Test Group Summary Report

C38 Volatile Organic Compounds by TCLP

June 2025 PT Round

Issued: August 25, 2025

PTC | Proficiency Testing Canada

Table of Contents

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 PTC Proficiency Testing Reports contain some terms that new participants may not be familiar with:

PT Code:	The PT Code is unique to each analyte that a participant is registered for.
Lab Info:	If a participant is accredited by CALA, this three-digit number in the Laboratory Information is the appendix number that the accredited method is assigned to.
N:	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.
Assigned Value:	The Assigned Value is the Robust Mean of the reported results, outliers excluded. This is often referred to as the "target" value.
Reported Value:	The result reported by the participant.
SDPTA:	The Standard Deviation of Proficiency Testing Assessment; this value is used to determine the acceptance limits for the PT evaluation. The calculations examine the Robust Standard Deviation (from consensus STD) and Regression Standard Deviation (STD from historical studies or TNI limits); and, if any, Homogeneity and Stability flags to determine the SDPTA (whichever is higher).
z-Score:	A value assigned to each reported result that is a measure of the degree to which it deviates from the Assigned Value.
PT Score:	The composite score of the four results reported for each analyte. It is normalized to a score out of 100.
Bias:	A flag assigned if bias is detected using the re-scaled *z*-score procedure.
U:	The Uncertainty of the assigned value.

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 *Statistical methods for use in proficiency testing by interlaboratory comparison*.

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).

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:

$$z - Score = \frac{(x - \bar{X})}{SDPA}$$

where: x = participant result;
$\overline{X}$ = the Assigned Value;
SDPA = the Standard Deviation for Proficiency Assessment.

The assigned value $\overline{X}$ 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 x 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.

$$RSZ = \frac{\square z}{\sqrt{N}}$$

where *z* = the *z*- score
N = the number of samples

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

RSZ ≥ -2 and ≤ 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 5th and 95th 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.

1,2-Dichlorobenzene

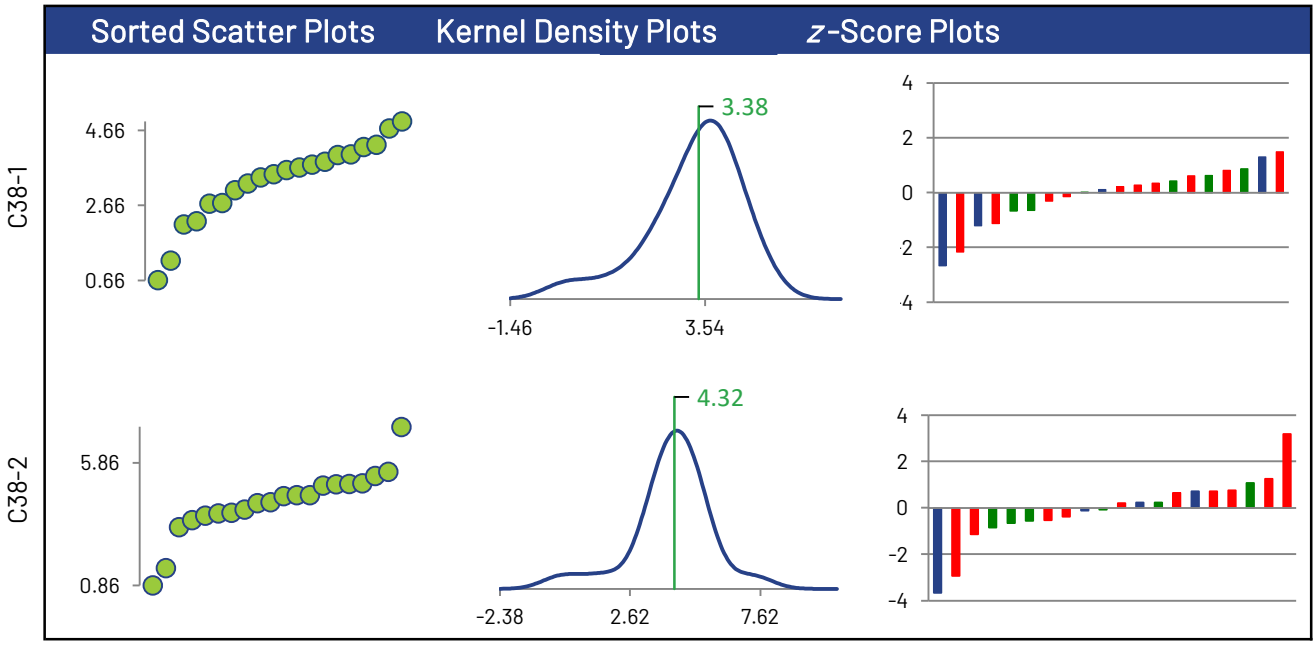
Summary Statistics

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	20	0	0
Median mg/L	3.55	4.38		
Robust Mean mg/L	3.38	4.32		
Uncdrtainty of the Assigned Value mg/L	0.285	0.264		
Robust Standard Deviation mg/L	1.02	0.945		
Regression Standard Deviation mg/L				
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	1.02	0.945		
Flagged Outliers	0	0	0	0
|z|>3.0	0	2	0	0
2<|z|<3	2	1	0	0
Failure Rate %*	10.0			

Methods Used

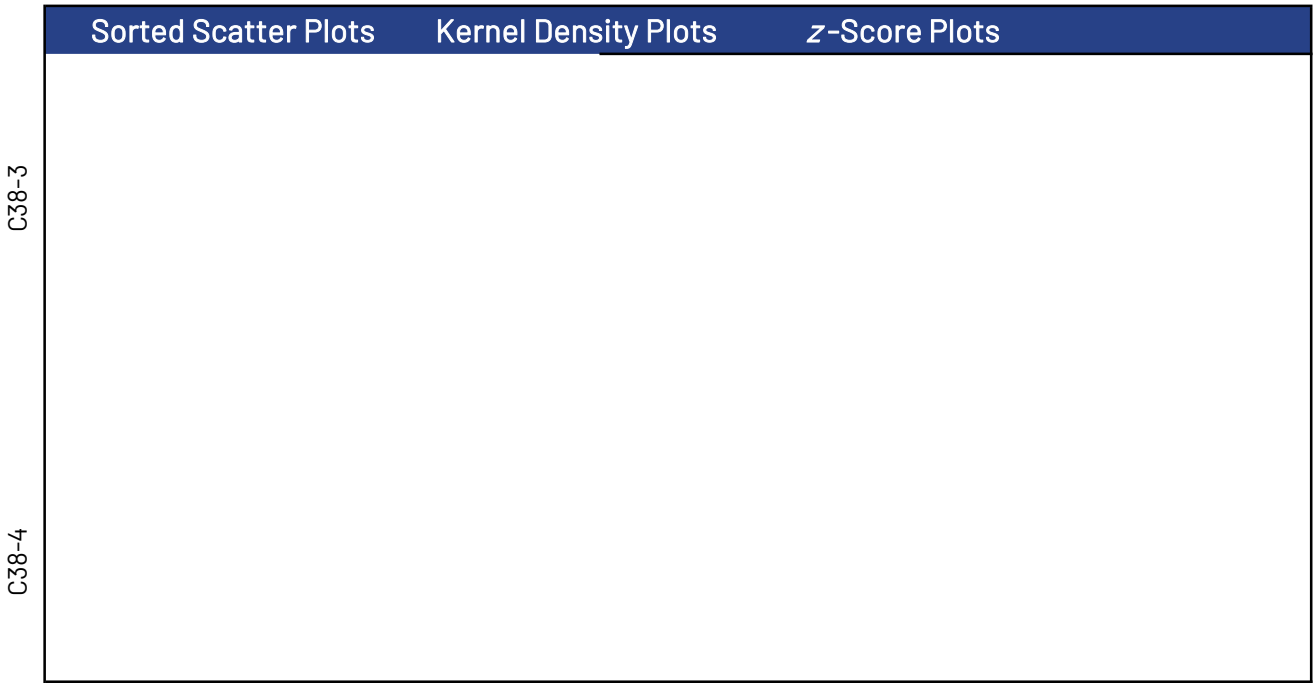
Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

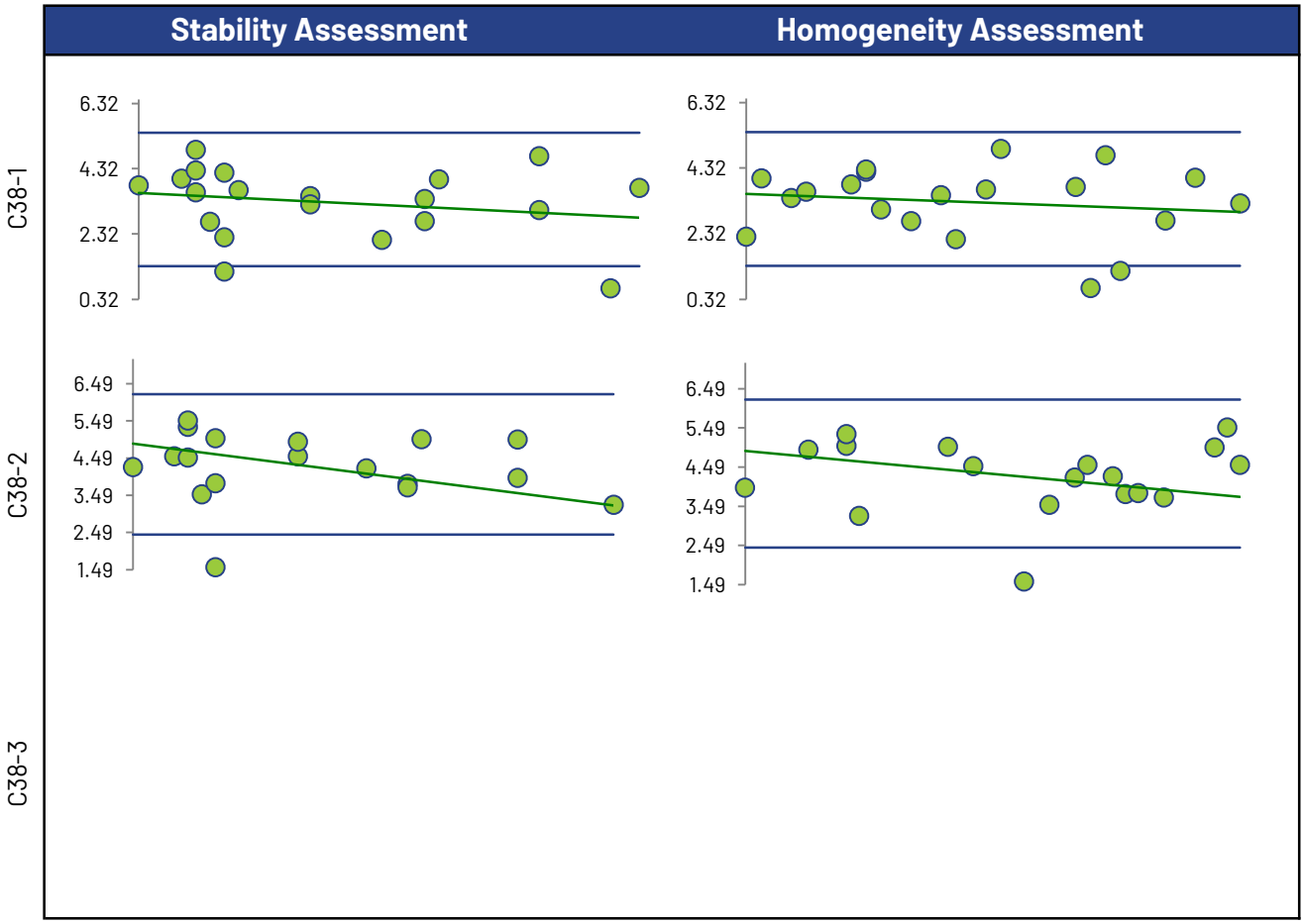
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

1,2-Dichlorobenzene





1,2-Dichlorobenzene

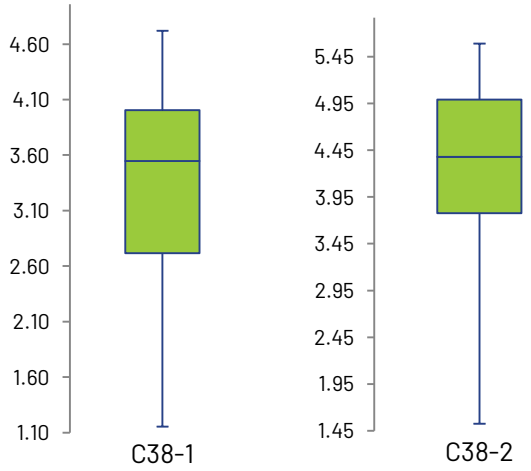
C38-4

Stability Assessment	Homogeneity Assessment

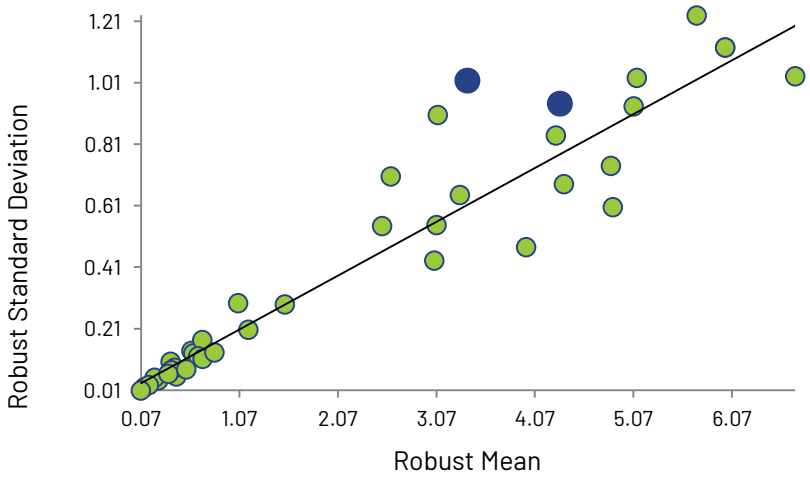
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



1,2-Dichloroethane

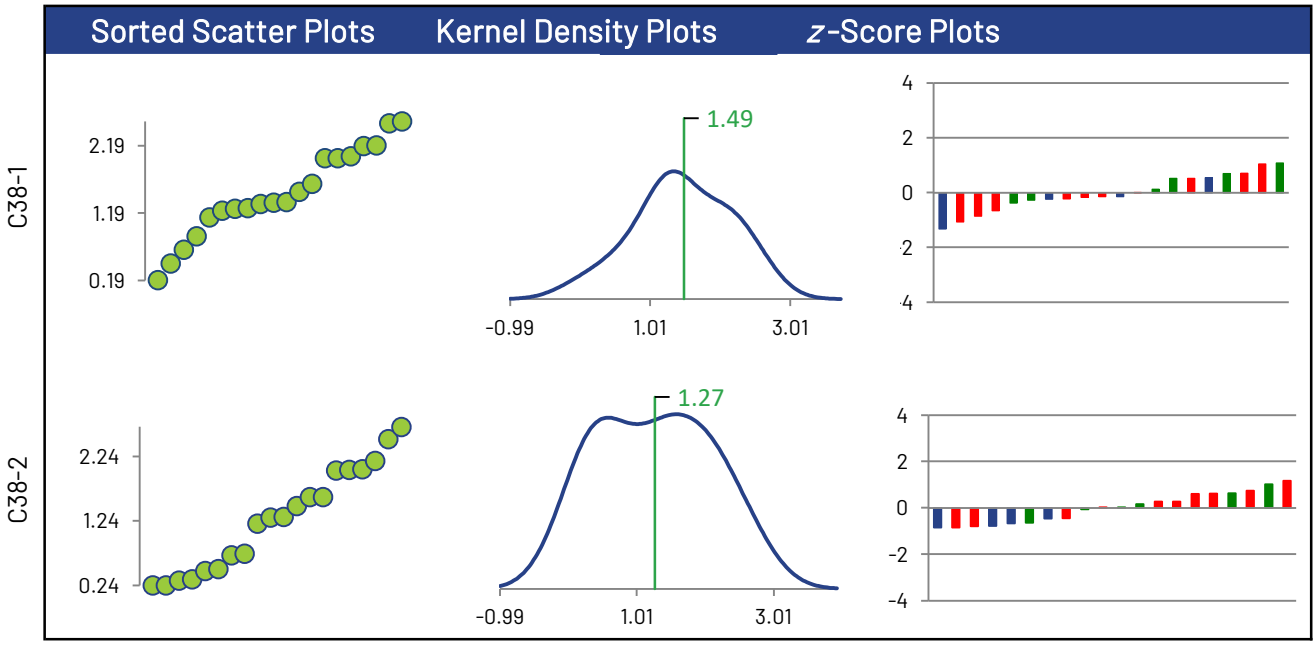
Summary Statistics

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	20	0	0
Median mg/L	1.35	1.30		
Robust Mean mg/L	1.49	1.27		
Uncdrtainty of the Assigned Value mg/L	0.203	0.252		
Robust Standard Deviation mg/L	0.727	0.900		
Regression Standard Deviation mg/L				
Stability Flag	Stability			
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA) mg/L	0.984	1.22		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



