

# Test Group Summary Report

## C02A Metals in Water – Full Range

### October 2023

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**Issued: November 27, 2023**

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## 1.0 The Proficiency Testing Report

The Proficiency Testing Report consists of two parts.

- *PTC Proficiency Testing Report*: This report contains participant-specific data and other confidential information. This report is emailed to participants at the end of the PT round.
- *Test Group Summary Report*: A Test Group Summary Report is created for each quantified test group at the end of the PT round. These reports contain more detailed information on the round than is found in the participant-specific PTC Proficiency Testing Report. These reports do not contain any confidential information and are made available on the PTC web site.

## 2.0 Definitions

The participant-specific PTC Proficiency Testing Report contains some terms that new participants may not be familiar with.

<i>Code:</i>	The registration code that is unique to each analyte that a participant is registered for.
<i>App:</i>	If a participant is accredited by CALA, this three-digit number is the appendix number that the accredited method is assigned to.
<i>N:</i>	The number of participants results that were used to calculate the summary statistics. This excludes qualified data (e.g., <) and any results that were flagged as outliers.
<i>Assigned:</i>	The Assigned Value is the robust mean of the reported results, outliers excluded. This is often referred to as the “target” value.
<i><math>\pm u</math>:</i>	The uncertainty of the assigned value.
<i>Reported:</i>	The result reported by the participant.
<i>s:</i>	The Standard Deviation of Proficiency Assessment (SDPA). This value is used to determine the acceptance limits for the PT evaluation.
<i>z-Score:</i>	A value assigned to each reported result that is a measure of the degree to which it deviates from the Assigned Value.
<i>Score:</i>	The composite score of the four results reported for each analyte. It is normalized to a score out of 100.
<i>Bias:</i>	A flag assigned if bias is detected using the re-scaled z-score procedure.

## 3.0 Scoring System

Participant performance is evaluated for each proficiency testing sample by a quantitative method that is consistent with ISO/IEC 17043 – *Conformity assessment- General requirements for the competence of proficiency testing providers*, the *International Harmonized Protocol for Proficiency Testing of (Chemical) Analytical Laboratories* (2006), and ISO 13528:2015 *Statistical methods for use in proficiency testing by interlaboratory comparisons*.

The following is a brief description of the evaluation procedure used by PTC. The detailed evaluation procedure is described in PROC09 – *PT Evaluation Procedure*, which is available on the PTC website [www.PTCanada.org](http://www.PTCanada.org)).

### 3.1 HOMOGENEITY AND STABILITY ASSESSMENT

Homogeneity and stability are assessed using participant data. Regression analysis is performed on reported result against order of sample production (Homogeneity) and reported result against date of analysis (Stability). If the slope is significantly different than zero for either then the Standard Deviation of Proficiency Assessment (s) is increased to minimize the impact.

### 3.2 THE Z SCORE

A "z-score" is calculated for each reported result as follows:

$$z - Score = \frac{(x - \bar{X})}{SDPA} \quad \text{where: } \begin{array}{l} x = \text{participant result;} \\ \bar{X} = \text{the Assigned Value;} \\ SDPA = \text{the Standard Deviation for Proficiency Assessment.} \end{array}$$

The assigned value  $\bar{X}$  is generally estimated from the inter-laboratory Robust mean after outliers due to obvious gross errors (e.g., reported in wrong units) have been removed.

The Standard Deviation for Proficiency Assessment, s, is determined as follows:

- The inter-laboratory Robust standard deviation ( $Stdev_{rob}$ ) is calculated using reported results, obvious outliers removed;
- The regression equation standard deviation ( $Stdev_{reg}$ ) is estimated from regression equations derived from previous studies (see PROC11- *PT Regression Equations* for details);
- The SDPA is the higher of  $Stdev_{rob}$  and  $Stdev_{reg}$ ;
- When a laboratory reports its detection limit, s will be estimated using a pooled variance procedure that uses both the inter-laboratory data and the reported detection limit.

### 3.2 COMPOSITE (PT) SCORE

Since each PT round involves four or two separate samples of distinct concentration for each test, it is necessary to calculate a composite PT score for each test to determine overall performance. The composite score is calculated by first averaging the absolute z-scores for the four results and then calculating a final score as  $100 + (-15 \times \text{avg } |z|)$ .

Acceptable PT Scores equal or exceed 70.

### 3.3 IDENTIFYING BIAS

The proficiency testing report provides flags for bias. These are determined using the re-scaled z-score procedure.

$$RSZ = \frac{\sum z}{\sqrt{N}} \quad \text{where } \begin{array}{l} z = \text{the z- score} \\ N = \text{the number of samples} \end{array}$$

Flags are assigned for each test group/parameter combination as follows:

$RSZ \geq -2$ and $\leq 2$	no flag assigned
$RSZ > 2$	H (High)
$RSZ > 3$	VH (Very High)
$RSZ < -2$	L (LOW)
$RSZ < -3$	VL (Very Low)

### 3.4 DEVIATIONS FROM EVALUATION PROCEDURE

Other than changes to the Standard Deviation of Proficiency Assessment due to homogeneity or stability flags, any deviation from the published evaluation procedure is described on the cover page(s) of the final *PTC Proficiency Testing Report*.

## 4.0 PT Round Specific Data Summary

The following pages provide more detailed information about the PT round indicated in the cover page of this report than is found in the participant-specific PTC Proficiency Testing Report. The graphical representations and the statistical summaries are based upon the data after outliers have been removed.

### 4.1 SUMMARY STATISTICS

In addition to some of the statistics found in the customer reports, this table includes additional summary statistics such as Median, different measures of dispersion, the number of outliers removed, the number of results in the Questionable range ( $|z|$  between 2 and 3) and the Unacceptable range ( $z > 3$ ), and whether a data set was flagged for Homogeneity or Stability. This section also includes sorted scatter plots of the data for each sample.

### 4.2 z - SCORE PLOTS

The z -scores for each sample are ranked in increasing order and plotted. When the data is normally distributed, the plot should show a slight sigmoidal curve, with an equal number of points above zero as below. Each bar in these plots is colour-coded to indicate the analytical method used by the participant.

### 4.3 KERNEL DENSITY PLOTS

Kernel density plots are generated for each data set. These plots are a graphical way to represent the overall data distribution and are used to visualize possible deviations from normality and unimodality.

### 4.4 STABILITY AND HOMOGENEITY PLOTS

Plots of reported result against analysis date, and reported result against order of bottling are displayed, along with the regression line. These regression analyses are used to determine if the SDPA should be adjusted due to homogeneity or stability.

### 4.5 BOX-AND-WHISKER PLOTS

Box-and-Whisker plots are another way to display the distribution of the data. The box denotes the first and third quartile and the whiskers are the 5<sup>th</sup> and 95<sup>th</sup> percentile.

### 4.6 HISTORIC COMPARISON PLOT

The Historic Comparison Plot is a plot of robust mean against robust standard deviation for the previous ten PT rounds as well as the current PT round. This plot can be used to identify possible changes in the sample formulation.

## ALUMINUM

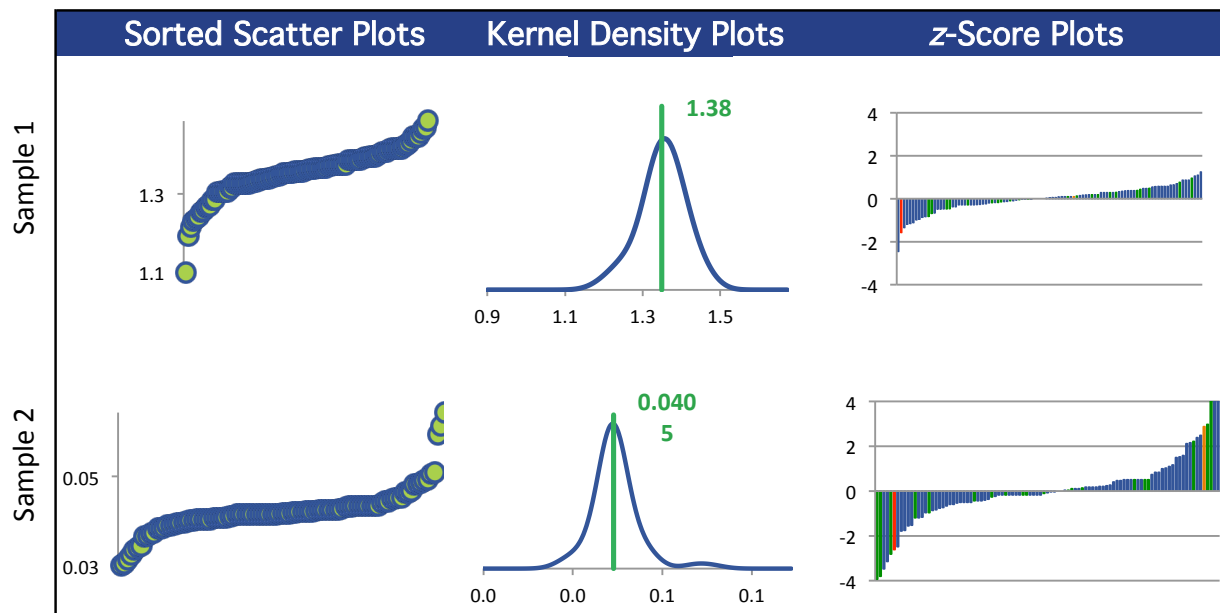
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	101	99	102	102
Median mg/L	1.39	0.0403	0.212	0.786
Robust Mean mg/L	1.38	0.0405	0.212	0.788
U mg/L	0.00658	0.000374	0.00115	0.00391
Robust Standard Deviation mg/L	0.0529	0.00298	0.00930	0.0316
Regression Standard Deviation mg/L	0.104	0.00303	0.0159	0.0591
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.104	0.00303	0.0159	0.0591
Outliers	2	1	1	1
$ z  > 3.0$	0	7	1	1
$2 <  z  < 3$	1	10	1	1

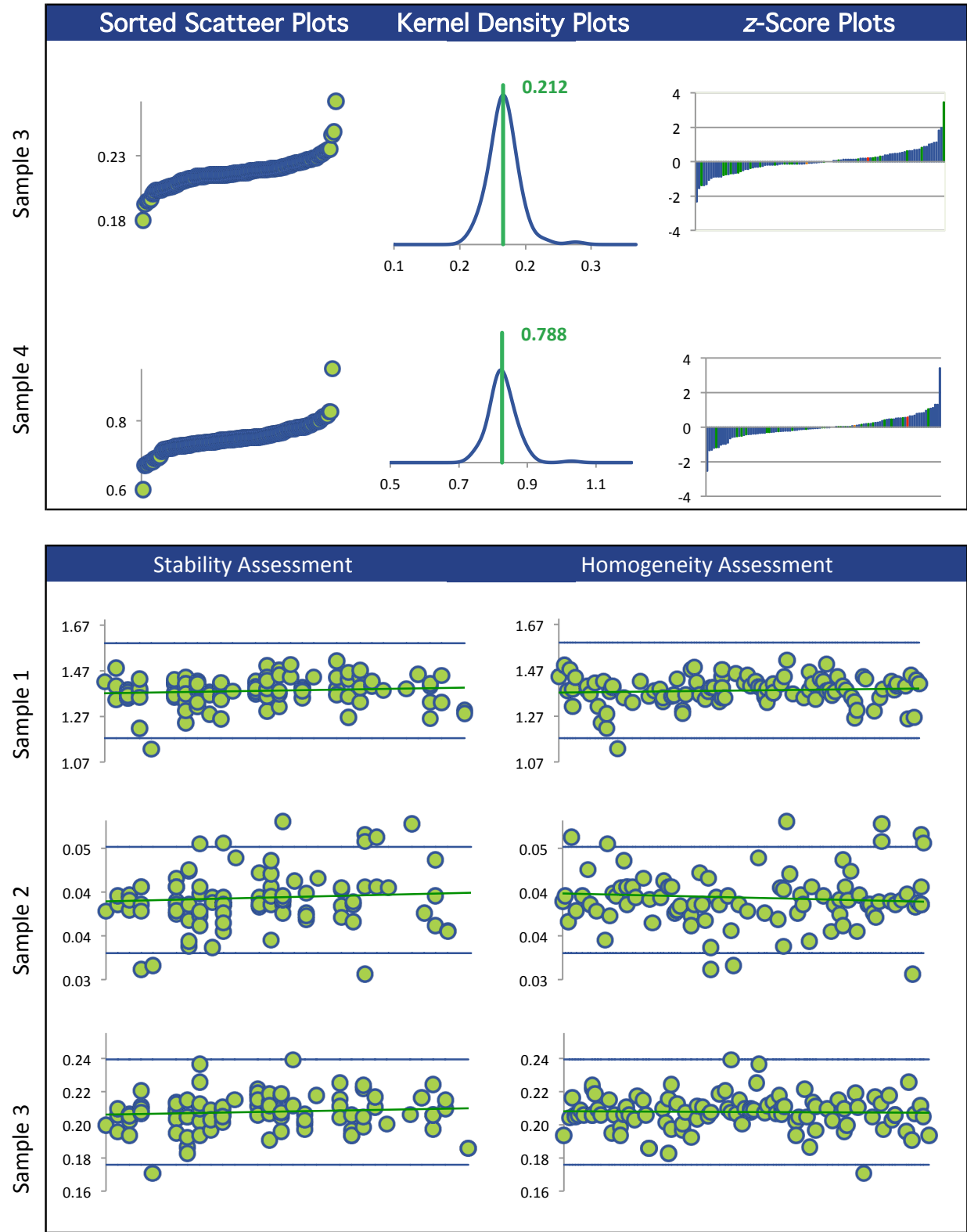
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	77	77	77	77
AAG (Red)	1	1	1	1
ICP/OES (Green)	22	20	23	23
AA (Orange)	1	1	1	1

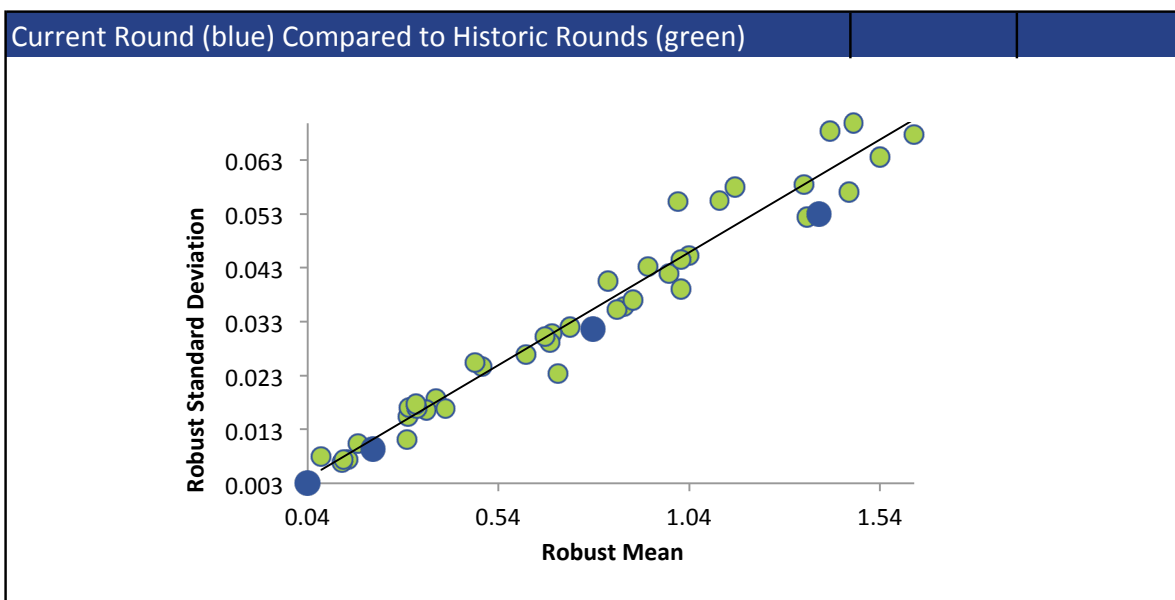
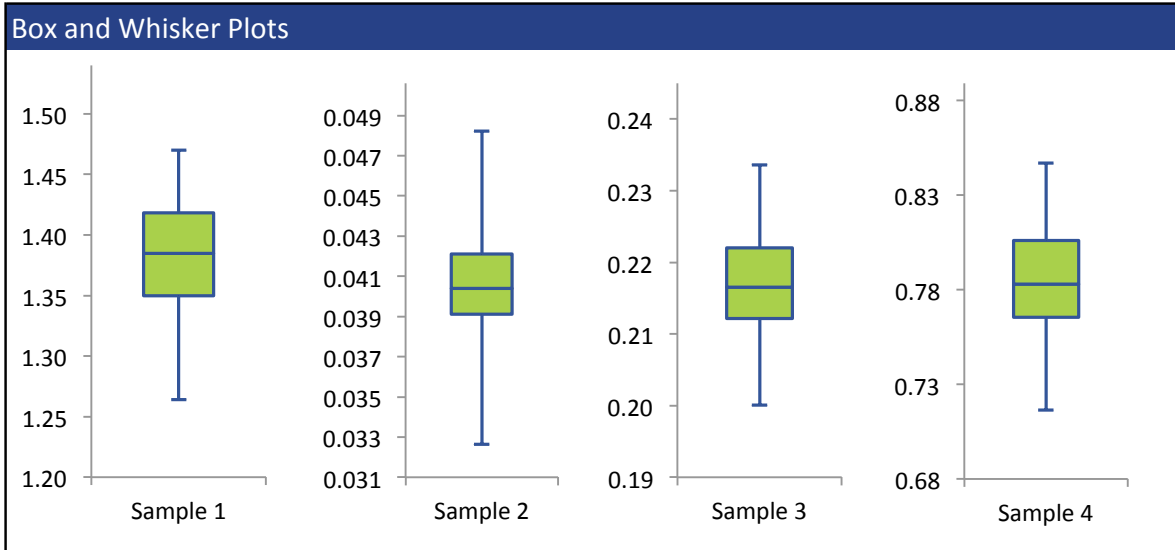
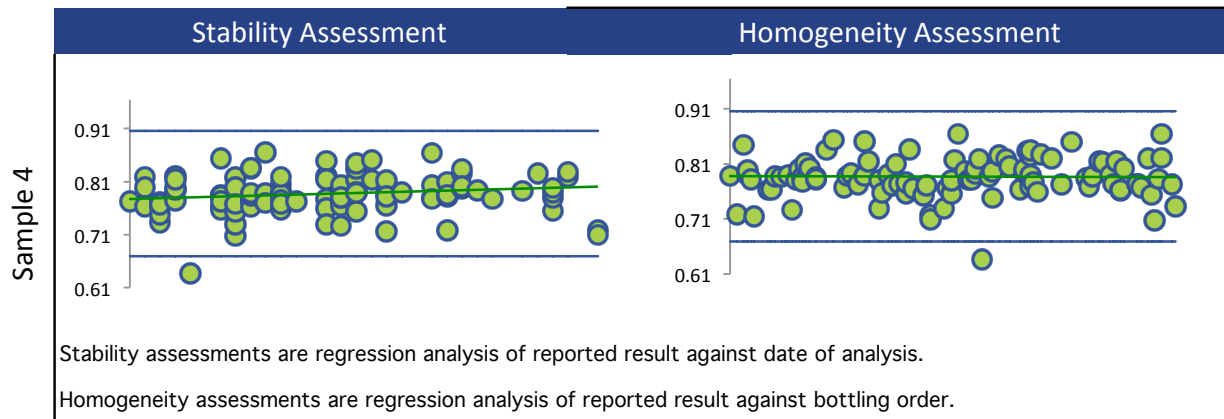
All summary stats and the plots below are based on the data excluding any flagged outliers



ALUMINUM



## ALUMINUM





## ANTIMONY

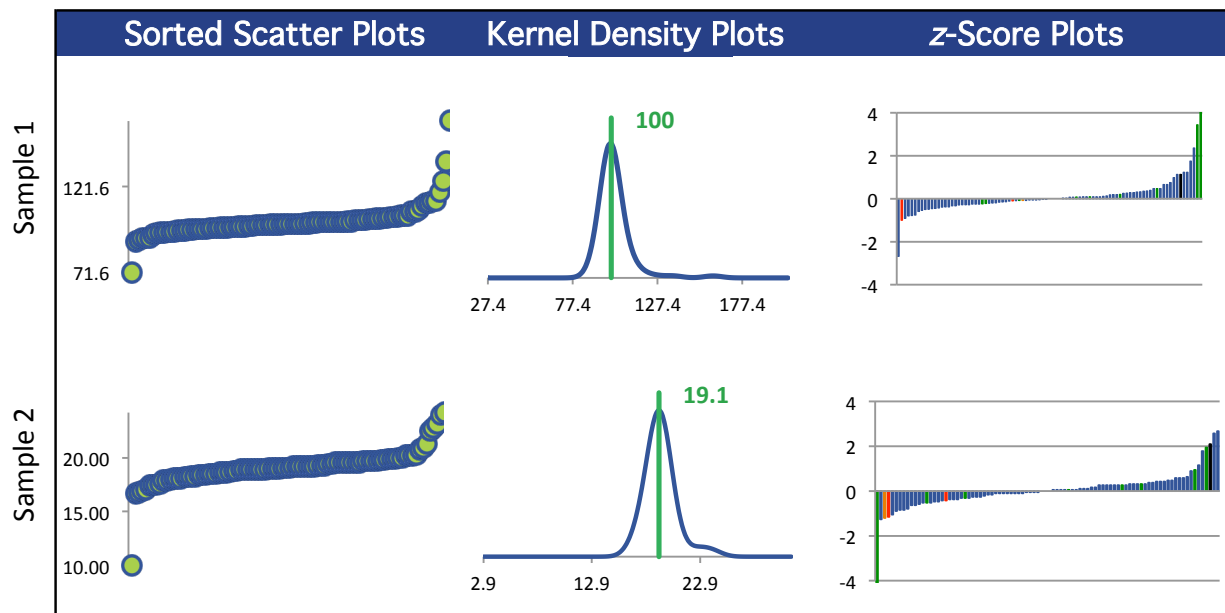
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	91	90	90	91
Median mg/L	100	19.1	35.4	50.9
Robust Mean mg/L	100	19.1	35.4	51.0
U mg/L	0.578	0.125	0.203	0.335
Robust Standard Deviation mg/L	4.41	0.947	1.54	2.56
Regression Standard Deviation mg/L	10.0	1.91	3.54	5.10
Stability Flag	Stability			
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	10.6	1.91	3.54	5.10
Outliers	1	1	1	1
$ z  > 3.0$	2	1	2	3
$2 <  z  < 3$	2	3	2	1

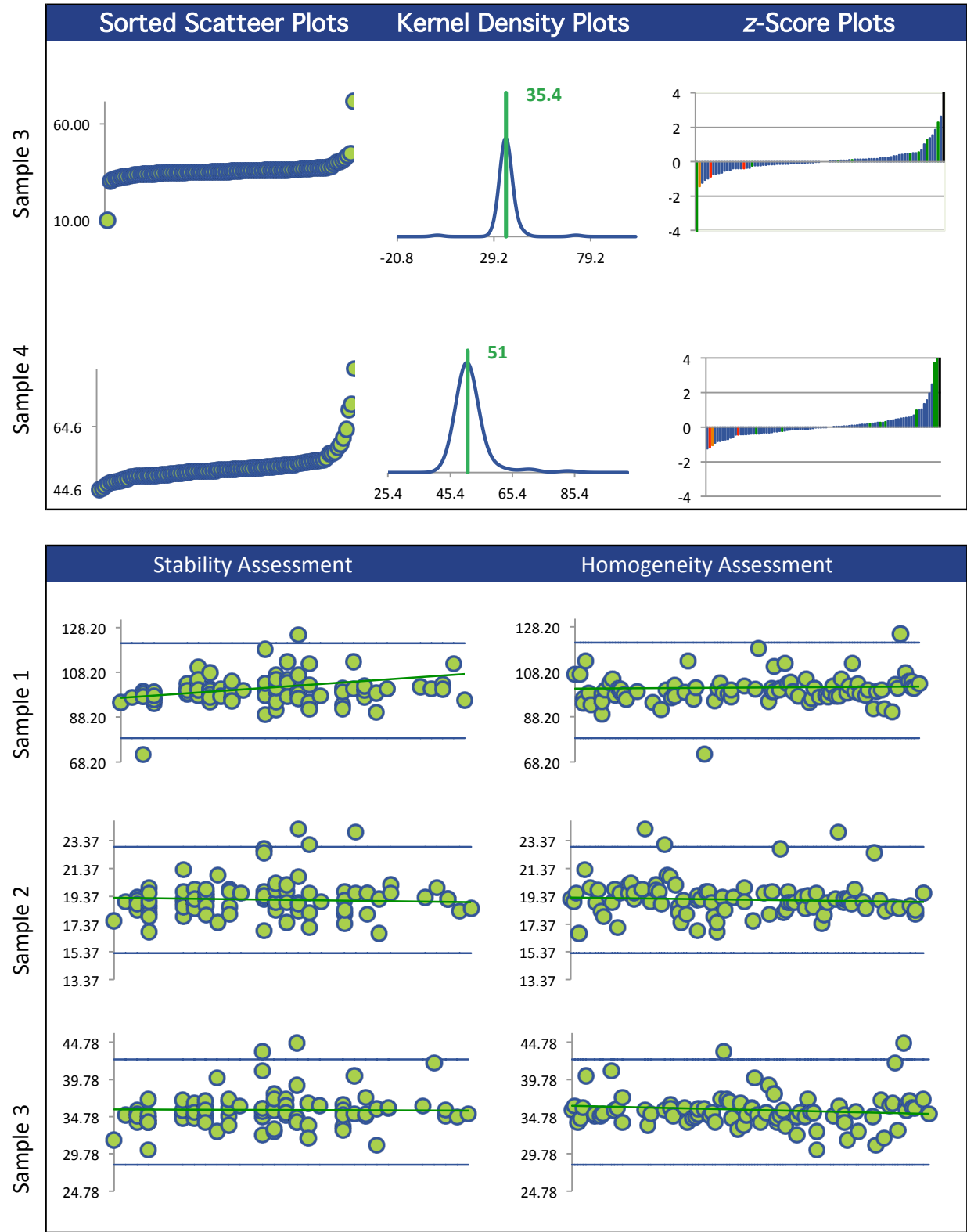
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	78	78	78	78
AAHY (Red)	2	2	2	2
ICP/OES (Green)	9	8	8	9
AAG (Orange)	1	1	1	1
ICPHY (Black)	1	1	1	1

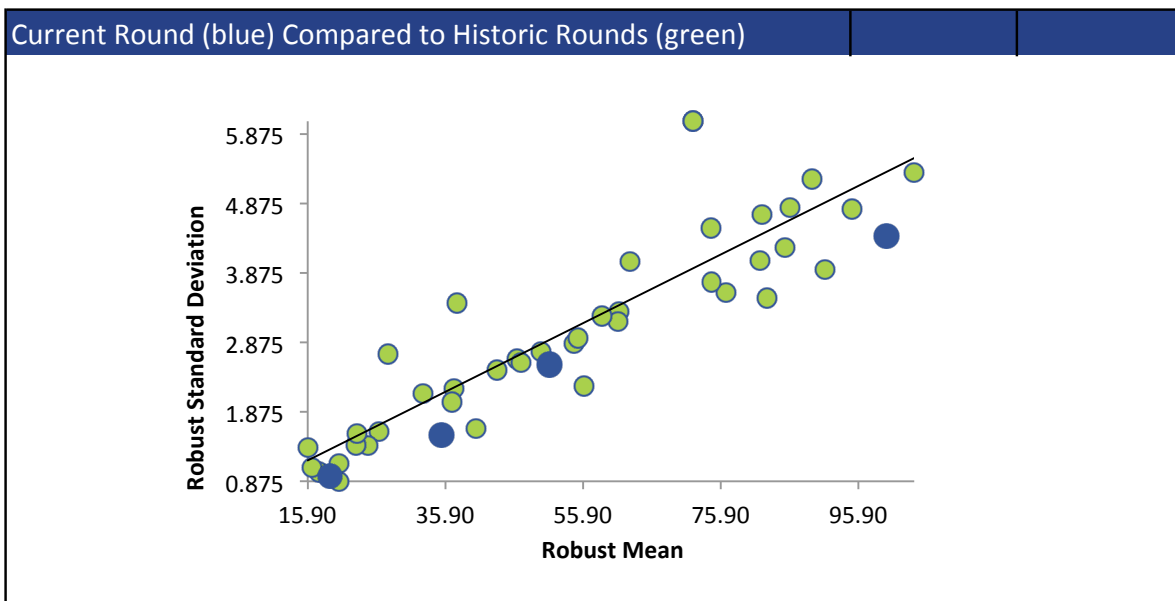
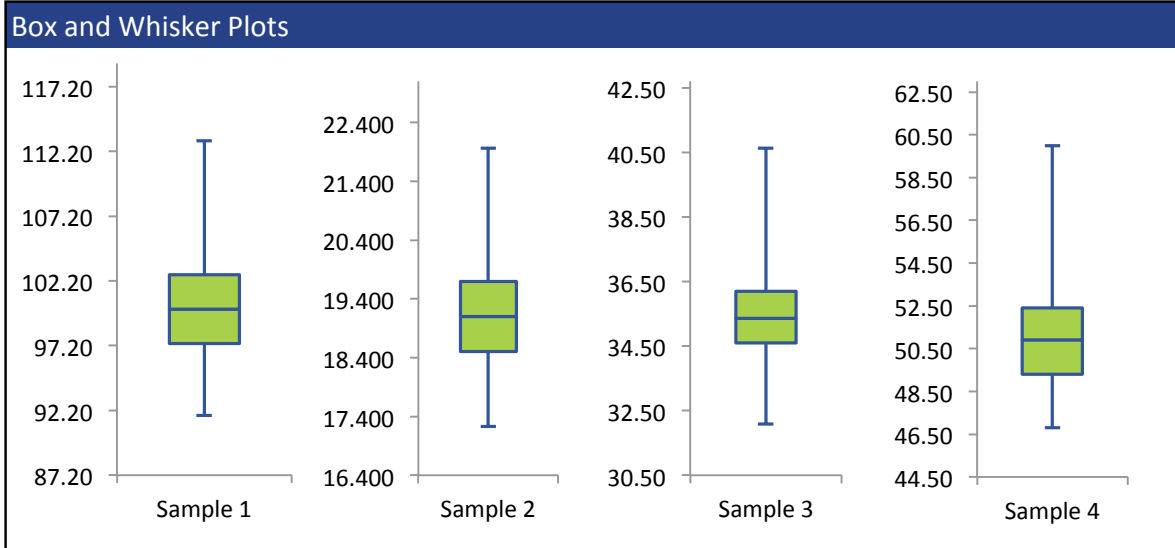
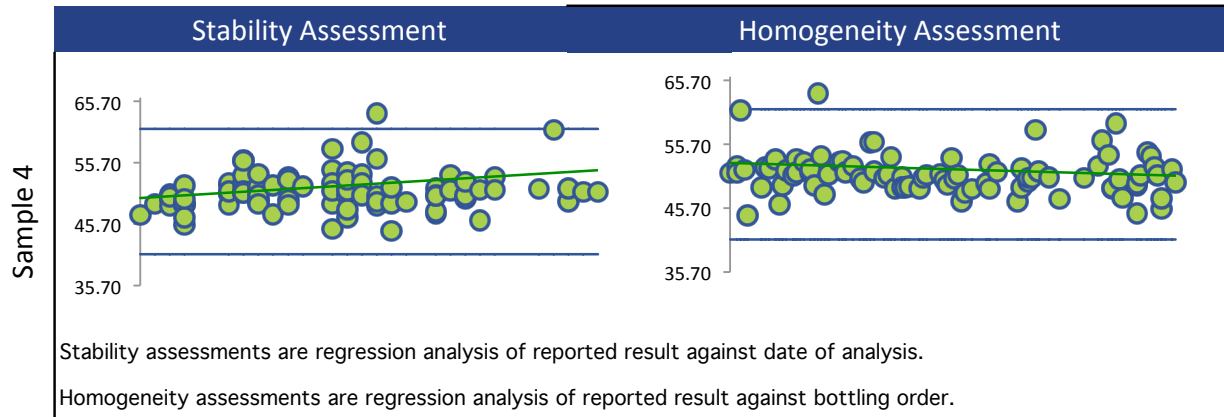
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ANTIMONY



## ANTIMONY



## ARSENIC

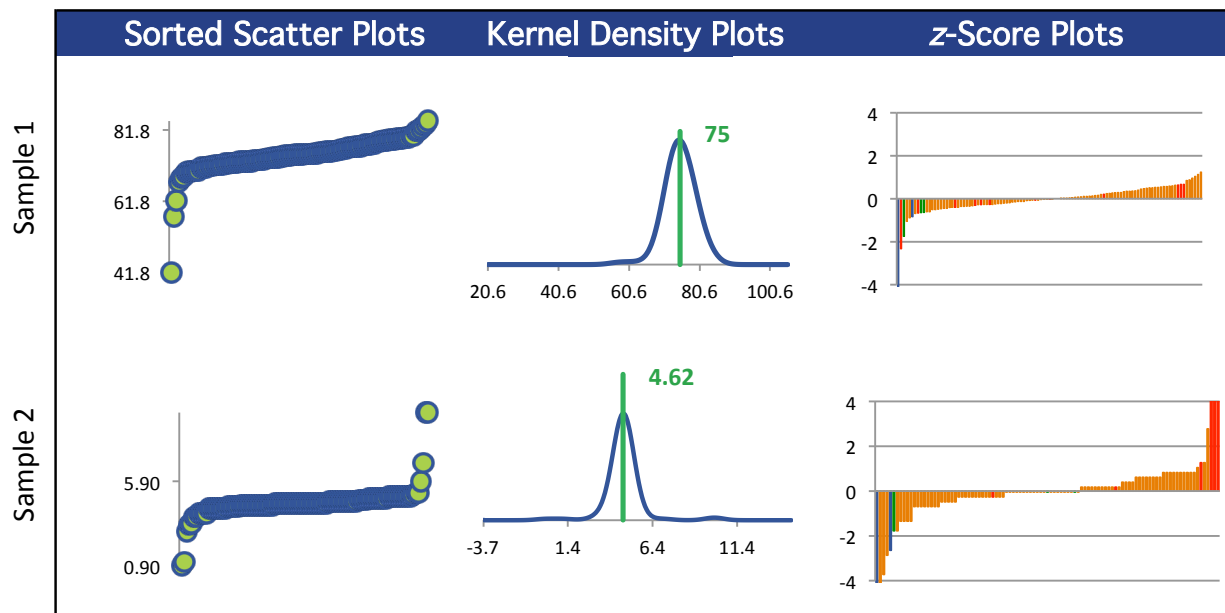
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	107	101	109	108
Median mg/L	74.9	4.60	43.9	76.0
Robust Mean mg/L	75.0	4.62	43.9	75.8
U mg/L	0.433	0.0383	0.269	0.409
Robust Standard Deviation mg/L	3.58	0.308	2.25	3.40
Regression Standard Deviation mg/L	7.50	0.462	4.39	7.58
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	7.50	0.462	4.39	7.58
Outliers	2	1	0	1
$ z  > 3.0$	1	6	3	1
$2 <  z  < 3$	1	3	0	0

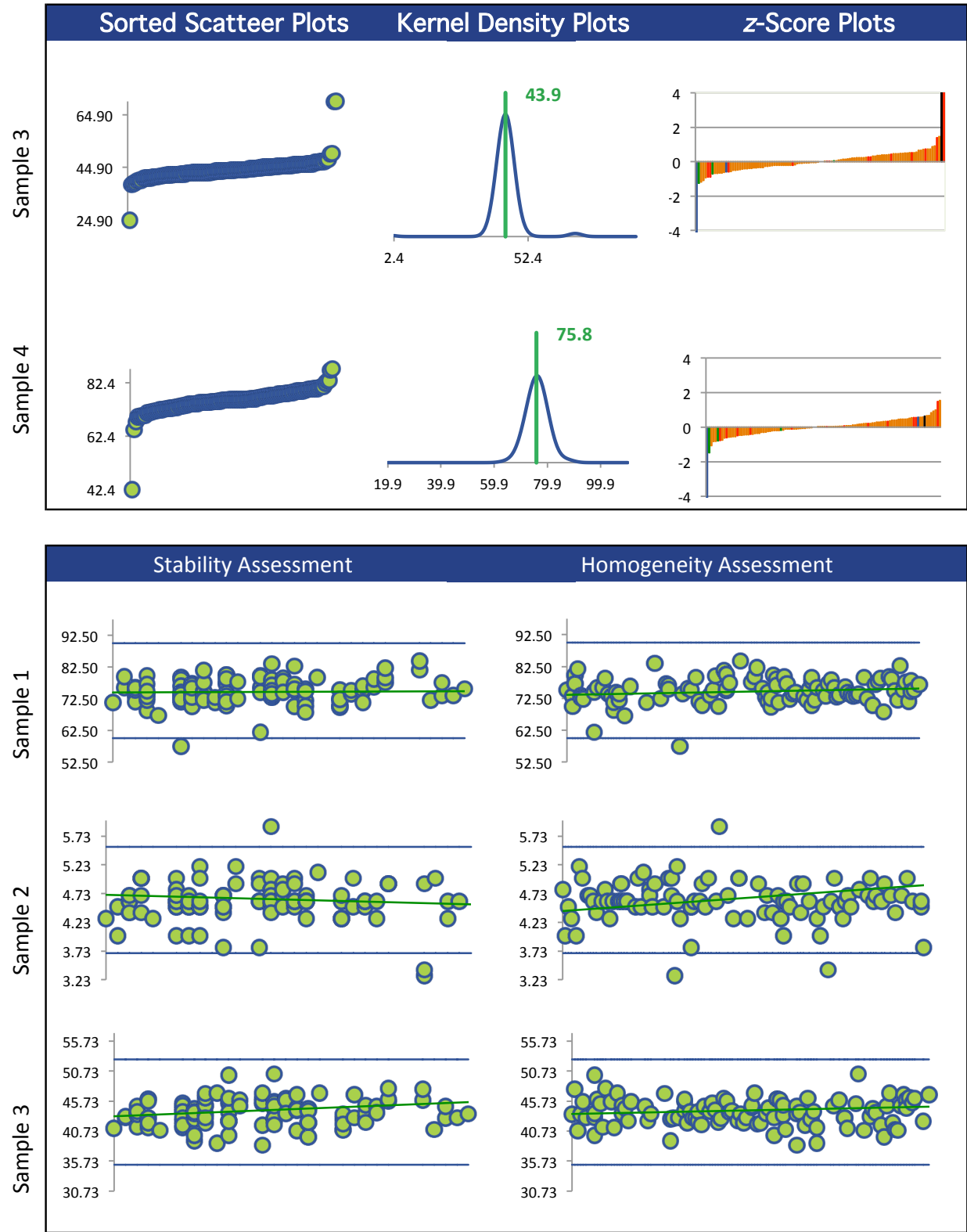
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AAG (Blue)	2	2	2	2
ICP/OES (Red)	12	6	13	12
AAHY (Green)	3	3	3	3
ICP/MS (Orange)	90	90	90	90
ICPHY (Black)	0	0	1	1

