B Groundwater BTV ProUCL Input and Output

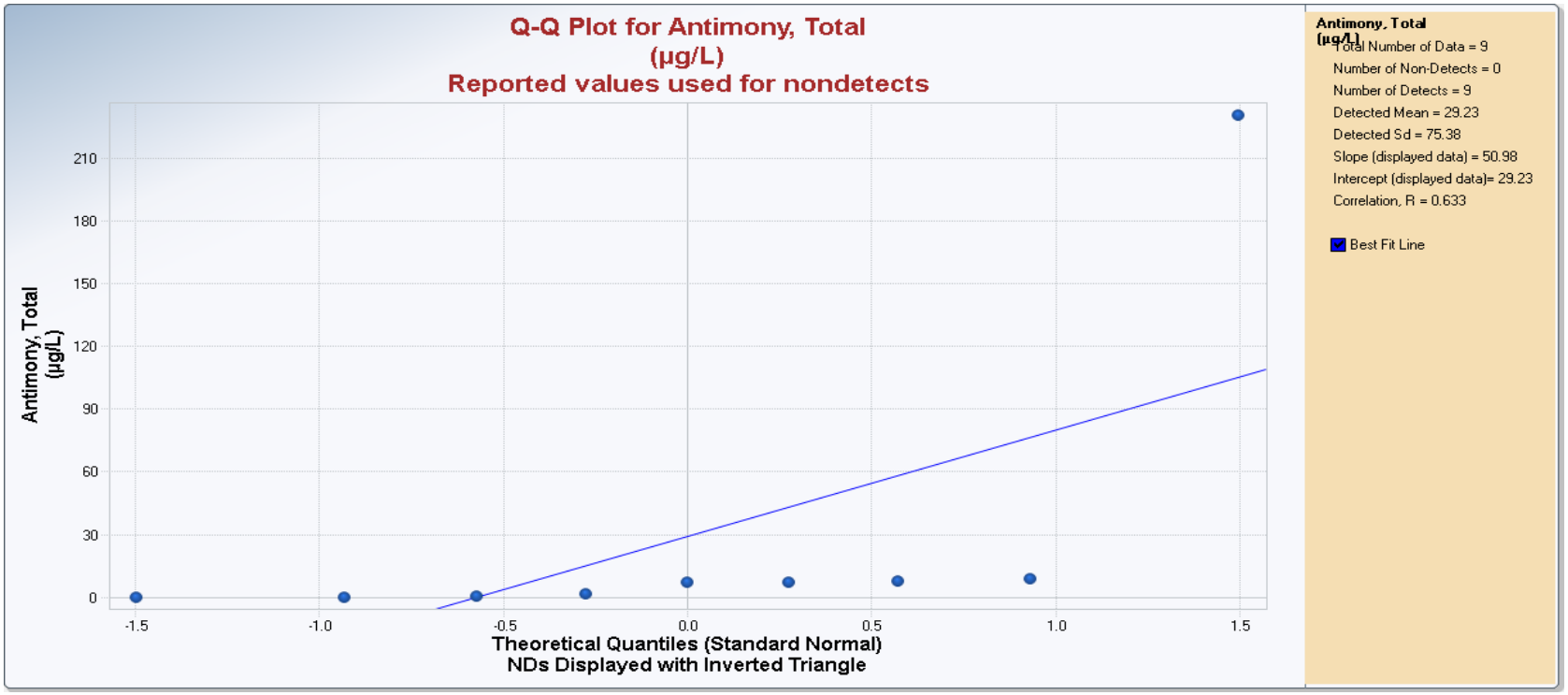
ProUCL Input Table - Complete

Well	Antimony, Dissolved (µg/L)	D_Antimony, Dissolved (µg/L)	Antimony, Total (µg/L)	D_Antimony, Total (µg/L)	Arsenic, Dissolved (µg/L)	D_Arsenic, Dissolved (µg/L)	Arsenic, Total (µg/L)	D_Arsenic, Total (µg/L)	Mercury, Dissolved (ng/L)	D_Mercury, Dissolved (ng/L)	Mercury, Total (1631) (ng/L)	D_Mercury, Total (1631) (ng/L)	Mercury, Total (7470) (µg/L)	D_Mercury, Total (7470) (µg/L)	Log_Antimony, Total (µg/L)	D_Log_Antimony, Total (µg/L)	Log_Arsenic, Total (µg/L)	D_Log_Arsenic, Total (µg/L)	Log_Mercury, Dissolved (ng/L)	D_Log_Mercury, Dissolved (ng/L)	Log_Mercury, Total (1631) (ng/L)	D_Log_Mercury, Total (1631) (ng/L)
MW29	1.568499982	1	1.50687501	1	25.55000019	1	59.73750019	1	4.4731251	1	80.67500001	1	0.0989	1	0.17807723	1	1.776247045	1	0.650611044	1	1.906738974	1
MW31	0.027000001	1	0.50466666	1	0.050000001	0	1.759999974	1	3.095	1	103.3141669	1	0.1402	1	-0.296995384	1	0.245512661	1	0.490660654	1	2.014159878	1
MW40			7.44999993	1			146.25	1	0.66749999	1	79.67499995	1	0.073125	1	0.872156269	1	2.165095875	1	-0.175548734	1	1.901322072	1
MW42			230	1			440	1	67.7200001	1	681.2000003	1	0.263875	1	2.361727836	1	2.643452676	1	1.83071695	1	2.833274639	1
MW43			7.0999999	1			194.5	1	2.60750005	1	17.82625037	1	0.069	1	0.851258343	1	2.288919606	1	0.416224325	1	1.251060002	1
MW50			7.30000019	1			490	1	14.8000002	1	1130	1	0.56999999	1	0.863322871	1	2.69019608	1	1.170261721	1	3.053078443	1
MW56			0.13	1			2.299999952	1	0.34999999	0	13.14999962	0	0.15000001	0	-0.886056664	1	0.361727827	1	-0.455931963	0	1.11892574	0
MW57			0.15000001	1			2.5	1	13.6000004	1	119	1	0.15000001	0	-0.823908724	1	0.397940009	1	1.133538921	1	2.075546961	1
MW59			8.89999962	1			78	1	3.71499991	0	312	1	0.15000001	0	0.949389988	1	1.892094603	1	0.569958808	0	2.494154594	1