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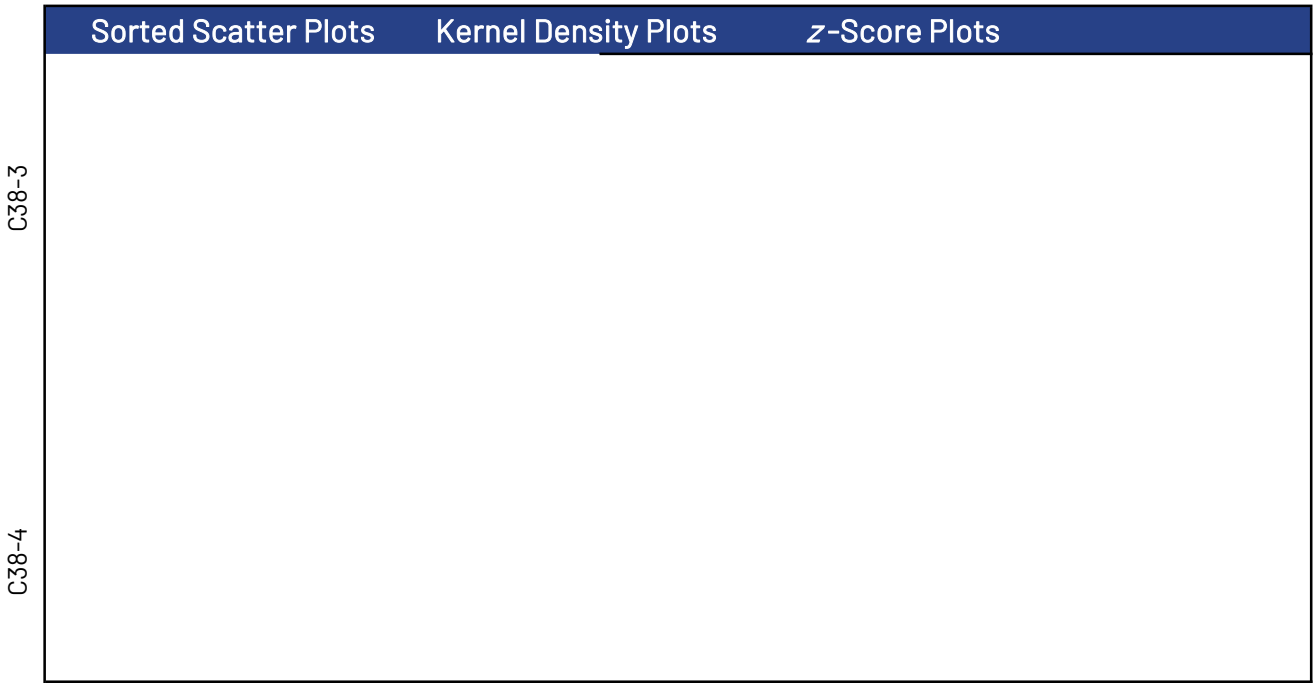
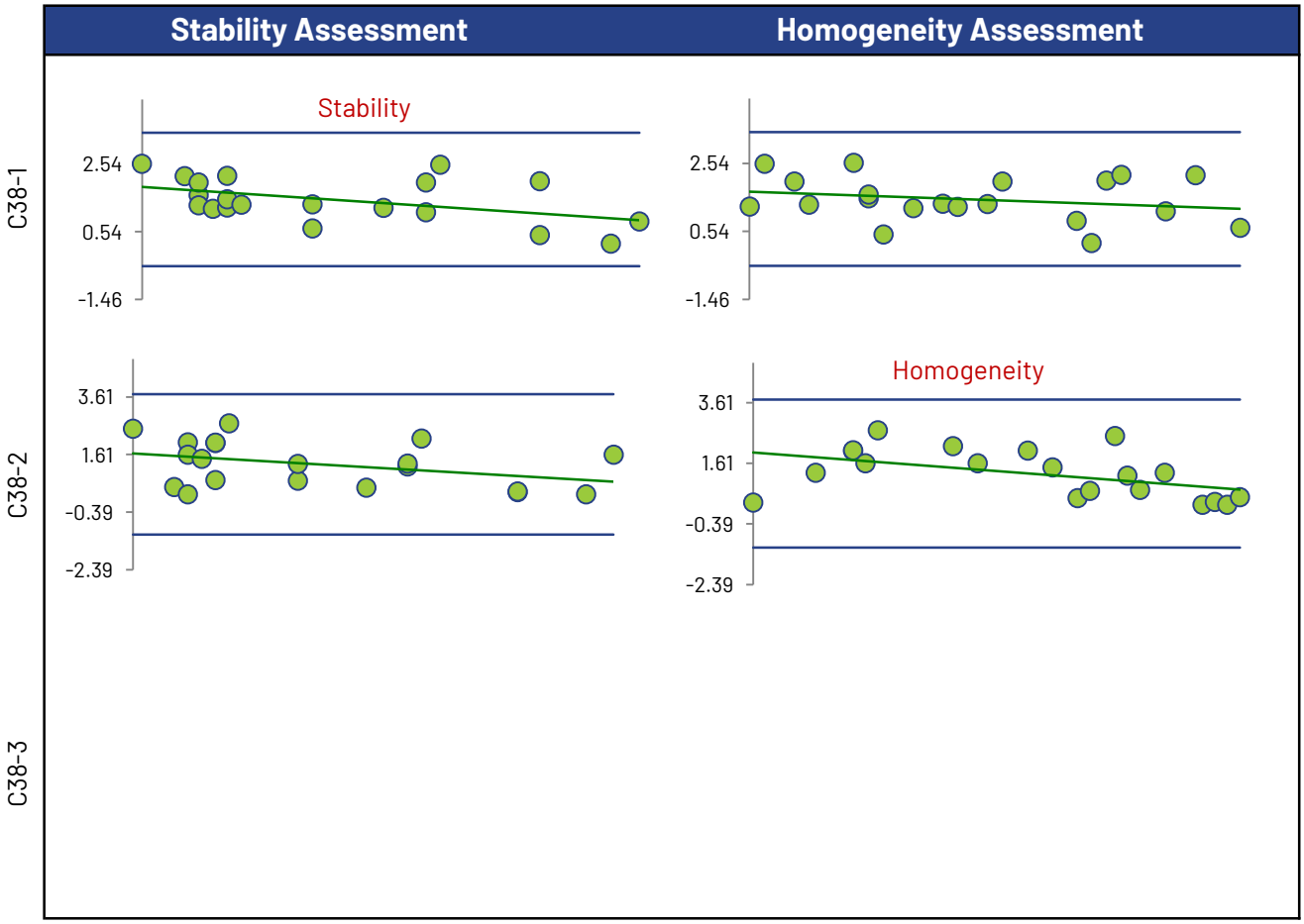
1,2-Dichloroethane





1,2-Dichloroethane

C38-4

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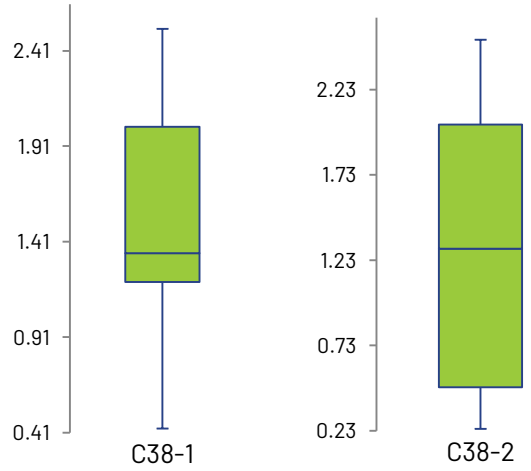
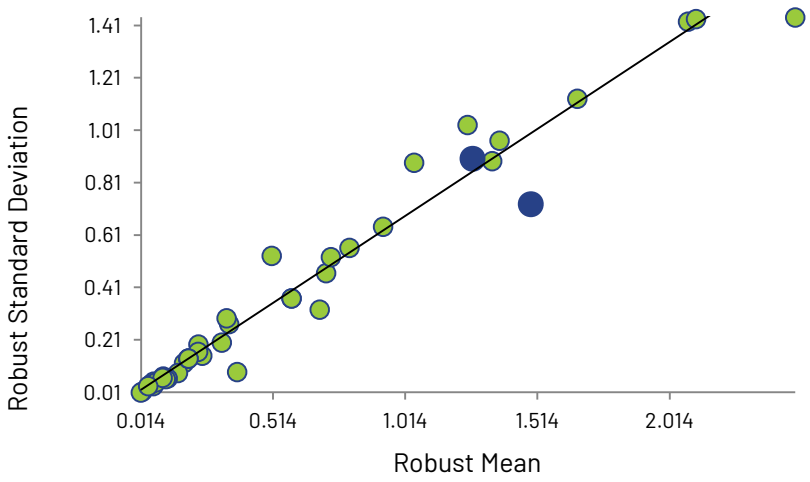
Box and Whisker Plots



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



1,4-Dichlorobenzene

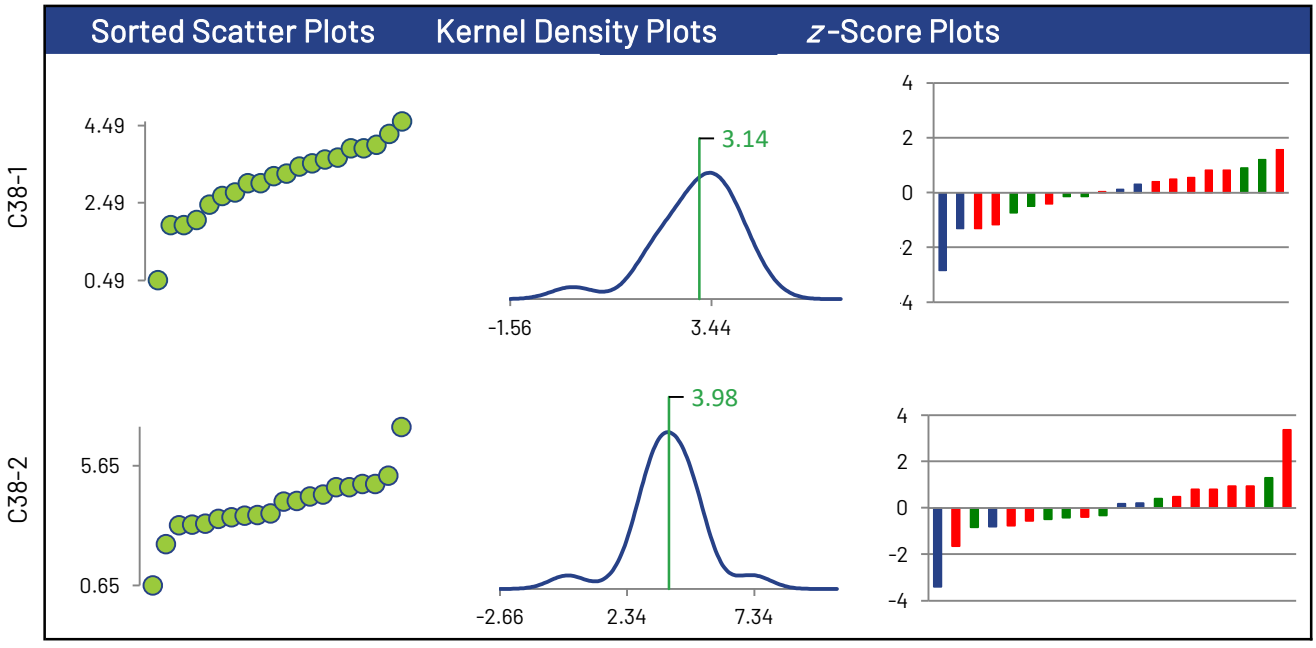
Summary Statistics

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	20	0	0
Median mg/L	3.22	3.92		
Robust Mean mg/L	3.14	3.98		
Uncdrtainty of the Assigned Value mg/L	0.261	0.273		
Robust Standard Deviation mg/L	0.932	0.978		
Regression Standard Deviation mg/L				
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.932	0.978		
Flagged Outliers	0	0	0	0
|z|>3.0	0	2	0	0
2<|z|<3	1	0	0	0
Failure Rate %*	5.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



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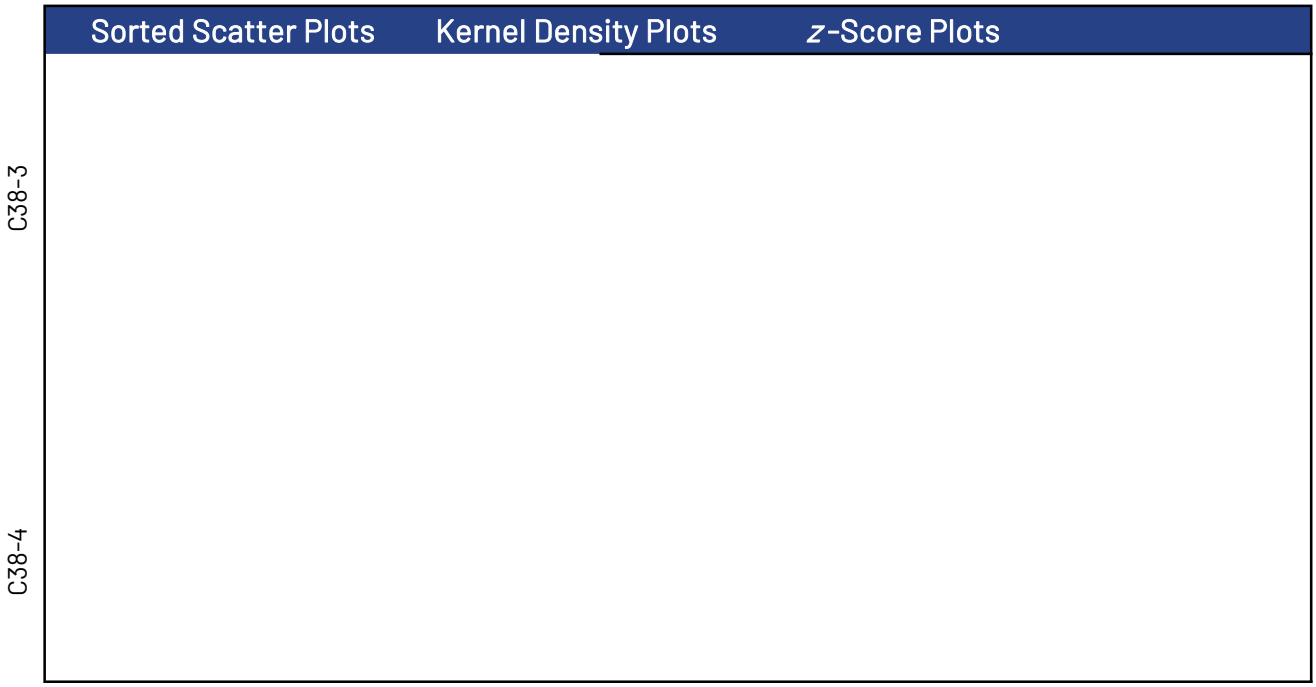
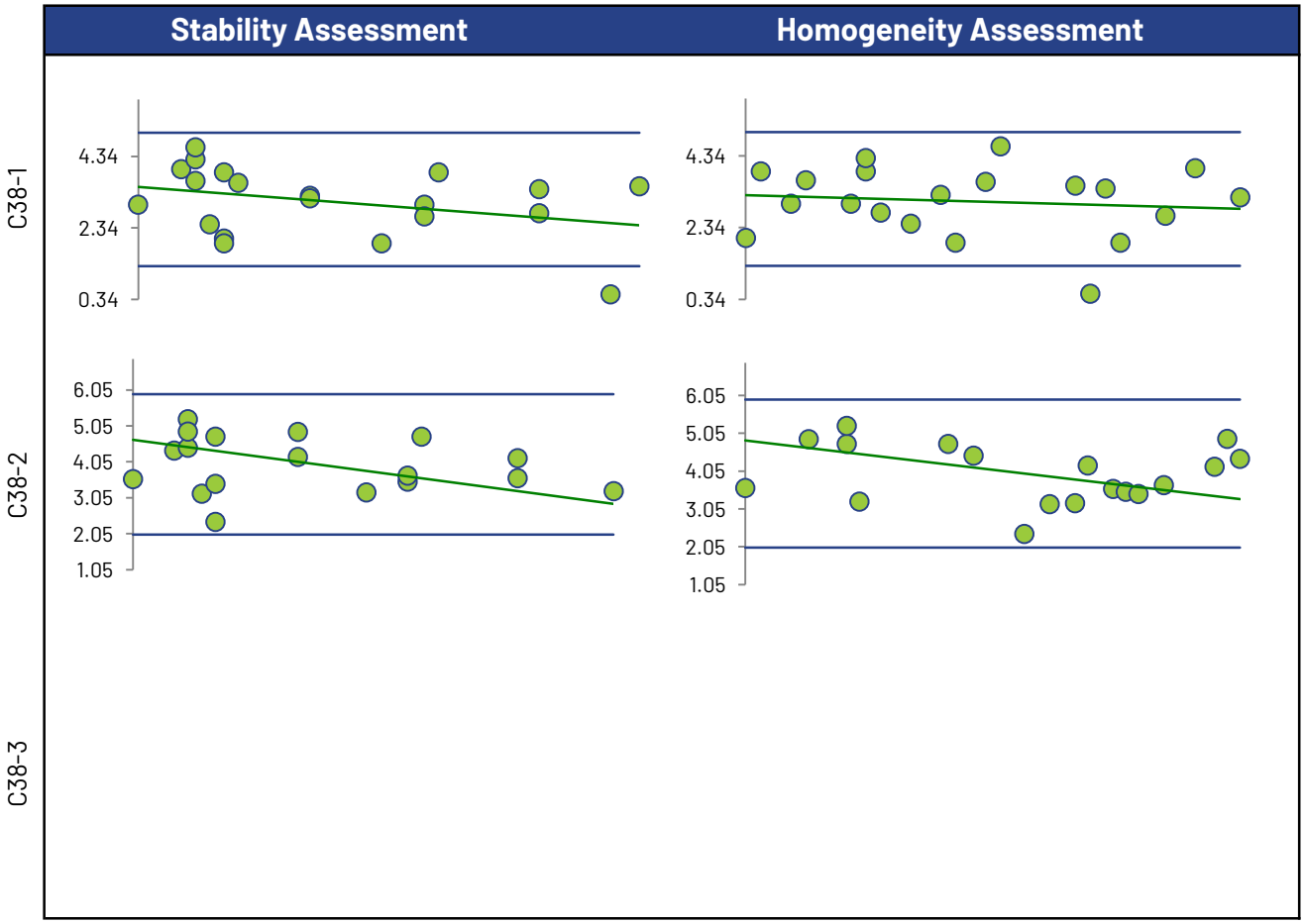
1,4-Dichlorobenzene