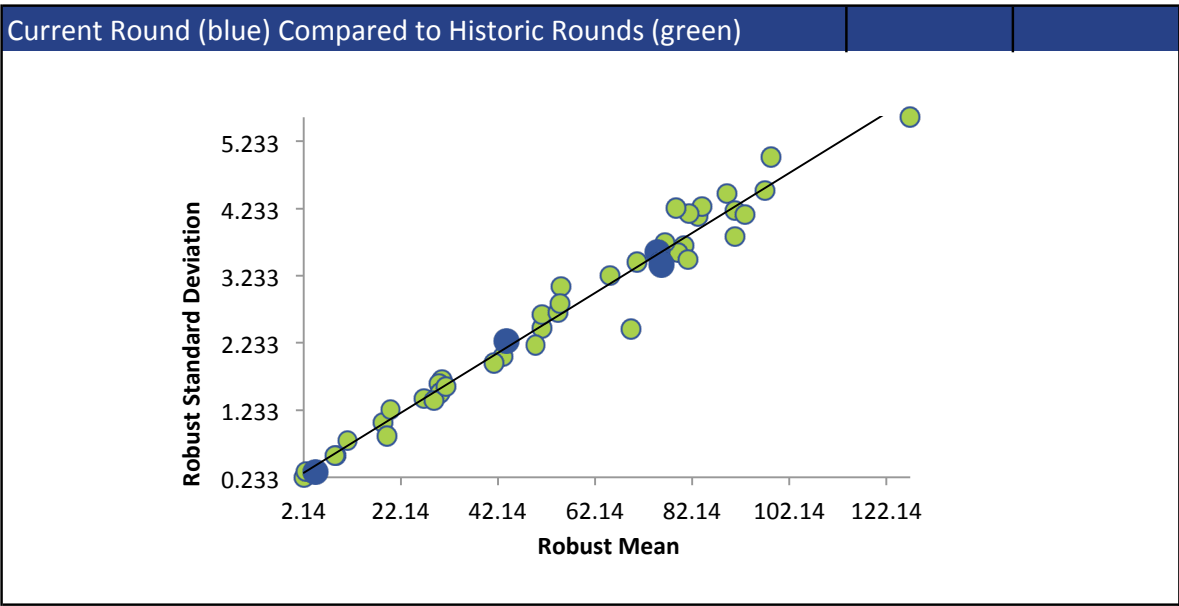
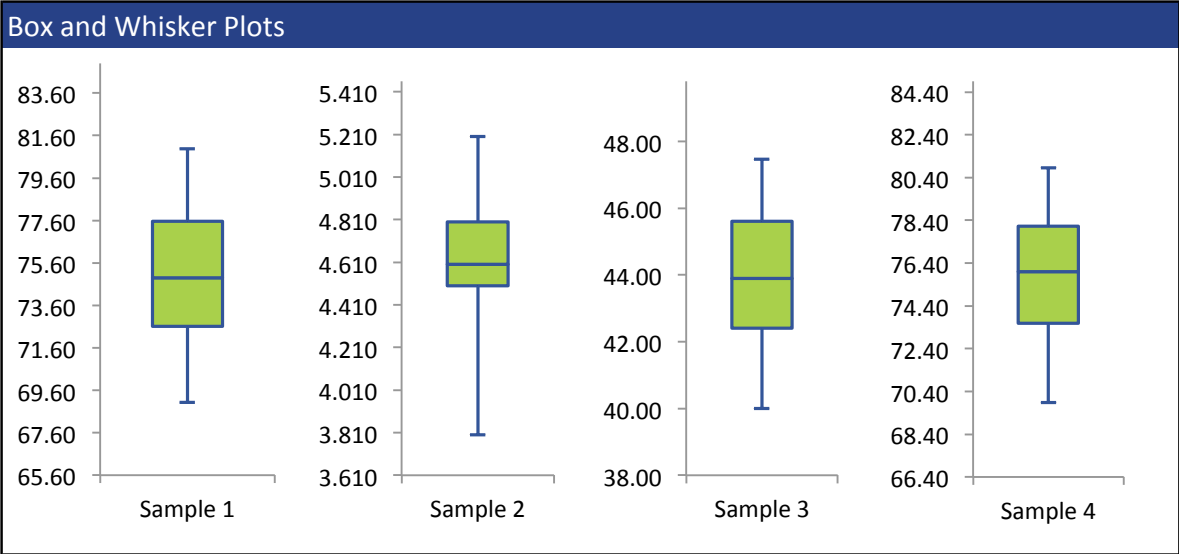
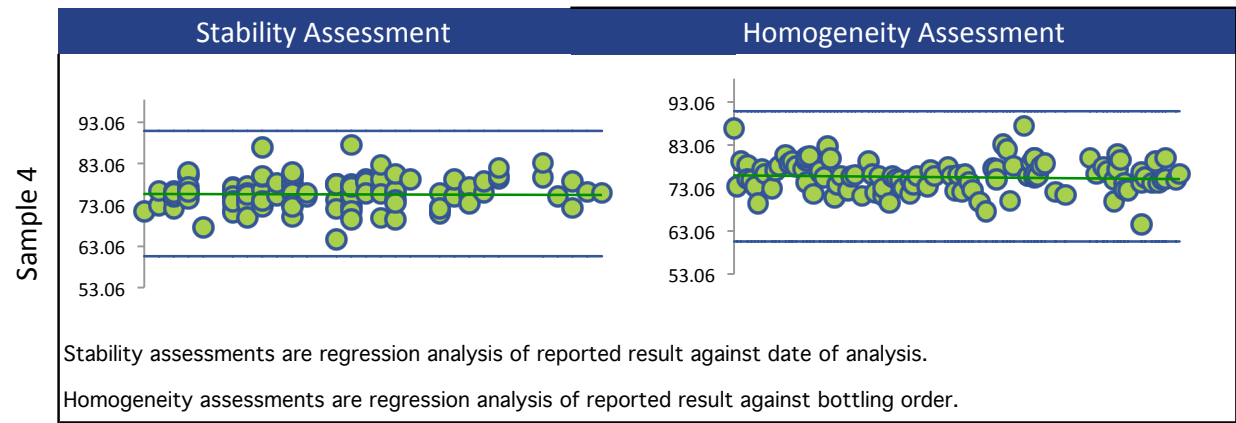
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ARSENIC



ARSENIC



## BARIUM

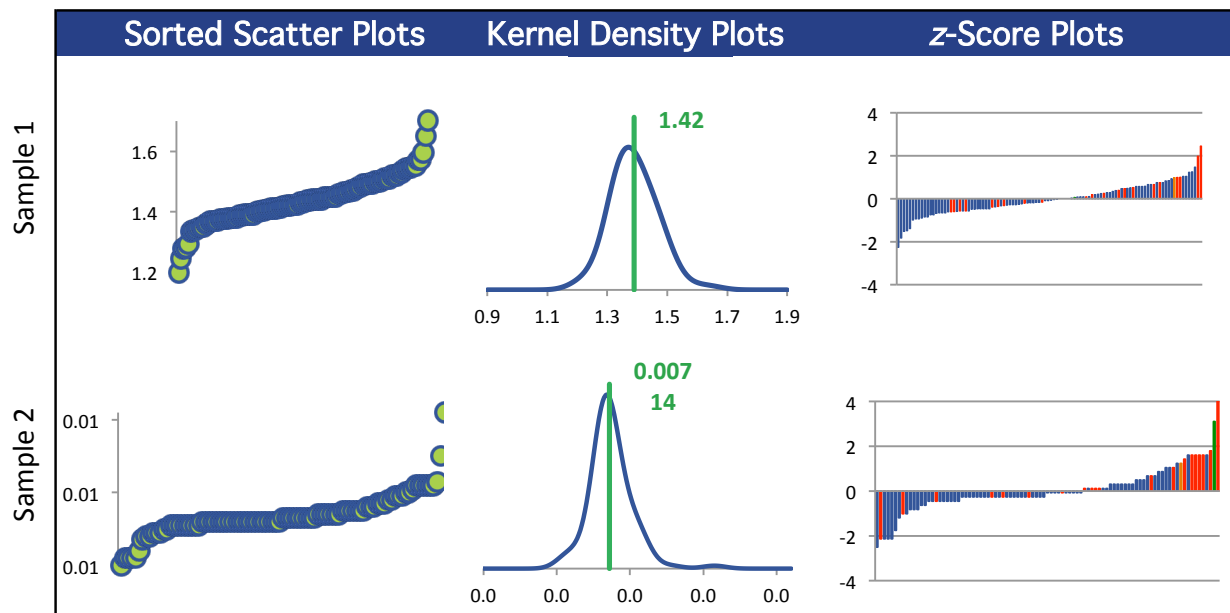
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	104	93	101	104
Median mg/L	1.41	0.00710	0.141	0.937
Robust Mean mg/L	1.42	0.00714	0.141	0.939
U mg/L	0.00891	0.000	0.000767	0.00538
Robust Standard Deviation mg/L	0.0727	0.000397	0.00617	0.0439
Regression Standard Deviation mg/L	0.106	0.000536	0.0106	0.0704
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.106	0.000536	0.0106	0.0704
Outliers	1	3	3	1
z >3.0	0	2	1	0
2< z <3	2	5	0	3

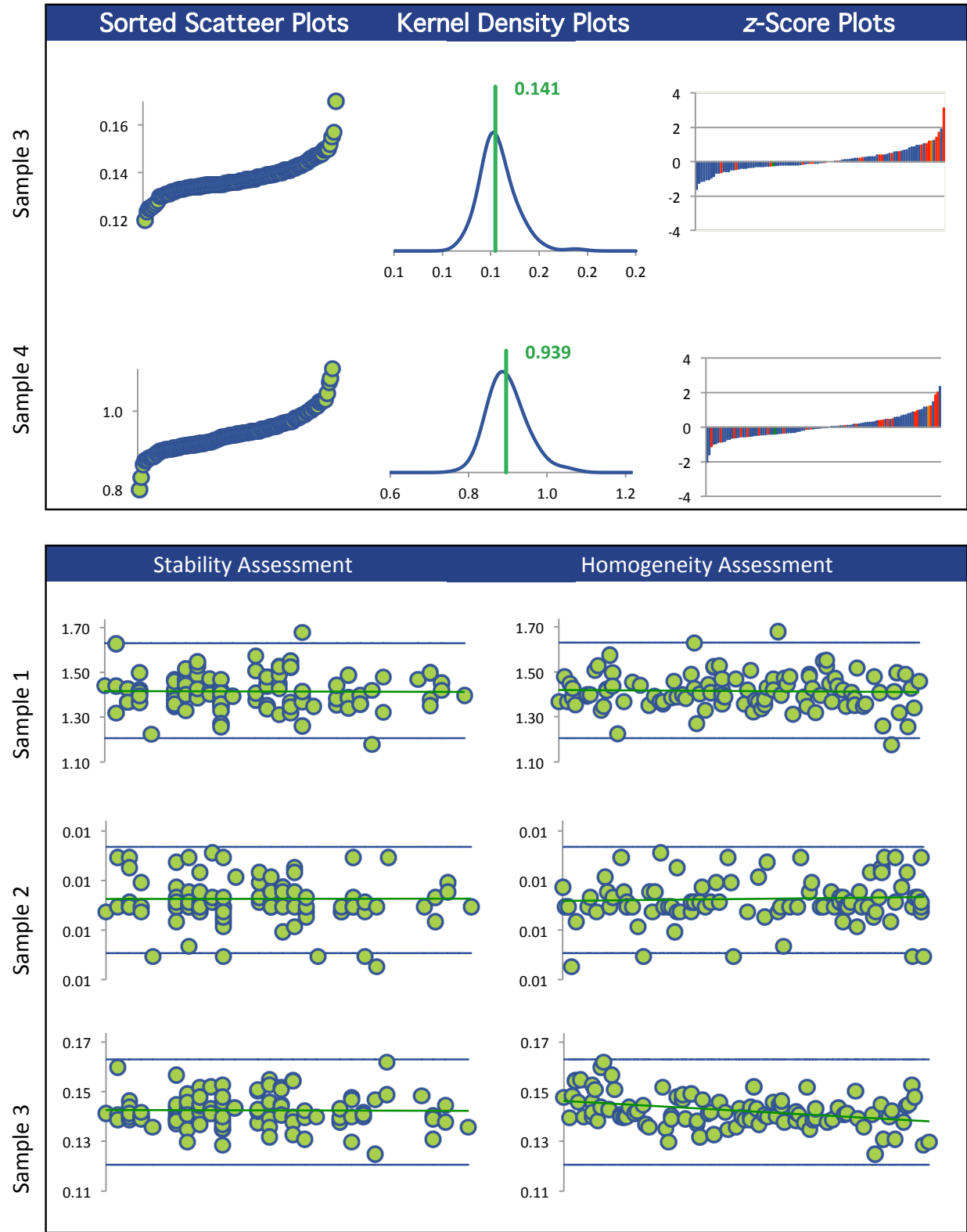
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	79	71	78	79
ICP/OES (Red)	23	20	21	23
AAG (Green)	1	1	1	1
AA (Orange)	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

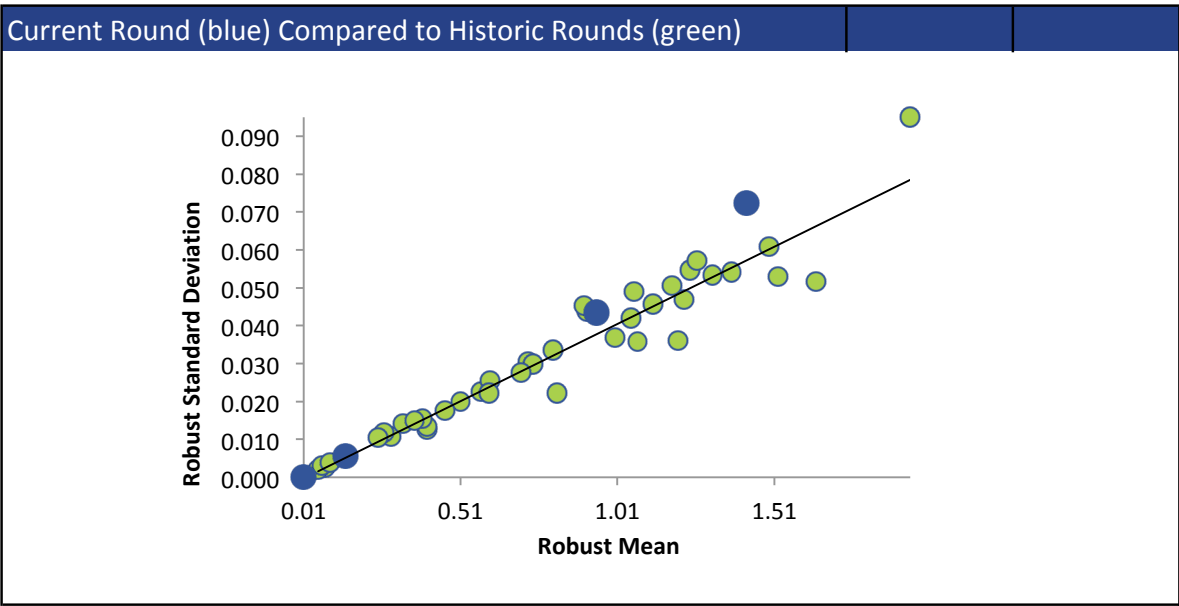
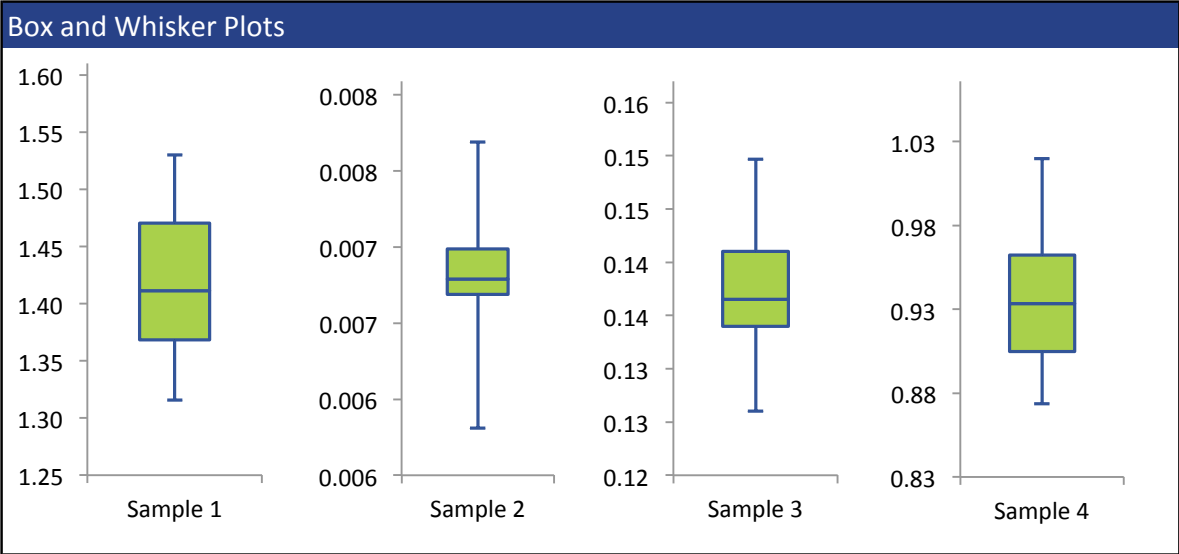
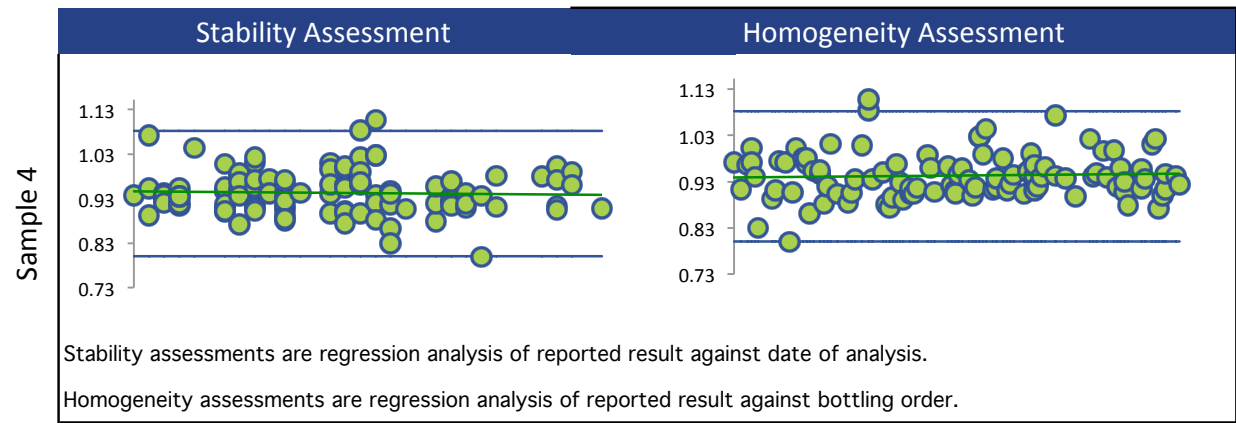


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## BERYLLIUM

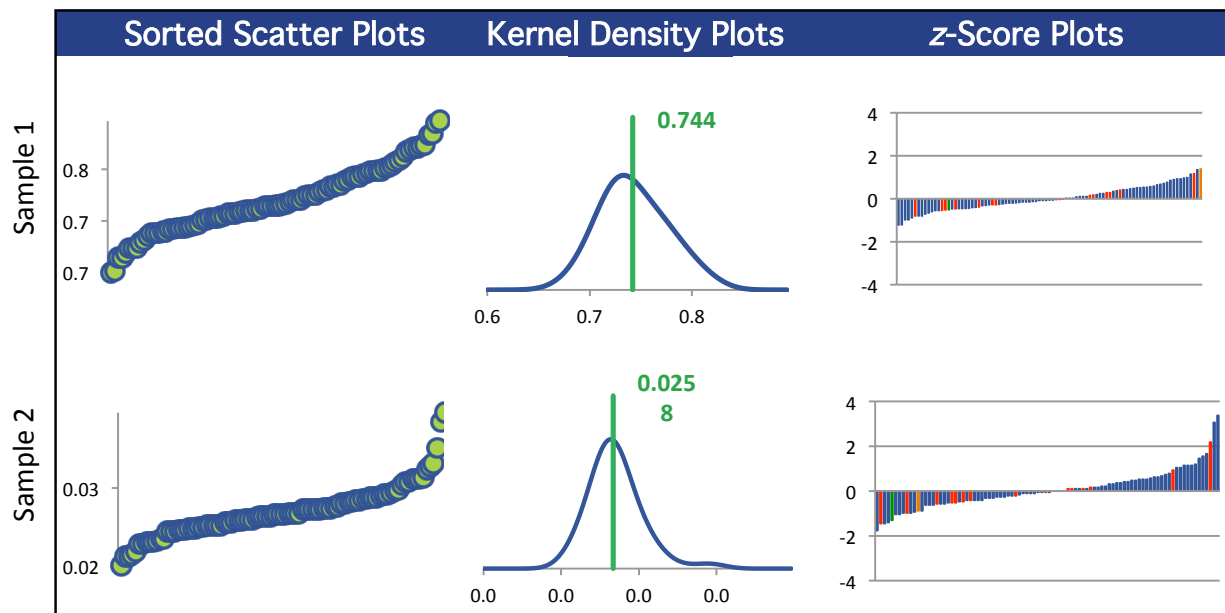
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	91	92	91	91
Median mg/L	0.740	0.0257	0.165	0.391
Robust Mean mg/L	0.744	0.0258	0.166	0.392
U mg/L	0.00438	0.000186	0.000988	0.00228
Robust Standard Deviation mg/L	0.0334	0.00143	0.00754	0.0174
Regression Standard Deviation mg/L	0.0558	0.00193	0.0124	0.0294
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0558	0.00193	0.0124	0.0294
Outliers	2	1	2	2
$ z  > 3.0$	0	2	0	0
$2 <  z  < 3$	0	1	0	1

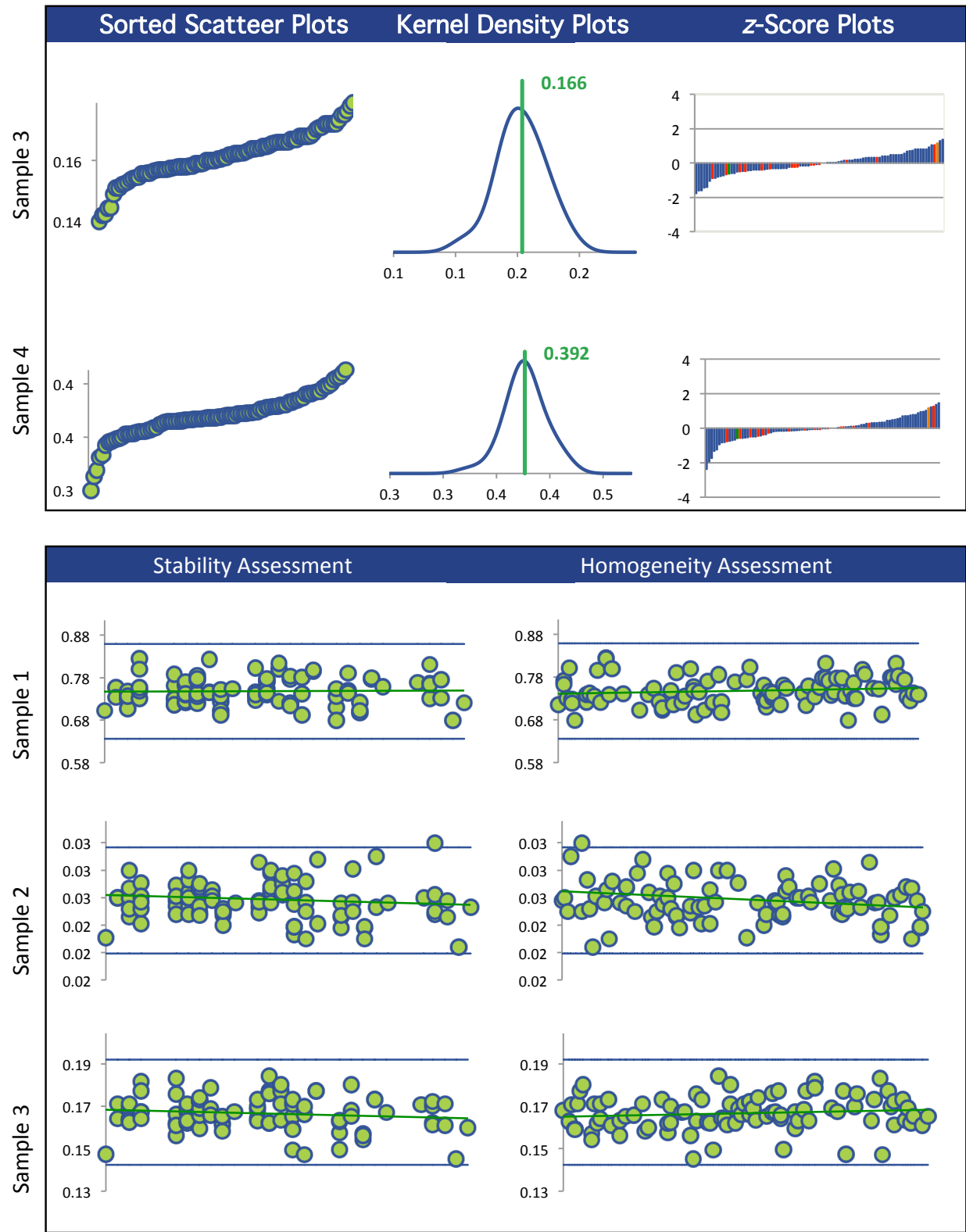
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	73	73	73	73
ICP/OES (Red)	16	17	16	16
AA (Green)	1	1	1	1
AAG (Orange)	1	1	1	1

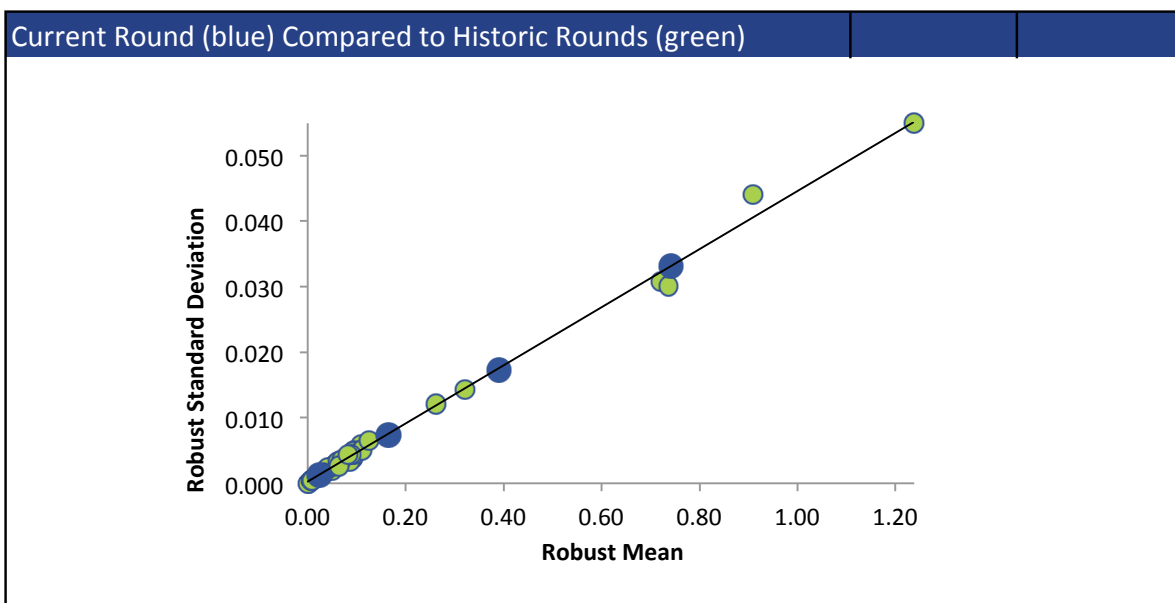
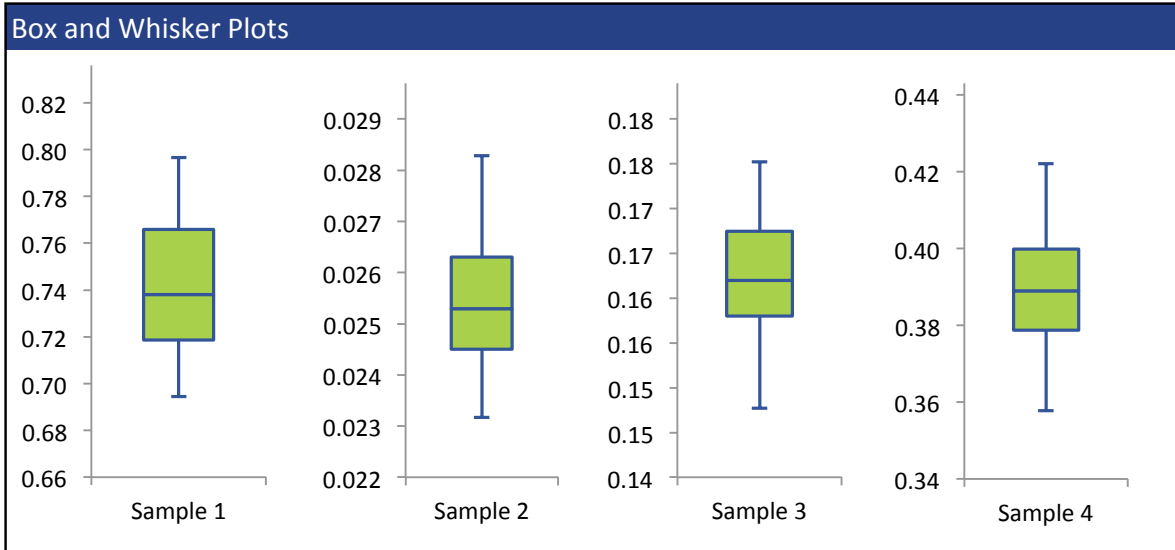
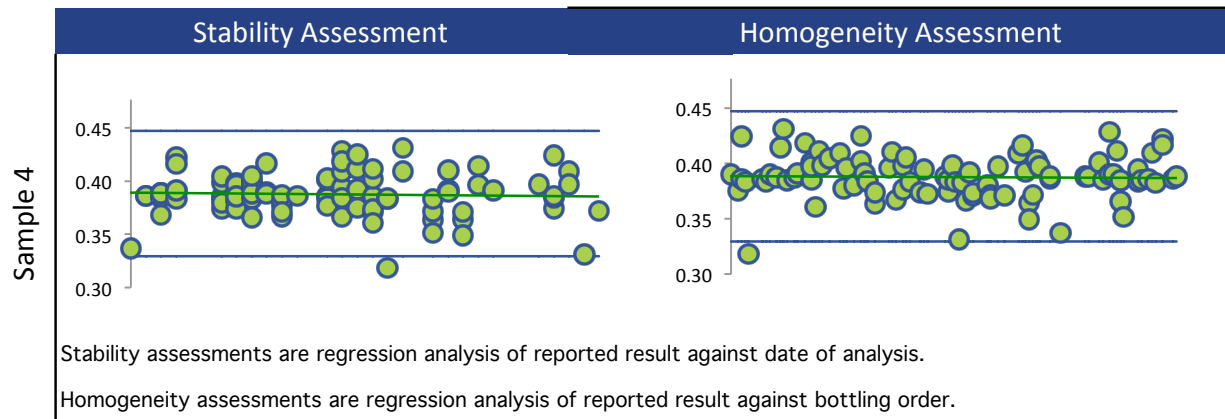
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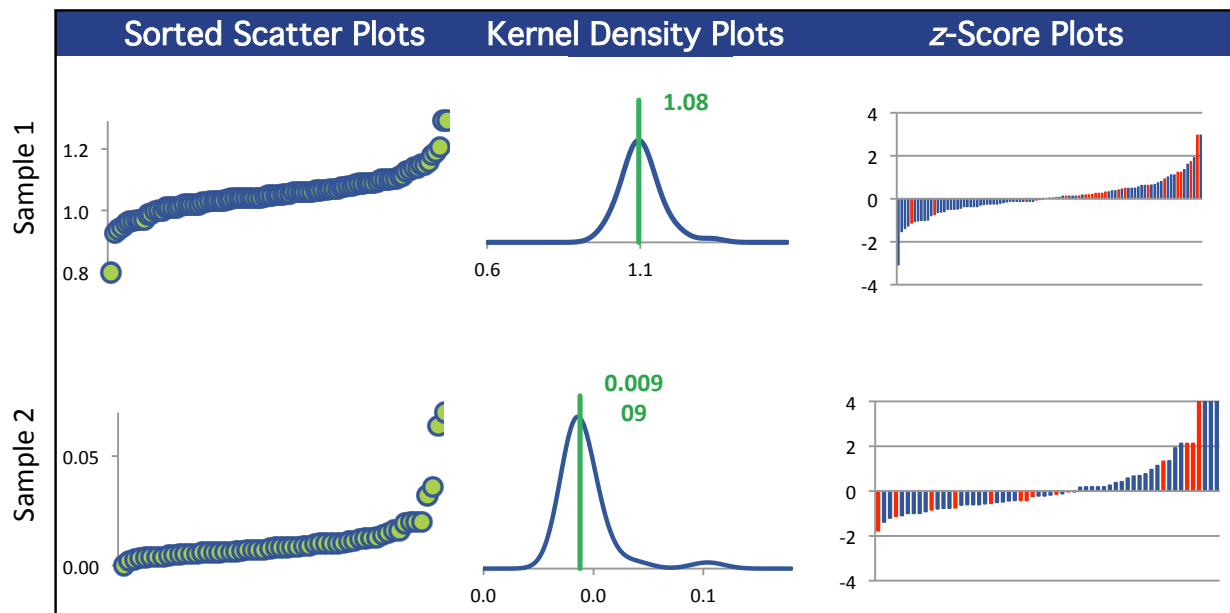
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	93	58	93	93
Median mg/L	1.08	0.00810	0.462	0.863
Robust Mean mg/L	1.08	0.00909	0.462	0.859
U mg/L	0.00709	0.000845	0.00301	0.00493
Robust Standard Deviation mg/L	0.0547	0.00515	0.0232	0.0380
Regression Standard Deviation mg/L	0.0812	0.000682	0.0346	0.0645
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0812	0.00515	0.0346	0.0645
Outliers	1	0	1	1
$ z  > 3.0$	1	4	1	0
$2 <  z  < 3$	2	3	3	1