ProUCL Input Table - Trimmed

Well	Antimony, Dissolved (µg/L)	D_Antimony, Dissolved (µg/L)	Antimony, Total (µg/L)	D_Antimony, Total (µg/L)	Arsenic, Dissolved (µg/L)	D_Arsenic, Dissolved (µg/L)	Arsenic, Total (µg/L)	D_Arsenic, Total (µg/L)	Mercury, Dissolved (ng/L)	D_Mercury, Dissolved (ng/L)	Mercury, Total (1631) (ng/L)	D_Mercury, Total (1631) (ng/L)	Mercury, Total (7470) (µg/L)	D_Mercury, Total (7470) (µg/L)	Log_Antimony, Total (µg/L)	D_Log_Antimony, Total (µg/L)	Log_Arsenic, Total (µg/L)	D_Log_Arsenic, Total (µg/L)	Log_Mercury, Dissolved (ng/L)	D_Log_Mercury, Dissolved (ng/L)	Log_Mercury, Total (1631) (ng/L)	D_Log_Mercury, Total (1631) (ng/L)
MW29	1.568499982	1	1.50687501	1	25.55000019	1	59.73750019	1	4.4731251	1	80.67500001	1	0.0989	1	0.17807723	1	1.776247045	1	0.650611044	1	1.906738974	1
MW31	0.027000001	1	0.50466666	1	0.050000001	0	1.759999974	1	3.095	1	103.3141669	1	0.1402	1	-0.296995384	1	0.245512661	1	0.490660654	1	2.014159878	1
MW40			7.44999993	1			146.25	1	0.66749999	1	79.67499995	1	0.073125	1	0.872156269	1	2.165095875	1	-0.175548734	1	1.901322072	1
MW42			(trimmed)	1			440	1	(trimmed)	1	681.2000003	1	0.263875	1	(trimmed)	1	2.643452676	1	(trimmed)	1	2.833274639	1
MW43			7.0999999	1			194.5	1	2.60750005	1	17.82625037	1	0.069	1	0.851258343	1	2.288919606	1	0.416224325	1	1.251060002	1
MW50			7.30000019	1			490	1	14.8000002	1	1130	1	0.56999999	1	0.863322871	1	2.69019608	1	1.170261721	1	3.053078443	1
MW56			0.13	1			2.299999952	1	0.34999999	0	13.14999962	0	0.15000001	0	-0.886056664	1	0.361727827	1	-0.455931963	0	1.11892574	0
MW57			0.15000001	1			2.5	1	13.6000004	1	119	1	0.15000001	0	-0.823908724	1	0.397940009	1	1.133538921	1	2.075546961	1
MW59			8.89999962	1			78	1	3.71499991	0	312	1	0.15000001	0	0.949389988	1	1.892094603	1	0.569958808	0	2.494154594	1

Antimony


Q-Q Plot for Antimony, Total
(µg/L)
Reported values used for nondetects
Antimony, Total (µg/L)
210
180
150
120
90
60
30
0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Antimony, Total (µg/L)
Total Number of Data = 9
Number of Non-Detects = 0
Number of Detects = 9
Detected Mean = 29.23
Detected Sd = 75.38
Slope (displayed data) = 50.98
Intercept (displayed data)= 29.23
Correlation, R = 0.633
Best Fit Line

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit
User Selected Options
Date/Time of Computation ProUCL 5.16/2/2018 4:09:52 PM
From File BTVs for GW from Minerlized Areas near RDM 06022018_a.xls
Full Precision OFF

Dixon's Outlier Test for Antimony, Total
(µg/L)

Total N = 9
Number NDs = 0
Number Detects = 9
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 230 is a Potential Outlier (Upper Tail)?

