.997	0.001	0.001
	Std Dev	0.026	0.001	0.018	0.001	0.018	0.002	0.001
	%RSD			1.8%		1.8%		
U (mg/L)	Mean	0.172	0.031	0.056	0.100	0.080	9.846	9.913
	Std Dev	0.187	0.145	0.144	0.105	0.107	0.180	0.179
	%RSD						1.8%	1.8%
Zr (mg/L)	Mean	-0.007	-0.007	0.977	-0.006	0.982	-0.005	-0.005
	Std Dev	0.016	0.015	0.013	0.015	0.012	0.016	0.015
	%RSD			1.3%		1.2%		

Exhibit A13 in the Appendix provides an investigation into sources of variation for the calibration and bench standards with replicate measurements within each block of SME or MFT analyses. The analysis combines the SME and MFT blocks into a single dataset with the intention of estimating between batch and within batch (residual) variation. A summary of the results is provided in Table 2-13, which shows, in general, that the larger contributor to the variation in these data was the batch-to-batch variation.

Table 2-13 Components of Variance for Mixed Acid Calibration and Bench Standards in a Process Batch

		Components of Variance				% of Variance			
Element		SM32	SM35	SM36	SM38	SM32	SM35	SM36	SM38
Al (mg/L)	Batch-to-batch	0.001169	0.087404	0.000745	0.018593	46.0%	100.0%	91.7%	99.9%
	Residual	0.001373	0.000016	0.000067	0.000023	54.0%	0.0%	8.3%	0.1%
	Total	0.002542	0.087420	0.000812	0.018616				
Ca (mg/L)	Batch-to-batch	0.000775	0.000508	0.002482	0.117891	28.6%	86.7%	97.7%	96.2%
	Residual	0.001934	0.000078	0.000058	0.004636	71.4%	13.3%	2.3%	3.8%
	Total	0.002709	0.000586	0.002540	0.122527				
Cr (mg/L)	Batch-to-batch	0.000012	0.000272	0.000004	0.000023	26.7%	91.9%	89.3%	88.5%
	Residual	0.000033	0.000024	0.000000	0.000003	73.3%	8.1%	10.7%	11.5%
	Total	0.000045	0.000296	0.000004	0.000026				
Cu (mg/L)	Batch-to-batch	0.000012	0.000175	0.000007	0.001116	63.2%	89.3%	94.4%	99.7%
	Residual	0.000007	0.000021	0.000000	0.000003	36.8%	10.7%	5.6%	0.3%
	Total	0.000019	0.000196	0.000007	0.001119				
Fe (mg/L)	Batch-to-batch	0.000896	0.000550	0.014124	0.000612	28.2%	98.9%	89.4%	96.8%
	Residual	0.002278	0.000006	0.001668	0.000020	71.8%	1.1%	10.6%	3.2%
	Total	0.003174	0.000556	0.015792	0.000632				
K (mg/L)	Batch-to-batch	0.003043	0.005879	0.001766	0.001624	49.6%	82.6%	62.8%	69.6%
	Residual	0.003091	0.001235	0.001048	0.000708	50.4%	17.4%	37.2%	30.4%
	Total	0.006134	0.007114	0.002814	0.002332				
Li (mg/L)	Batch-to-batch	0.000005	0.000913	0.000704	0.000003	62.5%	91.9%	4.9%	85.7%
	Residual	0.000003	0.000080	0.013696	0.000001	37.5%	8.1%	95.1%	14.3%
	Total	0.000008	0.000993	0.014400	0.000004				
Mg (mg/L)	Batch-to-batch	0.000011	0.000395	0.000071	0.000027	42.3%	86.4%	99.5%	97.4%
	Residual	0.000015	0.000062	0.000000	0.000001	57.7%	13.6%	0.5%	2.6%
	Total	0.000026	0.000457	0.000071	0.000028				
Mn (mg/L)	Batch-to-batch	0.000002	0.000004	0.000831	0.000001	2.0%	96.5%	93.5%	83.1%
	Residual	0.000099	0.000000	0.000058	0.000000	98.0%	3.5%	6.5%	16.9%
	Total	0.000101	0.000004	0.000889	0.000001				
Na (mg/L)	Batch-to-batch	0.008084	0.819909	0.008932	0.309782	22.0%	97.7%	95.3%	100.0%
	Residual	0.028598	0.019729	0.000439	0.000041	78.0%	2.3%	4.7%	0.0%
	Total	0.036682	0.839638	0.009371	0.309823				
Ni (mg/L)	Batch-to-batch	0.000055	0.000213	0.000033	0.000035	39.9%	68.5%	56.9%	61.4%
	Residual	0.000083	0.000098	0.000025	0.000022	60.1%	31.5%	43.1%	38.6%
	Total	0.000138	0.000311	0.000058	0.000057				
Si (mg/L)	Batch-to-batch	0.258251	0.142166	0.126453	0.268065	80.2%	84.1%	88.8%	80.3%
	Residual	0.063628	0.026969	0.015925	0.065902	19.8%	15.9%	11.2%	19.7%
	Total	0.321879	0.169135	0.142378	0.333967				
Ti (mg/L)	Batch-to-batch	0.000432	0.000001	0.000299	0.000002	66.3%	82.7%	95.5%	89.2%
	Residual	0.000220	0.000000	0.000014	0.000000	33.7%	17.3%	4.5%	10.8%
	Total	0.000652	0.000001	0.000313	0.000002				
U (mg/L)	Batch-to-batch	0.021752	0.009920	0.010613	0.027521	61.9%	89.4%	93.0%	85.3%
	Residual	0.013400	0.001179	0.000796	0.004741	38.1%	10.6%	7.0%	14.7%
	Total	0.035152	0.011099	0.011409	0.032262				
Zr (mg/L)	Batch-to-batch	0.000243	0.000228	0.000123	0.000235	99.2%	99.7%	89.8%	99.6%
	Residual	0.000002	0.000001	0.000014	0.000001	0.8%	0.3%	10.2%	0.4%
	Total	0.000245	0.000229	0.000137	0.000236				

As for the Cold Chem measurements, attempts were made during this data analysis to investigate for possible instrument drift in the Mixed Acid data. Comparisons between SM35 (Calibration Standard A) and SM33 (Bench Standard A) provide some insight into this possible problem for the Mixed Acid data. Exhibit A14 in the Appendix presents a paired comparison between the measurements for these standards across the SME and MFT batches. The average of the two SM35 measurements was compared to the

SM33 measurement for each batch. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., Ca, Cr, Cu, K, Li, Mg, Na, Ni, and Si). Table 2-14 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 1.50%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these Mixed Acid measurements across the SME and MFT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-14 Insights into Mixed Acid Instrument Drift by Comparisons of SM35 vs SM33

	Bench A	Cal A	
	SM33	SM35	%
N Rows	305	305	Diff
Mean(Al (mg/L))	0.0162	0.0217	
Mean(Ca (mg/L))	0.9953	1.0103	-1.49%
Mean(Cr (mg/L))	0.9944	1.0066	-1.21%
Mean(Cu (mg/L))	0.9942	1.0054	-1.11%
Mean(Fe (mg/L))	-0.0070	-0.0081	
Mean(K (mg/L))	4.9121	4.9847	-1.46%
Mean(Li (mg/L))	1.9706	1.9930	-1.12%
Mean(Mg (mg/L))	1.0064	1.0176	-1.10%
Mean(Mn (mg/L))	0.0002	0.0001	
Mean(Na (mg/L))	32.7116	33.0419	-1.00%
Mean(Ni (mg/L))	0.9947	1.0072	-1.24%
Mean(Si (mg/L))	20.2611	20.4596	-0.97%
Mean(Ti (mg/L))	0.0001	0.0007	
Mean(U (mg/L))	0.0298	0.0980	
Mean(Zr (mg/L))	-0.0069	-0.0058	
Std Dev(Al (mg/L))	0.2989	0.3028	
Std Dev(Ca (mg/L))	0.0258	0.0235	
Std Dev(Cr (mg/L))	0.0185	0.0168	
Std Dev(Cu (mg/L))	0.0139	0.0136	
Std Dev(Fe (mg/L))	0.0227	0.0229	
Std Dev(K (mg/L))	0.0832	0.0804	
Std Dev(Li (mg/L))	0.0279	0.0309	
Std Dev(Mg (mg/L))	0.0228	0.0201	
Std Dev(Mn (mg/L))	0.0019	0.0020	
Std Dev(Na (mg/L))	1.0046	0.8880	
Std Dev(Ni (mg/L))	0.0172	0.0164	
Std Dev(Si (mg/L))	0.4827	0.3965	
Std Dev(Ti (mg/L))	0.0014	0.0011	
Std Dev(U (mg/L))	0.1468	0.1031	
Std Dev(Zr (mg/L))	0.0155	0.0154	

Comparisons between SM36 (Calibration Standard B) and SM34 (Bench Standard B) also provide some insight into the possible problem of instrument drift for the Mixed Acid data. Exhibit A15 in the Appendix presents a paired comparison between the measurements for these standards across the SME and MFT batches for this prep method. The average of the two SM36 measurements was compared to the SM34 measurement for each batch and vessel combination. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., Al, Fe, Mn, Na, Ti, and Zr). Table 2-15 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 1.0%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SME and MFT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-15 Insights into Instrument Drift by Comparisons of SM36 vs SM34 for Mixed Acid

	Bench B	Cal B	
	SM34	SM36	%
N Rows	314	313	Diff
Mean(Al (mg/L))	1.9725	1.9857	-0.67%
Mean(Ca (mg/L))	0.0186	0.0142	
Mean(Cr (mg/L))	0.0019	0.0023	
Mean(Cu (mg/L))	0.0007	0.0012	
Mean(Fe (mg/L))	9.8966	9.9390	-0.43%
Mean(K (mg/L))	0.0075	0.0143	
Mean(Li (mg/L))	0.0069	0.0116	
Mean(Mg (mg/L))	0.0034	0.0027	
Mean(Mn (mg/L))	1.9694	1.9795	-0.51%
Mean(Na (mg/L))	4.9059	4.9208	-0.30%
Mean(Ni (mg/L))	0.0087	0.0091	
Mean(Si (mg/L))	0.1246	0.1131	
Mean(Ti (mg/L))	0.9929	0.9974	-0.45%
Mean(U (mg/L))	0.0554	0.0802	
Mean(Zr (mg/L))	0.9769	0.9815	-0.47%
Std Dev(Al (mg/L))	0.0302	0.0281	
Std Dev(Ca (mg/L))	0.0699	0.0506	
Std Dev(Cr (mg/L))	0.0027	0.0021	
Std Dev(Cu (mg/L))	0.0033	0.0027	
Std Dev(Fe (mg/L))	0.1424	0.1225	
Std Dev(K (mg/L))	0.0524	0.0482	
Std Dev(Li (mg/L))	0.0205	0.0870	
Std Dev(Mg (mg/L))	0.0118	0.0086	
Std Dev(Mn (mg/L))	0.0329	0.0295	
Std Dev(Na (mg/L))	0.1036	0.0964	
Std Dev(Ni (mg/L))	0.0079	0.0068	
Std Dev(Si (mg/L))	0.4747	0.3604	
Std Dev(Ti (mg/L))	0.0182	0.0176	
Std Dev(U (mg/L))	0.1449	0.1058	
Std Dev(Zr (mg/L))	0.0127	0.0114	

Finally, comparisons between SM38 (Bench Standard C) and SM37 (Calibration Standard C) provide some insight into the possible problem of instrument drift for the Mixed Acid data. Exhibit A16 in the Appendix presents a paired comparison between the measurements for these standards across the SME and MFT batches that used the Mixed Acid prep. The average of the two SM38 measurements was compared to the SM37 measurement for each batch. U is the only active element for this pair of standards, and the mean difference between the two standards was found to be statistically significant at the 5% level. Table 2-16 provides summary information for these measurements. This table reveals that although statistically significant, the % difference for U was only 0.68%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SRAT batches are also provided in this table, and a review of these statistics shows that the standard deviation for U for the bench standard is actually smaller than the U standard deviation for the corresponding calibration standard.

Table 2-16 Insights into Instrument Drift by Comparisons of SM38 vs SM37 for Mixed Acid

	Bench C	Cal C	
	SM37	SM38	%
N Rows	312	311	Diff
Mean(Al (mg/L))	0.0444	0.0540	
Mean(Ca (mg/L))	0.2877	0.2778	
Mean(Cr (mg/L))	0.0286	0.0291	
Mean(Cu (mg/L))	0.0251	0.0251	
Mean(Fe (mg/L))	-0.0052	-0.0060	
Mean(K (mg/L))	-0.0069	0.0032	
Mean(Li (mg/L))	0.0005	0.0006	
Mean(Mg (mg/L))	0.0052	0.0048	
Mean(Mn (mg/L))	0.0016	0.0015	
Mean(Na (mg/L))	0.1181	0.1184	
Mean(Ni (mg/L))	0.0019	0.0025	
Mean(Si (mg/L))	0.4320	0.1827	
Mean(Ti (mg/L))	0.0009	0.0011	
Mean(U (mg/L))	9.8445	9.9120	-0.68%
Mean(Zr (mg/L))	-0.0052	-0.0048	
Std Dev(Al (mg/L))	0.0182	0.1383	
Std Dev(Ca (mg/L))	0.3688	0.3501	
Std Dev(Cr (mg/L))	0.0047	0.0049	
Std Dev(Cu (mg/L))	0.0380	0.0339	
Std Dev(Fe (mg/L))	0.0246	0.0250	
Std Dev(K (mg/L))	0.0515	0.0446	
Std Dev(Li (mg/L))	0.0022	0.0018	
Std Dev(Mg (mg/L))	0.0051	0.0052	
Std Dev(Mn (mg/L))	0.0012	0.0012	
Std Dev(Na (mg/L))	0.5612	0.5639	
Std Dev(Ni (mg/L))	0.0077	0.0068	
Std Dev(Si (mg/L))	0.6324	0.5342	
Std Dev(Ti (mg/L))	0.0016	0.0014	
Std Dev(U (mg/L))	0.1773	0.1728	
Std Dev(Zr (mg/L))	0.0158	0.0155	

Thus, overall for the Mixed Acid data there is no indication of any instrument drift of practical concern over the course of a block of measurements needed to process a SME or MFT batch. The results presented in Table 2-10 through Table 2-16 also provide an opportunity to address one additional question regarding the calibration standards: Are the replicate measurements of SM36, SM37, and SM38 at the beginning of each Mixed Acid block worthwhile as a feature of the quality assurance of this analytical process? In Table 2-13 note that the within batch (residual) variances for these calibration standards are typically smaller than the between batch (batch-to-batch) variances, while the standard deviations of Table 2-14 through Table 2-16 suggest that the batch to batch variances of the calibration standards are comparable to the batch-to-batch variances of the bench standards. Thus, these results indicate that there is no practical drift in the precision of these measurements over a Mixed Acid block and that the replicate measurements of the calibration standards at the beginning of the Mixed Acid block are not needed.

2.2.2 Mixed Acid ARG-1 Results

Exhibit A17 in the Appendix provides time plots in the form of control charts of the elemental measurements of the ARG-1 standard glass under the Mixed Acid protocol. These measurements are in elemental weight percent (wt%), and the displays are in analytical sequence. The plotted values represented by an "×" are measurements that were not associated with a particular process (SME or MFT) batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistencies in precision.

Exhibit A18 in the Appendix provides histograms and descriptive statistics for all of the ARG-1 data while Exhibit A19 in the Appendix provides the same information for the ARG-1 results associated with a SME or MFT batch. The means and reference values for both groups of ARG-1 measurements are given in Table 2-17. The % relative difference (% Rel Diff) for each element for each group is also provided. Note that all of the % relative differences (or % biases) of the measured versus reference values are less than 5% for all of the elements present in ARG-1 at concentrations of at least 0.1 wt%. The table also presents the standard deviations and % RSDs for these data. For the major elements, the %RSDs are all less than 5%. Also, note that the bias in the Si values generated using the Mixed Acid prep is negative (i.e., the Si measurements are slightly less than the ARG-1 reference value for this element).

Table 2-17 ARG-1 Results for Mixed Acid Samples

		All of the Available Data (N = 649)				Data for SME & MFT Batches (N = 597)			
	Ref	Mean	% Rel	Std	% Rel	Mean	% Rel	Std	% Rel
Element	Value	wt%	Diff	Dev	Std Dev	wt%	Diff	Dev	Std Dev
Al (wt%)	2.5	2.386	-4.54%	0.073	3.06%	2.388	-4.49%	0.071	2.97%
Ca (wt%)	1.02	1.028	0.74%	0.045	4.38%	1.027	0.73%	0.043	4.21%
Cr (wt%)	0.06	0.071	18.35%	0.006	8.42%	0.071	18.29%	0.006	8.32%
Cu (wt%)	0.0001	0.006		0.005		0.006		0.004	
Fe (wt%)	9.79	9.592	-2.02%	0.263	2.74%	9.597	-1.97%	0.254	2.65%
K (wt%)	2.25	2.282	1.41%	0.087	3.79%	2.284	1.53%	0.085	3.71%
Li (wt%)	1.49	1.486	-0.29%	0.042	2.80%	1.488	-0.16%	0.039	2.62%
Mg (wt%)	0.52	0.518	-0.34%	0.017	3.28%	0.519	-0.26%	0.016	3.15%
Mn (wt%)	1.46	1.421	-2.64%	0.039	2.76%	1.422	-2.62%	0.038	2.66%
Na (wt%)	8.53	8.347	-2.15%	0.259	3.10%	8.352	-2.09%	0.249	2.98%
Ni (wt%)	0.83	0.832	0.23%	0.026	3.17%	0.832	0.27%	0.026	3.10%
Si (wt%)	22.39	21.506	-3.95%	1.190	5.53%	21.488	-4.03%	0.863	4.02%
Ti (wt%)	0.69	0.706	2.26%	0.033	4.68%	0.706	2.31%	0.033	4.69%
U (wt%)	0	0.194		0.162		0.194		0.161	
Zr (wt%)	0.1	0.098	-2.47%	0.017	17.92%	0.098	-2.41%	0.017	17.72%

Exhibit A20 in the Appendix provides an investigation into sources of variation for the replicated ARG-1 measurements within each block of SME and MFT analyses. The results are summarized in Table 2-18, which shows that the batch-to-batch variation is the smaller source of variation as compared to the within batch variation for most of the major elements.

Table 2-18 Components of Variation for ARG-1 Results for Mixed Acid Samples

	Mean	Variance			% Variance		%RSD	%RSD	%RSD
Element	wt%	Batch	Residual	Total	% Batch	% Residual	Batch	Residual	Total
Al (wt%)	2.387	0.001122	0.003795	0.004917	22.82%	77.18%	1.40%	2.58%	2.94%
Ca (wt%)	1.027	0.000838	0.001024	0.001862	45.01%	54.99%	2.82%	3.11%	4.20%
Cr (wt%)	0.071	0.000018	0.000017	0.000035	51.43%	48.57%	5.97%	5.81%	8.33%
Cu (wt%)	0.006	0.000010	0.000005	0.000015	66.67%	33.33%	51.70%	36.55%	63.32%
Fe (wt%)	9.590	0.001959	0.058366	0.060325	3.25%	96.75%	0.46%	2.52%	2.56%
K (wt%)	2.284	0.003054	0.004124	0.007178	42.55%	57.45%	2.42%	2.81%	3.71%
Li (wt%)	1.487	0.000108	0.001343	0.001451	7.44%	92.56%	0.70%	2.46%	2.56%
Mg (wt%)	0.518	0.000054	0.000210	0.000264	20.45%	79.55%	1.42%	2.80%	3.13%
Mn (wt%)	1.421	0.000110	0.001251	0.001361	8.08%	91.92%	0.74%	2.49%	2.60%
Na (wt%)	8.349	0.003927	0.056634	0.060561	6.48%	93.52%	0.75%	2.85%	2.95%
Ni (wt%)	0.832	0.000101	0.000544	0.000645	15.66%	84.34%	1.21%	2.80%	3.05%
Si (wt%)	21.500	0.311759	0.413924	0.725683	42.96%	57.04%	2.60%	2.99%	3.96%
Ti (wt%)	0.706	0.000573	0.000544	0.001117	51.30%	48.70%	3.39%	3.30%	4.74%
U (wt%)	0.197	0.020960	0.003742	0.024702	84.85%	15.15%	73.48%	31.05%	79.77%
Zr (wt%)	0.098	0.000261	0.000010	0.000271	96.31%	3.69%	16.48%	3.23%	16.80%

2.3 FUSION RESULTS

Recall the analytical protocol (provided in Table 1-6) for SME and MFT samples analyzed by the Fusion prep method. In Section 2.3.1, the calibration and bench standards are investigated. All of the available data are initially explored with the measurements of the standards associated with the SME and MFT batches subsequently investigated. The elemental measurements for these standards are expressed as mg/L. Section 2.3.2 provides a discussion of the ARG-1 measurements generated under the Fusion prep. The ARG-1 measurements are expressed in elemental wt%.

2.3.1 Fusion Calibration and Bench Standards

Exhibit A21 in the Appendix provides time plots in the form of control charts of the elemental measurements of each of the calibration and bench standards used as part of the Fusion protocol for both SME and MFT samples. These measurement are in mg/L, the displays are in analytical sequence by element for each of the standards. The plotted values represented by an "×" are measurements that were not associated with a particular process batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistencies in precision.

Exhibit A22 provides histograms and descriptive statistics for all of these data. The means and reference values for the standards are given in Table 2-19. The % relative differences (% Rel Diffs) of these measurements are also in this table; note that even without any screening of the data the largest % Rel Diff is only 2.6%.

Table 2-19 Averages and Relative Biases for All Calibration and Bench Standard Measurements by Fusion

		SM51	SM52	SM53	SM54	SM55
Element	N Rows	687	508	509	1104	1098
Al (mg/L)	Mean	0.006	1.972	0.010	1.979	0.024
	Ref Value	0	2	0	2	0
	% Rel Diff		-1.4%		-1.1%	
B (mg/L)	Mean	3.897	1.986	3.916	1.990	0.007
	Ref Value	4	2	4	2	0
	% Rel Diff	-2.6%	-0.7%	-2.1%	-0.5%	
Ca (mg/L)	Mean	0.999	0.012	1.002	0.007	-0.002
	Ref Value	1	0	1	0	0
	% Rel Diff	-0.1%		0.2%		
Cr (mg/L)	Mean	0.990	0.001	0.993	0.002	0.009
	Ref Value	1	0	1	0	0
	% Rel Diff	-1.0%		-0.7%		
Cu (mg/L)	Mean	0.990	0.000	0.992	0.001	0.005
	Ref Value	1	0	1	0	0
	% Rel Diff	-1.0%		-0.8%		
Fe (mg/L)	Mean	0.006	9.874	0.006	9.889	0.047
	Ref Value	0	10	0	10	0
	% Rel Diff		-1.3%		-1.1%	
K (mg/L)	Mean	4.929	0.016	4.944	0.018	0.051
	Ref Value	5	0	5	0	0
	% Rel Diff	-1.4%		-1.1%		
Li (mg/L)	Mean	1.974	0.001	1.978	0.001	0.005
	Ref Value	2	0	2	0	0
	% Rel Diff	-1.3%		-1.1%		
Mg (mg/L)	Mean	1.004	0.002	1.004	0.001	0.004
	Ref Value	1	0	1	0	0
	% Rel Diff	0.4%		0.4%		
Mn (mg/L)	Mean	0.001	1.971	0.001	1.975	0.005
	Ref Value	0	2	0	2	0
	% Rel Diff		-1.5%		-1.2%	
Ni (mg/L)	Mean	0.987	0.008	0.990	0.008	0.009
	Ref Value	1	0	1	0	0
	% Rel Diff	-1.3%		-1.0%		
Si (mg/L)	Mean	20.124	0.006	20.050	0.011	0.103
	Ref Value	20	0	20	0	0
	% Rel Diff	0.6%		0.2%		
Ti (mg/L)	Mean	0.000	0.993	0.001	0.995	0.004
	Ref Value	0	1	0	1	0
	% Rel Diff		-0.7%		-0.5%	

The % relative standard deviations (% RSDs) were computed from the means and standard deviations of Exhibit A22 and these data are provided in Table 2-20. Note that all of the %RSDs are no larger than 6.0% even without any screening of the data.

Table 2-20 Descriptive Statistics for All Fusion Calibration and Bench Standard Measurements

		SM51	SM52	SM53	SM54	SM55
Element	N Rows	687	508	509	1104	1098
Al (mg/L)	Mean	0.006	1.972	0.010	1.979	0.024
	Std Dev	0.016	0.033	0.012	0.030	0.042
	%RSD		1.7%		1.5%	
B (mg/L)	Mean	3.897	1.986	3.916	1.990	0.007
	Std Dev	0.231	0.034	0.234	0.033	0.023
	%RSD	5.9%	1.7%	6.0%	1.7%	
Ca (mg/L)	Mean	0.999	0.012	1.002	0.007	-0.002
	Std Dev	0.028	0.065	0.025	0.044	0.048
	%RSD	2.8%		2.5%		
Cr (mg/L)	Mean	0.990	0.001	0.993	0.002	0.009
	Std Dev	0.016	0.003	0.015	0.002	0.017
	%RSD	1.6%		1.5%		
Cu (mg/L)	Mean	0.990	0.000	0.992	0.001	0.005
	Std Dev	0.014	0.004	0.013	0.004	0.009
	%RSD	1.4%		1.3%		
Fe (mg/L)	Mean	0.006	9.874	0.006	9.889	0.047
	Std Dev	0.075	0.157	0.061	0.150	0.108
	%RSD		1.6%		1.5%	
K (mg/L)	Mean	4.929	0.016	4.944	0.018	0.051
	Std Dev	0.079	0.058	0.072	0.049	0.349
	%RSD	1.6%		1.4%		
Li (mg/L)	Mean	1.974	0.001	1.978	0.001	0.005
	Std Dev	0.029	0.002	0.025	0.002	0.007
	%RSD	1.5%		1.3%		
Mg (mg/L)	Mean	1.004	0.002	1.004	0.001	0.004
	Std Dev	0.024	0.020	0.020	0.003	0.008
	%RSD	2.4%		2.0%		
Mn (mg/L)	Mean	0.001	1.971	0.001	1.975	0.005
	Std Dev	0.002	0.034	0.002	0.031	0.012
	%RSD		1.7%		1.6%	
Ni (mg/L)	Mean	0.987	0.008	0.990	0.008	0.009
	Std Dev	0.019	0.008	0.017	0.008	0.020
	%RSD	1.9%		1.7%		
Si (mg/L)	Mean	20.124	0.006	20.050	0.011	0.103
	Std Dev	0.396	0.046	0.340	0.032	0.206
	%RSD	2.0%		1.7%		
Ti (mg/L)	Mean	0.000	0.993	0.001	0.995	0.004
	Std Dev	0.002	0.020	0.002	0.019	0.009
	%RSD		2.0%		1.9%	

Table 2-21 provides the same type of summary information for the fusion measurements, but this time for only those measurements of the calibration and bench standards that were reported as part of the information for a process (SME or MFT) batch. Note that the largest %RSD for these data is that for boron, with a value of 6.2%. All other %RSDs are less than 3%.

Table 2-21 Descriptive Statistics for Fusion Calibration and Bench Standards in a Process Batch

		SM51	SM52	SM53	SM54	SM55
Element	N Rows	325	321	648	646	635
Al (mg/L)	Mean	0.007	1.973	0.010	1.980	0.026
	Std Dev	0.014	0.032	0.011	0.028	0.042
	%RSD		1.6%		1.4%	
B (mg/L)	Mean	3.882	1.986	3.902	1.988	0.009
	Std Dev	0.241	0.032	0.240	0.032	0.023
	%RSD	6.2%	1.6%	6.2%	1.6%	
Ca (mg/L)	Mean	0.998	0.014	1.002	0.006	0.002
	Std Dev	0.028	0.071	0.025	0.038	0.049
	%RSD	2.8%		2.5%		
Cr (mg/L)	Mean	0.989	0.001	0.992	0.002	0.010
	Std Dev	0.015	0.003	0.014	0.002	0.019
	%RSD	1.5%		1.4%		
Cu (mg/L)	Mean	0.989	0.000	0.992	0.001	0.005
	Std Dev	0.014	0.003	0.013	0.002	0.010
	%RSD	1.4%		1.3%		
Fe (mg/L)	Mean	0.010	9.881	0.008	9.895	0.054
	Std Dev	0.093	0.145	0.080	0.132	0.111
	%RSD		1.5%		1.3%	
K (mg/L)	Mean	4.921	0.013	4.938	0.016	0.055
	Std Dev	0.080	0.051	0.069	0.040	0.388
	%RSD	1.6%		1.4%		
Li (mg/L)	Mean	1.974	0.001	1.979	0.001	0.005
	Std Dev	0.028	0.002	0.025	0.002	0.008
	%RSD	1.4%		1.2%		
Mg (mg/L)	Mean	1.003	0.003	1.003	0.001	0.004
	Std Dev	0.024	0.027	0.020	0.002	0.008
	%RSD	2.4%		2.0%		
Mn (mg/L)	Mean	0.001	1.972	0.001	1.976	0.005
	Std Dev	0.002	0.031	0.002	0.029	0.013
	%RSD		1.6%		1.5%	
Ni (mg/L)	Mean	0.986	0.008	0.990	0.008	0.009
	Std Dev	0.018	0.008	0.016	0.007	0.021
	%RSD	1.8%		1.6%		
Si (mg/L)	Mean	20.151	0.006	20.064	0.011	0.111
	Std Dev	0.406	0.047	0.326	0.029	0.210
	%RSD	2.0%		1.6%		
Ti (mg/L)	Mean	0.000	0.993	0.001	0.994	0.005
	Std Dev	0.001	0.019	0.001	0.019	0.010
	%RSD		1.9%		1.9%	

Exhibit A23 in the Appendix provides an investigation into sources of variation for the calibration and bench standards with replicate measurements within each block of SME or MFT analyses. The analysis combines the SME and MFT blocks into a single dataset with the intention of estimating between batch and within batch (residual) variation. A summary of the results is provided in Table 2-22, which shows that the batch-to-batch variation is, in general, larger than the within-batch (or residual) variation for these data.

Table 2-22 Components of Variance for Fusion Calibration and Bench Standards in a Process Batch

		Components of Variance			% of Variance		
Element		SM53	SM54	SM55	SM53	SM54	SM55
Al (mg/L)	Batch-to-batch	0.000098	0.000716	0.000329	87.5%	88.4%	18.9%
	Residual	0.000014	0.000094	0.001408	12.5%	11.6%	81.1%
	Total	0.000112	0.000810	0.001737			
B(mg/L)	Batch-to-batch	0.056529	0.000785	0.000242	97.9%	78.5%	47.2%
	Residual	0.001202	0.000215	0.000271	2.1%	21.5%	52.8%
	Total	0.057731	0.001000	0.000513			
Ca (mg/L)	Batch-to-batch	0.000549	0.001353	0.000938	88.3%	92.4%	38.9%
	Residual	0.000073	0.000111	0.001474	11.7%	7.6%	61.1%
	Total	0.000622	0.001464	0.002412			
Cr (mg/L)	Batch-to-batch	0.000183	0.000004	0.000047	89.3%	80.9%	13.2%
	Residual	0.000022	0.000001	0.000308	10.7%	19.1%	86.8%
	Total	0.000205	0.000005	0.000355			
Cu (mg/L)	Batch-to-batch	0.000151	0.000004	0.000039	89.9%	87.1%	39.0%
	Residual	0.000017	0.000001	0.000061	10.1%	12.9%	61.0%
	Total	0.000168	0.000005	0.000100			
Fe (mg/L)	Batch-to-batch	0.004083	0.015135	0.001558	64.1%	86.8%	12.7%
	Residual	0.002282	0.002292	0.010691	35.9%	13.2%	87.3%
	Total	0.006365	0.017427	0.012249			
K (mg/L)	Batch-to-batch	0.003658	0.000998	0.148998	76.3%	63.4%	98.8%
	Residual	0.001137	0.000575	0.001856	23.7%	36.6%	1.2%
	Total	0.004795	0.001573	0.150854			
Li (mg/L)	Batch-to-batch	0.000533	0.000002	0.000011	88.0%	73.5%	17.2%
	Residual	0.000073	0.000001	0.000053	12.0%	26.5%	82.8%
	Total	0.000606	0.000003	0.000064			
Mg (mg/L)	Batch-to-batch	0.000337	0.000001	0.000028	85.1%	24.0%	40.0%
	Residual	0.000059	0.000003	0.000042	14.9%	76.0%	60.0%
	Total	0.000396	0.000004	0.000070			
Mn (mg/L)	Batch-to-batch	0.000003	0.000767	0.000014	90.3%	90.4%	7.8%
	Residual	0.000000	0.000081	0.000165	9.7%	9.6%	92.2%
	Total	0.000003	0.000848	0.000179			
Ni (mg/L)	Batch-to-batch	0.000181	0.000033	0.000057	68.3%	60.0%	12.9%
	Residual	0.000084	0.000022	0.000386	31.7%	40.0%	87.1%
	Total	0.000265	0.000055	0.000443			
Si (mg/L)	Batch-to-batch	0.095160	0.000752	0.005051	89.2%	91.5%	11.4%
	Residual	0.011507	0.000070	0.039115	10.8%	8.5%	88.6%
	Total	0.106667	0.000822	0.044166			
Ti (mg/L)	Batch-to-batch	0.000001	0.000347	0.000015	79.8%	95.3%	15.8%
	Residual	0.000000	0.000017	0.000080	20.2%	4.7%	84.2%
	Total	0.000001	0.000364	0.000095			

As for the measurements for the other two prep methods, attempts were made during this data analysis to investigate for possible instrument drift in the Fusion data. Comparisons between SM53 (Calibration Standard A) and SM51 (Bench Standard A) provide some insight into this possible problem for the Fusion data. Exhibit A24 in the Appendix presents a paired comparison between the Fusion measurements for these standards across the SME and MFT batches. The average of the two SM53 measurements was compared to the SM51 measurement for each batch. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., B, Ca, Cr, Cu, K, Li, Ni, and Si) except Mg. Table 2-23 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 1.00%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these Fusion measurements across the SME and MFT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-23 Insights into Instrument Drift for Fusion Measurements of SM53 vs SM51

	Bench A	Cal A	
	SM51	SM53	%
N Rows	317	317	Diff
Mean(Al (mg/L))	0.0067	0.0099	
Mean(B (mg/L))	3.8806	3.9013	-0.53%
Mean(Ca (mg/L))	0.9980	1.0017	-0.37%
Mean(Cr (mg/L))	0.9891	0.9921	-0.30%
Mean(Cu (mg/L))	0.9892	0.9918	-0.27%
Mean(Fe (mg/L))	0.0100	0.0080	
Mean(K (mg/L))	4.9217	4.9381	-0.33%
Mean(Li (mg/L))	1.9743	1.9792	-0.25%
Mean(Mg (mg/L))	1.0032	1.0032	0.00%
Mean(Mn (mg/L))	0.0009	0.0008	
Mean(Ni (mg/L))	0.9866	0.9901	-0.36%
Mean(Si (mg/L))	20.1574	20.0630	0.47%
Mean(Ti (mg/L))	0.0005	0.0009	
Std Dev(Al (mg/L))	0.0138	0.0102	
Std Dev(B (mg/L))	0.2396	0.2380	
Std Dev(Ca (mg/L))	0.0278	0.0244	
Std Dev(Cr (mg/L))	0.0152	0.0139	
Std Dev(Cu (mg/L))	0.0140	0.0126	
Std Dev(Fe (mg/L))	0.0945	0.0729	
Std Dev(K (mg/L))	0.0807	0.0651	
Std Dev(Li (mg/L))	0.0275	0.0240	
Std Dev(Mg (mg/L))	0.0239	0.0192	
Std Dev(Mn (mg/L))	0.0018	0.0017	
Std Dev(Ni (mg/L))	0.0178	0.0149	
Std Dev(Si (mg/L))	0.4014	0.3182	
Std Dev(Ti (mg/L))	0.0014	0.0011	

Comparisons between SM52 (Bench Standard B) and SM54 (Calibration Standard B) also provide some insight into the possible problem of instrument drift for the Fusion data. Exhibit A25 in the Appendix presents a paired comparison between the measurements for these standards across the SME and MFT batches for this prep method. The average of the two SM54 measurements was compared to the SM52 measurement for each batch and vessel combination. The mean difference between the measurements of this pair of standards was found to be statistically significant for all of the active elements (i.e., Al, Fe, Mn, and Ti) except B. Table 2-24 provides summary information for these measurements. This table reveals that although statistically significant differences are seen, all of these differences are less than 0.50%. So no dramatic drift, in the form of a consistent mean shift, is evident from these data. The standard deviations of these measurements across the SME and MFT batches are also provided in this table, and a review of these statistics does not suggest that the measurements of the bench standard are dramatically less precise than the measurements of the corresponding calibration standard.

Table 2-24 Insights into Instrument Drift by Comparisons of SM52 vs SM54 for Fusion

	Bench B	Cal B	
	SM52	SM54	%
N Rows	312	317	Diff
Mean(Al (mg/L))	1.9733	1.9799	-0.33%
Mean(B (mg/L))	1.9863	1.9884	-0.11%
Mean(Ca (mg/L))	0.0145	0.0058	
Mean(Cr (mg/L))	0.0012	0.0018	
Mean(Cu (mg/L))	0.0002	0.0008	
Mean(Fe (mg/L))	9.8842	9.8951	-0.11%
Mean(K (mg/L))	0.0134	0.0153	
Mean(Li (mg/L))	0.0012	0.0013	
Mean(Mg (mg/L))	0.0032	0.0008	
Mean(Mn (mg/L))	1.9722	1.9761	-0.19%
Mean(Ni (mg/L))	0.0077	0.0080	
Mean(Si (mg/L))	0.0061	0.0109	
Mean(Ti (mg/L))	0.9928	0.9942	-0.14%
Std Dev(Al (mg/L))	0.0321	0.0277	
Std Dev(B (mg/L))	0.0321	0.0297	
Std Dev(Ca (mg/L))	0.0716	0.0378	
Std Dev(Cr (mg/L))	0.0028	0.0021	
Std Dev(Cu (mg/L))	0.0031	0.0022	
Std Dev(Fe (mg/L))	0.1441	0.1279	
Std Dev(K (mg/L))	0.0499	0.0358	
Std Dev(Li (mg/L))	0.0021	0.0017	
Std Dev(Mg (mg/L))	0.0271	0.0016	
Std Dev(Mn (mg/L))	0.0313	0.0284	
Std Dev(Ni (mg/L))	0.0080	0.0066	
Std Dev(Si (mg/L))	0.0464	0.0281	
Std Dev(Ti (mg/L))	0.0194	0.0189	

Thus, overall for the Fusion data there is no indication of any instrument drift of practical concern over the course of a block of measurements needed to process a SME or MFT batch. The results presented in Table 2-19 through Table 2-24 also provide an opportunity to address one additional question regarding the calibration standards: Are the replicate measurements of SM53 and SM54 at the beginning of each Fusion block worthwhile as a feature of the quality assurance of this analytical process? In Table 2-22 note that the within batch (residual) variances for these calibration standards are typically smaller than the between batch (batch-to-batch) variances, while the standard deviations of Table 2-23 and Table 2-24 suggest that the batch to batch variances of the calibration standards are comparable to the batch-to-batch variances of the bench standards. Thus, these results indicate that there is no practical drift in the precision of these measurements over a Fusion block and that the replicate measurements of the calibration standards at the beginning of the Fusion block are not needed.

2.3.2 Fusion ARG-1 Results

Exhibit A26 in the Appendix provides time plots in the form of control charts of the elemental measurements of the ARG-1 standard glass under the Fusion protocol. These measurements are in elemental weight percent (wt%), and the displays are in analytical sequence. The plotted values represented by an "×" are measurements that were not associated with a particular process (SME or MFT) batch. There are obvious outliers indicated in some of these plots as well as mean shifts, trends, and inconsistencies in precision.

Exhibit A27 in the Appendix provides histograms and descriptive statistics for all of the ARG-1 data while Exhibit A28 in the Appendix provides the same information for the ARG-1 results associated with a SME or MFT batch. The means and reference values for both groups of ARG-1 measurements are given in Table 2-25. The % relative difference (% Rel Diff) for each element for each group is also provided. Note that all of the % relative differences (or % biases) of the measured versus reference values are less than or equal to 3.12% for all of the elements present in ARG-1 at concentrations of at least 0.1 wt%. Also, note that the bias in the Si values generated using the Fusion prep is positive (i.e., the Si measurements are slightly greater than the ARG-1 reference value for this element). Recall that the Si bias for the Mixed Acid prep was negative. These results support the current DWPF Engineering approach to estimating the Si content in process samples by averaging the Si measurements from the two preparation methods.

Table 2-25 Summary Statistics for ARG-1 Fusion Measurements

		All of the Available Data (N = 712)				Data for SME & MFT Batches (N = 596)			
	Ref	Mean	% Rel	Std	% Rel	Mean	% Rel	Std	% Rel
Element	Value	wt%	Diff	Dev	Std Dev	wt%	Diff	Dev	Std Dev
Al (wt%)	2.5	2.462	-1.51%	0.118	4.79%	2.465	-1.41%	0.077	3.13%
B (wt%)	2.69	2.634	-2.09%	0.125	4.74%	2.635	-2.05%	0.075	2.83%
Ca (wt%)	1.02	0.989	-3.02%	0.068	6.89%	0.989	-2.99%	0.055	5.57%
Cr (wt%)	0.06	0.074	22.67%	0.011	15.35%	0.073	22.03%	0.009	12.33%
Cu (wt%)	0.0001	0.010		0.055		0.010		0.060	
Fe (wt%)	9.79	9.567	-2.28%	0.436	4.56%	9.557	-2.38%	0.261	2.73%
K (wt%)	2.25	2.226	-1.08%	0.123	5.55%	2.222	-1.24%	0.095	4.30%
Li (wt%)	1.49	1.460	-2.03%	0.067	4.56%	1.459	-2.08%	0.039	2.65%
Mg (wt%)	0.52	0.508	-2.33%	0.025	4.91%	0.507	-2.42%	0.017	3.26%
Mn (wt%)	1.46	1.416	-3.04%	0.066	4.68%	1.414	-3.12%	0.041	2.90%
Ni (wt%)	0.83	0.808	-2.66%	0.041	5.12%	0.807	-2.76%	0.029	3.63%
Si (wt%)	22.39	22.965	2.57%	1.173	5.11%	22.978	2.63%	0.770	3.35%
Ti (wt%)	0.69	0.675	-2.15%	0.032	4.68%	0.674	-2.25%	0.019	2.88%

Exhibit A29 in the Appendix provides an investigation into sources of variation for the replicated ARG-1 measurements generated from samples prepared using the Fusion method within each block of SME and MFT analyses. The results are summarized in Table 2-26.

Table 2-26 Components of Variation for ARG-1 Results for Fusion Samples

	Mean						%RSD	%RSD	%RSD
Element	wt%	Batch	Residual	Total	% Batch	% Residual	Batch	Residual	Total
Al (wt%)	2.467	0.001728	0.004295	0.006023	28.69%	71.31%	1.69%	2.66%	3.15%
B (wt%)	2.635	0.000741	0.004753	0.005494	13.49%	86.51%	1.03%	2.62%	2.81%
Ca (wt%)	0.991	0.001182	0.001822	0.003004	39.35%	60.65%	3.47%	4.31%	5.53%
Cr (wt%)	0.073	0.000028	0.000050	0.000078	35.90%	64.10%	7.23%	9.67%	12.07%
Cu (wt%)	0.0105	0.000002	0.003989	0.003991	0.05%	99.95%			
Fe (wt%)	9.563	0.005424	0.060836	0.066260	8.19%	91.81%	0.77%	2.58%	2.69%
K (wt%)	2.223	0.005712	0.003838	0.009550	59.81%	40.19%	3.40%	2.79%	4.40%
Li (wt%)	1.461	0.000163	0.001309	0.001472	11.07%	88.93%	0.87%	2.48%	2.63%
Mg (wt%)	0.508	0.000063	0.000202	0.000265	23.77%	76.23%	1.56%	2.80%	3.21%
Mn (wt%)	1.415	0.000171	0.001492	0.001663	10.28%	89.72%	0.92%	2.73%	2.88%
Ni (wt%)	0.808	0.000086	0.000784	0.000870	9.89%	90.11%	1.15%	3.47%	3.65%
Si (wt%)	22.983	0.239982	0.348987	0.588969	40.75%	59.25%	2.13%	2.57%	3.34%
Ti (wt%)	0.675	0.000028	0.000347	0.000375	7.47%	92.53%	0.78%	2.76%	2.87%

2.4 LIMS LIMITS

Section 1 provided a discussion of the current LIMS (Laboratory Information Management System) limits utilized by the DWPF Lab to screen for errors in the measurements of the standards discussed in this report. For the calibration and bench standards, the relative error was +/-7%. For ARG-1 the limits, which depend on the preparation method used, are provided in Table 1-1.

In this section, the results of the previous sections are revisited with an emphasis on comparisons between the LIMS limits and the uncertainties in the measurements of the standards as estimated in this study. The uncertainties are estimated by combining the biases and standard deviations presented earlier in one of two ways as outlined in [6]: (1) using a root sum square (RSS) approach to estimate the uncertainty at approximately a 95% confidence level and (2) using a additive approach to estimate the uncertainty at approximately a 99% confidence level.

The approaches may best be explained with the help of an example. Consider the % relative bias, -1.0%, of the Al measurements of the IN33 standard for the Cold Chem results of Table 2-1. Since this is a negative bias, a lower bound on the true Al bias for this standard can be computed using the sample size of n = 432 from Table 2-1 and the corresponding % relative standard deviation, %RSD = 1.5%, from Table 2-2. Representing the –1.0% relative bias as the % sample mean bias, $\%\overline{\text{x}}$, the equation for the lower bound, %B, (at the 95% confidence level) for the bias is given by

$$\%\text{B} = \%\overline{\text{x}} - \text{t}_{0.05,431} \cdot \frac{(\%\text{RSD})}{\sqrt{432}} = -1.0 - 1.645 \cdot \frac{1.5}{20.7} = -1.0 - 0.12 = -1.12\%$$

Using the RSS approach as outlined in [6], the uncertainty in the Al measurement of the IN33 standard under the Cold Chem protocol at a 95% confidence level is given by:

$$\text{Uncertainty}_{95\%} = \sqrt{\%\text{B}^2 + (2 \cdot \%\text{RSD})^2} = \sqrt{(-1.12\%)^2 + (2 \cdot 1.5\%)^2} = \sqrt{10.2544} = 3.20\%$$

Note that for this situation, the estimated bias is negative, so the uncertainty is asymmetrical and this estimates bounds the errors on the low side with 95% confidence. When the uncertainty is expressed as +/-3.2%, it conservatively bounds the potential positive errors as well.

Using the additive approach as outlined in [6], the uncertainty of negative errors in the Al measurement of the IN33 standard under the Cold Chem protocol at a 99% confidence level is given by:

$$\text{Uncertainty}_{99\%} = \%\text{B} - (2 \cdot \%\text{RSD}) = -1.0 - (2 \cdot 1.5) = -4.0\%$$

Thus, the uncertainty may be stated as +/- 4.0% with 99% confidence.

2.4.1 Measurement Uncertainties of Calibration and Bench Standards

This approach was used to determine uncertainties for the measurements of the active elements (i.e., those at non-zero concentrations) of the calibration and bench standards discussed in this report. Situations where the bias is positive are handled in a similar manner. For the elements at zero concentrations in the standards (i.e., not present in the standard), the measurements are in the noise associated with the detection limits of the instrumentation. The uncertainties for these measurements were determined in a manner similar to that just described except instead of expressing the uncertainty in percent relative error, the uncertainties are expressed in the same units as the measurements (i.e., mg/L). One other modification in the method of determining uncertainty at a 99% confidence level was introduced for these measurements at a nominal zero concentration. The uncertainty at this confidence level was determined as the maximum of the upper sample mean bias plus 2 times the sample standard deviation and 3 times the sample standard deviation. Thus,

$$\text{Uncertainty}_{99\%} = \text{MAXIMUM}(\text{B} + 2 \cdot \text{s}, 3 \cdot \text{s})$$

where B is the upper bound on the sample mean bias in mg/L and s represents the sample standard deviation in mg/L.

The uncertainties for the calibration and bench standards were computed using the methods described in this section, and the resulting uncertainties are presented in Table A1 in the Appendix. The measurements summarized in this table are those associated with a process batch. The summary information includes the number of measurements available (n), the reference value for each element of each standard, the sample mean and the sample standard deviation. From these statistics, the average bias and uncertainties are determined and provided in absolute units (mg/L) if the reference value is 0 or as a percentage relative to the reference value if the value is non-zero. Also, note that the relative standard deviation (RSD) in this table is computed relative to the reference value.

Some highlights from the table follow. The uncertainties of the Na values for the SM33 bench standard (8.4%) and for the SM35 calibration standard (9.0%) under the Mixed Acid prep are estimated to be larger than the 7% LIMS limit as is the uncertainty for B for the SM51 bench standard (15.0%) and the SM53 calibration standard (14.5%) under the Fusion prep. The uncertainties estimated for all of the other active elements in these bench and calibration standards are less than the 7% limit in LIMS.

The uncertainties in the measurements of elements at nominal zero concentrations in these standards may be useful as threshold levels in identifying possible contamination during the analytical process.

2.4.2 Measurement Uncertainties of ARG-1

The same approach as that just described was used to determine uncertainties for the measurements of the primary components of the ARG-1 standard glass. The resulting uncertainties are provided in Table 2-27. For the Cold Chem prep, only the 99% uncertainty for Al exceeds the LIMS limit (13.1% versus 12%). For the Mixed Acid prep, the LIMS limits are exceeded by the 99% uncertainties for Al (10.6% versus 9%), Cr (35.7% versus 35%), Mn (8.1% versus 8%), Si (12.3% versus 10%), Ti (12.1% versus 9%), and Zr (39.0% versus 12%).

Table 2-27 Uncertainties for ARG-1 Measurements

	Cold Chem Method			Mixed Acid Method			Fusion Method		
	uncertainty	uncertainty		uncertainty	uncertainty		uncertainty	uncertainty	
	@ 95%	@ 99%	LIMS	@ 95%	@ 99%	LIMS	@ 95%	@ 99%	LIMS
Element	Confidence	Confidence	Limits	Confidence	Confidence	Limits	Confidence	Confidence	Limits
Al	9.31%	13.13%	12%	7.57%	10.63%	9%	6.47%	7.89%	8%
B	7.54%	9.52%	-	-	-	-	6.09%	7.91%	11%
Ca	17.24%	19.74%	22%	8.49%	9.53%	13%	11.64%	14.51%	20%
Cr	16.26%	22.67%	35%	25.29%	35.68%	35%	33.62%	47.51%	35%
Cu	-	-	-	-	-	-			-
Fe	6.11%	7.45%	15%	5.72%	7.45%	8%	6.03%	8.03%	8%
K	6.74%	7.53%	20%	7.65%	9.29%	11%	8.73%	10.12%	10%
Li	6.44%	7.15%	15%	5.25%	5.58%	8%	5.75%	7.54%	8%
Mg	10.89%	14.63%	17%	6.33%	6.78%	10%	7.03%	9.16%	9%
Mn	6.37%	8.32%	14%	6.00%	8.11%	8%	6.68%	9.11%	8%
Na	6.97%	8.22%	15%	6.39%	8.26%	13%			
Ni	6.59%	8.33%	15%	6.22%	6.74%	9%	7.85%	10.26%	10%
Si	7.49%	8.72%	18%	9.11%	12.33%	10%	7.28%	9.55%	9%
Ti	6.14%	7.49%	17%	9.76%	12.11%	9%	6.26%	8.20%	8%
U	-	-	-	-	-	-	-	-	-
Zr	10.72%	14.40%	21%	35.61%	39.03%	12%			

The ARG-1 uncertainties from this study may provide an opportunity to update the LIMS limits to reflect the historical results for this standard glass.

2.5 SUM OF OXIDES

As a final area of investigation, the measured ARG-1 sums of oxides for each of the three preparation methods are compared to the theoretical values, which are based on the reference concentrations for the standard glass. Exhibit A30 in the Appendix provides time series plots of these data (wt% oxides) in analytical sequence by preparation method for all of the ARG-1 measurements provided in the datasets. Once again, the plotted values represented by an "×" are measurements that were not associated with a particular process batch. Exhibit A31 provides time series plots of the sum of oxides for ARG-1 measurements associated with a batch of process samples. And, finally, Exhibit A31 in the Appendix provides histograms and descriptive statistics for these sums of oxides. Table 2-28 provides summaries of the information from these exhibits in the Appendix. The reference sum is also provided. The results show that the Cold Chem and Mixed Acid preps sums of oxides, on average, are a little more than 1 wt% below their reference values while the sum of oxides for the Fusion prep is, on average, a little less than 0.5 wt% above its reference value. This may be due to the positive Si bias for the Fusion prep and the negative Si bias for the other two preps.

Table 2-28 Descriptive Statistics for ARG-1 Sums of Oxides by Preparation Method

	Cold Chem-SRAT-With Batch	Fusion-MFT-With Batch	Fusion-SME-With Batch	Mixed Acid-MFT-With Batch	Mixed Acid-SME-With Batch
N Rows	323	278	318	278	319
Average Sum of Oxides	98.1	88.1	88.1	88.2	88.3
Reference Value of Sum of Oxides	99.3	87.7	87.7	90.6	90.6
Std Dev of Sum of Oxides	3.0	2.3	2.4	2.2	2.7
Minimum Sum of Oxides	86.8	80.1	79.3	79.5	71.6
Maximum Sum of Oxides	114.3	98.2	99.9	96.8	105.3

2.6 MFT VERSUS SME RESULTS

In the discussion of the sum of oxides, a comparison was offered between the MFT and SME results for both the Mixed Acid and the Fusion preps. Even though the analytical protocol for measuring samples from the MFT is the same as that used for SME samples, measurements of the SME samples are tied to the production schedule while those for the MFT samples are not. Thus, comparisons of measurements of the standards between the two vessels are of interest. This section makes such comparisons for the calibration and bench standards and for ARG-1 for the Mixed Acid and the Fusion preps.

Table A2 in the Appendix provides a summary of the measurements of the calibration and bench standards associated with the Mixed Acid protocol by tank. The means and standard deviations (both expressed as mg/L values) of all of the elements are provided in the table. For the active elements, values for the percent relative difference of the MFT average as compared to the SME average are given as are values of the ratio of the MFT standard deviation to that of the SME. The percent relative standard deviations (%RSDs) for both tanks are also provided for the active elements. The largest % relative difference is that for Si for the SM35 standard at 0.21%, and ratios of standard deviations show comparable precision between the two tanks in the measurements of the active elements of these standards.

Table A3 in the Appendix provides a summary of the measurements of the calibration and bench standards associated with the Fusion protocol by tank. The means and standard deviations (both expressed as mg/L values) of all of the elements are provided in the table. For the active elements, values for the percent relative difference of the MFT average as compared to the SME average are given as are values of the ratio of the MFT standard deviation to that of the SME. The percent relative standard deviations (%RSDs) for both tanks are also provided for the active elements. The largest % relative difference is that for B for the SM51 standard at 0.40%, and ratios of standard deviations show comparable precision between the two tanks in the measurements of the active elements of these standards.

Table 2-29 provides similar information for the ARG-1 measurements (as wt% oxides) for the Mixed Acid prep method by tank. For those oxides at reference concentrations of at least 0.1 wt% in the ARG-1 standard, the % differences of the MFT means versus those of the SME are less than 0.25% except for ZrO_2. The % difference for ZrO_2 is 1.28%. For most of the oxides, the precision of the MFT measurements appears to be slightly better than their SME counterparts.

Table 2-29 Descriptive Statistics for ARG-1 Mixed Acid Measurements by Tank

Oxide	MFT Mean	SME Mean	% Difference	MFT Std Dev	SME Std Dev	MFT Std Dev/ SME Std Dev	%RSD MFT	%RSD SME
Al_2O_3 (wt%)	4.511	4.513	-0.05%	0.1173	0.1472	0.80	2.60%	3.26%
CaO (wt%)	1.437	1.438	-0.06%	0.0566	0.0638	0.89	3.94%	4.44%
Cr_2O_3 (wt%)	0.104	0.104	-0.23%	0.0084	0.0088	0.96	8.13%	8.49%
CuO (wt%)	0.008	0.008		0.0051	0.0050			
Fe_2O_3 (wt%)	13.705	13.734	-0.21%	0.3026	0.4088	0.74	2.21%	2.98%
K_2O (wt%)	2.754	2.750	0.12%	0.1007	0.1034	0.97	3.66%	3.76%
Li_2O (wt%)	3.200	3.205	-0.14%	0.0667	0.0964	0.69	2.08%	3.01%
MgO (wt%)	0.860	0.860	-0.06%	0.0241	0.0296	0.81	2.80%	3.44%
MnO (wt%)	1.834	1.837	-0.14%	0.0406	0.0549	0.74	2.21%	2.99%
Na_2O (wt%)	11.248	11.267	-0.16%	0.2697	0.3848	0.70	2.40%	3.42%
NiO (wt%)	1.059	1.059	-0.07%	0.0278	0.0366	0.76	2.63%	3.46%
SiO_2 (wt%)	45.947	45.990	-0.09%	1.7495	1.9293	0.91	3.81%	4.20%
Ti_2O (wt%)	1.177	1.178	-0.14%	0.0557	0.0548	1.02	4.73%	4.65%
U_3O_8 (wt%)	0.226	0.231	-2.05%	0.2058	0.1759	1.17	91.00%	76.20%
ZrO_2 (wt%)	0.133	0.131	1.28%	0.0204	0.0256	0.80	15.39%	19.57%

Table 2-30 provides similar information for the ARG-1 measurements (as wt% oxides) for the Fusion prep method by tank. For those oxides at reference concentrations of at least 0.1 wt% in the ARG-1 standard, the % differences of the MFT means versus those of the SME are less than 0.50% except for Cr_2O_3. The % difference for Cr_2O_3 is 1.78%. The precision of the measurements of the standards for the two vessels appears to be comparable.

Table 2-30 Descriptive Statistics for ARG-1 Fusion Measurements by Tank

Oxide	MFT Mean	SME Mean	% Difference	MFT Std Dev	SME Std Dev	MFT Std Dev/ SME Std Dev	%RSD MFT	%RSD SME
Al2O3 (wt%)	4.657	4.657	0.01%	0.1435	0.1483	0.97	3.08%	3.19%
B2O3 (wt%)	8.483	8.485	-0.02%	0.2296	0.2495	0.92	2.71%	2.94%
CaO (wt%)	1.381	1.387	-0.40%	0.0779	0.0765	1.02	5.64%	5.52%
Cr2O3 (wt%)	0.108	0.106	1.78%	0.0150	0.0114	1.32	13.86%	10.70%
CuO (wt%)	0.010	0.015		0.0265	0.0997			
Fe2O3 (wt%)	13.651	13.675	-0.18%	0.3730	0.3737	1.00	2.73%	2.73%
K2O (wt%)	2.672	2.681	-0.36%	0.0912	0.1324	0.69	3.41%	4.94%
Li2O (wt%)	3.143	3.140	0.12%	0.0831	0.0832	1.00	2.64%	2.65%
MgO (wt%)	0.842	0.841	0.16%	0.0273	0.0276	0.99	3.24%	3.28%
MnO (wt%)	1.824	1.828	-0.25%	0.0533	0.0526	1.01	2.92%	2.87%
NiO (wt%)	1.030	1.025	0.50%	0.0398	0.0348	1.14	3.86%	3.40%
SiO2 (wt%)	49.196	49.122	0.15%	1.5856	1.7005	0.93	3.22%	3.46%
Ti2O (wt%)	1.125	1.125	-0.01%	0.0339	0.0311	1.09	3.01%	2.77%

3.0 CONCLUSIONS

Measurements of calibration and bench standards as well as samples of ARG-1 that were performed by the DWPF Lab during the processing of batches 94 through 263 were provided to SCS for review. Three datasets, one associated with each of three preparation methods (Cold Chem, Mixed Acid, and Fusion), were included in the review.

The review conducted covered several areas of investigation. Biases in these measurements relative to the reference values for the standards including ARG-1 were estimated and found to be of no practical concern. Percent relative standard deviations for these data also were determined. Sources of variation in the measurements (i.e., batch-to-batch and within process batch) were estimated and compared. An investigation into evidence of instrument drift during a group of measurements representing a prototypical block was conducted for each preparation method using pairs of calibration and bench standards. No evidence of instrument drift at levels of practical concern was seen in these data. Also, the replicates of calibration standards at the beginning of each analytical block were found to be unnecessary.

The uncertainties of the measurements, which incorporated biases and precision errors, were computed for the calibration standards, bench standards, and ARG-1. The limits for these uncertainties were compared to the current, LIMS operating limits for the errors in the measurements of these standards. These comparisons may provide opportunities for revising these LIMS limits.

Comparisons between MFT and SME results were made for both the Mixed Acid and the Fusion prep methods. There was no evidence of differences (in either bias or precision) between the results for these two tanks for either of the two prep methods.

4.0 REFERENCES

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APPENDIX A.

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Table A1. Measurement Uncertainties for Calibration and Bench Standards

Std.	Elem.	n	Ref. Value	Sample Mean	Abs. Bias mg/L	%Bias	Std Dev mg/L	% RSD	95% Abs. Bound for Bias mg/L	95% Uncert. mg/L	99% Uncert. mg/L	95% Rel. Bound for Bias	95% Rel. Uncert.	99% Rel. Uncert.	LIMS Limits
IN32	Al	344	0	0.017	0.017		0.031		0.020	0.065	0.093				
IN32	B	344	0	0.000	0.000		0.035		0.003	0.069	0.104				
IN32	Ca	344	0	0.116	0.116		0.111		0.126	0.255	0.348				
IN32	Cr	344	0	0.002	0.002		0.006		0.003	0.013	0.019				
IN32	Cu	344	0	0.001	0.001		0.004		0.001	0.009	0.013				
IN32	Fe	344	0	0.004	0.004		0.080		0.011	0.161	0.241				
IN32	K	344	0	0.038	0.038		0.066		0.044	0.139	0.197				
IN32	Li	344	0	0.002	0.002		0.002		0.002	0.005	0.007				
IN32	Mg	344	0	0.001	0.001		0.005		0.002	0.010	0.014				
IN32	Mn	344	0	0.001	0.001		0.011		0.002	0.023	0.034				
IN32	Na	344	0	0.020	0.020		0.087		0.028	0.176	0.261				
IN32	Ni	344	0	0.002	0.002		0.008		0.003	0.017	0.025				
IN32	Si	344	0	-0.085	-0.085		0.526		0.047	1.052	1.577				
IN32	Ti	344	0	0.001	0.001		0.002		0.001	0.004	0.005				
IN32	U	344	0	0.109	0.109		0.186		0.126	0.393	0.558				
IN32	Zr	344	0	-0.002	-0.002		0.005		0.000	0.009	0.014				
IN33	Al	180	10	9.885	-0.115	-1.15%	0.150	1.50%				-1.33%	2.78%	4.15%	7%
IN33	B	180	0	-0.012	-0.012		0.038		0.005	0.076	0.113				
IN33	Ca	180	2	1.994	-0.006	-0.32%	0.043	2.17%				-0.59%	4.34%	4.67%	7%
IN33	Cr	180	2	1.983	-0.017	-0.87%	0.032	1.59%				-1.07%	3.06%	4.05%	7%
IN33	Cu	180	1	0.993	-0.007	-0.70%	0.018	1.78%				-0.92%	3.49%	4.26%	7%
IN33	Fe	180	20	19.821	-0.179	-0.90%	0.305	1.52%				-1.08%	2.91%	3.94%	7%
IN33	K	180	0	0.003	0.003		0.060		0.010	0.120	0.180				
IN33	Li	180	0	0.001	0.001		0.002		0.001	0.005	0.007				
IN33	Mg	180	1	1.002	0.002	0.23%	0.024	2.43%				0.53%	4.87%	5.09%	7%
IN33	Mn	180	1	0.991	-0.009	-0.87%	0.017	1.66%				-1.08%	3.21%	4.20%	7%
IN33	Na	180	20	19.857	-0.143	-0.72%	0.366	1.83%				-0.94%	3.59%	4.37%	7%
IN33	Ni	180	2	1.968	-0.032	-1.61%	0.037	1.83%				-1.84%	3.29%	5.27%	7%
IN33	Si	180	0	-0.269	-0.269		0.514		0.063	1.031	1.543				
IN33	Ti	180	2	1.973	-0.027	-1.35%	0.033	1.65%				-1.55%	3.02%	4.65%	7%
IN33	U	180	0	0.064	0.064		0.179		0.086	0.368	0.537				
IN33	Zr	180	2	2.000	0.000	-0.01%	0.040	2.02%				-0.26%	4.05%	4.05%	7%
IN34	Al	177	0	0.001	0.001		0.030		0.004	0.060	0.089				
IN34	B	177	10	10.007	0.007	0.07%	0.136	1.36%				0.24%	2.72%	2.79%	7%
IN34	Ca	177	0	0.087	0.087		0.069		0.095	0.168	0.234				
IN34	Cr	177	0	0.001	0.001		0.003		0.001	0.007	0.010				
IN34	Cu	177	0	0.000	0.000		0.005		0.001	0.009	0.014				
IN34	Fe	177	0	0.011	0.011		0.050		0.017	0.102	0.150				
IN34	K	177	10	9.897	-0.103	-1.03%	0.144	1.44%				-1.20%	2.70%	3.91%	7%
IN34	Li	177	10	9.938	-0.062	-0.62%	0.126	1.26%				-0.78%	2.44%	3.14%	7%
IN34	Mg	177	0	0.005	0.005		0.016		0.007	0.033	0.048				
IN34	Mn	177	0	0.006	0.006		0.021		0.009	0.043	0.063				
IN34	Na	177	65	65.930	0.930	1.43%	1.731	2.66%				1.76%	5.51%	6.76%	7%
IN34	Ni	177	0	0.001	0.001		0.007		0.002	0.014	0.021				
IN34	Si	177	40	40.008	0.008	0.02%	0.747	1.87%				0.25%	3.74%	3.76%	7%
IN34	Ti	177	0	0.003	0.003		0.004		0.003	0.009	0.013				
IN34	U	177	0	0.034	0.034		0.179		0.056	0.362	0.537				
IN34	Zr	177	0	0.009	0.009		0.030		0.013	0.061	0.089				
IN35	Al	370	10	9.978	-0.022	-0.22%	0.141	1.41%				-0.34%	2.81%	3.03%	7%
IN35	B	370	0	-0.004	-0.004		0.038		0.003	0.077	0.115				
IN35	Ca	370	2	1.996	-0.004	-0.20%	0.046	2.32%				-0.40%	4.63%	4.84%	7%
IN35	Cr	370	2	2.002	0.002	0.09%	0.030	1.49%				0.22%	2.98%	3.06%	7%
IN35	Cu	370	1	1.005	0.005	0.49%	0.016	1.57%				0.63%	3.19%	3.64%	7%
IN35	Fe	370	20	19.980	-0.020	-0.10%	0.277	1.38%				-0.22%	2.76%	2.86%	7%
IN35	K	370	0	0.018	0.018		0.075		0.024	0.152	0.225				
IN35	Li	370	0	0.001	0.001		0.004		0.002	0.008	0.011				
IN35	Mg	370	1	1.009	0.009	0.91%	0.023	2.26%				1.11%	4.62%	5.44%	7%
IN35	Mn	370	1	1.001	0.001	0.12%	0.016	1.64%				0.26%	3.28%	3.39%	7%
IN35	Na	370	20	19.976	-0.024	-0.12%	0.365	1.83%				-0.28%	3.65%	3.77%	7%
IN35	Ni	370	2	1.986	-0.014	-0.69%	0.034	1.72%				-0.84%	3.36%	4.13%	7%
IN35	Si	370	0	-0.600	-0.600		0.480		0.041	0.961	1.441				

Table A1. Measurement Uncertainties for Calibration and Bench Standards

									95% Abs.						
					Abs.		Std		Bound	95%	99%	95% Rel.	95%	99%	
			Ref.	Sample	Bias		Dev		for Bias	Uncert.	Uncert.	Bound	Rel.	Rel.	LIMS
Std.	Elem.	n	Value	Mean	mg/L	%Bias	mg/L	% RSD	mg/L	mg/L	mg/L	for Bias	Uncert.	Uncert.	Limits
IN35	Ti	370	2	1.990	-0.010	-0.52%	0.029	1.45%				-0.64%	2.85%	3.42%	7%
IN35	U	370	0	0.117	0.117		0.277		0.140	0.572	0.832				
IN35	Zr	370	2	2.015	0.015	0.77%	0.039	1.95%				0.93%	3.98%	4.67%	7%
IN36	Al	366	0	0.005	0.005		0.023		0.007	0.046	0.068				
IN36	B	366	10	10.052	0.052	0.52%	0.110	1.10%				0.61%	2.26%	2.71%	7%
IN36	Ca	366	0	0.086	0.086		0.092		0.094	0.206	0.277				
IN36	Cr	366	0	0.001	0.001		0.003		0.001	0.006	0.009				
IN36	Cu	366	0	0.000	0.000		0.004		0.001	0.007	0.011				
IN36	Fe	366	0	0.009	0.009		0.048		0.013	0.096	0.143				
IN36	K	366	10	9.937	-0.063	-0.63%	0.120	1.20%				-0.74%	2.32%	3.04%	7%
IN36	Li	366	10	9.971	-0.029	-0.29%	0.109	1.09%				-0.38%	2.16%	2.46%	7%
IN36	Mg	366	0	0.005	0.005		0.016		0.006	0.033	0.048				
IN36	Mn	366	0	0.006	0.006		0.021		0.008	0.044	0.064				
IN36	Na	366	65	66.133	1.133	1.74%	1.619	2.49%				1.96%	5.28%	6.72%	7%
IN36	Ni	366	0	0.001	0.001		0.007		0.001	0.015	0.022				
IN36	Si	366	40	40.316	0.316	0.79%	0.724	1.81%				0.95%	3.71%	4.41%	7%
IN36	Ti	366	0	0.003	0.003		0.004		0.003	0.009	0.013				
IN36	U	366	0	0.064	0.064		0.150		0.077	0.310	0.450				
IN36	Zr	366	0	0.010	0.010		0.030		0.012	0.062	0.091				
IN38	Al	120	0	0.021	0.021		0.025		0.025	0.056	0.076				
IN38	B	120	0	0.002	0.002		0.037		0.007	0.074	0.110				
IN38	Ca	120	0	0.241	0.241		0.215		0.274	0.509	0.703				
IN38	Cr	120	0	0.028	0.028		0.004		0.029	0.030	0.038				
IN38	Cu	120	0	0.024	0.024		0.012		0.026	0.035	0.050				
IN38	Fe	120	0	0.001	0.001		0.029		0.006	0.059	0.088				
IN38	K	120	0	-0.022	-0.022		0.064		0.010	0.128	0.191				
IN38	Li	120	0	0.002	0.002		0.005		0.002	0.009	0.014				
IN38	Mg	120	0	0.002	0.002		0.002		0.002	0.005	0.007				
IN38	Mn	120	0	0.002	0.002		0.001		0.002	0.003	0.004				
IN38	Na	120	0	0.485	0.485		1.045		0.643	2.187	3.136				
IN38	Ni	120	0	0.004	0.004		0.007		0.005	0.015	0.022				
IN38	Si	120	0	0.018	0.018		0.913		0.156	1.832	2.738				
IN38	Ti	120	0	0.000	0.000		0.002		0.001	0.003	0.005				
IN38	U	120	10	9.858	-0.142	-1.42%	0.165	1.65%				-1.67%	2.99%	4.73%	7%
IN38	Zr	120	0	0.001	0.001		0.003		0.002	0.005	0.008				
IN39	Al	60	0	0.020	0.020		0.025		0.026	0.056	0.076				
IN39	B	60	0	-0.002	-0.002		0.036		0.008	0.072	0.107				
IN39	Ca	60	0	0.255	0.255		0.238		0.306	0.566	0.782				
IN39	Cr	60	0	0.027	0.027		0.005		0.028	0.030	0.037				
IN39	Cu	60	0	0.023	0.023		0.013		0.026	0.037	0.052				
IN39	Fe	60	0	0.010	0.010		0.020		0.014	0.043	0.061				
IN39	K	60	0	-0.032	-0.032		0.067		0.014	0.135	0.202				
IN39	Li	60	0	0.002	0.002		0.005		0.003	0.010	0.015				
IN39	Mg	60	0	0.002	0.002		0.003		0.003	0.006	0.008				
IN39	Mn	60	0	0.002	0.002		0.001		0.003	0.004	0.006				
IN39	Na	60	0	0.499	0.499		1.048		0.725	2.218	3.144				
IN39	Ni	60	0	0.003	0.003		0.008		0.005	0.017	0.024				
IN39	Si	60	0	0.281	0.281		0.920		0.479	1.901	2.759				
IN39	Ti	60	0	0.000	0.000		0.002		0.001	0.004	0.006				
IN39	U	60	10	9.807	-0.193	-1.93%	0.206	2.06%				-2.38%	3.65%	6.06%	7%
IN39	Zr	60	0	0.001	0.001		0.003		0.002	0.006	0.008				
SM32	Al	619	0	0.011	0.011		0.050		0.014	0.102	0.151				
SM32	Ca	619	0	0.013	0.013		0.052		0.017	0.105	0.156				
SM32	Cr	619	0	0.004	0.004		0.007		0.005	0.014	0.020				
SM32	Cu	619	0	0.002	0.002		0.004		0.002	0.009	0.013				
SM32	Fe	619	0	0.004	0.004		0.056		0.008	0.113	0.169				
SM32	K	619	0	0.059	0.059		0.078		0.065	0.169	0.235				
SM32	Li	619	0	0.003	0.003		0.003		0.003	0.006	0.009				
SM32	Mg	619	0	0.001	0.001		0.005		0.001	0.010	0.015				
SM32	Mn	619	0	0.001	0.001		0.010		0.002	0.020	0.030				
SM32	Na	619	0	0.013	0.013		0.191		0.026	0.384	0.574				
SM32	Ni	619	0	0.005	0.005		0.012		0.006	0.024	0.035				

Table A1. Measurement Uncertainties for Calibration and Bench Standards

Std.	Elem.	n	Ref. Value	Sample Mean	Abs. Bias mg/L	%Bias	Std Dev mg/L	% RSD	95% Abs. Bound for Bias mg/L	95% Uncert. mg/L	99% Uncert. mg/L	95% Rel. Bound for Bias	95% Rel. Uncert.	99% Rel. Uncert.	LIMS Limits
SM32	Si	619	0	0.088	0.088		0.567		0.126	1.141	1.701				
SM32	Ti	619	0	0.014	0.014		0.026		0.016	0.053	0.077				
SM32	U	619	0	0.172	0.172		0.187		0.184	0.418	0.562				
SM32	Zr	619	0	-0.007	-0.007		0.016		0.001	0.031	0.047				
SM33	Al	319	0	0.015	0.015		0.292		0.042	0.586	0.877				
SM33	Ca	319	1	0.996	-0.004	-0.39%	0.026	2.61%				-0.63%	5.20%	5.61%	7%
SM33	Cr	319	1	0.994	-0.006	-0.57%	0.019	1.86%				-0.75%	3.67%	4.29%	7%
SM33	Cu	319	1	0.994	-0.006	-0.58%	0.014	1.39%				-0.71%	2.71%	3.35%	7%
SM33	Fe	319	0	-0.007	-0.007		0.022		0.002	0.045	0.067				
SM33	K	319	5	4.912	-0.088	-1.77%	0.083	1.66%				-1.92%	2.81%	5.09%	7%
SM33	Li	319	2	1.971	-0.029	-1.46%	0.028	1.40%				-1.59%	2.39%	4.26%	7%
SM33	Mg	319	1	1.007	0.007	0.67%	0.023	2.31%				0.88%	4.68%	5.30%	7%
SM33	Mn	319	0	0.000	0.000		0.002		0.000	0.004	0.006				
SM33	Na	319	32	32.702	0.702	2.20%	0.999	3.12%				2.48%	6.62%	8.44%	7%
SM33	Ni	319	1	0.995	-0.005	-0.53%	0.017	1.73%				-0.69%	3.42%	3.99%	7%
SM33	Si	319	20	20.257	0.257	1.28%	0.481	2.40%				1.51%	4.98%	6.09%	7%
SM33	Ti	319	0	0.000	0.000		0.001		0.000	0.003	0.004				
SM33	U	319	0	0.031	0.031		0.145		0.044	0.294	0.435				
SM33	Zr	319	0	-0.007	-0.007		0.015		0.001	0.030	0.046				
SM34	Al	324	2	1.972	-0.028	-1.38%	0.030	1.52%				-1.52%	2.71%	4.43%	7%
SM34	Ca	324	0	0.020	0.020		0.071		0.026	0.144	0.212				
SM34	Cr	324	0	0.002	0.002		0.003		0.002	0.006	0.008				
SM34	Cu	324	0	0.001	0.001		0.003		0.001	0.007	0.010				
SM34	Fe	324	10	9.897	-0.103	-1.03%	0.143	1.43%				-1.16%	2.67%	3.89%	7%
SM34	K	324	0	0.008	0.008		0.052		0.013	0.105	0.156				
SM34	Li	324	0	0.007	0.007		0.020		0.009	0.041	0.061				
SM34	Mg	324	0	0.003	0.003		0.012		0.004	0.024	0.035				
SM34	Mn	324	2	1.969	-0.031	-1.53%	0.033	1.64%				-1.68%	2.90%	4.81%	7%
SM34	Na	324	5	4.906	-0.094	-1.87%	0.103	2.05%				-2.06%	3.66%	5.98%	7%
SM34	Ni	324	0	0.009	0.009		0.008		0.009	0.018	0.025				
SM34	Si	324	0	0.121	0.121		0.469		0.164	0.952	1.407				
SM34	Ti	324	1	0.993	-0.007	-0.72%	0.018	1.82%				-0.88%	3.56%	4.35%	7%
SM34	U	324	0	0.056	0.056		0.144		0.069	0.296	0.432				
SM34	Zr	324	1	0.977	-0.023	-2.30%	0.013	1.27%				-2.42%	1.07%	4.84%	7%
SM35	Al	640	0	0.021	0.021		0.295		0.040	0.592	0.886				
SM35	Ca	640	1	1.010	0.010	1.02%	0.024	2.42%				1.18%	4.94%	5.86%	7%
SM35	Cr	640	1	1.006	0.006	0.64%	0.017	1.72%				0.75%	3.49%	4.07%	7%
SM35	Cu	640	1	1.005	0.005	0.55%	0.014	1.40%				0.64%	2.85%	3.34%	7%
SM35	Fe	640	0	-0.009	-0.009		0.024		0.002	0.047	0.071				
SM35	K	640	5	4.986	-0.014	-0.29%	0.084	1.69%				-0.40%	3.36%	3.66%	7%
SM35	Li	640	2	1.993	-0.007	-0.34%	0.031	1.57%				-0.44%	3.13%	3.49%	7%
SM35	Mg	640	1	1.017	0.017	1.73%	0.021	2.13%				1.86%	4.60%	5.99%	7%
SM35	Mn	640	0	0.000	0.000		0.002		0.000	0.004	0.006				
SM35	Na	640	32	33.050	1.050	3.28%	0.916	2.86%				3.47%	6.60%	9.00%	7%
SM35	Ni	640	1	1.007	0.007	0.72%	0.018	1.76%				0.84%	3.60%	4.25%	7%
SM35	Si	640	20	20.458	0.458	2.29%	0.411	2.05%				2.42%	4.70%	6.40%	7%
SM35	Ti	640	0	0.001	0.001		0.001		0.001	0.002	0.003				
SM35	U	640	0	0.100	0.100		0.105		0.107	0.236	0.317				
SM35	Zr	640	0	-0.006	-0.006		0.015		0.001	0.030	0.045				
SM36	Al	642	2	1.986	-0.014	-0.71%	0.028	1.42%				-0.81%	2.76%	3.56%	7%
SM36	Ca	642	0	0.014	0.014		0.050		0.017	0.102	0.151				
SM36	Cr	642	0	0.002	0.002		0.002		0.002	0.005	0.007				
SM36	Cu	642	0	0.001	0.001		0.003		0.001	0.006	0.008				
SM36	Fe	642	10	9.940	-0.060	-0.60%	0.126	1.26%				-0.68%	2.44%	3.11%	7%
SM36	K	642	0	0.015	0.015		0.053		0.018	0.108	0.159				
SM36	Li	642	0	0.011	0.011		0.120		0.019	0.241	0.360				
SM36	Mg	642	0	0.003	0.003		0.008		0.003	0.017	0.025				
SM36	Mn	642	2	1.980	-0.020	-1.02%	0.030	1.49%				-1.11%	2.80%	4.00%	7%
SM36	Na	642	5	4.921	-0.079	-1.57%	0.097	1.93%				-1.70%	3.54%	5.44%	7%
SM36	Ni	642	0	0.009	0.009		0.008		0.010	0.018	0.025				
SM36	Si	642	0	0.105	0.105		0.377		0.130	0.765	1.131				
SM36	Ti	642	1	0.997	-0.003	-0.27%	0.018	1.77%				-0.39%	3.53%	3.81%	7%

Table A1. Measurement Uncertainties for Calibration and Bench Standards

Std.	Elem.	n	Ref. Value	Sample Mean	Abs. Bias mg/L	%Bias	Std Dev mg/L	% RSD	95% Abs. Bound for Bias mg/L	95% Uncert. mg/L	99% Uncert. mg/L	95% Rel. Bound for Bias	95% Rel. Uncert.	99% Rel. Uncert.	LIMS Limits
SM36	U	642	0	0.080	0.080		0.107		0.087	0.231	0.320				
SM36	Zr	642	1	0.982	-0.018	-1.85%	0.012	1.17%				-1.92%	1.43%	4.18%	7%
SM37	Al	334	0	0.044	0.044		0.019		0.045	0.059	0.084				
SM37	Ca	334	0	0.281	0.281		0.360		0.313	0.785	1.079				
SM37	Cr	334	0	0.028	0.028		0.005		0.029	0.031	0.039				
SM37	Cu	334	0	0.025	0.025		0.037		0.028	0.079	0.110				
SM37	Fe	334	0	-0.005	-0.005		0.024		0.002	0.049	0.073				
SM37	K	334	0	-0.006	-0.006		0.051		0.005	0.103	0.154				
SM37	Li	334	0	0.001	0.001		0.002		0.001	0.005	0.007				
SM37	Mg	334	0	0.005	0.005		0.005		0.006	0.012	0.016				
SM37	Mn	334	0	0.002	0.002		0.001		0.002	0.003	0.004				
SM37	Na	334	0	0.115	0.115		0.544		0.164	1.101	1.633				
SM37	Ni	334	0	0.002	0.002		0.008		0.003	0.016	0.023				
SM37	Si	334	0	0.427	0.427		0.646		0.486	1.380	1.938				
SM37	Ti	334	0	0.001	0.001		0.002		0.001	0.003	0.005				
SM37	U	334	10	9.846	-0.154	-1.54%	0.180	1.80%				-1.71%	3.25%	5.14%	7%
SM37	Zr	334	0	-0.005	-0.005		0.016		0.001	0.032	0.048				
SM38	Al	640	0	0.054	0.054		0.136		0.062	0.280	0.409				
SM38	Ca	640	0	0.277	0.277		0.350		0.299	0.761	1.049				
SM38	Cr	640	0	0.029	0.029		0.005		0.029	0.031	0.040				
SM38	Cu	640	0	0.025	0.025		0.033		0.027	0.072	0.100				
SM38	Fe	640	0	-0.006	-0.006		0.025		0.002	0.050	0.075				
SM38	K	640	0	0.003	0.003		0.048		0.006	0.097	0.145				
SM38	Li	640	0	0.001	0.001		0.002		0.001	0.004	0.006				
SM38	Mg	640	0	0.005	0.005		0.005		0.005	0.012	0.016				
SM38	Mn	640	0	0.001	0.001		0.001		0.002	0.003	0.004				
SM38	Na	640	0	0.117	0.117		0.556		0.153	1.123	1.668				
SM38	Ni	640	0	0.002	0.002		0.008		0.003	0.015	0.023				
SM38	Si	640	0	0.172	0.172		0.577		0.209	1.174	1.732				
SM38	Ti	640	0	0.001	0.001		0.001		0.001	0.003	0.004				
SM38	U	640	10	9.913	-0.087	-0.87%	0.179	1.79%				-0.98%	3.48%	4.46%	7%
SM38	Zr	640	0	-0.005	-0.005		0.015		0.001	0.031	0.046				
SM51	Al	325	0	0.007	0.007		0.014		0.008	0.029	0.042				
SM51	B	325	4	3.882	-0.118	-2.94%	0.241	6.03%				-3.49%	11.70%	15.00%	7%
SM51	Ca	325	1	0.998	-0.002	-0.24%	0.028	2.78%				-0.49%	5.56%	5.81%	7%
SM51	Cr	325	1	0.989	-0.011	-1.09%	0.015	1.51%				-1.23%	2.83%	4.12%	7%
SM51	Cu	325	1	0.989	-0.011	-1.10%	0.014	1.41%				-1.23%	2.59%	3.91%	7%
SM51	Fe	325	0	0.010	0.010		0.093		0.018	0.188	0.280				
SM51	K	325	5	4.921	-0.079	-1.58%	0.080	1.61%				-1.73%	2.81%	4.80%	7%
SM51	Li	325	2	1.974	-0.026	-1.31%	0.028	1.40%				-1.44%	2.47%	4.11%	7%
SM51	Mg	325	1	1.003	0.003	0.31%	0.024	2.38%				0.53%	4.77%	5.07%	7%
SM51	Mn	325	0	0.001	0.001		0.002		0.001	0.004	0.005				
SM51	Ni	325	1	0.986	-0.014	-1.37%	0.018	1.80%				-1.53%	3.32%	4.96%	7%
SM51	Si	325	20	20.151	0.151	0.75%	0.406	2.03%				0.94%	4.13%	4.81%	7%
SM51	Ti	325	0	0.000	0.000		0.001		0.001	0.003	0.004				
SM52	Al	321	2	1.973	-0.027	-1.36%	0.032	1.62%				-1.51%	2.94%	4.60%	7%
SM52	B	321	2	1.986	-0.014	-0.70%	0.032	1.60%				-0.85%	3.12%	3.90%	7%
SM52	Ca	321	0	0.014	0.014		0.071		0.021	0.143	0.212				
SM52	Cr	321	0	0.001	0.001		0.003		0.001	0.006	0.009				
SM52	Cu	321	0	0.000	0.000		0.003		0.001	0.006	0.009				
SM52	Fe	321	10	9.881	-0.119	-1.19%	0.145	1.45%				-1.32%	2.65%	4.09%	7%
SM52	K	321	0	0.013	0.013		0.051		0.018	0.103	0.152				
SM52	Li	321	0	0.001	0.001		0.002		0.001	0.004	0.006				
SM52	Mg	321	0	0.003	0.003		0.027		0.006	0.054	0.080				
SM52	Mn	321	2	1.972	-0.028	-1.41%	0.031	1.57%				-1.56%	2.81%	4.56%	7%
SM52	Ni	321	0	0.008	0.008		0.008		0.008	0.018	0.024				
SM52	Si	321	0	0.006	0.006		0.047		0.011	0.095	0.142				
SM52	Ti	321	1	0.993	-0.007	-0.74%	0.019	1.92%				-0.91%	3.77%	4.58%	7%
SM53	Al	648	0	0.010	0.010		0.011		0.011	0.024	0.032				
SM53	B	648	4	3.902	-0.098	-2.45%	0.240	6.00%				-2.83%	11.75%	14.45%	7%
SM53	Ca	648	1	1.002	0.002	0.18%	0.025	2.49%				0.34%	4.99%	5.17%	7%
SM53	Cr	648	1	0.992	-0.008	-0.78%	0.014	1.43%				-0.87%	2.75%	3.64%	7%

Table A1. Measurement Uncertainties for Calibration and Bench Standards

Std.	Elem.	n	Ref. Value	Sample Mean	Abs. Bias mg/L	%Bias	Std Dev mg/L	% RSD	95% Abs. Bound for Bias mg/L	95% Uncert. mg/L	99% Uncert. mg/L	95% Rel. Bound for Bias	95% Rel. Uncert.	99% Rel. Uncert.	LIMS Limits
SM53	Cu	648	1	0.992	-0.008	-0.82%	0.013	1.29%				-0.90%	2.45%	3.40%	7%
SM53	Fe	648	0	0.008	0.008		0.080		0.013	0.160	0.239				
SM53	K	648	5	4.938	-0.062	-1.23%	0.069	1.38%				-1.32%	2.48%	4.00%	7%
SM53	Li	648	2	1.979	-0.021	-1.05%	0.025	1.23%				-1.13%	2.22%	3.51%	7%
SM53	Mg	648	1	1.003	0.003	0.32%	0.020	1.99%				0.45%	3.99%	4.30%	7%
SM53	Mn	648	0	0.001	0.001		0.002		0.001	0.004	0.005				
SM53	Ni	648	1	0.990	-0.010	-0.98%	0.016	1.63%				-1.08%	3.11%	4.24%	7%
SM53	Si	648	20	20.064	0.064	0.32%	0.326	1.63%				0.43%	3.28%	3.58%	7%
SM53	Ti	648	0	0.001	0.001		0.001		0.001	0.002	0.003				
SM54	Al	646	2	1.980	-0.020	-1.01%	0.028	1.42%				-1.10%	2.66%	3.86%	7%
SM54	B	646	2	1.988	-0.012	-0.58%	0.032	1.58%				-0.68%	3.11%	3.74%	7%
SM54	Ca	646	0	0.006	0.006		0.038		0.008	0.077	0.115				
SM54	Cr	646	0	0.002	0.002		0.002		0.002	0.005	0.007				
SM54	Cu	646	0	0.001	0.001		0.002		0.001	0.005	0.007				
SM54	Fe	646	10	9.895	-0.105	-1.05%	0.132	1.32%				-1.14%	2.42%	3.69%	7%
SM54	K	646	0	0.016	0.016		0.040		0.018	0.081	0.119				
SM54	Li	646	0	0.001	0.001		0.002		0.001	0.004	0.005				
SM54	Mg	646	0	0.001	0.001		0.002		0.001	0.004	0.006				
SM54	Mn	646	2	1.976	-0.024	-1.19%	0.029	1.46%				-1.29%	2.66%	4.10%	7%
SM54	Ni	646	0	0.008	0.008		0.007		0.008	0.017	0.023				
SM54	Si	646	0	0.011	0.011		0.029		0.013	0.059	0.086				
SM54	Ti	646	1	0.994	-0.006	-0.58%	0.019	1.91%				-0.71%	3.77%	4.40%	7%
SM55	Al	635	0	0.026	0.026		0.042		0.028	0.088	0.125				
SM55	B	635	0	0.009	0.009		0.023		0.011	0.046	0.068				
SM55	Ca	635	0	0.002	0.002		0.049		0.005	0.098	0.147				
SM55	Cr	635	0	0.010	0.010		0.019		0.011	0.039	0.056				
SM55	Cu	635	0	0.005	0.005		0.010		0.006	0.021	0.030				
SM55	Fe	635	0	0.054	0.054		0.111		0.061	0.230	0.332				
SM55	K	635	0	0.055	0.055		0.388		0.080	0.780	1.164				
SM55	Li	635	0	0.005	0.005		0.008		0.006	0.017	0.024				
SM55	Mg	635	0	0.004	0.004		0.008		0.005	0.017	0.025				
SM55	Mn	635	0	0.005	0.005		0.013		0.006	0.027	0.040				
SM55	Ni	635	0	0.009	0.009		0.021		0.011	0.043	0.063				
SM55	Si	635	0	0.111	0.111		0.210		0.125	0.438	0.630				
SM55	Ti	635	0	0.005	0.005		0.010		0.005	0.020	0.029				

Table A2. Comparisons of SME and MFT Measurements for Mixed Acid Calibration and Bench Standards

Standard	n	Element	MFT Mean	SME Mean	% Difference	MFT Std Dev	SME Std Dev	MFT Std Dev/ SME Std Dev	%RSD MFT	%RSD SME
SM32	294	Al (mg/L)	0.011	0.010		0.0405	0.0580			
SM32	294	Ca (mg/L)	0.013	0.013		0.0436	0.0587			
SM32	294	Cr (mg/L)	0.004	0.004		0.0064	0.0071			
SM32	294	Cu (mg/L)	0.002	0.002		0.0040	0.0045			
SM32	294	Fe (mg/L)	0.008	0.001		0.0566	0.0559			
SM32	294	K (mg/L)	0.058	0.060		0.0628	0.0901			
SM32	294	Li (mg/L)	0.002	0.003		0.0022	0.0033			
SM32	294	Mg (mg/L)	0.001	0.001		0.0056	0.0044			
SM32	294	Mn (mg/L)	0.001	0.002		0.0023	0.0137			
SM32	294	Na (mg/L)	0.009	0.016		0.1909	0.1923			
SM32	294	Ni (mg/L)	0.006	0.005		0.0113	0.0122			
SM32	294	Si (mg/L)	0.101	0.077		0.4823	0.6344			
SM32	294	Ti (mg/L)	0.014	0.014		0.0245	0.0264			
SM32	294	U (mg/L)	0.169	0.175		0.1710	0.2013			
SM32	294	Zr (mg/L)	-0.006	-0.007		0.0148	0.0163			
SM33	153	Al (mg/L)	0.000	0.030		0.0148	0.4050			
SM33	153	Ca (mg/L)	0.996	0.996	0.01%	0.0263	0.0260	1.01	2.64%	2.61%
SM33	153	Cr (mg/L)	0.994	0.995	-0.09%	0.0188	0.0184	1.02	1.89%	1.85%
SM33	153	Cu (mg/L)	0.994	0.994	-0.07%	0.0137	0.0140	0.98	1.38%	1.41%
SM33	153	Fe (mg/L)	-0.004	-0.010		0.0140	0.0279			
SM33	153	K (mg/L)	4.914	4.909	0.10%	0.0848	0.0814	1.04	1.73%	1.66%
SM33	153	Li (mg/L)	1.971	1.971	-0.01%	0.0293	0.0269	1.09	1.49%	1.37%
SM33	153	Mg (mg/L)	1.007	1.007	0.02%	0.0227	0.0236	0.96	2.26%	2.35%
SM33	153	Mn (mg/L)	0.000	0.000		0.0012	0.0025			
SM33	153	Na (mg/L)	32.724	32.683	0.13%	0.9660	1.0306	0.94	2.95%	3.15%
SM33	153	Ni (mg/L)	0.994	0.996	-0.19%	0.0171	0.0175	0.97	1.72%	1.76%
SM33	153	Si (mg/L)	20.264	20.251	0.06%	0.4672	0.4945	0.94	2.31%	2.44%
SM33	153	Ti (mg/L)	0.000	0.000		0.0014	0.0014			
SM33	153	U (mg/L)	0.028	0.033		0.1556	0.1351			
SM33	153	Zr (mg/L)	-0.006	-0.007		0.0144	0.0160			
SM34	154	Al (mg/L)	1.971	1.974	-0.13%	0.0315	0.0295	1.07	1.60%	1.50%
SM34	154	Ca (mg/L)	0.021	0.019		0.0705	0.0712			
SM34	154	Cr (mg/L)	0.002	0.002		0.0027	0.0026			
SM34	154	Cu (mg/L)	0.001	0.001		0.0035	0.0031			
SM34	154	Fe (mg/L)	9.889	9.904	-0.14%	0.1413	0.1445	0.98	1.43%	1.46%
SM34	154	K (mg/L)	0.009	0.007		0.0539	0.0506			
SM34	154	Li (mg/L)	0.007	0.006		0.0218	0.0187			
SM34	154	Mg (mg/L)	0.004	0.003		0.0146	0.0080			
SM34	154	Mn (mg/L)	1.968	1.971	-0.18%	0.0301	0.0350	0.86	1.53%	1.77%
SM34	154	Na (mg/L)	4.907	4.905	0.04%	0.1056	0.1003	1.05	2.15%	2.05%
SM34	154	Ni (mg/L)	0.009	0.009		0.0076	0.0082			
SM34	154	Si (mg/L)	0.169	0.077		0.5105	0.4245			
SM34	154	Ti (mg/L)	0.993	0.993	-0.02%	0.0185	0.0180	1.03	1.86%	1.81%
SM34	154	U (mg/L)	0.052	0.060		0.1573	0.1309			
SM34	154	Zr (mg/L)	0.977	0.977	0.05%	0.0116	0.0137	0.85	1.19%	1.40%
SM35	300	Al (mg/L)	0.005	0.035		0.0106	0.4049			
SM35	300	Ca (mg/L)	1.010	1.010	0.04%	0.0248	0.0236	1.05	2.46%	2.34%
SM35	300	Cr (mg/L)	1.006	1.007	-0.02%	0.0183	0.0161	1.14	1.82%	1.60%
SM35	300	Cu (mg/L)	1.005	1.006	-0.01%	0.0144	0.0136	1.06	1.44%	1.35%
SM35	300	Fe (mg/L)	-0.005	-0.012		0.0133	0.0295			
SM35	300	K (mg/L)	4.990	4.982	0.17%	0.0886	0.0802	1.11	1.78%	1.61%
SM35	300	Li (mg/L)	1.995	1.992	0.13%	0.0321	0.0310	1.04	1.61%	1.55%
SM35	300	Mg (mg/L)	1.018	1.016	0.19%	0.0218	0.0209	1.05	2.15%	2.06%
SM35	300	Mn (mg/L)	0.000	0.000		0.0010	0.0025			
SM35	300	Na (mg/L)	33.078	33.026	0.16%	0.8707	0.9539	0.91	2.63%	2.89%
SM35	300	Ni (mg/L)	1.008	1.006	0.16%	0.0183	0.0170	1.08	1.82%	1.69%
SM35	300	Si (mg/L)	20.481	20.438	0.21%	0.4119	0.4097	1.01	2.01%	2.00%
SM35	300	Ti (mg/L)	0.001	0.001		0.0010	0.0013			
SM35	300	U (mg/L)	0.094	0.106		0.0984	0.1108			
SM35	300	Zr (mg/L)	-0.005	-0.006		0.0142	0.0158			
SM36	300	Al (mg/L)	1.986	1.986	-0.01%	0.0310	0.0261	1.19	1.56%	1.31%
SM36	300	Ca (mg/L)	0.012	0.016		0.0312	0.0625			
SM36	300	Cr (mg/L)	0.002	0.002		0.0019	0.0023			
SM36	300	Cu (mg/L)	0.001	0.001		0.0026	0.0028			
SM36	300	Fe (mg/L)	9.940	9.940	0.00%	0.1316	0.1202	1.09	1.32%	1.21%
SM36	300	K (mg/L)	0.016	0.013		0.0620	0.0437			

Table A2. Comparisons of SME and MFT Measurements for Mixed Acid Calibration and Bench Standards

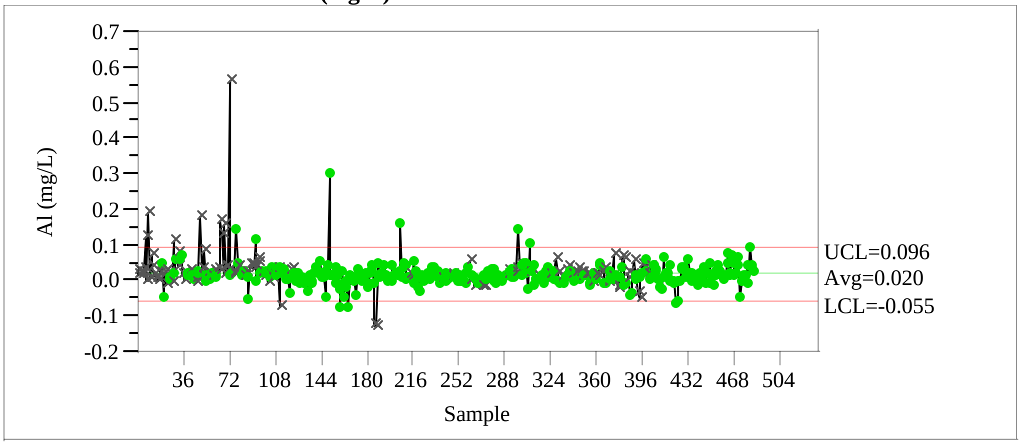
Standard	n	Element	MFT Mean	SME Mean	% Difference	MFT Std Dev	SME Std Dev	MFT Std Dev/ SME Std Dev	%RSD MFT	%RSD SME
SM36	300	Li (mg/L)	0.008	0.015		0.0221	0.1631			
SM36	300	Mg (mg/L)	0.003	0.002		0.0092	0.0077			
SM36	300	Mn (mg/L)	1.979	1.980	-0.06%	0.0294	0.0301	0.98	1.49%	1.52%
SM36	300	Na (mg/L)	4.926	4.917	0.18%	0.1059	0.0878	1.21	2.15%	1.79%
SM36	300	Ni (mg/L)	0.009	0.009		0.0072	0.0079			
SM36	300	Si (mg/L)	0.152	0.064		0.3591	0.3880			
SM36	300	Ti (mg/L)	0.998	0.997	0.12%	0.0187	0.0167	1.12	1.88%	1.68%
SM36	300	U (mg/L)	0.074	0.086		0.1042	0.1088			
SM36	300	Zr (mg/L)	0.982	0.981	0.18%	0.0116	0.0118	0.98	1.18%	1.20%
SM37	161	Al (mg/L)	0.043	0.044		0.0194	0.0189			
SM37	161	Ca (mg/L)	0.290	0.272		0.3927	0.3270			
SM37	161	Cr (mg/L)	0.029	0.028		0.0043	0.0056			
SM37	161	Cu (mg/L)	0.024	0.026		0.0249	0.0452			
SM37	161	Fe (mg/L)	-0.003	-0.008		0.0161	0.0298			
SM37	161	K (mg/L)	-0.006	-0.007		0.0529	0.0501			
SM37	161	Li (mg/L)	0.000	0.001		0.0024	0.0021			
SM37	161	Mg (mg/L)	0.005	0.005		0.0052	0.0051			
SM37	161	Mn (mg/L)	0.002	0.002		0.0012	0.0013			
SM37	161	Na (mg/L)	0.057	0.170		0.3498	0.6734			
SM37	161	Ni (mg/L)	0.002	0.002		0.0077	0.0079			
SM37	161	Si (mg/L)	0.471	0.387		0.6063	0.6802			
SM37	161	Ti (mg/L)	0.001	0.001		0.0015	0.0017			
SM37	161	U (mg/L)	9.846	9.845	0.01%	0.1958	0.1641	1.19	1.99%	1.67%
SM37	161	Zr (mg/L)	-0.005	-0.005		0.0163	0.0158			
SM38	300	Al (mg/L)	0.046	0.060		0.0163	0.1863			
SM38	300	Ca (mg/L)	0.292	0.263		0.3754	0.3254			
SM38	300	Cr (mg/L)	0.029	0.029		0.0040	0.0059			
SM38	300	Cu (mg/L)	0.024	0.026		0.0162	0.0433			
SM38	300	Fe (mg/L)	-0.003	-0.008		0.0162	0.0307			
SM38	300	K (mg/L)	0.002	0.004		0.0490	0.0476			
SM38	300	Li (mg/L)	0.000	0.001		0.0017	0.0021			
SM38	300	Mg (mg/L)	0.005	0.005		0.0053	0.0051			
SM38	300	Mn (mg/L)	0.001	0.002		0.0010	0.0015			
SM38	300	Na (mg/L)	0.053	0.174		0.3600	0.6796			
SM38	300	Ni (mg/L)	0.003	0.002		0.0077	0.0074			
SM38	300	Si (mg/L)	0.210	0.138		0.4877	0.6453			
SM38	300	Ti (mg/L)	0.001	0.001		0.0010	0.0017			
SM38	300	U (mg/L)	9.914	9.912	0.02%	0.1904	0.1696	1.12	1.92%	1.71%
SM38	300	Zr (mg/L)	-0.005	-0.005		0.0147	0.0159			

Table A3. Comparisons of SME and MFT Measurements for Fusion Calibration and Bench Standards

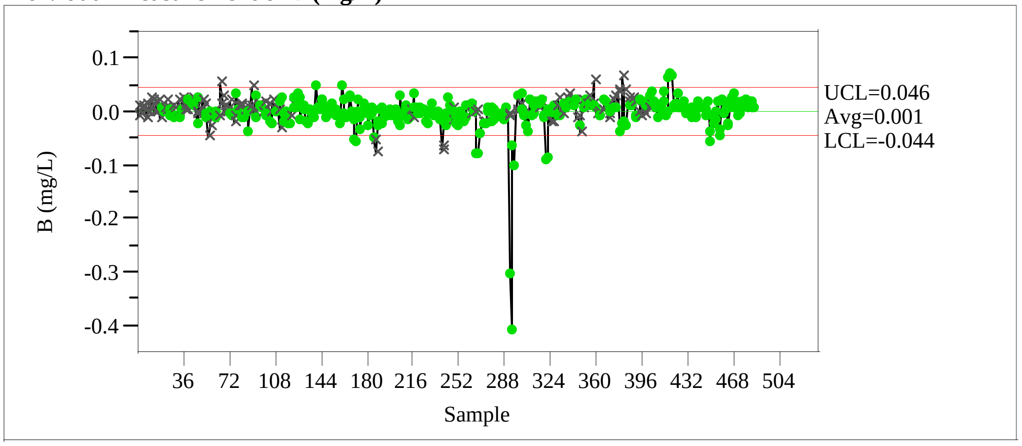
Standard	n	Element	MFT Mean	SME Mean	% Difference	MFT Std Dev	SME Std Dev	MFT Std Dev/ SME Std Dev	%RSD MFT	%RSD SME
SM51	153	AL (mg/L)	0.006	0.008		0.0144	0.0133			
SM51	153	B (mg/L)	3.874	3.890	-0.40%	0.2420	0.2410	1.00	6.25%	6.20%
SM51	153	Ca (mg/L)	0.999	0.997	0.24%	0.0285	0.0273	1.04	2.85%	2.74%
SM51	153	Cr (mg/L)	0.989	0.989	-0.08%	0.0166	0.0138	1.20	1.68%	1.39%
SM51	153	Cu (mg/L)	0.989	0.989	0.02%	0.0148	0.0134	1.11	1.50%	1.36%
SM51	153	Fe (mg/L)	0.016	0.004		0.1354	0.0128			
SM51	153	K (mg/L)	4.922	4.920	0.06%	0.0841	0.0774	1.09	1.71%	1.57%
SM51	153	Li (mg/L)	1.975	1.973	0.08%	0.0273	0.0286	0.96	1.38%	1.45%
SM51	153	Mg (mg/L)	1.004	1.002	0.25%	0.0241	0.0236	1.02	2.40%	2.35%
SM51	153	Mn (mg/L)	0.001	0.001		0.0018	0.0018			
SM51	153	Ni (mg/L)	0.986	0.987	-0.12%	0.0193	0.0167	1.16	1.96%	1.69%
SM51	153	Si (mg/L)	20.159	20.144	0.08%	0.4072	0.4053	1.00	2.02%	2.01%
SM51	153	Ti (mg/L)	0.000	0.001		0.0015	0.0015			
SM52	151	AL (mg/L)	1.971	1.975	-0.20%	0.0328	0.0320	1.03	1.67%	1.62%
SM52	151	B (mg/L)	1.984	1.988	-0.18%	0.0302	0.0335	0.90	1.52%	1.69%
SM52	151	Ca (mg/L)	0.018	0.011		0.0820	0.0590			
SM52	151	Cr (mg/L)	0.001	0.001		0.0028	0.0029			
SM52	151	Cu (mg/L)	0.000	0.000		0.0032	0.0030			
SM52	151	Fe (mg/L)	9.872	9.890	-0.18%	0.1421	0.1479	0.96	1.44%	1.50%
SM52	151	K (mg/L)	0.011	0.014		0.0523	0.0490			
SM52	151	Li (mg/L)	0.001	0.001		0.0019	0.0023			
SM52	151	Mg (mg/L)	0.004	0.003		0.0280	0.0255			
SM52	151	Mn (mg/L)	1.970	1.974	-0.21%	0.0302	0.0325	0.93	1.54%	1.65%
SM52	151	Ni (mg/L)	0.008	0.008		0.0077	0.0083			
SM52	151	Si (mg/L)	0.005	0.007		0.0355	0.0558			
SM52	151	Ti (mg/L)	0.992	0.993	-0.09%	0.0195	0.0190	1.02	1.96%	1.92%
SM53	305	AL (mg/L)	0.009	0.011		0.0106	0.0104			
SM53	305	B (mg/L)	3.897	3.907	-0.23%	0.2411	0.2395	1.01	6.19%	6.13%
SM53	305	Ca (mg/L)	1.003	1.001	0.14%	0.0251	0.0248	1.01	2.50%	2.48%
SM53	305	Cr (mg/L)	0.991	0.993	-0.17%	0.0145	0.0141	1.03	1.46%	1.42%
SM53	305	Cu (mg/L)	0.991	0.992	-0.08%	0.0129	0.0129	1.00	1.30%	1.30%
SM53	305	Fe (mg/L)	0.012	0.004		0.1153	0.0130			
SM53	305	K (mg/L)	4.935	4.941	-0.12%	0.0669	0.0712	0.94	1.36%	1.44%
SM53	305	Li (mg/L)	1.980	1.978	0.06%	0.0232	0.0257	0.90	1.17%	1.30%
SM53	305	Mg (mg/L)	1.004	1.003	0.12%	0.0199	0.0198	1.00	1.99%	1.98%
SM53	305	Mn (mg/L)	0.001	0.001		0.0015	0.0020			
SM53	305	Ni (mg/L)	0.989	0.991	-0.19%	0.0171	0.0155	1.11	1.73%	1.56%
SM53	305	Si (mg/L)	20.067	20.062	0.03%	0.3073	0.3428	0.90	1.53%	1.71%
SM53	305	Ti (mg/L)	0.001	0.001		0.0010	0.0012			
SM54	304	AL (mg/L)	1.979	1.981	-0.12%	0.0295	0.0275	1.07	1.49%	1.39%
SM54	304	B (mg/L)	1.988	1.989	-0.06%	0.0321	0.0311	1.03	1.62%	1.57%
SM54	304	Ca (mg/L)	0.008	0.004		0.0511	0.0208			
SM54	304	Cr (mg/L)	0.002	0.002		0.0021	0.0022			
SM54	304	Cu (mg/L)	0.001	0.001		0.0026	0.0019			
SM54	304	Fe (mg/L)	9.889	9.900	-0.11%	0.1380	0.1262	1.09	1.40%	1.27%
SM54	304	K (mg/L)	0.015	0.017		0.0429	0.0365			
SM54	304	Li (mg/L)	0.001	0.001		0.0018	0.0017			
SM54	304	Mg (mg/L)	0.001	0.001		0.0018	0.0023			
SM54	304	Mn (mg/L)	1.974	1.978	-0.17%	0.0295	0.0287	1.03	1.50%	1.45%
SM54	304	Ni (mg/L)	0.008	0.008		0.0075	0.0073			
SM54	304	Si (mg/L)	0.013	0.009		0.0237	0.0324			
SM54	304	Ti (mg/L)	0.994	0.994	-0.07%	0.0193	0.0189	1.02	1.94%	1.90%
SM55	299	AL (mg/L)	0.029	0.023		0.0494	0.0331			
SM55	299	B (mg/L)	0.009	0.009		0.0247	0.0207			
SM55	299	Ca (mg/L)	0.001	0.003		0.0527	0.0457			
SM55	299	Cr (mg/L)	0.011	0.008		0.0261	0.0078			
SM55	299	Cu (mg/L)	0.005	0.005		0.0128	0.0066			
SM55	299	Fe (mg/L)	0.063	0.046		0.1497	0.0556			
SM55	299	K (mg/L)	0.027	0.079		0.0533	0.5303			
SM55	299	Li (mg/L)	0.005	0.005		0.0096	0.0062			
SM55	299	Mg (mg/L)	0.004	0.004		0.0084	0.0083			
SM55	299	Mn (mg/L)	0.006	0.005		0.0178	0.0075			
SM55	299	Ni (mg/L)	0.011	0.008		0.0282	0.0113			
SM55	299	Si (mg/L)	0.115	0.108		0.2081	0.2122			
SM55	299	Ti (mg/L)	0.005	0.004		0.0138	0.0032			

Exhibit A1. Cold Chem Standards in Analytical Sequence

STCd=IN32
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)

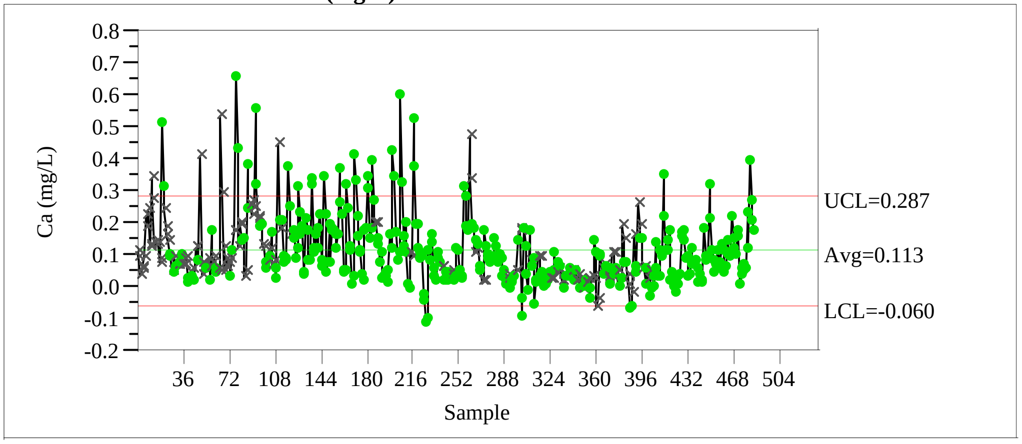
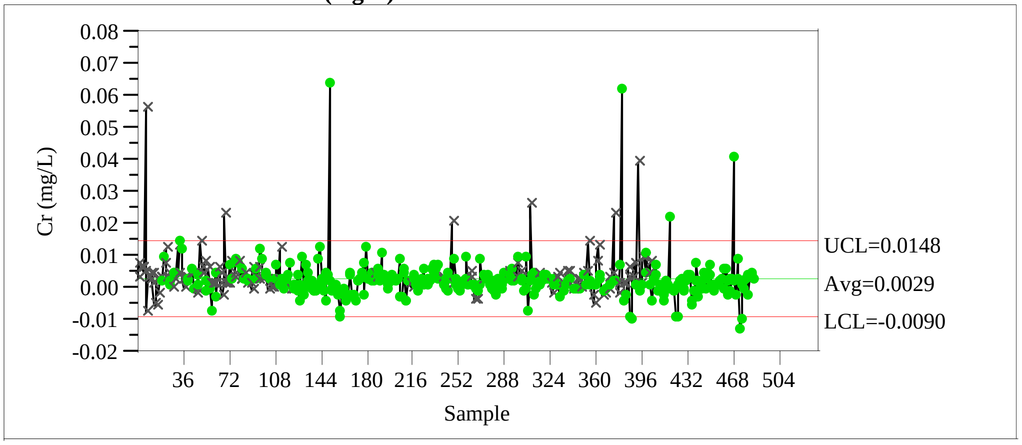
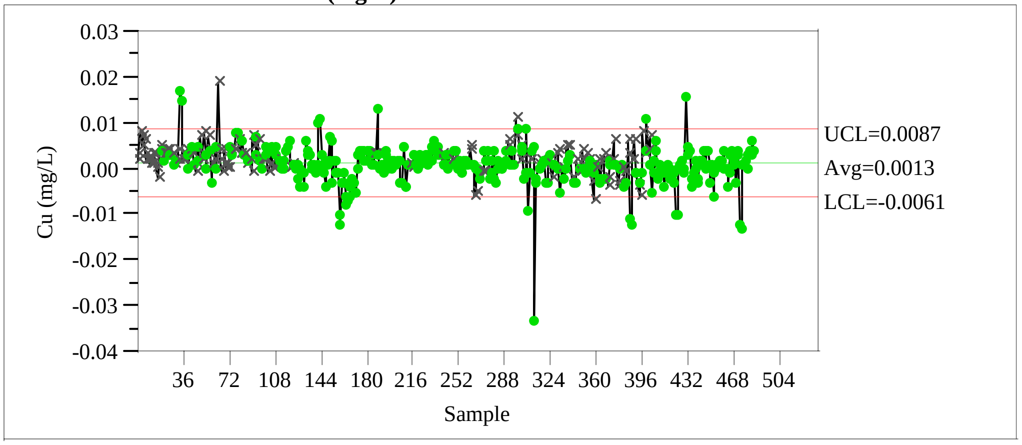


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

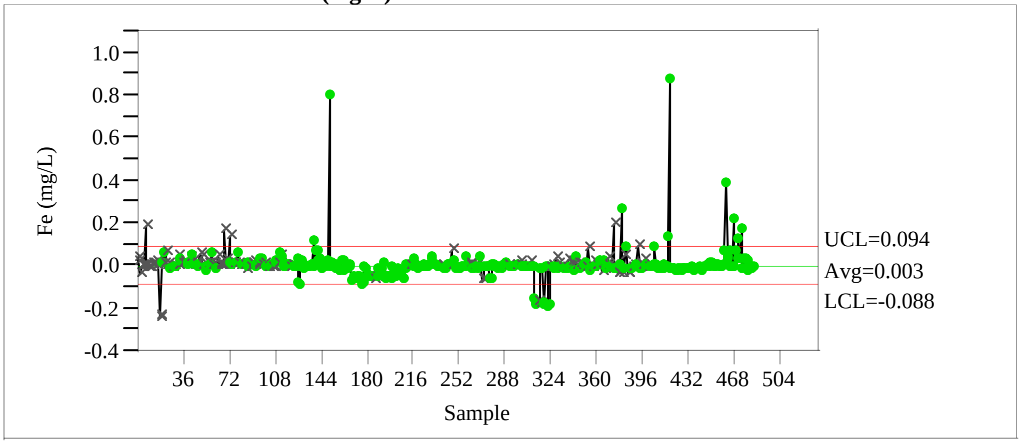
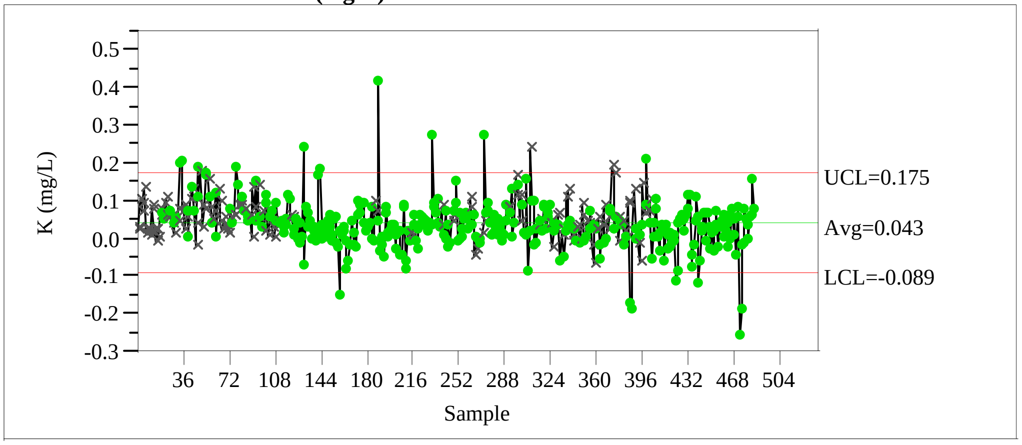
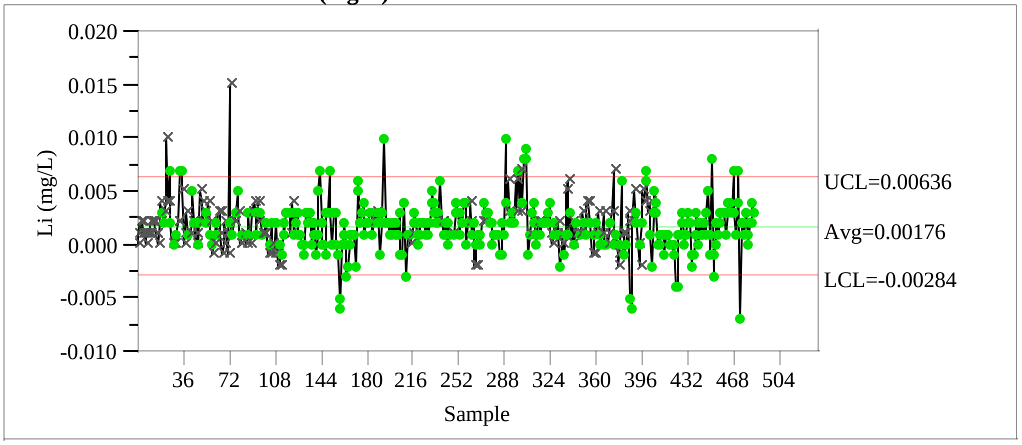


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

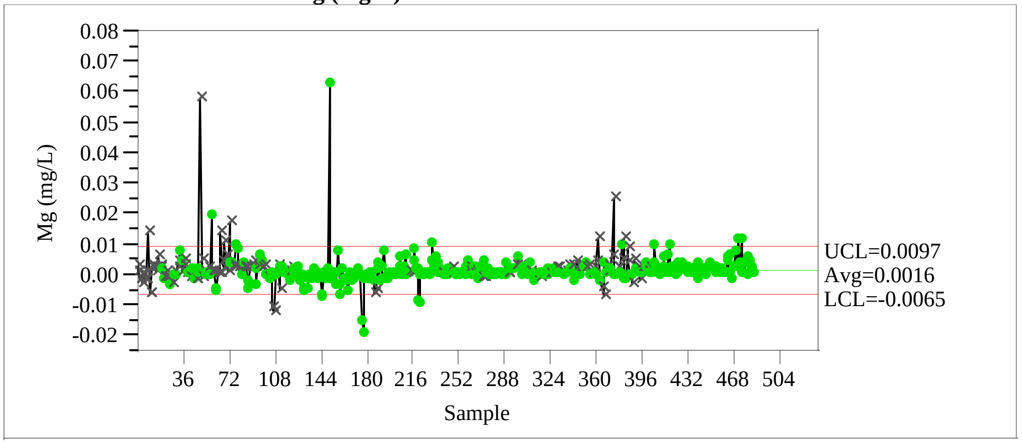
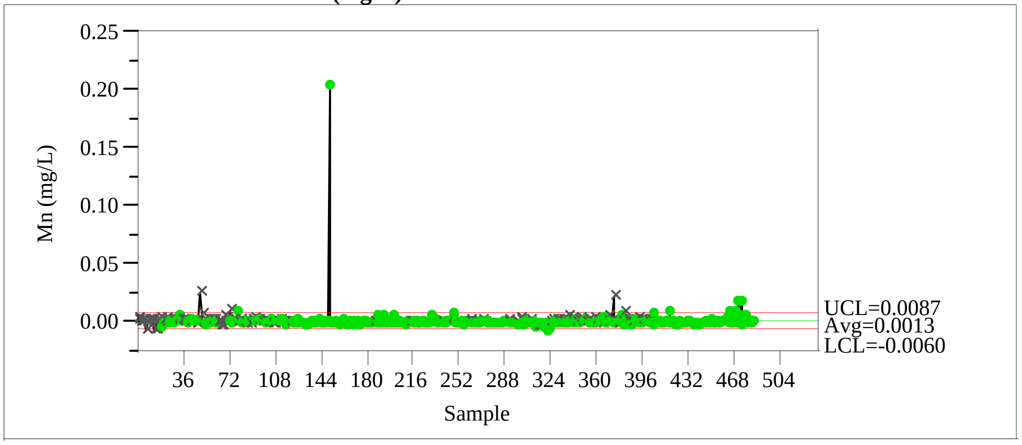
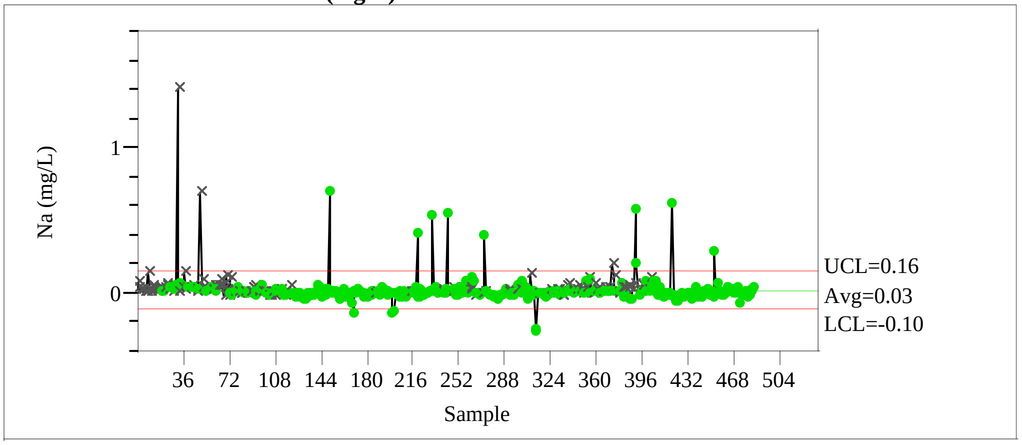


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)

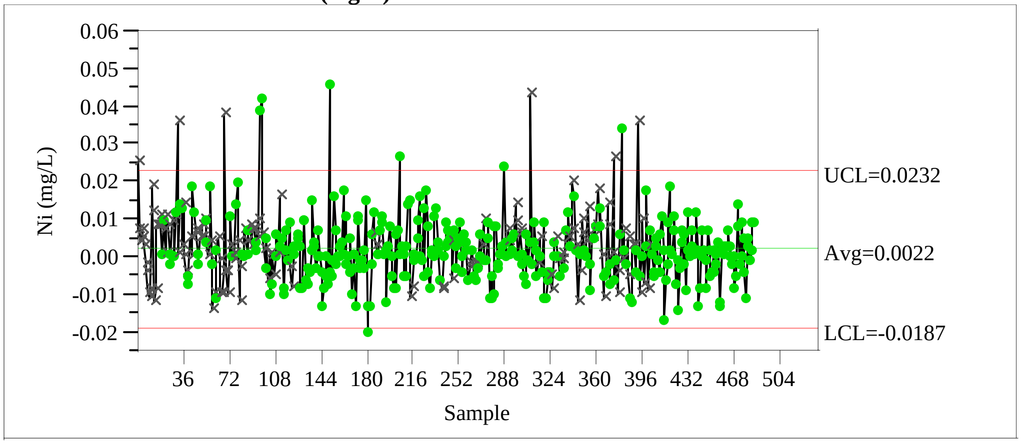
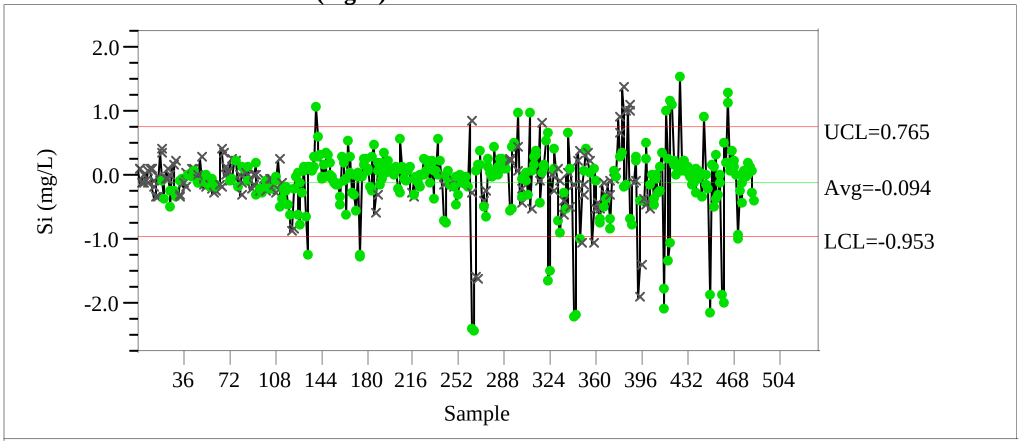
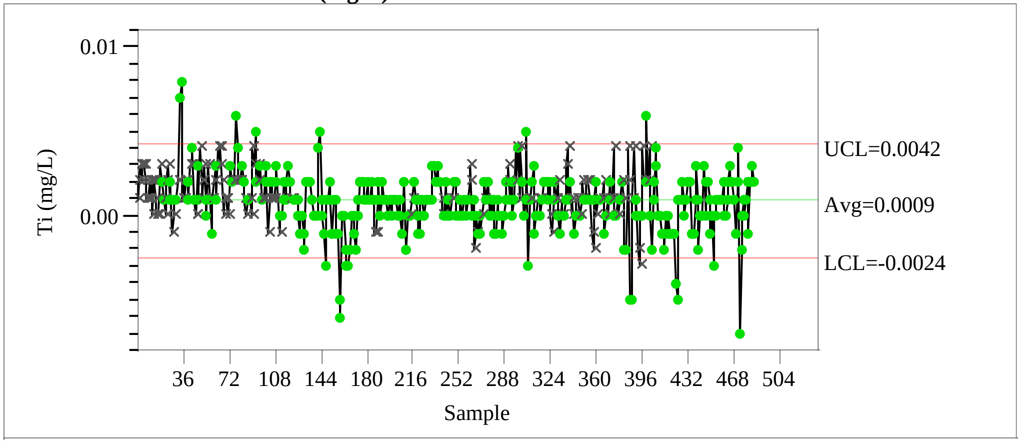


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



Individual Measurement of Zr (mg/L)

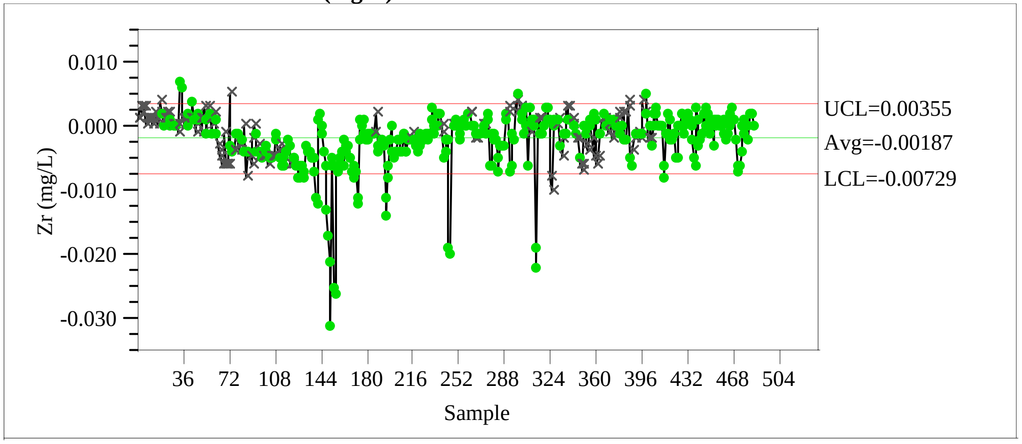
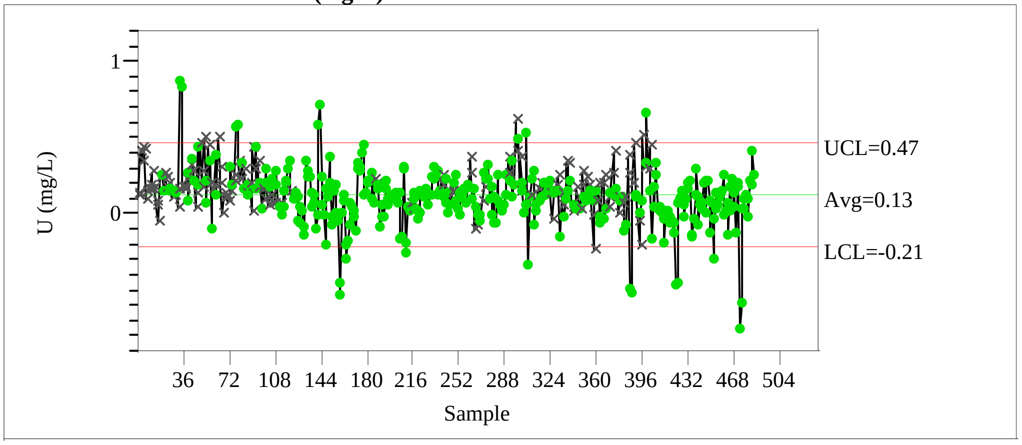
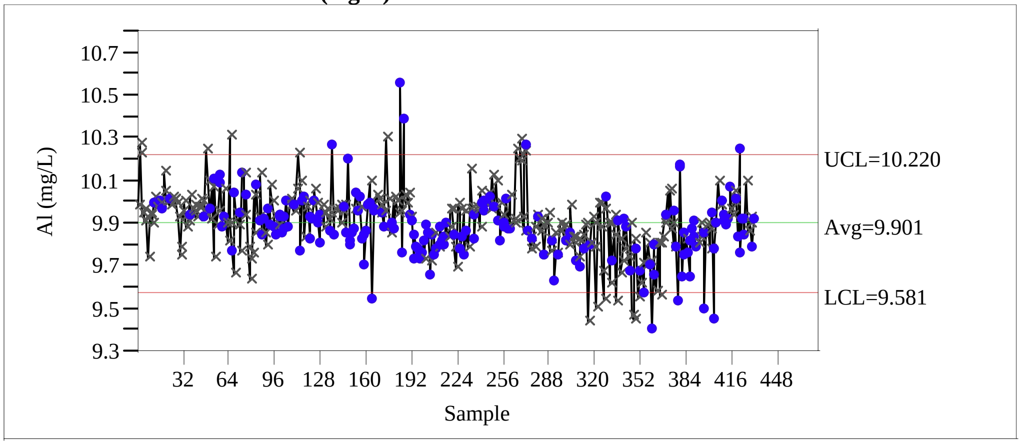


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of U (mg/L)



STCd=IN33
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of B (mg/L)

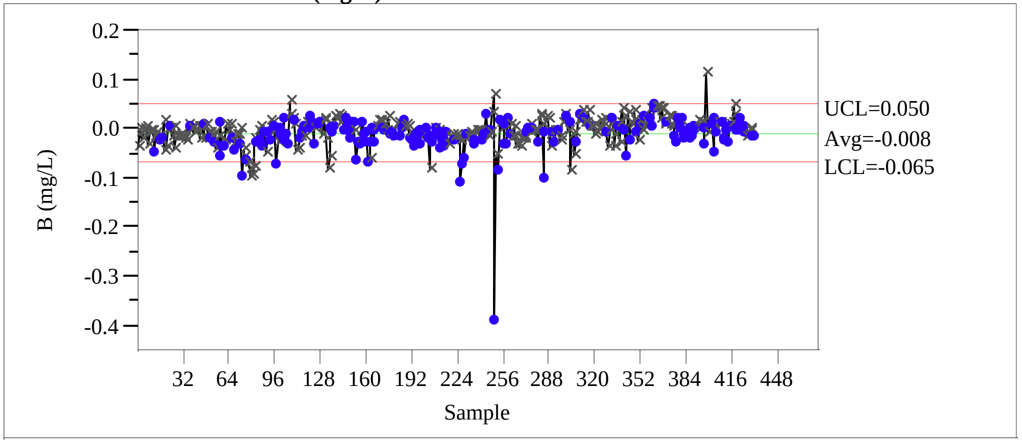
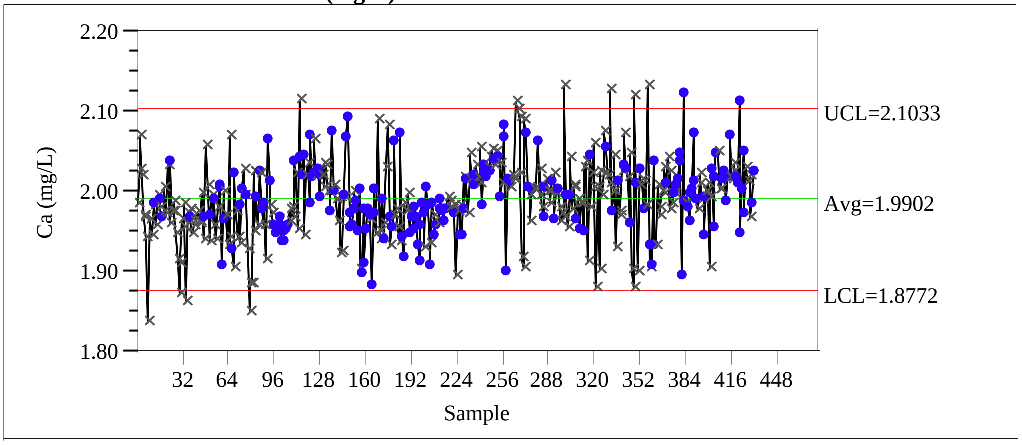
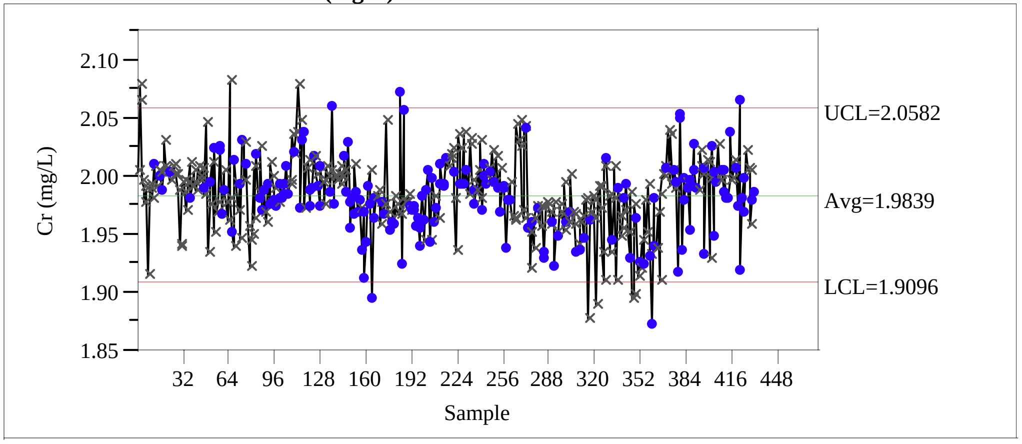


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

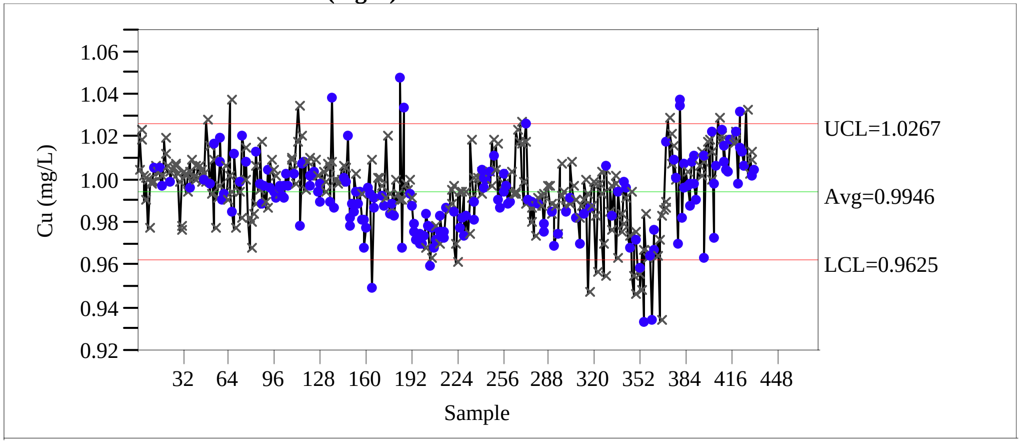
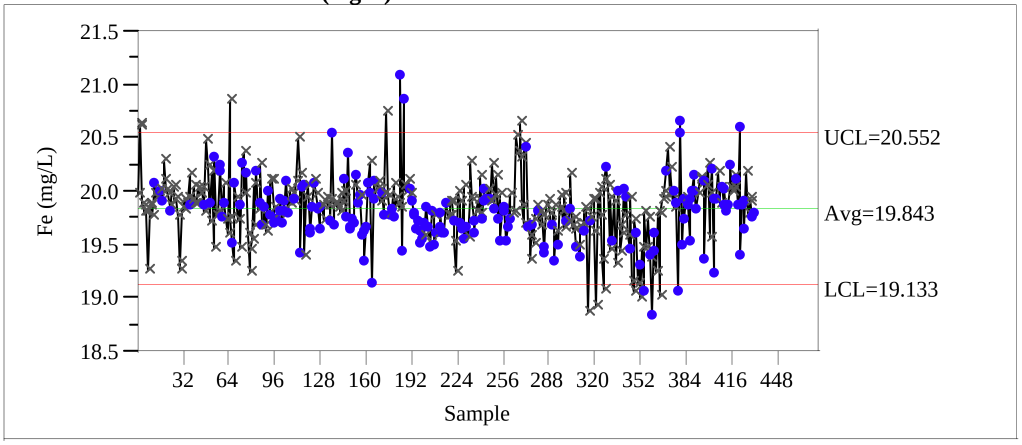
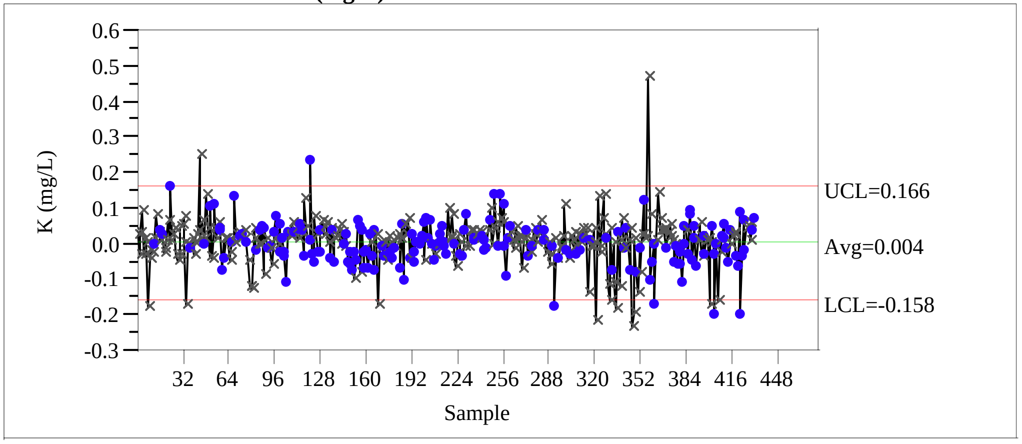


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

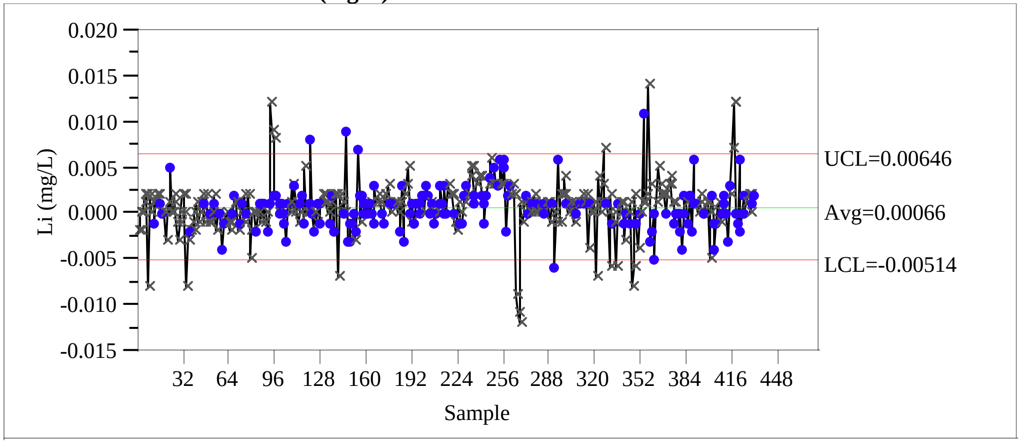
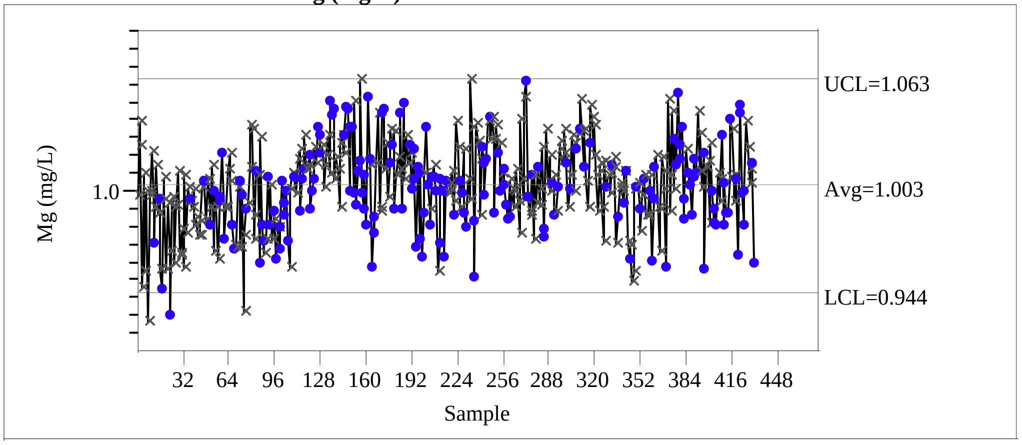
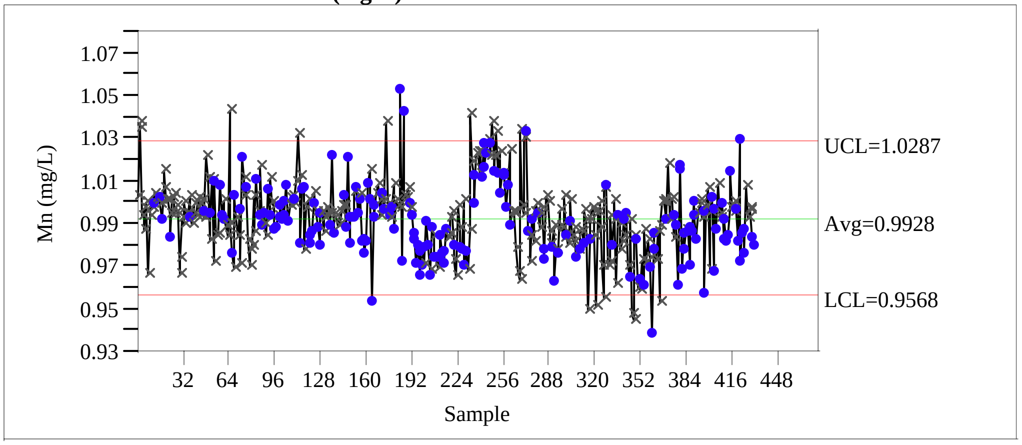