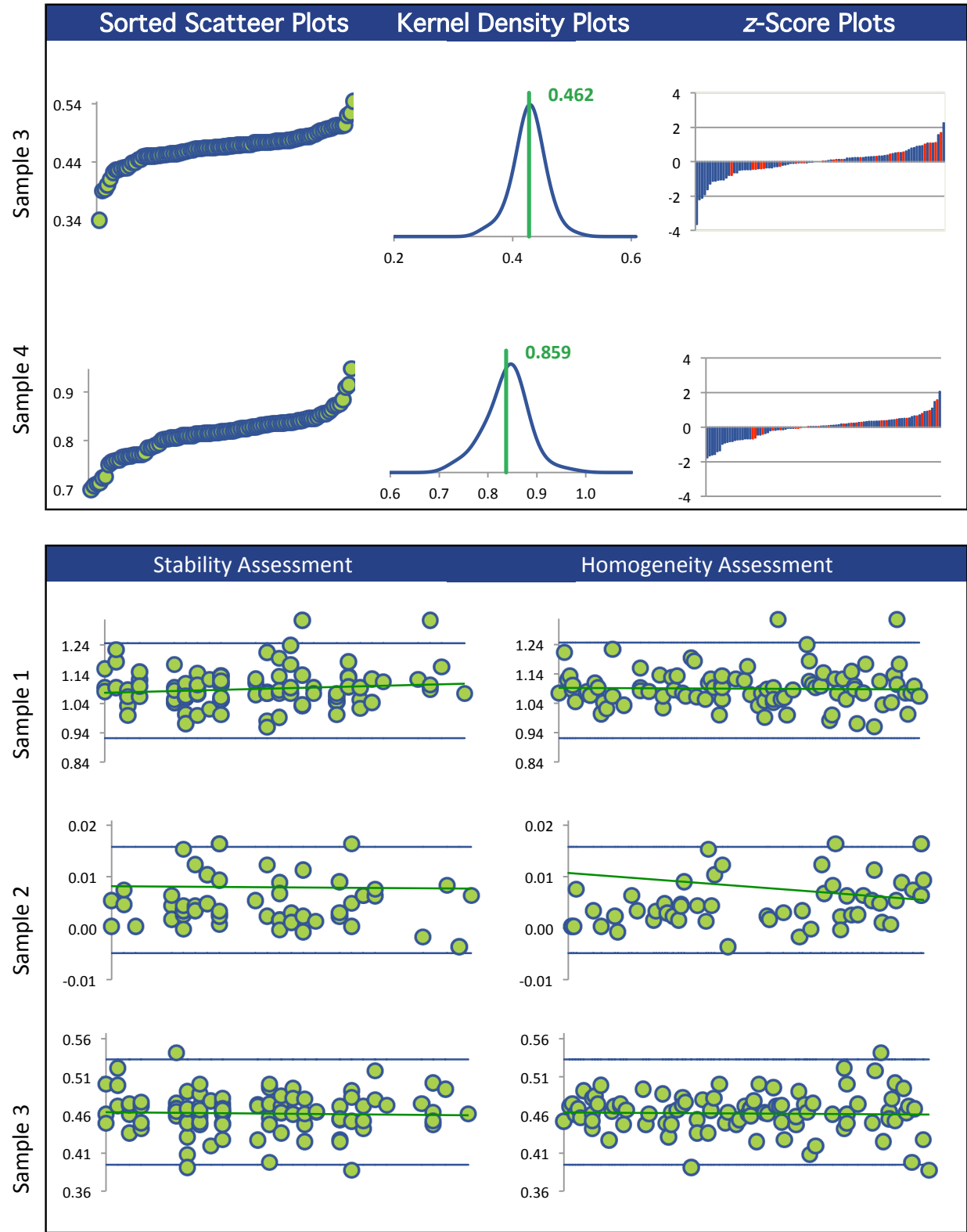
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	70	44	70	70
ICP/OES (Red)	23	14	23	23

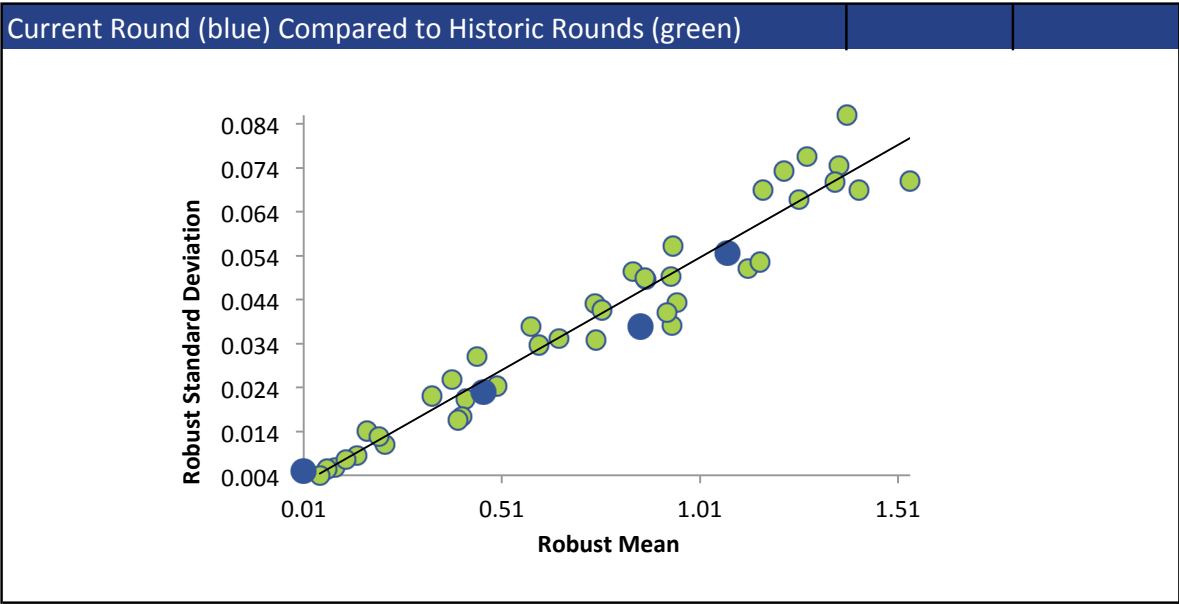
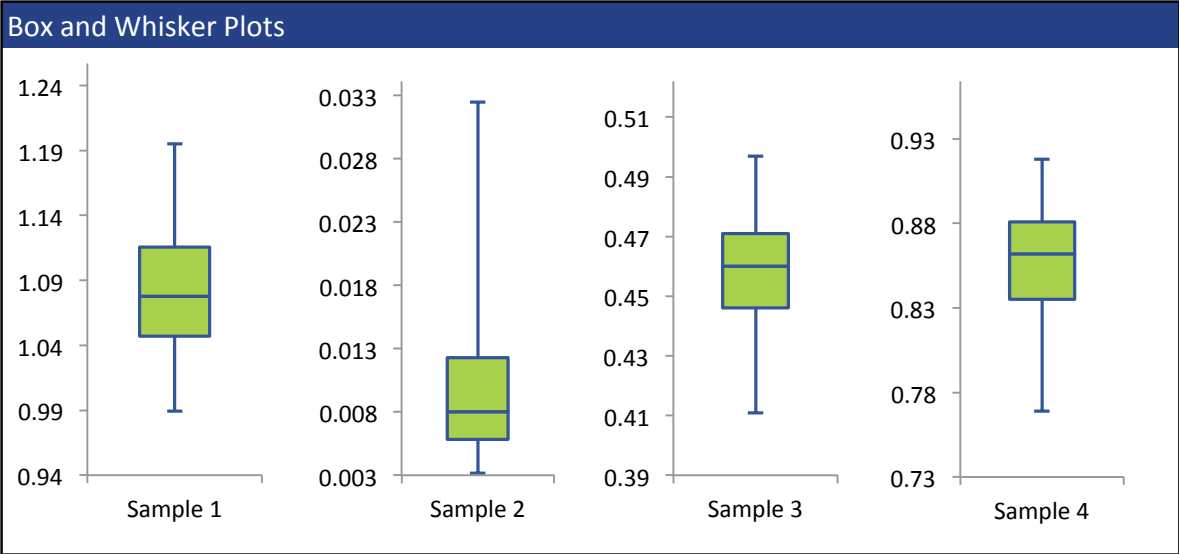
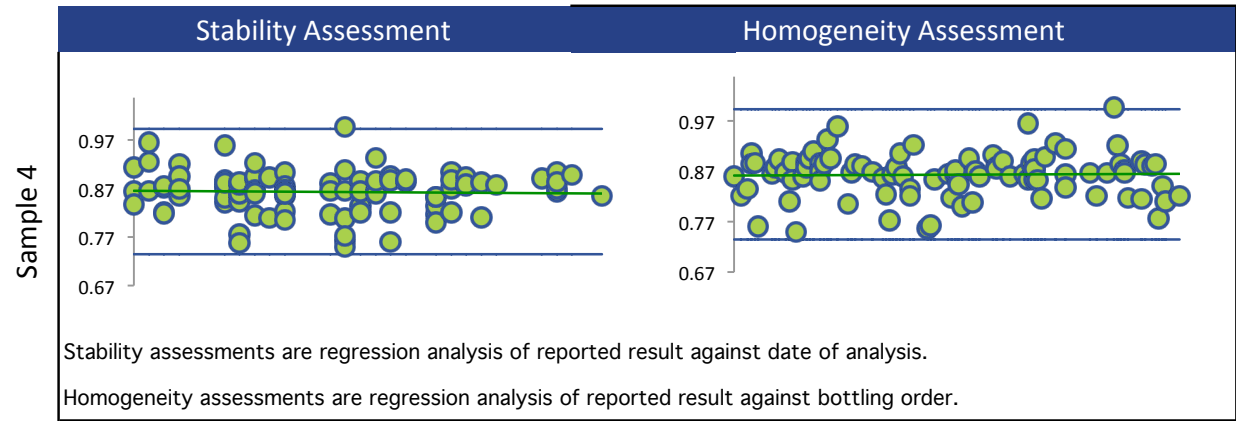
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BORON



BORON



## CADMIUM

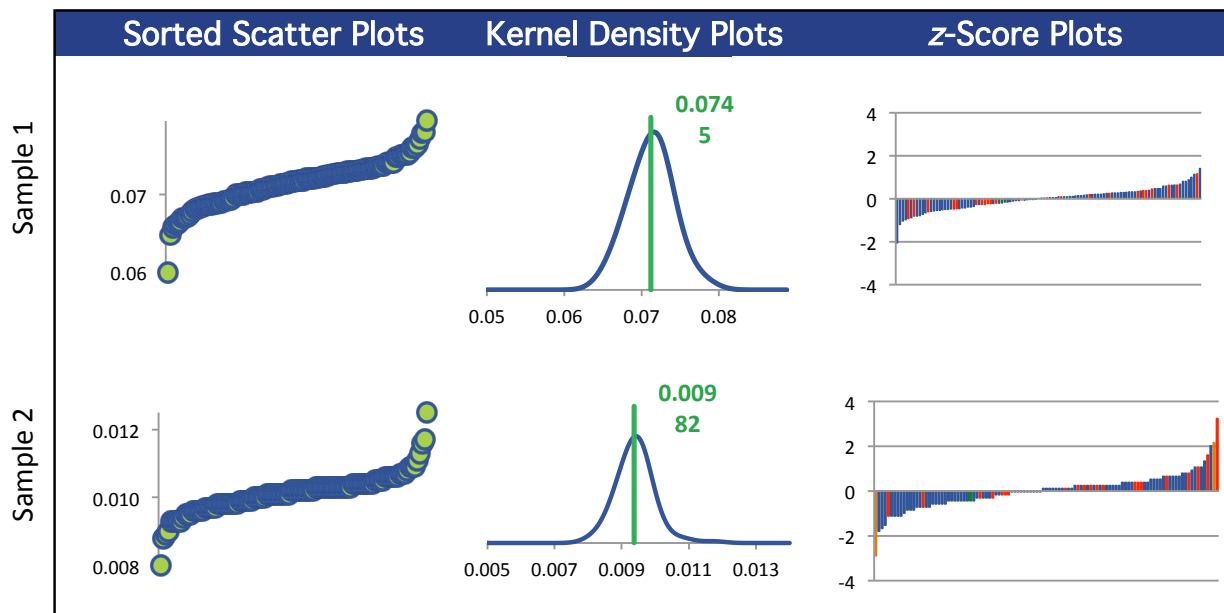
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	108	109	110	110
Median mg/L	0.0748	0.00990	0.0386	0.0641
Robust Mean mg/L	0.0745	0.00982	0.0386	0.0640
U mg/L	0.000331	0.000	0.000187	0.000300
Robust Standard Deviation mg/L	0.00275	0.000464	0.00157	0.00252
Regression Standard Deviation mg/L	0.00559	0.000736	0.00289	0.00480
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00559	0.000736	0.00289	0.00480
Outliers	3	2	1	1
z >3.0	0	1	2	2
2< z <3	1	3	0	0

## Methods Used

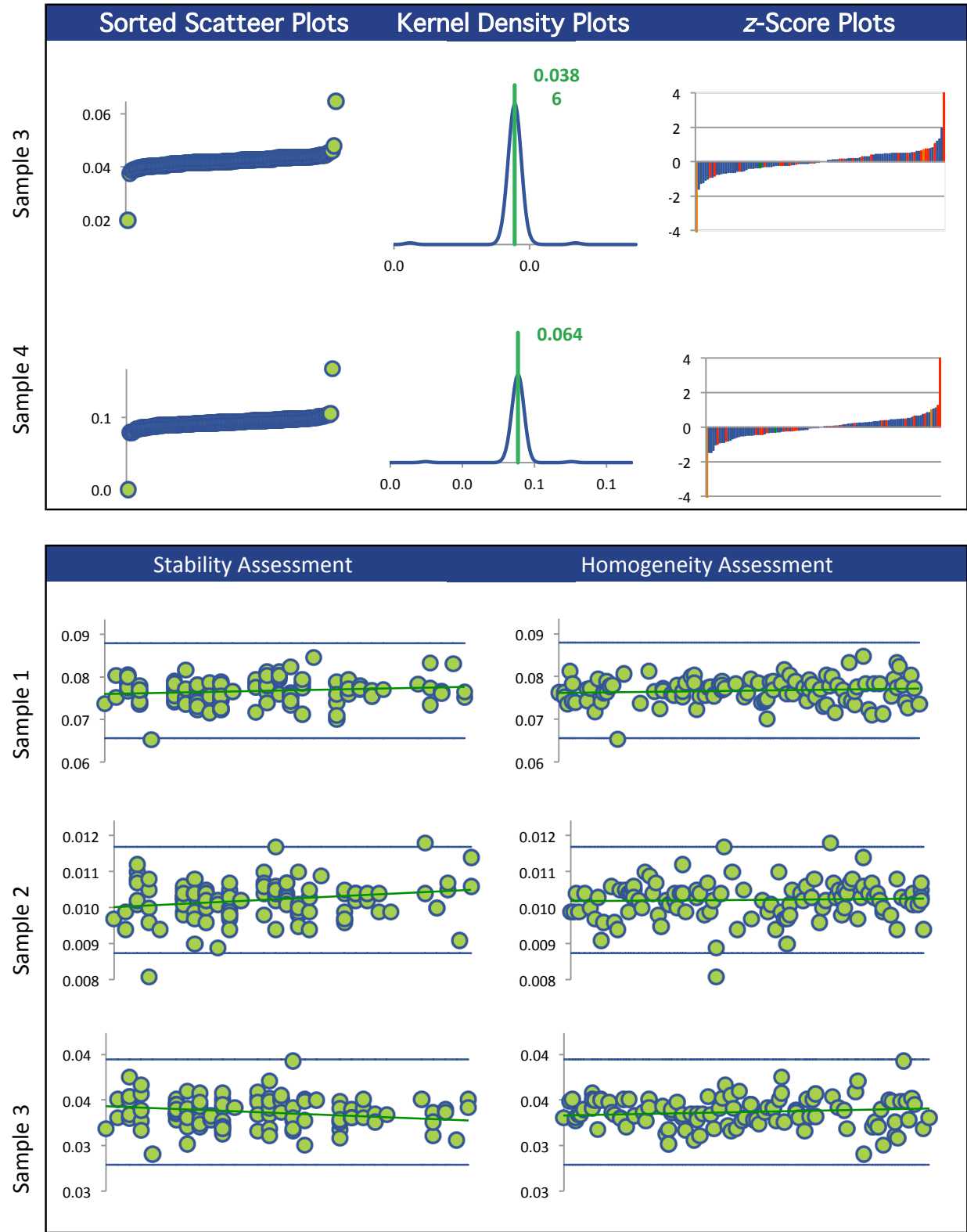
Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	83	83	83	83
ICP/OES (Red)	23	23	24	24
AA (Green)	1	1	1	1
AAG (Orange)	1	2	2	2

All summary stats and the plots below are based on the data excluding any flagged outliers

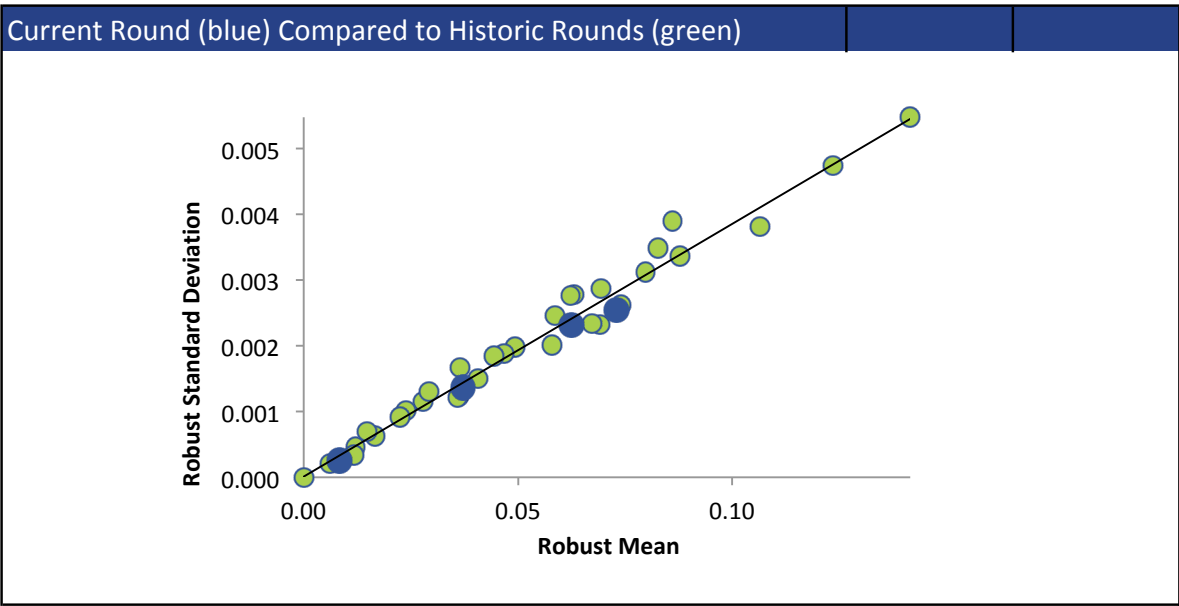
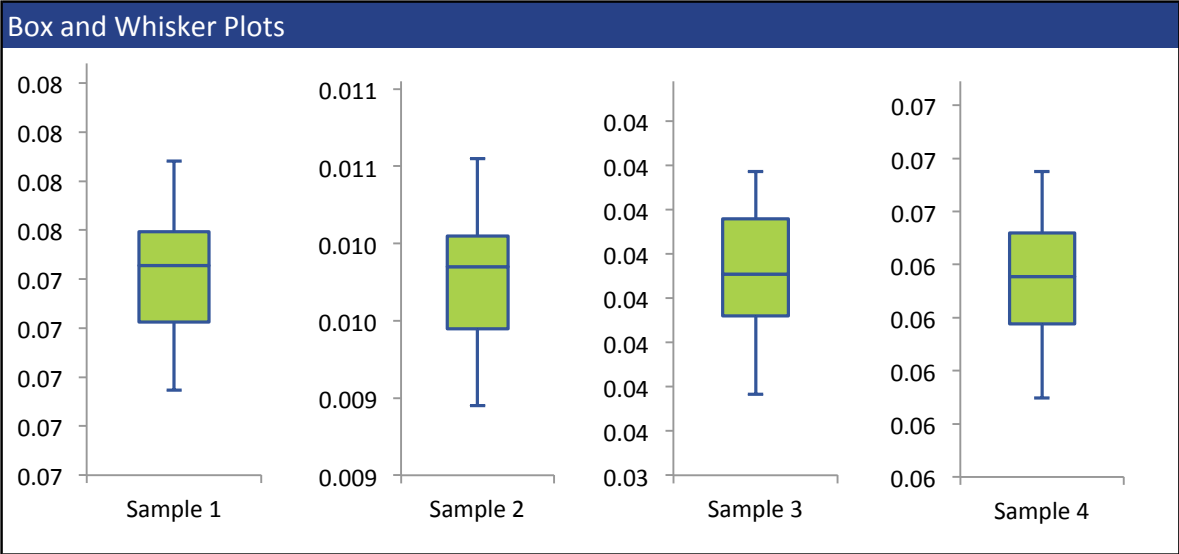
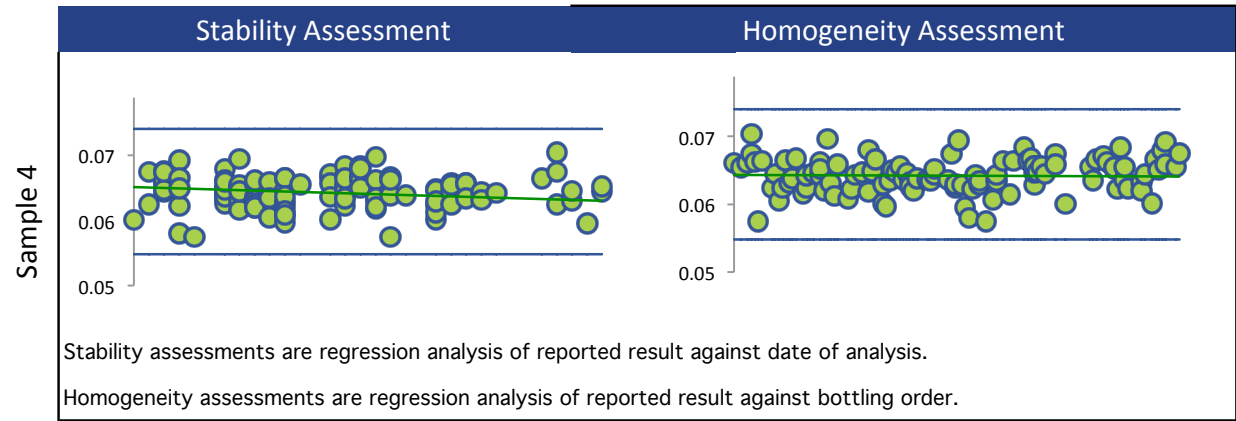




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CADMIUM



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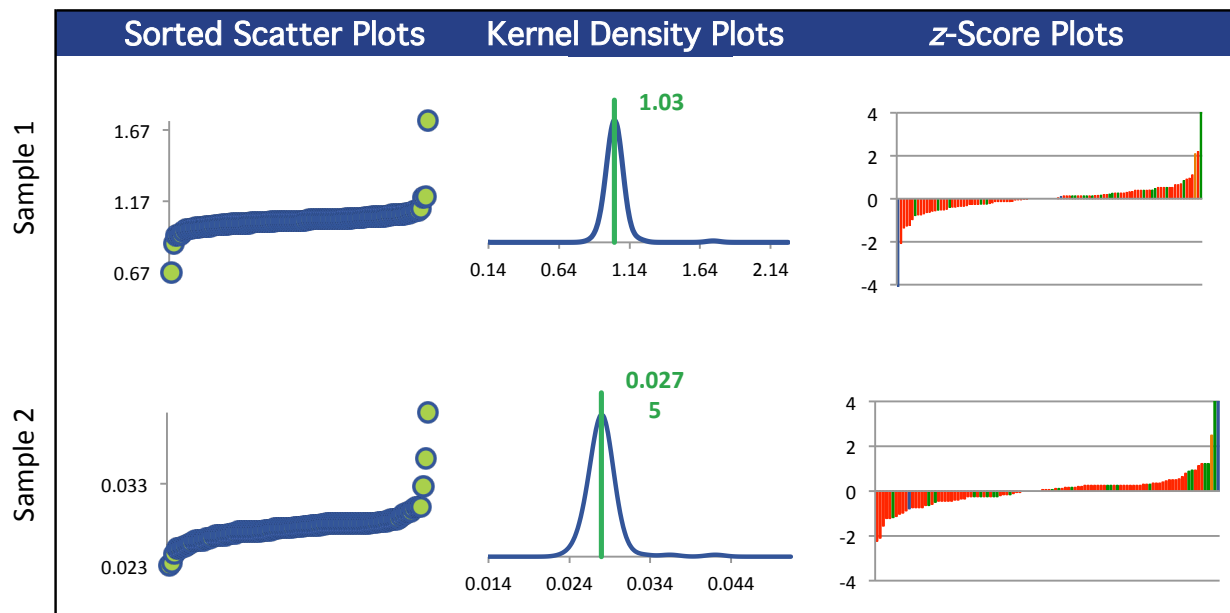
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	107	106	107	107
Median mg/L	1.03	0.0276	0.150	0.586
Robust Mean mg/L	1.03	0.0275	0.150	0.586
U mg/L	0.00429	0.000134	0.000660	0.00265
Robust Standard Deviation mg/L	0.0355	0.00110	0.00546	0.0219
Regression Standard Deviation mg/L	0.0773	0.00206	0.0112	0.0440
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0773	0.00206	0.0112	0.0440
Outliers	1	2	1	1
$ z  > 3.0$	2	2	0	1
$2 <  z  < 3$	3	3	2	1

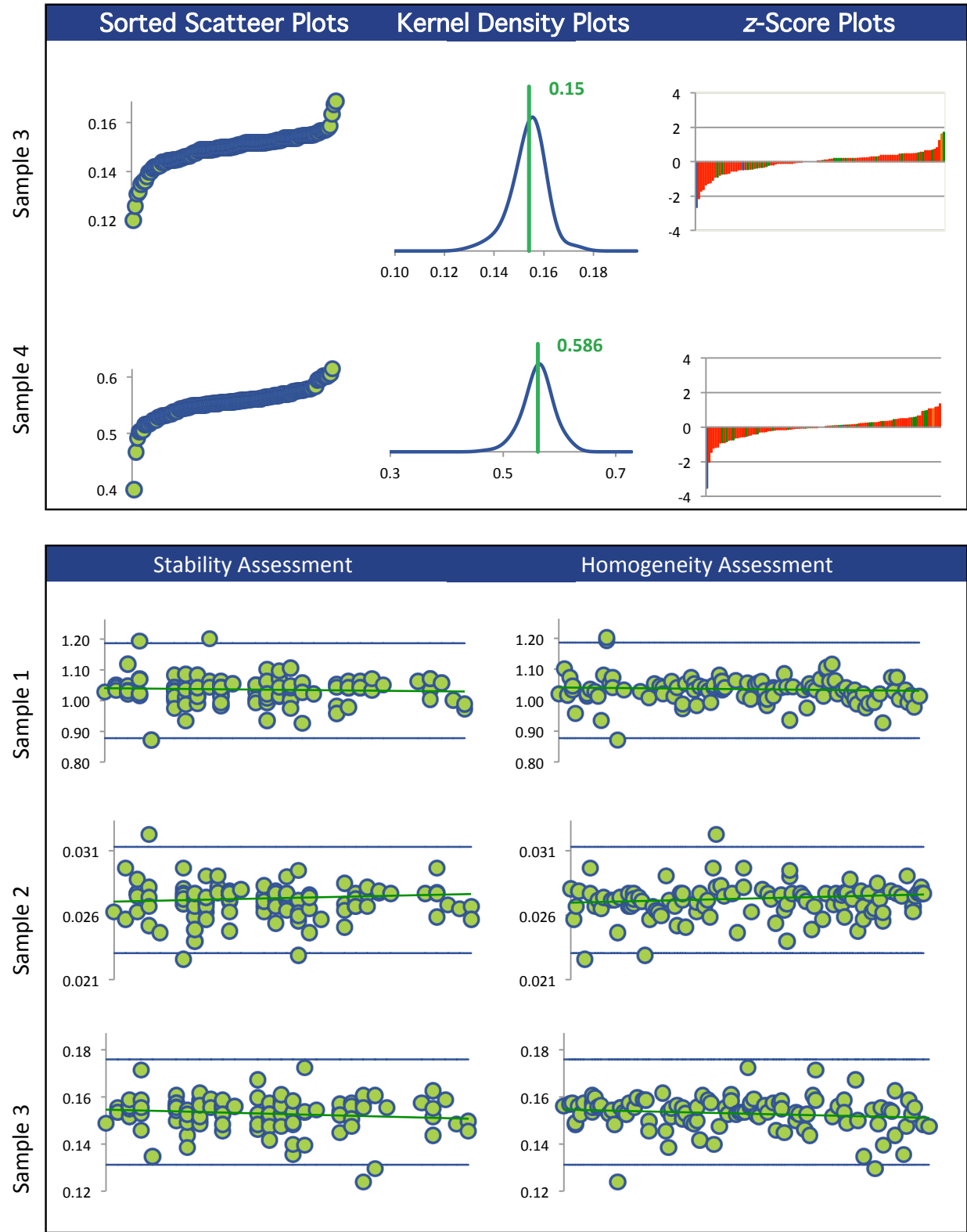
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AA (Blue)	2	2	2	2
ICP/MS (Red)	81	81	81	81
ICP/OES (Green)	23	22	23	23
AAG (Orange)	1	1	1	1

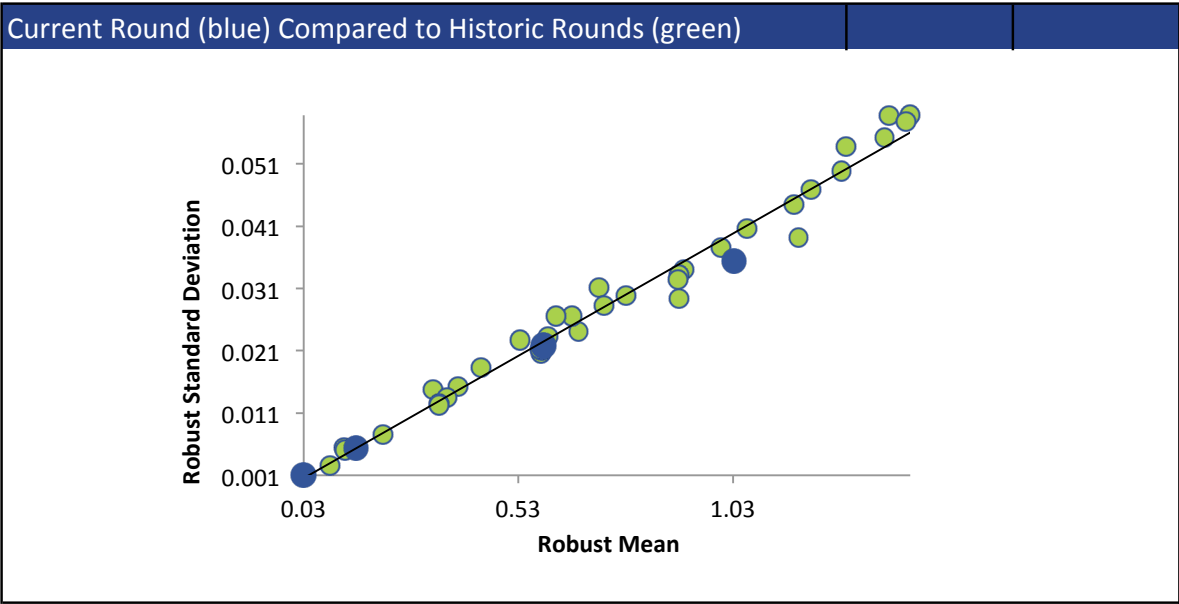
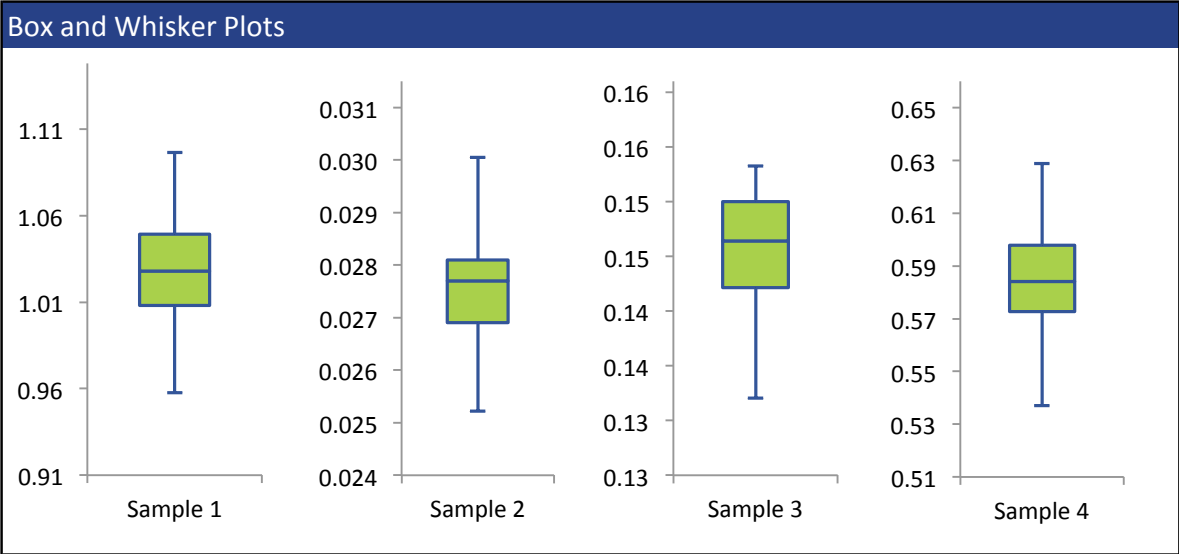
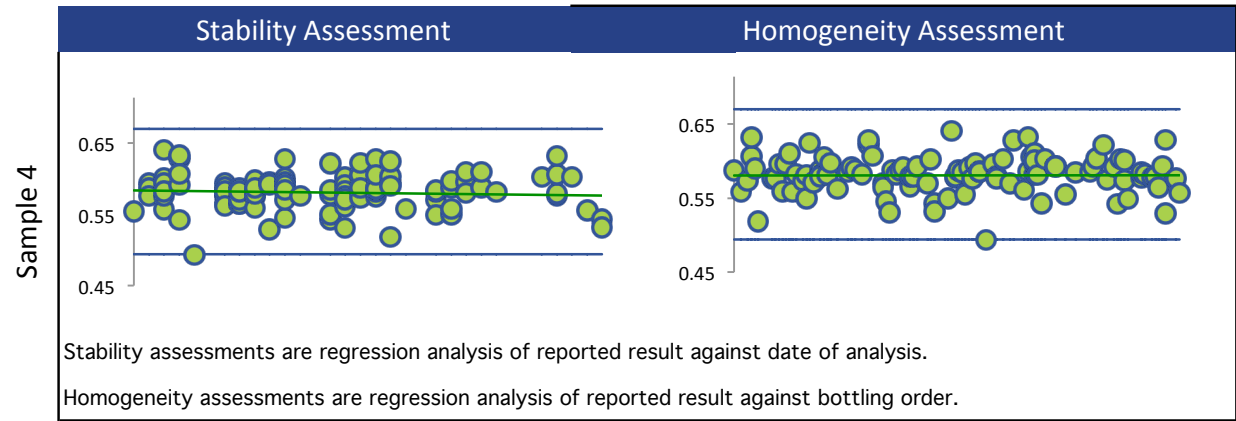
All summary stats and the plots below are based on the data excluding any flagged outliers



CHROMIUM



CHROMIUM



## COBALT

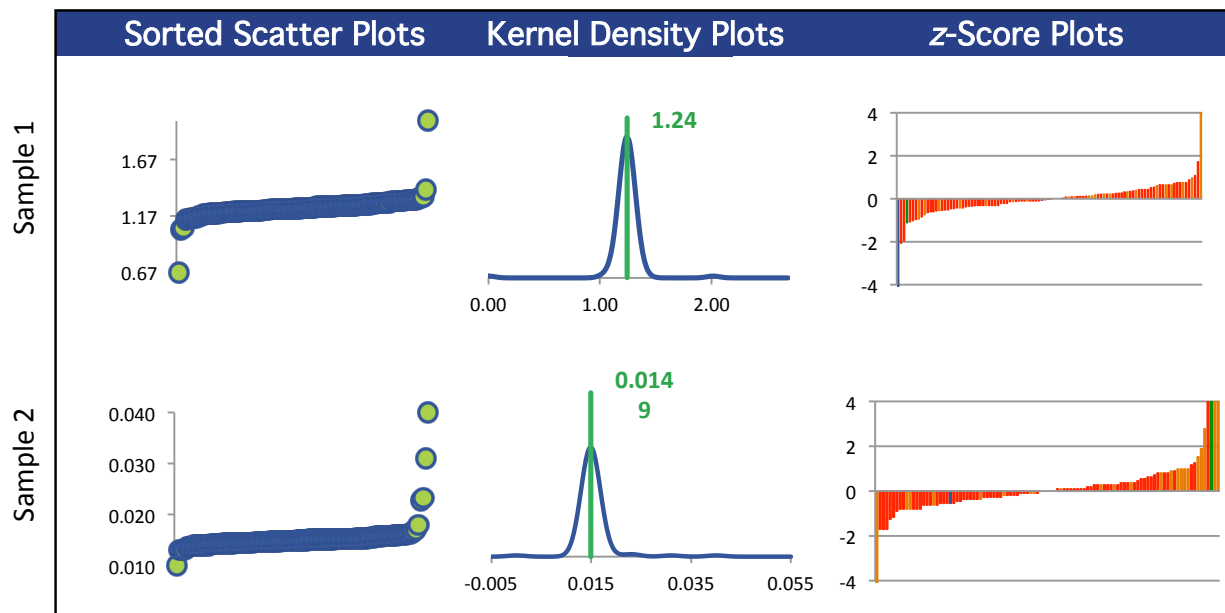
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	104	103	104	104
Median mg/L	1.24	0.0149	0.314	0.630
Robust Mean mg/L	1.24	0.0149	0.314	0.630
U mg/L	0.00603	0.000	0.00156	0.00293
Robust Standard Deviation mg/L	0.0492	0.000779	0.0127	0.0239
Regression Standard Deviation mg/L	0.0929	0.00112	0.0235	0.0473
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0929	0.00112	0.0235	0.0473
Outliers	1	2	1	1
$ z  > 3.0$	2	5	1	1
$2 <  z  < 3$	1	1	1	1