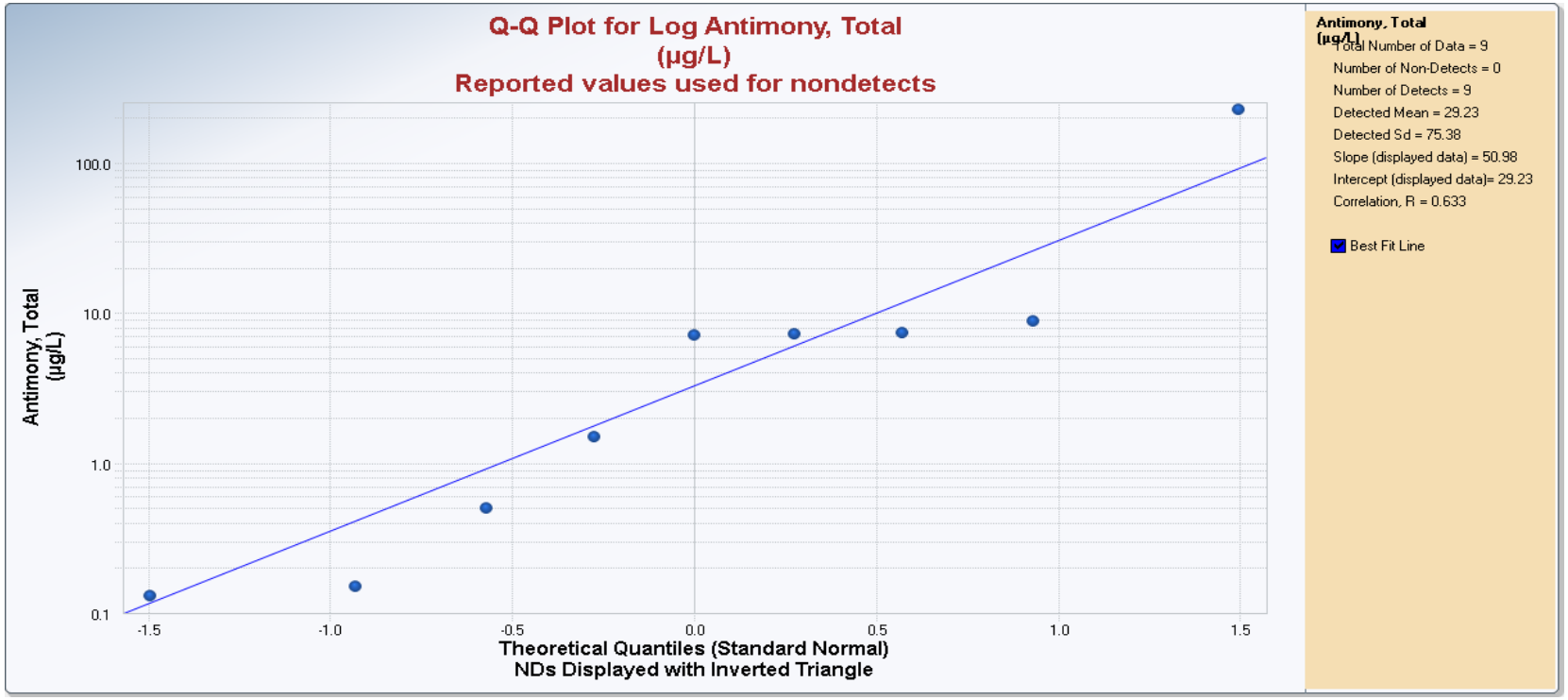
Test Statistic: 0.962

For 10% significance level, 230 is an outlier.
For 5% significance level, 230 is an outlier.
For 1% significance level, 230 is an outlier.

2. Data Value 0.129999995231628 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.002

For 10% significance level, 0.129999995231628 is not an outlier.
For 5% significance level, 0.129999995231628 is not an outlier.
For 1% significance level, 0.129999995231628 is not an outlier.


Q-Q Plot for Log Antimony, Total (µg/L)
Reported values used for nondetects
Antimony, Total (µg/L)
100.0
10.0
1.0
0.1
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Antimony, Total (µg/L)
Total Number of Data = 9
Number of Non-Detects = 0
Number of Detects = 9
Detected Mean = 29.23
Detected Sd = 75.38
Slope (displayed data) = 50.98
Intercept (displayed data)= 29.23
Correlation, R = 0.633
Best Fit Line

Dixon's Outlier Test for Log_Antimony, Total
(µg/L)

Total N = 9
Number NDs = 0
Number Detects = 9
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 2.36172783601759 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.443