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)

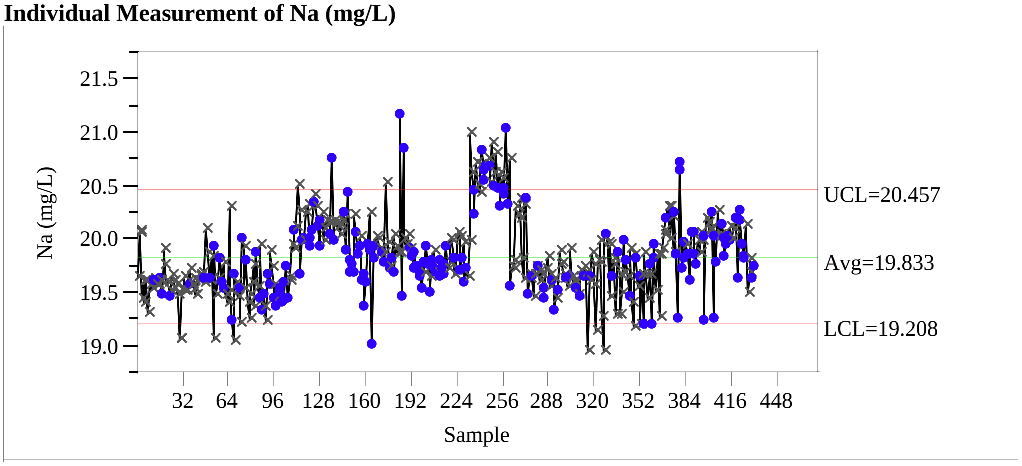
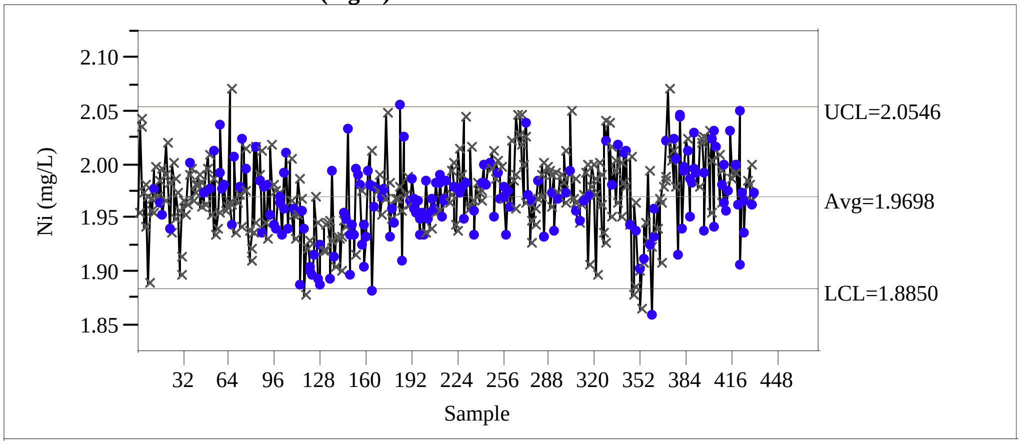
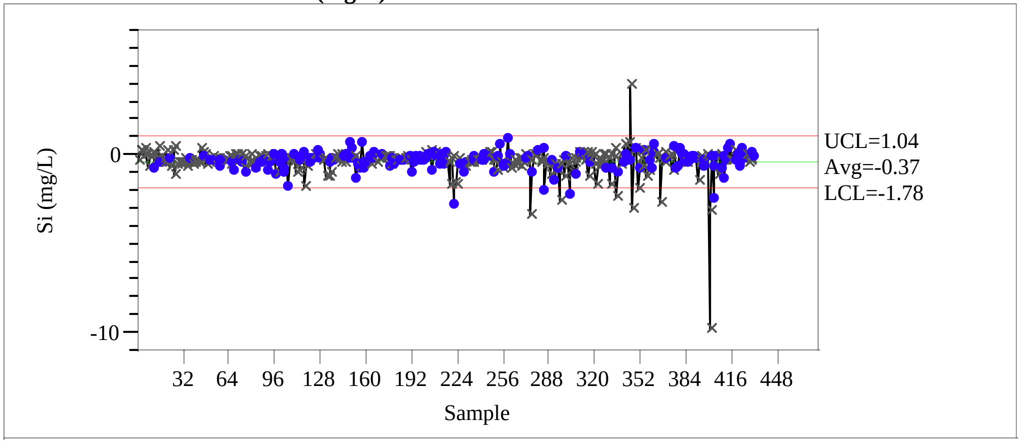


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

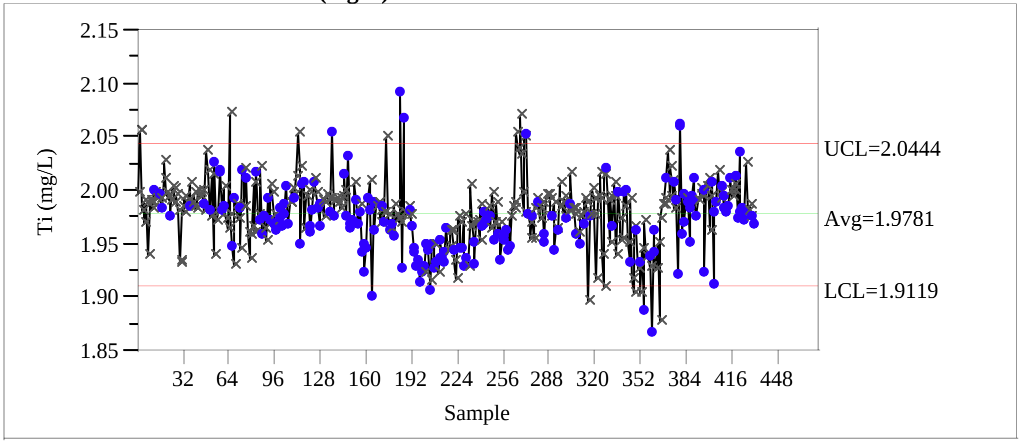
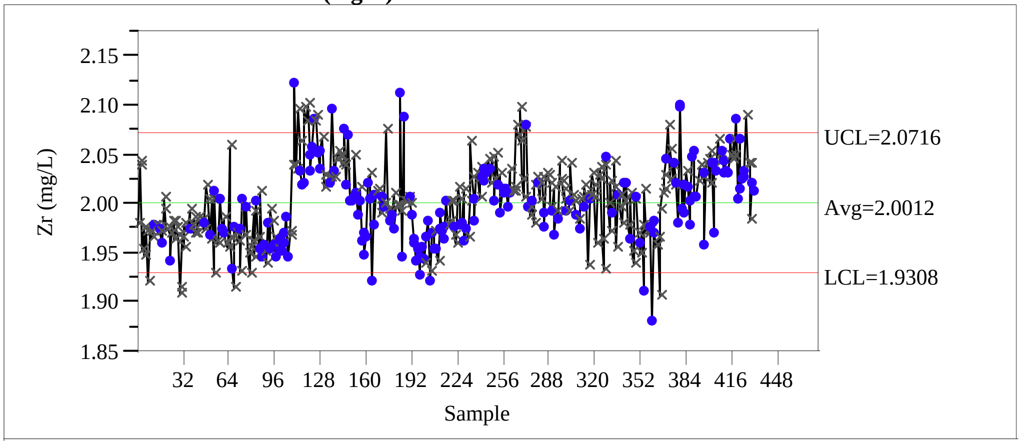
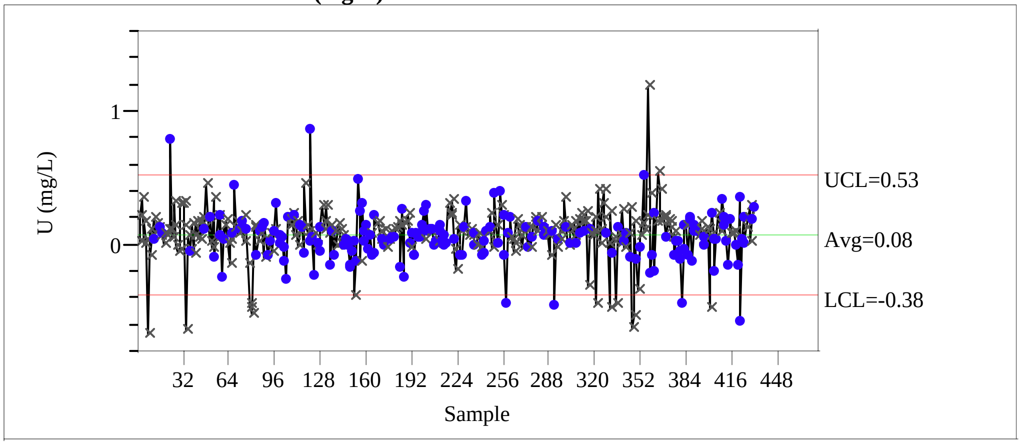


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Zr (mg/L)



Individual Measurement of U (mg/L)



STCd=IN34
Control Chart
Individual Measurement of Al (mg/L)

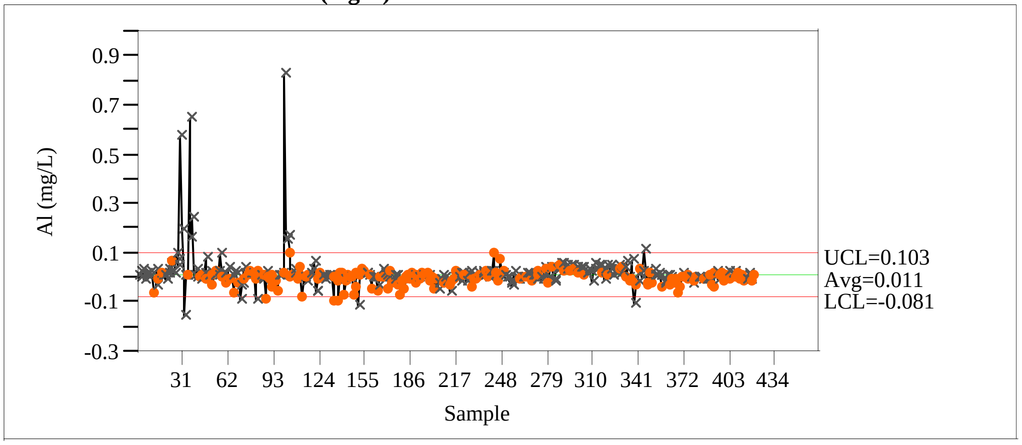
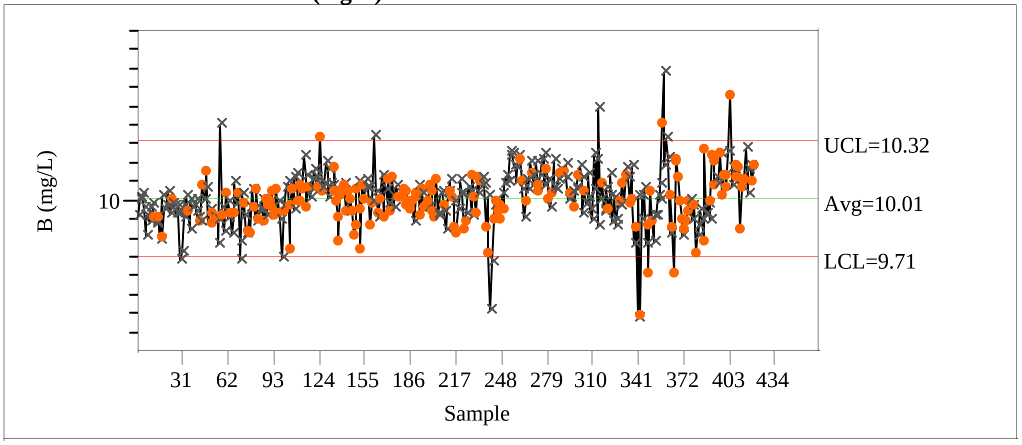
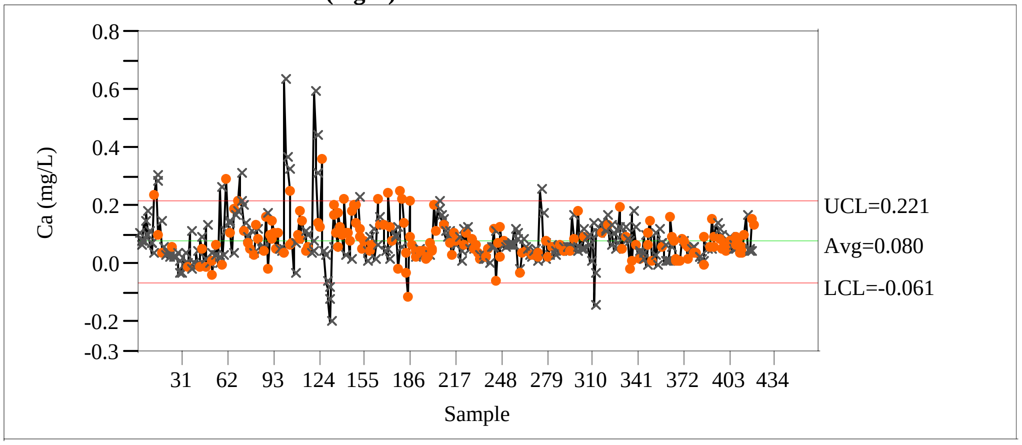


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

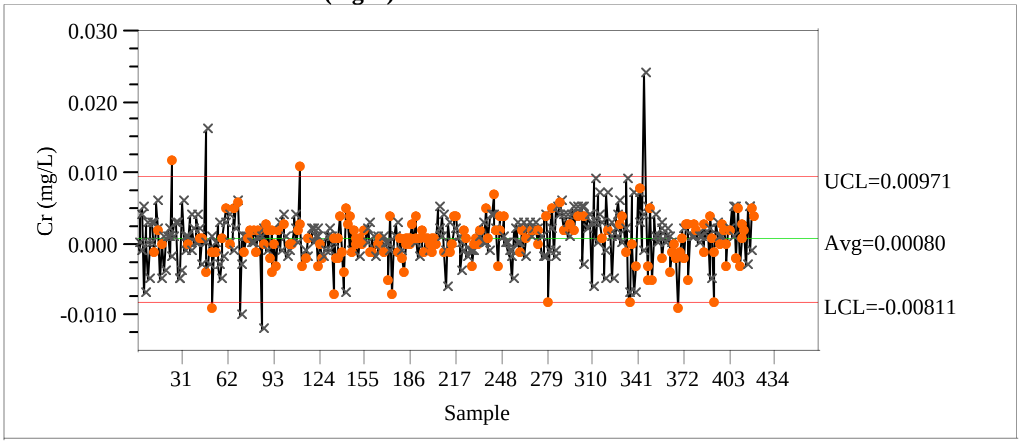
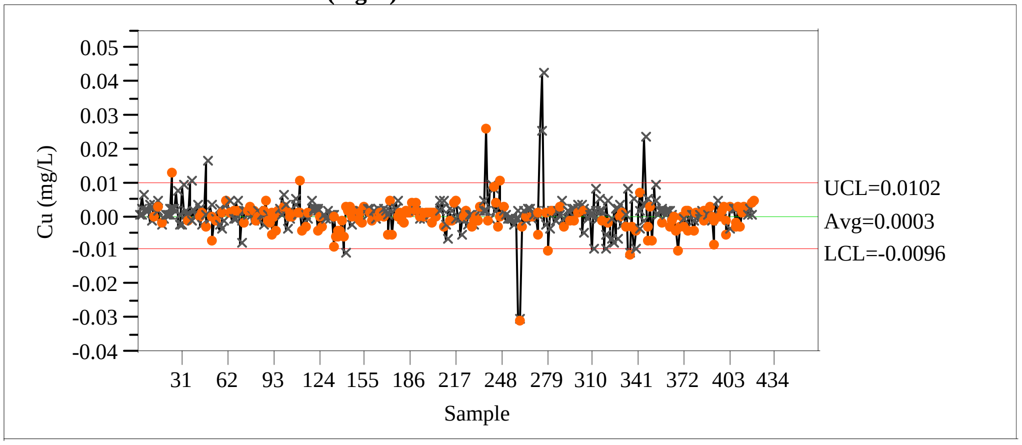
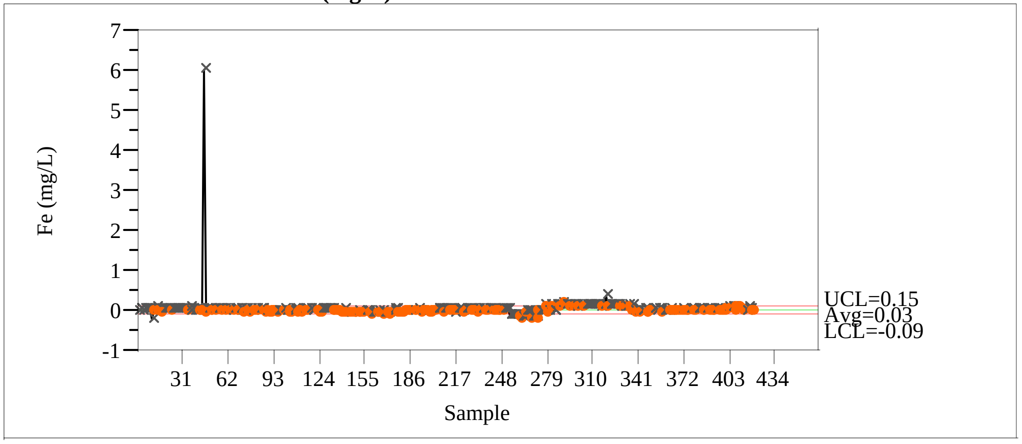


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

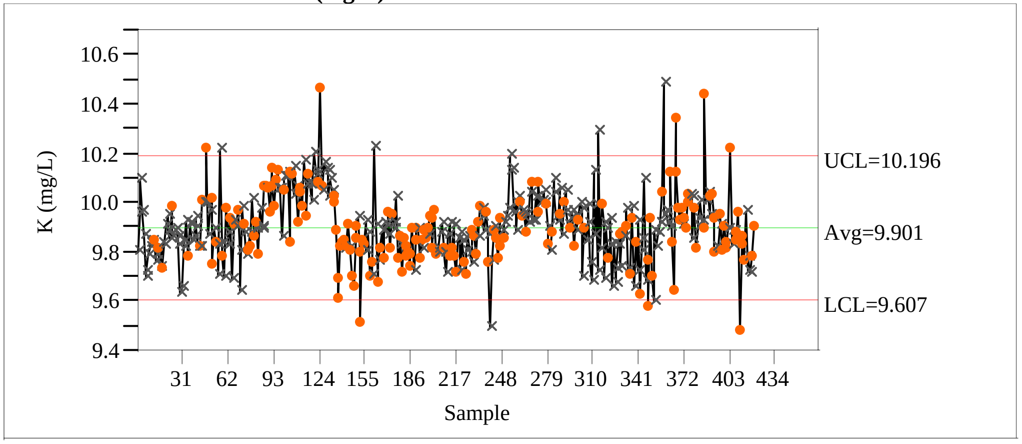
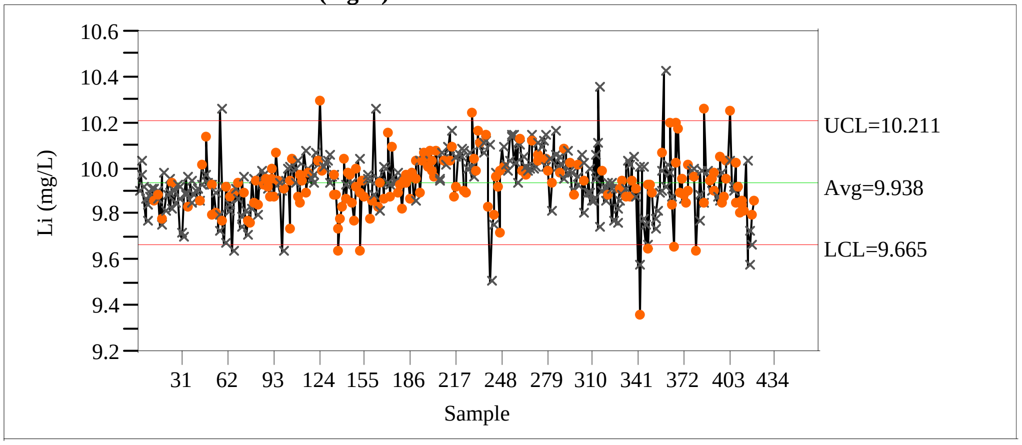
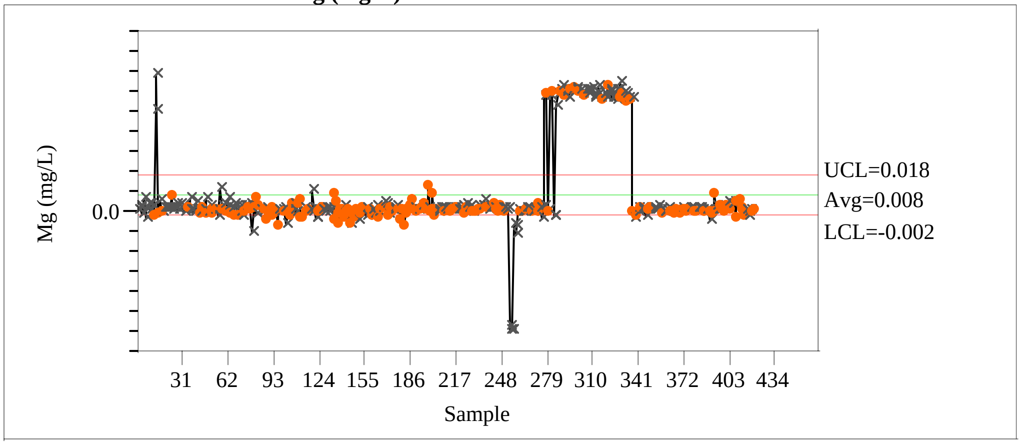


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

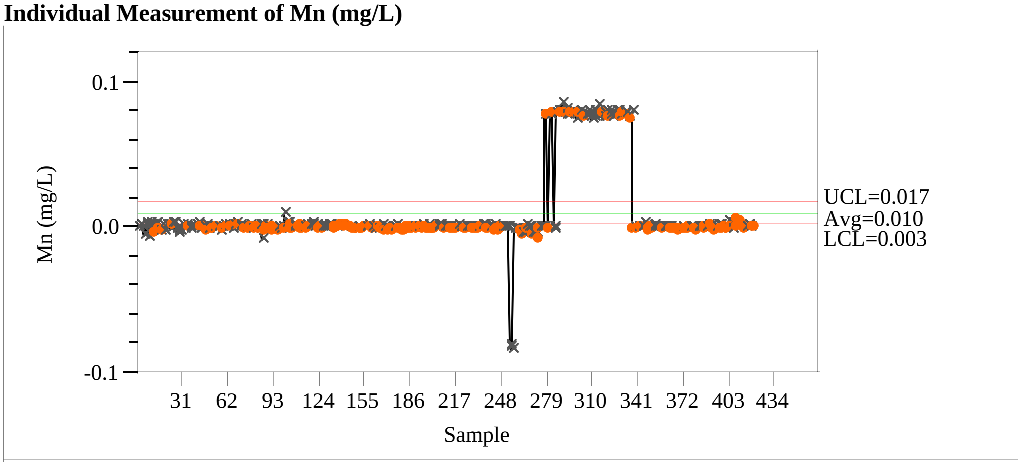
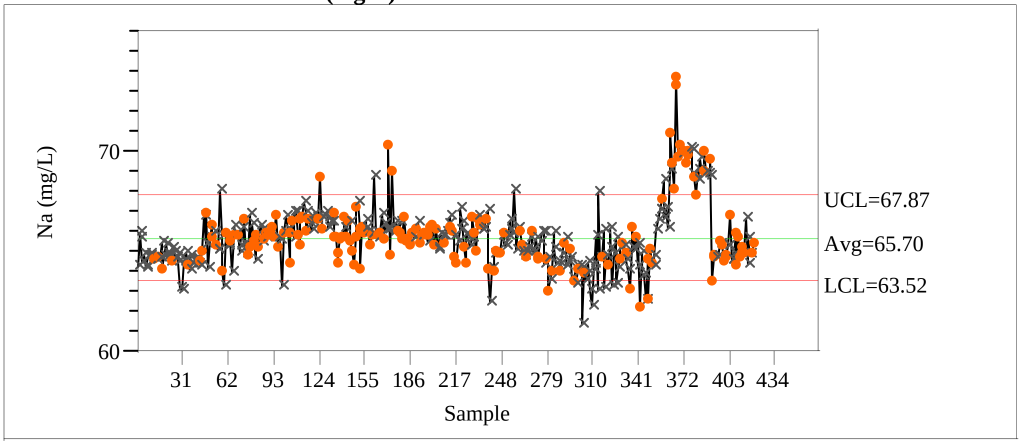
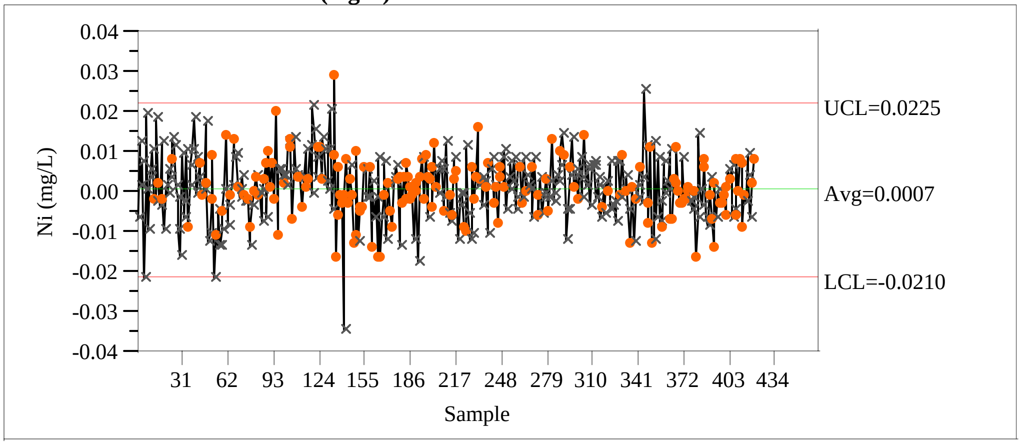


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

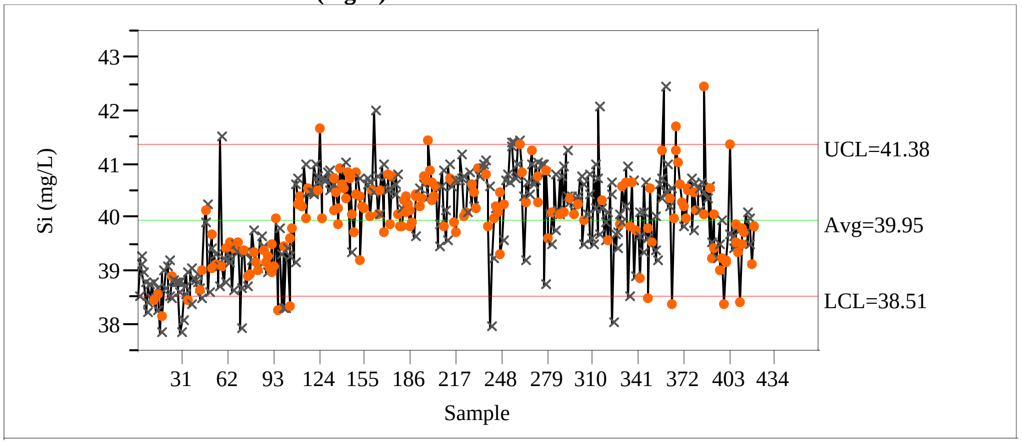
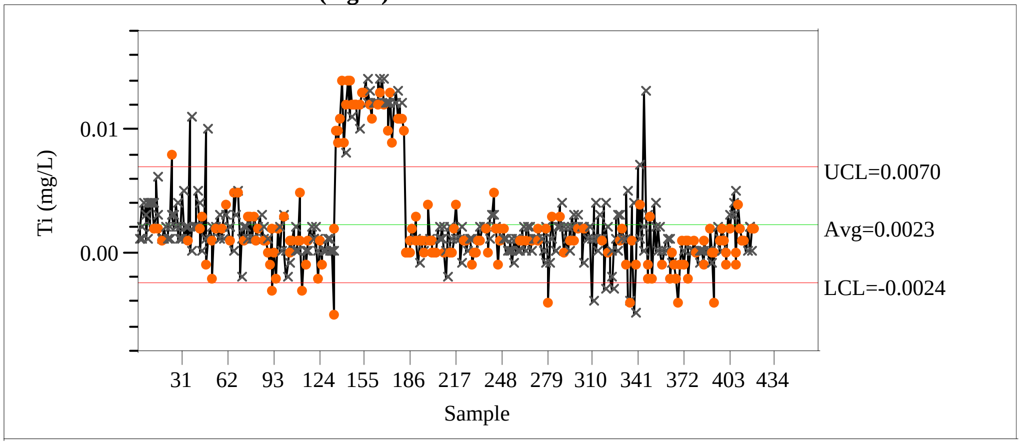
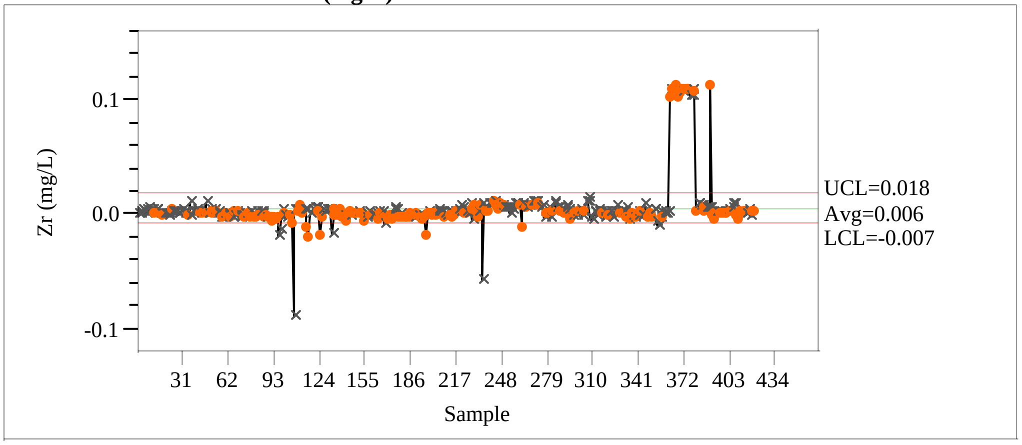


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



Individual Measurement of Zr (mg/L)



Individual Measurement of U (mg/L)

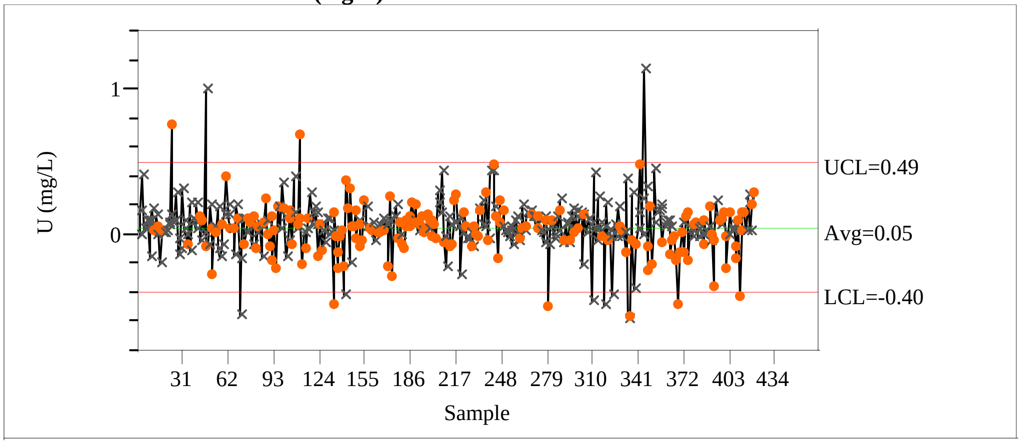
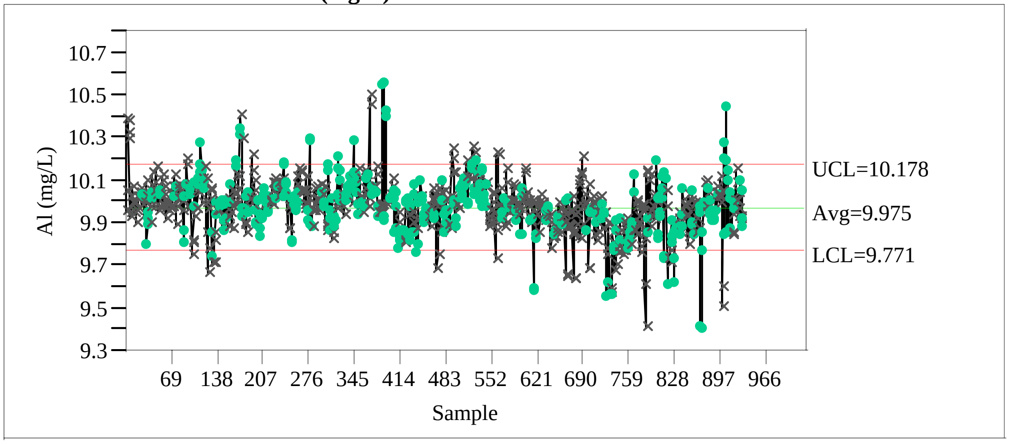
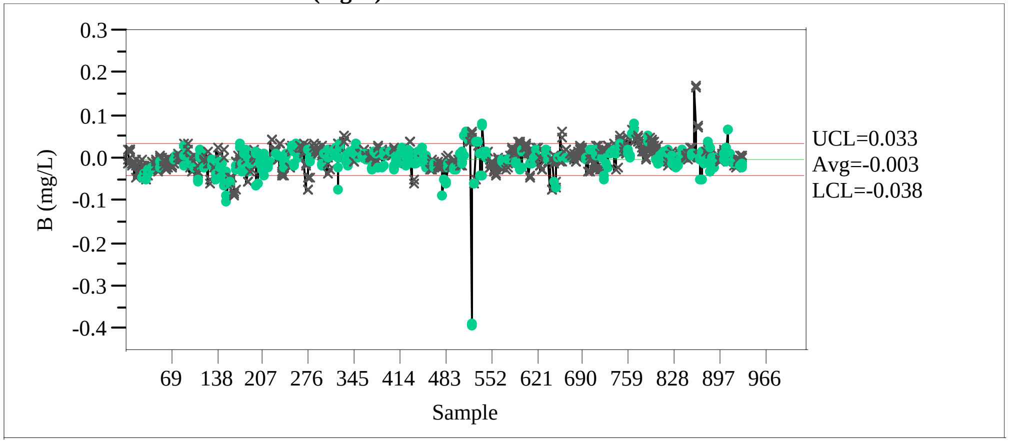


Exhibit A1. Cold Chem Standards in Analytical Sequence

STCd=IN35
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)

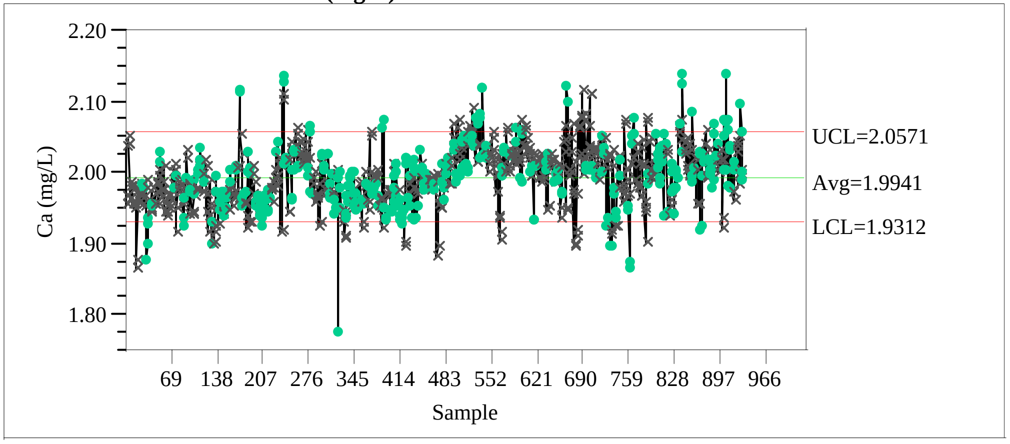
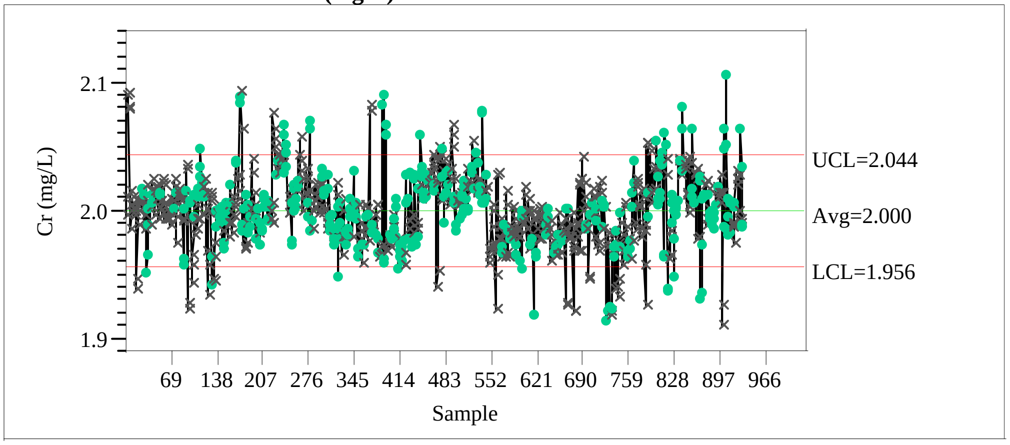
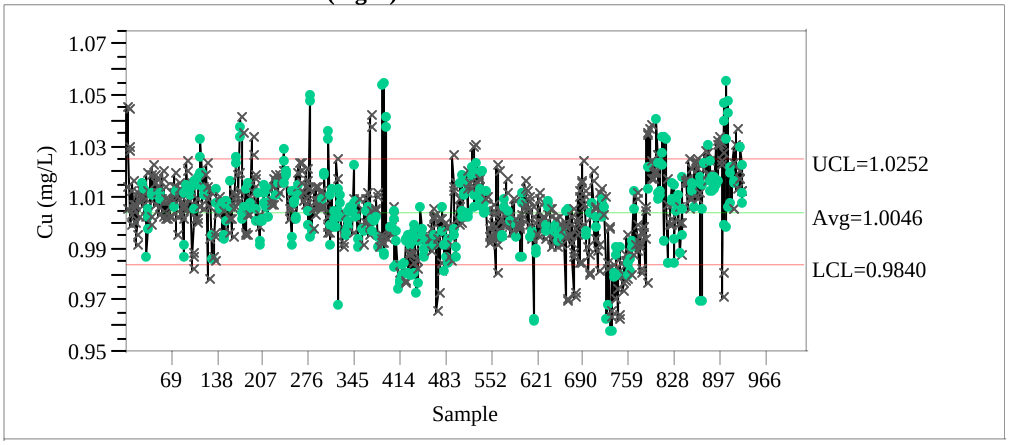


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

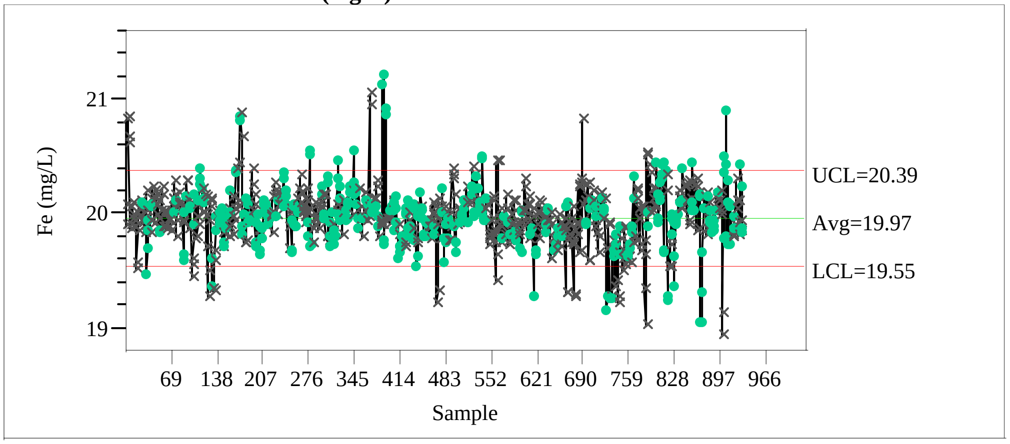
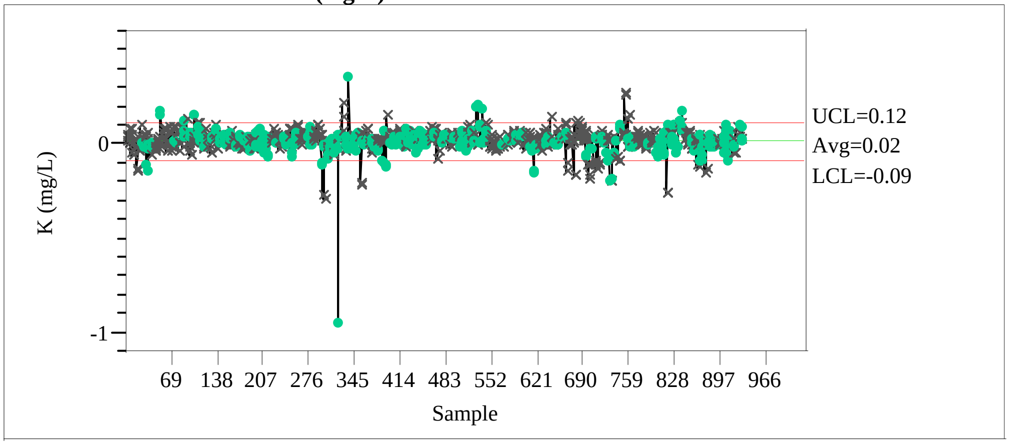
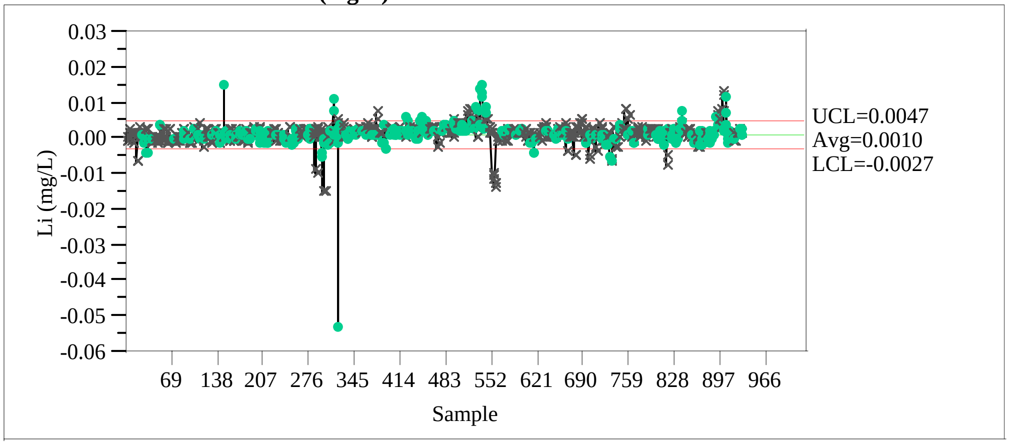


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

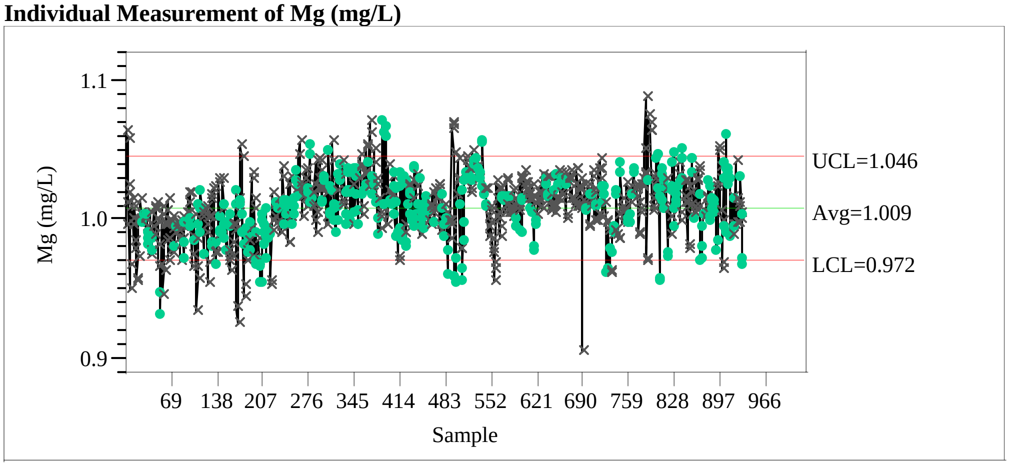
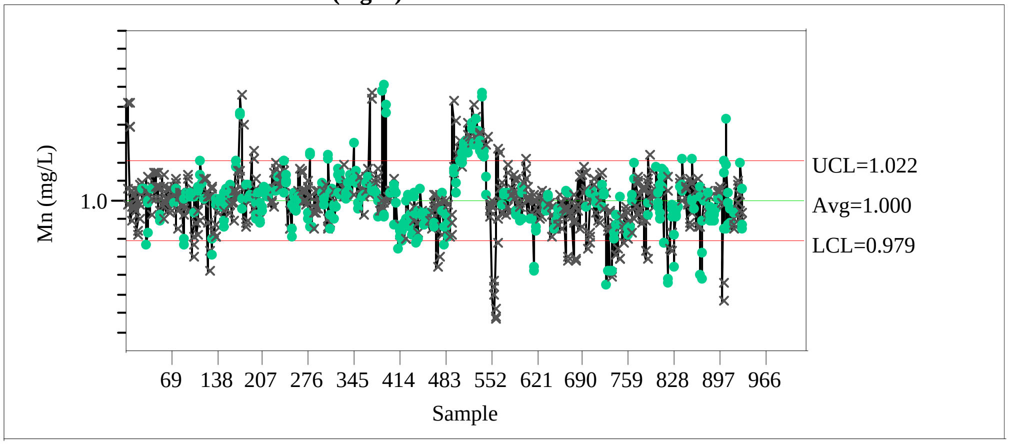
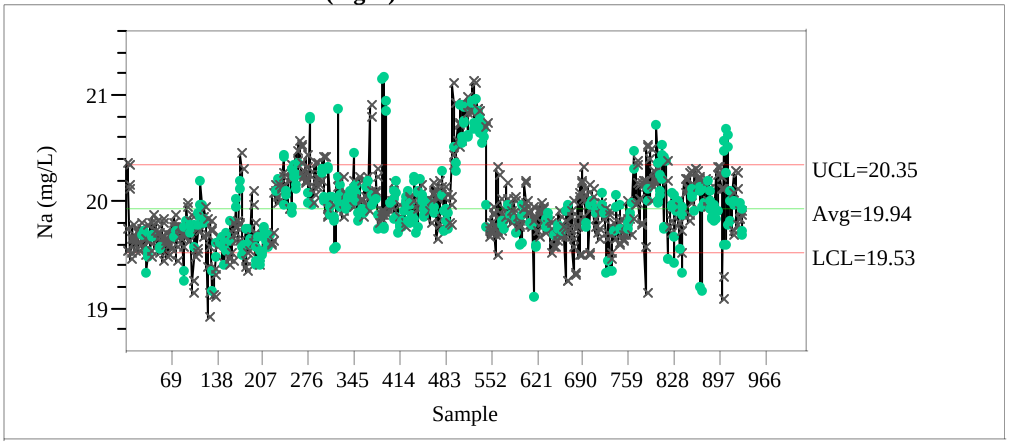


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)

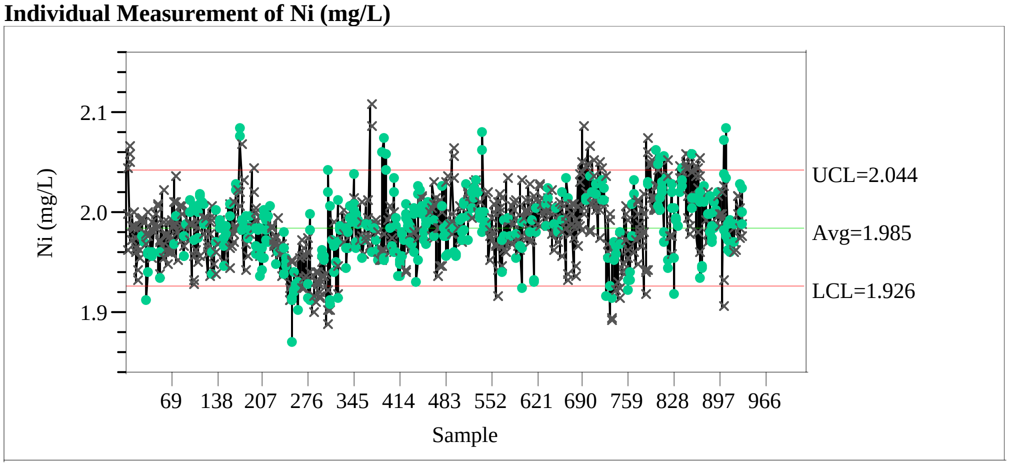
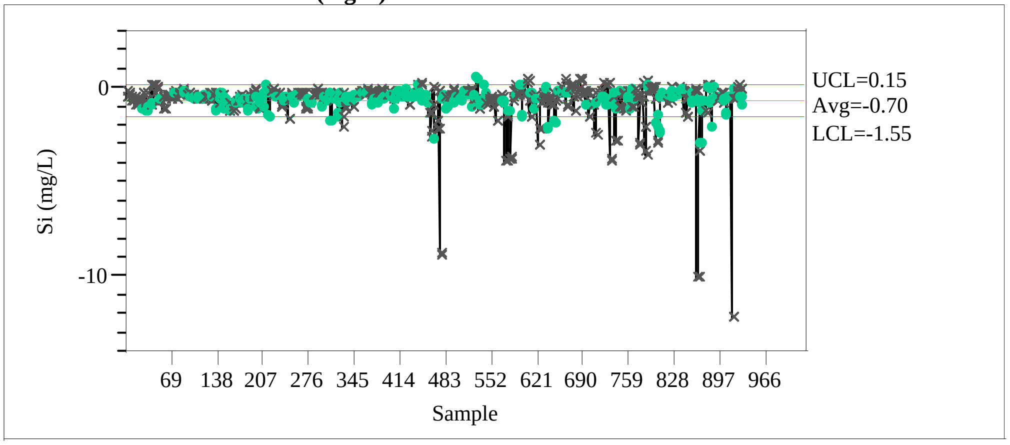
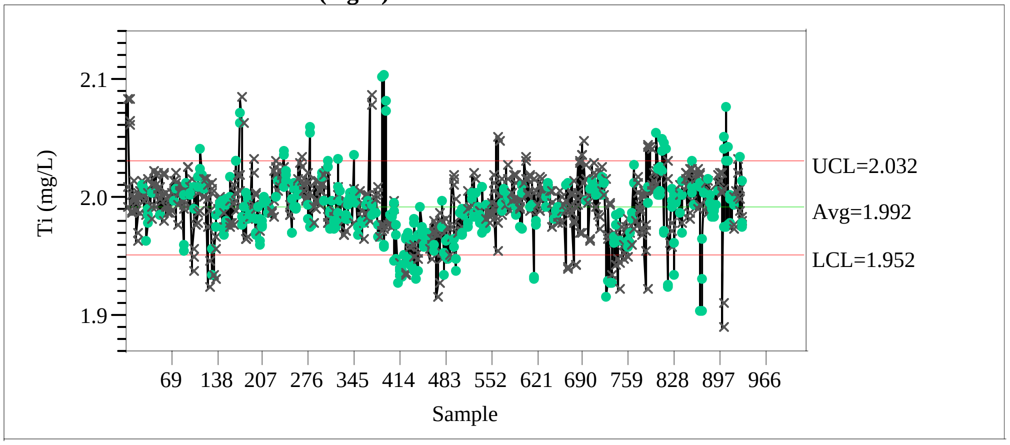


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



Individual Measurement of Zr (mg/L)

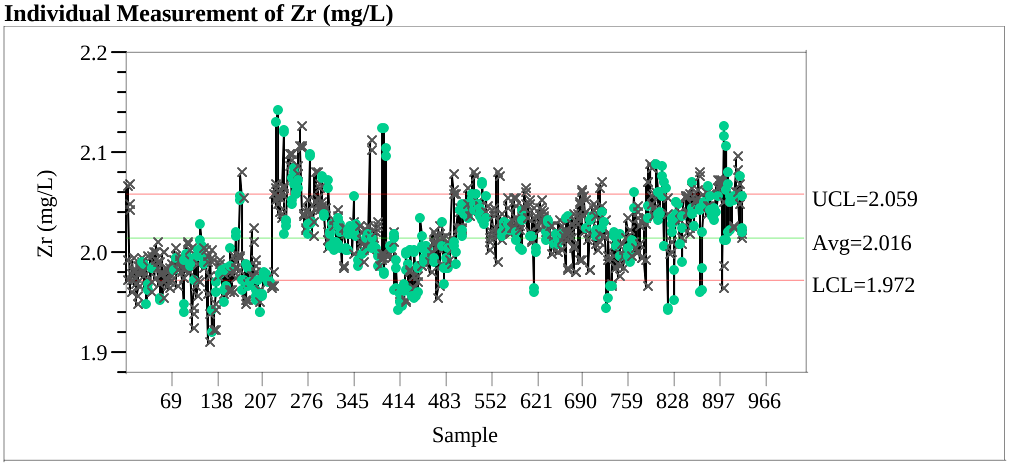
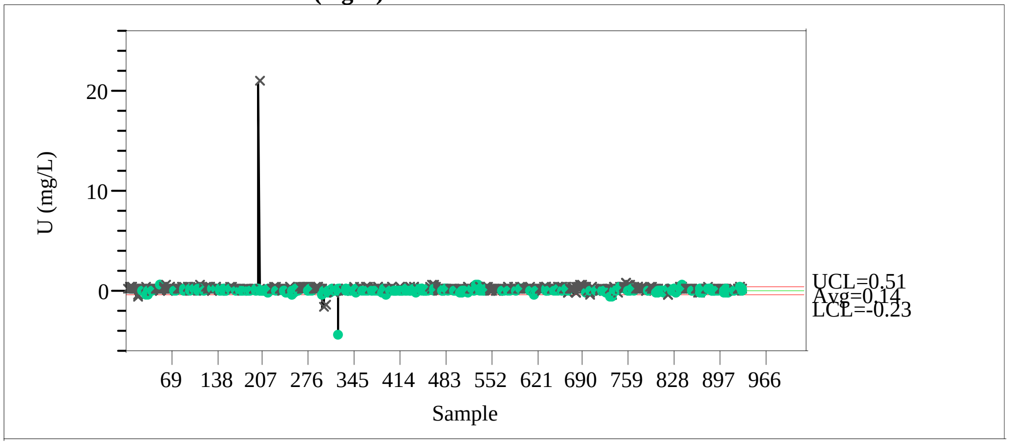
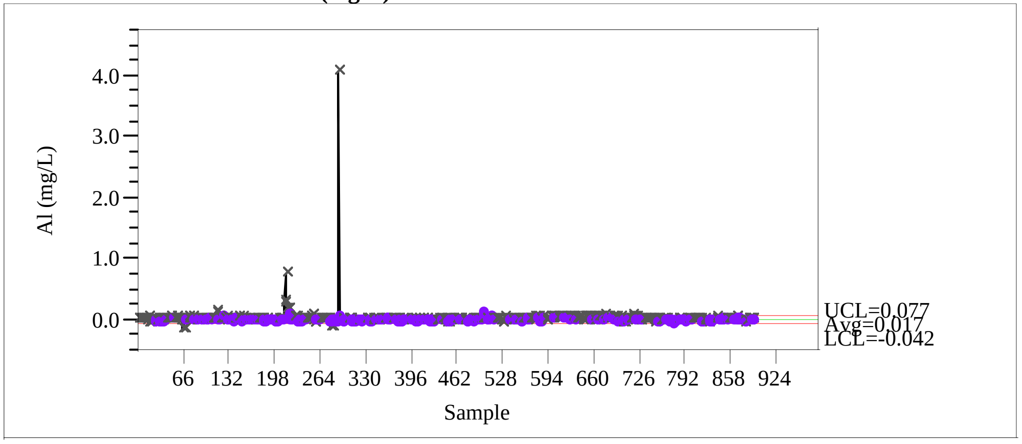


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of U (mg/L)



STCd=IN36
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of B (mg/L)

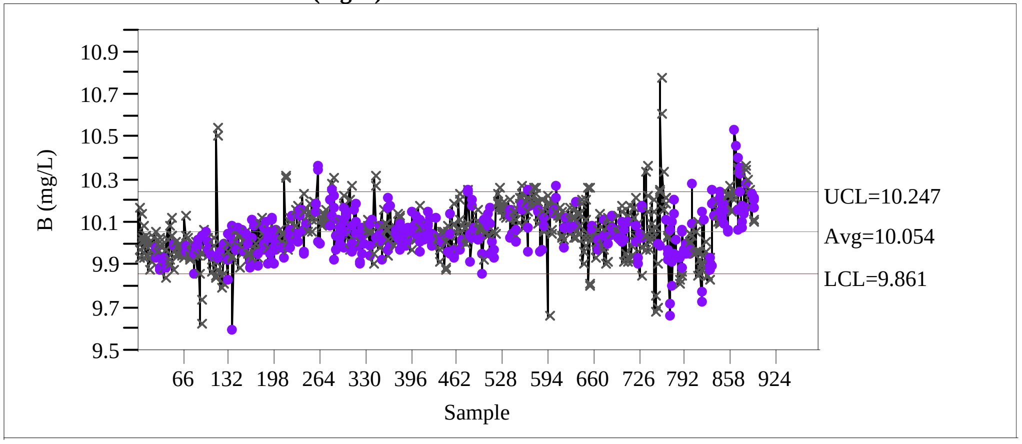
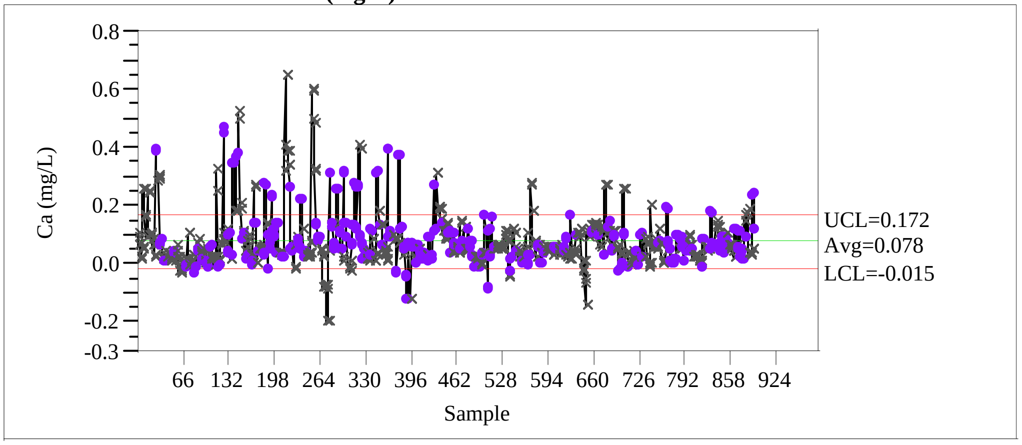
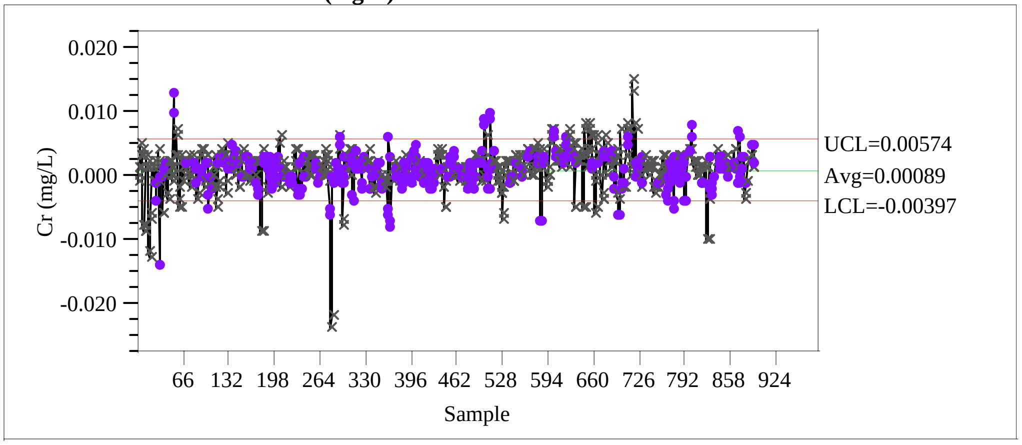


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

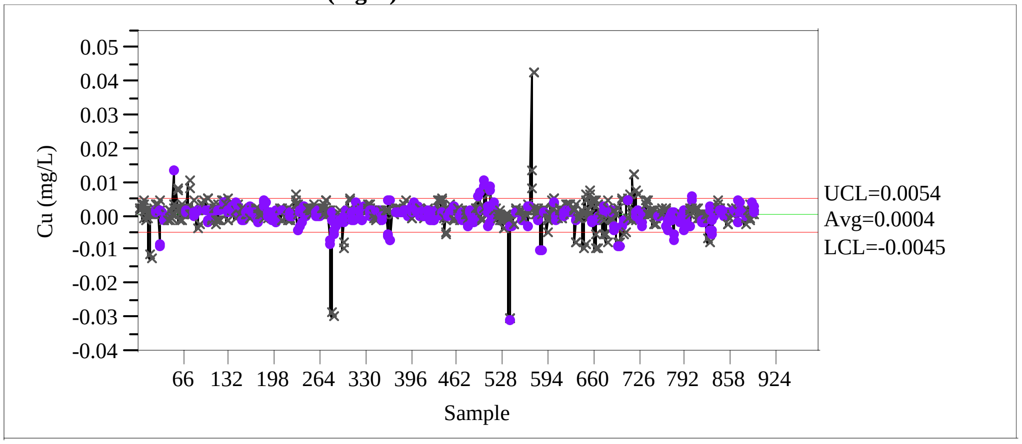
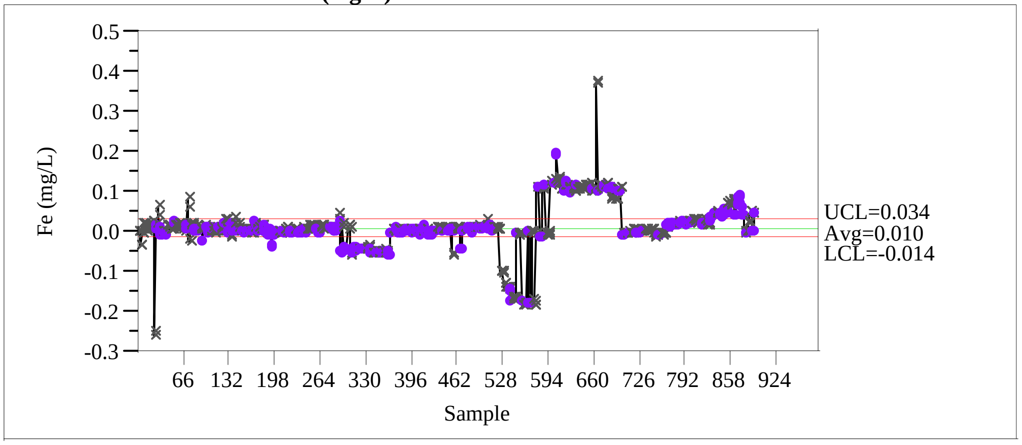
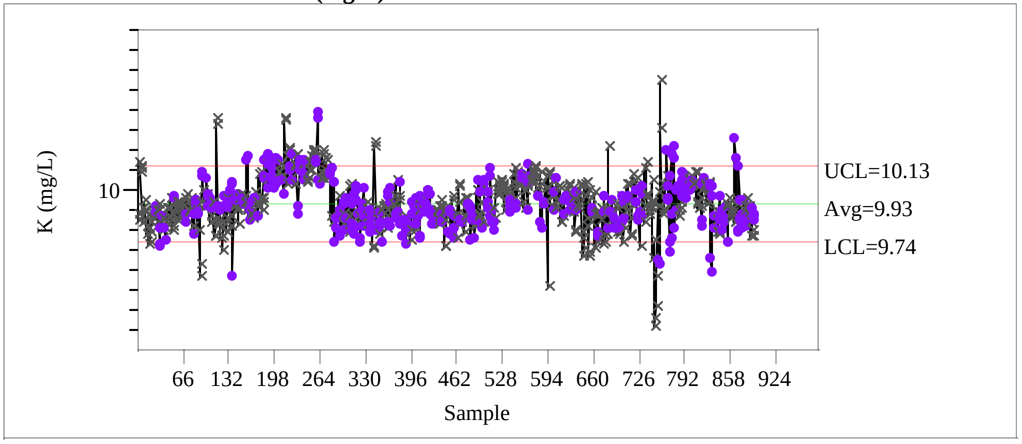


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

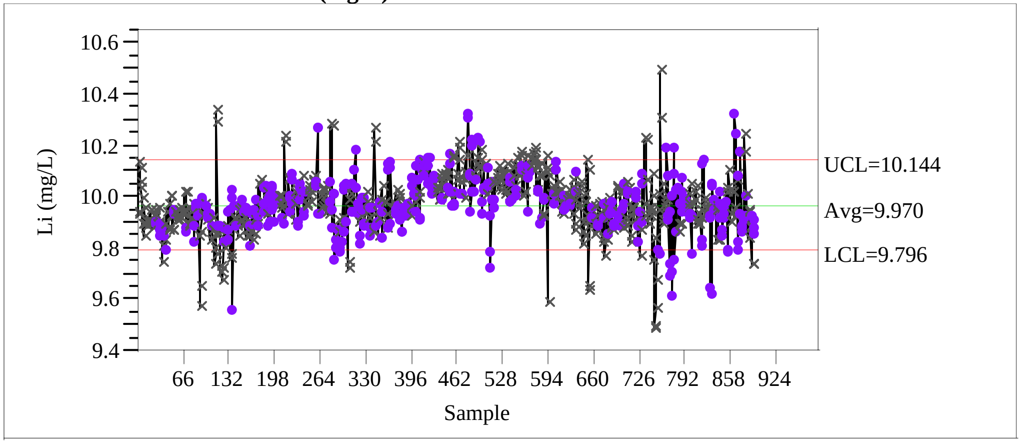
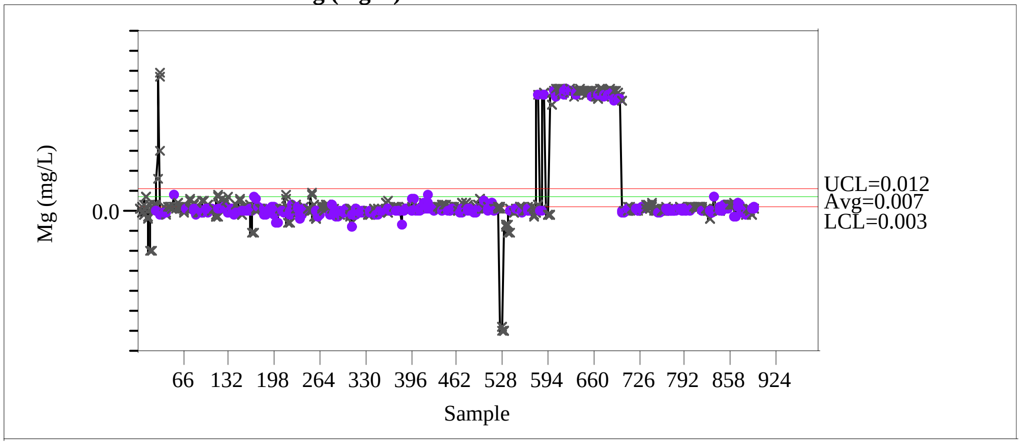
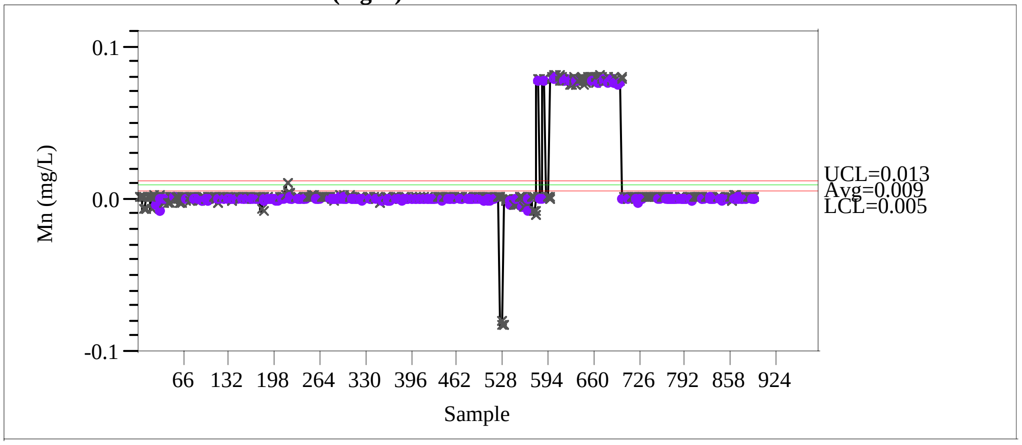


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)

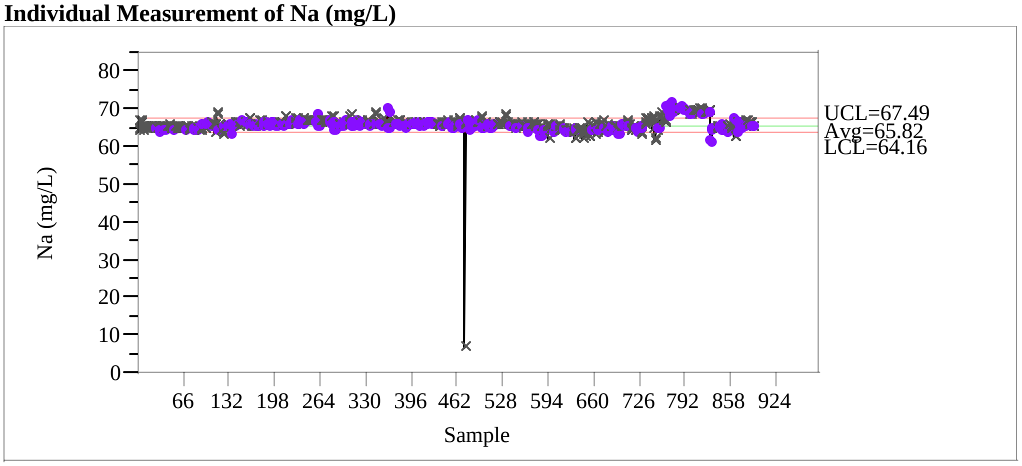
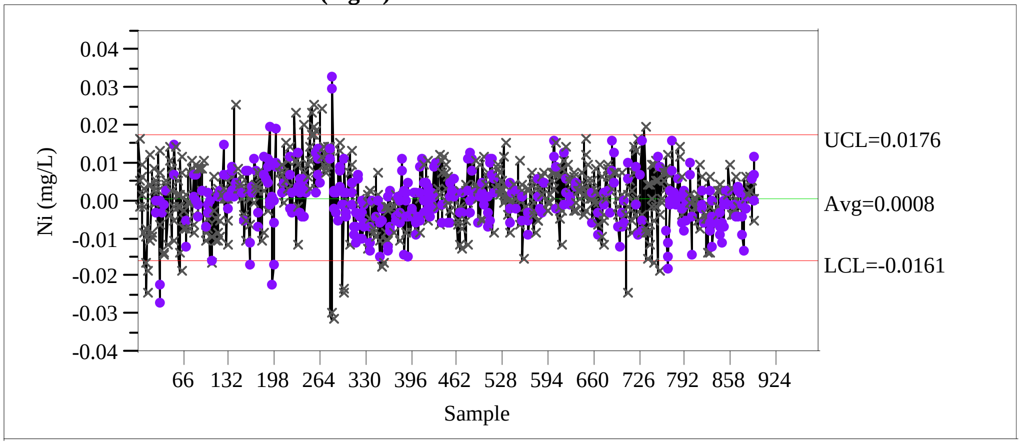
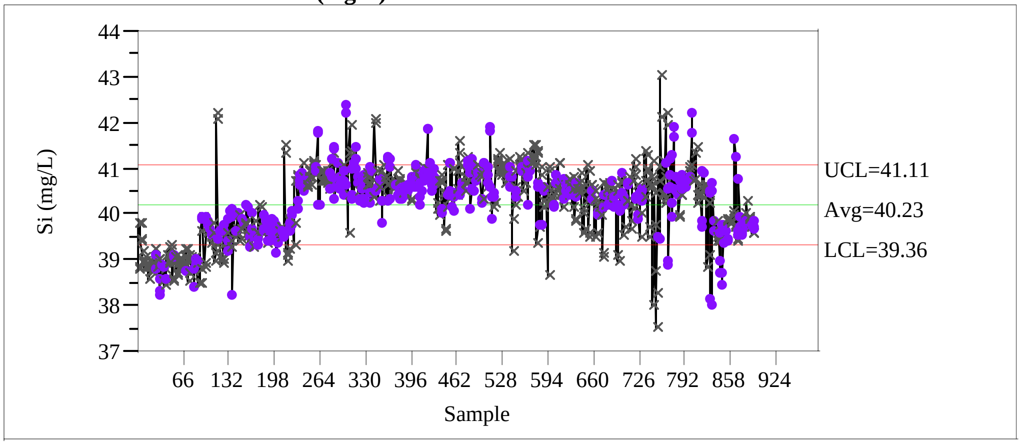


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

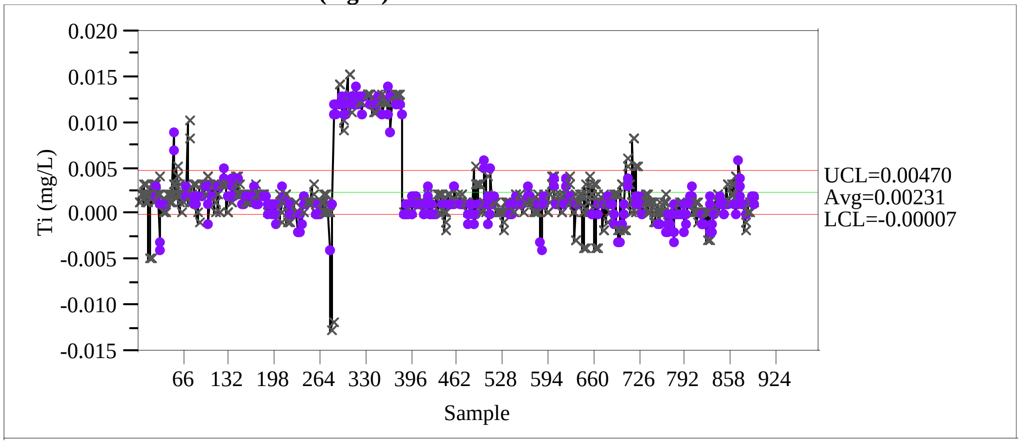
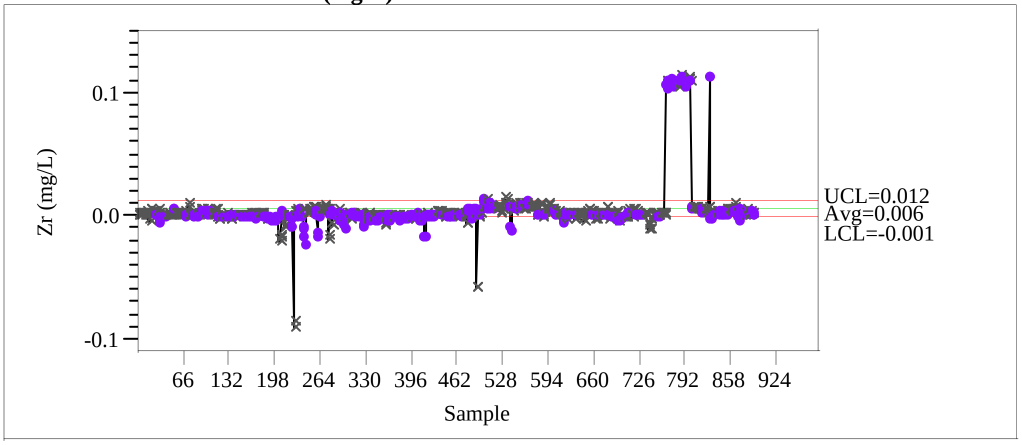
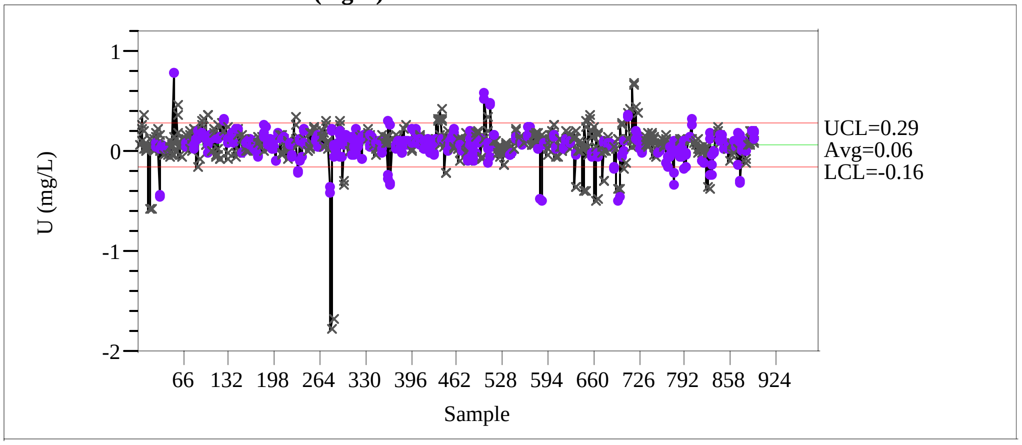


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Zr (mg/L)



Individual Measurement of U (mg/L)



STCd=IN38
Control Chart
Individual Measurement of Al (mg/L)

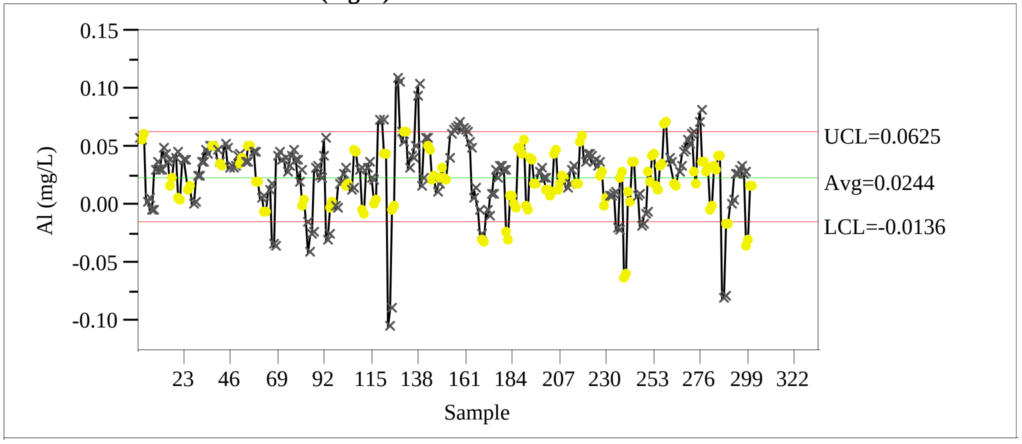
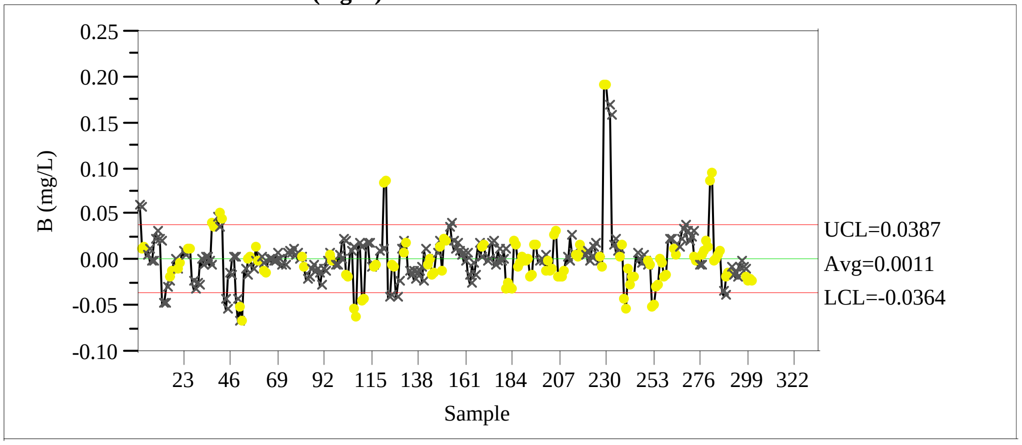
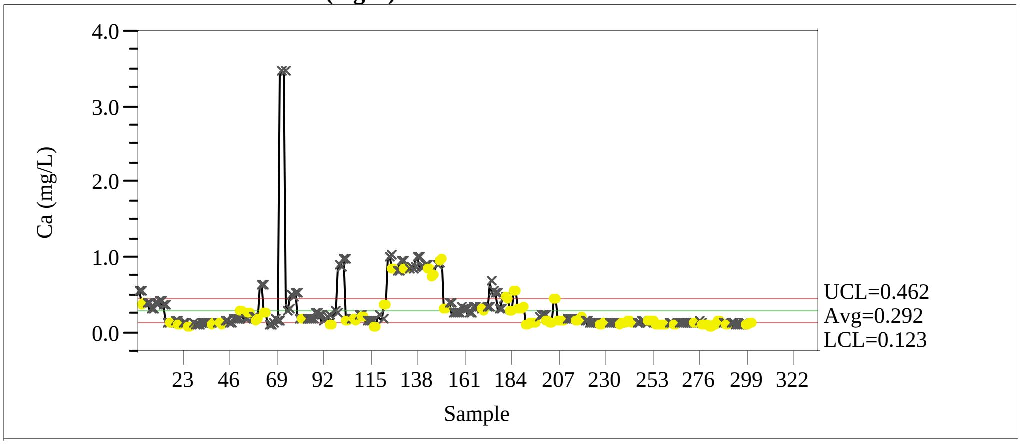


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

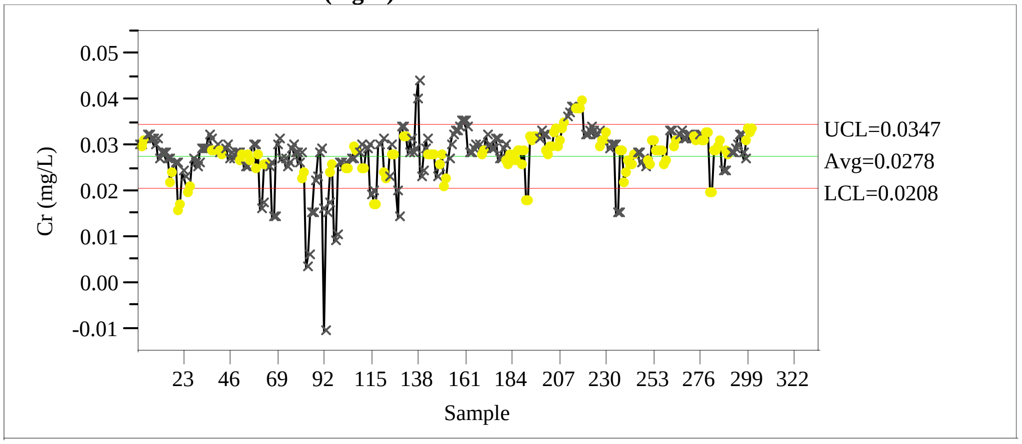
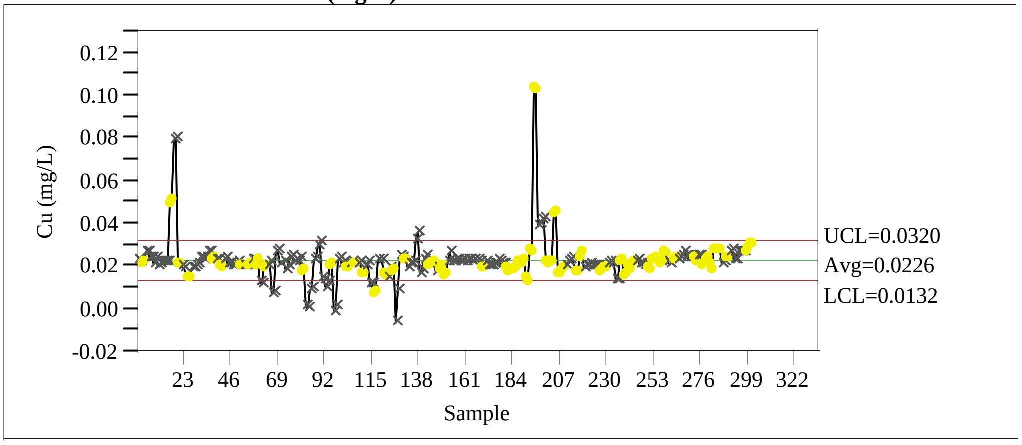
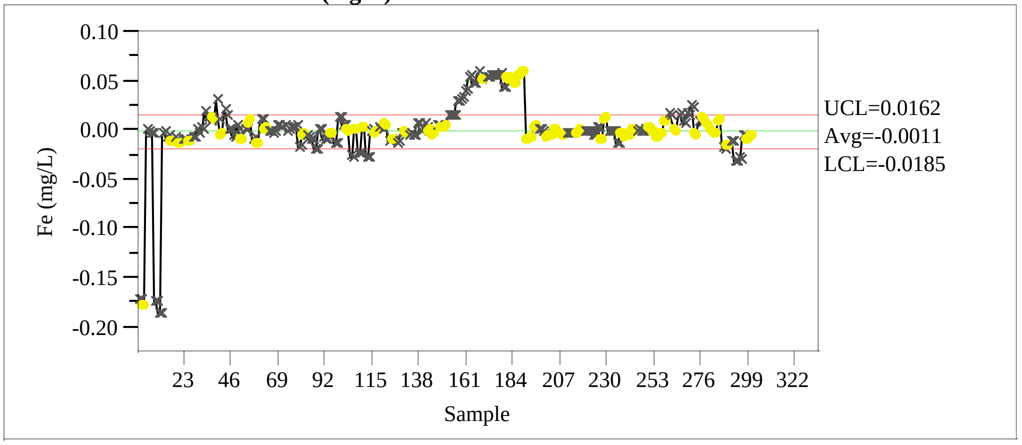


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

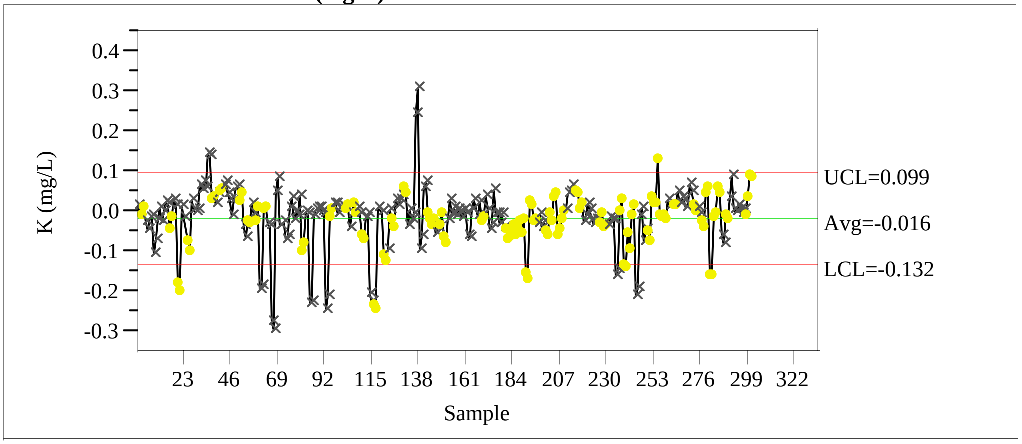
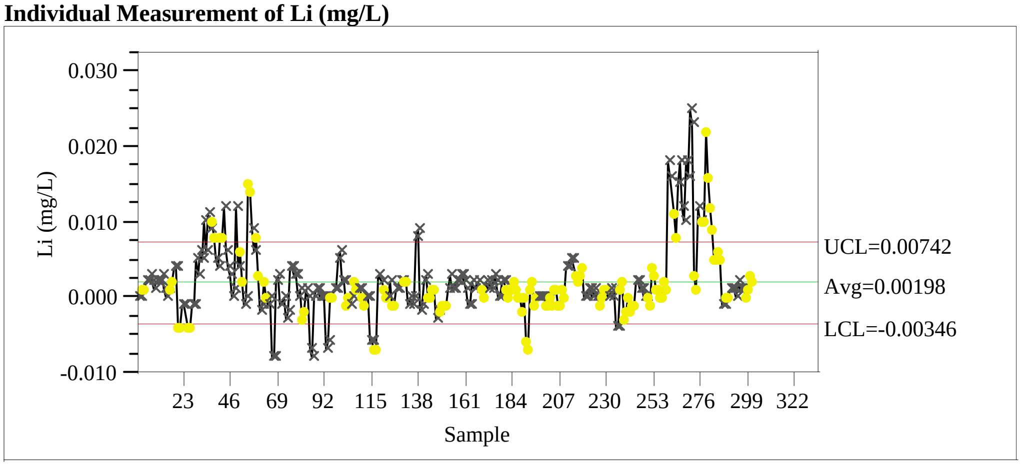
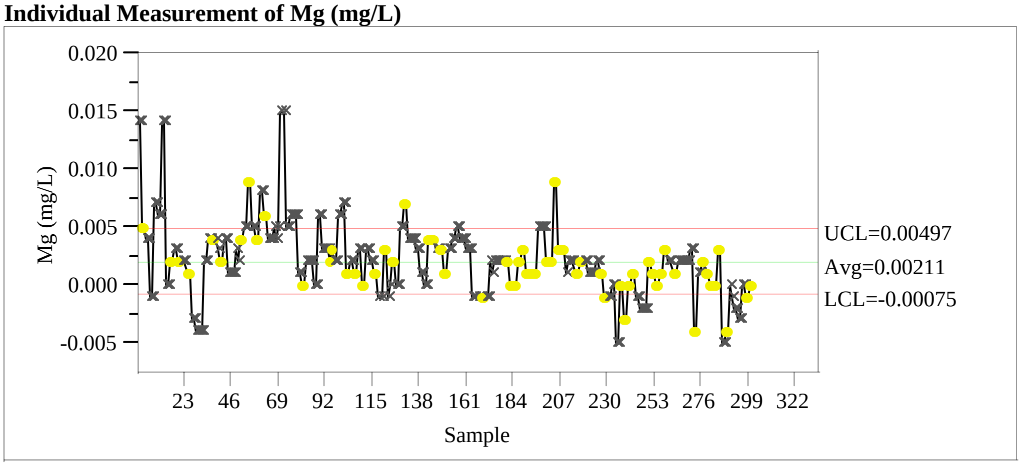


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

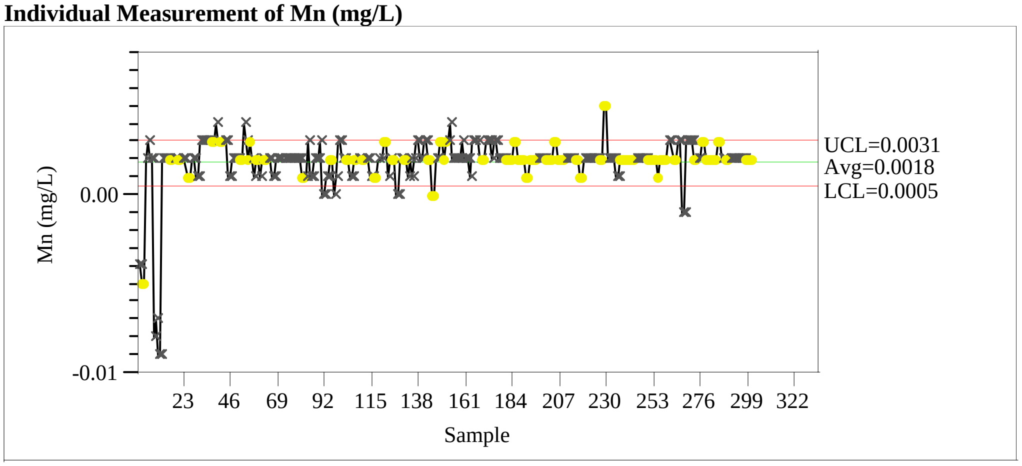
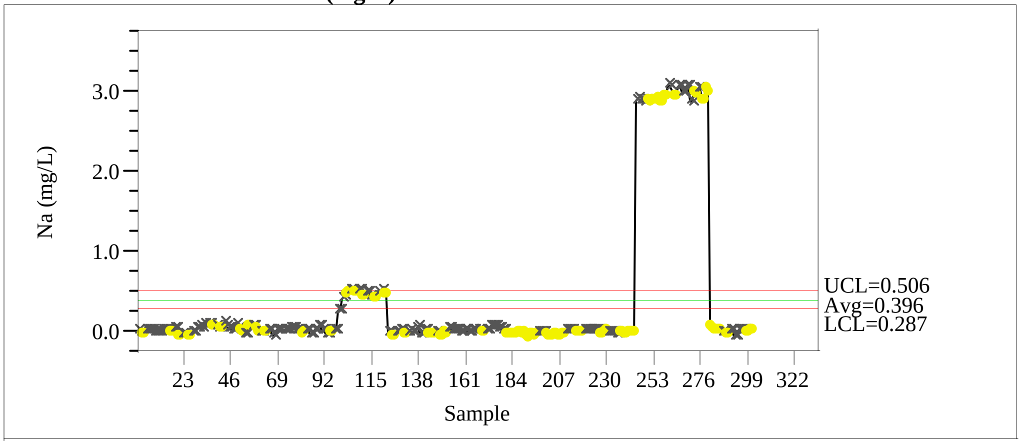
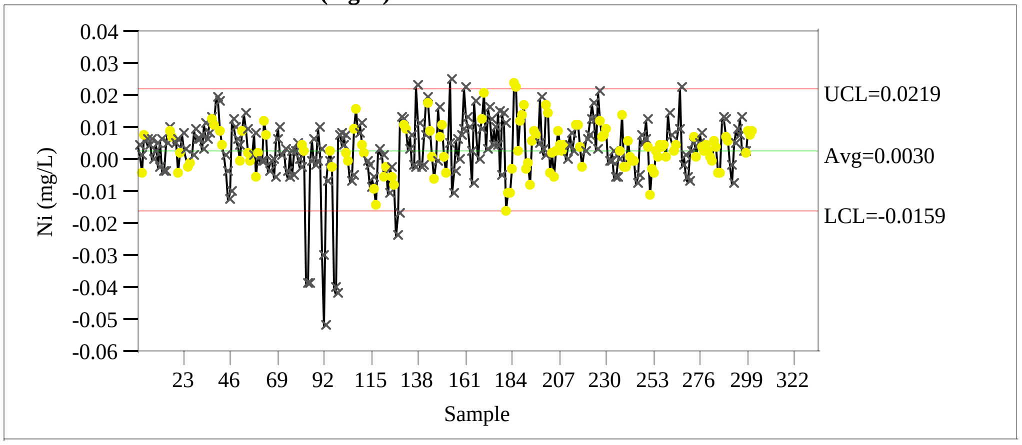


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

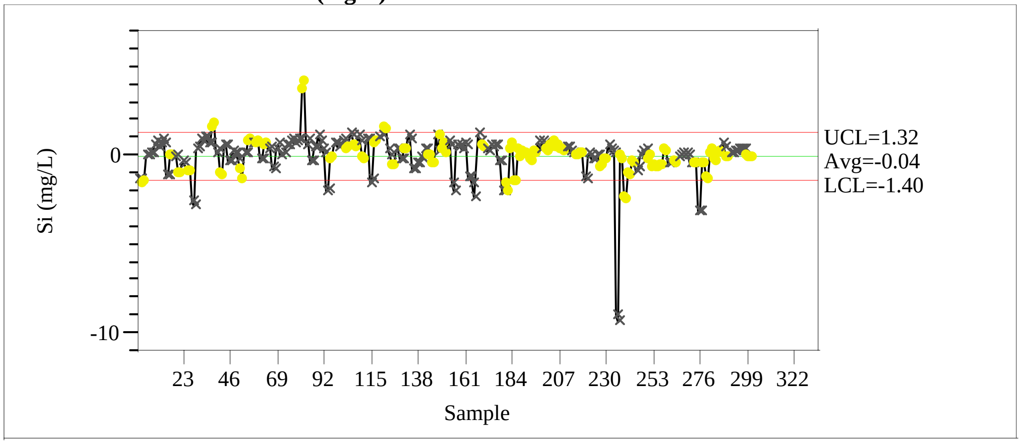
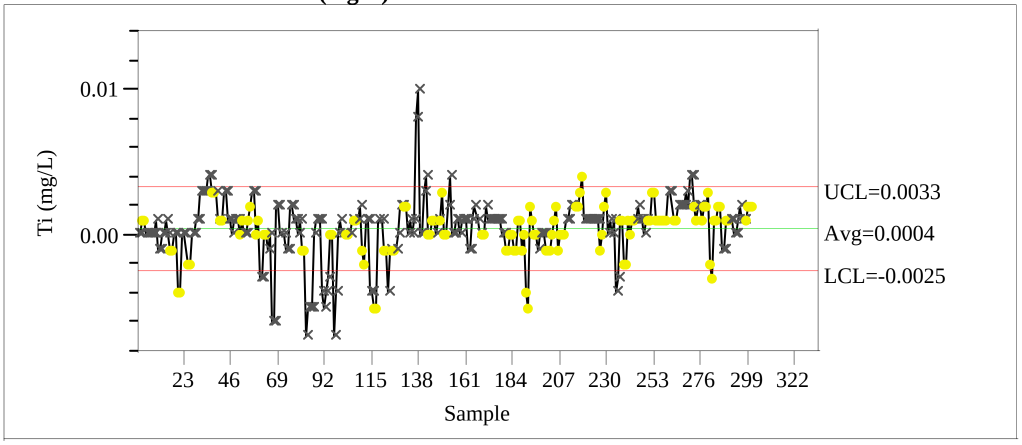
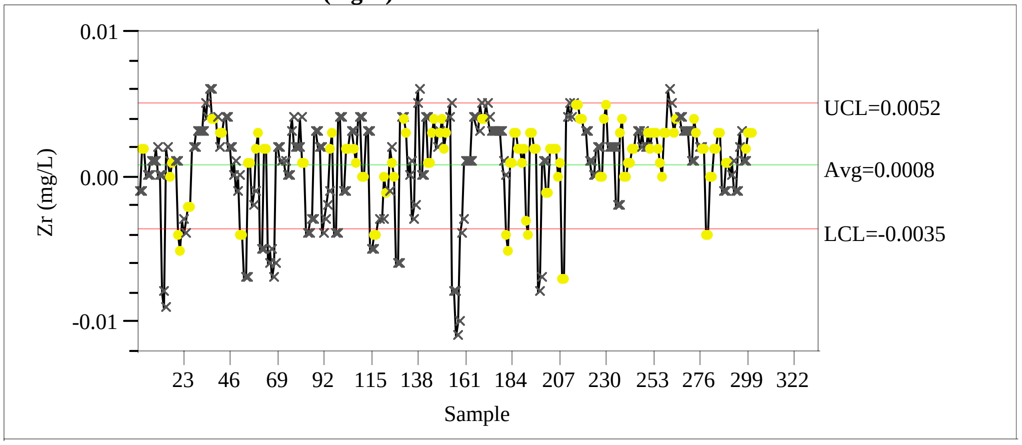


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



Individual Measurement of Zr (mg/L)



Individual Measurement of U (mg/L)

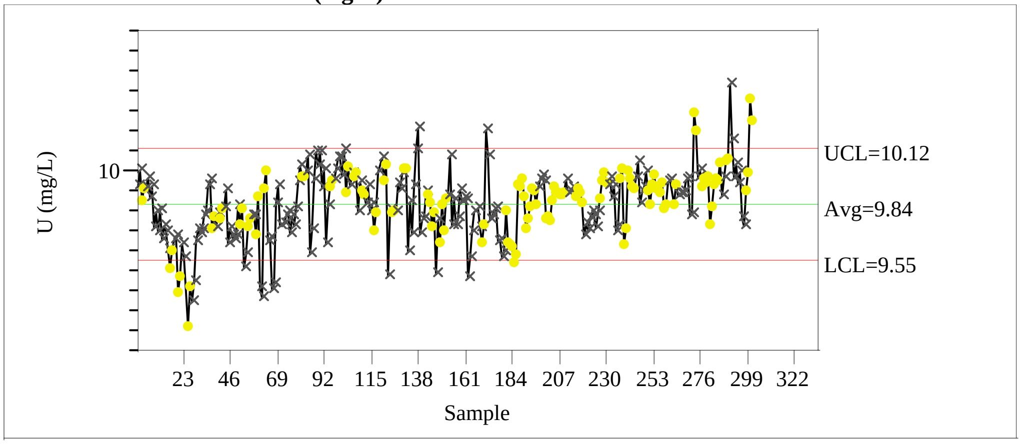
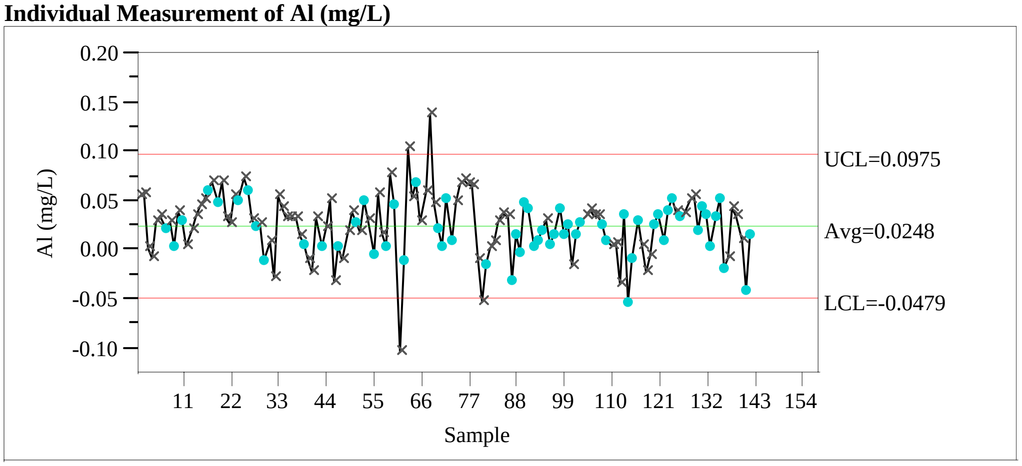
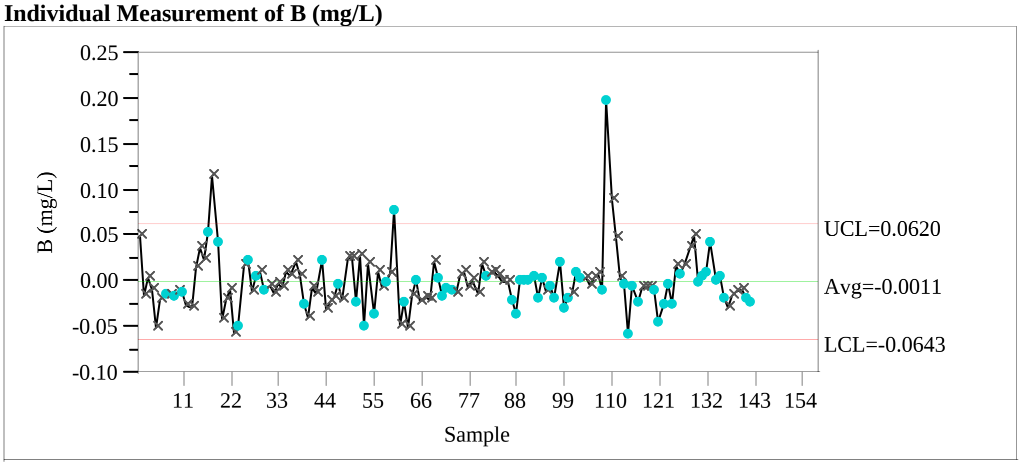


Exhibit A1. Cold Chem Standards in Analytical Sequence

STCd=IN39
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)

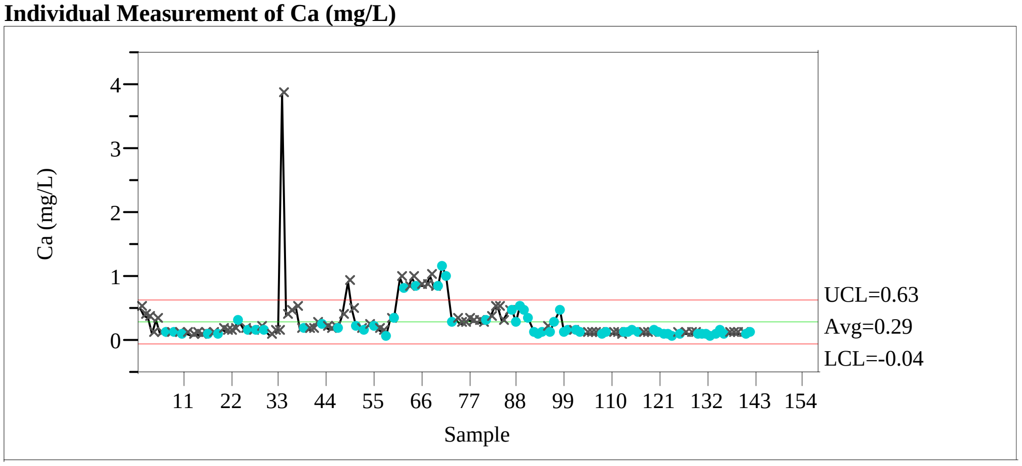
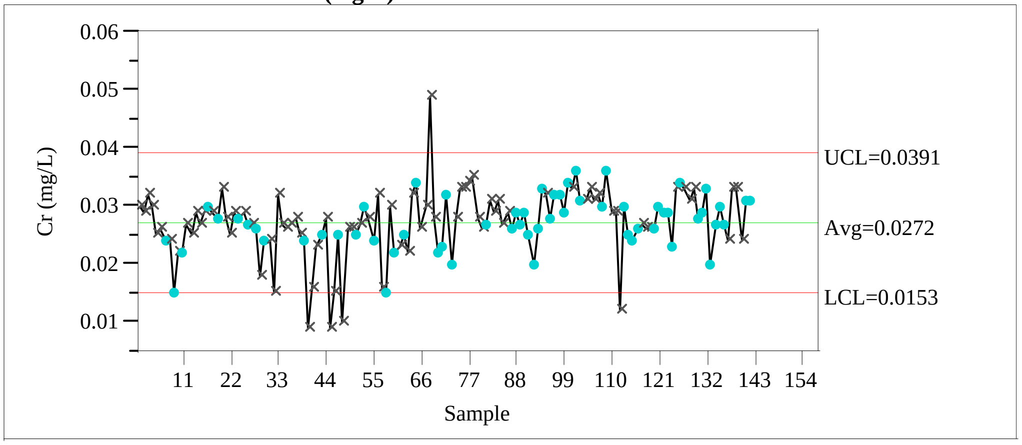
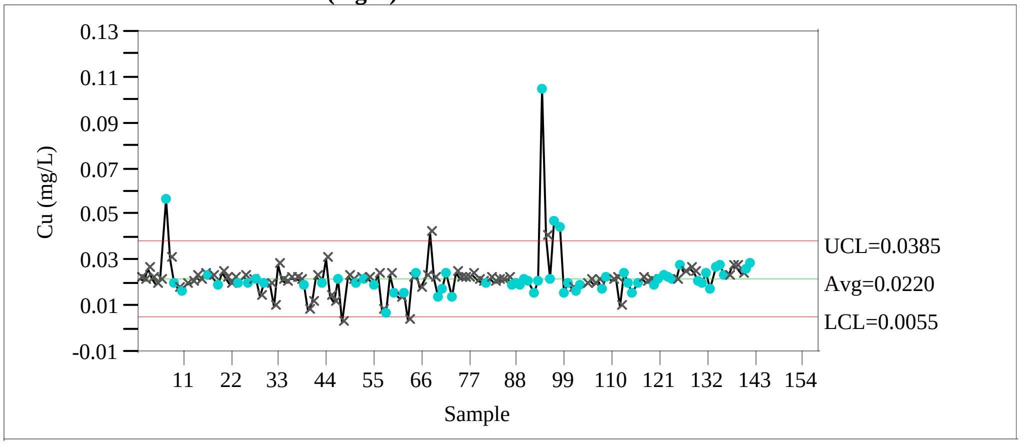


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

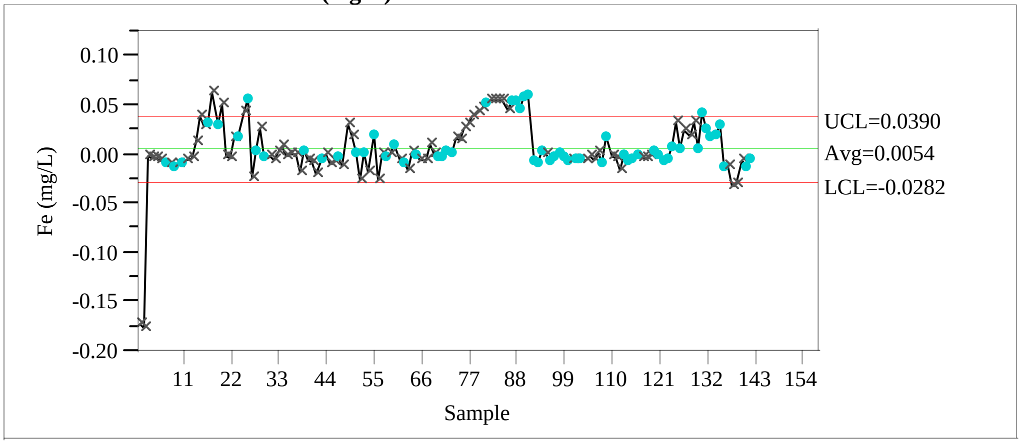
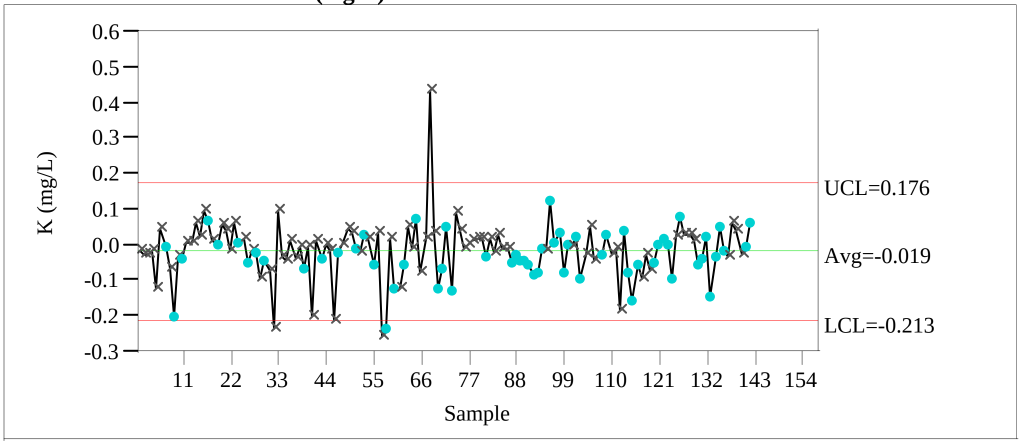
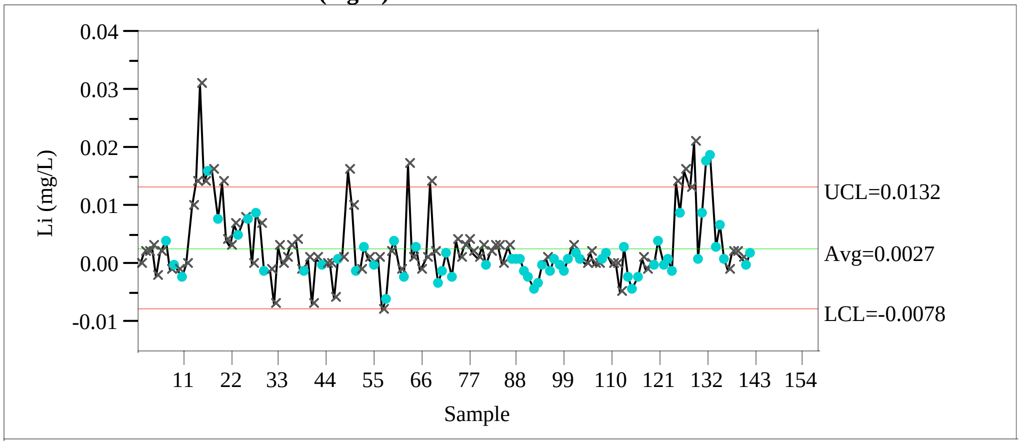


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

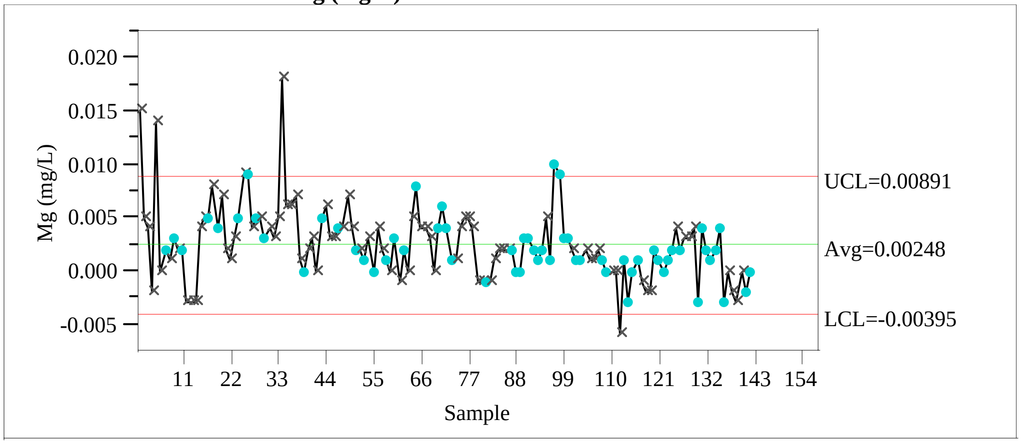
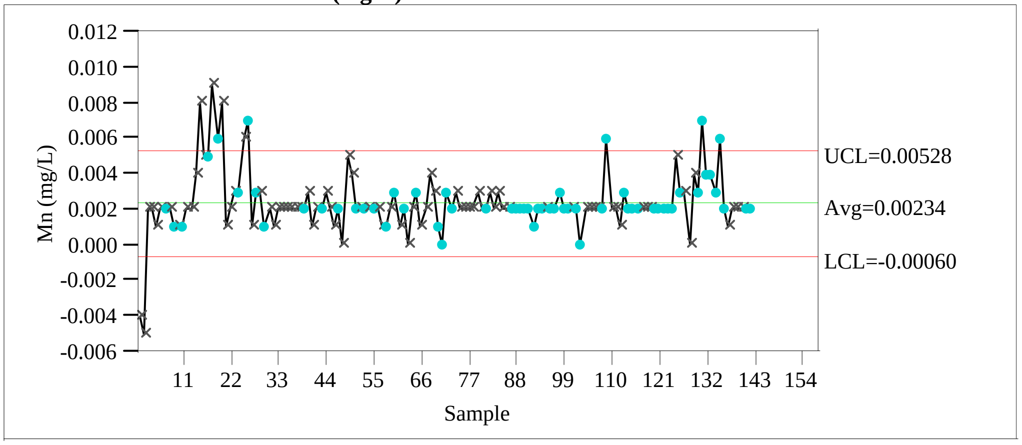
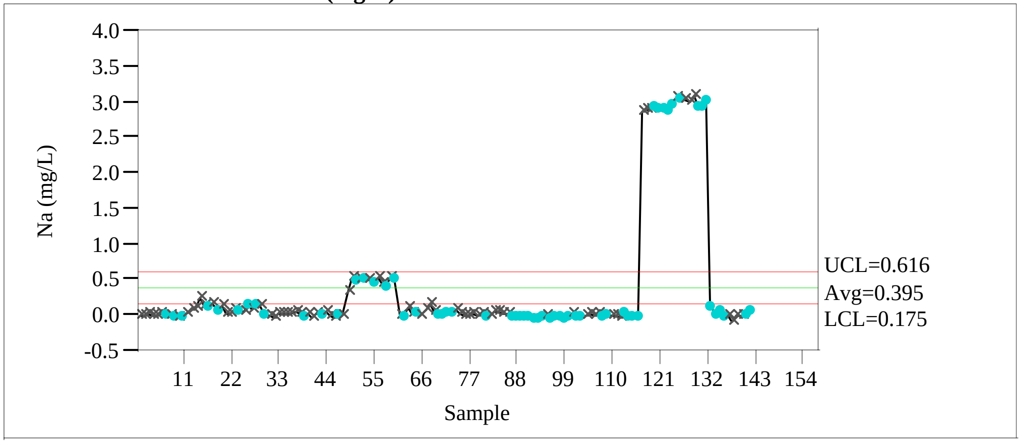


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)

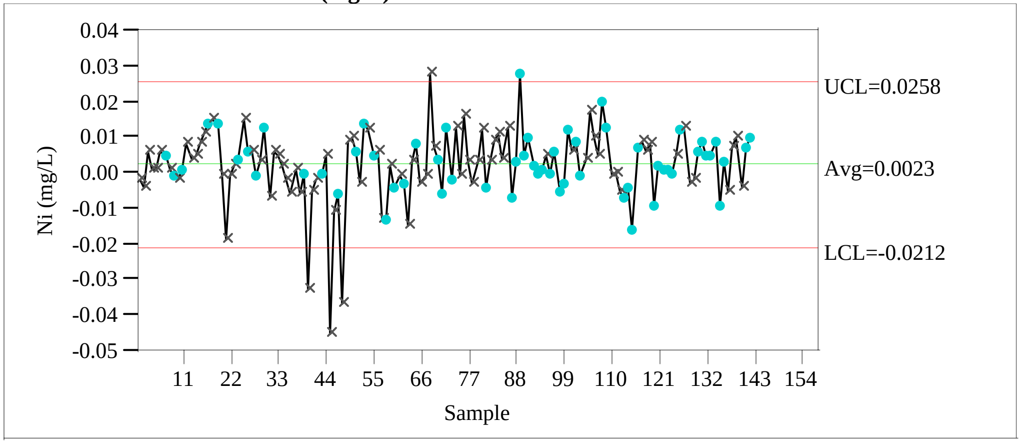
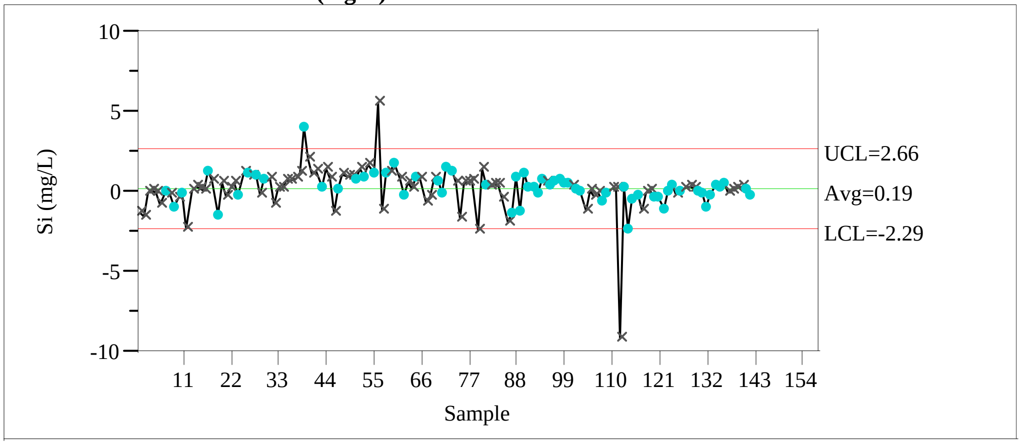
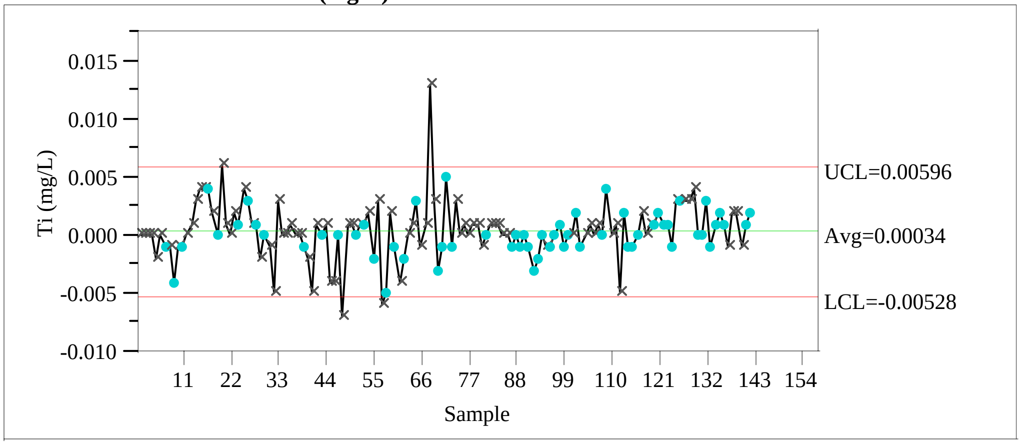


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



Individual Measurement of Zr (mg/L)

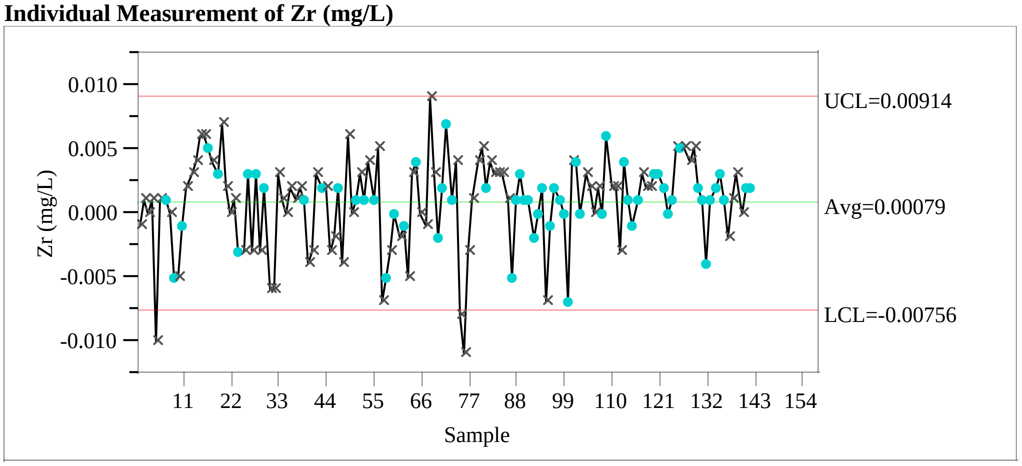


Exhibit A1. Cold Chem Standards in Analytical Sequence

Individual Measurement of U (mg/L)

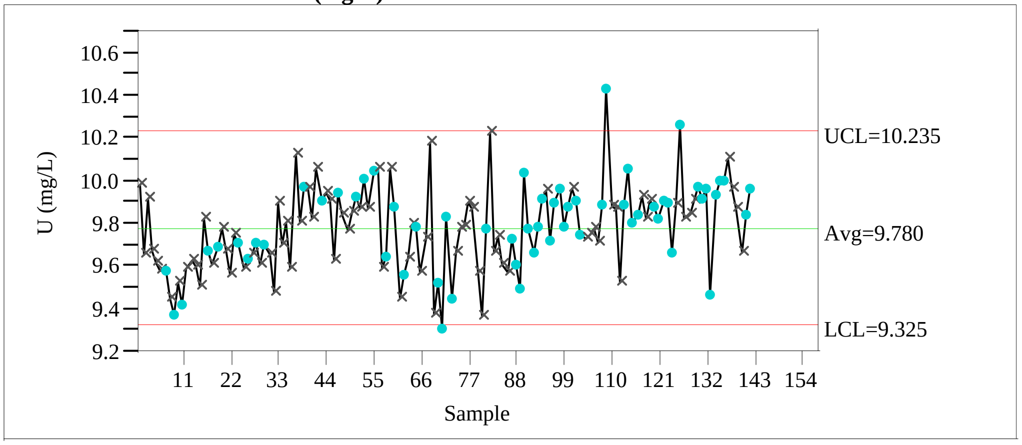
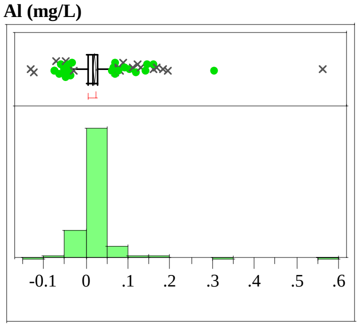


Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN32
Distributions
Al (mg/L)



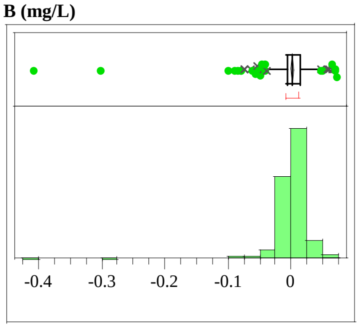
Quantiles

100.0%	maximum	0.5620
99.5%		0.2571
97.5%		0.1189
90.0%		0.0465
75.0%	quartile	0.0280
50.0%	median	0.0170
25.0%	quartile	0.0043
10.0%		-0.0070
2.5%		-0.0439
0.5%		-0.1027
0.0%	minimum	-0.1320

Moments

Mean	0.0204793
Std Dev	0.0422526
Std Err Mean	0.0019206
upper 95% Mean	0.0242531
lower 95% Mean	0.0167056
N	484

B (mg/L)



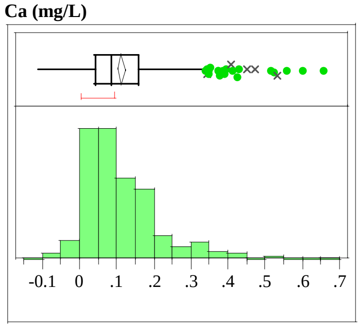
Quantiles

100.0%	maximum	0.0730
99.5%		0.0716
97.5%		0.0399
90.0%		0.0240
75.0%	quartile	0.0140
50.0%	median	0.0030
25.0%	quartile	-0.0070
10.0%		-0.0200
2.5%		-0.0550
0.5%		-0.2141
0.0%	minimum	-0.4050

Moments

Mean	0.0011963
Std Dev	0.0313091
Std Err Mean	0.0014231
upper 95% Mean	0.0039926
lower 95% Mean	-0.0016
N	484

Ca (mg/L)



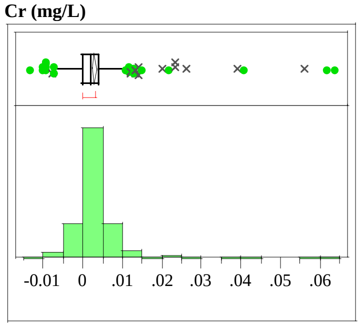
Quantiles

100.0%	maximum	0.6590
99.5%		0.5850
97.5%		0.4056
90.0%		0.2445
75.0%	quartile	0.1610
50.0%	median	0.0860
25.0%	quartile	0.0420
10.0%		0.0180
2.5%		-0.0254
0.5%		-0.0956
0.0%	minimum	-0.1090

Moments

Mean	0.1133822
Std Dev	0.1075139
Std Err Mean	0.004887
upper 95% Mean	0.1229846
lower 95% Mean	0.1037798
N	484

Cr (mg/L)



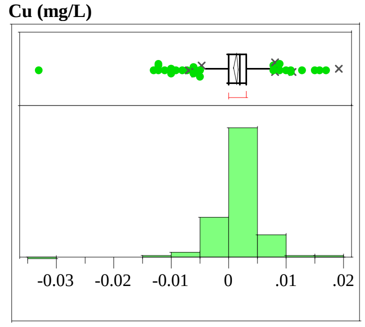
Quantiles

100.0%	maximum	0.0640
99.5%		0.0594
97.5%		0.0140
90.0%		0.0070
75.0%	quartile	0.0040
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0059
0.5%		-0.0100
0.0%	minimum	-0.0130

Moments

Mean	0.0028926
Std Dev	0.0067149
Std Err Mean	0.0003052
upper 95% Mean	0.0034923
lower 95% Mean	0.0022928
N	484

Cu (mg/L)



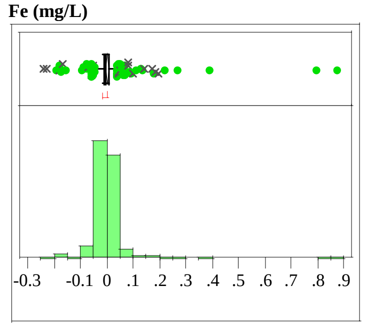
Quantiles

100.0%	maximum	0.0190
99.5%		0.0166
97.5%		0.0080
90.0%		0.0050
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0030
2.5%		-0.0070
0.5%		-0.0126
0.0%	minimum	-0.0330

Moments

Mean	0.0012934
Std Dev	0.0040104
Std Err Mean	0.0001823
upper 95% Mean	0.0016516
lower 95% Mean	0.0009352
N	484

Fe (mg/L)



Quantiles

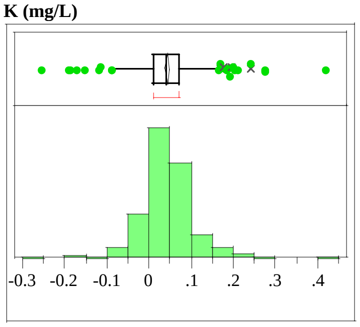
100.0%	maximum	0.8790
99.5%		0.6273
97.5%		0.1293
90.0%		0.0360
75.0%	quartile	0.0090
50.0%	median	-0.0020
25.0%	quartile	-0.0108
10.0%		-0.0400
2.5%		-0.0872
0.5%		-0.2130
0.0%	minimum	-0.2430

Moments

Mean	0.0030909
Std Dev	0.0730918
Std Err Mean	0.0033224
upper 95% Mean	0.009619
lower 95% Mean	-0.003437
N	484

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

K (mg/L)



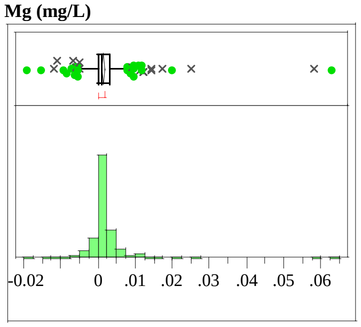
Quantiles

100.0%	maximum	0.4220
99.5%		0.2786
97.5%		0.1846
90.0%		0.1075
75.0%	quartile	0.0730
50.0%	median	0.0400
25.0%	quartile	0.0100
10.0%		-0.0170
2.5%		-0.0733
0.5%		-0.1857
0.0%	minimum	-0.2530

Moments

Mean	0.0430269
Std Dev	0.0619135
Std Err Mean	0.0028142
upper 95% Mean	0.0485565
lower 95% Mean	0.0374972
N	484

Mg (mg/L)



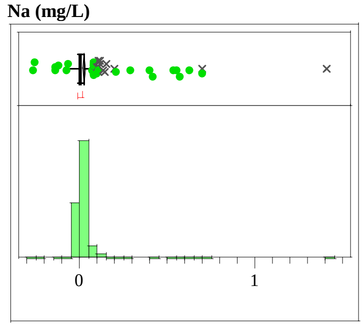
Quantiles

100.0%	maximum	0.0630
99.5%		0.0440
97.5%		0.0110
90.0%		0.0050
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0060
0.5%		-0.0137
0.0%	minimum	-0.0190

Moments

Mean	0.0015909
Std Dev	0.0052453
Std Err Mean	0.0002384
upper 95% Mean	0.0020594
lower 95% Mean	0.0011224
N	484

Na (mg/L)



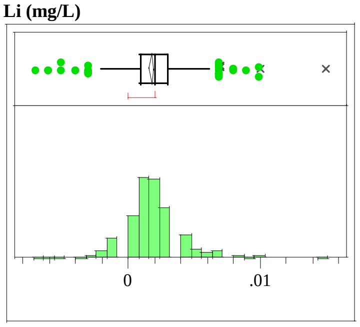
Quantiles

100.0%	maximum	1.404
99.5%		0.701
97.5%		0.187
90.0%		0.051
75.0%	quartile	0.028
50.0%	median	0.012
25.0%	quartile	-0.003
10.0%		-0.016
2.5%		-0.037
0.5%		-0.199
0.0%	minimum	-0.261

Moments

Mean	0.0259917
Std Dev	0.1030939
Std Err Mean	0.0046861
upper 95% Mean	0.0351994
lower 95% Mean	0.0167841
N	484

Li (mg/L)



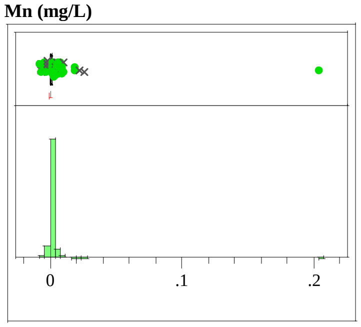
Quantiles

100.0%	maximum	0.0150
99.5%		0.0100
97.5%		0.0070
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		-0.0010
2.5%		-0.0020
0.5%		-0.0060
0.0%	minimum	-0.0070

Moments

Mean	0.0017603
Std Dev	0.0022551
Std Err Mean	0.0001025
upper 95% Mean	0.0019617
lower 95% Mean	0.0015589
N	484

Mn (mg/L)



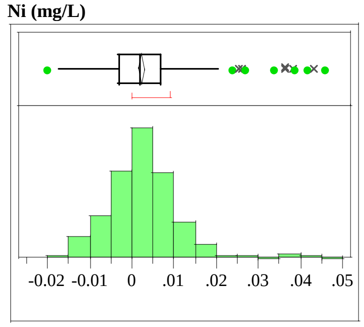
Quantiles

100.0%	maximum	0.2050
99.5%		0.0237
97.5%		0.0090
90.0%		0.0030
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0039
0.5%		-0.0070
0.0%	minimum	-0.0070

Moments

Mean	0.0013471
Std Dev	0.0096945
Std Err Mean	0.0004407
upper 95% Mean	0.002213
lower 95% Mean	0.0004813
N	484

Ni (mg/L)



Quantiles

100.0%	maximum	0.0460
99.5%		0.0426
97.5%		0.0235
90.0%		0.0115
75.0%	quartile	0.0070
50.0%	median	0.0020
25.0%	quartile	-0.0030
10.0%		-0.0080
2.5%		-0.0120
0.5%		-0.0157
0.0%	minimum	-0.0200

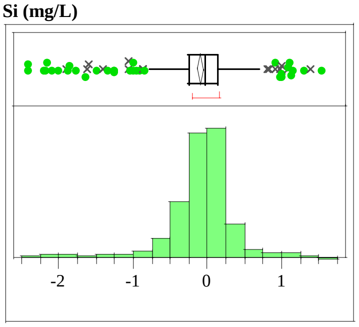
Moments

Mean	0.00225
Std Dev	0.0087749
Std Err Mean	0.0003989
upper 95% Mean	0.0030337
lower 95% Mean	0.0014663
N	484

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN33
Distributions

Si (mg/L)



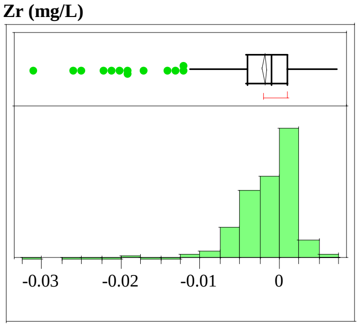
Quantiles

100.0%	maximum	1.543
99.5%		1.341
97.5%		0.986
90.0%		0.326
75.0%	quartile	0.134
50.0%	median	-0.026
25.0%	quartile	-0.247
10.0%		-0.551
2.5%		-1.634
0.5%		-2.313
0.0%	minimum	-2.413

Moments

Mean	-0.094004
Std Dev	0.5050078
Std Err Mean	0.0229549
upper 95% Mean	-0.0489
lower 95% Mean	-0.139108
N	484

Zr (mg/L)



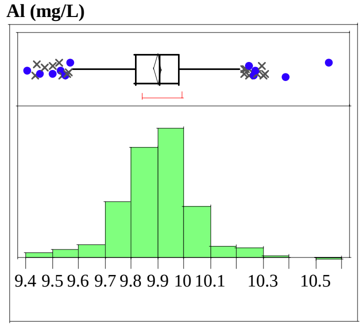
Quantiles

100.0%	maximum	0.0070
99.5%		0.0056
97.5%		0.0030
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	-0.0010
25.0%	quartile	-0.0040
10.0%		-0.0060
2.5%		-0.0120
0.5%		-0.0256
0.0%	minimum	-0.0310

Moments

Mean	-0.00187
Std Dev	0.0042448
Std Err Mean	0.0001929
upper 95% Mean	-0.001491
lower 95% Mean	-0.002249
N	484

Al (mg/L)



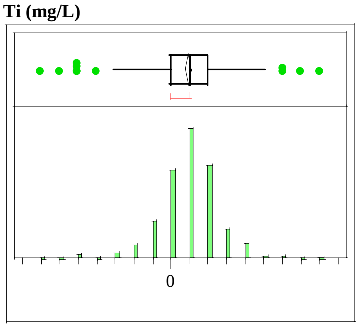
Quantiles

100.0%	maximum	10.557
99.5%		10.376
97.5%		10.245
90.0%		10.049
75.0%	quartile	9.981
50.0%	median	9.907
25.0%	quartile	9.819
10.0%		9.734
2.5%		9.550
0.5%		9.437
0.0%	minimum	9.409

Moments

Mean	9.9006157
Std Dev	0.1478098
Std Err Mean	0.0071115
upper 95% Mean	9.9145933
lower 95% Mean	9.8866382
N	432

Ti (mg/L)



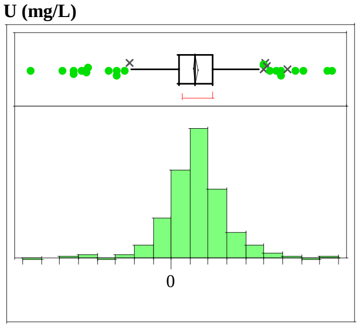
Quantiles

100.0%	maximum	0.0080
99.5%		0.0066
97.5%		0.0040
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0056
0.0%	minimum	-0.0070

Moments

Mean	0.0009112
Std Dev	0.0016861
Std Err Mean	0.0000766
upper 95% Mean	0.0010618
lower 95% Mean	0.0007606
N	484

U (mg/L)



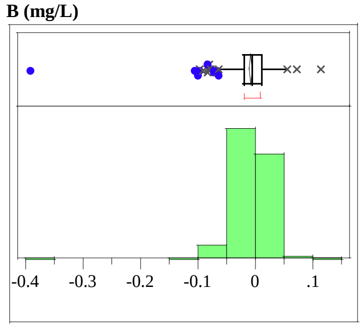
Quantiles

100.0%	maximum	0.8720
99.5%		0.7880
97.5%		0.4986
90.0%		0.3275
75.0%	quartile	0.2198
50.0%	median	0.1310
25.0%	quartile	0.0452
10.0%		-0.0535
2.5%		-0.2425
0.5%		-0.5565
0.0%	minimum	-0.7540

Moments

Mean	0.131095
Std Dev	0.1774388
Std Err Mean	0.0080654
upper 95% Mean	0.1469426
lower 95% Mean	0.1152474
N	484

B (mg/L)



Quantiles

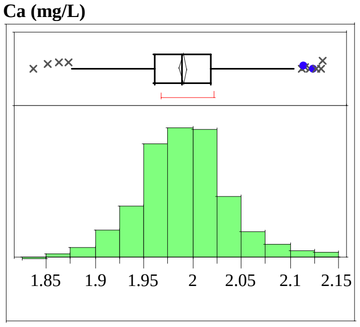
100.0%	maximum	0.1120
99.5%		0.0674
97.5%		0.0392
90.0%		0.0220
75.0%	quartile	0.0100
50.0%	median	-0.0050
25.0%	quartile	-0.0190
10.0%		-0.0357
2.5%		-0.0820
0.5%		-0.1042
0.0%	minimum	-0.3890

Moments

Mean	-0.00762
Std Dev	0.0317911
Std Err Mean	0.0015295
upper 95% Mean	-0.004614
lower 95% Mean	-0.010627
N	432

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Ca (mg/L)



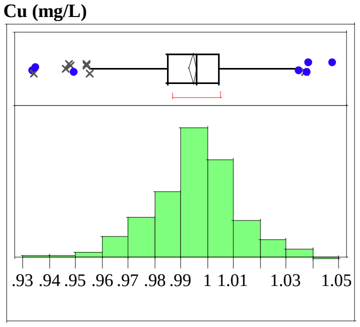
Quantiles

100.0%	maximum	2.1320
99.5%		2.1302
97.5%		2.0915
90.0%		2.0467
75.0%	quartile	2.0190
50.0%	median	1.9890
25.0%	quartile	1.9620
10.0%		1.9340
2.5%		1.8963
0.5%		1.8520
0.0%	minimum	1.8360

Moments

Mean	1.9902477
Std Dev	0.0472228
Std Err Mean	0.002272
upper 95% Mean	1.9947133
lower 95% Mean	1.9857821
N	432

Cu (mg/L)



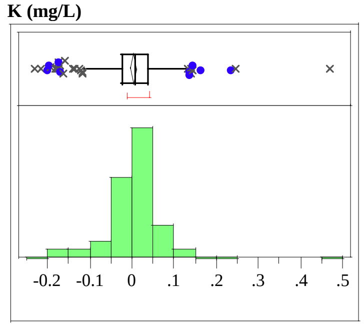
Quantiles

100.0%	maximum	1.0480
99.5%		1.0388
97.5%		1.0280
90.0%		1.0167
75.0%	quartile	1.0048
50.0%	median	0.9960
25.0%	quartile	0.9850
10.0%		0.9730
2.5%		0.9558
0.5%		0.9342
0.0%	minimum	0.9340

Moments

Mean	0.9946204
Std Dev	0.0170972
Std Err Mean	0.0008226
upper 95% Mean	0.9962372
lower 95% Mean	0.9930036
N	432