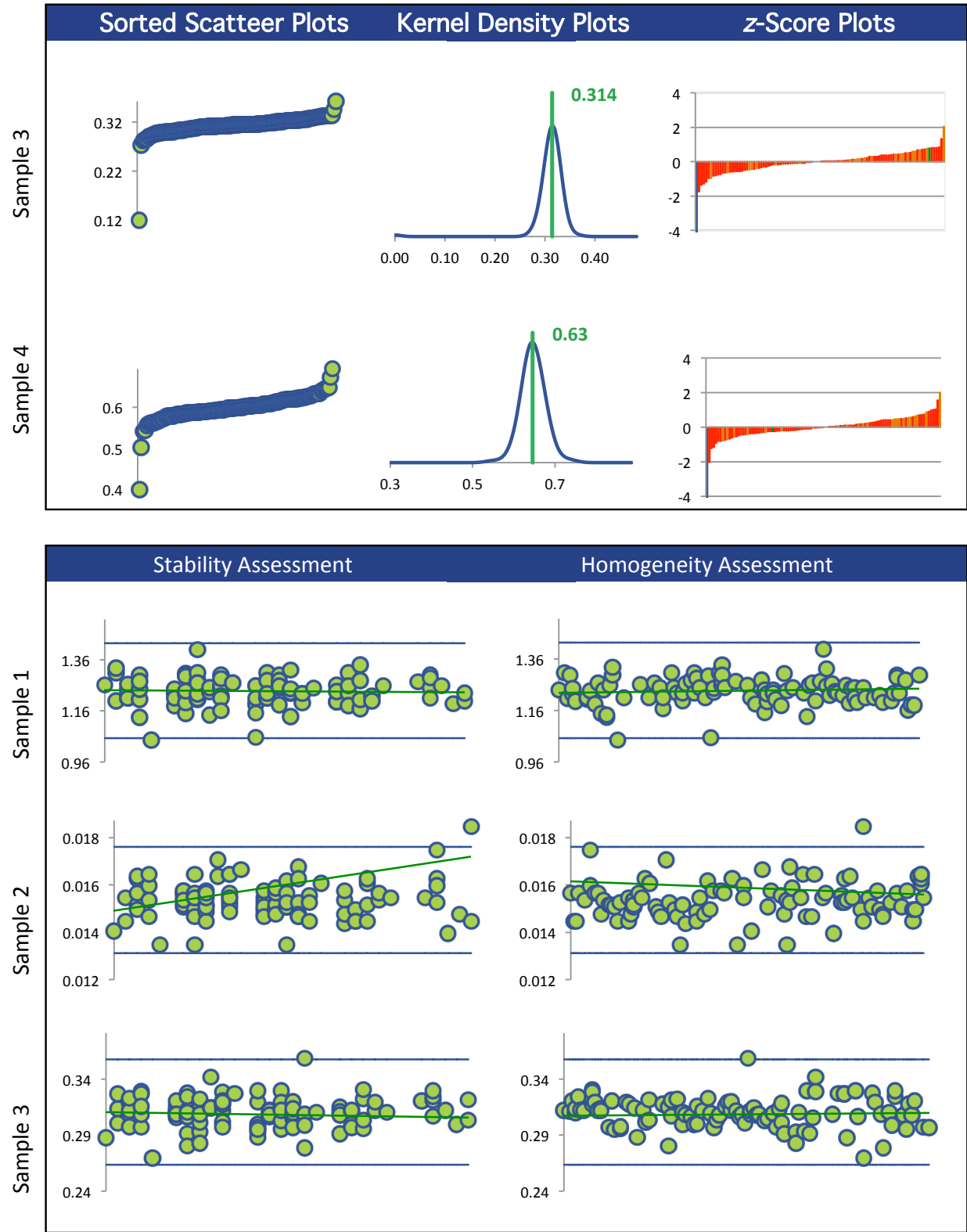
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AA (Blue)	2	1	2	2
ICP/MS (Red)	78	77	78	78
AAG (Green)	1	1	1	1
ICP/OES (Orange)	23	24	23	23

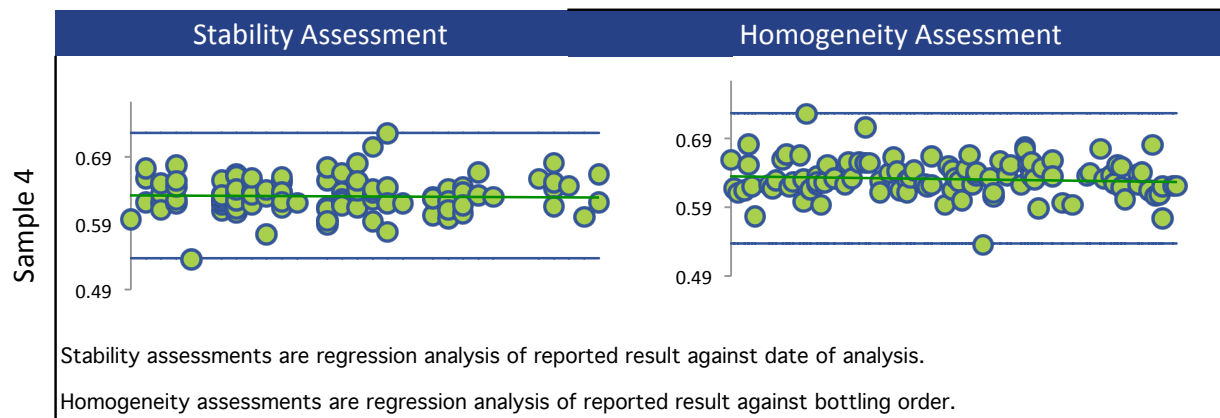
All summary stats and the plots below are based on the data excluding any flagged outliers



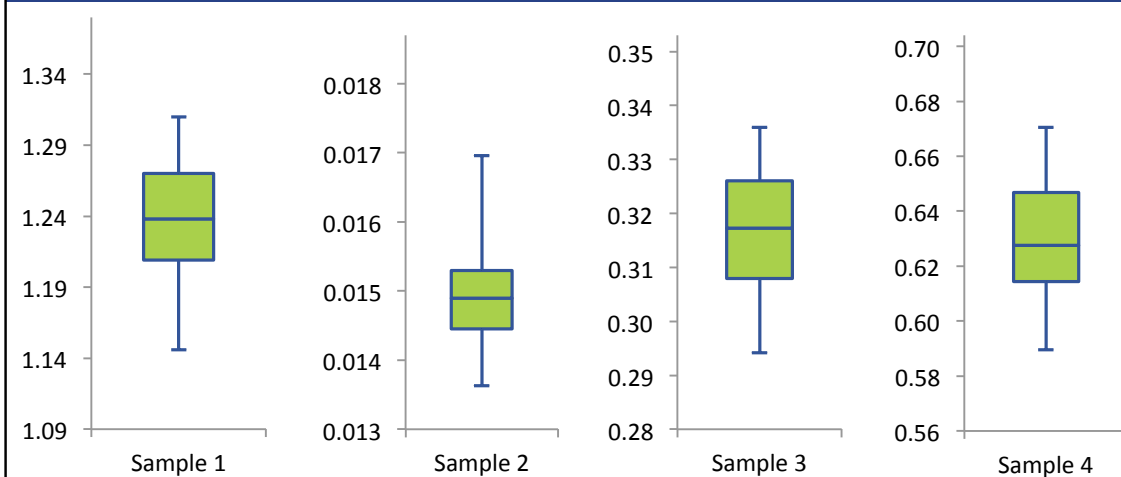
COBALT



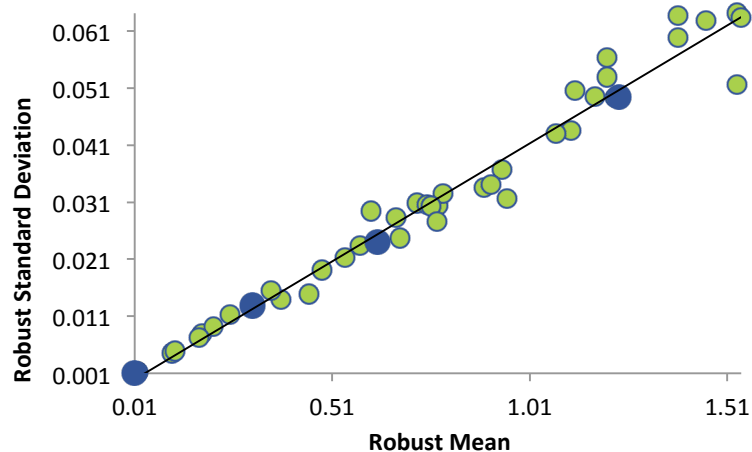
## COBALT



## Box and Whisker Plots



## Current Round (blue) Compared to Historic Rounds (green)





## COPPER

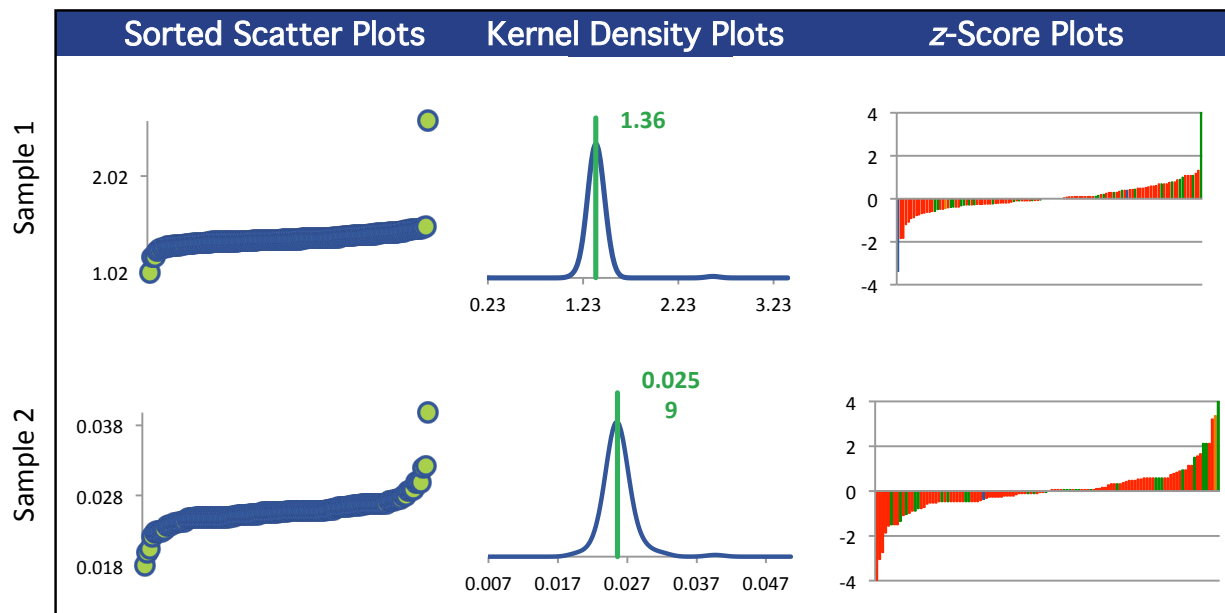
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	116	116	116	116
Median mg/L	1.36	0.0259	0.346	0.956
Robust Mean mg/L	1.36	0.0259	0.345	0.955
U mg/L	0.00630	0.000153	0.00180	0.00453
Robust Standard Deviation mg/L	0.0543	0.00132	0.0155	0.0390
Regression Standard Deviation mg/L	0.102	0.00194	0.0259	0.0716
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.102	0.00194	0.0259	0.0716
Outliers	1	1	1	1
z >3.0	2	5	0	1
2< z <3	0	4	1	1

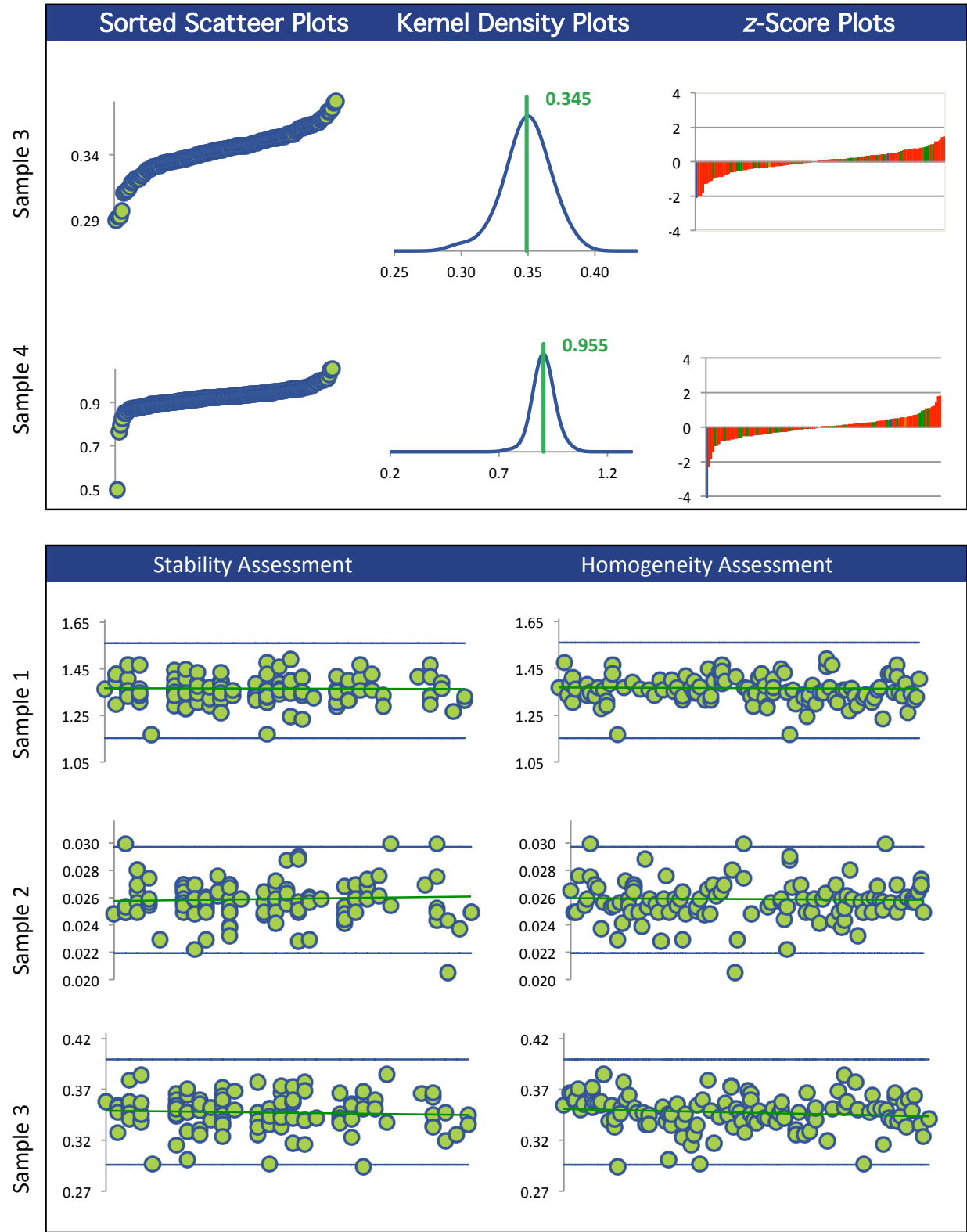
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AA (Blue)	2	1	2	2
ICP/MS (Red)	87	87	87	87
ICP/OES (Green)	26	27	26	26
AAG (Orange)	1	1	1	1

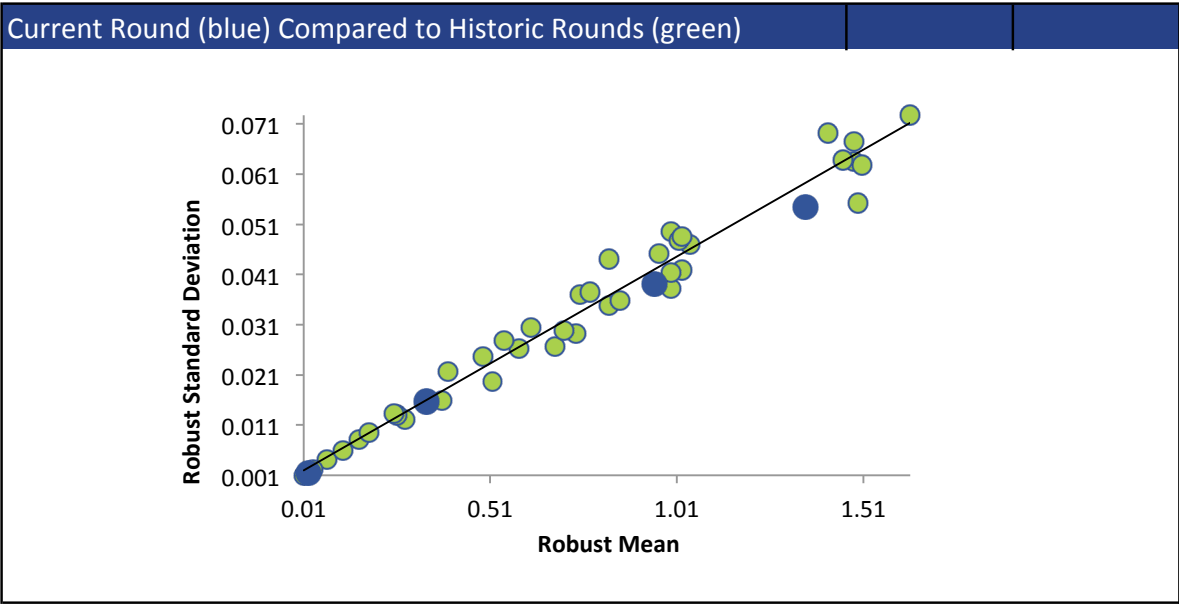
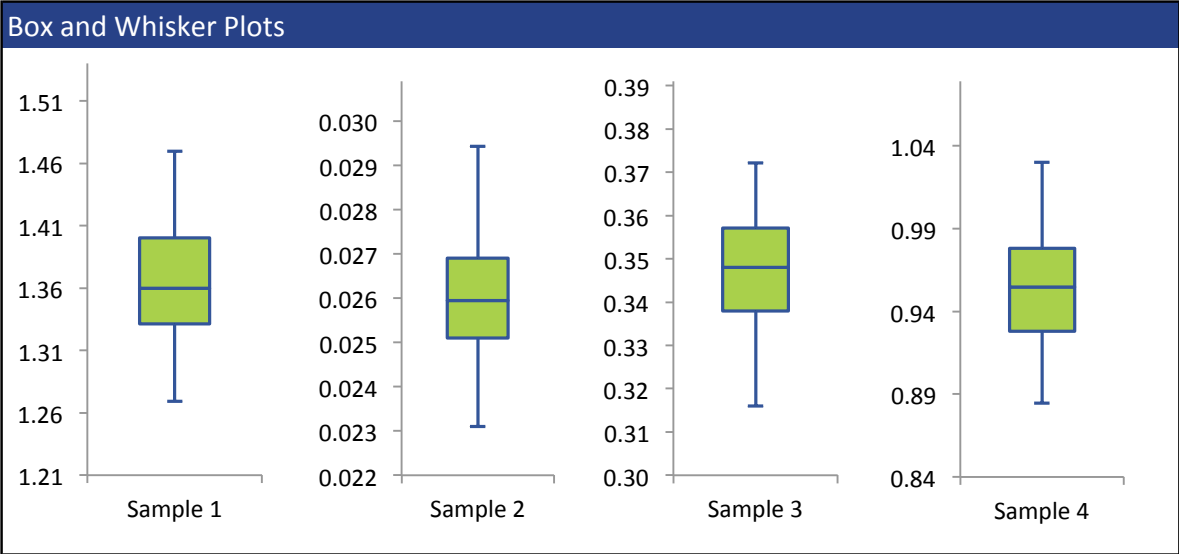
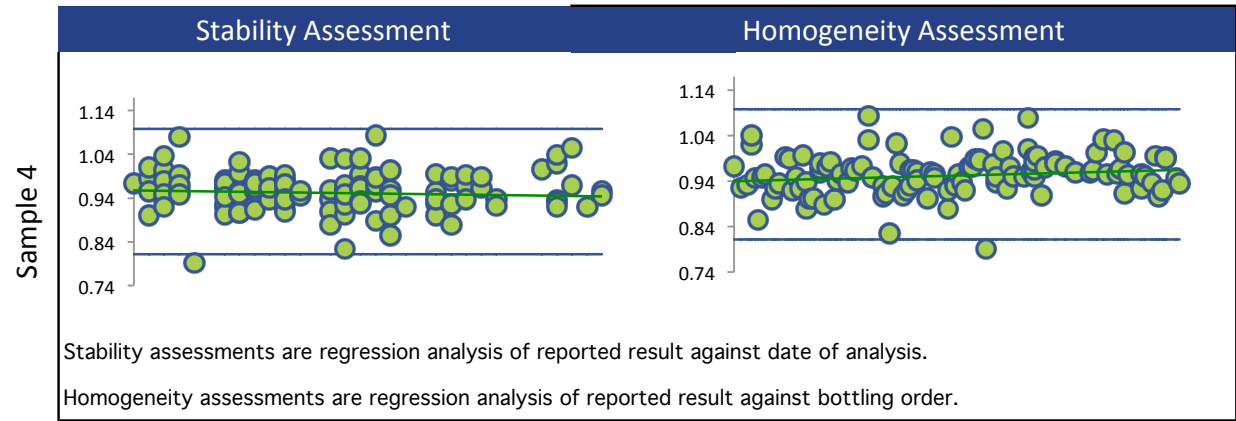
All summary stats and the plots below are based on the data excluding any flagged outliers



COPPER



COPPER



## IRON

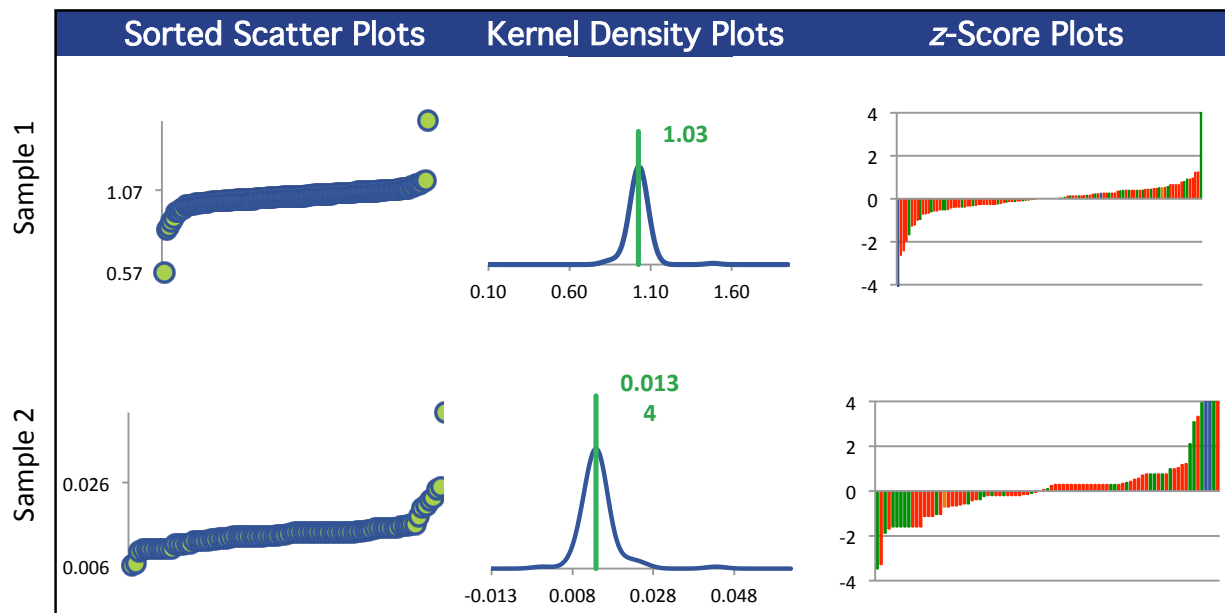
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	110	87	110	110
Median mg/L	1.03	0.0136	0.272	0.799
Robust Mean mg/L	1.03	0.0134	0.271	0.798
U mg/L	0.00460	0.000287	0.00142	0.00380
Robust Standard Deviation mg/L	0.0386	0.00214	0.0119	0.0319
Regression Standard Deviation mg/L	0.0773	0.00100	0.0203	0.0598
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0773	0.00214	0.0203	0.0598
Outliers	1	0	1	1
$ z  > 3.0$	2	9	5	1
$2 <  z  < 3$	2	1	2	3

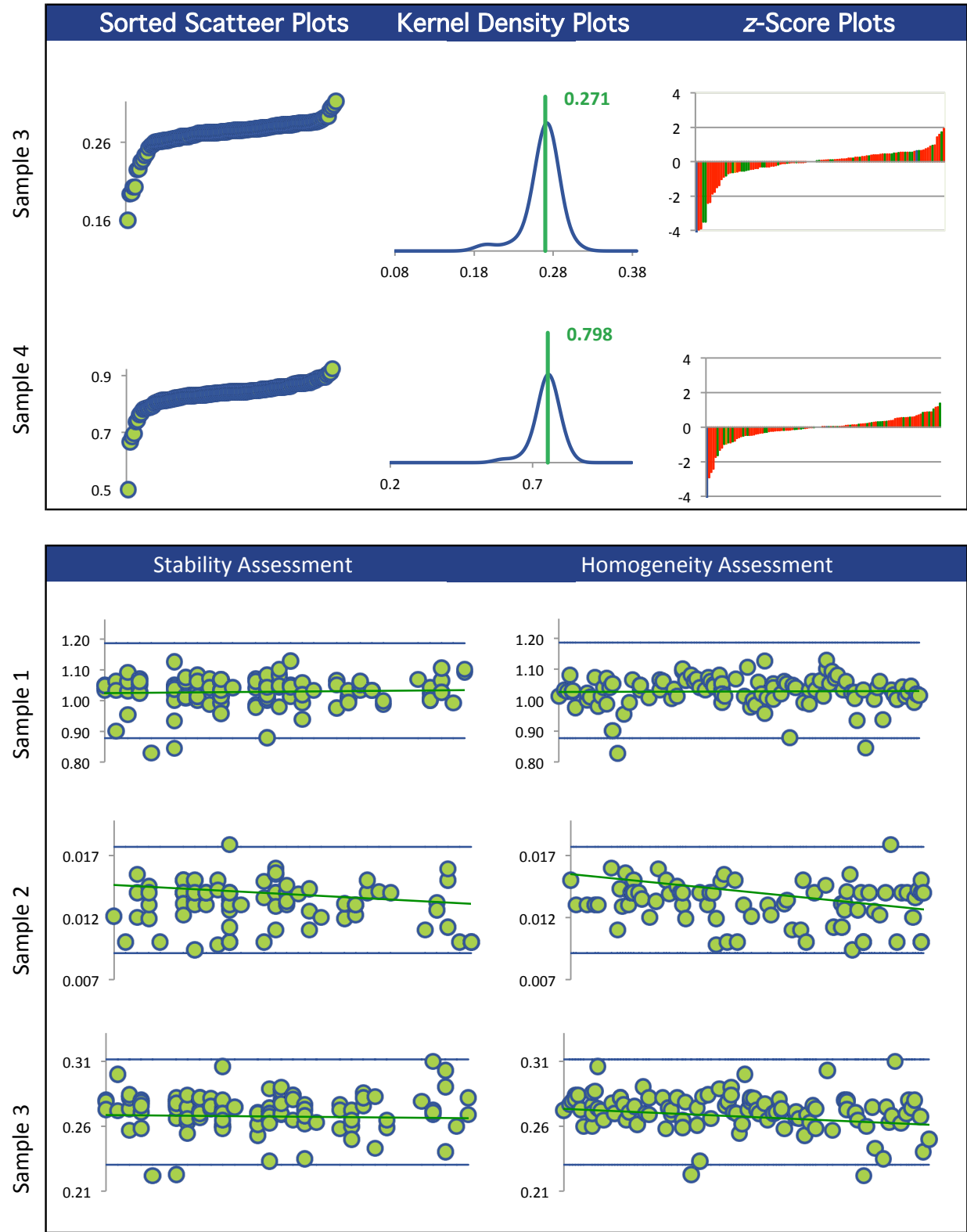
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AA (Blue)	2	2	2	2
ICP/MS (Red)	76	58	76	76
ICP/OES (Green)	31	26	31	31
AAG (Orange)	1	1	1	1

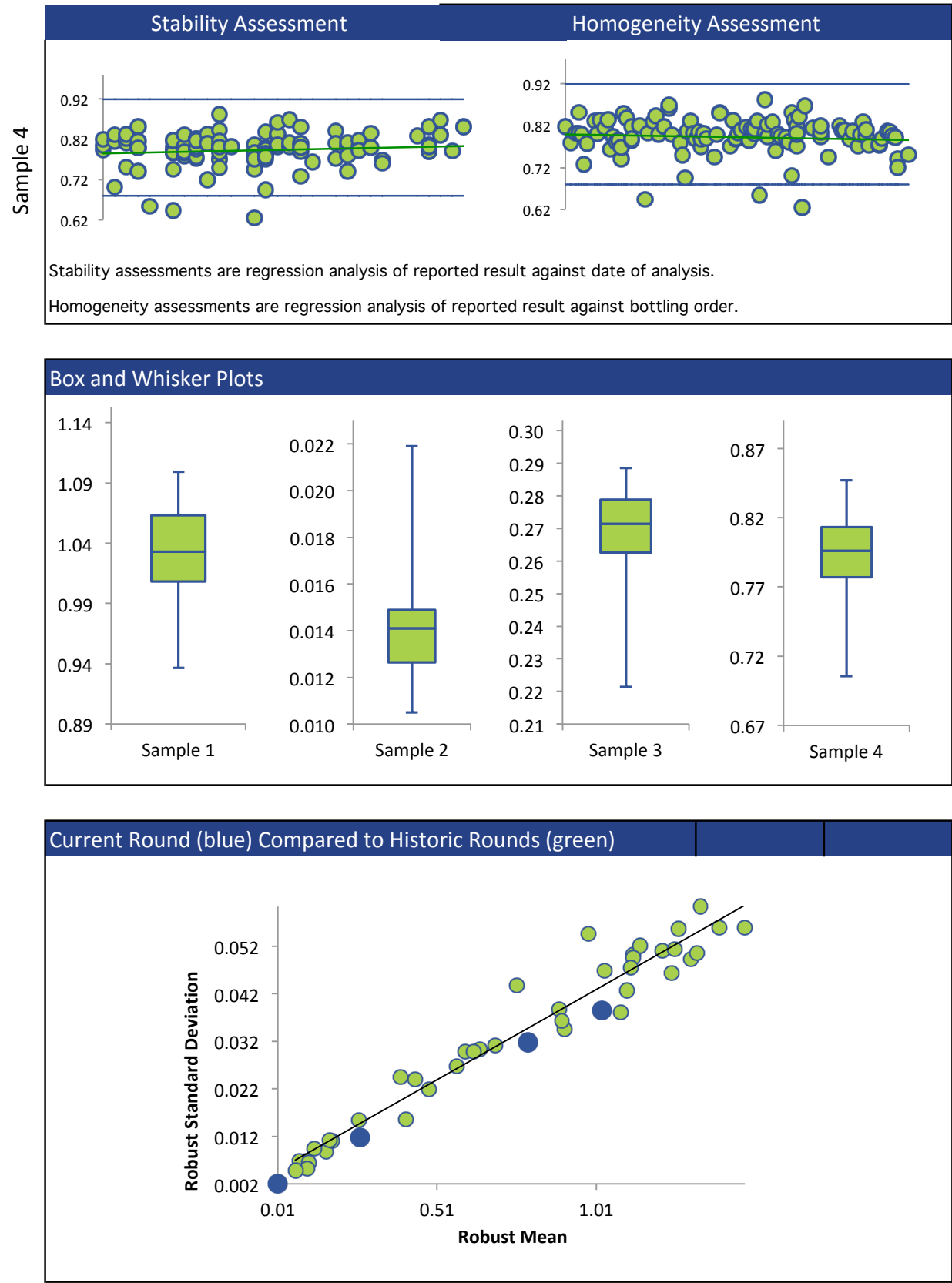
All summary stats and the plots below are based on the data excluding any flagged outliers



IRON



IRON



## LEAD

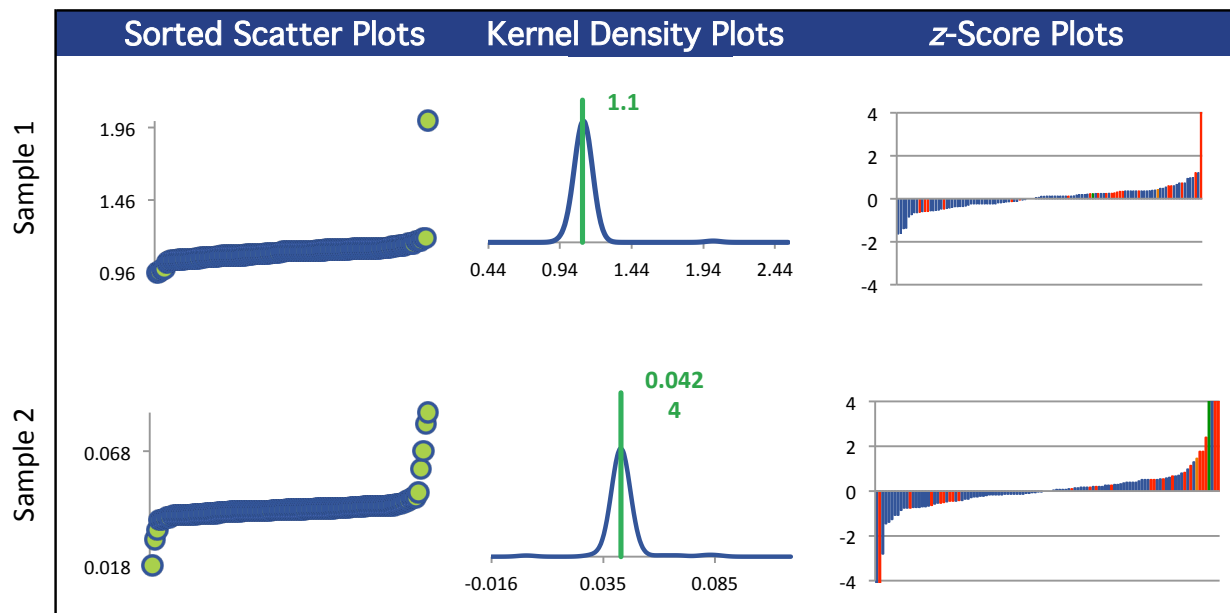
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	113	113	114	113
Median mg/L	1.11	0.0424	0.0679	0.927
Robust Mean mg/L	1.10	0.0424	0.0679	0.926
U mg/L	0.00452	0.000225	0.000375	0.00428
Robust Standard Deviation mg/L	0.0384	0.00191	0.00320	0.0364
Regression Standard Deviation mg/L	0.0827	0.00318	0.00509	0.0695
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0827	0.00318	0.00509	0.0695
Outliers	2	1	0	2
$ z  > 3.0$	1	6	6	0
$2 <  z  < 3$	0	2	1	0

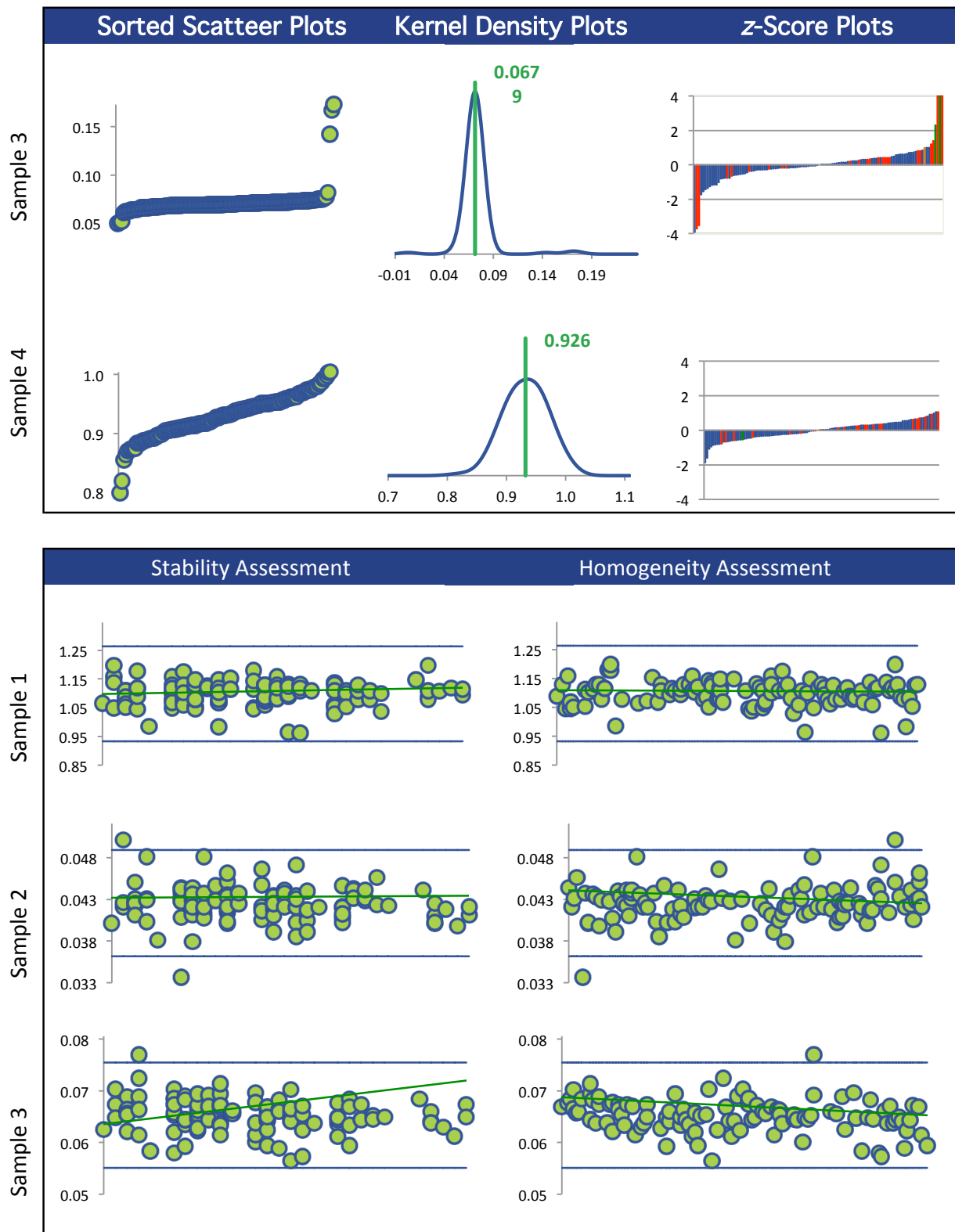
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	88	88	88	88
ICP/OES (Red)	23	23	23	23
AAG (Green)	1	1	2	1
AA (Orange)	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