1,4-Dichlorobenzene

C38-4

Stability Assessment	Homogeneity Assessment

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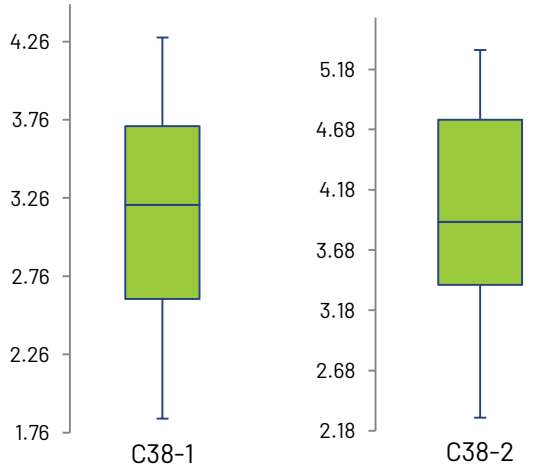
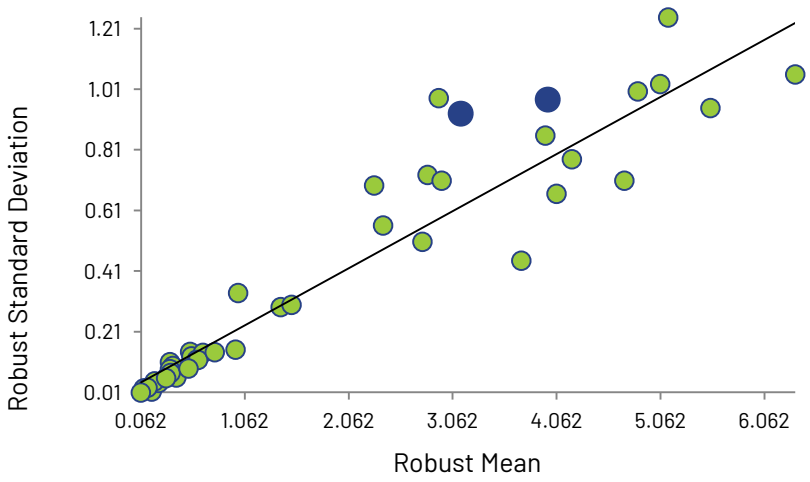
Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Benzene

Summary Statistics

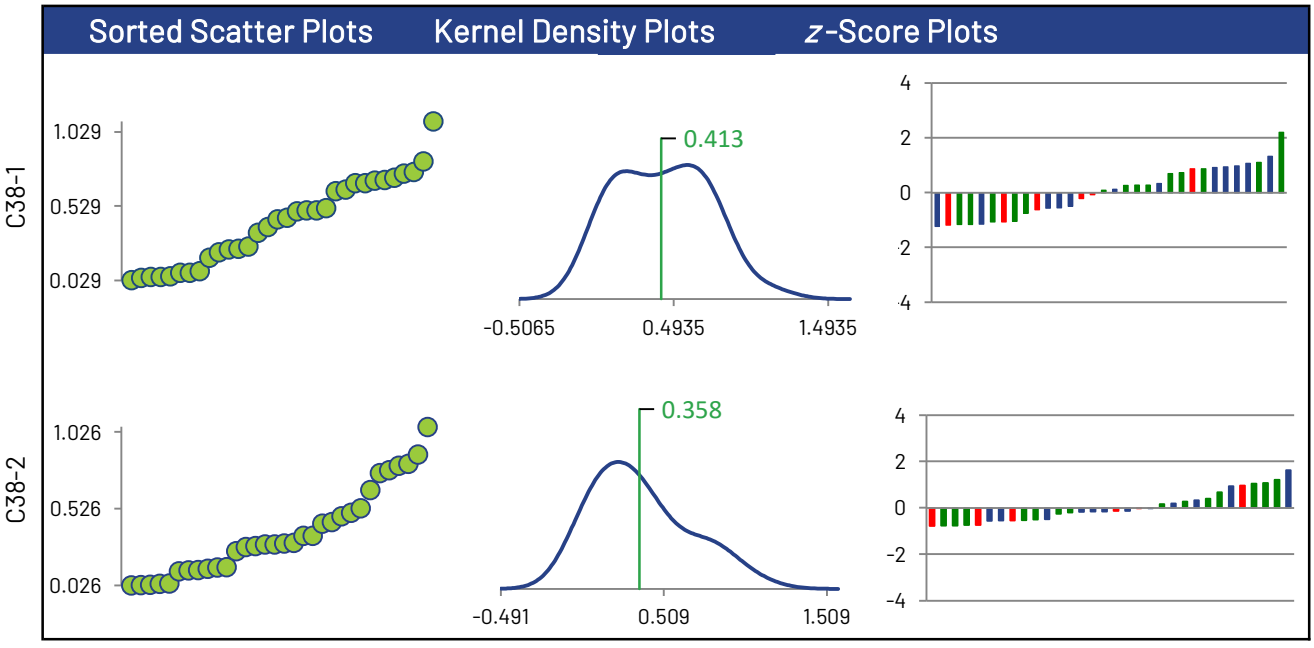
Excluded

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	32	32	0	0
Median mg/L	0.445	0.297		
Robust Mean mg/L	0.413	0.358		
Uncdrtainty of the Assigned Value mg/L	0.0689	0.0665		
Robust Standard Deviation mg/L	0.312	0.301		
Regression Standard Deviation mg/L				
Stability Flag				
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA) mg/L	0.312	0.432		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	1	0	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS - HEADSPACE (Blue)	12	12	0	0
GC/MS (Red)	6	6	0	0
GC/MS - PURGE AND TRAP (Green)	14	14	0	0

All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



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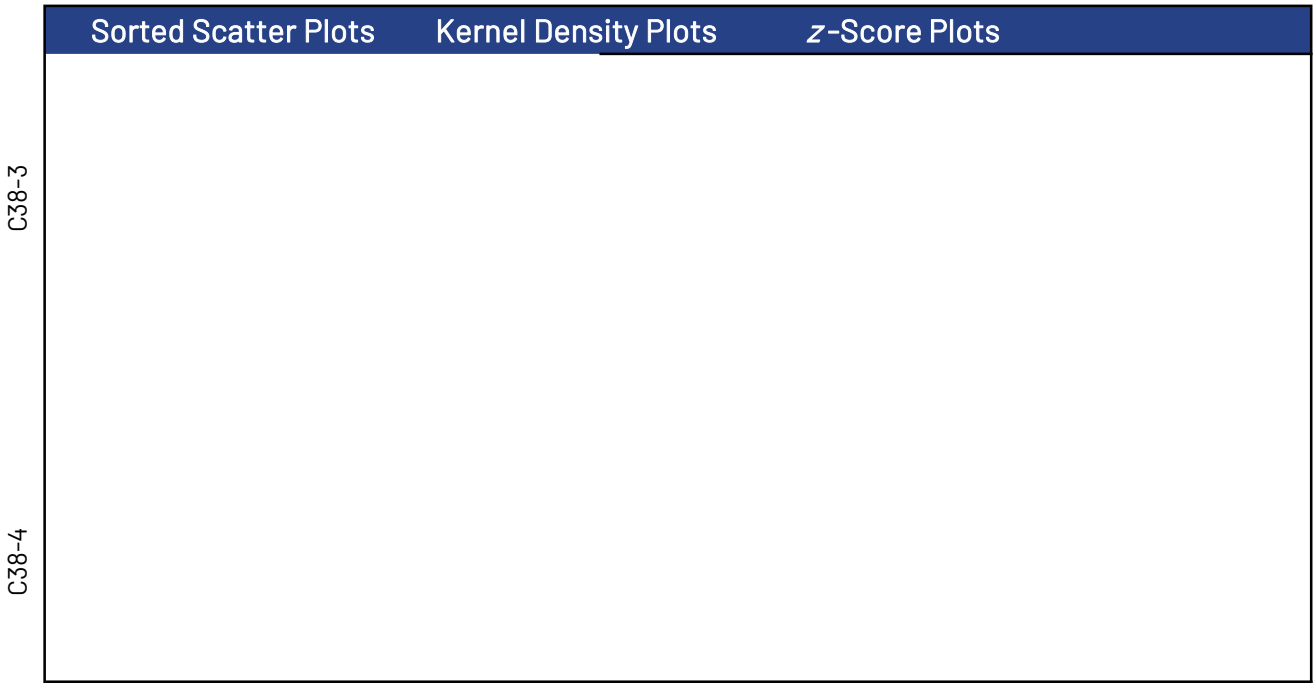
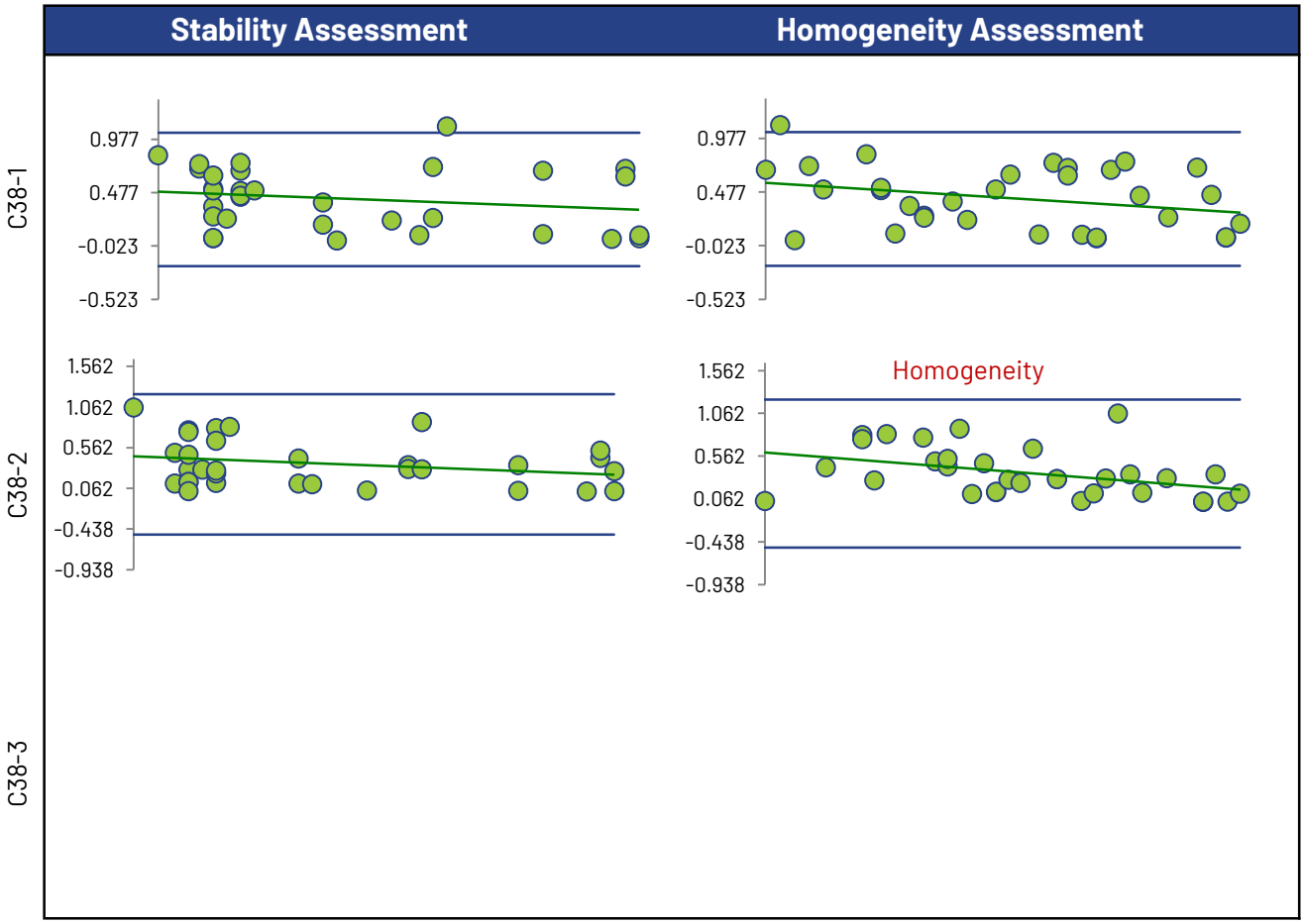
Benzene


Sorted Scatter Plots
Kernel Density Plots
z-Score Plots
C38-3
C38-4


Stability Assessment
Homogeneity Assessment
C38-1
C38-2
C38-3
0.977
0.477
-0.023
-0.523
1.562
1.062
0.562
0.062
-0.438
-0.938
Homogeneity

Benzene

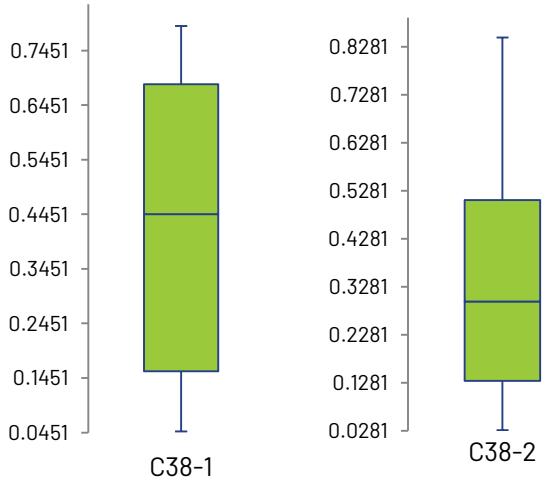
C38-4

Stability Assessment	Homogeneity Assessment

Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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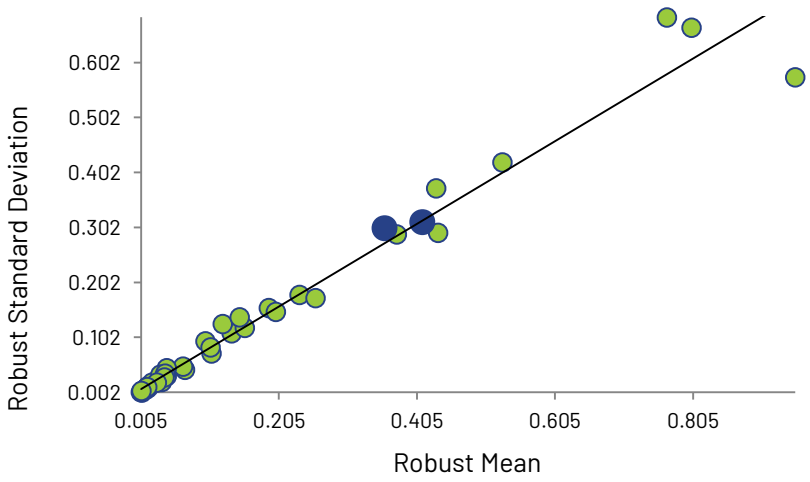