K (mg/L)



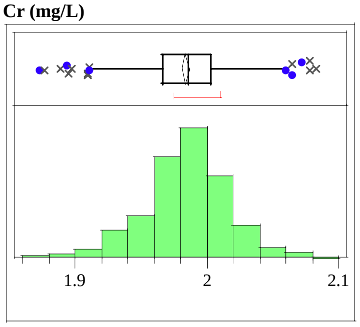
Quantiles

100.0%	maximum	0.4660
99.5%		0.2443
97.5%		0.1312
90.0%		0.0640
75.0%	quartile	0.0367
50.0%	median	0.0090
25.0%	quartile	-0.0240
10.0%		-0.0617
2.5%		-0.1722
0.5%		-0.2129
0.0%	minimum	-0.2340

Moments

Mean	0.0040926
Std Dev	0.0644453
Std Err Mean	0.0031006
upper 95% Mean	0.0101868
lower 95% Mean	-0.002002
N	432

Cr (mg/L)



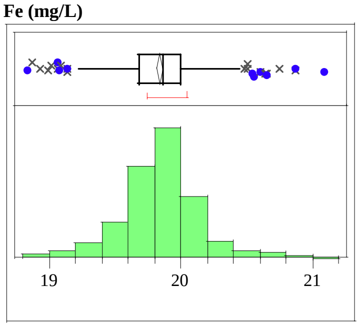
Quantiles

100.0%	maximum	2.0820
99.5%		2.0770
97.5%		2.0477
90.0%		2.0220
75.0%	quartile	2.0030
50.0%	median	1.9860
25.0%	quartile	1.9670
10.0%		1.9410
2.5%		1.9128
0.5%		1.8780
0.0%	minimum	1.8740

Moments

Mean	1.9839051
Std Dev	0.0323171
Std Err Mean	0.0015549
upper 95% Mean	1.9869611
lower 95% Mean	1.9808491
N	432

Fe (mg/L)



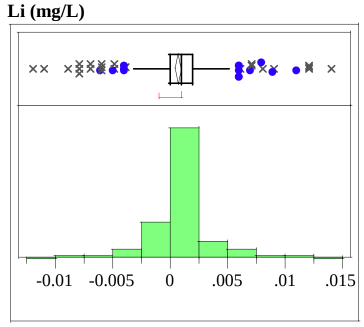
Quantiles

100.0%	maximum	21.100
99.5%		20.878
97.5%		20.556
90.0%		20.161
75.0%	quartile	19.999
50.0%	median	19.866
25.0%	quartile	19.680
10.0%		19.468
2.5%		19.138
0.5%		18.876
0.0%	minimum	18.847

Moments

Mean	19.842933
Std Dev	0.3027379
Std Err Mean	0.0145655
upper 95% Mean	19.871561
lower 95% Mean	19.814305
N	432

Li (mg/L)



Quantiles

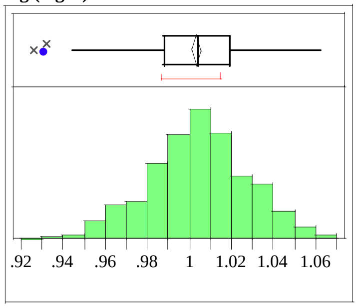
100.0%	maximum	0.0140
99.5%		0.0120
97.5%		0.0070
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0060
0.5%		-0.0107
0.0%	minimum	-0.0120

Moments

Mean	0.0006597
Std Dev	0.0027783
Std Err Mean	0.0001337
upper 95% Mean	0.0009225
lower 95% Mean	0.000397
N	432

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Mg (mg/L)



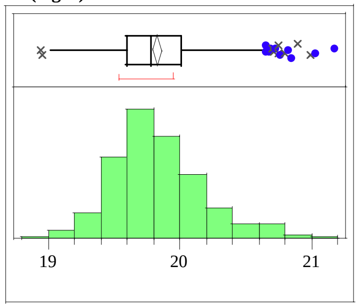
Quantiles

100.0%	maximum	1.0620
99.5%		1.0620
97.5%		1.0500
90.0%		1.0350
75.0%	quartile	1.0190
50.0%	median	1.0040
25.0%	quartile	0.9882
10.0%		0.9710
2.5%		0.9558
0.5%		0.9312
0.0%	minimum	0.9260

Moments

Mean	1.0034074
Std Dev	0.0239651
Std Err Mean	0.001153
upper 95% Mean	1.0056737
lower 95% Mean	1.0011412
N	432

Na (mg/L)



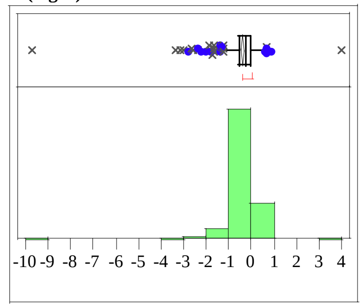
Quantiles

100.0%	maximum	21.184
99.5%		21.032
97.5%		20.734
90.0%		20.301
75.0%	quartile	20.017
50.0%	median	19.779
25.0%	quartile	19.601
10.0%		19.454
2.5%		19.202
0.5%		18.967
0.0%	minimum	18.940

Moments

Mean	19.832558
Std Dev	0.3638111
Std Err Mean	0.0175039
upper 95% Mean	19.866961
lower 95% Mean	19.798154
N	432

Si (mg/L)



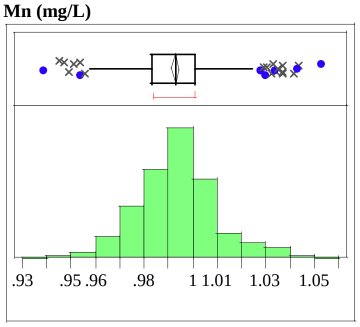
Quantiles

100.0%	maximum	3.960
99.5%		0.910
97.5%		0.462
90.0%		0.137
75.0%	quartile	-0.056
50.0%	median	-0.274
25.0%	quartile	-0.527
10.0%		-0.937
2.5%		-2.017
0.5%		-3.354
0.0%	minimum	-9.764

Moments

Mean	-0.371558
Std Dev	0.7418883
Std Err Mean	0.0356941
upper 95% Mean	-0.301402
lower 95% Mean	-0.441714
N	432

Mn (mg/L)



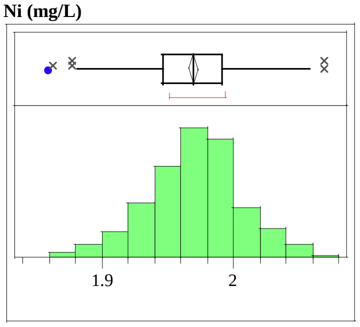
Quantiles

100.0%	maximum	1.0530
99.5%		1.0430
97.5%		1.0332
90.0%		1.0130
75.0%	quartile	1.0010
50.0%	median	0.9930
25.0%	quartile	0.9830
10.0%		0.9720
2.5%		0.9598
0.5%		0.9453
0.0%	minimum	0.9390

Moments

Mean	0.9927801
Std Dev	0.0167417
Std Err Mean	0.0008055
upper 95% Mean	0.9943633
lower 95% Mean	0.9911969
N	432

Ni (mg/L)



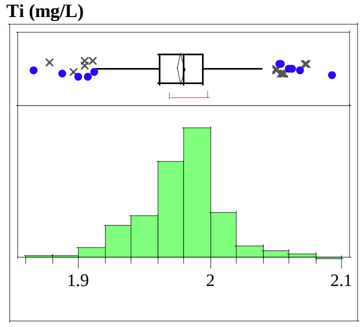
Quantiles

100.0%	maximum	2.0690
99.5%		2.0670
97.5%		2.0434
90.0%		2.0167
75.0%	quartile	1.9920
50.0%	median	1.9700
25.0%	quartile	1.9463
10.0%		1.9260
2.5%		1.8938
0.5%		1.8653
0.0%	minimum	1.8600

Moments

Mean	1.9697685
Std Dev	0.0358308
Std Err Mean	0.0017239
upper 95% Mean	1.9731568
lower 95% Mean	1.9663802
N	432

Ti (mg/L)



Quantiles

100.0%	maximum	2.0930
99.5%		2.0727
97.5%		2.0532
90.0%		2.0120
75.0%	quartile	1.9940
50.0%	median	1.9800
25.0%	quartile	1.9623
10.0%		1.9363
2.5%		1.9147
0.5%		1.8798
0.0%	minimum	1.8670

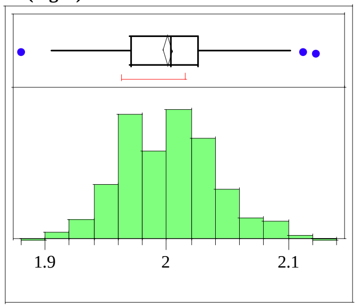
Moments

Mean	1.9781412
Std Dev	0.0312213
Std Err Mean	0.0015021
upper 95% Mean	1.9810936
lower 95% Mean	1.9751888
N	432

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN34
Distributions

Zr (mg/L)



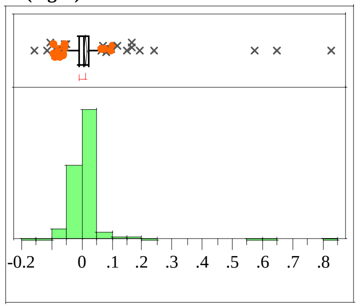
Quantiles

100.0%	maximum	2.1240
99.5%		2.1110
97.5%		2.0882
90.0%		2.0500
75.0%	quartile	2.0260
50.0%	median	2.0030
25.0%	quartile	1.9710
10.0%		1.9540
2.5%		1.9288
0.5%		1.9063
0.0%	minimum	1.8810

Moments

Mean	2.0012153
Std Dev	0.0396537
Std Err Mean	0.0019078
upper 95% Mean	2.0049651
lower 95% Mean	1.9974655
N	432

Al (mg/L)



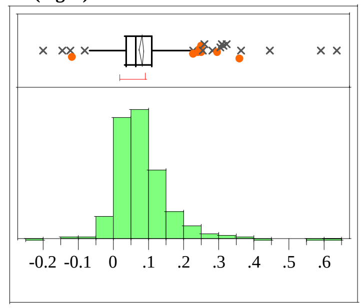
Quantiles

100.0%	maximum	0.8250
99.5%		0.6389
97.5%		0.1034
90.0%		0.0370
75.0%	quartile	0.0208
50.0%	median	0.0050
25.0%	quartile	-0.0070
10.0%		-0.0269
2.5%		-0.0715
0.5%		-0.1160
0.0%	minimum	-0.1580

Moments

Mean	0.0111952
Std Dev	0.0677428
Std Err Mean	0.0033055
upper 95% Mean	0.0176927
lower 95% Mean	0.0046978
N	420

Ca (mg/L)



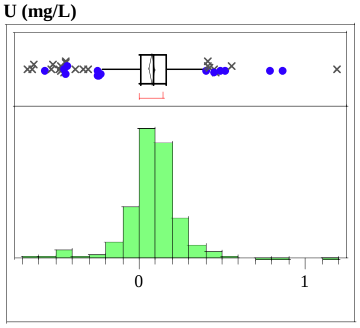
Quantiles

100.0%	maximum	0.6340
99.5%		0.5735
97.5%		0.2891
90.0%		0.1717
75.0%	quartile	0.1108
50.0%	median	0.0640
25.0%	quartile	0.0343
10.0%		0.0080
2.5%		-0.0354
0.5%		-0.1438
0.0%	minimum	-0.2020

Moments

Mean	0.08
Std Dev	0.0818628
Std Err Mean	0.0039945
upper 95% Mean	0.0878517
lower 95% Mean	0.0721483
N	420

U (mg/L)



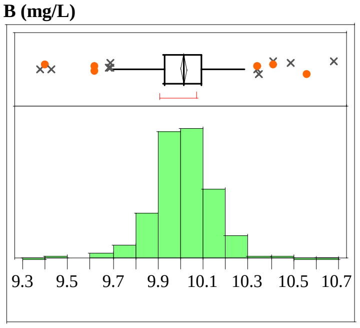
Quantiles

100.0%	maximum	1.181
99.5%		0.857
97.5%		0.413
90.0%		0.238
75.0%	quartile	0.161
50.0%	median	0.087
25.0%	quartile	0.006
10.0%		-0.083
2.5%		-0.450
0.5%		-0.646
0.0%	minimum	-0.675

Moments

Mean	0.0758167
Std Dev	0.1860189
Std Err Mean	0.0089602
upper 95% Mean	0.093428
lower 95% Mean	0.0582054
N	431

B (mg/L)



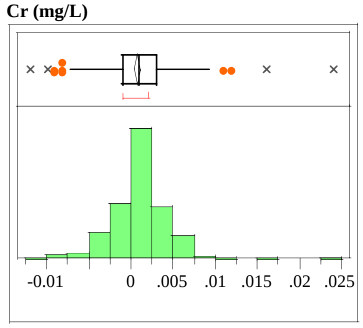
Quantiles

100.0%	maximum	10.677
99.5%		10.557
97.5%		10.266
90.0%		10.179
75.0%	quartile	10.092
50.0%	median	10.012
25.0%	quartile	9.931
10.0%		9.863
2.5%		9.723
0.5%		9.403
0.0%	minimum	9.371

Moments

Mean	10.012571
Std Dev	0.1424814
Std Err Mean	0.0069524
upper 95% Mean	10.026237
lower 95% Mean	9.9989055
N	420

Cr (mg/L)



Quantiles

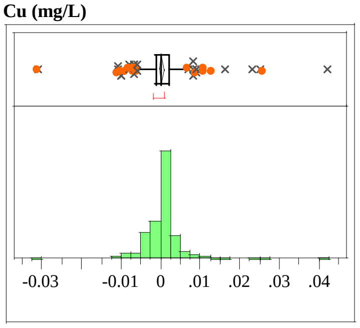
100.0%	maximum	0.0240
99.5%		0.0156
97.5%		0.0070
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	-0.0010
10.0%		-0.0030
2.5%		-0.0070
0.5%		-0.0099
0.0%	minimum	-0.0120

Moments

Mean	0.0008
Std Dev	0.0034334
Std Err Mean	0.0001675
upper 95% Mean	0.0011293
lower 95% Mean	0.0004707
N	420

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Cu (mg/L)



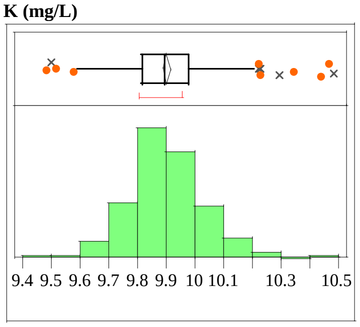
Quantiles

100.0%	maximum	0.0420
99.5%		0.0259
97.5%		0.0090
90.0%		0.0040
75.0%	quartile	0.0020
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0040
2.5%		-0.0095
0.5%		-0.0289
0.0%	minimum	-0.0310

Moments

Mean	0.0002833
Std Dev	0.0049694
Std Err Mean	0.0002425
upper 95% Mean	0.00076
lower 95% Mean	-0.000193
N	420

K (mg/L)



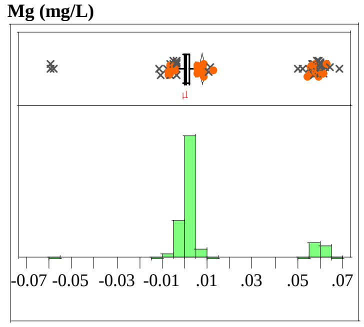
Quantiles

100.0%	maximum	10.481
99.5%		10.465
97.5%		10.195
90.0%		10.072
75.0%	quartile	9.977
50.0%	median	9.892
25.0%	quartile	9.819
10.0%		9.727
2.5%		9.651
0.5%		9.498
0.0%	minimum	9.484

Moments

Mean	9.9013071
Std Dev	0.1372437
Std Err Mean	0.0066968
upper 95% Mean	9.9144707
lower 95% Mean	9.8881436
N	420

Mg (mg/L)



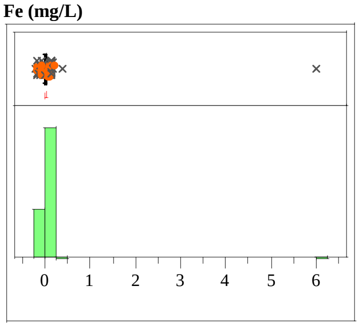
Quantiles

100.0%	maximum	0.0680
99.5%		0.0639
97.5%		0.0600
90.0%		0.0570
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0070
0.5%		-0.0598
0.0%	minimum	-0.0600

Moments

Mean	0.0080881
Std Dev	0.021038
Std Err Mean	0.0010265
upper 95% Mean	0.0101059
lower 95% Mean	0.0060703
N	420

Fe (mg/L)



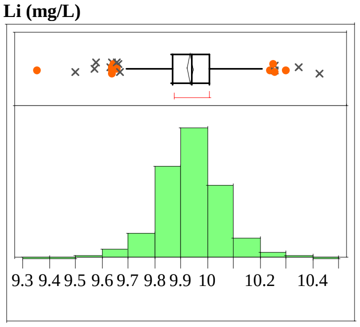
Quantiles

100.0%	maximum	6.000
99.5%		0.361
97.5%		0.127
90.0%		0.108
75.0%	quartile	0.024
50.0%	median	0.007
25.0%	quartile	-0.001
10.0%		-0.040
2.5%		-0.141
0.5%		-0.186
0.0%	minimum	-0.246

Moments

Mean	0.0287357
Std Dev	0.2981018
Std Err Mean	0.0145459
upper 95% Mean	0.0573277
lower 95% Mean	0.0001437
N	420

Li (mg/L)



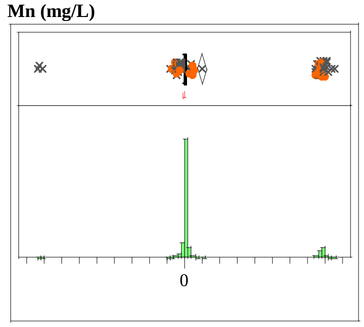
Quantiles

100.0%	maximum	10.425
99.5%		10.342
97.5%		10.191
90.0%		10.081
75.0%	quartile	10.009
50.0%	median	9.942
25.0%	quartile	9.872
10.0%		9.785
2.5%		9.653
0.5%		9.506
0.0%	minimum	9.360

Moments

Mean	9.9380524
Std Dev	0.1252111
Std Err Mean	0.0061097
upper 95% Mean	9.9500618
lower 95% Mean	9.9260429
N	420

Mn (mg/L)



Quantiles

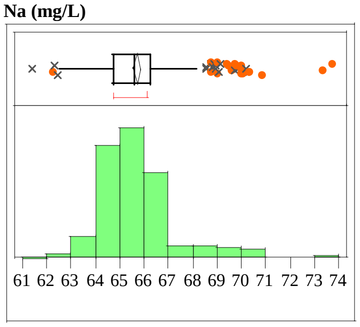
100.0%	maximum	0.0850
99.5%		0.0828
97.5%		0.0790
90.0%		0.0770
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0050
0.5%		-0.0828
0.0%	minimum	-0.0840

Moments

Mean	0.0099238
Std Dev	0.0276642
Std Err Mean	0.0013499
upper 95% Mean	0.0125772
lower 95% Mean	0.0072704
N	420

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Na (mg/L)



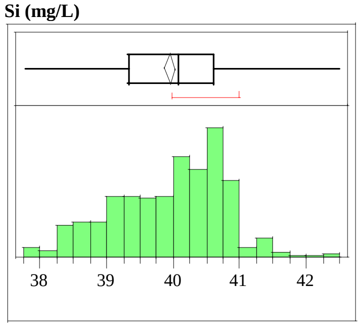
Quantiles

100.0%	maximum	73.741
99.5%		73.096
97.5%		70.027
90.0%		67.168
75.0%	quartile	66.238
50.0%	median	65.605
25.0%	quartile	64.725
10.0%		64.187
2.5%		63.098
0.5%		62.263
0.0%	minimum	61.388

Moments

Mean	65.697169
Std Dev	1.5599693
Std Err Mean	0.0761187
upper 95% Mean	65.846791
lower 95% Mean	65.547547
N	420

Si (mg/L)



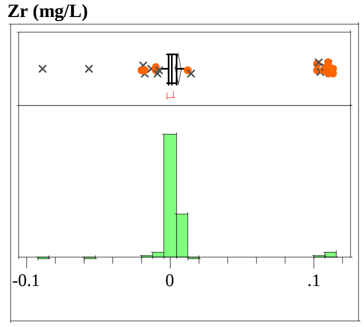
Quantiles

100.0%	maximum	42.470
99.5%		42.390
97.5%		41.378
90.0%		40.900
75.0%	quartile	40.594
50.0%	median	40.078
25.0%	quartile	39.332
10.0%		38.704
2.5%		38.266
0.5%		37.838
0.0%	minimum	37.803

Moments

Mean	39.948552
Std Dev	0.8462857
Std Err Mean	0.0412945
upper 95% Mean	40.029723
lower 95% Mean	39.867382
N	420

Zr (mg/L)



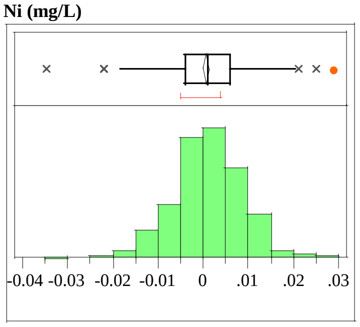
Quantiles

100.0%	maximum	0.1140
99.5%		0.1138
97.5%		0.1095
90.0%		0.0090
75.0%	quartile	0.0040
50.0%	median	0.0010
25.0%	quartile	-0.0008
10.0%		-0.0030
2.5%		-0.0100
0.5%		-0.0531
0.0%	minimum	-0.0900

Moments

Mean	0.0059548
Std Dev	0.0234382
Std Err Mean	0.0011437
upper 95% Mean	0.0082028
lower 95% Mean	0.0037067
N	420

Ni (mg/L)



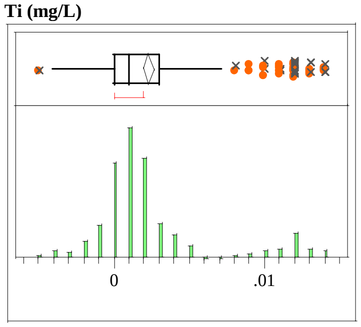
Quantiles

100.0%	maximum	0.0290
99.5%		0.0246
97.5%		0.0155
90.0%		0.0100
75.0%	quartile	0.0060
50.0%	median	0.0010
25.0%	quartile	-0.0040
10.0%		-0.0090
2.5%		-0.0140
0.5%		-0.0220
0.0%	minimum	-0.0350

Moments

Mean	0.0007262
Std Dev	0.0077224
Std Err Mean	0.0003768
upper 95% Mean	0.0014669
lower 95% Mean	-0.000014
N	420

Ti (mg/L)



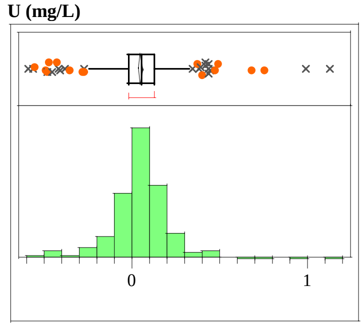
Quantiles

100.0%	maximum	0.0140
99.5%		0.0140
97.5%		0.0130
90.0%		0.0100
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0049
0.0%	minimum	-0.0050

Moments

Mean	0.0023238
Std Dev	0.003885
Std Err Mean	0.0001896
upper 95% Mean	0.0026964
lower 95% Mean	0.0019512
N	420

U (mg/L)



Quantiles

100.0%	maximum	1.126
99.5%		0.966
97.5%		0.423
90.0%		0.214
75.0%	quartile	0.124
50.0%	median	0.050
25.0%	quartile	-0.022
10.0%		-0.142
2.5%		-0.418
0.5%		-0.564
0.0%	minimum	-0.593

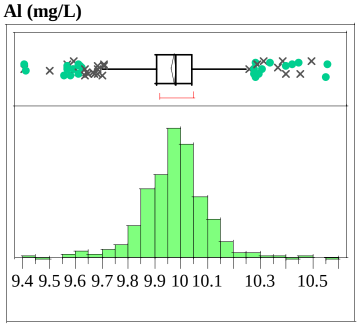
Moments

Mean	0.049494
Std Dev	0.1781261
Std Err Mean	0.008702
upper 95% Mean	0.0665992
lower 95% Mean	0.0323888
N	419

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN35
Distributions

Al (mg/L)



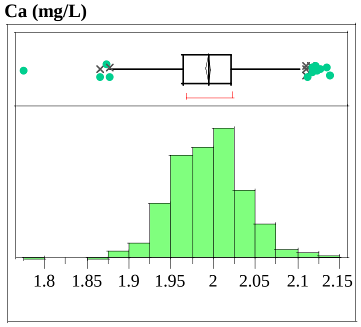
Quantiles

100.0%	maximum	10.560
99.5%		10.451
97.5%		10.225
90.0%		10.112
75.0%	quartile	10.042
50.0%	median	9.980
25.0%	quartile	9.908
10.0%		9.833
2.5%		9.671
0.5%		9.539
0.0%	minimum	9.405

Moments

Mean	9.974574
Std Dev	0.1301197
Std Err Mean	0.0042622
upper 95% Mean	9.9829387
lower 95% Mean	9.9662094
N	932

Ca (mg/L)



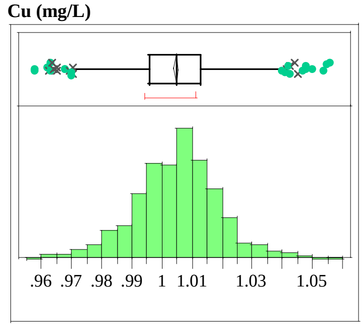
Quantiles

100.0%	maximum	2.1400
99.5%		2.1260
97.5%		2.0777
90.0%		2.0480
75.0%	quartile	2.0220
50.0%	median	1.9950
25.0%	quartile	1.9650
10.0%		1.9420
2.5%		1.9103
0.5%		1.8757
0.0%	minimum	1.7760

Moments

Mean	1.9941373
Std Dev	0.0433714
Std Err Mean	0.0014207
upper 95% Mean	1.9969254
lower 95% Mean	1.9913492
N	932

Cu (mg/L)



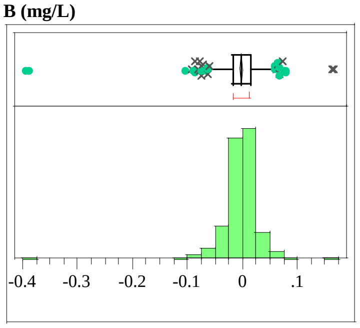
Quantiles

100.0%	maximum	1.0560
99.5%		1.0487
97.5%		1.0350
90.0%		1.0210
75.0%	quartile	1.0130
50.0%	median	1.0050
25.0%	quartile	0.9960
10.0%		0.9870
2.5%		0.9733
0.5%		0.9627
0.0%	minimum	0.9580

Moments

Mean	1.0045912
Std Dev	0.0144782
Std Err Mean	0.0004742
upper 95% Mean	1.0055219
lower 95% Mean	1.0036605
N	932

B (mg/L)



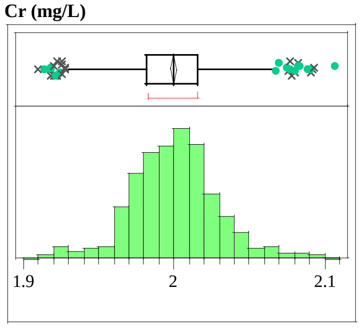
Quantiles

100.0%	maximum	0.1660
99.5%		0.0793
97.5%		0.0493
90.0%		0.0257
75.0%	quartile	0.0140
50.0%	median	-0.0010
25.0%	quartile	-0.0160
10.0%		-0.0310
2.5%		-0.0593
0.5%		-0.0897
0.0%	minimum	-0.3920

Moments

Mean	-0.002663
Std Dev	0.0319273
Std Err Mean	0.0010458
upper 95% Mean	-0.000611
lower 95% Mean	-0.004716
N	932

Cr (mg/L)



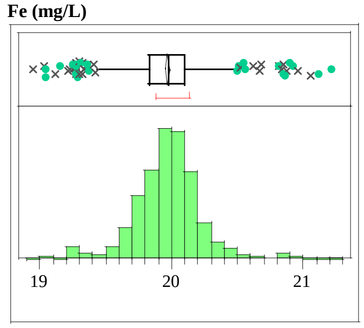
Quantiles

100.0%	maximum	2.1070
99.5%		2.0903
97.5%		2.0640
90.0%		2.0340
75.0%	quartile	2.0160
50.0%	median	2.0000
25.0%	quartile	1.9820
10.0%		1.9670
2.5%		1.9370
0.5%		1.9190
0.0%	minimum	1.9090

Moments

Mean	1.9997929
Std Dev	0.0287791
Std Err Mean	0.0009427
upper 95% Mean	2.001643
lower 95% Mean	1.9979429
N	932

Fe (mg/L)



Quantiles

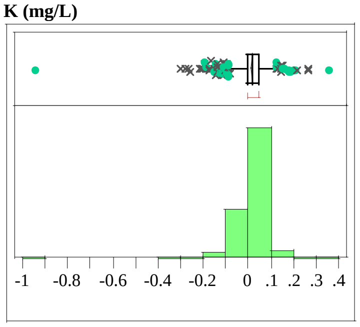
100.0%	maximum	21.226
99.5%		20.937
97.5%		20.496
90.0%		20.233
75.0%	quartile	20.103
50.0%	median	19.977
25.0%	quartile	19.836
10.0%		19.690
2.5%		19.302
0.5%		19.094
0.0%	minimum	18.940

Moments

Mean	19.97019
Std Dev	0.259994
Std Err Mean	0.0085164
upper 95% Mean	19.986903
lower 95% Mean	19.953476
N	932

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

K (mg/L)



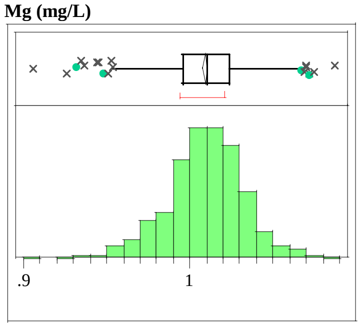
Quantiles

100.0%	maximum	0.3610
99.5%		0.2140
97.5%		0.1110
90.0%		0.0717
75.0%	quartile	0.0450
50.0%	median	0.0200
25.0%	quartile	-0.0050
10.0%		-0.0390
2.5%		-0.1394
0.5%		-0.2633
0.0%	minimum	-0.9430

Moments

Mean	0.0159903
Std Dev	0.0658909
Std Err Mean	0.0021583
upper 95% Mean	0.0202261
lower 95% Mean	0.0117546
N	932

Mg (mg/L)



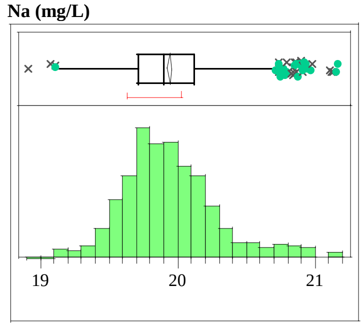
Quantiles

100.0%	maximum	1.0870
99.5%		1.0697
97.5%		1.0530
90.0%		1.0350
75.0%	quartile	1.0240
50.0%	median	1.0100
25.0%	quartile	0.9960
10.0%		0.9790
2.5%		0.9587
0.5%		0.9353
0.0%	minimum	0.9050

Moments

Mean	1.0091459
Std Dev	0.0228722
Std Err Mean	0.0007492
upper 95% Mean	1.0106162
lower 95% Mean	1.0076756
N	932

Na (mg/L)



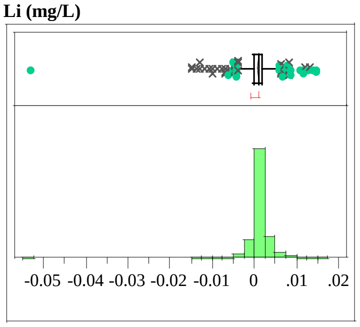
Quantiles

100.0%	maximum	21.174
99.5%		21.106
97.5%		20.852
90.0%		20.351
75.0%	quartile	20.116
50.0%	median	19.904
25.0%	quartile	19.715
10.0%		19.564
2.5%		19.337
0.5%		19.118
0.0%	minimum	18.906

Moments

Mean	19.940065
Std Dev	0.3464977
Std Err Mean	0.0113499
upper 95% Mean	19.96234
lower 95% Mean	19.917791
N	932

Li (mg/L)



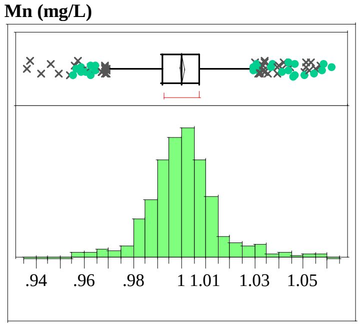
Quantiles

100.0%	maximum	0.0150
99.5%		0.0130
97.5%		0.0070
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0050
0.5%		-0.0133
0.0%	minimum	-0.0530

Moments

Mean	0.0010386
Std Dev	0.0032429
Std Err Mean	0.0001062
upper 95% Mean	0.0012471
lower 95% Mean	0.0008302
N	932

Mn (mg/L)



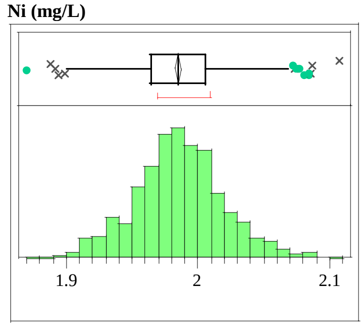
Quantiles

100.0%	maximum	1.0620
99.5%		1.0557
97.5%		1.0390
90.0%		1.0167
75.0%	quartile	1.0070
50.0%	median	1.0000
25.0%	quartile	0.9920
10.0%		0.9840
2.5%		0.9657
0.5%		0.9480
0.0%	minimum	0.9360

Moments

Mean	1.0001685
Std Dev	0.0158127
Std Err Mean	0.000518
upper 95% Mean	1.001185
lower 95% Mean	0.9991519
N	932

Ni (mg/L)



Quantiles

100.0%	maximum	2.1070
99.5%		2.0850
97.5%		2.0567
90.0%		2.0287
75.0%	quartile	2.0060
50.0%	median	1.9850
25.0%	quartile	1.9642
10.0%		1.9403
2.5%		1.9153
0.5%		1.8973
0.0%	minimum	1.8710

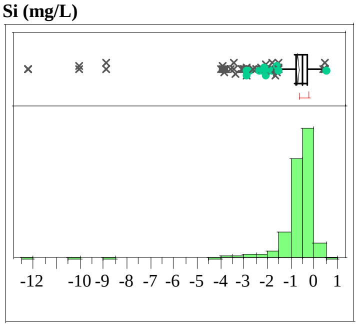
Moments

Mean	1.9851373
Std Dev	0.0339141
Std Err Mean	0.0011109
upper 95% Mean	1.9873175
lower 95% Mean	1.9829572
N	932

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN36
Distributions

Si (mg/L)



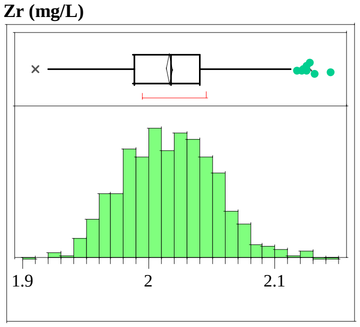
Quantiles

100.0%	maximum	0.56
99.5%		0.40
97.5%		0.17
90.0%		-0.13
75.0%	quartile	-0.32
50.0%	median	-0.50
25.0%	quartile	-0.78
10.0%		-1.23
2.5%		-2.96
0.5%		-9.30
0.0%	minimum	-12.28

Moments

Mean	-0.704152
Std Dev	1.0092571
Std Err Mean	0.0330593
upper 95% Mean	-0.639273
lower 95% Mean	-0.769032
N	932

Zr (mg/L)



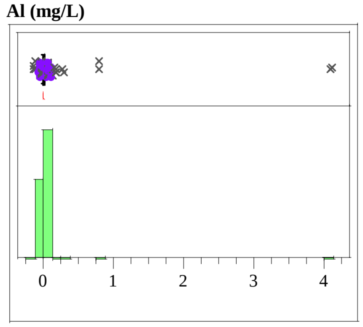
Quantiles

100.0%	maximum	2.1440
99.5%		2.1253
97.5%		2.0964
90.0%		2.0610
75.0%	quartile	2.0400
50.0%	median	2.0170
25.0%	quartile	1.9890
10.0%		1.9670
2.5%		1.9500
0.5%		1.9227
0.0%	minimum	1.9090

Moments

Mean	2.0157876
Std Dev	0.0368529
Std Err Mean	0.0012072
upper 95% Mean	2.0181566
lower 95% Mean	2.0134185
N	932

Al (mg/L)



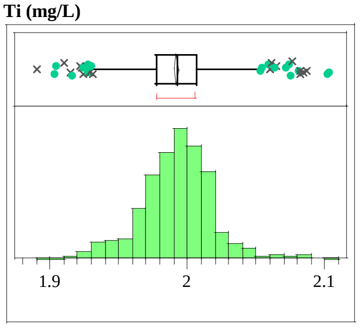
Quantiles

100.0%	maximum	4.091
99.5%		0.546
97.5%		0.063
90.0%		0.035
75.0%	quartile	0.015
50.0%	median	0.004
25.0%	quartile	-0.005
10.0%		-0.017
2.5%		-0.040
0.5%		-0.093
0.0%	minimum	-0.156

Moments

Mean	0.017387
Std Dev	0.1985419
Std Err Mean	0.0066402
upper 95% Mean	0.0304193
lower 95% Mean	0.0043547
N	894

Ti (mg/L)



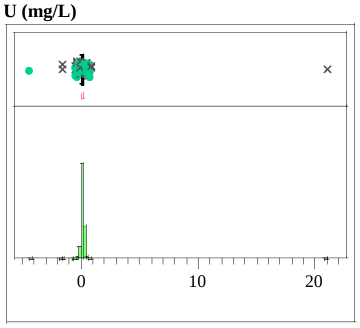
Quantiles

100.0%	maximum	2.1040
99.5%		2.0827
97.5%		2.0467
90.0%		2.0190
75.0%	quartile	2.0070
50.0%	median	1.9930
25.0%	quartile	1.9770
10.0%		1.9600
2.5%		1.9333
0.5%		1.9127
0.0%	minimum	1.8900

Moments

Mean	1.991853
Std Dev	0.0266891
Std Err Mean	0.0008742
upper 95% Mean	1.9935687
lower 95% Mean	1.9901373
N	932

U (mg/L)



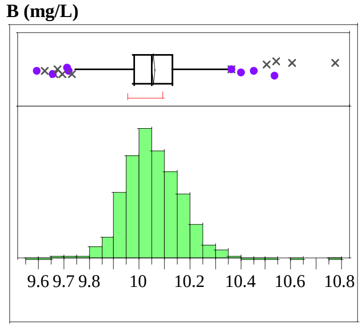
Quantiles

100.0%	maximum	20.97
99.5%		0.75
97.5%		0.39
90.0%		0.27
75.0%	quartile	0.20
50.0%	median	0.14
25.0%	quartile	0.07
10.0%		-0.01
2.5%		-0.27
0.5%		-0.60
0.0%	minimum	-4.38

Moments

Mean	0.1413796
Std Dev	0.7188008
Std Err Mean	0.0235704
upper 95% Mean	0.187637
lower 95% Mean	0.0951222
N	930

B (mg/L)



Quantiles

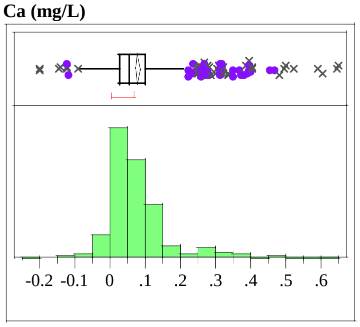
100.0%	maximum	10.773
99.5%		10.519
97.5%		10.299
90.0%		10.197
75.0%	quartile	10.130
50.0%	median	10.046
25.0%	quartile	9.977
10.0%		9.924
2.5%		9.835
0.5%		9.665
0.0%	minimum	9.596

Moments

Mean	10.054342
Std Dev	0.120021
Std Err Mean	0.0040141
upper 95% Mean	10.06222
lower 95% Mean	10.046464
N	894

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Ca (mg/L)



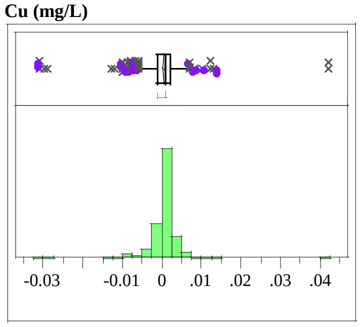
Quantiles

100.0%	maximum	0.6460
99.5%		0.5567
97.5%		0.3744
90.0%		0.1790
75.0%	quartile	0.1020
50.0%	median	0.0540
25.0%	quartile	0.0250
10.0%		0.0030
2.5%		-0.0363
0.5%		-0.1350
0.0%	minimum	-0.2020

Moments

Mean	0.0781846
Std Dev	0.0967781
Std Err Mean	0.0032367
upper 95% Mean	0.0845371
lower 95% Mean	0.0718321
N	894

Cu (mg/L)



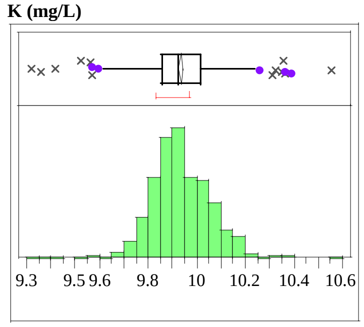
Quantiles

100.0%	maximum	0.0420
99.5%		0.0135
97.5%		0.0060
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	-0.0010
10.0%		-0.0020
2.5%		-0.0080
0.5%		-0.0305
0.0%	minimum	-0.0310

Moments

Mean	0.0004362
Std Dev	0.0043039
Std Err Mean	0.0001439
upper 95% Mean	0.0007188
lower 95% Mean	0.0001537
N	894

K (mg/L)



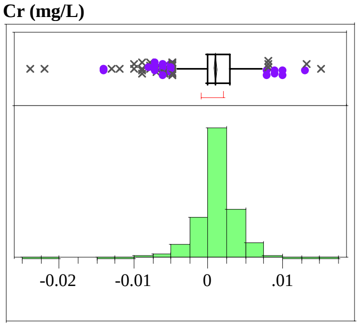
Quantiles

100.0%	maximum	10.550
99.5%		10.356
97.5%		10.184
90.0%		10.090
75.0%	quartile	10.016
50.0%	median	9.921
25.0%	quartile	9.859
10.0%		9.795
2.5%		9.717
0.5%		9.539
0.0%	minimum	9.317

Moments

Mean	9.9349989
Std Dev	0.1252223
Std Err Mean	0.0041881
upper 95% Mean	9.9432185
lower 95% Mean	9.9267793
N	894

Cr (mg/L)



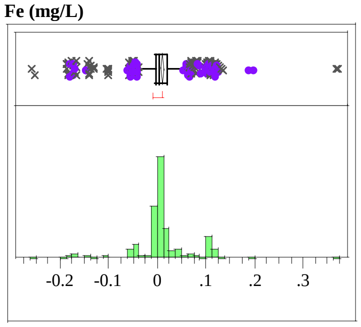
Quantiles

100.0%	maximum	0.0150
99.5%		0.0100
97.5%		0.0070
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0066
0.5%		-0.0135
0.0%	minimum	-0.0240

Moments

Mean	0.000887
Std Dev	0.0032208
Std Err Mean	0.0001077
upper 95% Mean	0.0010984
lower 95% Mean	0.0006756
N	894

Fe (mg/L)



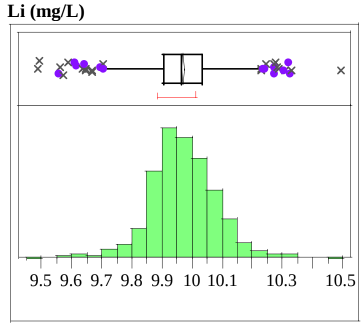
Quantiles

100.0%	maximum	0.3700
99.5%		0.1629
97.5%		0.1160
90.0%		0.1040
75.0%	quartile	0.0200
50.0%	median	0.0040
25.0%	quartile	-0.0033
10.0%		-0.0420
2.5%		-0.1690
0.5%		-0.1870
0.0%	minimum	-0.2600

Moments

Mean	0.0099396
Std Dev	0.0583876
Std Err Mean	0.0019528
upper 95% Mean	0.0137722
lower 95% Mean	0.006107
N	894

Li (mg/L)



Quantiles

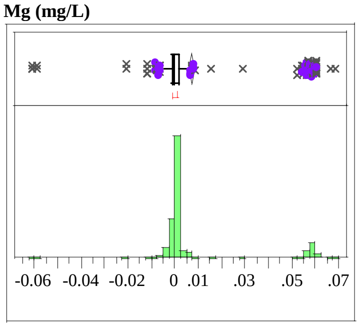
100.0%	maximum	10.493
99.5%		10.315
97.5%		10.206
90.0%		10.108
75.0%	quartile	10.033
50.0%	median	9.964
25.0%	quartile	9.905
10.0%		9.851
2.5%		9.730
0.5%		9.564
0.0%	minimum	9.485

Moments

Mean	9.9701633
Std Dev	0.1129319
Std Err Mean	0.003777
upper 95% Mean	9.9775762
lower 95% Mean	9.9627505
N	894

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Mg (mg/L)



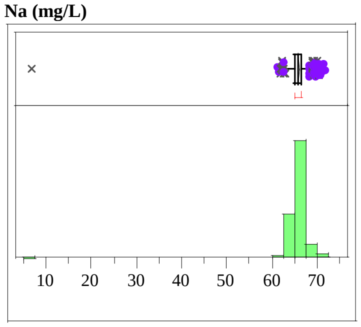
Quantiles

100.0%	maximum	0.0680
99.5%		0.0600
97.5%		0.0590
90.0%		0.0570
75.0%	quartile	0.0020
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0020
2.5%		-0.0070
0.5%		-0.0600
0.0%	minimum	-0.0610

Moments

Mean	0.0071253
Std Dev	0.0203489
Std Err Mean	0.0006806
upper 95% Mean	0.008461
lower 95% Mean	0.0057896
N	894

Na (mg/L)



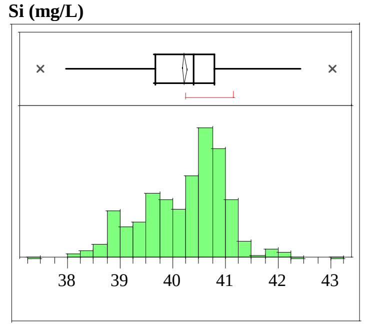
Quantiles

100.0%	maximum	71.901
99.5%		71.051
97.5%		70.042
90.0%		67.603
75.0%	quartile	66.391
50.0%	median	65.787
25.0%	quartile	64.983
10.0%		64.357
2.5%		63.368
0.5%		61.667
0.0%	minimum	6.674

Moments

Mean	65.823494
Std Dev	2.4838219
Std Err Mean	0.0830714
upper 95% Mean	65.986532
lower 95% Mean	65.660456
N	894

Si (mg/L)



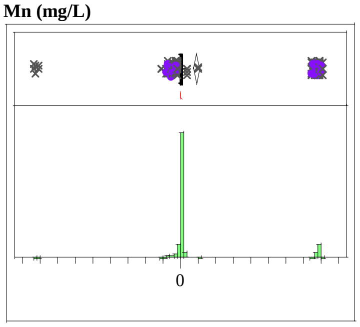
Quantiles

100.0%	maximum	43.033
99.5%		42.200
97.5%		41.621
90.0%		41.082
75.0%	quartile	40.795
50.0%	median	40.412
25.0%	quartile	39.667
10.0%		39.007
2.5%		38.666
0.5%		38.202
0.0%	minimum	37.490

Moments

Mean	40.232102
Std Dev	0.791628
Std Err Mean	0.026476
upper 95% Mean	40.284064
lower 95% Mean	40.180139
N	894

Mn (mg/L)



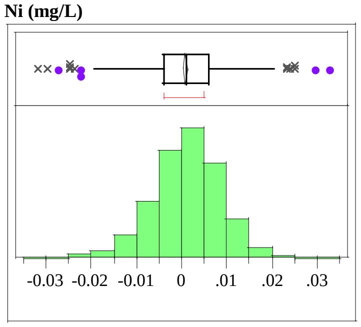
Quantiles

100.0%	maximum	0.0800
99.5%		0.0800
97.5%		0.0790
90.0%		0.0770
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0066
0.5%		-0.0821
0.0%	minimum	-0.0840

Moments

Mean	0.0090705
Std Dev	0.0269138
Std Err Mean	0.0009001
upper 95% Mean	0.0108371
lower 95% Mean	0.0073039
N	894

Ni (mg/L)



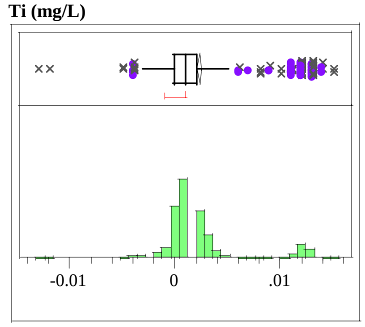
Quantiles

100.0%	maximum	0.0330
99.5%		0.0245
97.5%		0.0156
90.0%		0.0100
75.0%	quartile	0.0060
50.0%	median	0.0010
25.0%	quartile	-0.0040
10.0%		-0.0090
2.5%		-0.0160
0.5%		-0.0250
0.0%	minimum	-0.0320

Moments

Mean	0.0007528
Std Dev	0.0078838
Std Err Mean	0.0002637
upper 95% Mean	0.0012703
lower 95% Mean	0.0002353
N	894

Ti (mg/L)



Quantiles

100.0%	maximum	0.0150
99.5%		0.0140
97.5%		0.0130
90.0%		0.0110
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0020
0.5%		-0.0045
0.0%	minimum	-0.0130

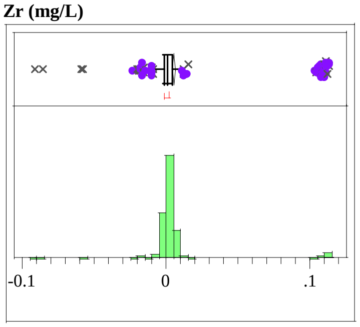
Moments

Mean	0.0023143
Std Dev	0.0038865
Std Err Mean	0.00013
upper 95% Mean	0.0025694
lower 95% Mean	0.0020592
N	894

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN38
Distributions

Zr (mg/L)



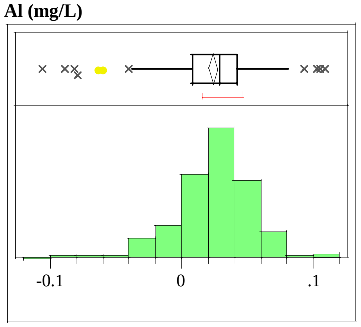
Quantiles

100.0%	maximum	0.1140
99.5%		0.1125
97.5%		0.1100
90.0%		0.0070
75.0%	quartile	0.0040
50.0%	median	0.0010
25.0%	quartile	-0.0010
10.0%		-0.0030
2.5%		-0.0096
0.5%		-0.0414
0.0%	minimum	-0.0920

Moments

Mean	0.0056029
Std Dev	0.0234652
Std Err Mean	0.0007848
upper 95% Mean	0.0071432
lower 95% Mean	0.0040627
N	894

Al (mg/L)



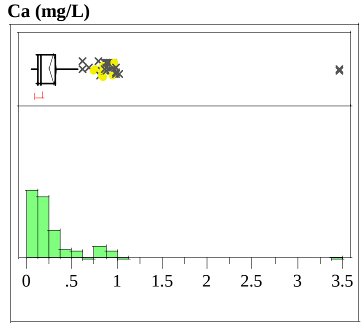
Quantiles

100.0%	maximum	0.1080
99.5%		0.1065
97.5%		0.0710
90.0%		0.0570
75.0%	quartile	0.0420
50.0%	median	0.0290
25.0%	quartile	0.0090
10.0%		-0.0070
2.5%		-0.0381
0.5%		-0.0972
0.0%	minimum	-0.1060

Moments

Mean	0.024447
Std Dev	0.0291811
Std Err Mean	0.0016792
upper 95% Mean	0.0277514
lower 95% Mean	0.0211426
N	302

Ca (mg/L)



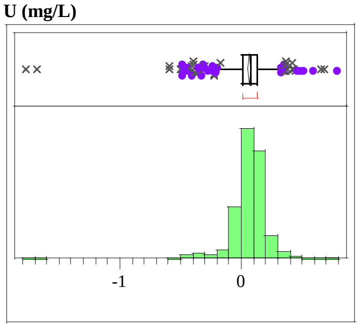
Quantiles

100.0%	maximum	3.4580
99.5%		3.4549
97.5%		0.9652
90.0%		0.8198
75.0%	quartile	0.3142
50.0%	median	0.1620
25.0%	quartile	0.1150
10.0%		0.1000
2.5%		0.0807
0.5%		0.0690
0.0%	minimum	0.0690

Moments

Mean	0.2920364
Std Dev	0.3540215
Std Err Mean	0.0203717
upper 95% Mean	0.3321253
lower 95% Mean	0.2519475
N	302

U (mg/L)



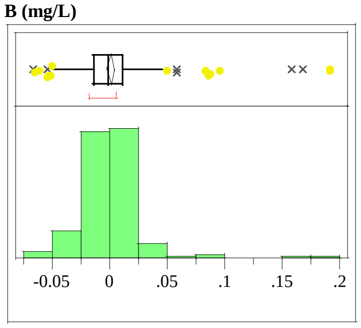
Quantiles

100.0%	maximum	0.793
99.5%		0.621
97.5%		0.334
90.0%		0.202
75.0%	quartile	0.132
50.0%	median	0.075
25.0%	quartile	0.007
10.0%		-0.057
2.5%		-0.355
0.5%		-0.557
0.0%	minimum	-1.784

Moments

Mean	0.0635863
Std Dev	0.1658348
Std Err Mean	0.0055526
upper 95% Mean	0.0744839
lower 95% Mean	0.0526887
N	892

B (mg/L)



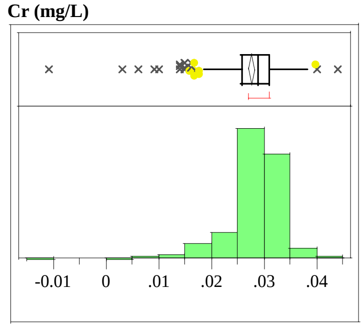
Quantiles

100.0%	maximum	0.1930
99.5%		0.1930
97.5%		0.0853
90.0%		0.0220
75.0%	quartile	0.0110
50.0%	median	-0.0010
25.0%	quartile	-0.0133
10.0%		-0.0270
2.5%		-0.0504
0.5%		-0.0665
0.0%	minimum	-0.0680

Moments

Mean	0.001149
Std Dev	0.0306786
Std Err Mean	0.0017654
upper 95% Mean	0.004623
lower 95% Mean	-0.002325
N	302

Cr (mg/L)



Quantiles

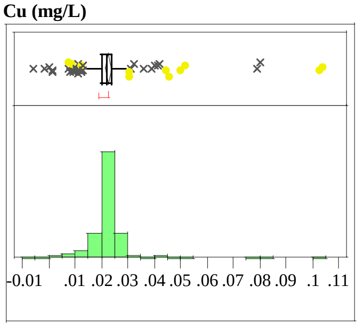
100.0%	maximum	0.0440
99.5%		0.0419
97.5%		0.0380
90.0%		0.0330
75.0%	quartile	0.0310
50.0%	median	0.0290
25.0%	quartile	0.0260
10.0%		0.0210
2.5%		0.0140
0.5%		-0.0038
0.0%	minimum	-0.0110

Moments

Mean	0.0277682
Std Dev	0.0057633
Std Err Mean	0.0003316
upper 95% Mean	0.0284208
lower 95% Mean	0.0271156
N	302

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Cu (mg/L)



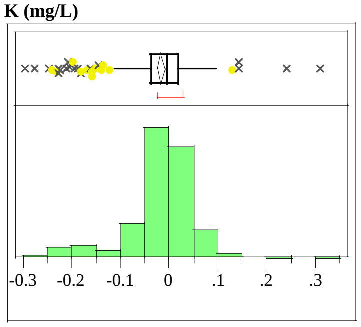
Quantiles

100.0%	maximum	0.1040
99.5%		0.1035
97.5%		0.0454
90.0%		0.0267
75.0%	quartile	0.0240
50.0%	median	0.0220
25.0%	quartile	0.0200
10.0%		0.0160
2.5%		0.0080
0.5%		-0.0039
0.0%	minimum	-0.0060

Moments

Mean	0.0225762
Std Dev	0.0102341
Std Err Mean	0.0005889
upper 95% Mean	0.0237351
lower 95% Mean	0.0214173
N	302

K (mg/L)



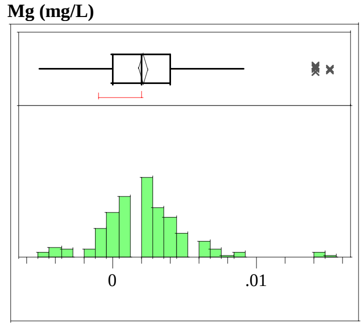
Quantiles

100.0%	maximum	0.3080
99.5%		0.2735
97.5%		0.0877
90.0%		0.0497
75.0%	quartile	0.0182
50.0%	median	-0.0060
25.0%	quartile	-0.0360
10.0%		-0.0957
2.5%		-0.2273
0.5%		-0.2882
0.0%	minimum	-0.2980

Moments

Mean	-0.016417
Std Dev	0.0717532
Std Err Mean	0.0041289
upper 95% Mean	-0.008292
lower 95% Mean	-0.024542
N	302

Mg (mg/L)



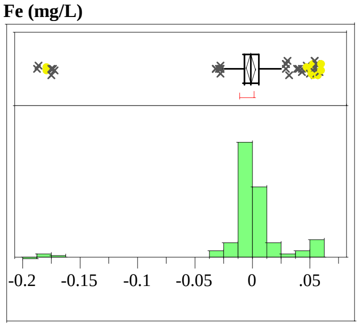
Quantiles

100.0%	maximum	0.0150
99.5%		0.0150
97.5%		0.0090
90.0%		0.0057
75.0%	quartile	0.0040
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0040
0.5%		-0.0050
0.0%	minimum	-0.0050

Moments

Mean	0.0021126
Std Dev	0.0031307
Std Err Mean	0.0001802
upper 95% Mean	0.0024671
lower 95% Mean	0.0017581
N	302

Fe (mg/L)



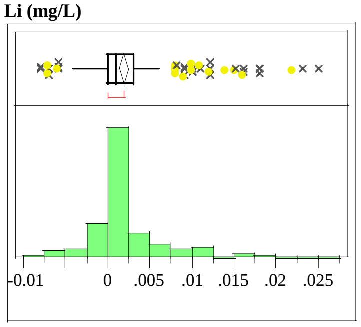
Quantiles

100.0%	maximum	0.0610
99.5%		0.0605
97.5%		0.0550
90.0%		0.0359
75.0%	quartile	0.0060
50.0%	median	-0.0020
25.0%	quartile	-0.0070
10.0%		-0.0140
2.5%		-0.1734
0.5%		-0.1875
0.0%	minimum	-0.1880

Moments

Mean	-0.001126
Std Dev	0.034847
Std Err Mean	0.0020052
upper 95% Mean	0.0028202
lower 95% Mean	-0.005072
N	302

Li (mg/L)



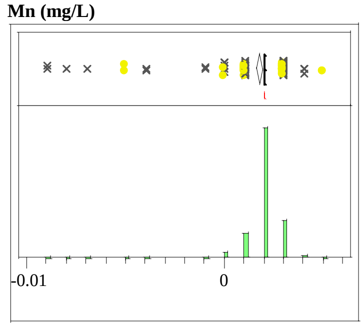
Quantiles

100.0%	maximum	0.0250
99.5%		0.0240
97.5%		0.0160
90.0%		0.0080
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0070
0.5%		-0.0080
0.0%	minimum	-0.0080

Moments

Mean	0.0019768
Std Dev	0.0047999
Std Err Mean	0.0002762
upper 95% Mean	0.0025204
lower 95% Mean	0.0014333
N	302

Mn (mg/L)



Quantiles

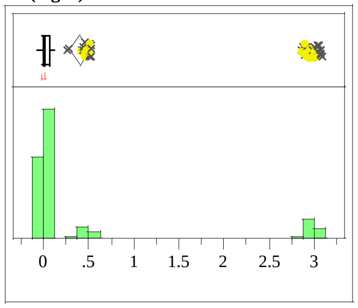
100.0%	maximum	0.0050
99.5%		0.0050
97.5%		0.0030
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0020
25.0%	quartile	0.0020
10.0%		0.0010
2.5%		-0.0040
0.5%		-0.0090
0.0%	minimum	-0.0090

Moments

Mean	0.0018179
Std Dev	0.0015774
Std Err Mean	0.0000908
upper 95% Mean	0.0019965
lower 95% Mean	0.0016393
N	302

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Na (mg/L)



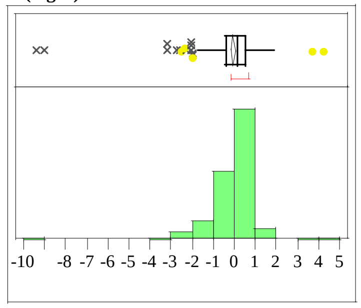
Quantiles

100.0%	maximum	3.089
99.5%		3.079
97.5%		3.044
90.0%		2.889
75.0%	quartile	0.062
50.0%	median	0.013
25.0%	quartile	-0.005
10.0%		-0.025
2.5%		-0.038
0.5%		-0.056
0.0%	minimum	-0.057

Moments

Mean	0.3962417
Std Dev	0.9526342
Std Err Mean	0.0548179
upper 95% Mean	0.5041167
lower 95% Mean	0.2883668
N	302

Si (mg/L)



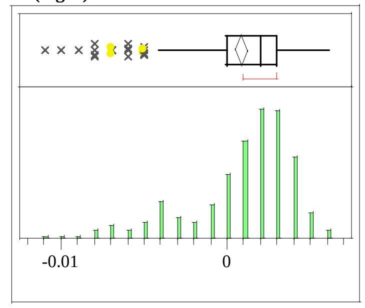
Quantiles

100.0%	maximum	4.284
99.5%		4.016
97.5%		1.217
90.0%		0.861
75.0%	quartile	0.536
50.0%	median	0.131
25.0%	quartile	-0.382
10.0%		-1.281
2.5%		-2.379
0.5%		-9.230
0.0%	minimum	-9.421

Moments

Mean	-0.041921
Std Dev	1.1552129
Std Err Mean	0.066475
upper 95% Mean	0.0888941
lower 95% Mean	-0.172735
N	302

Zr (mg/L)



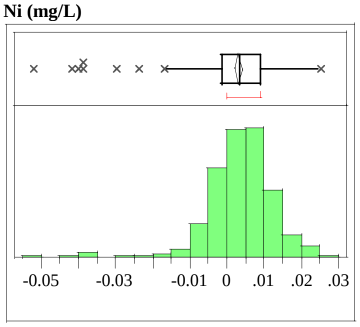
Quantiles

100.0%	maximum	0.0060
99.5%		0.0060
97.5%		0.0050
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0040
2.5%		-0.0074
0.5%		-0.0105
0.0%	minimum	-0.0110

Moments

Mean	0.0008444
Std Dev	0.0031966
Std Err Mean	0.0001839
upper 95% Mean	0.0012063
lower 95% Mean	0.0004824
N	302

Ni (mg/L)



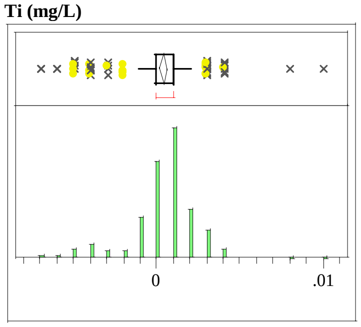
Quantiles

100.0%	maximum	0.0250
99.5%		0.0245
97.5%		0.0210
90.0%		0.0130
75.0%	quartile	0.0090
50.0%	median	0.0035
25.0%	quartile	-0.0013
10.0%		-0.0060
2.5%		-0.0200
0.5%		-0.0469
0.0%	minimum	-0.0520

Moments

Mean	0.0030033
Std Dev	0.009793
Std Err Mean	0.0005635
upper 95% Mean	0.0041123
lower 95% Mean	0.0018944
N	302

Ti (mg/L)



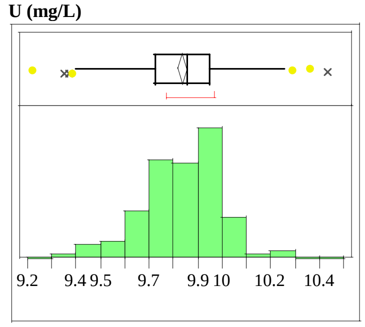
Quantiles

100.0%	maximum	0.0100
99.5%		0.0090
97.5%		0.0040
90.0%		0.0027
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0050
0.5%		-0.0070
0.0%	minimum	-0.0070

Moments

Mean	0.0004073
Std Dev	0.0020516
Std Err Mean	0.0001181
upper 95% Mean	0.0006396
lower 95% Mean	0.000175
N	302

U (mg/L)



Quantiles

100.0%	maximum	10.434
99.5%		10.397
97.5%		10.178
90.0%		10.013
75.0%	quartile	9.949
50.0%	median	9.857
25.0%	quartile	9.729
10.0%		9.635
2.5%		9.432
0.5%		9.287
0.0%	minimum	9.223

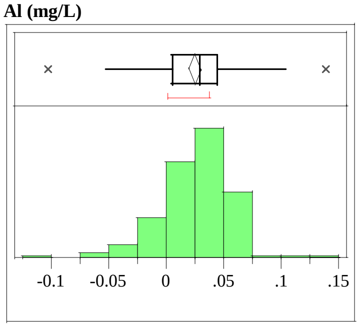
Moments

Mean	9.8369205
Std Dev	0.1698887
Std Err Mean	0.009776
upper 95% Mean	9.8561585
lower 95% Mean	9.8176826
N	302

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN39
Distributions

Al (mg/L)



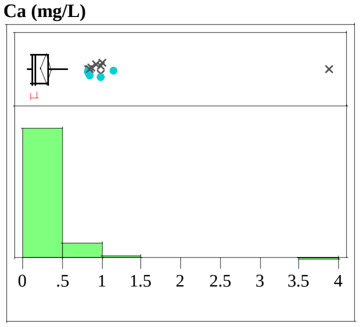
Quantiles

100.0%	maximum	0.1380
99.5%		0.1380
97.5%		0.0751
90.0%		0.0574
75.0%	quartile	0.0442
50.0%	median	0.0285
25.0%	quartile	0.0050
10.0%		-0.0107
2.5%		-0.0451
0.5%		-0.1030
0.0%	minimum	-0.1030

Moments

Mean	0.024838
Std Dev	0.0310336
Std Err Mean	0.0026043
upper 95% Mean	0.0299865
lower 95% Mean	0.0196895
N	142

Ca (mg/L)



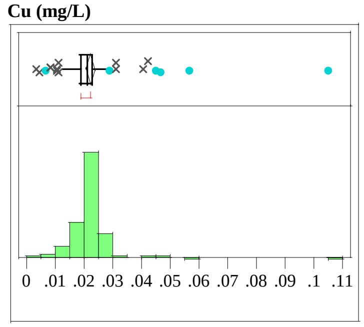
Quantiles

100.0%	maximum	3.8590
99.5%		3.8590
97.5%		1.0041
90.0%		0.7412
75.0%	quartile	0.3220
50.0%	median	0.1620
25.0%	quartile	0.1180
10.0%		0.1013
2.5%		0.0856
0.5%		0.0730
0.0%	minimum	0.0730

Moments

Mean	0.2938099
Std Dev	0.3845455
Std Err Mean	0.0322703
upper 95% Mean	0.3576061
lower 95% Mean	0.2300136
N	142

Cu (mg/L)



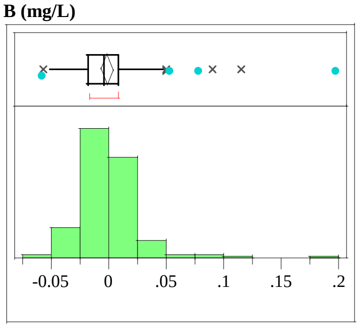
Quantiles

100.0%	maximum	0.10500
99.5%		0.10500
97.5%		0.04585
90.0%		0.02700
75.0%	quartile	0.02300
50.0%	median	0.02100
25.0%	quartile	0.01900
10.0%		0.01460
2.5%		0.00758
0.5%		0.00300
0.0%	minimum	0.00300

Moments

Mean	0.022007
Std Dev	0.0096921
Std Err Mean	0.0008133
upper 95% Mean	0.023615
lower 95% Mean	0.0203991
N	142

B (mg/L)



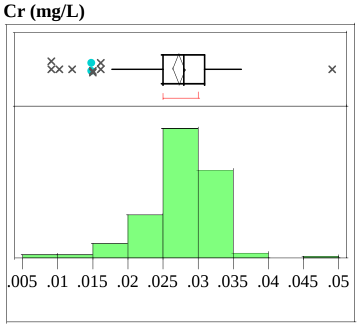
Quantiles

100.0%	maximum	0.1980
99.5%		0.1980
97.5%		0.0832
90.0%		0.0257
75.0%	quartile	0.0080
50.0%	median	-0.0045
25.0%	quartile	-0.0180
10.0%		-0.0290
2.5%		-0.0500
0.5%		-0.0580
0.0%	minimum	-0.0580

Moments

Mean	-0.00112
Std Dev	0.0310199
Std Err Mean	0.0026031
upper 95% Mean	0.0040265
lower 95% Mean	-0.006266
N	142

Cr (mg/L)



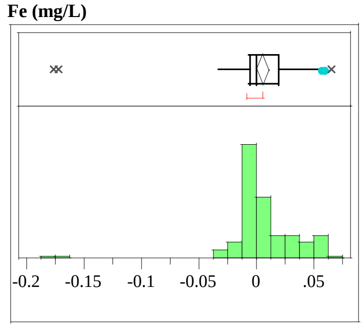
Quantiles

100.0%	maximum	0.04900
99.5%		0.04900
97.5%		0.03542
90.0%		0.03300
75.0%	quartile	0.03100
50.0%	median	0.02800
25.0%	quartile	0.02500
10.0%		0.02060
2.5%		0.01115
0.5%		0.00900
0.0%	minimum	0.00900

Moments

Mean	0.0272042
Std Dev	0.0055742
Std Err Mean	0.0004678
upper 95% Mean	0.028129
lower 95% Mean	0.0262795
N	142

Fe (mg/L)



Quantiles

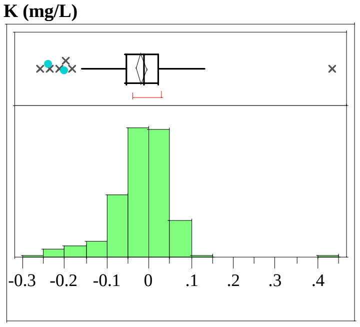
100.0%	maximum	0.0640
99.5%		0.0640
97.5%		0.0583
90.0%		0.0454
75.0%	quartile	0.0190
50.0%	median	0.0000
25.0%	quartile	-0.0060
10.0%		-0.0127
2.5%		-0.0308
0.5%		-0.1770
0.0%	minimum	-0.1770

Moments

Mean	0.0053873
Std Dev	0.0305663
Std Err Mean	0.0025651
upper 95% Mean	0.0104583
lower 95% Mean	0.0003164
N	142

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

K (mg/L)



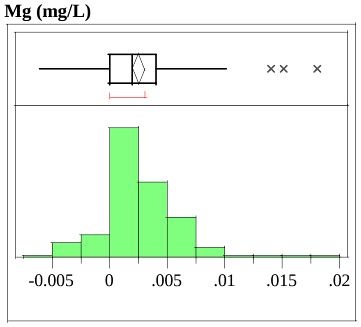
Quantiles

100.0%	maximum	0.4320
99.5%		0.4320
97.5%		0.0954
90.0%		0.0534
75.0%	quartile	0.0230
50.0%	median	-0.0115
25.0%	quartile	-0.0520
10.0%		-0.1138
2.5%		-0.2243
0.5%		-0.2590
0.0%	minimum	-0.2590

Moments

Mean	-0.018507
Std Dev	0.0781534
Std Err Mean	0.0065585
upper 95% Mean	-0.005541
lower 95% Mean	-0.031473
N	142

Mg (mg/L)



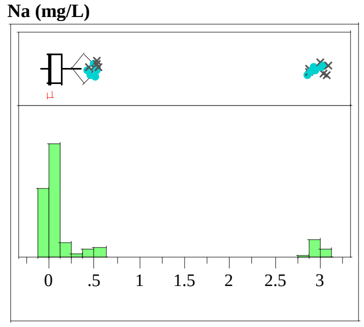
Quantiles

100.0%	maximum	0.0180
99.5%		0.0180
97.5%		0.0117
90.0%		0.0060
75.0%	quartile	0.0040
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0060
0.0%	minimum	-0.0060

Moments

Mean	0.0024789
Std Dev	0.003389
Std Err Mean	0.0002844
upper 95% Mean	0.0030411
lower 95% Mean	0.0019166
N	142

Na (mg/L)



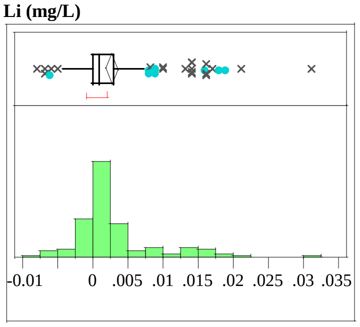
Quantiles

100.0%	maximum	3.083
99.5%		3.083
97.5%		3.035
90.0%		2.878
75.0%	quartile	0.140
50.0%	median	0.022
25.0%	quartile	-0.002
10.0%		-0.016
2.5%		-0.044
0.5%		-0.079
0.0%	minimum	-0.079

Moments

Mean	0.3951761
Std Dev	0.9274652
Std Err Mean	0.0778311
upper 95% Mean	0.5490429
lower 95% Mean	0.2413092
N	142

Li (mg/L)



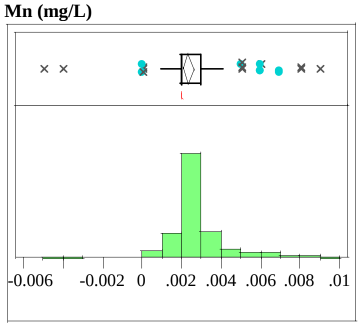
Quantiles

100.0%	maximum	0.0310
99.5%		0.0310
97.5%		0.0184
90.0%		0.0137
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0064
0.5%		-0.0080
0.0%	minimum	-0.0080

Moments

Mean	0.0027324
Std Dev	0.0059357
Std Err Mean	0.0004981
upper 95% Mean	0.0037171
lower 95% Mean	0.0017477
N	142

Mn (mg/L)



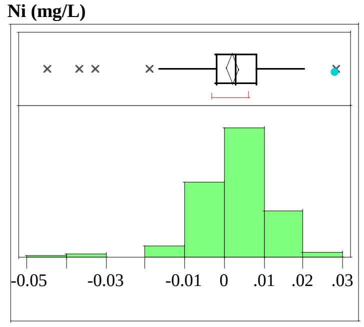
Quantiles

100.0%	maximum	0.0090
99.5%		0.0090
97.5%		0.0074
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0020
10.0%		0.0010
2.5%		0.0000
0.5%		-0.0050
0.0%	minimum	-0.0050

Moments

Mean	0.002338
Std Dev	0.0017295
Std Err Mean	0.0001451
upper 95% Mean	0.002625
lower 95% Mean	0.0020511
N	142

Ni (mg/L)



Quantiles

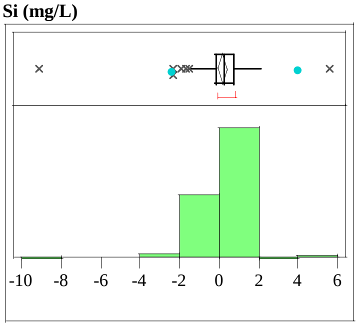
100.0%	maximum	0.0280
99.5%		0.0280
97.5%		0.0183
90.0%		0.0130
75.0%	quartile	0.0080
50.0%	median	0.0030
25.0%	quartile	-0.0020
10.0%		-0.0067
2.5%		-0.0249
0.5%		-0.0450
0.0%	minimum	-0.0450

Moments

Mean	0.0023169
Std Dev	0.0097503
Std Err Mean	0.0008182
upper 95% Mean	0.0039345
lower 95% Mean	0.0006993
N	142

Exhibit A2. Histograms and Descriptive Statistics for Cold Chem Measurements of Calibration and Bench Standards

Si (mg/L)



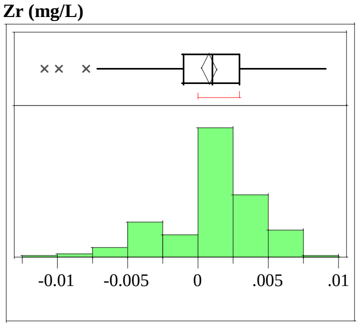
Quantiles

100.0%	maximum	5.544
99.5%		5.544
97.5%		1.888
90.0%		1.204
75.0%	quartile	0.771
50.0%	median	0.248
25.0%	quartile	-0.168
10.0%		-1.154
2.5%		-2.352
0.5%		-9.128
0.0%	minimum	-9.128

Moments

Mean	0.1866831
Std Dev	1.270652
Std Err Mean	0.1066307
upper 95% Mean	0.3974848
lower 95% Mean	-0.024119
N	142

Zr (mg/L)



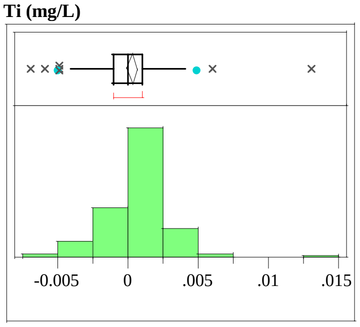
Quantiles

100.0%	maximum	0.0090
99.5%		0.0090
97.5%		0.0064
90.0%		0.0047
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	-0.0010
10.0%		-0.0040
2.5%		-0.0074
0.5%		-0.0110
0.0%	minimum	-0.0110

Moments

Mean	0.0007887
Std Dev	0.0034288
Std Err Mean	0.0002877
upper 95% Mean	0.0013576
lower 95% Mean	0.0002199
N	142

Ti (mg/L)



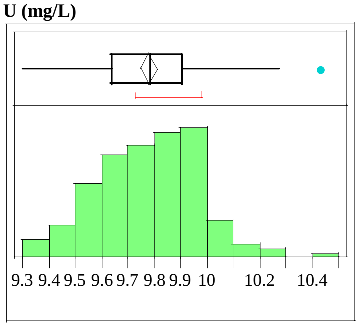
Quantiles

100.0%	maximum	0.0130
99.5%		0.0130
97.5%		0.0044
90.0%		0.0030
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0020
2.5%		-0.0050
0.5%		-0.0070
0.0%	minimum	-0.0070

Moments

Mean	0.000338
Std Dev	0.0023994
Std Err Mean	0.0002014
upper 95% Mean	0.0007361
lower 95% Mean	-0.00006
N	142

U (mg/L)



Quantiles

100.0%	maximum	10.435
99.5%		10.435
97.5%		10.203
90.0%		10.002
75.0%	quartile	9.908
50.0%	median	9.787
25.0%	quartile	9.637
10.0%		9.523
2.5%		9.376
0.5%		9.306
0.0%	minimum	9.306

Moments

Mean	9.7802887
Std Dev	0.1946235
Std Err Mean	0.0163324
upper 95% Mean	9.8125769
lower 95% Mean	9.7480006
N	142

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN32

Response Al (mg/L)
Summary of Fit

RSquare	0.656857
RSquare Adj	0.311706
Root Mean Square Error	0.025669
Mean of Response	0.01743
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.21567908	0.001254	1.9031
Error	171	0.11267125	0.000659	Prob > F
C. Total	343	0.32835033		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000299	31.234
Residual	0.000659	68.766
Total	0.000958	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.947822
RSquare Adj	0.895339
Root Mean Square Error	0.011189
Mean of Response	-0.00017
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.38887206	0.002261	18.0596
Error	171	0.02140750	0.000125	Prob > F
C. Total	343	0.41027956		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001074	89.562
Residual	0.000125	10.438
Total	0.001199	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.923231
RSquare Adj	0.846012
Root Mean Square Error	0.043614
Mean of Response	0.115875
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	3.9116654	0.022742	11.9561
Error	171	0.3252663	0.001902	Prob > F
C. Total	343	4.2369316		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.010481	84.640
Residual	0.001902	15.360
Total	0.012383	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.617719
RSquare Adj	0.233202
Root Mean Square Error	0.0056
Mean of Response	0.00243
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00866433	0.000050	1.6065
Error	171	0.00536200	0.000031	Prob > F
C. Total	343	0.01402633		0.0010

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00001	23.373
Residual	0.000031	76.627
Total	0.000041	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.878763
RSquare Adj	0.756817
Root Mean Square Error	0.002074
Mean of Response	0.000901
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00533114	0.000031	7.2062
Error	171	0.00073550	0.000004	Prob > F
C. Total	343	0.00606664		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000013	75.736
Residual	0.000004	24.264
Total	0.000018	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.653172
RSquare Adj	0.304316
Root Mean Square Error	0.066896
Mean of Response	0.003561
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	1.4411712	0.008379	1.8723
Error	171	0.7652475	0.004475	Prob > F
C. Total	343	2.2064187		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001963	30.494
Residual	0.004475	69.506
Total	0.006438	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response K (mg/L)
Summary of Fit

RSquare	0.757873
RSquare Adj	0.514331
Root Mean Square Error	0.045823
Mean of Response	0.038078
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	1.1238631	0.006534	3.1119
Error	171	0.3590537	0.002100	Prob > F
C. Total	343	1.4829169		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00223	51.507
Residual	0.0021	48.493
Total	0.00433	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.77327
RSquare Adj	0.545214
Root Mean Square Error	0.001511
Mean of Response	0.001727
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00133181	0.0000077	3.3907
Error	171	0.00039050	0.0000023	Prob > F
C. Total	343	0.00172231		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000003	54.595
Residual	0.000002	45.405
Total	0.000005	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.628863
RSquare Adj	0.255556
Root Mean Square Error	0.00403
Mean of Response	0.001398
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00470669	0.000027	1.6846
Error	171	0.00277775	0.000016	Prob > F
C. Total	343	0.00748444		0.0003

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000006	25.612
Residual	0.000016	74.388
Total	0.000022	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.505088
RSquare Adj	0.007283
Root Mean Square Error	0.011235
Mean of Response	0.00148
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.02202886	0.000128	1.0146
Error	171	0.02158500	0.000126	Prob > F
C. Total	343	0.04361386		0.4622

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	9.288e-7	0.730
Residual	0.000126	99.270
Total	0.000127	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (mg/L)
Summary of Fit

RSquare	0.605544
RSquare Adj	0.208782
Root Mean Square Error	0.077498
Mean of Response	0.019855
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	1.5766100	0.009166	1.5262
Error	171	1.0270148	0.006006	Prob > F
C. Total	343	2.6036247		0.0029

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001589	20.927
Residual	0.006006	79.073
Total	0.007595	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.723613
RSquare Adj	0.44561
Root Mean Square Error	0.006168
Mean of Response	0.001887
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.01703283	0.000099	2.6029
Error	171	0.00650575	0.000038	Prob > F
C. Total	343	0.02353858		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000031	44.634
Residual	0.000038	55.366
Total	0.000069	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Si (mg/L)
Summary of Fit

RSquare	0.944741
RSquare Adj	0.889158
Root Mean Square Error	0.174973
Mean of Response	-0.0845
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	89.504563	0.520375	16.9971
Error	171	5.235263	0.030616	Prob > F
C. Total	343	94.739826		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.24632	88.945
Residual	0.030616	11.055
Total	0.276936	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.859089
RSquare Adj	0.717354
Root Mean Square Error	0.000932
Mean of Response	0.00073
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00090536	0.0000053	6.0612
Error	171	0.00014850	8.6842e-7	Prob > F
C. Total	343	0.00105386		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000002	71.795
Residual	8.684e-7	28.205
Total	0.000003	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.966344
RSquare Adj	0.932491
Root Mean Square Error	0.001188
Mean of Response	-0.00224
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	0.00693399	0.000040	28.5452
Error	171	0.00024150	0.000001	Prob > F
C. Total	343	0.00717549		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00002	93.268
Residual	0.000001	6.732
Total	0.000021	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.872907
RSquare Adj	0.745071
Root Mean Square Error	0.093895
Mean of Response	0.109384
Observations (or Sum Wgts)	344

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	172	10.354488	0.060201	6.8283
Error	171	1.507588	0.008816	Prob > F
C. Total	343	11.862075		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.025843	74.563
Residual	0.008816	25.437
Total	0.03466	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=IN35
Response Al (mg/L)
Summary of Fit

RSquare	0.921157
RSquare Adj	0.851565
Root Mean Square Error	0.054285
Mean of Response	9.978497
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	6.7481716	0.039007	13.2367
Error	196	0.5775869	0.002947	Prob > F
C. Total	369	7.3257585		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.016965	85.200
Residual	0.002947	14.800
Total	0.019912	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.968199
RSquare Adj	0.940129
Root Mean Square Error	0.009402
Mean of Response	-0.00419
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.52752767	0.003049	34.4929
Error	196	0.01732708	0.000088	Prob > F
C. Total	369	0.54485476		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001393	94.032
Residual	0.000088	5.968
Total	0.001481	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Ca (mg/L)
Summary of Fit

RSquare	0.931883
RSquare Adj	0.871759
Root Mean Square Error	0.016593
Mean of Response	1.995949
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.73821894	0.004267	15.4994
Error	196	0.05396108	0.000275	Prob > F
C. Total	369	0.79218002		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001878	87.215
Residual	0.000275	12.785
Total	0.002153	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.91563
RSquare Adj	0.841161
Root Mean Square Error	0.01186
Mean of Response	2.001754
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.29919187	0.001729	12.2954
Error	196	0.02756875	0.000141	Prob > F
C. Total	369	0.32676062		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000747	84.162
Residual	0.000141	15.838
Total	0.000888	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.913098
RSquare Adj	0.836394
Root Mean Square Error	0.006369
Mean of Response	1.004914
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.08354415	0.000483	11.9042
Error	196	0.00795108	0.000041	Prob > F
C. Total	369	0.09149523		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000208	83.687
Residual	0.000041	16.313
Total	0.000249	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.907255
RSquare Adj	0.825393
Root Mean Square Error	0.115559
Mean of Response	19.98021
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	25.603487	0.147997	11.0827
Error	196	2.617349	0.013354	Prob > F
C. Total	369	28.220836		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.063345	82.589
Residual	0.013354	17.411
Total	0.076699	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.717264
RSquare Adj	0.467707
Root Mean Square Error	0.054612
Mean of Response	0.017919
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	1.4829492	0.008572	2.8741
Error	196	0.5845584	0.002982	Prob > F
C. Total	369	2.0675076		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00263	46.857
Residual	0.002982	53.143
Total	0.005612	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.69516
RSquare Adj	0.426092
Root Mean Square Error	0.002899
Mean of Response	0.001365
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.00375508	0.000022	2.5836
Error	196	0.00164667	0.000008	Prob > F
C. Total	369	0.00540174		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000006	42.694
Residual	0.000008	57.306
Total	0.000015	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Mg (mg/L)
Summary of Fit

RSquare	0.925357
RSquare Adj	0.859474
Root Mean Square Error	0.008486
Mean of Response	1.009135
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.17498808	0.001011	14.0453
Error	196	0.01411517	0.000072	Prob > F
C. Total	369	0.18910324		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000442	85.989
Residual	0.000072	14.011
Total	0.000514	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.922755
RSquare Adj	0.854574
Root Mean Square Error	0.006251
Mean of Response	1.001154
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.09148764	0.000529	13.5339
Error	196	0.00765858	0.000039	Prob > F
C. Total	369	0.09914622		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00023	85.501
Residual	0.000039	14.499
Total	0.000269	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (mg/L)
Summary of Fit

RSquare	0.947381
RSquare Adj	0.900937
Root Mean Square Error	0.114991
Mean of Response	19.97589
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	46.661920	0.269722	20.3982
Error	196	2.591672	0.013223	Prob > F
C. Total	369	49.253593		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.120675	90.125
Residual	0.013223	9.875
Total	0.133898	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.859103
RSquare Adj	0.73474
Root Mean Square Error	0.017688
Mean of Response	1.986154
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.37389730	0.002161	6.9080
Error	196	0.06132092	0.000313	Prob > F
C. Total	369	0.43521822		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00087	73.542
Residual	0.000313	26.458
Total	0.001182	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.98588
RSquare Adj	0.973416
Root Mean Square Error	0.078302
Mean of Response	-0.60047
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	83.903511	0.484991	79.1017
Error	196	1.201723	0.006131	Prob > F
C. Total	369	85.105234		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.225288	97.351
Residual	0.006131	2.649
Total	0.23142	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.916756
RSquare Adj	0.843281
Root Mean Square Error	0.011467
Mean of Response	1.989592
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.28381796	0.001641	12.4770
Error	196	0.02577142	0.000131	Prob > F
C. Total	369	0.30958938		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00071	84.374
Residual	0.000131	15.626
Total	0.000841	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Zr (mg/L)
Summary of Fit

RSquare	0.951275
RSquare Adj	0.908268
Root Mean Square Error	0.011823
Mean of Response	2.015308
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.53486871	0.003092	22.1191
Error	196	0.02739617	0.000140	Prob > F
C. Total	369	0.56226488		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001389	90.856
Residual	0.00014	9.144
Total	0.001529	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.644226
RSquare Adj	0.330201
Root Mean Square Error	0.226897
Mean of Response	0.116586
Observations (or Sum Wgts)	370

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	18.271676	0.105617	2.0515
Error	196	10.090542	0.051482	Prob > F
C. Total	369	28.362218		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.025468	33.097
Residual	0.051482	66.903
Total	0.076951	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=IN36
Response Al (mg/L)
Summary of Fit

RSquare	0.974681
RSquare Adj	0.951868
Root Mean Square Error	0.004985
Mean of Response	0.004836
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.18364566	0.001062	42.7240
Error	192	0.00477050	0.000025	Prob > F
C. Total	365	0.18841616		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000493	95.202
Residual	0.000025	4.798
Total	0.000518	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.868769
RSquare Adj	0.750524
Root Mean Square Error	0.054865
Mean of Response	10.0517
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	3.8261756	0.022117	7.3472
Error	192	0.5779605	0.003010	Prob > F
C. Total	365	4.4041361		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.009086	75.114
Residual	0.00301	24.886
Total	0.012096	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.953611
RSquare Adj	0.911812
Root Mean Square Error	0.027229
Mean of Response	0.085713
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	2.9263594	0.016915	22.8144
Error	192	0.1423555	0.000741	Prob > F
C. Total	365	3.0687149		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.007691	91.208
Residual	0.000741	8.792
Total	0.008433	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.86122
RSquare Adj	0.736173
Root Mean Square Error	0.001482
Mean of Response	0.000885
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.00261568	0.000015	6.8872
Error	192	0.00042150	0.000002	Prob > F
C. Total	365	0.00303718		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000006	73.681
Residual	0.000002	26.319
Total	0.000008	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Cu (mg/L)
Summary of Fit

RSquare	0.948701
RSquare Adj	0.902478
Root Mean Square Error	0.001152
Mean of Response	0.000262
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.00471582	0.000027	20.5245
Error	192	0.00025500	0.000001	Prob > F
C. Total	365	0.00497082		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000012	90.277
Residual	0.000001	9.723
Total	0.000014	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.997913
RSquare Adj	0.996032
Root Mean Square Error	0.003007
Mean of Response	0.008923
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.82998386	0.004798	530.6095
Error	192	0.00173600	0.000009	Prob > F
C. Total	365	0.83171986		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.002277	99.605
Residual	0.000009	0.395
Total	0.002286	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.895648
RSquare Adj	0.801623
Root Mean Square Error	0.053634
Mean of Response	9.936781
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	4.7404665	0.027402	9.5256
Error	192	0.5523120	0.002877	Prob > F
C. Total	365	5.2927785		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.011662	80.214
Residual	0.002877	19.786
Total	0.014539	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.89616
RSquare Adj	0.802595
Root Mean Square Error	0.048316
Mean of Response	9.971454
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	3.8681840	0.022359	9.5780
Error	192	0.4482167	0.002334	Prob > F
C. Total	365	4.3164007		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.009523	80.311
Residual	0.002334	19.689
Total	0.011857	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.999421
RSquare Adj	0.998899
Root Mean Square Error	0.000532
Mean of Response	0.005
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.09358575	0.000541	1914.543
Error	192	0.00005425	0.000000	Prob > F
C. Total	365	0.09364000		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000257	99.890
Residual	2.826e-7	0.110
Total	0.000257	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.999521
RSquare Adj	0.999089
Root Mean Square Error	0.000648
Mean of Response	0.006426
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.16782301	0.000970	2313.72
Error	192	0.00008050	0.000000	Prob > F
C. Total	365	0.16790351		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000461	99.909
Residual	4.193e-7	0.091
Total	0.000462	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Na (mg/L)
Summary of Fit

RSquare	0.972247
RSquare Adj	0.94724
Root Mean Square Error	0.371927
Mean of Response	66.13271
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	930.42887	5.37820	38.8796
Error	192	26.55929	0.13833	Prob > F
C. Total	365	956.98816		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	2.491725	94.740
Residual	0.13833	5.260
Total	2.630055	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.782118
RSquare Adj	0.585798
Root Mean Square Error	0.004805
Mean of Response	0.000522
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.01590933	0.000092	3.9839
Error	192	0.00443200	0.000023	Prob > F
C. Total	365	0.02034133		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000033	58.659
Residual	0.000023	41.341
Total	0.000056	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.956555
RSquare Adj	0.917409
Root Mean Square Error	0.208107
Mean of Response	40.31627
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	183.08250	1.05828	24.4358
Error	192	8.31526	0.04331	Prob > F
C. Total	365	191.39776		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.482651	91.766
Residual	0.043309	8.234
Total	0.52596	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.988755
RSquare Adj	0.978623
Root Mean Square Error	0.000634
Mean of Response	0.002694
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.00679248	0.000039	97.5854
Error	192	0.00007725	0.000000	Prob > F
C. Total	365	0.00686973		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000018	97.869
Residual	4.023e-7	2.131
Total	0.000019	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.99955
RSquare Adj	0.999145
Root Mean Square Error	0.000885
Mean of Response	0.009604
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	0.33380530	0.001930	2465.664
Error	192	0.00015025	0.000001	Prob > F
C. Total	365	0.33395555		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000917	99.915
Residual	7.826e-7	0.085
Total	0.000918	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.938278
RSquare Adj	0.882664
Root Mean Square Error	0.051421
Mean of Response	0.06382
Observations (or Sum Wgts)	366

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	173	7.7175661	0.044610	16.8712
Error	192	0.5076780	0.002644	Prob > F
C. Total	365	8.2252441		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.019956	88.300
Residual	0.002644	11.700
Total	0.0226	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

STCd=IN38

Response Al (mg/L)
Summary of Fit

RSquare	0.993119
RSquare Adj	0.986352
Root Mean Square Error	0.002948
Mean of Response	0.021008
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.07526549	0.001276	146.7712
Error	60	0.00052150	0.000009	Prob > F
C. Total	119	0.07578699		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000633	98.647
Residual	0.000009	1.353
Total	0.000642	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.990775
RSquare Adj	0.981703
Root Mean Square Error	0.00498
Mean of Response	0.001533
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.15980987	0.002709	109.2194
Error	60	0.00148800	0.000025	Prob > F
C. Total	119	0.16129787		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001342	98.185
Residual	0.000025	1.815
Total	0.001367	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.999792
RSquare Adj	0.999587
Root Mean Square Error	0.004366
Mean of Response	0.241108
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	5.4855981	0.092976	4878.508
Error	60	0.0011435	0.000019	Prob > F
C. Total	119	5.4867416		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.046479	99.959
Residual	0.000019	0.041
Total	0.046498	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.981639
RSquare Adj	0.963585
Root Mean Square Error	0.000847
Mean of Response	0.028017
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00229897	0.000039	54.3705
Error	60	0.00004300	0.000001	Prob > F
C. Total	119	0.00234197		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000019	96.388
Residual	7.167e-7	3.612
Total	0.00002	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.9976
RSquare Adj	0.995239
Root Mean Square Error	0.000837
Mean of Response	0.023683
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.01745597	0.000296	422.6626
Error	60	0.00004200	0.000001	Prob > F
C. Total	119	0.01749797		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000148	99.528
Residual	7e-7	0.472
Total	0.000148	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.999492
RSquare Adj	0.998992
Root Mean Square Error	0.000935
Mean of Response	0.001325
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.10327783	0.001750	2000.539
Error	60	0.00005250	0.000001	Prob > F
C. Total	119	0.10333033		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000875	99.900
Residual	8.75e-7	0.100
Total	0.000876	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response K (mg/L)
Summary of Fit

RSquare	0.965343
RSquare Adj	0.931263
Root Mean Square Error	0.016718
Mean of Response	-0.02228
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.46711237	0.007917	28.3261
Error	60	0.01677000	0.000280	Prob > F
C. Total	119	0.48388237		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.003819	93.180
Residual	0.00028	6.820
Total	0.004098	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.970666
RSquare Adj	0.94182
Root Mean Square Error	0.001088
Mean of Response	0.001617
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00234937	0.000040	33.6505
Error	60	0.00007100	0.000001	Prob > F
C. Total	119	0.00242037		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000019	94.228
Residual	0.000001	5.772
Total	0.000021	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.999284
RSquare Adj	0.998581
Root Mean Square Error	0.000091
Mean of Response	0.001708
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00069829	0.000012	1420.254
Error	60	0.00000050	0.000000	Prob > F
C. Total	119	0.00069879		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000006	99.859
Residual	8.333e-9	0.141
Total	0.000006	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.990183
RSquare Adj	0.980529
Root Mean Square Error	0.000158
Mean of Response	0.001958
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00015129	0.0000026	102.5706
Error	60	0.00000150	2.5e-8	Prob > F
C. Total	119	0.00015279		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000001	98.069
Residual	2.5e-8	1.931
Total	0.000001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (mg/L)
Summary of Fit

RSquare	0.999972
RSquare Adj	0.999945
Root Mean Square Error	0.007739
Mean of Response	0.485142
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	129.99820	2.20336	36789.08
Error	60	0.00359	0.00006	Prob > F
C. Total	119	130.00179		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	1.10165	99.995
Residual	0.00006	0.005
Total	1.10171	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.861096
RSquare Adj	0.724507
Root Mean Square Error	0.003843
Mean of Response	0.00375
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00549250	0.000093	6.3043
Error	60	0.00088600	0.000015	Prob > F
C. Total	119	0.00637850		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000039	72.619
Residual	0.000015	27.381
Total	0.000054	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A3. Components of Variance for Cold Chem Measurements of Calibration and Bench Standards

Response Si (mg/L)
Summary of Fit

RSquare	0.986142
RSquare Adj	0.972515
Root Mean Square Error	0.1513
Mean of Response	0.018117
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	97.740267	1.65661	72.3672
Error	60	1.373507	0.02289	Prob > F
C. Total	119	99.113774		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.816861	97.274
Residual	0.022892	2.726
Total	0.839753	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.985142
RSquare Adj	0.970532
Root Mean Square Error	0.000438
Mean of Response	0.001242
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00076249	0.000013	67.4274
Error	60	0.00001150	0.000000	Prob > F
C. Total	119	0.00077399		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000006	97.077
Residual	1.917e-7	2.923
Total	0.000007	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.967477
RSquare Adj	0.935495
Root Mean Square Error	0.000438
Mean of Response	0.000308
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	0.00034209	0.0000058	30.2513
Error	60	0.00001150	1.9167e-7	Prob > F
C. Total	119	0.00035359		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000003	93.600
Residual	1.917e-7	6.400
Total	0.000003	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.941637
RSquare Adj	0.884246
Root Mean Square Error	0.056257
Mean of Response	9.857983
Observations (or Sum Wgts)	120

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	59	3.0637070	0.051927	16.4075
Error	60	0.1898910	0.003165	Prob > F
C. Total	119	3.2535980		<.0001

Variance Component Estimates

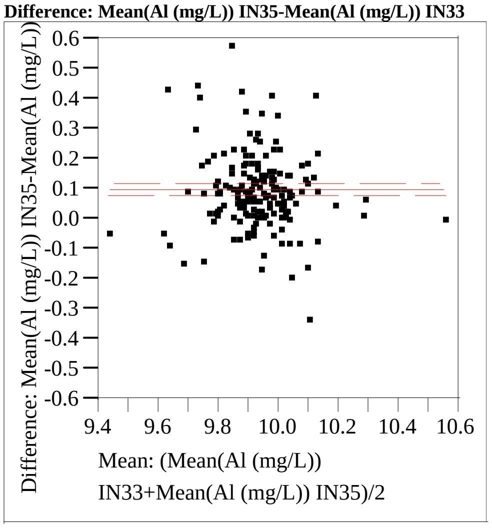
Component	Var Comp Est	Percent of Total
Batch&Random	0.024381	88.511
Residual	0.003165	11.489
Total	0.027546	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A4. Paired Differences for IN33 and IN35

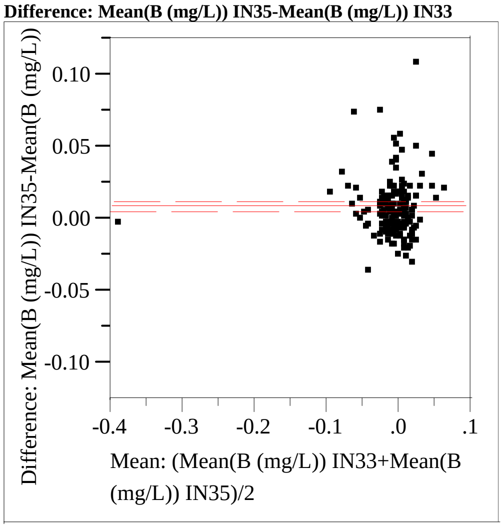
Matched Pairs

Difference: Mean(Al (mg/L)) IN35-Mean(Al (mg/L)) IN33



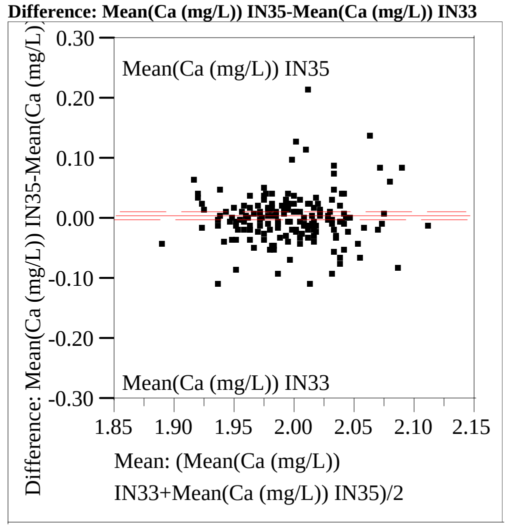
Mean(Al (mg/L)) IN35	9.97829	t-Ratio	10.04499
Mean(Al (mg/L)) IN33	9.88129	DF	172
Mean Difference	0.097	Prob > |t|	<.0001
Std Error	0.00966	Prob > t	<.0001
Upper95%	0.11606	Prob < t	1.0000
Lower95%	0.07794		
N	173		
Correlation	0.59167		

Difference: Mean(B (mg/L)) IN35-Mean(B (mg/L)) IN33



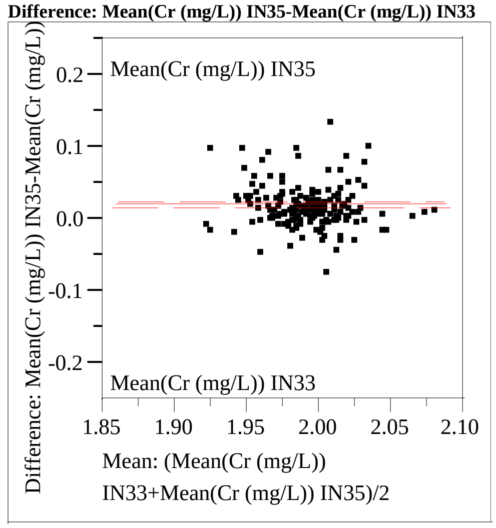
Mean(B (mg/L)) IN35	-0.0035	t-Ratio	5.650437
Mean(B (mg/L)) IN33	-0.0119	DF	172
Mean Difference	0.00837	Prob > |t|	<.0001
Std Error	0.00148	Prob > t	<.0001
Upper95%	0.01129	Prob < t	1.0000
Lower95%	0.00544		
N	173		
Correlation	0.87068		

Difference: Mean(Ca (mg/L)) IN35-Mean(Ca (mg/L)) IN33



Mean(Ca (mg/L)) IN35	1.99846	t-Ratio	1.454665
Mean(Ca (mg/L)) IN33	1.99382	DF	172
Mean Difference	0.00464	Prob > |t|	0.1476
Std Error	0.00319	Prob > t	0.0738
Upper95%	0.01094	Prob < t	0.9262
Lower95%	-0.0017		
N	173		
Correlation	0.53464		

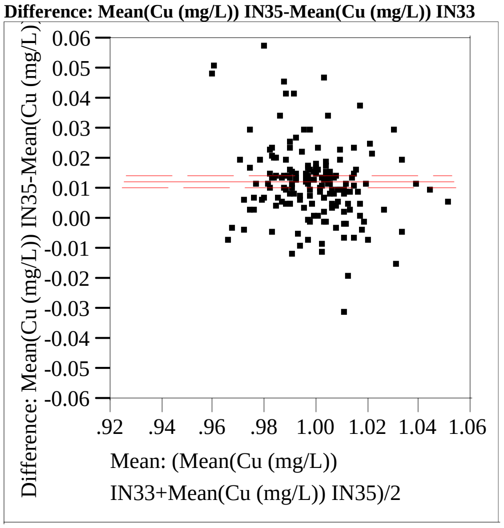
Difference: Mean(Cr (mg/L)) IN35-Mean(Cr (mg/L)) IN33



Mean(Cr (mg/L)) IN35	2.00226	t-Ratio	9.10471
Mean(Cr (mg/L)) IN33	1.98201	DF	172
Mean Difference	0.02025	Prob > |t|	<.0001
Std Error	0.00222	Prob > t	<.0001
Upper95%	0.02464	Prob < t	1.0000
Lower95%	0.01586		
N	173		
Correlation	0.52972		

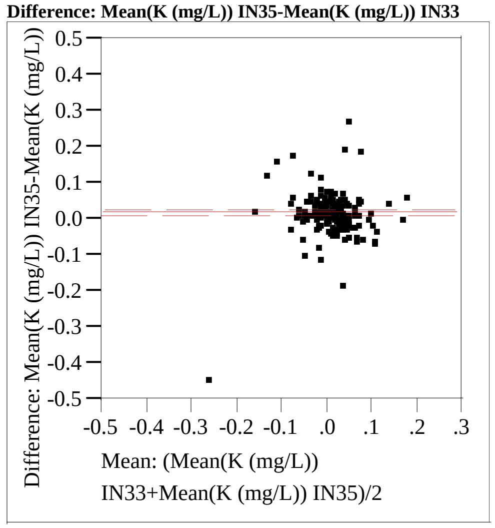
Exhibit A4. Paired Differences for IN33 and IN35

Difference: Mean(Cu (mg/L)) IN35-Mean(Cu (mg/L)) IN33



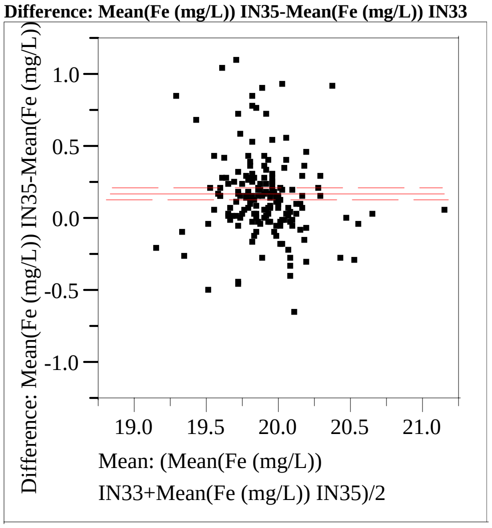
Mean(Cu (mg/L)) IN35	1.00495	t-Ratio	12.98091
Mean(Cu (mg/L)) IN33	0.99263	DF	172
Mean Difference	0.01232	Prob > |t|	<.0001
Std Error	0.00095	Prob > t	<.0001
Upper95%	0.01419	Prob < t	1.0000
Lower95%	0.01045		
N	173		
Correlation	0.7187		

Difference: Mean(K (mg/L)) IN35-Mean(K (mg/L)) IN33



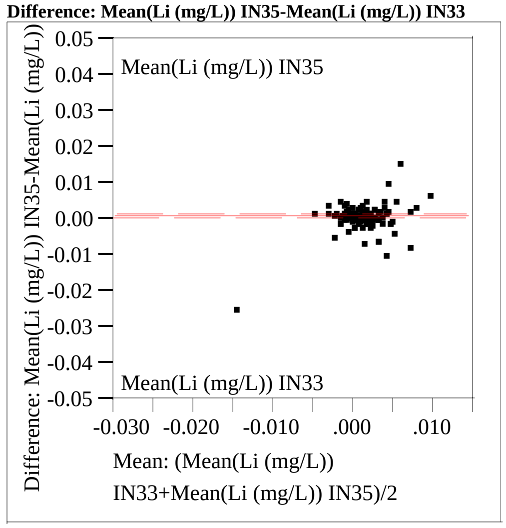
Mean(K (mg/L)) IN35	0.01948	t-Ratio	3.5229
Mean(K (mg/L)) IN33	0.00266	DF	172
Mean Difference	0.01682	Prob > |t|	0.0005
Std Error	0.00477	Prob > t	0.0003
Upper95%	0.02625	Prob < t	0.9997
Lower95%	0.0074		
N	173		
Correlation	0.46066		

Difference: Mean(Fe (mg/L)) IN35-Mean(Fe (mg/L)) IN33



Mean(Fe (mg/L)) IN35	19.9818	t-Ratio	7.884254
Mean(Fe (mg/L)) IN33	19.8142	DF	172
Mean Difference	0.16759	Prob > |t|	<.0001
Std Error	0.02126	Prob > t	<.0001
Upper95%	0.20955	Prob < t	1.0000
Lower95%	0.12563		
N	173		
Correlation	0.50585		

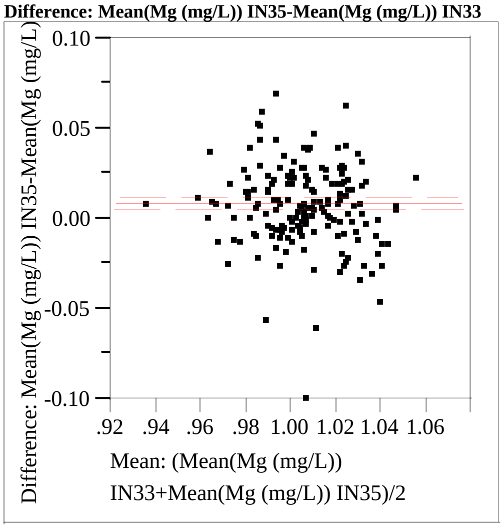
Difference: Mean(Li (mg/L)) IN35-Mean(Li (mg/L)) IN33



Mean(Li (mg/L)) IN35	0.00146	t-Ratio	3.244913
Mean(Li (mg/L)) IN33	0.00067	DF	172
Mean Difference	0.00079	Prob > |t|	0.0014
Std Error	0.00024	Prob > t	0.0007
Upper95%	0.00127	Prob < t	0.9993
Lower95%	0.00031		
N	173		
Correlation	0.36487		

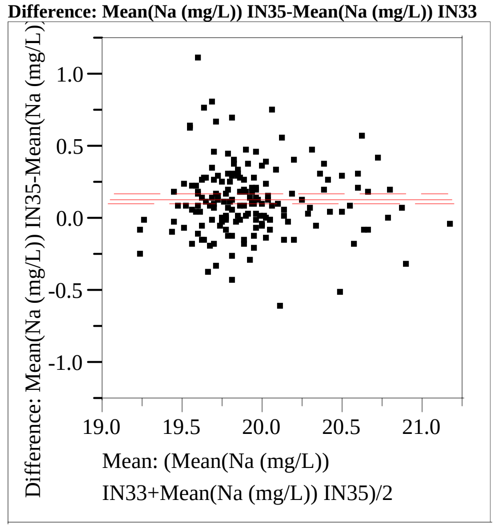
Exhibit A4. Paired Differences for IN33 and IN35

Difference: Mean(Mg (mg/L)) IN35-Mean(Mg (mg/L)) IN33



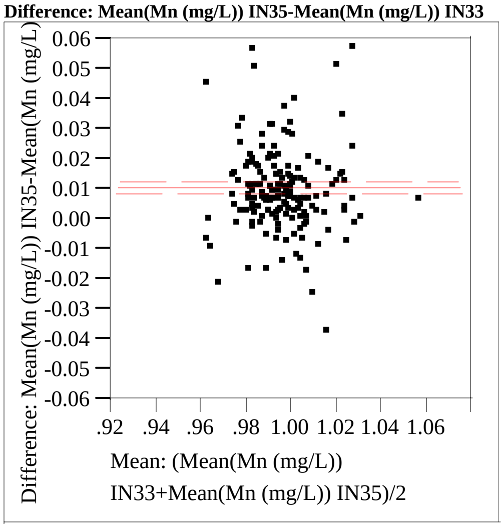
Mean(Mg (mg/L)) IN35	1.00989	t-Ratio	4.678915
Mean(Mg (mg/L)) IN33	1.00188	DF	172
Mean Difference	0.008	Prob > |t|	<.0001
Std Error	0.00171	Prob > t	<.0001
Upper95%	0.01138	Prob < t	1.0000
Lower95%	0.00463		
N	173		
Correlation	0.5213		

Difference: Mean(Na (mg/L)) IN35-Mean(Na (mg/L)) IN33



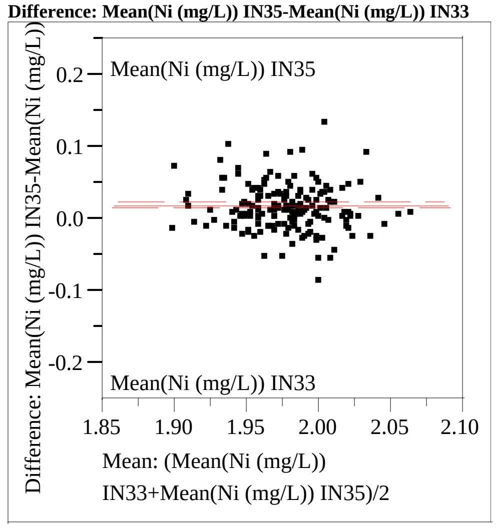
Mean(Na (mg/L)) IN35	19.9922	t-Ratio	7.454294
Mean(Na (mg/L)) IN33	19.8535	DF	172
Mean Difference	0.13865	Prob > |t|	<.0001
Std Error	0.0186	Prob > t	<.0001
Upper95%	0.17536	Prob < t	1.0000
Lower95%	0.10193		
N	173		
Correlation	0.7674		

Difference: Mean(Mn (mg/L)) IN35-Mean(Mn (mg/L)) IN33



Mean(Mn (mg/L)) IN35	1.00128	t-Ratio	9.949129
Mean(Mn (mg/L)) IN33	0.99097	DF	172
Mean Difference	0.01032	Prob > |t|	<.0001
Std Error	0.00104	Prob > t	<.0001
Upper95%	0.01236	Prob < t	1.0000
Lower95%	0.00827		
N	173		
Correlation	0.64171		

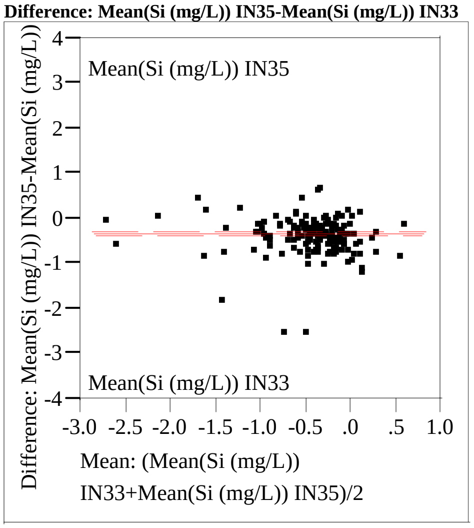
Difference: Mean(Ni (mg/L)) IN35-Mean(Ni (mg/L)) IN33



Mean(Ni (mg/L)) IN35	1.98689	t-Ratio	7.848886
Mean(Ni (mg/L)) IN33	1.96802	DF	172
Mean Difference	0.01887	Prob > |t|	<.0001
Std Error	0.0024	Prob > t	<.0001
Upper95%	0.02362	Prob < t	1.0000
Lower95%	0.01413		
N	173		
Correlation	0.56247		

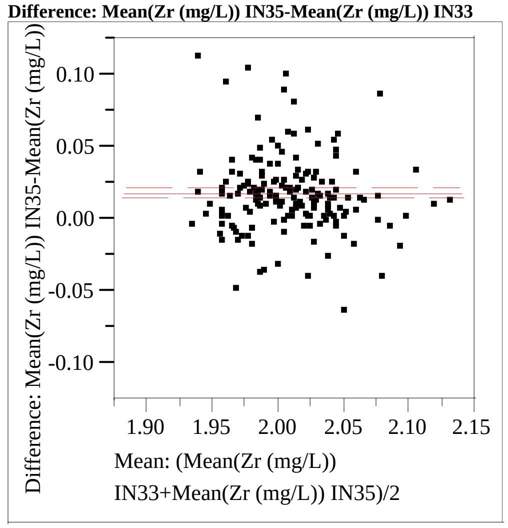
Exhibit A4. Paired Differences for IN33 and IN35

Difference: Mean(Si (mg/L)) IN35-Mean(Si (mg/L)) IN33



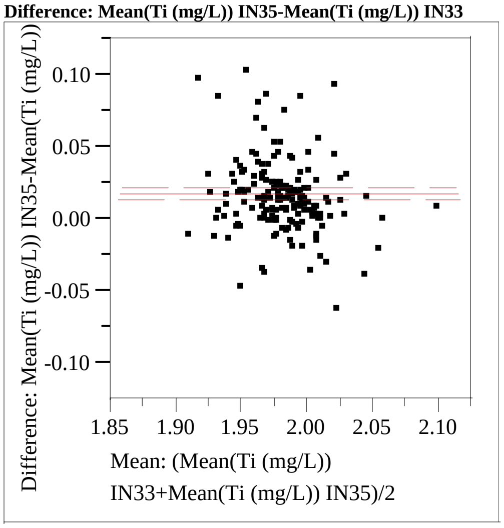
Mean(Si (mg/L)) IN35	-0.6047	t-Ratio	-10.8793
Mean(Si (mg/L)) IN33	-0.2732	DF	172
Mean Difference	-0.3315	Prob > |t|	<.0001
Std Error	0.03047	Prob > t	1.0000
Upper95%	-0.2714	Prob < t	<.0001
Lower95%	-0.3917		
N	173		
Correlation	0.68712		

Difference: Mean(Zr (mg/L)) IN35-Mean(Zr (mg/L)) IN33



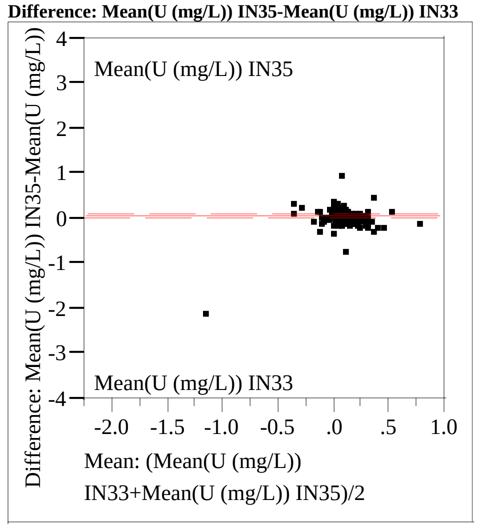
Mean(Zr (mg/L)) IN35	2.01713	t-Ratio	8.902987
Mean(Zr (mg/L)) IN33	1.99913	DF	172
Mean Difference	0.01799	Prob > |t|	<.0001
Std Error	0.00202	Prob > t	<.0001
Upper95%	0.02198	Prob < t	1.0000
Lower95%	0.014		
N	173		
Correlation	0.76931		

Difference: Mean(Ti (mg/L)) IN35-Mean(Ti (mg/L)) IN33



Mean(Ti (mg/L)) IN35	1.98943	t-Ratio	8.872537
Mean(Ti (mg/L)) IN33	1.9722	DF	172
Mean Difference	0.01723	Prob > |t|	<.0001
Std Error	0.00194	Prob > t	<.0001
Upper95%	0.02107	Prob < t	1.0000
Lower95%	0.0134		
N	173		
Correlation	0.65268		

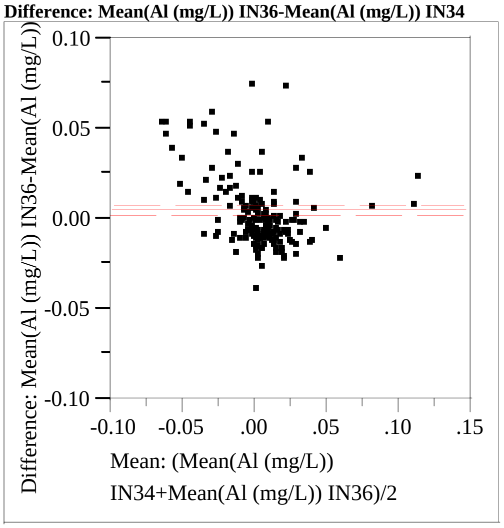
Difference: Mean(U (mg/L)) IN35-Mean(U (mg/L)) IN33



Mean(U (mg/L)) IN35	0.12129	t-Ratio	3.345885
Mean(U (mg/L)) IN33	0.06457	DF	172
Mean Difference	0.05673	Prob > |t|	0.0010
Std Error	0.01695	Prob > t	0.0005
Upper95%	0.09019	Prob < t	0.9995
Lower95%	0.02326		
N	173		
Correlation	0.38918		

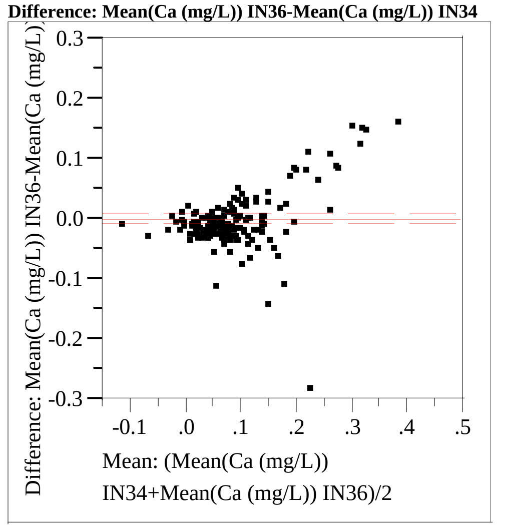
Exhibit A5. Paired Differences for IN34 and IN36

Difference: Mean(Al (mg/L)) IN36-Mean(Al (mg/L)) IN34



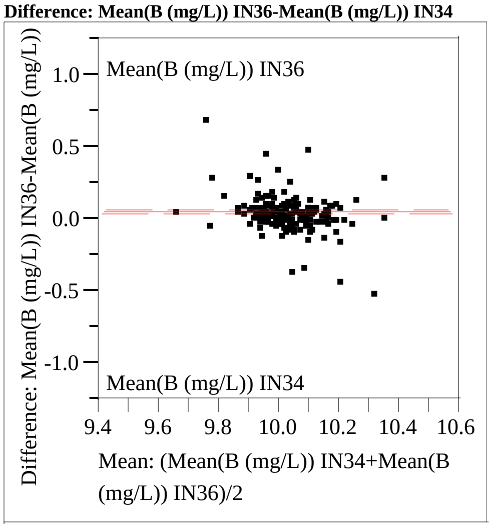
Mean(Al (mg/L)) IN36	0.00508	t-Ratio	2.971443
Mean(Al (mg/L)) IN34	0.00062	DF	171
Mean Difference	0.00446	Prob > |t|	0.0034
Std Error	0.0015	Prob > t	0.0017
Upper95%	0.00743	Prob < t	0.9983
Lower95%	0.0015		
N	172		
Correlation	0.75306		

Difference: Mean(Ca (mg/L)) IN36-Mean(Ca (mg/L)) IN34



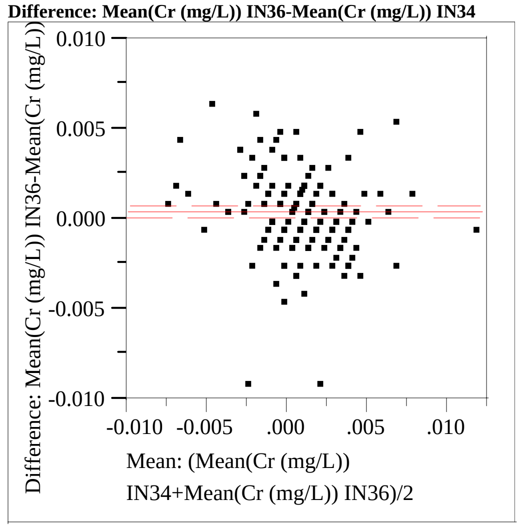
Mean(Ca (mg/L)) IN36	0.08731	t-Ratio	-0.09392
Mean(Ca (mg/L)) IN34	0.08766	DF	171
Mean Difference	-0.0003	Prob > |t|	0.9253
Std Error	0.00368	Prob > t	0.5374
Upper95%	0.00692	Prob < t	0.4626
Lower95%	-0.0076		
N	172		
Correlation	0.8546		

Difference: Mean(B (mg/L)) IN36-Mean(B (mg/L)) IN34



Mean(B (mg/L)) IN36	10.0553	t-Ratio	4.868207
Mean(B (mg/L)) IN34	10.0074	DF	171
Mean Difference	0.04795	Prob > |t|	<.0001
Std Error	0.00985	Prob > t	<.0001
Upper95%	0.06739	Prob < t	1.0000
Lower95%	0.02851		
N	172		
Correlation	0.45439		

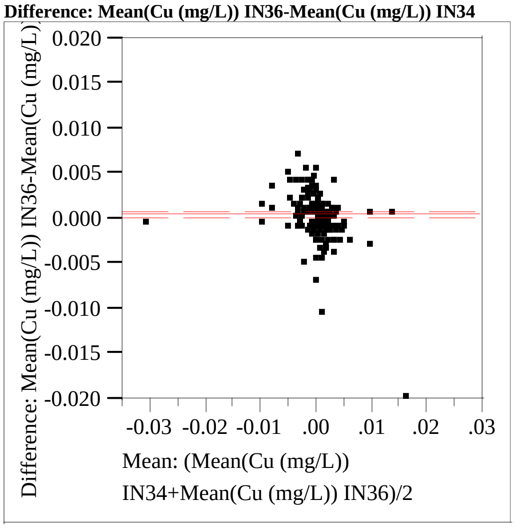
Difference: Mean(Cr (mg/L)) IN36-Mean(Cr (mg/L)) IN34



Mean(Cr (mg/L)) IN36	0.00094	t-Ratio	2.065946
Mean(Cr (mg/L)) IN34	0.00058	DF	171
Mean Difference	0.00035	Prob > |t|	0.0403
Std Error	0.00017	Prob > t	0.0202
Upper95%	0.00069	Prob < t	0.9798
Lower95%	0.00002		
N	172		
Correlation	0.70603		

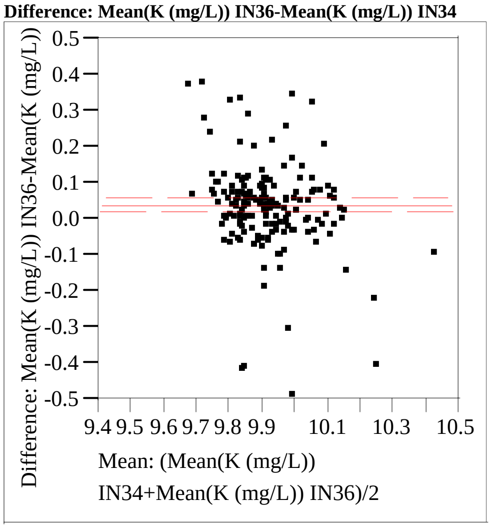
Exhibit A5. Paired Differences for IN34 and IN36

Difference: Mean(Cu (mg/L)) IN36-Mean(Cu (mg/L)) IN34



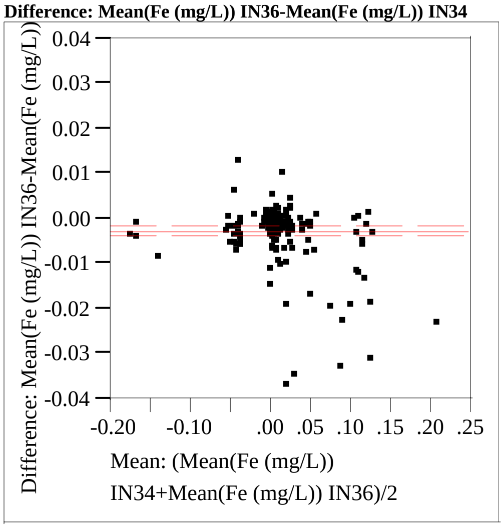
Mean(Cu (mg/L)) IN36	0.00029	t-Ratio	2.197645
Mean(Cu (mg/L)) IN34	-0.0002	DF	171
Mean Difference	0.00046	Prob > |t|	0.0293
Std Error	0.00021	Prob > t	0.0147
Upper95%	0.00087	Prob < t	0.9853
Lower95%	0.00005		
N	172		
Correlation	0.80463		

Difference: Mean(K (mg/L)) IN36-Mean(K (mg/L)) IN34



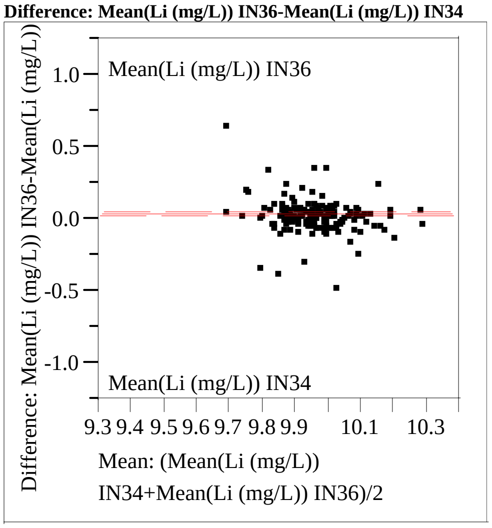
Mean(K (mg/L)) IN36	9.93594	t-Ratio	4.122717
Mean(K (mg/L)) IN34	9.89708	DF	171
Mean Difference	0.03886	Prob > |t|	<.0001
Std Error	0.00943	Prob > t	<.0001
Upper95%	0.05747	Prob < t	1.0000
Lower95%	0.02026		
N	172		
Correlation	0.56512		

Difference: Mean(Fe (mg/L)) IN36-Mean(Fe (mg/L)) IN34



Mean(Fe (mg/L)) IN36	0.0086	t-Ratio	-5.34193
Mean(Fe (mg/L)) IN34	0.01141	DF	171
Mean Difference	-0.0028	Prob > |t|	<.0001
Std Error	0.00052	Prob > t	1.0000
Upper95%	-0.0018	Prob < t	<.0001
Lower95%	-0.0038		
N	172		
Correlation	0.99148		

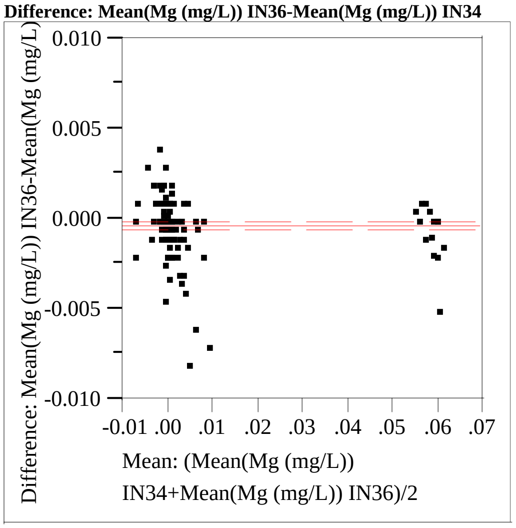
Difference: Mean(Li (mg/L)) IN36-Mean(Li (mg/L)) IN34



Mean(Li (mg/L)) IN36	9.97395	t-Ratio	3.962486
Mean(Li (mg/L)) IN34	9.93931	DF	171
Mean Difference	0.03464	Prob > |t|	0.0001
Std Error	0.00874	Prob > t	<.0001
Upper95%	0.0519	Prob < t	0.9999
Lower95%	0.01738		
N	172		
Correlation	0.52087		

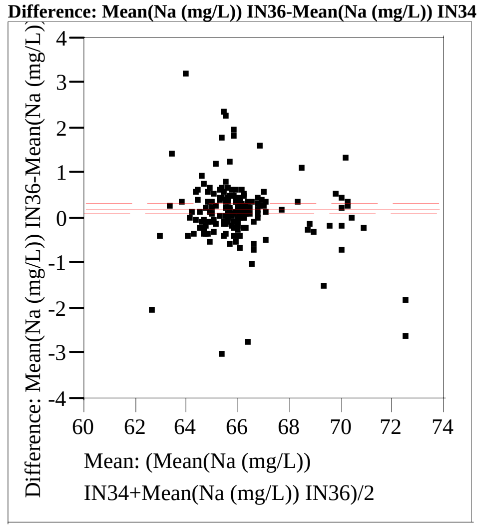
Exhibit A5. Paired Differences for IN34 and IN36

Difference: Mean(Mg (mg/L)) IN36-Mean(Mg (mg/L)) IN34



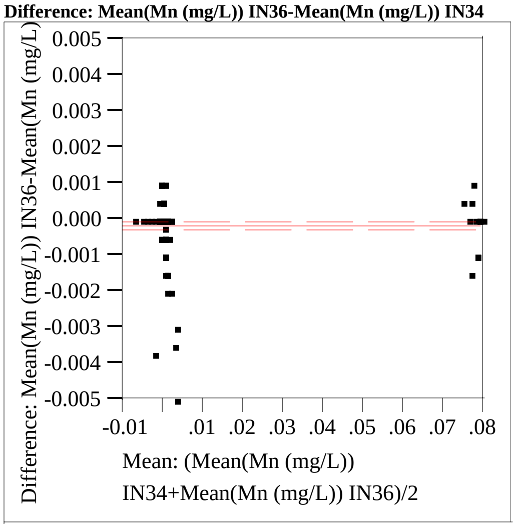
Mean(Mg (mg/L)) IN36	0.00501	t-Ratio	-3.16373
Mean(Mg (mg/L)) IN34	0.00539	DF	171
Mean Difference	-0.0004	Prob > |t|	0.0018
Std Error	0.00012	Prob > t	0.9991
Upper95%	-0.0001	Prob < t	0.0009
Lower95%	-0.0006		
N	172		
Correlation	0.99537		

Difference: Mean(Na (mg/L)) IN36-Mean(Na (mg/L)) IN34



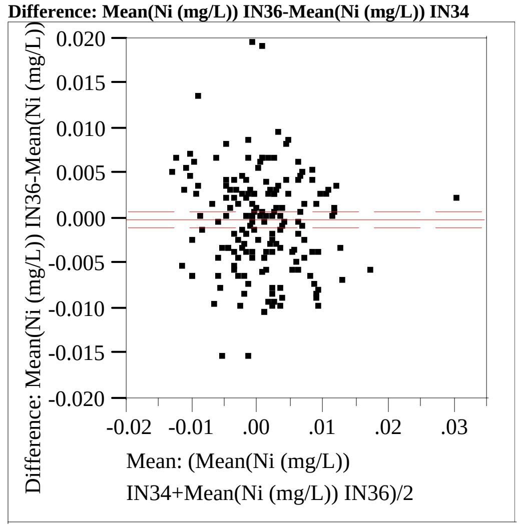
Mean(Na (mg/L)) IN36	66.1319	t-Ratio	3.654829
Mean(Na (mg/L)) IN34	65.9269	DF	171
Mean Difference	0.20496	Prob > |t|	0.0003
Std Error	0.05608	Prob > t	0.0002
Upper95%	0.31566	Prob < t	0.9998
Lower95%	0.09426		
N	172		
Correlation	0.90651		

Difference: Mean(Mn (mg/L)) IN36-Mean(Mn (mg/L)) IN34



Mean(Mn (mg/L)) IN36	0.00639	t-Ratio	-3.51619
Mean(Mn (mg/L)) IN34	0.0066	DF	171
Mean Difference	-0.0002	Prob > |t|	0.0006
Std Error	0.00006	Prob > t	0.9997
Upper95%	-9.3e-5	Prob < t	0.0003
Lower95%	-0.0003		
N	172		
Correlation	0.99932		

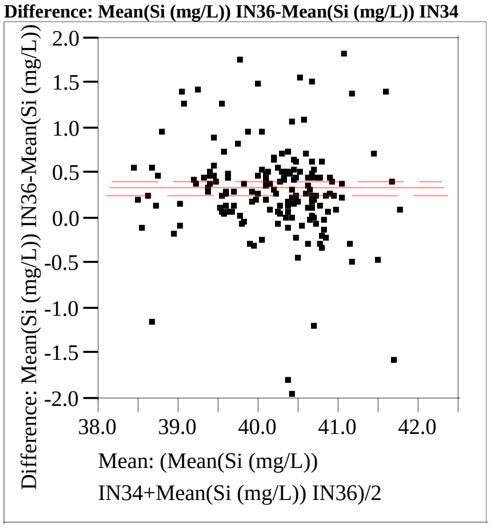
Difference: Mean(Ni (mg/L)) IN36-Mean(Ni (mg/L)) IN34



Mean(Ni (mg/L)) IN36	0.00062	t-Ratio	-0.33968
Mean(Ni (mg/L)) IN34	0.00077	DF	171
Mean Difference	-0.0001	Prob > |t|	0.7345
Std Error	0.00043	Prob > t	0.6327
Upper95%	0.0007	Prob < t	0.3673
Lower95%	-0.001		
N	172		
Correlation	0.66338		

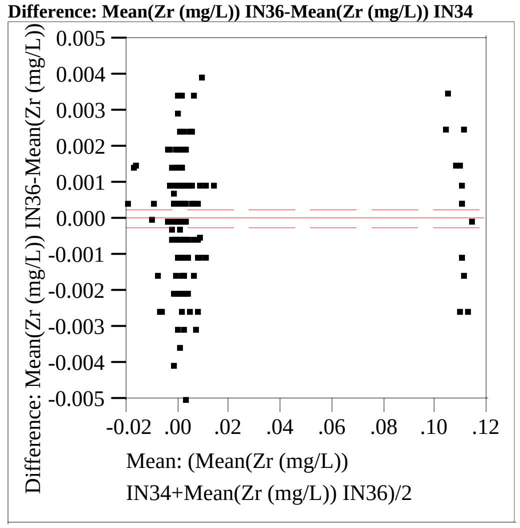
Exhibit A5. Paired Differences for IN34 and IN36

Difference: Mean(Si (mg/L)) IN36-Mean(Si (mg/L)) IN34



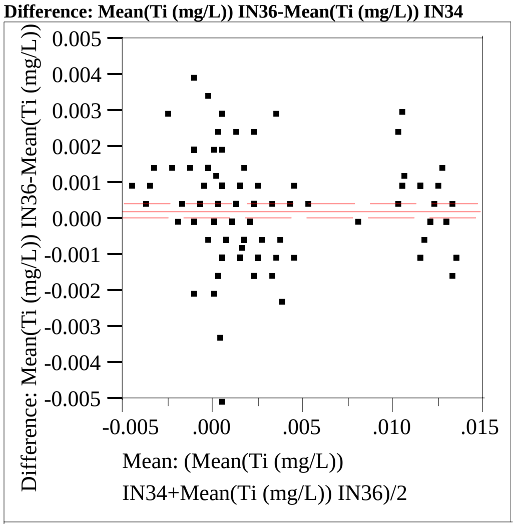
Mean(Si (mg/L)) IN36	40.345	t-Ratio	8.287566
Mean(Si (mg/L)) IN34	40.0109	DF	171
Mean Difference	0.33409	Prob > |t|	<.0001
Std Error	0.04031	Prob > t	<.0001
Upper95%	0.41367	Prob < t	1.0000
Lower95%	0.25452		
N	172		
Correlation	0.73509		

Difference: Mean(Zr (mg/L)) IN36-Mean(Zr (mg/L)) IN34



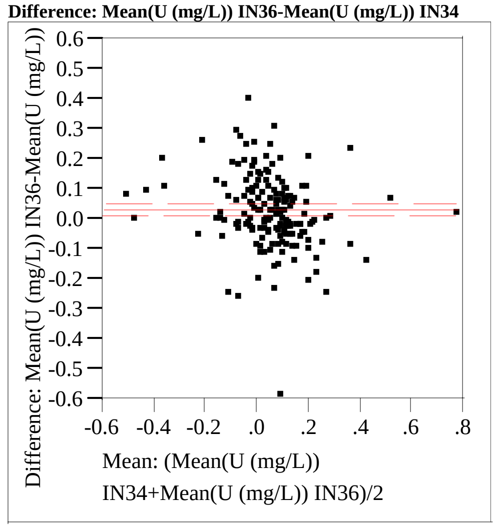
Mean(Zr (mg/L)) IN36	0.0096	t-Ratio	0.037726
Mean(Zr (mg/L)) IN34	0.00959	DF	171
Mean Difference	4.36e-6	Prob > |t|	0.9700
Std Error	0.00012	Prob > t	0.4850
Upper95%	0.00023	Prob < t	0.5150
Lower95%	-0.0002		
N	172		
Correlation	0.99875		

Difference: Mean(Ti (mg/L)) IN36-Mean(Ti (mg/L)) IN34



Mean(Ti (mg/L)) IN36	0.00269	t-Ratio	2.262904
Mean(Ti (mg/L)) IN34	0.00248	DF	171
Mean Difference	0.00021	Prob > |t|	0.0249
Std Error	0.00009	Prob > t	0.0124
Upper95%	0.0004	Prob < t	0.9876
Lower95%	0.00003		
N	172		
Correlation	0.95992		

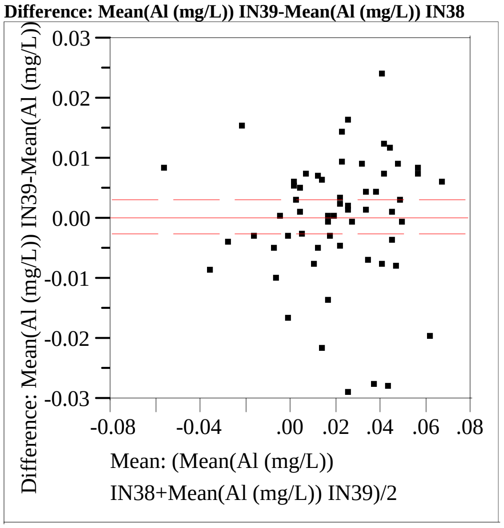
Difference: Mean(U (mg/L)) IN36-Mean(U (mg/L)) IN34



Mean(U (mg/L)) IN36	0.06586	t-Ratio	3.357473
Mean(U (mg/L)) IN34	0.03474	DF	171
Mean Difference	0.03112	Prob > |t|	0.0010
Std Error	0.00927	Prob > t	0.0005
Upper95%	0.04941	Prob < t	0.9995
Lower95%	0.01282		
N	172		
Correlation	0.72433		

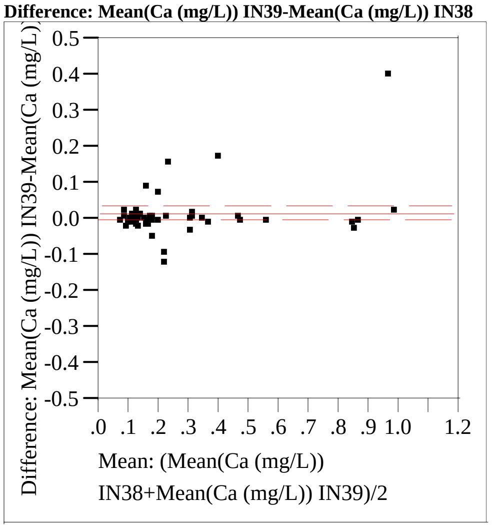
Exhibit A6. Paired Differences for IN38 and IN39