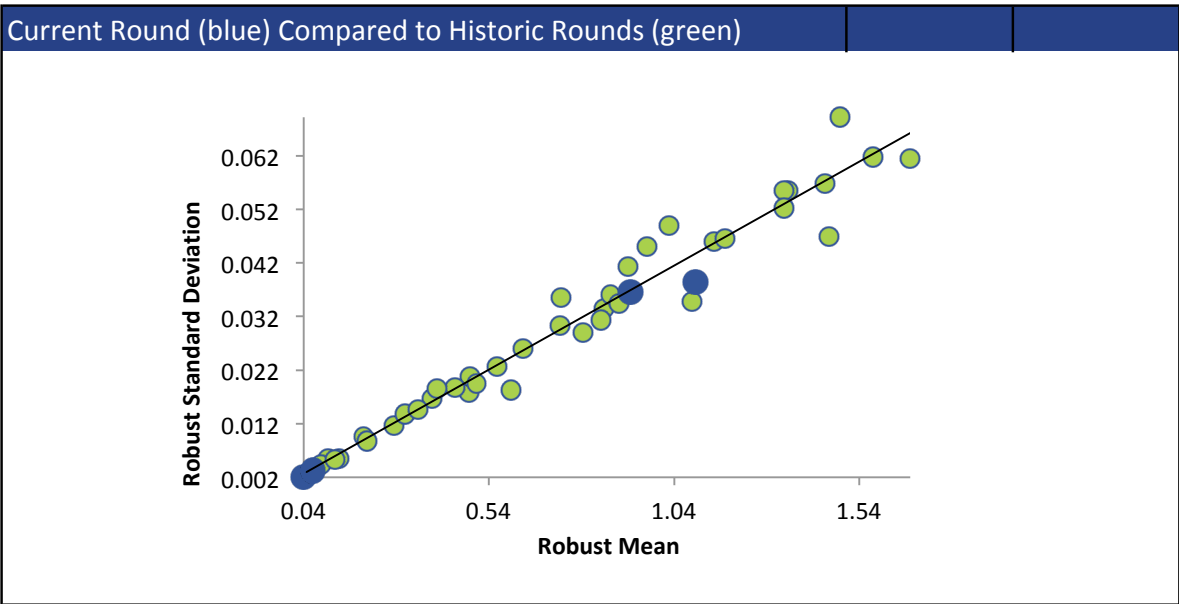
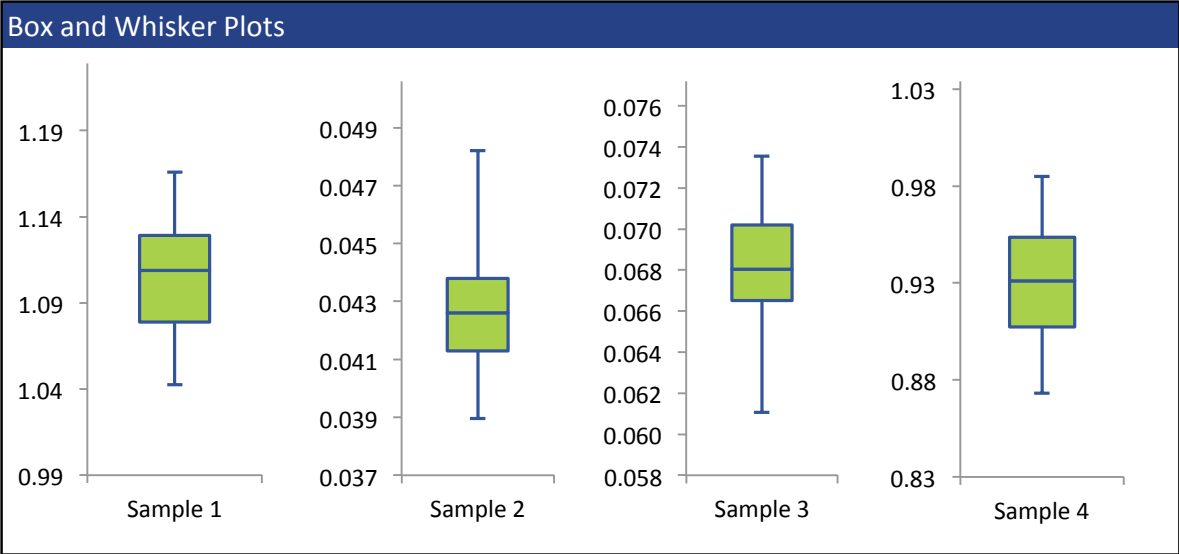
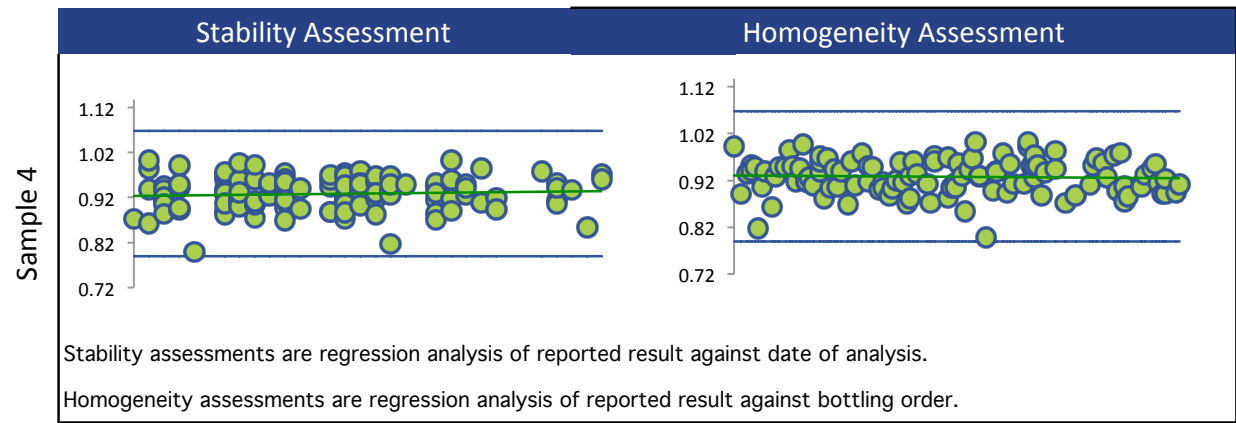


# LEAD





LEAD



## MANGANESE

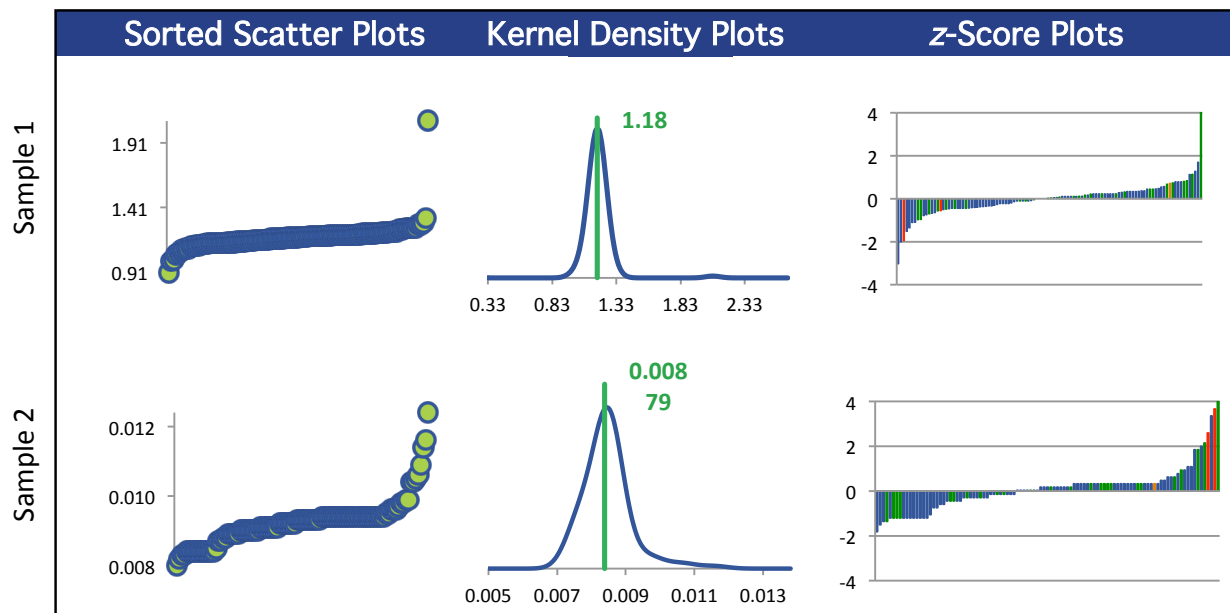
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	108	103	108	108
Median mg/L	1.18	0.00890	0.0461	0.855
Robust Mean mg/L	1.18	0.00879	0.0461	0.857
U mg/L	0.00577	0.0001	0.000203	0.00402
Robust Standard Deviation mg/L	0.0480	0.000489	0.00169	0.0334
Regression Standard Deviation mg/L	0.0884	0.000659	0.00346	0.0643
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0884	0.000659	0.00346	0.0643
Outliers	1	2	1	1
$ z  > 3.0$	2	3	4	1
$2 <  z  < 3$	1	2	0	2

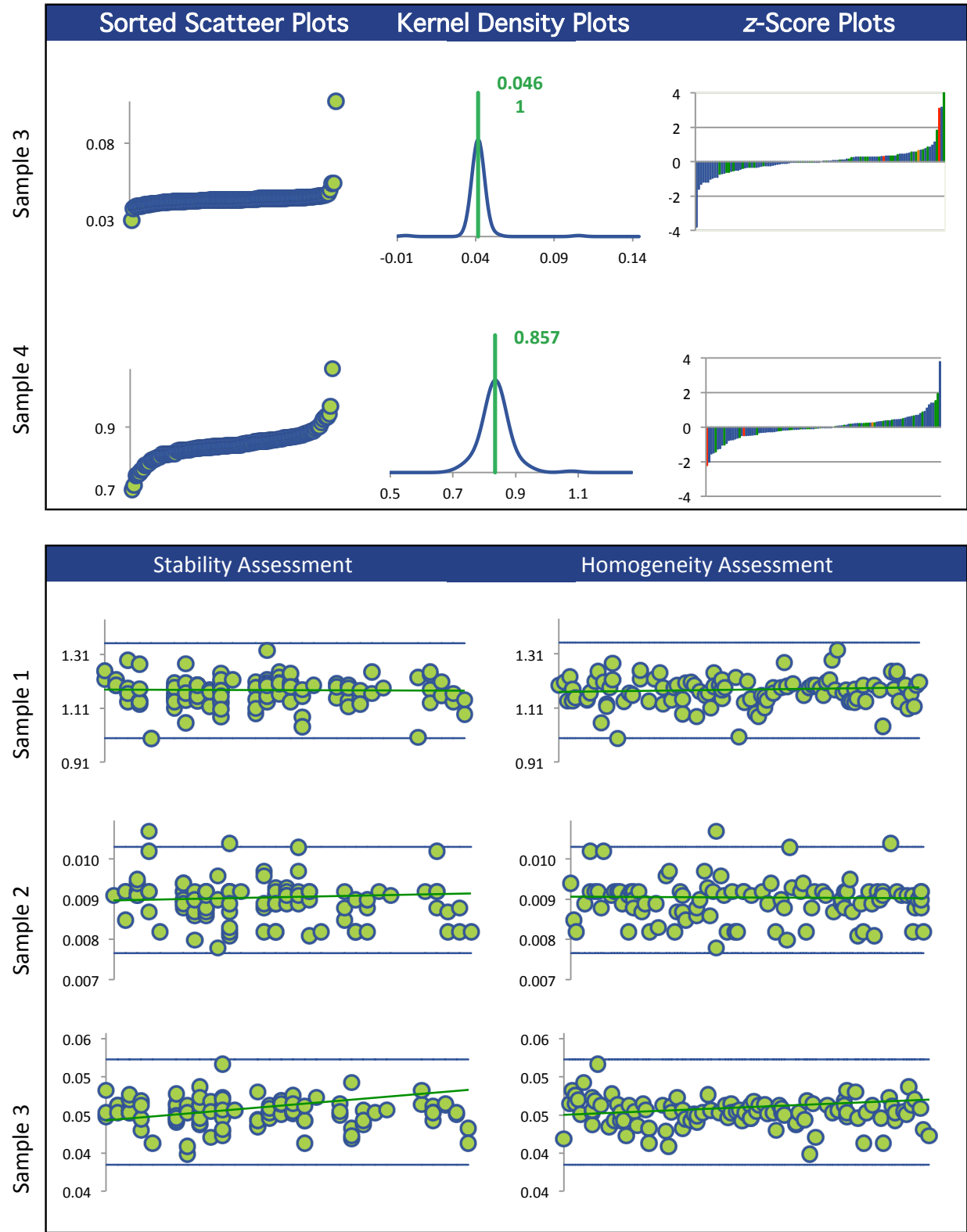
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	76	75	76	76
AAG (Red)	2	2	2	2
ICP/OES (Green)	29	25	29	29
AA (Orange)	1	1	1	1

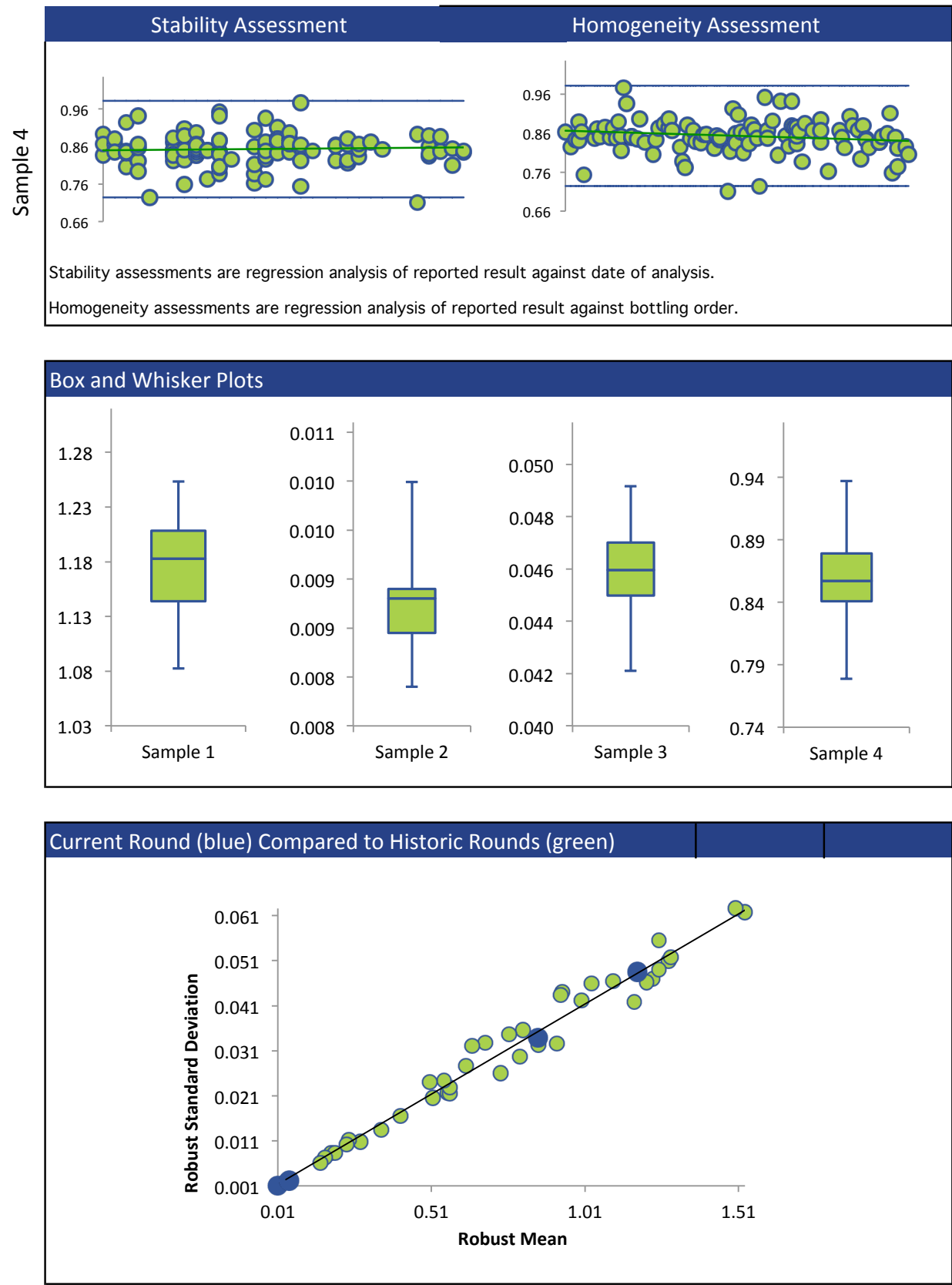
All summary stats and the plots below are based on the data excluding any flagged outliers



MANGANESE



MANGANESE



## MOLYBDENUM

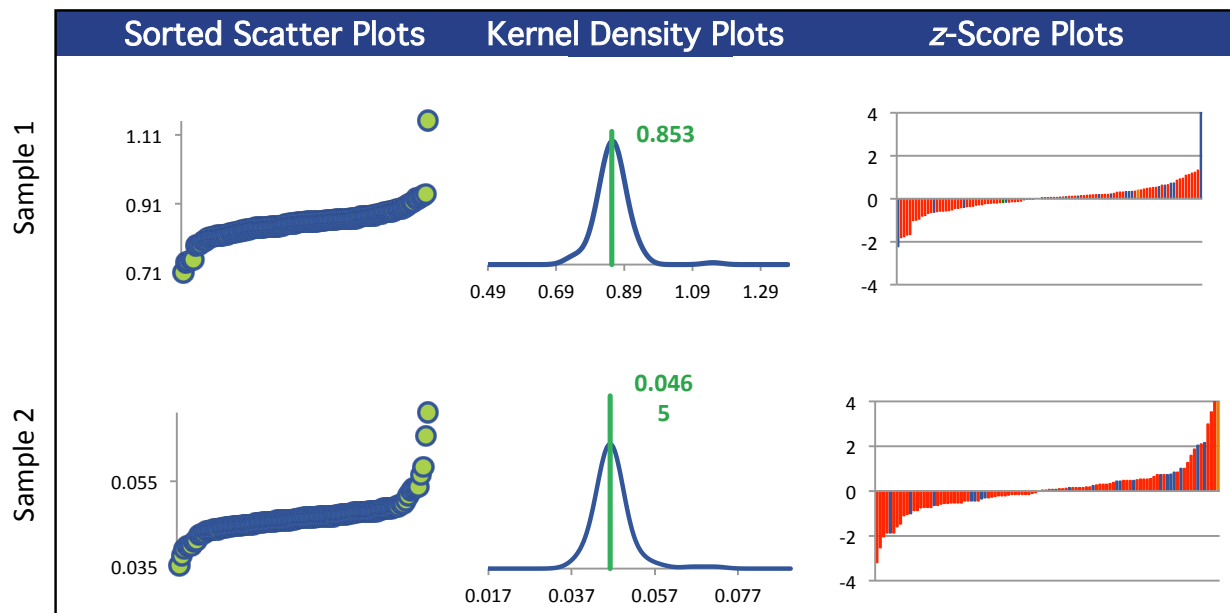
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	102	102	102	102
Median mg/L	0.857	0.0467	0.0825	0.620
Robust Mean mg/L	0.853	0.0465	0.0820	0.619
U mg/L	0.00426	0.000319	0.000526	0.00303
Robust Standard Deviation mg/L	0.0344	0.00258	0.00425	0.0245
Regression Standard Deviation mg/L	0.0640	0.00349	0.00615	0.0464
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0640	0.00349	0.00615	0.0464
Outliers	0	0	0	0
$ z  > 3.0$	1	4	1	0
$2 <  z  < 3$	1	6	0	1

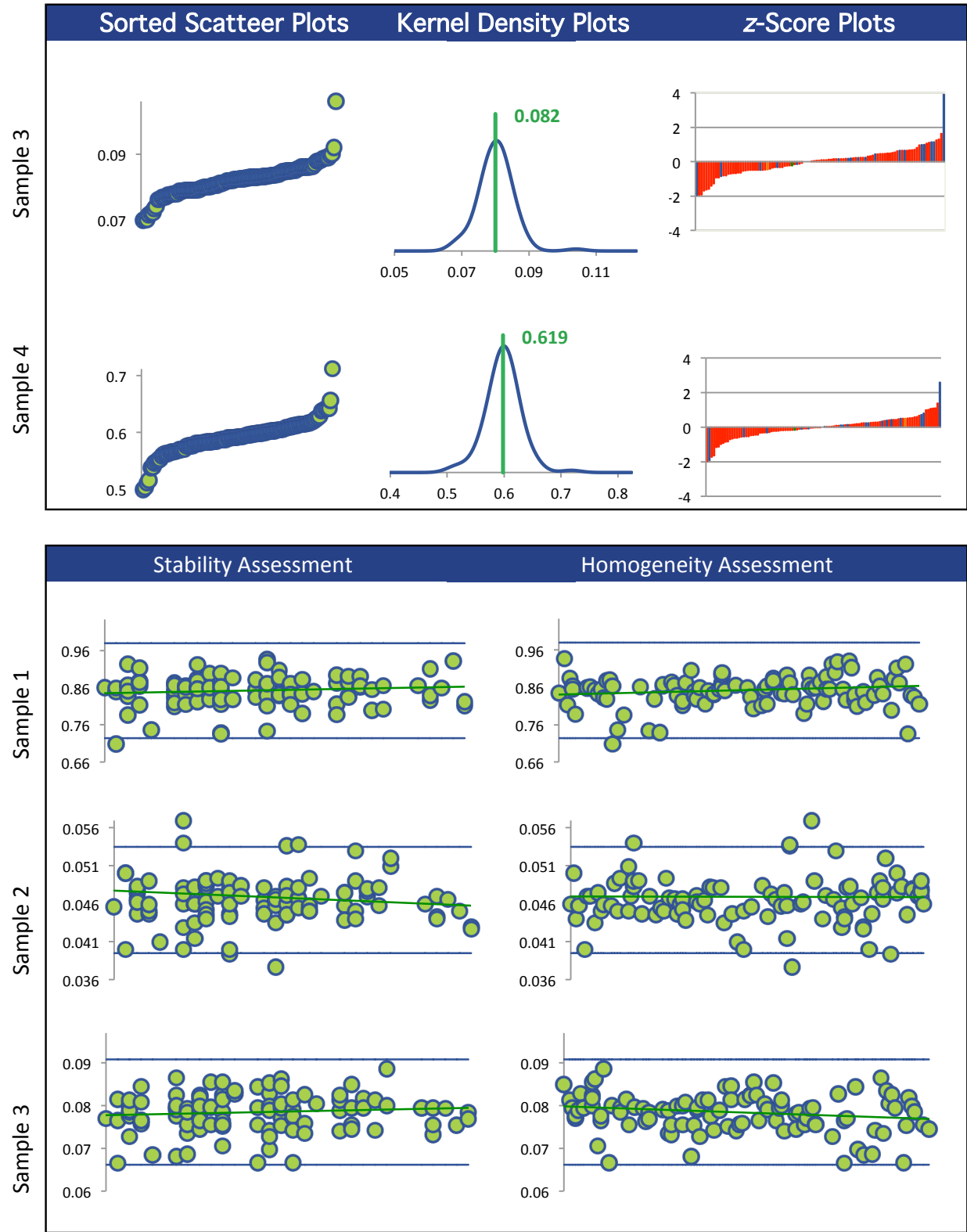
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	19	19	19	19
ICP/MS (Red)	81	81	81	81
AA (Green)	1	1	1	1
AAG (Orange)	1	1	1	1

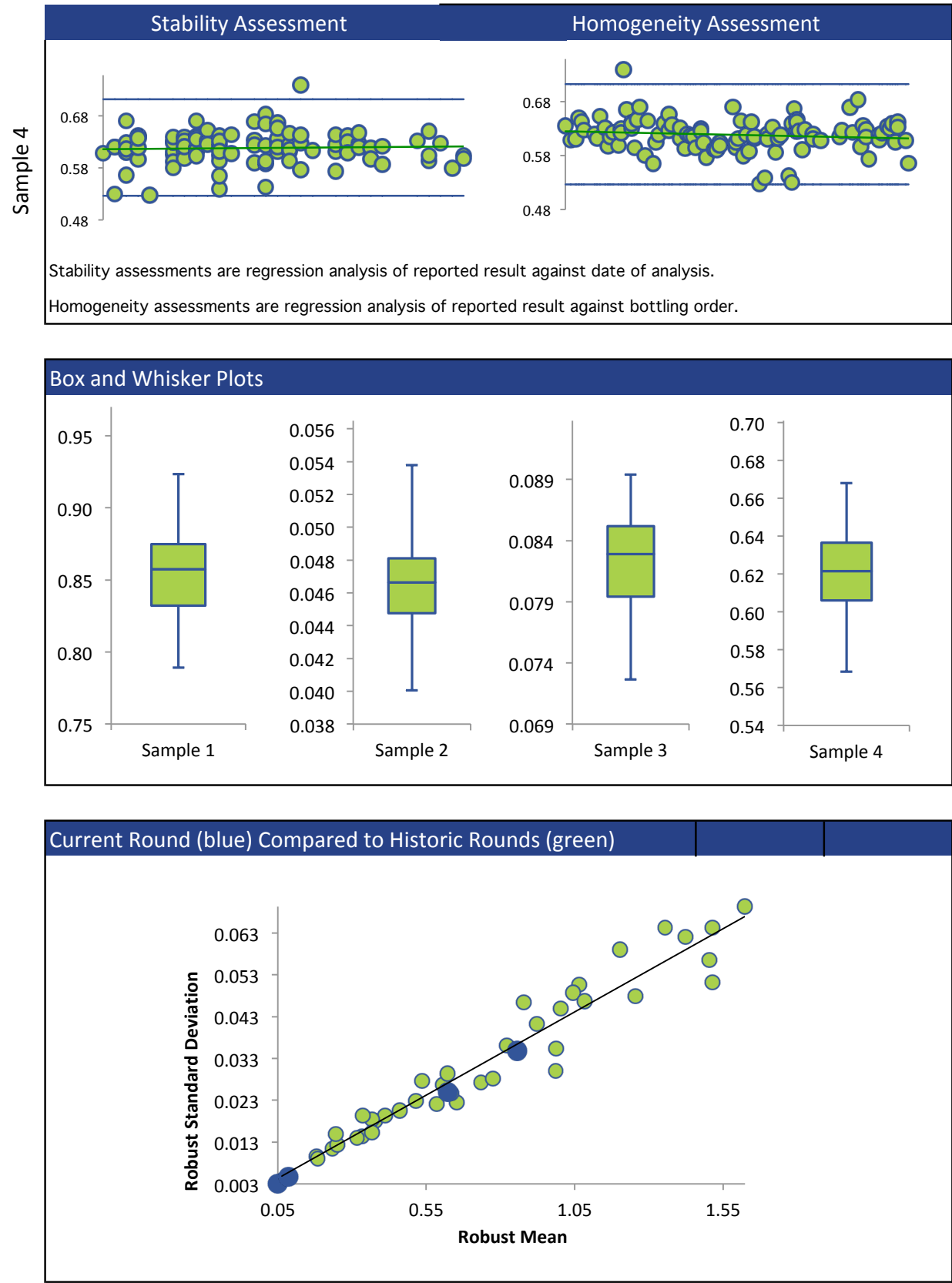
All summary stats and the plots below are based on the data excluding any flagged outliers



MOLYBDENUM



MOLYBDENUM



## NICKEL

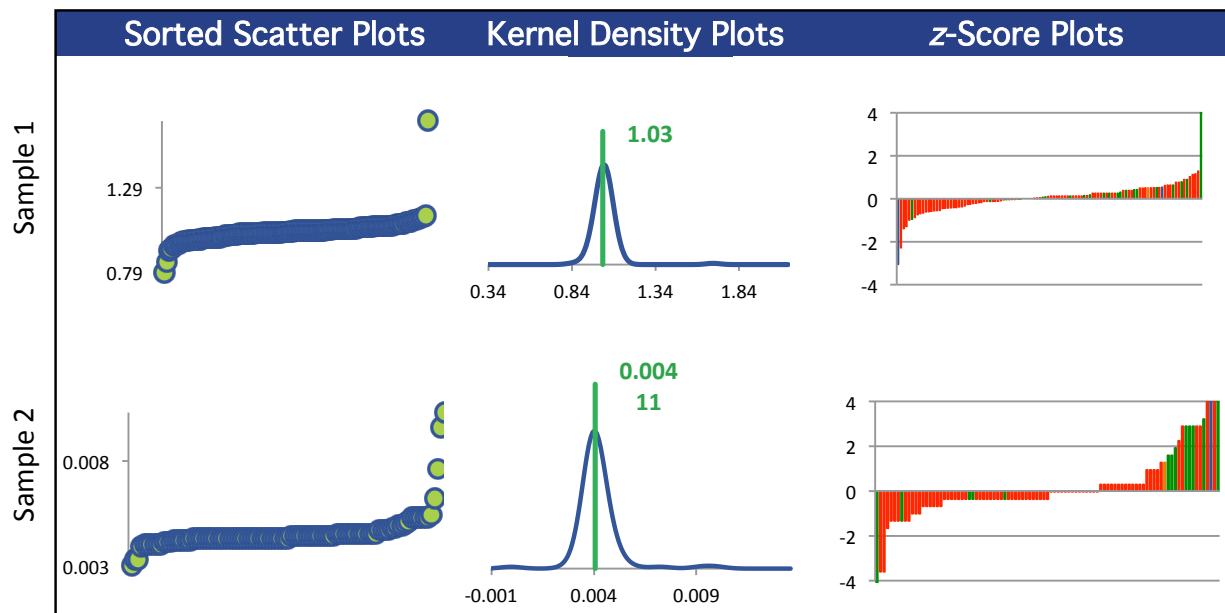
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	110	97	110	110
Median mg/L	1.04	0.00400	0.275	0.840
Robust Mean mg/L	1.03	0.00411	0.275	0.841
U mg/L	0.00455	0.000037	0.00128	0.00390
Robust Standard Deviation mg/L	0.0382	0.000288	0.0107	0.0327
Regression Standard Deviation mg/L	0.0776	0.000308	0.0207	0.0631
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0776	0.000308	0.0207	0.0631
Outliers	1	2	1	1
z >3.0	2	8	1	1
2< z <3	1	7	2	1

## Methods Used

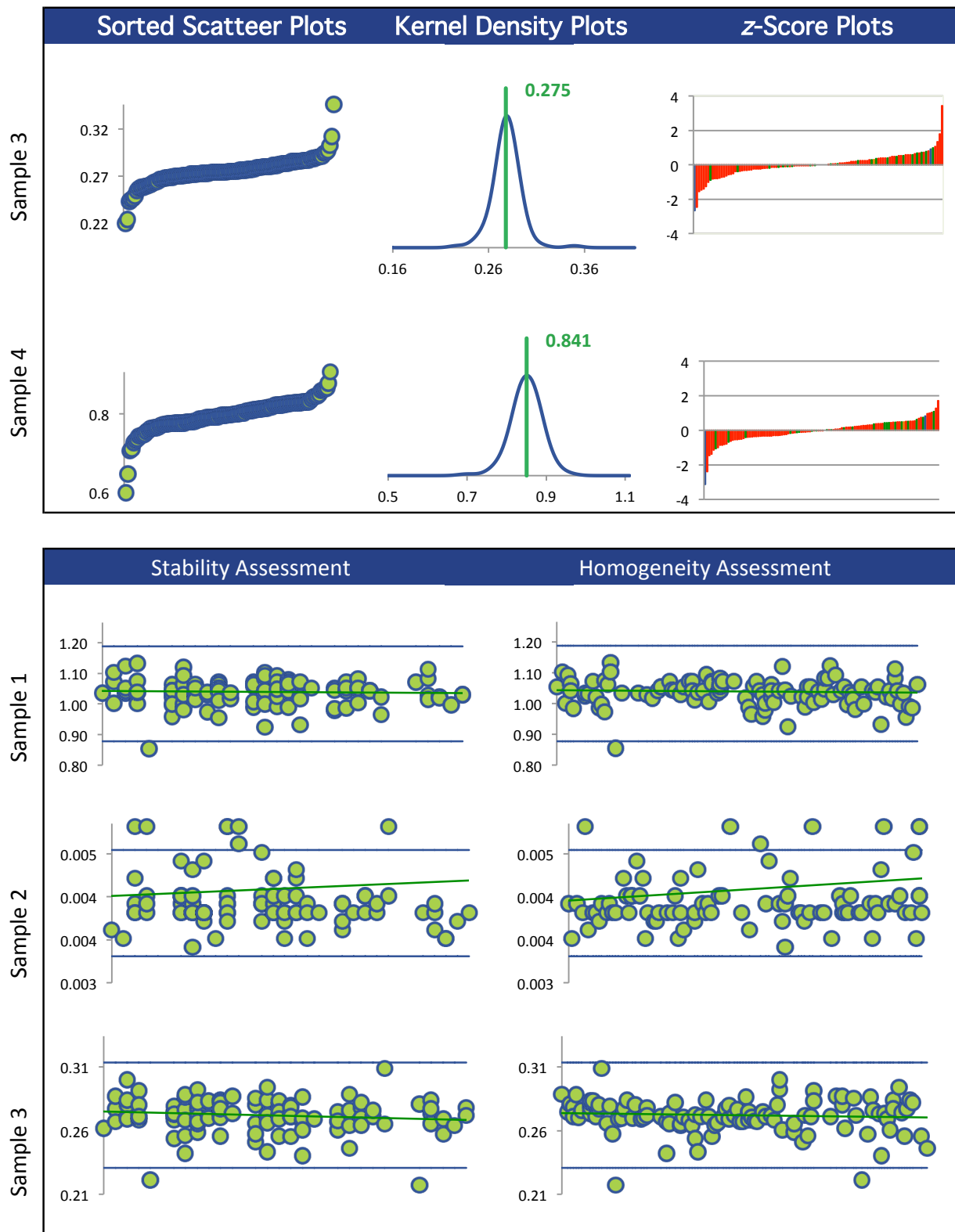
Method	C02A-1	C02A-2	C02A-3	C02A-4
AAG (Blue)	2	1	2	2
ICP/MS (Red)	85	82	85	85
ICP/OES (Green)	22	13	22	22
AA (Orange)	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