Chlorobenzene

Summary Statistics

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	20	0	0
Median mg/L	4.16	4.10		
Robust Mean mg/L	3.95	4.28		
Uncdrtainty of the Assigned Value mg/L	0.307	0.335		
Robust Standard Deviation mg/L	1.10	1.20		
Regression Standard Deviation mg/L				
Stability Flag	Stability			
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA) mg/L	1.83	2.61		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

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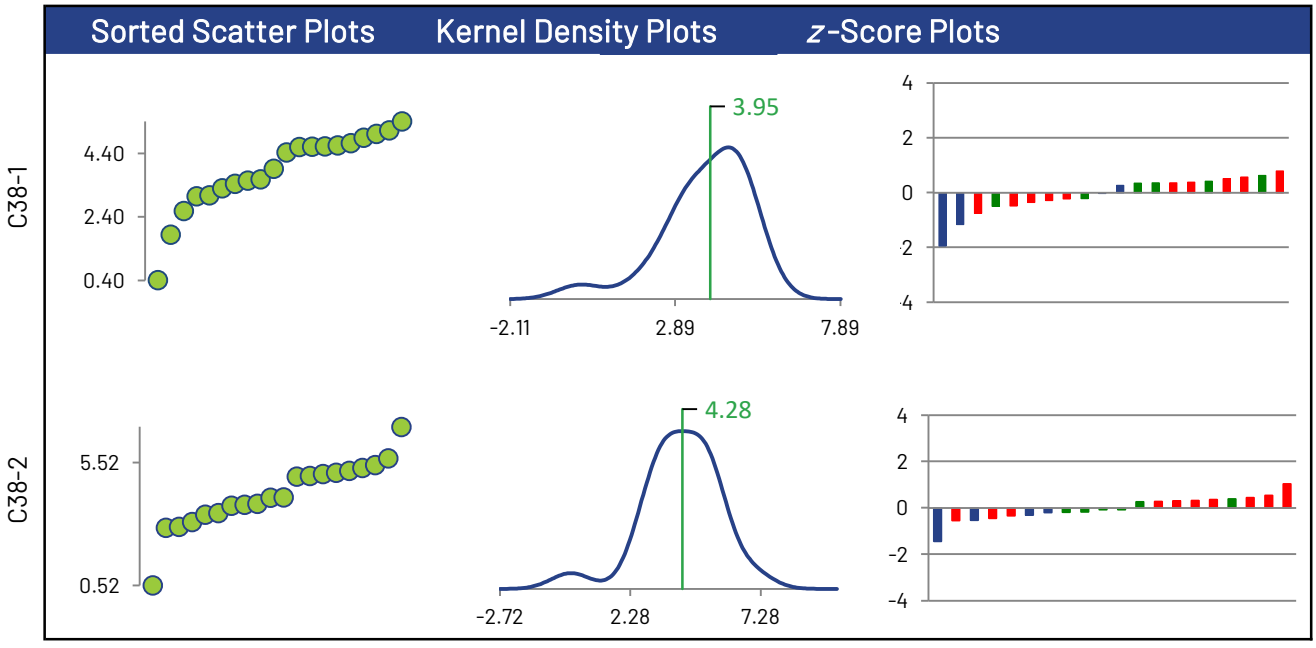

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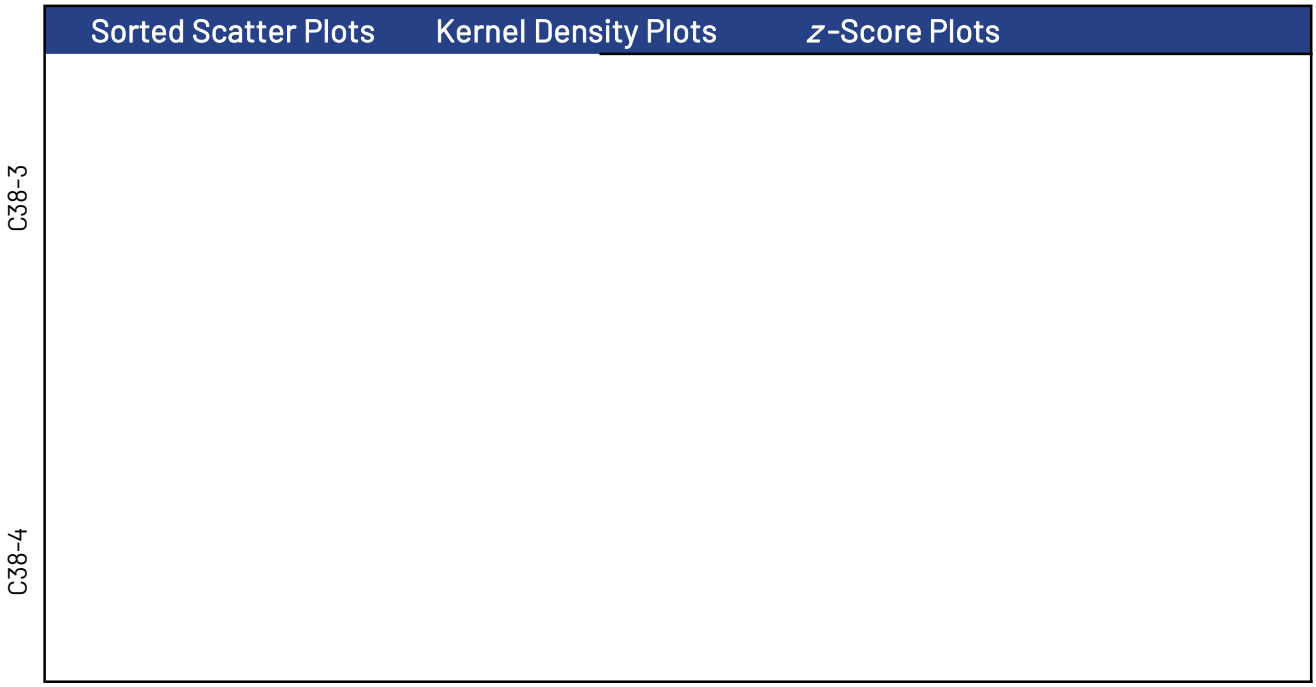
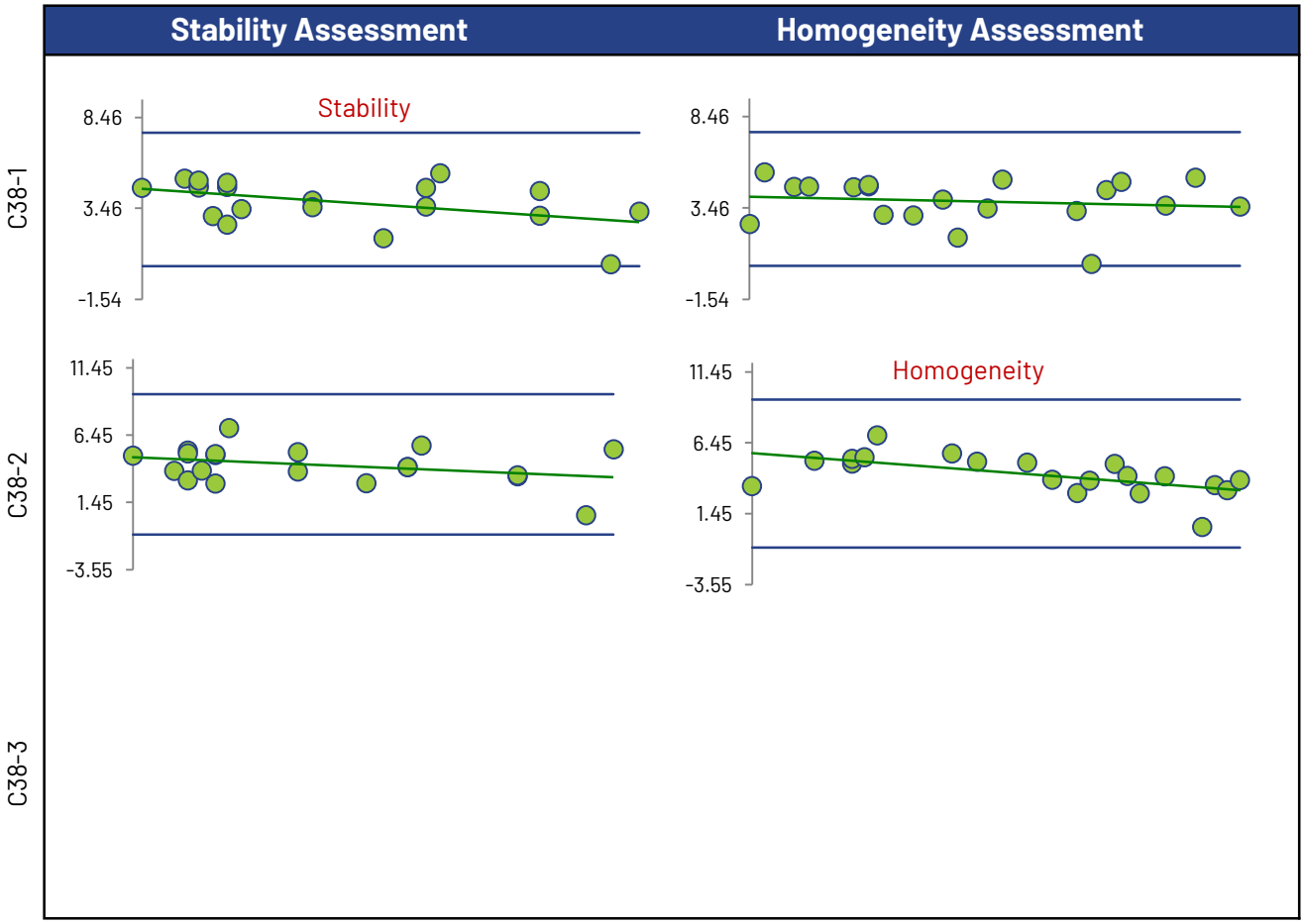
Chlorobenzene





Chlorobenzene

C38-4

Stability Assessment	Homogeneity Assessment

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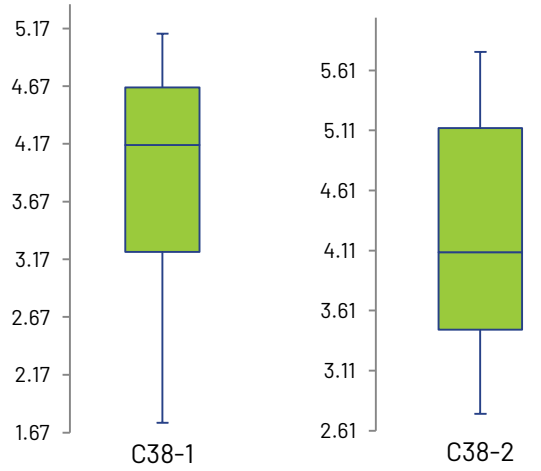
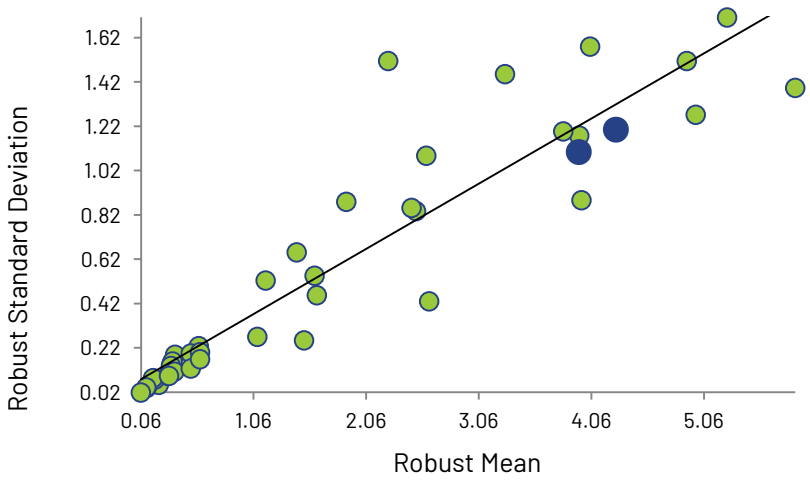
Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Chlorobenzene

Summary Statistics

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Median mg/L	4.16	4.10		
Robust Mean mg/L	3.95	4.28		
Uncdrtainty of the Assigned Value mg/L	0.307	0.335		
Robust Standard Deviation mg/L	1.10	1.20		
Regression Standard Deviation mg/L				
Stability Flag	Stability			
Homogeneity Flag		Homogeneity		
Standard Deviation Used (SDPA) mg/L	1.83	2.61		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