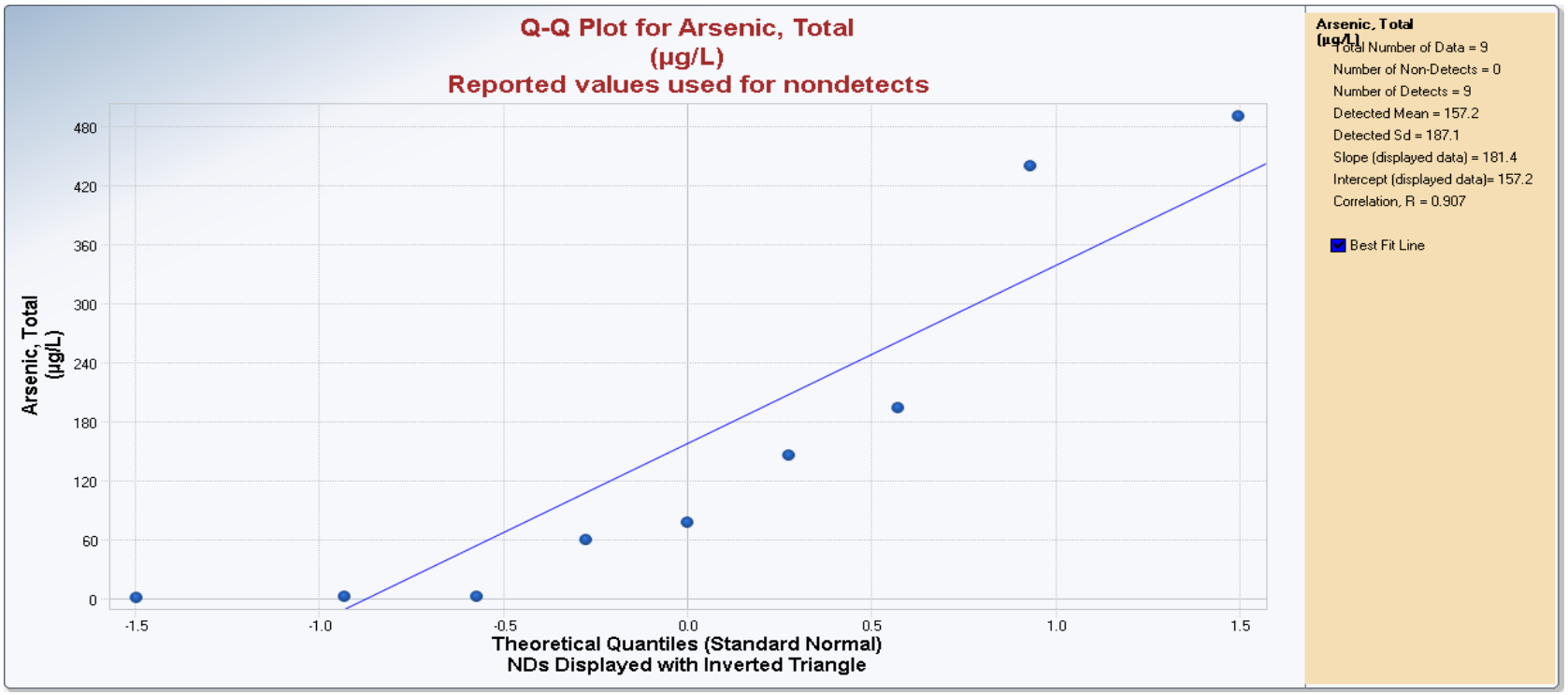
For 10% significance level, 2.36172783601759 is an outlier.
For 5% significance level, 2.36172783601759 is not an outlier.
For 1% significance level, 2.36172783601759 is not an outlier.

2. Data Value -0.886056663622992 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.034

For 10% significance level, -0.886056663622992 is not an outlier.
For 5% significance level, -0.886056663622992 is not an outlier.
For 1% significance level, -0.886056663622992 is not an outlier.

Arsenic


Q-Q Plot for Arsenic, Total
(µg/L)
Reported values used for nondetects
Arsenic, Total (µg/L)
480
420
360
300
240
180
120
60
0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Arsenic, Total (µg/L)
Total Number of Data = 9
Number of Non-Detects = 0
Number of Detects = 9
Detected Mean = 157.2
Detected Sd = 187.1
Slope (displayed data) = 181.4
Intercept (displayed data)= 157.2
Correlation, R = 0.907
Best Fit Line

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit
User Selected Options
Date/Time of Computation ProUCL 5.16/2/2018 4:18:13 PM
From File BTVs for GW from Minerlized Areas near RDM 06022018_
Full Precision OFF

Dixon's Outlier Test for Arsenic, Total
(µg/L)

Total N = 9
Number NDs = 0
Number Detects = 9
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 490 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.103

For 10% significance level, 490 is not an outlier.
For 5% significance level, 490 is not an outlier.
For 1% significance level, 490 is not an outlier.

2. Data Value 1.75999997369945 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.001

For 10% significance level, 1.75999997369945 is not an outlier.
For 5% significance level, 1.75999997369945 is not an outlier.
For 1% significance level, 1.75999997369945 is not an outlier.


Q-Q Plot for Log Arsenic, Total
(µg/L)
Reported values used for nondetects
Arsenic, Total
(µg/L)
1000
100
10
1
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Arsenic, Total
(µg/L)
Total Number of Data = 9
Number of Non-Detects = 0
Number of Detects = 9
Detected Mean = 157.2
Detected Sd = 187.1
Slope (displayed data) = 181.4
Intercept (displayed data)= 157.2
Correlation, R = 0.907
Best Fit Line

Dixon's Outlier Test for Log_Arsenic, Total
(µg/L)

Total N = 9
Number NDs = 0
Number Detects = 9
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 2.69019608002851 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.020