Difference: Mean(Al (mg/L)) IN39-Mean(Al (mg/L)) IN38



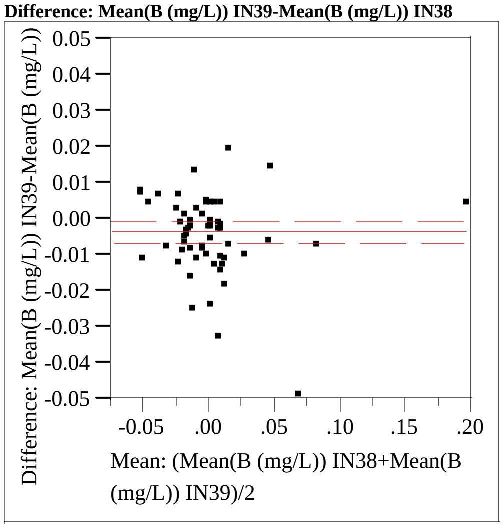
Mean(Al (mg/L)) IN39	0.02066	t-Ratio	0.212524
Mean(Al (mg/L)) IN38	0.02036	DF	58
Mean Difference	0.0003	Prob > |t|	0.8324
Std Error	0.0014	Prob > t	0.4162
Upper95%	0.00309	Prob < t	0.5838
Lower95%	-0.0025		
N	59		
Correlation	0.90864		

Difference: Mean(Ca (mg/L)) IN39-Mean(Ca (mg/L)) IN38



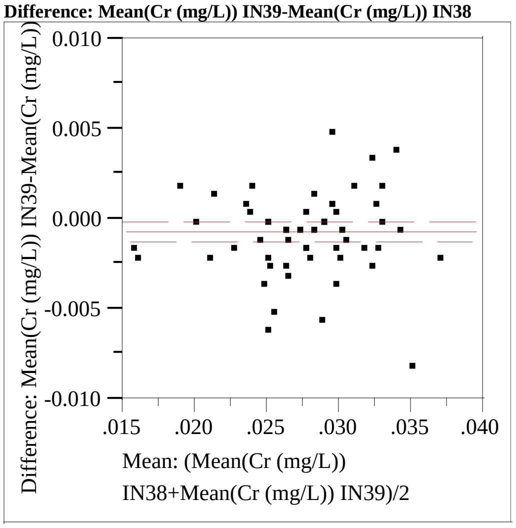
Mean(Ca (mg/L)) IN39	0.25512	t-Ratio	1.892014
Mean(Ca (mg/L)) IN38	0.23871	DF	58
Mean Difference	0.01641	Prob > |t|	0.0635
Std Error	0.00867	Prob > t	0.0317
Upper95%	0.03376	Prob < t	0.9683
Lower95%	-0.001		
N	59		
Correlation	0.96248		

Difference: Mean(B (mg/L)) IN39-Mean(B (mg/L)) IN38



Mean(B (mg/L)) IN39	-0.0025	t-Ratio	-2.64729
Mean(B (mg/L)) IN38	0.00133	DF	58
Mean Difference	-0.0038	Prob > |t|	0.0104
Std Error	0.00144	Prob > t	0.9948
Upper95%	-0.0009	Prob < t	0.0052
Lower95%	-0.0067		
N	59		
Correlation	0.95428		

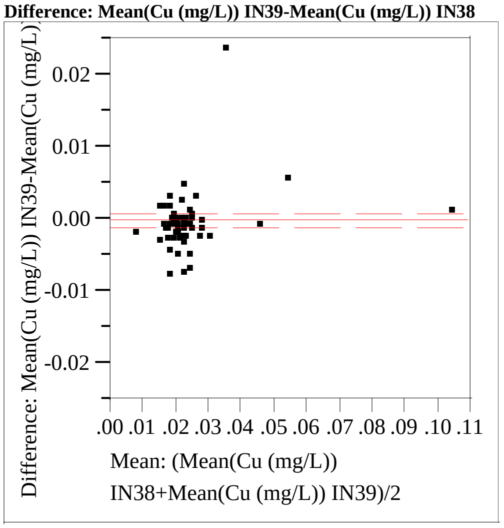
Difference: Mean(Cr (mg/L)) IN39-Mean(Cr (mg/L)) IN38



Mean(Cr (mg/L)) IN39	0.02724	t-Ratio	-2.49352
Mean(Cr (mg/L)) IN38	0.02797	DF	58
Mean Difference	-0.0007	Prob > |t|	0.0155
Std Error	0.0003	Prob > t	0.9922
Upper95%	-0.0001	Prob < t	0.0078
Lower95%	-0.0013		
N	59		
Correlation	0.87224		

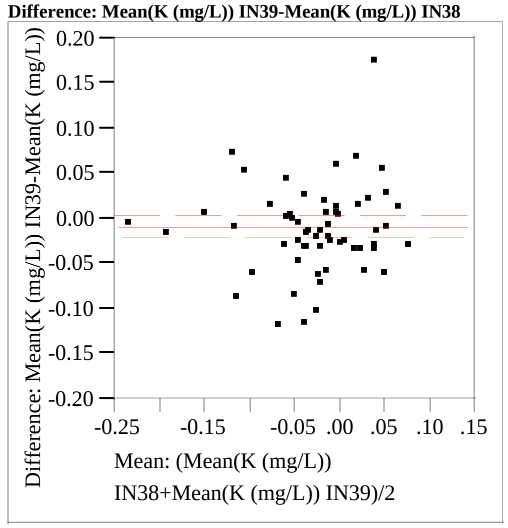
Exhibit A6. Paired Differences for IN38 and IN39

Difference: Mean(Cu (mg/L)) IN39-Mean(Cu (mg/L)) IN38



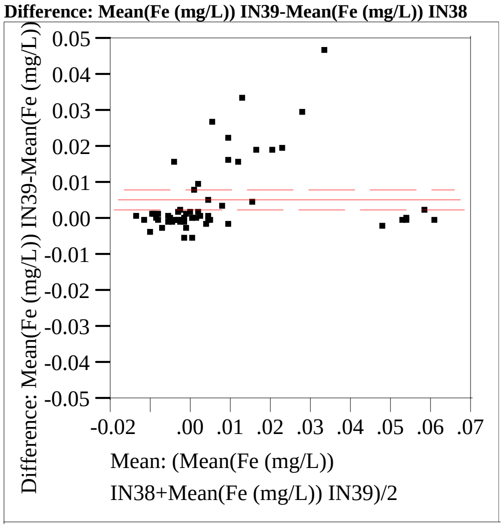
Mean(Cu (mg/L)) IN39	0.02344	t-Ratio	-0.49557
Mean(Cu (mg/L)) IN38	0.0237	DF	58
Mean Difference	-0.0003	Prob > |t|	0.6221
Std Error	0.00053	Prob > t	0.6890
Upper95%	0.0008	Prob < t	0.3110
Lower95%	-0.0013		
N	59		
Correlation	0.95145		

Difference: Mean(K (mg/L)) IN39-Mean(K (mg/L)) IN38



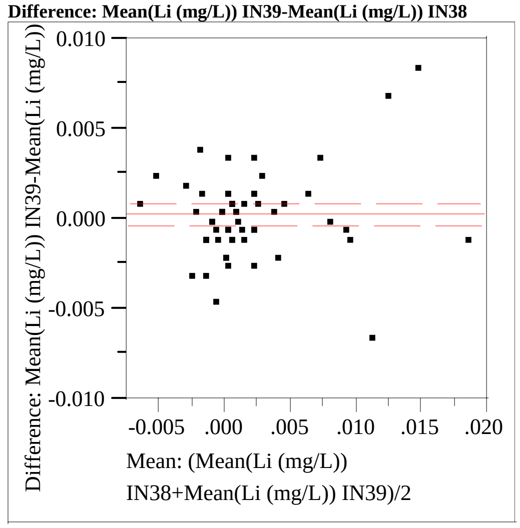
Mean(K (mg/L)) IN39	-0.0317	t-Ratio	-1.417
Mean(K (mg/L)) IN38	-0.0227	DF	58
Mean Difference	-0.009	Prob > |t|	0.1618
Std Error	0.00634	Prob > t	0.9191
Upper95%	0.00371	Prob < t	0.0809
Lower95%	-0.0217		
N	59		
Correlation	0.72612		

Difference: Mean(Fe (mg/L)) IN39-Mean(Fe (mg/L)) IN38



Mean(Fe (mg/L)) IN39	0.00981	t-Ratio	4.032934
Mean(Fe (mg/L)) IN38	0.00436	DF	58
Mean Difference	0.00545	Prob > |t|	0.0002
Std Error	0.00135	Prob > t	<.0001
Upper95%	0.00815	Prob < t	0.9999
Lower95%	0.00274		
N	59		
Correlation	0.86304		

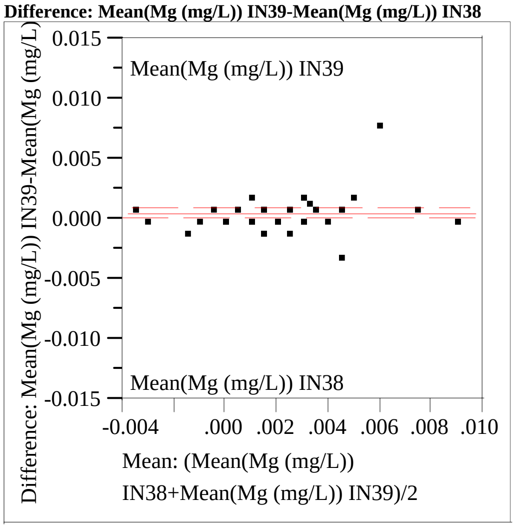
Difference: Mean(Li (mg/L)) IN39-Mean(Li (mg/L)) IN38



Mean(Li (mg/L)) IN39	0.00188	t-Ratio	0.824099
Mean(Li (mg/L)) IN38	0.00163	DF	58
Mean Difference	0.00025	Prob > |t|	0.4133
Std Error	0.00031	Prob > t	0.2066
Upper95%	0.00087	Prob < t	0.7934
Lower95%	-0.0004		
N	59		
Correlation	0.87734		

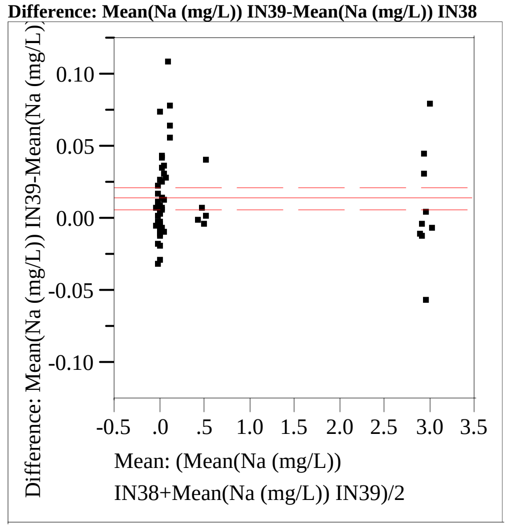
Exhibit A6. Paired Differences for IN38 and IN39

Difference: Mean(Mg (mg/L)) IN39-Mean(Mg (mg/L)) IN38



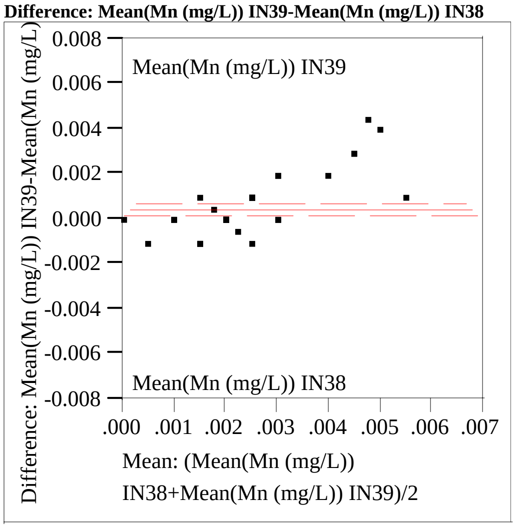
Mean(Mg (mg/L)) IN39	0.00215	t-Ratio	2.932233
Mean(Mg (mg/L)) IN38	0.00165	DF	58
Mean Difference	0.0005	Prob > |t|	0.0048
Std Error	0.00017	Prob > t	0.0024
Upper95%	0.00084	Prob < t	0.9976
Lower95%	0.00016		
N	59		
Correlation	0.87262		

Difference: Mean(Na (mg/L)) IN39-Mean(Na (mg/L)) IN38



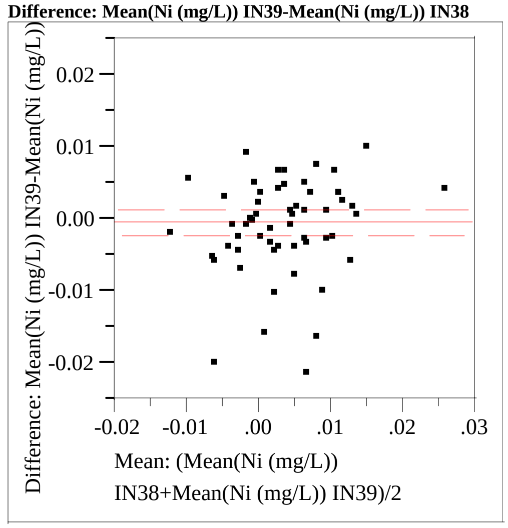
Mean(Na (mg/L)) IN39	0.50751	t-Ratio	3.635412
Mean(Na (mg/L)) IN38	0.49352	DF	58
Mean Difference	0.01399	Prob > |t|	0.0006
Std Error	0.00385	Prob > t	0.0003
Upper95%	0.0217	Prob < t	0.9997
Lower95%	0.00629		
N	59		
Correlation	0.99961		

Difference: Mean(Mn (mg/L)) IN39-Mean(Mn (mg/L)) IN38



Mean(Mn (mg/L)) IN39	0.00249	t-Ratio	2.89151
Mean(Mn (mg/L)) IN38	0.00208	DF	58
Mean Difference	0.00042	Prob > |t|	0.0054
Std Error	0.00014	Prob > t	0.0027
Upper95%	0.0007	Prob < t	0.9973
Lower95%	0.00013		
N	59		
Correlation	0.70195		

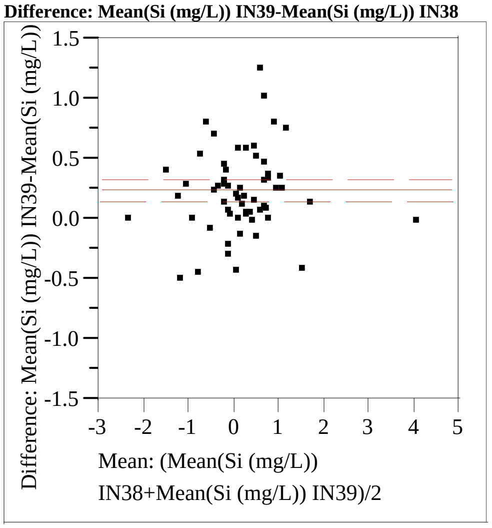
Difference: Mean(Ni (mg/L)) IN39-Mean(Ni (mg/L)) IN38



Mean(Ni (mg/L)) IN39	0.00325	t-Ratio	-0.60716
Mean(Ni (mg/L)) IN38	0.00378	DF	58
Mean Difference	-0.0005	Prob > |t|	0.5461
Std Error	0.00087	Prob > t	0.7269
Upper95%	0.00121	Prob < t	0.2731
Lower95%	-0.0023		
N	59		
Correlation	0.61148		

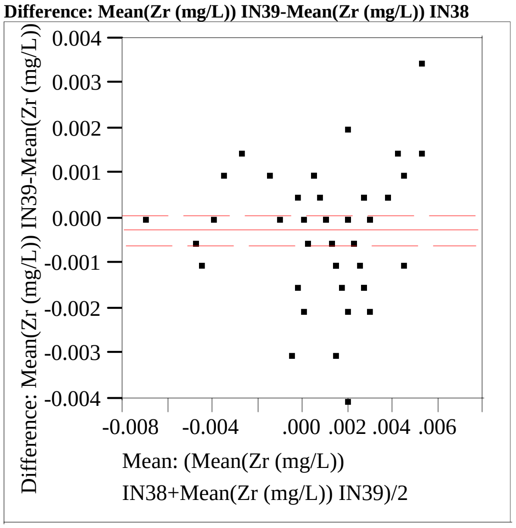
Exhibit A6. Paired Differences for IN38 and IN39

Difference: Mean(Si (mg/L)) IN39-Mean(Si (mg/L)) IN38



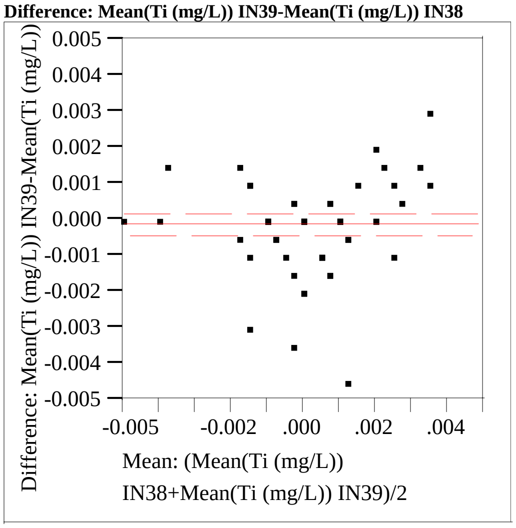
Mean(Si (mg/L)) IN39	0.28093	t-Ratio	5.314948
Mean(Si (mg/L)) IN38	0.04201	DF	58
Mean Difference	0.23892	Prob > |t|	<.0001
Std Error	0.04495	Prob > t	<.0001
Upper95%	0.32891	Prob < t	1.0000
Lower95%	0.14894		
N	59		
Correlation	0.929		

Difference: Mean(Zr (mg/L)) IN39-Mean(Zr (mg/L)) IN38



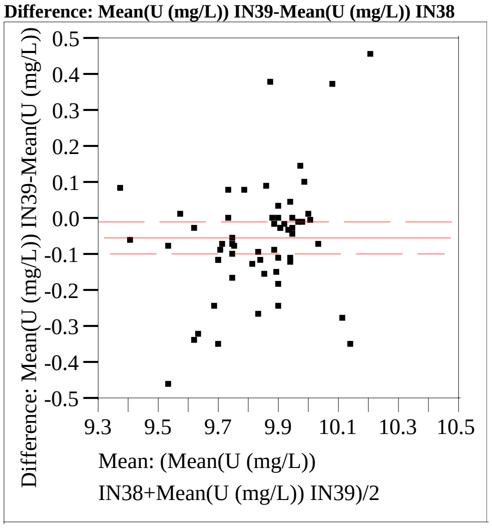
Mean(Zr (mg/L)) IN39	0.00097	t-Ratio	-1.60504
Mean(Zr (mg/L)) IN38	0.00123	DF	58
Mean Difference	-0.0003	Prob > |t|	0.1139
Std Error	0.00016	Prob > t	0.9430
Upper95%	0.00006	Prob < t	0.0570
Lower95%	-0.0006		
N	59		
Correlation	0.88502		

Difference: Mean(Ti (mg/L)) IN39-Mean(Ti (mg/L)) IN38



Mean(Ti (mg/L)) IN39	0.00014	t-Ratio	-0.99165
Mean(Ti (mg/L)) IN38	0.0003	DF	58
Mean Difference	-0.0002	Prob > |t|	0.3255
Std Error	0.00016	Prob > t	0.8373
Upper95%	0.00016	Prob < t	0.1627
Lower95%	-0.0005		
N	59		
Correlation	0.76617		

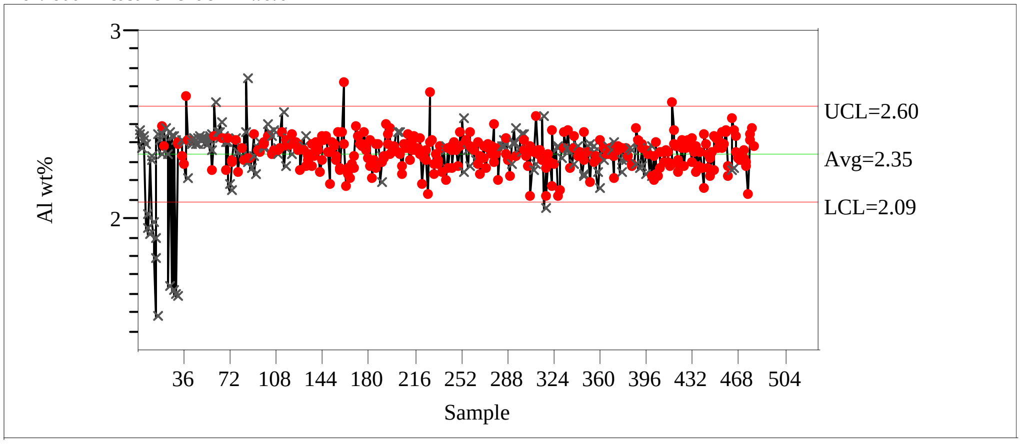
Difference: Mean(U (mg/L)) IN39-Mean(U (mg/L)) IN38



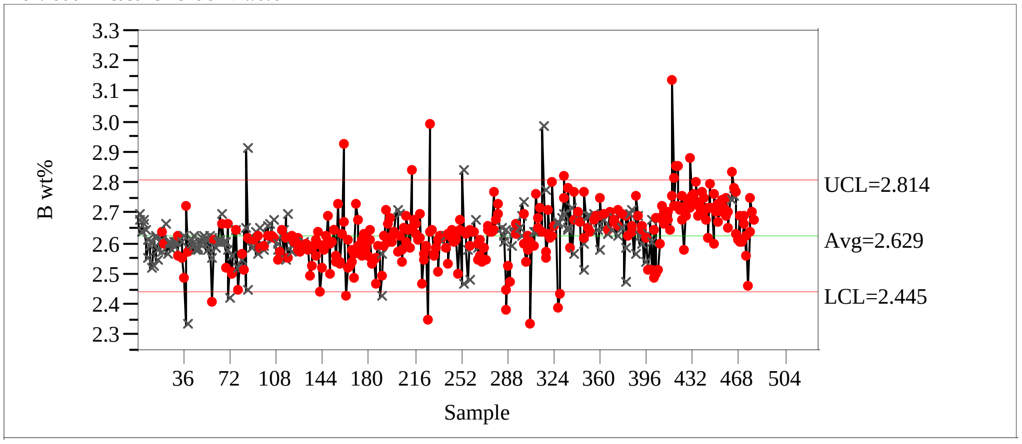
Mean(U (mg/L)) IN39	9.80522	t-Ratio	-2.44717
Mean(U (mg/L)) IN38	9.85751	DF	58
Mean Difference	-0.0523	Prob > |t|	0.0174
Std Error	0.02137	Prob > t	0.9913
Upper95%	-0.0095	Prob < t	0.0087
Lower95%	-0.0951		
N	59		
Correlation	0.63107		

Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of Al wt%



Individual Measurement of B wt%



Individual Measurement of Ca wt%

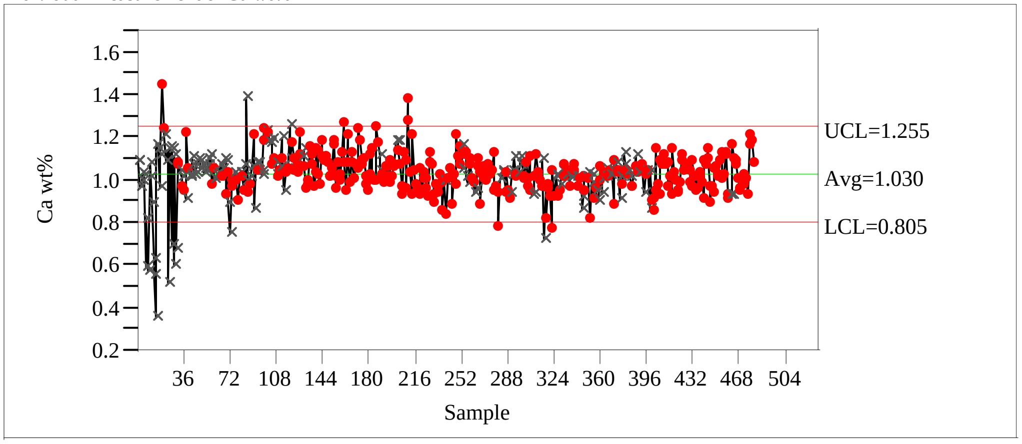
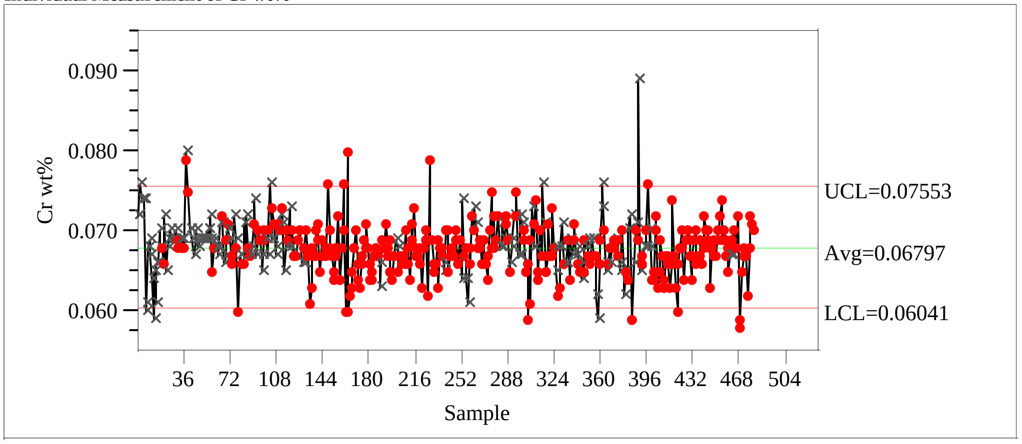
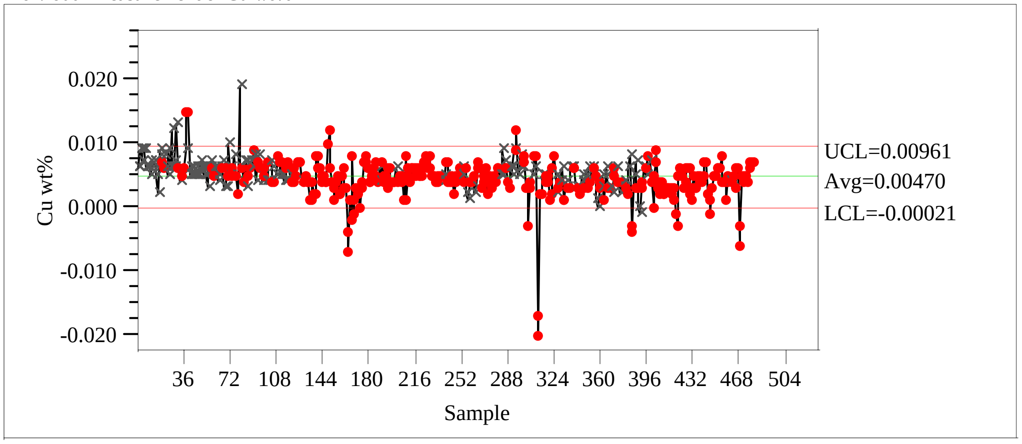


Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of Cr wt%



Individual Measurement of Cu wt%



Individual Measurement of Fe wt%

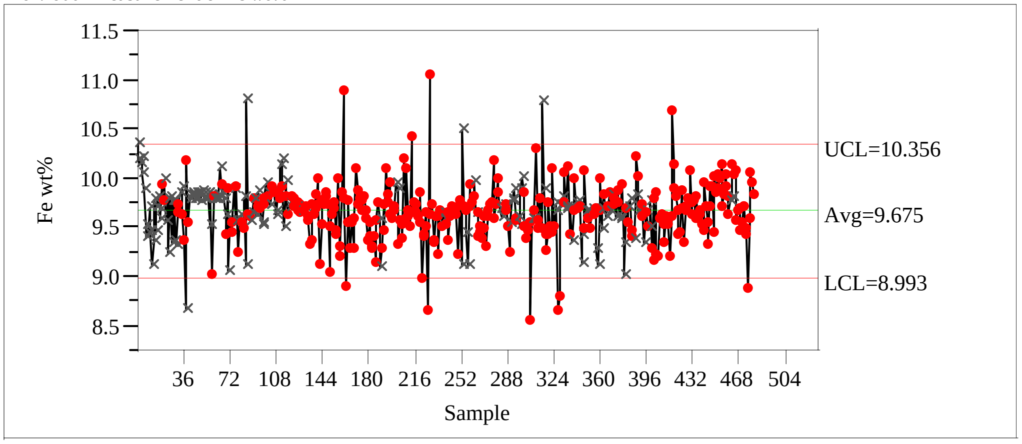
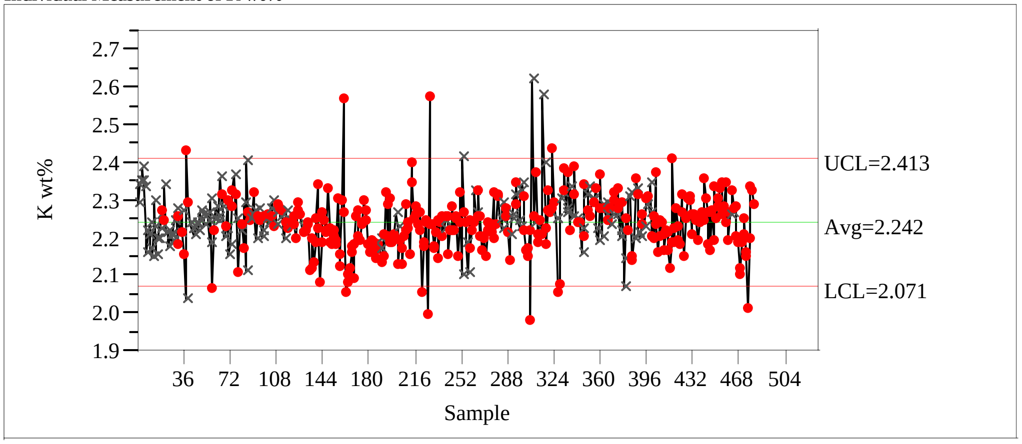
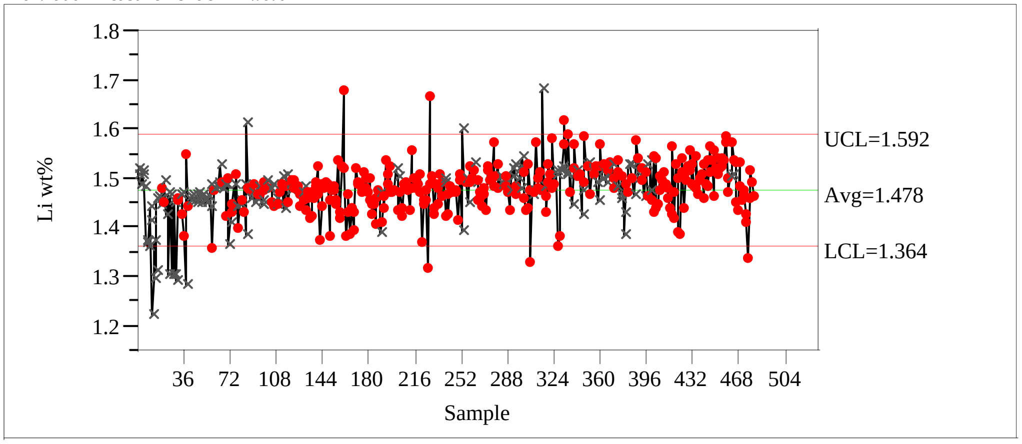


Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of K wt%



Individual Measurement of Li wt%



Individual Measurement of Mg wt%

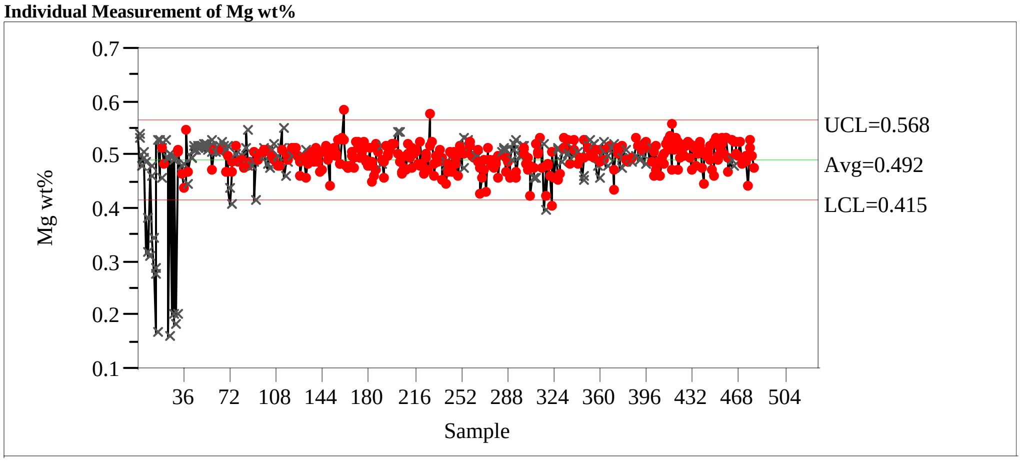
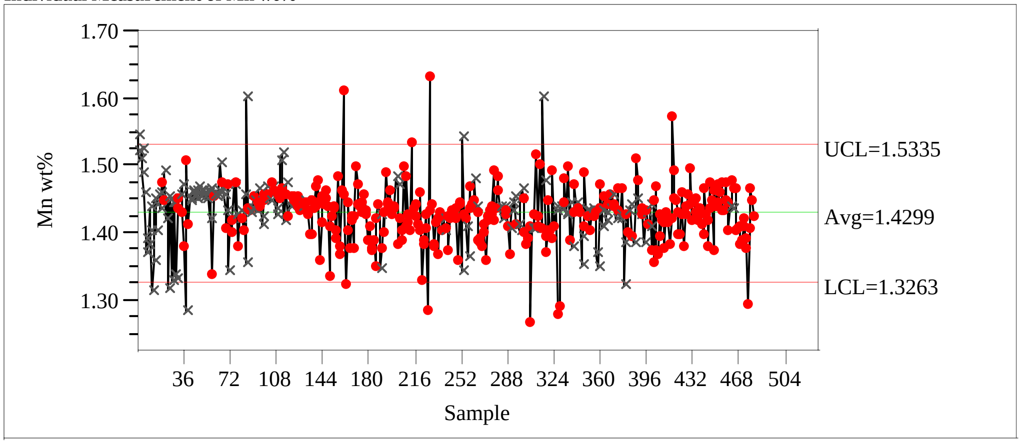
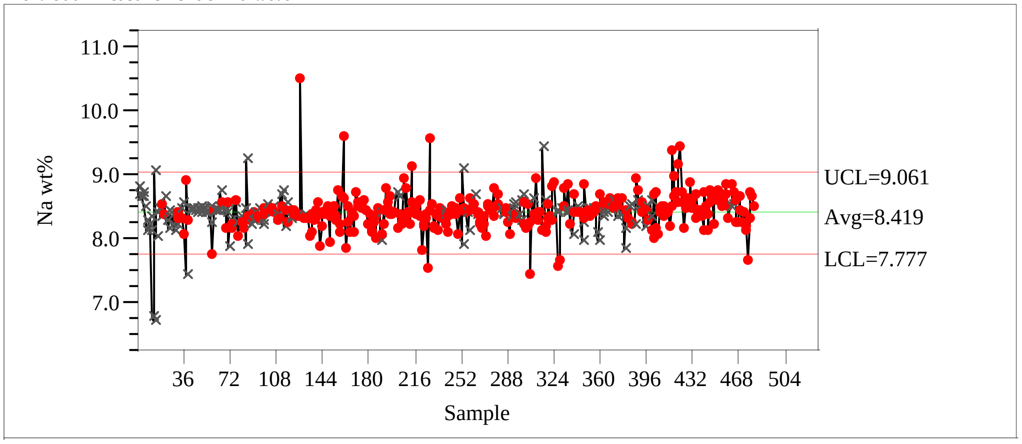


Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of Mn wt%



Individual Measurement of Na wt%



Individual Measurement of Ni wt%

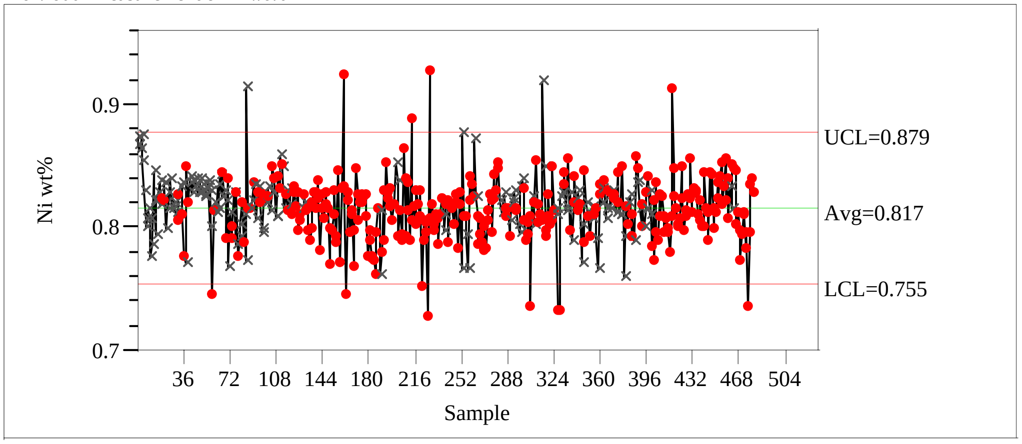
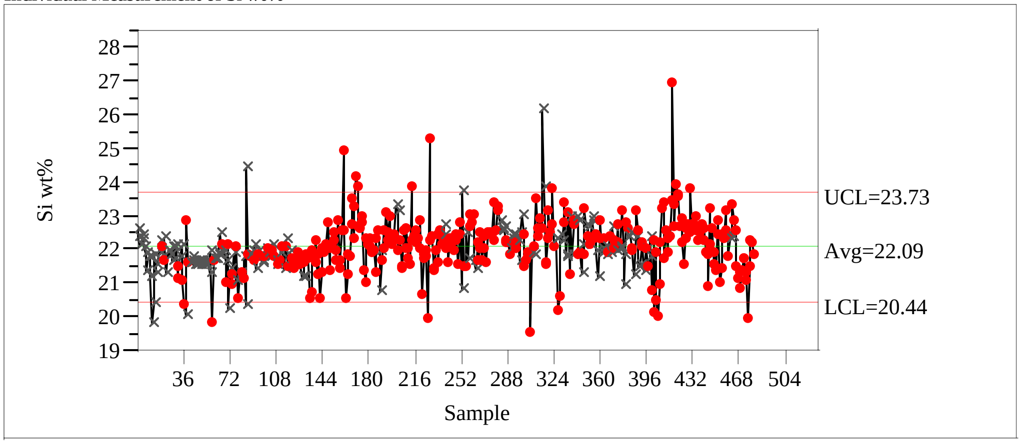
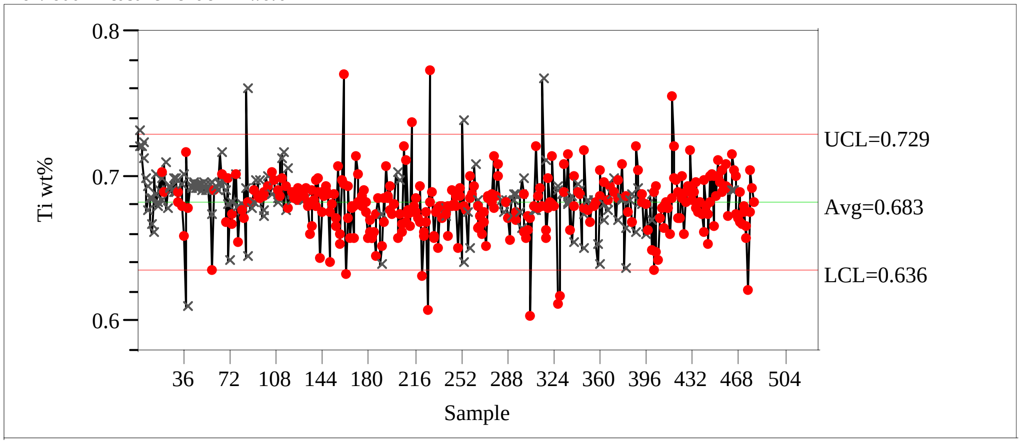


Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of Si wt%



Individual Measurement of Ti wt%



Individual Measurement of U wt%

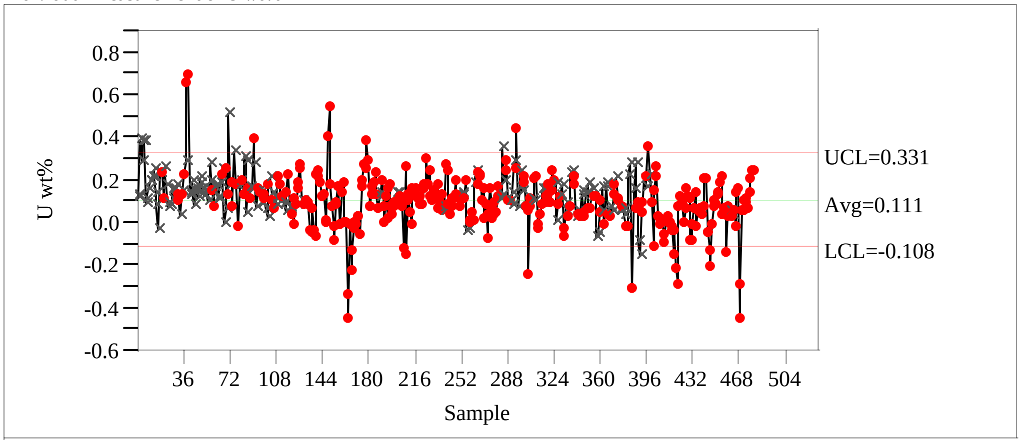


Exhibit A7. Control Charts for Cold Chem ARG-1 Measurements

Individual Measurement of Zr wt%

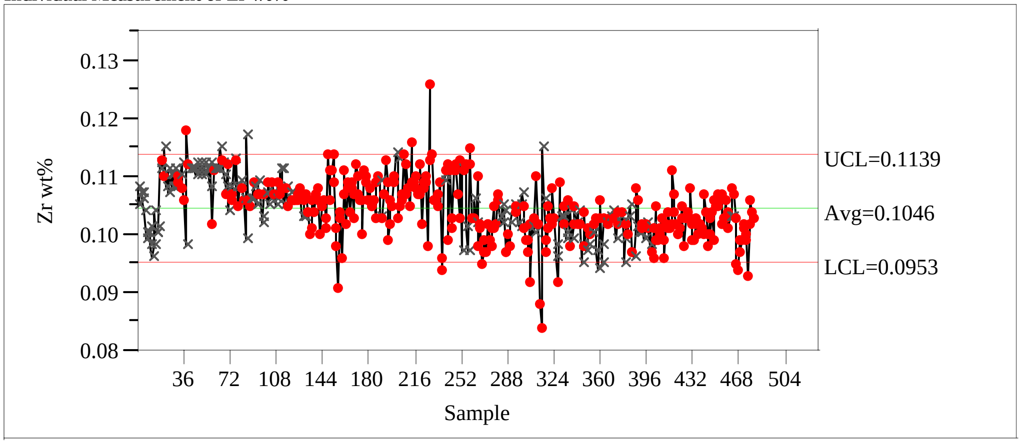
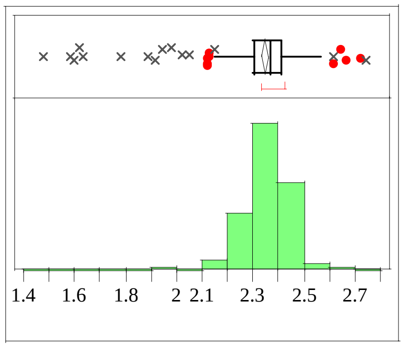


Exhibit A8. Histograms and Descriptive Statistics for All ARG-1 Cold Chem Data

Al wt%



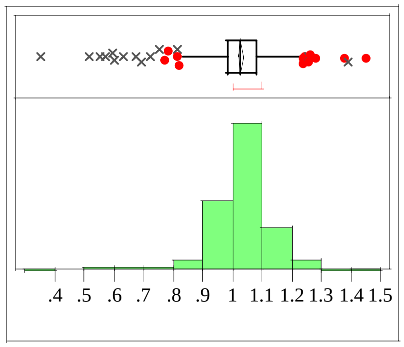
Quantiles

100.0%	maximum	2.7430
99.5%		2.7037
97.5%		2.5069
90.0%		2.4520
75.0%	quartile	2.4097
50.0%	median	2.3680
25.0%	quartile	2.3053
10.0%		2.2372
2.5%		2.0479
0.5%		1.5879
0.0%	minimum	1.4720

Moments

Mean	2.3473146
Std Dev	0.1260735
Std Err Mean	0.0057544
upper 95% Mean	2.3586217
lower 95% Mean	2.3360075
N	480

Ca wt%



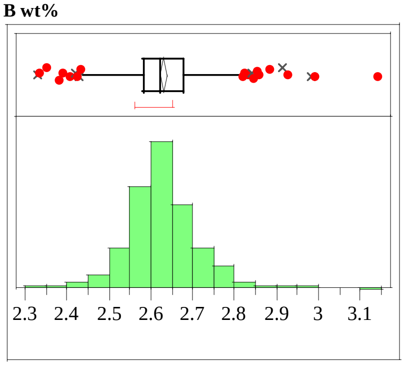
Quantiles

100.0%	maximum	1.4550
99.5%		1.3848
97.5%		1.2280
90.0%		1.1437
75.0%	quartile	1.0838
50.0%	median	1.0300
25.0%	quartile	0.9830
10.0%		0.9331
2.5%		0.7763
0.5%		0.5292
0.0%	minimum	0.3540

Moments

Mean	1.0299021
Std Dev	0.1085724
Std Err Mean	0.0049556
upper 95% Mean	1.0396395
lower 95% Mean	1.0201646
N	480

B wt%



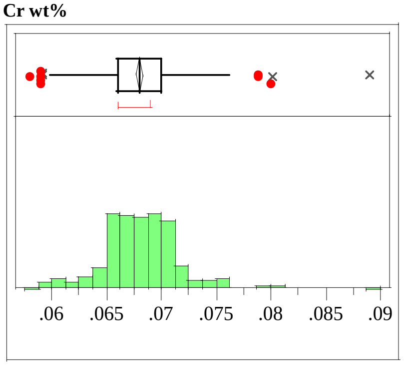
Quantiles

100.0%	maximum	3.1420
99.5%		2.9885
97.5%		2.8259
90.0%		2.7298
75.0%	quartile	2.6777
50.0%	median	2.6230
25.0%	quartile	2.5833
10.0%		2.5330
2.5%		2.4432
0.5%		2.3441
0.0%	minimum	2.3300

Moments

Mean	2.6293729
Std Dev	0.0889848
Std Err Mean	0.0040616
upper 95% Mean	2.6373536
lower 95% Mean	2.6213922
N	480

Cr wt%



Quantiles

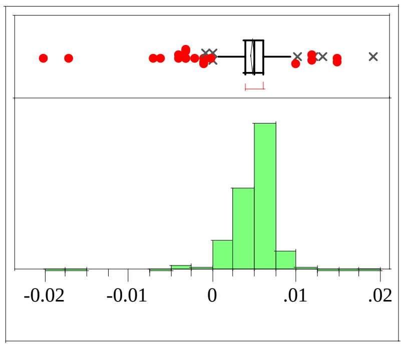
100.0%	maximum	0.08900
99.5%		0.08000
97.5%		0.07597
90.0%		0.07200
75.0%	quartile	0.07000
50.0%	median	0.06800
25.0%	quartile	0.06600
10.0%		0.06400
2.5%		0.06002
0.5%		0.05900
0.0%	minimum	0.05800

Moments

Mean	0.0679708
Std Dev	0.003368
Std Err Mean	0.0001537
upper 95% Mean	0.0682729
lower 95% Mean	0.0676688
N	480

Exhibit A8. Histograms and Descriptive Statistics for All ARG-1 Cold Chem Data

Cu wt%



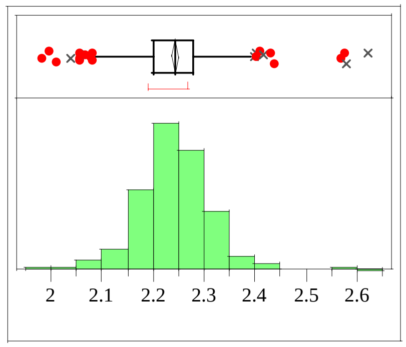
Quantiles

100.0%	maximum	0.0190
99.5%		0.0150
97.5%		0.0090
90.0%		0.0070
75.0%	quartile	0.0060
50.0%	median	0.0050
25.0%	quartile	0.0040
10.0%		0.0020
2.5%		-0.0010
0.5%		-0.0130
0.0%	minimum	-0.0200

Moments

Mean	0.0047021
Std Dev	0.00294
Std Err Mean	0.0001342
upper 95% Mean	0.0049658
lower 95% Mean	0.0044384
N	480

K wt%



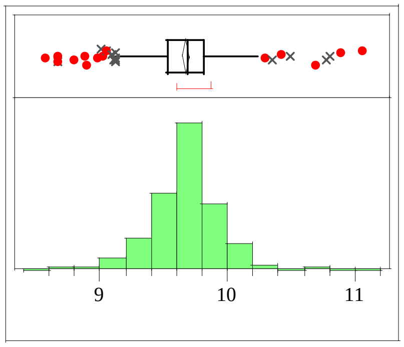
Quantiles

100.0%	maximum	2.6200
99.5%		2.5776
97.5%		2.3889
90.0%		2.3268
75.0%	quartile	2.2780
50.0%	median	2.2430
25.0%	quartile	2.2003
10.0%		2.1590
2.5%		2.0823
0.5%		2.0041
0.0%	minimum	1.9820

Moments

Mean	2.2422167
Std Dev	0.0740392
Std Err Mean	0.0033794
upper 95% Mean	2.248857
lower 95% Mean	2.2355764
N	480

Fe wt%



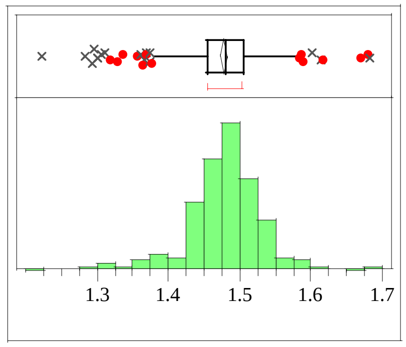
Quantiles

100.0%	maximum	11.064
99.5%		10.858
97.5%		10.214
90.0%		9.970
75.0%	quartile	9.815
50.0%	median	9.686
25.0%	quartile	9.537
10.0%		9.346
2.5%		9.059
0.5%		8.667
0.0%	minimum	8.575

Moments

Mean	9.6745917
Std Dev	0.286491
Std Err Mean	0.0130765
upper 95% Mean	9.700286
lower 95% Mean	9.6488973
N	480

Li wt%



Quantiles

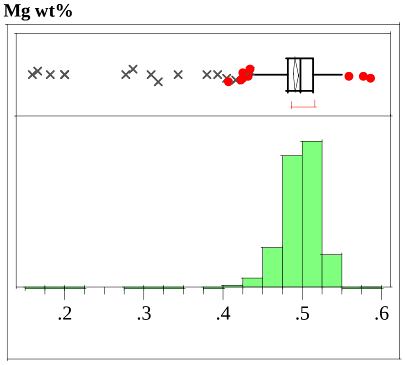
100.0%	maximum	1.6810
99.5%		1.6759
97.5%		1.5760
90.0%		1.5290
75.0%	quartile	1.5057
50.0%	median	1.4810
25.0%	quartile	1.4550
10.0%		1.4261
2.5%		1.3590
0.5%		1.2851
0.0%	minimum	1.2210

Moments

Mean	1.4780812
Std Dev	0.0521977
Std Err Mean	0.0023825
upper 95% Mean	1.4827627
lower 95% Mean	1.4733998
N	480

Exhibit A8. Histograms and Descriptive Statistics for All ARG-1 Cold Chem Data

Mg wt%



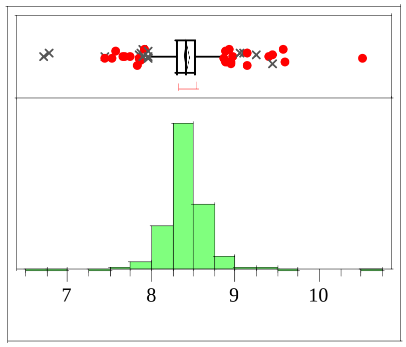
Quantiles

100.0%	maximum	0.58700
99.5%		0.57111
97.5%		0.53497
90.0%		0.52400
75.0%	quartile	0.51300
50.0%	median	0.49800
25.0%	quartile	0.48200
10.0%		0.46110
2.5%		0.39328
0.5%		0.17108
0.0%	minimum	0.15700

Moments

Mean	0.4915313
Std Dev	0.0448749
Std Err Mean	0.0020483
upper 95% Mean	0.4955559
lower 95% Mean	0.4875066
N	480

Na wt%



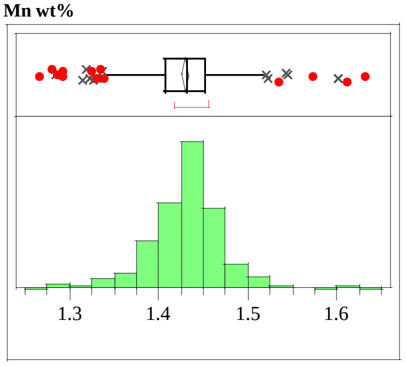
Quantiles

100.0%	maximum	10.514
99.5%		9.594
97.5%		8.980
90.0%		8.703
75.0%	quartile	8.521
50.0%	median	8.420
25.0%	quartile	8.298
10.0%		8.139
2.5%		7.870
0.5%		7.032
0.0%	minimum	6.712

Moments

Mean	8.4187354
Std Dev	0.2924117
Std Err Mean	0.0133467
upper 95% Mean	8.4449607
lower 95% Mean	8.3925101
N	480

Mn wt%



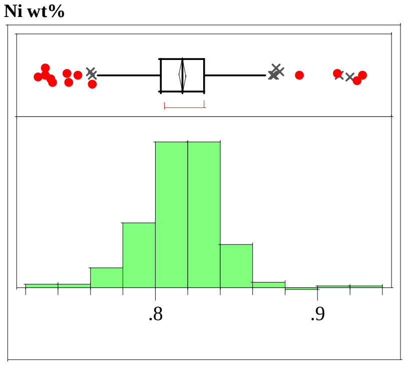
Quantiles

100.0%	maximum	1.6330
99.5%		1.6075
97.5%		1.5159
90.0%		1.4730
75.0%	quartile	1.4518
50.0%	median	1.4325
25.0%	quartile	1.4083
10.0%		1.3791
2.5%		1.3300
0.5%		1.2822
0.0%	minimum	1.2670

Moments

Mean	1.4298833
Std Dev	0.0437338
Std Err Mean	0.0019962
upper 95% Mean	1.4338057
lower 95% Mean	1.425961
N	480

Ni wt%



Quantiles

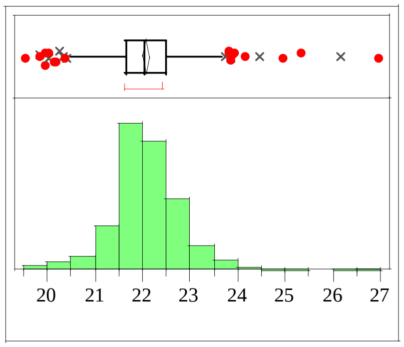
100.0%	maximum	0.92800
99.5%		0.92257
97.5%		0.86495
90.0%		0.84400
75.0%	quartile	0.83000
50.0%	median	0.81700
25.0%	quartile	0.80300
10.0%		0.78900
2.5%		0.76600
0.5%		0.73300
0.0%	minimum	0.72800

Moments

Mean	0.8166562
Std Dev	0.0252176
Std Err Mean	0.001151
upper 95% Mean	0.8189179
lower 95% Mean	0.8143946
N	480

Exhibit A8. Histograms and Descriptive Statistics for All ARG-1 Cold Chem Data

Si wt%



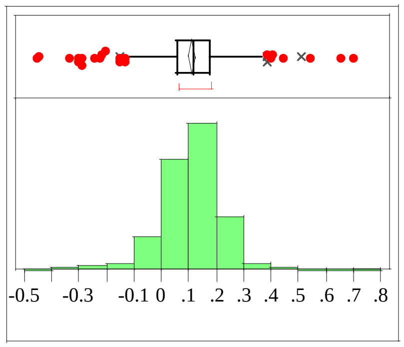
Quantiles

100.0%	maximum	26.974
99.5%		25.827
97.5%		23.818
90.0%		22.920
75.0%	quartile	22.486
50.0%	median	22.039
25.0%	quartile	21.656
10.0%		21.283
2.5%		20.380
0.5%		19.830
0.0%	minimum	19.541

Moments

Mean	22.08754
Std Dev	0.7925825
Std Err Mean	0.0361763
upper 95% Mean	22.158623
lower 95% Mean	22.016456
N	480

U wt%



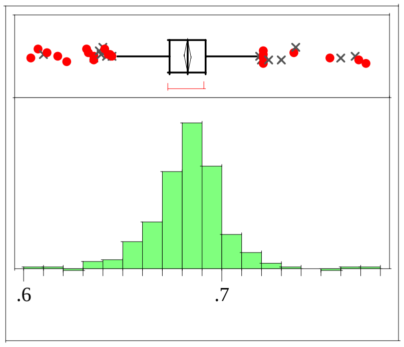
Quantiles

100.0%	maximum	0.7030
99.5%		0.6124
97.5%		0.3608
90.0%		0.2396
75.0%	quartile	0.1780
50.0%	median	0.1150
25.0%	quartile	0.0560
10.0%		-0.0119
2.5%		-0.1529
0.5%		-0.3978
0.0%	minimum	-0.4500

Moments

Mean	0.1113583
Std Dev	0.1224947
Std Err Mean	0.0055911
upper 95% Mean	0.1223444
lower 95% Mean	0.1003722
N	480

Ti wt%



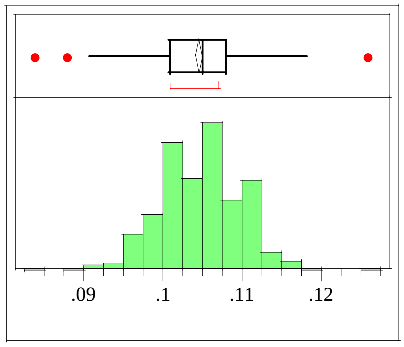
Quantiles

100.0%	maximum	0.77300
99.5%		0.76878
97.5%		0.72100
90.0%		0.70200
75.0%	quartile	0.69200
50.0%	median	0.68300
25.0%	quartile	0.67400
10.0%		0.65900
2.5%		0.63802
0.5%		0.60881
0.0%	minimum	0.60400

Moments

Mean	0.6825833
Std Dev	0.0201457
Std Err Mean	0.0009195
upper 95% Mean	0.6843901
lower 95% Mean	0.6807765
N	480

Zr wt%



Quantiles

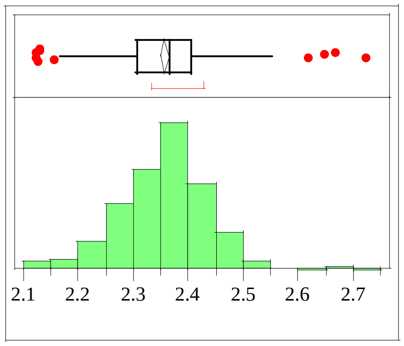
100.0%	maximum	0.12600
99.5%		0.11759
97.5%		0.11400
90.0%		0.11100
75.0%	quartile	0.10800
50.0%	median	0.10500
25.0%	quartile	0.10100
10.0%		0.09800
2.5%		0.09500
0.5%		0.08921
0.0%	minimum	0.08400

Moments

Mean	0.1046187
Std Dev	0.0050598
Std Err Mean	0.0002309
upper 95% Mean	0.1050725
lower 95% Mean	0.104165
N	480

Exhibit A9. Histograms and Descriptive Statistics for ARG-1 Cold Chem Data Associated with a SRAT Batch

Al wt%



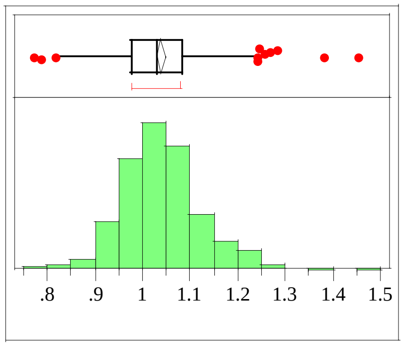
Quantiles

100.0%	maximum	2.7260
99.5%		2.6919
97.5%		2.5009
90.0%		2.4544
75.0%	quartile	2.4040
50.0%	median	2.3660
25.0%	quartile	2.3070
10.0%		2.2540
2.5%		2.1725
0.5%		2.1240
0.0%	minimum	2.1240

Moments

Mean	2.3570867
Std Dev	0.0834893
Std Err Mean	0.0046455
upper 95% Mean	2.366226
lower 95% Mean	2.3479474
N	323

Ca wt%



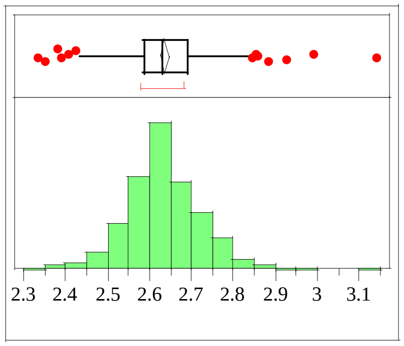
Quantiles

100.0%	maximum	1.4550
99.5%		1.4104
97.5%		1.2417
90.0%		1.1498
75.0%	quartile	1.0840
50.0%	median	1.0320
25.0%	quartile	0.9790
10.0%		0.9416
2.5%		0.8851
0.5%		0.7847
0.0%	minimum	0.7760

Moments

Mean	1.0397307
Std Dev	0.0884977
Std Err Mean	0.0049241
upper 95% Mean	1.0494182
lower 95% Mean	1.0300431
N	323

B wt%



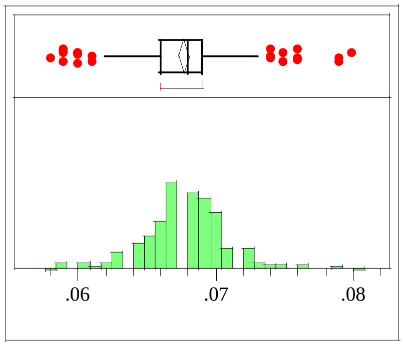
Quantiles

100.0%	maximum	3.1420
99.5%		3.0496
97.5%		2.8350
90.0%		2.7502
75.0%	quartile	2.6910
50.0%	median	2.6300
25.0%	quartile	2.5870
10.0%		2.5254
2.5%		2.4429
0.5%		2.3473
0.0%	minimum	2.3380

Moments

Mean	2.6354427
Std Dev	0.0943969
Std Err Mean	0.0052524
upper 95% Mean	2.645776
lower 95% Mean	2.6251094
N	323

Cr wt%



Quantiles

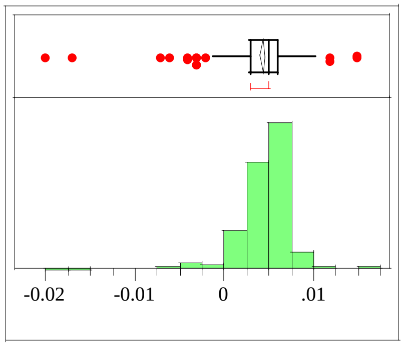
100.0%	maximum	0.08000
99.5%		0.07938
97.5%		0.07500
90.0%		0.07100
75.0%	quartile	0.06900
50.0%	median	0.06800
25.0%	quartile	0.06600
10.0%		0.06400
2.5%		0.06000
0.5%		0.05862
0.0%	minimum	0.05800

Moments

Mean	0.0677059
Std Dev	0.0031804
Std Err Mean	0.000177
upper 95% Mean	0.068054
lower 95% Mean	0.0673577
N	323

Exhibit A9. Histograms and Descriptive Statistics for ARG-1 Cold Chem Data Associated with a SRAT Batch

Cu wt%



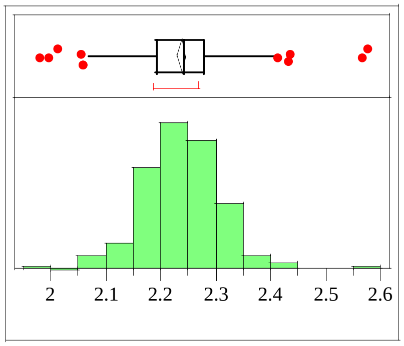
Quantiles

100.0%	maximum	0.0150
99.5%		0.0150
97.5%		0.0089
90.0%		0.0070
75.0%	quartile	0.0060
50.0%	median	0.0050
25.0%	quartile	0.0030
10.0%		0.0020
2.5%		-0.0030
0.5%		-0.0181
0.0%	minimum	-0.0200

Moments

Mean	0.0043189
Std Dev	0.0031318
Std Err Mean	0.0001743
upper 95% Mean	0.0046617
lower 95% Mean	0.0039761
N	323

K wt%



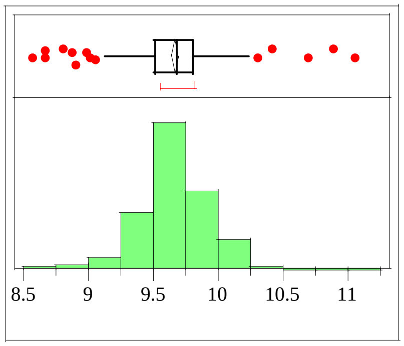
Quantiles

100.0%	maximum	2.5780
99.5%		2.5730
97.5%		2.3840
90.0%		2.3242
75.0%	quartile	2.2780
50.0%	median	2.2420
25.0%	quartile	2.1930
10.0%		2.1530
2.5%		2.0792
0.5%		1.9919
0.0%	minimum	1.9820

Moments

Mean	2.2380155
Std Dev	0.0748142
Std Err Mean	0.0041628
upper 95% Mean	2.2462052
lower 95% Mean	2.2298258
N	323

Fe wt%



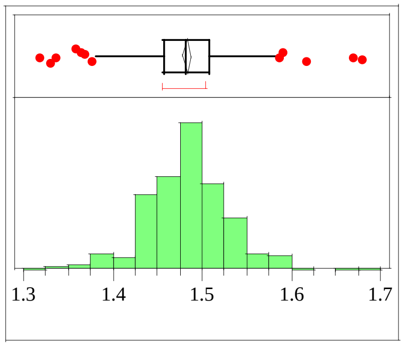
Quantiles

100.0%	maximum	11.064
99.5%		10.961
97.5%		10.194
90.0%		10.002
75.0%	quartile	9.809
50.0%	median	9.676
25.0%	quartile	9.520
10.0%		9.347
2.5%		9.028
0.5%		8.633
0.0%	minimum	8.575

Moments

Mean	9.6671331
Std Dev	0.2861554
Std Err Mean	0.0159221
upper 95% Mean	9.6984576
lower 95% Mean	9.6358086
N	323

Li wt%



Quantiles

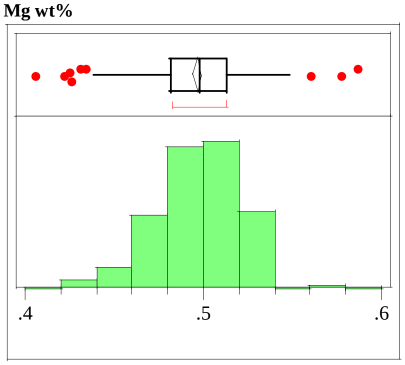
100.0%	maximum	1.6800
99.5%		1.6738
97.5%		1.5787
90.0%		1.5380
75.0%	quartile	1.5090
50.0%	median	1.4820
25.0%	quartile	1.4570
10.0%		1.4300
2.5%		1.3821
0.5%		1.3268
0.0%	minimum	1.3200

Moments

Mean	1.4830712
Std Dev	0.0474279
Std Err Mean	0.002639
upper 95% Mean	1.488263
lower 95% Mean	1.4778794
N	323

Exhibit A9. Histograms and Descriptive Statistics for ARG-1 Cold Chem Data Associated with a SRAT Batch

Mg wt%



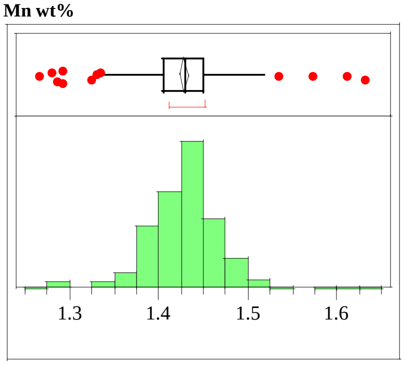
Quantiles

100.0%	maximum	0.58700
99.5%		0.58142
97.5%		0.53390
90.0%		0.52560
75.0%	quartile	0.51300
50.0%	median	0.49800
25.0%	quartile	0.48200
10.0%		0.46700
2.5%		0.44310
0.5%		0.41692
0.0%	minimum	0.40700

Moments

Mean	0.4967895
Std Dev	0.0241455
Std Err Mean	0.0013435
upper 95% Mean	0.4994326
lower 95% Mean	0.4941463
N	323

Mn wt%



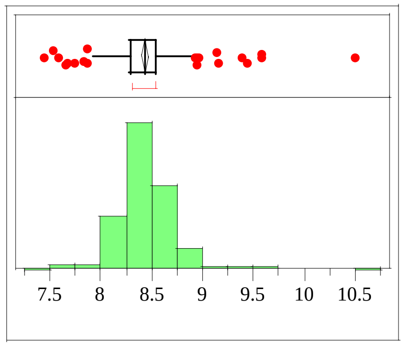
Quantiles

100.0%	maximum	1.6330
99.5%		1.6200
97.5%		1.5037
90.0%		1.4736
75.0%	quartile	1.4500
50.0%	median	1.4300
25.0%	quartile	1.4060
10.0%		1.3804
2.5%		1.3364
0.5%		1.2757
0.0%	minimum	1.2670

Moments

Mean	1.4282972
Std Dev	0.041983
Std Err Mean	0.002336
upper 95% Mean	1.432893
lower 95% Mean	1.4237015
N	323

Na wt%



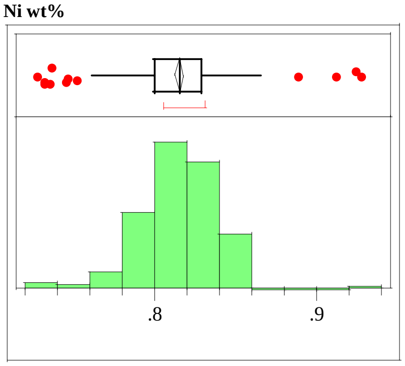
Quantiles

100.0%	maximum	10.514
99.5%		9.947
97.5%		8.978
90.0%		8.725
75.0%	quartile	8.544
50.0%	median	8.426
25.0%	quartile	8.297
10.0%		8.152
2.5%		7.873
0.5%		7.510
0.0%	minimum	7.459

Moments

Mean	8.4380526
Std Dev	0.288092
Std Err Mean	0.0160299
upper 95% Mean	8.4695891
lower 95% Mean	8.4065161
N	323

Ni wt%



Quantiles

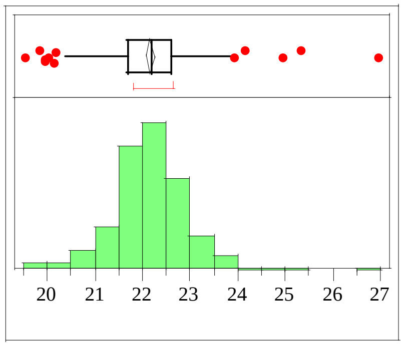
100.0%	maximum	0.92800
99.5%		0.92614
97.5%		0.85700
90.0%		0.84500
75.0%	quartile	0.82900
50.0%	median	0.81600
25.0%	quartile	0.80000
10.0%		0.78800
2.5%		0.75390
0.5%		0.73110
0.0%	minimum	0.72800

Moments

Mean	0.8151981
Std Dev	0.0255098
Std Err Mean	0.0014194
upper 95% Mean	0.8179906
lower 95% Mean	0.8124057
N	323

Exhibit A9. Histograms and Descriptive Statistics for ARG-1 Cold Chem Data Associated with a SRAT Batch

Si wt%



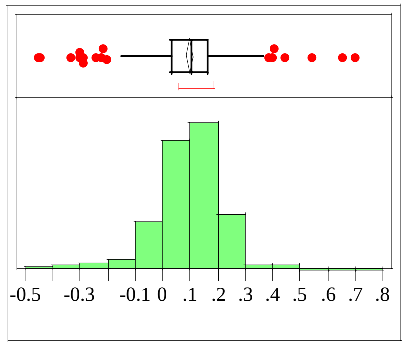
Quantiles

100.0%	maximum	26.974
99.5%		25.969
97.5%		23.838
90.0%		23.093
75.0%	quartile	22.588
50.0%	median	22.172
25.0%	quartile	21.709
10.0%		21.288
2.5%		20.404
0.5%		19.732
0.0%	minimum	19.541

Moments

Mean	22.161598
Std Dev	0.8160743
Std Err Mean	0.0454076
upper 95% Mean	22.250931
lower 95% Mean	22.072265
N	323

U wt%



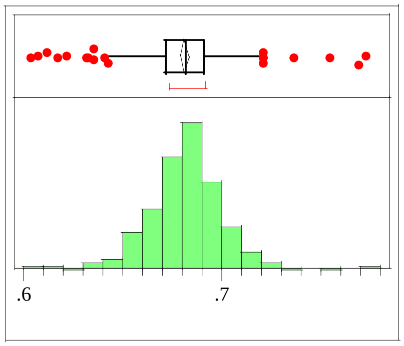
Quantiles

100.0%	maximum	0.7030
99.5%		0.6745
97.5%		0.3549
90.0%		0.2328
75.0%	quartile	0.1650
50.0%	median	0.1030
25.0%	quartile	0.0310
10.0%		-0.0334
2.5%		-0.2398
0.5%		-0.4463
0.0%	minimum	-0.4500

Moments

Mean	0.096452
Std Dev	0.1319181
Std Err Mean	0.0073401
upper 95% Mean	0.1108927
lower 95% Mean	0.0820114
N	323

Ti wt%



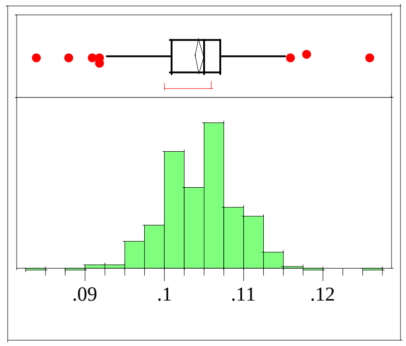
Quantiles

100.0%	maximum	0.77300
99.5%		0.77114
97.5%		0.72070
90.0%		0.70200
75.0%	quartile	0.69100
50.0%	median	0.68200
25.0%	quartile	0.67200
10.0%		0.65800
2.5%		0.63600
0.5%		0.60648
0.0%	minimum	0.60400

Moments

Mean	0.681226
Std Dev	0.0202557
Std Err Mean	0.0011271
upper 95% Mean	0.6834433
lower 95% Mean	0.6790087
N	323

Zr wt%



Quantiles

100.0%	maximum	0.12600
99.5%		0.12104
97.5%		0.11390
90.0%		0.11100
75.0%	quartile	0.10700
50.0%	median	0.10500
25.0%	quartile	0.10100
10.0%		0.09800
2.5%		0.09410
0.5%		0.08648
0.0%	minimum	0.08400

Moments

Mean	0.1043932
Std Dev	0.0049923
Std Err Mean	0.0002778
upper 95% Mean	0.1049397
lower 95% Mean	0.1038467
N	323

Exhibit A10. Components of Variance for ARG-1 Cold Chem Data Associated with a SRAT Batch

Response Al wt%
Summary of Fit

RSquare	0.625316
RSquare Adj	0.253129
Root Mean Square Error	0.07277
Mean of Response	2.35624
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	1.3256557	0.008897	1.6801
Error	150	0.7943230	0.005295	Prob > F
C. Total	299	2.1199787		0.0008

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001801	25.376
Residual	0.005295	74.624
Total	0.007096	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B wt%
Summary of Fit

RSquare	0.70023
RSquare Adj	0.402459
Root Mean Square Error	0.073561
Mean of Response	2.63438
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	1.8960237	0.012725	2.3516
Error	150	0.8116910	0.005411	Prob > F
C. Total	299	2.7077147		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.003657	40.326
Residual	0.005411	59.674
Total	0.009068	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca wt%
Summary of Fit

RSquare	0.809481
RSquare Adj	0.620232
Root Mean Square Error	0.054449
Mean of Response	1.038653
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	1.8894989	0.012681	4.2773
Error	150	0.4447110	0.002965	Prob > F
C. Total	299	2.3342099		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.004858	62.102
Residual	0.002965	37.898
Total	0.007823	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr wt%
Summary of Fit

RSquare	0.703876
RSquare Adj	0.409726
Root Mean Square Error	0.00243
Mean of Response	0.067673
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.00210599	0.000014	2.3929
Error	150	0.00088600	0.000006	Prob > F
C. Total	299	0.00299199		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000004	41.054
Residual	0.000006	58.946
Total	0.00001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu wt%
Summary of Fit

RSquare	0.945743
RSquare Adj	0.891847
Root Mean Square Error	0.001041
Mean of Response	0.004337
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.00283250	0.000019	17.5477
Error	150	0.00016250	0.000001	Prob > F
C. Total	299	0.00299500		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000009	89.217
Residual	0.000001	10.783
Total	0.00001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe wt%
Summary of Fit

RSquare	0.580876
RSquare Adj	0.164546
Root Mean Square Error	0.259474
Mean of Response	9.660673
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	13.996515	0.093936	1.3952
Error	150	10.099011	0.067327	Prob > F
C. Total	299	24.095526		0.0212

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.013305	16.501
Residual	0.067327	83.499
Total	0.080632	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A10. Components of Variance for ARG-1 Cold Chem Data Associated with a SRAT Batch

Response K wt%
Summary of Fit

RSquare	0.655459
RSquare Adj	0.313215
Root Mean Square Error	0.062387
Mean of Response	2.23771
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	1.1106713	0.007454	1.9152
Error	150	0.5838225	0.003892	Prob > F
C. Total	299	1.6944938		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.001781	31.394
Residual	0.003892	68.606
Total	0.005673	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn wt%
Summary of Fit

RSquare	0.575902
RSquare Adj	0.154631
Root Mean Square Error	0.038398
Mean of Response	1.427333
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.30032967	0.002016	1.3671
Error	150	0.22116500	0.001474	Prob > F
C. Total	299	0.52149467		0.0284

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000271	15.507
Residual	0.001474	84.493
Total	0.001745	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li wt%
Summary of Fit

RSquare	0.646925
RSquare Adj	0.296203
Root Mean Square Error	0.040234
Mean of Response	1.482897
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.44490930	0.002986	1.8446
Error	150	0.24282050	0.001619	Prob > F
C. Total	299	0.68772980		0.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000684	29.690
Residual	0.001619	70.310
Total	0.002302	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na wt%
Summary of Fit

RSquare	0.600372
RSquare Adj	0.203409
Root Mean Square Error	0.258392
Mean of Response	8.434523
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	15.045749	0.100978	1.5124
Error	150	10.014949	0.066766	Prob > F
C. Total	299	25.060699		0.0059

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.017106	20.395
Residual	0.066766	79.605
Total	0.083872	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg wt%
Summary of Fit

RSquare	0.706454
RSquare Adj	0.414866
Root Mean Square Error	0.018748
Mean of Response	0.496703
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.12688810	0.000852	2.4228
Error	150	0.05272450	0.000351	Prob > F
C. Total	299	0.17961260		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.00025	41.568
Residual	0.000351	58.432
Total	0.000602	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni wt%
Summary of Fit

RSquare	0.59347
RSquare Adj	0.189651
Root Mean Square Error	0.022666
Mean of Response	0.814423
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.11250374	0.000755	1.4696
Error	150	0.07706550	0.000514	Prob > F
C. Total	299	0.18956924		0.0096

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000121	19.017
Residual	0.000514	80.983
Total	0.000634	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A10. Components of Variance for ARG-1 Cold Chem Data Associated with a SRAT Batch

Response Si wt%
Summary of Fit

RSquare	0.700818
RSquare Adj	0.403631
Root Mean Square Error	0.636209
Mean of Response	22.15984
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	142.22005	0.954497	2.3582
Error	150	60.71431	0.404762	Prob > F
C. Total	299	202.93435		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.274867	40.444
Residual	0.404762	59.556
Total	0.679629	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti wt%
Summary of Fit

RSquare	0.58982
RSquare Adj	0.182374
Root Mean Square Error	0.018085
Mean of Response	0.68075
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.07054375	0.000473	1.4476
Error	150	0.04905850	0.000327	Prob > F
C. Total	299	0.11960225		0.0122

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000073	18.287
Residual	0.000327	81.713
Total	0.0004	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U wt%
Summary of Fit

RSquare	0.943342
RSquare Adj	0.887062
Root Mean Square Error	0.044115
Mean of Response	0.09819
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	4.8604357	0.032620	16.7615
Error	150	0.2919225	0.001946	Prob > F
C. Total	299	5.1523582		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.015337	88.740
Residual	0.001946	11.260
Total	0.017283	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr wt%
Summary of Fit

RSquare	0.782691
RSquare Adj	0.566831
Root Mean Square Error	0.003237
Mean of Response	0.104347
Observations (or Sum Wgts)	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	149	0.00566195	0.000038	3.6259
Error	150	0.00157200	0.000010	Prob > F
C. Total	299	0.00723395		<.0001

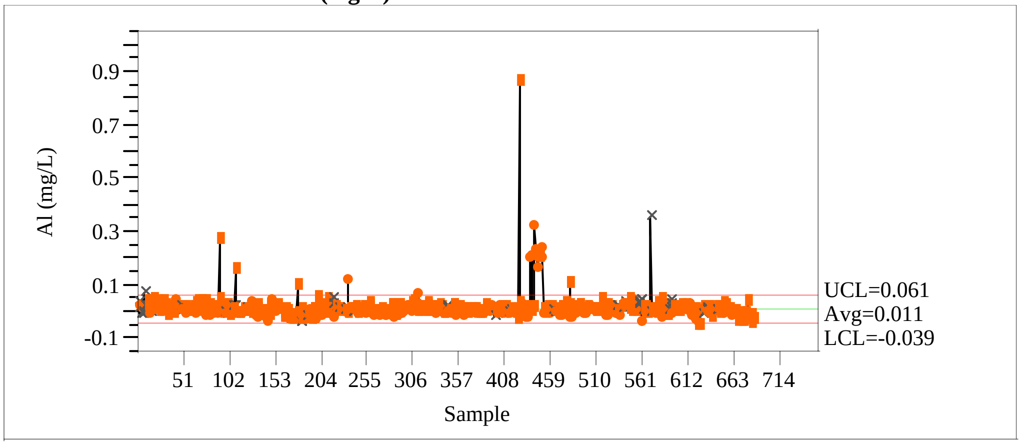
Variance Component Estimates

Component	Var Comp Est	Percent of Total
Batch&Random	0.000014	56.765
Residual	0.00001	43.235
Total	0.000024	100.000

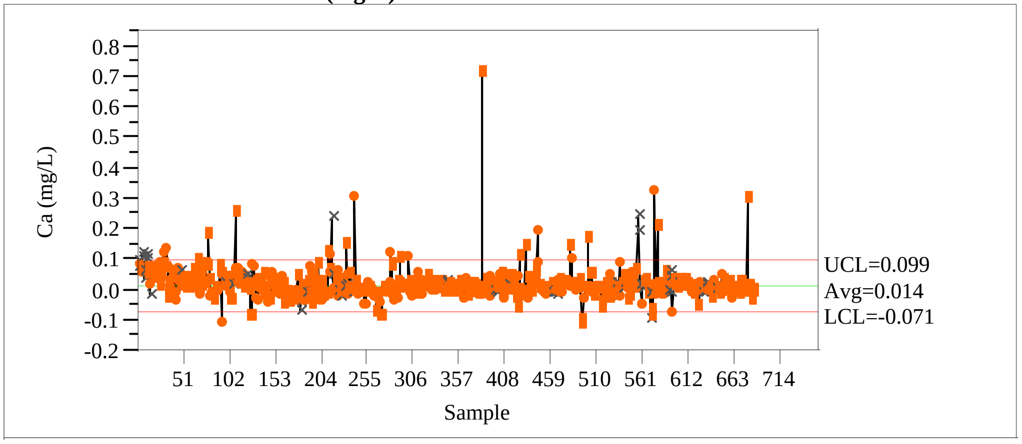
These estimates based on equating Mean Squares to Expected Value.

Exhibit A11. MA Standards in Analytical Sequence

STCd=SM32
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

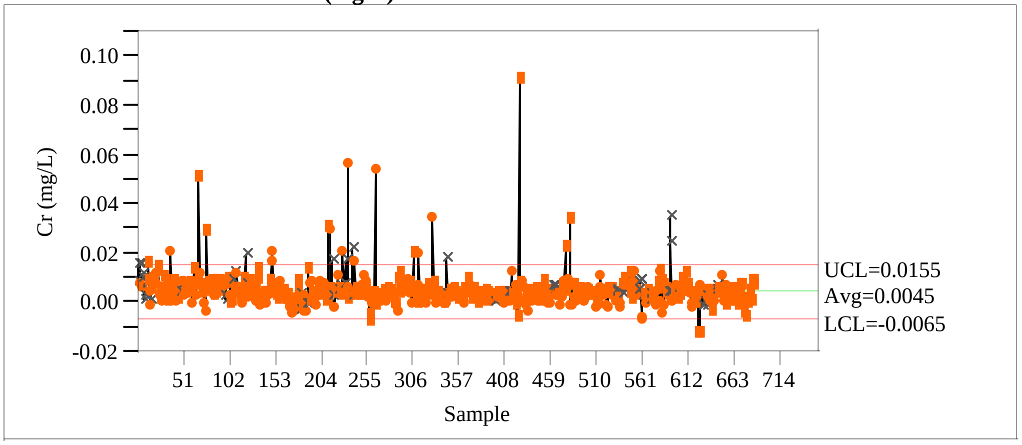
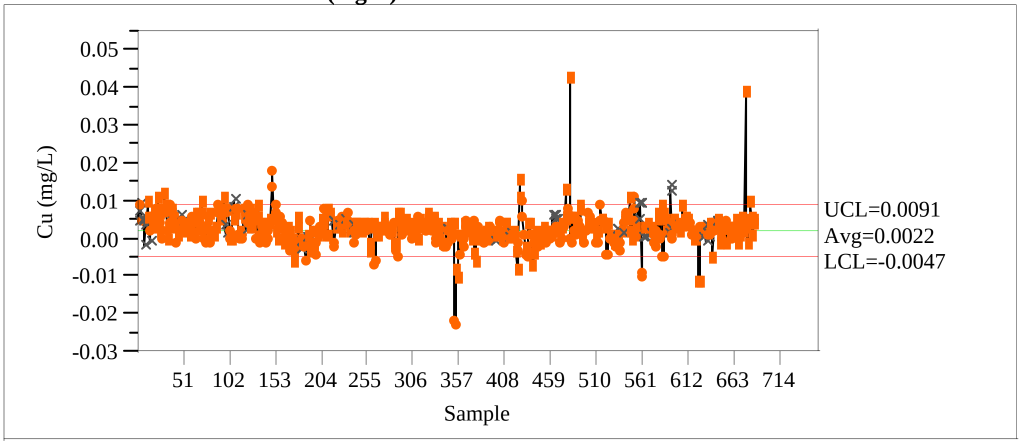
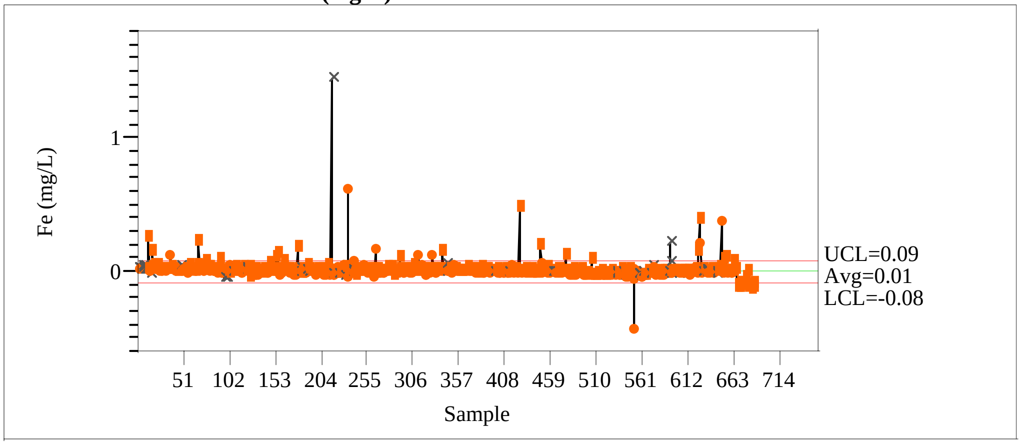


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

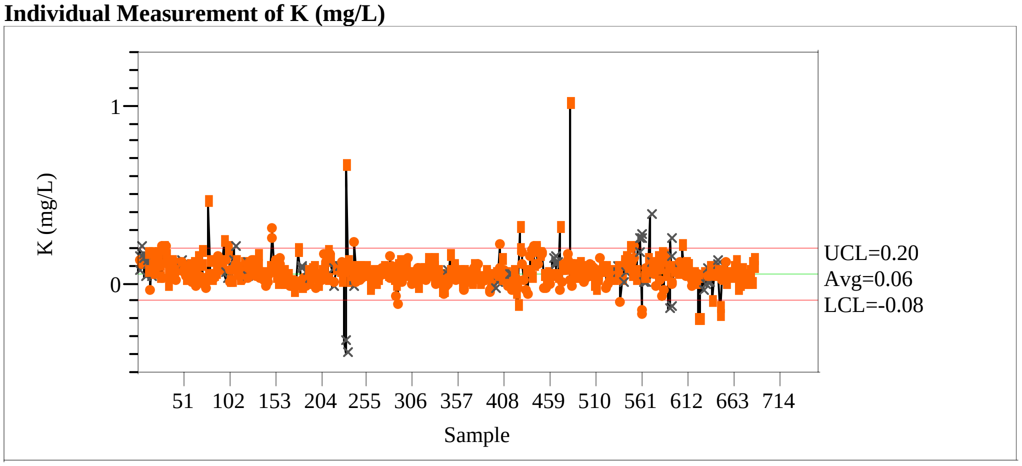
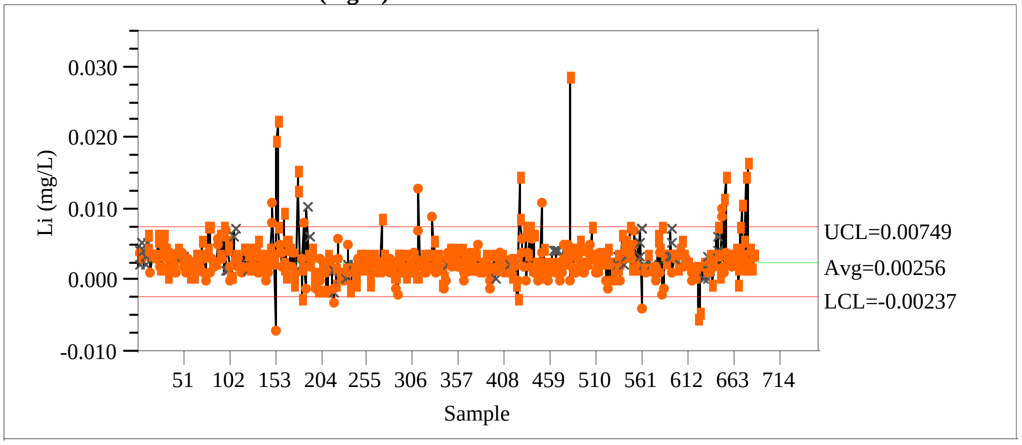
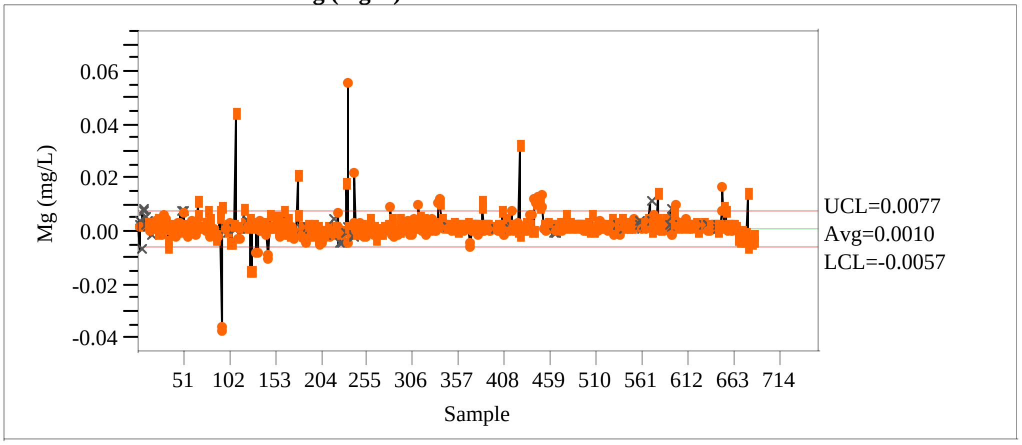


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

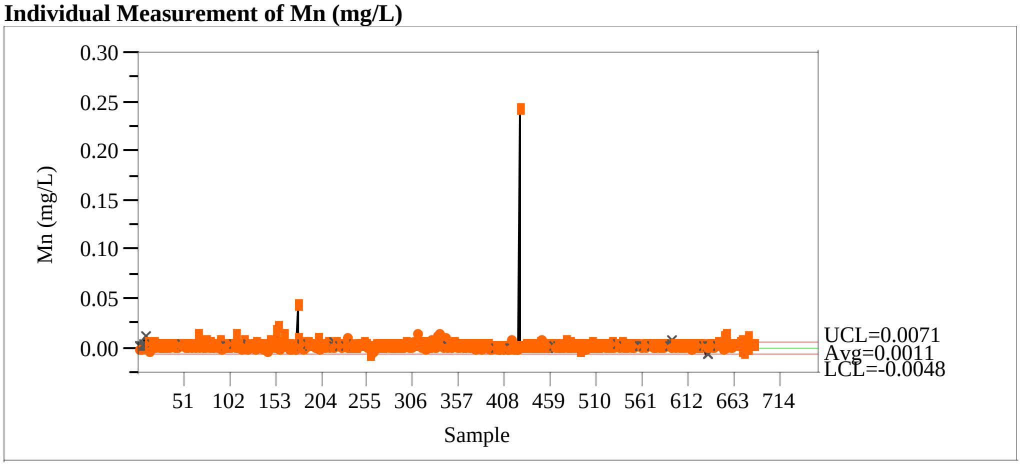
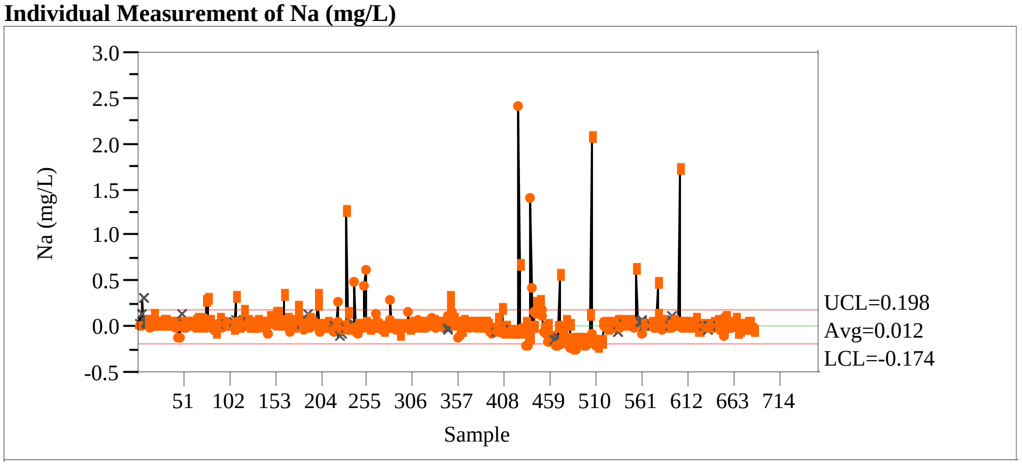
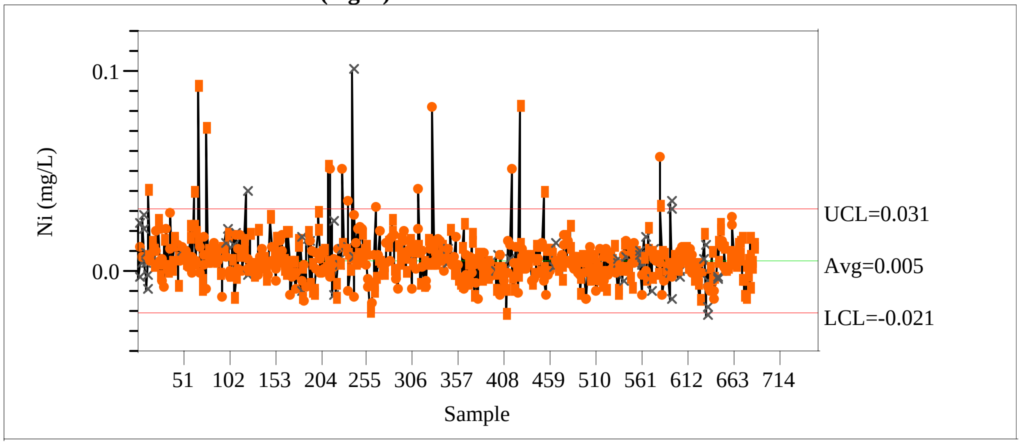


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

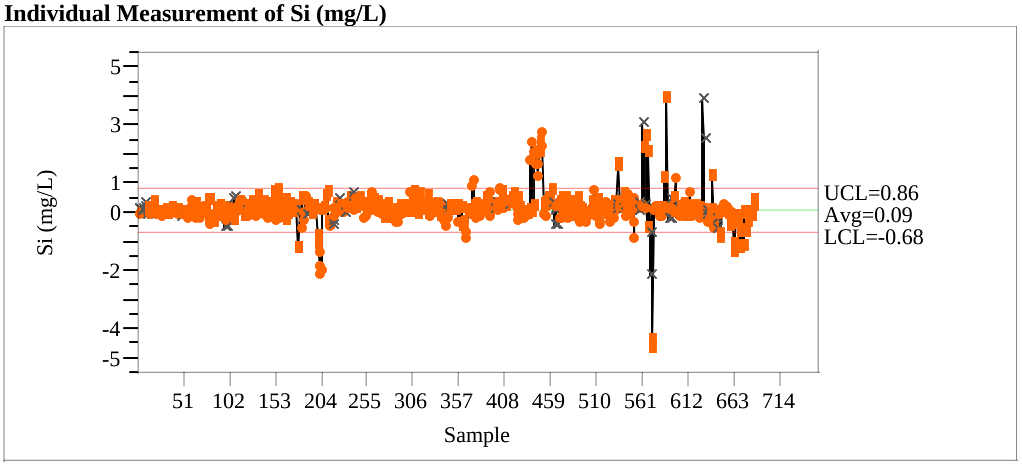
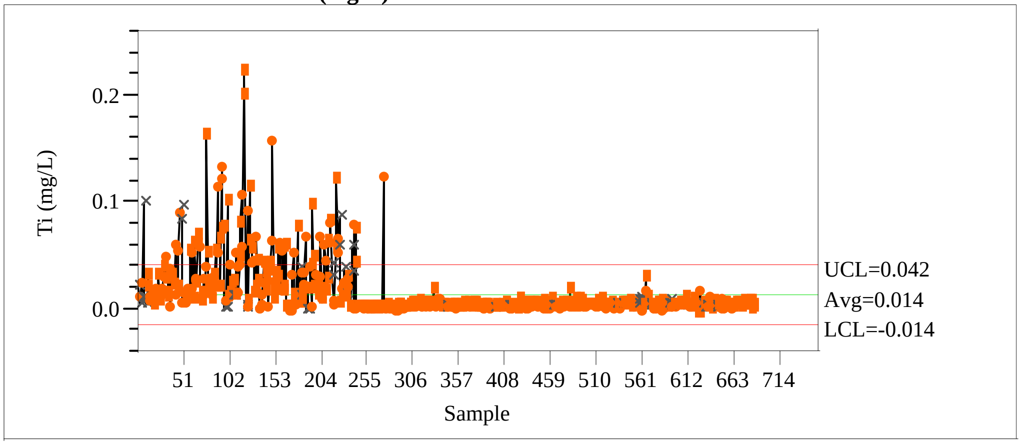
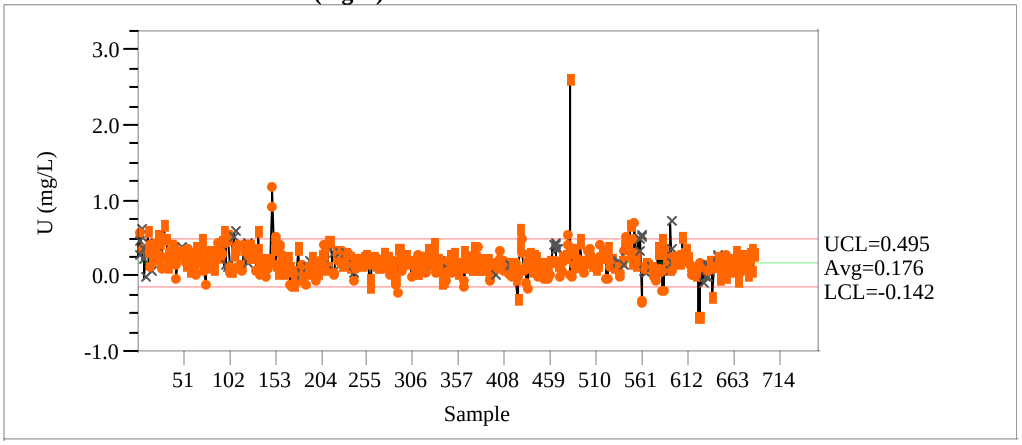


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



Individual Measurement of U (mg/L)



STCd=SM33
Control Chart
Individual Measurement of Al (mg/L)

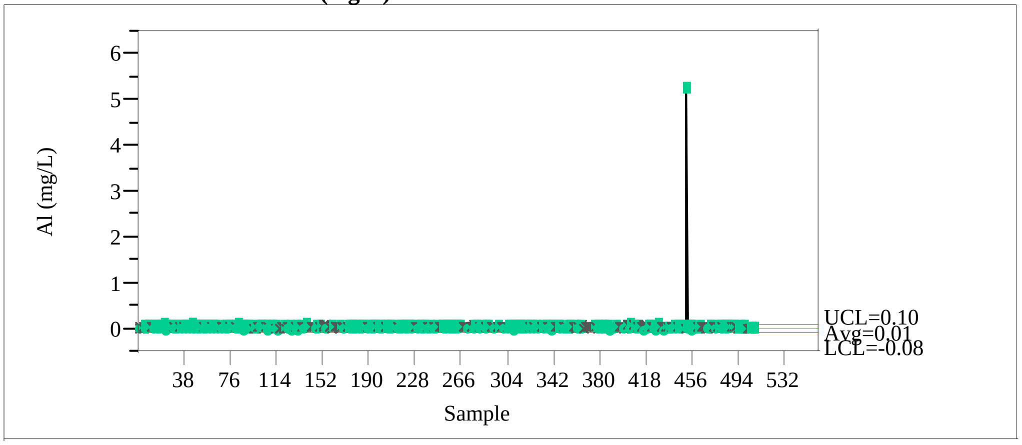
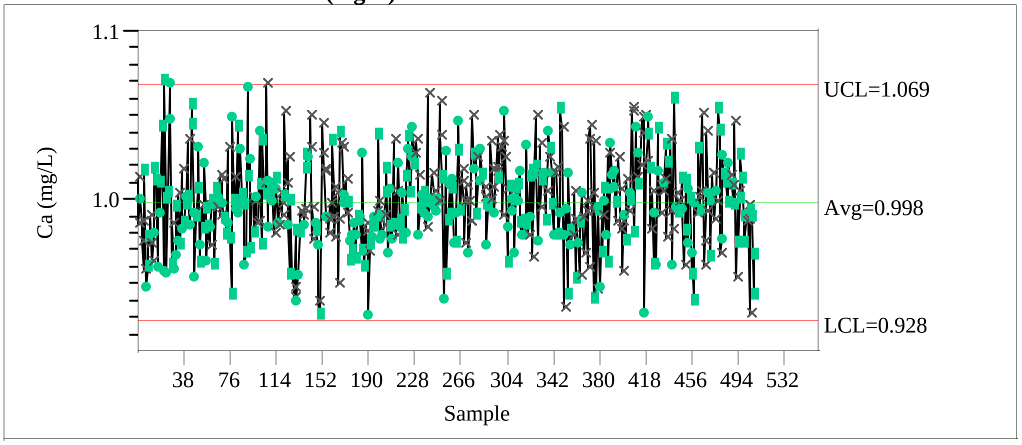
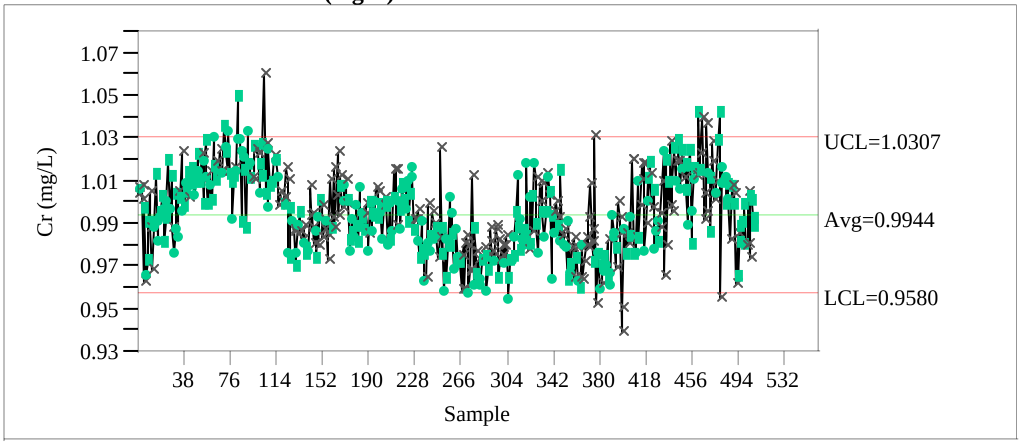


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

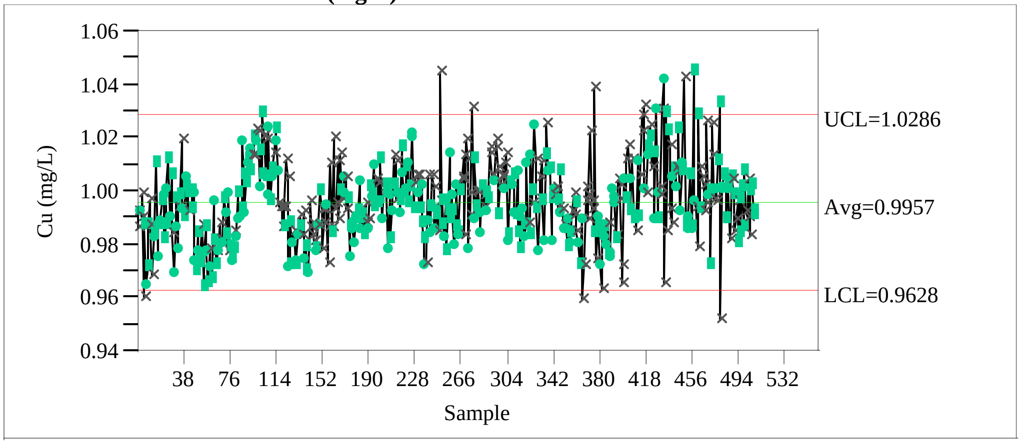
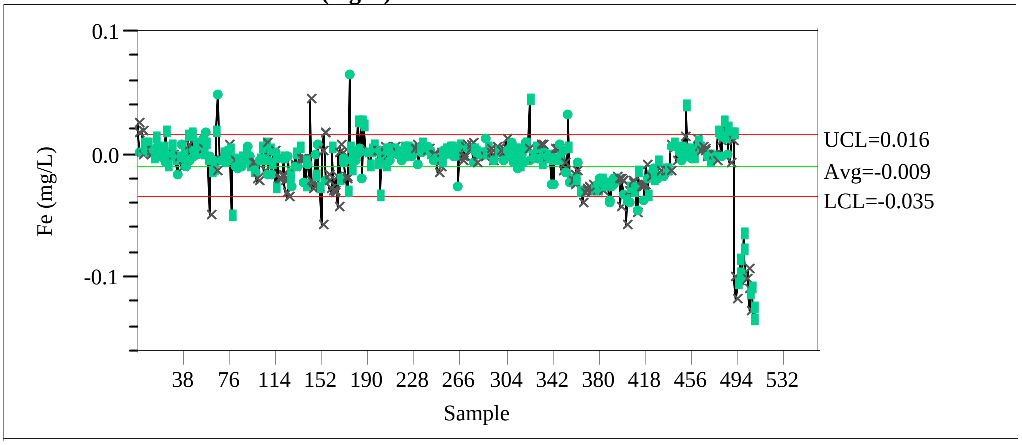
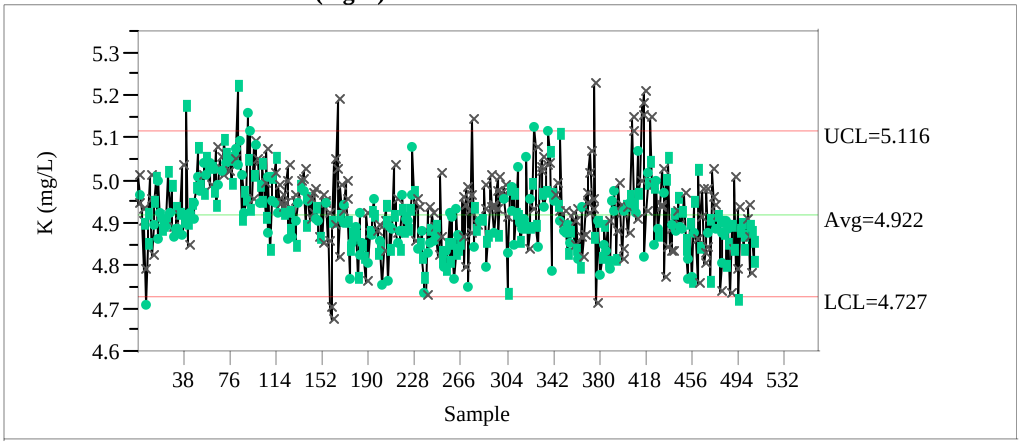


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

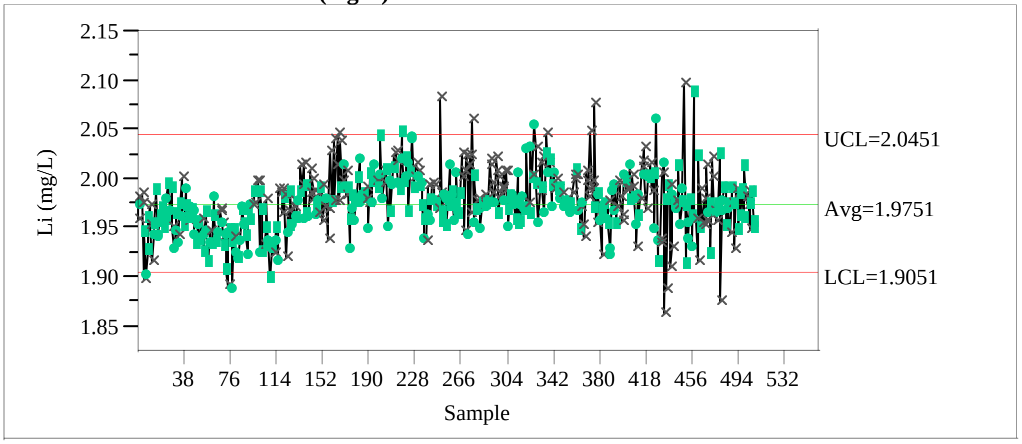
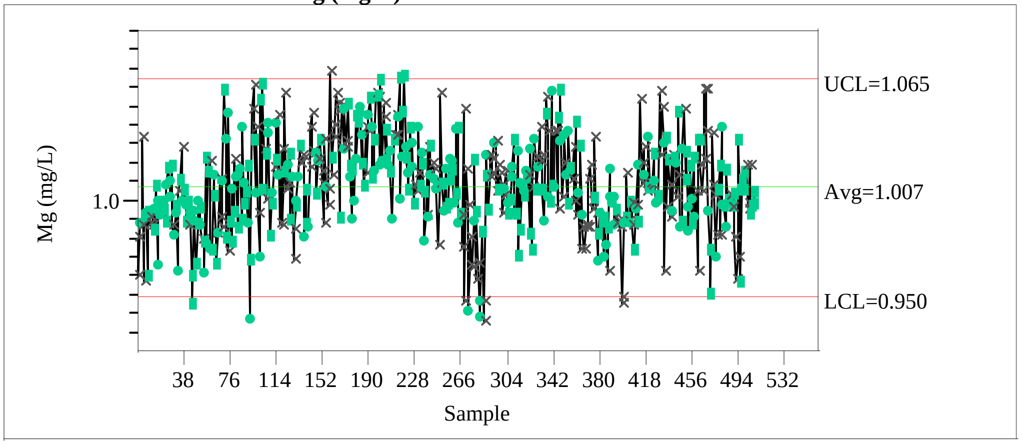
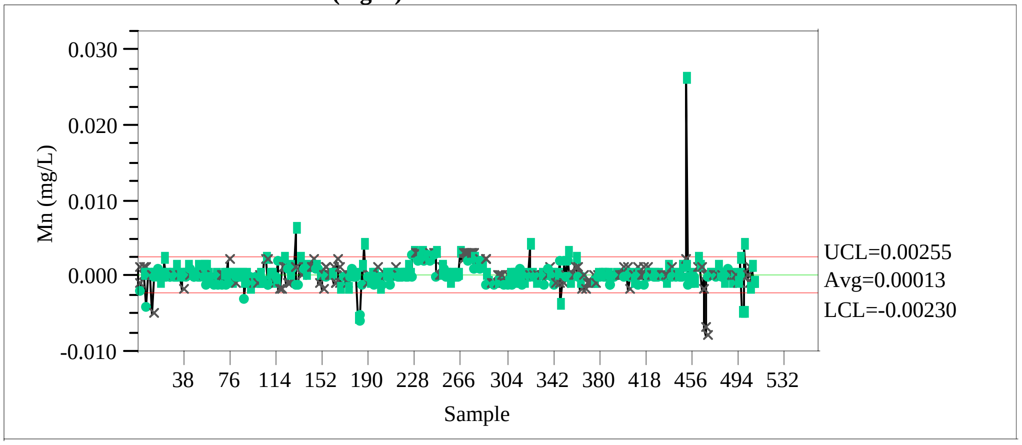


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)

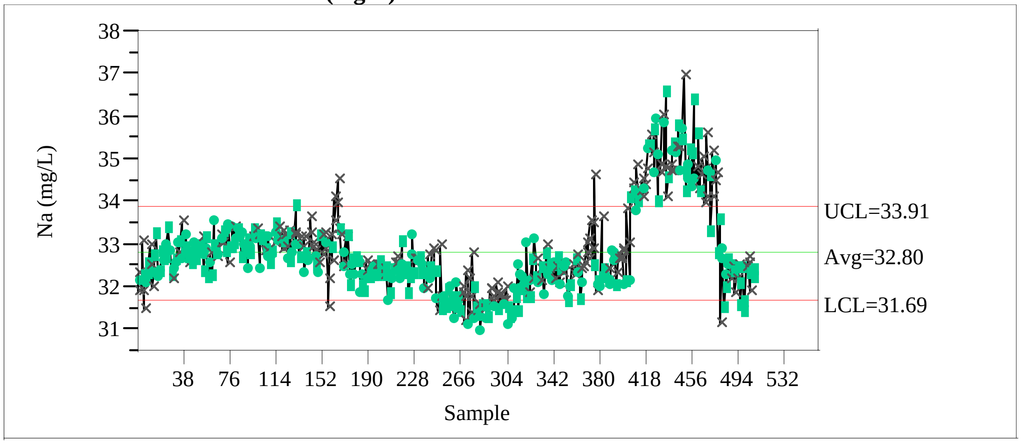
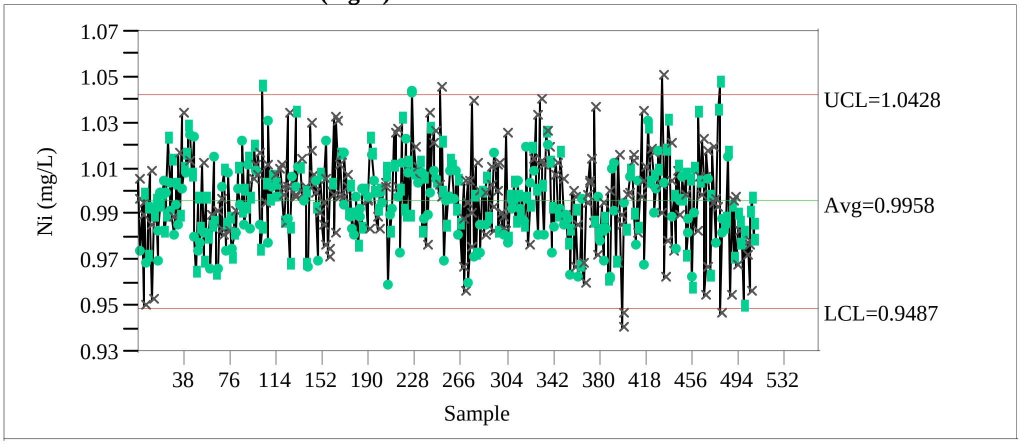
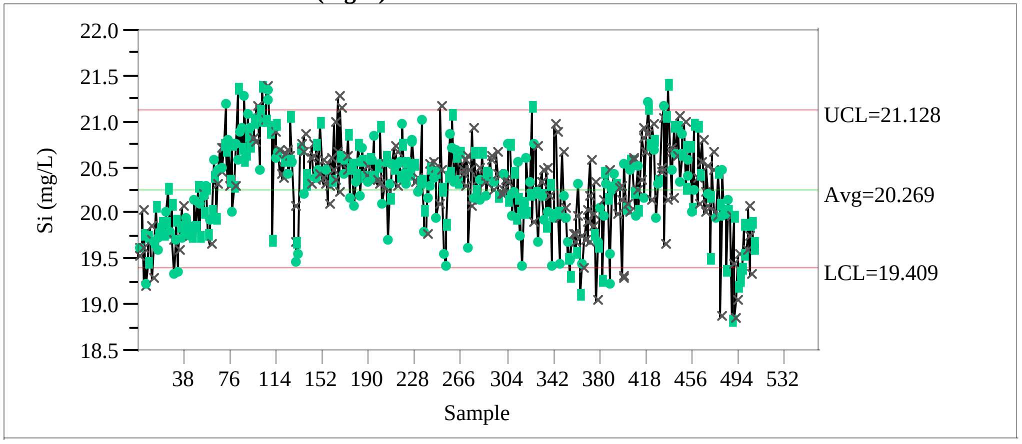


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

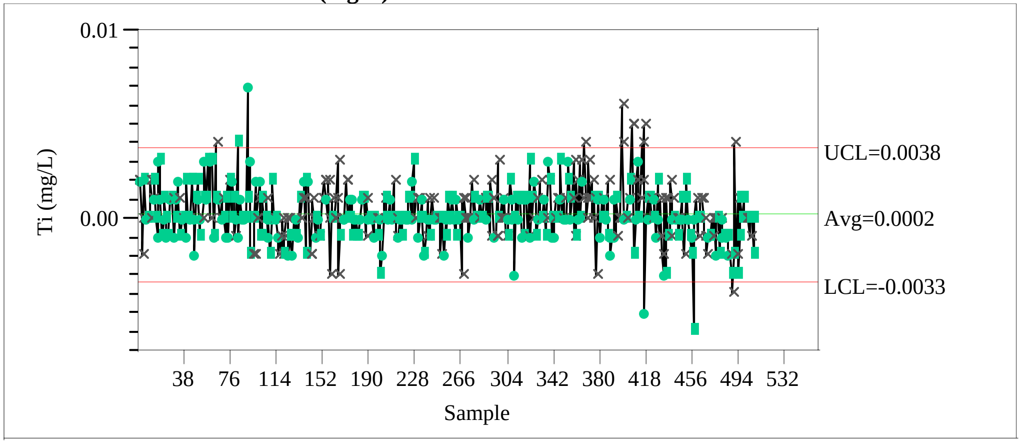
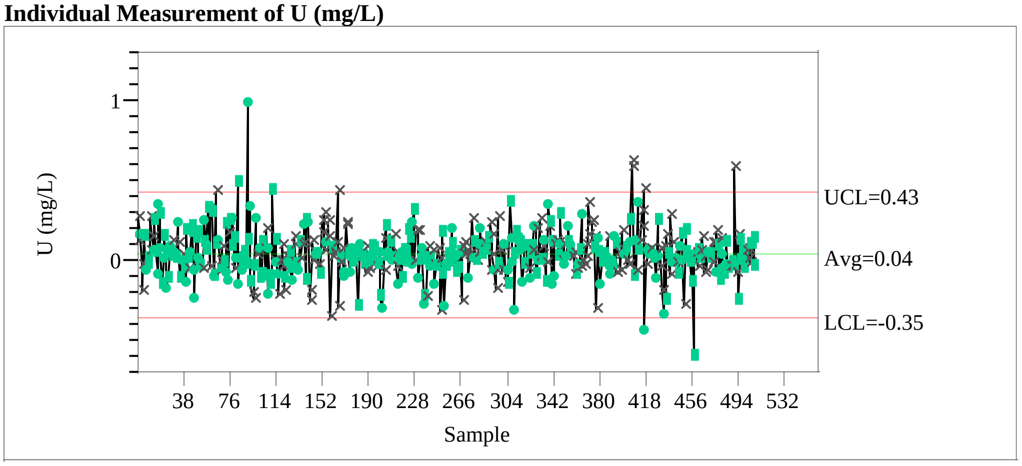
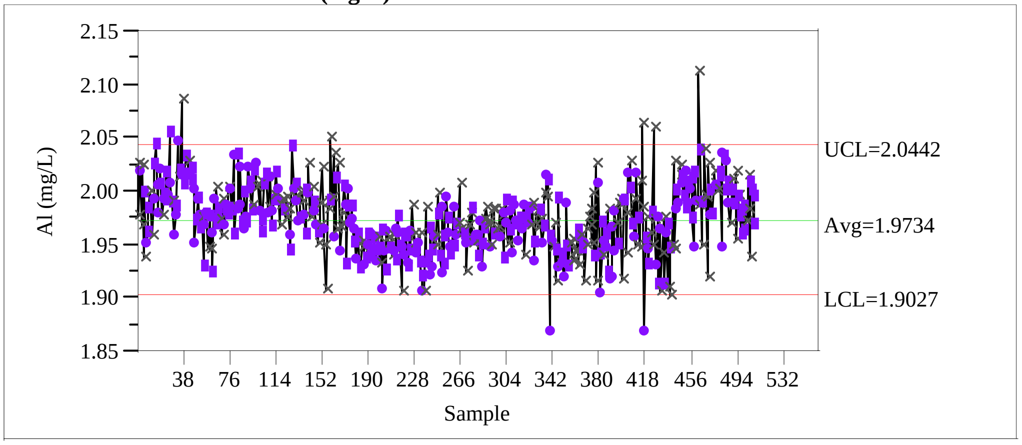


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of U (mg/L)



STCd=SM34
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of Ca (mg/L)

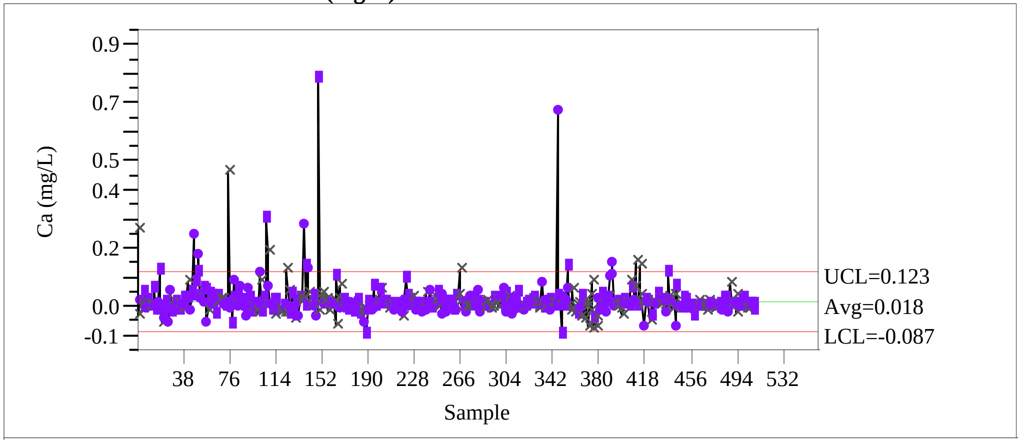
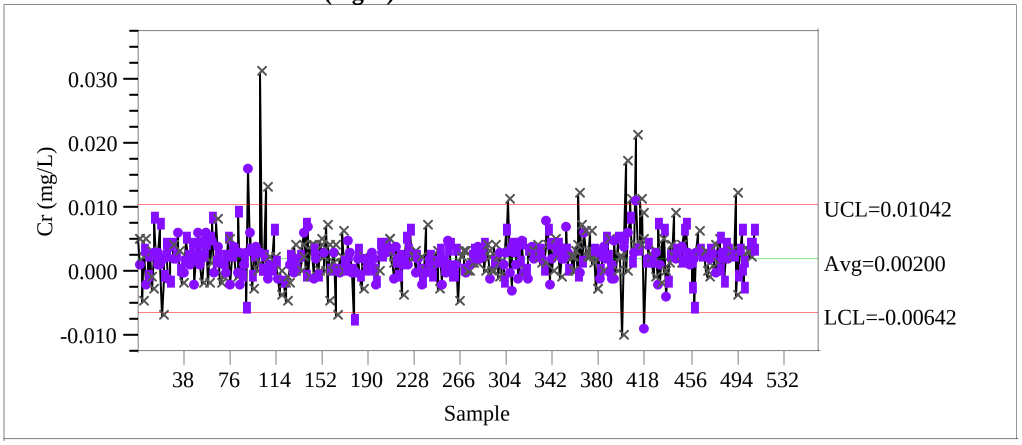
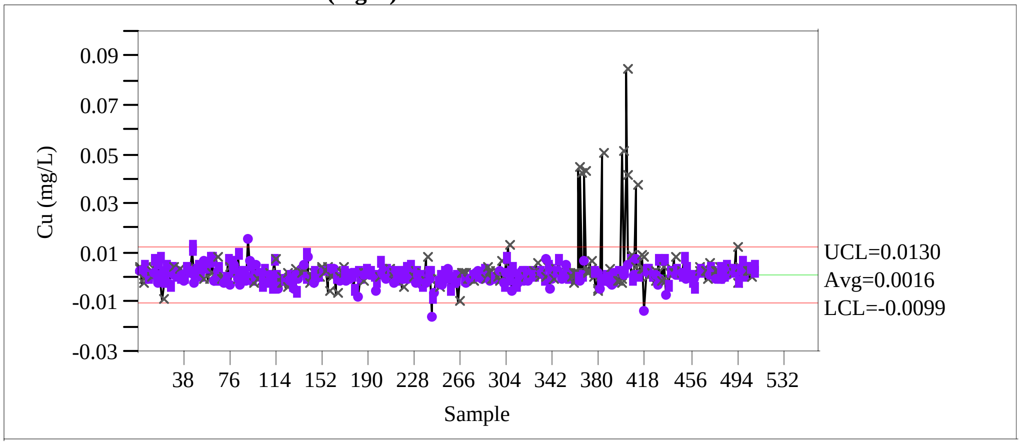


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

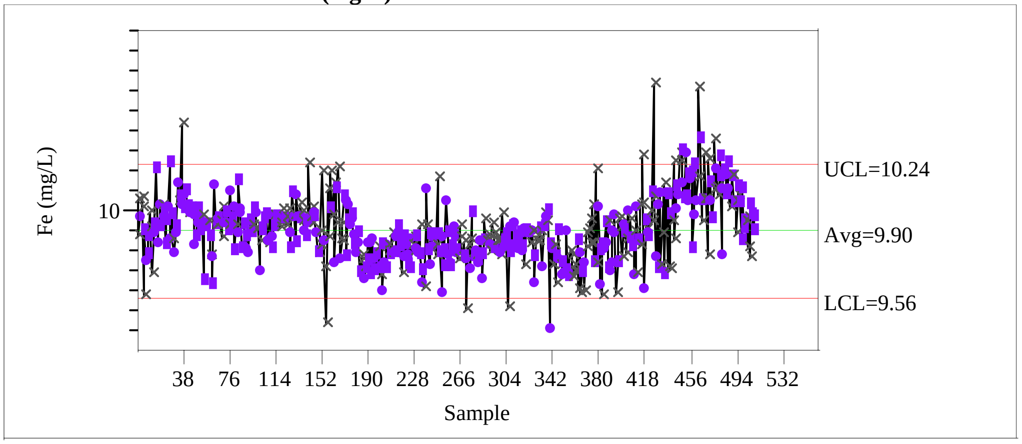
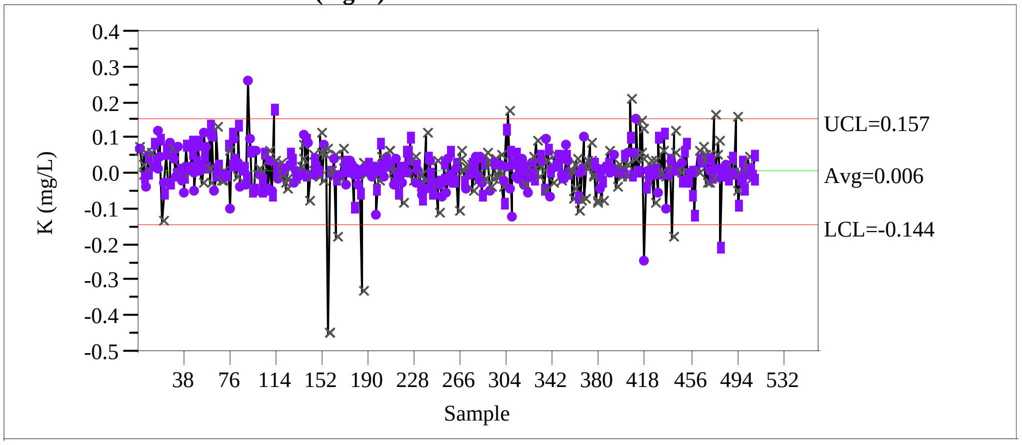
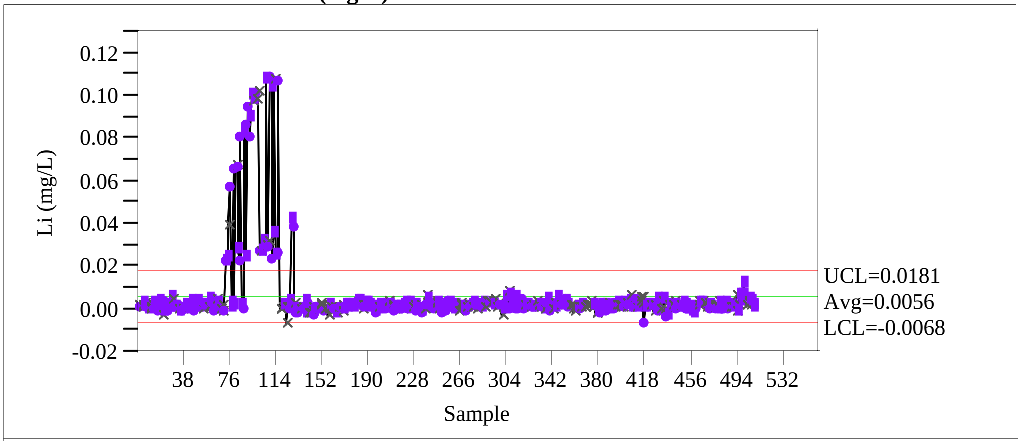


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

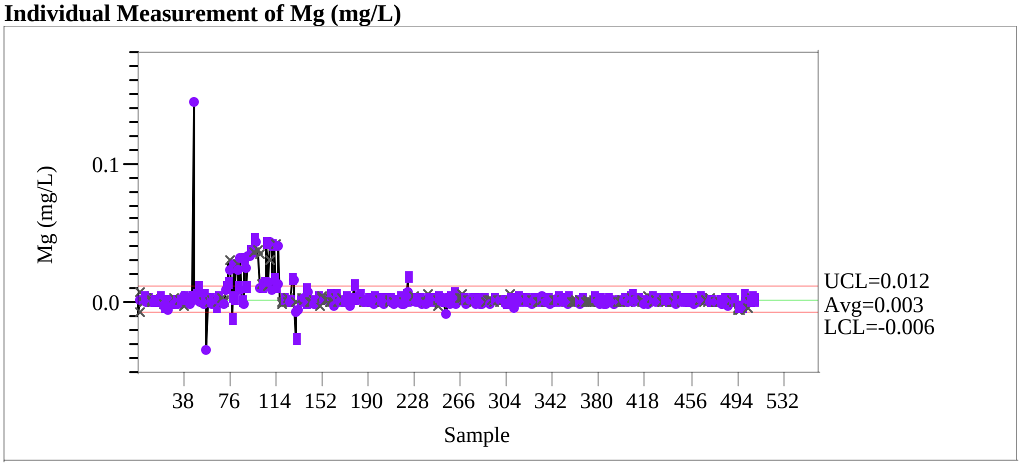
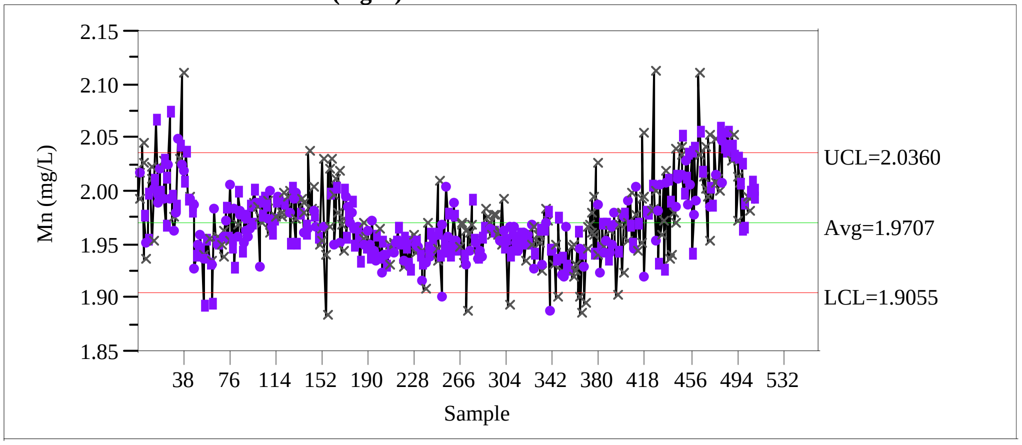
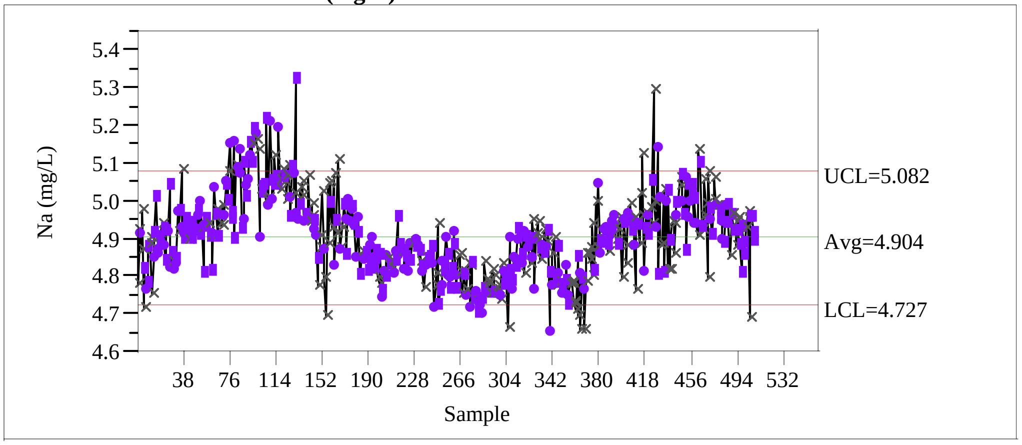


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)

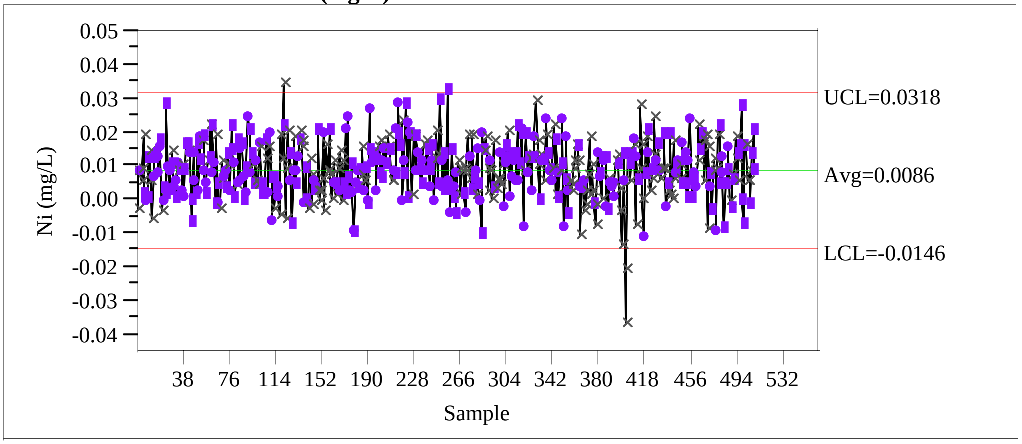
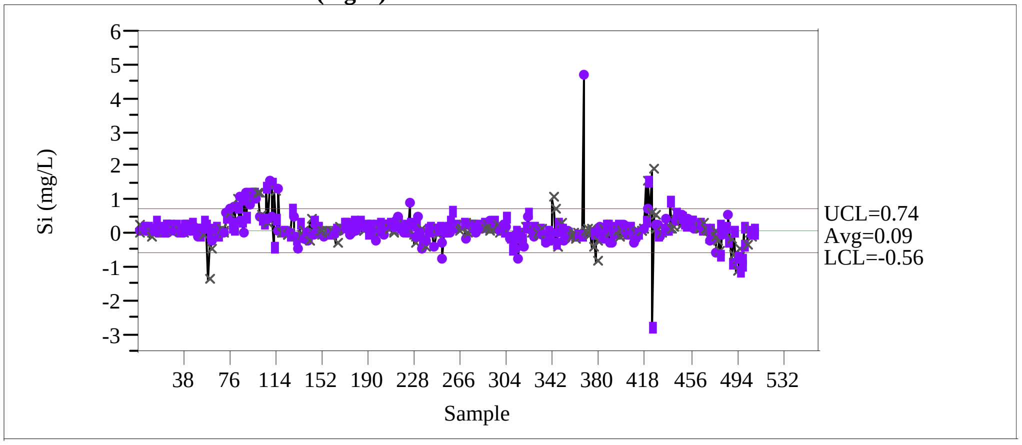
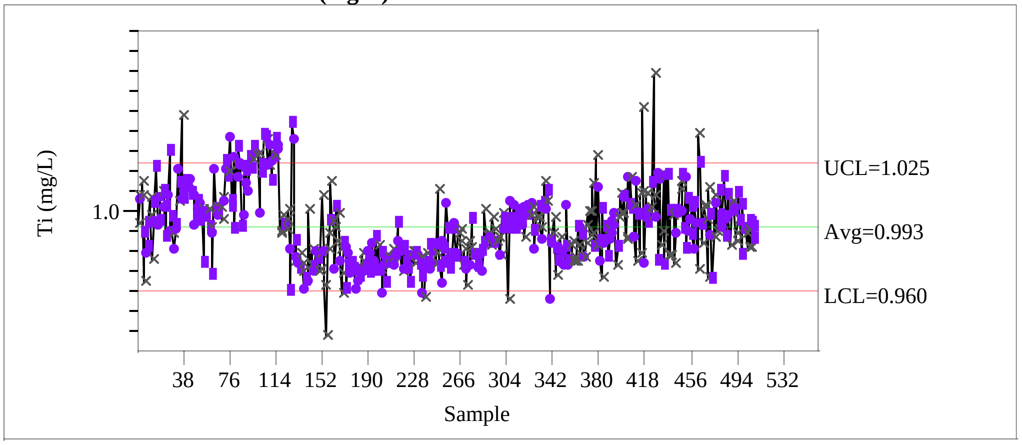


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



Individual Measurement of U (mg/L)

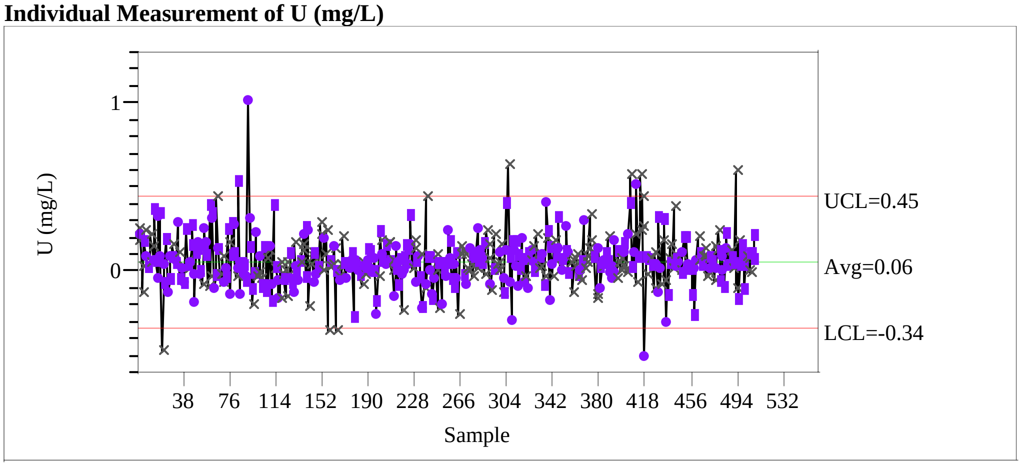
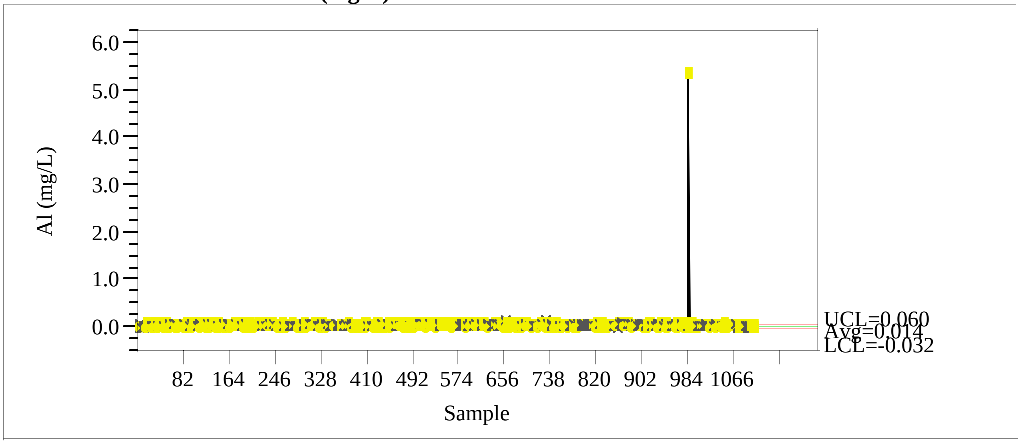
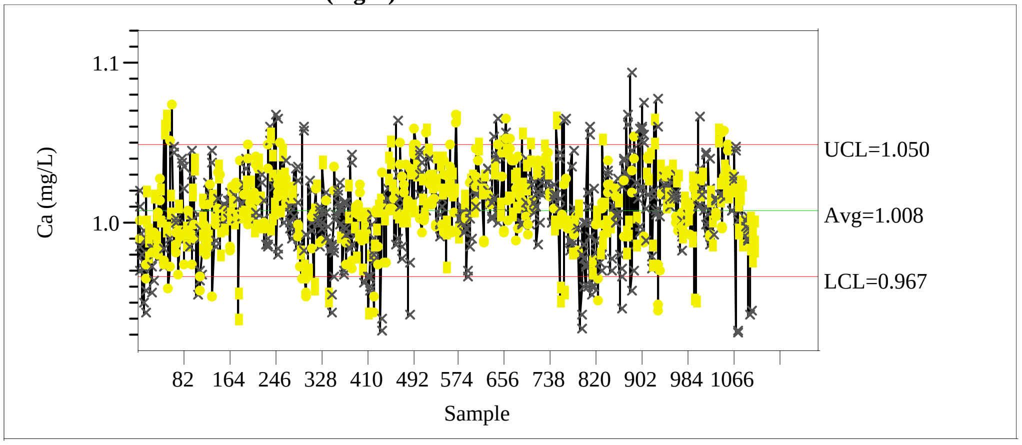