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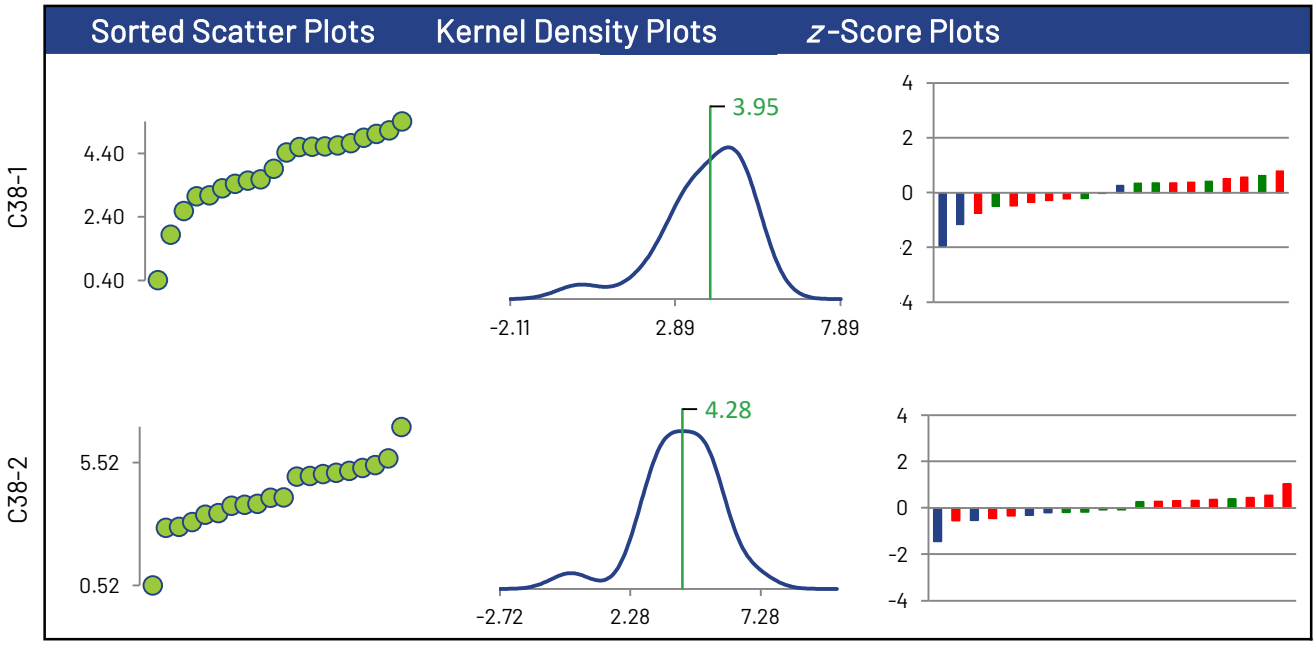
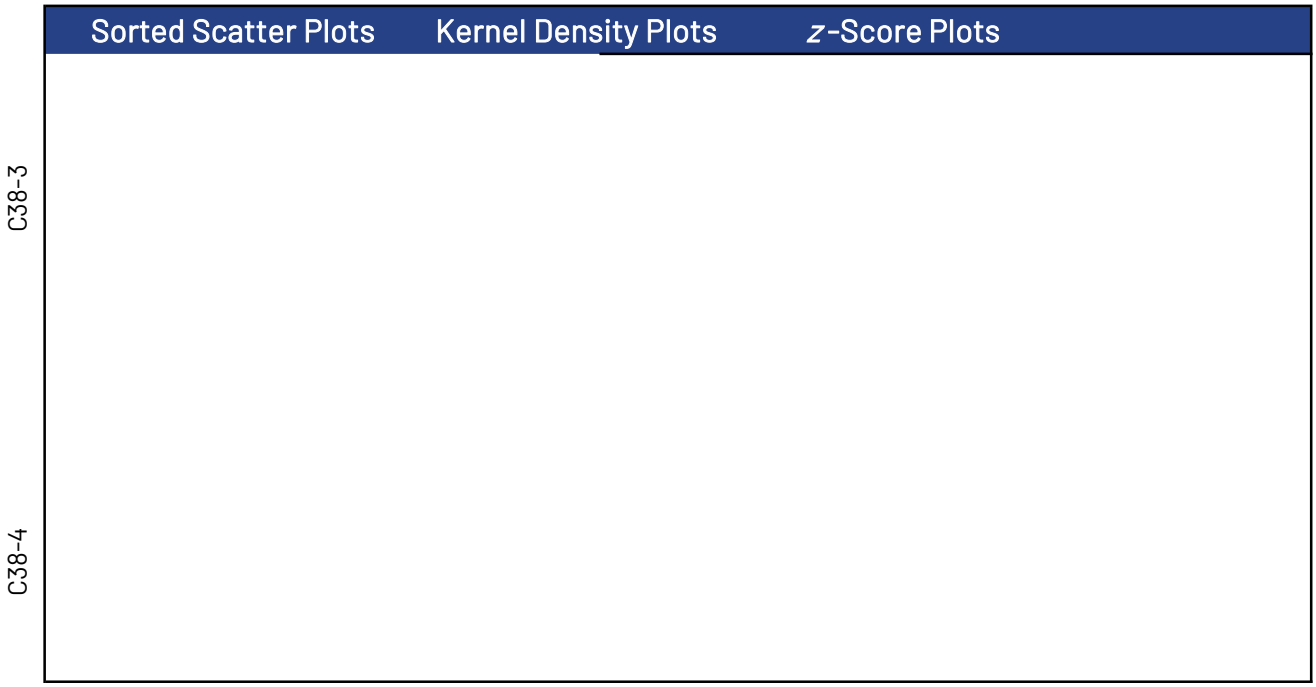
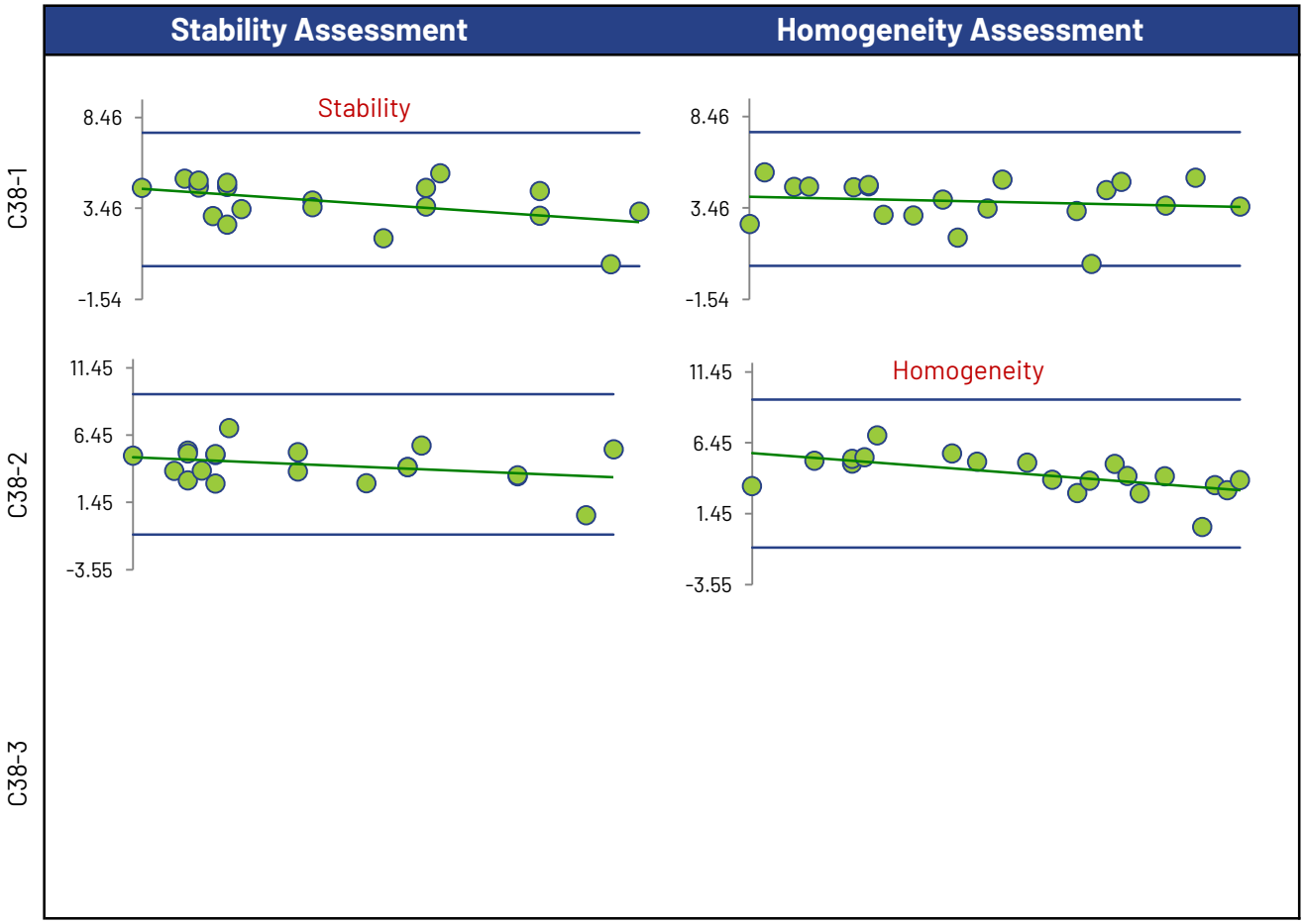


* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Chlorobenzene





Chlorobenzene

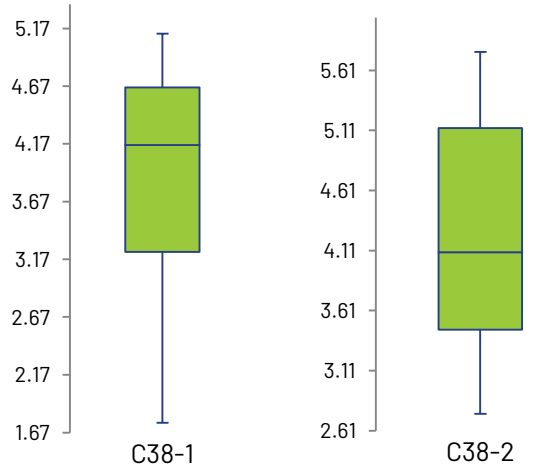
C38-4

Stability Assessment	Homogeneity Assessment

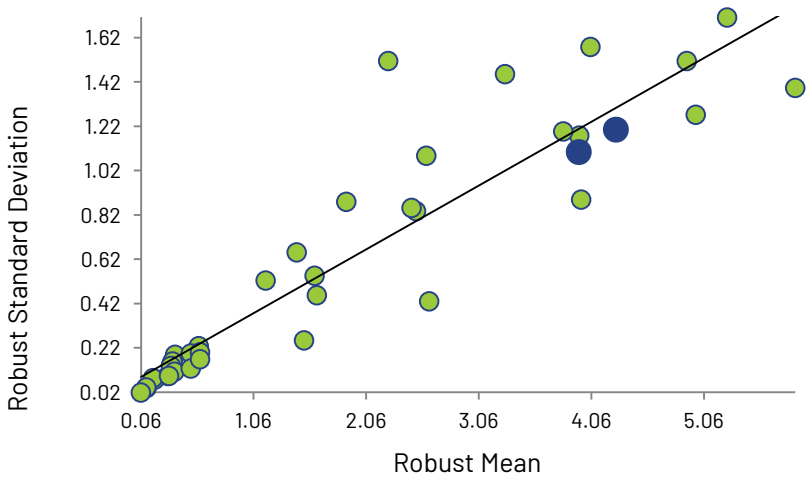
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Chloroform

Summary Statistics

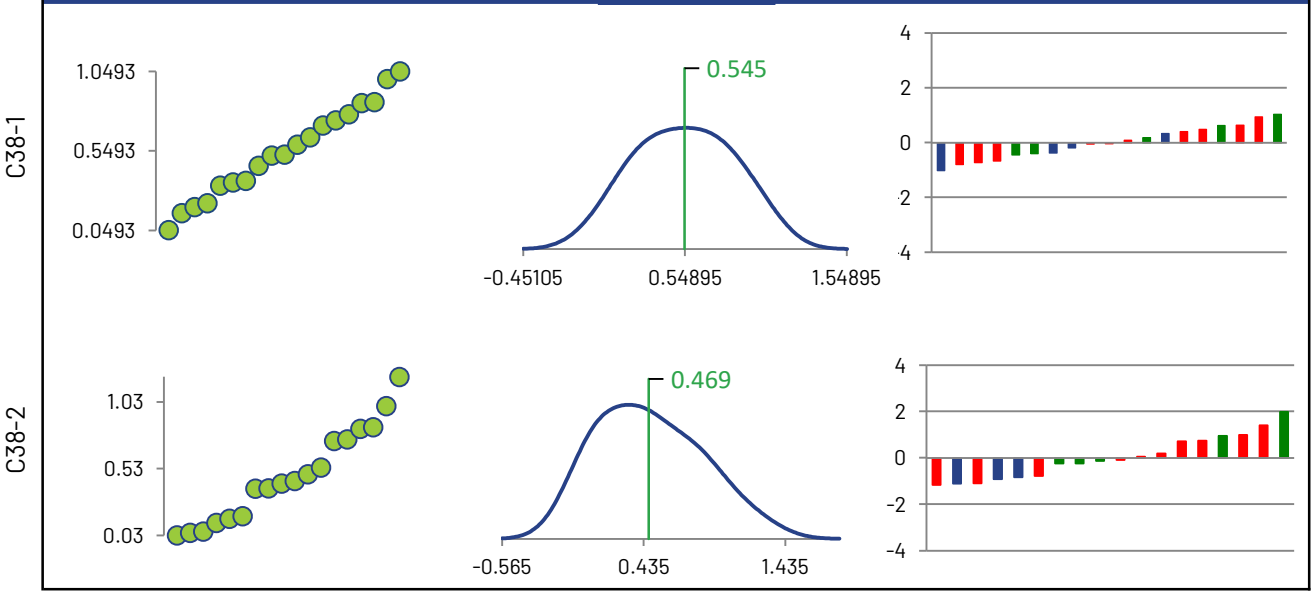
Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	19	18	0	0
Median mg/L	0.526	0.429		
Robust Mean mg/L	0.545	0.469		
Uncdrtainty of the Assigned Value mg/L	0.0946	0.111		
Robust Standard Deviation mg/L	0.330	0.378		
Regression Standard Deviation mg/L				
Stability Flag				
Homogeneity Flag	Homogeneity			
Standard Deviation Used (SDPA) mg/L	0.484	0.378		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	3	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	5	5	0	0

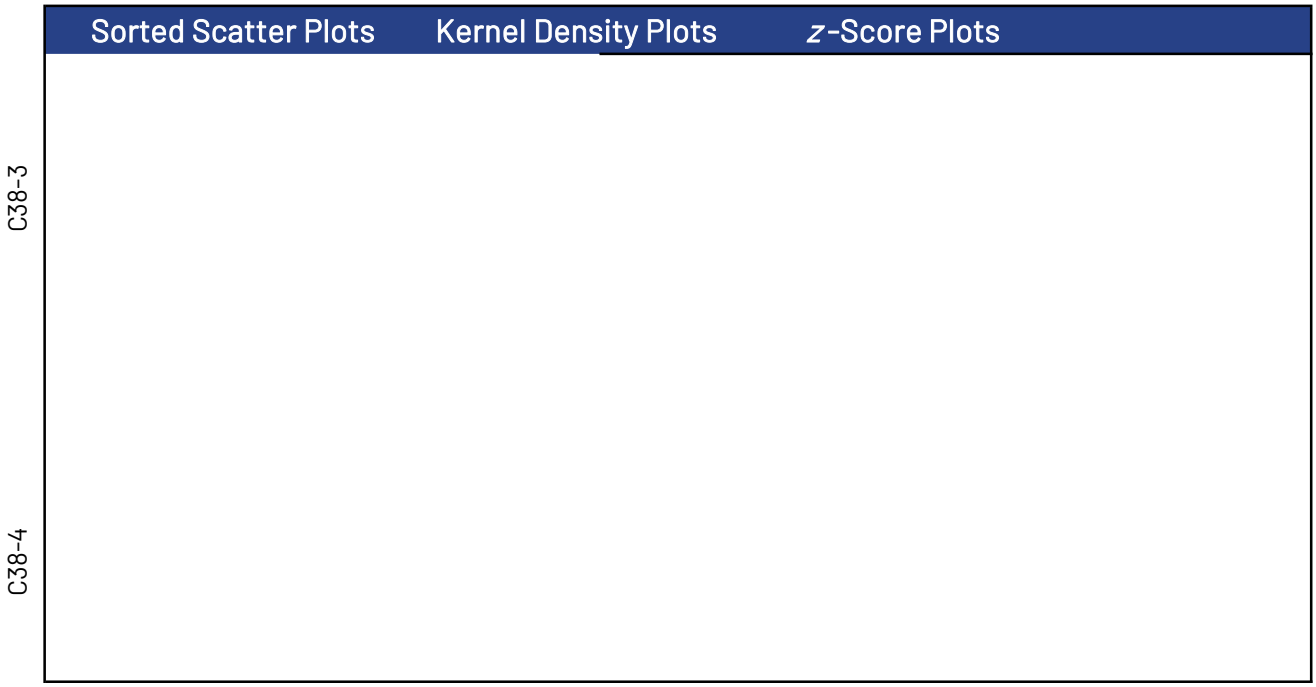
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers

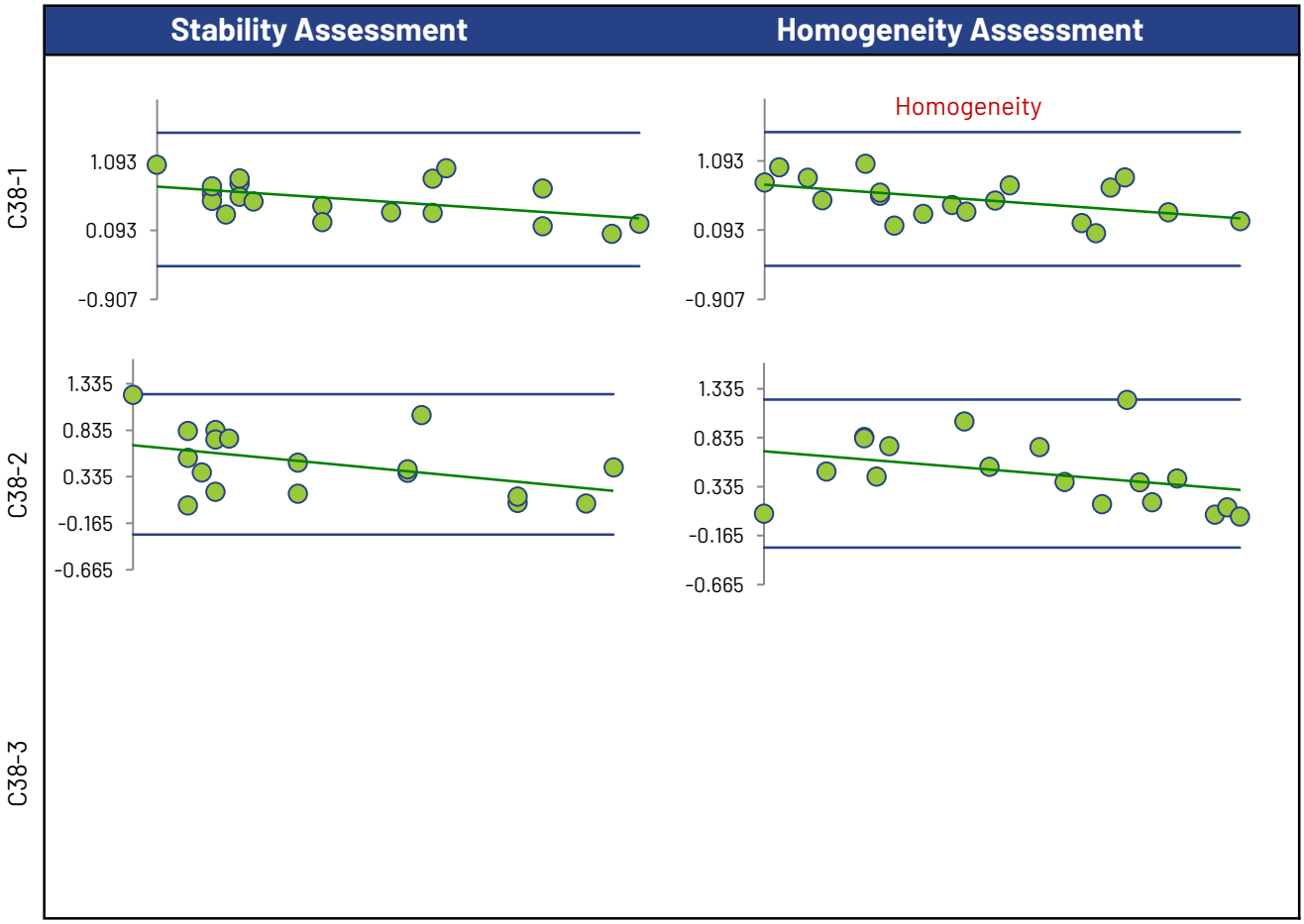
Sorted Scatter Plots | Kernel Density Plots | *z*-Score Plots