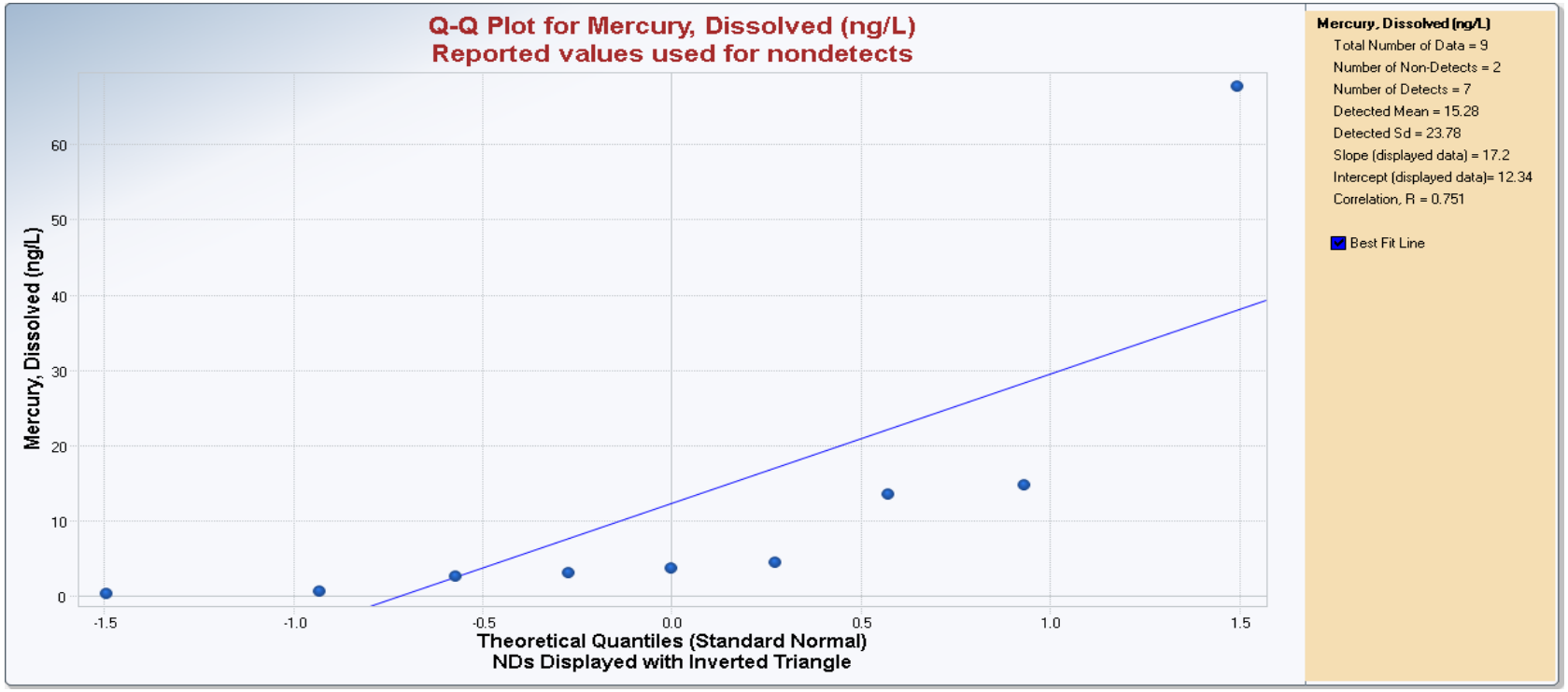
For 10% significance level, 2.69019608002851 is not an outlier.
For 5% significance level, 2.69019608002851 is not an outlier.
For 1% significance level, 2.69019608002851 is not an outlier.

2. Data Value 0.245512661324273 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.048

For 10% significance level, 0.245512661324273 is not an outlier.
For 5% significance level, 0.245512661324273 is not an outlier.
For 1% significance level, 0.245512661324273 is not an outlier.

Mercury, Dissolved



Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit
User Selected Options
Date/Time of Computation ProUCL 5.16/2/2018 4:26:31 PM
From File BTVs for GW from Minerlized Areas near RDM 06022018_
Full Precision OFF

Dixon's Outlier Test for Mercury, Dissolved (ng/L)

Total N = 9
Number NDs = 2
Number Detects = 7
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 67.7200000882149 is a Potential Outlier (Upper Tail)?