Exhibit A11. MA Standards in Analytical Sequence

STCd=SM35
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

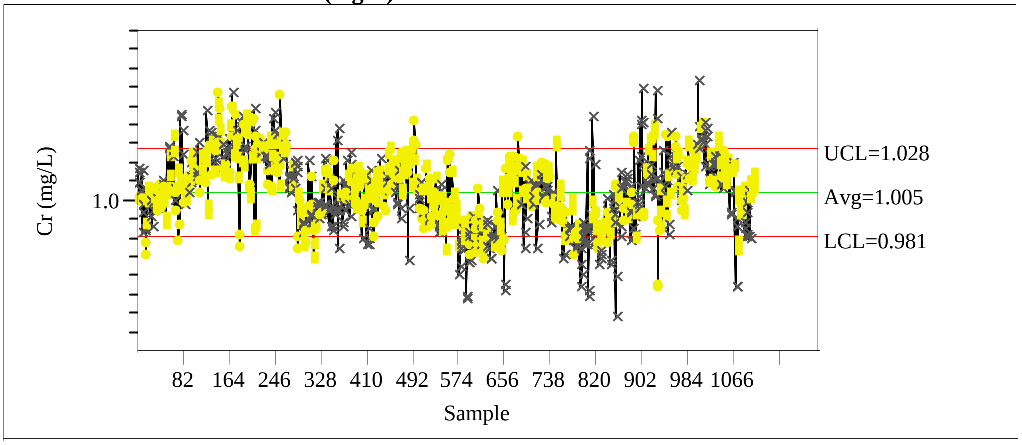
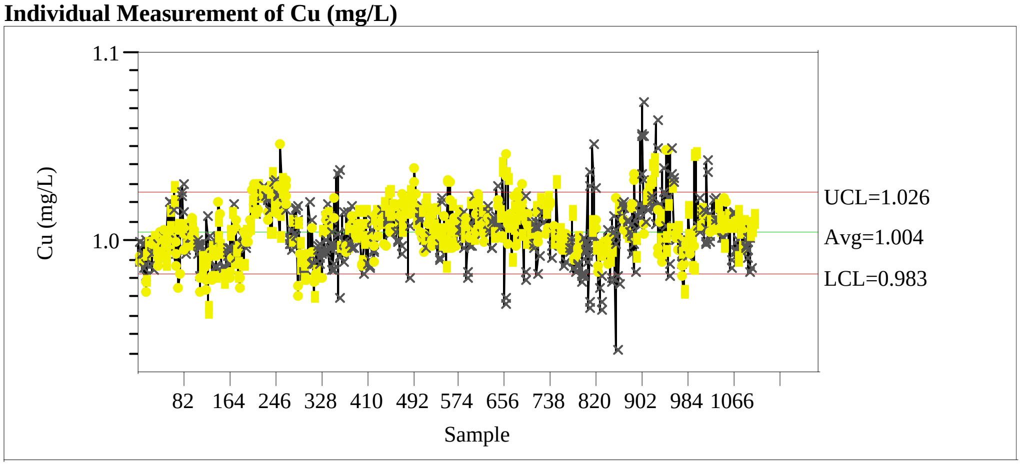
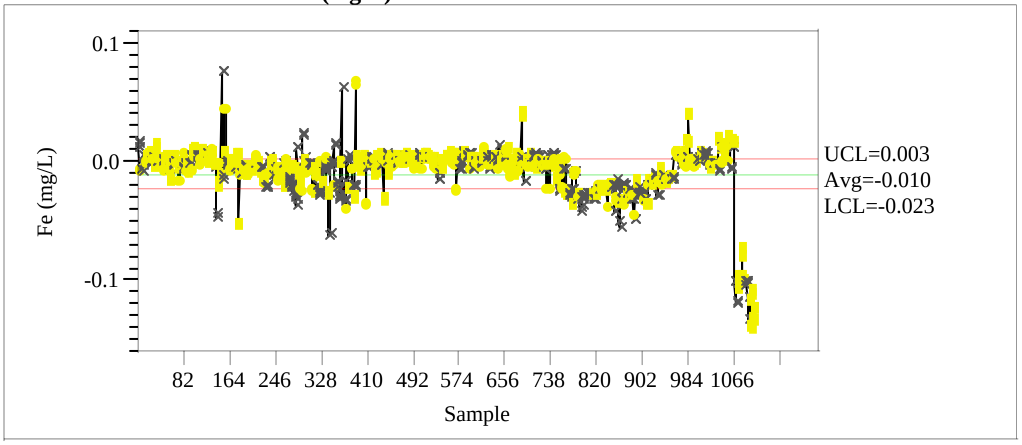


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

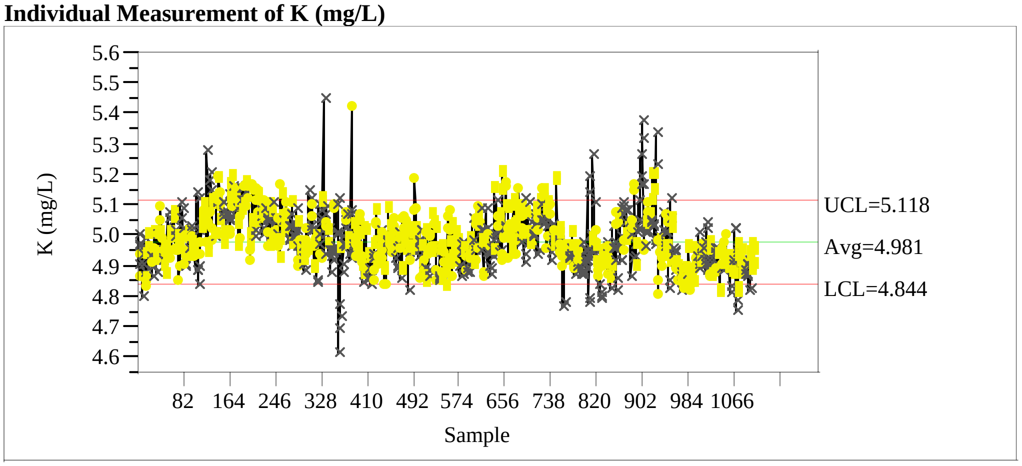
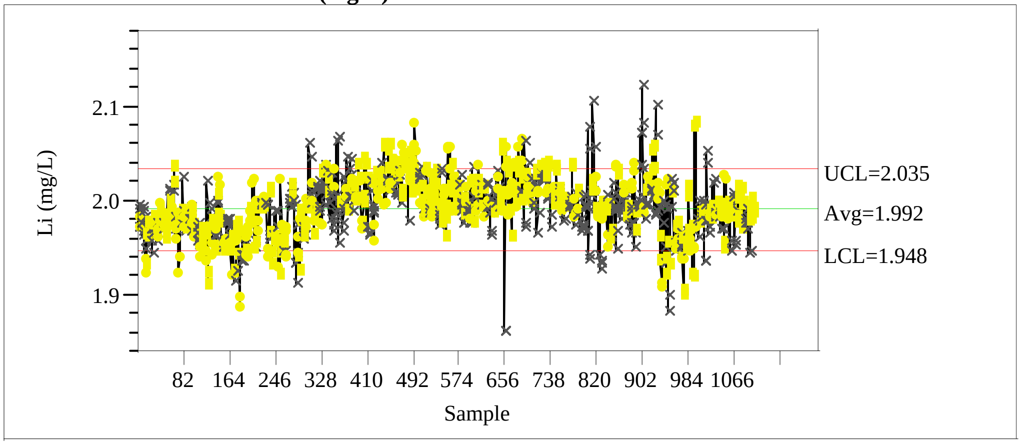
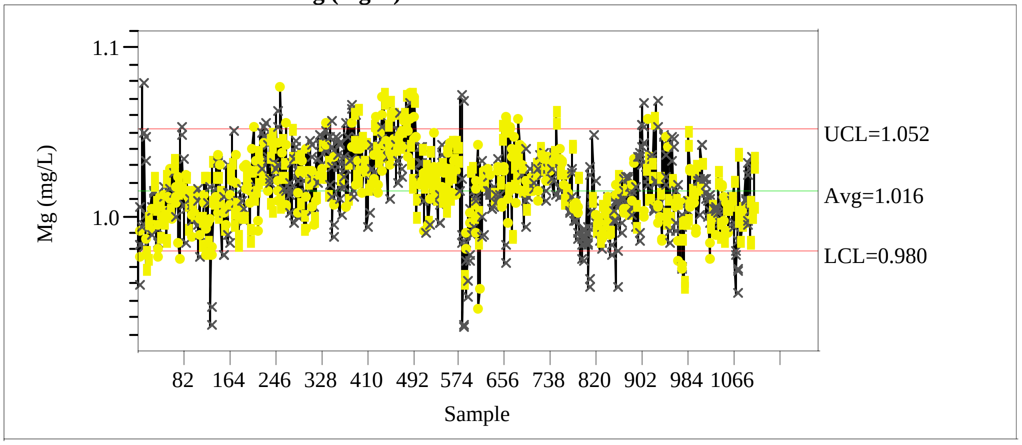


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

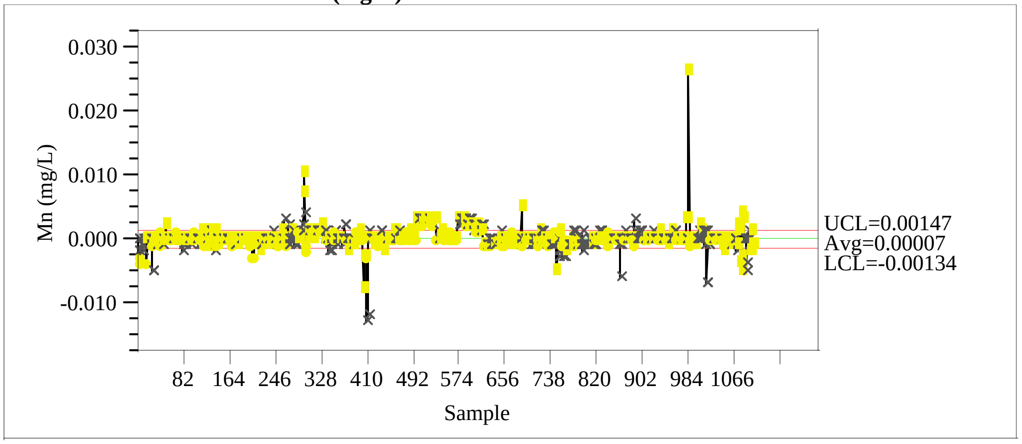
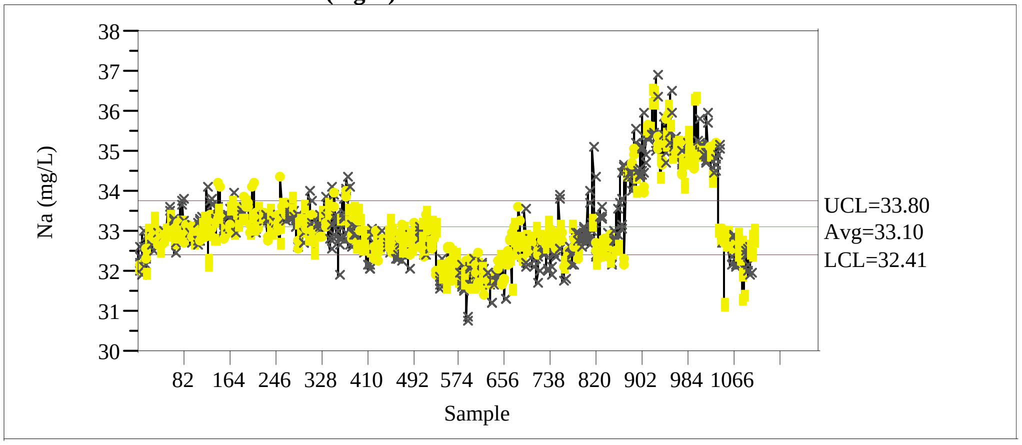
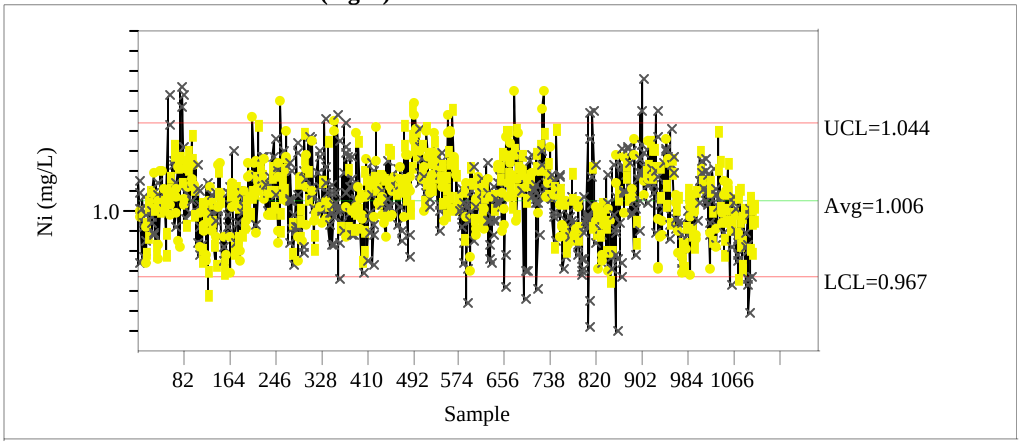


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

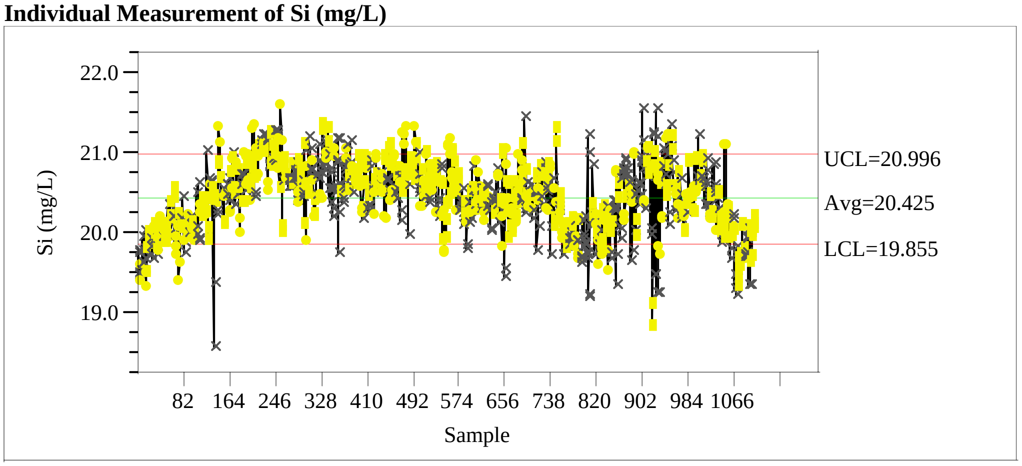
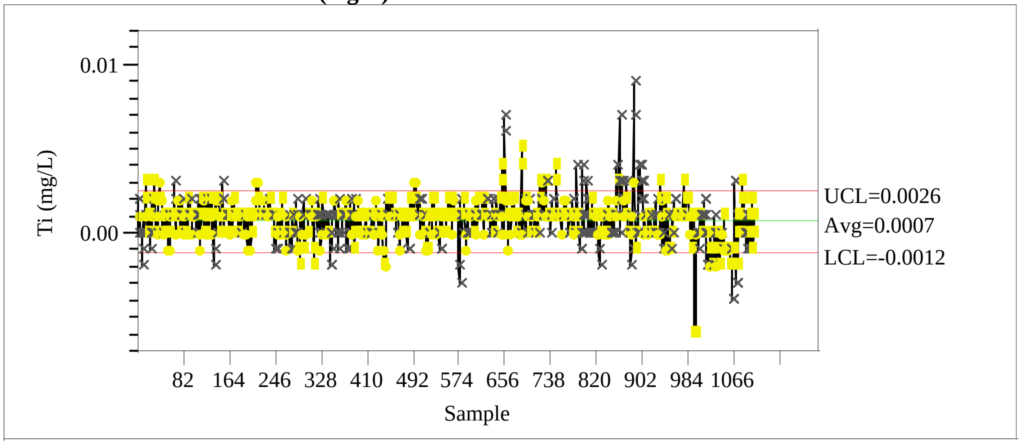
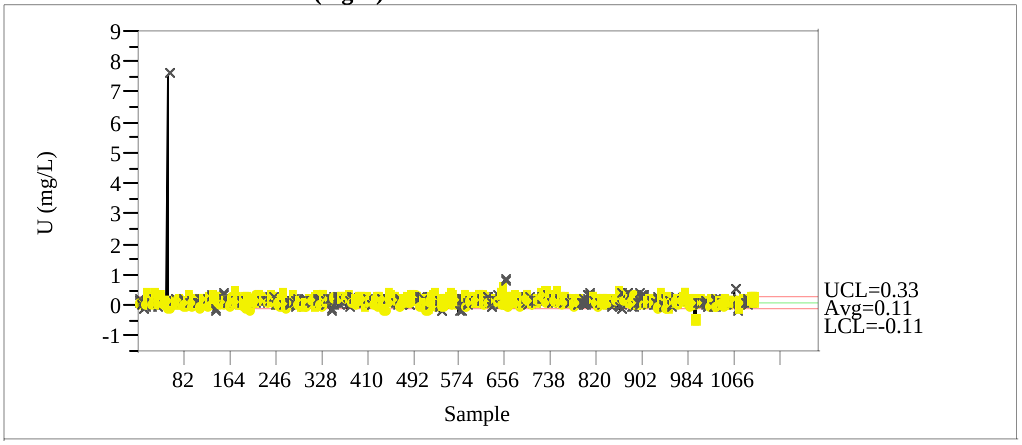


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



Individual Measurement of U (mg/L)



STCd=SM36
Control Chart
Individual Measurement of Al (mg/L)

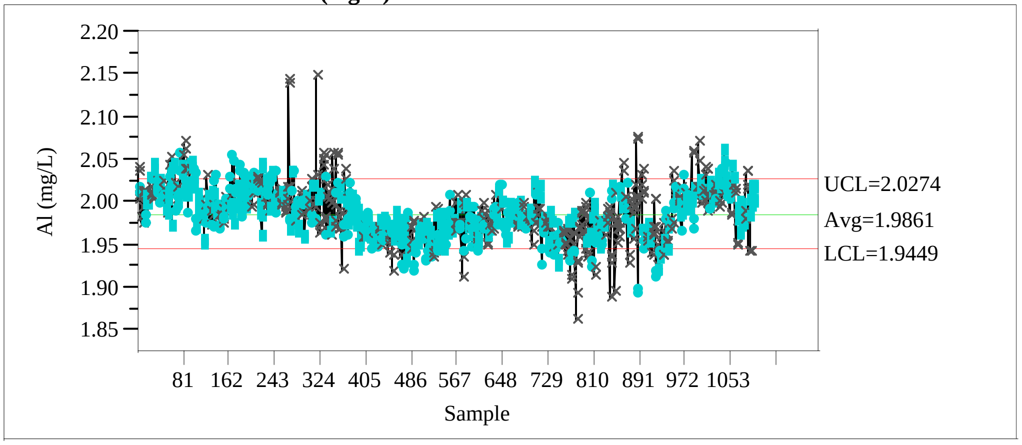
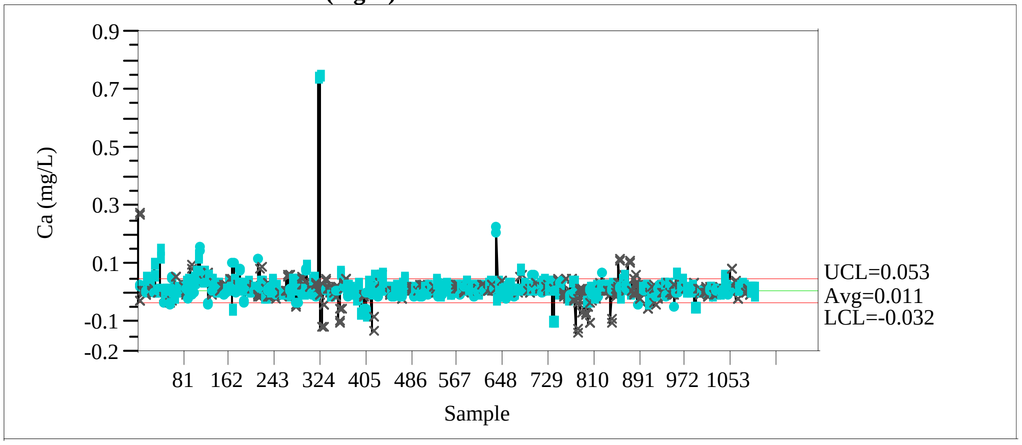
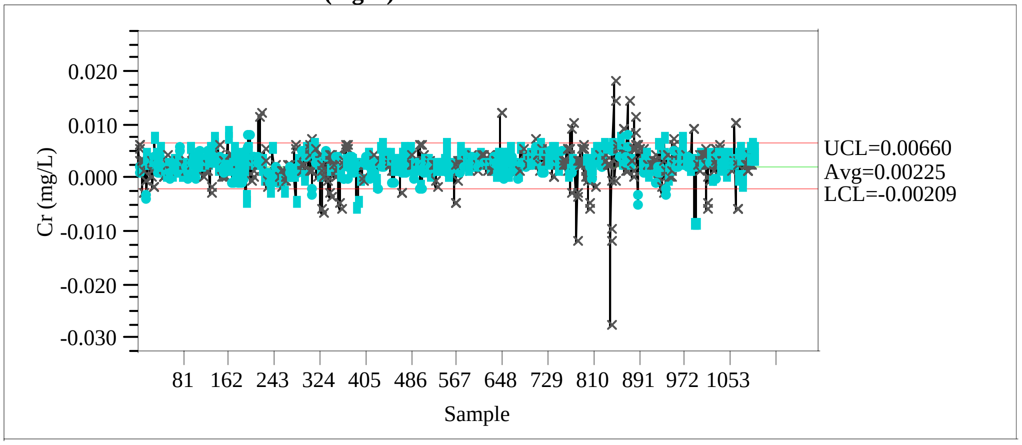


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

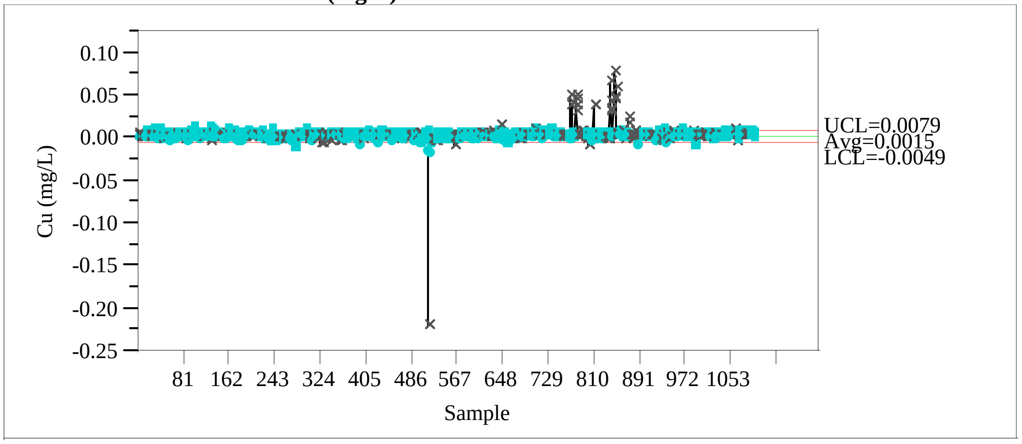
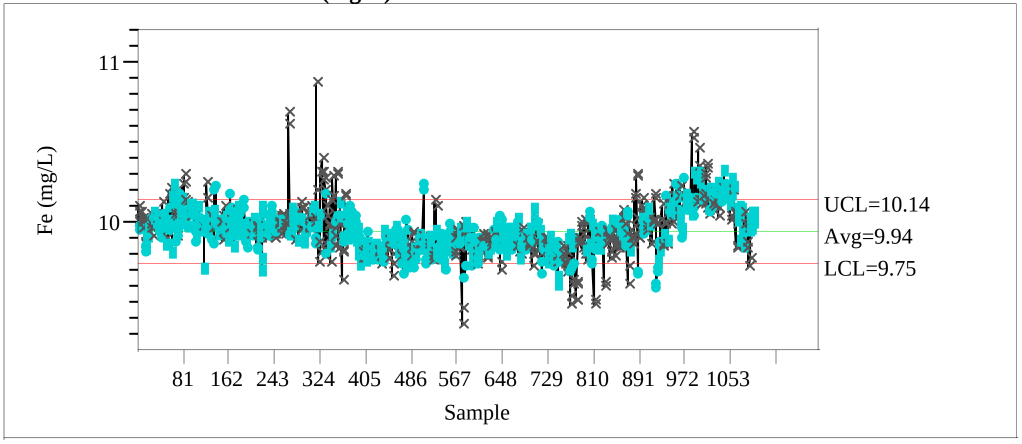
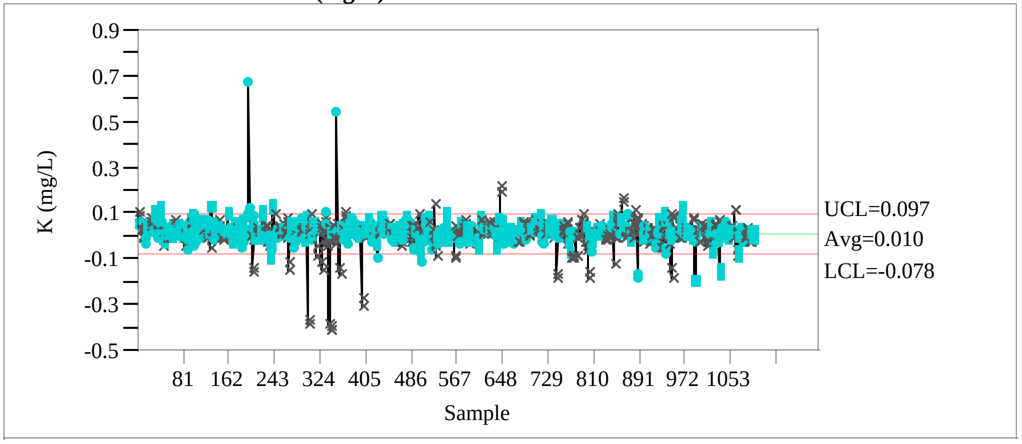


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

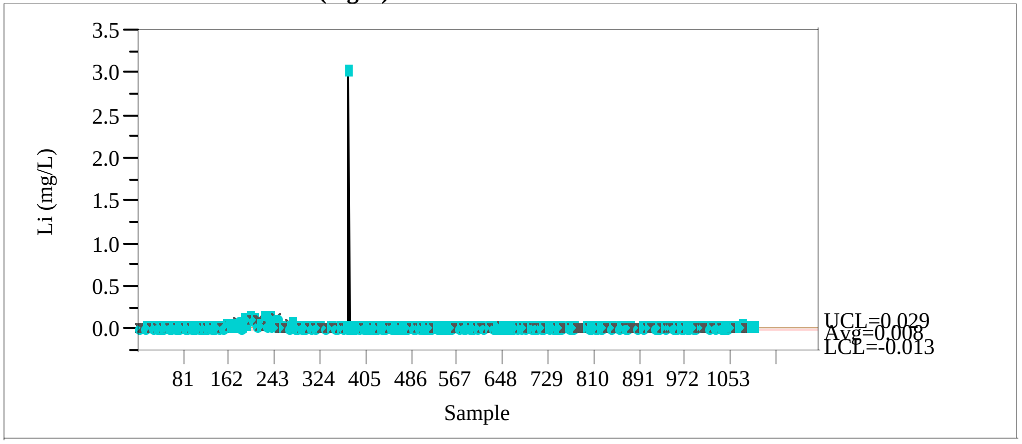
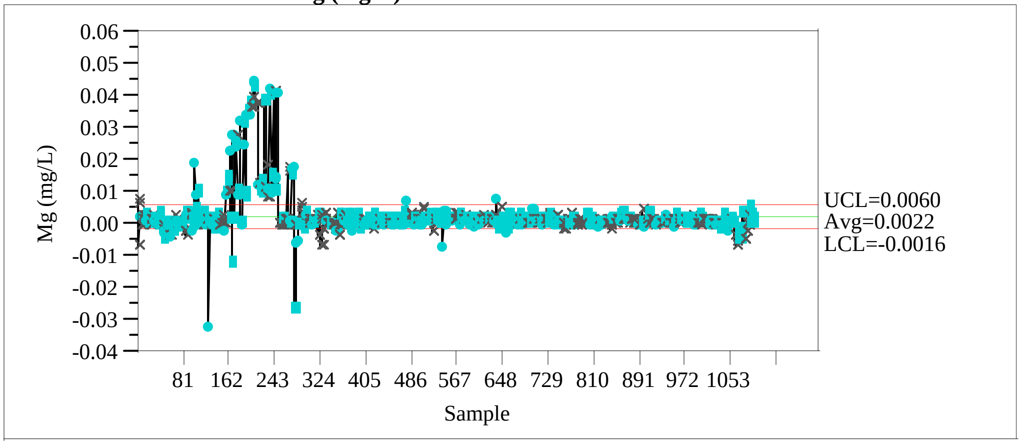
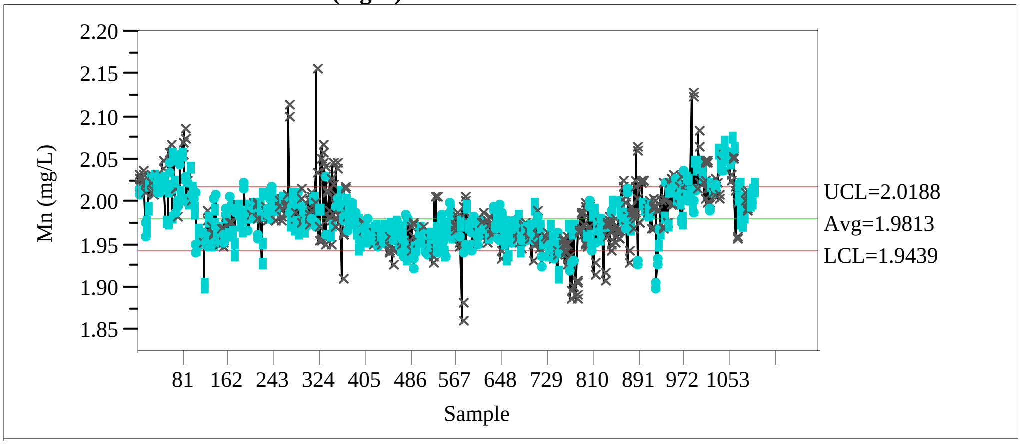


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)

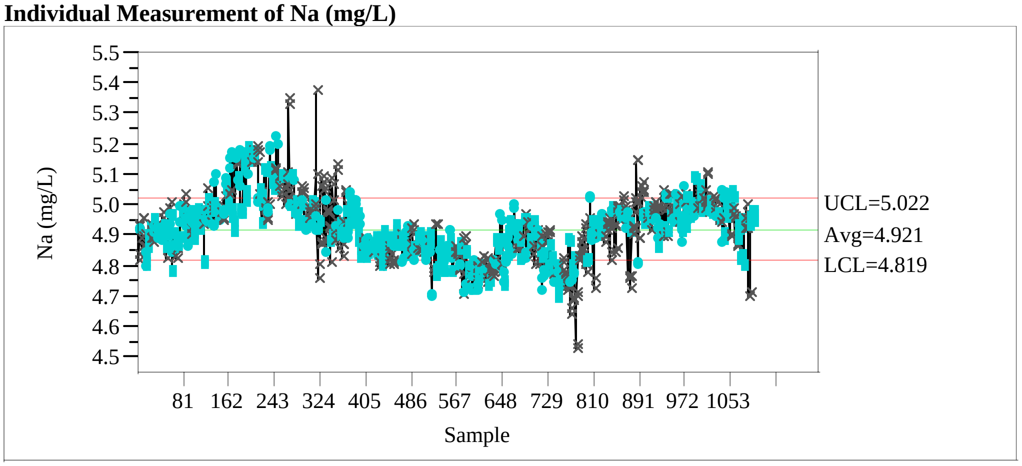
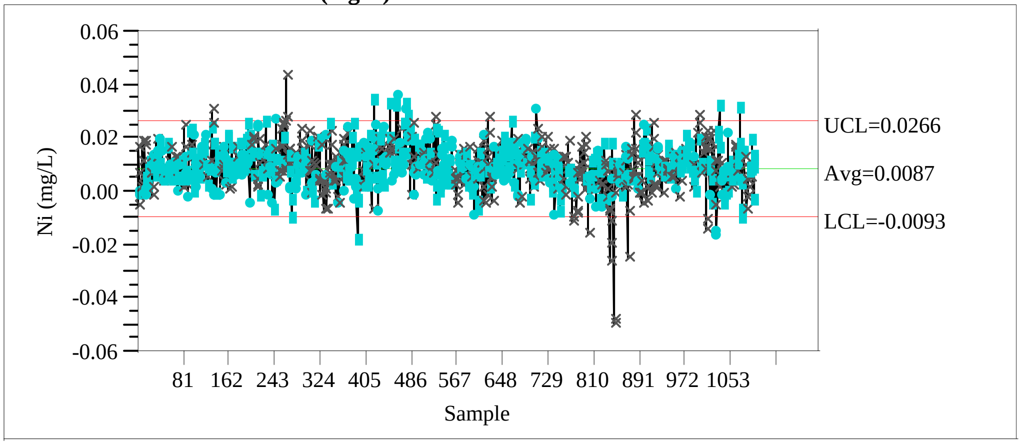
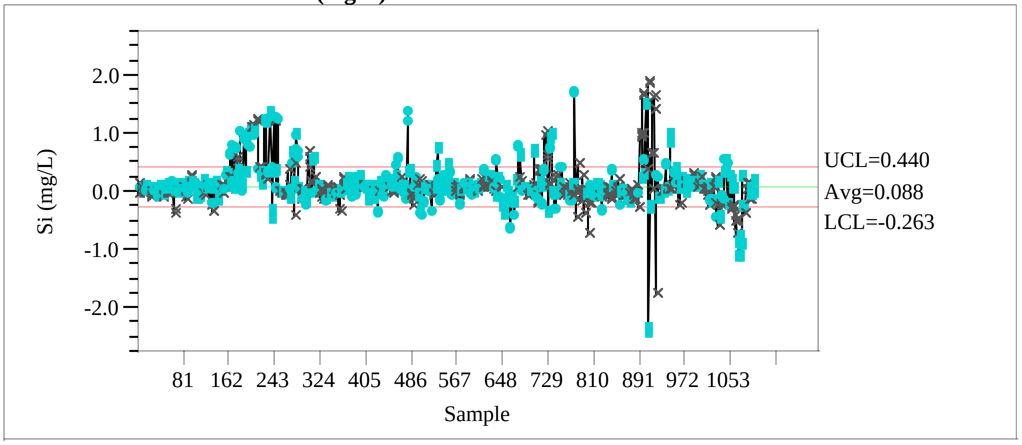


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

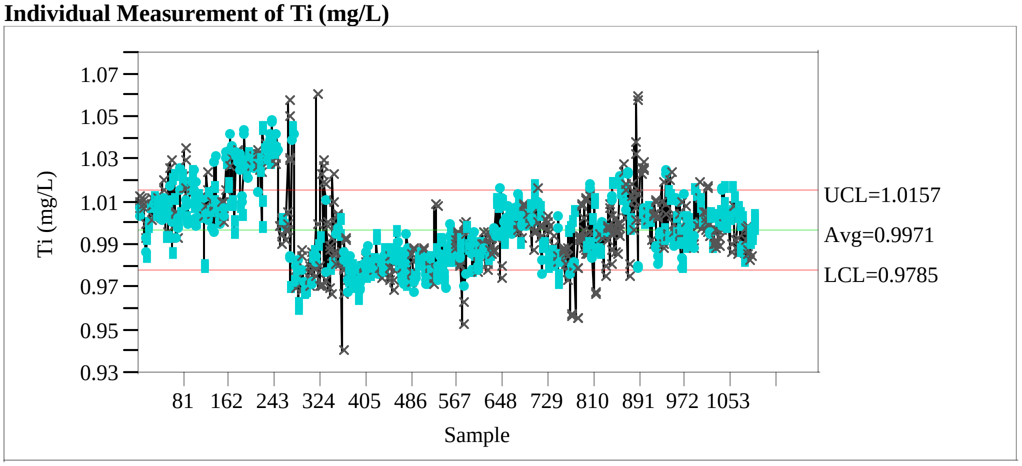
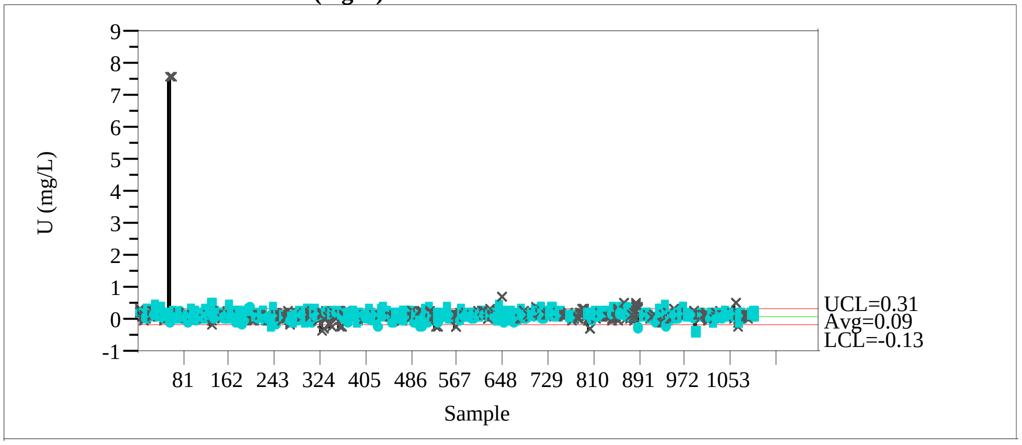
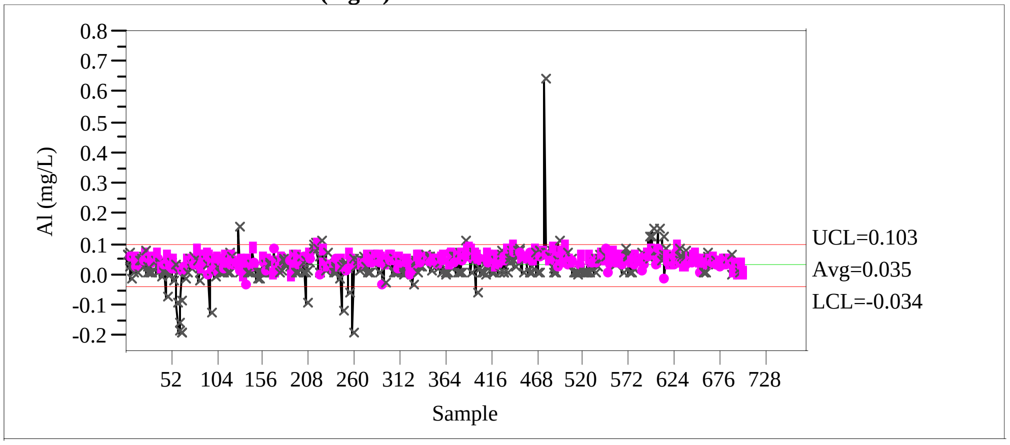


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of U (mg/L)



STCd=SM37
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of Ca (mg/L)

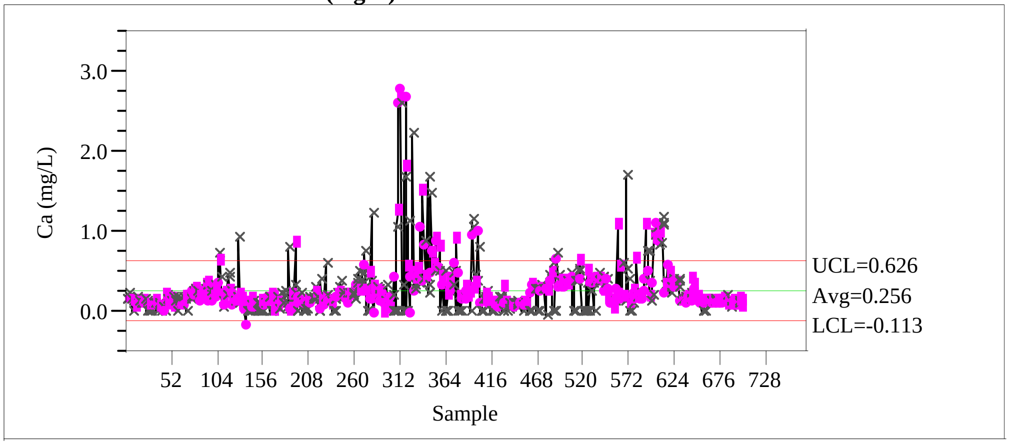
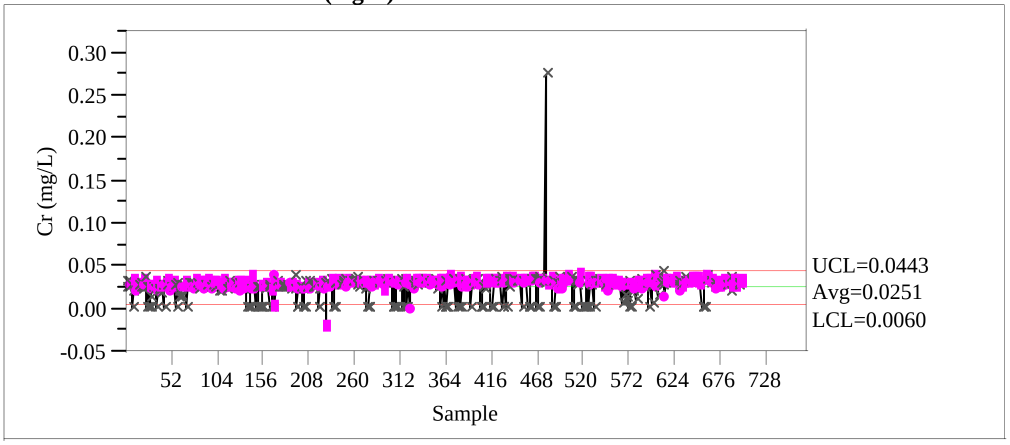
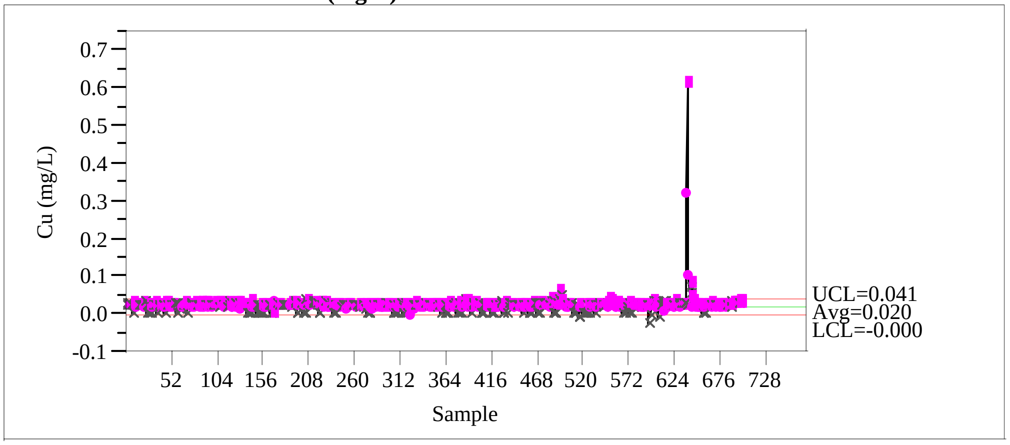


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

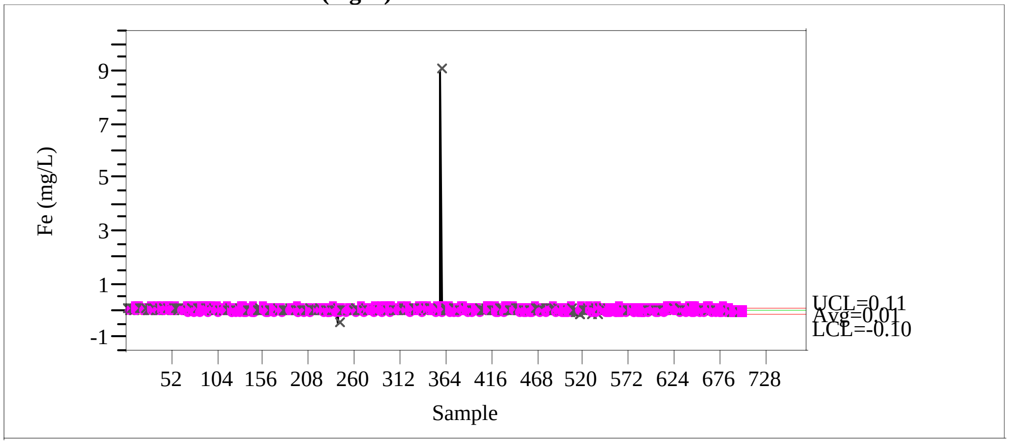
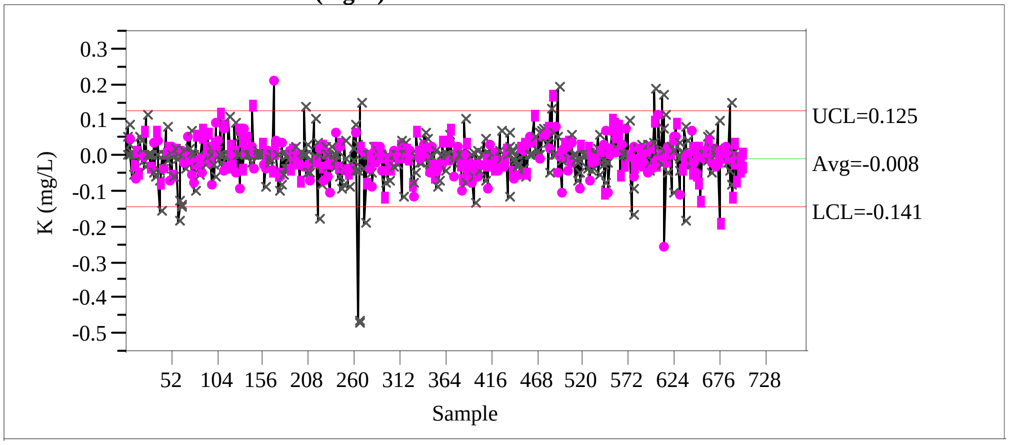
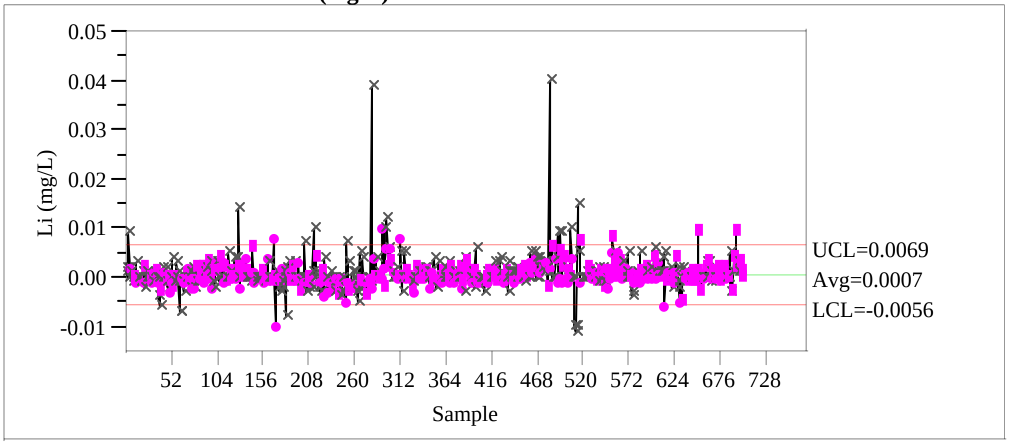


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

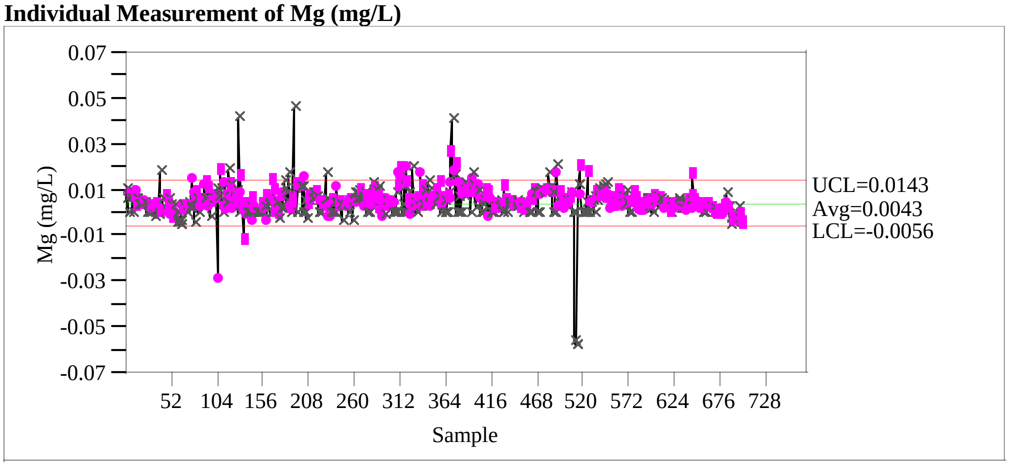
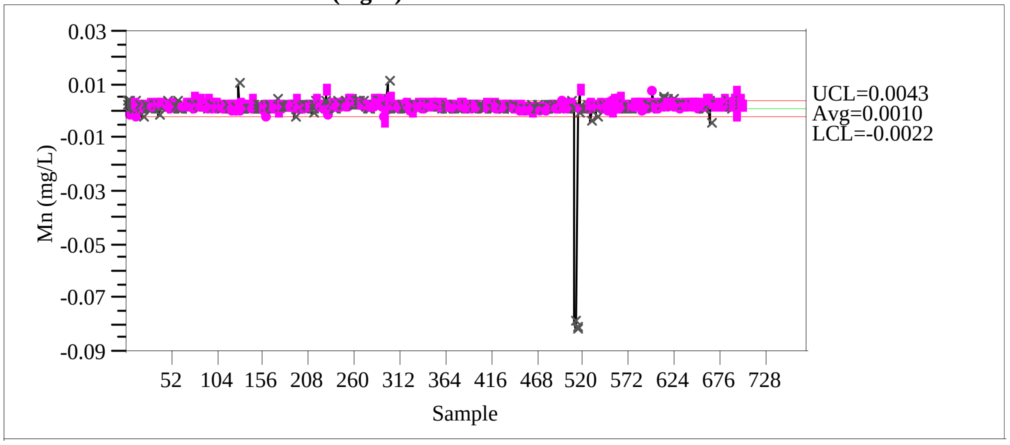
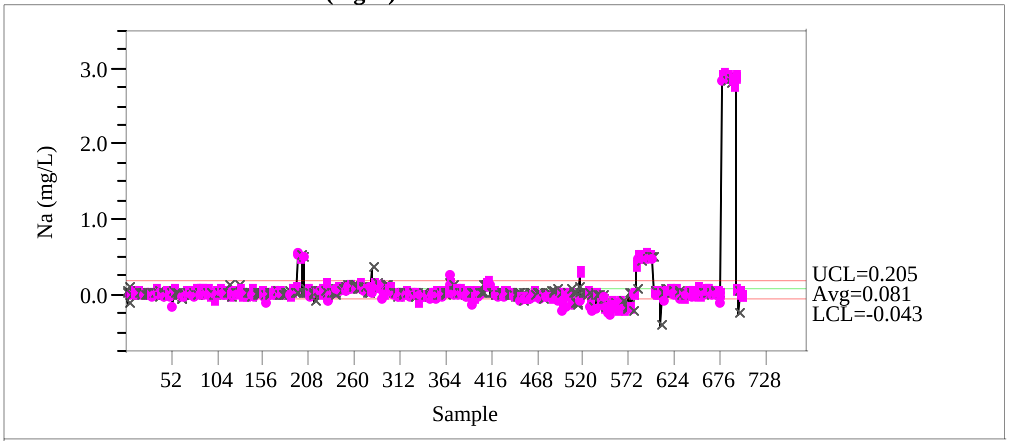


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)

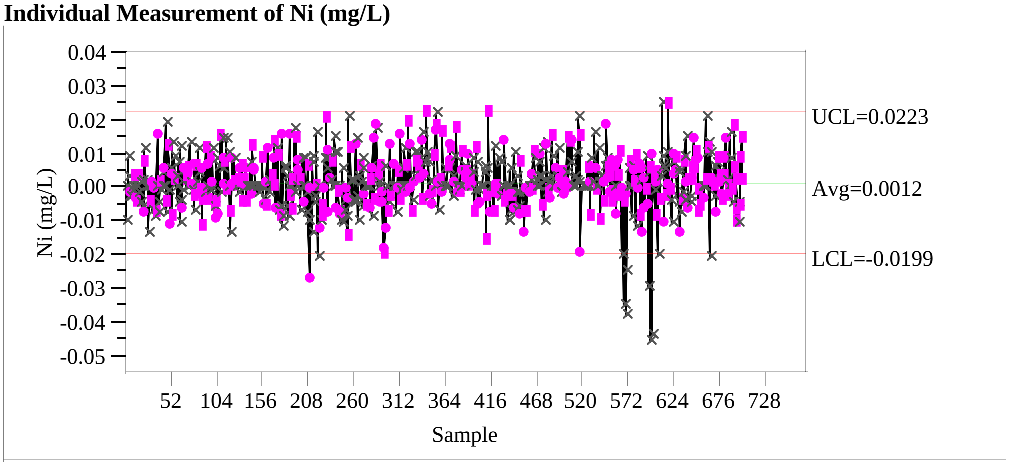
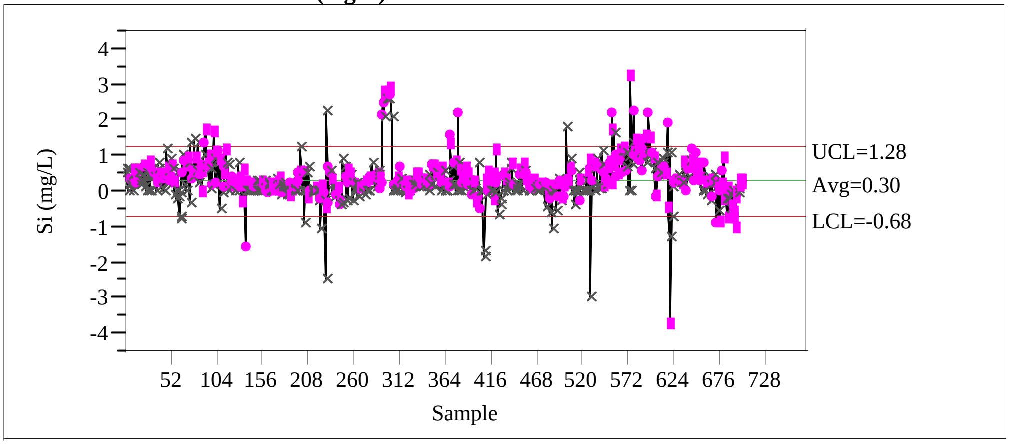
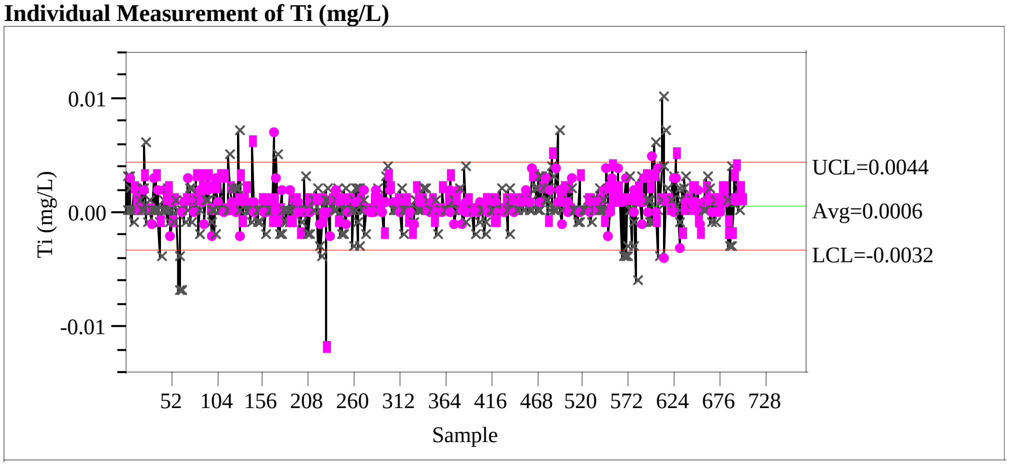


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



Individual Measurement of U (mg/L)

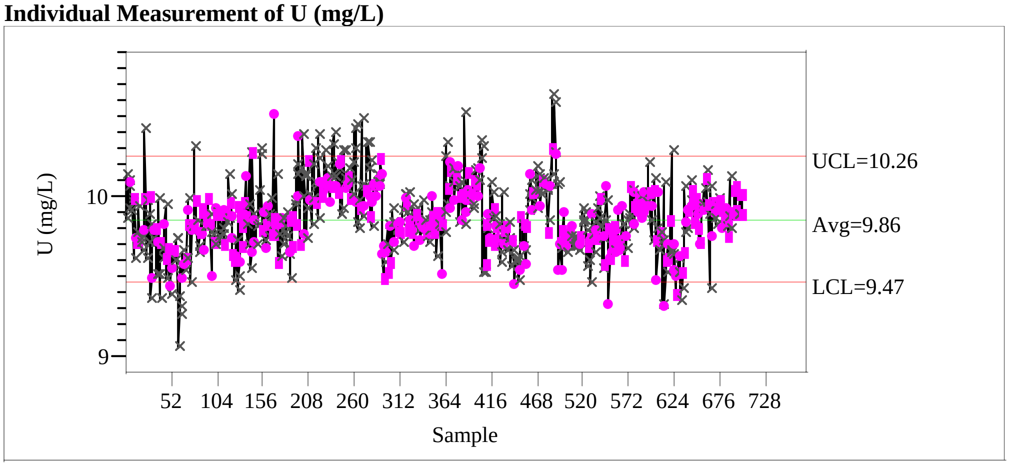
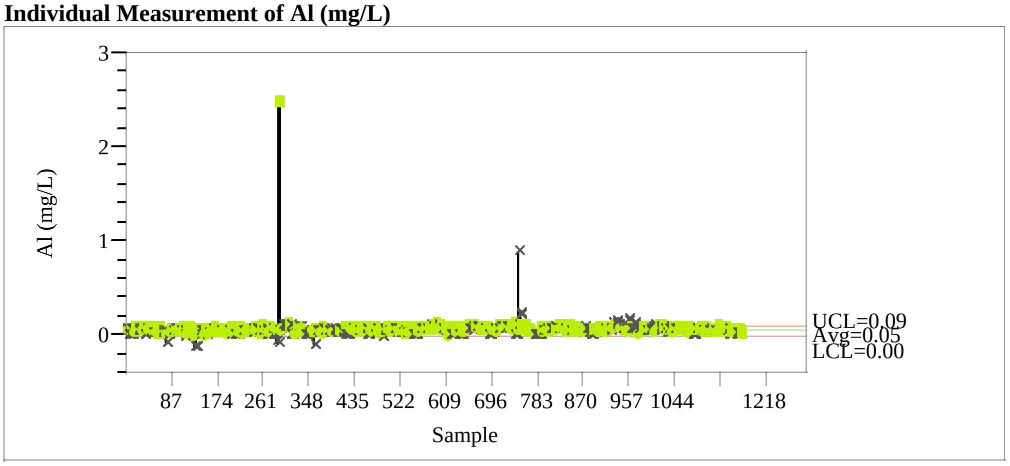
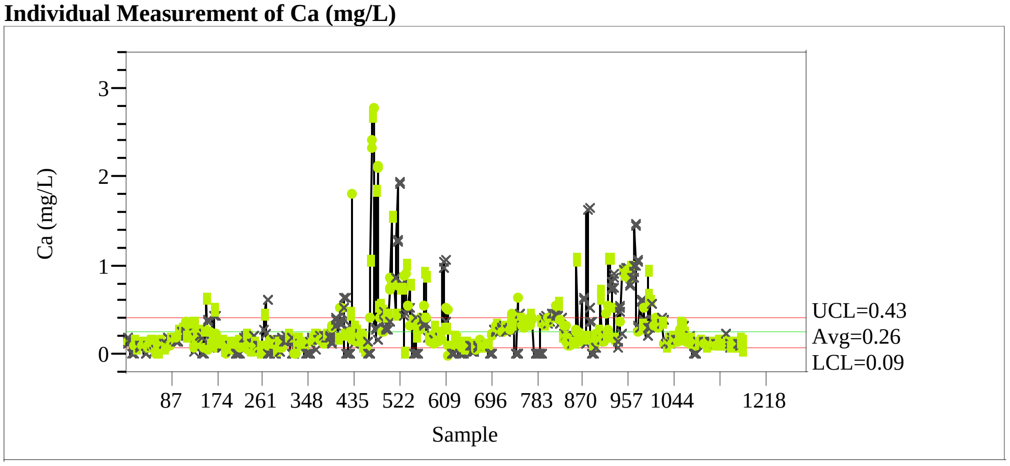


Exhibit A11. MA Standards in Analytical Sequence

STCd=SM38
Control Chart
Individual Measurement of Al (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

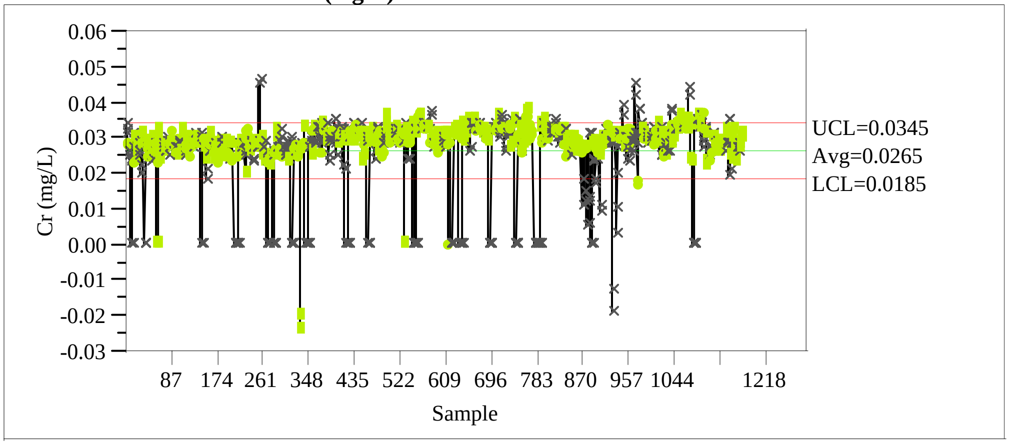
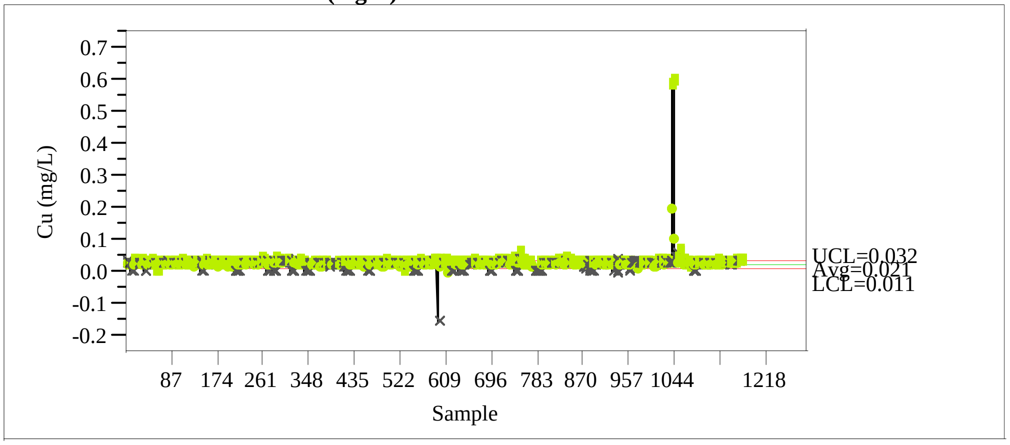
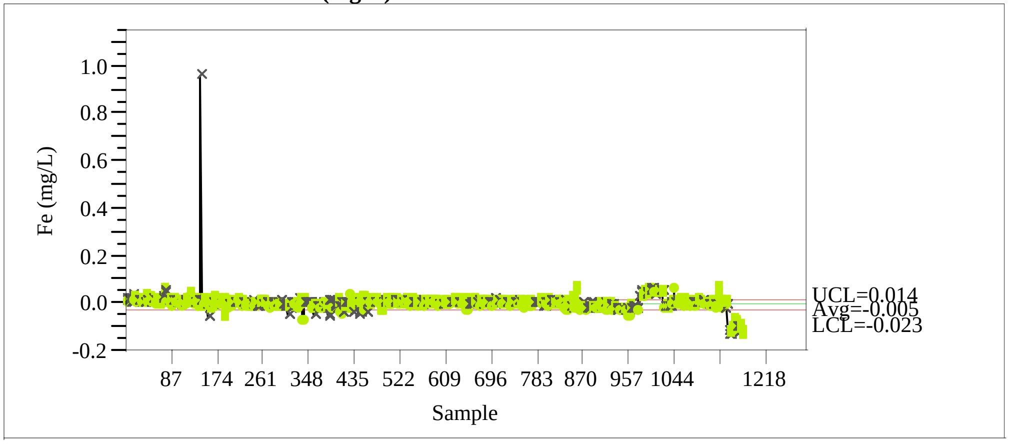


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

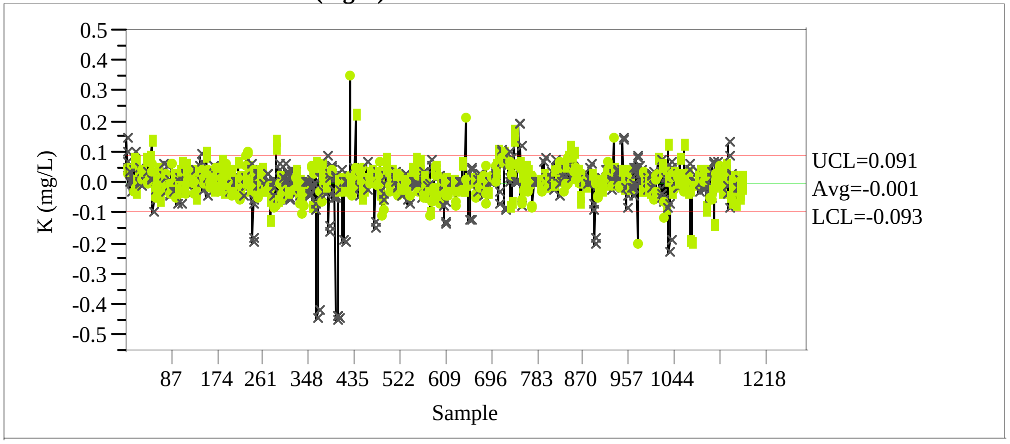
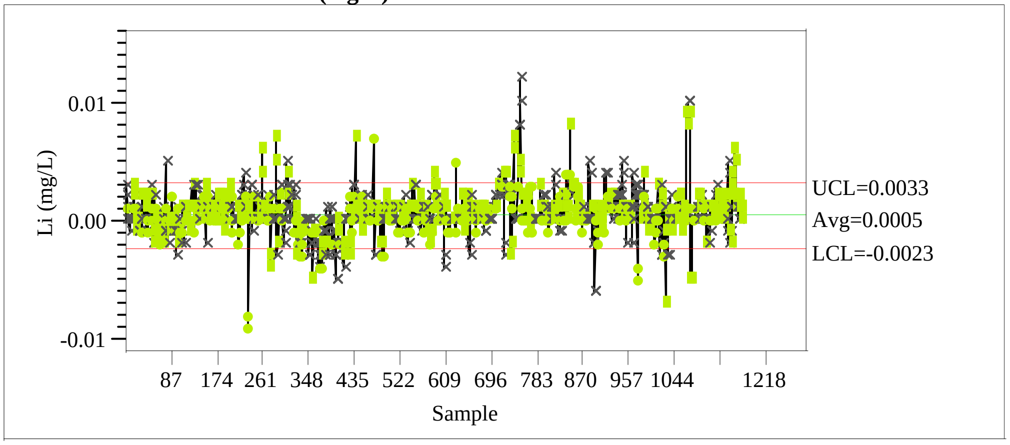
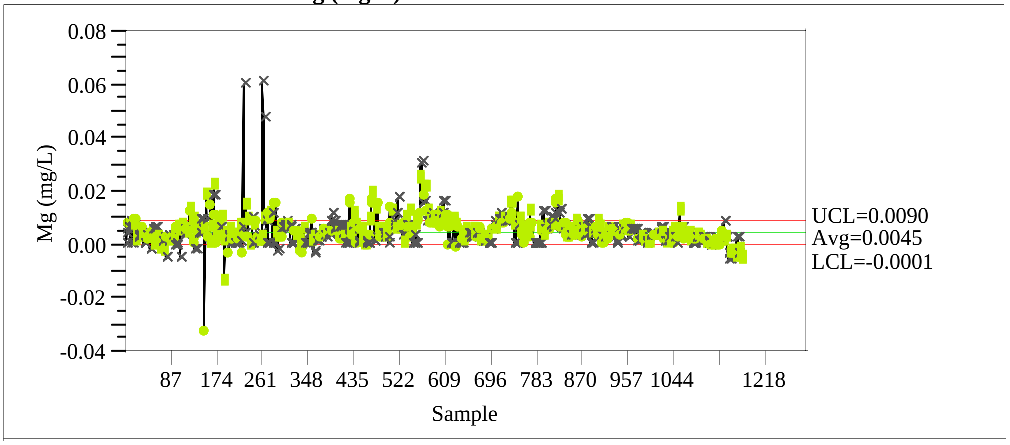


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

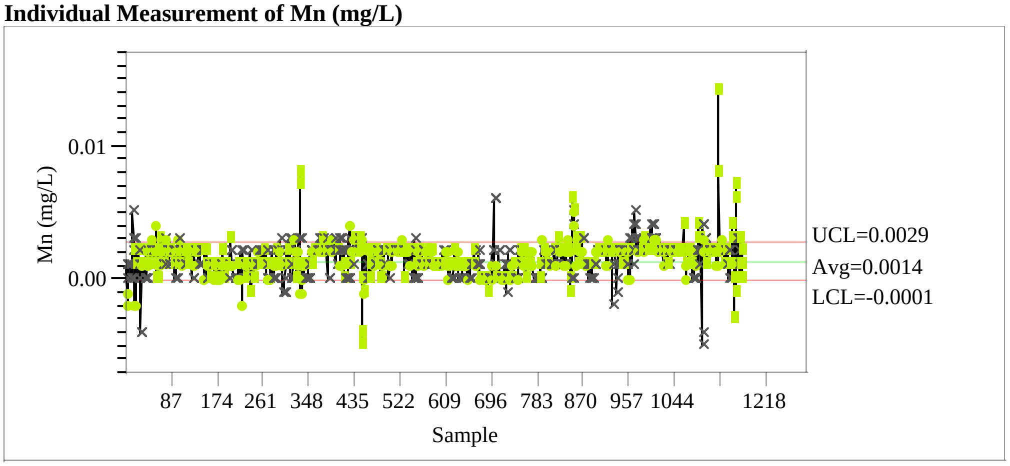
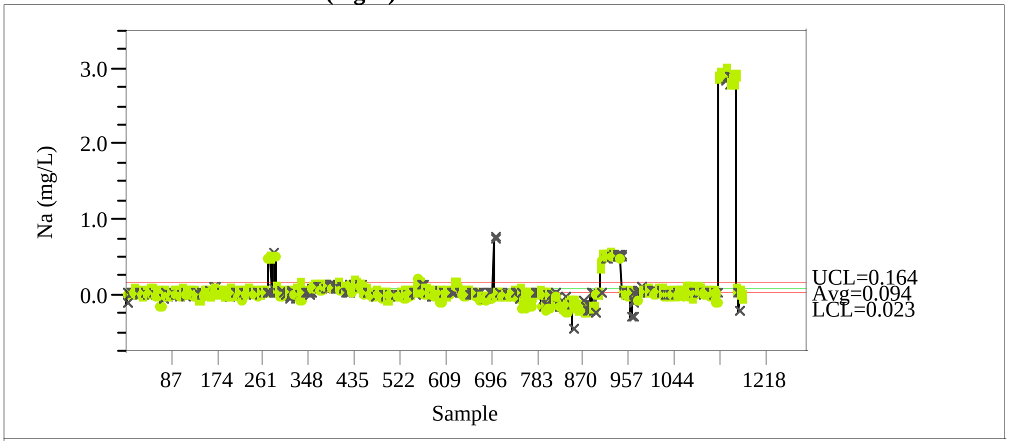
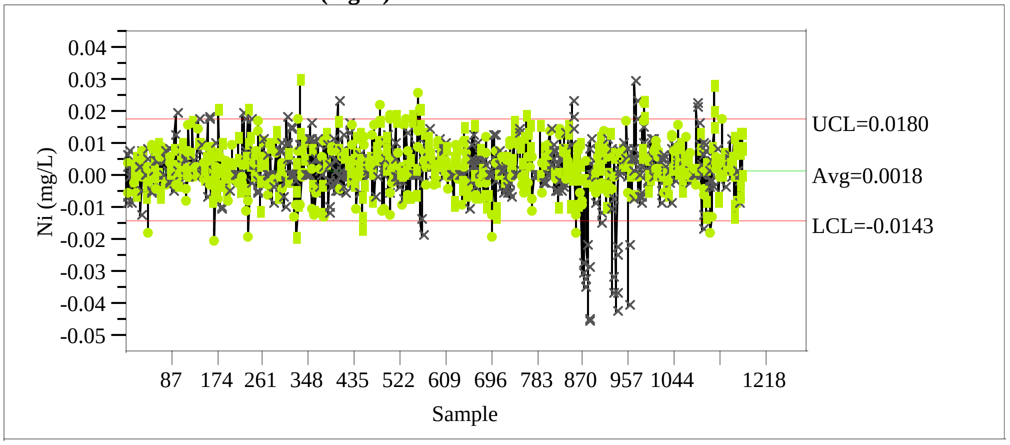


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Na (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

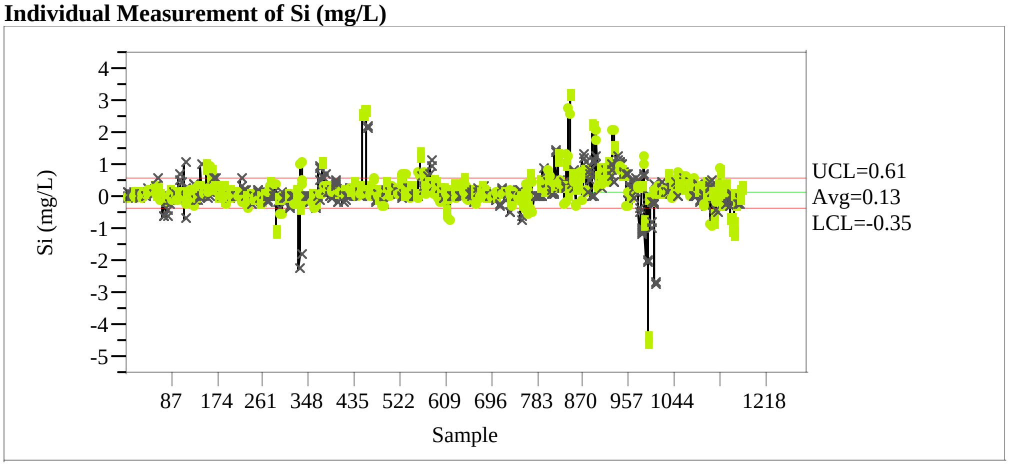
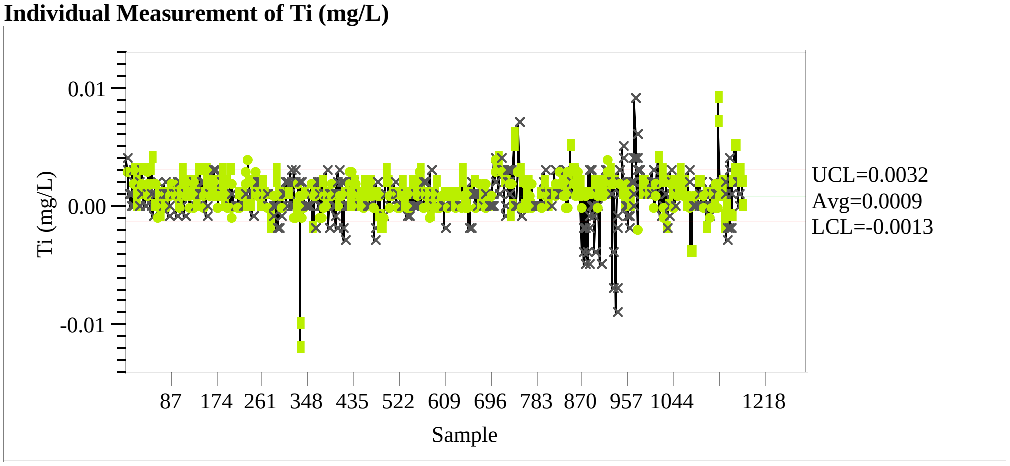


Exhibit A11. MA Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



Individual Measurement of U (mg/L)

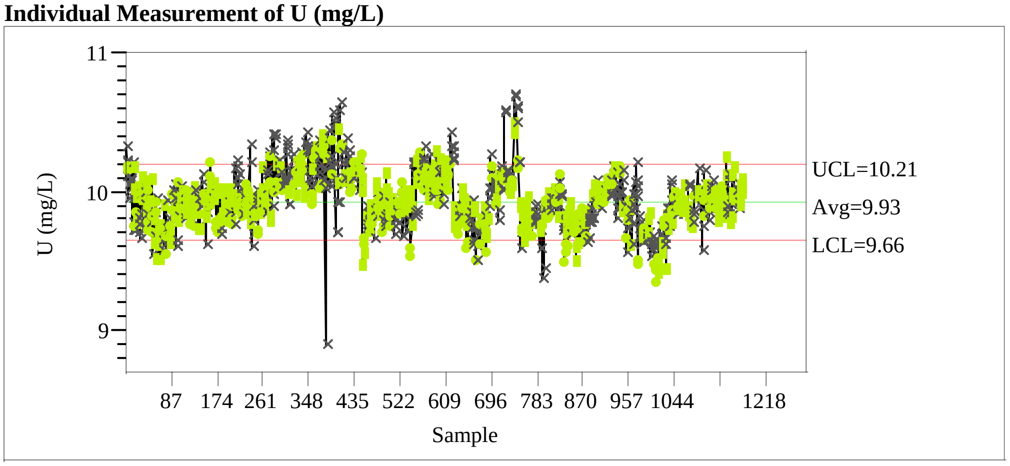
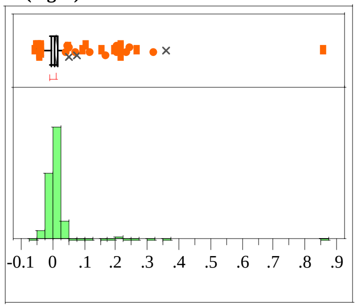


Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM32
Distributions
Al (mg/L)



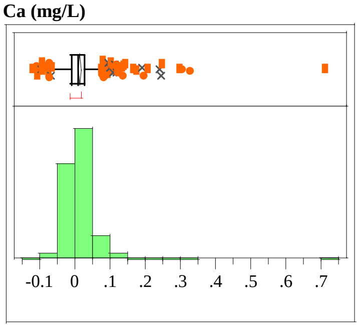
Quantiles

100.0%	maximum	0.8590
99.5%		0.2988
97.5%		0.1184
90.0%		0.0280
75.0%	quartile	0.0150
50.0%	median	0.0040
25.0%	quartile	-0.0050
10.0%		-0.0140
2.5%		-0.0338
0.5%		-0.0452
0.0%	minimum	-0.0560

Moments

Mean	0.0109505
Std Dev	0.0499794
Std Err Mean	0.0019068
upper 95% Mean	0.0146944
lower 95% Mean	0.0072066
N	687

Ca (mg/L)



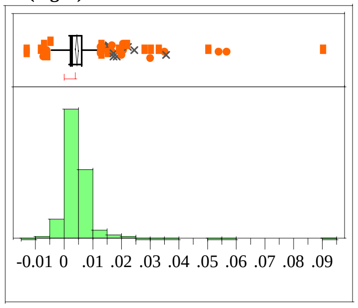
Quantiles

100.0%	maximum	0.7120
99.5%		0.3037
97.5%		0.1278
90.0%		0.0600
75.0%	quartile	0.0250
50.0%	median	0.0070
25.0%	quartile	-0.0090
10.0%		-0.0230
2.5%		-0.0636
0.5%		-0.1050
0.0%	minimum	-0.1190

Moments

Mean	0.0141092
Std Dev	0.0526992
Std Err Mean	0.0020106
upper 95% Mean	0.0180568
lower 95% Mean	0.0101615
N	687

Cr (mg/L)



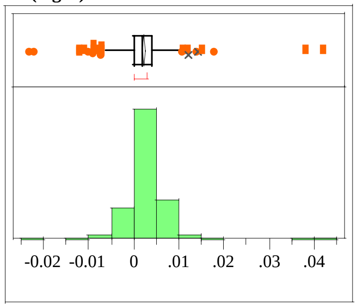
Quantiles

100.0%	maximum	0.0900
99.5%		0.0522
97.5%		0.0198
90.0%		0.0090
75.0%	quartile	0.0060
50.0%	median	0.0030
25.0%	quartile	0.0020
10.0%		0.0000
2.5%		-0.0030
0.5%		-0.0076
0.0%	minimum	-0.0130

Moments

Mean	0.0044672
Std Dev	0.006749
Std Err Mean	0.0002575
upper 95% Mean	0.0049728
lower 95% Mean	0.0039617
N	687

Cu (mg/L)



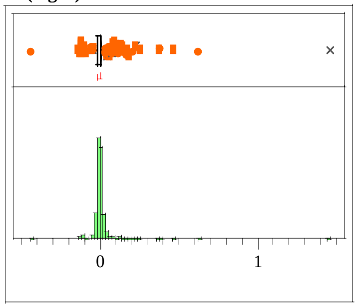
Quantiles

100.0%	maximum	0.0420
99.5%		0.0167
97.5%		0.0090
90.0%		0.0060
75.0%	quartile	0.0040
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0050
0.5%		-0.0120
0.0%	minimum	-0.0230

Moments

Mean	0.0022052
Std Dev	0.0042165
Std Err Mean	0.0001609
upper 95% Mean	0.0025211
lower 95% Mean	0.0018894
N	687

Fe (mg/L)



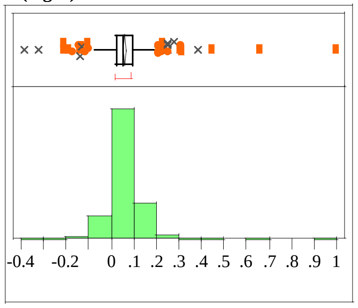
Quantiles

100.0%	maximum	1.455
99.5%		0.432
97.5%		0.123
90.0%		0.032
75.0%	quartile	0.010
50.0%	median	0.000
25.0%	quartile	-0.011
10.0%		-0.024
2.5%		-0.102
0.5%		-0.128
0.0%	minimum	-0.430

Moments

Mean	0.0061164
Std Dev	0.0777535
Std Err Mean	0.0029665
upper 95% Mean	0.0119409
lower 95% Mean	0.000292
N	687

K (mg/L)



Quantiles

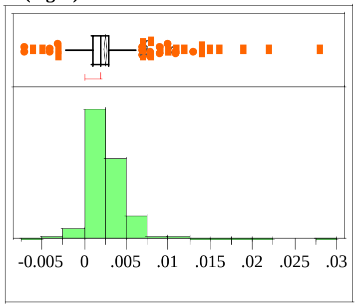
100.0%	maximum	0.9970
99.5%		0.4187
97.5%		0.2118
90.0%		0.1394
75.0%	quartile	0.0930
50.0%	median	0.0540
25.0%	quartile	0.0220
10.0%		-0.0090
2.5%		-0.0632
0.5%		-0.2137
0.0%	minimum	-0.3900

Moments

Mean	0.0602824
Std Dev	0.082613
Std Err Mean	0.0031519
upper 95% Mean	0.0664709
lower 95% Mean	0.0540939
N	687

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Li (mg/L)



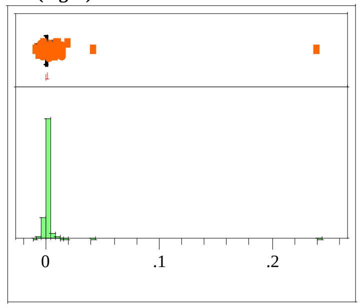
Quantiles

100.0%	maximum	0.0280
99.5%		0.0177
97.5%		0.0090
90.0%		0.0050
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0018
0.5%		-0.0056
0.0%	minimum	-0.0070

Moments

Mean	0.0025604
Std Dev	0.0027935
Std Err Mean	0.0001066
upper 95% Mean	0.0027697
lower 95% Mean	0.0023511
N	687

Mn (mg/L)



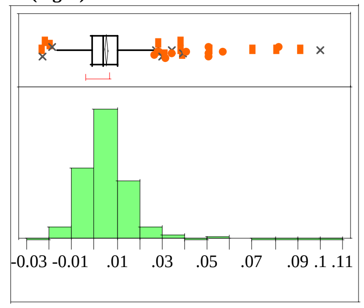
Quantiles

100.0%	maximum	0.2400
99.5%		0.0172
97.5%		0.0088
90.0%		0.0030
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0070
0.0%	minimum	-0.0090

Moments

Mean	0.0011237
Std Dev	0.009567
Std Err Mean	0.000365
upper 95% Mean	0.0018404
lower 95% Mean	0.0004071
N	687

Ni (mg/L)



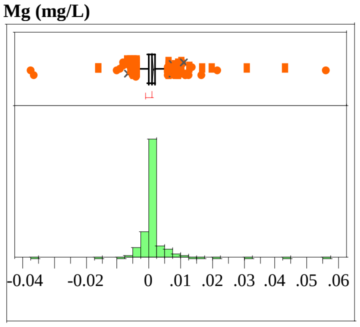
Quantiles

100.0%	maximum	0.1000
99.5%		0.0816
97.5%		0.0336
90.0%		0.0170
75.0%	quartile	0.0100
50.0%	median	0.0040
25.0%	quartile	-0.0010
10.0%		-0.0070
2.5%		-0.0130
0.5%		-0.0211
0.0%	minimum	-0.0230

Moments

Mean	0.0052897
Std Dev	0.0122807
Std Err Mean	0.0004685
upper 95% Mean	0.0062096
lower 95% Mean	0.0043697
N	687

Mg (mg/L)



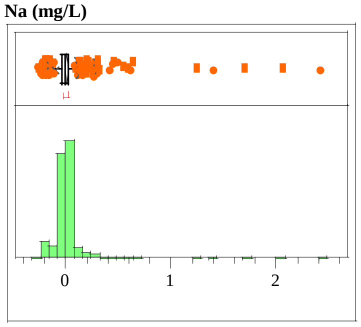
Quantiles

100.0%	maximum	0.0560
99.5%		0.0270
97.5%		0.0108
90.0%		0.0040
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0050
0.5%		-0.0160
0.0%	minimum	-0.0370

Moments

Mean	0.0010204
Std Dev	0.0048532
Std Err Mean	0.0001852
upper 95% Mean	0.0013839
lower 95% Mean	0.0006568
N	687

Na (mg/L)



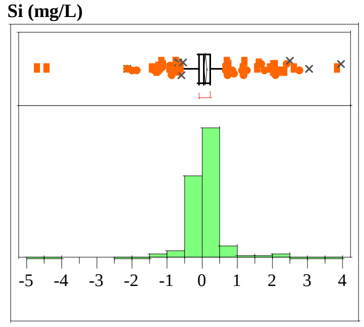
Quantiles

100.0%	maximum	2.422
99.5%		1.569
97.5%		0.302
90.0%		0.066
75.0%	quartile	0.020
50.0%	median	0.000
25.0%	quartile	-0.030
10.0%		-0.095
2.5%		-0.193
0.5%		-0.236
0.0%	minimum	-0.252

Moments

Mean	0.0117118
Std Dev	0.183502
Std Err Mean	0.007001
upper 95% Mean	0.0254578
lower 95% Mean	-0.002034
N	687

Si (mg/L)



Quantiles

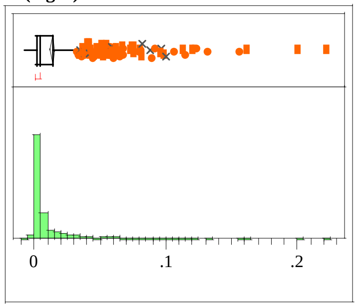
100.0%	maximum	3.917
99.5%		2.938
97.5%		1.689
90.0%		0.442
75.0%	quartile	0.225
50.0%	median	0.061
25.0%	quartile	-0.084
10.0%		-0.268
2.5%		-0.935
0.5%		-2.132
0.0%	minimum	-4.691

Moments

Mean	0.0934571
Std Dev	0.5888657
Std Err Mean	0.0224666
upper 95% Mean	0.1375687
lower 95% Mean	0.0493455
N	687

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Ti (mg/L)



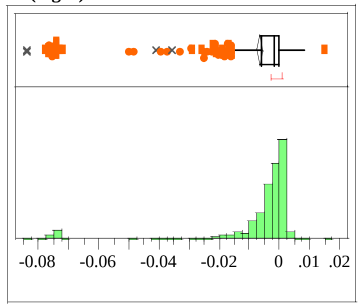
Quantiles

100.0%	maximum	0.2220
99.5%		0.1598
97.5%		0.0894
90.0%		0.0422
75.0%	quartile	0.0140
50.0%	median	0.0040
25.0%	quartile	0.0020
10.0%		0.0010
2.5%		-0.0008
0.5%		-0.0020
0.0%	minimum	-0.0060

Moments

Mean	0.0139563
Std Dev	0.0252993
Std Err Mean	0.0009652
upper 95% Mean	0.0158515
lower 95% Mean	0.0120612
N	687

Zr (mg/L)



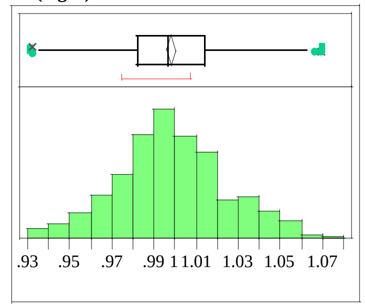
Quantiles

100.0%	maximum	0.0150
99.5%		0.0057
97.5%		0.0030
90.0%		0.0010
75.0%	quartile	0.0000
50.0%	median	-0.0020
25.0%	quartile	-0.0060
10.0%		-0.0140
2.5%		-0.0750
0.5%		-0.0776
0.0%	minimum	-0.0840

Moments

Mean	-0.006632
Std Dev	0.016075
Std Err Mean	0.0006133
upper 95% Mean	-0.005428
lower 95% Mean	-0.007836
N	687

Ca (mg/L)



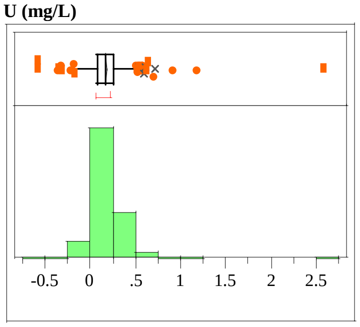
Quantiles

100.0%	maximum	1.0700
99.5%		1.0695
97.5%		1.0523
90.0%		1.0341
75.0%	quartile	1.0140
50.0%	median	0.9970
25.0%	quartile	0.9820
10.0%		0.9639
2.5%		0.9430
0.5%		0.9320
0.0%	minimum	0.9310

Moments

Mean	0.9983071
Std Dev	0.0263959
Std Err Mean	0.0011711
upper 95% Mean	1.0006079
lower 95% Mean	0.9960062
N	508

U (mg/L)



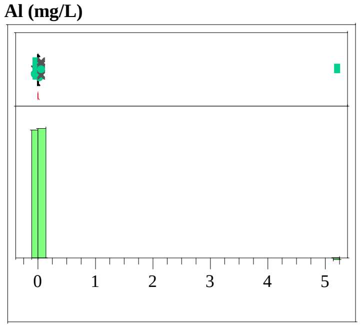
Quantiles

100.0%	maximum	2.576
99.5%		0.835
97.5%		0.532
90.0%		0.373
75.0%	quartile	0.254
50.0%	median	0.161
25.0%	quartile	0.084
10.0%		0.003
2.5%		-0.115
0.5%		-0.352
0.0%	minimum	-0.583

Moments

Mean	0.1764978
Std Dev	0.1865608
Std Err Mean	0.0071177
upper 95% Mean	0.190473
lower 95% Mean	0.1625226
N	687

STCd=SM33
Distributions
Al (mg/L)



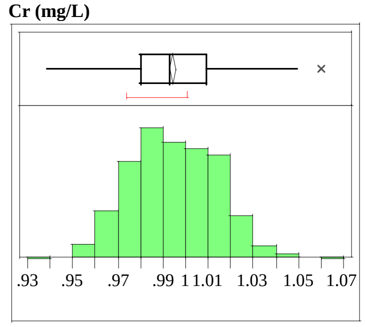
Quantiles

100.0%	maximum	5.213
99.5%		0.054
97.5%		0.036
90.0%		0.017
75.0%	quartile	0.009
50.0%	median	0.000
25.0%	quartile	-0.007
10.0%		-0.018
2.5%		-0.037
0.5%		-0.051
0.0%	minimum	-0.056

Moments

Mean	0.0100787
Std Dev	0.2318297
Std Err Mean	0.0102858
upper 95% Mean	0.0302867
lower 95% Mean	-0.010129
N	508

Cr (mg/L)



Quantiles

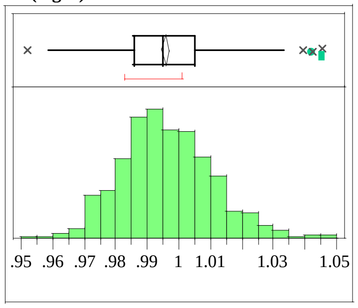
100.0%	maximum	1.0600
99.5%		1.0446
97.5%		1.0300
90.0%		1.0190
75.0%	quartile	1.0090
50.0%	median	0.9930
25.0%	quartile	0.9800
10.0%		0.9710
2.5%		0.9607
0.5%		0.9511
0.0%	minimum	0.9390

Moments

Mean	0.994374
Std Dev	0.0188004
Std Err Mean	0.0008341
upper 95% Mean	0.9960128
lower 95% Mean	0.9927352
N	508

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Cu (mg/L)



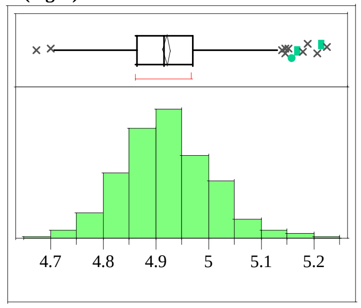
Quantiles

100.0%	maximum	1.0450
99.5%		1.0434
97.5%		1.0283
90.0%		1.0140
75.0%	quartile	1.0050
50.0%	median	0.9950
25.0%	quartile	0.9860
10.0%		0.9780
2.5%		0.9700
0.5%		0.9595
0.0%	minimum	0.9520

Moments

Mean	0.9957126
Std Dev	0.0147638
Std Err Mean	0.000655
upper 95% Mean	0.9969995
lower 95% Mean	0.9944257
N	508

K (mg/L)



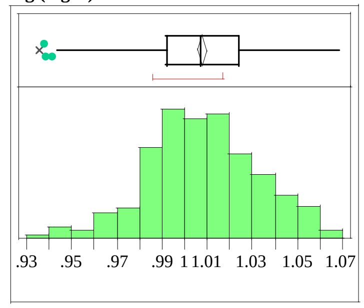
Quantiles

100.0%	maximum	5.2250
99.5%		5.2106
97.5%		5.1210
90.0%		5.0391
75.0%	quartile	4.9722
50.0%	median	4.9160
25.0%	quartile	4.8650
10.0%		4.8168
2.5%		4.7564
0.5%		4.7055
0.0%	minimum	4.6730

Moments

Mean	4.9218031
Std Dev	0.088368
Std Err Mean	0.0039207
upper 95% Mean	4.929506
lower 95% Mean	4.9141003
N	508

Mg (mg/L)



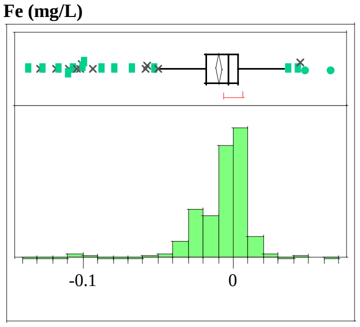
Quantiles

100.0%	maximum	1.0680
99.5%		1.0645
97.5%		1.0573
90.0%		1.0401
75.0%	quartile	1.0240
50.0%	median	1.0070
25.0%	quartile	0.9920
10.0%		0.9779
2.5%		0.9567
0.5%		0.9385
0.0%	minimum	0.9350

Moments

Mean	1.0074862
Std Dev	0.0248284
Std Err Mean	0.0011016
upper 95% Mean	1.0096505
lower 95% Mean	1.005322
N	508

Fe (mg/L)



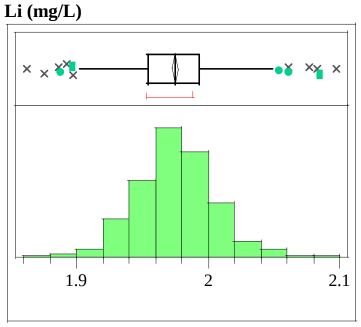
Quantiles

100.0%	maximum	0.0650
99.5%		0.0458
97.5%		0.0183
90.0%		0.0070
75.0%	quartile	0.0030
50.0%	median	-0.0030
25.0%	quartile	-0.0177
10.0%		-0.0300
2.5%		-0.0993
0.5%		-0.1279
0.0%	minimum	-0.1360

Moments

Mean	-0.009201
Std Dev	0.0233795
Std Err Mean	0.0010373
upper 95% Mean	-0.007163
lower 95% Mean	-0.011239
N	508

Li (mg/L)



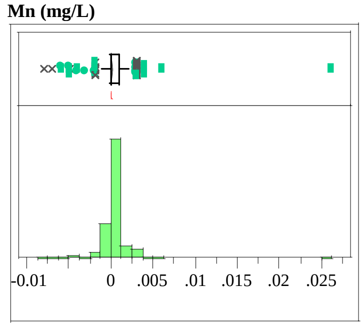
Quantiles

100.0%	maximum	2.0970
99.5%		2.0834
97.5%		2.0423
90.0%		2.0131
75.0%	quartile	1.9930
50.0%	median	1.9750
25.0%	quartile	1.9550
10.0%		1.9369
2.5%		1.9137
0.5%		1.8810
0.0%	minimum	1.8620

Moments

Mean	1.9750807
Std Dev	0.031235
Std Err Mean	0.0013858
upper 95% Mean	1.9778034
lower 95% Mean	1.972358
N	508

Mn (mg/L)



Quantiles

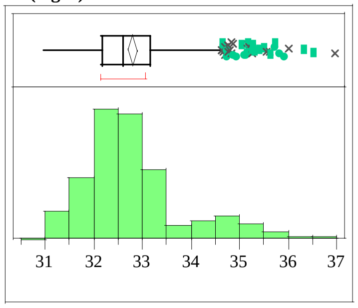
100.0%	maximum	0.0260
99.5%		0.0049
97.5%		0.0030
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0020
0.5%		-0.0065
0.0%	minimum	-0.0080

Moments

Mean	0.000126
Std Dev	0.0017919
Std Err Mean	0.0000795
upper 95% Mean	0.0002822
lower 95% Mean	-0.00003
N	508

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Na (mg/L)



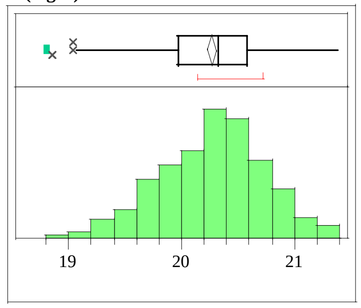
Quantiles

100.0%	maximum	36.940
99.5%		36.420
97.5%		35.445
90.0%		34.505
75.0%	quartile	33.150
50.0%	median	32.590
25.0%	quartile	32.174
10.0%		31.690
2.5%		31.347
0.5%		31.139
0.0%	minimum	30.989

Moments

Mean	32.798274
Std Dev	1.023373
Std Err Mean	0.0454048
upper 95% Mean	32.887478
lower 95% Mean	32.709069
N	508

Si (mg/L)



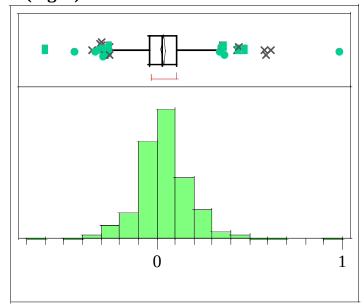
Quantiles

100.0%	maximum	21.369
99.5%		21.362
97.5%		21.154
90.0%		20.869
75.0%	quartile	20.584
50.0%	median	20.324
25.0%	quartile	19.966
10.0%		19.638
2.5%		19.265
0.5%		18.849
0.0%	minimum	18.804

Moments

Mean	20.268593
Std Dev	0.475845
Std Err Mean	0.0211122
upper 95% Mean	20.310071
lower 95% Mean	20.227114
N	508

U (mg/L)



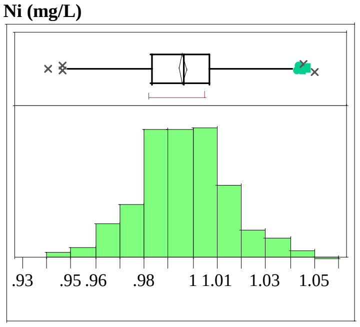
Quantiles

100.0%	maximum	0.9900
99.5%		0.5972
97.5%		0.3605
90.0%		0.2172
75.0%	quartile	0.1048
50.0%	median	0.0340
25.0%	quartile	-0.0398
10.0%		-0.1170
2.5%		-0.2733
0.5%		-0.3899
0.0%	minimum	-0.6030

Moments

Mean	0.0382205
Std Dev	0.1485597
Std Err Mean	0.0065913
upper 95% Mean	0.05117
lower 95% Mean	0.0252709
N	508

Ni (mg/L)



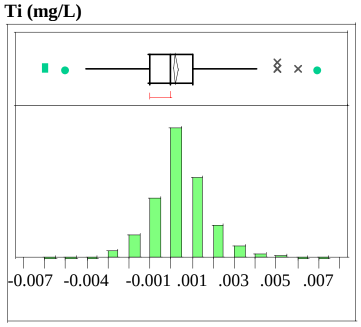
Quantiles

100.0%	maximum	1.0500
99.5%		1.0459
97.5%		1.0340
90.0%		1.0181
75.0%	quartile	1.0070
50.0%	median	0.9960
25.0%	quartile	0.9832
10.0%		0.9719
2.5%		0.9590
0.5%		0.9460
0.0%	minimum	0.9400

Moments

Mean	0.9957539
Std Dev	0.0184791
Std Err Mean	0.0008199
upper 95% Mean	0.9973647
lower 95% Mean	0.9941432
N	508

Ti (mg/L)



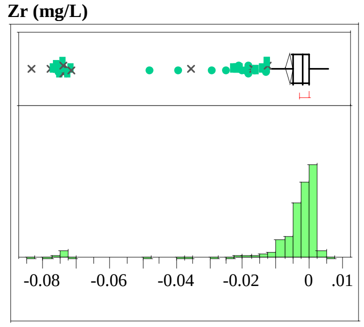
Quantiles

100.0%	maximum	0.0070
99.5%		0.0055
97.5%		0.0030
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0045
0.0%	minimum	-0.0060

Moments

Mean	0.0002323
Std Dev	0.0014531
Std Err Mean	0.0000645
upper 95% Mean	0.000359
lower 95% Mean	0.0001056
N	508

Zr (mg/L)



Quantiles

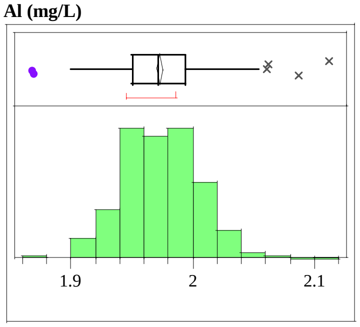
100.0%	maximum	0.0050
99.5%		0.0040
97.5%		0.0030
90.0%		0.0010
75.0%	quartile	0.0000
50.0%	median	-0.0020
25.0%	quartile	-0.0050
10.0%		-0.0120
2.5%		-0.0743
0.5%		-0.0775
0.0%	minimum	-0.0840

Moments

Mean	-0.006022
Std Dev	0.0153449
Std Err Mean	0.0006808
upper 95% Mean	-0.004684
lower 95% Mean	-0.007359
N	508

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM34
Distributions
Al (mg/L)



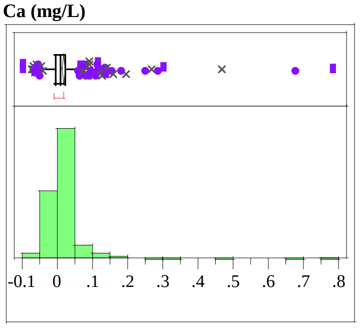
Quantiles

100.0%	maximum	2.1110
99.5%		2.0728
97.5%		2.0353
90.0%		2.0150
75.0%	quartile	1.9935
50.0%	median	1.9720
25.0%	quartile	1.9510
10.0%		1.9360
2.5%		1.9110
0.5%		1.8870
0.0%	minimum	1.8690

Moments

Mean	1.9734244
Std Dev	0.0316693
Std Err Mean	0.0014037
upper 95% Mean	1.9761822
lower 95% Mean	1.9706666
N	509

Ca (mg/L)



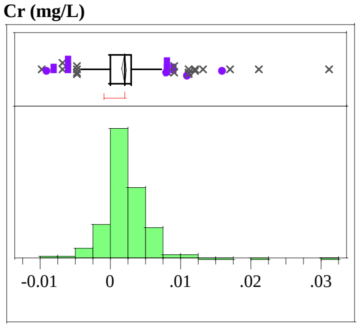
Quantiles

100.0%	maximum	0.7820
99.5%		0.5634
97.5%		0.1375
90.0%		0.0540
75.0%	quartile	0.0225
50.0%	median	0.0070
25.0%	quartile	-0.0040
10.0%		-0.0190
2.5%		-0.0480
0.5%		-0.0860
0.0%	minimum	-0.0970

Moments

Mean	0.0179764
Std Dev	0.064652
Std Err Mean	0.0028657
upper 95% Mean	0.0236064
lower 95% Mean	0.0123464
N	509

Cr (mg/L)



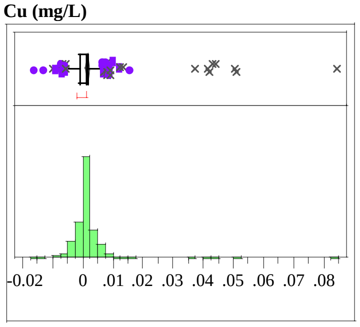
Quantiles

100.0%	maximum	0.0310
99.5%		0.0188
97.5%		0.0090
90.0%		0.0050
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0040
0.5%		-0.0084
0.0%	minimum	-0.0100

Moments

Mean	0.0019961
Std Dev	0.0034051
Std Err Mean	0.0001509
upper 95% Mean	0.0022926
lower 95% Mean	0.0016996
N	509

Cu (mg/L)



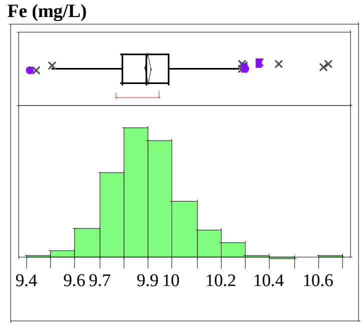
Quantiles

100.0%	maximum	0.0840
99.5%		0.0504
97.5%		0.0105
90.0%		0.0050
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	-0.0010
10.0%		-0.0030
2.5%		-0.0060
0.5%		-0.0113
0.0%	minimum	-0.0160

Moments

Mean	0.001554
Std Dev	0.0070389
Std Err Mean	0.000312
upper 95% Mean	0.002167
lower 95% Mean	0.0009411
N	509

Fe (mg/L)



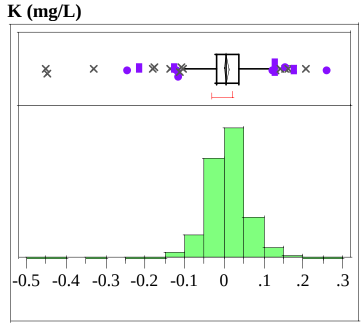
Quantiles

100.0%	maximum	10.640
99.5%		10.517
97.5%		10.249
90.0%		10.108
75.0%	quartile	9.986
50.0%	median	9.891
25.0%	quartile	9.796
10.0%		9.714
2.5%		9.615
0.5%		9.474
0.0%	minimum	9.418

Moments

Mean	9.9013301
Std Dev	0.1585996
Std Err Mean	0.0070298
upper 95% Mean	9.9151411
lower 95% Mean	9.887519
N	509

K (mg/L)



Quantiles

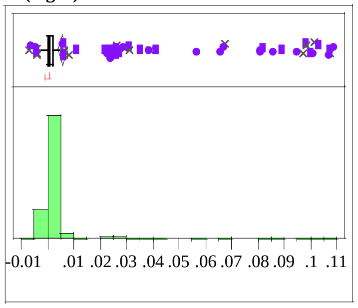
100.0%	maximum	0.2600
99.5%		0.1885
97.5%		0.1200
90.0%		0.0710
75.0%	quartile	0.0360
50.0%	median	0.0070
25.0%	quartile	-0.0210
10.0%		-0.0510
2.5%		-0.1110
0.5%		-0.3862
0.0%	minimum	-0.4530

Moments

Mean	0.006275
Std Dev	0.0624951
Std Err Mean	0.00277
upper 95% Mean	0.0117172
lower 95% Mean	0.0008329
N	509

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Li (mg/L)



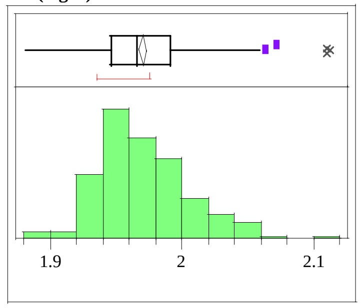
Quantiles

100.0%	maximum	0.1090
99.5%		0.1070
97.5%		0.0905
90.0%		0.0060
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0049
0.0%	minimum	-0.0070

Moments

Mean	0.0056385
Std Dev	0.0188253
Std Err Mean	0.0008344
upper 95% Mean	0.0072778
lower 95% Mean	0.0039992
N	509

Mn (mg/L)



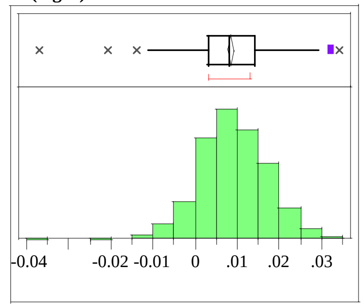
Quantiles

100.0%	maximum	2.1120
99.5%		2.1100
97.5%		2.0505
90.0%		2.0190
75.0%	quartile	1.9920
50.0%	median	1.9660
25.0%	quartile	1.9470
10.0%		1.9330
2.5%		1.9065
0.5%		1.8857
0.0%	minimum	1.8820

Moments

Mean	1.9707426
Std Dev	0.03523
Std Err Mean	0.0015615
upper 95% Mean	1.9738105
lower 95% Mean	1.9676748
N	509

Ni (mg/L)



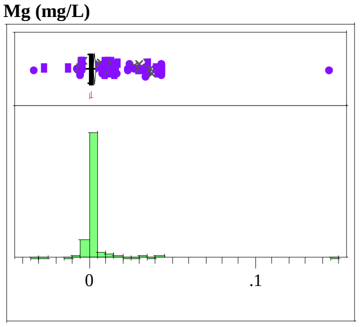
Quantiles

100.0%	maximum	0.0340
99.5%		0.0303
97.5%		0.0243
90.0%		0.0190
75.0%	quartile	0.0140
50.0%	median	0.0080
25.0%	quartile	0.0030
10.0%		-0.0010
2.5%		-0.0080
0.5%		-0.0171
0.0%	minimum	-0.0370

Moments

Mean	0.008556
Std Dev	0.0082909
Std Err Mean	0.0003675
upper 95% Mean	0.009278
lower 95% Mean	0.007834
N	509

Mg (mg/L)



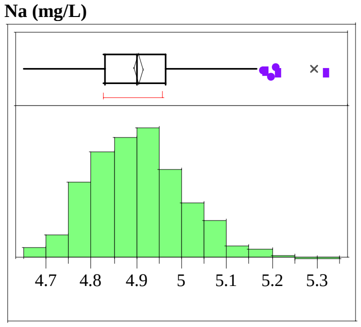
Quantiles

100.0%	maximum	0.1450
99.5%		0.0440
97.5%		0.0343
90.0%		0.0060
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0050
0.5%		-0.0193
0.0%	minimum	-0.0330

Moments

Mean	0.0028291
Std Dev	0.010134
Std Err Mean	0.0004492
upper 95% Mean	0.0037116
lower 95% Mean	0.0019466
N	509

Na (mg/L)



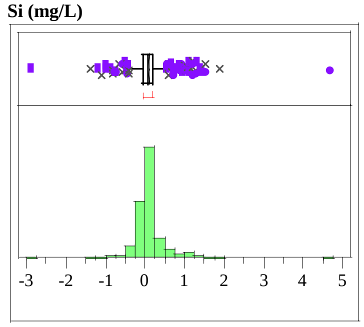
Quantiles

100.0%	maximum	5.3190
99.5%		5.2492
97.5%		5.1438
90.0%		5.0470
75.0%	quartile	4.9660
50.0%	median	4.9010
25.0%	quartile	4.8300
10.0%		4.7720
2.5%		4.7200
0.5%		4.6576
0.0%	minimum	4.6550

Moments

Mean	4.9044165
Std Dev	0.1072869
Std Err Mean	0.0047554
upper 95% Mean	4.9137592
lower 95% Mean	4.8950738
N	509

Si (mg/L)



Quantiles

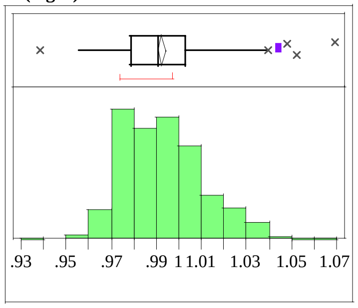
100.0%	maximum	4.701
99.5%		1.701
97.5%		1.178
90.0%		0.454
75.0%	quartile	0.188
50.0%	median	0.059
25.0%	quartile	-0.050
10.0%		-0.205
2.5%		-0.738
0.5%		-1.291
0.0%	minimum	-2.901

Moments

Mean	0.0933202
Std Dev	0.434354
Std Err Mean	0.0192524
upper 95% Mean	0.1311444
lower 95% Mean	0.0554961
N	509

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Ti (mg/L)



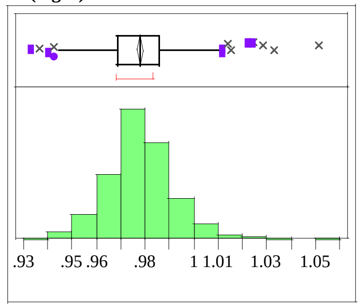
Quantiles

100.0%	maximum	1.0690
99.5%		1.0498
97.5%		1.0340
90.0%		1.0180
75.0%	quartile	1.0030
50.0%	median	0.9910
25.0%	quartile	0.9790
10.0%		0.9720
2.5%		0.9630
0.5%		0.9566
0.0%	minimum	0.9380

Moments

Mean	0.9925147
Std Dev	0.0182871
Std Err Mean	0.0008106
upper 95% Mean	0.9941072
lower 95% Mean	0.9909223
N	509

Zr (mg/L)



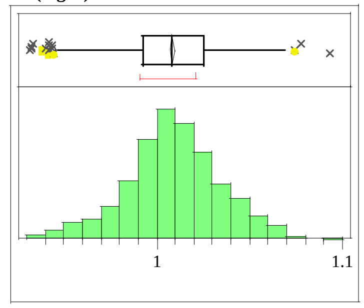
Quantiles

100.0%	maximum	1.0510
99.5%		1.0302
97.5%		1.0093
90.0%		0.9950
75.0%	quartile	0.9855
50.0%	median	0.9780
25.0%	quartile	0.9690
10.0%		0.9600
2.5%		0.9497
0.5%		0.9382
0.0%	minimum	0.9330

Moments

Mean	0.977725
Std Dev	0.0144137
Std Err Mean	0.0006389
upper 95% Mean	0.9789801
lower 95% Mean	0.9764698
N	509

Ca (mg/L)



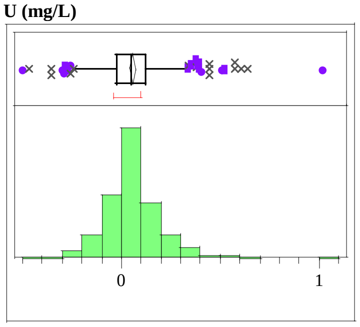
Quantiles

100.0%	maximum	1.0930
99.5%		1.0675
97.5%		1.0590
90.0%		1.0410
75.0%	quartile	1.0250
50.0%	median	1.0080
25.0%	quartile	0.9930
10.0%		0.9770
2.5%		0.9550
0.5%		0.9390
0.0%	minimum	0.9310

Moments

Mean	1.0084511
Std Dev	0.0252653
Std Err Mean	0.0007604
upper 95% Mean	1.0099431
lower 95% Mean	1.0069591
N	1104

U (mg/L)



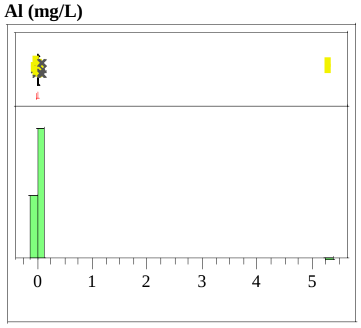
Quantiles

100.0%	maximum	1.023
99.5%		0.615
97.5%		0.393
90.0%		0.224
75.0%	quartile	0.121
50.0%	median	0.048
25.0%	quartile	-0.021
10.0%		-0.102
2.5%		-0.222
0.5%		-0.410
0.0%	minimum	-0.496

Moments

Mean	0.0578468
Std Dev	0.147824
Std Err Mean	0.0065522
upper 95% Mean	0.0707195
lower 95% Mean	0.044974
N	509

STCd=SM35
Distributions
Al (mg/L)



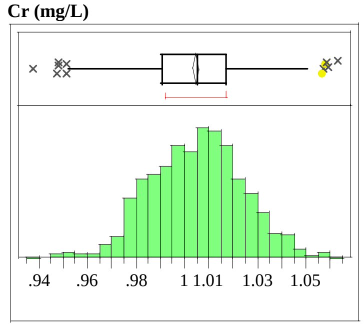
Quantiles

100.0%	maximum	5.292
99.5%		0.077
97.5%		0.032
90.0%		0.021
75.0%	quartile	0.012
50.0%	median	0.004
25.0%	quartile	-0.003
10.0%		-0.011
2.5%		-0.032
0.5%		-0.045
0.0%	minimum	-0.062

Moments

Mean	0.0137192
Std Dev	0.2252538
Std Err Mean	0.0067793
upper 95% Mean	0.0270211
lower 95% Mean	0.0004173
N	1104

Cr (mg/L)



Quantiles

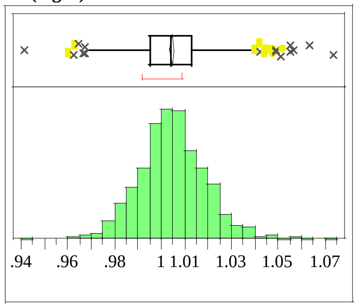
100.0%	maximum	1.0630
99.5%		1.0570
97.5%		1.0420
90.0%		1.0290
75.0%	quartile	1.0170
50.0%	median	1.0050
25.0%	quartile	0.9910
10.0%		0.9800
2.5%		0.9680
0.5%		0.9510
0.0%	minimum	0.9370

Moments

Mean	1.004529
Std Dev	0.0190072
Std Err Mean	0.000572
upper 95% Mean	1.0056514
lower 95% Mean	1.0034066
N	1104

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Cu (mg/L)



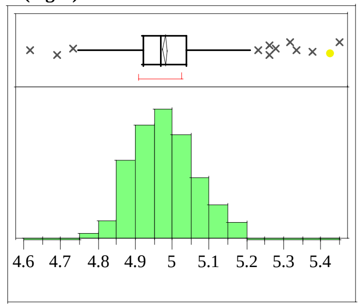
Quantiles

100.0%	maximum	1.0730
99.5%		1.0534
97.5%		1.0350
90.0%		1.0225
75.0%	quartile	1.0130
50.0%	median	1.0040
25.0%	quartile	0.9950
10.0%		0.9870
2.5%		0.9780
0.5%		0.9650
0.0%	minimum	0.9410

Moments

Mean	1.0044429
Std Dev	0.0146858
Std Err Mean	0.000442
upper 95% Mean	1.0053102
lower 95% Mean	1.0035757
N	1104

K (mg/L)



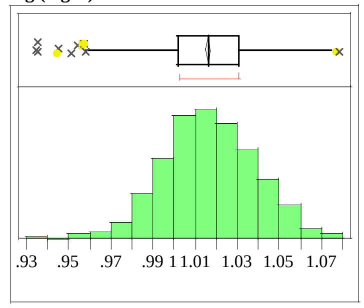
Quantiles

100.0%	maximum	5.4470
99.5%		5.2946
97.5%		5.1694
90.0%		5.0995
75.0%	quartile	5.0370
50.0%	median	4.9690
25.0%	quartile	4.9203
10.0%		4.8745
2.5%		4.8243
0.5%		4.7683
0.0%	minimum	4.6130

Moments

Mean	4.9807446
Std Dev	0.0906175
Std Err Mean	0.0027273
upper 95% Mean	4.9860958
lower 95% Mean	4.9753933
N	1104

Mg (mg/L)



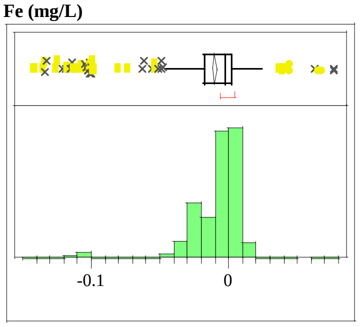
Quantiles

100.0%	maximum	1.0780
99.5%		1.0720
97.5%		1.0590
90.0%		1.0440
75.0%	quartile	1.0310
50.0%	median	1.0160
25.0%	quartile	1.0020
10.0%		0.9880
2.5%		0.9730
0.5%		0.9481
0.0%	minimum	0.9340

Moments

Mean	1.0161304
Std Dev	0.0222401
Std Err Mean	0.0006693
upper 95% Mean	1.0174438
lower 95% Mean	1.0148171
N	1104

Fe (mg/L)



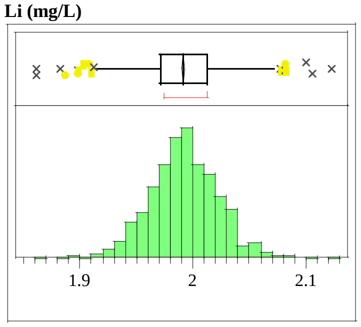
Quantiles

100.0%	maximum	0.0760
99.5%		0.0531
97.5%		0.0134
90.0%		0.0050
75.0%	quartile	0.0020
50.0%	median	-0.0030
25.0%	quartile	-0.0180
10.0%		-0.0300
2.5%		-0.1020
0.5%		-0.1335
0.0%	minimum	-0.1430

Moments

Mean	-0.010252
Std Dev	0.0239595
Std Err Mean	0.0007211
upper 95% Mean	-0.008837
lower 95% Mean	-0.011667
N	1104

Li (mg/L)



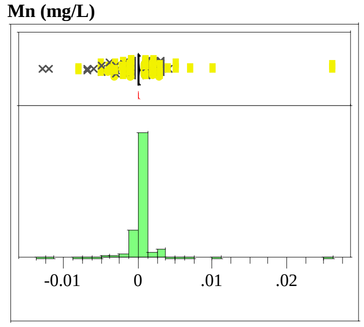
Quantiles

100.0%	maximum	2.1220
99.5%		2.0815
97.5%		2.0550
90.0%		2.0300
75.0%	quartile	2.0120
50.0%	median	1.9920
25.0%	quartile	1.9720
10.0%		1.9530
2.5%		1.9300
0.5%		1.8985
0.0%	minimum	1.8600

Moments

Mean	1.9916748
Std Dev	0.0311962
Std Err Mean	0.0009389
upper 95% Mean	1.993517
lower 95% Mean	1.9898326
N	1104

Mn (mg/L)



Quantiles

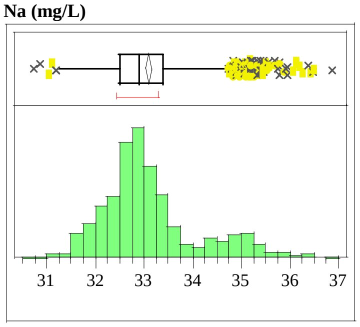
100.0%	maximum	0.0260
99.5%		0.0050
97.5%		0.0030
90.0%		0.0010
75.0%	quartile	0.0000
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0070
0.0%	minimum	-0.0130

Moments

Mean	0.000067
Std Dev	0.0017877
Std Err Mean	0.0000538
upper 95% Mean	0.0001726
lower 95% Mean	-0.000039
N	1104

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Na (mg/L)



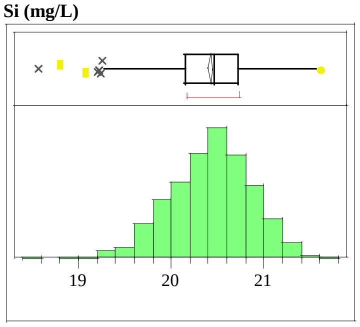
Quantiles

100.0%	maximum	36.859
99.5%		36.302
97.5%		35.453
90.0%		34.814
75.0%	quartile	33.389
50.0%	median	32.907
25.0%	quartile	32.511
10.0%		32.041
2.5%		31.637
0.5%		31.173
0.0%	minimum	30.718

Moments

Mean	33.102668
Std Dev	0.993759
Std Err Mean	0.0299086
upper 95% Mean	33.161352
lower 95% Mean	33.043983
N	1104

Si (mg/L)



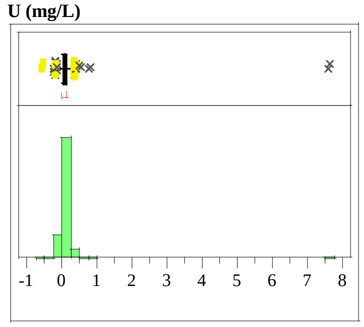
Quantiles

100.0%	maximum	21.621
99.5%		21.356
97.5%		21.206
90.0%		20.978
75.0%	quartile	20.725
50.0%	median	20.457
25.0%	quartile	20.147
10.0%		19.856
2.5%		19.512
0.5%		19.210
0.0%	minimum	18.571

Moments

Mean	20.425424
Std Dev	0.4321271
Std Err Mean	0.0130055
upper 95% Mean	20.450942
lower 95% Mean	20.399906
N	1104

U (mg/L)



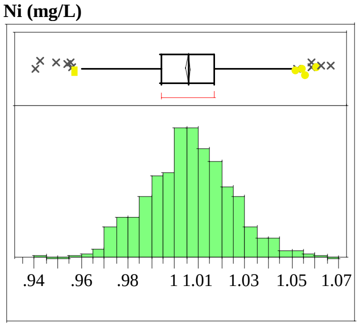
Quantiles

100.0%	maximum	7.594
99.5%		0.501
97.5%		0.328
90.0%		0.217
75.0%	quartile	0.154
50.0%	median	0.090
25.0%	quartile	0.033
10.0%		-0.021
2.5%		-0.124
0.5%		-0.231
0.0%	minimum	-0.548

Moments

Mean	0.1080634
Std Dev	0.3372052
Std Err Mean	0.0101487
upper 95% Mean	0.1279763
lower 95% Mean	0.0881505
N	1104

Ni (mg/L)



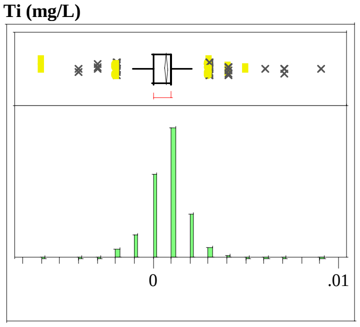
Quantiles

100.0%	maximum	1.0660
99.5%		1.0580
97.5%		1.0420
90.0%		1.0290
75.0%	quartile	1.0170
50.0%	median	1.0060
25.0%	quartile	0.9940
10.0%		0.9820
2.5%		0.9700
0.5%		0.9555
0.0%	minimum	0.9400

Moments

Mean	1.00576
Std Dev	0.0183881
Std Err Mean	0.0005534
upper 95% Mean	1.0068458
lower 95% Mean	1.0046741
N	1104

Ti (mg/L)



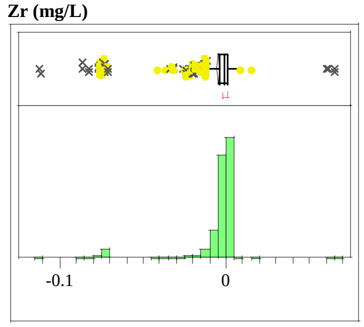
Quantiles

100.0%	maximum	0.0090
99.5%		0.0055
97.5%		0.0030
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0020
0.5%		-0.0030
0.0%	minimum	-0.0060

Moments

Mean	0.0007301
Std Dev	0.0012155
Std Err Mean	0.0000366
upper 95% Mean	0.0008018
lower 95% Mean	0.0006583
N	1104

Zr (mg/L)



Quantiles

100.0%	maximum	0.0650
99.5%		0.0123
97.5%		0.0030
90.0%		0.0010
75.0%	quartile	0.0010
50.0%	median	-0.0010
25.0%	quartile	-0.0040
10.0%		-0.0105
2.5%		-0.0740
0.5%		-0.0830
0.0%	minimum	-0.1130

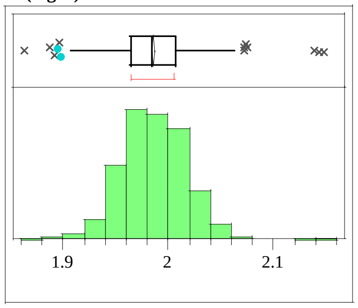
Moments

Mean	-0.005158
Std Dev	0.0163872
Std Err Mean	0.0004932
upper 95% Mean	-0.00419
lower 95% Mean	-0.006125
N	1104

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM36
Distributions

Al (mg/L)



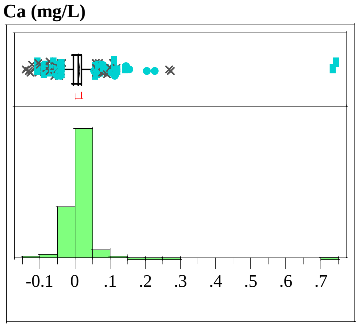
Quantiles

100.0%	maximum	2.1470
99.5%		2.0720
97.5%		2.0440
90.0%		2.0250
75.0%	quartile	2.0070
50.0%	median	1.9850
25.0%	quartile	1.9650
10.0%		1.9490
2.5%		1.9265
0.5%		1.8965
0.0%	minimum	1.8620

Moments

Mean	1.9861302
Std Dev	0.0310151
Std Err Mean	0.000936
upper 95% Mean	1.9879668
lower 95% Mean	1.9842937
N	1098

Ca (mg/L)



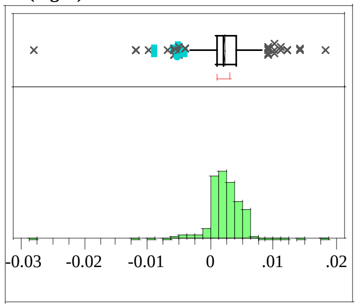
Quantiles

100.0%	maximum	0.7410
99.5%		0.2191
97.5%		0.0810
90.0%		0.0370
75.0%	quartile	0.0200
50.0%	median	0.0090
25.0%	quartile	-0.0030
10.0%		-0.0170
2.5%		-0.0580
0.5%		-0.1130
0.0%	minimum	-0.1410

Moments

Mean	0.0105228
Std Dev	0.0451304
Std Err Mean	0.001362
upper 95% Mean	0.0131951
lower 95% Mean	0.0078504
N	1098

Cr (mg/L)



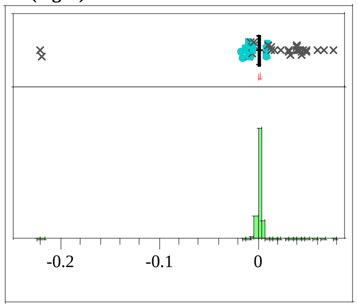
Quantiles

100.0%	maximum	0.0180
99.5%		0.0120
97.5%		0.0070
90.0%		0.0050
75.0%	quartile	0.0040
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0035
0.5%		-0.0090
0.0%	minimum	-0.0280

Moments

Mean	0.0022523
Std Dev	0.0027346
Std Err Mean	0.0000825
upper 95% Mean	0.0024142
lower 95% Mean	0.0020904
N	1098

Cu (mg/L)



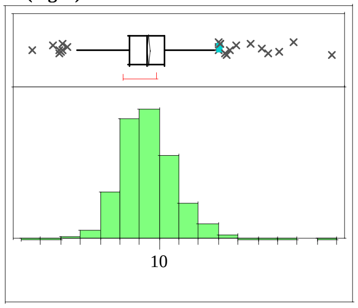
Quantiles

100.0%	maximum	0.0760
99.5%		0.0470
97.5%		0.0080
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0050
0.5%		-0.0120
0.0%	minimum	-0.2210

Moments

Mean	0.0015273
Std Dev	0.0113871
Std Err Mean	0.0003436
upper 95% Mean	0.0022016
lower 95% Mean	0.000853
N	1098

Fe (mg/L)



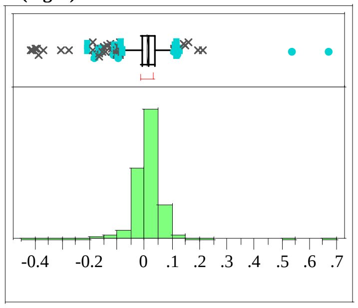
Quantiles

100.0%	maximum	10.875
99.5%		10.488
97.5%		10.255
90.0%		10.132
75.0%	quartile	10.026
50.0%	median	9.936
25.0%	quartile	9.847
10.0%		9.780
2.5%		9.686
0.5%		9.505
0.0%	minimum	9.352

Moments

Mean	9.9434681
Std Dev	0.1471541
Std Err Mean	0.0044409
upper 95% Mean	9.9521817
lower 95% Mean	9.9347545
N	1098

K (mg/L)



Quantiles

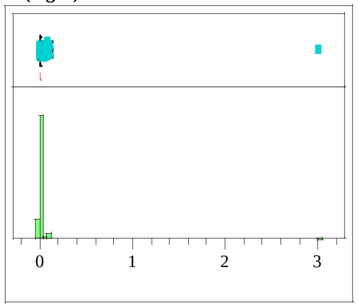
100.0%	maximum	0.6730
99.5%		0.1526
97.5%		0.0945
90.0%		0.0610
75.0%	quartile	0.0360
50.0%	median	0.0130
25.0%	quartile	-0.0100
10.0%		-0.0331
2.5%		-0.1261
0.5%		-0.3801
0.0%	minimum	-0.4200

Moments

Mean	0.0096667
Std Dev	0.0613561
Std Err Mean	0.0018516
upper 95% Mean	0.0132998
lower 95% Mean	0.0060335
N	1098

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Li (mg/L)



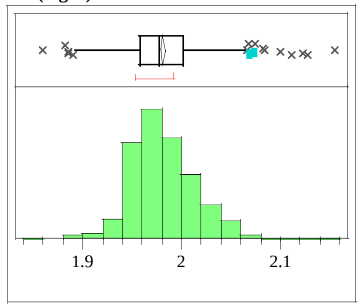
Quantiles

100.0%	maximum	3.003
99.5%		0.109
97.5%		0.091
90.0%		0.004
75.0%	quartile	0.002
50.0%	median	0.001
25.0%	quartile	0.000
10.0%		-0.001
2.5%		-0.003
0.5%		-0.005
0.0%	minimum	-0.008

Moments

Mean	0.008225
Std Dev	0.0923785
Std Err Mean	0.0027879
upper 95% Mean	0.0136951
lower 95% Mean	0.0027548
N	1098

Mn (mg/L)



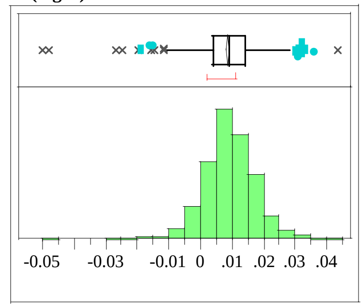
Quantiles

100.0%	maximum	2.1540
99.5%		2.0916
97.5%		2.0535
90.0%		2.0240
75.0%	quartile	2.0010
50.0%	median	1.9770
25.0%	quartile	1.9580
10.0%		1.9450
2.5%		1.9275
0.5%		1.8915
0.0%	minimum	1.8590

Moments

Mean	1.9813315
Std Dev	0.0331636
Std Err Mean	0.0010008
upper 95% Mean	1.9832953
lower 95% Mean	1.9793678
N	1098

Ni (mg/L)



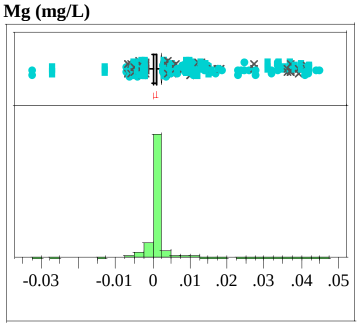
Quantiles

100.0%	maximum	0.0430
99.5%		0.0320
97.5%		0.0250
90.0%		0.0190
75.0%	quartile	0.0140
50.0%	median	0.0090
25.0%	quartile	0.0040
10.0%		-0.0010
2.5%		-0.0070
0.5%		-0.0195
0.0%	minimum	-0.0500

Moments

Mean	0.0086903
Std Dev	0.0082834
Std Err Mean	0.00025
upper 95% Mean	0.0091808
lower 95% Mean	0.0081998
N	1098

Mg (mg/L)



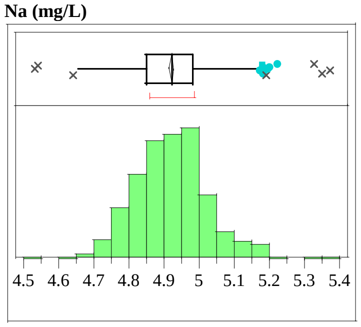
Quantiles

100.0%	maximum	0.0450
99.5%		0.0420
97.5%		0.0340
90.0%		0.0041
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0050
0.5%		-0.0130
0.0%	minimum	-0.0320

Moments

Mean	0.0021858
Std Dev	0.0076626
Std Err Mean	0.0002312
upper 95% Mean	0.0026395
lower 95% Mean	0.0017321
N	1098

Na (mg/L)



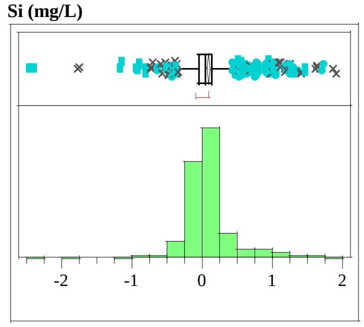
Quantiles

100.0%	maximum	5.3690
99.5%		5.1985
97.5%		5.1500
90.0%		5.0440
75.0%	quartile	4.9810
50.0%	median	4.9220
25.0%	quartile	4.8510
10.0%		4.7890
2.5%		4.7315
0.5%		4.6845
0.0%	minimum	4.5280

Moments

Mean	4.9208015
Std Dev	0.1026389
Std Err Mean	0.0030975
upper 95% Mean	4.9268791
lower 95% Mean	4.9147238
N	1098

Si (mg/L)



Quantiles

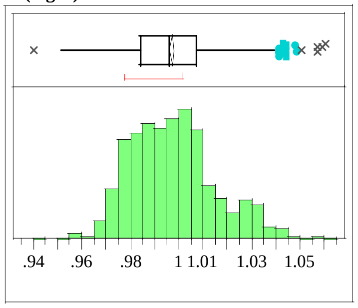
100.0%	maximum	1.888
99.5%		1.651
97.5%		1.171
90.0%		0.463
75.0%	quartile	0.144
50.0%	median	0.035
25.0%	quartile	-0.056
10.0%		-0.177
2.5%		-0.472
0.5%		-1.154
0.0%	minimum	-2.468

Moments

Mean	0.0880956
Std Dev	0.373166
Std Err Mean	0.0112616
upper 95% Mean	0.1101924
lower 95% Mean	0.0659989
N	1098

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Ti (mg/L)



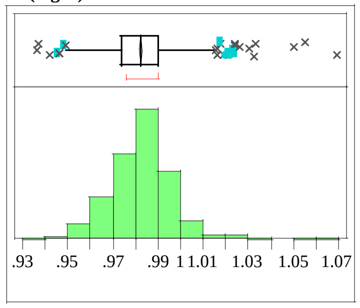
Quantiles

100.0%	maximum	1.0600
99.5%		1.0495
97.5%		1.0350
90.0%		1.0230
75.0%	quartile	1.0070
50.0%	median	0.9960
25.0%	quartile	0.9840
10.0%		0.9760
2.5%		0.9690
0.5%		0.9565
0.0%	minimum	0.9400

Moments

Mean	0.9970947
Std Dev	0.0176609
Std Err Mean	0.000533
upper 95% Mean	0.9981405
lower 95% Mean	0.9960489
N	1098

Zr (mg/L)



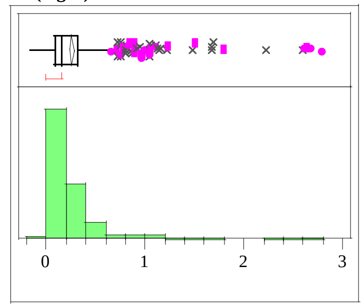
Quantiles

100.0%	maximum	1.0690
99.5%		1.0310
97.5%		1.0105
90.0%		0.9970
75.0%	quartile	0.9900
50.0%	median	0.9825
25.0%	quartile	0.9740
10.0%		0.9649
2.5%		0.9560
0.5%		0.9460
0.0%	minimum	0.9360

Moments

Mean	0.9822222
Std Dev	0.0137874
Std Err Mean	0.0004161
upper 95% Mean	0.9830386
lower 95% Mean	0.9814058
N	1098

Ca (mg/L)