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Chloroform


Sorted Scatter Plots
Kernel Density Plots
z-Score Plots
C38-3
C38-4


Stability Assessment
Homogeneity Assessment
Homogeneity
C38-1
C38-2
C38-3
1.093
0.093
-0.907
1.335
0.835
0.335
-0.165
-0.665

Chloroform

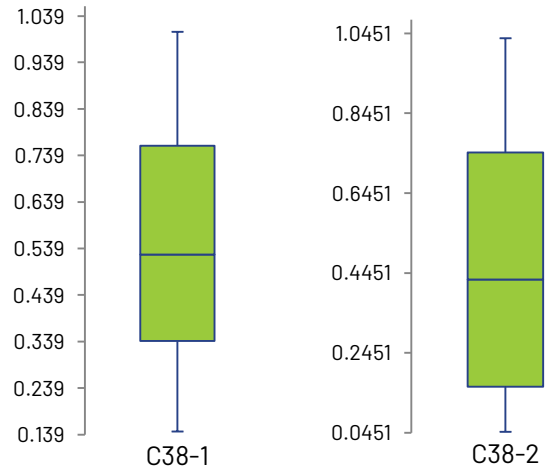
C38-4

Stability Assessment	Homogeneity Assessment

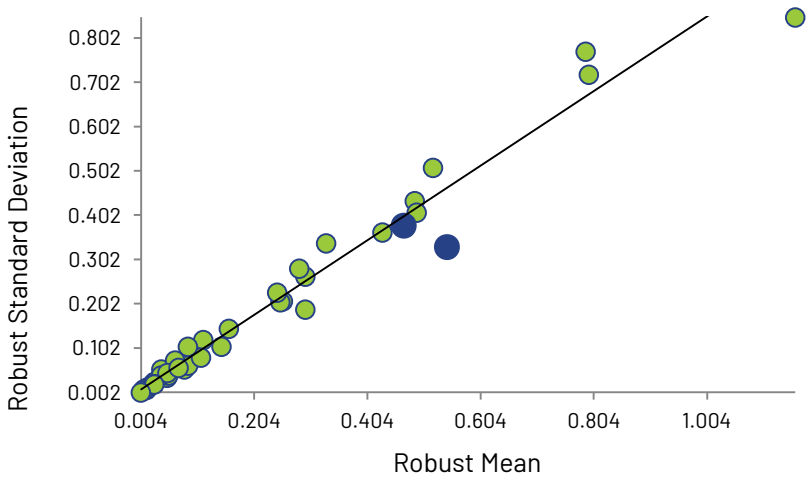
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Dichloromethane

Summary Statistics

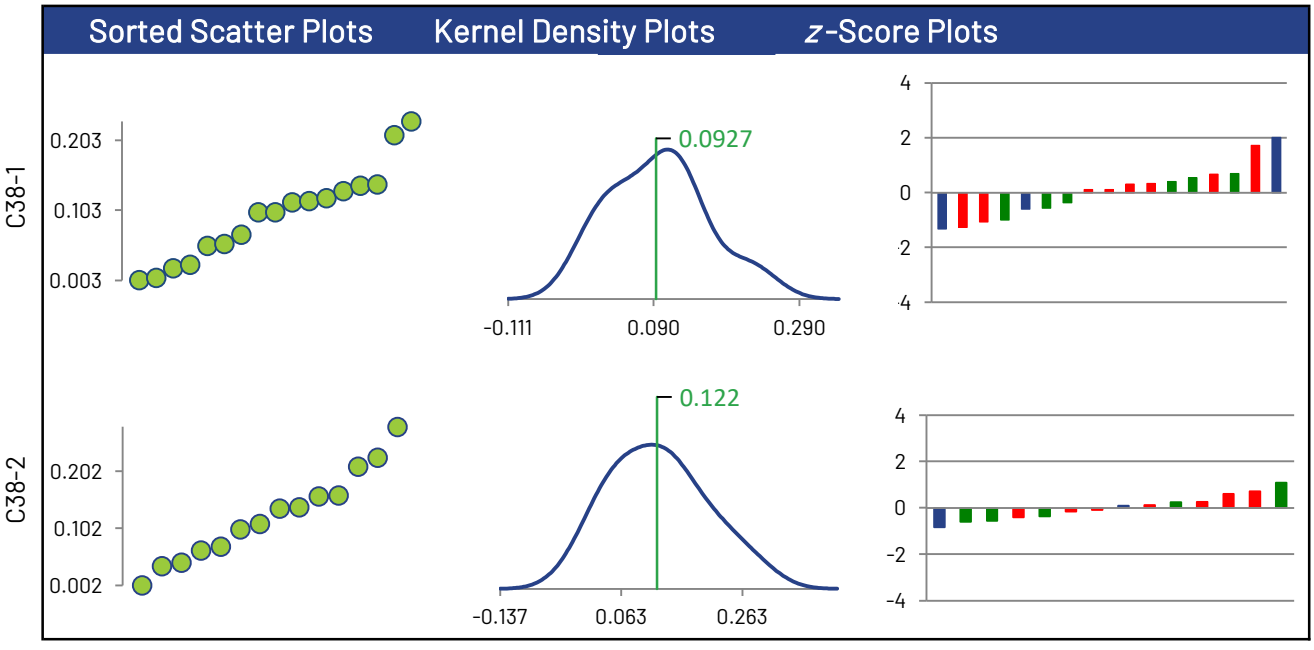
Excluded

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	17	14	0	0
Median mg/L	0.100	0.124		
Robust Mean mg/L	0.0927	0.122		
Uncdrtainty of the Assigned Value mg/L	0.0206	0.0284		
Robust Standard Deviation mg/L	0.0679	0.0849		
Regression Standard Deviation mg/L				
Stability Flag		Stability		
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0679	0.145		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	1	0	0	0
Failure Rate %*	0.0			

Methods Used

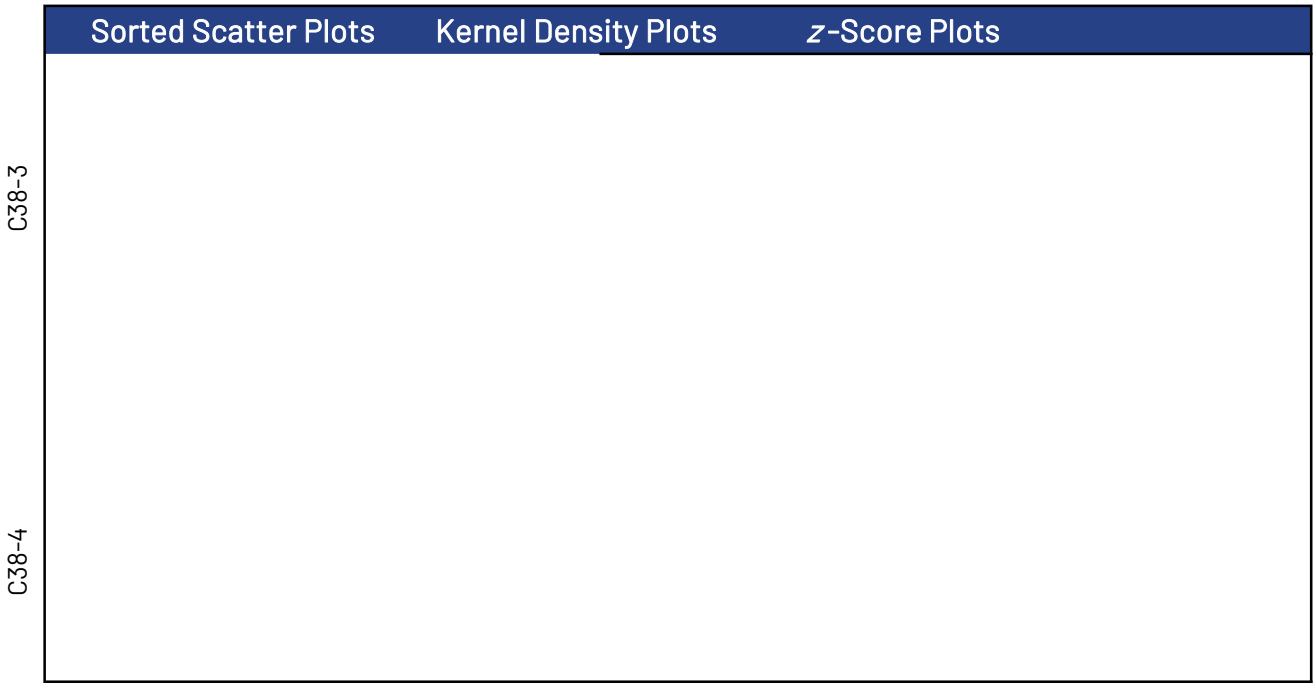
Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	3	2	0	0
GC/MS - PURGE AND TRAP (Red)	8	7	0	0
GC/MS - HEADSPACE (Green)	6	5	0	0

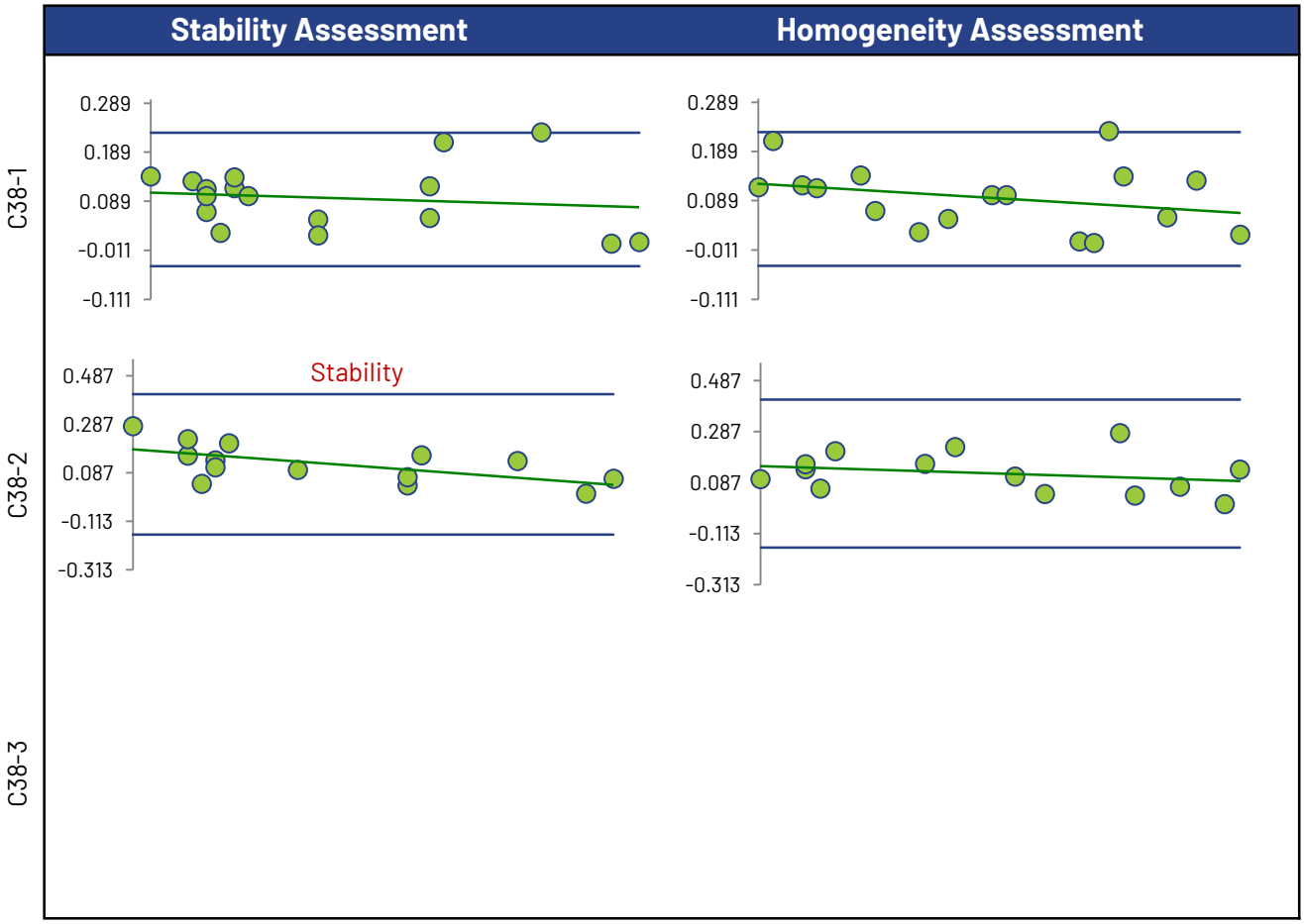
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Dichloromethane





Dichloromethane

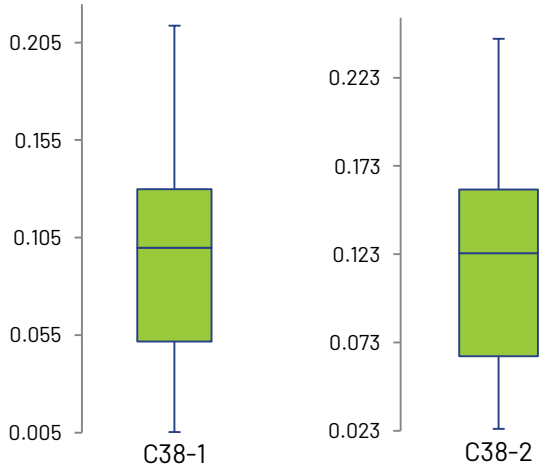
C38-4

Stability Assessment	Homogeneity Assessment

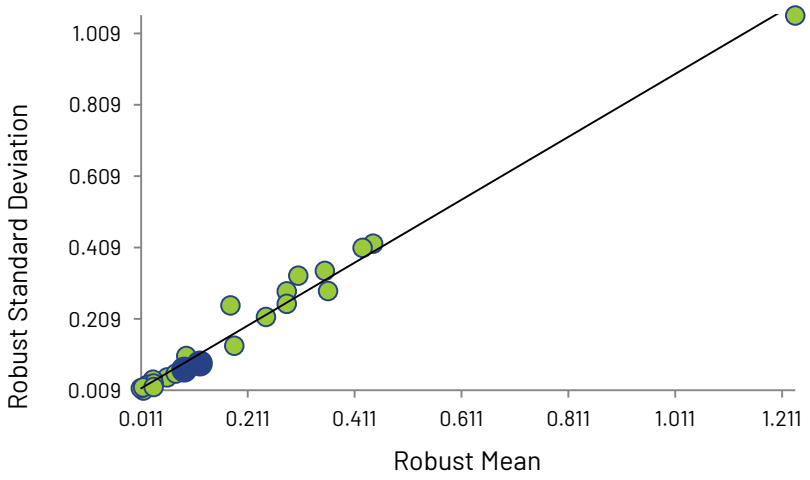
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Methyl ethyl ketone

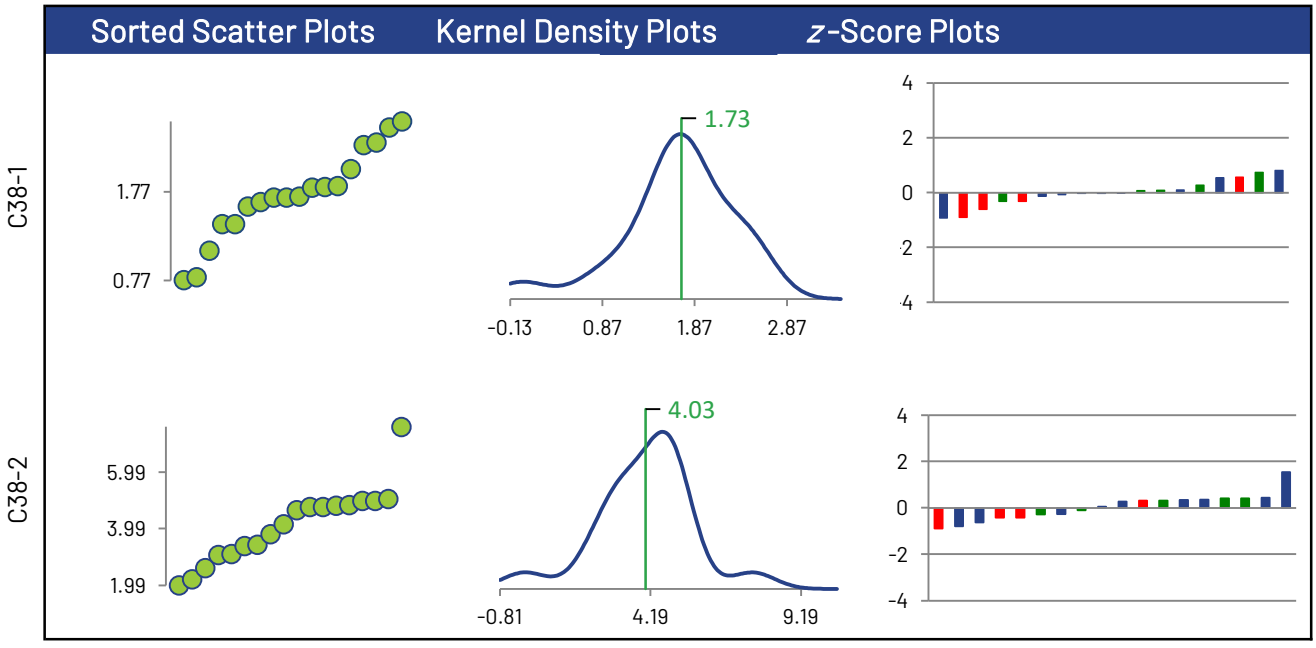
Summary Statistics

Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	18	18	0	0
Median mg/L	1.71	4.40		
Robust Mean mg/L	1.73	4.03		
Uncdrtainty of the Assigned Value mg/L	0.163	0.365		
Robust Standard Deviation mg/L	0.553	1.24		
Regression Standard Deviation mg/L				
Stability Flag	Stability	Stability		
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	1.03	2.29		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	0.0			