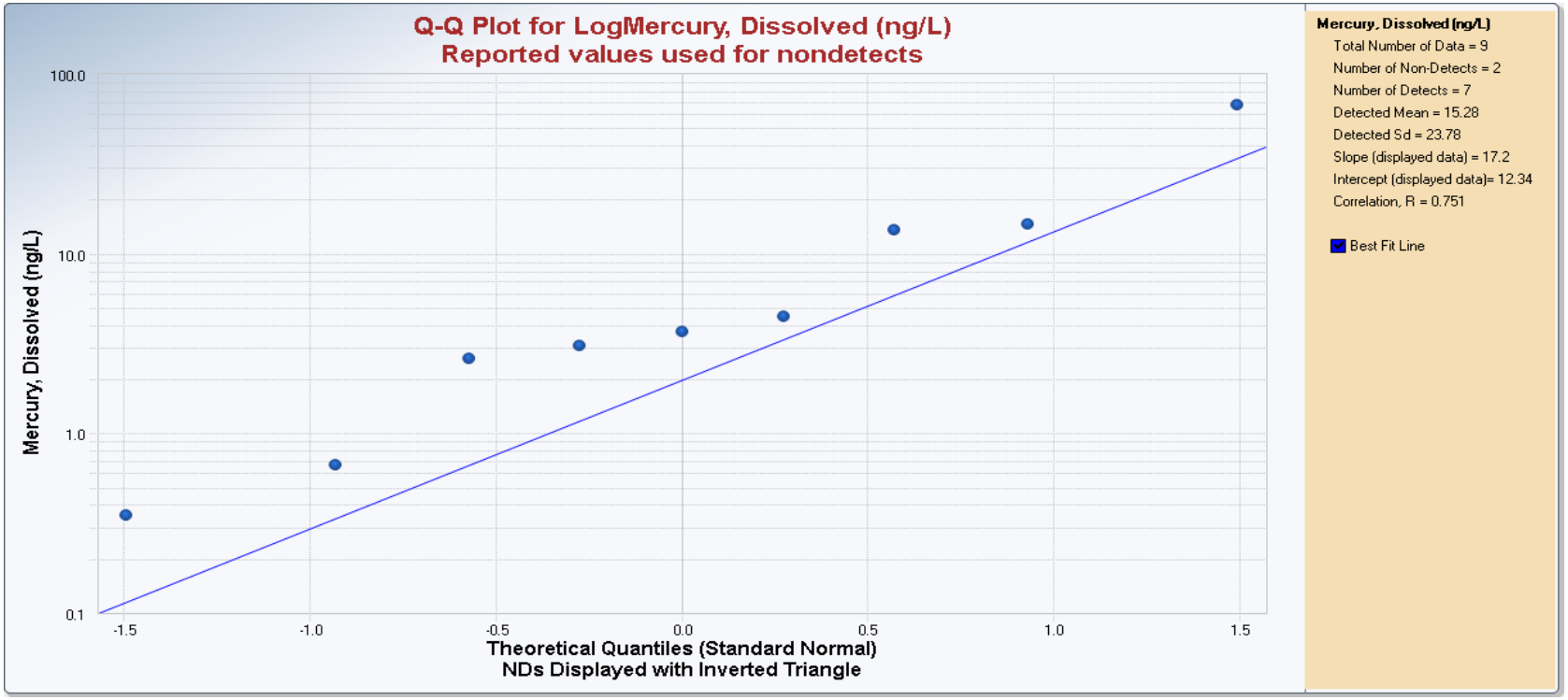
Test Statistic: 0.789

For 10% significance level, 67.7200000882149 is an outlier.
For 5% significance level, 67.7200000882149 is an outlier.
For 1% significance level, 67.7200000882149 is an outlier.

2. Data Value 0.174999997019768 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.034

For 10% significance level, 0.174999997019768 is not an outlier.
For 5% significance level, 0.174999997019768 is not an outlier.
For 1% significance level, 0.174999997019768 is not an outlier.


Q-Q Plot for LogMercury, Dissolved (ng/L)
Reported values used for nondetects
Mercury, Dissolved (ng/L)
100.0
10.0
1.0
0.1
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Mercury, Dissolved (ng/L)
Total Number of Data = 9
Number of Non-Detects = 2
Number of Detects = 7
Detected Mean = 15.28
Detected Sd = 23.78
Slope (displayed data) = 17.2
Intercept (displayed data)= 12.34
Correlation, R = 0.751
Best Fit Line

Dixon's Outlier Test for Log_Mercury, Dissolved (ng/L)

Total N = 9
Number NDs = 2
Number Detects = 7
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.83071695000263 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.329

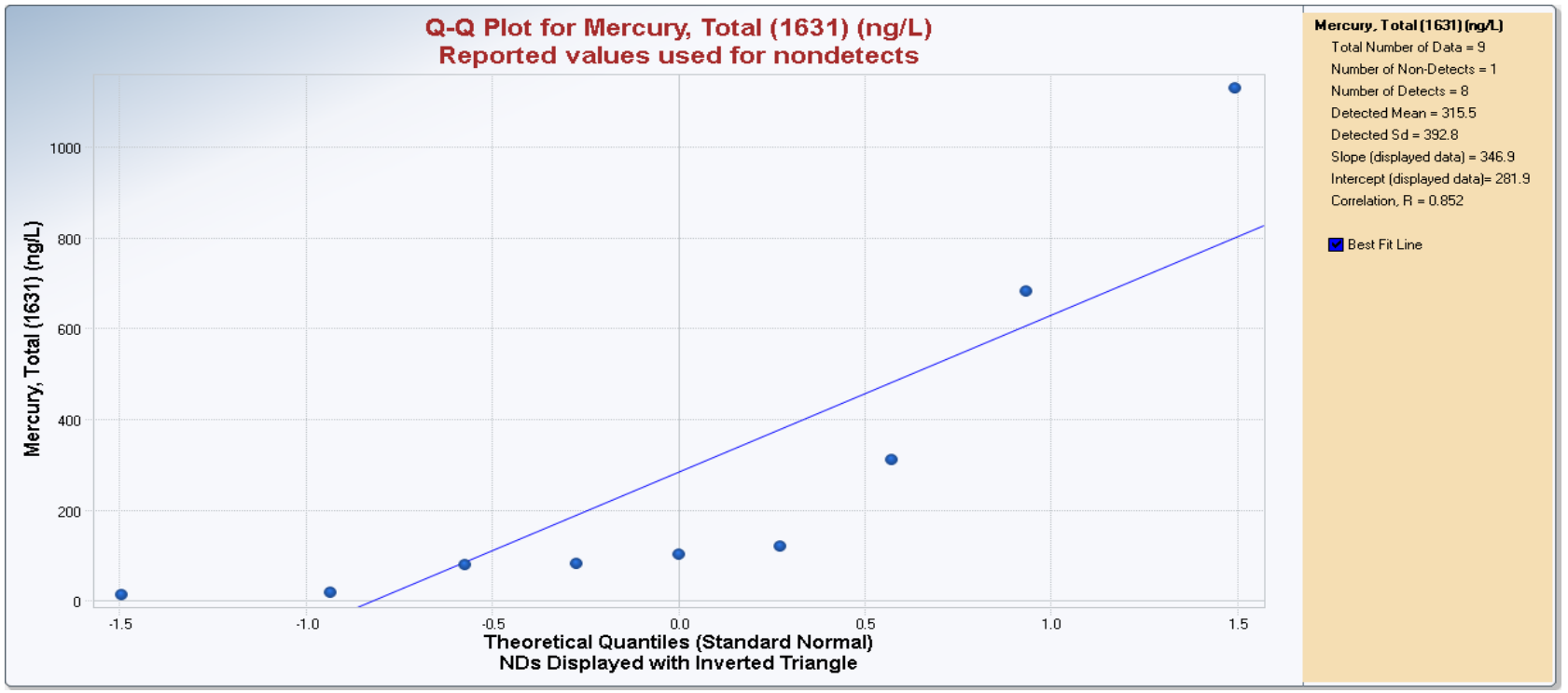
For 10% significance level, 1.83071695000263 is not an outlier.
For 5% significance level, 1.83071695000263 is not an outlier.
For 1% significance level, 1.83071695000263 is not an outlier.