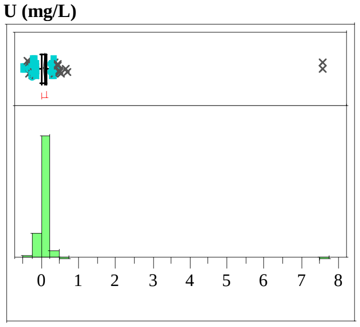
Quantiles

100.0%	maximum	2.796
99.5%		2.627
97.5%		1.114
90.0%		0.514
75.0%	quartile	0.320
50.0%	median	0.160
25.0%	quartile	0.091
10.0%		0.000
2.5%		0.000
0.5%		-0.026
0.0%	minimum	-0.156

Moments

Mean	0.256359
Std Dev	0.3390257
Std Err Mean	0.0127957
upper 95% Mean	0.2814815
lower 95% Mean	0.2312365
N	702

U (mg/L)



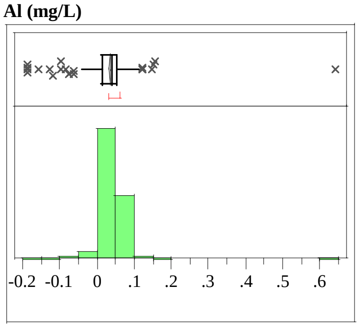
Quantiles

100.0%	maximum	7.541
99.5%		0.492
97.5%		0.308
90.0%		0.203
75.0%	quartile	0.137
50.0%	median	0.081
25.0%	quartile	0.028
10.0%		-0.045
2.5%		-0.188
0.5%		-0.353
0.0%	minimum	-0.469

Moments

Mean	0.0924772
Std Dev	0.3378057
Std Err Mean	0.0101945
upper 95% Mean	0.1124801
lower 95% Mean	0.0724743
N	1098

STCd=SM37
Distributions
Al (mg/L)



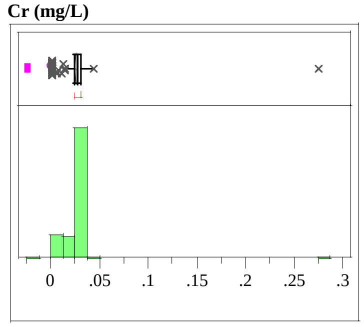
Quantiles

100.0%	maximum	0.6400
99.5%		0.1469
97.5%		0.0880
90.0%		0.0670
75.0%	quartile	0.0540
50.0%	median	0.0400
25.0%	quartile	0.0158
10.0%		0.0000
2.5%		-0.0253
0.5%		-0.1900
0.0%	minimum	-0.1910

Moments

Mean	0.0346994
Std Dev	0.0420383
Std Err Mean	0.0015866
upper 95% Mean	0.0378145
lower 95% Mean	0.0315843
N	702

Cr (mg/L)



Quantiles

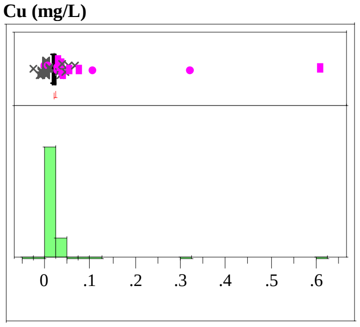
100.0%	maximum	0.2750
99.5%		0.0395
97.5%		0.0354
90.0%		0.0330
75.0%	quartile	0.0310
50.0%	median	0.0280
25.0%	quartile	0.0240
10.0%		0.0000
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	-0.0240

Moments

Mean	0.025141
Std Dev	0.0140059
Std Err Mean	0.0005286
upper 95% Mean	0.0261789
lower 95% Mean	0.0241032
N	702

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Cu (mg/L)



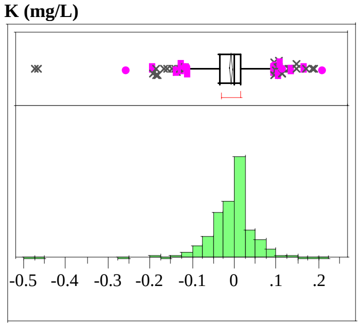
Quantiles

100.0%	maximum	0.6110
99.5%		0.0910
97.5%		0.0320
90.0%		0.0260
75.0%	quartile	0.0230
50.0%	median	0.0200
25.0%	quartile	0.0180
10.0%		0.0000
2.5%		0.0000
0.5%		-0.0100
0.0%	minimum	-0.0260

Moments

Mean	0.0201425
Std Dev	0.0269049
Std Err Mean	0.0010155
upper 95% Mean	0.0221362
lower 95% Mean	0.0181487
N	702

K (mg/L)



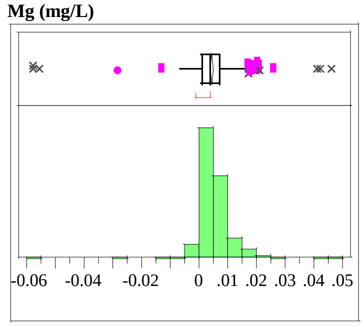
Quantiles

100.0%	maximum	0.2120
99.5%		0.1763
97.5%		0.0993
90.0%		0.0540
75.0%	quartile	0.0153
50.0%	median	0.0000
25.0%	quartile	-0.0340
10.0%		-0.0657
2.5%		-0.1225
0.5%		-0.2251
0.0%	minimum	-0.4760

Moments

Mean	-0.007788
Std Dev	0.0569735
Std Err Mean	0.0021503
upper 95% Mean	-0.003566
lower 95% Mean	-0.01201
N	702

Mg (mg/L)



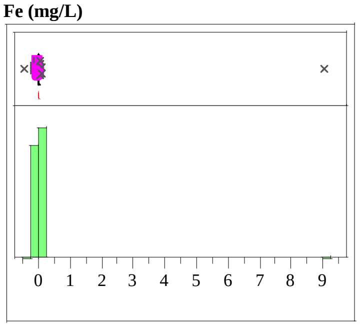
Quantiles

100.0%	maximum	0.0460
99.5%		0.0333
97.5%		0.0174
90.0%		0.0100
75.0%	quartile	0.0070
50.0%	median	0.0040
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0040
0.5%		-0.0416
0.0%	minimum	-0.0580

Moments

Mean	0.0043091
Std Dev	0.0068012
Std Err Mean	0.0002567
upper 95% Mean	0.0048131
lower 95% Mean	0.0038051
N	702

Fe (mg/L)



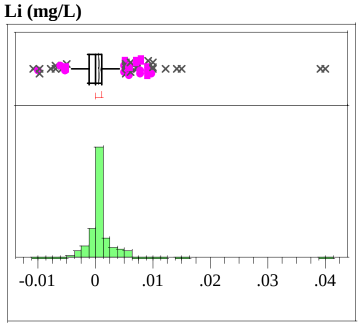
Quantiles

100.0%	maximum	9.000
99.5%		0.060
97.5%		0.042
90.0%		0.010
75.0%	quartile	0.003
50.0%	median	0.000
25.0%	quartile	-0.009
10.0%		-0.025
2.5%		-0.110
0.5%		-0.153
0.0%	minimum	-0.460

Moments

Mean	0.0062707
Std Dev	0.341381
Std Err Mean	0.0128846
upper 95% Mean	0.0315677
lower 95% Mean	-0.019026
N	702

Li (mg/L)



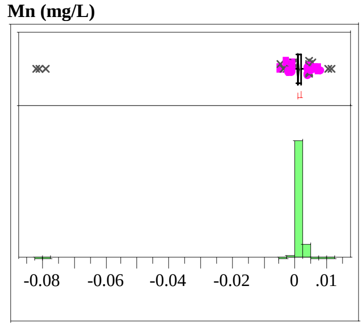
Quantiles

100.0%	maximum	0.0400
99.5%		0.0145
97.5%		0.0074
90.0%		0.0037
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0020
2.5%		-0.0040
0.5%		-0.0100
0.0%	minimum	-0.0110

Moments

Mean	0.0006652
Std Dev	0.0032906
Std Err Mean	0.0001242
upper 95% Mean	0.0009091
lower 95% Mean	0.0004214
N	702

Mn (mg/L)



Quantiles

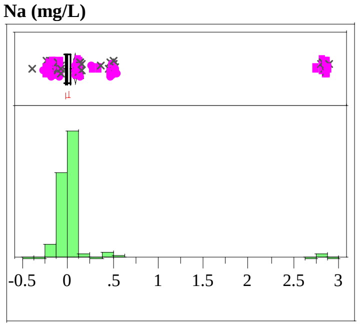
100.0%	maximum	0.0110
99.5%		0.0075
97.5%		0.0040
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0010
0.5%		-0.0409
0.0%	minimum	-0.0820

Moments

Mean	0.00101
Std Dev	0.0055176
Std Err Mean	0.0002082
upper 95% Mean	0.0014188
lower 95% Mean	0.0006011
N	702

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Na (mg/L)



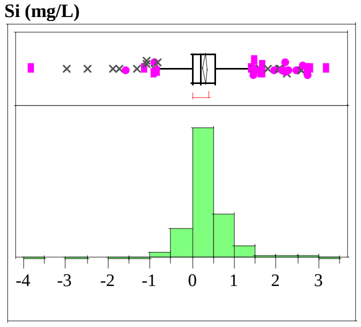
Quantiles

100.0%	maximum	2.893
99.5%		2.875
97.5%		1.488
90.0%		0.108
75.0%	quartile	0.022
50.0%	median	0.000
25.0%	quartile	-0.018
10.0%		-0.065
2.5%		-0.174
0.5%		-0.245
0.0%	minimum	-0.409

Moments

Mean	0.0811353
Std Dev	0.4497681
Std Err Mean	0.0169754
upper 95% Mean	0.114464
lower 95% Mean	0.0478066
N	702

Si (mg/L)



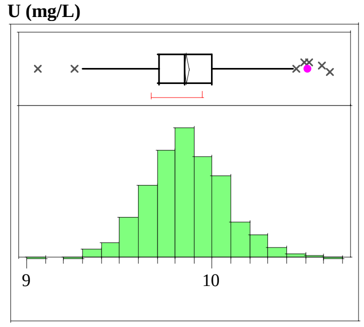
Quantiles

100.0%	maximum	3.173
99.5%		2.741
97.5%		1.998
90.0%		0.906
75.0%	quartile	0.553
50.0%	median	0.204
25.0%	quartile	0.000
10.0%		-0.160
2.5%		-0.756
0.5%		-2.189
0.0%	minimum	-3.818

Moments

Mean	0.3020171
Std Dev	0.6073006
Std Err Mean	0.0229211
upper 95% Mean	0.3470193
lower 95% Mean	0.2570149
N	702

U (mg/L)



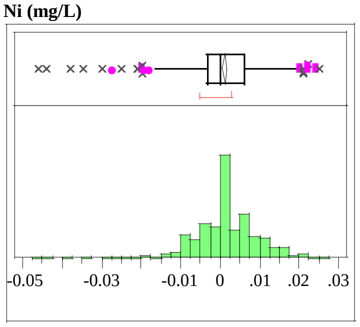
Quantiles

100.0%	maximum	10.629
99.5%		10.515
97.5%		10.312
90.0%		10.131
75.0%	quartile	9.999
50.0%	median	9.854
25.0%	quartile	9.716
10.0%		9.596
2.5%		9.456
0.5%		9.314
0.0%	minimum	9.053

Moments

Mean	9.8617365
Std Dev	0.215953
Std Err Mean	0.0081506
upper 95% Mean	9.877739
lower 95% Mean	9.8457339
N	702

Ni (mg/L)



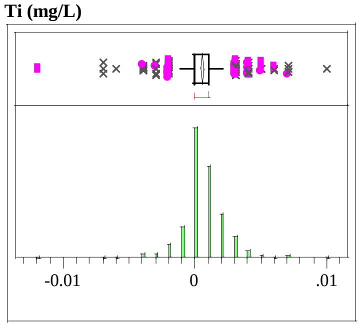
Quantiles

100.0%	maximum	0.0250
99.5%		0.0220
97.5%		0.0170
90.0%		0.0110
75.0%	quartile	0.0060
50.0%	median	0.0000
25.0%	quartile	-0.0030
10.0%		-0.0080
2.5%		-0.0140
0.5%		-0.0365
0.0%	minimum	-0.0460

Moments

Mean	0.0012336
Std Dev	0.0081033
Std Err Mean	0.0003058
upper 95% Mean	0.0018341
lower 95% Mean	0.0006332
N	702

Ti (mg/L)



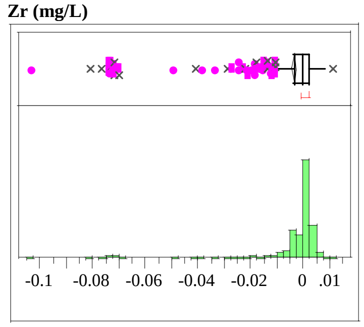
Quantiles

100.0%	maximum	0.0100
99.5%		0.0070
97.5%		0.0040
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0070
0.0%	minimum	-0.0120

Moments

Mean	0.0005769
Std Dev	0.0017371
Std Err Mean	0.0000656
upper 95% Mean	0.0007056
lower 95% Mean	0.0004482
N	702

Zr (mg/L)



Quantiles

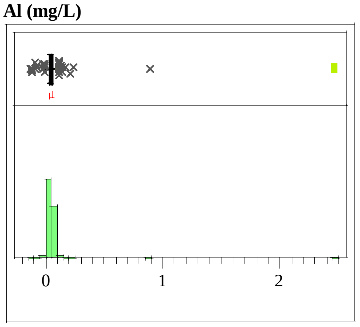
100.0%	maximum	0.0110
99.5%		0.0070
97.5%		0.0050
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0000
25.0%	quartile	-0.0030
10.0%		-0.0080
2.5%		-0.0714
0.5%		-0.0755
0.0%	minimum	-0.1030

Moments

Mean	-0.003417
Std Dev	0.0137093
Std Err Mean	0.0005174
upper 95% Mean	-0.002401
lower 95% Mean	-0.004433
N	702

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM38
Distributions
Al (mg/L)



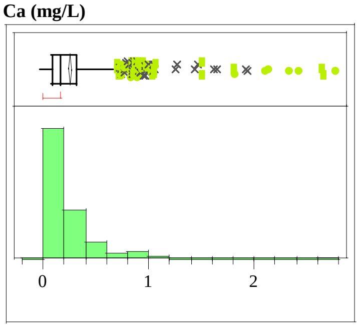
Quantiles

100.0%	maximum	2.467
99.5%		0.168
97.5%		0.092
90.0%		0.072
75.0%	quartile	0.057
50.0%	median	0.046
25.0%	quartile	0.029
10.0%		0.000
2.5%		0.000
0.5%		-0.092
0.0%	minimum	-0.135

Moments

Mean	0.0472568
Std Dev	0.1065797
Std Err Mean	0.0031079
upper 95% Mean	0.0533545
lower 95% Mean	0.0411591
N	1176

Ca (mg/L)



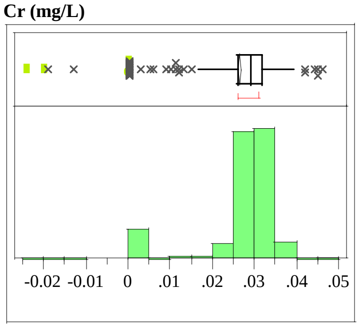
Quantiles

100.0%	maximum	2.779
99.5%		2.345
97.5%		1.032
90.0%		0.547
75.0%	quartile	0.319
50.0%	median	0.159
25.0%	quartile	0.095
10.0%		0.011
2.5%		0.000
0.5%		0.000
0.0%	minimum	-0.011

Moments

Mean	0.2575306
Std Dev	0.3197154
Std Err Mean	0.0093231
upper 95% Mean	0.2758224
lower 95% Mean	0.2392389
N	1176

Cr (mg/L)



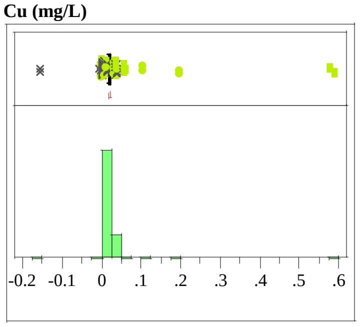
Quantiles

100.0%	maximum	0.0460
99.5%		0.0420
97.5%		0.0360
90.0%		0.0340
75.0%	quartile	0.0320
50.0%	median	0.0290
25.0%	quartile	0.0260
10.0%		0.0117
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	-0.0240

Moments

Mean	0.0265136
Std Dev	0.0096118
Std Err Mean	0.0002803
upper 95% Mean	0.0270635
lower 95% Mean	0.0259637
N	1176

Cu (mg/L)



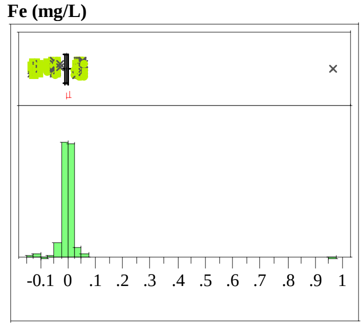
Quantiles

100.0%	maximum	0.5880
99.5%		0.1040
97.5%		0.0330
90.0%		0.0270
75.0%	quartile	0.0240
50.0%	median	0.0220
25.0%	quartile	0.0200
10.0%		0.0070
2.5%		0.0000
0.5%		-0.0042
0.0%	minimum	-0.1590

Moments

Mean	0.0213801
Std Dev	0.0268302
Std Err Mean	0.0007824
upper 95% Mean	0.0229151
lower 95% Mean	0.0198451
N	1176

Fe (mg/L)



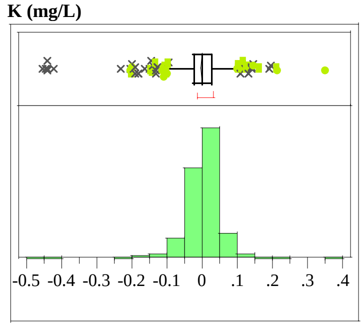
Quantiles

100.0%	maximum	0.9620
99.5%		0.0581
97.5%		0.0460
90.0%		0.0090
75.0%	quartile	0.0030
50.0%	median	-0.0010
25.0%	quartile	-0.0110
10.0%		-0.0250
2.5%		-0.0807
0.5%		-0.1301
0.0%	minimum	-0.1360

Moments

Mean	-0.004812
Std Dev	0.0374291
Std Err Mean	0.0010915
upper 95% Mean	-0.002671
lower 95% Mean	-0.006953
N	1176

K (mg/L)



Quantiles

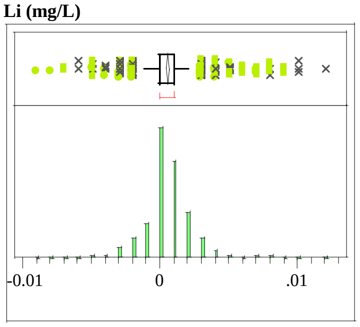
100.0%	maximum	0.3520
99.5%		0.1642
97.5%		0.0920
90.0%		0.0523
75.0%	quartile	0.0270
50.0%	median	0.0000
25.0%	quartile	-0.0220
10.0%		-0.0510
2.5%		-0.1208
0.5%		-0.4261
0.0%	minimum	-0.4580

Moments

Mean	-0.001117
Std Dev	0.0578298
Std Err Mean	0.0016864
upper 95% Mean	0.0021913
lower 95% Mean	-0.004426
N	1176

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Li (mg/L)



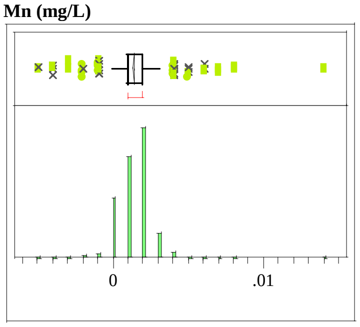
Quantiles

100.0%	maximum	0.0120
99.5%		0.0090
97.5%		0.0046
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0013
2.5%		-0.0030
0.5%		-0.0051
0.0%	minimum	-0.0090

Moments

Mean	0.000523
Std Dev	0.0018981
Std Err Mean	0.0000554
upper 95% Mean	0.0006316
lower 95% Mean	0.0004144
N	1176

Mn (mg/L)



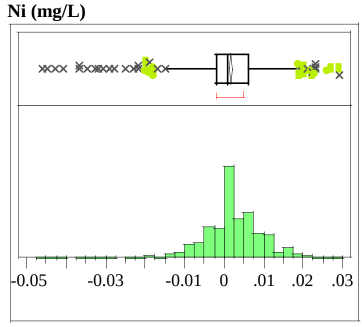
Quantiles

100.0%	maximum	0.0140
99.5%		0.0061
97.5%		0.0040
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0006
0.5%		-0.0040
0.0%	minimum	-0.0050

Moments

Mean	0.0013997
Std Dev	0.0012467
Std Err Mean	0.0000364
upper 95% Mean	0.001471
lower 95% Mean	0.0013283
N	1176

Ni (mg/L)



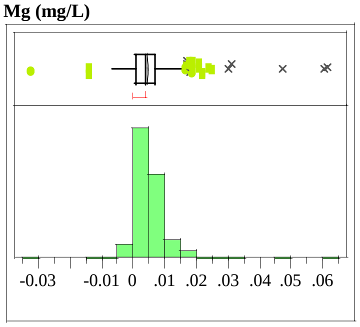
Quantiles

100.0%	maximum	0.0290
99.5%		0.0230
97.5%		0.0180
90.0%		0.0110
75.0%	quartile	0.0060
50.0%	median	0.0010
25.0%	quartile	-0.0020
10.0%		-0.0070
2.5%		-0.0140
0.5%		-0.0370
0.0%	minimum	-0.0460

Moments

Mean	0.0018342
Std Dev	0.0081552
Std Err Mean	0.0002378
upper 95% Mean	0.0023008
lower 95% Mean	0.0013676
N	1176

Mg (mg/L)



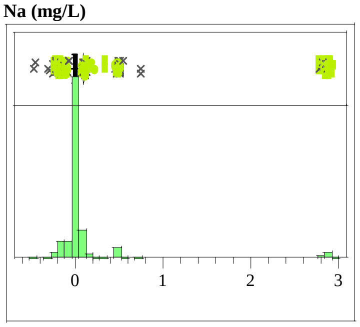
Quantiles

100.0%	maximum	0.0610
99.5%		0.0256
97.5%		0.0160
90.0%		0.0100
75.0%	quartile	0.0070
50.0%	median	0.0040
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0040
0.5%		-0.0060
0.0%	minimum	-0.0320

Moments

Mean	0.0044702
Std Dev	0.0054961
Std Err Mean	0.0001603
upper 95% Mean	0.0047847
lower 95% Mean	0.0041558
N	1176

Na (mg/L)



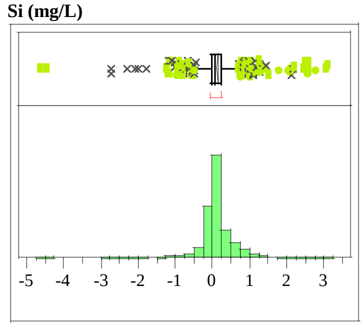
Quantiles

100.0%	maximum	2.944
99.5%		2.889
97.5%		2.792
90.0%		0.111
75.0%	quartile	0.020
50.0%	median	0.000
25.0%	quartile	-0.019
10.0%		-0.072
2.5%		-0.196
0.5%		-0.262
0.0%	minimum	-0.482

Moments

Mean	0.0937415
Std Dev	0.4926536
Std Err Mean	0.0143661
upper 95% Mean	0.1219275
lower 95% Mean	0.0655555
N	1176

Si (mg/L)



Quantiles

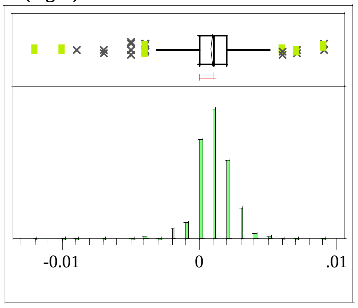
100.0%	maximum	3.072
99.5%		2.574
97.5%		1.234
90.0%		0.641
75.0%	quartile	0.258
50.0%	median	0.065
25.0%	quartile	-0.037
10.0%		-0.220
2.5%		-0.800
0.5%		-2.139
0.0%	minimum	-4.630

Moments

Mean	0.1311216
Std Dev	0.5247348
Std Err Mean	0.0153016
upper 95% Mean	0.1611431
lower 95% Mean	0.1011001
N	1176

Exhibit A12. Histograms and Descriptive Statistics for Mixed Acid Measurements of Calibration and Bench Standards

Ti (mg/L)



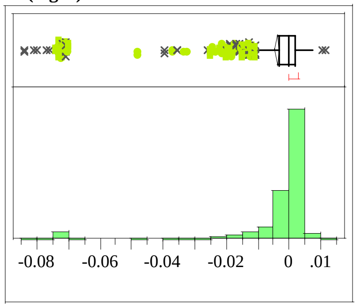
Quantiles

100.0%	maximum	0.0090
99.5%		0.0070
97.5%		0.0040
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0020
0.5%		-0.0052
0.0%	minimum	-0.0120

Moments

Mean	0.0009439
Std Dev	0.001583
Std Err Mean	0.0000462
upper 95% Mean	0.0010344
lower 95% Mean	0.0008533
N	1176

Zr (mg/L)



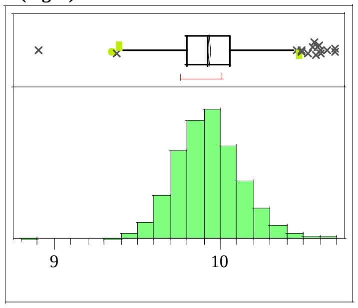
Quantiles

100.0%	maximum	0.0110
99.5%		0.0060
97.5%		0.0050
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0000
25.0%	quartile	-0.0030
10.0%		-0.0110
2.5%		-0.0720
0.5%		-0.0761
0.0%	minimum	-0.0840

Moments

Mean	-0.003895
Std Dev	0.0149417
Std Err Mean	0.0004357
upper 95% Mean	-0.00304
lower 95% Mean	-0.004749
N	1176

U (mg/L)



Quantiles

100.0%	maximum	10.686
99.5%		10.588
97.5%		10.354
90.0%		10.188
75.0%	quartile	10.056
50.0%	median	9.925
25.0%	quartile	9.798
10.0%		9.689
2.5%		9.539
0.5%		9.436
0.0%	minimum	8.898

Moments

Mean	9.9324371
Std Dev	0.202447
Std Err Mean	0.0059035
upper 95% Mean	9.9440196
lower 95% Mean	9.9208545
N	1176

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM32
Least Squares Fit
Response Al (mg/L)
Summary of Fit

RSquare	0.731448
RSquare Adj	0.459397
Root Mean Square Error	0.037056
Mean of Response	0.010732
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	1.1482092	0.003692	2.6886
Error	307	0.4215662	0.001373	Prob > F
C. Total	618	1.5697755		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.001169	45.980
Residual	0.001373	54.020
Total	0.002542	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.645226
RSquare Adj	0.285831
Root Mean Square Error	0.043983
Mean of Response	0.013079
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	1.0800944	0.003473	1.7953
Error	307	0.5938827	0.001934	Prob > F
C. Total	618	1.6739771		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000775	28.616
Residual	0.001934	71.384
Total	0.00271	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.637097
RSquare Adj	0.269467
Root Mean Square Error	0.005754
Mean of Response	0.004292
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.01784132	0.000057	1.7330
Error	307	0.01016275	0.000033	Prob > F
C. Total	618	0.02800407		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000012	26.979
Residual	0.000033	73.021
Total	0.000045	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.819704
RSquare Adj	0.637059
Root Mean Square Error	0.002582
Mean of Response	0.00209
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.00930768	0.000030	4.4880
Error	307	0.00204725	0.000007	Prob > F
C. Total	618	0.01135493		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000012	63.744
Residual	0.000007	36.256
Total	0.000018	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.6433
RSquare Adj	0.281953
Root Mean Square Error	0.047725
Mean of Response	0.004237
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	1.2610783	0.004055	1.7803
Error	307	0.6992477	0.002278	Prob > F
C. Total	618	1.9603261		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000896	28.228
Residual	0.002278	71.772
Total	0.003174	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.749507
RSquare Adj	0.49575
Root Mean Square Error	0.055593
Mean of Response	0.059318
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	2.8389248	0.009128	2.9536
Error	307	0.9487995	0.003091	Prob > F
C. Total	618	3.7877243		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.003043	49.616
Residual	0.003091	50.384
Total	0.006134	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Li (mg/L)
Summary of Fit

RSquare	0.815283
RSquare Adj	0.628159
Root Mean Square Error	0.001742
Mean of Response	0.00253
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.00411245	0.000013	4.3569
Error	307	0.00093175	0.000003	Prob > F
C. Total	618	0.00504420		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000005	62.854
Residual	0.000003	37.146
Total	0.000008	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.710526
RSquare Adj	0.41728
Root Mean Square Error	0.00383
Mean of Response	0.000989
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.01105217	0.000036	2.4230
Error	307	0.00450275	0.000015	Prob > F
C. Total	618	0.01555492		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000011	41.768
Residual	0.000015	58.232
Total	0.000025	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.514042
RSquare Adj	0.021752
Root Mean Square Error	0.00994
Mean of Response	0.001163
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.03208677	0.000103	1.0442
Error	307	0.03033375	0.000099	Prob > F
C. Total	618	0.06242052		0.3522

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000002	2.179
Residual	0.000099	97.821
Total	0.000101	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (mg/L)
Summary of Fit

RSquare	0.612569
RSquare Adj	0.220091
Root Mean Square Error	0.169108
Mean of Response	0.013015
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	13.881307	0.044634	1.5608
Error	307	8.779484	0.028598	Prob > F
C. Total	618	22.660791		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.008084	22.037
Residual	0.028598	77.963
Total	0.036681	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.700966
RSquare Adj	0.398036
Root Mean Square Error	0.009129
Mean of Response	0.005105
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.05996917	0.000193	2.3140
Error	307	0.02558300	0.000083	Prob > F
C. Total	618	0.08555217		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000055	39.843
Residual	0.000083	60.157
Total	0.000139	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.901673
RSquare Adj	0.802064
Root Mean Square Error	0.252245
Mean of Response	0.088454
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	179.12582	0.575967	9.0522
Error	307	19.53365	0.063628	Prob > F
C. Total	618	198.65948		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.258251	80.232
Residual	0.063628	19.768
Total	0.321878	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Ti (mg/L)
Summary of Fit

RSquare	0.832348
RSquare Adj	0.662511
Root Mean Square Error	0.014828
Mean of Response	0.013963
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.33511490	0.001078	4.9009
Error	307	0.06749925	0.000220	Prob > F
C. Total	618	0.40261415		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000432	66.288
Residual	0.00022	33.712
Total	0.000652	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.810443
RSquare Adj	0.618417
Root Mean Square Error	0.115758
Mean of Response	0.171911
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	17.588249	0.056554	4.2205
Error	307	4.113757	0.013400	Prob > F
C. Total	618	21.702006		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.021752	61.880
Residual	0.0134	38.120
Total	0.035152	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.99585
RSquare Adj	0.991646
Root Mean Square Error	0.001429
Mean of Response	-0.00663
Observations (or Sum Wgts)	619

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.15045249	0.000484	236.8699
Error	307	0.00062700	0.000002	Prob > F
C. Total	618	0.15107949		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000243	99.166
Residual	0.000002	0.834
Total	0.000245	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=SM35
Least Squares Fit
Response Al (mg/L)
Summary of Fit

RSquare	0.999908
RSquare Adj	0.999821
Root Mean Square Error	0.003954
Mean of Response	0.021078
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	55.759775	0.179292	11468.9
Error	328	0.005128	0.000016	Prob > F
C. Total	639	55.764902		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.087404	99.982
Residual	0.000016	0.018
Total	0.087419	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.931703
RSquare Adj	0.866946
Root Mean Square Error	0.008818
Mean of Response	1.01023
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.34794390	0.001119	14.3877
Error	328	0.02550533	0.000078	Prob > F
C. Total	639	0.37344924		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000508	86.715
Residual	0.000078	13.285
Total	0.000585	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.958953
RSquare Adj	0.920033
Root Mean Square Error	0.004855
Mean of Response	1.006403
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.18060916	0.000581	24.6392
Error	328	0.00773083	0.000024	Prob > F
C. Total	639	0.18833999		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000272	92.016
Residual	0.000024	7.984
Total	0.000295	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Cu (mg/L)
Summary of Fit

RSquare	0.945467
RSquare Adj	0.893761
Root Mean Square Error	0.004551
Mean of Response	1.005462
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.11775902	0.000379	18.2854
Error	328	0.00679208	0.000021	Prob > F
C. Total	639	0.12455110		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000175	89.392
Residual	0.000021	10.608
Total	0.000195	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.994141
RSquare Adj	0.988586
Root Mean Square Error	0.002517
Mean of Response	-0.0085
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.35271724	0.001134	178.9525
Error	328	0.00207875	0.000006	Prob > F
C. Total	639	0.35479599		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.00055	98.861
Residual	0.000006	1.139
Total	0.000556	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.910762
RSquare Adj	0.826149
Root Mean Square Error	0.035144
Mean of Response	4.985609
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	4.1346358	0.013295	10.7639
Error	328	0.4051186	0.001235	Prob > F
C. Total	639	4.5397543		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.005879	82.640
Residual	0.001235	17.360
Total	0.007115	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.958425
RSquare Adj	0.919004
Root Mean Square Error	0.008964
Mean of Response	1.993216
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.60755916	0.001954	24.3129
Error	328	0.02635508	0.000080	Prob > F
C. Total	639	0.63391424		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000913	91.913
Residual	0.00008	8.087
Total	0.000994	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.930673
RSquare Adj	0.864939
Root Mean Square Error	0.007845
Mean of Response	1.017252
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.27096583	0.000871	14.1581
Error	328	0.02018467	0.000062	Prob > F
C. Total	639	0.29115050		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000395	86.514
Residual	0.000062	13.486
Total	0.000456	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.98071
RSquare Adj	0.96242
Root Mean Square Error	0.000382
Mean of Response	0.000142
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.00243614	0.0000078	53.6204
Error	328	0.00004792	1.4609e-7	Prob > F
C. Total	639	0.00248406		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000004	96.248
Residual	1.461e-7	3.752
Total	0.000004	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Na (mg/L)
Summary of Fit

RSquare	0.987919
RSquare Adj	0.976463
Root Mean Square Error	0.14046
Mean of Response	33.05044
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	529.15574	1.70147	86.2419
Error	328	6.47111	0.01973	Prob > F
C. Total	639	535.62685		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.819909	97.650
Residual	0.019729	2.350
Total	0.839638	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.837895
RSquare Adj	0.684192
Root Mean Square Error	0.009906
Mean of Response	1.007205
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.16635085	0.000535	5.4514
Error	328	0.03218333	0.000098	Prob > F
C. Total	639	0.19853419		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000213	68.456
Residual	0.000098	31.544
Total	0.000311	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.918035
RSquare Adj	0.840319
Root Mean Square Error	0.164221
Mean of Response	20.4581
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	99.07467	0.318568	11.8126
Error	328	8.84567	0.026969	Prob > F
C. Total	639	107.92034		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.142166	84.055
Residual	0.026969	15.945
Total	0.169134	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.915101
RSquare Adj	0.834603
Root Mean Square Error	0.000457
Mean of Response	0.000734
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.00073834	0.0000024	11.3679
Error	328	0.00006850	2.0884e-7	Prob > F
C. Total	639	0.00080684		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000001	83.484
Residual	2.088e-7	16.516
Total	0.000001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.94539
RSquare Adj	0.89361
Root Mean Square Error	0.034337
Mean of Response	0.100041
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	6.6947554	0.021527	18.2579
Error	328	0.3867196	0.001179	Prob > F
C. Total	639	7.0814749		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.00992	89.377
Residual	0.001179	10.623
Total	0.011099	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.998234
RSquare Adj	0.99656
Root Mean Square Error	0.000885
Mean of Response	-0.00557
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	311	0.14539981	0.000468	596.2970
Error	328	0.00025717	0.000001	Prob > F
C. Total	639	0.14565698		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000228	99.657
Residual	7.84e-7	0.343
Total	0.000228	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

STCd=SM36
Least Squares Fit
Response Al (mg/L)
Summary of Fit

RSquare	0.95777
RSquare Adj	0.917723
Root Mean Square Error	0.008164
Mean of Response	1.985738
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.49727254	0.001594	23.9159
Error	329	0.02192550	0.000067	Prob > F
C. Total	641	0.51919804		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000745	91.785
Residual	0.000067	8.215
Total	0.000811	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.98817
RSquare Adj	0.976952
Root Mean Square Error	0.007646
Mean of Response	0.014014
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	1.6065306	0.005149	88.0846
Error	329	0.0192322	0.000058	Prob > F
C. Total	641	1.6257629		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.002482	97.699
Residual	0.000058	2.301
Total	0.002541	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.945494
RSquare Adj	0.893804
Root Mean Square Error	0.000691
Mean of Response	0.002301
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.00272773	0.0000087	18.2916
Error	329	0.00015725	4.7796e-7	Prob > F
C. Total	641	0.00288498		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000004	89.397
Residual	4.78e-7	10.603
Total	0.000005	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.971071
RSquare Adj	0.943638
Root Mean Square Error	0.000645
Mean of Response	0.001173
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.00459881	0.000015	35.3970
Error	329	0.00013700	0.000000	Prob > F
C. Total	641	0.00473581		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000007	94.373
Residual	4.164e-7	5.627
Total	0.000007	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.945694
RSquare Adj	0.894194
Root Mean Square Error	0.040845
Mean of Response	9.939983
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	9.558196	0.030635	18.3629
Error	329	0.548877	0.001668	Prob > F
C. Total	641	10.107073		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.014124	89.436
Residual	0.001668	10.564
Total	0.015792	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.808647
RSquare Adj	0.627181
Root Mean Square Error	0.032376
Mean of Response	0.014528
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	1.4573787	0.004671	4.4562
Error	329	0.3448652	0.001048	Prob > F
C. Total	641	1.8022440		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.001766	62.758
Residual	0.001048	37.242
Total	0.002815	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Li (mg/L)
Summary of Fit

RSquare	0.51178
RSquare Adj	0.048788
Root Mean Square Error	0.117031
Mean of Response	0.011338
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	4.7235519	0.015140	1.1054
Error	329	4.5060957	0.013696	Prob > F
C. Total	641	9.2296477		0.1849

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000704	4.887
Residual	0.013696	95.113
Total	0.0144	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.99744
RSquare Adj	0.995012
Root Mean Square Error	0.000597
Mean of Response	0.002645
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.04568378	0.000146	410.8568
Error	329	0.00011725	0.000000	Prob > F
C. Total	641	0.04580103		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000071	99.502
Residual	3.564e-7	0.498
Total	0.000072	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.966581
RSquare Adj	0.934888
Root Mean Square Error	0.007599
Mean of Response	1.979662
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.54953365	0.001761	30.4987
Error	329	0.01900000	0.000058	Prob > F
C. Total	641	0.56853365		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000831	93.499
Residual	0.000058	6.501
Total	0.000888	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (mg/L)
Summary of Fit

RSquare	0.975938
RSquare Adj	0.95312
Root Mean Square Error	0.020942
Mean of Response	4.92141
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	5.8521605	0.018757	42.7698
Error	329	0.1442848	0.000439	Prob > F
C. Total	641	5.9964453		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.008932	95.320
Residual	0.000439	4.680
Total	0.00937	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.781709
RSquare Adj	0.574697
Root Mean Square Error	0.004956
Mean of Response	0.009037
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.02894285	0.000093	3.7762
Error	329	0.00808225	0.000025	Prob > F
C. Total	641	0.03702510		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000033	57.512
Residual	0.000025	42.488
Total	0.000058	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.942504
RSquare Adj	0.887978
Root Mean Square Error	0.126195
Mean of Response	0.105315
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	85.886059	0.275276	17.2856
Error	329	5.239385	0.015925	Prob > F
C. Total	641	91.125444		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.126453	88.815
Residual	0.015925	11.185
Total	0.142378	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Ti (mg/L)
Summary of Fit

RSquare	0.977565
RSquare Adj	0.95629
Root Mean Square Error	0.003696
Mean of Response	0.997285
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.19585209	0.000628	45.9477
Error	329	0.00449475	0.000014	Prob > F
C. Total	641	0.20034684		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000299	95.636
Residual	0.000014	4.364
Total	0.000313	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.964136
RSquare Adj	0.930125
Root Mean Square Error	0.028213
Mean of Response	0.080436
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	7.0399106	0.022564	28.3477
Error	329	0.2618732	0.000796	Prob > F
C. Total	641	7.3017839		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.010613	93.024
Residual	0.000796	6.976
Total	0.011409	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.947128
RSquare Adj	0.896987
Root Mean Square Error	0.003751
Mean of Response	0.981547
Observations (or Sum Wgts)	642

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	312	0.08291260	0.000266	18.8895
Error	329	0.00462850	0.000014	Prob > F
C. Total	641	0.08754110		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000123	89.715
Residual	0.000014	10.285
Total	0.000137	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=SM38
Least Squares Fit
Response Al (mg/L)
Summary of Fit

RSquare	0.999352
RSquare Adj	0.998742
Root Mean Square Error	0.004835
Mean of Response	0.053603
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	11.867425	0.038282	1637.441
Error	329	0.007692	0.000023	Prob > F
C. Total	639	11.875117		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.018593	99.874
Residual	0.000023	0.126
Total	0.018616	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.980486
RSquare Adj	0.962099
Root Mean Square Error	0.068089
Mean of Response	0.276666
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	76.638089	0.247220	53.3247
Error	329	1.525283	0.004636	Prob > F
C. Total	639	78.163372		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.117891	96.216
Residual	0.004636	3.784
Total	0.122527	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.934417
RSquare Adj	0.872622
Root Mean Square Error	0.001823
Mean of Response	0.029059
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.01557649	0.000050	15.1211
Error	329	0.00109325	0.000003	Prob > F
C. Total	639	0.01666974		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000023	87.282
Residual	0.000003	12.718
Total	0.000026	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Cu (mg/L)
Summary of Fit

RSquare	0.998625
RSquare Adj	0.99733
Root Mean Square Error	0.001727
Mean of Response	0.024969
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.71264238	0.002299	770.9689
Error	329	0.00098100	0.000003	Prob > F
C. Total	639	0.71362337		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.001116	99.733
Residual	0.000003	0.267
Total	0.001119	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.983698
RSquare Adj	0.968338
Root Mean Square Error	0.004469
Mean of Response	-0.00586
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.39653137	0.001279	64.0418
Error	329	0.00657125	0.000020	Prob > F
C. Total	639	0.40310262		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000612	96.839
Residual	0.00002	3.161
Total	0.000632	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.843468
RSquare Adj	0.695977
Root Mean Square Error	0.026611
Mean of Response	0.003142
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	1.2554488	0.004050	5.7187
Error	329	0.2329873	0.000708	Prob > F
C. Total	639	1.4884361		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.001624	69.635
Residual	0.000708	30.365
Total	0.002332	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.927906
RSquare Adj	0.859976
Root Mean Square Error	0.000707
Mean of Response	0.000559
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.00211724	0.0000068	13.6596
Error	329	0.00016450	0.0000005	Prob > F
C. Total	639	0.00228174		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000003	86.019
Residual	5e-7	13.981
Total	0.000004	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.986396
RSquare Adj	0.973578
Root Mean Square Error	0.000848
Mean of Response	0.004812
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.01716675	0.000055	76.9542
Error	329	0.00023675	0.000001	Prob > F
C. Total	639	0.01740350		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000027	97.362
Residual	7.196e-7	2.638
Total	0.000027	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.935927
RSquare Adj	0.875554
Root Mean Square Error	0.00045
Mean of Response	0.001481
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.00097502	0.0000031	15.5024
Error	329	0.00006675	2.0289e-7	Prob > F
C. Total	639	0.00104178		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000001	87.574
Residual	2.029e-7	12.426
Total	0.000002	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A13. Components of Variance for the Mixed Acid Measurements of Calibration and Bench Standards

Response Na (mg/L)
Summary of Fit

RSquare	0.999931
RSquare Adj	0.999867
Root Mean Square Error	0.00642
Mean of Response	0.11727
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	197.61906	0.637481	15464.34
Error	329	0.01356	0.000041	Prob > F
C. Total	639	197.63262		0.0000

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.309782	99.987
Residual	0.000041	0.013
Total	0.309824	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.801291
RSquare Adj	0.614058
Root Mean Square Error	0.004689
Mean of Response	0.00248
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.02916999	0.000094	4.2796
Error	329	0.00723375	0.000022	Prob > F
C. Total	639	0.03640374		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000035	61.447
Residual	0.000022	38.553
Total	0.000057	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.898259
RSquare Adj	0.802393
Root Mean Square Error	0.256714
Mean of Response	0.171572
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	191.42465	0.617499	9.3700
Error	329	21.68175	0.065902	Prob > F
C. Total	639	213.10640		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.268065	80.267
Residual	0.065902	19.733
Total	0.333967	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.938576
RSquare Adj	0.880699
Root Mean Square Error	0.000491
Mean of Response	0.001117
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.00121096	0.0000039	16.2168
Error	329	0.00007925	2.4088e-7	Prob > F
C. Total	639	0.00129021		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000002	88.088
Residual	2.409e-7	11.912
Total	0.000002	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (mg/L)
Summary of Fit

RSquare	0.924231
RSquare Adj	0.852838
Root Mean Square Error	0.068853
Mean of Response	9.913252
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	19.025153	0.061371	12.9457
Error	329	1.559687	0.004741	Prob > F
C. Total	639	20.584840		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.027521	85.306
Residual	0.004741	14.694
Total	0.032262	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (mg/L)
Summary of Fit

RSquare	0.997853
RSquare Adj	0.99583
Root Mean Square Error	0.00099
Mean of Response	-0.00467
Observations (or Sum Wgts)	640

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	310	0.14999034	0.000484	493.2093
Error	329	0.00032275	0.000001	Prob > F
C. Total	639	0.15031309		0.0000

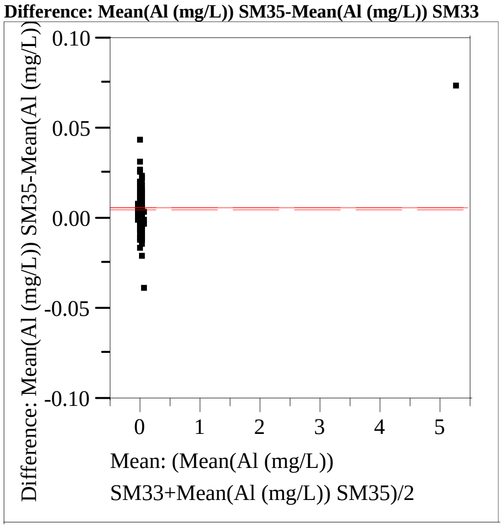
Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank & Batch&Random	0.000235	99.584
Residual	9.81e-7	0.416
Total	0.000236	100.000

These estimates based on equating Mean Squares to Expected Value.

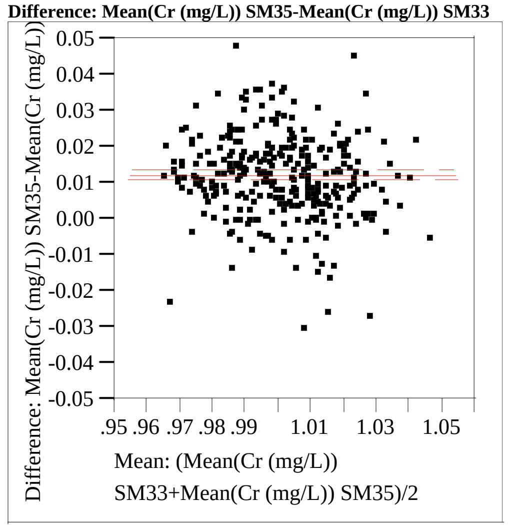
Exhibit A14. Paired Comparisons of SM35 versus SM33 for Mixed Acid Data

Difference: Mean(Al (mg/L)) SM35-Mean(Al (mg/L)) SM33



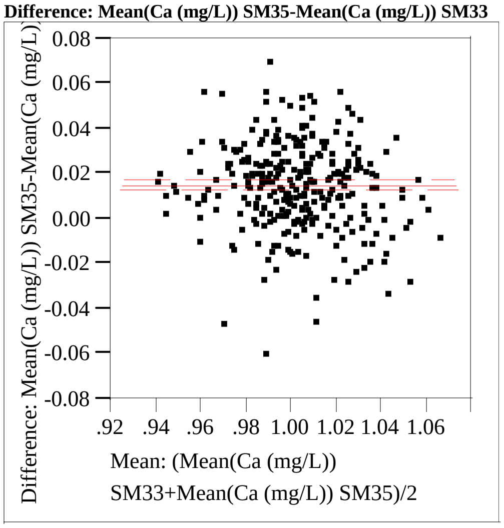
Mean(Al (mg/L)) SM35	0.02175	t-Ratio	10.66921
Mean(Al (mg/L)) SM33	0.01616	DF	304
Mean Difference	0.00559	Prob > |t|	<.0001
Std Error	0.00052	Prob > t	<.0001
Upper95%	0.00662	Prob < t	1.0000
Lower95%	0.00456		
N	305		
Correlation	0.99962		

Difference: Mean(Cr (mg/L)) SM35-Mean(Cr (mg/L)) SM33



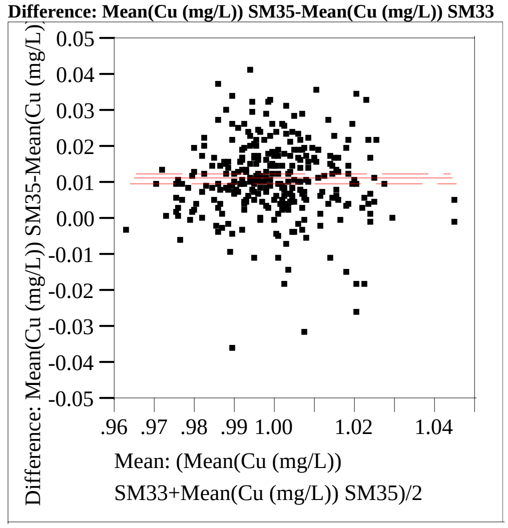
Mean(Cr (mg/L)) SM35	1.00657	t-Ratio	18.35433
Mean(Cr (mg/L)) SM33	0.99444	DF	304
Mean Difference	0.01213	Prob > |t|	<.0001
Std Error	0.00066	Prob > t	<.0001
Upper95%	0.01344	Prob < t	1.0000
Lower95%	0.01083		
N	305		
Correlation	0.79083		

Difference: Mean(Ca (mg/L)) SM35-Mean(Ca (mg/L)) SM33



Mean(Ca (mg/L)) SM35	1.01034	t-Ratio	13.64267
Mean(Ca (mg/L)) SM33	0.99531	DF	304
Mean Difference	0.01503	Prob > |t|	<.0001
Std Error	0.0011	Prob > t	<.0001
Upper95%	0.0172	Prob < t	1.0000
Lower95%	0.01286		
N	305		
Correlation	0.69877		

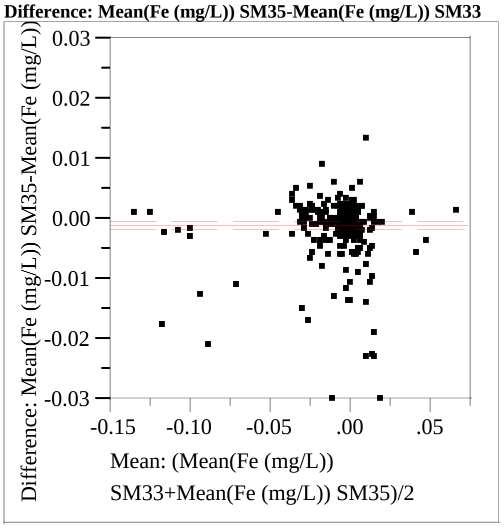
Difference: Mean(Cu (mg/L)) SM35-Mean(Cu (mg/L)) SM33



Mean(Cu (mg/L)) SM35	1.00538	t-Ratio	18.38029
Mean(Cu (mg/L)) SM33	0.99421	DF	304
Mean Difference	0.01117	Prob > |t|	<.0001
Std Error	0.00061	Prob > t	<.0001
Upper95%	0.01237	Prob < t	1.0000
Lower95%	0.00997		
N	305		
Correlation	0.70216		

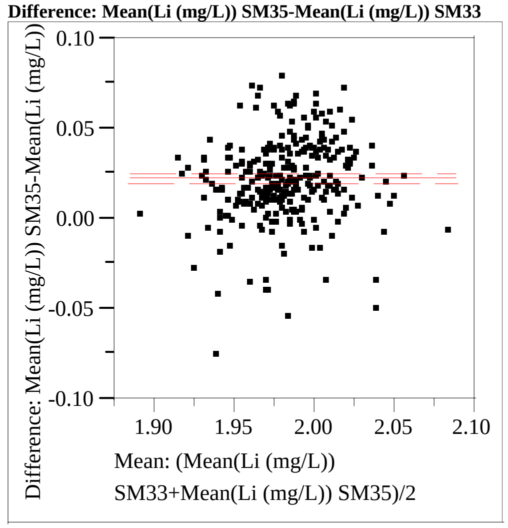
Exhibit A14. Paired Comparisons of SM35 versus SM33 for Mixed Acid Data

Difference: Mean(Fe (mg/L)) SM35-Mean(Fe (mg/L)) SM33



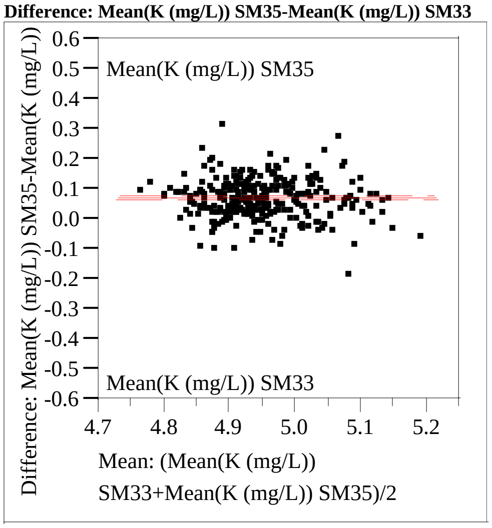
Mean(Fe (mg/L)) SM35	-0.0081	t-Ratio	-3.89603
Mean(Fe (mg/L)) SM33	-0.007	DF	304
Mean Difference	-0.0011	Prob > |t|	0.0001
Std Error	0.00029	Prob > t	0.9999
Upper95%	-0.0006	Prob < t	<.0001
Lower95%	-0.0017		
N	305		
Correlation	0.97592		

Difference: Mean(Li (mg/L)) SM35-Mean(Li (mg/L)) SM33



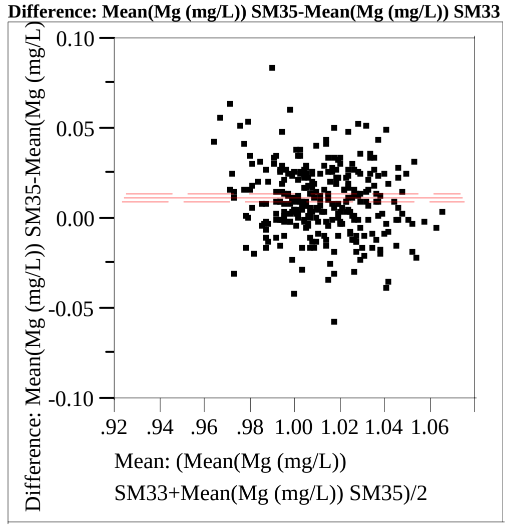
Mean(Li (mg/L)) SM35	1.99297	t-Ratio	17.36545
Mean(Li (mg/L)) SM33	1.9706	DF	304
Mean Difference	0.02237	Prob > |t|	<.0001
Std Error	0.00129	Prob > t	<.0001
Upper95%	0.02491	Prob < t	1.0000
Lower95%	0.01984		
N	305		
Correlation	0.71247		

Difference: Mean(K (mg/L)) SM35-Mean(K (mg/L)) SM33



Mean(K (mg/L)) SM35	4.98468	t-Ratio	19.43239
Mean(K (mg/L)) SM33	4.91212	DF	304
Mean Difference	0.07256	Prob > |t|	<.0001
Std Error	0.00373	Prob > t	<.0001
Upper95%	0.07991	Prob < t	1.0000
Lower95%	0.06521		
N	305		
Correlation	0.68301		

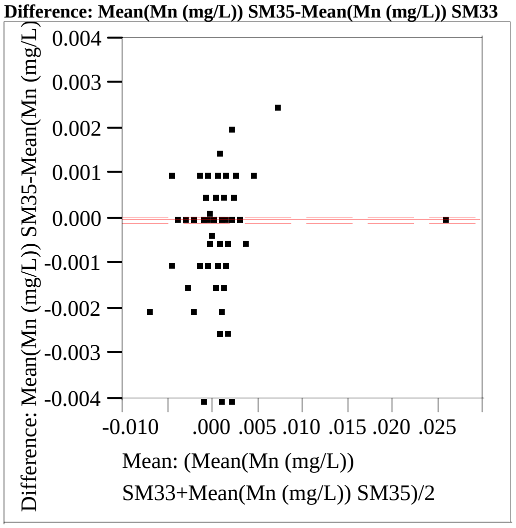
Difference: Mean(Mg (mg/L)) SM35-Mean(Mg (mg/L)) SM33



Mean(Mg (mg/L)) SM35	1.01765	t-Ratio	10.22383
Mean(Mg (mg/L)) SM33	1.00642	DF	304
Mean Difference	0.01123	Prob > |t|	<.0001
Std Error	0.0011	Prob > t	<.0001
Upper95%	0.01339	Prob < t	1.0000
Lower95%	0.00907		
N	305		
Correlation	0.60749		

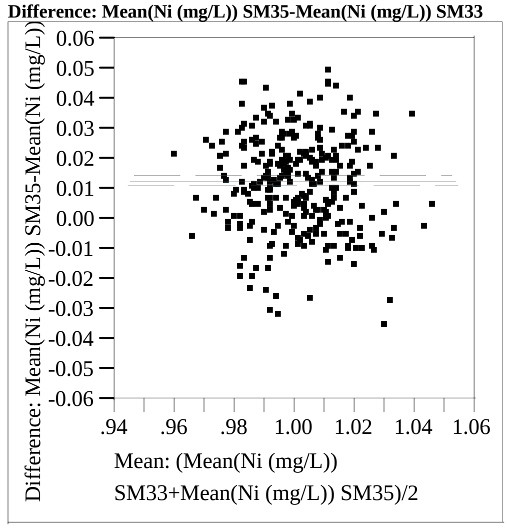
Exhibit A14. Paired Comparisons of SM35 versus SM33 for Mixed Acid Data

Difference: Mean(Mn (mg/L)) SM35-Mean(Mn (mg/L)) SM33



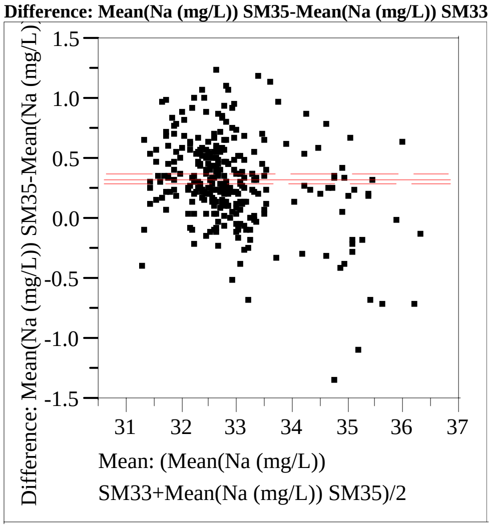
Mean(Mn (mg/L)) SM35	0.00012	t-Ratio	-0.97016
Mean(Mn (mg/L)) SM33	0.00016	DF	304
Mean Difference	-4.2e-5	Prob > |t|	0.3327
Std Error	0.00004	Prob > t	0.8336
Upper95%	0.00004	Prob < t	0.1664
Lower95%	-0.0001		
N	305		
Correlation	0.92751		

Difference: Mean(Ni (mg/L)) SM35-Mean(Ni (mg/L)) SM33



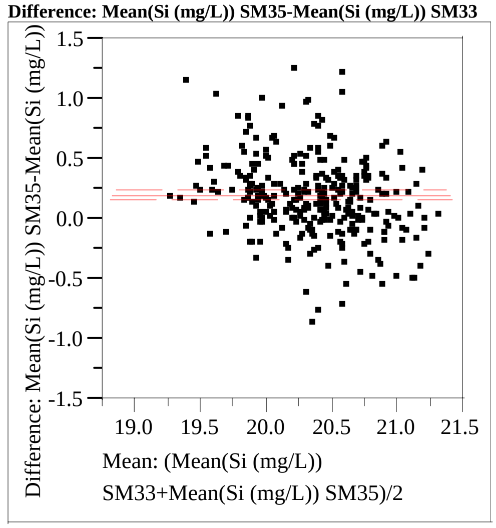
Mean(Ni (mg/L)) SM35	1.00718	t-Ratio	13.89571
Mean(Ni (mg/L)) SM33	0.99469	DF	304
Mean Difference	0.01249	Prob > |t|	<.0001
Std Error	0.0009	Prob > t	<.0001
Upper95%	0.01426	Prob < t	1.0000
Lower95%	0.01072		
N	305		
Correlation	0.56414		

Difference: Mean(Na (mg/L)) SM35-Mean(Na (mg/L)) SM33



Mean(Na (mg/L)) SM35	33.0419	t-Ratio	16.24694
Mean(Na (mg/L)) SM33	32.7116	DF	304
Mean Difference	0.33031	Prob > |t|	<.0001
Std Error	0.02033	Prob > t	<.0001
Upper95%	0.37031	Prob < t	1.0000
Lower95%	0.2903		
N	305		
Correlation	0.93697		

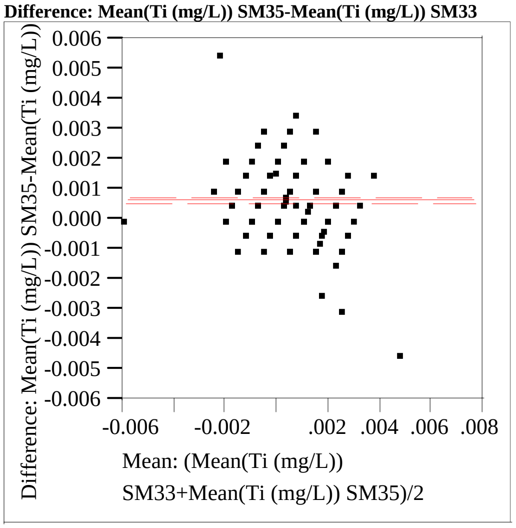
Difference: Mean(Si (mg/L)) SM35-Mean(Si (mg/L)) SM33



Mean(Si (mg/L)) SM35	20.4596	t-Ratio	10.5016
Mean(Si (mg/L)) SM33	20.2611	DF	304
Mean Difference	0.19853	Prob > |t|	<.0001
Std Error	0.01891	Prob > t	<.0001
Upper95%	0.23574	Prob < t	1.0000
Lower95%	0.16133		
N	305		
Correlation	0.73459		

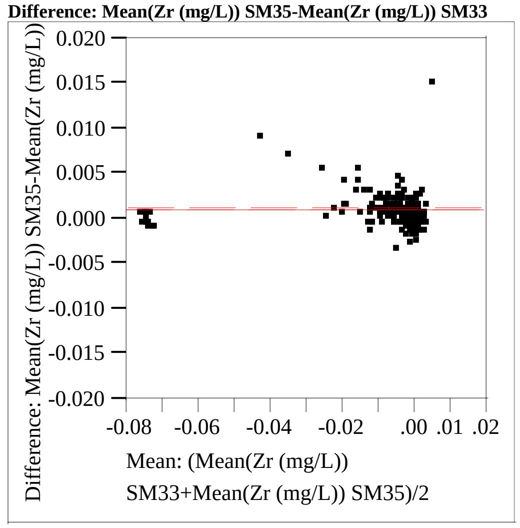
Exhibit A14. Paired Comparisons of SM35 versus SM33 for Mixed Acid Data

Difference: Mean(Ti (mg/L)) SM35-Mean(Ti (mg/L)) SM33



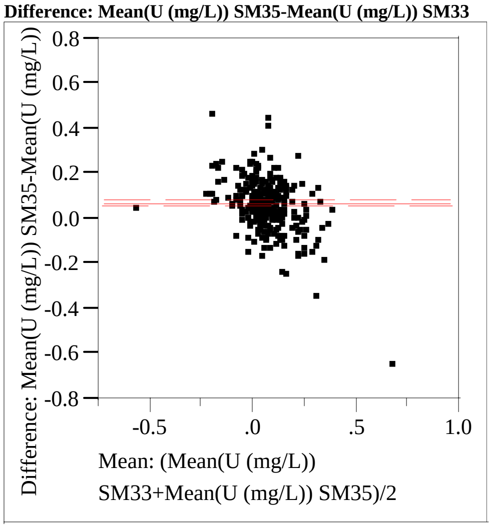
Mean(Ti (mg/L)) SM35	0.00072	t-Ratio	10.42806
Mean(Ti (mg/L)) SM33	0.00011	DF	304
Mean Difference	0.00061	Prob > |t|	<.0001
Std Error	0.00006	Prob > t	<.0001
Upper95%	0.00072	Prob < t	1.0000
Lower95%	0.00049		
N	305		
Correlation	0.68648		

Difference: Mean(Zr (mg/L)) SM35-Mean(Zr (mg/L)) SM33



Mean(Zr (mg/L)) SM35	-0.0058	t-Ratio	12.28788
Mean(Zr (mg/L)) SM33	-0.0069	DF	304
Mean Difference	0.00111	Prob > |t|	<.0001
Std Error	0.00009	Prob > t	<.0001
Upper95%	0.00128	Prob < t	1.0000
Lower95%	0.00093		
N	305		
Correlation	0.99485		

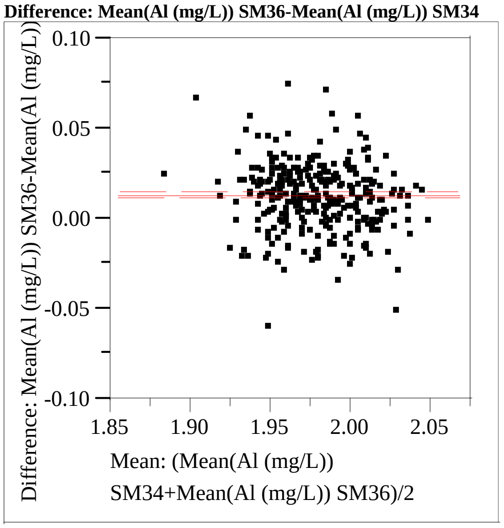
Difference: Mean(U (mg/L)) SM35-Mean(U (mg/L)) SM33



Mean(U (mg/L)) SM35	0.09804	t-Ratio	10.59003
Mean(U (mg/L)) SM33	0.02976	DF	304
Mean Difference	0.06828	Prob > |t|	<.0001
Std Error	0.00645	Prob > t	<.0001
Upper95%	0.08097	Prob < t	1.0000
Lower95%	0.05559		
N	305		
Correlation	0.6441		

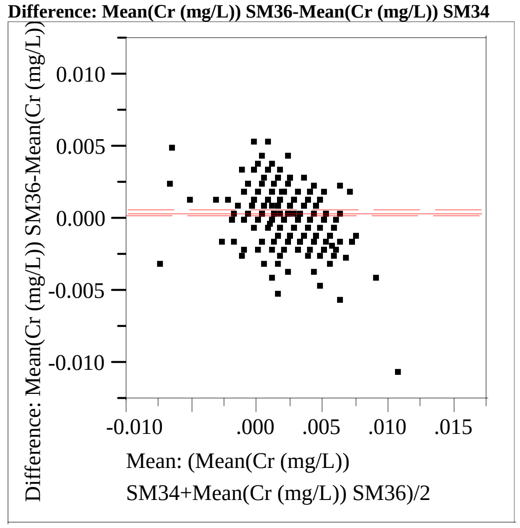
Exhibit A15. Paired Comparisons of SM36 versus SM34 for Mixed Acid Data

Difference: Mean(Al (mg/L)) SM36-Mean(Al (mg/L)) SM34



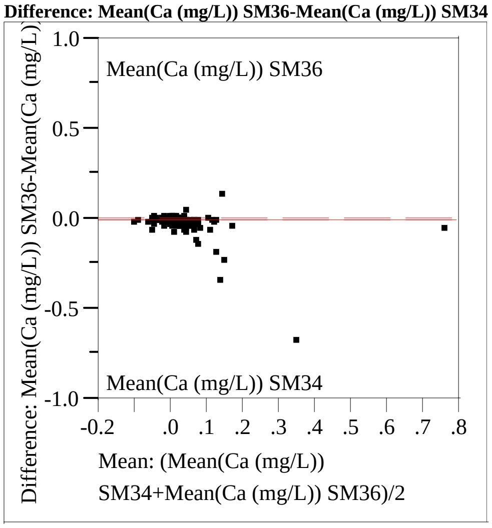
Mean(Al (mg/L)) SM36	1.98574	t-Ratio	12.68897
Mean(Al (mg/L)) SM34	1.97255	DF	312
Mean Difference	0.01319	Prob > |t|	<.0001
Std Error	0.00104	Prob > t	<.0001
Upper95%	0.01524	Prob < t	1.0000
Lower95%	0.01115		
N	313		
Correlation	0.8036		

Difference: Mean(Cr (mg/L)) SM36-Mean(Cr (mg/L)) SM34



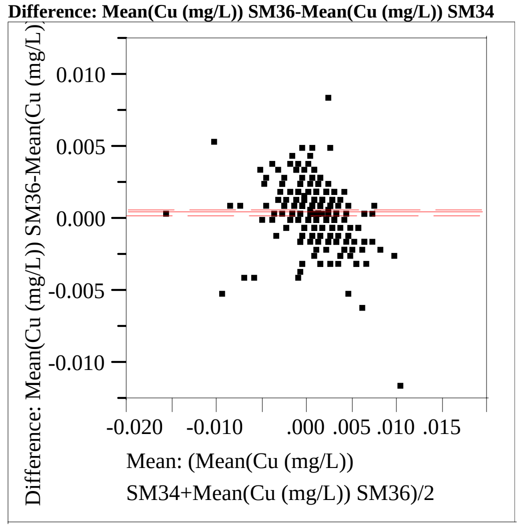
Mean(Cr (mg/L)) SM36	0.00229	t-Ratio	3.805284
Mean(Cr (mg/L)) SM34	0.00191	DF	312
Mean Difference	0.00038	Prob > |t|	0.0002
Std Error	0.0001	Prob > t	<.0001
Upper95%	0.00058	Prob < t	0.9999
Lower95%	0.00019		
N	313		
Correlation	0.74744		

Difference: Mean(Ca (mg/L)) SM36-Mean(Ca (mg/L)) SM34



Mean(Ca (mg/L)) SM36	0.01416	t-Ratio	-1.65222
Mean(Ca (mg/L)) SM34	0.01868	DF	312
Mean Difference	-0.0045	Prob > |t|	0.0995
Std Error	0.00274	Prob > t	0.9503
Upper95%	0.00086	Prob < t	0.0497
Lower95%	-0.0099		
N	313		
Correlation	0.72302		

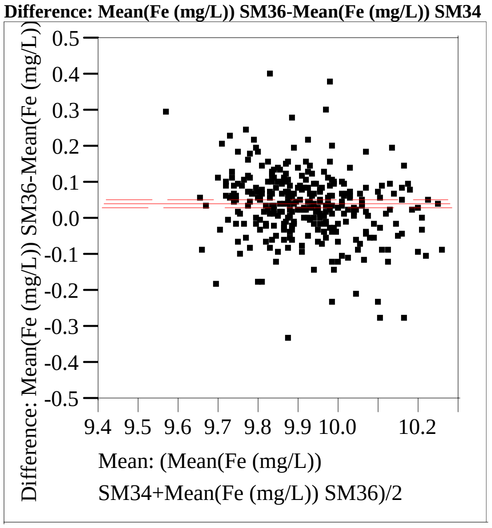
Difference: Mean(Cu (mg/L)) SM36-Mean(Cu (mg/L)) SM34



Mean(Cu (mg/L)) SM36	0.00115	t-Ratio	4.304008
Mean(Cu (mg/L)) SM34	0.00068	DF	312
Mean Difference	0.00047	Prob > |t|	<.0001
Std Error	0.00011	Prob > t	<.0001
Upper95%	0.00069	Prob < t	1.0000
Lower95%	0.00026		
N	313		
Correlation	0.80579		

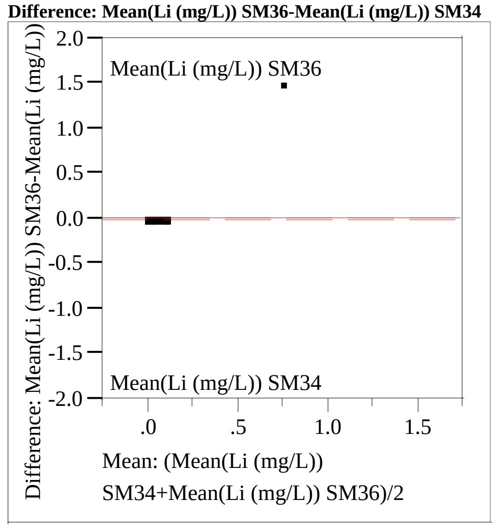
Exhibit A15. Paired Comparisons of SM36 versus SM34 for Mixed Acid Data

Difference: Mean(Fe (mg/L)) SM36-Mean(Fe (mg/L)) SM34



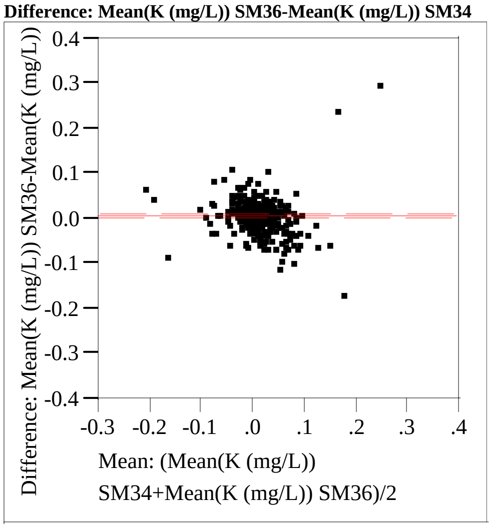
Mean(Fe (mg/L)) SM36	9.93903	t-Ratio	7.955643
Mean(Fe (mg/L)) SM34	9.89681	DF	312
Mean Difference	0.04222	Prob > |t|	<.0001
Std Error	0.00531	Prob > t	<.0001
Upper95%	0.05266	Prob < t	1.0000
Lower95%	0.03178		
N	313		
Correlation	0.75927		

Difference: Mean(Li (mg/L)) SM36-Mean(Li (mg/L)) SM34



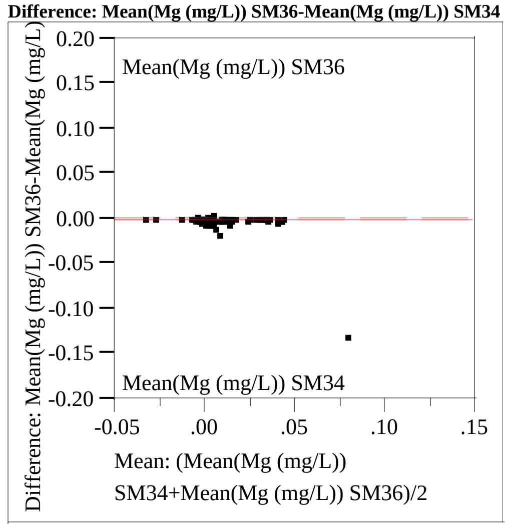
Mean(Li (mg/L)) SM36	0.01161	t-Ratio	0.988498
Mean(Li (mg/L)) SM34	0.00687	DF	312
Mean Difference	0.00474	Prob > |t|	0.3237
Std Error	0.0048	Prob > t	0.1618
Upper95%	0.01418	Prob < t	0.8382
Lower95%	-0.0047		
N	313		
Correlation	0.22067		

Difference: Mean(K (mg/L)) SM36-Mean(K (mg/L)) SM34



Mean(K (mg/L)) SM36	0.01434	t-Ratio	2.943505
Mean(K (mg/L)) SM34	0.00746	DF	312
Mean Difference	0.00688	Prob > |t|	0.0035
Std Error	0.00234	Prob > t	0.0017
Upper95%	0.01147	Prob < t	0.9983
Lower95%	0.00228		
N	313		
Correlation	0.66582		

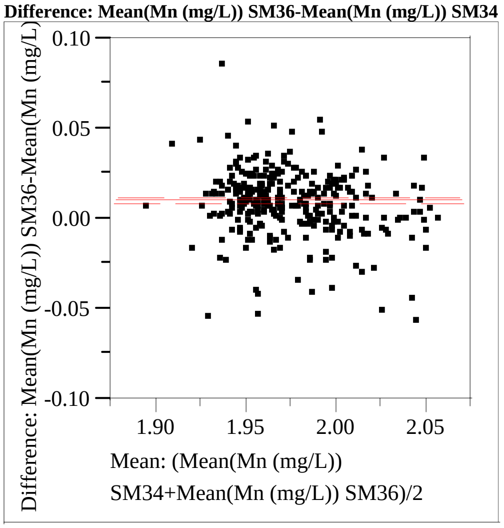
Difference: Mean(Mg (mg/L)) SM36-Mean(Mg (mg/L)) SM34



Mean(Mg (mg/L)) SM36	0.00268	t-Ratio	-1.80112
Mean(Mg (mg/L)) SM34	0.00345	DF	312
Mean Difference	-0.0008	Prob > |t|	0.0726
Std Error	0.00043	Prob > t	0.9637
Upper95%	0.00007	Prob < t	0.0363
Lower95%	-0.0016		
N	313		
Correlation	0.77139		

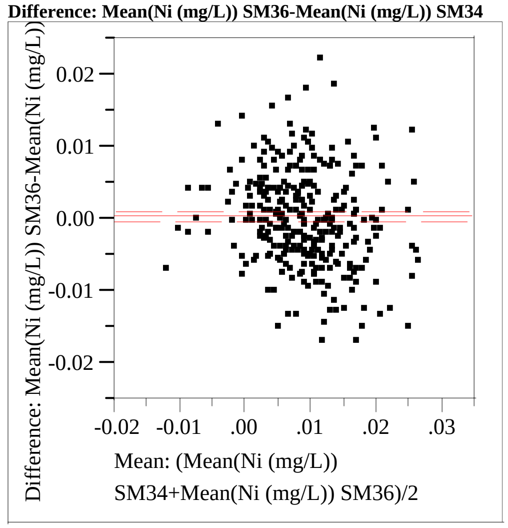
Exhibit A15. Paired Comparisons of SM36 versus SM34 for Mixed Acid Data

Difference: Mean(Mn (mg/L)) SM36-Mean(Mn (mg/L)) SM34



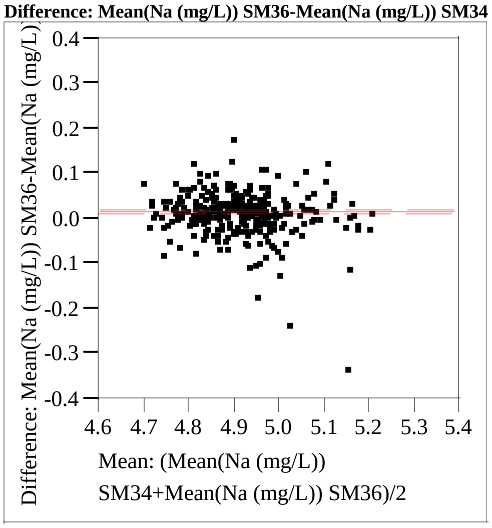
Mean(Mn (mg/L)) SM36	1.9795	t-Ratio	9.886838
Mean(Mn (mg/L)) SM34	1.96941	DF	312
Mean Difference	0.01009	Prob > |t|	<.0001
Std Error	0.00102	Prob > t	<.0001
Upper95%	0.01209	Prob < t	1.0000
Lower95%	0.00808		
N	313		
Correlation	0.83874		

Difference: Mean(Ni (mg/L)) SM36-Mean(Ni (mg/L)) SM34



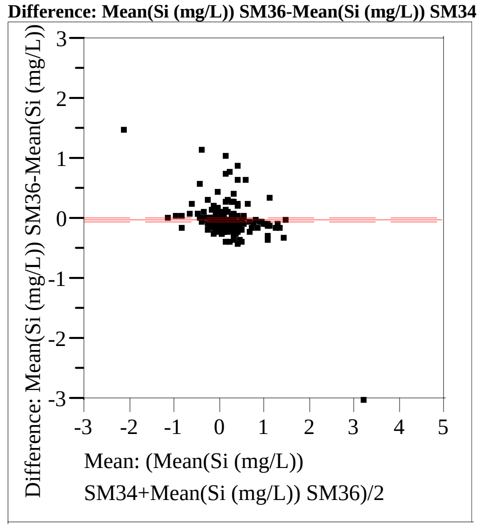
Mean(Ni (mg/L)) SM36	0.0091	t-Ratio	0.882697
Mean(Ni (mg/L)) SM34	0.00877	DF	312
Mean Difference	0.00033	Prob > |t|	0.3781
Std Error	0.00037	Prob > t	0.1890
Upper95%	0.00107	Prob < t	0.8110
Lower95%	-0.0004		
N	313		
Correlation	0.59945		

Difference: Mean(Na (mg/L)) SM36-Mean(Na (mg/L)) SM34



Mean(Na (mg/L)) SM36	4.92084	t-Ratio	5.361701
Mean(Na (mg/L)) SM34	4.90595	DF	312
Mean Difference	0.01488	Prob > |t|	<.0001
Std Error	0.00278	Prob > t	<.0001
Upper95%	0.02035	Prob < t	1.0000
Lower95%	0.00942		
N	313		
Correlation	0.88203		

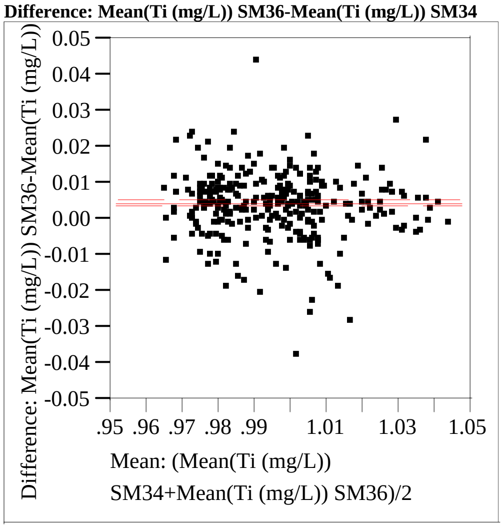
Difference: Mean(Si (mg/L)) SM36-Mean(Si (mg/L)) SM34



Mean(Si (mg/L)) SM36	0.1131	t-Ratio	-0.77095
Mean(Si (mg/L)) SM34	0.12468	DF	312
Mean Difference	-0.0116	Prob > |t|	0.4413
Std Error	0.01503	Prob > t	0.7793
Upper95%	0.01798	Prob < t	0.2207
Lower95%	-0.0411		
N	313		
Correlation	0.8324		

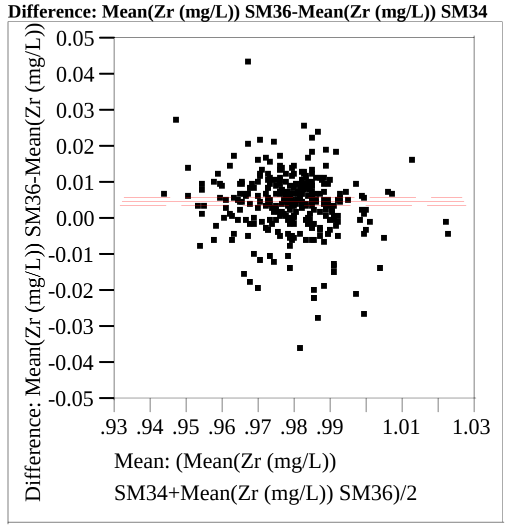
Exhibit A15. Paired Comparisons of SM36 versus SM34 for Mixed Acid Data

Difference: Mean(Ti (mg/L)) SM36-Mean(Ti (mg/L)) SM34



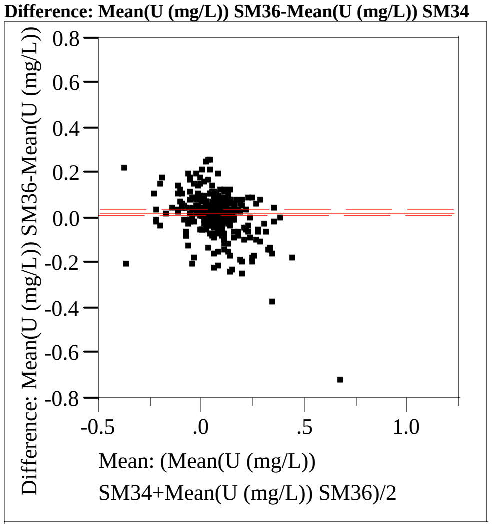
Mean(Ti (mg/L)) SM36	0.99744	t-Ratio	8.82996
Mean(Ti (mg/L)) SM34	0.993	DF	312
Mean Difference	0.00444	Prob > |t|	<.0001
Std Error	0.0005	Prob > t	<.0001
Upper95%	0.00543	Prob < t	1.0000
Lower95%	0.00345		
N	313		
Correlation	0.87666		

Difference: Mean(Zr (mg/L)) SM36-Mean(Zr (mg/L)) SM34



Mean(Zr (mg/L)) SM36	0.98149	t-Ratio	9.288836
Mean(Zr (mg/L)) SM34	0.97686	DF	312
Mean Difference	0.00463	Prob > |t|	<.0001
Std Error	0.0005	Prob > t	<.0001
Upper95%	0.00561	Prob < t	1.0000
Lower95%	0.00365		
N	313		
Correlation	0.73919		

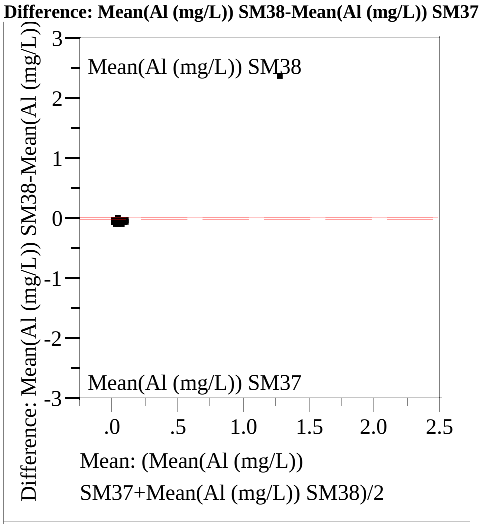
Difference: Mean(U (mg/L)) SM36-Mean(U (mg/L)) SM34



Mean(U (mg/L)) SM36	0.08016	t-Ratio	4.406798
Mean(U (mg/L)) SM34	0.0554	DF	312
Mean Difference	0.02476	Prob > |t|	<.0001
Std Error	0.00562	Prob > t	<.0001
Upper95%	0.03582	Prob < t	1.0000
Lower95%	0.01371		
N	313		
Correlation	0.7284		

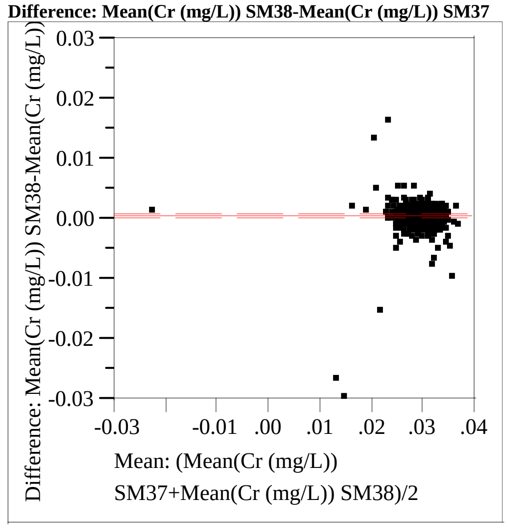
Exhibit A16. Paired Comparisons of SM38 versus SM37 for Mixed Acid Data

Difference: Mean(Al (mg/L)) SM38-Mean(Al (mg/L)) SM37



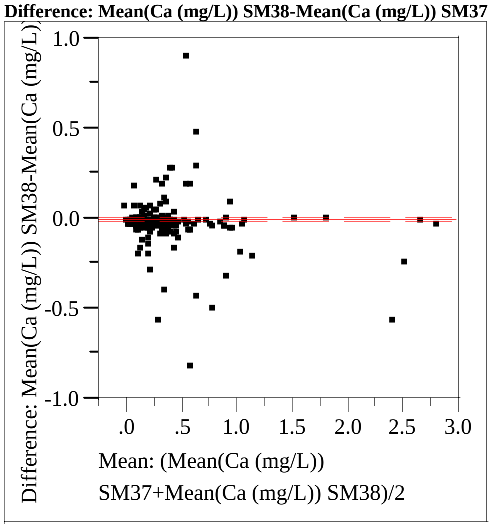
Mean(Al (mg/L)) SM38	0.05396	t-Ratio	1.230675
Mean(Al (mg/L)) SM37	0.04436	DF	308
Mean Difference	0.0096	Prob > |t|	0.2194
Std Error	0.0078	Prob > t	0.1097
Upper95%	0.02495	Prob < t	0.8903
Lower95%	-0.0057		
N	309		
Correlation	0.15477		

Difference: Mean(Cr (mg/L)) SM38-Mean(Cr (mg/L)) SM37



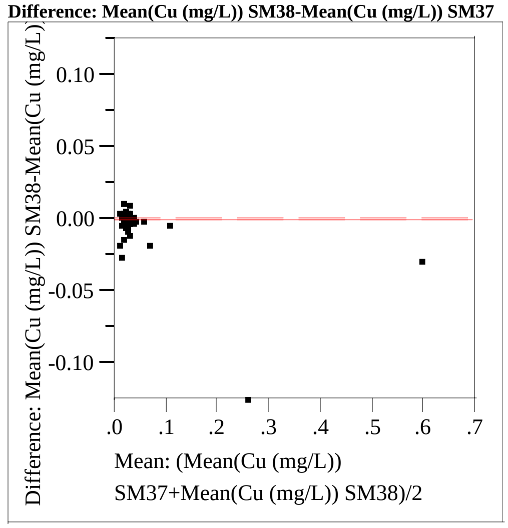
Mean(Cr (mg/L)) SM38	0.02906	t-Ratio	2.724395
Mean(Cr (mg/L)) SM37	0.02855	DF	308
Mean Difference	0.00051	Prob > |t|	0.0068
Std Error	0.00019	Prob > t	0.0034
Upper95%	0.00087	Prob < t	0.9966
Lower95%	0.00014		
N	309		
Correlation	0.77076		

Difference: Mean(Ca (mg/L)) SM38-Mean(Ca (mg/L)) SM37



Mean(Ca (mg/L)) SM38	0.27853	t-Ratio	-1.38752
Mean(Ca (mg/L)) SM37	0.28758	DF	308
Mean Difference	-0.0091	Prob > |t|	0.1663
Std Error	0.00652	Prob > t	0.9169
Upper95%	0.00379	Prob < t	0.0831
Lower95%	-0.0219		
N	309		
Correlation	0.95075		

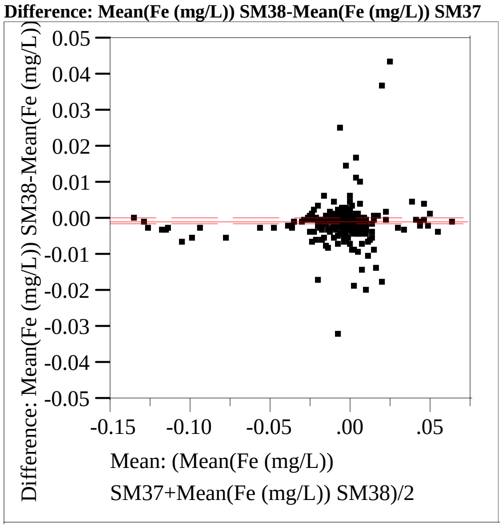
Difference: Mean(Cu (mg/L)) SM38-Mean(Cu (mg/L)) SM37



Mean(Cu (mg/L)) SM38	0.02508	t-Ratio	-0.01795
Mean(Cu (mg/L)) SM37	0.02509	DF	308
Mean Difference	-8.1e-6	Prob > |t|	0.9857
Std Error	0.00045	Prob > t	0.5072
Upper95%	0.00088	Prob < t	0.4928
Lower95%	-0.0009		
N	309		
Correlation	0.98269		

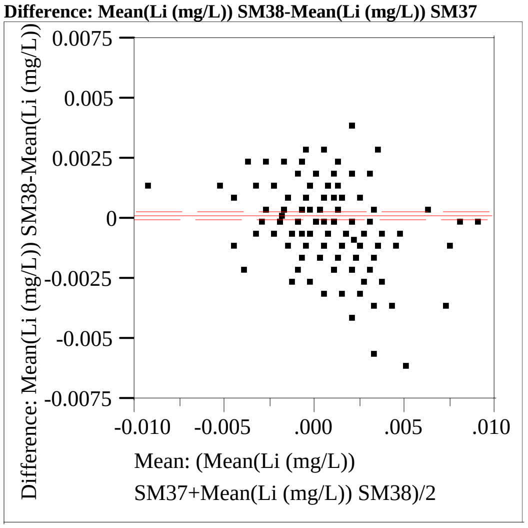
Exhibit A16. Paired Comparisons of SM38 versus SM37 for Mixed Acid Data

Difference: Mean(Fe (mg/L)) SM38-Mean(Fe (mg/L)) SM37



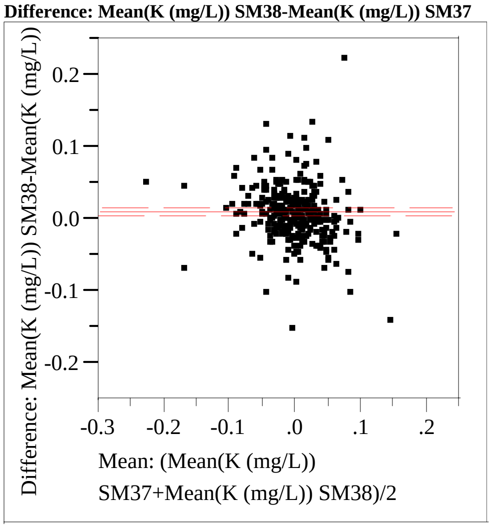
Mean(Fe (mg/L)) SM38	-0.0061	t-Ratio	-1.8934
Mean(Fe (mg/L)) SM37	-0.0055	DF	308
Mean Difference	-0.0006	Prob > |t|	0.0592
Std Error	0.00031	Prob > t	0.9704
Upper95%	0.00002	Prob < t	0.0296
Lower95%	-0.0012		
N	309		
Correlation	0.9754		

Difference: Mean(Li (mg/L)) SM38-Mean(Li (mg/L)) SM37



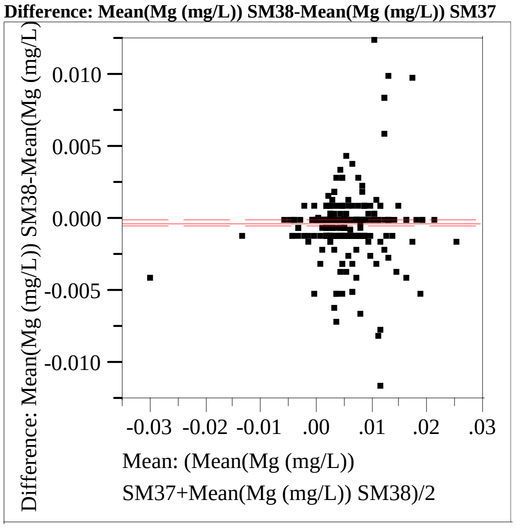
Mean(Li (mg/L)) SM38	0.00055	t-Ratio	1.650136
Mean(Li (mg/L)) SM37	0.00042	DF	308
Mean Difference	0.00013	Prob > |t|	0.0999
Std Error	0.00008	Prob > t	0.0500
Upper95%	0.00028	Prob < t	0.9500
Lower95%	-2.5e-5		
N	309		
Correlation	0.77398		

Difference: Mean(K (mg/L)) SM38-Mean(K (mg/L)) SM37



Mean(K (mg/L)) SM38	0.00275	t-Ratio	4.424413
Mean(K (mg/L)) SM37	-0.0072	DF	308
Mean Difference	0.00998	Prob > |t|	<.0001
Std Error	0.00226	Prob > t	<.0001
Upper95%	0.01442	Prob < t	1.0000
Lower95%	0.00554		
N	309		
Correlation	0.66467		

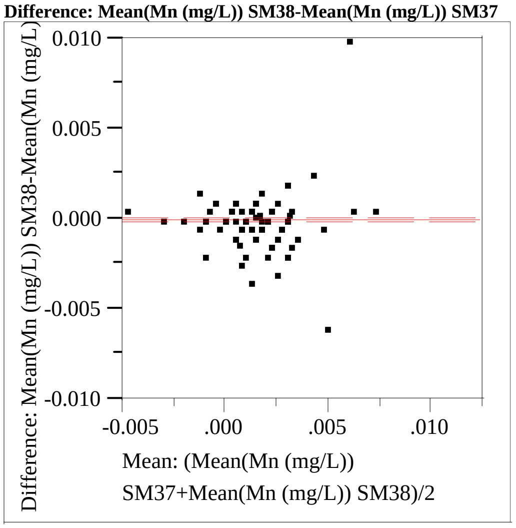
Difference: Mean(Mg (mg/L)) SM38-Mean(Mg (mg/L)) SM37



Mean(Mg (mg/L)) SM38	0.00485	t-Ratio	-2.45937
Mean(Mg (mg/L)) SM37	0.00516	DF	308
Mean Difference	-0.0003	Prob > |t|	0.0145
Std Error	0.00012	Prob > t	0.9928
Upper95%	-6.1e-5	Prob < t	0.0072
Lower95%	-0.0005		
N	309		
Correlation	0.91143		

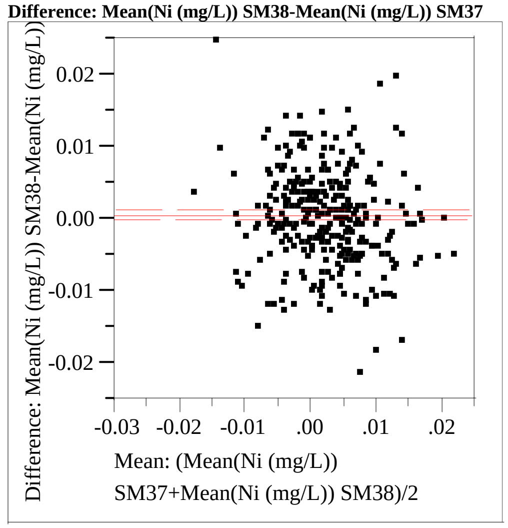
Exhibit A16. Paired Comparisons of SM38 versus SM37 for Mixed Acid Data

Difference: Mean(Mn (mg/L)) SM38-Mean(Mn (mg/L)) SM37



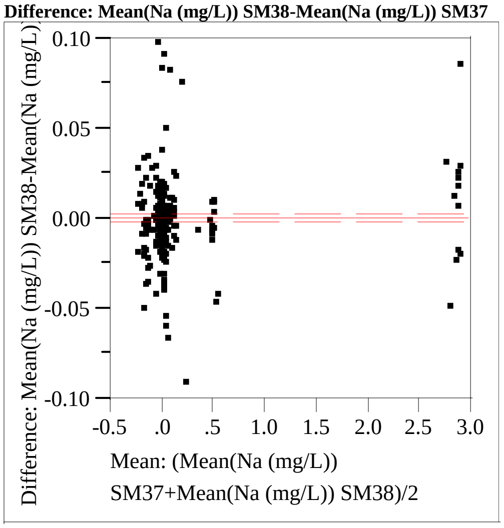
Mean(Mn (mg/L)) SM38	0.00147	t-Ratio	-1.31912
Mean(Mn (mg/L)) SM37	0.00155	DF	308
Mean Difference	-7e-5	Prob > |t|	0.1881
Std Error	0.00005	Prob > t	0.9059
Upper95%	0.00003	Prob < t	0.0941
Lower95%	-0.0002		
N	309		
Correlation	0.71016		

Difference: Mean(Ni (mg/L)) SM38-Mean(Ni (mg/L)) SM37



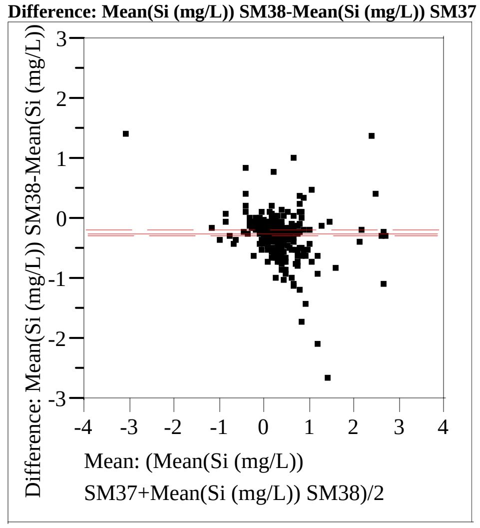
Mean(Ni (mg/L)) SM38	0.00251	t-Ratio	1.404357
Mean(Ni (mg/L)) SM37	0.00198	DF	308
Mean Difference	0.00053	Prob > |t|	0.1612
Std Error	0.00038	Prob > t	0.0806
Upper95%	0.00128	Prob < t	0.9194
Lower95%	-0.0002		
N	309		
Correlation	0.57971		

Difference: Mean(Na (mg/L)) SM38-Mean(Na (mg/L)) SM37



Mean(Na (mg/L)) SM38	0.11885	t-Ratio	0.472686
Mean(Na (mg/L)) SM37	0.1183	DF	308
Mean Difference	0.00054	Prob > |t|	0.6368
Std Error	0.00115	Prob > t	0.3184
Upper95%	0.0028	Prob < t	0.6816
Lower95%	-0.0017		
N	309		
Correlation	0.99937		

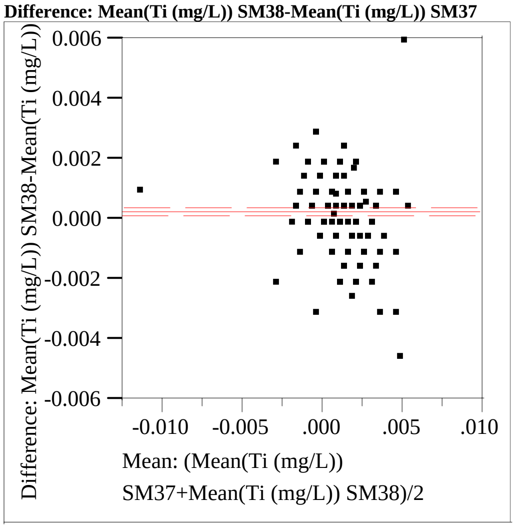
Difference: Mean(Si (mg/L)) SM38-Mean(Si (mg/L)) SM37



Mean(Si (mg/L)) SM38	0.18767	t-Ratio	-11.1414
Mean(Si (mg/L)) SM37	0.42607	DF	308
Mean Difference	-0.2384	Prob > |t|	<.0001
Std Error	0.0214	Prob > t	1.0000
Upper95%	-0.1963	Prob < t	<.0001
Lower95%	-0.2805		
N	309		
Correlation	0.79916		

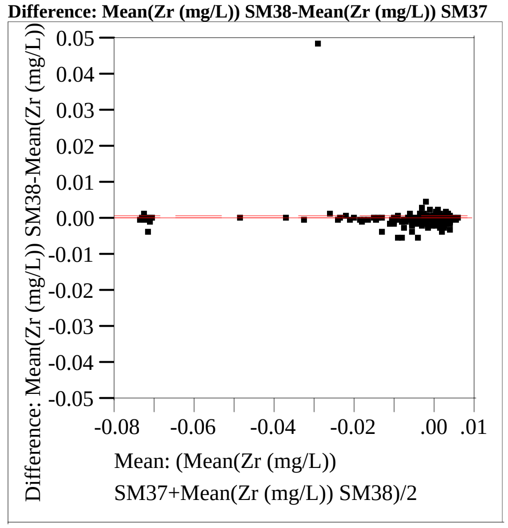
Exhibit A16. Paired Comparisons of SM38 versus SM37 for Mixed Acid Data

Difference: Mean(Ti (mg/L)) SM38-Mean(Ti (mg/L)) SM37



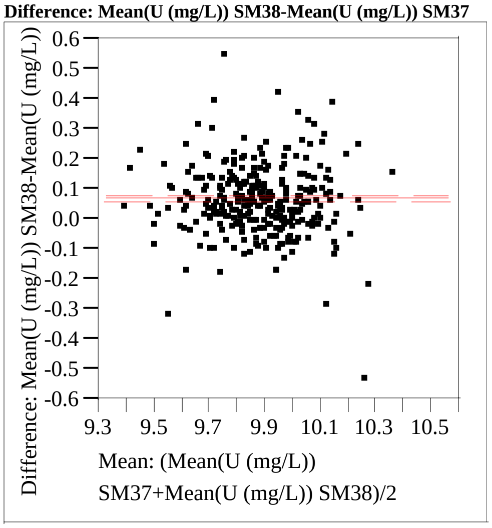
Mean(Ti (mg/L)) SM38	0.00111	t-Ratio	4.147508
Mean(Ti (mg/L)) SM37	0.00086	DF	308
Mean Difference	0.00025	Prob > |t|	<.0001
Std Error	0.00006	Prob > t	<.0001
Upper95%	0.00036	Prob < t	1.0000
Lower95%	0.00013		
N	309		
Correlation	0.76455		

Difference: Mean(Zr (mg/L)) SM38-Mean(Zr (mg/L)) SM37



Mean(Zr (mg/L)) SM38	-0.0049	t-Ratio	2.110308
Mean(Zr (mg/L)) SM37	-0.0052	DF	308
Mean Difference	0.00036	Prob > |t|	0.0356
Std Error	0.00017	Prob > t	0.0178
Upper95%	0.0007	Prob < t	0.9822
Lower95%	0.00002		
N	309		
Correlation	0.9819		

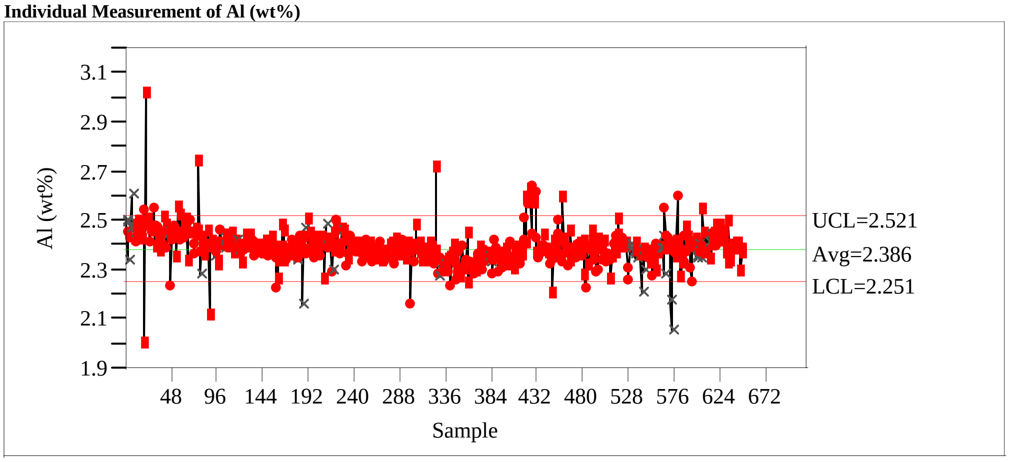
Difference: Mean(U (mg/L)) SM38-Mean(U (mg/L)) SM37



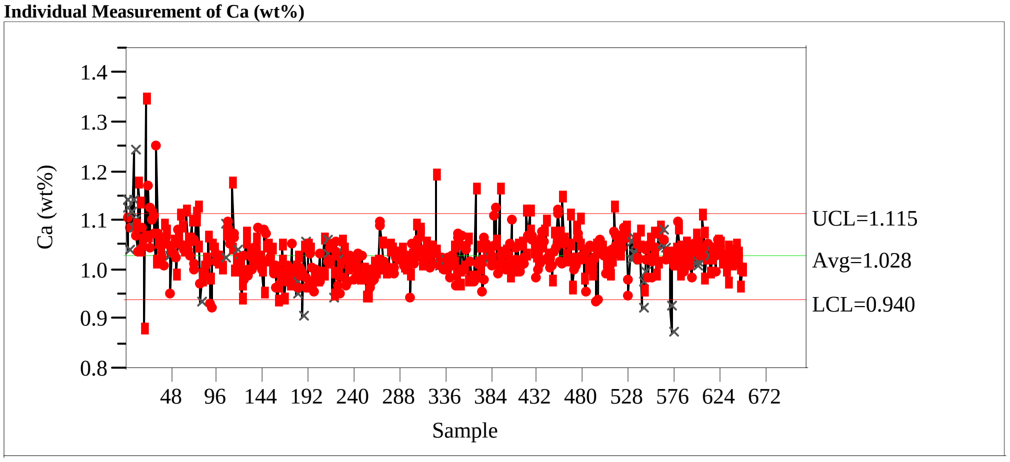
Mean(U (mg/L)) SM38	9.91223	t-Ratio	10.20373
Mean(U (mg/L)) SM37	9.84519	DF	308
Mean Difference	0.06705	Prob > |t|	<.0001
Std Error	0.00657	Prob > t	<.0001
Upper95%	0.07997	Prob < t	1.0000
Lower95%	0.05412		
N	309		
Correlation	0.78196		

Exhibit A17. Time Series Plots of ARG-1 Measurements for Mixed Acid Data

Control Chart
Individual Measurement of Al (wt%)



Individual Measurement of Ca (wt%)



Individual Measurement of Cr (wt%)

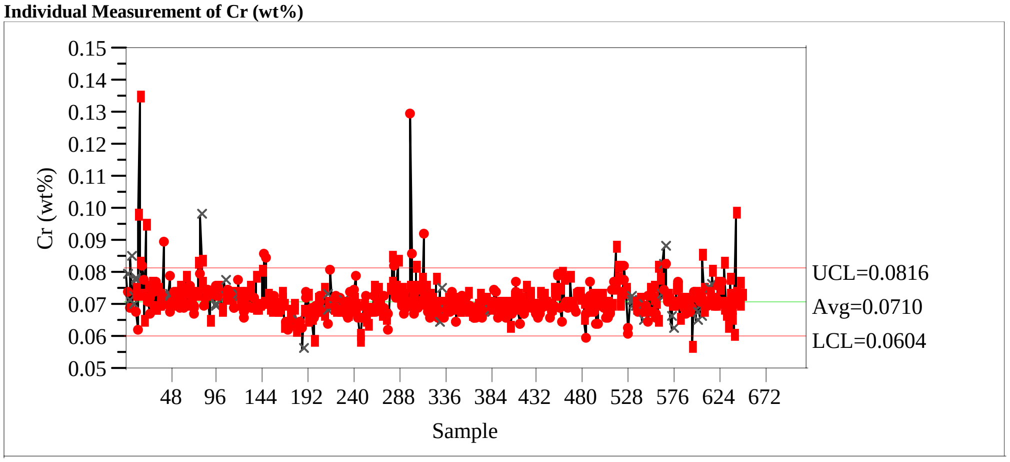
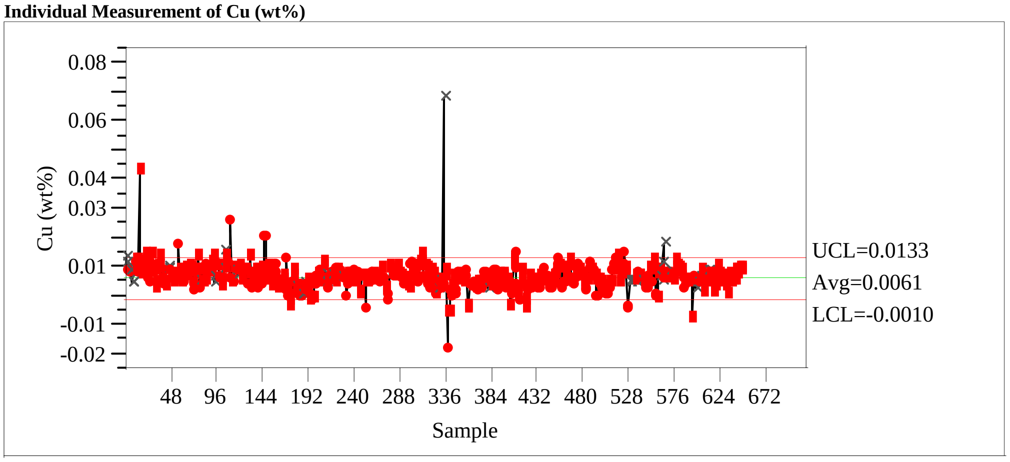
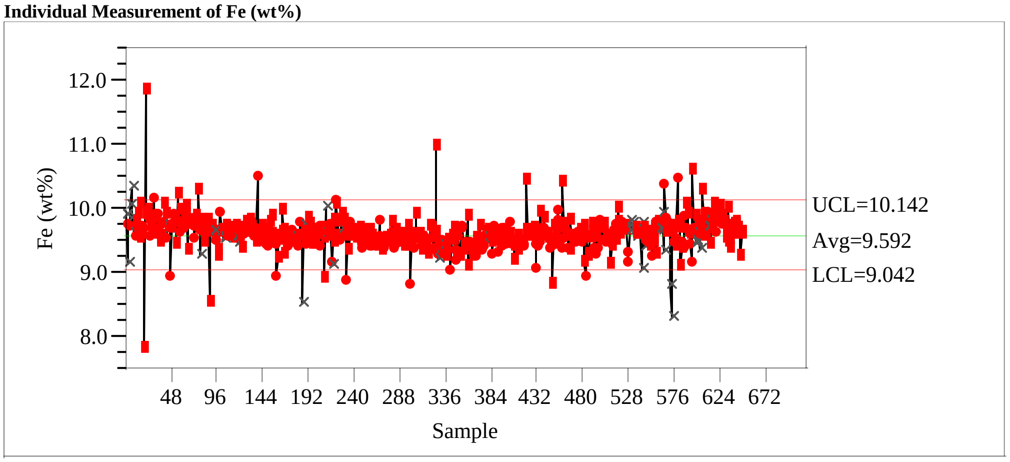


Exhibit A17. Time Series Plots of ARG-1 Measurements for Mixed Acid Data

Individual Measurement of Cu (wt%)



Individual Measurement of Fe (wt%)



Individual Measurement of K (wt%)

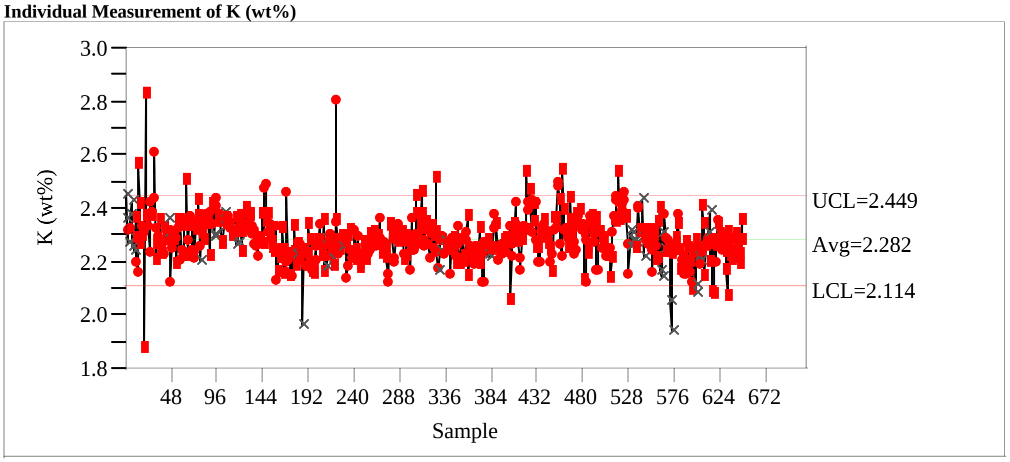
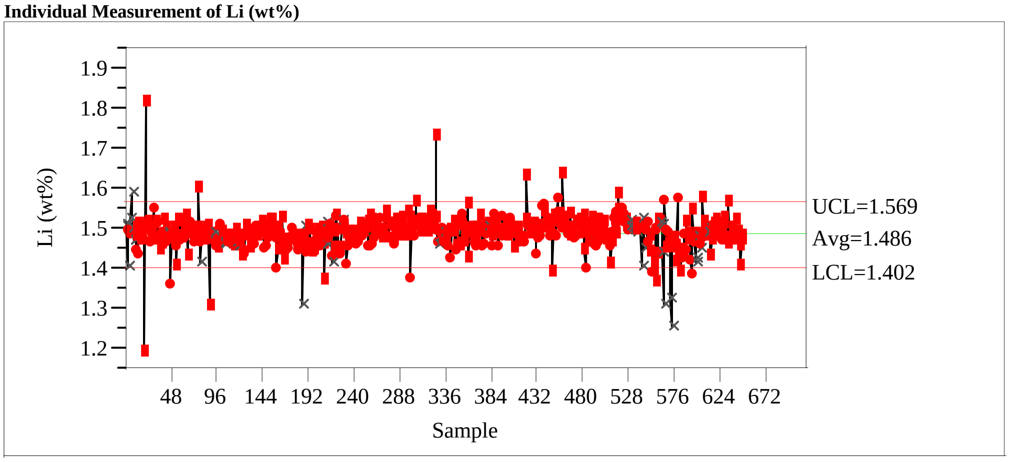
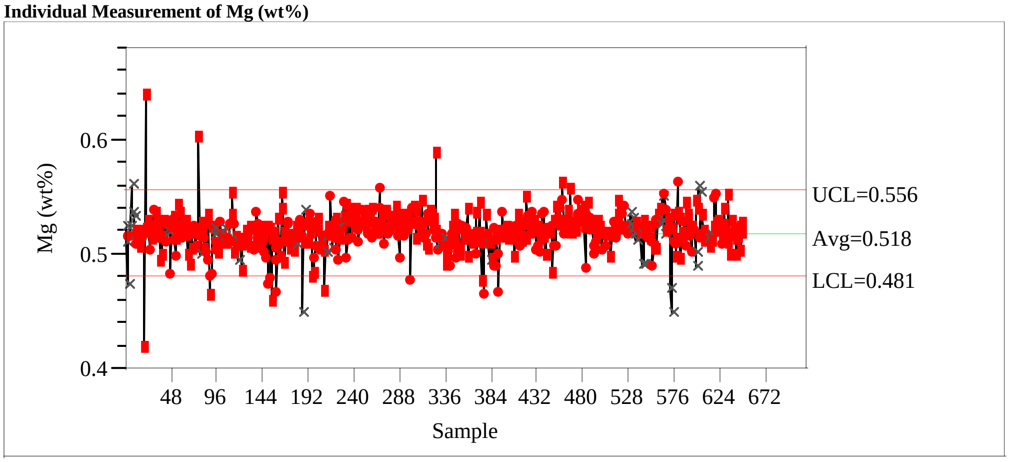


Exhibit A17. Time Series Plots of ARG-1 Measurements for Mixed Acid Data

Individual Measurement of Li (wt%)



Individual Measurement of Mg (wt%)



Individual Measurement of Mn (wt%)

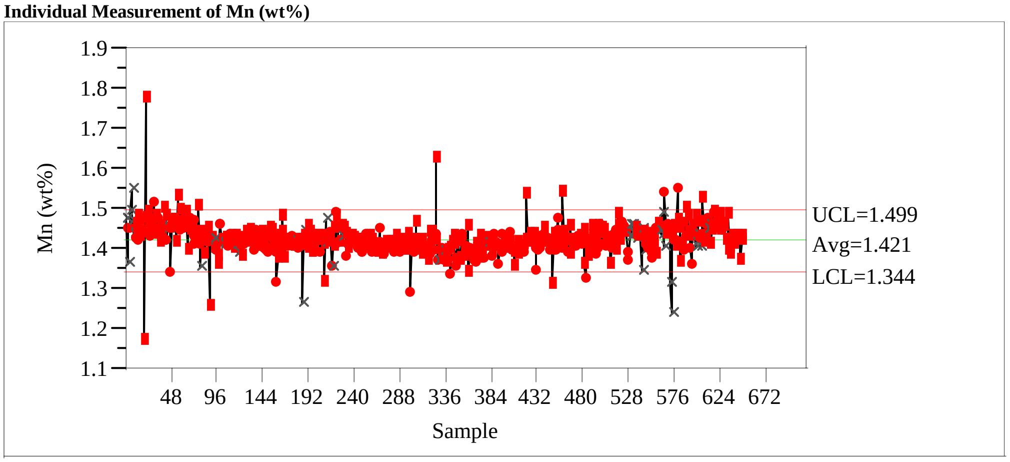
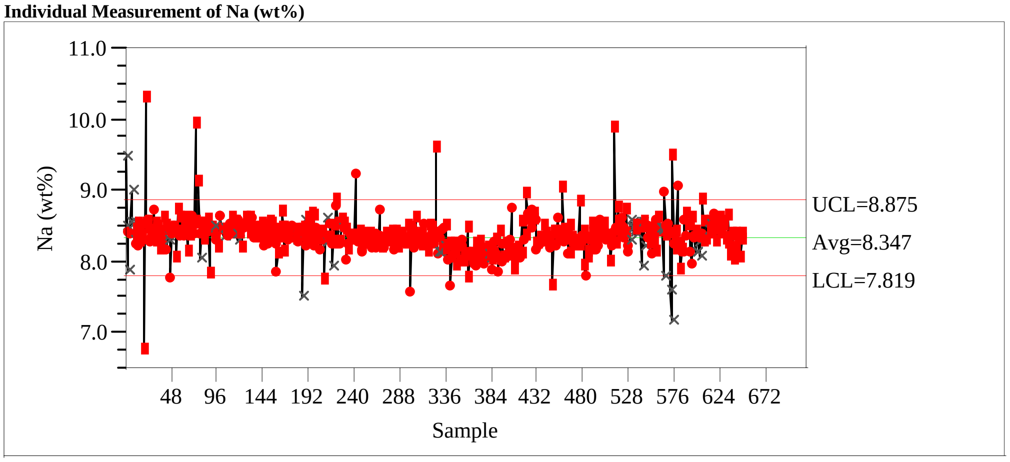
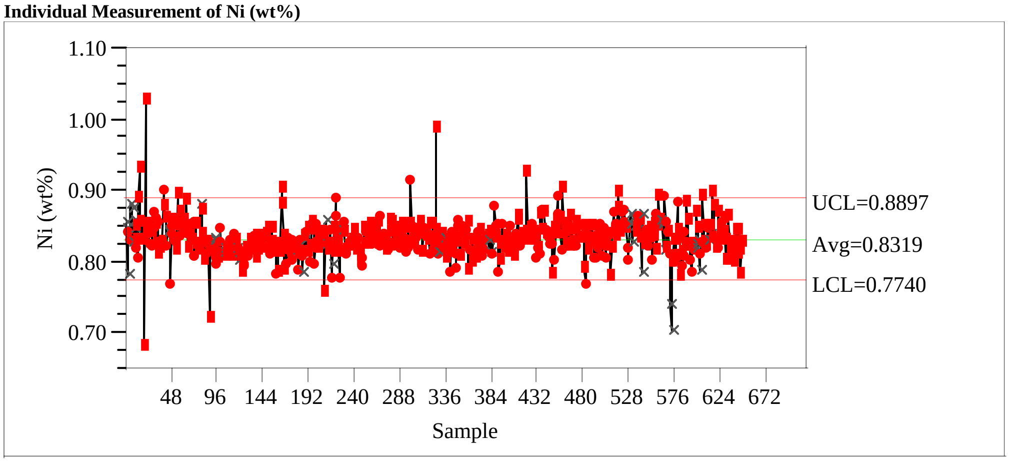


Exhibit A17. Time Series Plots of ARG-1 Measurements for Mixed Acid Data

Individual Measurement of Na (wt%)



Individual Measurement of Ni (wt%)



Individual Measurement of Si (wt%)

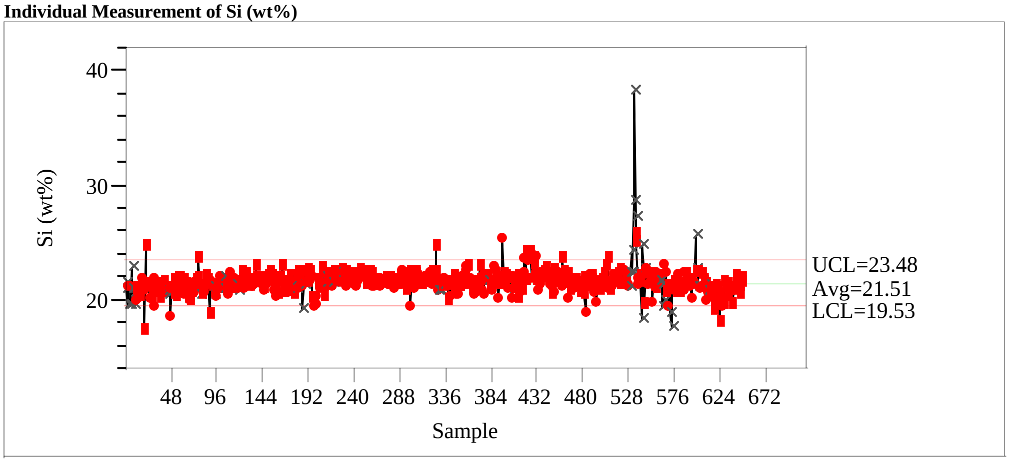
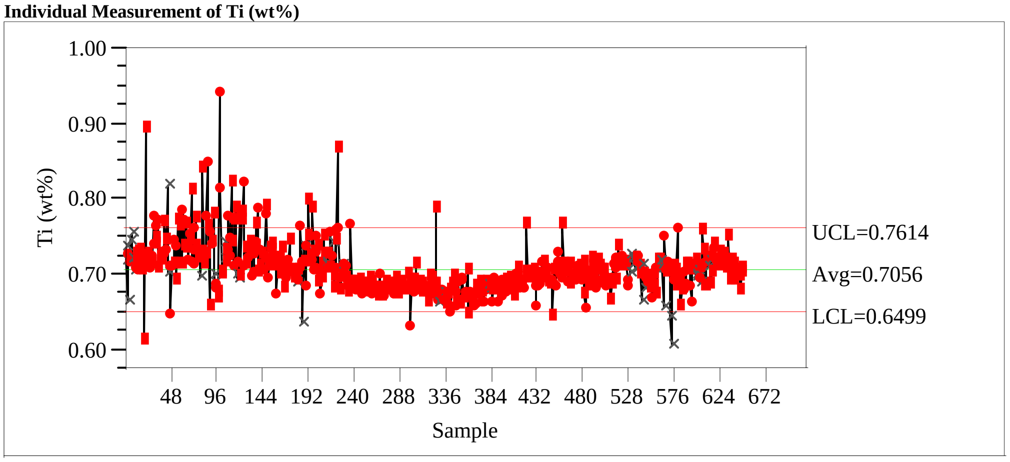
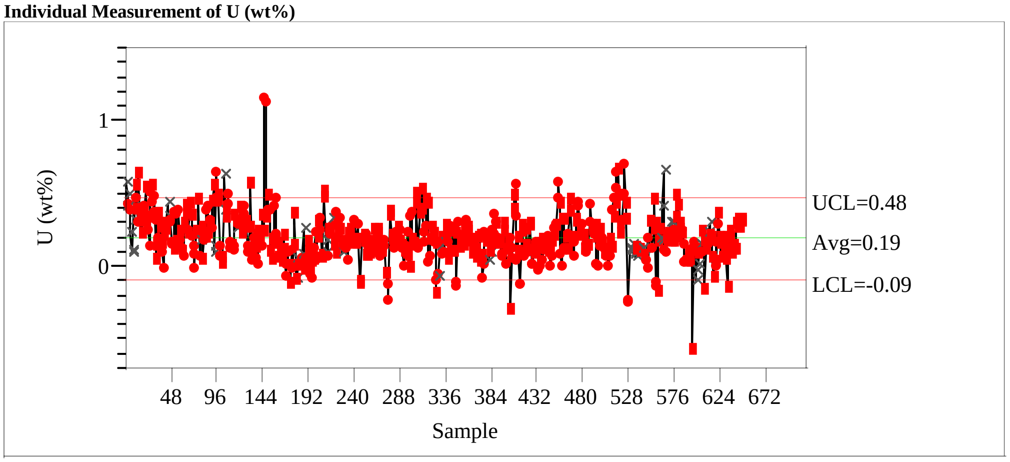


Exhibit A17. Time Series Plots of ARG-1 Measurements for Mixed Acid Data

Individual Measurement of Ti (wt%)



Individual Measurement of U (wt%)



Individual Measurement of Zr (wt%)

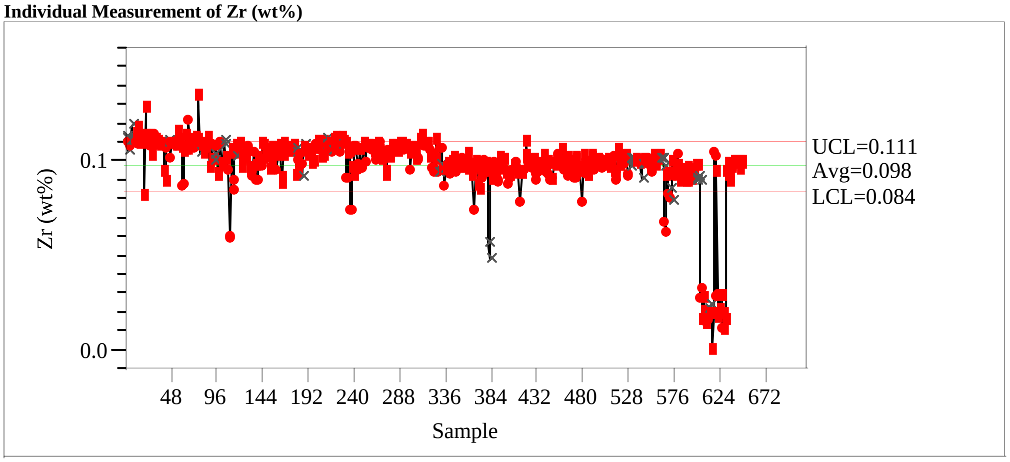
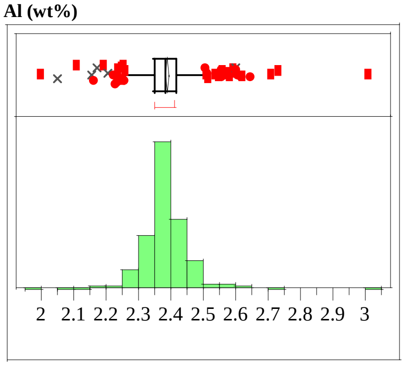


Exhibit A18. Histograms and Descriptive Statistics for All ARG-1 Measurements for Mixed Acid Data

Al (wt%)



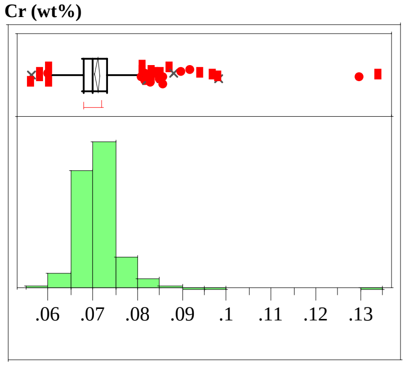
Quantiles

100.0%	maximum	3.0070
99.5%		2.6930
97.5%		2.5570
90.0%		2.4600
75.0%	quartile	2.4140
50.0%	median	2.3830
25.0%	quartile	2.3525
10.0%		2.3190
2.5%		2.2510
0.5%		2.1190
0.0%	minimum	1.9970

Moments

Mean	2.3863775
Std Dev	0.0730998
Std Err Mean	0.0028694
upper 95% Mean	2.392012
lower 95% Mean	2.380743
N	649

Cr (wt%)



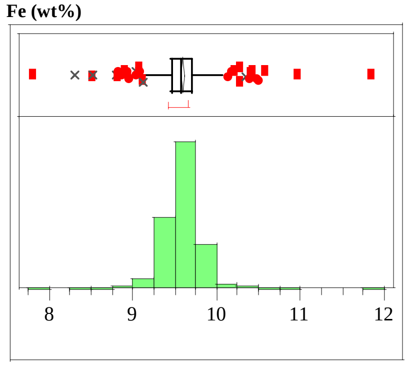
Quantiles

100.0%	maximum	0.13400
99.5%		0.09800
97.5%		0.08375
90.0%		0.07600
75.0%	quartile	0.07300
50.0%	median	0.07000
25.0%	quartile	0.06800
10.0%		0.06600
2.5%		0.06200
0.5%		0.05800
0.0%	minimum	0.05600

Moments

Mean	0.0710092
Std Dev	0.0059755
Std Err Mean	0.0002346
upper 95% Mean	0.0714698
lower 95% Mean	0.0705487
N	649

Fe (wt%)



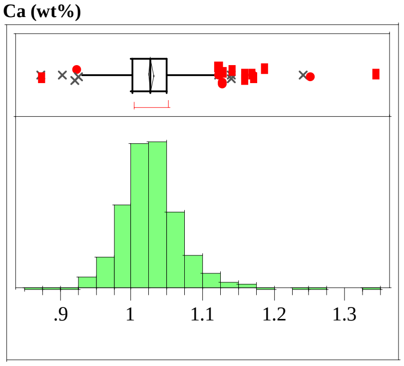
Quantiles

100.0%	maximum	11.843
99.5%		10.557
97.5%		10.047
90.0%		9.843
75.0%	quartile	9.710
50.0%	median	9.582
25.0%	quartile	9.475
10.0%		9.354
2.5%		9.078
0.5%		8.515
0.0%	minimum	7.806

Moments

Mean	9.5919815
Std Dev	0.2628951
Std Err Mean	0.0103195
upper 95% Mean	9.6122453
lower 95% Mean	9.5717177
N	649

Ca (wt%)



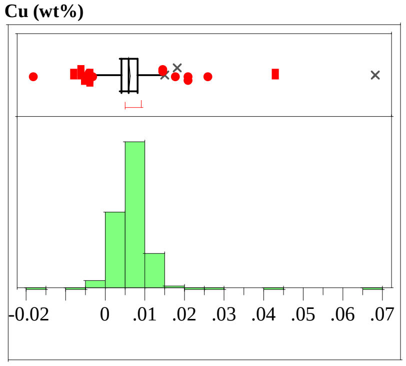
Quantiles

100.0%	maximum	1.3440
99.5%		1.2263
97.5%		1.1250
90.0%		1.0770
75.0%	quartile	1.0490
50.0%	median	1.0260
25.0%	quartile	1.0010
10.0%		0.9780
2.5%		0.9422
0.5%		0.9065
0.0%	minimum	0.8710

Moments

Mean	1.0275131
Std Dev	0.0450471
Std Err Mean	0.0017683
upper 95% Mean	1.0309853
lower 95% Mean	1.0240409
N	649

Cu (wt%)



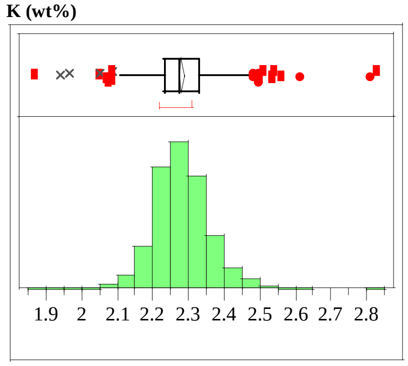
Quantiles

100.0%	maximum	0.0680
99.5%		0.0248
97.5%		0.0130
90.0%		0.0100
75.0%	quartile	0.0080
50.0%	median	0.0060
25.0%	quartile	0.0040
10.0%		0.0020
2.5%		-0.0010
0.5%		-0.0060
0.0%	minimum	-0.0180

Moments

Mean	0.0061279
Std Dev	0.0046661
Std Err Mean	0.0001832
upper 95% Mean	0.0064875
lower 95% Mean	0.0057682
N	649

K (wt%)



Quantiles

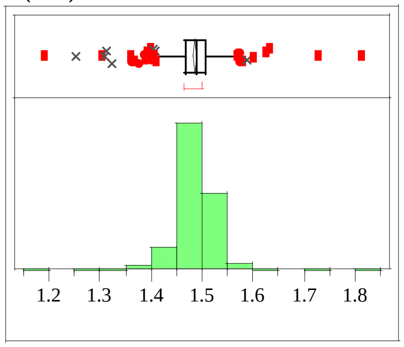
100.0%	maximum	2.8260
99.5%		2.6015
97.5%		2.4605
90.0%		2.3760
75.0%	quartile	2.3290
50.0%	median	2.2760
25.0%	quartile	2.2330
10.0%		2.1900
2.5%		2.1290
0.5%		1.9835
0.0%	minimum	1.8680

Moments

Mean	2.2818166
Std Dev	0.0865792
Std Err Mean	0.0033985
upper 95% Mean	2.2884901
lower 95% Mean	2.2751432
N	649

Exhibit A18. Histograms and Descriptive Statistics for All ARG-1 Measurements for Mixed Acid Data

Li (wt%)



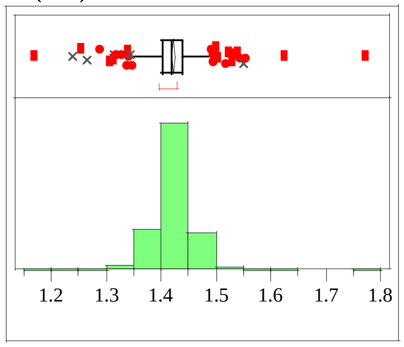
Quantiles

100.0%	maximum	1.8120
99.5%		1.6320
97.5%		1.5578
90.0%		1.5210
75.0%	quartile	1.5070
50.0%	median	1.4890
25.0%	quartile	1.4680
10.0%		1.4480
2.5%		1.4013
0.5%		1.3047
0.0%	minimum	1.1890

Moments

Mean	1.4857304
Std Dev	0.0415409
Std Err Mean	0.0016306
upper 95% Mean	1.4889323
lower 95% Mean	1.4825284
N	649

Mn (wt%)



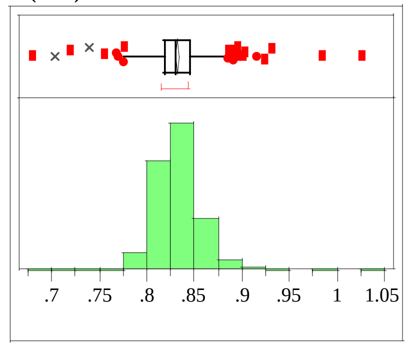
Quantiles

100.0%	maximum	1.7720
99.5%		1.5528
97.5%		1.4920
90.0%		1.4620
75.0%	quartile	1.4380
50.0%	median	1.4190
25.0%	quartile	1.4030
10.0%		1.3850
2.5%		1.3533
0.5%		1.2545
0.0%	minimum	1.1690

Moments

Mean	1.421396
Std Dev	0.0392112
Std Err Mean	0.0015392
upper 95% Mean	1.4244184
lower 95% Mean	1.4183736
N	649

Ni (wt%)



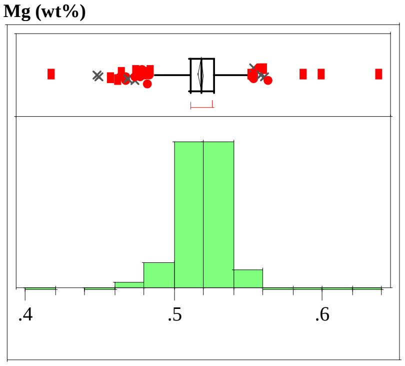
Quantiles

100.0%	maximum	1.0260
99.5%		0.9293
97.5%		0.8892
90.0%		0.8570
75.0%	quartile	0.8450
50.0%	median	0.8300
25.0%	quartile	0.8180
10.0%		0.8060
2.5%		0.7835
0.5%		0.7248
0.0%	minimum	0.6790

Moments

Mean	0.8318706
Std Dev	0.0263452
Std Err Mean	0.0010341
upper 95% Mean	0.8339012
lower 95% Mean	0.8298399
N	649

Mg (wt%)



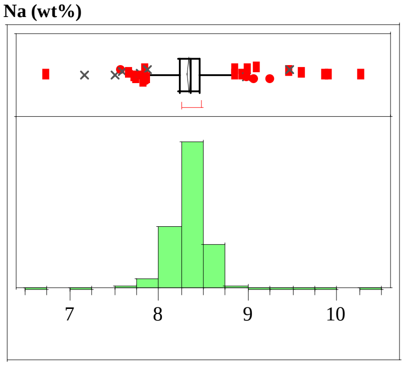
Quantiles

100.0%	maximum	0.63800
99.5%		0.58125
97.5%		0.55000
90.0%		0.53500
75.0%	quartile	0.52700
50.0%	median	0.51900
25.0%	quartile	0.51100
10.0%		0.50000
2.5%		0.47975
0.5%		0.45100
0.0%	minimum	0.41700

Moments

Mean	0.5182388
Std Dev	0.0169733
Std Err Mean	0.0006663
upper 95% Mean	0.5195471
lower 95% Mean	0.5169305
N	649

Na (wt%)



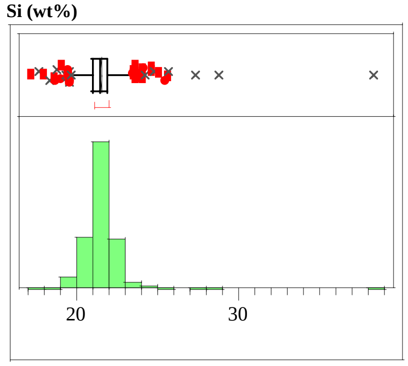
Quantiles

100.0%	maximum	10.271
99.5%		9.796
97.5%		8.816
90.0%		8.573
75.0%	quartile	8.470
50.0%	median	8.349
25.0%	quartile	8.232
10.0%		8.089
2.5%		7.858
0.5%		7.526
0.0%	minimum	6.734

Moments

Mean	8.34698
Std Dev	0.2588451
Std Err Mean	0.0101606
upper 95% Mean	8.3669316
lower 95% Mean	8.3270284
N	649

Si (wt%)



Quantiles

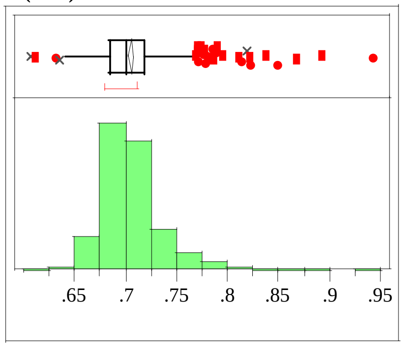
100.0%	maximum	38.227
99.5%		26.862
97.5%		23.667
90.0%		22.363
75.0%	quartile	21.940
50.0%	median	21.489
25.0%	quartile	21.017
10.0%		20.386
2.5%		19.535
0.5%		18.077
0.0%	minimum	17.194

Moments

Mean	21.506364
Std Dev	1.1897877
Std Err Mean	0.0467033
upper 95% Mean	21.598072
lower 95% Mean	21.414656
N	649

Exhibit A18. Histograms and Descriptive Statistics for All ARG-1 Measurements for Mixed Acid Data

Ti (wt%)



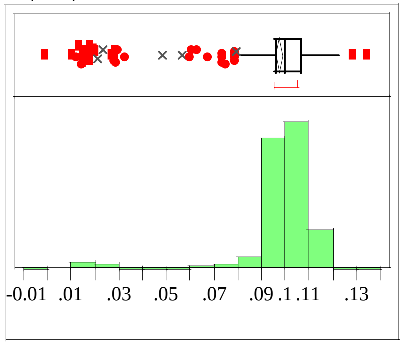
Quantiles

100.0%	maximum	0.94300
99.5%		0.86275
97.5%		0.78600
90.0%		0.74200
75.0%	quartile	0.71800
50.0%	median	0.70100
25.0%	quartile	0.68500
10.0%		0.67500
2.5%		0.65925
0.5%		0.63350
0.0%	minimum	0.60600

Moments

Mean	0.7056055
Std Dev	0.033036
Std Err Mean	0.0012968
upper 95% Mean	0.7081519
lower 95% Mean	0.7030592
N	649

Zr (wt%)



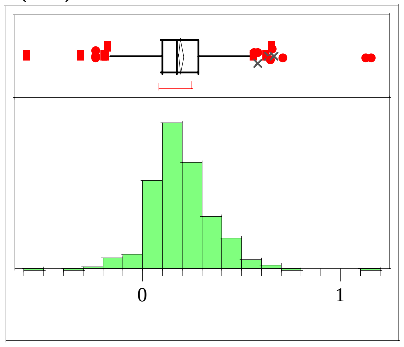
Quantiles

100.0%	maximum	0.1340
99.5%		0.1213
97.5%		0.1128
90.0%		0.1100
75.0%	quartile	0.1070
50.0%	median	0.1000
25.0%	quartile	0.0960
10.0%		0.0900
2.5%		0.0215
0.5%		0.0123
0.0%	minimum	-0.0010

Moments

Mean	0.097527
Std Dev	0.0174746
Std Err Mean	0.0006859
upper 95% Mean	0.0988739
lower 95% Mean	0.09618
N	649

U (wt%)



Quantiles

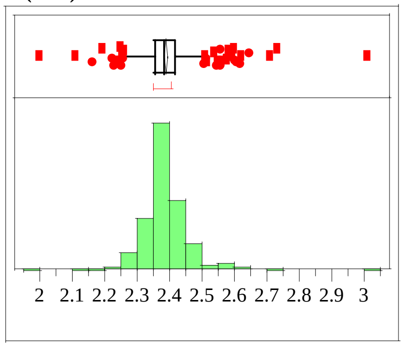
100.0%	maximum	1.158
99.5%		0.700
97.5%		0.540
90.0%		0.402
75.0%	quartile	0.280
50.0%	median	0.177
25.0%	quartile	0.099
10.0%		0.023
2.5%		-0.115
0.5%		-0.234
0.0%	minimum	-0.585

Moments

Mean	0.1941279
Std Dev	0.1622673
Std Err Mean	0.0063695
upper 95% Mean	0.2066353
lower 95% Mean	0.1816204
N	649

Exhibit A19. Histograms and Descriptive Statistics for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Al (wt%)



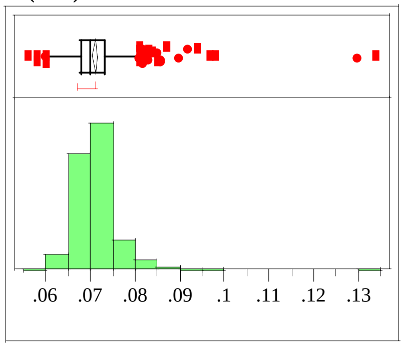
Quantiles

100.0%	maximum	3.0070
99.5%		2.7092
97.5%		2.5572
90.0%		2.4574
75.0%	quartile	2.4140
50.0%	median	2.3840
25.0%	quartile	2.3530
10.0%		2.3238
2.5%		2.2580
0.5%		2.1654
0.0%	minimum	1.9970

Moments

Mean	2.3878626
Std Dev	0.0709146
Std Err Mean	0.0029023
upper 95% Mean	2.3935627
lower 95% Mean	2.3821626
N	597

Cr (wt%)



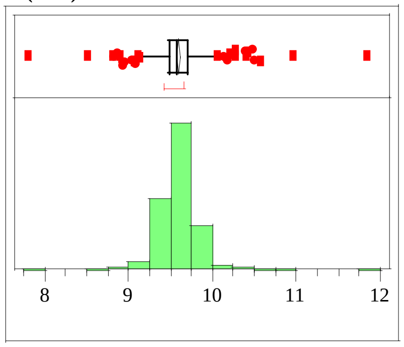
Quantiles

100.0%	maximum	0.13400
99.5%		0.09832
97.5%		0.08300
90.0%		0.07600
75.0%	quartile	0.07300
50.0%	median	0.07000
25.0%	quartile	0.06800
10.0%		0.06600
2.5%		0.06295
0.5%		0.05800
0.0%	minimum	0.05600

Moments

Mean	0.0709732
Std Dev	0.0059024
Std Err Mean	0.0002416
upper 95% Mean	0.0714476
lower 95% Mean	0.0704988
N	597

Fe (wt%)



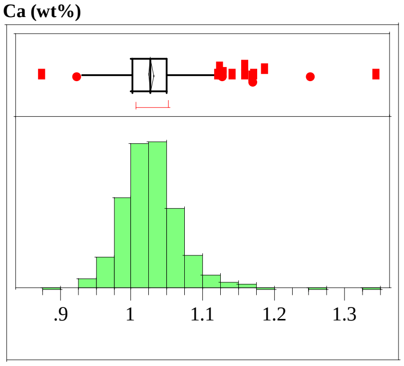
Quantiles

100.0%	maximum	11.843
99.5%		10.574
97.5%		10.047
90.0%		9.833
75.0%	quartile	9.710
50.0%	median	9.582
25.0%	quartile	9.479
10.0%		9.372
2.5%		9.126
0.5%		8.807
0.0%	minimum	7.806

Moments

Mean	9.5967018
Std Dev	0.2540405
Std Err Mean	0.0103972
upper 95% Mean	9.6171214
lower 95% Mean	9.5762823
N	597

Ca (wt%)



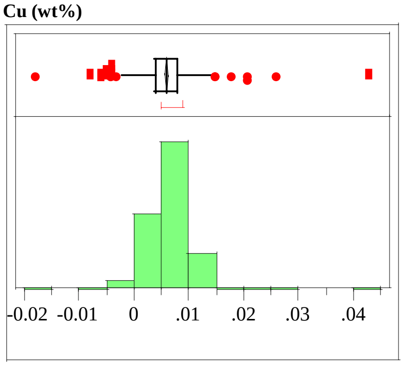
Quantiles

100.0%	maximum	1.3440
99.5%		1.1886
97.5%		1.1222
90.0%		1.0750
75.0%	quartile	1.0490
50.0%	median	1.0260
25.0%	quartile	1.0010
10.0%		0.9800
2.5%		0.9509
0.5%		0.9339
0.0%	minimum	0.8750

Moments

Mean	1.0274389
Std Dev	0.0432341
Std Err Mean	0.0017695
upper 95% Mean	1.030914
lower 95% Mean	1.0239637
N	597

Cu (wt%)



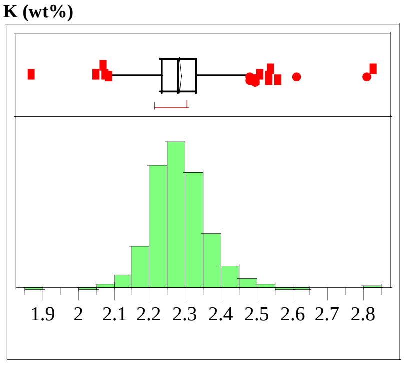
Quantiles

100.0%	maximum	0.0430
99.5%		0.0210
97.5%		0.0130
90.0%		0.0100
75.0%	quartile	0.0080
50.0%	median	0.0060
25.0%	quartile	0.0040
10.0%		0.0020
2.5%		-0.0020
0.5%		-0.0060
0.0%	minimum	-0.0180

Moments

Mean	0.0060117
Std Dev	0.0040294
Std Err Mean	0.0001649
upper 95% Mean	0.0063356
lower 95% Mean	0.0056878
N	597

K (wt%)



Quantiles

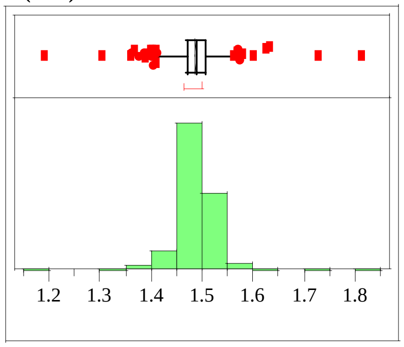
100.0%	maximum	2.8260
99.5%		2.6180
97.5%		2.4642
90.0%		2.3760
75.0%	quartile	2.3315
50.0%	median	2.2790
25.0%	quartile	2.2330
10.0%		2.1930
2.5%		2.1348
0.5%		2.0698
0.0%	minimum	1.8680

Moments

Mean	2.2843719
Std Dev	0.0847541
Std Err Mean	0.0034688
upper 95% Mean	2.2911843
lower 95% Mean	2.2775594
N	597

Exhibit A19. Histograms and Descriptive Statistics for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Li (wt%)



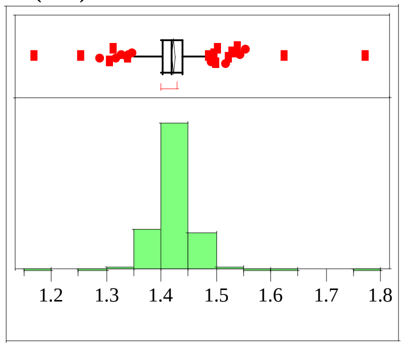
Quantiles

100.0%	maximum	1.8120
99.5%		1.6349
97.5%		1.5590
90.0%		1.5220
75.0%	quartile	1.5070
50.0%	median	1.4890
25.0%	quartile	1.4700
10.0%		1.4500
2.5%		1.4049
0.5%		1.3604
0.0%	minimum	1.1890

Moments

Mean	1.4875963
Std Dev	0.0389618
Std Err Mean	0.0015946
upper 95% Mean	1.490728
lower 95% Mean	1.4844646
N	597

Mn (wt%)



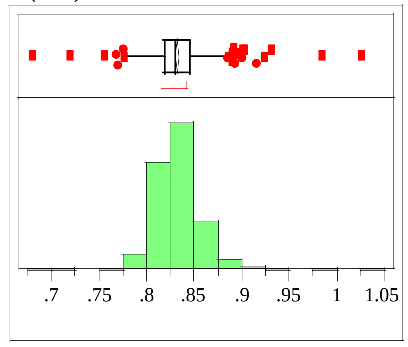
Quantiles

100.0%	maximum	1.7720
99.5%		1.5547
97.5%		1.4920
90.0%		1.4620
75.0%	quartile	1.4375
50.0%	median	1.4190
25.0%	quartile	1.4040
10.0%		1.3860
2.5%		1.3589
0.5%		1.2906
0.0%	minimum	1.1690

Moments

Mean	1.4218124
Std Dev	0.0377614
Std Err Mean	0.0015455
upper 95% Mean	1.4248476
lower 95% Mean	1.4187772
N	597

Ni (wt%)



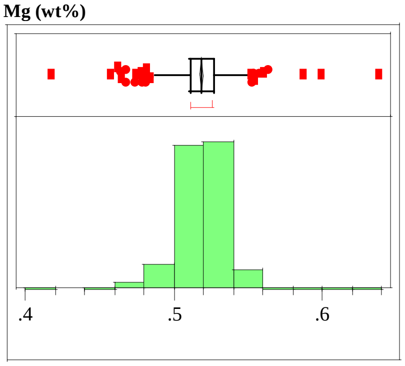
Quantiles

100.0%	maximum	1.0260
99.5%		0.9315
97.5%		0.8910
90.0%		0.8570
75.0%	quartile	0.8450
50.0%	median	0.8310
25.0%	quartile	0.8180
10.0%		0.8060
2.5%		0.7860
0.5%		0.7556
0.0%	minimum	0.6790

Moments

Mean	0.832206
Std Dev	0.0257768
Std Err Mean	0.001055
upper 95% Mean	0.8342779
lower 95% Mean	0.8301341
N	597

Mg (wt%)



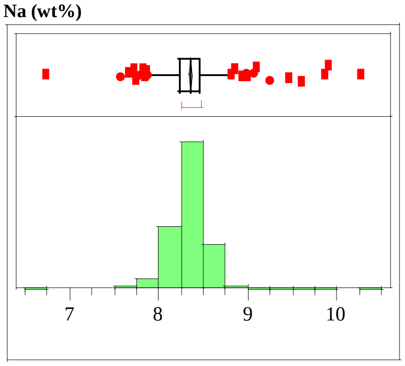
Quantiles

100.0%	maximum	0.63800
99.5%		0.58713
97.5%		0.54810
90.0%		0.53500
75.0%	quartile	0.52700
50.0%	median	0.51900
25.0%	quartile	0.51100
10.0%		0.50100
2.5%		0.48200
0.5%		0.46294
0.0%	minimum	0.41700

Moments

Mean	0.51866
Std Dev	0.0163612
Std Err Mean	0.0006696
upper 95% Mean	0.5199751
lower 95% Mean	0.5173449
N	597

Na (wt%)



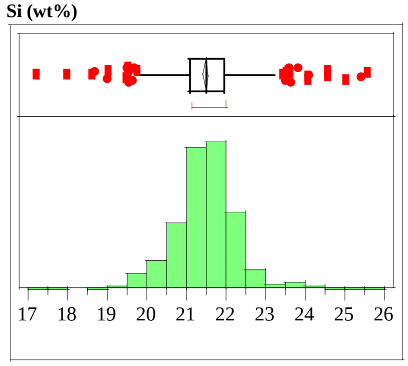
Quantiles

100.0%	maximum	10.271
99.5%		9.863
97.5%		8.802
90.0%		8.575
75.0%	quartile	8.470
50.0%	median	8.349
25.0%	quartile	8.238
10.0%		8.103
2.5%		7.917
0.5%		7.652
0.0%	minimum	6.734

Moments

Mean	8.3516482
Std Dev	0.2492558
Std Err Mean	0.0102014
upper 95% Mean	8.3716832
lower 95% Mean	8.3316133
N	597

Si (wt%)



Quantiles

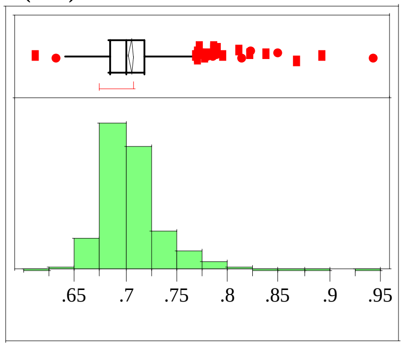
100.0%	maximum	25.573
99.5%		25.017
97.5%		23.532
90.0%		22.350
75.0%	quartile	21.940
50.0%	median	21.506
25.0%	quartile	21.070
10.0%		20.510
2.5%		19.652
0.5%		18.622
0.0%	minimum	17.194

Moments

Mean	21.488307
Std Dev	0.8630585
Std Err Mean	0.0353226
upper 95% Mean	21.557678
lower 95% Mean	21.418935
N	597

Exhibit A19. Histograms and Descriptive Statistics for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Ti (wt%)



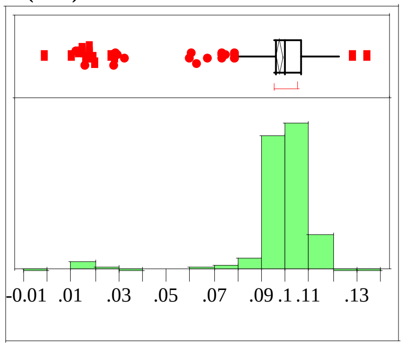
Quantiles

100.0%	maximum	0.94300
99.5%		0.86726
97.5%		0.78600
90.0%		0.74320
75.0%	quartile	0.71800
50.0%	median	0.70000
25.0%	quartile	0.68500
10.0%		0.67500
2.5%		0.66095
0.5%		0.64290
0.0%	minimum	0.61100

Moments

Mean	0.7059229
Std Dev	0.0330783
Std Err Mean	0.0013538
upper 95% Mean	0.7085818
lower 95% Mean	0.7032641
N	597

Zr (wt%)



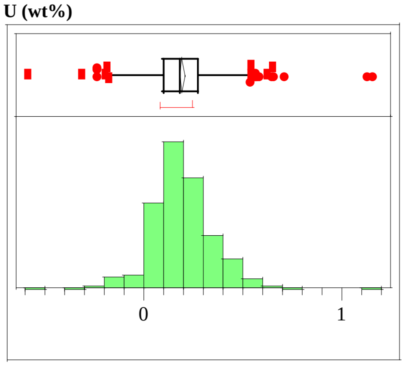
Quantiles

100.0%	maximum	0.1340
99.5%		0.1221
97.5%		0.1120
90.0%		0.1100
75.0%	quartile	0.1070
50.0%	median	0.1000
25.0%	quartile	0.0960
10.0%		0.0900
2.5%		0.0199
0.5%		0.0120
0.0%	minimum	-0.0010

Moments

Mean	0.097593
Std Dev	0.0172891
Std Err Mean	0.0007076
upper 95% Mean	0.0989826
lower 95% Mean	0.0962033
N	597

U (wt%)



Quantiles

100.0%	maximum	1.158
99.5%		0.717
97.5%		0.525
90.0%		0.395
75.0%	quartile	0.277
50.0%	median	0.179
25.0%	quartile	0.102
10.0%		0.023
2.5%		-0.116
0.5%		-0.236
0.0%	minimum	-0.585

Moments

Mean	0.1939095
Std Dev	0.1613449
Std Err Mean	0.0066034
upper 95% Mean	0.2068783
lower 95% Mean	0.1809408
N	597

Exhibit A20. Variance Components for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Response Al (wt%)
Summary of Fit

RSquare	0.61327
RSquare Adj	0.227911
Root Mean Square Error	0.061605
Mean of Response	2.387021
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	1.6971587	0.006040	1.5914
Error	282	1.0702350	0.003795	Prob > F
C. Total	563	2.7673937		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001122	22.822
Residual	0.003795	77.178
Total	0.004917	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (wt%)
Summary of Fit

RSquare	0.724319
RSquare Adj	0.449615
Root Mean Square Error	0.031993
Mean of Response	1.027449
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.7583890	0.002699	2.6367
Error	282	0.2886485	0.001024	Prob > F
C. Total	563	1.0470375		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000838	45.006
Residual	0.001024	54.994
Total	0.001861	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (wt%)
Summary of Fit

RSquare	0.761515
RSquare Adj	0.523876
Root Mean Square Error	0.00409
Mean of Response	0.071009
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.01506046	0.000054	3.2045
Error	282	0.00471650	0.000017	Prob > F
C. Total	563	0.01977696		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000018	52.432
Residual	0.000017	47.568
Total	0.000035	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (wt%)
Summary of Fit

RSquare	0.845709
RSquare Adj	0.691965
Root Mean Square Error	0.002141
Mean of Response	0.006117
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.00708728	0.000025	5.5008
Error	282	0.00129300	0.000005	Prob > F
C. Total	563	0.00838028		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.00001	69.234
Residual	0.000005	30.766
Total	0.000015	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (wt%)
Summary of Fit

RSquare	0.515347
RSquare Adj	0.032412
Root Mean Square Error	0.24159
Mean of Response	9.590246
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	17.501453	0.062283	1.0671
Error	282	16.459081	0.058366	Prob > F
C. Total	563	33.960535		0.2931

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001959	3.247
Residual	0.058366	96.753
Total	0.060324	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (wt%)
Summary of Fit

RSquare	0.712031
RSquare Adj	0.425082
Root Mean Square Error	0.064217
Mean of Response	2.284351
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	2.8754175	0.010233	2.4814
Error	282	1.1629170	0.004124	Prob > F
C. Total	563	4.0383345		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.003054	42.552
Residual	0.004124	57.448
Total	0.007178	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A20. Variance Components for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Response Li (wt%)
Summary of Fit

RSquare	0.53644
RSquare Adj	0.074524
Root Mean Square Error	0.03665
Mean of Response	1.486697
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.43833865	0.001560	1.1613
Error	282	0.37878650	0.001343	Prob > F
C. Total	563	0.81712515		0.1051

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000108	7.465
Residual	0.001343	92.535
Total	0.001452	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Na (wt%)
Summary of Fit

RSquare	0.531534
RSquare Adj	0.06473
Root Mean Square Error	0.237979
Mean of Response	8.349112
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	18.120888	0.064487	1.1387
Error	282	15.970784	0.056634	Prob > F
C. Total	563	34.091672		0.1383

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.003927	6.484
Residual	0.056634	93.516
Total	0.060561	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (wt%)
Summary of Fit

RSquare	0.601894
RSquare Adj	0.205199
Root Mean Square Error	0.014507
Mean of Response	0.518385
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.08973001	0.000319	1.5173
Error	282	0.05934950	0.000210	Prob > F
C. Total	563	0.14907951		0.0002

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000054	20.549
Residual	0.00021	79.451
Total	0.000265	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (wt%)
Summary of Fit

RSquare	0.577399
RSquare Adj	0.156297
Root Mean Square Error	0.023322
Mean of Response	0.831945
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.20957480	0.000746	1.3712
Error	282	0.15338850	0.000544	Prob > F
C. Total	563	0.36296330		0.0041

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000101	15.653
Residual	0.000544	84.347
Total	0.000645	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (wt%)
Summary of Fit

RSquare	0.539631
RSquare Adj	0.080895
Root Mean Square Error	0.035375
Mean of Response	1.421126
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.41364256	0.001472	1.1763
Error	282	0.35288550	0.001251	Prob > F
C. Total	563	0.76652806		0.0868

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.00011	8.103
Residual	0.001251	91.897
Total	0.001362	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (wt%)
Summary of Fit

RSquare	0.714079
RSquare Adj	0.429172
Root Mean Square Error	0.643369
Mean of Response	21.50027
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	291.52144	1.03744	2.5064
Error	282	116.72660	0.41392	Prob > F
C. Total	563	408.24804		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.311759	42.961
Residual	0.413924	57.039
Total	0.725683	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A20. Variance Components for ARG-1 Measurements for Mixed Acid Data Associated with SME and MFT Batches

Response Ti (wt%)
Summary of Fit

RSquare	0.755915
RSquare Adj	0.512695
Root Mean Square Error	0.023315
Mean of Response	0.705715
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.47475454	0.001690	3.1079
Error	282	0.15329850	0.000544	Prob > F
C. Total	563	0.62805304		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000573	51.314
Residual	0.000544	48.686
Total	0.001117	100.000

These estimates based on equating Mean Squares to Expected Value.