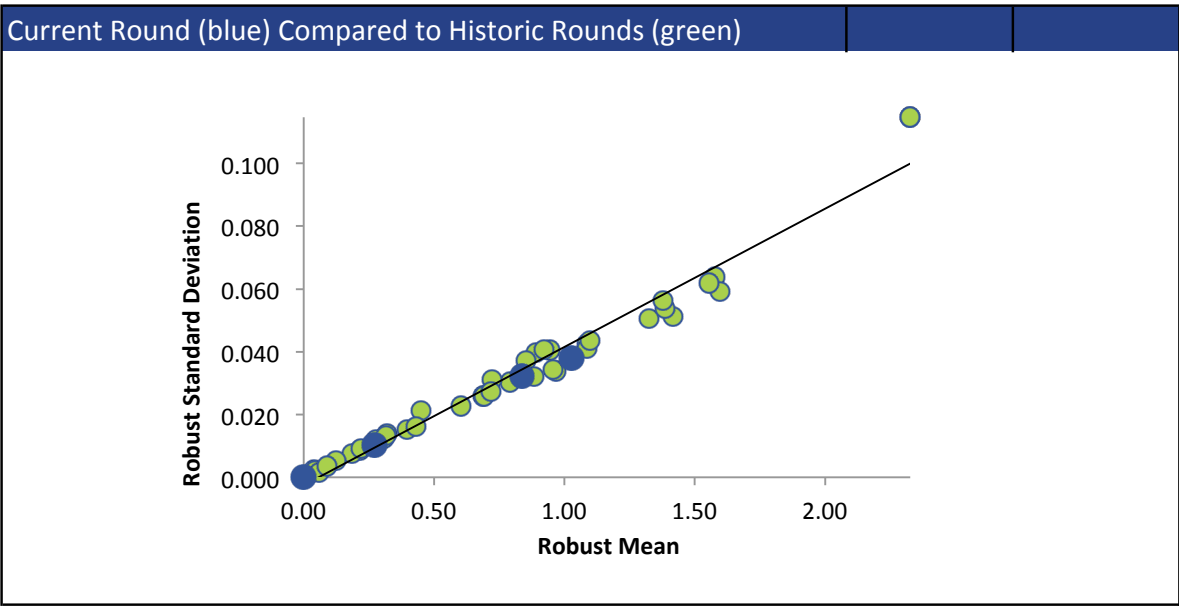
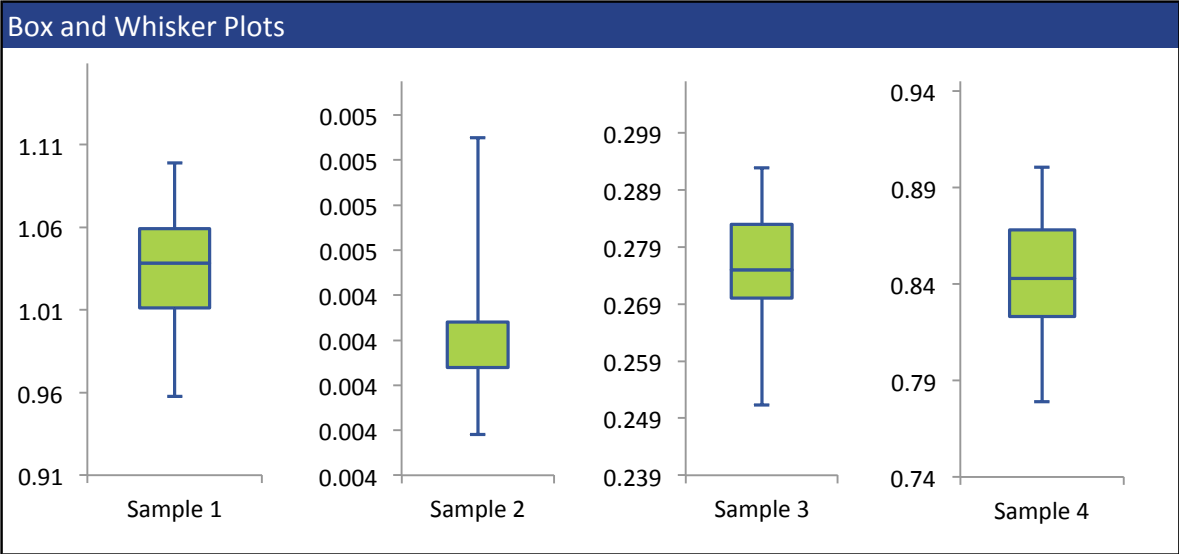
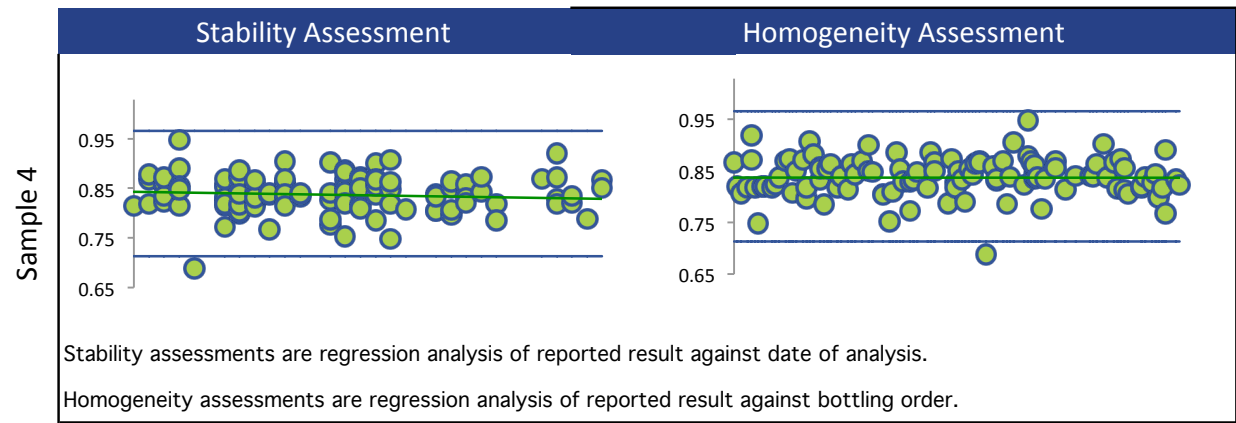




# NICKEL



NICKEL



## SELENIUM

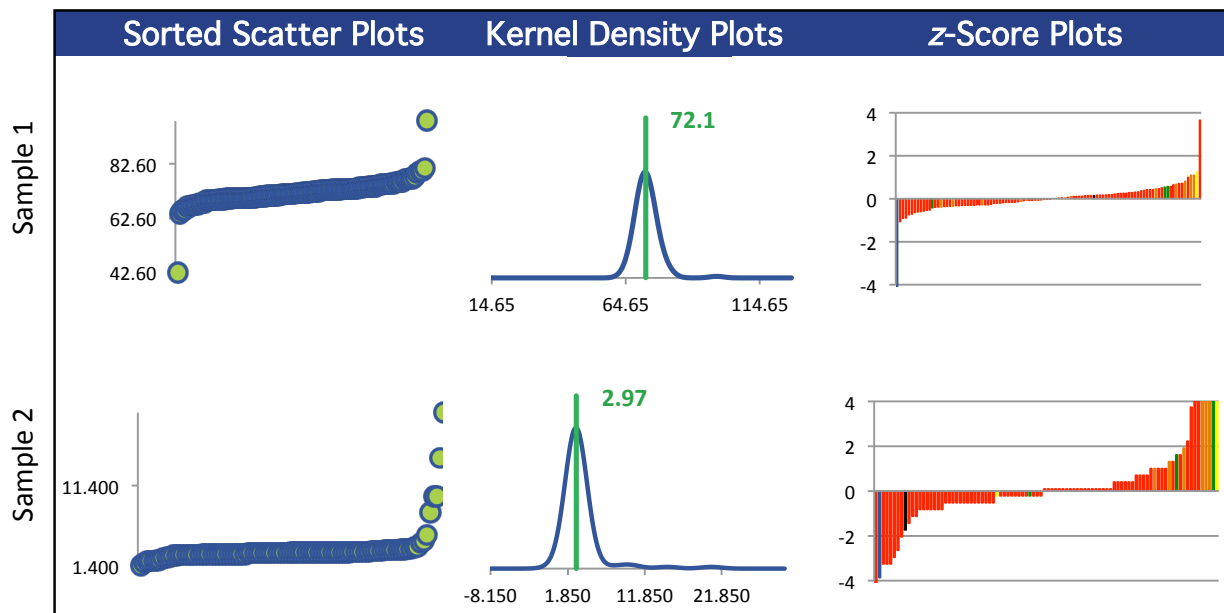
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	104	94	105	105
Median mg/L	72.0	3.00	45.4	76.8
Robust Mean mg/L	72.1	2.97	45.6	77.0
U mg/L	0.382	0.0424	0.305	0.439
Robust Standard Deviation mg/L	3.12	0.329	2.50	3.60
Regression Standard Deviation mg/L	7.21	0.297	4.56	7.70
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	7.21	0.329	4.56	7.70
Outliers	2	1	1	1
$ z  > 3.0$	2	13	1	2
$2 <  z  < 3$	0	4	3	2

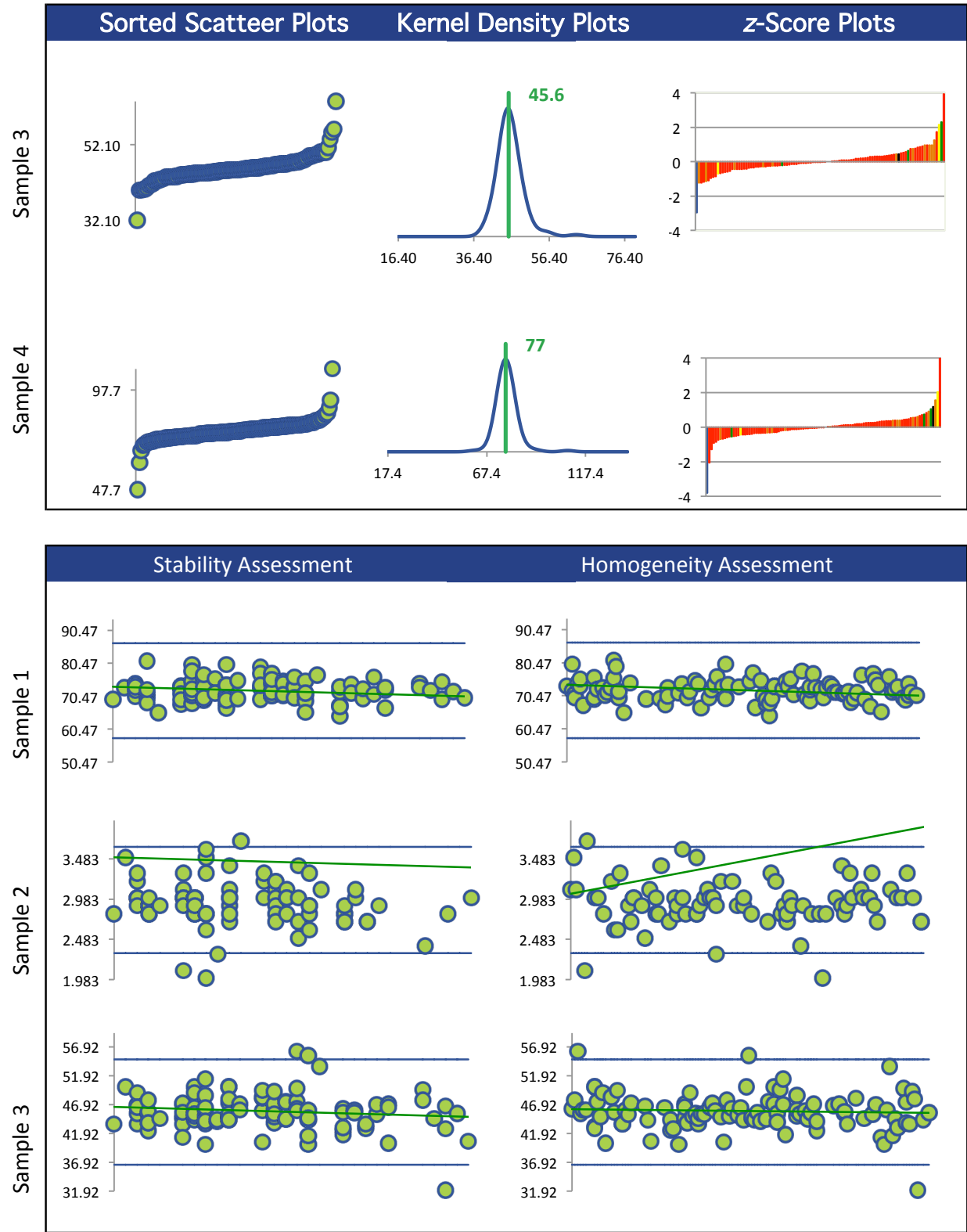
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AFS (Blue)	1	1	1	1
ICP/MS (Red)	86	81	86	86
AAHY (Green)	3	3	3	3
ICP/OES (Orange)	12	6	12	12
CVAFS (Black)	1	1	1	1
AAG (Yellow)	1	1	1	1
ICPHY (Purple)	0	1	1	1

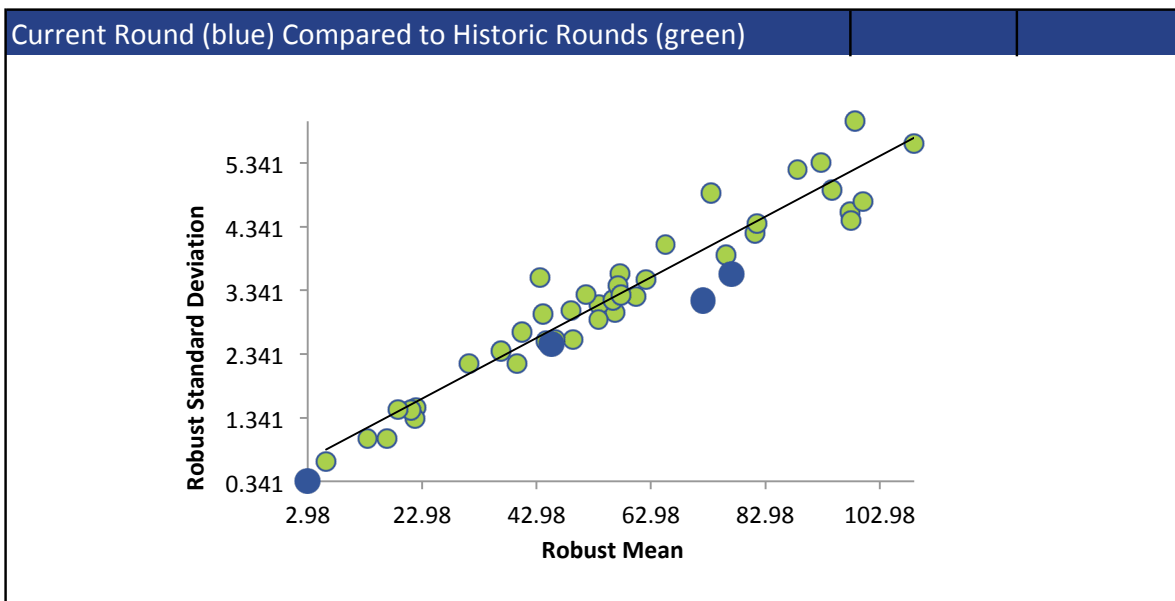
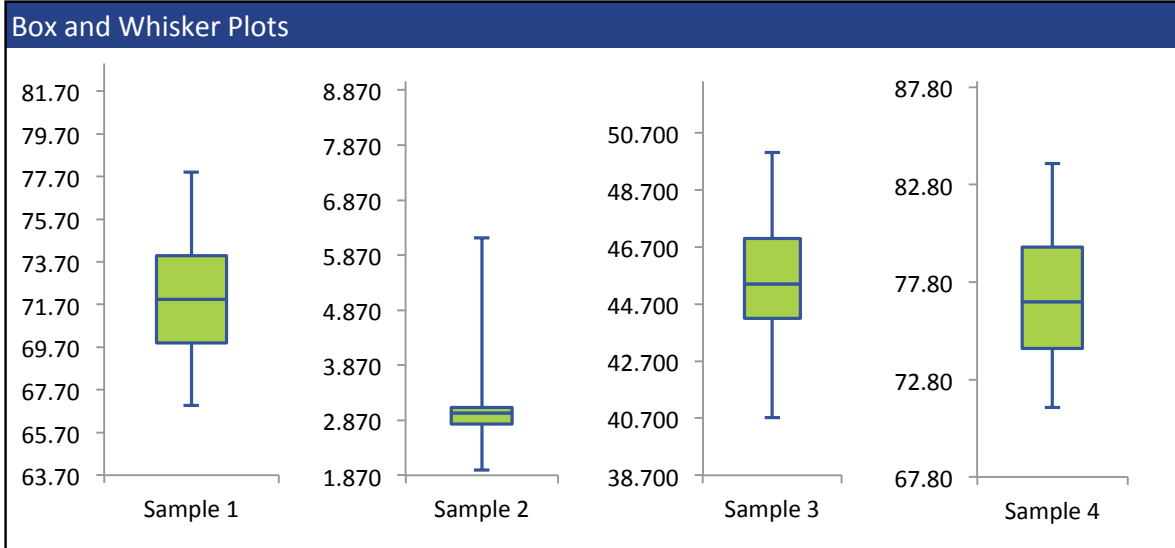
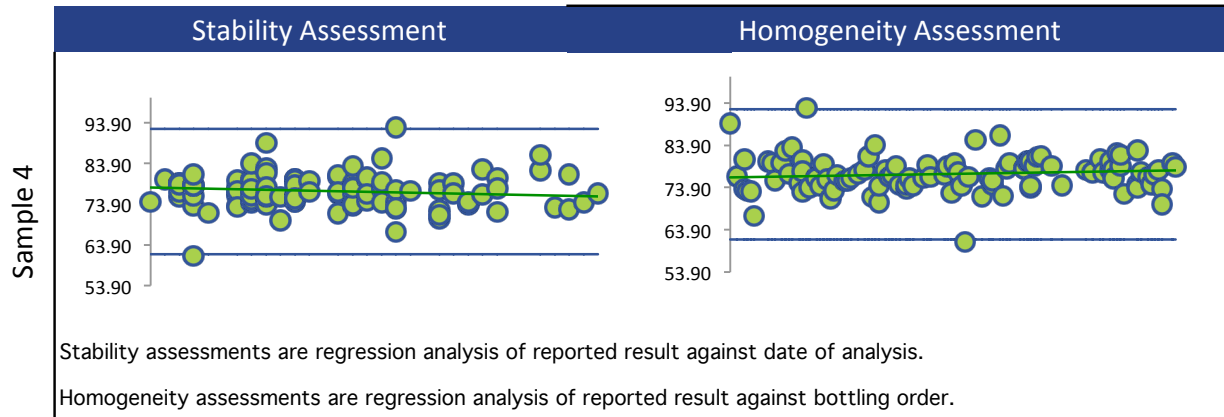
All summary stats and the plots below are based on the data excluding any flagged outliers



SELENIUM



## SELENIUM



## SILVER

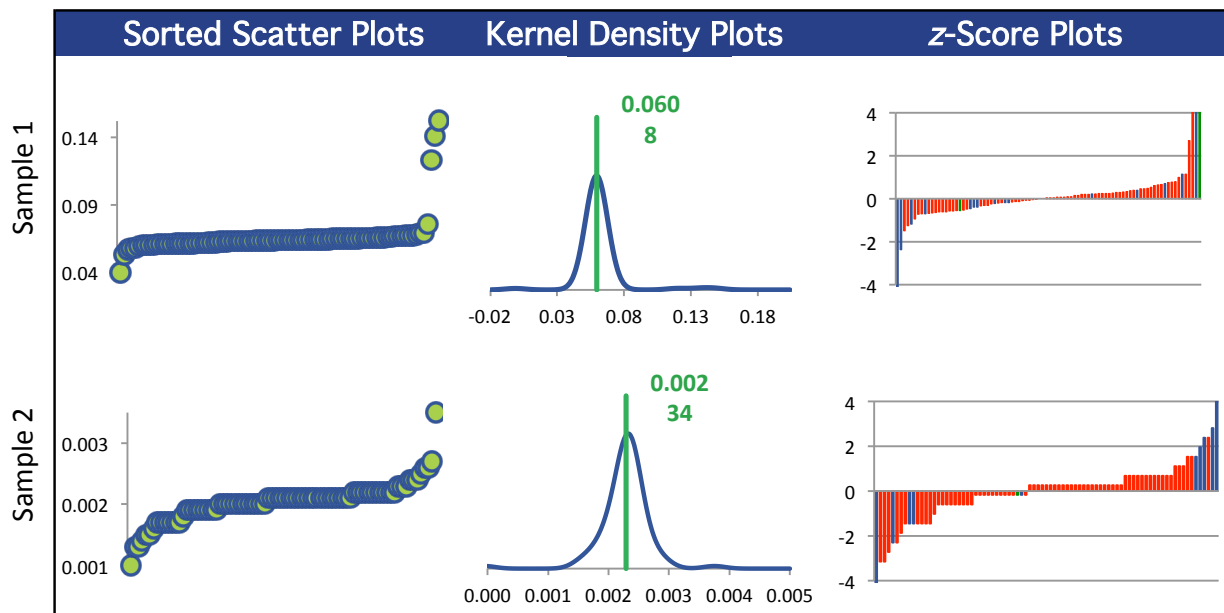
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	88	83	88	89
Median mg/L	0.0610	0.00240	0.0366	0.0680
Robust Mean mg/L	0.0608	0.00234	0.0363	0.0684
U mg/L	0.000348	0.000032	0.000217	0.000384
Robust Standard Deviation mg/L	0.00261	0.000235	0.00163	0.00290
Regression Standard Deviation mg/L	0.00456	0.000176	0.00273	0.00513
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00456	0.000235	0.00273	0.00513
Outliers	2	2	2	1
$ z  > 3.0$	4	4	3	3
$2 <  z  < 3$	2	6	1	1

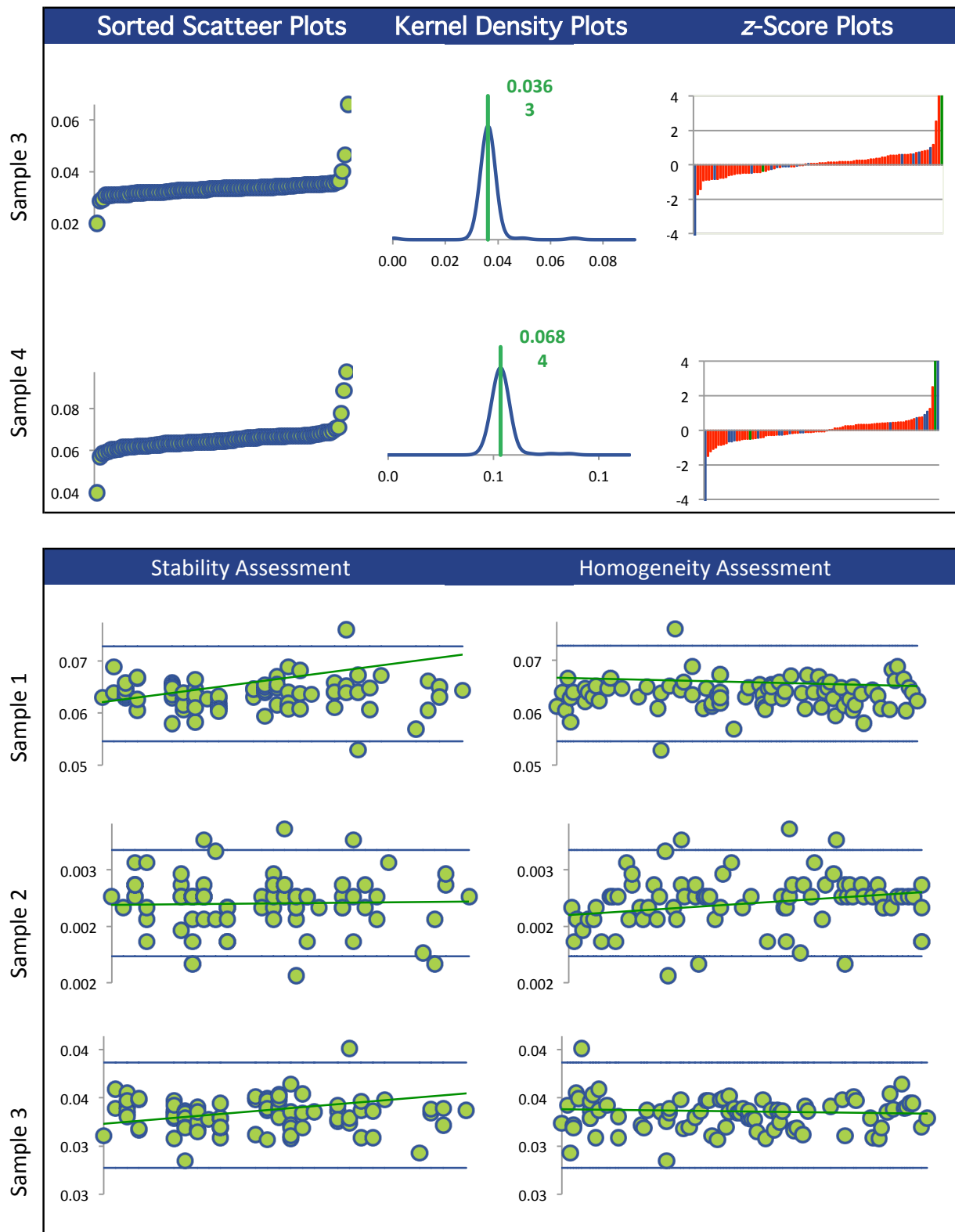
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	15	10	14	15
ICP/MS (Red)	71	72	72	72
AA (Green)	2	1	2	2

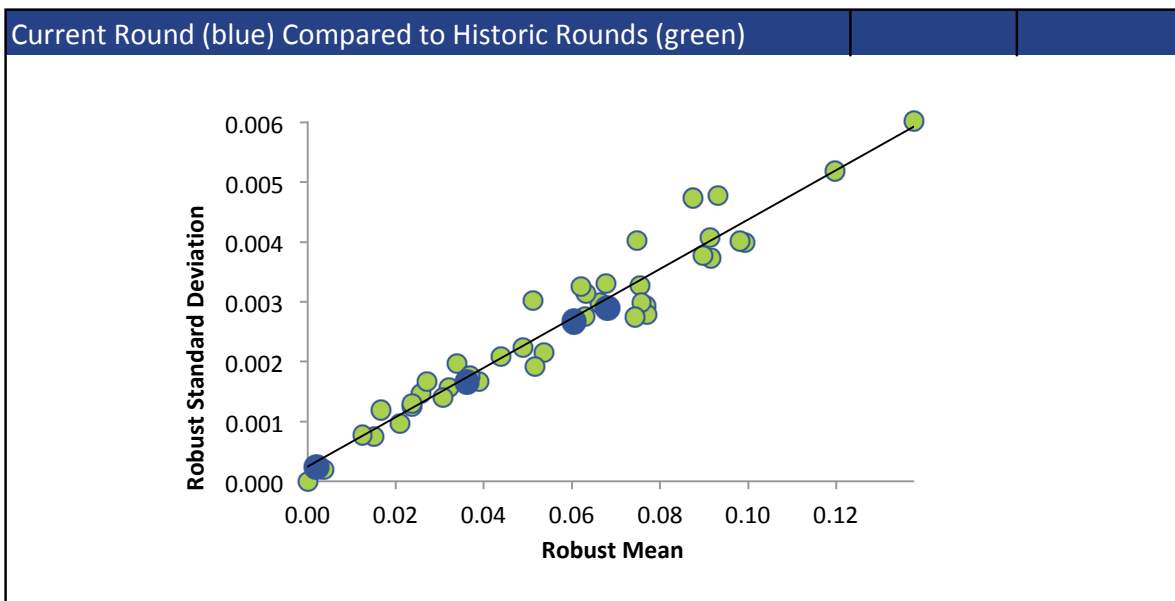
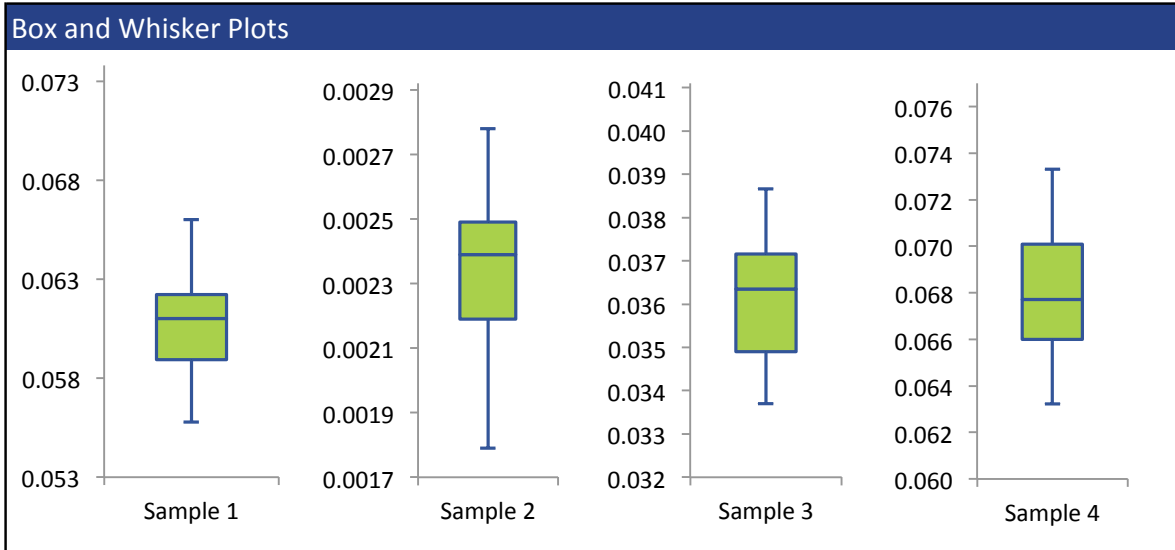
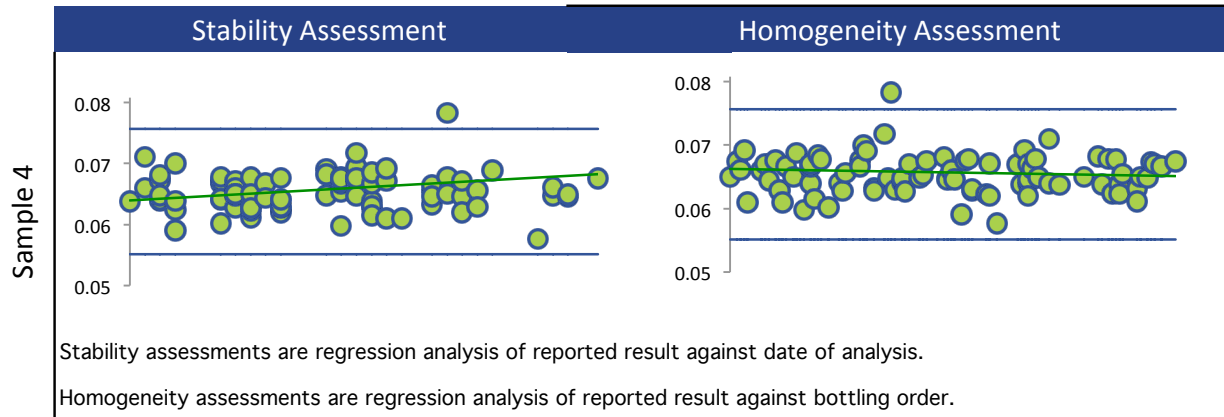
All summary stats and the plots below are based on the data excluding any flagged outliers



# SILVER



## SILVER





## STRONTIUM

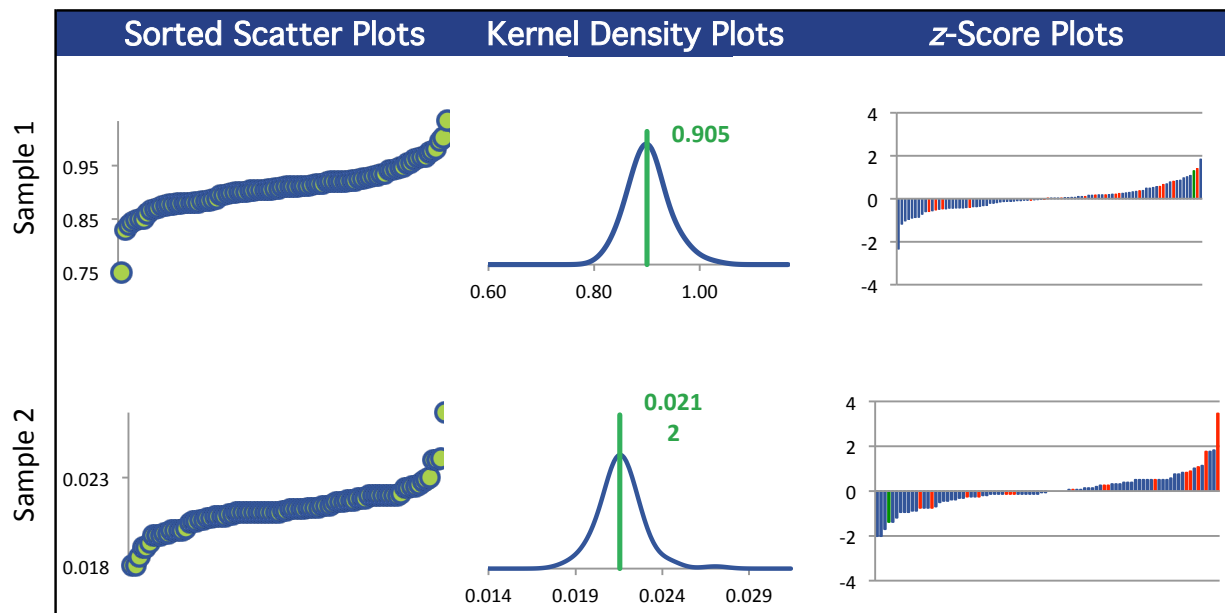
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	90	88	90	90
Median mg/L	0.906	0.0212	0.449	0.618
Robust Mean mg/L	0.905	0.0212	0.449	0.617
U mg/L	0.00455	0.000135	0.00212	0.00318
Robust Standard Deviation mg/L	0.0345	0.00101	0.0161	0.0241
Regression Standard Deviation mg/L	0.0679	0.00159	0.0336	0.0462
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0679	0.00159	0.0336	0.0462
Outliers	1	2	1	1
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	1	2	0	0

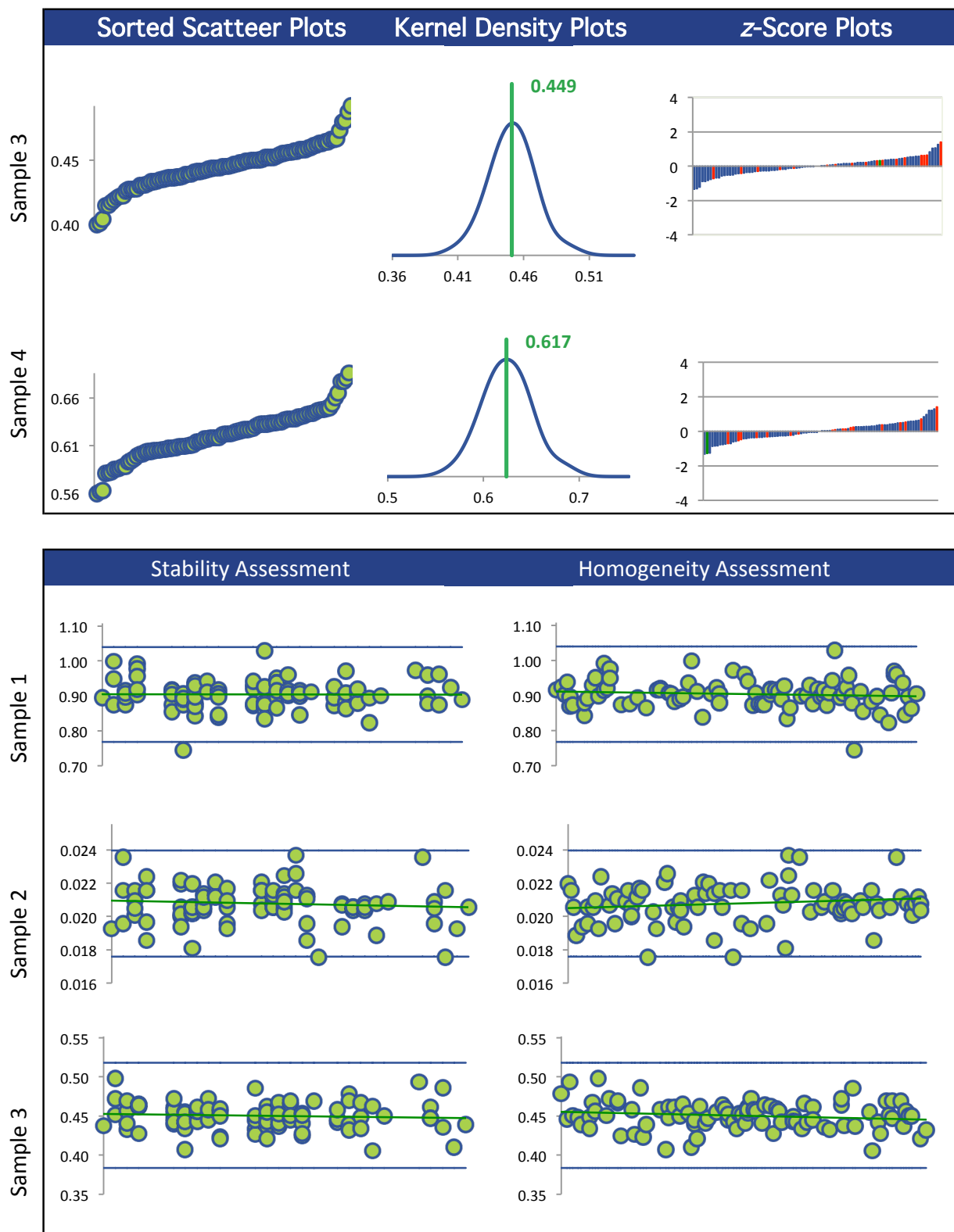
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	71	70	71	71
ICP/OES (Red)	18	17	18	18
AAG (Green)	1	1	1	1