Methods Used

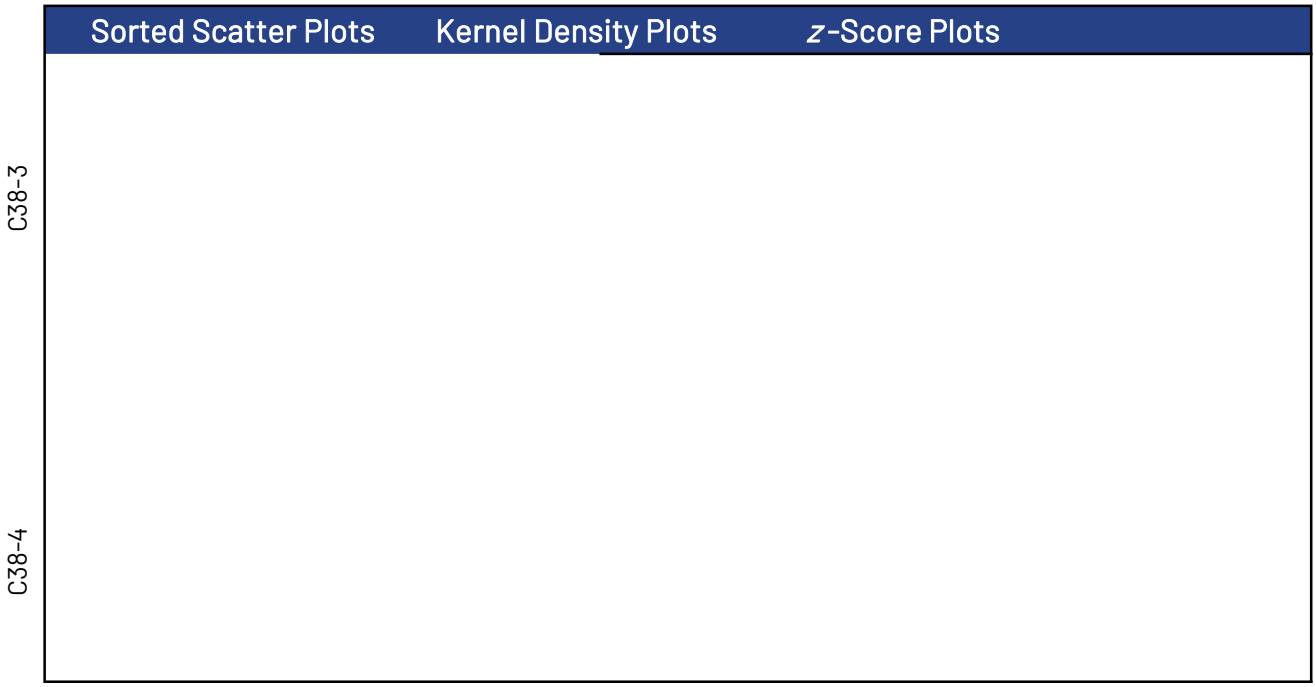
Method	C38-1	C38-2	C38-3	C38-4
GC/MS - PURGE AND TRAP (Blue)	9	9	0	0
GC/MS (Red)	4	4	0	0
GC/MS - HEADSPACE (Green)	5	5	0	0

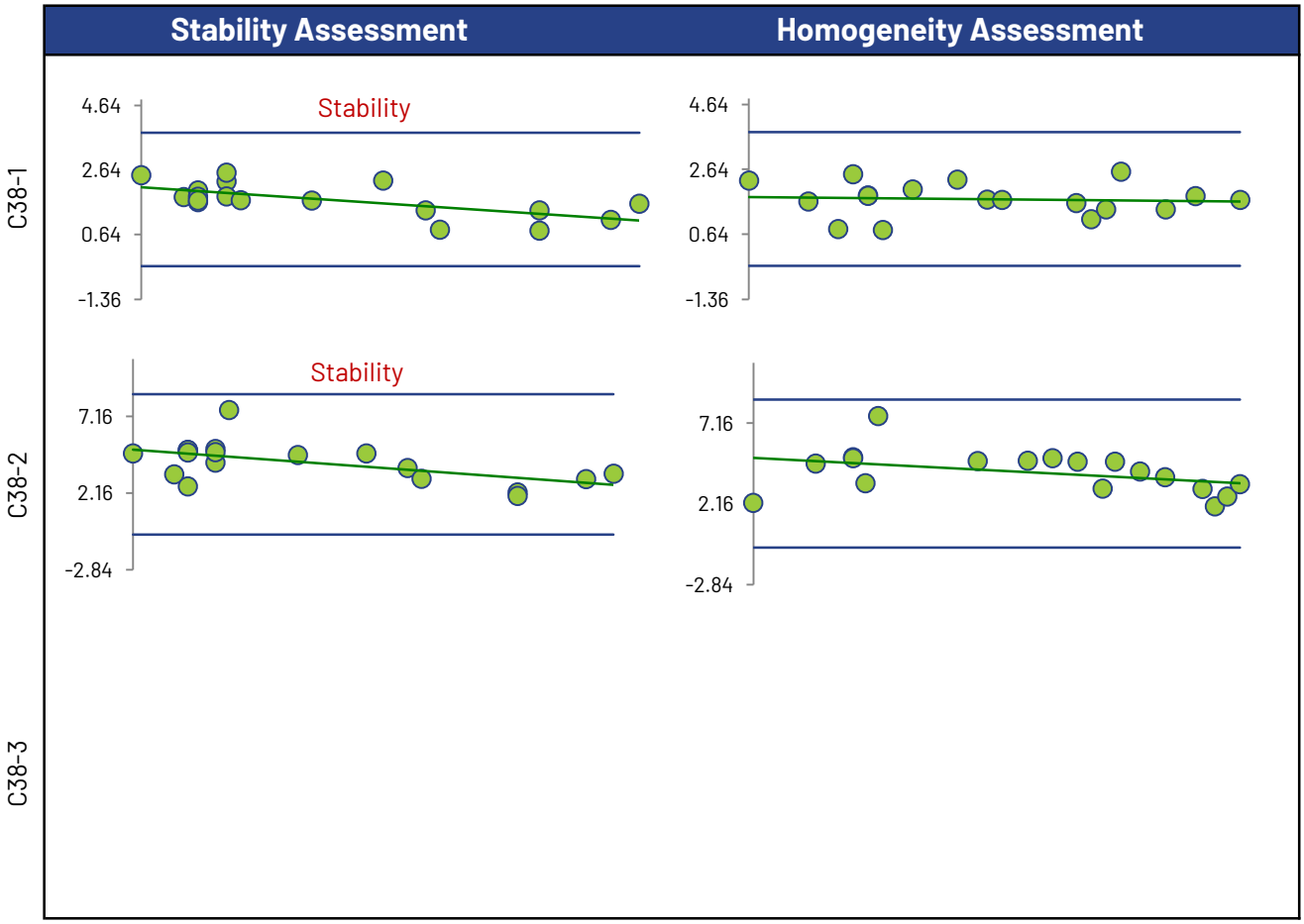
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Methyl ethyl ketone





Methyl ethyl ketone

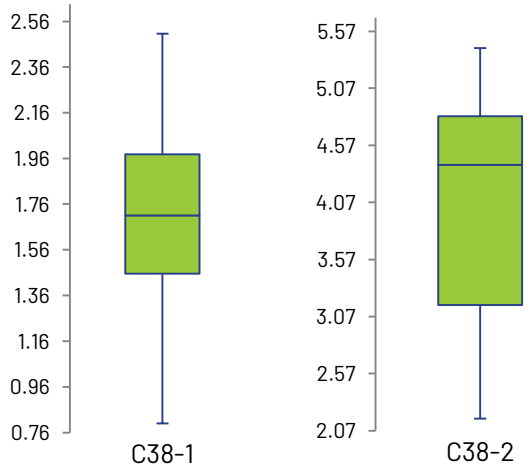
C38-4

Stability Assessment	Homogeneity Assessment

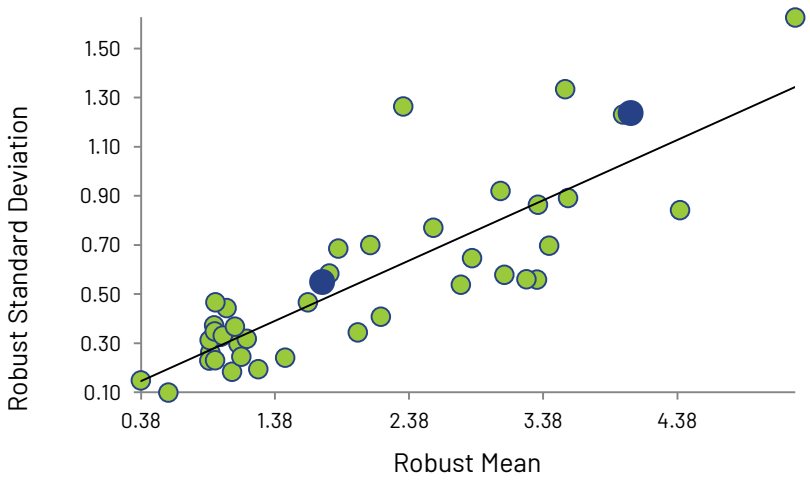
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Tetrachloroethylene

Summary Statistics

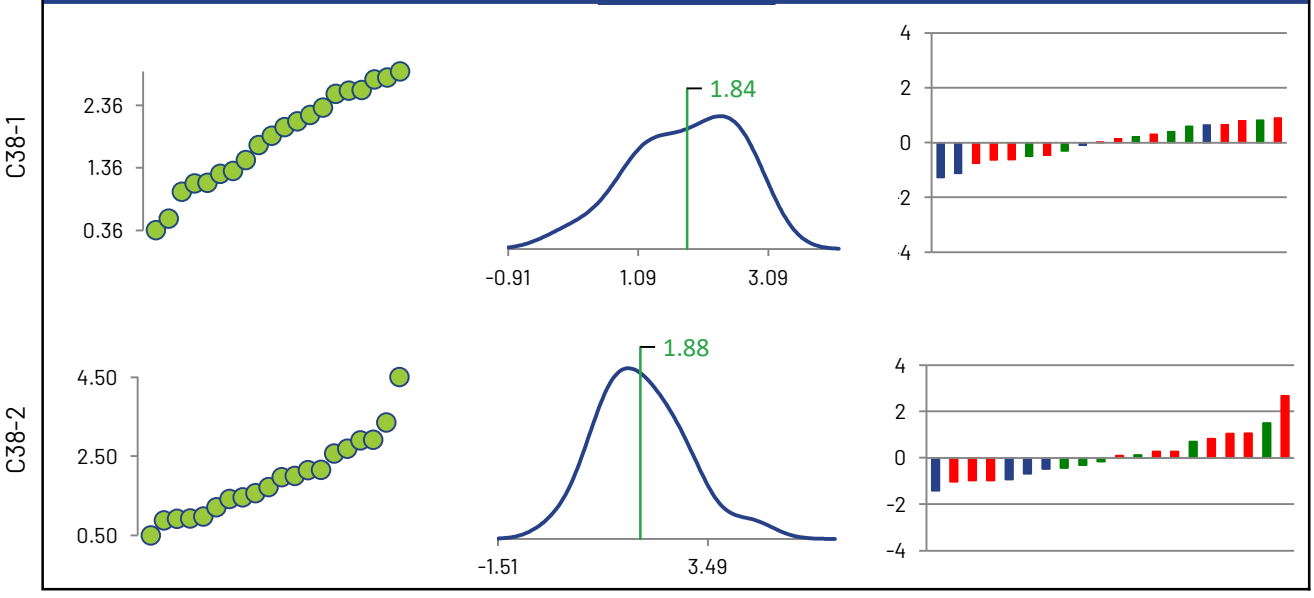
Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	20	0	0
Median mg/L	1.94	1.85		
Robust Mean mg/L	1.84	1.88		
Uncdrtainty of the Assigned Value mg/L	0.240	0.275		
Robust Standard Deviation mg/L	0.858	0.985		
Regression Standard Deviation mg/L				
Stability Flag	Stability			
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	1.16	0.985		
Flagged Outliers	0	0	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	1	0	0
Failure Rate %*	0.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	6	0	0

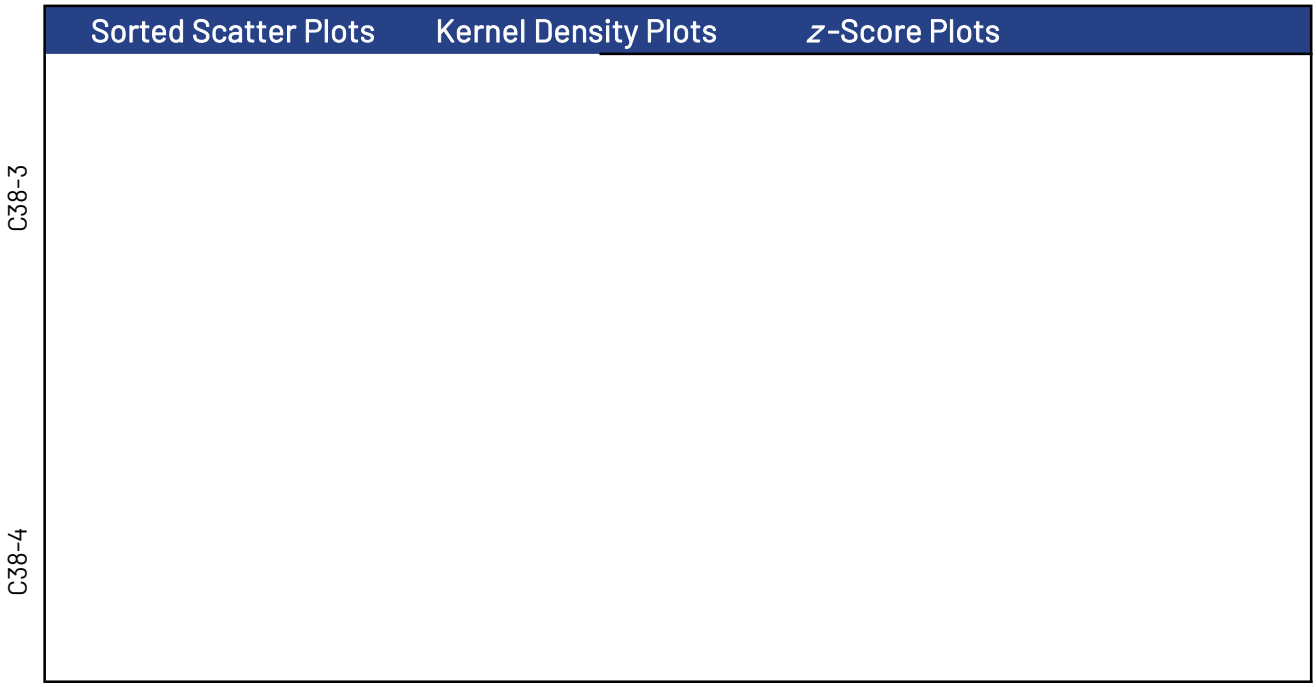
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers

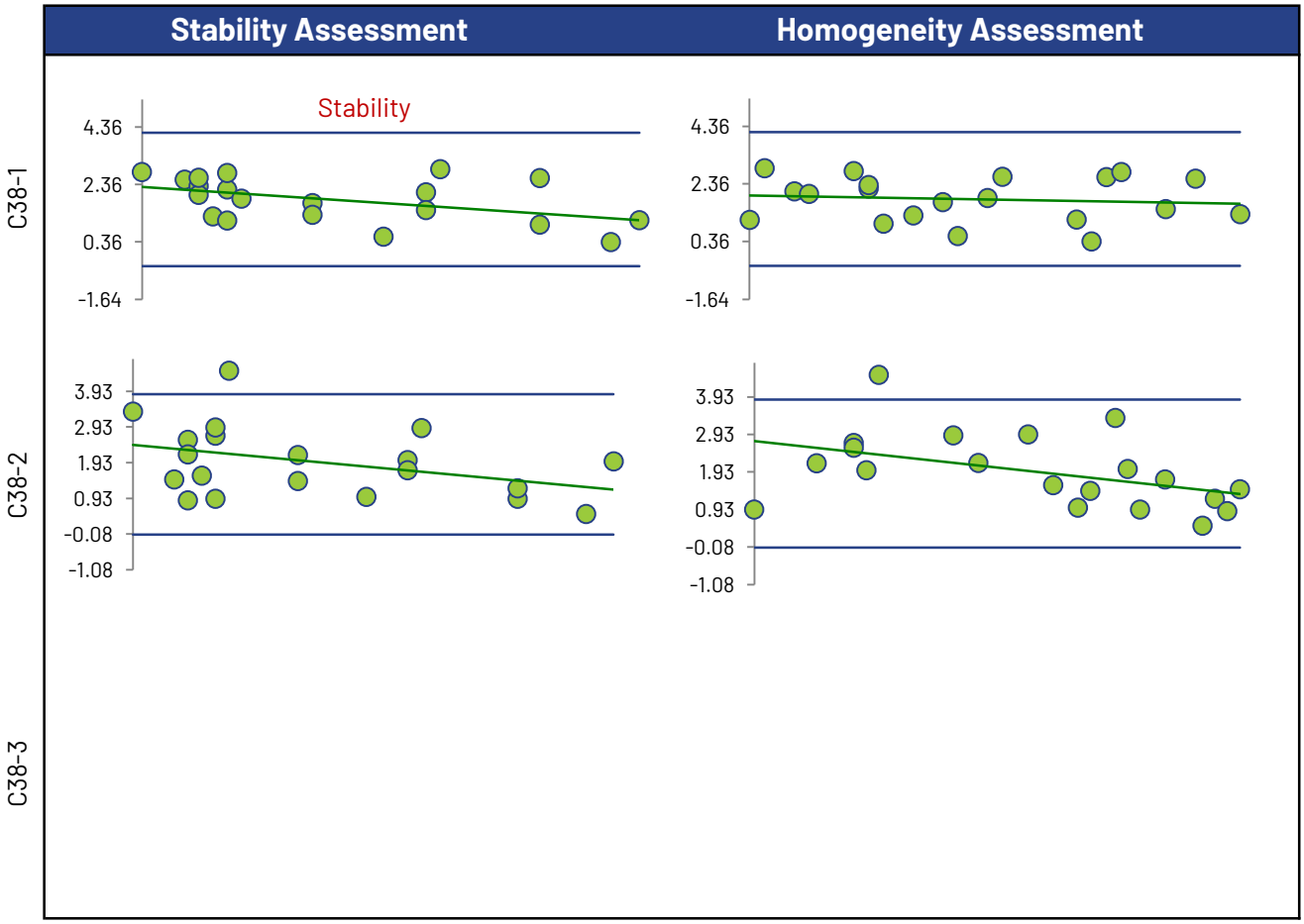
Sorted Scatter Plots | Kernel Density Plots | *z*-Score Plots



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Tetrachloroethylene





Tetrachloroethylene

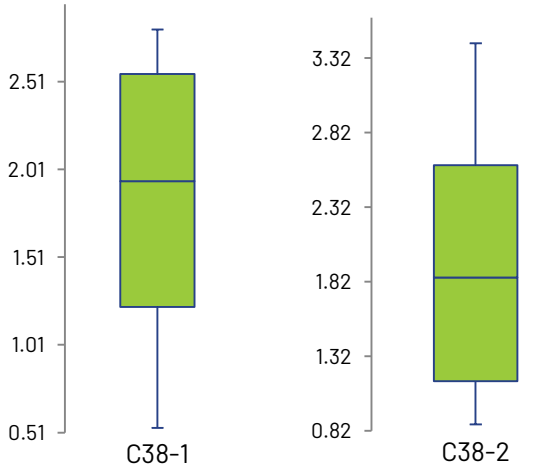
C38-4

Stability Assessment	Homogeneity Assessment

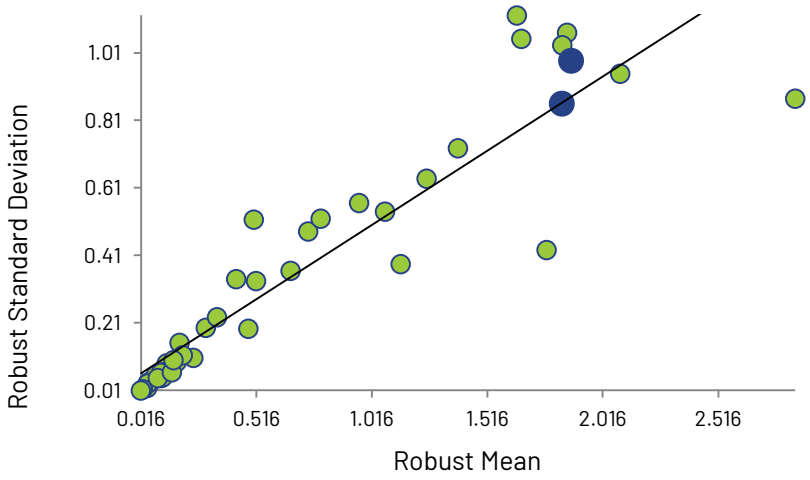
Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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



Trichloroethylene

Summary Statistics

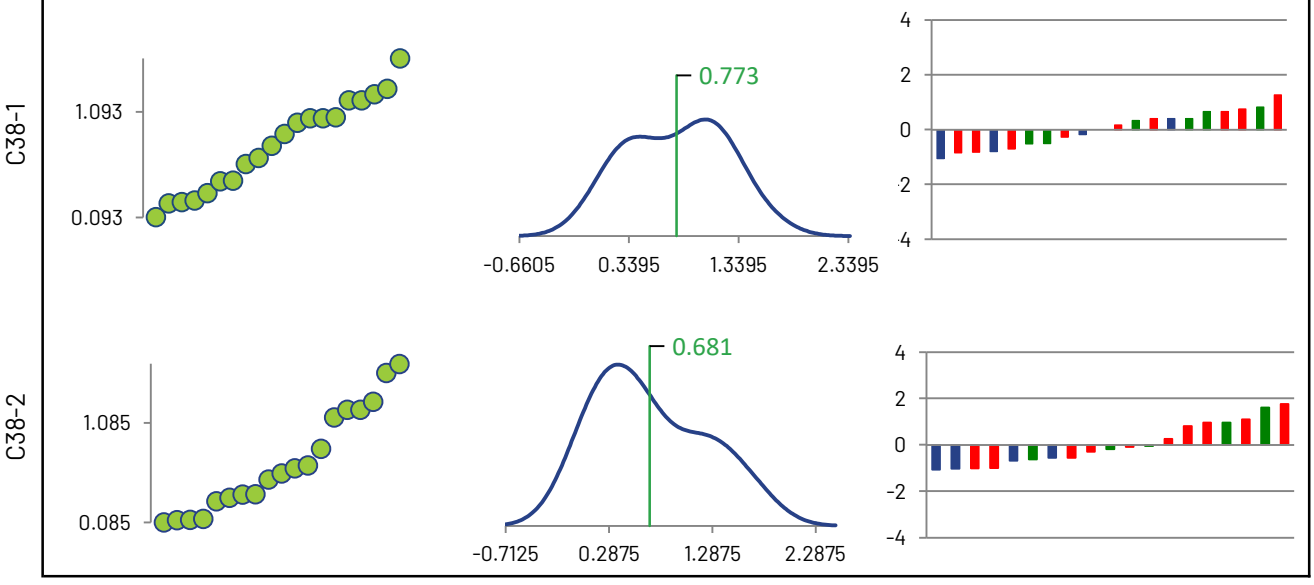
Statistic	C38-1	C38-2	C38-3	C38-4
No. of results used for summary statistics	20	19	0	0
Median mg/L	0.827	0.579		
Robust Mean mg/L	0.773	0.681		
Uncdrtainty of the Assigned Value mg/L	0.136	0.162		
Robust Standard Deviation mg/L	0.485	0.564		
Regression Standard Deviation mg/L				
Stability Flag	Stability			
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.650	0.564		
Flagged Outliers	0	1	0	0
|z|>3.0	0	0	0	0
2<|z|<3	0	0	0	0
Failure Rate %*	5.0			

Methods Used

Method	C38-1	C38-2	C38-3	C38-4
GC/MS (Blue)	4	4	0	0
GC/MS - PURGE AND TRAP (Red)	10	10	0	0
GC/MS - HEADSPACE (Green)	6	5	0	0

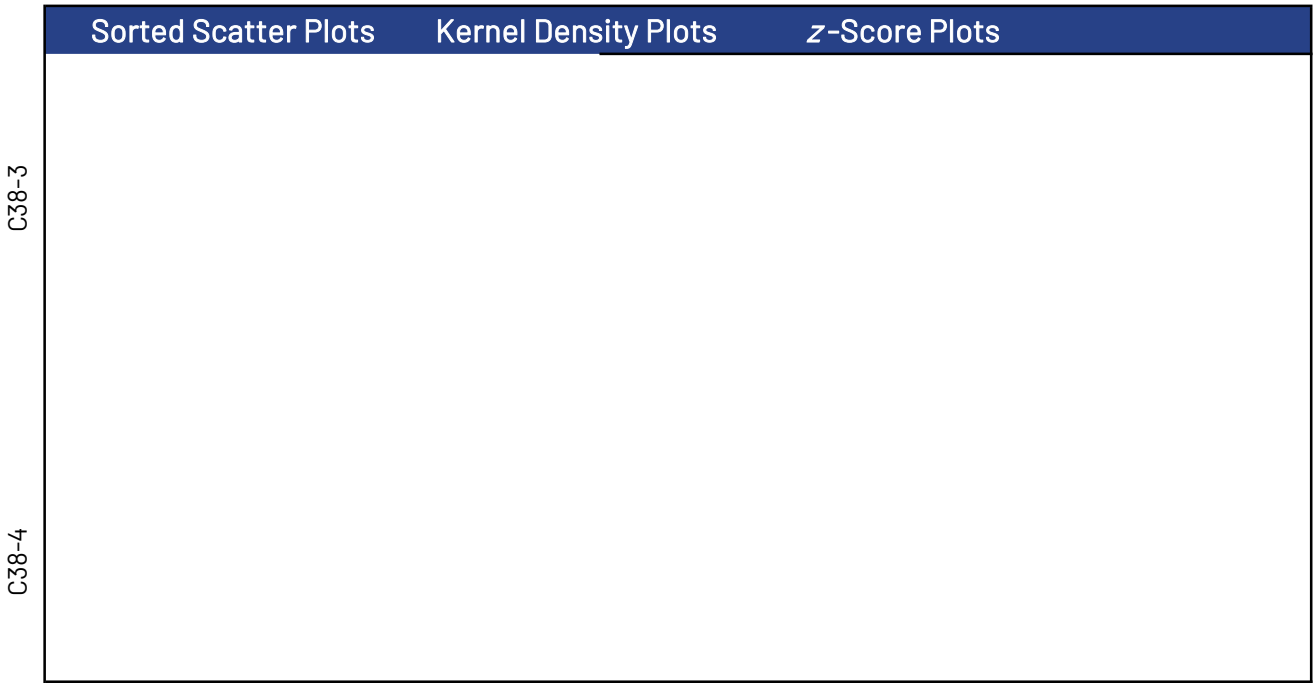
All summary stats, except the failure rate, and the plots below are based on the data excluding any flagged outliers

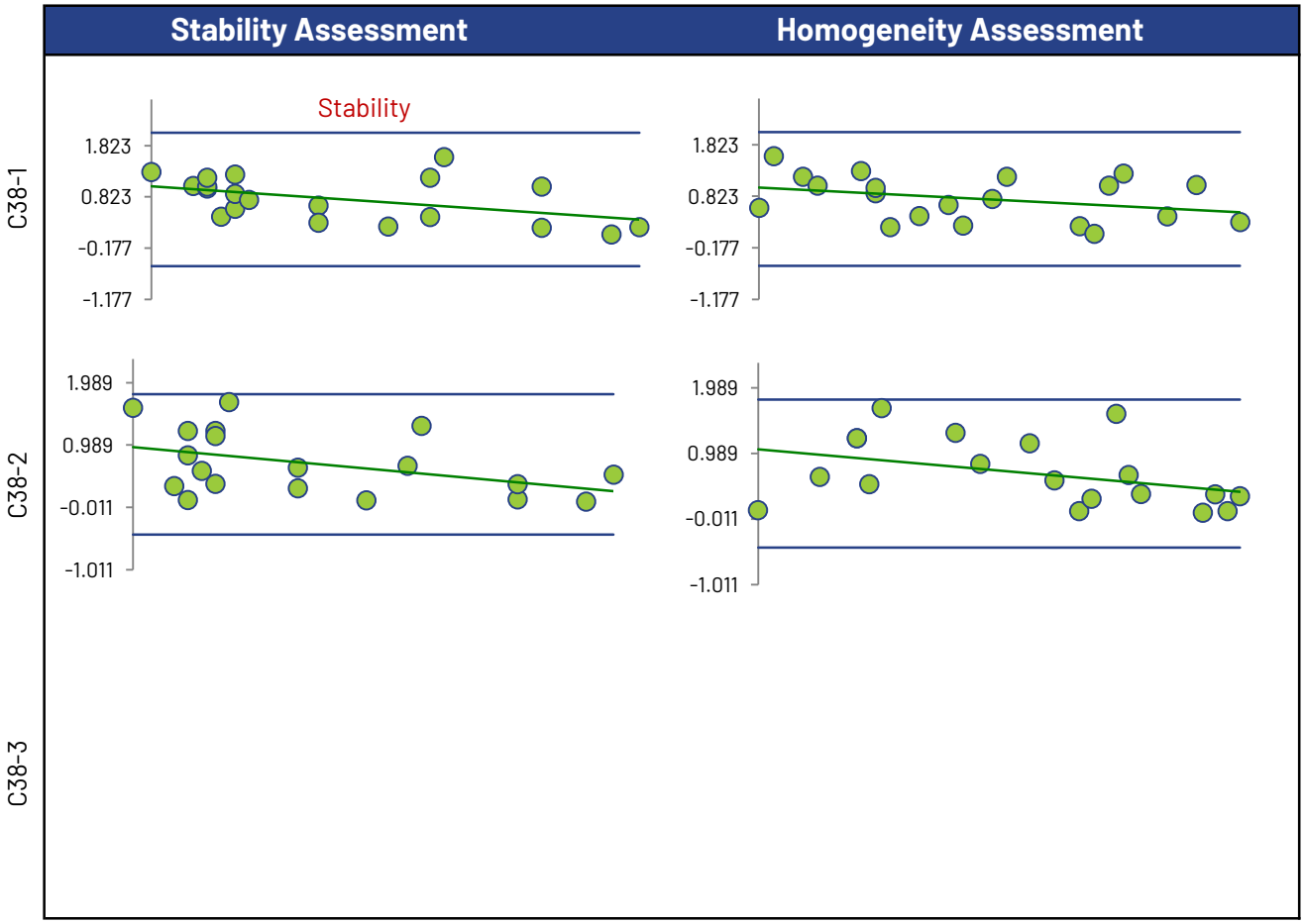
Sorted Scatter Plots | Kernel Density Plots | *z*-Score Plots



* Displayed failure rate does not account for the RDL modified z-Scores or inaccurately reported non-detects.

Trichloroethylene





Trichloroethylene

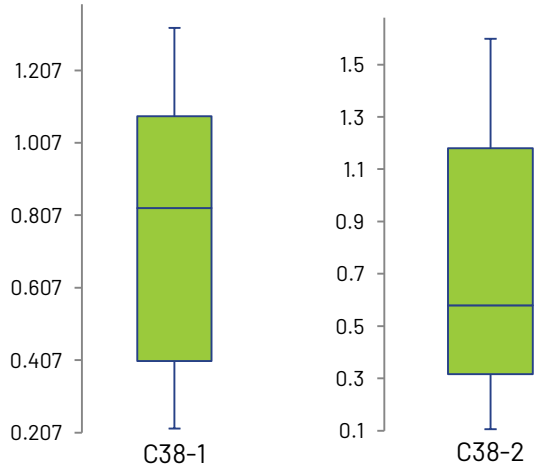
C38-4

Stability Assessment	Homogeneity Assessment

Stability assessments are regression analysis of reported result against date of analysis.

Homogeneity assessments are regression analysis of reported result against bottling order.

Box and Whisker Plots



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