Response U (wt%)
Summary of Fit

RSquare	0.924012
RSquare Adj	0.848293
Root Mean Square Error	0.06117
Mean of Response	0.197027
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	12.830809	0.045661	12.2032
Error	282	1.055170	0.003742	Prob > F
C. Total	563	13.885979		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.02096	84.852
Residual	0.003742	15.148
Total	0.024701	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Zr (wt%)
Summary of Fit

RSquare	0.981072
RSquare Adj	0.962211
Root Mean Square Error	0.003198
Mean of Response	0.098002
Observations (or Sum Wgts)	564

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	281	0.14950650	0.000532	52.0154
Error	282	0.00288450	0.000010	Prob > F
C. Total	563	0.15239100		<.0001

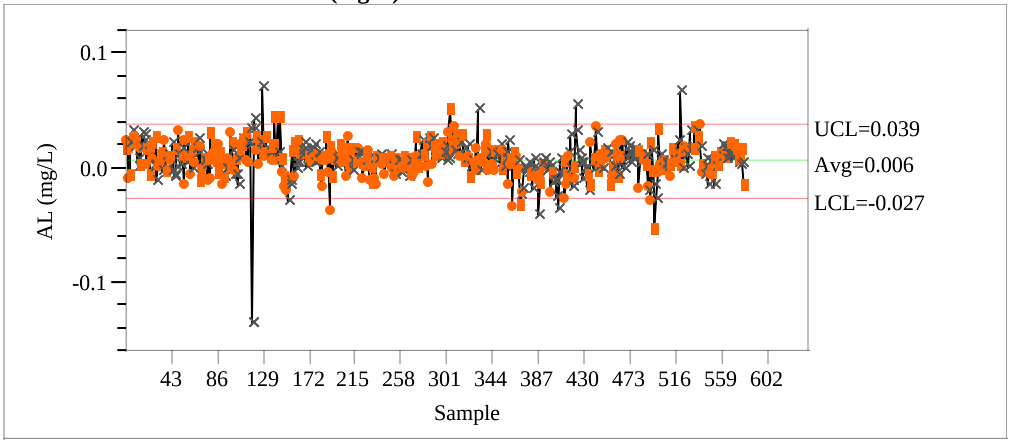
Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000261	96.228
Residual	0.00001	3.772
Total	0.000271	100.000

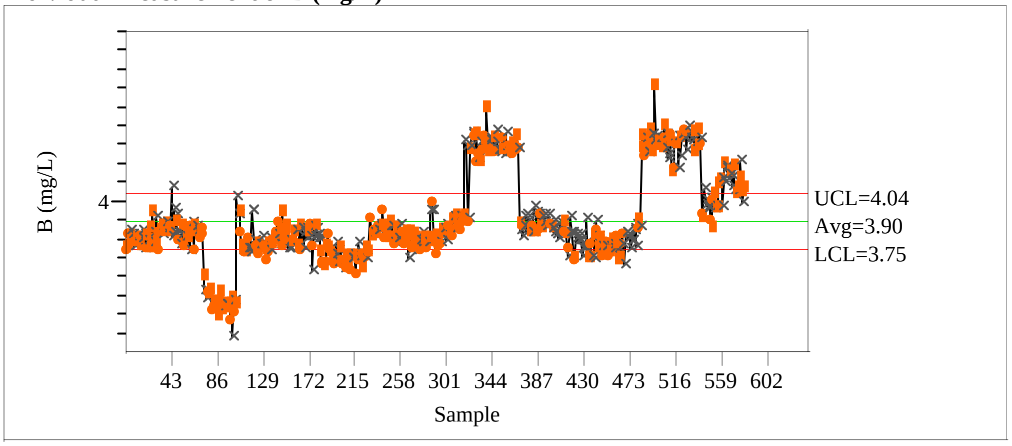
These estimates based on equating Mean Squares to Expected Value.

Exhibit A21. Fusion Preparation Standards in Analytical Sequence

STCd=SM51
Control Chart
Individual Measurement of AL (mg/L)



Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)

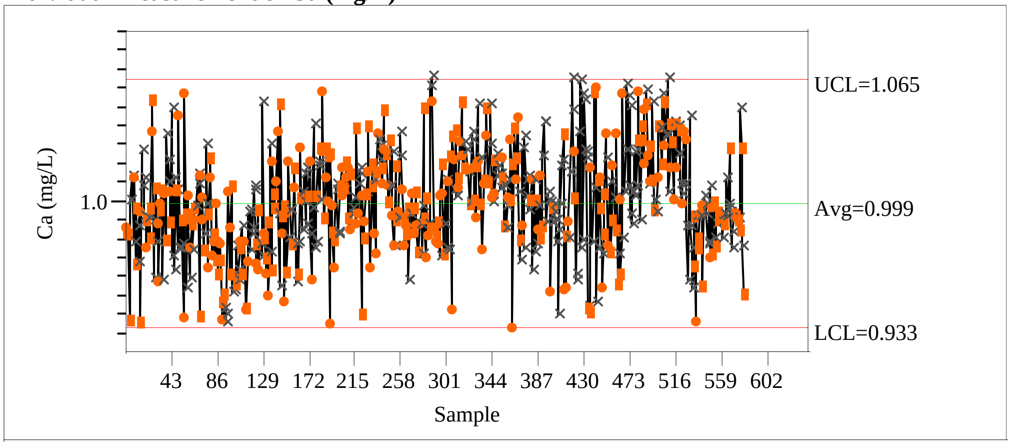
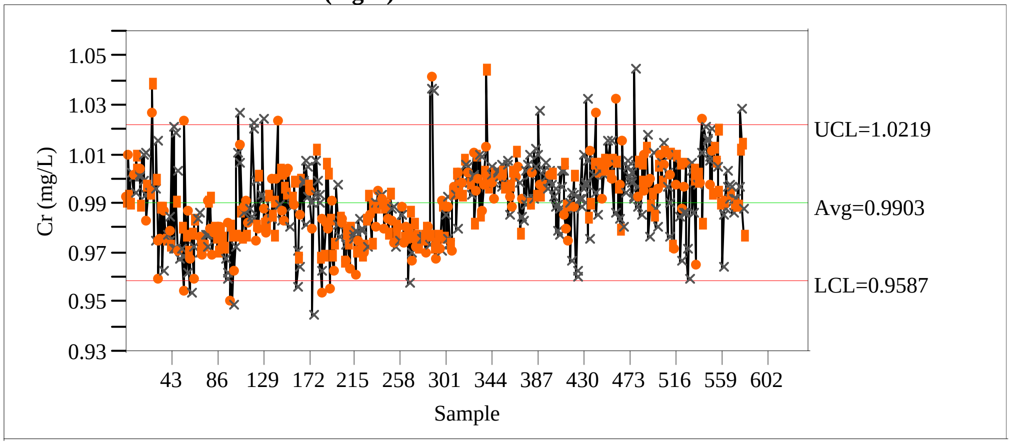
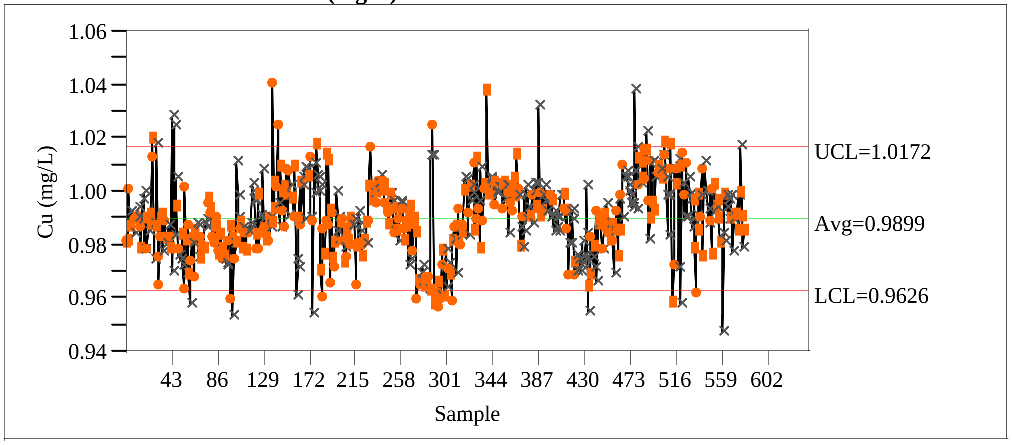


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

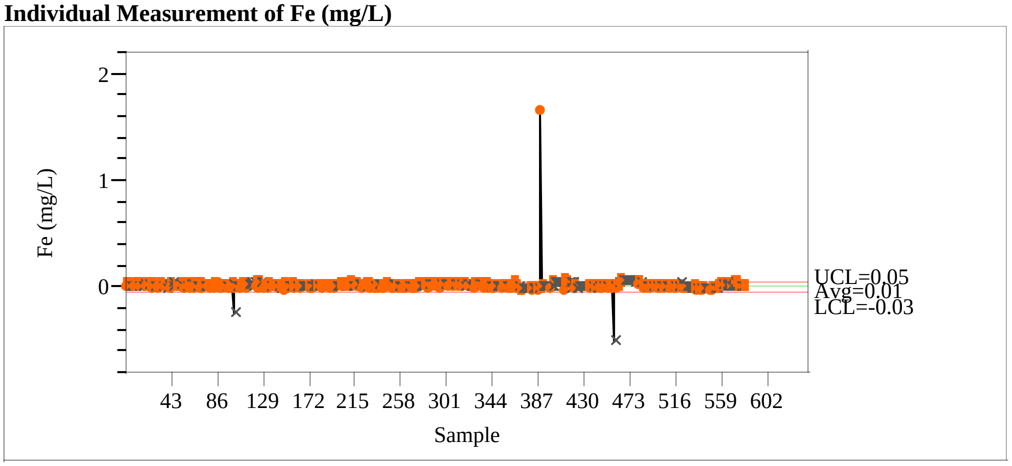
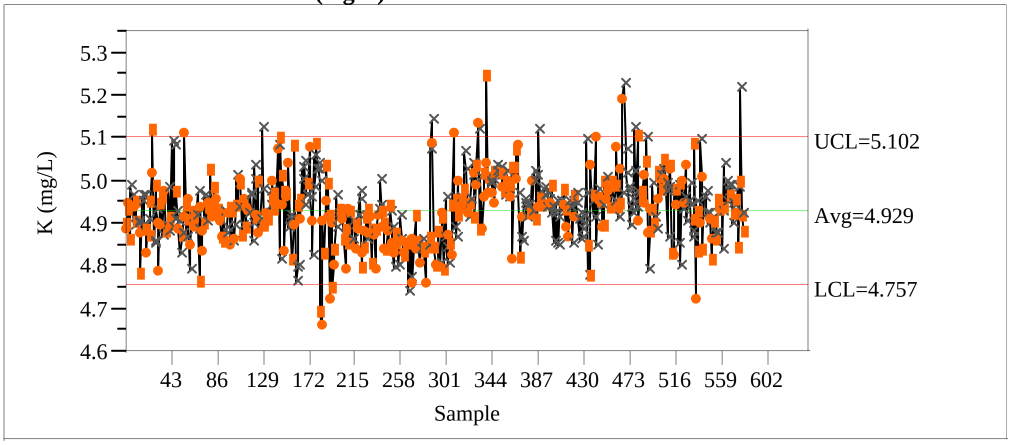
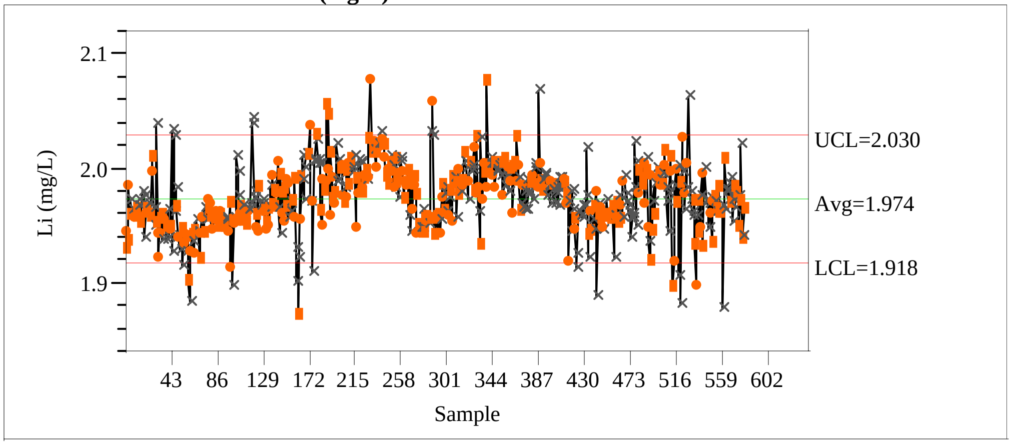


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

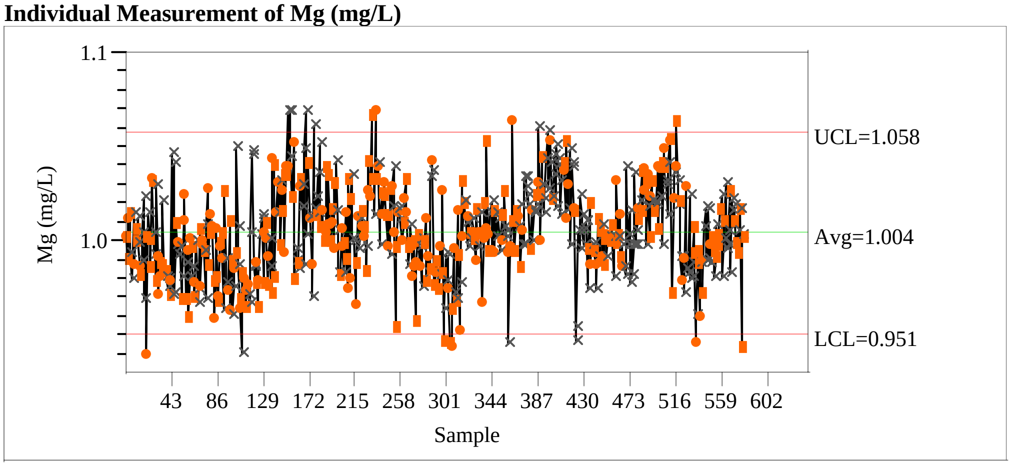
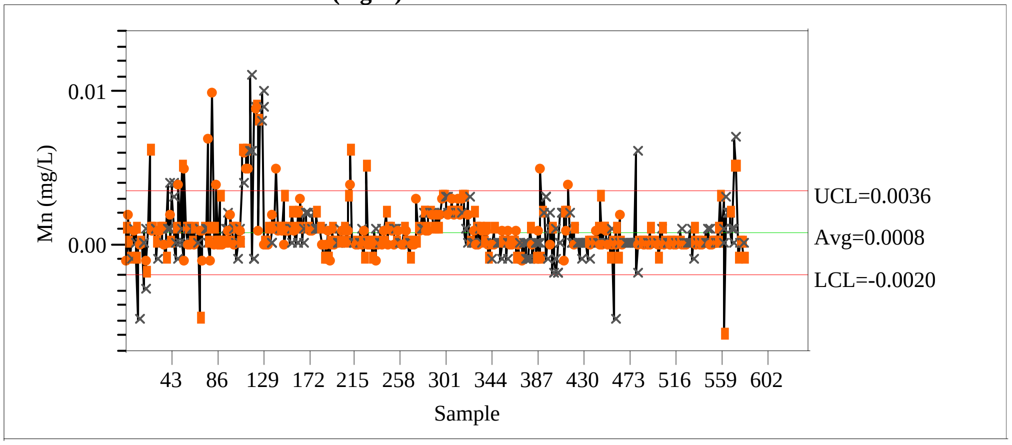
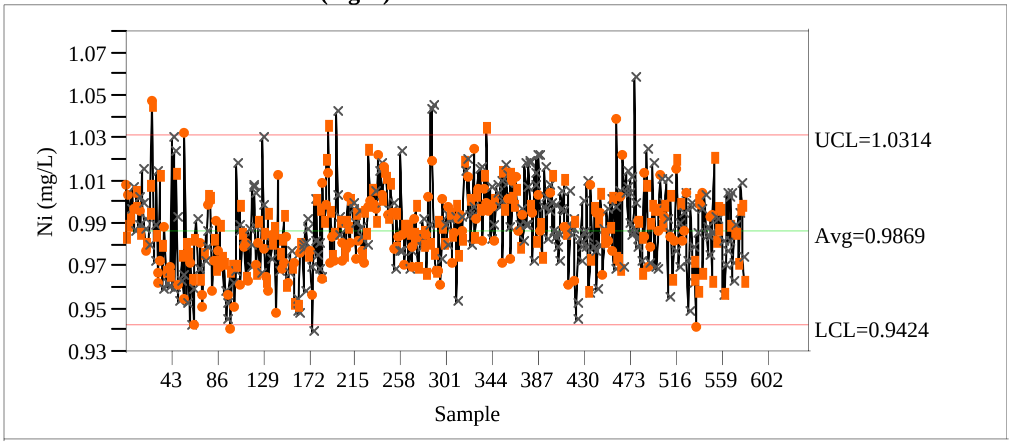


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

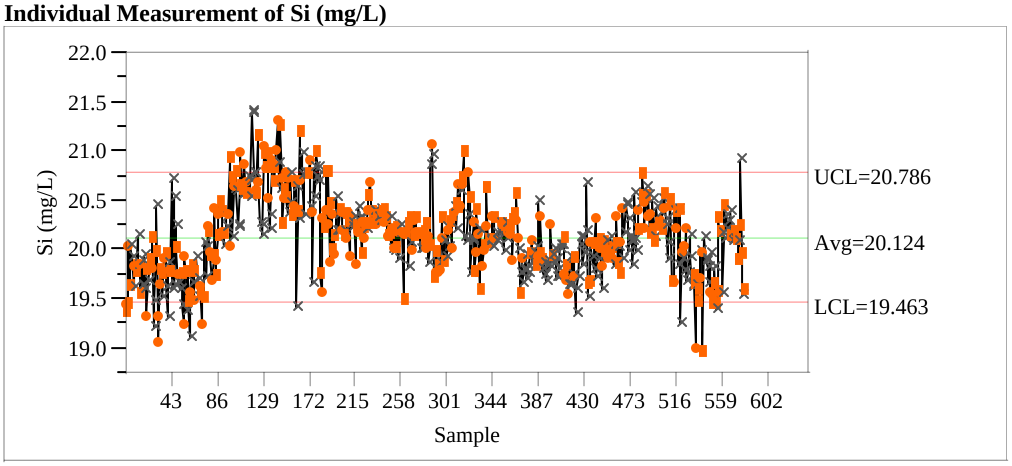
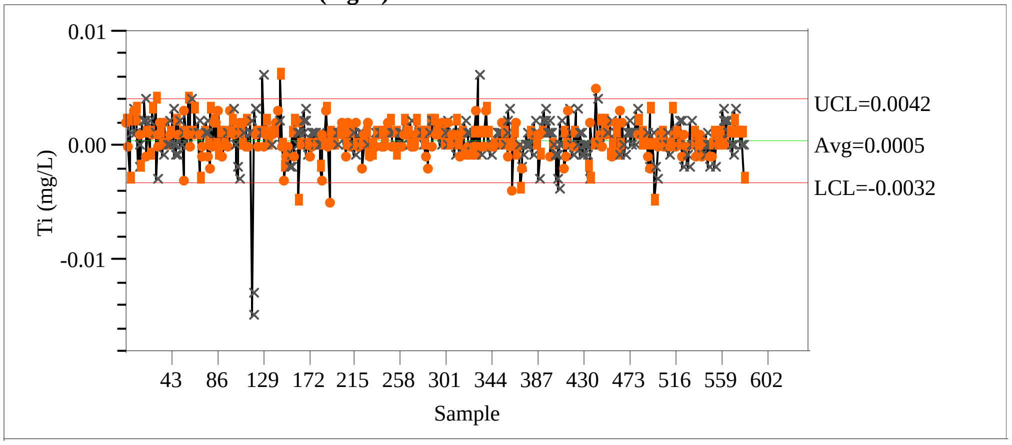
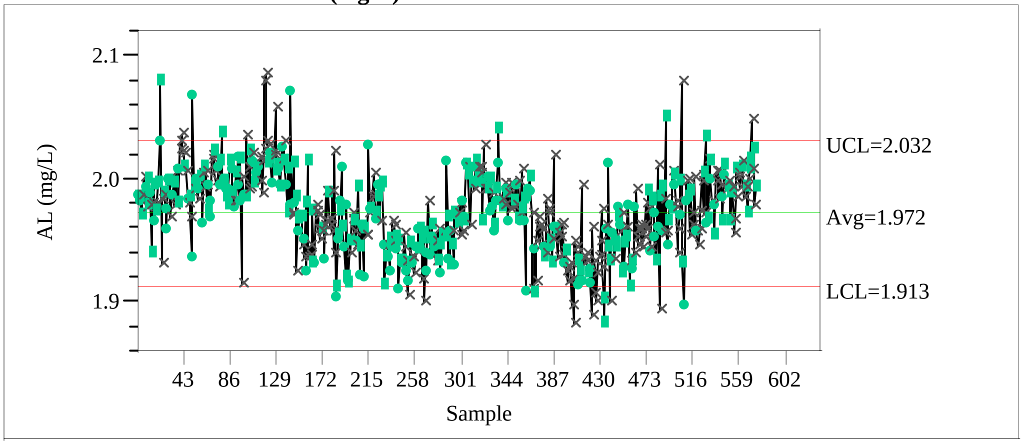


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



STCd=SM52
Control Chart
Individual Measurement of AL (mg/L)



Individual Measurement of B (mg/L)

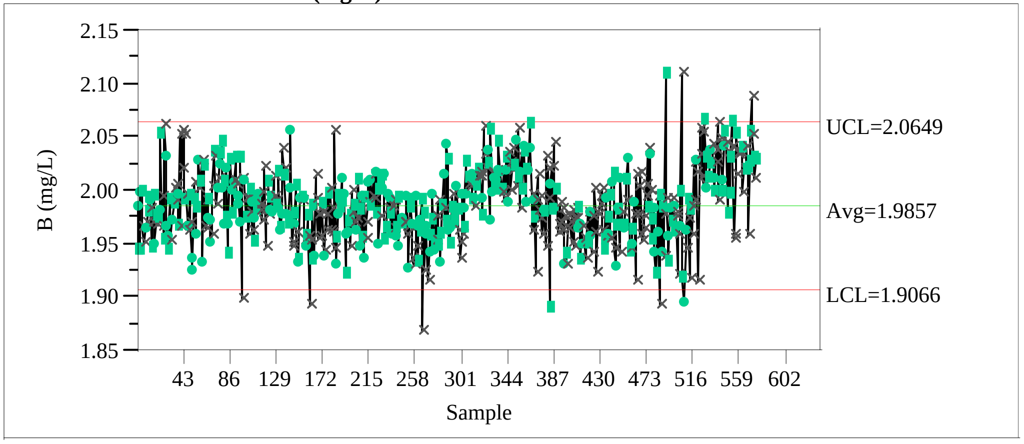
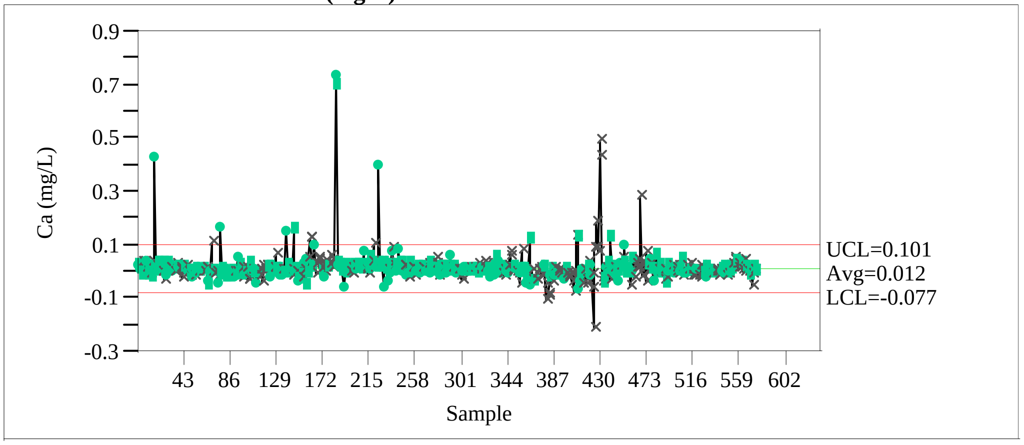
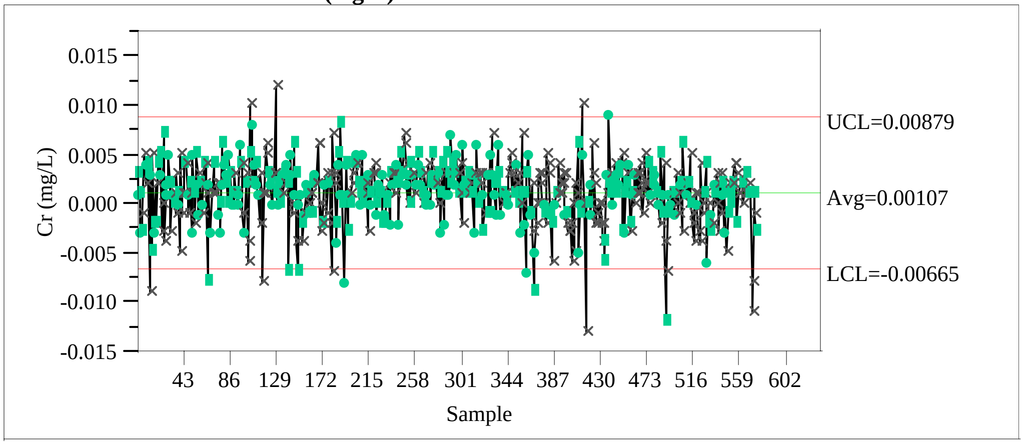


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

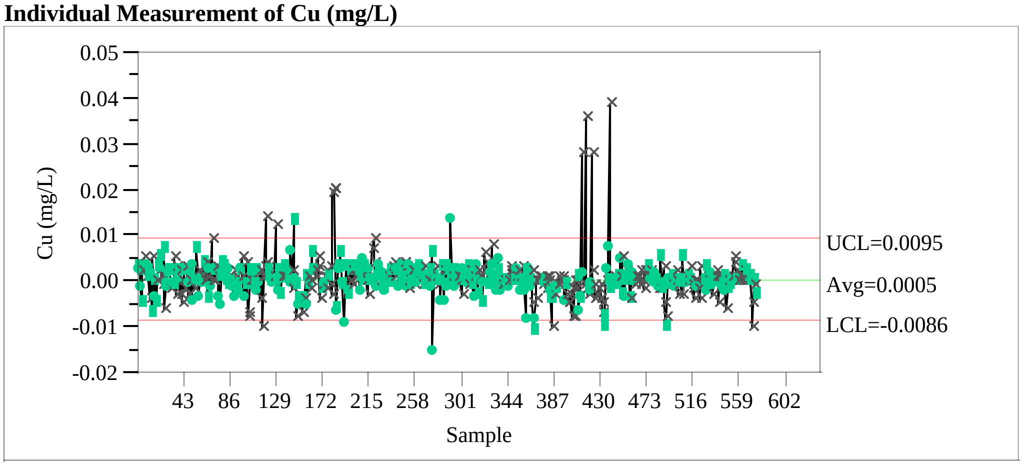
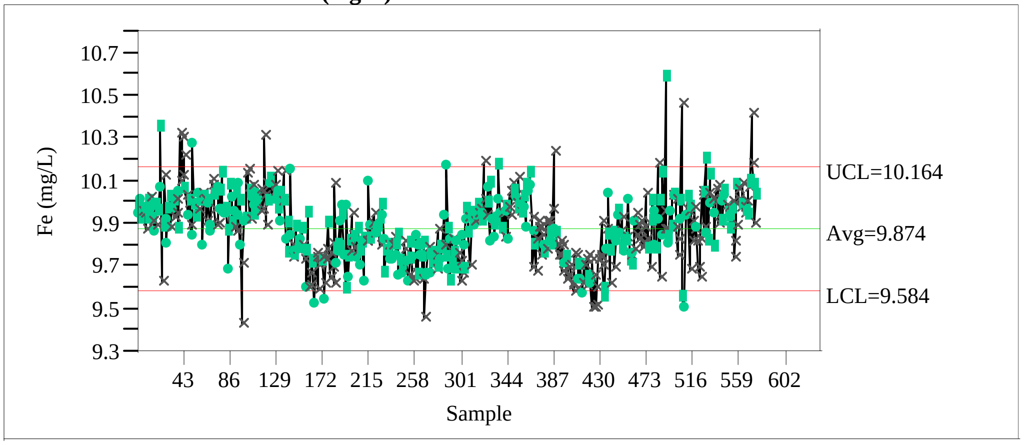
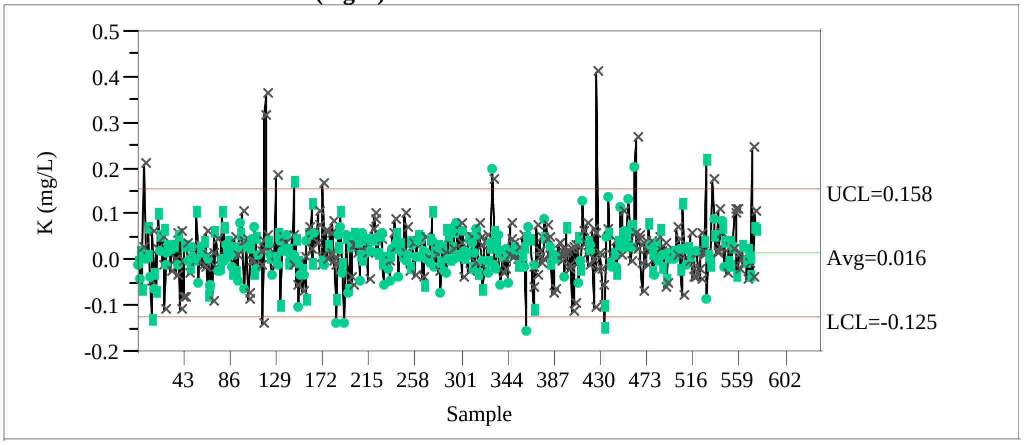


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

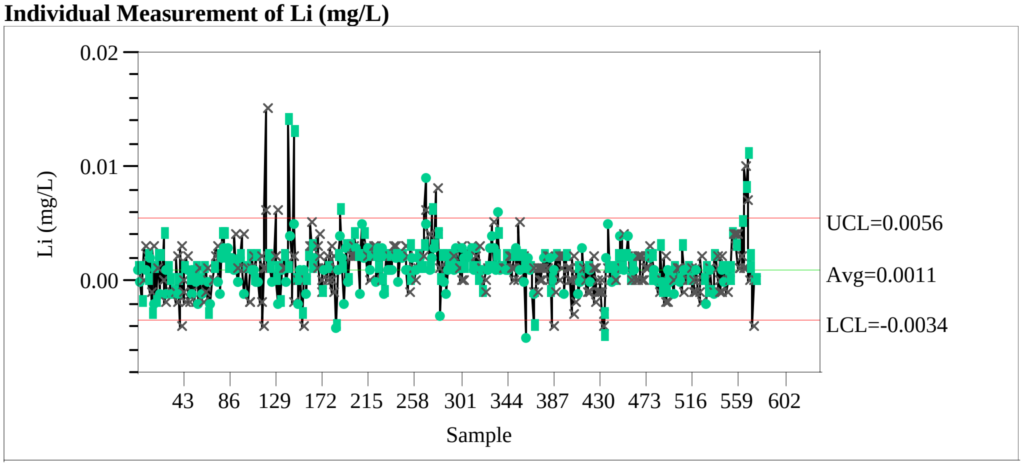
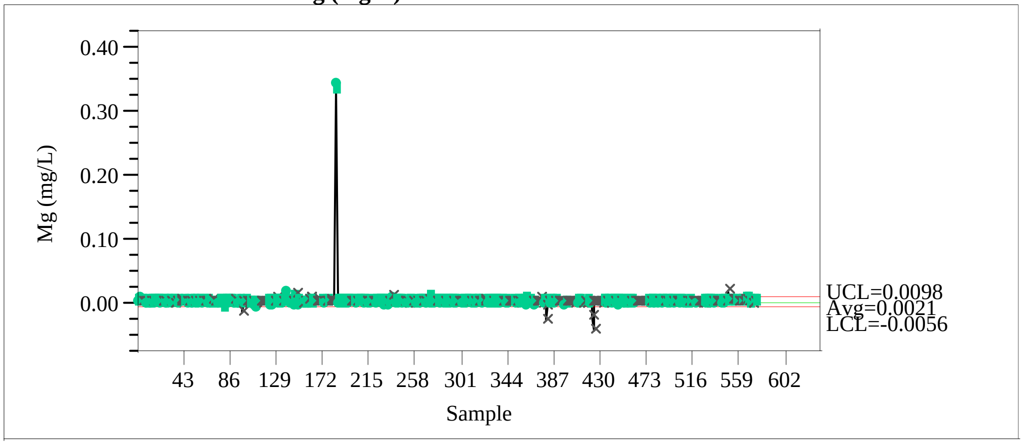
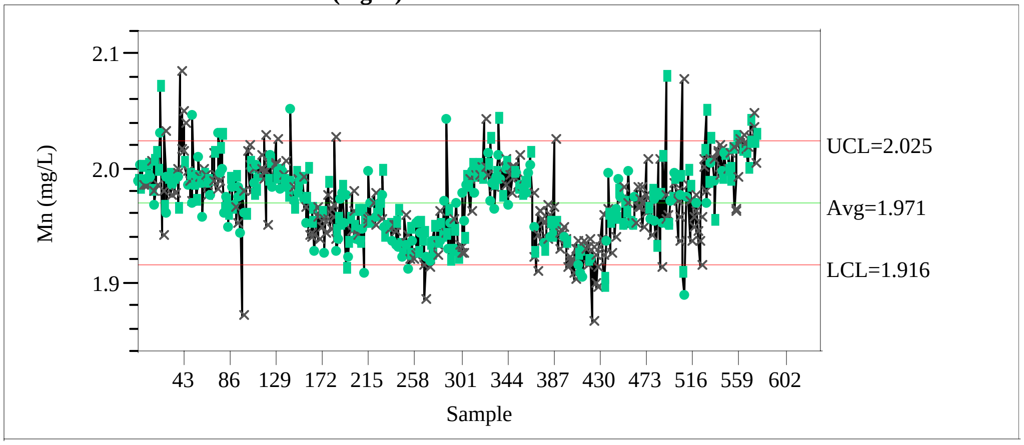


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Ni (mg/L)

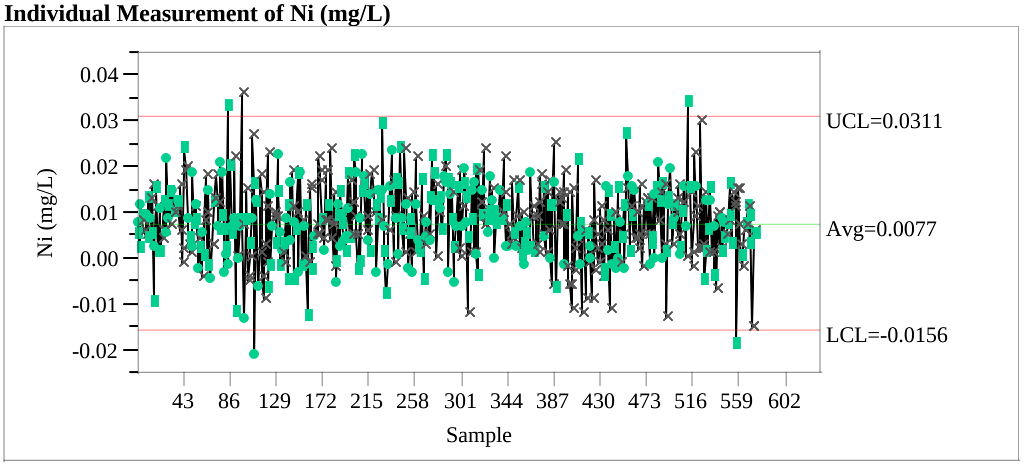
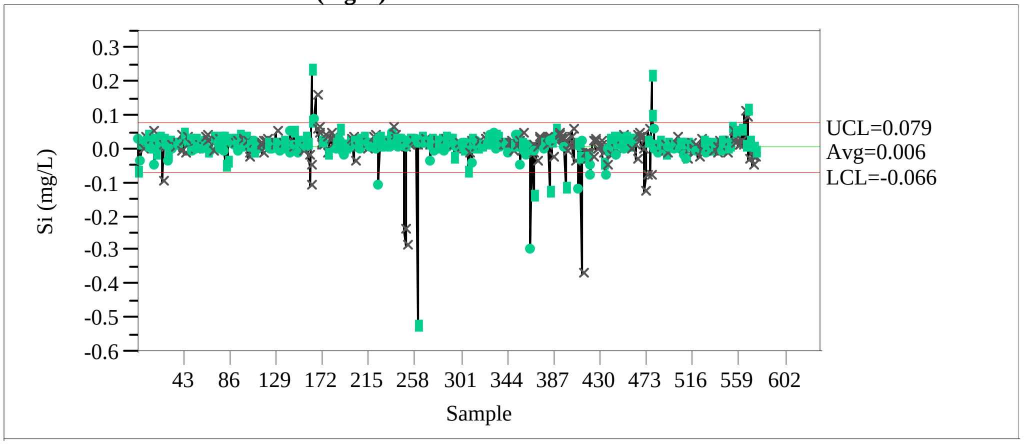
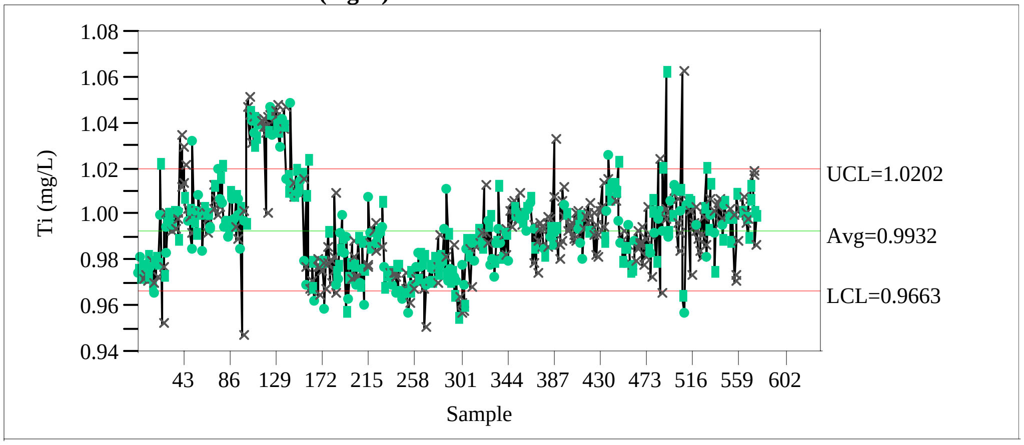


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)



STCd=SM53
Control Chart
Individual Measurement of AL (mg/L)

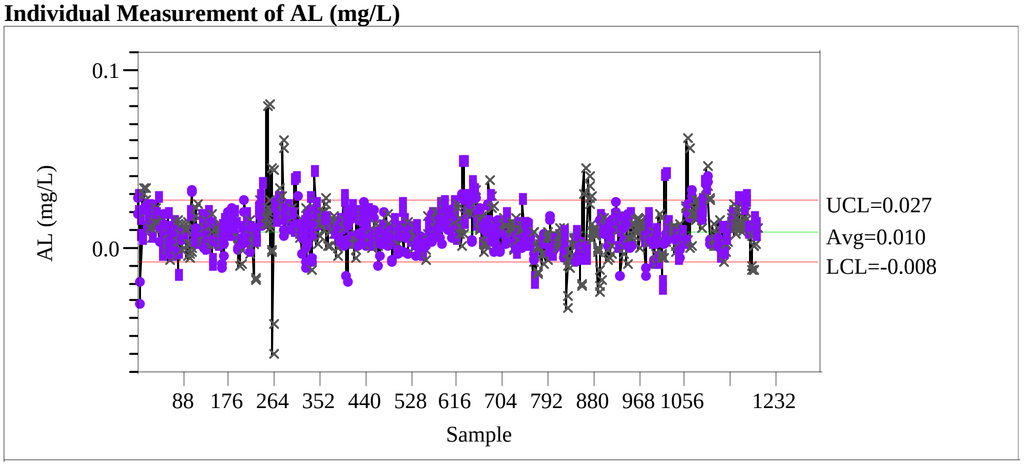
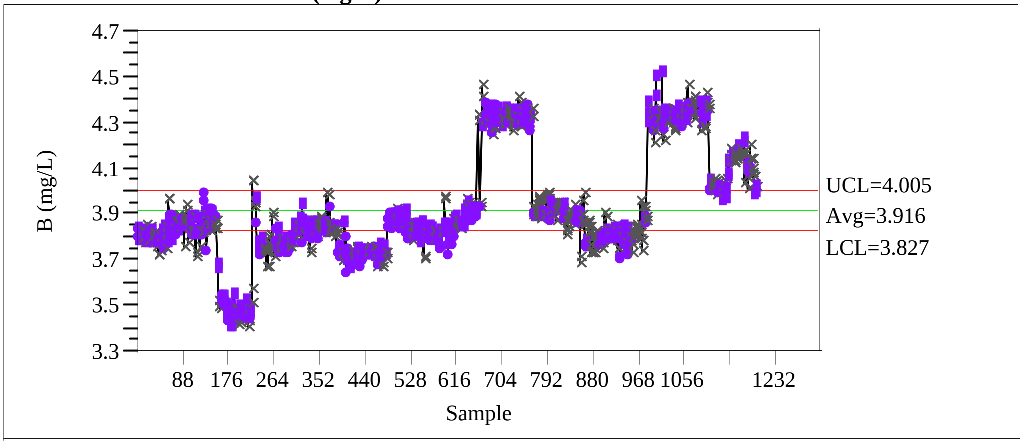
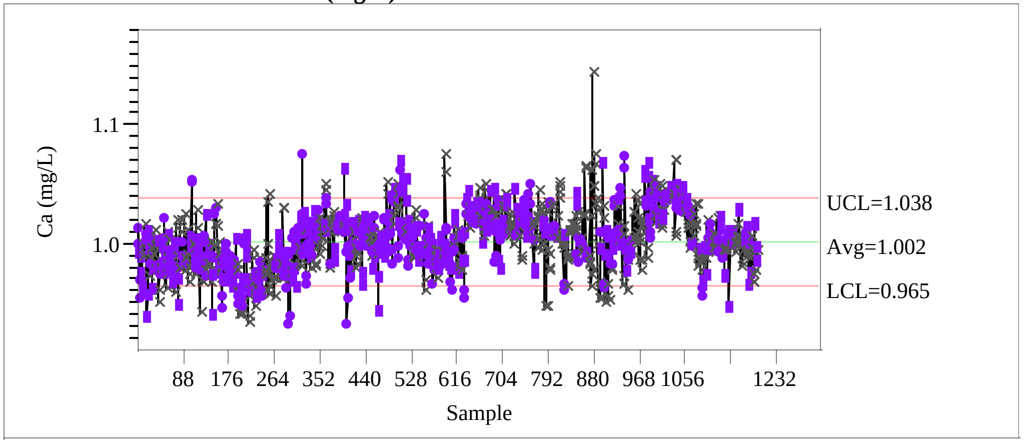


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)

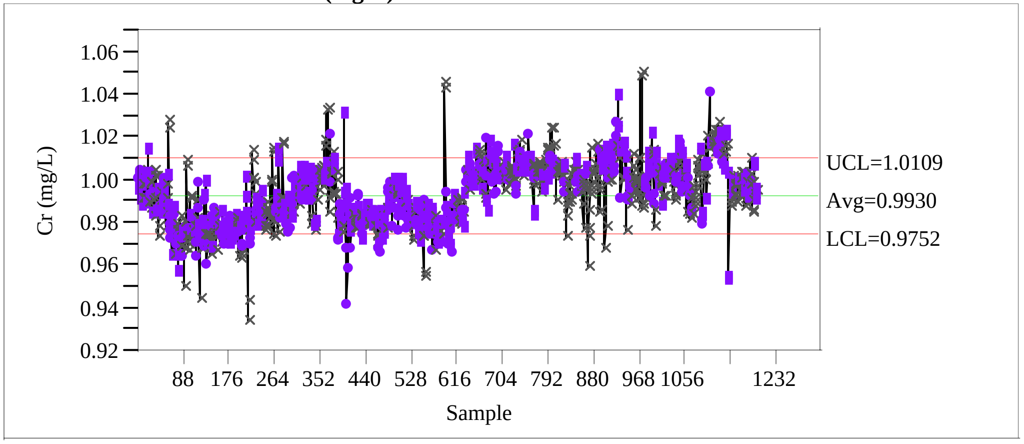
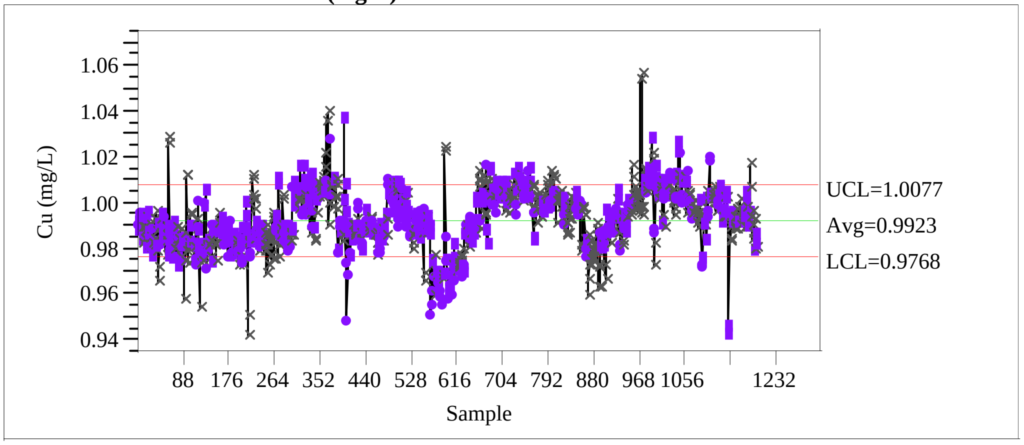
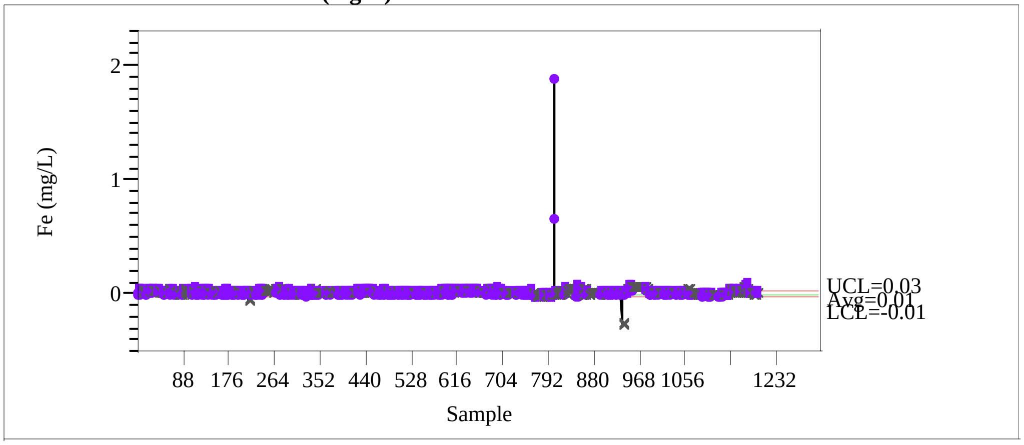


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)

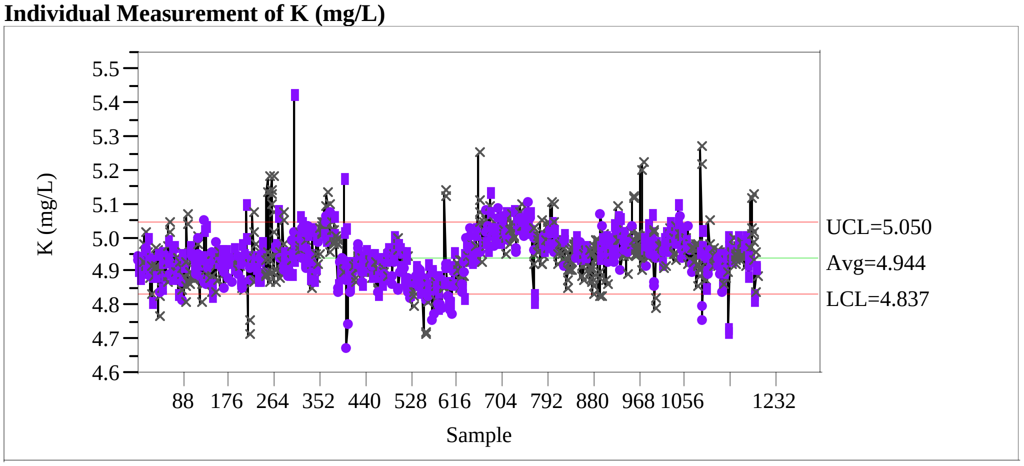
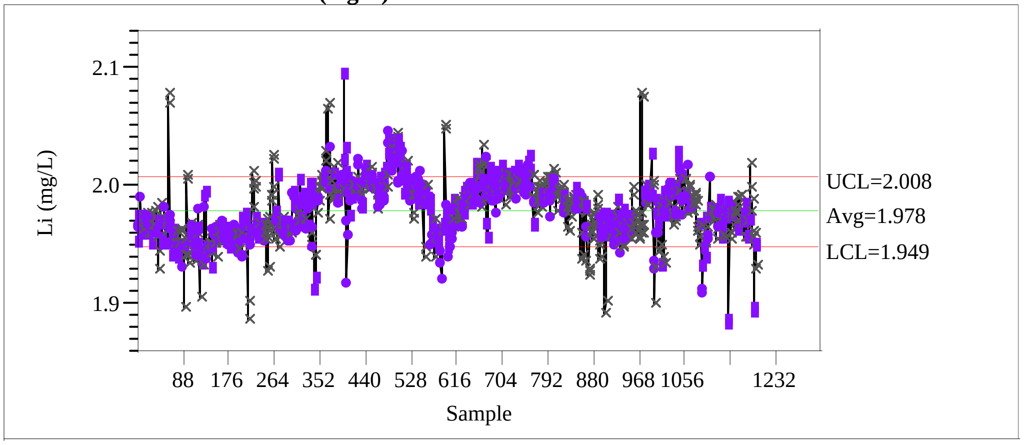
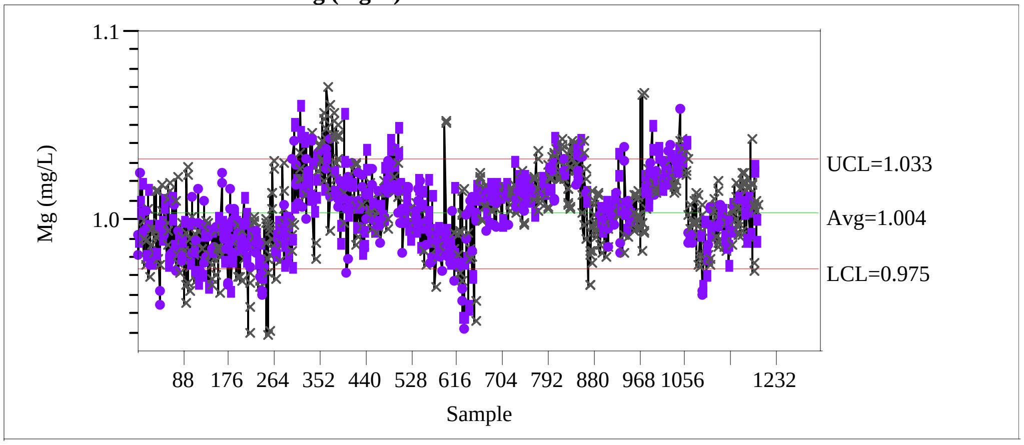


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)

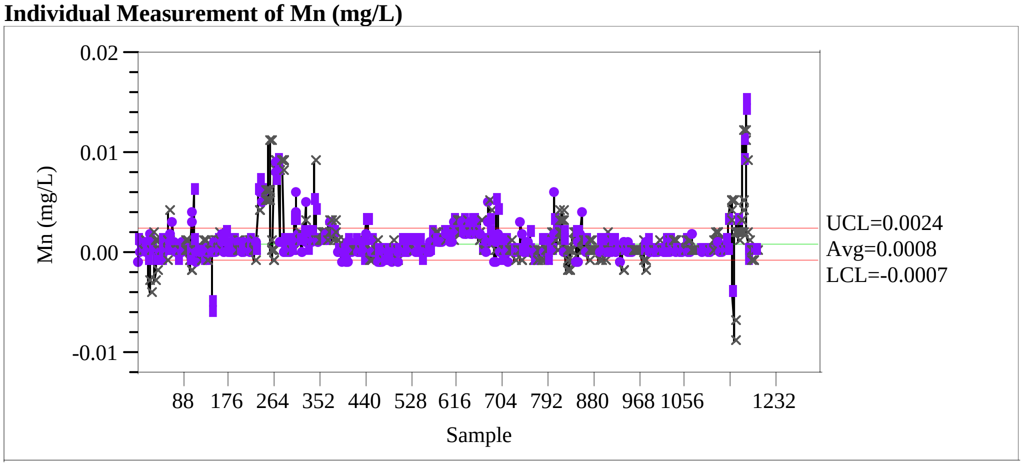
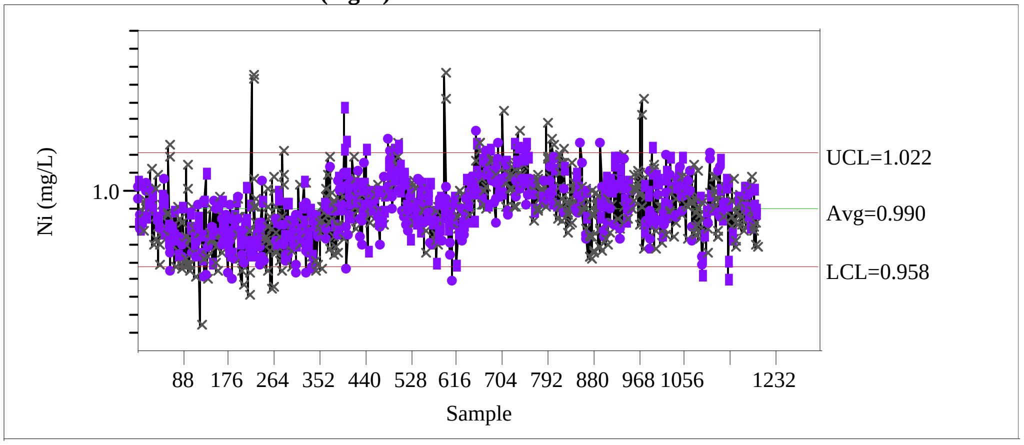
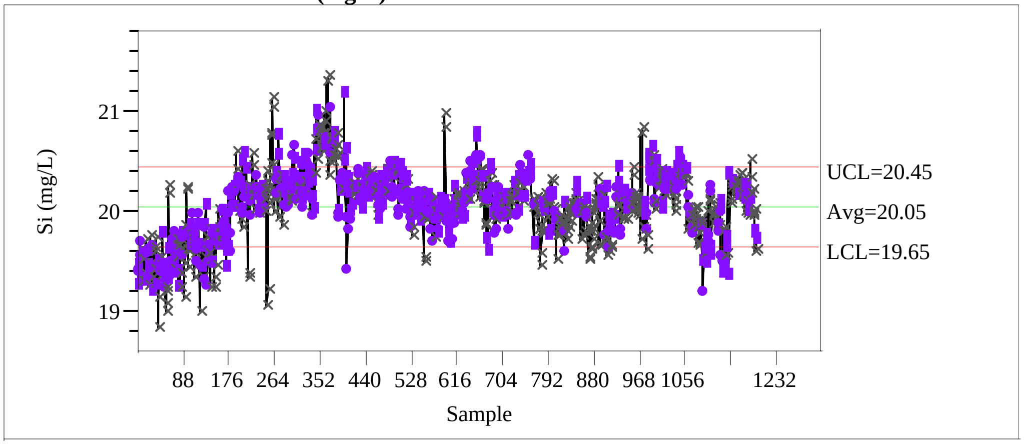


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

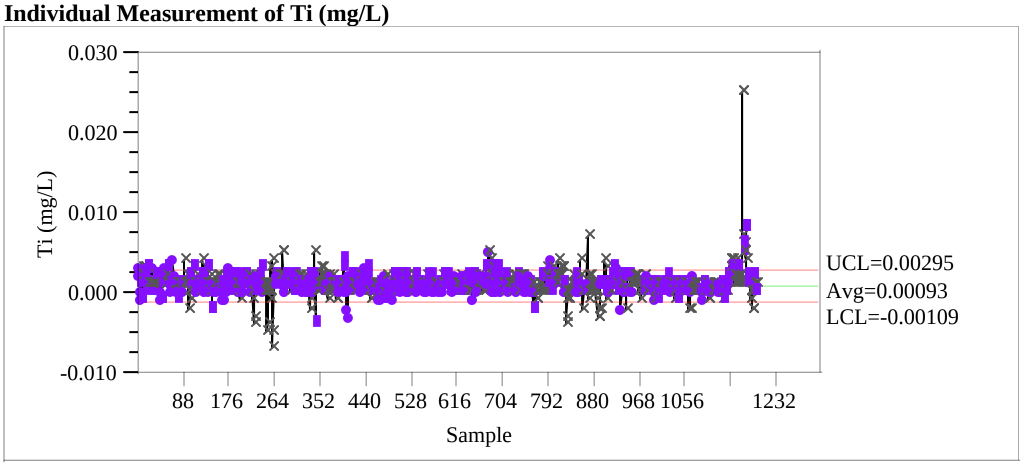
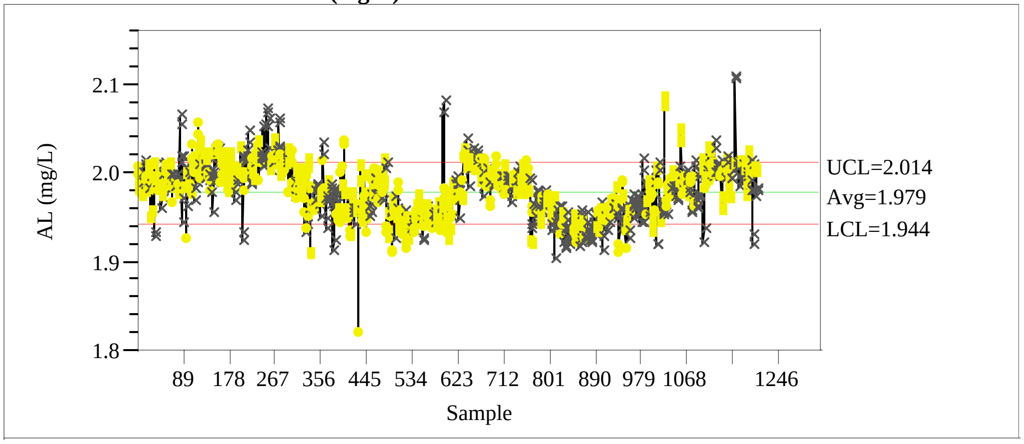
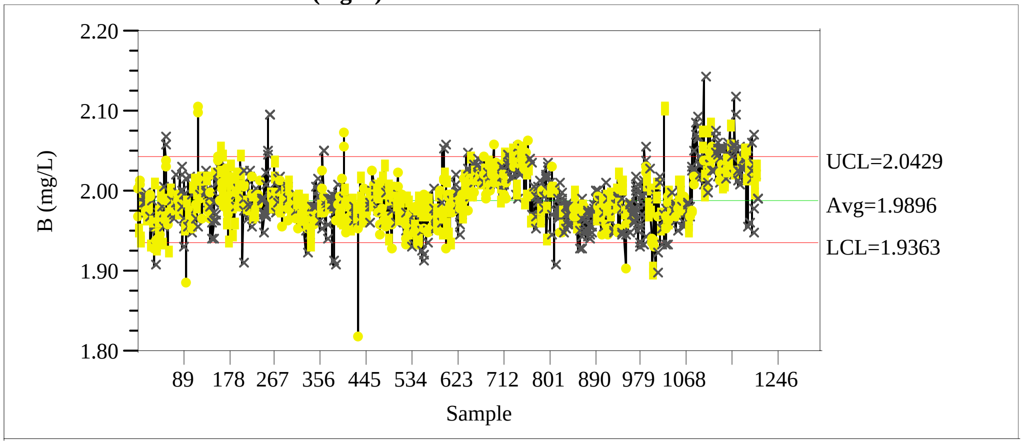


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

STCd=SM54
Control Chart
Individual Measurement of AL (mg/L)



Individual Measurement of B (mg/L)



Individual Measurement of Ca (mg/L)

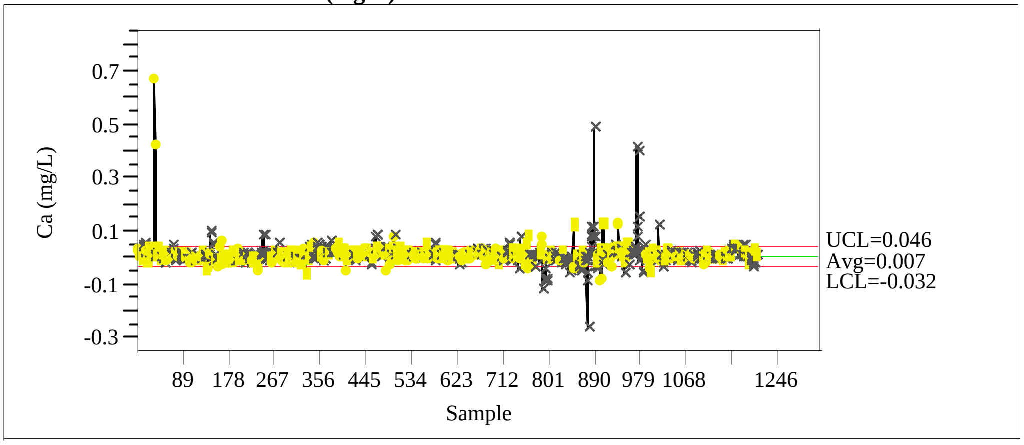
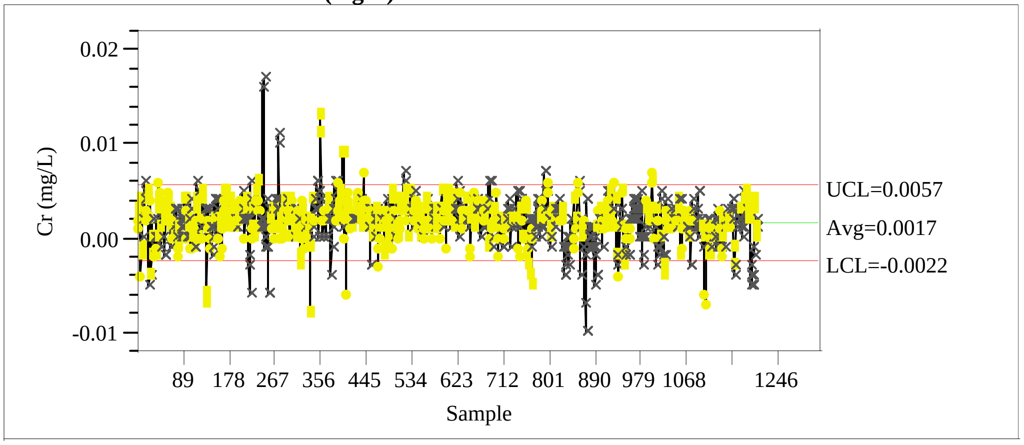
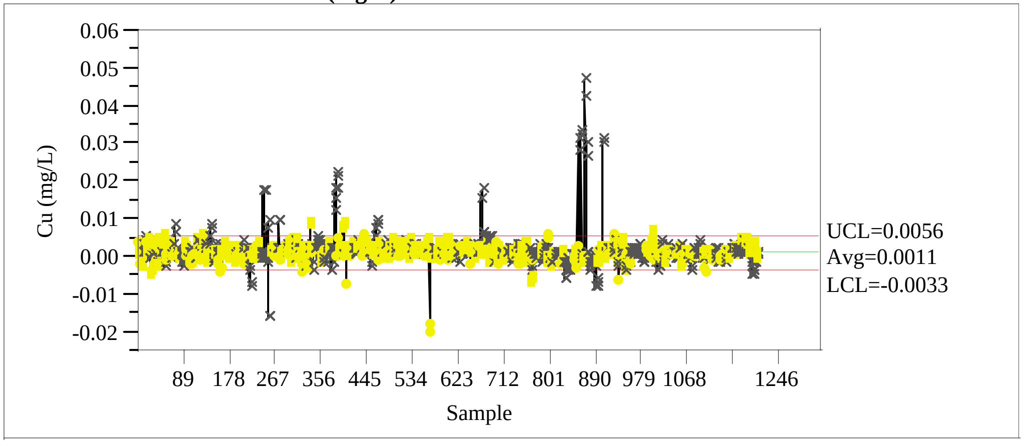


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)



Individual Measurement of Fe (mg/L)

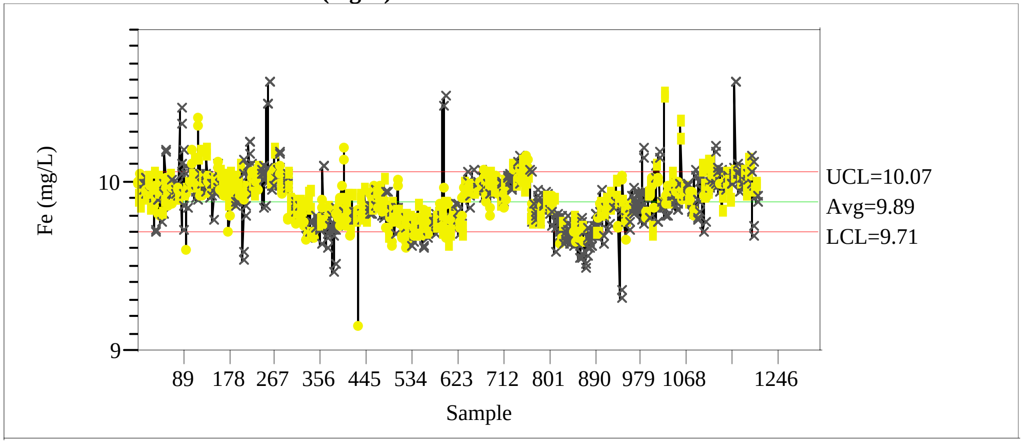
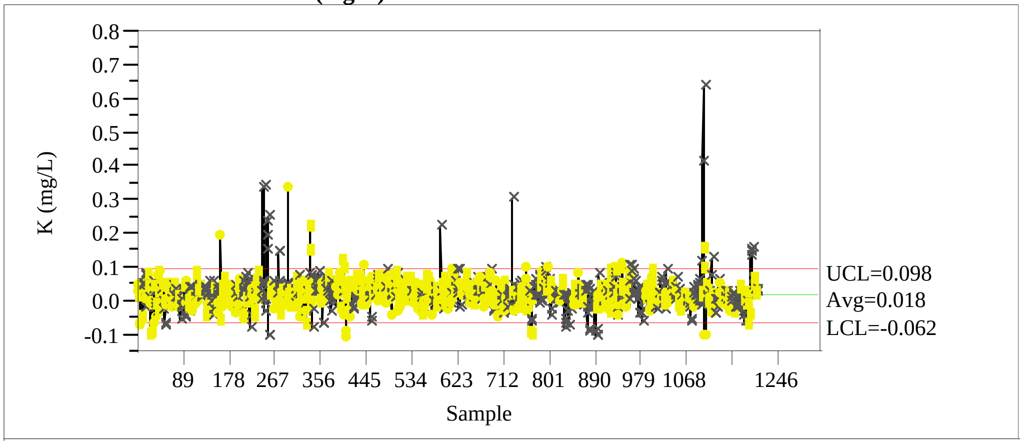
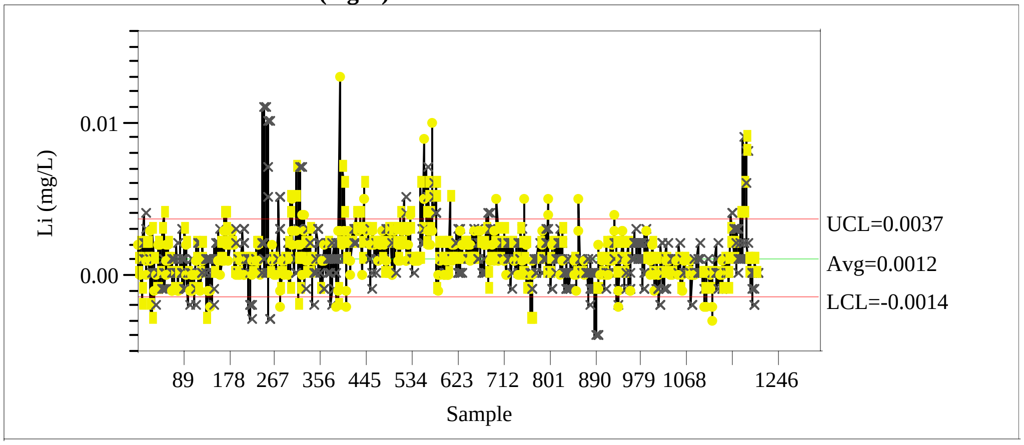


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)



Individual Measurement of Mg (mg/L)

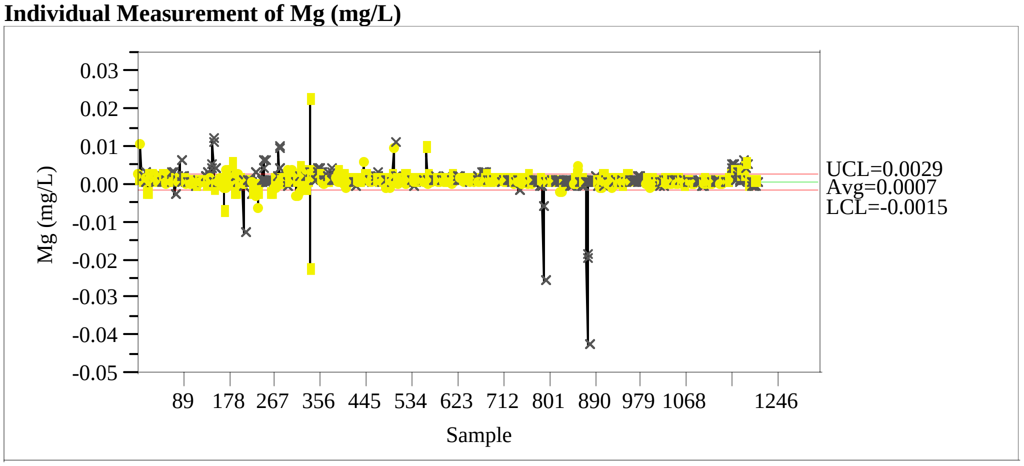
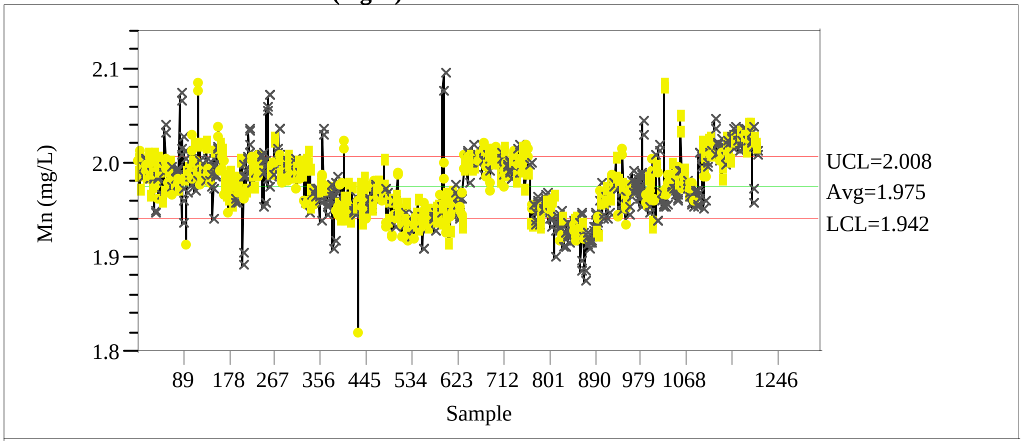
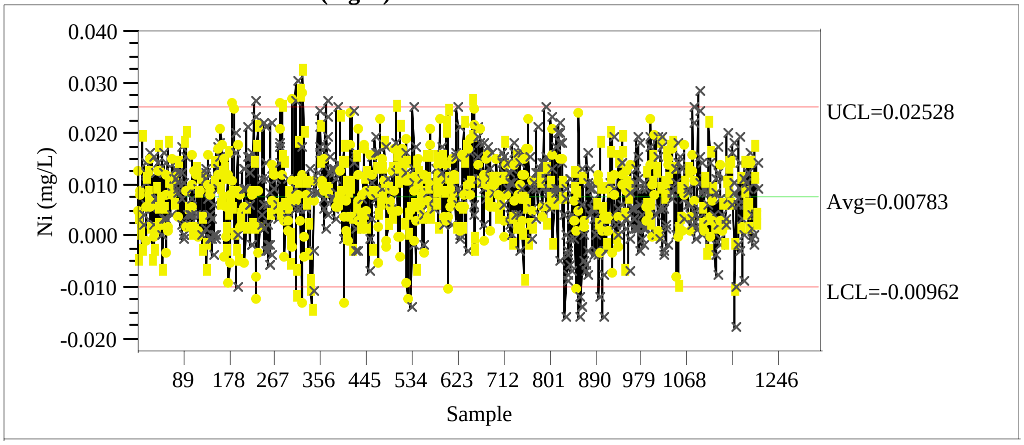


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Mn (mg/L)



Individual Measurement of Ni (mg/L)



Individual Measurement of Si (mg/L)

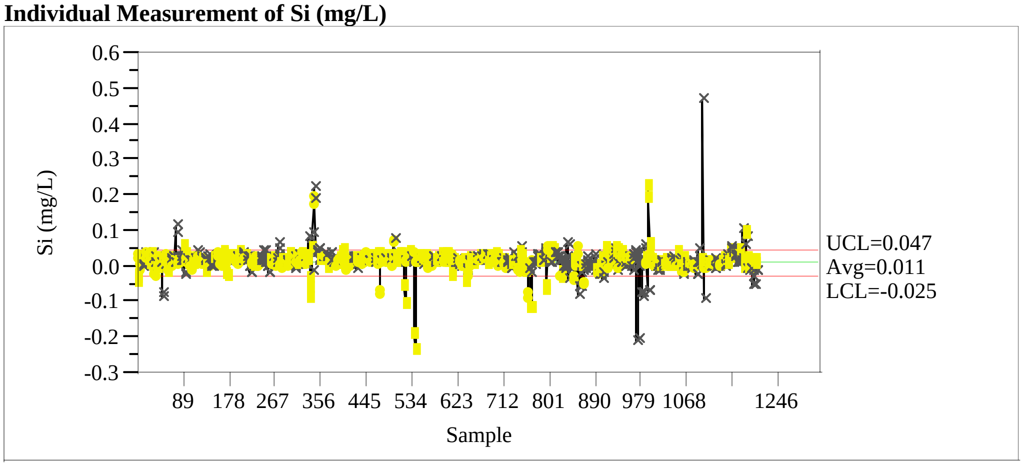
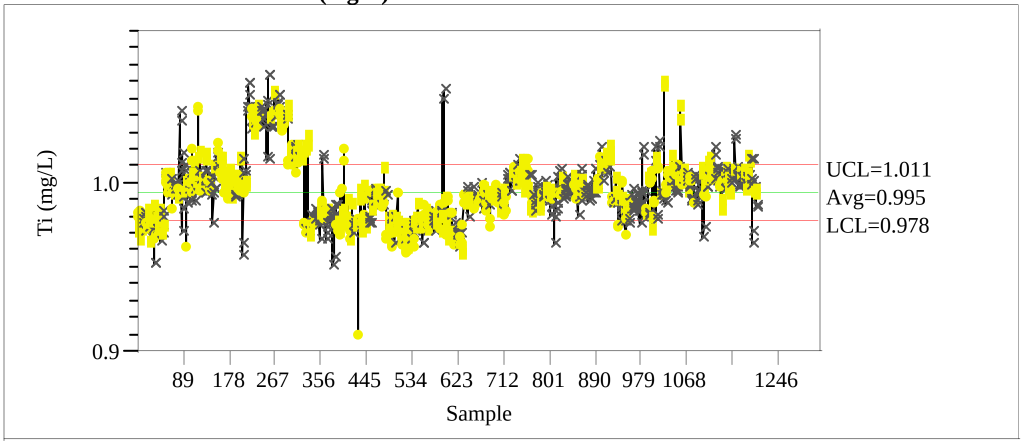
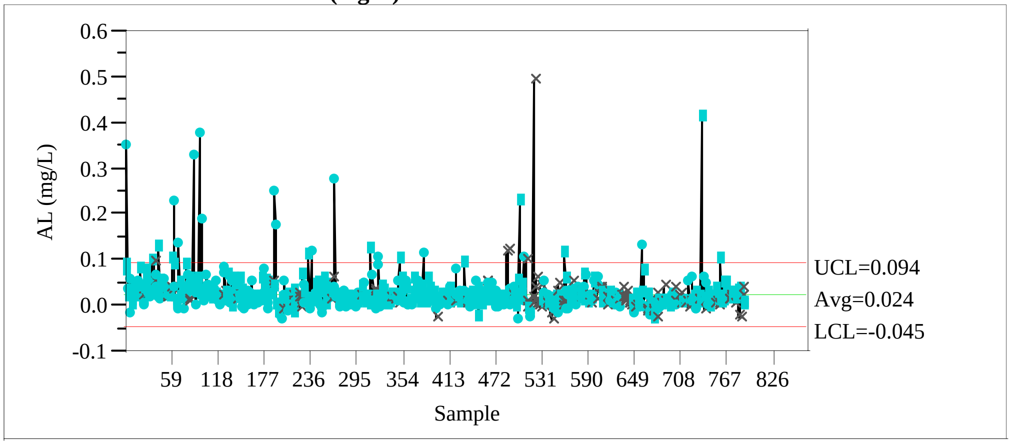


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Ti (mg/L)



STCd=SM55
Control Chart
Individual Measurement of AL (mg/L)



Individual Measurement of B (mg/L)

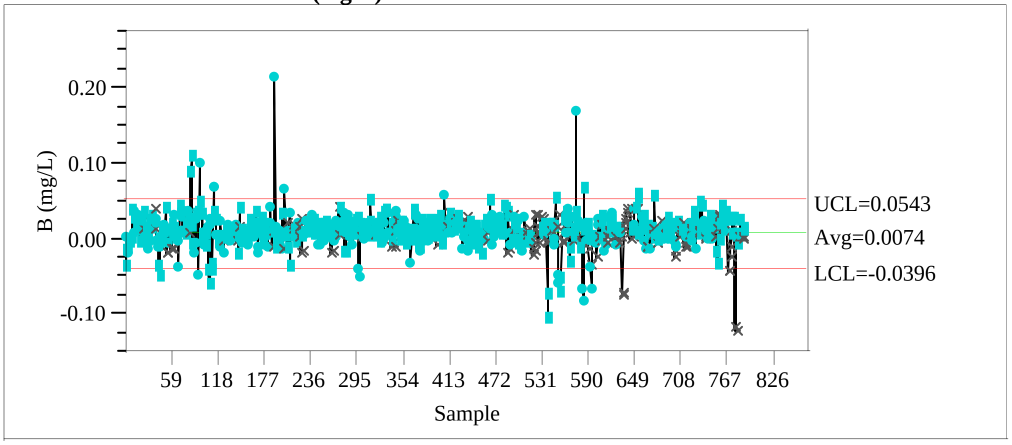
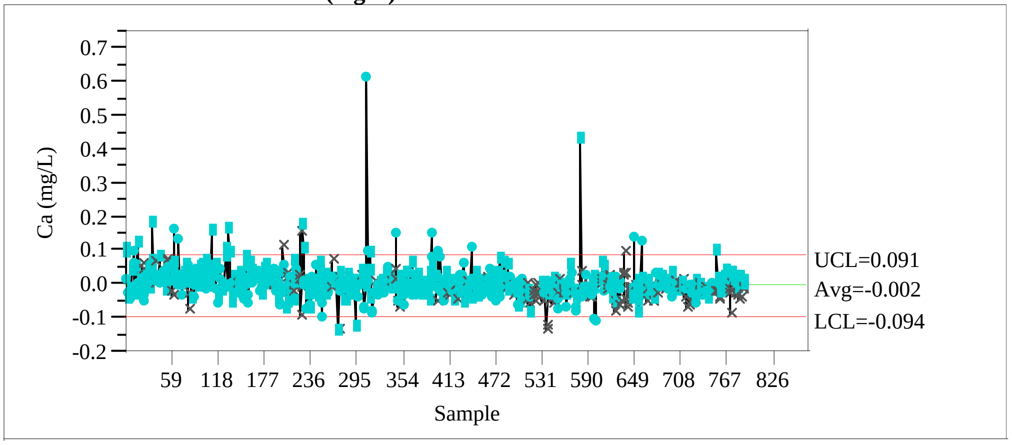
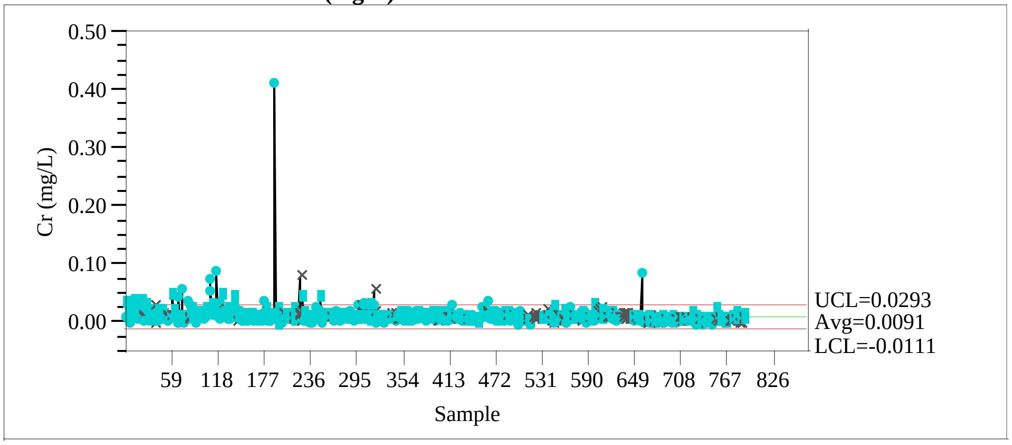


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Ca (mg/L)



Individual Measurement of Cr (mg/L)



Individual Measurement of Cu (mg/L)

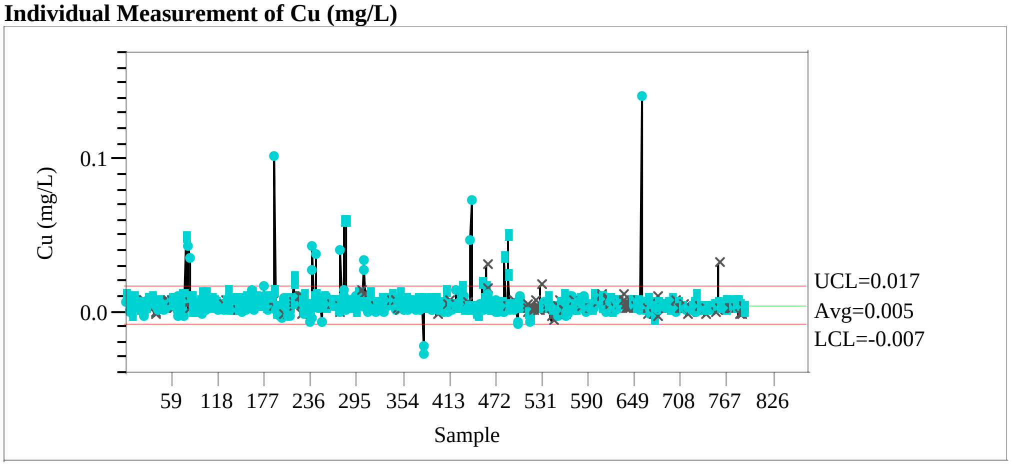
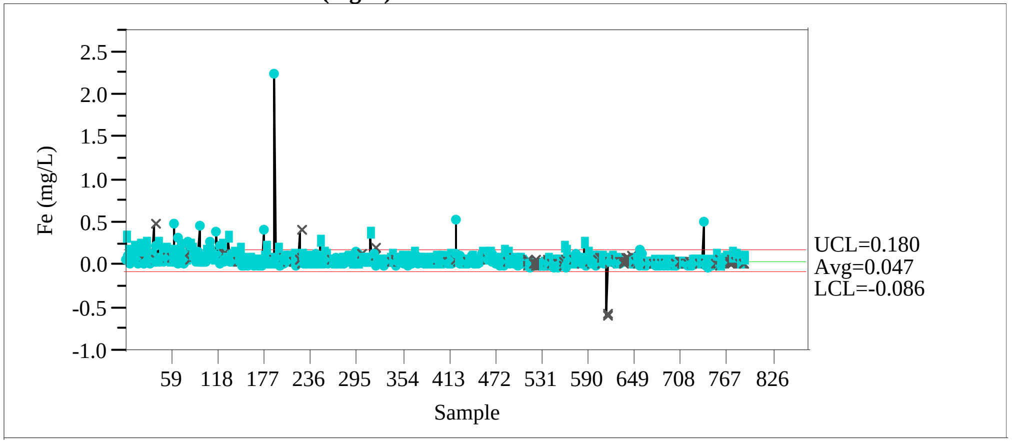
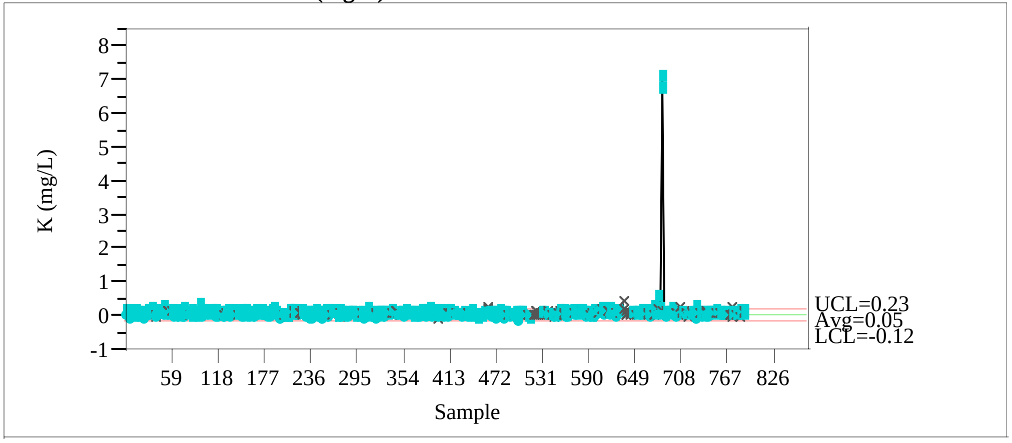


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Fe (mg/L)



Individual Measurement of K (mg/L)



Individual Measurement of Li (mg/L)

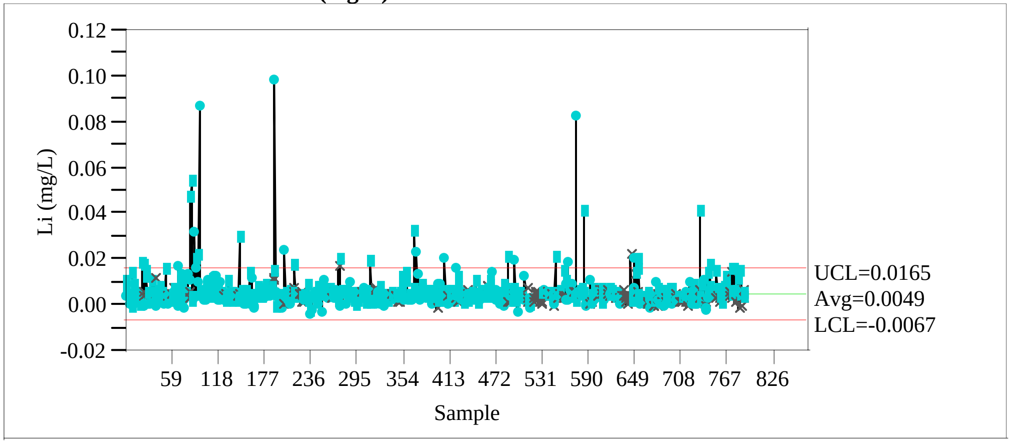
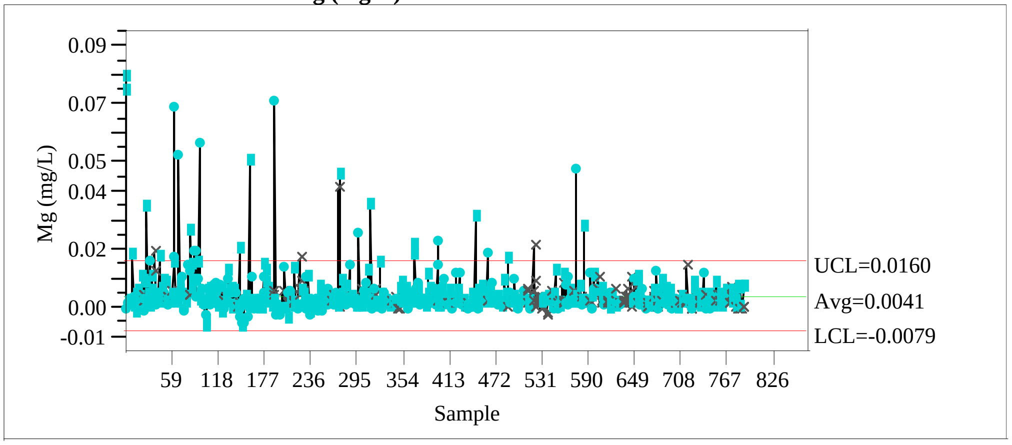
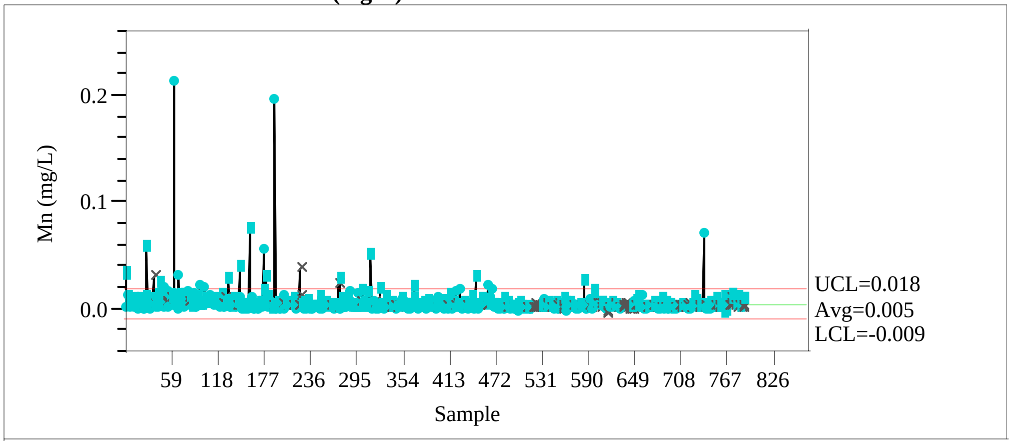


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Mg (mg/L)



Individual Measurement of Mn (mg/L)



Individual Measurement of Ni (mg/L)

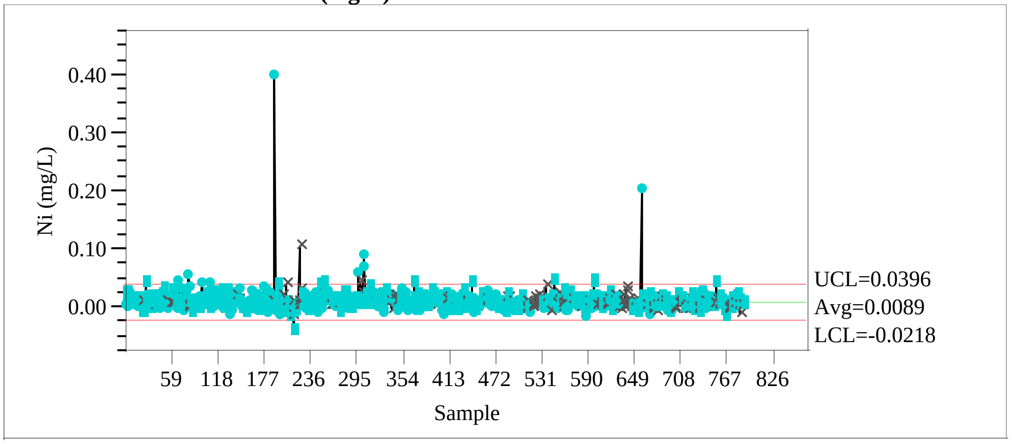
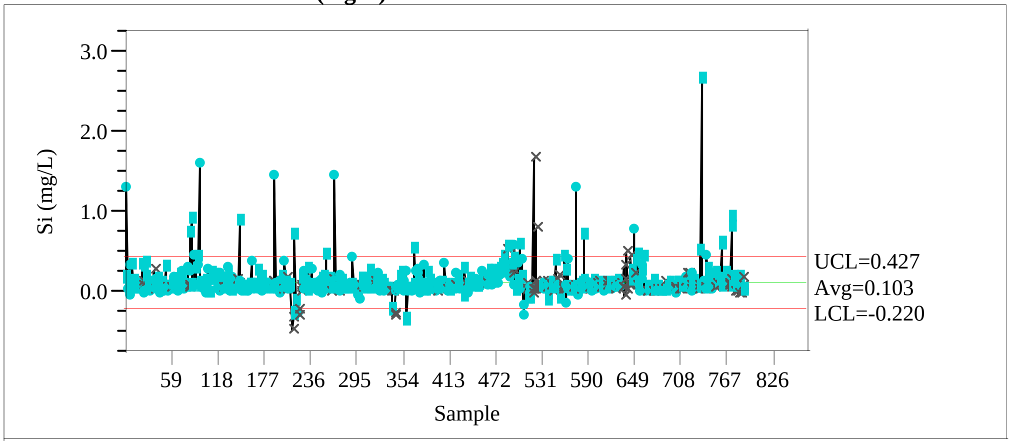


Exhibit A21. Fusion Preparation Standards in Analytical Sequence

Individual Measurement of Si (mg/L)



Individual Measurement of Ti (mg/L)

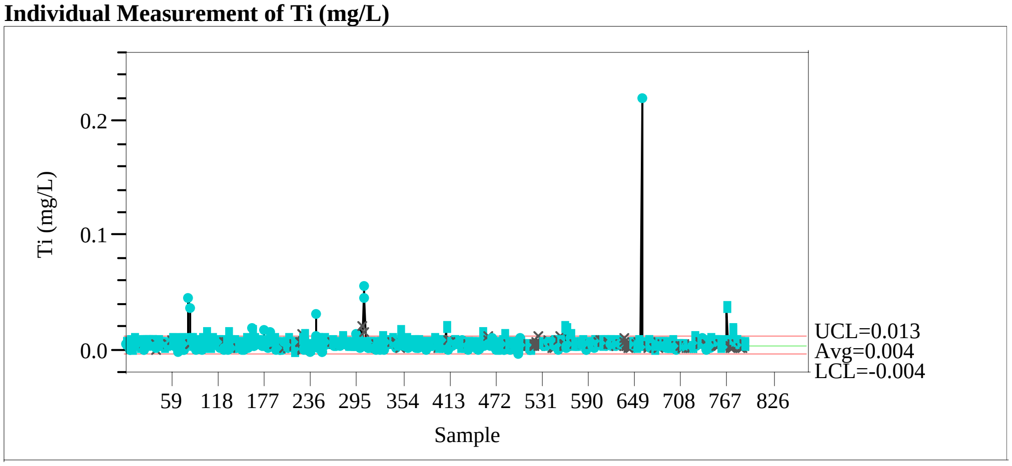
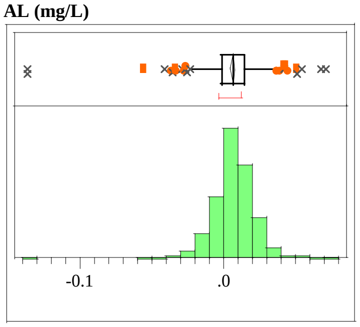


Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

STCd=SM51
Distributions
AL (mg/L)



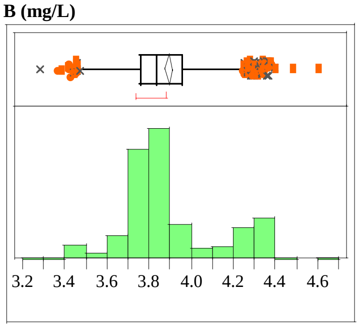
Quantiles

100.0%	maximum	0.0700
99.5%		0.0552
97.5%		0.0340
90.0%		0.0230
75.0%	quartile	0.0140
50.0%	median	0.0070
25.0%	quartile	-0.0010
10.0%		-0.0100
2.5%		-0.0224
0.5%		-0.0637
0.0%	minimum	-0.1370

Moments

Mean	0.0062655
Std Dev	0.0162766
Std Err Mean	0.0006758
upper 95% Mean	0.0075929
lower 95% Mean	0.0049381
N	580

B (mg/L)



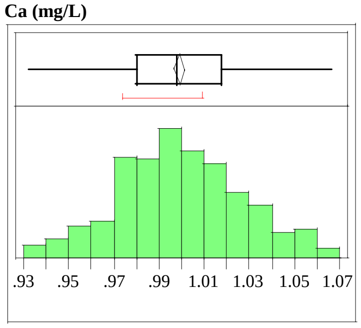
Quantiles

100.0%	maximum	4.6080
99.5%		4.4082
97.5%		4.3585
90.0%		4.3049
75.0%	quartile	3.9580
50.0%	median	3.8340
25.0%	quartile	3.7640
10.0%		3.6950
2.5%		3.4520
0.5%		3.3873
0.0%	minimum	3.2770

Moments

Mean	3.89655
Std Dev	0.2313833
Std Err Mean	0.0096077
upper 95% Mean	3.9154201
lower 95% Mean	3.8776799
N	580

Ca (mg/L)



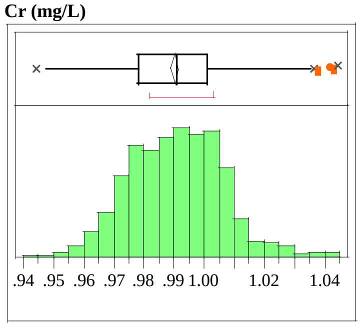
Quantiles

100.0%	maximum	1.0660
99.5%		1.0650
97.5%		1.0565
90.0%		1.0360
75.0%	quartile	1.0180
50.0%	median	0.9980
25.0%	quartile	0.9800
10.0%		0.9630
2.5%		0.9420
0.5%		0.9349
0.0%	minimum	0.9330

Moments

Mean	0.999
Std Dev	0.0276726
Std Err Mean	0.001149
upper 95% Mean	1.0012568
lower 95% Mean	0.9967432
N	580

Cr (mg/L)



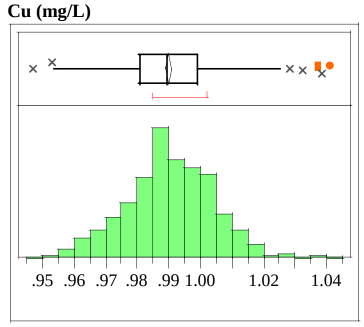
Quantiles

100.0%	maximum	1.0440
99.5%		1.0421
97.5%		1.0245
90.0%		1.0090
75.0%	quartile	1.0010
50.0%	median	0.9910
25.0%	quartile	0.9783
10.0%		0.9710
2.5%		0.9605
0.5%		0.9507
0.0%	minimum	0.9440

Moments

Mean	0.9903293
Std Dev	0.0157958
Std Err Mean	0.0006559
upper 95% Mean	0.9916175
lower 95% Mean	0.9890411
N	580

Cu (mg/L)



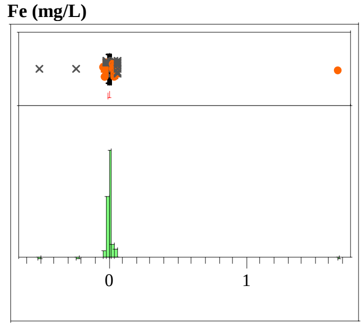
Quantiles

100.0%	maximum	1.0410
99.5%		1.0371
97.5%		1.0170
90.0%		1.0080
75.0%	quartile	0.9990
50.0%	median	0.9895
25.0%	quartile	0.9810
10.0%		0.9720
2.5%		0.9605
0.5%		0.9539
0.0%	minimum	0.9470

Moments

Mean	0.9898672
Std Dev	0.0141485
Std Err Mean	0.0005875
upper 95% Mean	0.9910211
lower 95% Mean	0.9887134
N	580

Fe (mg/L)



Quantiles

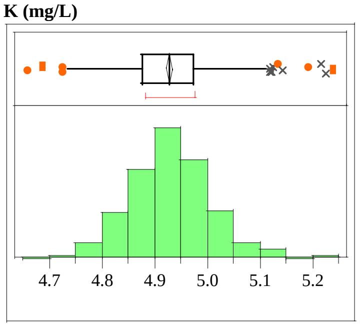
100.0%	maximum	1.673
99.5%		0.056
97.5%		0.046
90.0%		0.026
75.0%	quartile	0.010
50.0%	median	0.003
25.0%	quartile	-0.003
10.0%		-0.012
2.5%		-0.026
0.5%		-0.054
0.0%	minimum	-0.516

Moments

Mean	0.0062707
Std Dev	0.0748345
Std Err Mean	0.0031073
upper 95% Mean	0.0123737
lower 95% Mean	0.0001677
N	580

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

K (mg/L)



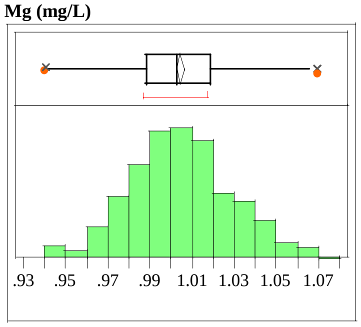
Quantiles

100.0%	maximum	5.2380
99.5%		5.2160
97.5%		5.1029
90.0%		5.0230
75.0%	quartile	4.9740
50.0%	median	4.9280
25.0%	quartile	4.8782
10.0%		4.8341
2.5%		4.7797
0.5%		4.7223
0.0%	minimum	4.6620

Moments

Mean	4.9292966
Std Dev	0.0791543
Std Err Mean	0.0032867
upper 95% Mean	4.9357519
lower 95% Mean	4.9228412
N	580

Mg (mg/L)



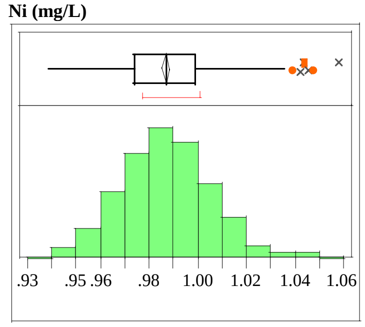
Quantiles

100.0%	maximum	1.0700
99.5%		1.0690
97.5%		1.0525
90.0%		1.0379
75.0%	quartile	1.0190
50.0%	median	1.0030
25.0%	quartile	0.9880
10.0%		0.9750
2.5%		0.9585
0.5%		0.9418
0.0%	minimum	0.9400

Moments

Mean	1.0043845
Std Dev	0.023866
Std Err Mean	0.000991
upper 95% Mean	1.0063308
lower 95% Mean	1.0024381
N	580

Ni (mg/L)



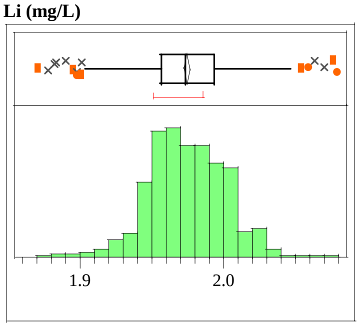
Quantiles

100.0%	maximum	1.0580
99.5%		1.0453
97.5%		1.0235
90.0%		1.0110
75.0%	quartile	0.9990
50.0%	median	0.9870
25.0%	quartile	0.9740
10.0%		0.9620
2.5%		0.9510
0.5%		0.9419
0.0%	minimum	0.9390

Moments

Mean	0.9868741
Std Dev	0.0188345
Std Err Mean	0.0007821
upper 95% Mean	0.9884102
lower 95% Mean	0.9853381
N	580

Li (mg/L)



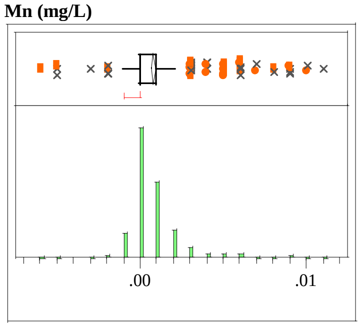
Quantiles

100.0%	maximum	2.0790
99.5%		2.0697
97.5%		2.0300
90.0%		2.0080
75.0%	quartile	1.9930
50.0%	median	1.9730
25.0%	quartile	1.9563
10.0%		1.9431
2.5%		1.9140
0.5%		1.8815
0.0%	minimum	1.8700

Moments

Mean	1.9743517
Std Dev	0.0288364
Std Err Mean	0.0011974
upper 95% Mean	1.9767034
lower 95% Mean	1.972
N	580

Mn (mg/L)



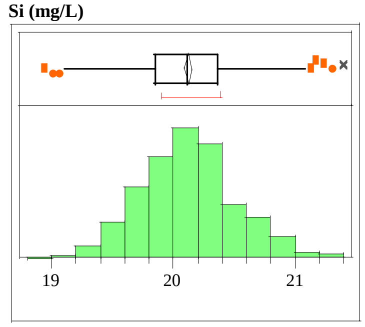
Quantiles

100.0%	maximum	0.0110
99.5%		0.0100
97.5%		0.0060
90.0%		0.0029
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		-0.0009
2.5%		-0.0010
0.5%		-0.0050
0.0%	minimum	-0.0060

Moments

Mean	0.0008121
Std Dev	0.0018354
Std Err Mean	0.0000762
upper 95% Mean	0.0009618
lower 95% Mean	0.0006624
N	580

Si (mg/L)



Quantiles

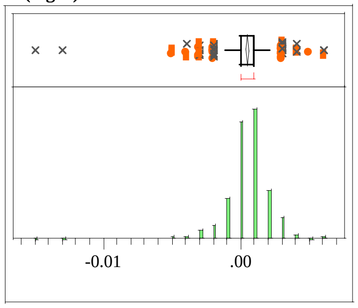
100.0%	maximum	21.392
99.5%		21.325
97.5%		20.949
90.0%		20.679
75.0%	quartile	20.365
50.0%	median	20.115
25.0%	quartile	19.852
10.0%		19.628
2.5%		19.378
0.5%		19.061
0.0%	minimum	18.934

Moments

Mean	20.124321
Std Dev	0.3956577
Std Err Mean	0.0164288
upper 95% Mean	20.156588
lower 95% Mean	20.092053
N	580

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Ti (mg/L)



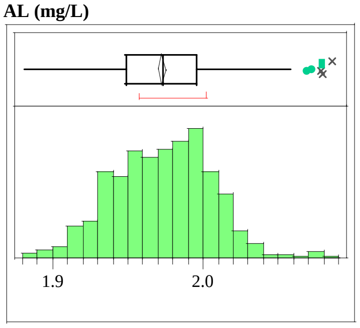
Quantiles

100.0%	maximum	0.0060
99.5%		0.0060
97.5%		0.0030
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0058
0.0%	minimum	-0.0150

Moments

Mean	0.0004741
Std Dev	0.001673
Std Err Mean	0.0000695
upper 95% Mean	0.0006106
lower 95% Mean	0.0003377
N	580

STCd=SM52
Distributions
AL (mg/L)



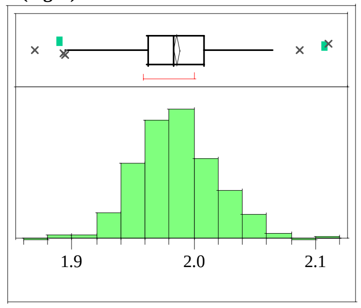
Quantiles

100.0%	maximum	2.0850
99.5%		2.0790
97.5%		2.0321
90.0%		2.0130
75.0%	quartile	1.9960
50.0%	median	1.9730
25.0%	quartile	1.9490
10.0%		1.9307
2.5%		1.9079
0.5%		1.8882
0.0%	minimum	1.8820

Moments

Mean	1.9724184
Std Dev	0.033092
Std Err Mean	0.0013788
upper 95% Mean	1.9751266
lower 95% Mean	1.9697102
N	576

B (mg/L)



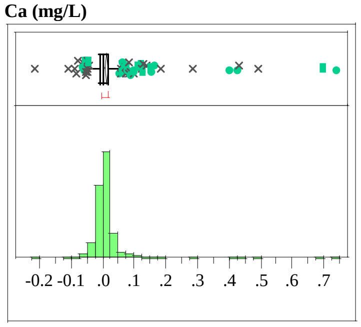
Quantiles

100.0%	maximum	2.1100
99.5%		2.0894
97.5%		2.0550
90.0%		2.0313
75.0%	quartile	2.0080
50.0%	median	1.9840
25.0%	quartile	1.9630
10.0%		1.9447
2.5%		1.9219
0.5%		1.8917
0.0%	minimum	1.8680

Moments

Mean	1.9857431
Std Dev	0.0339009
Std Err Mean	0.0014125
upper 95% Mean	1.9885174
lower 95% Mean	1.9829687
N	576

Ca (mg/L)



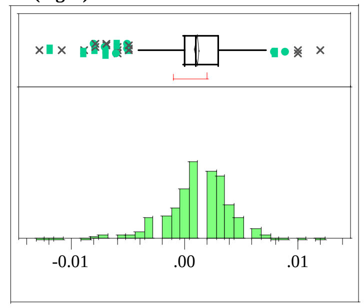
Quantiles

100.0%	maximum	0.7410
99.5%		0.5146
97.5%		0.1231
90.0%		0.0379
75.0%	quartile	0.0170
50.0%	median	0.0040
25.0%	quartile	-0.0080
10.0%		-0.0240
2.5%		-0.0520
0.5%		-0.0941
0.0%	minimum	-0.2170

Moments

Mean	0.0119653
Std Dev	0.0650883
Std Err Mean	0.002712
upper 95% Mean	0.0172919
lower 95% Mean	0.0066386
N	576

Cr (mg/L)



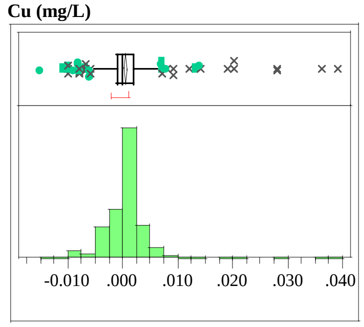
Quantiles

100.0%	maximum	0.0120
99.5%		0.0100
97.5%		0.0060
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0030
2.5%		-0.0066
0.5%		-0.0111
0.0%	minimum	-0.0130

Moments

Mean	0.0010677
Std Dev	0.0030355
Std Err Mean	0.0001265
upper 95% Mean	0.0013161
lower 95% Mean	0.0008193
N	576

Cu (mg/L)



Quantiles

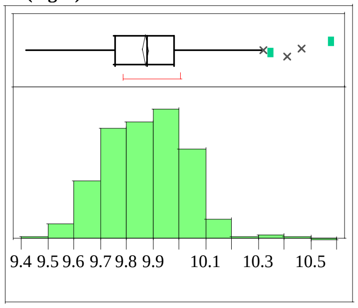
100.0%	maximum	0.0390
99.5%		0.0289
97.5%		0.0080
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0000
25.0%	quartile	-0.0010
10.0%		-0.0040
2.5%		-0.0080
0.5%		-0.0101
0.0%	minimum	-0.0150

Moments

Mean	0.0004653
Std Dev	0.0044172
Std Err Mean	0.0001841
upper 95% Mean	0.0008268
lower 95% Mean	0.0001038
N	576

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Fe (mg/L)



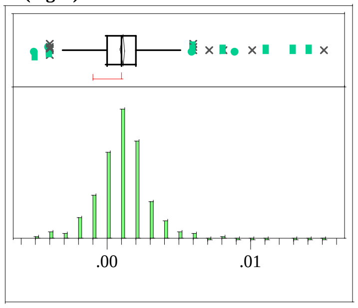
Quantiles

100.0%	maximum	10.580
99.5%		10.414
97.5%		10.177
90.0%		10.056
75.0%	quartile	9.982
50.0%	median	9.878
25.0%	quartile	9.758
10.0%		9.673
2.5%		9.587
0.5%		9.495
0.0%	minimum	9.424

Moments

Mean	9.8741892
Std Dev	0.1572581
Std Err Mean	0.0065524
upper 95% Mean	9.8870588
lower 95% Mean	9.8613196
N	576

Li (mg/L)



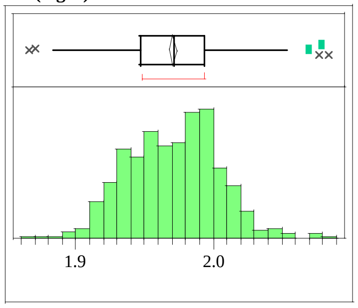
Quantiles

100.0%	maximum	0.0150
99.5%		0.0131
97.5%		0.0060
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0030
0.5%		-0.0041
0.0%	minimum	-0.0050

Moments

Mean	0.001092
Std Dev	0.0021403
Std Err Mean	0.0000892
upper 95% Mean	0.0012672
lower 95% Mean	0.0009169
N	576

Mn (mg/L)



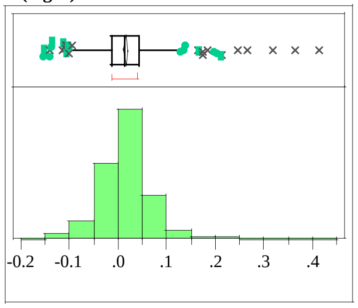
Quantiles

100.0%	maximum	2.0840
99.5%		2.0772
97.5%		2.0373
90.0%		2.0120
75.0%	quartile	1.9940
50.0%	median	1.9720
25.0%	quartile	1.9470
10.0%		1.9260
2.5%		1.9100
0.5%		1.8824
0.0%	minimum	1.8650

Moments

Mean	1.9705347
Std Dev	0.0335045
Std Err Mean	0.001396
upper 95% Mean	1.9732766
lower 95% Mean	1.9677928
N	576

K (mg/L)



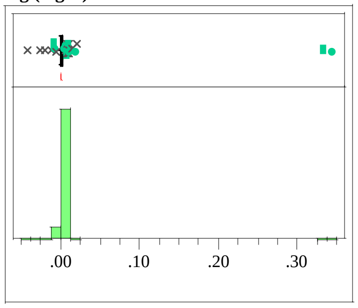
Quantiles

100.0%	maximum	0.4120
99.5%		0.3215
97.5%		0.1538
90.0%		0.0676
75.0%	quartile	0.0440
50.0%	median	0.0140
25.0%	quartile	-0.0120
10.0%		-0.0433
2.5%		-0.1011
0.5%		-0.1440
0.0%	minimum	-0.1540

Moments

Mean	0.0164688
Std Dev	0.0584744
Std Err Mean	0.0024364
upper 95% Mean	0.0212541
lower 95% Mean	0.0116834
N	576

Mg (mg/L)



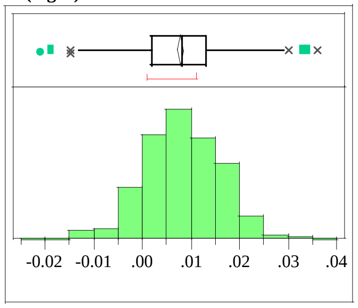
Quantiles

100.0%	maximum	0.3440
99.5%		0.0560
97.5%		0.0070
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0020
0.5%		-0.0208
0.0%	minimum	-0.0430

Moments

Mean	0.0021111
Std Dev	0.0201373
Std Err Mean	0.0008391
upper 95% Mean	0.0037591
lower 95% Mean	0.0004631
N	576

Ni (mg/L)



Quantiles

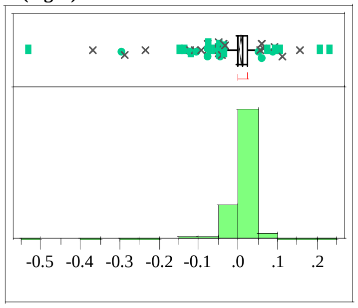
100.0%	maximum	0.0360
99.5%		0.0331
97.5%		0.0236
90.0%		0.0180
75.0%	quartile	0.0130
50.0%	median	0.0080
25.0%	quartile	0.0020
10.0%		-0.0020
2.5%		-0.0090
0.5%		-0.0155
0.0%	minimum	-0.0210

Moments

Mean	0.0077274
Std Dev	0.0081073
Std Err Mean	0.0003378
upper 95% Mean	0.0083909
lower 95% Mean	0.0070639
N	576

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Si (mg/L)



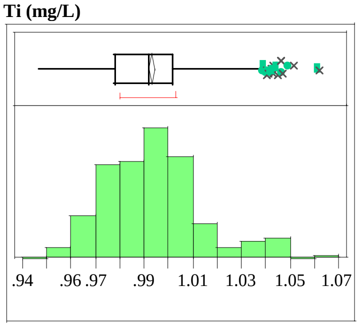
Quantiles

100.0%	maximum	0.2300
99.5%		0.1620
97.5%		0.0550
90.0%		0.0330
75.0%	quartile	0.0220
50.0%	median	0.0100
25.0%	quartile	0.0003
10.0%		-0.0180
2.5%		-0.0801
0.5%		-0.3030
0.0%	minimum	-0.5310

Moments

Mean	0.006408
Std Dev	0.0458688
Std Err Mean	0.0019112
upper 95% Mean	0.0101618
lower 95% Mean	0.0026542
N	576

Ti (mg/L)



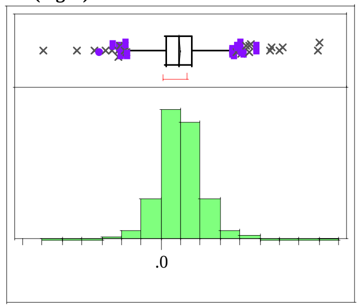
Quantiles

100.0%	maximum	1.0620
99.5%		1.0522
97.5%		1.0426
90.0%		1.0163
75.0%	quartile	1.0020
50.0%	median	0.9920
25.0%	quartile	0.9780
10.0%		0.9700
2.5%		0.9614
0.5%		0.9518
0.0%	minimum	0.9470

Moments

Mean	0.9932135
Std Dev	0.0196068
Std Err Mean	0.0008169
upper 95% Mean	0.9948181
lower 95% Mean	0.991609
N	576

STCd=SM53
Distributions
AL (mg/L)



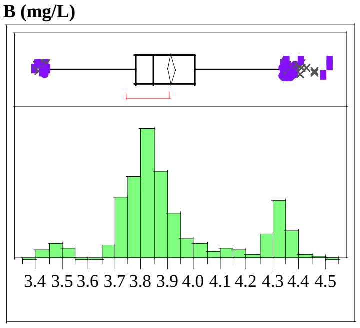
Quantiles

100.0%	maximum	0.0800
99.5%		0.0550
97.5%		0.0330
90.0%		0.0230
75.0%	quartile	0.0160
50.0%	median	0.0090
25.0%	quartile	0.0030
10.0%		-0.0030
2.5%		-0.0130
0.5%		-0.0250
0.0%	minimum	-0.0600

Moments

Mean	0.0095635
Std Dev	0.0116537
Std Err Mean	0.000337
upper 95% Mean	0.0102247
lower 95% Mean	0.0089024
N	1196

B (mg/L)



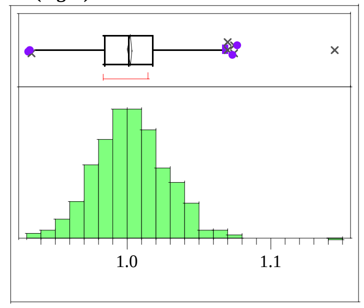
Quantiles

100.0%	maximum	4.5160
99.5%		4.4284
97.5%		4.3690
90.0%		4.3260
75.0%	quartile	4.0047
50.0%	median	3.8470
25.0%	quartile	3.7820
10.0%		3.7167
2.5%		3.4669
0.5%		3.4220
0.0%	minimum	3.3970

Moments

Mean	3.916036
Std Dev	0.2339384
Std Err Mean	0.0067645
upper 95% Mean	3.9293076
lower 95% Mean	3.9027643
N	1196

Ca (mg/L)



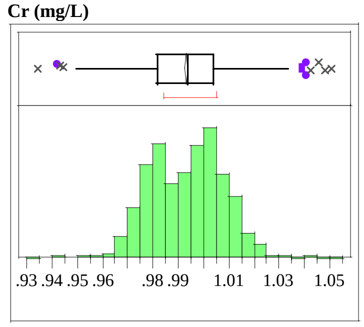
Quantiles

100.0%	maximum	1.1440
99.5%		1.0701
97.5%		1.0510
90.0%		1.0350
75.0%	quartile	1.0180
50.0%	median	1.0010
25.0%	quartile	0.9850
10.0%		0.9710
2.5%		0.9539
0.5%		0.9380
0.0%	minimum	0.9320

Moments

Mean	1.0019022
Std Dev	0.0251626
Std Err Mean	0.0007276
upper 95% Mean	1.0033297
lower 95% Mean	1.0004747
N	1196

Cr (mg/L)



Quantiles

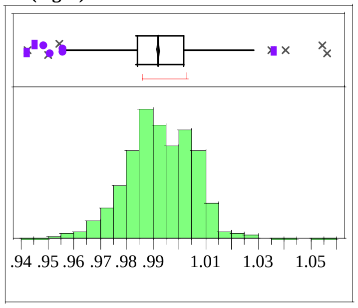
100.0%	maximum	1.0500
99.5%		1.0410
97.5%		1.0200
90.0%		1.0110
75.0%	quartile	1.0040
50.0%	median	0.9940
25.0%	quartile	0.9820
10.0%		0.9750
2.5%		0.9670
0.5%		0.9520
0.0%	minimum	0.9340

Moments

Mean	0.9930376
Std Dev	0.0146903
Std Err Mean	0.0004248
upper 95% Mean	0.993871
lower 95% Mean	0.9922042
N	1196

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Cu (mg/L)



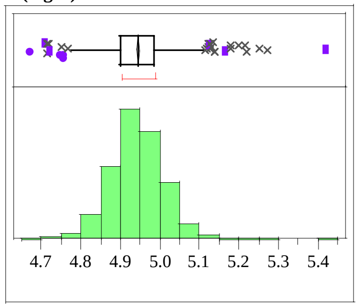
Quantiles

100.0%	maximum	1.0560
99.5%		1.0281
97.5%		1.0140
90.0%		1.0080
75.0%	quartile	1.0020
50.0%	median	0.9920
25.0%	quartile	0.9840
10.0%		0.9760
2.5%		0.9660
0.5%		0.9510
0.0%	minimum	0.9420