2. Data Value -0.227965981522857 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.037

For 10% significance level, -0.227965981522857 is not an outlier.
For 5% significance level, -0.227965981522857 is not an outlier.
For 1% significance level, -0.227965981522857 is not an outlier.

Mercury, Total (Method 1631)



Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit
User Selected Options
Date/Time of Computation ProUCL 5.16/2/2018 4:33:27 PM
From File BTVs for GW from Minerlized Areas near RDM 06022018_
Full Precision OFF

Dixon's Outlier Test for Mercury, Total (1631) (ng/L)

Total N = 9
Number NDs = 1
Number Detects = 8
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1130 is a Potential Outlier (Upper Tail)?

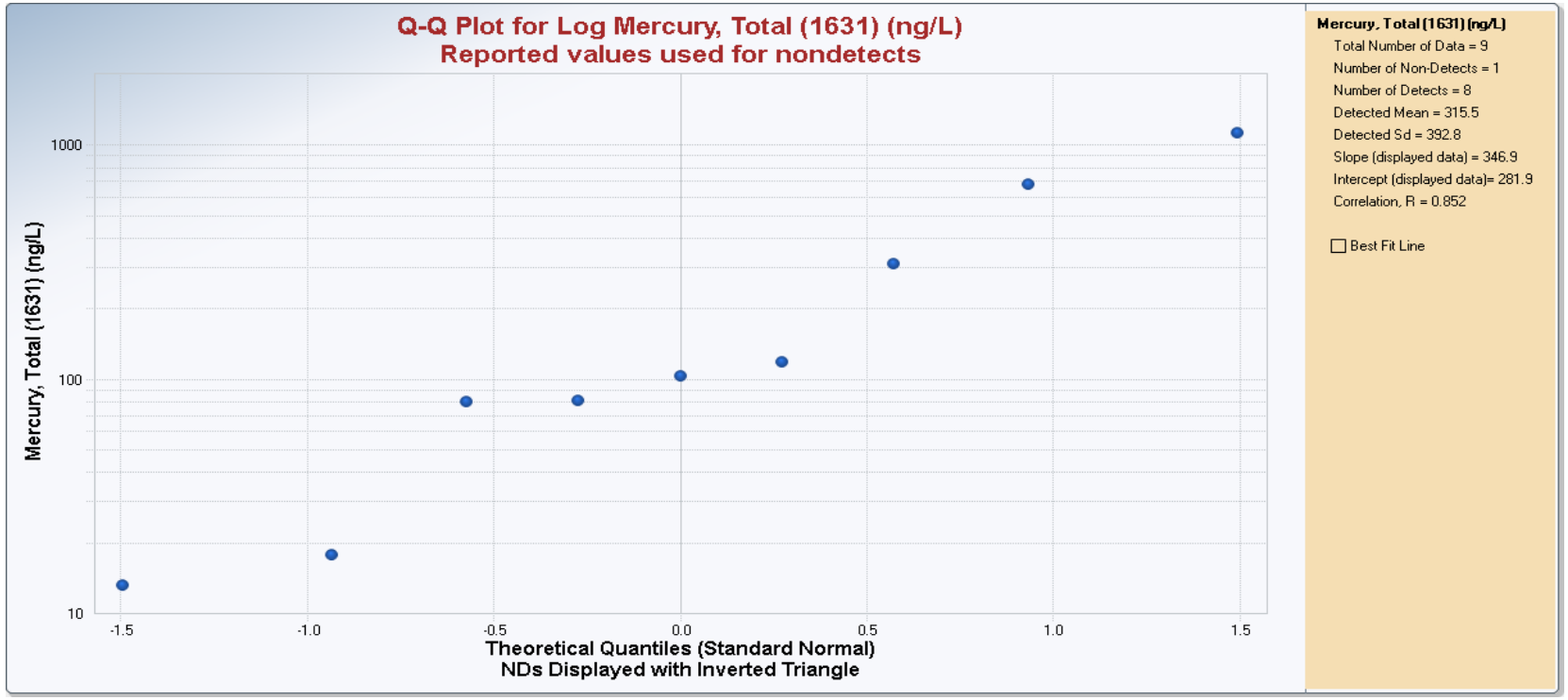
Test Statistic: 0.404

For 10% significance level, 1130 is not an outlier.
For 5% significance level, 1130 is not an outlier.
For 1% significance level, 1130 is not an outlier.

2. Data Value 6.57499980926515 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.017

For 10% significance level, 6.57499980926515 is not an outlier.
For 5% significance level, 6.57499980926515 is not an outlier.
For 1% significance level, 6.57499980926515 is not an outlier.