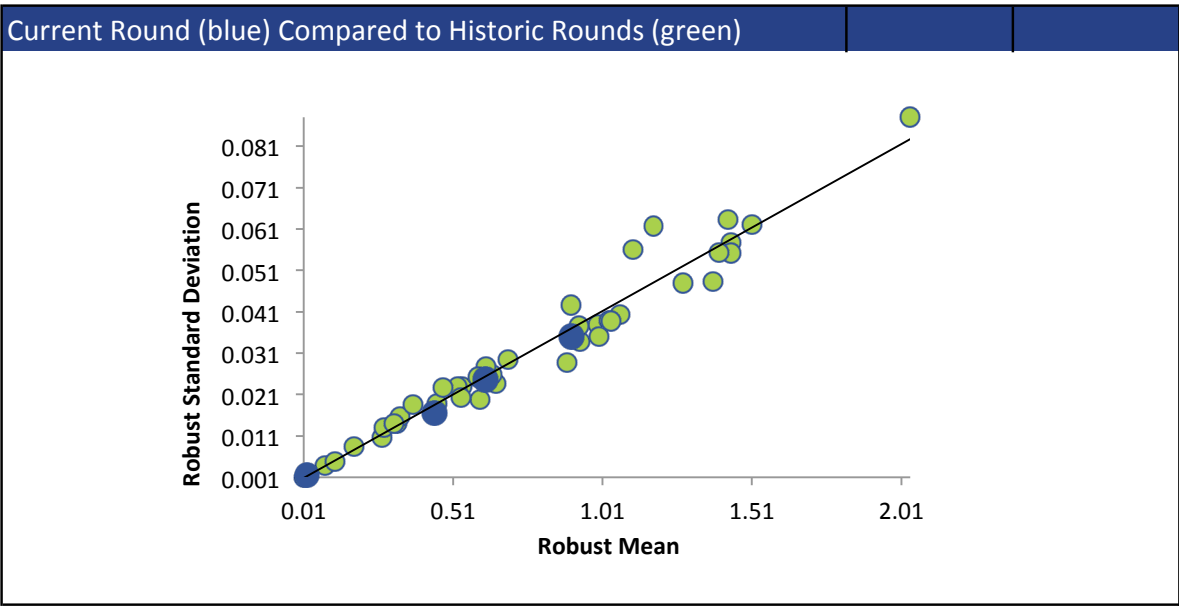
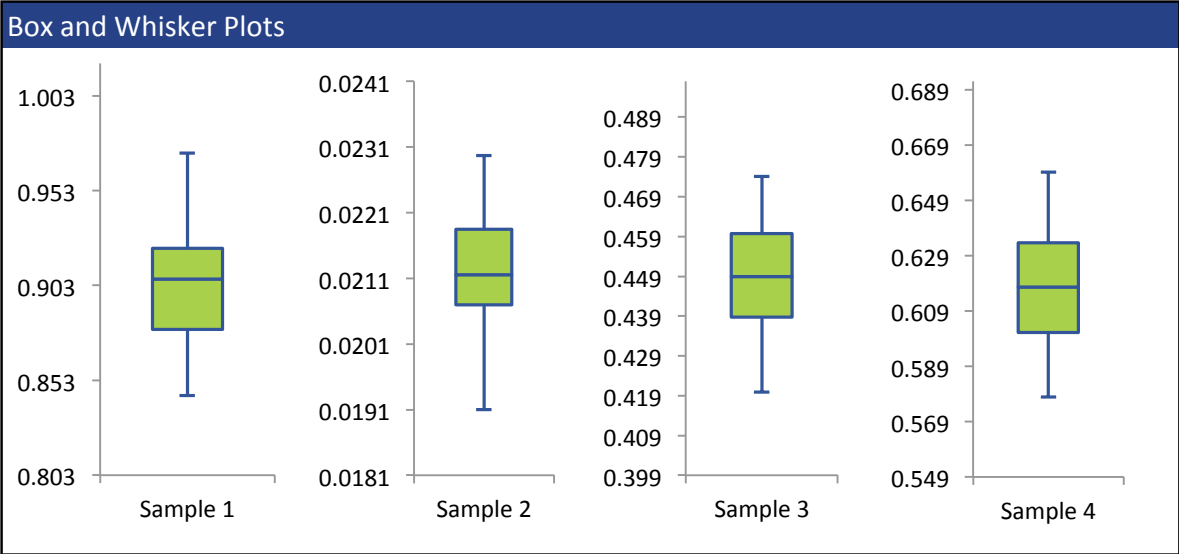
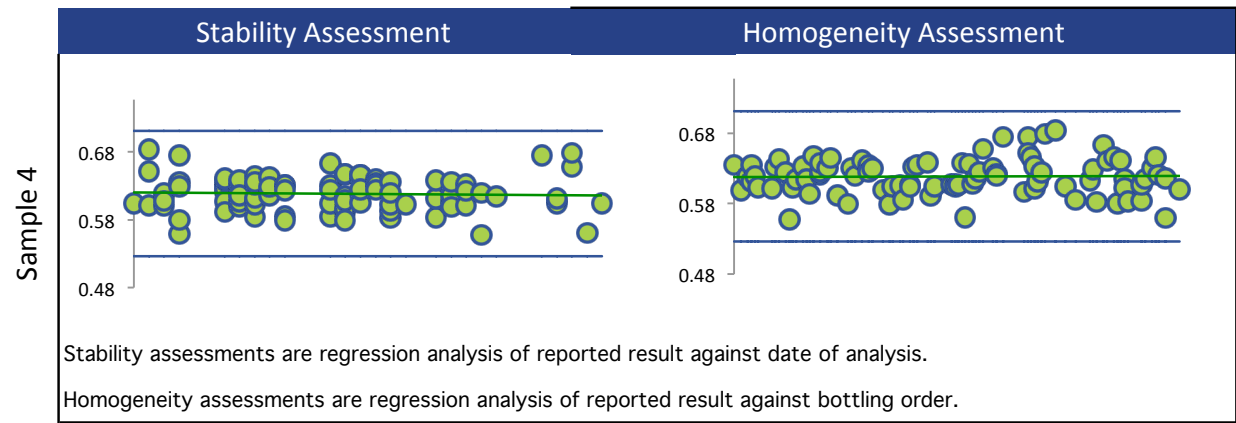
All summary stats and the plots below are based on the data excluding any flagged outliers



## STRONTIUM



STRONTIUM



## THALLIUM

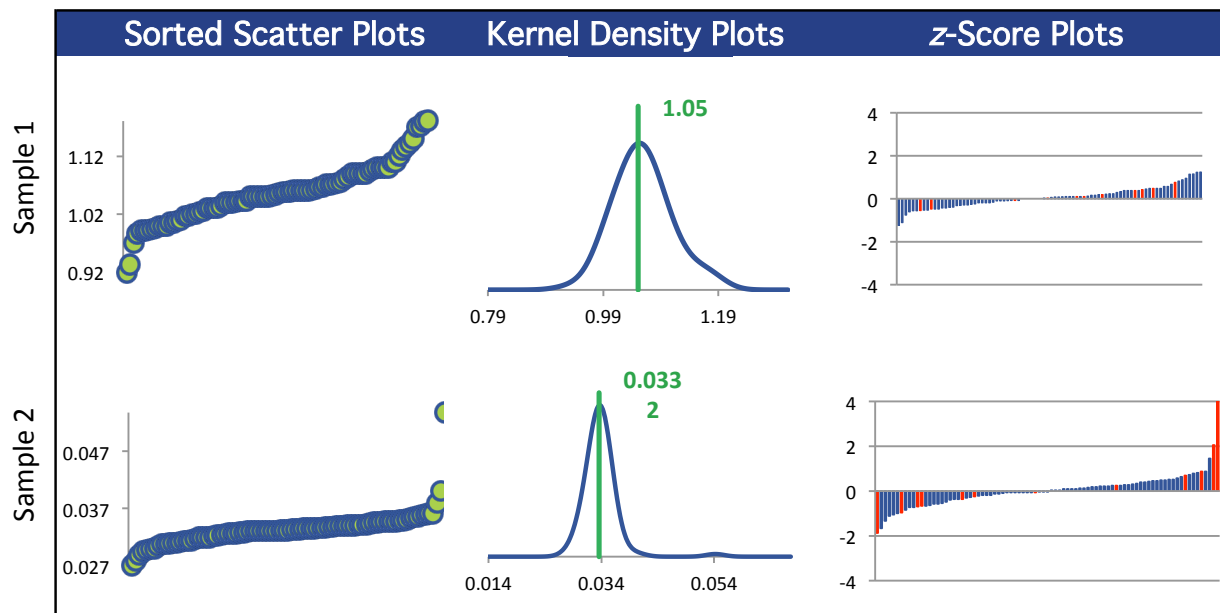
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	84	85	84	84
Median mg/L	1.05	0.0331	0.674	0.818
Robust Mean mg/L	1.05	0.0332	0.674	0.819
U mg/L	0.00631	0.000245	0.00348	0.00480
Robust Standard Deviation mg/L	0.0463	0.00181	0.0255	0.0352
Regression Standard Deviation mg/L	0.105	0.00332	0.0674	0.0819
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.105	0.00332	0.0674	0.0819
Outliers	1	1	2	2
$ z  > 3.0$	0	1	0	0
$2 <  z  < 3$	0	1	0	0

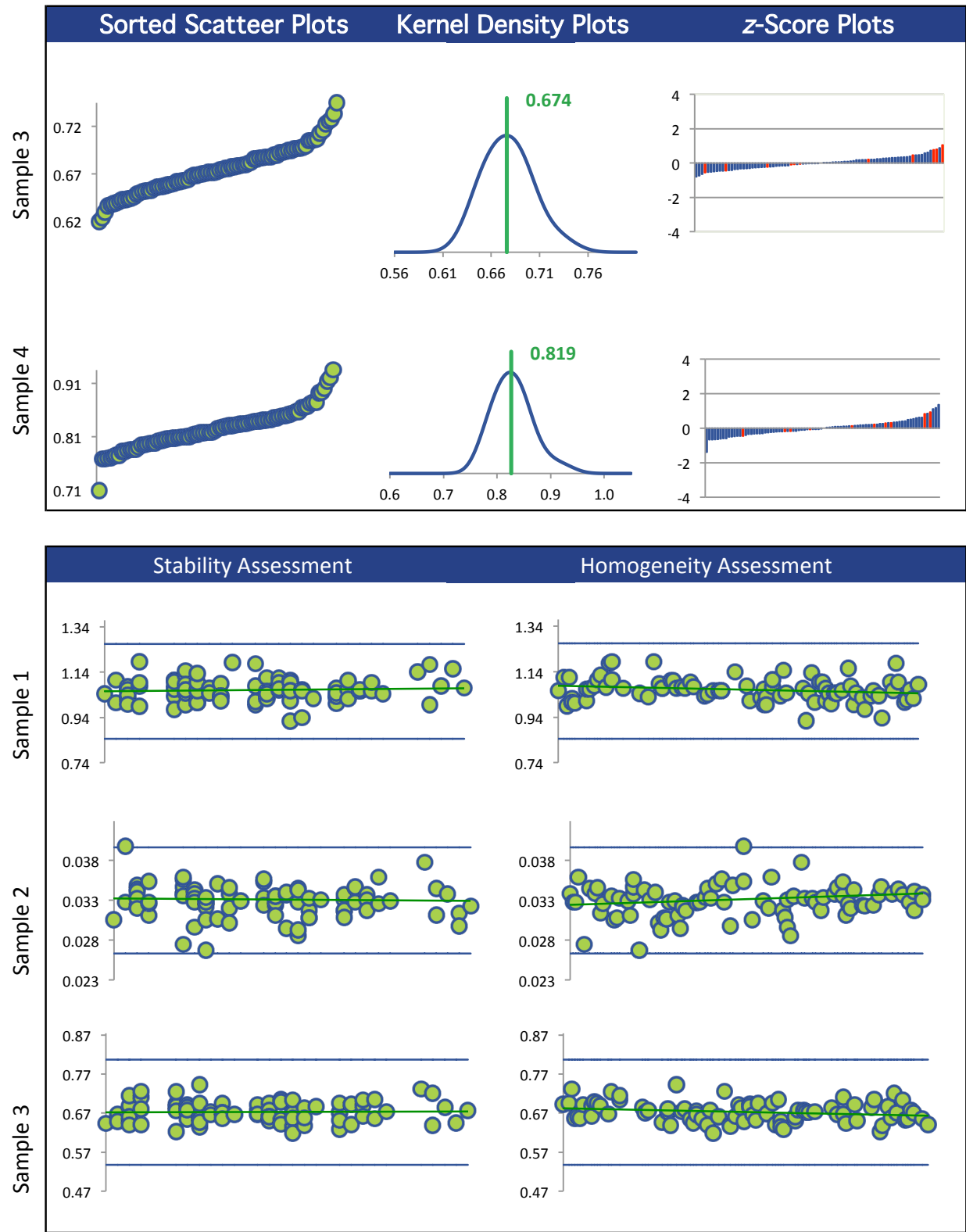
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	73	73	73	73
ICP/OES (Red)	11	12	11	11

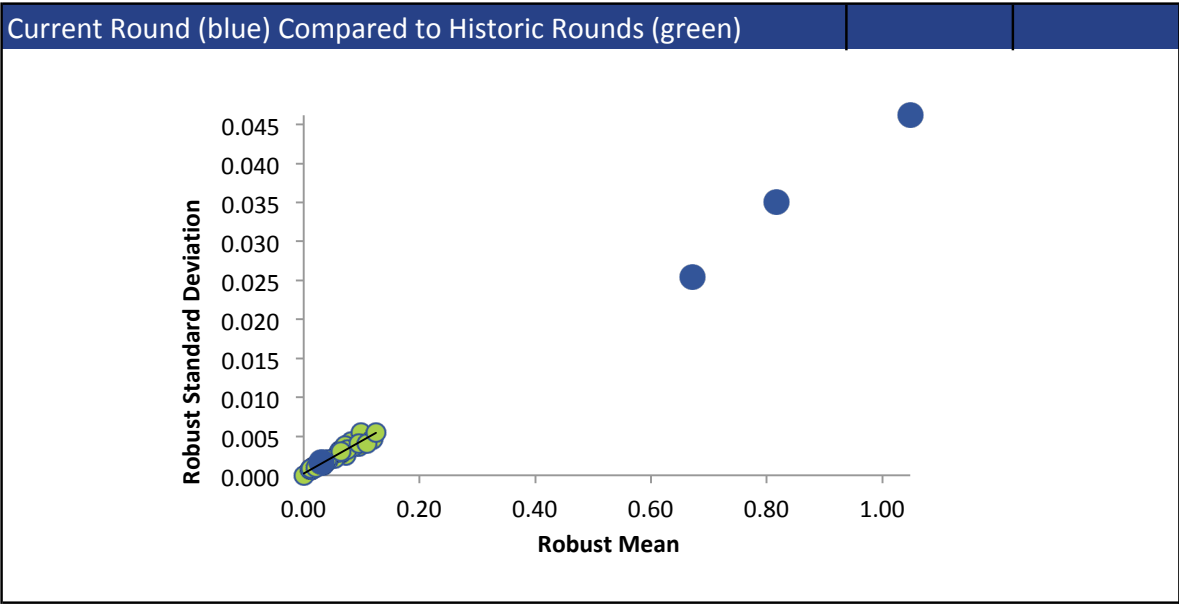
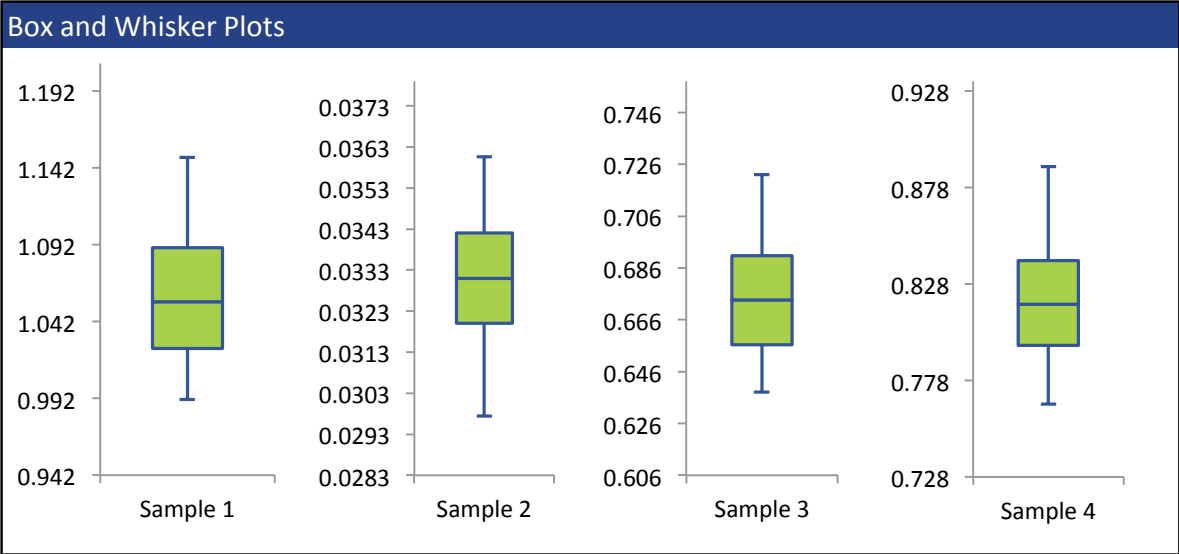
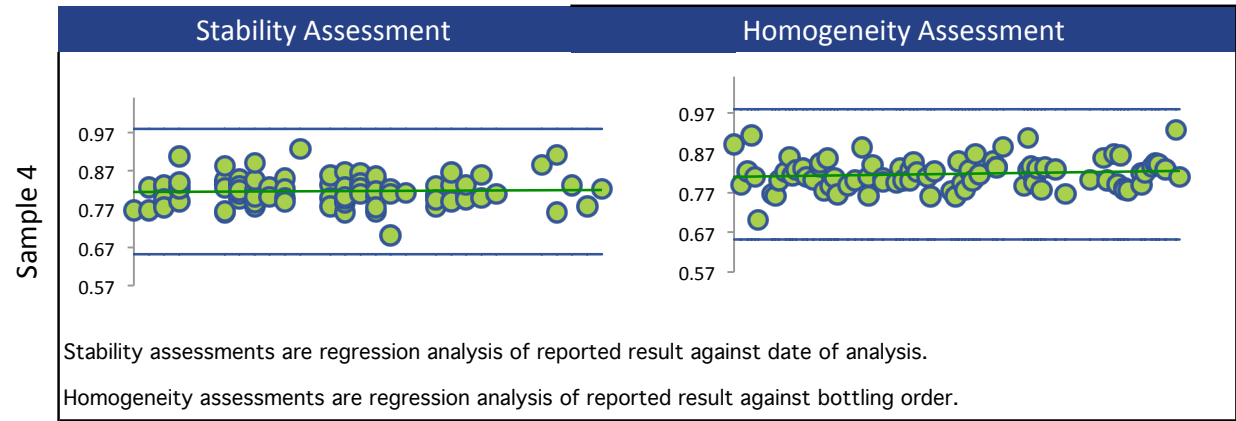
All summary stats and the plots below are based on the data excluding any flagged outliers



THALLIUM



THALLIUM



## TIN

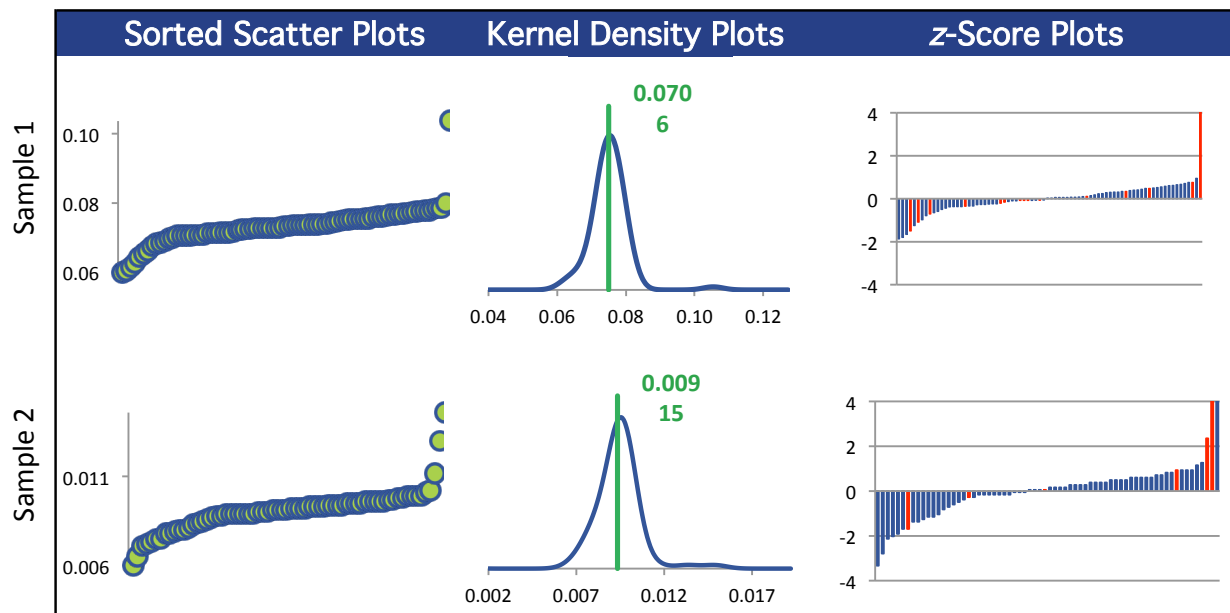
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	78	68	75	78
Median mg/L	0.0708	0.00925	0.0302	0.0690
Robust Mean mg/L	0.0706	0.00915	0.0301	0.0688
U mg/L	0.000505	0.000124	0.000232	0.000543
Robust Standard Deviation mg/L	0.00357	0.000817	0.00161	0.00384
Regression Standard Deviation mg/L	0.00706	0.000915	0.00301	0.00688
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00706	0.000915	0.00301	0.00688
Outliers	1	1	2	1
$ z  > 3.0$	1	3	0	0
$2 <  z  < 3$	0	4	3	2

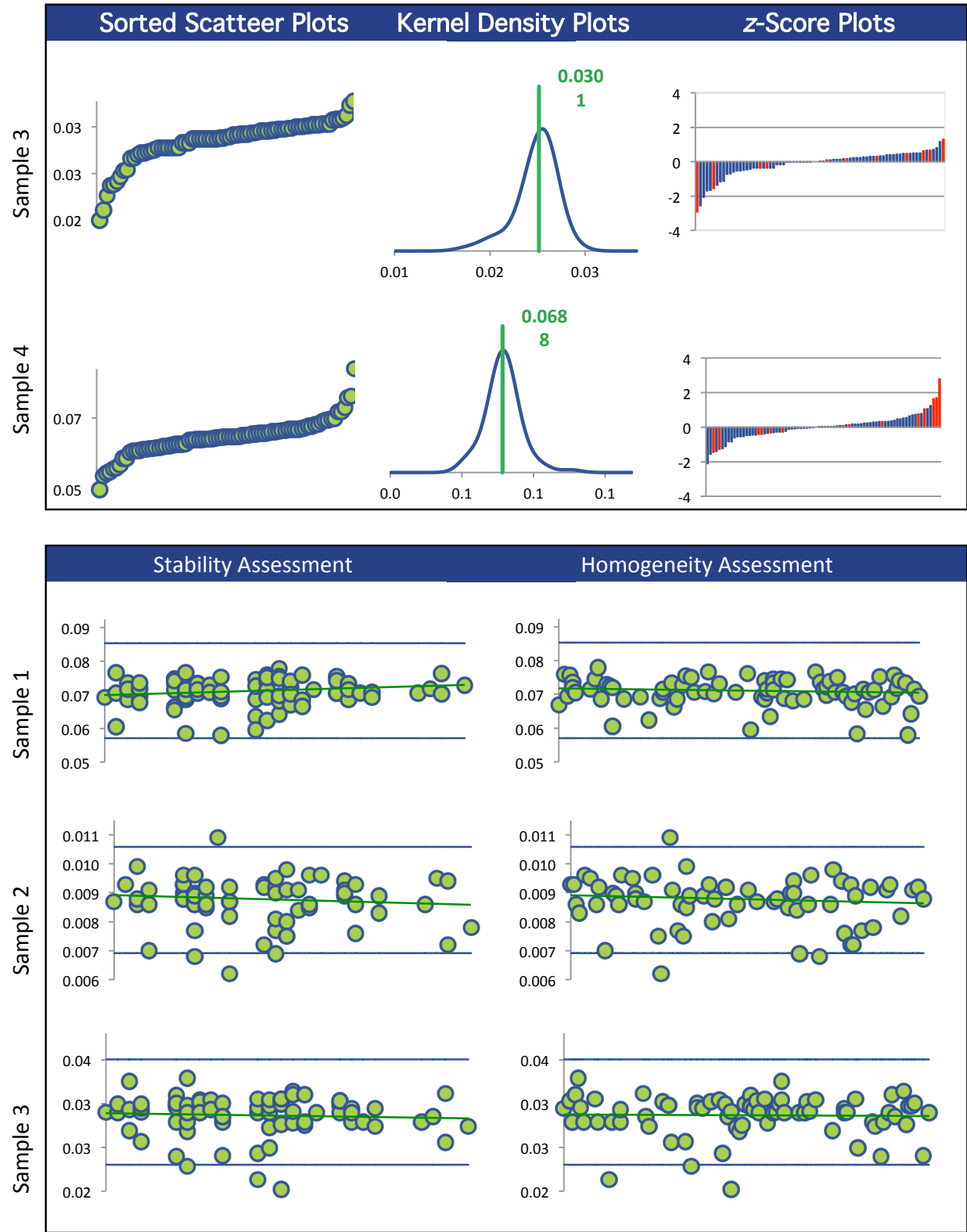
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	63	62	63	63
ICP/OES (Red)	15	6	12	15

All summary stats and the plots below are based on the data excluding any flagged outliers

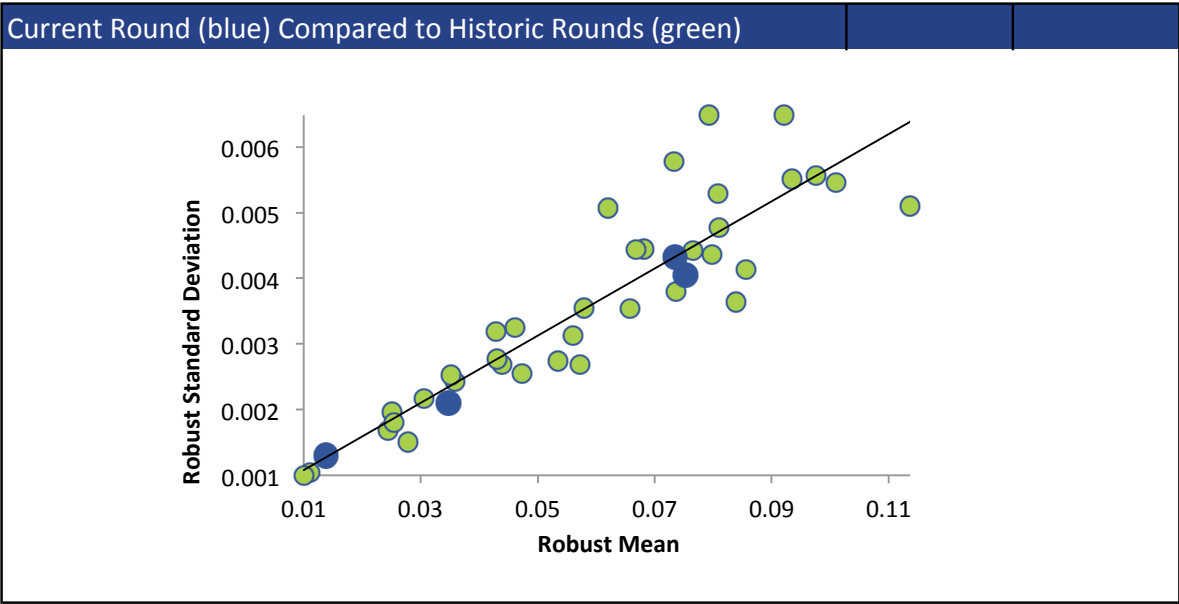
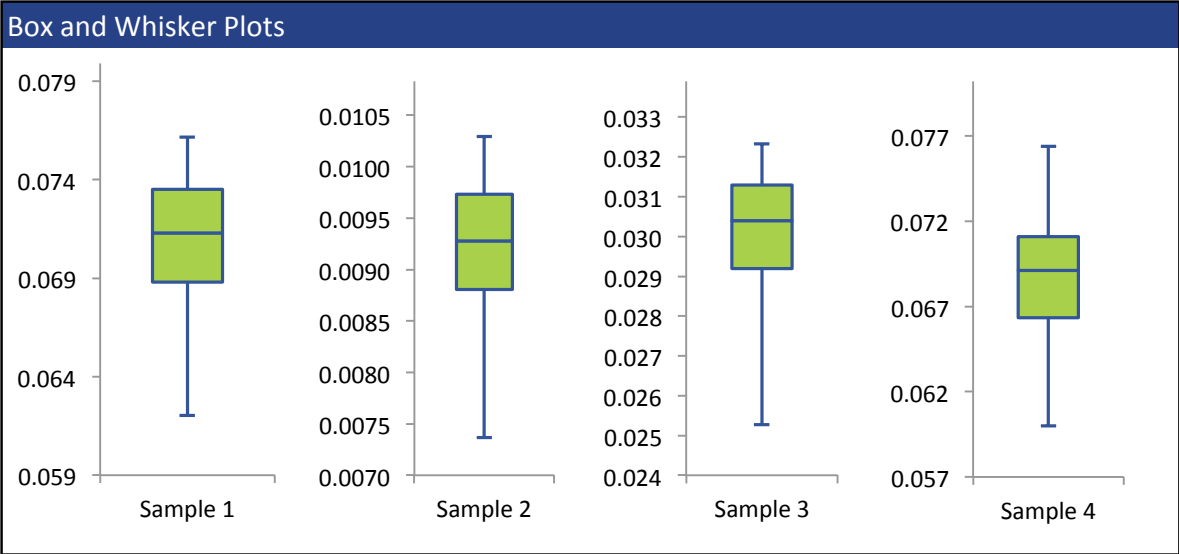
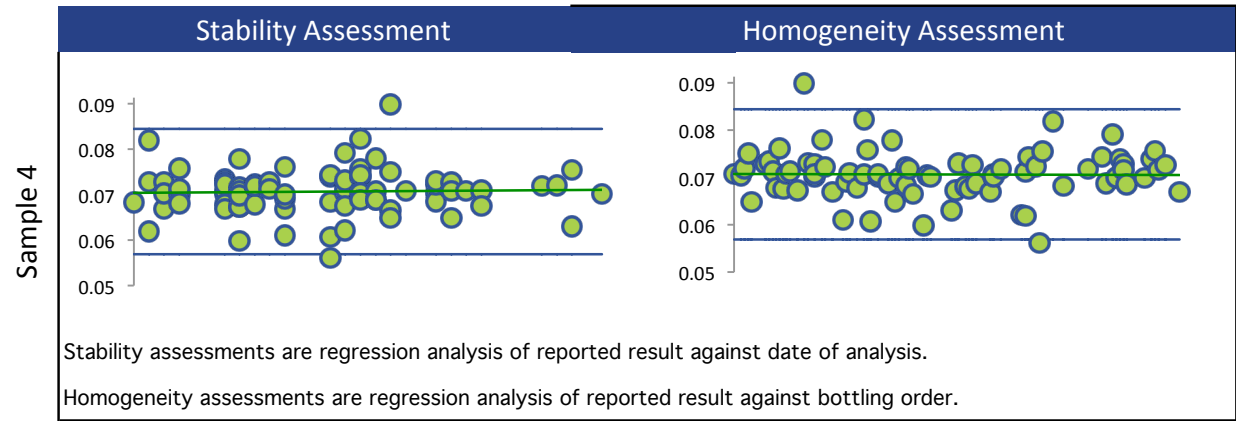


TIN





TIN



## TITANIUM

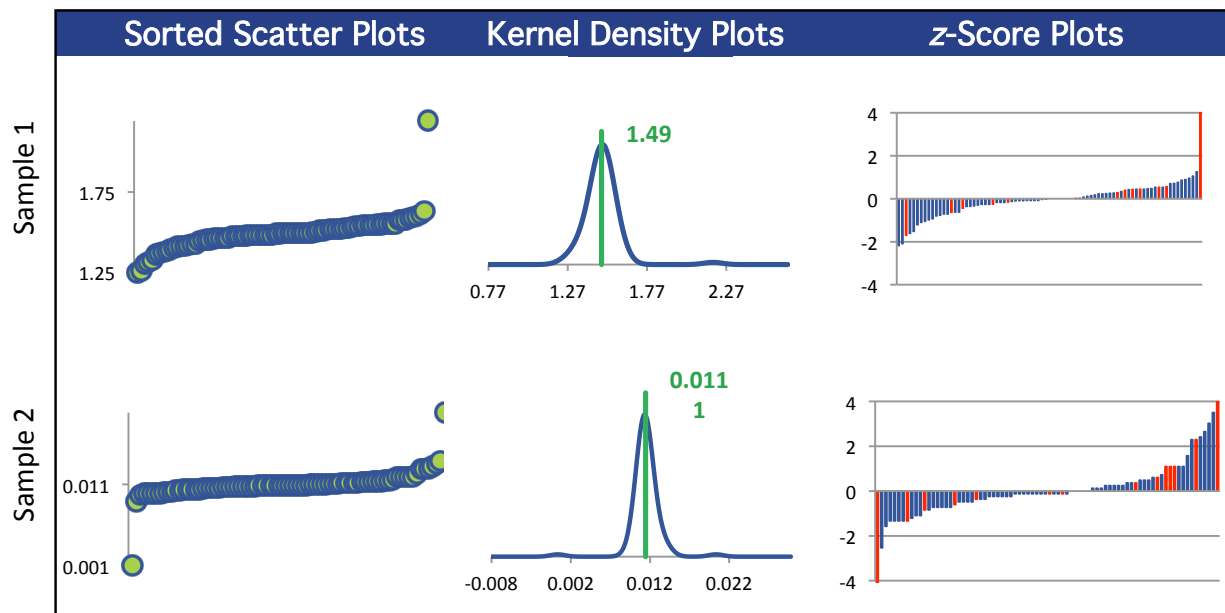
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	81	80	81	81
Median mg/L	1.49	0.0110	0.470	0.791
Robust Mean mg/L	1.49	0.0111	0.471	0.793
U mg/L	0.00944	0.000098	0.00224	0.00417
Robust Standard Deviation mg/L	0.0680	0.000704	0.0161	0.0300
Regression Standard Deviation mg/L	0.111	0.000829	0.0353	0.0595
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.111	0.000829	0.0353	0.0595
Outliers	1	1	1	1
$ z  > 3.0$	1	4	0	0
$2 <  z  < 3$	2	5	2	1

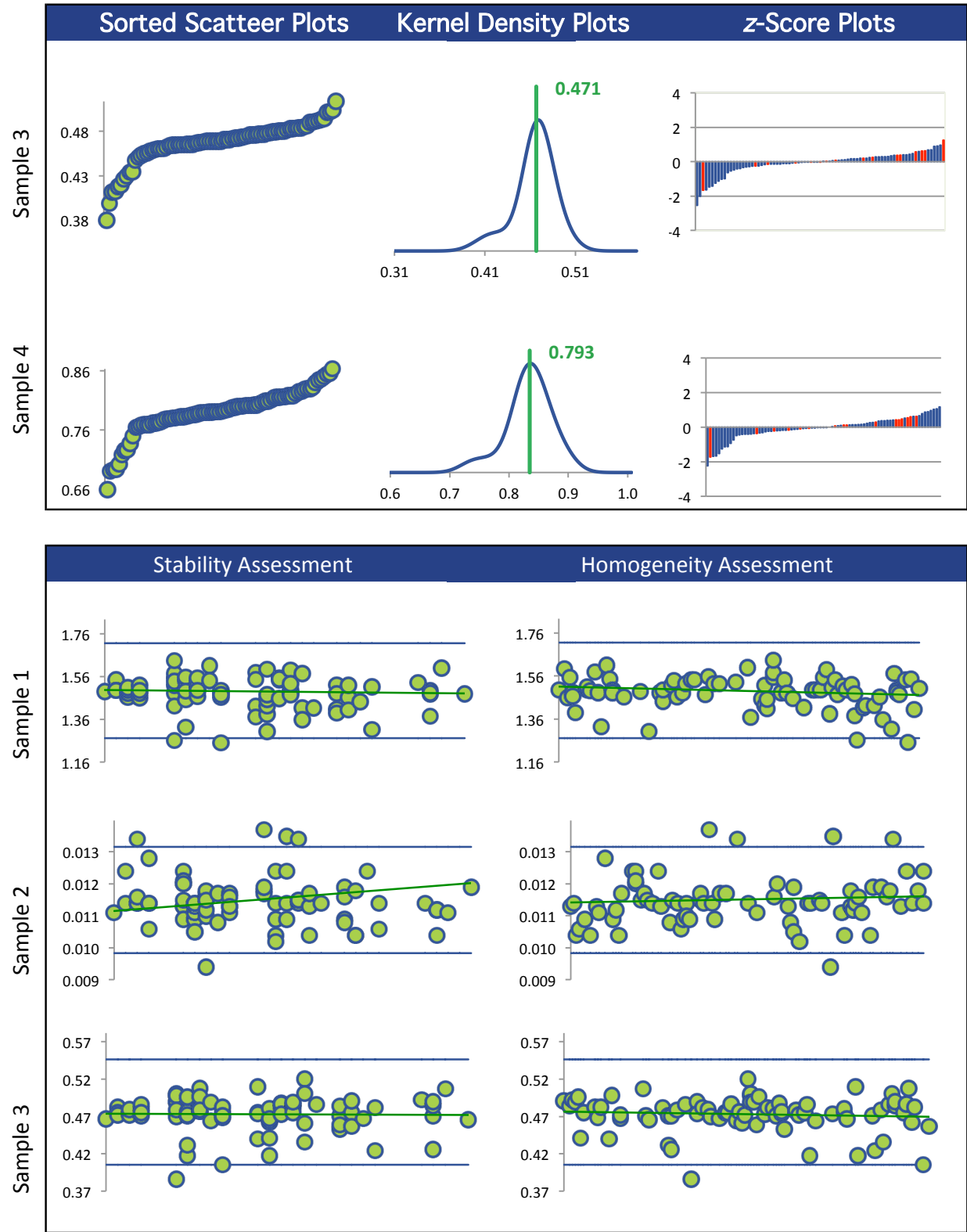
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	65	65	65	65
ICP/OES (Red)	16	15	16	16