Moments

Mean	0.9922575
Std Dev	0.0131491
Std Err Mean	0.0003802
upper 95% Mean	0.9930035
lower 95% Mean	0.9915116
N	1196

K (mg/L)



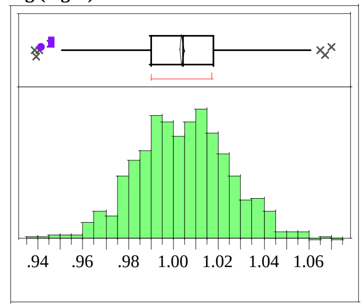
Quantiles

100.0%	maximum	5.4180
99.5%		5.1963
97.5%		5.0900
90.0%		5.0280
75.0%	quartile	4.9850
50.0%	median	4.9430
25.0%	quartile	4.9000
10.0%		4.8570
2.5%		4.8069
0.5%		4.7190
0.0%	minimum	4.6740

Moments

Mean	4.9437759
Std Dev	0.0715555
Std Err Mean	0.0020691
upper 95% Mean	4.9478354
lower 95% Mean	4.9397165
N	1196

Mg (mg/L)



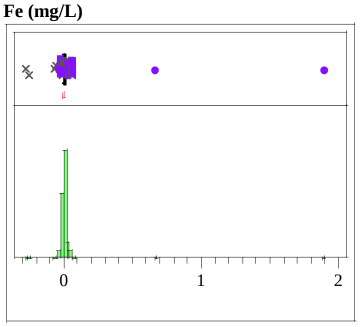
Quantiles

100.0%	maximum	1.0700
99.5%		1.0590
97.5%		1.0420
90.0%		1.0300
75.0%	quartile	1.0180
50.0%	median	1.0040
25.0%	quartile	0.9900
10.0%		0.9780
2.5%		0.9649
0.5%		0.9460
0.0%	minimum	0.9380

Moments

Mean	1.0037065
Std Dev	0.0203674
Std Err Mean	0.0005889
upper 95% Mean	1.004862
lower 95% Mean	1.0025511
N	1196

Fe (mg/L)



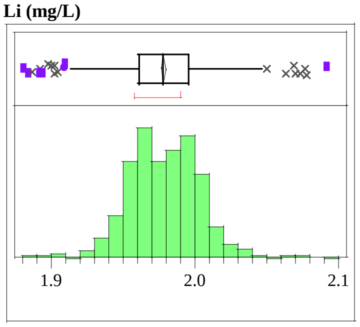
Quantiles

100.0%	maximum	1.897
99.5%		0.056
97.5%		0.048
90.0%		0.022
75.0%	quartile	0.010
50.0%	median	0.003
25.0%	quartile	-0.002
10.0%		-0.012
2.5%		-0.026
0.5%		-0.030
0.0%	minimum	-0.277

Moments

Mean	0.0062542
Std Dev	0.0609374
Std Err Mean	0.0017621
upper 95% Mean	0.0097112
lower 95% Mean	0.0027971
N	1196

Li (mg/L)



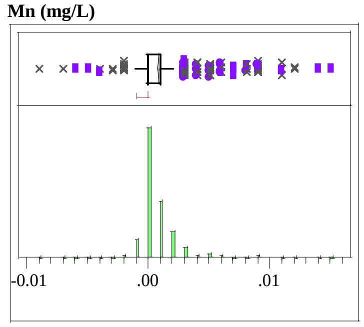
Quantiles

100.0%	maximum	2.0920
99.5%		2.0680
97.5%		2.0281
90.0%		2.0070
75.0%	quartile	1.9950
50.0%	median	1.9780
25.0%	quartile	1.9610
10.0%		1.9497
2.5%		1.9300
0.5%		1.8940
0.0%	minimum	1.8810

Moments

Mean	1.9781656
Std Dev	0.0250678
Std Err Mean	0.0007249
upper 95% Mean	1.9795877
lower 95% Mean	1.9767434
N	1196

Mn (mg/L)



Quantiles

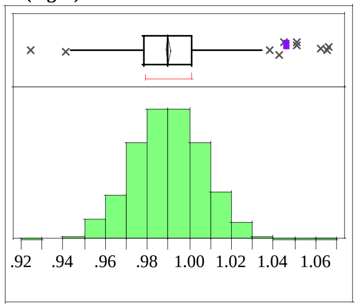
100.0%	maximum	0.0150
99.5%		0.0110
97.5%		0.0070
90.0%		0.0030
75.0%	quartile	0.0010
50.0%	median	0.0000
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0010
0.5%		-0.0040
0.0%	minimum	-0.0090

Moments

Mean	0.0008403
Std Dev	0.0019744
Std Err Mean	0.0000571
upper 95% Mean	0.0009523
lower 95% Mean	0.0007283
N	1196

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Ni (mg/L)



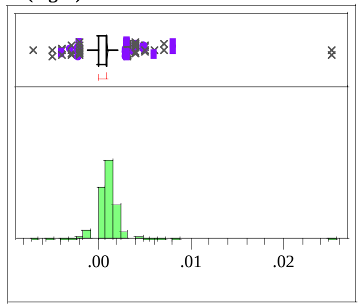
Quantiles

100.0%	maximum	1.0660
99.5%		1.0461
97.5%		1.0230
90.0%		1.0120
75.0%	quartile	1.0010
50.0%	median	0.9900
25.0%	quartile	0.9780
10.0%		0.9687
2.5%		0.9570
0.5%		0.9490
0.0%	minimum	0.9240

Moments

Mean	0.9898779
Std Dev	0.0172227
Std Err Mean	0.000498
upper 95% Mean	0.990855
lower 95% Mean	0.9889009
N	1196

Ti (mg/L)



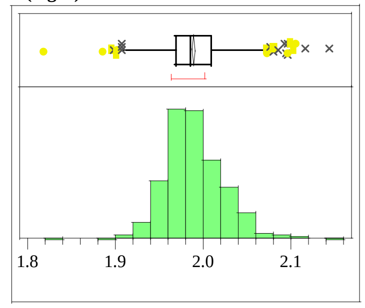
Quantiles

100.0%	maximum	0.0250
99.5%		0.0070
97.5%		0.0040
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0011
0.5%		-0.0040
0.0%	minimum	-0.0070

Moments

Mean	0.0009348
Std Dev	0.0015952
Std Err Mean	0.0000461
upper 95% Mean	0.0010253
lower 95% Mean	0.0008443
N	1196

B (mg/L)



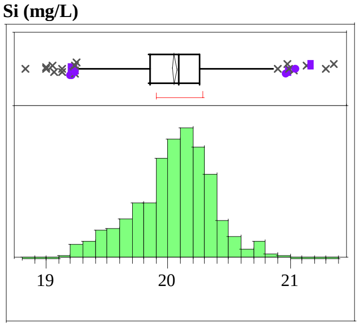
Quantiles

100.0%	maximum	2.1420
99.5%		2.0979
97.5%		2.0578
90.0%		2.0340
75.0%	quartile	2.0100
50.0%	median	1.9855
25.0%	quartile	1.9690
10.0%		1.9520
2.5%		1.9310
0.5%		1.9031
0.0%	minimum	1.8200

Moments

Mean	1.9895705
Std Dev	0.0332189
Std Err Mean	0.0009566
upper 95% Mean	1.9914472
lower 95% Mean	1.9876938
N	1206

Si (mg/L)



Quantiles

100.0%	maximum	21.354
99.5%		21.026
97.5%		20.745
90.0%		20.412
75.0%	quartile	20.257
50.0%	median	20.083
25.0%	quartile	19.853
10.0%		19.583
2.5%		19.307
0.5%		19.120
0.0%	minimum	18.823

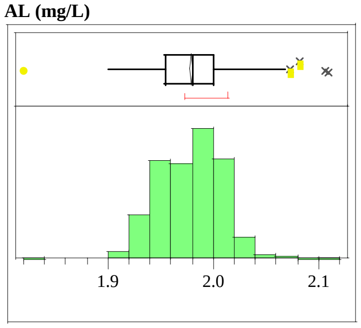
Moments

Mean	20.049995
Std Dev	0.3401347
Std Err Mean	0.0098352
upper 95% Mean	20.069291
lower 95% Mean	20.030699
N	1196

STCd=SM54

Distributions

AL (mg/L)



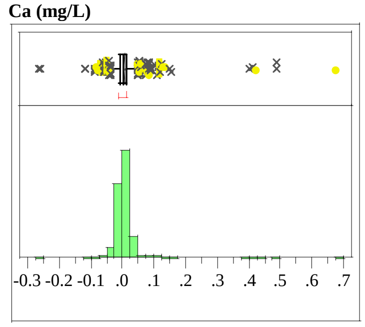
Quantiles

100.0%	maximum	2.1080
99.5%		2.0718
97.5%		2.0320
90.0%		2.0133
75.0%	quartile	2.0000
50.0%	median	1.9810
25.0%	quartile	1.9550
10.0%		1.9390
2.5%		1.9222
0.5%		1.9110
0.0%	minimum	1.8210

Moments

Mean	1.9786725
Std Dev	0.030148
Std Err Mean	0.0008681
upper 95% Mean	1.9803757
lower 95% Mean	1.9769693
N	1206

Ca (mg/L)



Quantiles

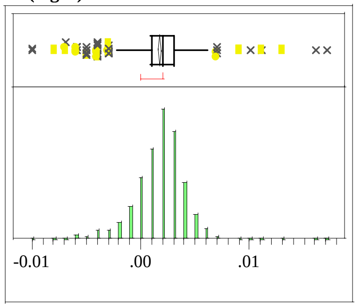
100.0%	maximum	0.6770
99.5%		0.3903
97.5%		0.0798
90.0%		0.0300
75.0%	quartile	0.0140
50.0%	median	0.0040
25.0%	quartile	-0.0070
10.0%		-0.0190
2.5%		-0.0460
0.5%		-0.0880
0.0%	minimum	-0.2650

Moments

Mean	0.0066468
Std Dev	0.0442153
Std Err Mean	0.0012732
upper 95% Mean	0.0091447
lower 95% Mean	0.0041488
N	1206

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Cr (mg/L)



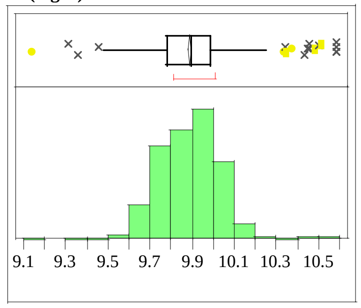
Quantiles

100.0%	maximum	0.0170
99.5%		0.0100
97.5%		0.0060
90.0%		0.0040
75.0%	quartile	0.0030
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		-0.0010
2.5%		-0.0040
0.5%		-0.0070
0.0%	minimum	-0.0100

Moments

Mean	0.0017131
Std Dev	0.0023746
Std Err Mean	0.0000684
upper 95% Mean	0.0018473
lower 95% Mean	0.0015789
N	1206

Fe (mg/L)



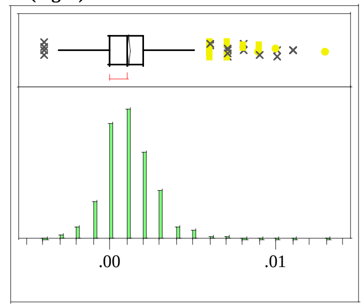
Quantiles

100.0%	maximum	10.584
99.5%		10.499
97.5%		10.167
90.0%		10.052
75.0%	quartile	9.983
50.0%	median	9.892
25.0%	quartile	9.783
10.0%		9.709
2.5%		9.624
0.5%		9.504
0.0%	minimum	9.145

Moments

Mean	9.8886857
Std Dev	0.1496554
Std Err Mean	0.0043094
upper 95% Mean	9.8971405
lower 95% Mean	9.8802309
N	1206

Li (mg/L)



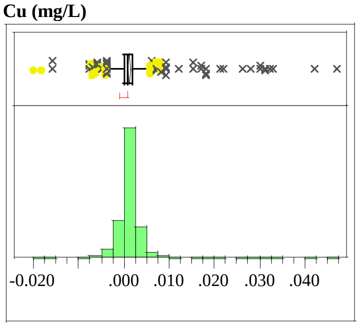
Quantiles

100.0%	maximum	0.0130
99.5%		0.0100
97.5%		0.0050
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0010
2.5%		-0.0020
0.5%		-0.0030
0.0%	minimum	-0.0040

Moments

Mean	0.0011609
Std Dev	0.0017904
Std Err Mean	0.0000516
upper 95% Mean	0.001262
lower 95% Mean	0.0010597
N	1206

Cu (mg/L)



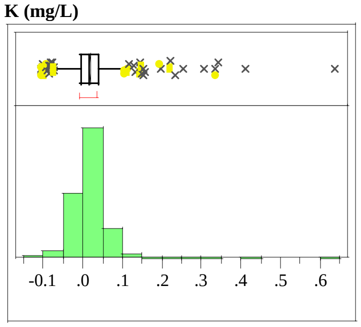
Quantiles

100.0%	maximum	0.0470
99.5%		0.0310
97.5%		0.0078
90.0%		0.0030
75.0%	quartile	0.0020
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		-0.0020
2.5%		-0.0040
0.5%		-0.0080
0.0%	minimum	-0.0200

Moments

Mean	0.0011368
Std Dev	0.0041057
Std Err Mean	0.0001182
upper 95% Mean	0.0013688
lower 95% Mean	0.0009049
N	1206

K (mg/L)



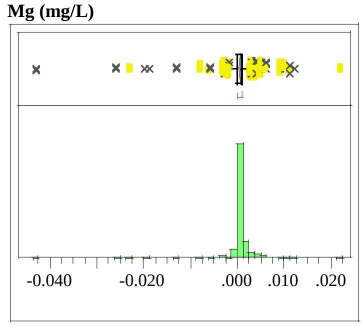
Quantiles

100.0%	maximum	0.6360
99.5%		0.3041
97.5%		0.1020
90.0%		0.0603
75.0%	quartile	0.0380
50.0%	median	0.0160
25.0%	quartile	-0.0060
10.0%		-0.0283
2.5%		-0.0660
0.5%		-0.1030
0.0%	minimum	-0.1060

Moments

Mean	0.0180199
Std Dev	0.0485744
Std Err Mean	0.0013987
upper 95% Mean	0.0207641
lower 95% Mean	0.0152757
N	1206

Mg (mg/L)



Quantiles

100.0%	maximum	0.0220
99.5%		0.0110
97.5%		0.0050
90.0%		0.0020
75.0%	quartile	0.0010
50.0%	median	0.0010
25.0%	quartile	0.0000
10.0%		0.0000
2.5%		-0.0030
0.5%		-0.0200
0.0%	minimum	-0.0430

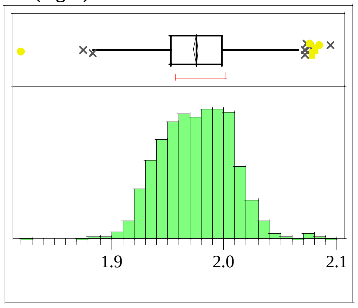
Moments

Mean	0.0006766
Std Dev	0.0029765
Std Err Mean	0.0000857
upper 95% Mean	0.0008448
lower 95% Mean	0.0005085
N	1206

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

STCd=SM55
Distributions

Mn (mg/L)



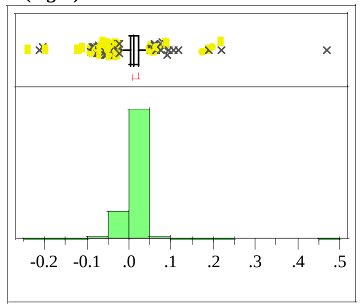
Quantiles

100.0%	maximum	2.0940
99.5%		2.0749
97.5%		2.0328
90.0%		2.0130
75.0%	quartile	1.9980
50.0%	median	1.9760
25.0%	quartile	1.9528
10.0%		1.9340
2.5%		1.9190
0.5%		1.8951
0.0%	minimum	1.8210

Moments

Mean	1.9750954
Std Dev	0.0314758
Std Err Mean	0.0009064
upper 95% Mean	1.9768736
lower 95% Mean	1.9733171
N	1206

Si (mg/L)



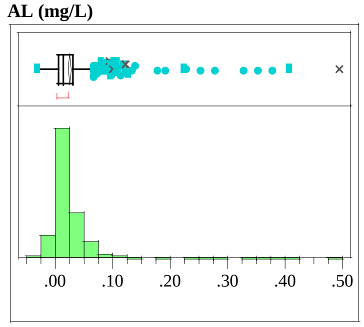
Quantiles

100.0%	maximum	0.4690
99.5%		0.1856
97.5%		0.0500
90.0%		0.0320
75.0%	quartile	0.0210
50.0%	median	0.0120
25.0%	quartile	0.0030
10.0%		-0.0093
2.5%		-0.0525
0.5%		-0.1197
0.0%	minimum	-0.2400

Moments

Mean	0.0114088
Std Dev	0.0316349
Std Err Mean	0.0009109
upper 95% Mean	0.013196
lower 95% Mean	0.0096216
N	1206

AL (mg/L)



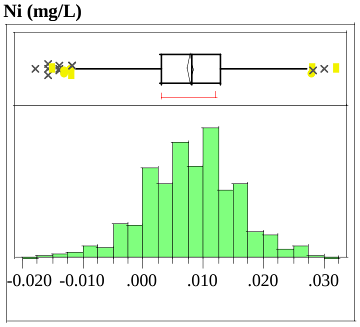
Quantiles

100.0%	maximum	0.4930
99.5%		0.3561
97.5%		0.1121
90.0%		0.0540
75.0%	quartile	0.0302
50.0%	median	0.0150
25.0%	quartile	0.0060
10.0%		-0.0010
2.5%		-0.0150
0.5%		-0.0290
0.0%	minimum	-0.0310

Moments

Mean	0.0242329
Std Dev	0.0423149
Std Err Mean	0.0015055
upper 95% Mean	0.0271882
lower 95% Mean	0.0212777
N	790

Ni (mg/L)



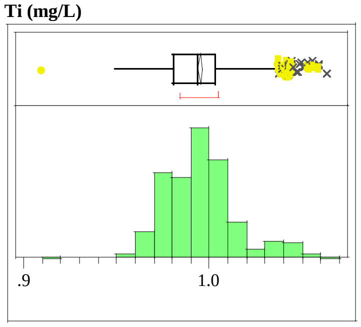
Quantiles

100.0%	maximum	0.0320
99.5%		0.0270
97.5%		0.0230
90.0%		0.0170
75.0%	quartile	0.0130
50.0%	median	0.0080
25.0%	quartile	0.0030
10.0%		-0.0020
2.5%		-0.0088
0.5%		-0.0140
0.0%	minimum	-0.0180

Moments

Mean	0.0078317
Std Dev	0.007602
Std Err Mean	0.0002189
upper 95% Mean	0.0082611
lower 95% Mean	0.0074022
N	1206

Ti (mg/L)



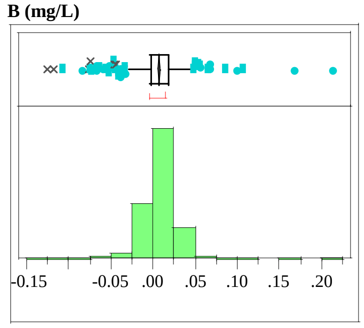
Quantiles

100.0%	maximum	1.0630
99.5%		1.0560
97.5%		1.0438
90.0%		1.0170
75.0%	quartile	1.0033
50.0%	median	0.9935
25.0%	quartile	0.9810
10.0%		0.9730
2.5%		0.9642
0.5%		0.9560
0.0%	minimum	0.9100

Moments

Mean	0.9949212
Std Dev	0.0191474
Std Err Mean	0.0005514
upper 95% Mean	0.996003
lower 95% Mean	0.9938395
N	1206

B (mg/L)



Quantiles

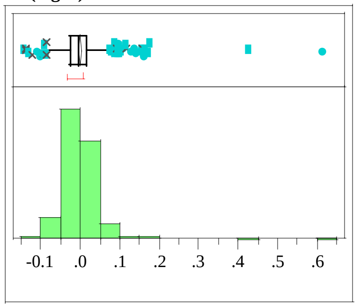
100.0%	maximum	0.2140
99.5%		0.1003
97.5%		0.0412
90.0%		0.0290
75.0%	quartile	0.0180
50.0%	median	0.0080
25.0%	quartile	-0.0020
10.0%		-0.0130
2.5%		-0.0444
0.5%		-0.0841
0.0%	minimum	-0.1260

Moments

Mean	0.0073949
Std Dev	0.0230525
Std Err Mean	0.0008202
upper 95% Mean	0.0090049
lower 95% Mean	0.005785
N	790

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Ca (mg/L)



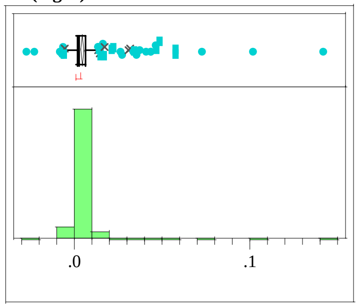
Quantiles

100.0%	maximum	0.6150
99.5%		0.1702
97.5%		0.0982
90.0%		0.0420
75.0%	quartile	0.0150
50.0%	median	-0.0040
25.0%	quartile	-0.0250
10.0%		-0.0470
2.5%		-0.0754
0.5%		-0.1333
0.0%	minimum	-0.1440

Moments

Mean	-0.00181
Std Dev	0.0480522
Std Err Mean	0.0017096
upper 95% Mean	0.0015458
lower 95% Mean	-0.005166
N	790

Cu (mg/L)



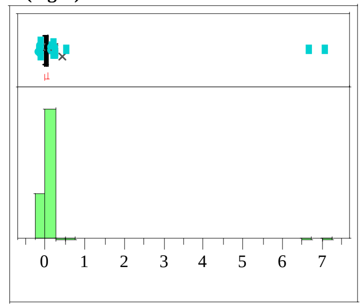
Quantiles

100.0%	maximum	0.1420
99.5%		0.0587
97.5%		0.0231
90.0%		0.0080
75.0%	quartile	0.0060
50.0%	median	0.0030
25.0%	quartile	0.0020
10.0%		0.0000
2.5%		-0.0030
0.5%		-0.0070
0.0%	minimum	-0.0270

Moments

Mean	0.0045671
Std Dev	0.0092372
Std Err Mean	0.0003286
upper 95% Mean	0.0052122
lower 95% Mean	0.003922
N	790

K (mg/L)



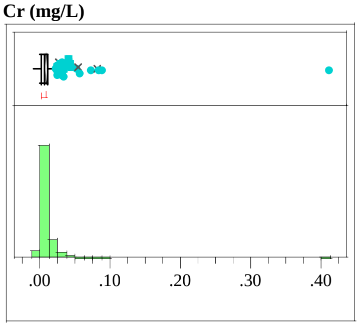
Quantiles

100.0%	maximum	7.072
99.5%		0.397
97.5%		0.163
90.0%		0.098
75.0%	quartile	0.062
50.0%	median	0.031
25.0%	quartile	-0.001
10.0%		-0.033
2.5%		-0.072
0.5%		-0.122
0.0%	minimum	-0.165

Moments

Mean	0.0505241
Std Dev	0.3490953
Std Err Mean	0.0124203
upper 95% Mean	0.0749047
lower 95% Mean	0.0261434
N	790

Cr (mg/L)



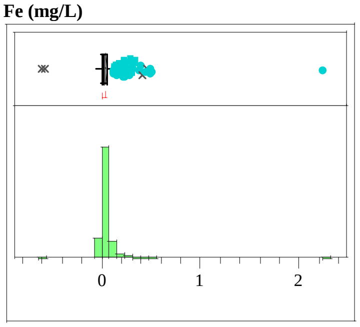
Quantiles

100.0%	maximum	0.4120
99.5%		0.0803
97.5%		0.0350
90.0%		0.0180
75.0%	quartile	0.0110
50.0%	median	0.0060
25.0%	quartile	0.0030
10.0%		0.0010
2.5%		-0.0020
0.5%		-0.0040
0.0%	minimum	-0.0060

Moments

Mean	0.0091013
Std Dev	0.0173743
Std Err Mean	0.0006181
upper 95% Mean	0.0103147
lower 95% Mean	0.0078879
N	790

Fe (mg/L)



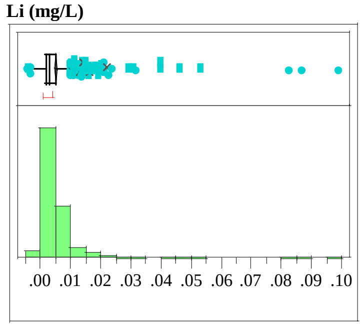
Quantiles

100.0%	maximum	2.249
99.5%		0.499
97.5%		0.239
90.0%		0.109
75.0%	quartile	0.060
50.0%	median	0.028
25.0%	quartile	0.010
10.0%		-0.005
2.5%		-0.017
0.5%		-0.036
0.0%	minimum	-0.621

Moments

Mean	0.0470848
Std Dev	0.1079556
Std Err Mean	0.0038409
upper 95% Mean	0.0546244
lower 95% Mean	0.0395452
N	790

Li (mg/L)



Quantiles

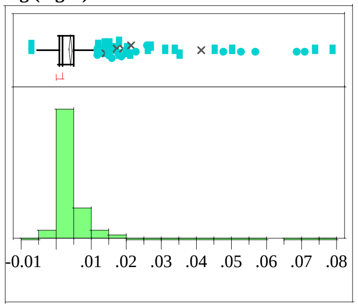
100.0%	maximum	0.0990
99.5%		0.0543
97.5%		0.0192
90.0%		0.0090
75.0%	quartile	0.0050
50.0%	median	0.0030
25.0%	quartile	0.0020
10.0%		0.0010
2.5%		-0.0010
0.5%		-0.0030
0.0%	minimum	-0.0040

Moments

Mean	0.0048785
Std Dev	0.0073499
Std Err Mean	0.0002615
upper 95% Mean	0.0053918
lower 95% Mean	0.0043652
N	790

Exhibit A22. Histograms and Descriptive Statistics for Fusion Measurements of Calibration and Bench Standards

Mg (mg/L)



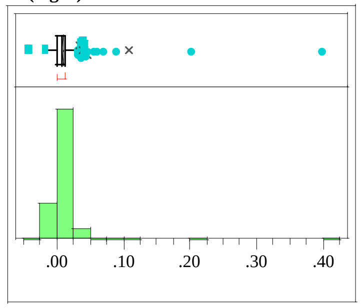
Quantiles

100.0%	maximum	0.0790
99.5%		0.0691
97.5%		0.0202
90.0%		0.0090
75.0%	quartile	0.0050
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		0.0000
2.5%		-0.0020
0.5%		-0.0050
0.0%	minimum	-0.0070

Moments

Mean	0.0040835
Std Dev	0.0077988
Std Err Mean	0.0002775
upper 95% Mean	0.0046282
lower 95% Mean	0.0035389
N	790

Ni (mg/L)



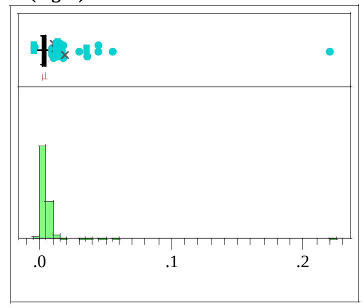
Quantiles

100.0%	maximum	0.4010
99.5%		0.0917
97.5%		0.0390
90.0%		0.0210
75.0%	quartile	0.0130
50.0%	median	0.0070
25.0%	quartile	0.0010
10.0%		-0.0040
2.5%		-0.0100
0.5%		-0.0170
0.0%	minimum	-0.0430

Moments

Mean	0.0089266
Std Dev	0.0196088
Std Err Mean	0.0006976
upper 95% Mean	0.010296
lower 95% Mean	0.0075571
N	790

Ti (mg/L)



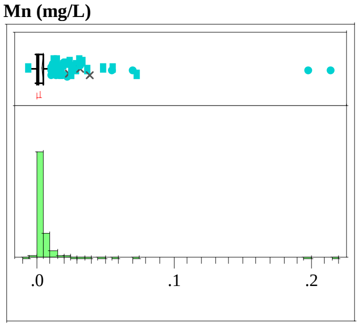
Quantiles

100.0%	maximum	0.2210
99.5%		0.0450
97.5%		0.0140
90.0%		0.0070
75.0%	quartile	0.0050
50.0%	median	0.0030
25.0%	quartile	0.0020
10.0%		0.0010
2.5%		0.0000
0.5%		-0.0020
0.0%	minimum	-0.0040

Moments

Mean	0.0044203
Std Dev	0.0088443
Std Err Mean	0.0003147
upper 95% Mean	0.0050379
lower 95% Mean	0.0038026
N	790

Mn (mg/L)



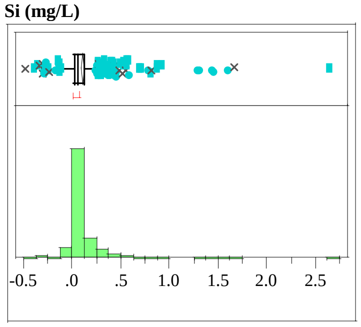
Quantiles

100.0%	maximum	0.2150
99.5%		0.0711
97.5%		0.0230
90.0%		0.0090
75.0%	quartile	0.0050
50.0%	median	0.0020
25.0%	quartile	0.0010
10.0%		0.0010
2.5%		0.0000
0.5%		-0.0030
0.0%	minimum	-0.0060

Moments

Mean	0.0048051
Std Dev	0.012204
Std Err Mean	0.0004342
upper 95% Mean	0.0056574
lower 95% Mean	0.0039527
N	790

Si (mg/L)



Quantiles

100.0%	maximum	2.637
99.5%		1.471
97.5%		0.560
90.0%		0.261
75.0%	quartile	0.116
50.0%	median	0.056
25.0%	quartile	0.026
10.0%		0.002
2.5%		-0.126
0.5%		-0.340
0.0%	minimum	-0.485

Moments

Mean	0.1032595
Std Dev	0.2061269
Std Err Mean	0.0073337
upper 95% Mean	0.1176553
lower 95% Mean	0.0888637
N	790

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

STCd=SM53
Response Al (mg/L)
Summary of Fit

RSquare	0.9358
RSquare Adj	0.87451
Root Mean Square Error	0.003742
Mean of Response	0.00998
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.06757482	0.000214	15.2683
Error	331	0.00463592	0.000014	Prob > F
C. Total	647	0.07221074		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000098	87.469
Residual	0.000014	12.531
Total	0.000112	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.989335
RSquare Adj	0.979152
Root Mean Square Error	0.034664
Mean of Response	3.902182
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	36.892338	0.116748	97.1636
Error	331	0.397716	0.001202	Prob > F
C. Total	647	37.290055		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.056529	97.919
Residual	0.001202	2.081
Total	0.057731	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.939638
RSquare Adj	0.882012
Root Mean Square Error	0.008566
Mean of Response	1.001775
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.37810969	0.001197	16.3058
Error	331	0.02428942	0.000073	Prob > F
C. Total	647	0.40239910		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000549	88.219
Residual	0.000073	11.781
Total	0.000623	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.945308
RSquare Adj	0.893094
Root Mean Square Error	0.004673
Mean of Response	0.992208
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.12491187	0.000395	18.1045
Error	331	0.00722700	0.000022	Prob > F
C. Total	647	0.13213887		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000183	89.325
Residual	0.000022	10.675
Total	0.000205	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.949232
RSquare Adj	0.900765
Root Mean Square Error	0.004072
Mean of Response	0.991847
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.10259671	0.000325	19.5851
Error	331	0.00548717	0.000017	Prob > F
C. Total	647	0.10808387		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000151	90.092
Residual	0.000017	9.908
Total	0.000167	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.816391
RSquare Adj	0.641102
Root Mean Square Error	0.047766
Mean of Response	0.007932
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	3.3579138	0.010626	4.6574
Error	331	0.7552073	0.002282	Prob > F
C. Total	647	4.1131210		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.004083	64.149
Residual	0.002282	35.851
Total	0.006364	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response K (mg/L)
Summary of Fit

RSquare	0.87852
RSquare Adj	0.762546
Root Mean Square Error	0.033723
Mean of Response	4.938444
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	2.7222093	0.008615	7.5751
Error	331	0.3764207	0.001137	Prob > F
C. Total	647	3.0986300		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.003658	76.285
Residual	0.001137	23.715
Total	0.004795	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.938513
RSquare Adj	0.879813
Root Mean Square Error	0.008523
Mean of Response	1.979003
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.36702433	0.001161	15.9882
Error	331	0.02404567	0.000073	Prob > F
C. Total	647	0.39106999		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000533	87.999
Residual	0.000073	12.001
Total	0.000605	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.92405
RSquare Adj	0.851541
Root Mean Square Error	0.007659
Mean of Response	1.003215
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.23620293	0.000747	12.7440
Error	331	0.01941425	0.000059	Prob > F
C. Total	647	0.25561718		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000337	85.175
Residual	0.000059	14.825
Total	0.000396	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.948209
RSquare Adj	0.898766
Root Mean Square Error	0.000566
Mean of Response	0.000799
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00194375	0.0000062	19.1776
Error	331	0.00010617	3.2075e-7	Prob > F
C. Total	647	0.00204992		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000003	89.892
Residual	3.207e-7	10.108
Total	0.000003	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.837913
RSquare Adj	0.683172
Root Mean Square Error	0.009166
Mean of Response	0.990213
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.14374619	0.000455	5.4149
Error	331	0.02780642	0.000084	Prob > F
C. Total	647	0.17155261		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000181	68.354
Residual	0.000084	31.646
Total	0.000265	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.944727
RSquare Adj	0.891959
Root Mean Square Error	0.107271
Mean of Response	20.06408
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	65.100755	0.206015	17.9034
Error	331	3.808832	0.011507	Prob > F
C. Total	647	68.909587		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.09516	89.212
Residual	0.011507	10.788
Total	0.106667	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response Ti (mg/L)
Summary of Fit

RSquare	0.896927
RSquare Adj	0.798525
Root Mean Square Error	0.000504
Mean of Response	0.000934
Observations (or Sum Wgts)	648

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00073023	0.0000023	9.1149
Error	331	0.00008392	2.5352e-7	Prob > F
C. Total	647	0.00081415		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000001	79.880
Residual	2.535e-7	20.120
Total	0.000001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.961124
RSquare Adj	0.923785
Root Mean Square Error	0.010556
Mean of Response	0.005833
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.90633044	0.002868	25.7400
Error	329	0.03665950	0.000111	Prob > F
C. Total	645	0.94298994		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001353	92.390
Residual	0.000111	7.610
Total	0.001464	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=SM54
Response Al (mg/L)
Summary of Fit

RSquare	0.940636
RSquare Adj	0.883618
Root Mean Square Error	0.009705
Mean of Response	1.979769
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.49102763	0.001554	16.4971
Error	329	0.03098900	0.000094	Prob > F
C. Total	645	0.52201663		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000716	88.379
Residual	0.000094	11.621
Total	0.000811	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.89941
RSquare Adj	0.802794
Root Mean Square Error	0.000971
Mean of Response	0.001819
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00277181	0.0000088	9.3092
Error	329	0.00031000	9.4225e-7	Prob > F
C. Total	645	0.00308181		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000004	80.306
Residual	9.422e-7	19.694
Total	0.000005	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.890117
RSquare Adj	0.784575
Root Mean Square Error	0.014668
Mean of Response	1.988483
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.57341431	0.001815	8.4338
Error	329	0.07078700	0.000215	Prob > F
C. Total	645	0.64420131		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000785	78.486
Residual	0.000215	21.514
Total	0.001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (mg/L)
Summary of Fit

RSquare	0.939669
RSquare Adj	0.881722
Root Mean Square Error	0.000771
Mean of Response	0.000836
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00304886	0.0000096	16.2160
Error	329	0.00019575	5.9498e-7	Prob > F
C. Total	645	0.00324461		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000004	88.190
Residual	5.95e-7	11.810
Total	0.000005	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response Fe (mg/L)
Summary of Fit

RSquare	0.932824
RSquare Adj	0.868302
Root Mean Square Error	0.047873
Mean of Response	9.894831
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	10.470202	0.033134	14.4575
Error	329	0.753997	0.002292	Prob > F
C. Total	645	11.224199		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.015135	86.849
Residual	0.002292	13.151
Total	0.017427	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.813318
RSquare Adj	0.634012
Root Mean Square Error	0.02398
Mean of Response	0.015715
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.8242128	0.002608	4.5359
Error	329	0.1891828	0.000575	Prob > F
C. Total	645	1.0133956		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000998	63.440
Residual	0.000575	36.560
Total	0.001573	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.880386
RSquare Adj	0.765499
Root Mean Square Error	0.000848
Mean of Response	0.001291
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00174254	0.0000055	7.6630
Error	329	0.00023675	7.196e-7	Prob > F
C. Total	645	0.00197929		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000002	76.580
Residual	7.196e-7	23.420
Total	0.000003	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.605423
RSquare Adj	0.226437
Root Mean Square Error	0.001799
Mean of Response	0.000785
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.00163409	0.0000052	1.5975
Error	329	0.00106500	0.0000032	Prob > F
C. Total	645	0.00269909		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	9.491e-7	22.673
Residual	0.000003	77.327
Total	0.000004	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.950951
RSquare Adj	0.90384
Root Mean Square Error	0.009028
Mean of Response	1.976125
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.51983434	0.001645	20.1854
Error	329	0.02681250	0.000081	Prob > F
C. Total	645	0.54664684		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000767	90.398
Residual	0.000081	9.602
Total	0.000849	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (mg/L)
Summary of Fit

RSquare	0.794376
RSquare Adj	0.596877
Root Mean Square Error	0.004717
Mean of Response	0.007923
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.02827513	0.000089	4.0222
Error	329	0.00731900	0.000022	Prob > F
C. Total	645	0.03559413		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000033	59.728
Residual	0.000022	40.272
Total	0.000055	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response Si (mg/L)
Summary of Fit

RSquare	0.956326
RSquare Adj	0.914378
Root Mean Square Error	0.008383
Mean of Response	0.010935
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.50627452	0.001602	22.7978
Error	329	0.02312075	0.000070	Prob > F
C. Total	645	0.52939527		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000752	91.451
Residual	0.00007	8.549
Total	0.000822	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (mg/L)
Summary of Fit

RSquare	0.733514
RSquare Adj	0.472025
Root Mean Square Error	0.01645
Mean of Response	0.009044
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.23834577	0.000759	2.8051
Error	320	0.08659100	0.000271	Prob > F
C. Total	634	0.32493677		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000242	47.244
Residual	0.000271	52.756
Total	0.000513	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.975601
RSquare Adj	0.952165
Root Mean Square Error	0.00417
Mean of Response	0.994164
Observations (or Sum Wgts)	646

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	316	0.22875161	0.000724	41.6295
Error	329	0.00572100	0.000017	Prob > F
C. Total	645	0.23447261		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000347	95.224
Residual	0.000017	4.776
Total	0.000364	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (mg/L)
Summary of Fit

RSquare	0.691343
RSquare Adj	0.388474
Root Mean Square Error	0.038398
Mean of Response	0.001937
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	1.0568048	0.003366	2.2826
Error	320	0.4718207	0.001474	Prob > F
C. Total	634	1.5286255		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000938	38.887
Residual	0.001474	61.113
Total	0.002413	100.000

These estimates based on equating Mean Squares to Expected Value.

STCd=SM55
Response Al (mg/L)
Summary of Fit

RSquare	0.590604
RSquare Adj	0.188884
Root Mean Square Error	0.037528
Mean of Response	0.025602
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.6501650	0.002071	1.4702
Error	320	0.4506832	0.001408	Prob > F
C. Total	634	1.1008482		0.0003

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000329	18.914
Residual	0.001408	81.086
Total	0.001737	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (mg/L)
Summary of Fit

RSquare	0.5618
RSquare Adj	0.131816
Root Mean Square Error	0.017543
Mean of Response	0.009624
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.12626738	0.000402	1.3066
Error	320	0.09848767	0.000308	Prob > F
C. Total	634	0.22475505		0.0087

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000047	13.201
Residual	0.000308	86.799
Total	0.000355	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response Cu (mg/L)
Summary of Fit

RSquare	0.691523
RSquare Adj	0.388831
Root Mean Square Error	0.007824
Mean of Response	0.004891
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.04391000	0.000140	2.2846
Error	320	0.01958750	0.000061	Prob > F
C. Total	634	0.06349750		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000039	38.923
Residual	0.000061	61.077
Total	0.0001	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (mg/L)
Summary of Fit

RSquare	0.584718
RSquare Adj	0.177223
Root Mean Square Error	0.007257
Mean of Response	0.005272
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.02372895	0.000076	1.4349
Error	320	0.01685292	0.000053	Prob > F
C. Total	634	0.04058187		0.0007

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000011	17.747
Residual	0.000053	82.253
Total	0.000064	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (mg/L)
Summary of Fit

RSquare	0.559378
RSquare Adj	0.127017
Root Mean Square Error	0.103396
Mean of Response	0.05398
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	4.3430983	0.013832	1.2938
Error	320	3.4210624	0.010691	Prob > F
C. Total	634	7.7641607		0.0110

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001558	12.720
Residual	0.010691	87.280
Total	0.012249	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (mg/L)
Summary of Fit

RSquare	0.698651
RSquare Adj	0.402952
Root Mean Square Error	0.006475
Mean of Response	0.004339
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.03110129	0.000099	2.3627
Error	320	0.01341492	0.000042	Prob > F
C. Total	634	0.04451620		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000028	40.335
Residual	0.000042	59.665
Total	0.00007	100.000

These estimates based on equating Mean Squares to Expected Value.

Response K (mg/L)
Summary of Fit

RSquare	0.993779
RSquare Adj	0.987675
Root Mean Square Error	0.043083
Mean of Response	0.054534
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	94.890086	0.302198	162.8094
Error	320	0.593966	0.001856	Prob > F
C. Total	634	95.484052		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.148998	98.770
Residual	0.001856	1.230
Total	0.150854	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (mg/L)
Summary of Fit

RSquare	0.534931
RSquare Adj	0.078581
Root Mean Square Error	0.012836
Mean of Response	0.005301
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.06064805	0.000193	1.1722
Error	320	0.05272750	0.000165	Prob > F
C. Total	634	0.11337555		0.0788

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000014	7.870
Residual	0.000165	92.130
Total	0.000179	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A23. Components of Variance for Fusion Measurements of Calibration and Bench Standard Measurements Reported in a Process Batch

Response Ni (mg/L)
Summary of Fit

RSquare	0.559588
RSquare Adj	0.127434
Root Mean Square Error	0.019659
Mean of Response	0.00923
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.15713476	0.000500	1.2949
Error	320	0.12366967	0.000386	Prob > F
C. Total	634	0.28080443		0.0108

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000057	12.762
Residual	0.000386	87.238
Total	0.000443	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (mg/L)
Summary of Fit

RSquare	0.55291
RSquare Adj	0.114203
Root Mean Square Error	0.197776
Mean of Response	0.111131
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	15.479474	0.049298	1.2603
Error	320	12.516892	0.039115	Prob > F
C. Total	634	27.996366		0.0199

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.005051	11.437
Residual	0.039115	88.563
Total	0.044167	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ti (mg/L)
Summary of Fit

RSquare	0.573782
RSquare Adj	0.155556
Root Mean Square Error	0.008967
Mean of Response	0.004639
Observations (or Sum Wgts)	635

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	314	0.03463717	0.000110	1.3719
Error	320	0.02572925	0.000080	Prob > F
C. Total	634	0.06036642		0.0025

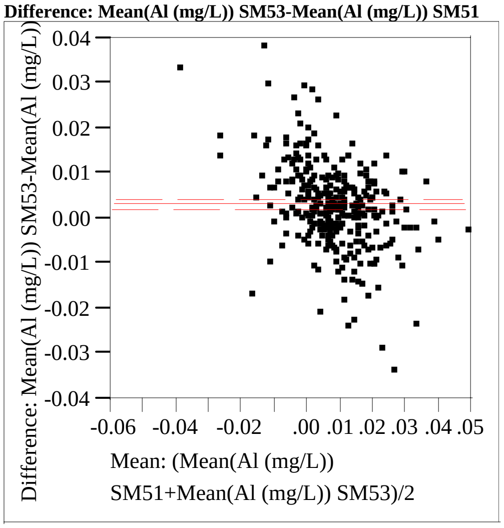
Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000015	15.578
Residual	0.00008	84.422
Total	0.000095	100.000

These estimates based on equating Mean Squares to Expected Value.

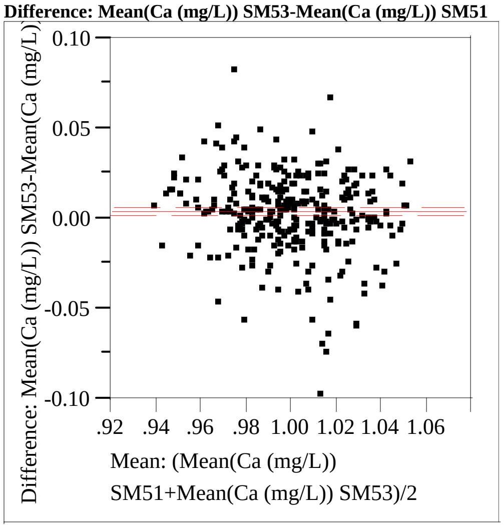
Exhibit A24. Paired Comparisons of SM53 vs SM51 for Fusion Measurements

Difference: Mean(Al (mg/L)) SM53-Mean(Al (mg/L)) SM51



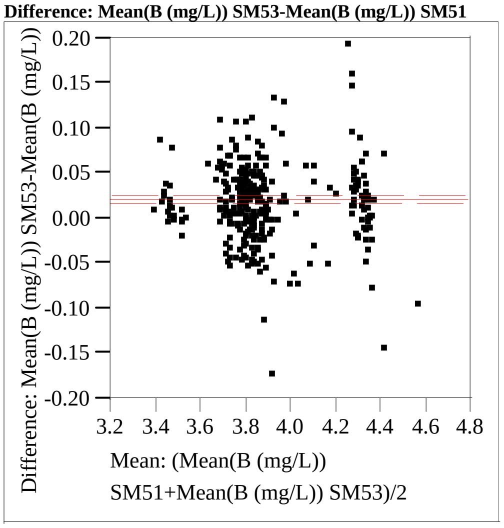
Mean(Al (mg/L)) SM53	0.00986	t-Ratio	6.00785
Mean(Al (mg/L)) SM51	0.00668	DF	316
Mean Difference	0.00318	Prob > |t|	<.0001
Std Error	0.00053	Prob > t	<.0001
Upper95%	0.00422	Prob < t	1.0000
Lower95%	0.00214		
N	317		
Correlation	0.7309		

Difference: Mean(Ca (mg/L)) SM53-Mean(Ca (mg/L)) SM51



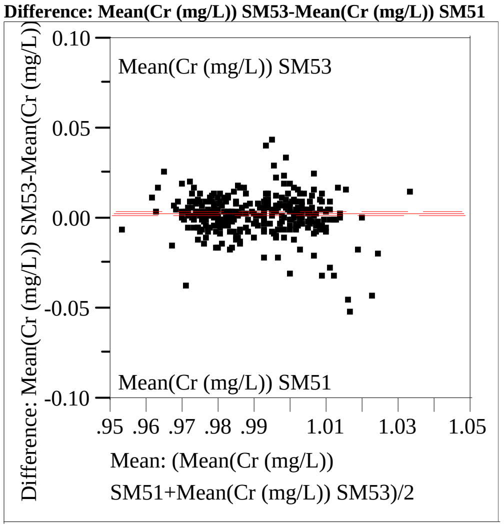
Mean(Ca (mg/L)) SM53	1.00173	t-Ratio	3.068298
Mean(Ca (mg/L)) SM51	0.99797	DF	316
Mean Difference	0.00376	Prob > |t|	0.0023
Std Error	0.00122	Prob > t	0.0012
Upper95%	0.00616	Prob < t	0.9988
Lower95%	0.00135		
N	317		
Correlation	0.65821		

Difference: Mean(B (mg/L)) SM53-Mean(B (mg/L)) SM51



Mean(B (mg/L)) SM53	3.90127	t-Ratio	8.461604
Mean(B (mg/L)) SM51	3.88062	DF	316
Mean Difference	0.02066	Prob > |t|	<.0001
Std Error	0.00244	Prob > t	<.0001
Upper95%	0.02546	Prob < t	1.0000
Lower95%	0.01585		
N	317		
Correlation	0.98346		

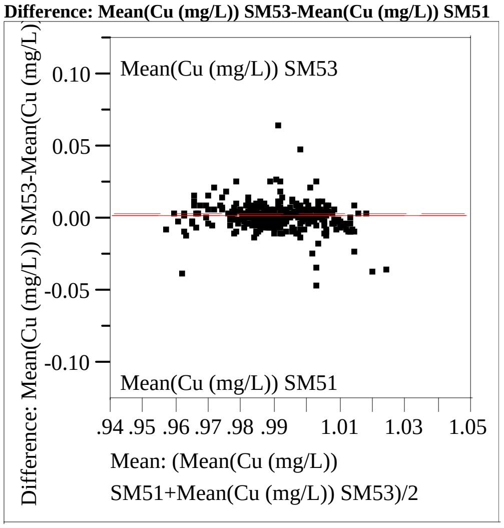
Difference: Mean(Cr (mg/L)) SM53-Mean(Cr (mg/L)) SM51



Mean(Cr (mg/L)) SM53	0.99211	t-Ratio	4.714181
Mean(Cr (mg/L)) SM51	0.98913	DF	316
Mean Difference	0.00297	Prob > |t|	<.0001
Std Error	0.00063	Prob > t	<.0001
Upper95%	0.00421	Prob < t	1.0000
Lower95%	0.00173		
N	317		
Correlation	0.70515		

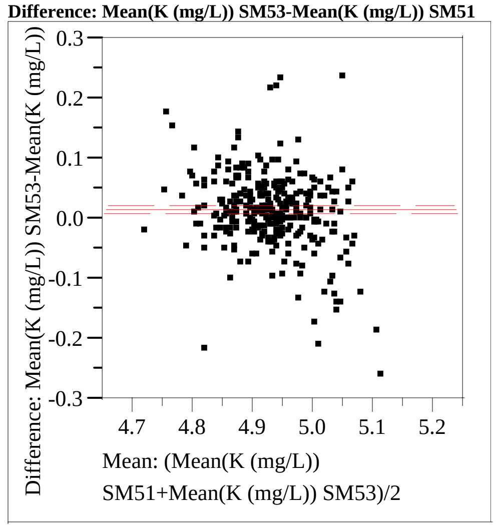
Exhibit A24. Paired Comparisons of SM53 vs SM51 for Fusion Measurements

Difference: Mean(Cu (mg/L)) SM53-Mean(Cu (mg/L)) SM51



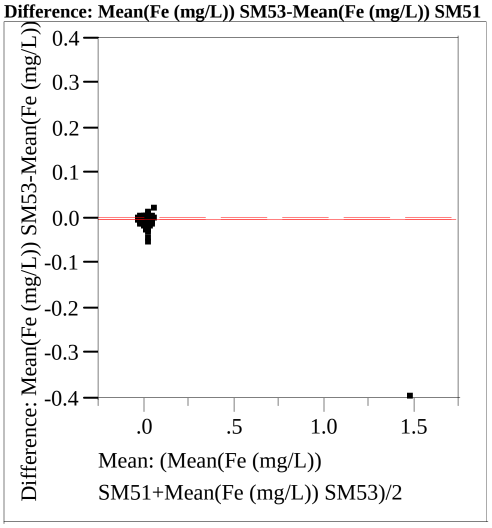
Mean(Cu (mg/L)) SM53	0.99183	t-Ratio	4.740339
Mean(Cu (mg/L)) SM51	0.98919	DF	316
Mean Difference	0.00263	Prob > |t|	<.0001
Std Error	0.00056	Prob > t	<.0001
Upper95%	0.00373	Prob < t	1.0000
Lower95%	0.00154		
N	317		
Correlation	0.72872		

Difference: Mean(K (mg/L)) SM53-Mean(K (mg/L)) SM51



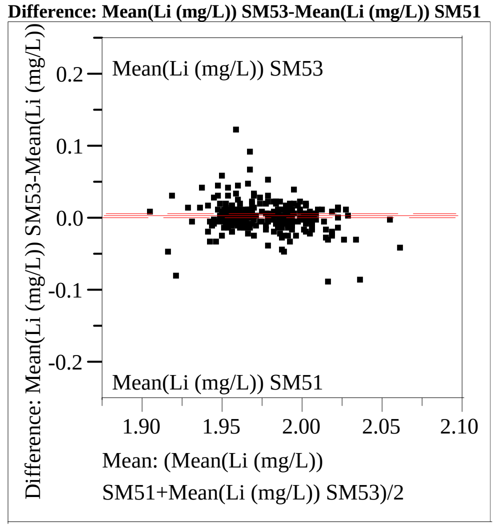
Mean(K (mg/L)) SM53	4.9381	t-Ratio	4.652804
Mean(K (mg/L)) SM51	4.92172	DF	316
Mean Difference	0.01638	Prob > |t|	<.0001
Std Error	0.00352	Prob > t	<.0001
Upper95%	0.02331	Prob < t	1.0000
Lower95%	0.00945		
N	317		
Correlation	0.64919		

Difference: Mean(Fe (mg/L)) SM53-Mean(Fe (mg/L)) SM51



Mean(Fe (mg/L)) SM53	0.00805	t-Ratio	-1.5284
Mean(Fe (mg/L)) SM51	0.00999	DF	316
Mean Difference	-0.0019	Prob > |t|	0.1274
Std Error	0.00127	Prob > t	0.9363
Upper95%	0.00056	Prob < t	0.0637
Lower95%	-0.0044		
N	317		
Correlation	0.99714		

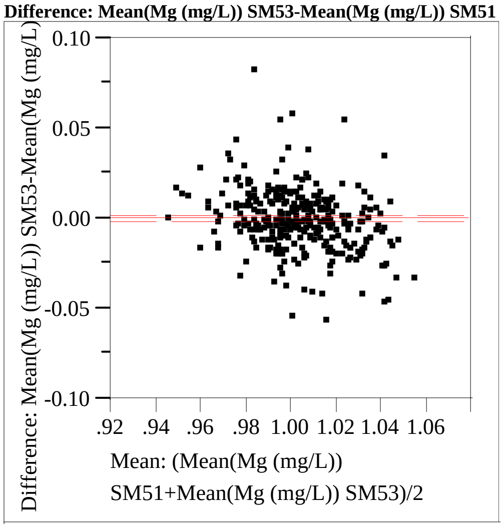
Difference: Mean(Li (mg/L)) SM53-Mean(Li (mg/L)) SM51



Mean(Li (mg/L)) SM53	1.97919	t-Ratio	4.397236
Mean(Li (mg/L)) SM51	1.97428	DF	316
Mean Difference	0.00491	Prob > |t|	<.0001
Std Error	0.00112	Prob > t	<.0001
Upper95%	0.00711	Prob < t	1.0000
Lower95%	0.00271		
N	317		
Correlation	0.70889		

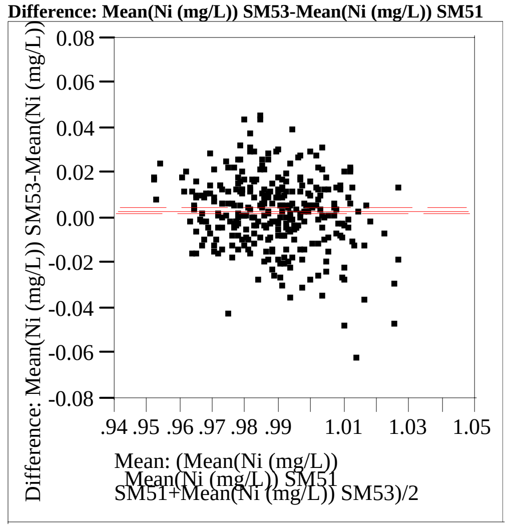
Exhibit A24. Paired Comparisons of SM53 vs SM51 for Fusion Measurements

Difference: Mean(Mg (mg/L)) SM53-Mean(Mg (mg/L)) SM51



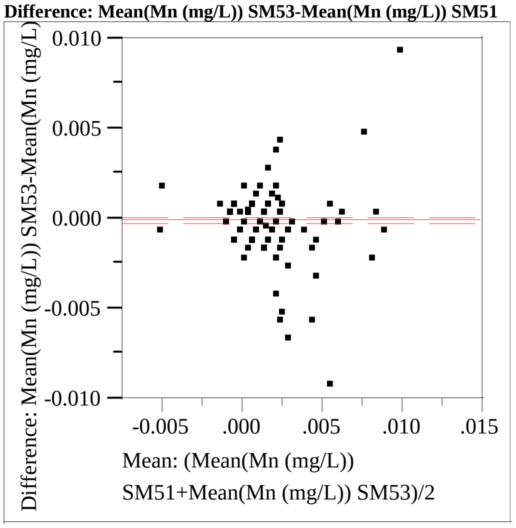
Mean(Mg (mg/L)) SM53	1.00324	t-Ratio	0.046533
Mean(Mg (mg/L)) SM51	1.0032	DF	316
Mean Difference	0.00004	Prob > |t|	0.9629
Std Error	0.00097	Prob > t	0.4815
Upper95%	0.00195	Prob < t	0.5185
Lower95%	-0.0019		
N	317		
Correlation	0.70106		

Difference: Mean(Ni (mg/L)) SM53-Mean(Ni (mg/L)) SM51



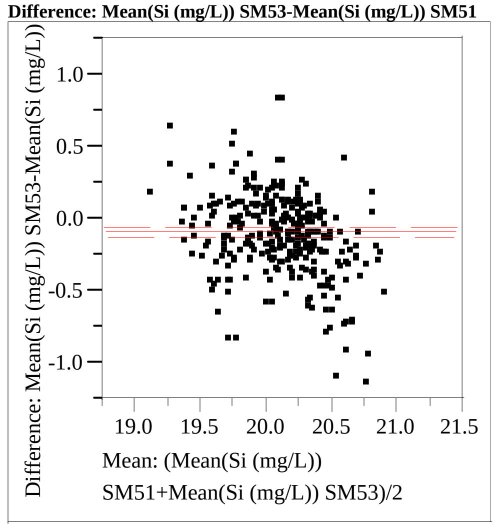
Mean(Ni (mg/L)) SM53	0.99014	t-Ratio	3.977338
Mean(Ni (mg/L)) SM51	0.98661	DF	316
Mean Difference	0.00353	Prob > |t|	<.0001
Std Error	0.00089	Prob > t	<.0001
Upper95%	0.00528	Prob < t	1.0000
Lower95%	0.00179		
N	317		
Correlation	0.54352		

Difference: Mean(Mn (mg/L)) SM53-Mean(Mn (mg/L)) SM51



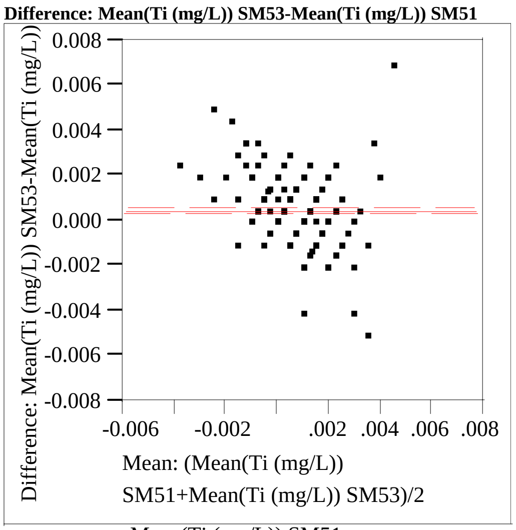
Mean(Mn (mg/L)) SM53	0.0008	t-Ratio	-1.24501
Mean(Mn (mg/L)) SM51	0.00089	DF	316
Mean Difference	-9.3e-5	Prob > |t|	0.2141
Std Error	0.00007	Prob > t	0.8930
Upper95%	0.00005	Prob < t	0.1070
Lower95%	-0.0002		
N	317		
Correlation	0.71957		

Difference: Mean(Si (mg/L)) SM53-Mean(Si (mg/L)) SM51



Mean(Si (mg/L)) SM53	20.063	t-Ratio	-5.9821
Mean(Si (mg/L)) SM51	20.1574	DF	316
Mean Difference	-0.0944	Prob > |t|	<.0001
Std Error	0.01578	Prob > t	1.0000
Upper95%	-0.0634	Prob < t	<.0001
Lower95%	-0.1254		
N	317		
Correlation	0.71814		

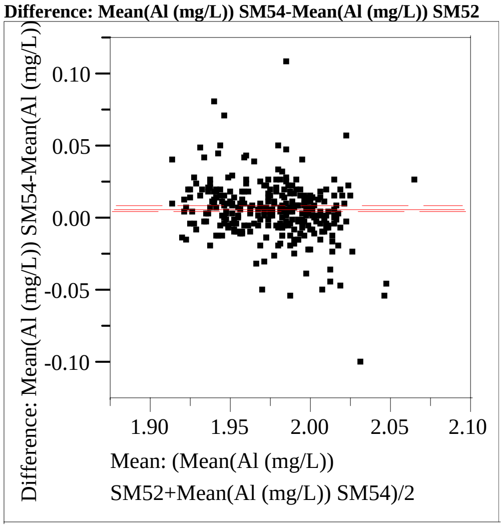
Exhibit A24. Paired Comparisons of SM53 vs SM51 for Fusion Measurements



Mean(Ti (mg/L)) SM53	0.00094	t-Ratio	5.933979
Mean(Ti (mg/L)) SM51	0.00052	DF	316
Mean Difference	0.00042	Prob > |t|	<.0001
Std Error	0.00007	Prob > t	<.0001
Upper95%	0.00056	Prob < t	1.0000
Lower95%	0.00028		
N	317		
Correlation	0.52916		

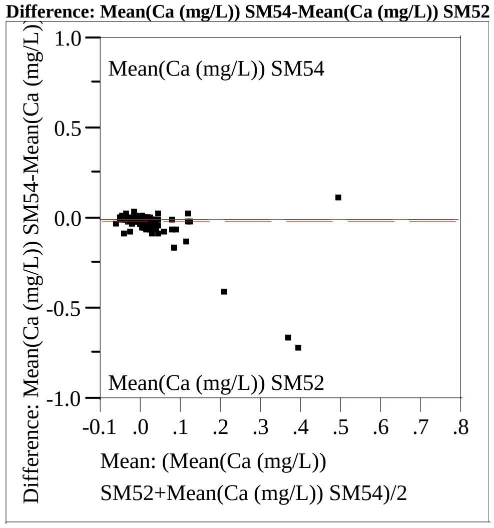
Exhibit A25. Paired Comparisons of SM54 vs SM52 for Fusion Measurements

Difference: Mean(Al (mg/L)) SM54-Mean(Al (mg/L)) SM52



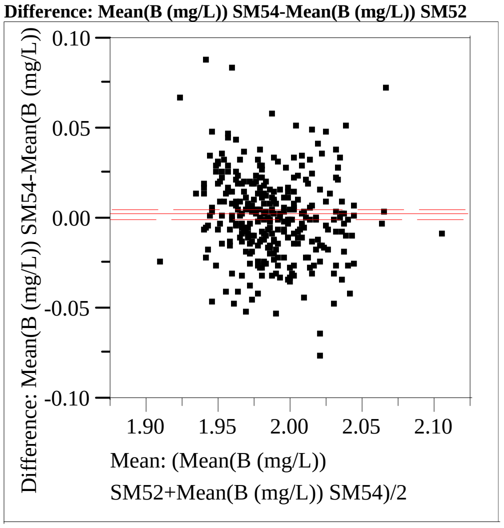
Mean(Al (mg/L)) SM54	1.98009	t-Ratio	6.072392
Mean(Al (mg/L)) SM52	1.97329	DF	311
Mean Difference	0.0068	Prob > |t|	<.0001
Std Error	0.00112	Prob > t	<.0001
Upper95%	0.009	Prob < t	1.0000
Lower95%	0.0046		
N	312		
Correlation	0.78997		

Difference: Mean(Ca (mg/L)) SM54-Mean(Ca (mg/L)) SM52



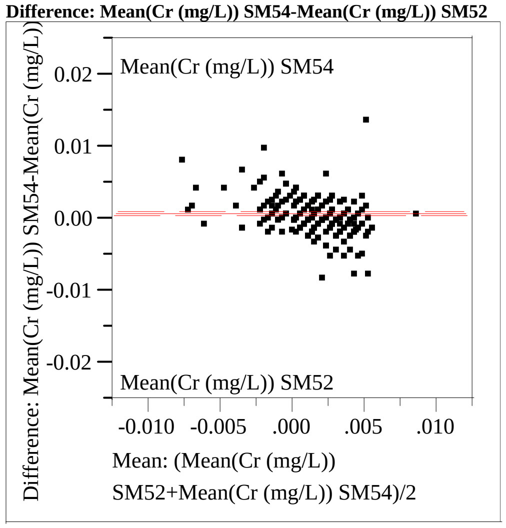
Mean(Ca (mg/L)) SM54	0.00571	t-Ratio	-2.50136
Mean(Ca (mg/L)) SM52	0.01448	DF	311
Mean Difference	-0.0088	Prob > |t|	0.0129
Std Error	0.00351	Prob > t	0.9936
Upper95%	-0.0019	Prob < t	0.0064
Lower95%	-0.0157		
N	312		
Correlation	0.50328		

Difference: Mean(B (mg/L)) SM54-Mean(B (mg/L)) SM52



Mean(B (mg/L)) SM54	1.98862	t-Ratio	1.762773
Mean(B (mg/L)) SM52	1.98628	DF	311
Mean Difference	0.00234	Prob > |t|	0.0789
Std Error	0.00133	Prob > t	0.0395
Upper95%	0.00496	Prob < t	0.9605
Lower95%	-0.0003		
N	312		
Correlation	0.71103		

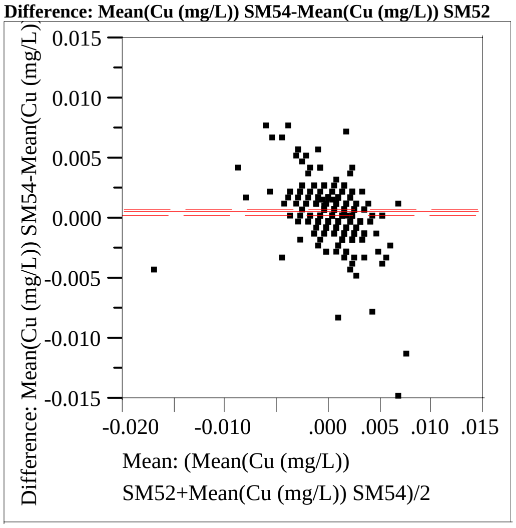
Difference: Mean(Cr (mg/L)) SM54-Mean(Cr (mg/L)) SM52



Mean(Cr (mg/L)) SM54	0.0018	t-Ratio	4.770828
Mean(Cr (mg/L)) SM52	0.00118	DF	311
Mean Difference	0.00062	Prob > |t|	<.0001
Std Error	0.00013	Prob > t	<.0001
Upper95%	0.00087	Prob < t	1.0000
Lower95%	0.00036		
N	312		
Correlation	0.60319		

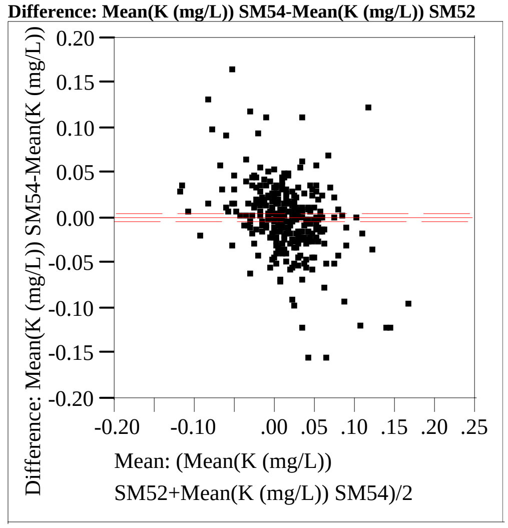
Exhibit A25. Paired Comparisons of SM54 vs SM52 for Fusion Measurements

Difference: Mean(Cu (mg/L)) SM54-Mean(Cu (mg/L)) SM52



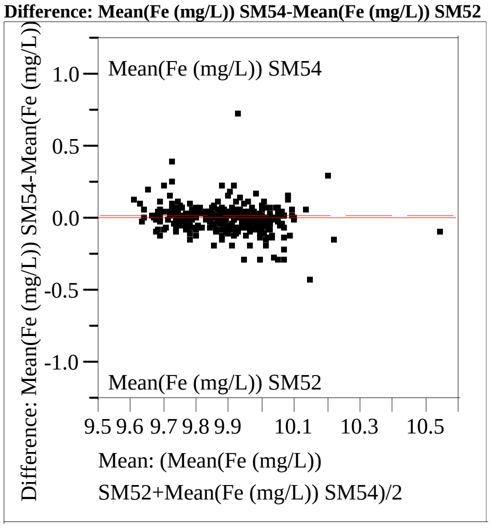
Mean(Cu (mg/L)) SM54	0.0008	t-Ratio	4.231774
Mean(Cu (mg/L)) SM52	0.00025	DF	311
Mean Difference	0.00056	Prob > |t|	<.0001
Std Error	0.00013	Prob > t	<.0001
Upper95%	0.00081	Prob < t	1.0000
Lower95%	0.0003		
N	312		
Correlation	0.65834		

Difference: Mean(K (mg/L)) SM54-Mean(K (mg/L)) SM52



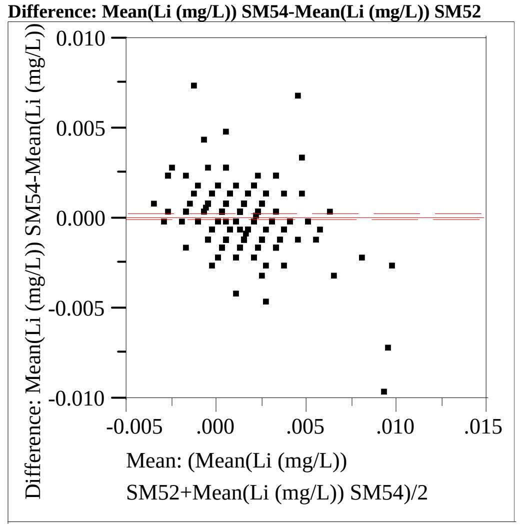
Mean(K (mg/L)) SM54	0.01486	t-Ratio	0.670486
Mean(K (mg/L)) SM52	0.01335	DF	311
Mean Difference	0.00151	Prob > |t|	0.5030
Std Error	0.00226	Prob > t	0.2515
Upper95%	0.00596	Prob < t	0.7485
Lower95%	-0.0029		
N	312		
Correlation	0.61011		

Difference: Mean(Fe (mg/L)) SM54-Mean(Fe (mg/L)) SM52



Mean(Fe (mg/L)) SM54	9.89664	t-Ratio	2.241425
Mean(Fe (mg/L)) SM52	9.88419	DF	311
Mean Difference	0.01245	Prob > |t|	0.0257
Std Error	0.00556	Prob > t	0.0129
Upper95%	0.02339	Prob < t	0.9871
Lower95%	0.00152		
N	312		
Correlation	0.74436		

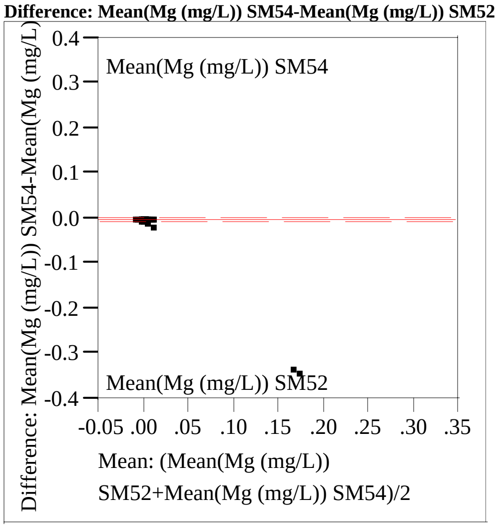
Difference: Mean(Li (mg/L)) SM54-Mean(Li (mg/L)) SM52



Mean(Li (mg/L)) SM54	0.00129	t-Ratio	0.856487
Mean(Li (mg/L)) SM52	0.00121	DF	311
Mean Difference	0.00007	Prob > |t|	0.3924
Std Error	0.00009	Prob > t	0.1962
Upper95%	0.00024	Prob < t	0.8038
Lower95%	-9.5e-5		
N	312		
Correlation	0.70833		

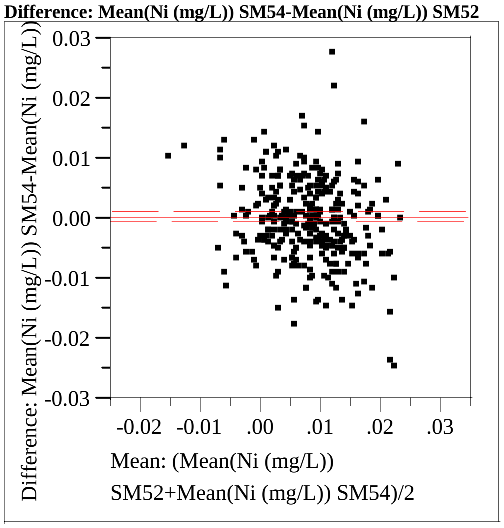
Exhibit A25. Paired Comparisons of SM54 vs SM52 for Fusion Measurements

Difference: Mean(Mg (mg/L)) SM54-Mean(Mg (mg/L)) SM52



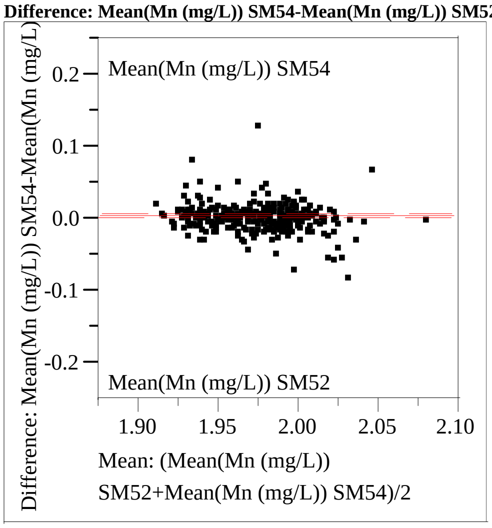
Mean(Mg (mg/L)) SM54	0.00078	t-Ratio	-1.6184
Mean(Mg (mg/L)) SM52	0.00324	DF	311
Mean Difference	-0.0025	Prob > |t|	0.1066
Std Error	0.00152	Prob > t	0.9467
Upper95%	0.00053	Prob < t	0.0533
Lower95%	-0.0055		
N	312		
Correlation	0.14638		

Difference: Mean(Ni (mg/L)) SM54-Mean(Ni (mg/L)) SM52



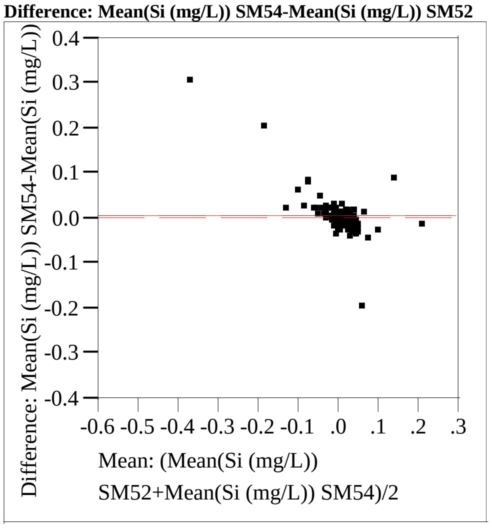
Mean(Ni (mg/L)) SM54	0.008	t-Ratio	0.648544
Mean(Ni (mg/L)) SM52	0.00774	DF	311
Mean Difference	0.00025	Prob > |t|	0.5171
Std Error	0.00039	Prob > t	0.2586
Upper95%	0.00103	Prob < t	0.7414
Lower95%	-0.0005		
N	312		
Correlation	0.56474		

Difference: Mean(Mn (mg/L)) SM54-Mean(Mn (mg/L)) SM52



Mean(Mn (mg/L)) SM54	1.97641	t-Ratio	3.806688
Mean(Mn (mg/L)) SM52	1.97222	DF	311
Mean Difference	0.00419	Prob > |t|	0.0002
Std Error	0.0011	Prob > t	<.0001
Upper95%	0.00635	Prob < t	0.9999
Lower95%	0.00202		
N	312		
Correlation	0.79156		

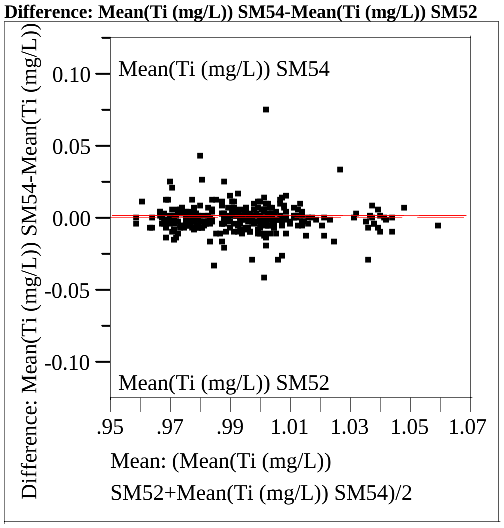
Difference: Mean(Si (mg/L)) SM54-Mean(Si (mg/L)) SM52



Mean(Si (mg/L)) SM54	0.01117	t-Ratio	3.17119
Mean(Si (mg/L)) SM52	0.00613	DF	311
Mean Difference	0.00504	Prob > |t|	0.0017
Std Error	0.00159	Prob > t	0.0008
Upper95%	0.00817	Prob < t	0.9992
Lower95%	0.00191		
N	312		
Correlation	0.8293		

Exhibit A25. Paired Comparisons of SM54 vs SM52 for Fusion Measurements

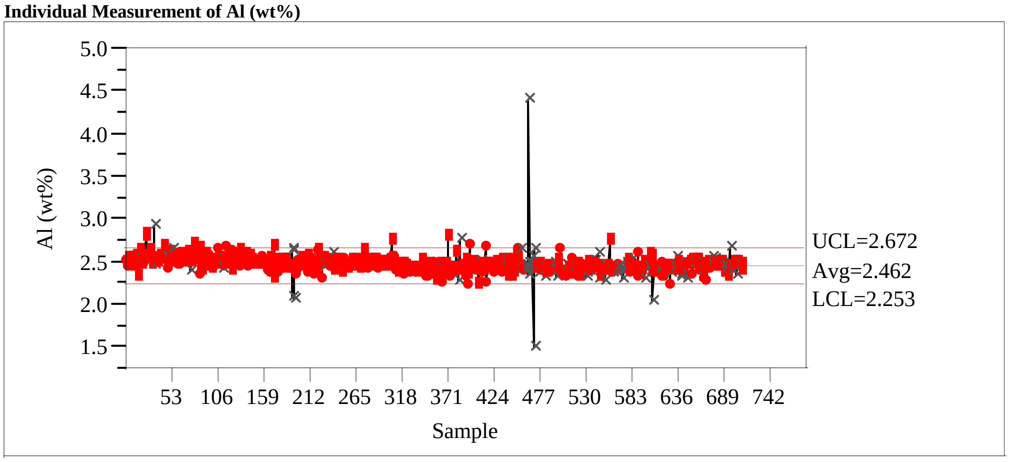
Difference: Mean(Ti (mg/L)) SM54-Mean(Ti (mg/L)) SM52



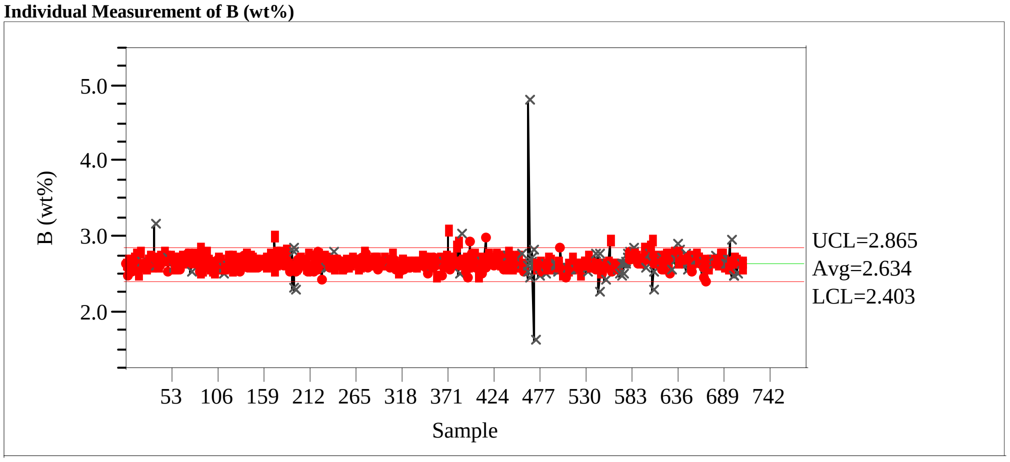
Mean(Ti (mg/L)) SM54	0.99444	t-Ratio	2.972818
Mean(Ti (mg/L)) SM52	0.9928	DF	311
Mean Difference	0.00165	Prob > |t|	0.0032
Std Error	0.00055	Prob > t	0.0016
Upper95%	0.00274	Prob < t	0.9984
Lower95%	0.00056		
N	312		
Correlation	0.86912		

Exhibit A26. Time Series Plot (Control Charts) for ARG-1 Measurements Using Fusion Prep

Individual Measurement of Al (wt%)



Individual Measurement of B (wt%)



Individual Measurement of Ca (wt%)

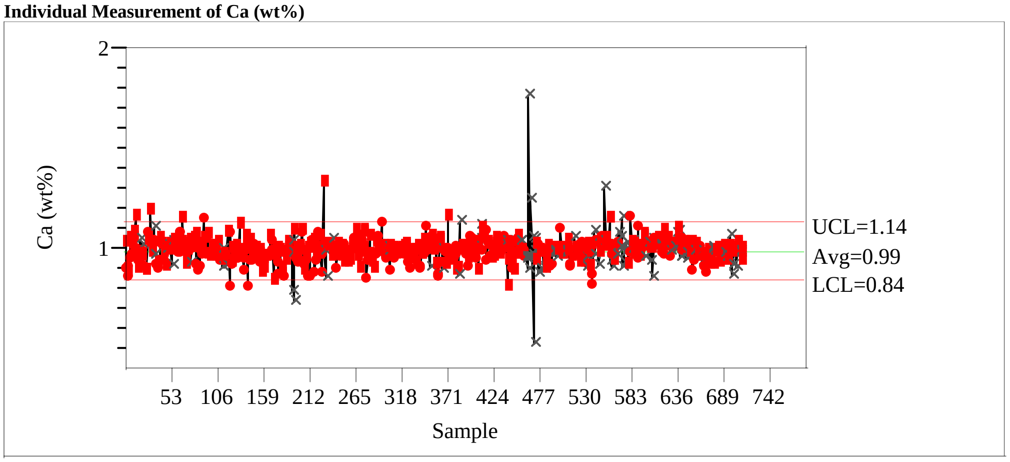
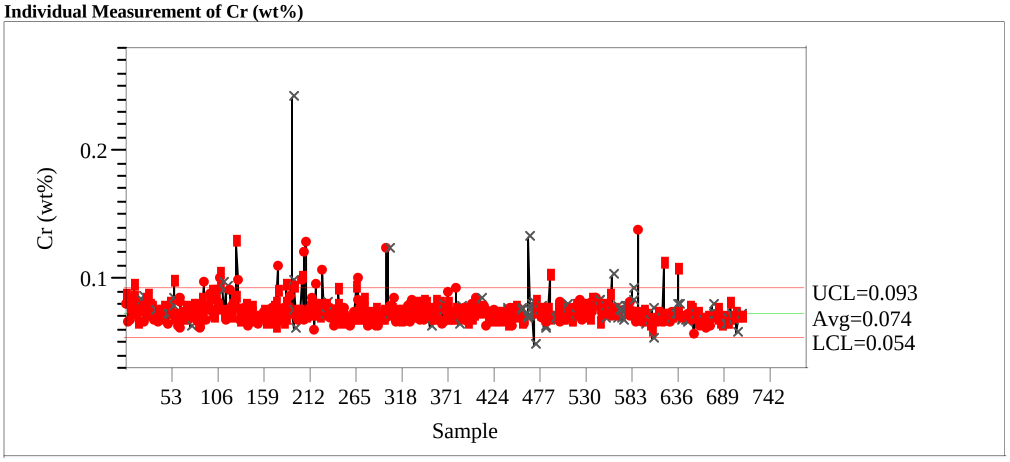
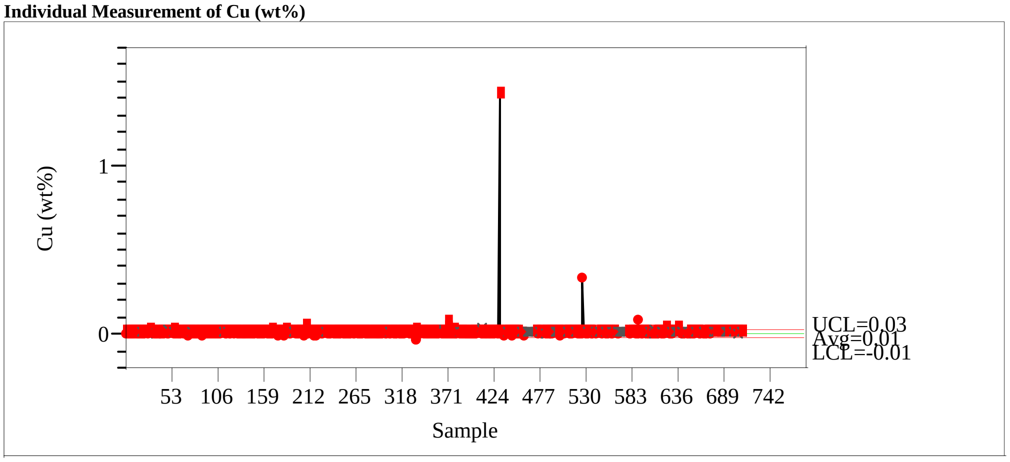


Exhibit A26. Time Series Plot (Control Charts) for ARG-1 Measurements Using Fusion Prep

Individual Measurement of Cr (wt%)



Individual Measurement of Cu (wt%)



Individual Measurement of Fe (wt%)

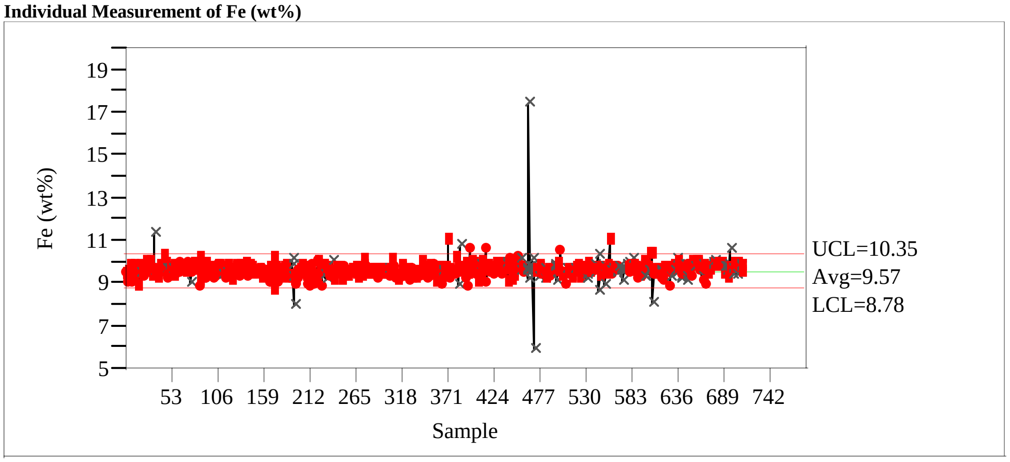
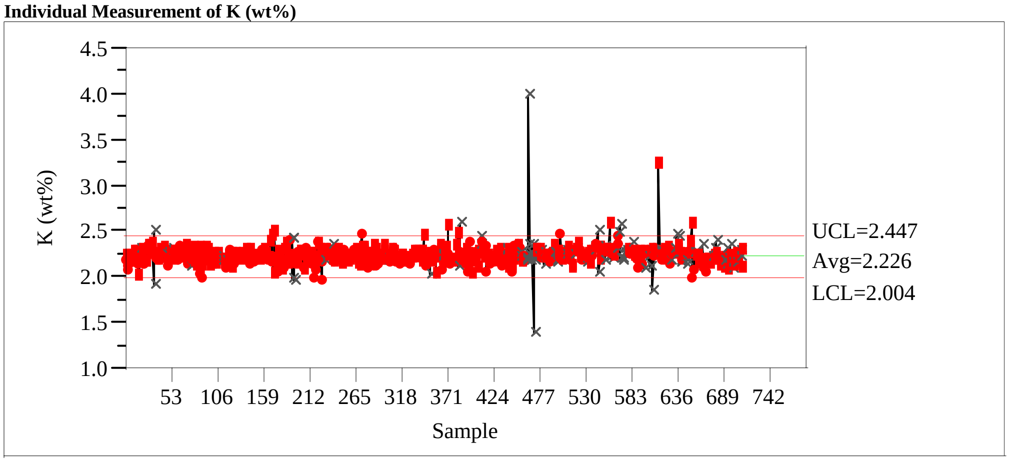
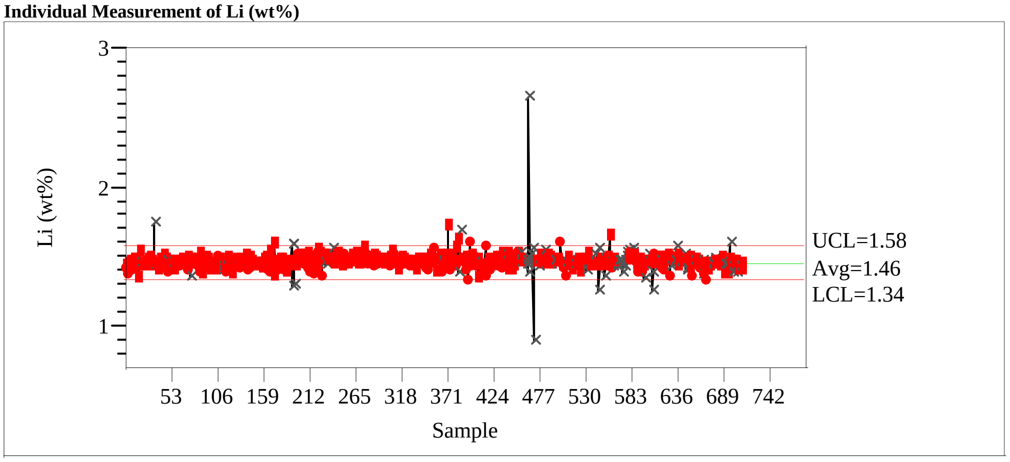


Exhibit A26. Time Series Plot (Control Charts) for ARG-1 Measurements Using Fusion Prep

Individual Measurement of K (wt%)



Individual Measurement of Li (wt%)



Individual Measurement of Mg (wt%)

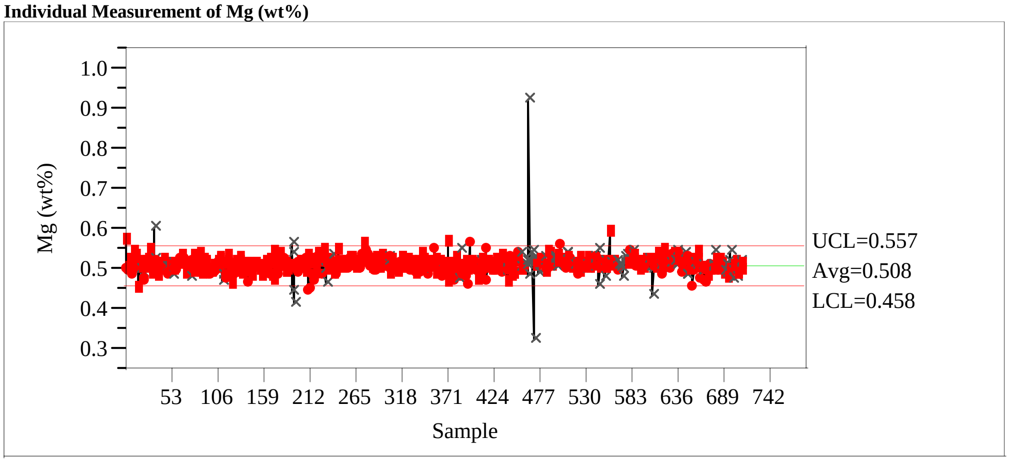
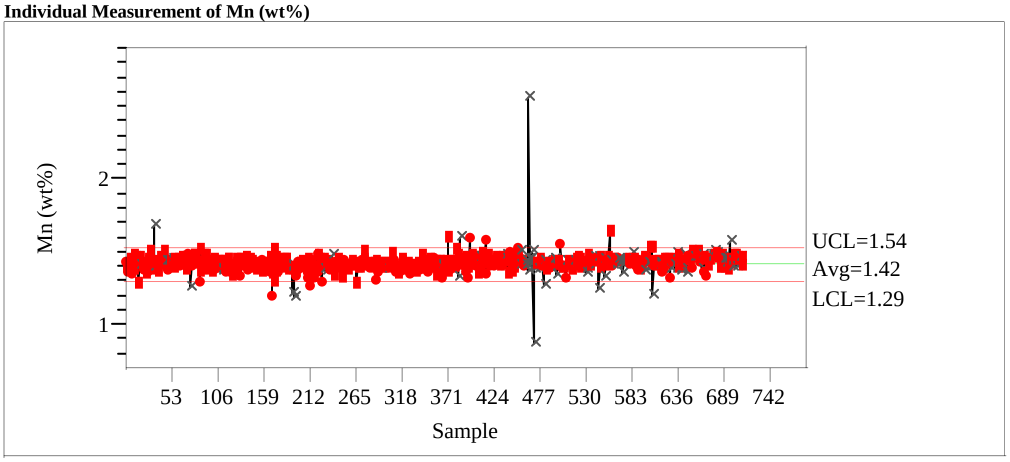
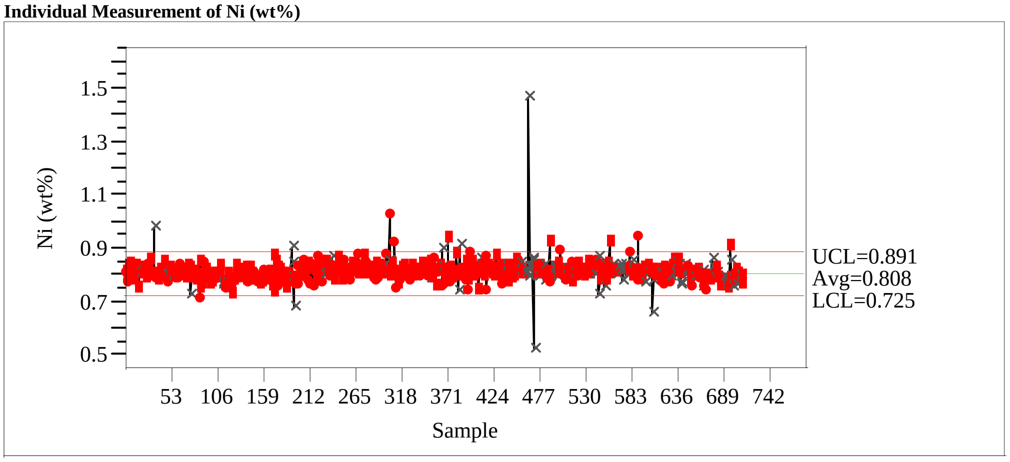


Exhibit A26. Time Series Plot (Control Charts) for ARG-1 Measurements Using Fusion Prep

Individual Measurement of Mn (wt%)



Individual Measurement of Ni (wt%)



Individual Measurement of Si (wt%)

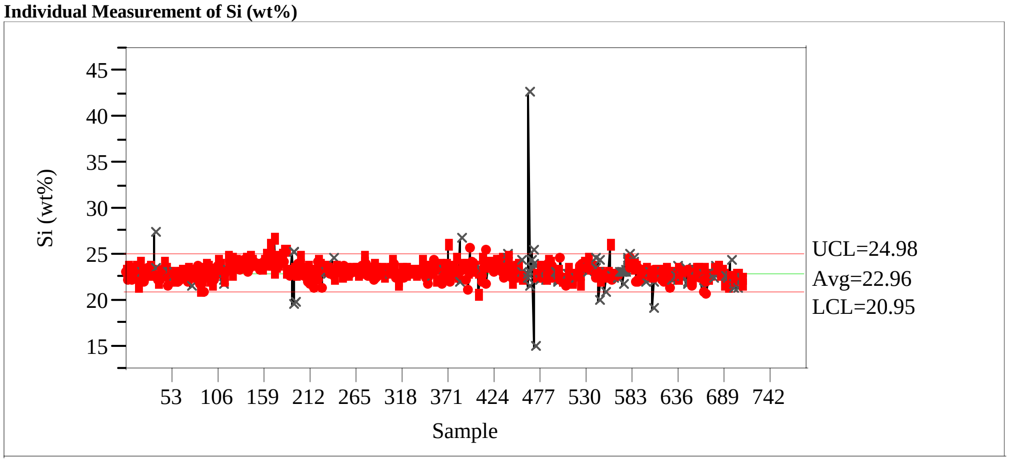


Exhibit A26. Time Series Plot (Control Charts) for ARG-1 Measurements Using Fusion Prep

Individual Measurement of Ti (wt%)

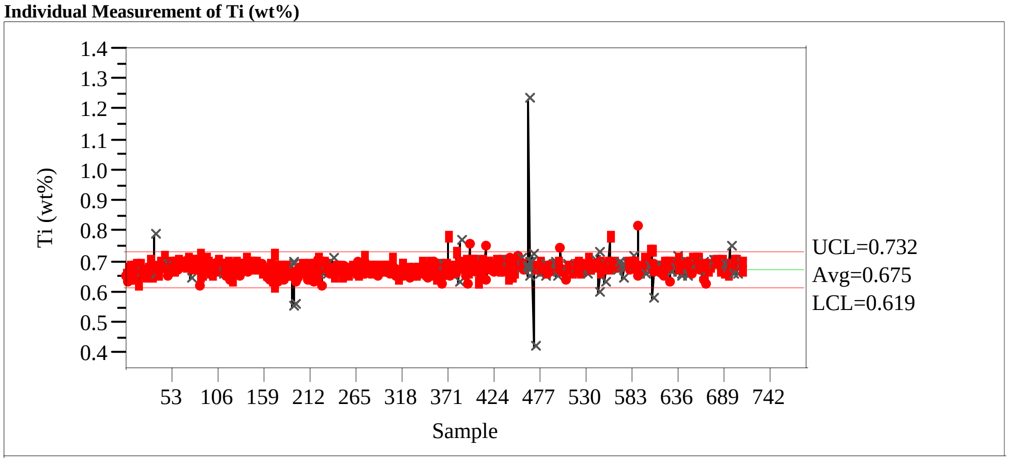
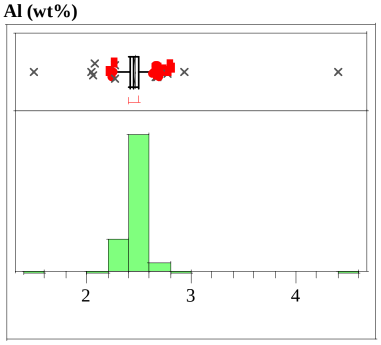


Exhibit A27. Histograms and Descriptive Statistics for the ARG-1 Measurements Using Fusion Prep

Al (wt%)



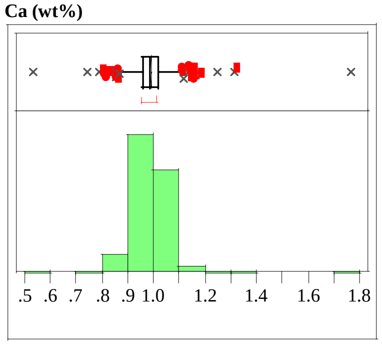
Quantiles

100.0%	maximum	4.4000
99.5%		2.8021
97.5%		2.6592
90.0%		2.5570
75.0%	quartile	2.5040
50.0%	median	2.4540
25.0%	quartile	2.4130
10.0%		2.3730
2.5%		2.3017
0.5%		2.0665
0.0%	minimum	1.4940

Moments

Mean	2.462316
Std Dev	0.1180327
Std Err Mean	0.0044235
upper 95% Mean	2.4710006
lower 95% Mean	2.4536314
N	712

Ca (wt%)



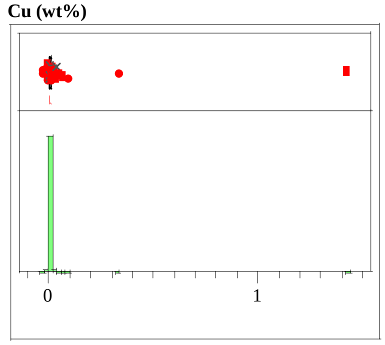
Quantiles

100.0%	maximum	1.7660
99.5%		1.2750
97.5%		1.1120
90.0%		1.0510
75.0%	quartile	1.0200
50.0%	median	0.9890
25.0%	quartile	0.9590
10.0%		0.9133
2.5%		0.8678
0.5%		0.7984
0.0%	minimum	0.5300

Moments

Mean	0.9891489
Std Dev	0.068133
Std Err Mean	0.0025534
upper 95% Mean	0.994162
lower 95% Mean	0.9841358
N	712

Cu (wt%)



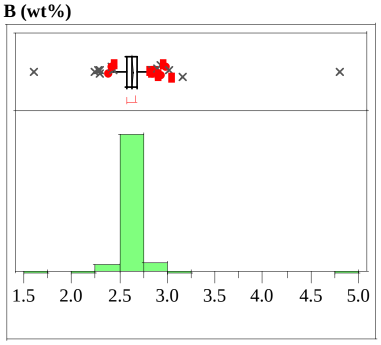
Quantiles

100.0%	maximum	1.424
99.5%		0.080
97.5%		0.018
90.0%		0.012
75.0%	quartile	0.009
50.0%	median	0.007
25.0%	quartile	0.005
10.0%		0.003
2.5%		-0.001
0.5%		-0.006
0.0%	minimum	-0.026

Moments

Mean	0.0095927
Std Dev	0.0548654
Std Err Mean	0.0020562
upper 95% Mean	0.0136296
lower 95% Mean	0.0055558
N	712

B (wt%)



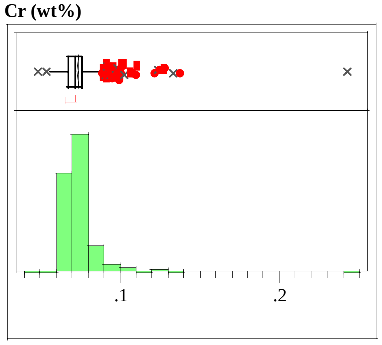
Quantiles

100.0%	maximum	4.8030
99.5%		3.0301
97.5%		2.8157
90.0%		2.7260
75.0%	quartile	2.6790
50.0%	median	2.6295
25.0%	quartile	2.5850
10.0%		2.5400
2.5%		2.4588
0.5%		2.2743
0.0%	minimum	1.6000

Moments

Mean	2.6339129
Std Dev	0.1249286
Std Err Mean	0.0046819
upper 95% Mean	2.6431049
lower 95% Mean	2.6247209
N	712

Cr (wt%)



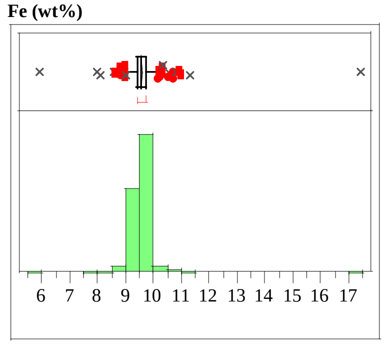
Quantiles

100.0%	maximum	0.24200
99.5%		0.13074
97.5%		0.10017
90.0%		0.08200
75.0%	quartile	0.07600
50.0%	median	0.07150
25.0%	quartile	0.06800
10.0%		0.06600
2.5%		0.06200
0.5%		0.05757
0.0%	minimum	0.04800

Moments

Mean	0.0735997
Std Dev	0.0112944
Std Err Mean	0.0004233
upper 95% Mean	0.0744307
lower 95% Mean	0.0727687
N	712

Fe (wt%)



Quantiles

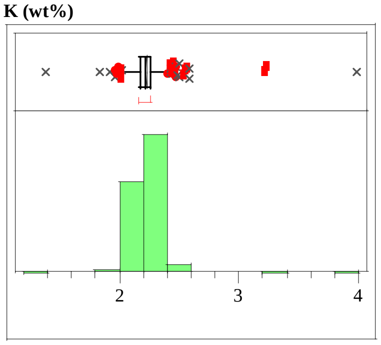
100.0%	maximum	17.414
99.5%		10.968
97.5%		10.121
90.0%		9.847
75.0%	quartile	9.717
50.0%	median	9.566
25.0%	quartile	9.419
10.0%		9.233
2.5%		8.969
0.5%		8.351
0.0%	minimum	5.892

Moments

Mean	9.5666138
Std Dev	0.4359804
Std Err Mean	0.0163391
upper 95% Mean	9.5986923
lower 95% Mean	9.5345352
N	712

Exhibit A27. Histograms and Descriptive Statistics for the ARG-1 Measurements Using Fusion Prep

K (wt%)



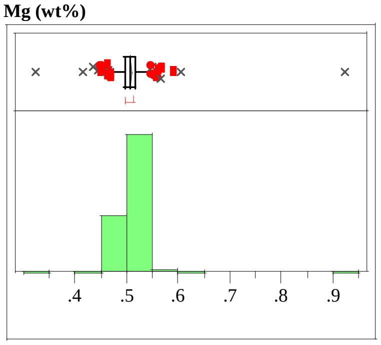
Quantiles

100.0%	maximum	3.9830
99.5%		2.8545
97.5%		2.4410
90.0%		2.3134
75.0%	quartile	2.2670
50.0%	median	2.2210
25.0%	quartile	2.1740
10.0%		2.1310
2.5%		2.0579
0.5%		1.9429
0.0%	minimum	1.3790

Moments

Mean	2.2255983
Std Dev	0.1234474
Std Err Mean	0.0046264
upper 95% Mean	2.2346813
lower 95% Mean	2.2165153
N	712

Mg (wt%)



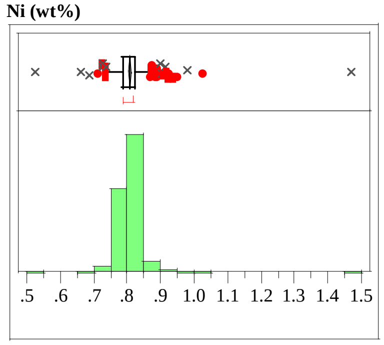
Quantiles

100.0%	maximum	0.92200
99.5%		0.57713
97.5%		0.54500
90.0%		0.52800
75.0%	quartile	0.51700
50.0%	median	0.50700
25.0%	quartile	0.49800
10.0%		0.48700
2.5%		0.46900
0.5%		0.43878
0.0%	minimum	0.32200

Moments

Mean	0.5078652
Std Dev	0.0249493
Std Err Mean	0.000935
upper 95% Mean	0.5097009
lower 95% Mean	0.5060295
N	712

Ni (wt%)



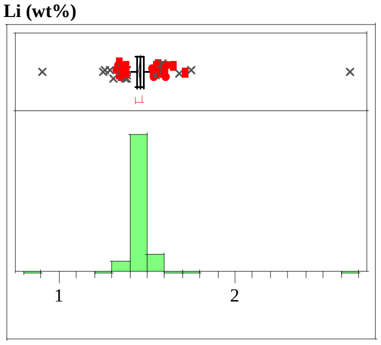
Quantiles

100.0%	maximum	1.4680
99.5%		0.9617
97.5%		0.8774
90.0%		0.8400
75.0%	quartile	0.8220
50.0%	median	0.8070
25.0%	quartile	0.7900
10.0%		0.7740
2.5%		0.7478
0.5%		0.7006
0.0%	minimum	0.5230

Moments

Mean	0.8079466
Std Dev	0.0413266
Std Err Mean	0.0015488
upper 95% Mean	0.8109874
lower 95% Mean	0.8049059
N	712

Li (wt%)



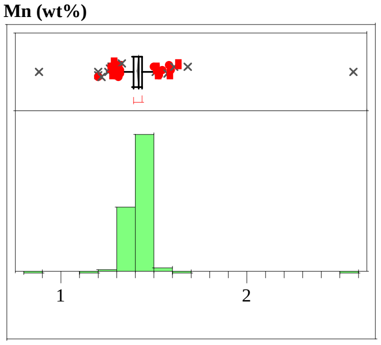
Quantiles

100.0%	maximum	2.6500
99.5%		1.6928
97.5%		1.5590
90.0%		1.5047
75.0%	quartile	1.4770
50.0%	median	1.4580
25.0%	quartile	1.4390
10.0%		1.4113
2.5%		1.3706
0.5%		1.2738
0.0%	minimum	0.8970

Moments

Mean	1.459684
Std Dev	0.0666204
Std Err Mean	0.0024967
upper 95% Mean	1.4645858
lower 95% Mean	1.4547822
N	712

Mn (wt%)



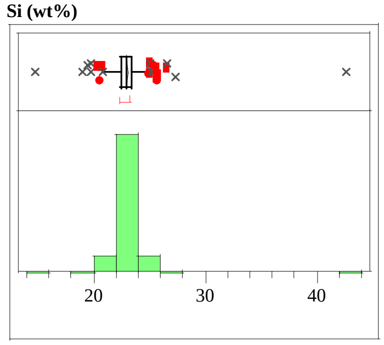
Quantiles

100.0%	maximum	2.5640
99.5%		1.6150
97.5%		1.5013
90.0%		1.4627
75.0%	quartile	1.4380
50.0%	median	1.4160
25.0%	quartile	1.3920
10.0%		1.3693
2.5%		1.3200
0.5%		1.1994
0.0%	minimum	0.8740

Moments

Mean	1.4156798
Std Dev	0.0662428
Std Err Mean	0.0024826
upper 95% Mean	1.4205538
lower 95% Mean	1.4108058
N	712

Si (wt%)



Quantiles

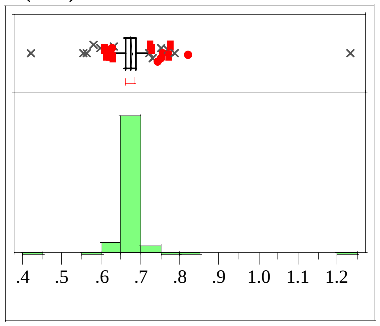
100.0%	maximum	42.493
99.5%		26.508
97.5%		24.743
90.0%		23.980
75.0%	quartile	23.426
50.0%	median	22.907
25.0%	quartile	22.455
10.0%		22.002
2.5%		21.265
0.5%		19.546
0.0%	minimum	14.693

Moments

Mean	22.964976
Std Dev	1.1730263
Std Err Mean	0.043961
upper 95% Mean	23.051285
lower 95% Mean	22.878667
N	712

Exhibit A27. Histograms and Descriptive Statistics for the ARG-1 Measurements Using Fusion Prep

Ti (wt%)



Quantiles

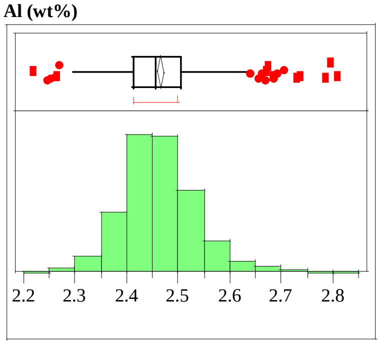
100.0%	maximum	1.2320
99.5%		0.7793
97.5%		0.7162
90.0%		0.6950
75.0%	quartile	0.6860
50.0%	median	0.6760
25.0%	quartile	0.6640
10.0%		0.6520
2.5%		0.6328
0.5%		0.5692
0.0%	minimum	0.4190

Moments

Mean	0.6751798
Std Dev	0.0316071
Std Err Mean	0.0011845
upper 95% Mean	0.6775054
lower 95% Mean	0.6728542
N	712

Exhibit A28. Histograms and Descriptive Statistics for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

Al (wt%)



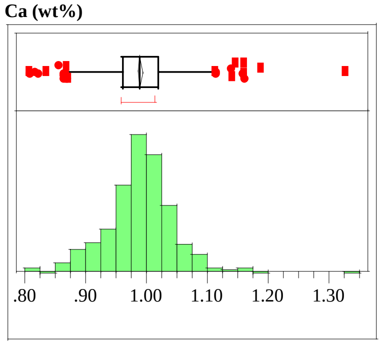
Quantiles

100.0%	maximum	2.8100
99.5%		2.7852
97.5%		2.6423
90.0%		2.5553
75.0%	quartile	2.5048
50.0%	median	2.4560
25.0%	quartile	2.4150
10.0%		2.3807
2.5%		2.3168
0.5%		2.2539
0.0%	minimum	2.2190

Moments

Mean	2.464797
Std Dev	0.0772526
Std Err Mean	0.0031644
upper 95% Mean	2.4710117
lower 95% Mean	2.4585823
N	596

Ca (wt%)



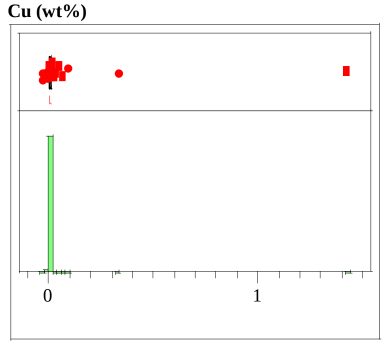
Quantiles

100.0%	maximum	1.3260
99.5%		1.1634
97.5%		1.0991
90.0%		1.0500
75.0%	quartile	1.0200
50.0%	median	0.9900
25.0%	quartile	0.9610
10.0%		0.9190
2.5%		0.8758
0.5%		0.8179
0.0%	minimum	0.8080

Moments

Mean	0.9894832
Std Dev	0.0551448
Std Err Mean	0.0022588
upper 95% Mean	0.9939194
lower 95% Mean	0.985047
N	596

Cu (wt%)



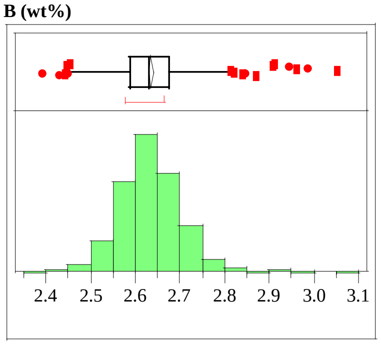
Quantiles

100.0%	maximum	1.424
99.5%		0.100
97.5%		0.018
90.0%		0.012
75.0%	quartile	0.009
50.0%	median	0.007
25.0%	quartile	0.005
10.0%		0.003
2.5%		0.000
0.5%		-0.006
0.0%	minimum	-0.026

Moments

Mean	0.010146
Std Dev	0.0599259
Std Err Mean	0.0024547
upper 95% Mean	0.0149668
lower 95% Mean	0.0053251
N	596

B (wt%)



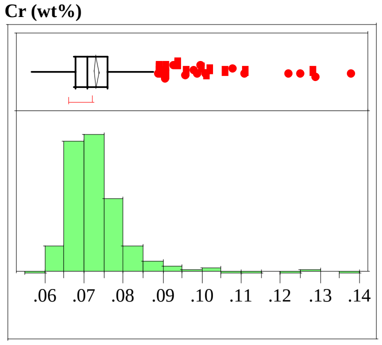
Quantiles

100.0%	maximum	3.0510
99.5%		2.9624
97.5%		2.7864
90.0%		2.7196
75.0%	quartile	2.6770
50.0%	median	2.6315
25.0%	quartile	2.5880
10.0%		2.5497
2.5%		2.4949
0.5%		2.4409
0.0%	minimum	2.3940

Moments

Mean	2.6348054
Std Dev	0.0745982
Std Err Mean	0.0030557
upper 95% Mean	2.6408066
lower 95% Mean	2.6288042
N	596

Cr (wt%)



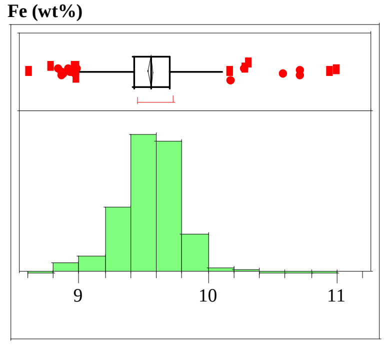
Quantiles

100.0%	maximum	0.13800
99.5%		0.12801
97.5%		0.10000
90.0%		0.08200
75.0%	quartile	0.07600
50.0%	median	0.07100
25.0%	quartile	0.06800
10.0%		0.06600
2.5%		0.06300
0.5%		0.06096
0.0%	minimum	0.05700

Moments

Mean	0.0732164
Std Dev	0.0090257
Std Err Mean	0.0003697
upper 95% Mean	0.0739425
lower 95% Mean	0.0724904
N	596

Fe (wt%)



Quantiles

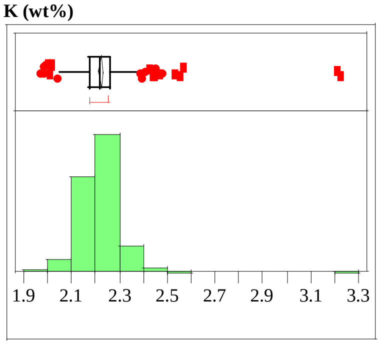
100.0%	maximum	10.999
99.5%		10.721
97.5%		10.041
90.0%		9.832
75.0%	quartile	9.705
50.0%	median	9.562
25.0%	quartile	9.422
10.0%		9.244
2.5%		8.982
0.5%		8.847
0.0%	minimum	8.610

Moments

Mean	9.5570856
Std Dev	0.2610757
Std Err Mean	0.0106941
upper 95% Mean	9.5780883
lower 95% Mean	9.5360828
N	596

Exhibit A28. Histograms and Descriptive Statistics for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

K (wt%)



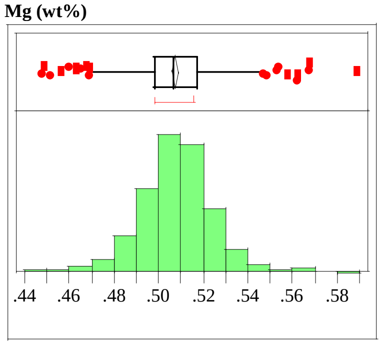
Quantiles

100.0%	maximum	3.2270
99.5%		2.5747
97.5%		2.3961
90.0%		2.3073
75.0%	quartile	2.2600
50.0%	median	2.2185
25.0%	quartile	2.1750
10.0%		2.1354
2.5%		2.0629
0.5%		1.9900
0.0%	minimum	1.9720

Moments

Mean	2.2221342
Std Dev	0.0954932
Std Err Mean	0.0039116
upper 95% Mean	2.2298164
lower 95% Mean	2.2144521
N	596

Mg (wt%)



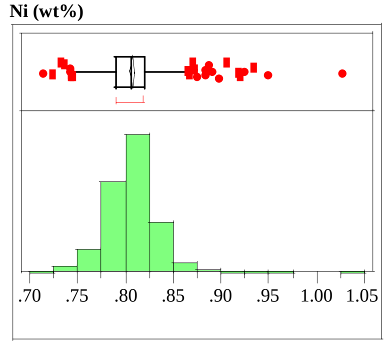
Quantiles

100.0%	maximum	0.58900
99.5%		0.56800
97.5%		0.54115
90.0%		0.52700
75.0%	quartile	0.51700
50.0%	median	0.50700
25.0%	quartile	0.49800
10.0%		0.48800
2.5%		0.47400
0.5%		0.45196
0.0%	minimum	0.44800

Moments

Mean	0.5073909
Std Dev	0.0165256
Std Err Mean	0.0006769
upper 95% Mean	0.5087204
lower 95% Mean	0.5060615
N	596

Ni (wt%)



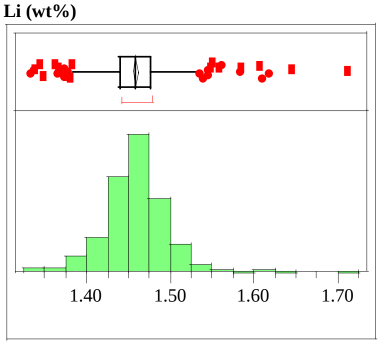
Quantiles

100.0%	maximum	1.0280
99.5%		0.9352
97.5%		0.8720
90.0%		0.8380
75.0%	quartile	0.8197
50.0%	median	0.8060
25.0%	quartile	0.7900
10.0%		0.7757
2.5%		0.7520
0.5%		0.7329
0.0%	minimum	0.7150

Moments

Mean	0.807094
Std Dev	0.0292767
Std Err Mean	0.0011992
upper 95% Mean	0.8094492
lower 95% Mean	0.8047387
N	596

Li (wt%)



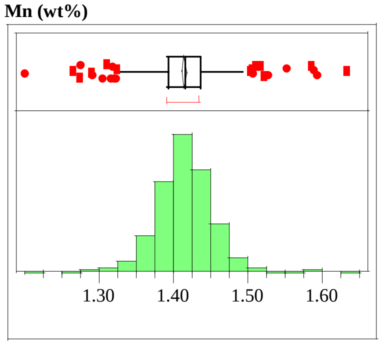
Quantiles

100.0%	maximum	1.7120
99.5%		1.6194
97.5%		1.5373
90.0%		1.5000
75.0%	quartile	1.4770
50.0%	median	1.4590
25.0%	quartile	1.4400
10.0%		1.4157
2.5%		1.3768
0.5%		1.3390
0.0%	minimum	1.3340

Moments

Mean	1.4590789
Std Dev	0.0385957
Std Err Mean	0.0015809
upper 95% Mean	1.4621838
lower 95% Mean	1.455974
N	596

Mn (wt%)



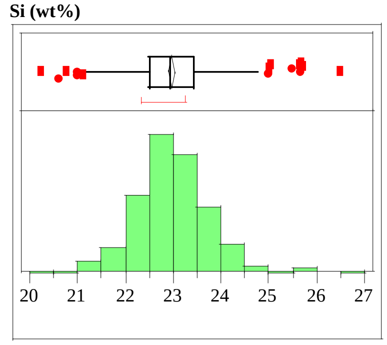
Quantiles

100.0%	maximum	1.6320
99.5%		1.5901
97.5%		1.4890
90.0%		1.4573
75.0%	quartile	1.4368
50.0%	median	1.4150
25.0%	quartile	1.3930
10.0%		1.3707
2.5%		1.3290
0.5%		1.2748
0.0%	minimum	1.2020

Moments

Mean	1.4144681
Std Dev	0.040994
Std Err Mean	0.0016792
upper 95% Mean	1.417766
lower 95% Mean	1.4111703
N	596

Si (wt%)



Quantiles

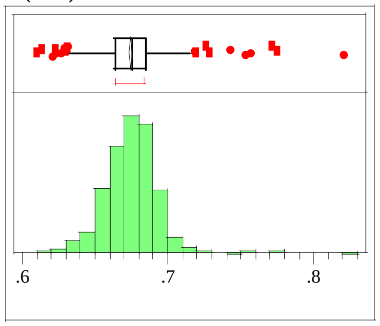
100.0%	maximum	26.500
99.5%		25.683
97.5%		24.516
90.0%		23.902
75.0%	quartile	23.439
50.0%	median	22.934
25.0%	quartile	22.512
10.0%		22.089
2.5%		21.420
0.5%		20.752
0.0%	minimum	20.218

Moments

Mean	22.977993
Std Dev	0.7698535
Std Err Mean	0.0315344
upper 95% Mean	23.039926
lower 95% Mean	22.916061
N	596

Exhibit A28. Histograms and Descriptive Statistics for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

Ti (wt%)



Quantiles

100.0%	maximum	0.82100
99.5%		0.77106
97.5%		0.70907
90.0%		0.69400
75.0%	quartile	0.68500
50.0%	median	0.67500
25.0%	quartile	0.66400
10.0%		0.65270
2.5%		0.63492
0.5%		0.62088
0.0%	minimum	0.61000

Moments

Mean	0.6744916
Std Dev	0.0194301
Std Err Mean	0.0007959
upper 95% Mean	0.6760547
lower 95% Mean	0.6729285
N	596

Exhibit A29. Components of Variance for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

Response Al (wt%)
Summary of Fit

RSquare	0.642597
RSquare Adj	0.286528
Root Mean Square Error	0.06554
Mean of Response	2.46686
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	2.0697860	0.007752	1.8047
Error	268	1.1511825	0.004295	Prob > F
C. Total	535	3.2209685		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001728	28.691
Residual	0.004295	71.309
Total	0.006024	100.000

These estimates based on equating Mean Squares to Expected Value.

Response B (wt%)
Summary of Fit

RSquare	0.566521
RSquare Adj	0.13466
Root Mean Square Error	0.068939
Mean of Response	2.635424
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	1.6646354	0.006235	1.3118
Error	268	1.2737095	0.004753	Prob > F
C. Total	535	2.9383449		0.0134

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000741	13.488
Residual	0.004753	86.512
Total	0.005494	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ca (wt%)
Summary of Fit

RSquare	0.695905
RSquare Adj	0.392945
Root Mean Square Error	0.04269
Mean of Response	0.990711
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	1.1176987	0.004186	2.2970
Error	268	0.4884095	0.001822	Prob > F
C. Total	535	1.6061082		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.001182	39.339
Residual	0.001822	60.661
Total	0.003004	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cr (wt%)
Summary of Fit

RSquare	0.678199
RSquare Adj	0.357598
Root Mean Square Error	0.00708
Mean of Response	0.073149
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.02830806	0.000106	2.1154
Error	268	0.01343200	0.000050	Prob > F
C. Total	535	0.04174006		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000028	35.803
Residual	0.00005	64.197
Total	0.000078	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Cu (wt%)
Summary of Fit

RSquare	0.499352
RSquare Adj	0.000571
Root Mean Square Error	0.063157
Mean of Response	0.010494
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	1.0662265	0.003993	1.0011
Error	268	1.0689955	0.003989	Prob > F
C. Total	535	2.1352220		0.4962

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000002	0.057
Residual	0.003989	99.943
Total	0.003991	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Fe (wt%)
Summary of Fit

RSquare	0.540001
RSquare Adj	0.081718
Root Mean Square Error	0.24665
Mean of Response	9.563257
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	19.139734	0.071684	1.1783
Error	268	16.304158	0.060836	Prob > F
C. Total	535	35.443892		0.0901

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.005424	8.186
Residual	0.060836	91.814
Total	0.06626	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A29. Components of Variance for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

Response K (wt%)
Summary of Fit

RSquare	0.798448
RSquare Adj	0.597647
Root Mean Square Error	0.061952
Mean of Response	2.223088
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	4.0747884	0.015261	3.9763
Error	268	1.0286005	0.003838	Prob > F
C. Total	535	5.1033889		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.005712	59.810
Residual	0.003838	40.190
Total	0.00955	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mn (wt%)
Summary of Fit

RSquare	0.550444
RSquare Adj	0.102565
Root Mean Square Error	0.03863
Mean of Response	1.414802
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.48968204	0.001834	1.2290
Error	268	0.39993100	0.001492	Prob > F
C. Total	535	0.88961304		0.0462

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000171	10.274
Residual	0.001492	89.726
Total	0.001663	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Li (wt%)
Summary of Fit

RSquare	0.55432
RSquare Adj	0.110304
Root Mean Square Error	0.036186
Mean of Response	1.46064
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.43646601	0.001635	1.2484
Error	268	0.35092350	0.001309	Prob > F
C. Total	535	0.78738951		0.0351

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000163	11.049
Residual	0.001309	88.951
Total	0.001472	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Ni (wt%)
Summary of Fit

RSquare	0.548413
RSquare Adj	0.098511
Root Mean Square Error	0.027995
Mean of Response	0.807976
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.25506718	0.000955	1.2190
Error	268	0.21003350	0.000784	Prob > F
C. Total	535	0.46510068		0.0530

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000086	9.868
Residual	0.000784	90.132
Total	0.00087	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Mg (wt%)
Summary of Fit

RSquare	0.617697
RSquare Adj	0.23682
Root Mean Square Error	0.014229
Mean of Response	0.50778
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.08766602	0.000328	1.6218
Error	268	0.05425800	0.000202	Prob > F
C. Total	535	0.14192402		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000063	23.716
Residual	0.000202	76.284
Total	0.000265	100.000

These estimates based on equating Mean Squares to Expected Value.

Response Si (wt%)
Summary of Fit

RSquare	0.702951
RSquare Adj	0.40701
Root Mean Square Error	0.590752
Mean of Response	22.98275
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	221.33015	0.828952	2.3753
Error	268	93.52862	0.348987	Prob > F
C. Total	535	314.85877		<.0001

Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.239982	40.746
Residual	0.348987	59.254
Total	0.58897	100.000

These estimates based on equating Mean Squares to Expected Value.

Exhibit A29. Components of Variance for the ARG-1 Measurements from SME and MFT Batches for Fusion Prep

Response Ti (wt%)
Summary of Fit

RSquare	0.535873
RSquare Adj	0.073478
Root Mean Square Error	0.018632
Mean of Response	0.674841
Observations (or Sum Wgts)	536

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	267	0.10742302	0.000402	1.1589
Error	268	0.09304050	0.000347	Prob > F
C. Total	535	0.20046352		0.1142

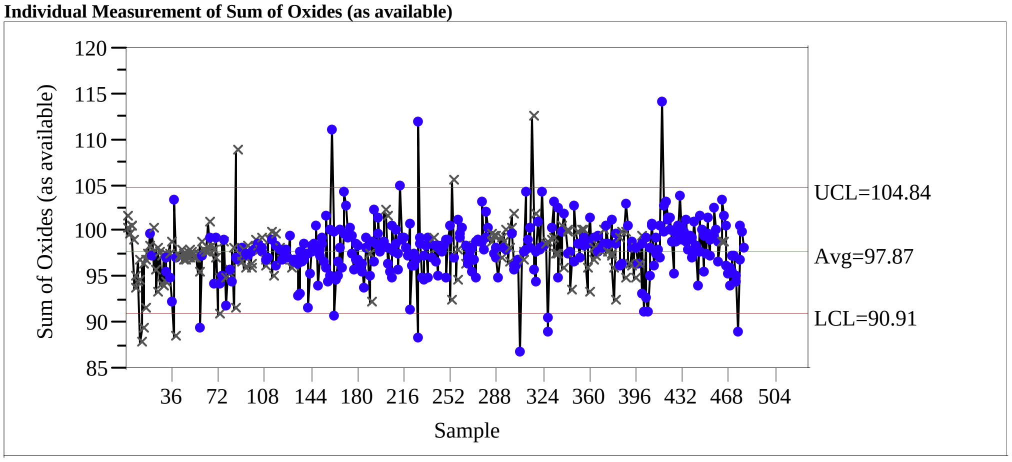
Variance Component Estimates

Component	Var Comp Est	Percent of Total
Tank&Batch&Random	0.000028	7.361
Residual	0.000347	92.639
Total	0.000375	100.000

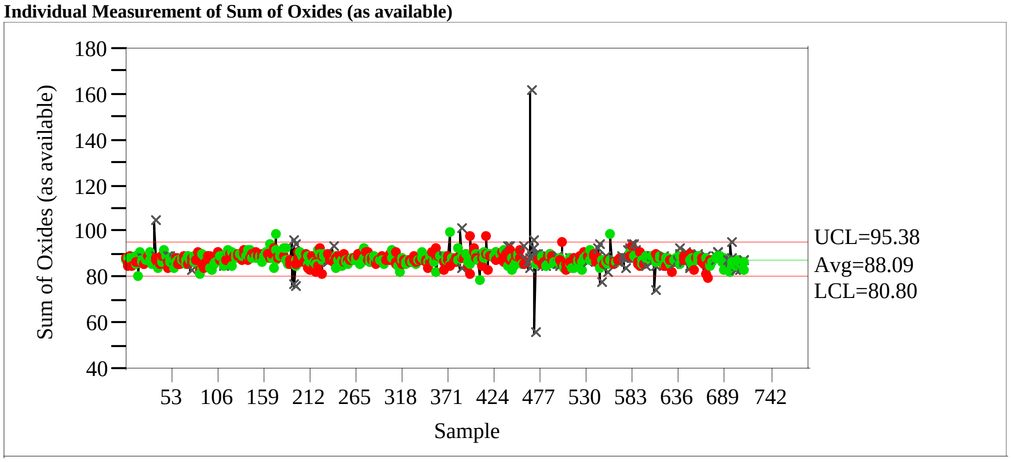
These estimates based on equating Mean Squares to Expected Value.

Exhibit A30. Time Series Plots as Control Charts for the ARG-1 Sum of Oxides in Analytical Sequence by Preparation Method

Method=Cold Chem
Control Chart
Individual Measurement of Sum of Oxides (as available)



Method=Fusion
Control Chart
Individual Measurement of Sum of Oxides (as available)



Method=Mixed Acid
Control Chart
Individual Measurement of Sum of Oxides (as available)

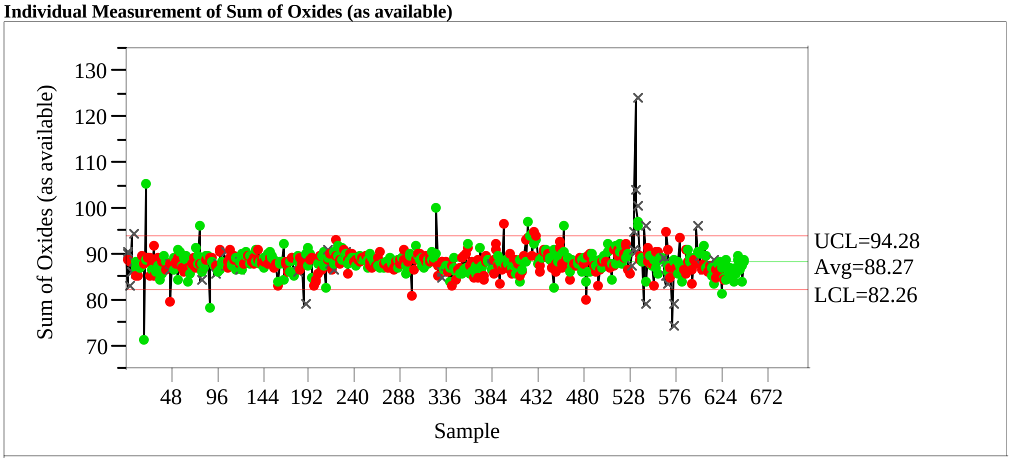
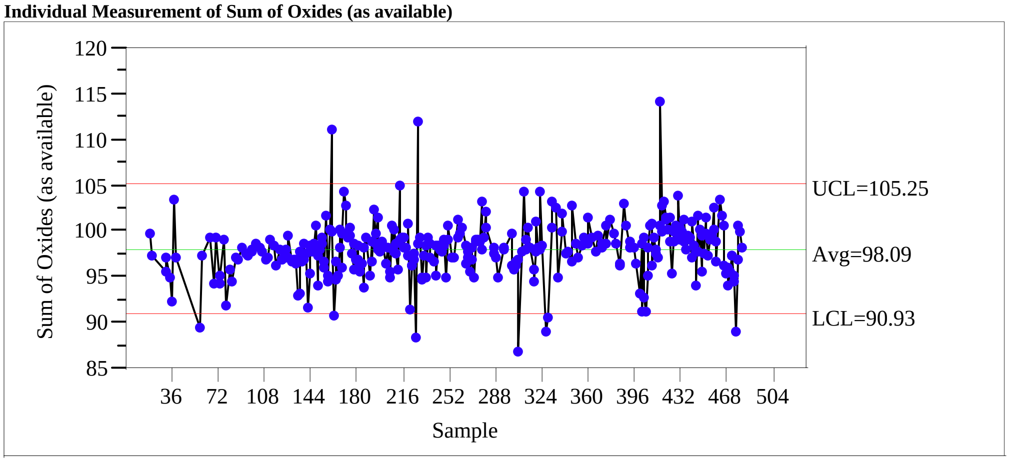
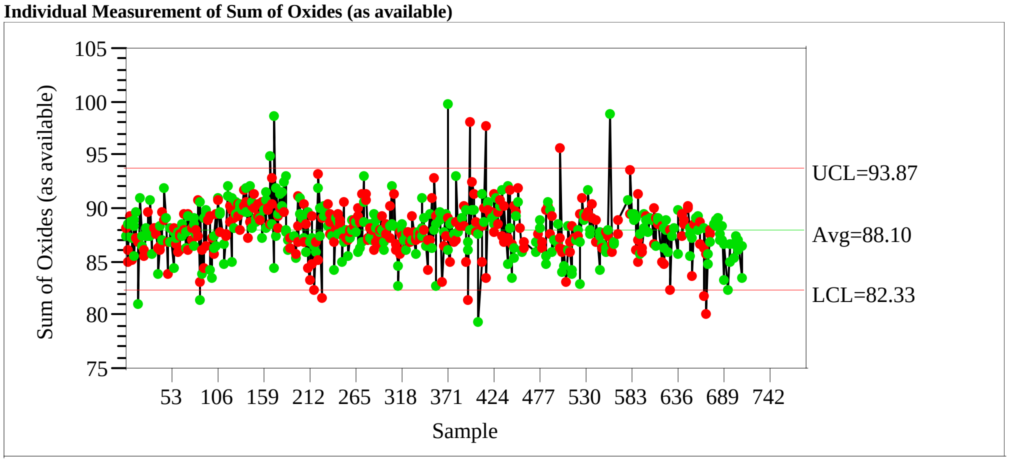


Exhibit A31. Time Series Plots as Control Charts for the ARG-1 Sum of Oxides in Analytical Sequence by Preparation Method with Process Batch Information

Method=Cold Chem
Control Chart
Individual Measurement of Sum of Oxides (as available)



Method=Fusion
Control Chart
Individual Measurement of Sum of Oxides (as available)



Method=Mixed Acid
Control Chart
Individual Measurement of Sum of Oxides (as available)

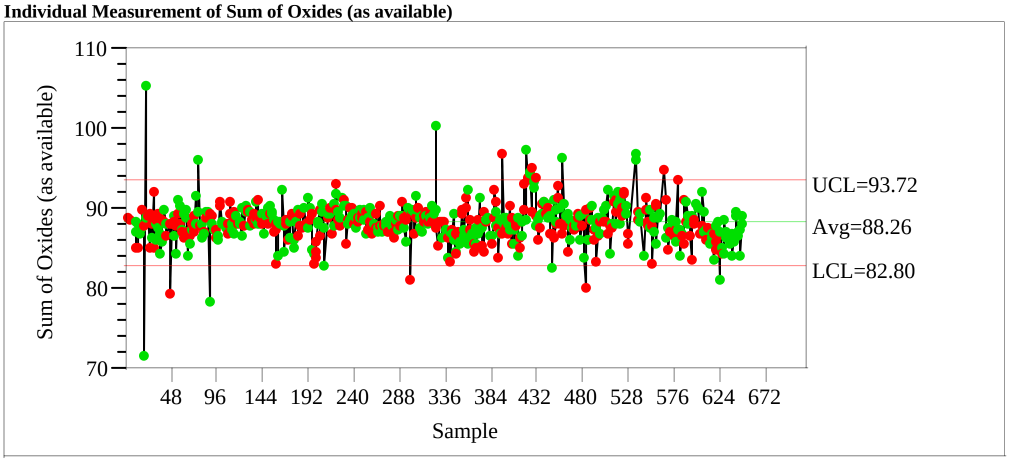
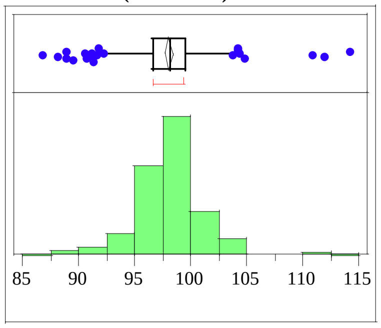


Exhibit A32. Histograms and Descriptive Statistics for the ARG-1 Sum of Oxides in Analytical Sequence by Preparation Method with Process Batch Information

Descriptor=Cold Chem-SRAT-With Batch
Sum of Oxides (as available)



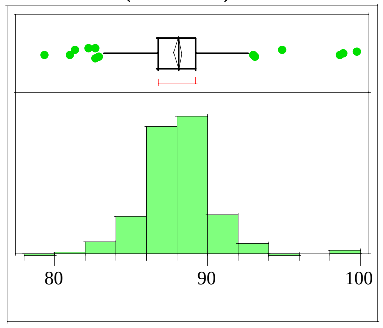
Quantiles

100.0%	maximum	114.27
99.5%		112.91
97.5%		103.87
90.0%		101.32
75.0%	quartile	99.53
50.0%	median	98.19
25.0%	quartile	96.71
10.0%		94.92
2.5%		91.20
0.5%		87.76
0.0%	minimum	86.85

Moments

Mean	98.089771
Std Dev	3.0383525
Std Err Mean	0.1690585
upper 95% Mean	98.42237
lower 95% Mean	97.757172
N	323

Descriptor=Fusion-SME-With Batch
Sum of Oxides (as available)



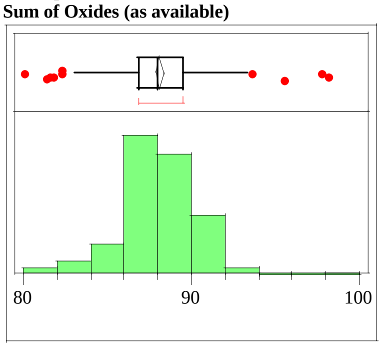
Quantiles

100.0%	maximum	99.873
99.5%		99.342
97.5%		92.612
90.0%		90.788
75.0%	quartile	89.256
50.0%	median	88.097
25.0%	quartile	86.813
10.0%		85.429
2.5%		83.333
0.5%		80.372
0.0%	minimum	79.346

Moments

Mean	88.08721
Std Dev	2.4180965
Std Err Mean	0.1356001
upper 95% Mean	88.354
lower 95% Mean	87.82042
N	318

Descriptor=Fusion-MFT-With Batch
Sum of Oxides (as available)



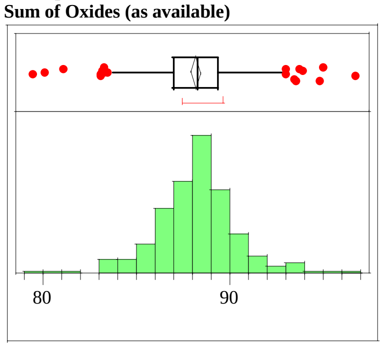
Quantiles

100.0%	maximum	98.236
99.5%		98.075
97.5%		92.893
90.0%		90.653
75.0%	quartile	89.536
50.0%	median	88.018
25.0%	quartile	86.874
10.0%		85.747
2.5%		83.067
0.5%		80.656
0.0%	minimum	80.143

Moments

Mean	88.122365
Std Dev	2.3351801
Std Err Mean	0.1400548
upper 95% Mean	88.398072
lower 95% Mean	87.846658
N	278

Descriptor=Mixed Acid-MFT-With Batch
Sum of Oxides (as available)



Quantiles

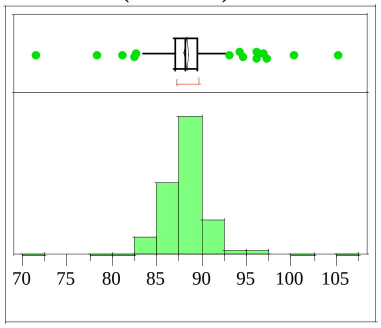
100.0%	maximum	96.755
99.5%		96.094
97.5%		93.513
90.0%		90.830
75.0%	quartile	89.330
50.0%	median	88.251
25.0%	quartile	87.009
10.0%		85.545
2.5%		83.273
0.5%		79.743
0.0%	minimum	79.494

Moments

Mean	88.20173
Std Dev	2.2359544
Std Err Mean	0.1341036
upper 95% Mean	88.465722
lower 95% Mean	87.937738
N	278

Exhibit A32. Histograms and Descriptive Statistics for the ARG-1 Sum of Oxides in Analytical Sequence by Preparation Method with Process Batch Information

Descriptor=Mixed Acid-SME-With Batch
Sum of Oxides (as available)



Quantiles

100.0%	maximum	105.31
99.5%		102.36
97.5%		94.69
90.0%		90.70
75.0%	quartile	89.47
50.0%	median	88.25
25.0%	quartile	86.98
10.0%		85.72
2.5%		84.00
0.5%		75.63
0.0%	minimum	71.55

Moments

Mean	88.303786
Std Dev	2.7229765
Std Err Mean	0.1524574
upper 95% Mean	88.603739
lower 95% Mean	88.003833
N	319