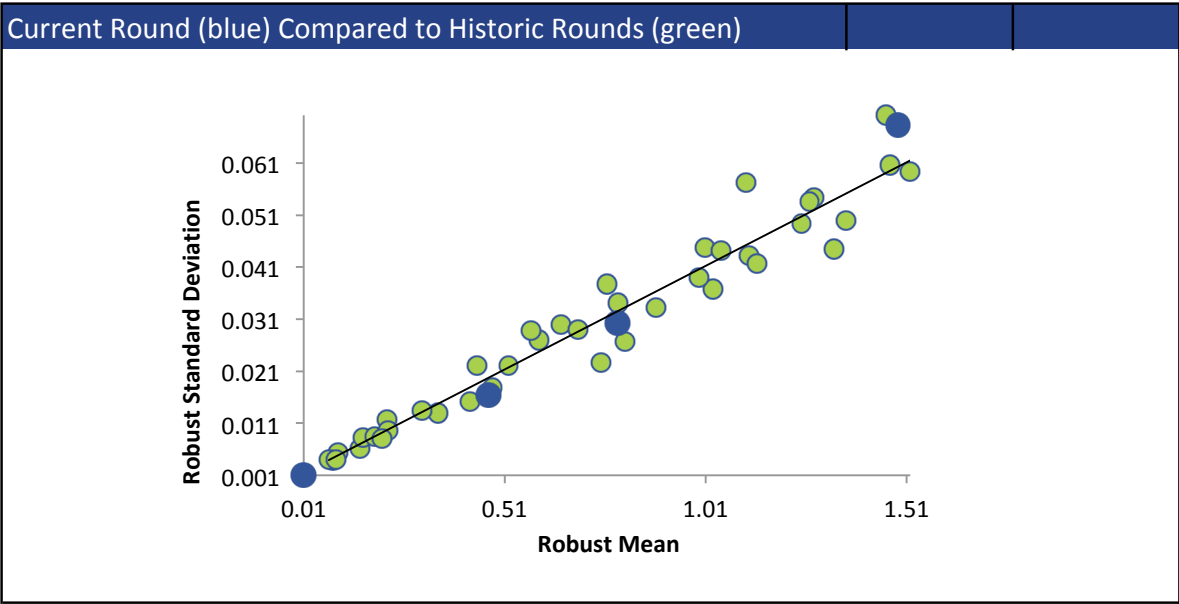
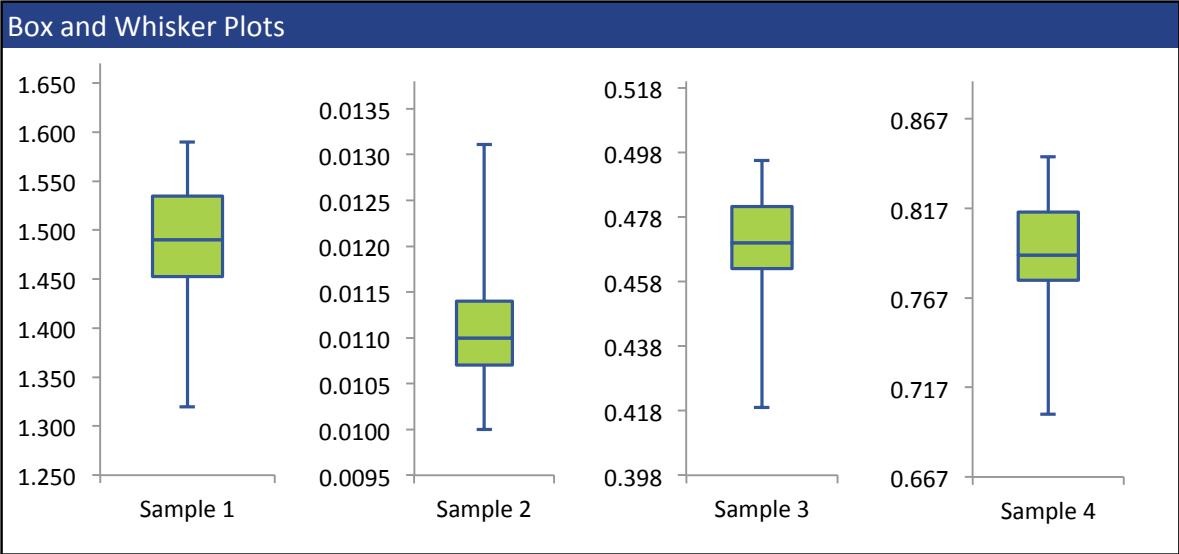
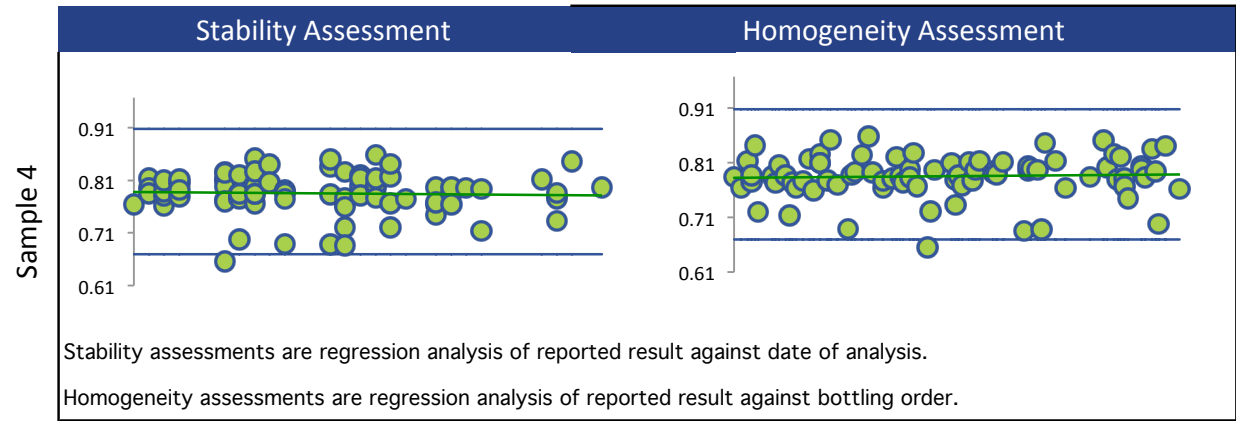
All summary stats and the plots below are based on the data excluding any flagged outliers



TITANIUM



TITANIUM



## URANIUM

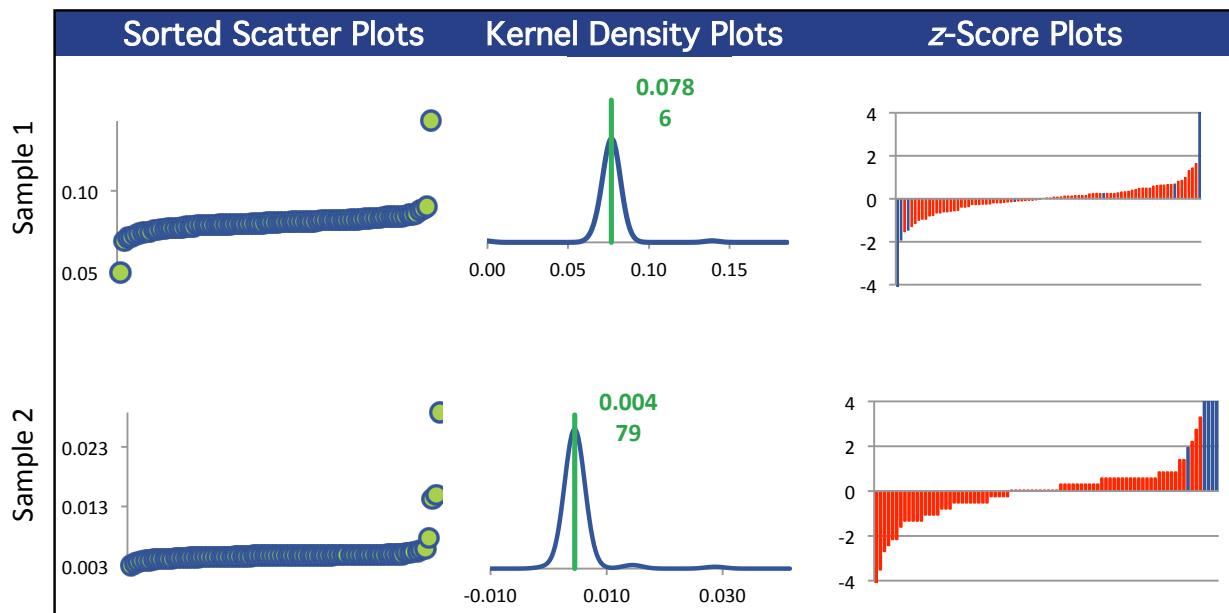
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	86	84	86	86
Median mg/L	0.0787	0.00480	0.0391	0.0673
Robust Mean mg/L	0.0786	0.00479	0.0391	0.0675
U mg/L	0.000456	0.000050	0.000263	0.000388
Robust Standard Deviation mg/L	0.00338	0.000368	0.00195	0.00288
Regression Standard Deviation mg/L	0.00589	0.000360	0.00293	0.00506
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00589	0.000368	0.00293	0.00506
Outliers	0	0	0	0
$ z  > 3.0$	2	7	3	2
$2 <  z  < 3$	0	6	4	0

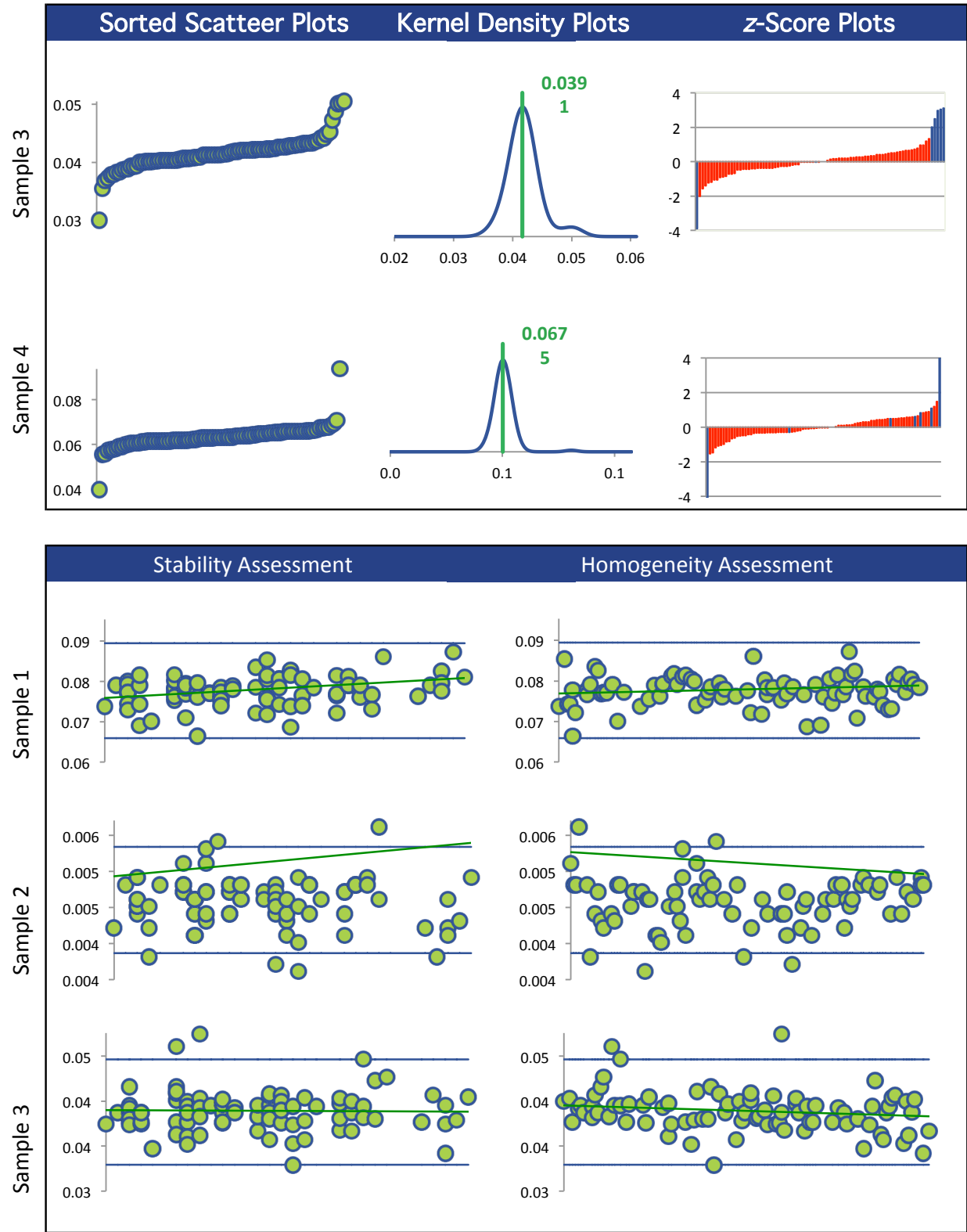
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/OES (Blue)	7	5	7	7
ICP/MS (Red)	79	79	79	79

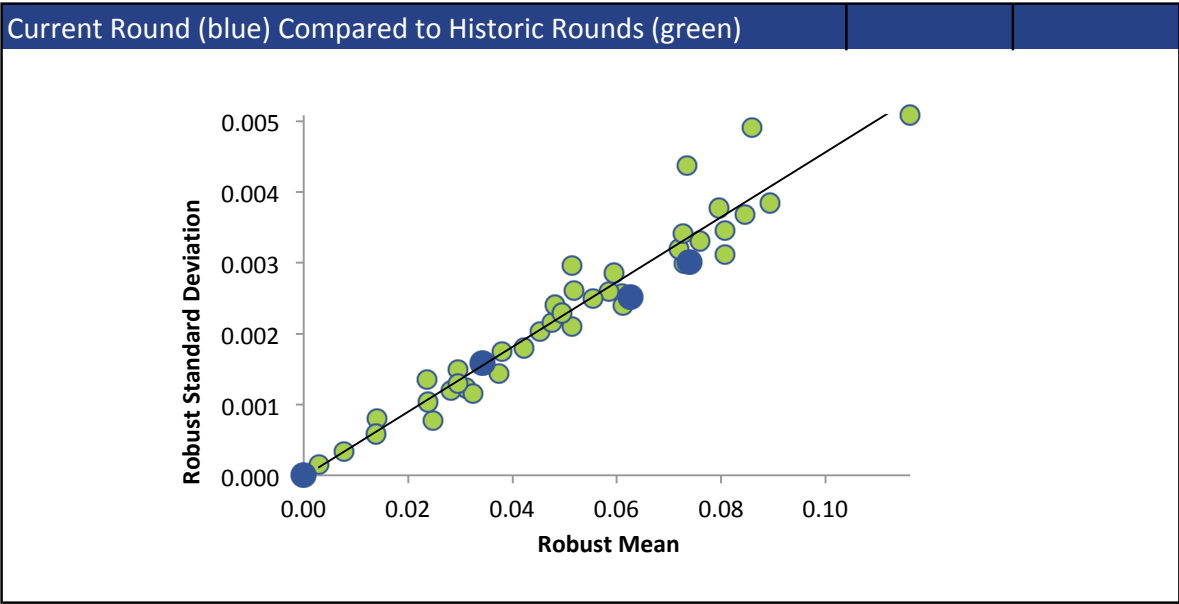
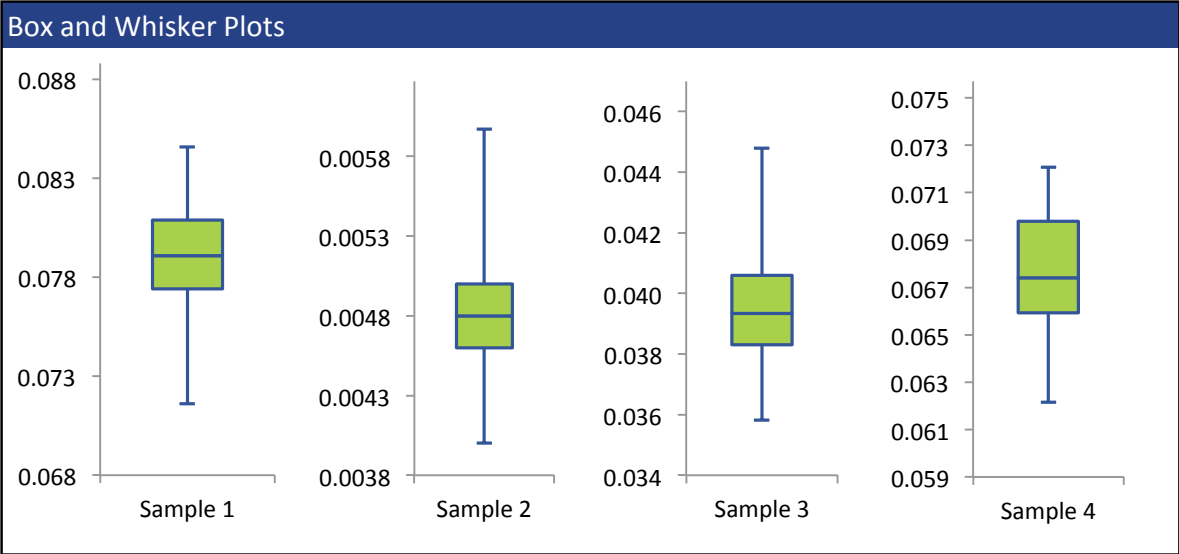
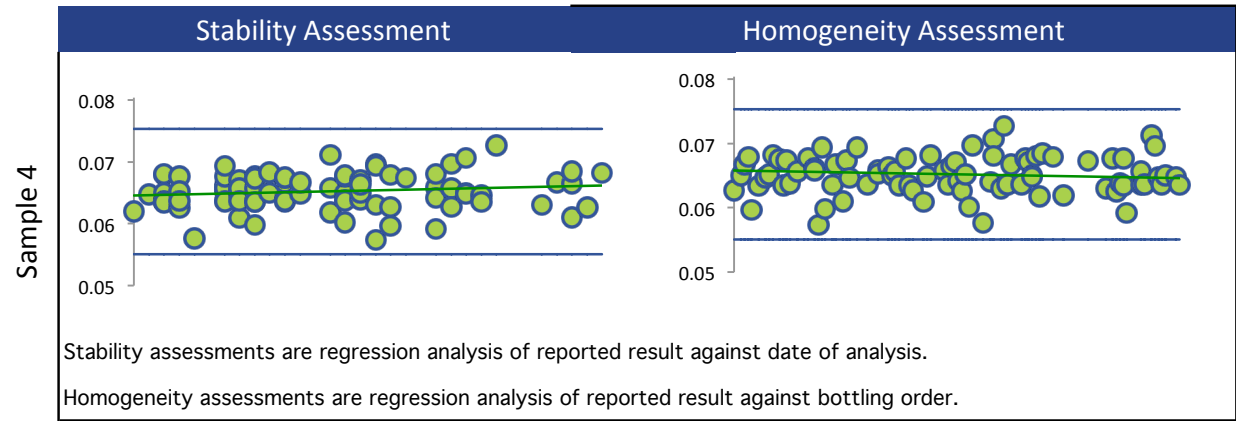
All summary stats and the plots below are based on the data excluding any flagged outliers



URANIUM



URANIUM



## VANADIUM

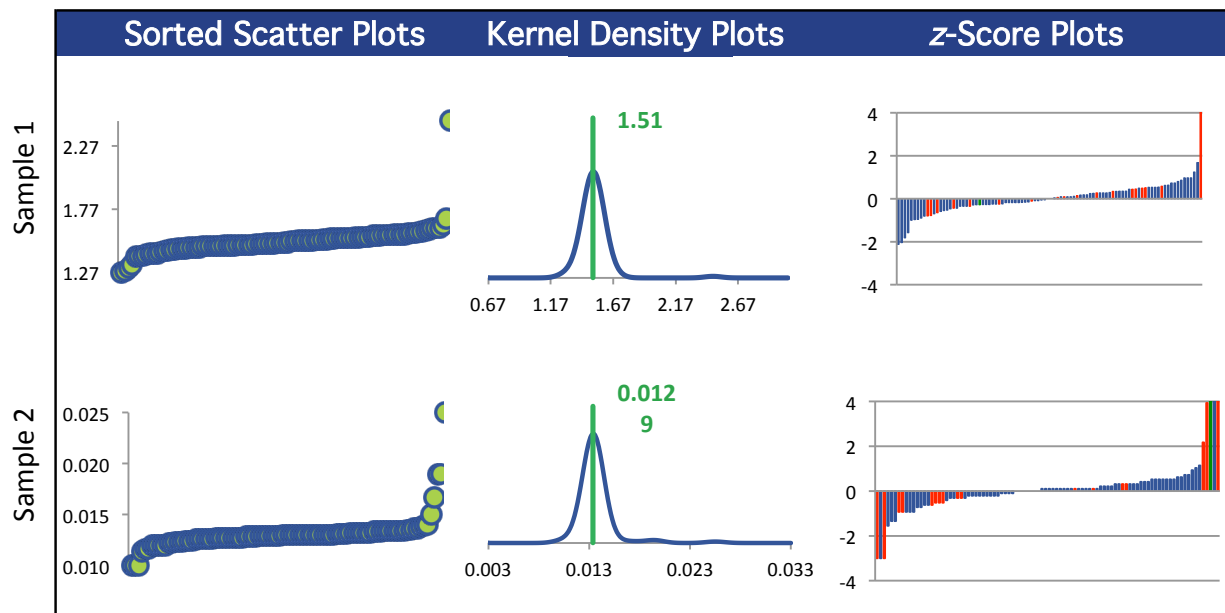
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	94	94	94	94
Median mg/L	1.51	0.0130	0.239	0.403
Robust Mean mg/L	1.51	0.0129	0.239	0.403
U mg/L	0.00824	0.000070	0.00112	0.00197
Robust Standard Deviation mg/L	0.0639	0.000541	0.00866	0.0153
Regression Standard Deviation mg/L	0.113	0.000968	0.0179	0.0302
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.113	0.000968	0.0179	0.0302
Outliers	1	1	1	1
$ z  > 3.0$	1	4	0	0
$2 <  z  < 3$	2	4	0	1

## Methods Used

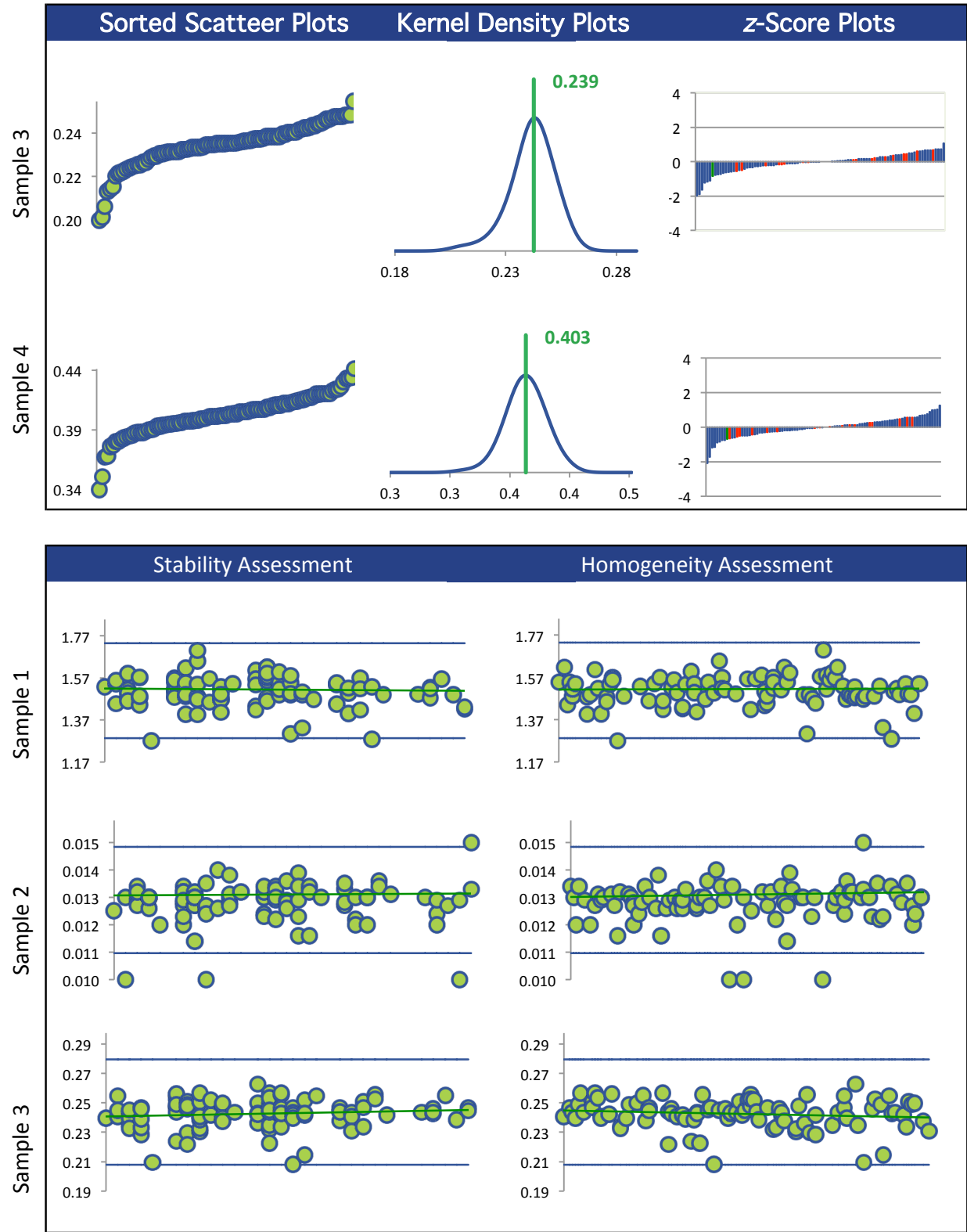
Method	C02A-1	C02A-2	C02A-3	C02A-4
ICP/MS (Blue)	75	75	75	75
ICP/OES (Red)	18	18	18	18
AAG (Green)	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

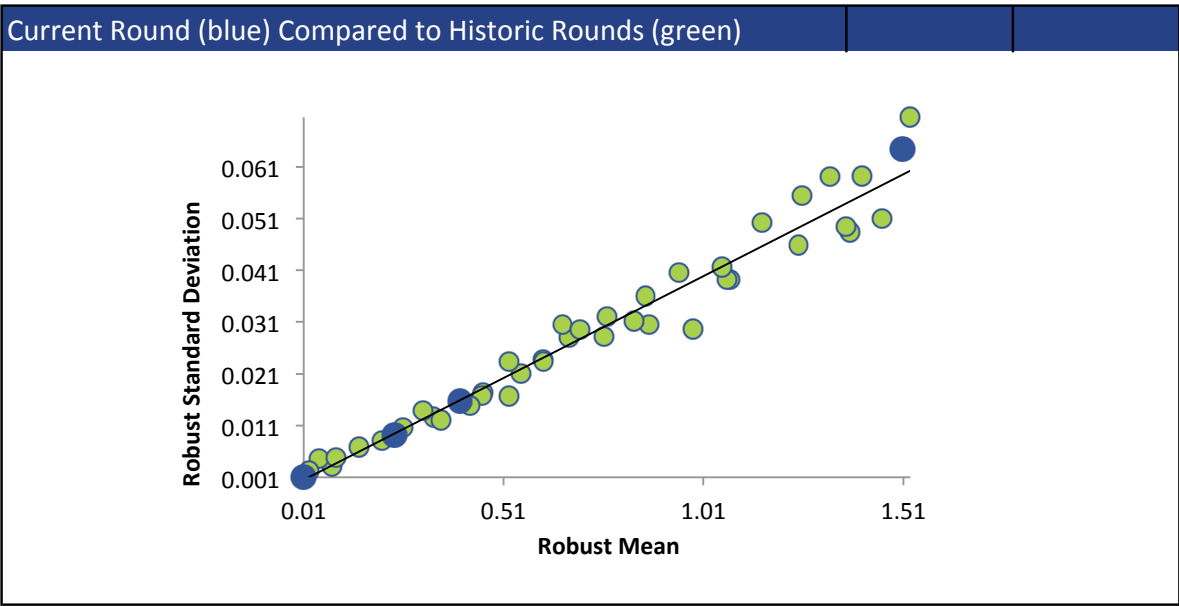
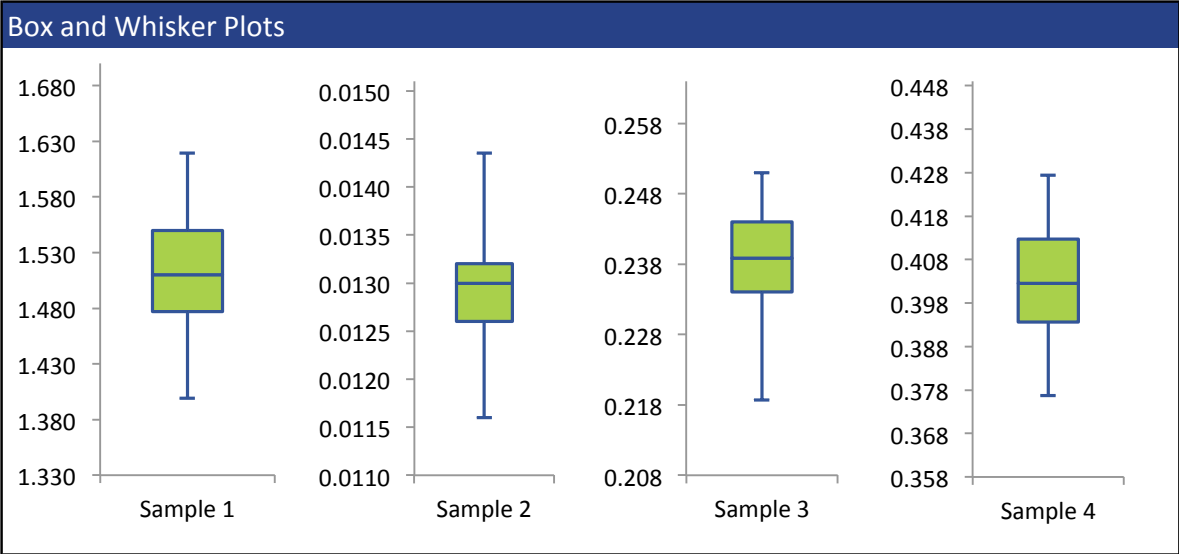
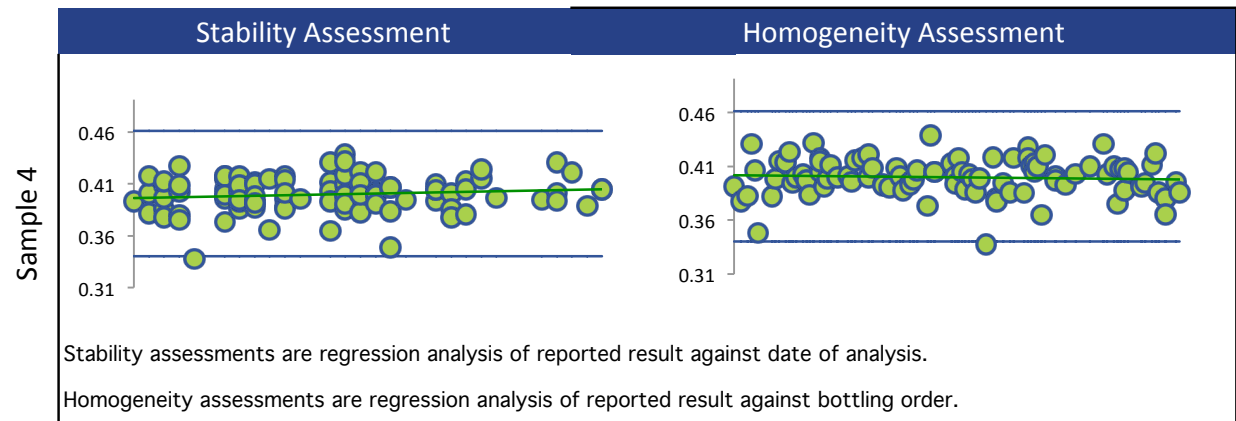




VANADIUM



VANADIUM



## ZINC

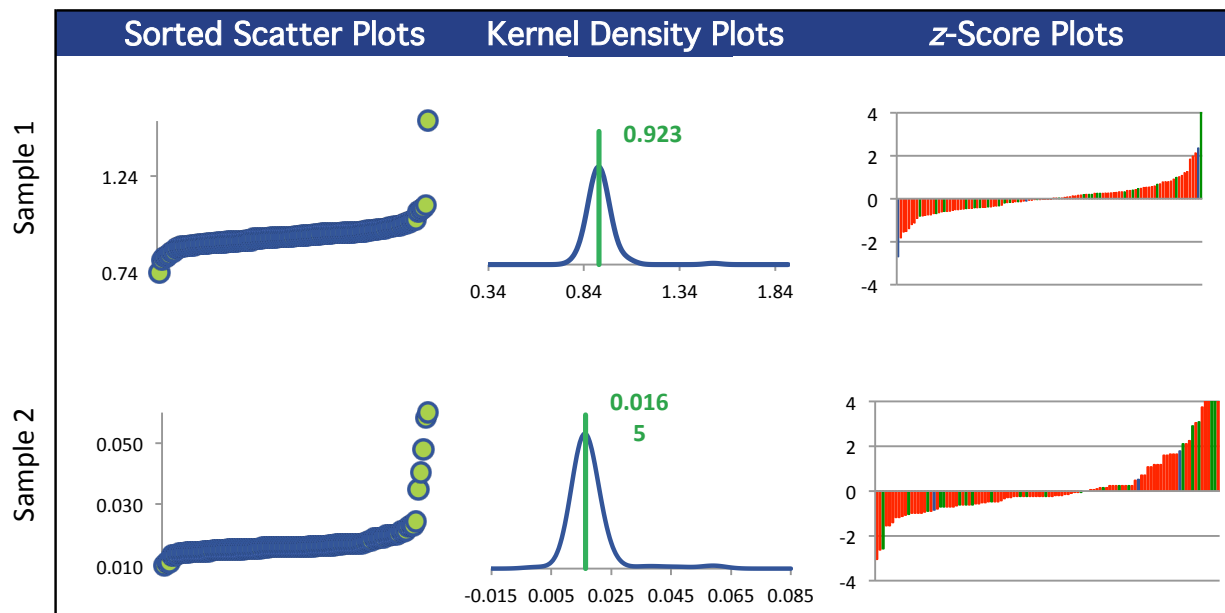
## Summary Statistics

Statistic	C02A-1	C02A-2	C02A-3	C02A-4
N	112	108	112	112
Median mg/L	0.922	0.0160	0.460	0.743
Robust Mean mg/L	0.923	0.0165	0.459	0.745
U mg/L	0.00504	0.000257	0.00273	0.00398
Robust Standard Deviation mg/L	0.0427	0.00214	0.0231	0.0337
Regression Standard Deviation mg/L	0.0692	0.00123	0.0344	0.0559
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0692	0.00214	0.0344	0.0559
Outliers	1	0	1	1
$ z  > 3.0$	1	9	2	0
$2 <  z  < 3$	3	6	2	4

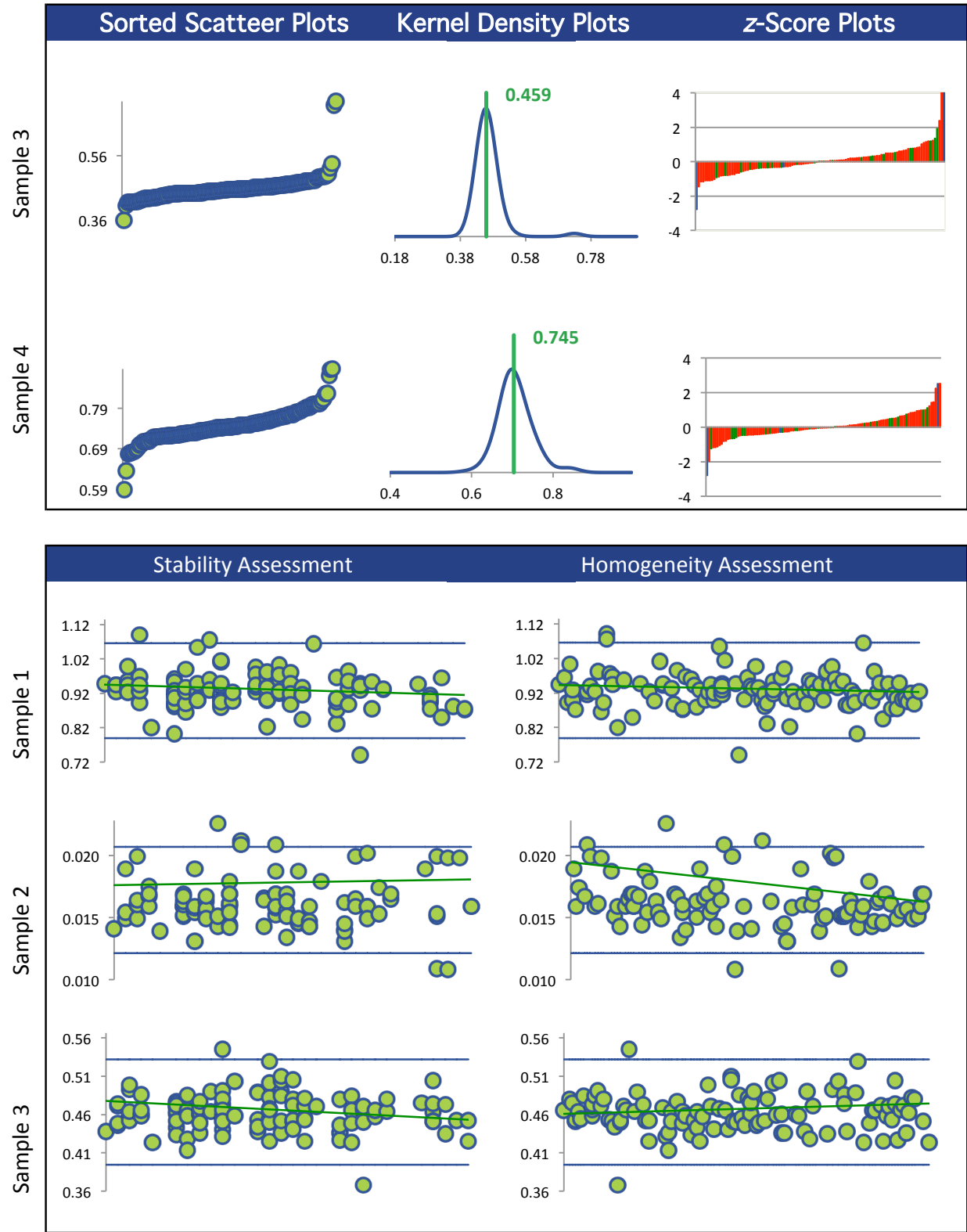
## Methods Used

Method	C02A-1	C02A-2	C02A-3	C02A-4
AA (Blue)	3	3	3	3
ICP/MS (Red)	85	84	85	85
ICP/OES (Green)	24	21	24	24

All summary stats and the plots below are based on the data excluding any flagged outliers



ZINC



ZINC