Q-Q Plot for Log Mercury, Total (1631) (ng/L)
Reported values used for nondetects
Mercury, Total (1631) (ng/L)
1000
100
10
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)
NDs Displayed with Inverted Triangle
Mercury, Total (1631) (ng/L)
Total Number of Data = 9
Number of Non-Detects = 1
Number of Detects = 8
Detected Mean = 315.5
Detected Sd = 392.8
Slope (displayed data) = 346.9
Intercept (displayed data)= 281.9
Correlation, R = 0.852
Best Fit Line

Dixon's Outlier Test for Log_Mercury, Total (1631) (ng/L)

Total N = 9
Number NDs = 1
Number Detects = 8
Number Data (n) = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 3.05307844348342 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.122

For 10% significance level, 3.05307844348342 is not an outlier.
For 5% significance level, 3.05307844348342 is not an outlier.
For 1% significance level, 3.05307844348342 is not an outlier.

2. Data Value 0.559462870113642 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.304

For 10% significance level, 0.559462870113642 is not an outlier.
For 5% significance level, 0.559462870113642 is not an outlier.
For 1% significance level, 0.559462870113642 is not an outlier.

ProUCL Output - Complete Dataset

Background Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.16/2/2018 4:43:36 PM
From File	BTVs for GW from Minerlized Areas near RDM 06022018_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Observations	1
Number of Bootstrap Operations	2000

Antimony, Dissolved (µg/L)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Minimum	0.027	First Quartile	0.412
Second Largest	0.027	Median	0.798
Maximum	1.568	Third Quartile	1.183
Mean	0.798	SD	1.09
Coefficient of Variation	1.366	Skewness	N/A

Warning: This data set only has 2 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Antimony, Dissolved (µg/L) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!

If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Antimony, Total

(µg/L)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Minimum	0.13	First Quartile	0.505
Second Largest	8.9	Median	7.1
Maximum	230	Third Quartile	7.45
Mean	29.23	SD	75.38
Coefficient of Variation	2.579	Skewness	2.987
Mean of logged Data	1.041	SD of logged Data	2.367

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.031	d2max (for USL)	2.11

Normal GOF Test

Shapiro Wilk Test Statistic	0.432	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.495	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	257.7	90% Percentile (z)	125.8
95% UPL (t)	177	95% Percentile (z)	153.2
95% USL	188.2	99% Percentile (z)	204.6

Gamma GOF Test

A-D Test Statistic	0.911	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.809	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.354	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.302	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.296	k star (bias corrected MLE)	0.271
Theta hat (MLE)	98.72	Theta star (bias corrected MLE)	107.7
nu hat (MLE)	5.329	nu star (bias corrected)	4.886
MLE Mean (bias corrected)	29.23	MLE Sd (bias corrected)	56.1

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	144.5	90% Percentile	87.13
95% Hawkins Wixley (HW) Approx. Gamma UPL	147.6	95% Percentile	138
95% WH Approx. Gamma UTL with 95% Coverage	355.4	99% Percentile	271.8
95% HW Approx. Gamma UTL with 95% Coverage	431.2		
95% WH USL	166.7	95% HW USL	174.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.207	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	3698	90% Percentile (z)	58.82
95% UPL (t)	293.1	95% Percentile (z)	139
95% USL	417.5	99% Percentile (z)	697.5

Nonparametric Distribution Free Background Statistics

Data appear Lognormal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	9	95% UTL with 95% Coverage	230
Approx, f used to compute achieved CC	0.474	Approximate Actual Confidence Coefficient achieved by U	0.37
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	230	95% BCA Bootstrap UTL with 95% Coverage	230
95% UPL	230	90% Percentile	53.12
90% Chebyshev UPL	267.6	95% Percentile	141.6
95% Chebyshev UPL	375.6	99% Percentile	212.3
95% USL	230		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Arsenic, Dissolved (µg/L)

General Statistics			
Total Number of Observations	2	Number of Missing Observations	0
Number of Distinct Observations	2		
Number of Detects	1	Number of Non-Detects	1
Number of Distinct Detects	1	Number of Distinct Non-Detects	1
Minimum Detect	25.55	Minimum Non-Detect	0.05
Maximum Detect	25.55	Maximum Non-Detect	0.05
Variance Detected	N/A	Percent Non-Detects	50%
Mean Detected	25.55	SD Detected	N/A
Mean of Detected Logged Data	3.241	SD of Detected Logged Data	N/A

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Arsenic, Dissolved (µg/L) was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Arsenic, Total
(µg/L)

General Statistics			
Total Number of Observations	9	Number of Distinct Observations	9
Minimum	1.76	First Quartile	2.5
Second Largest	440	Median	78
Maximum	490	Third Quartile	194.5
Mean	157.2	SD	187.1
Coefficient of Variation	1.19	Skewness	1.151
Mean of logged Data	3.7	SD of logged Data	2.303

Critical Values for Background Threshold Values (BTVs)			
Tolerance Factor K (For UTL)	3.031	d2max (for USL)	2.11

Normal GOF Test		
Shapiro Wilk Test Statistic	0.808	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.22	Lilliefors GOF Test
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution			
95% UTL with 95% Coverage	724.4	90% Percentile (z)	397
95% UPL (t)	524	95% Percentile (z)	465
95% USL	552	99% Percentile (z)	592.5

Gamma GOF Test		
A-D Test Statistic	0.448	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.776	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.221	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.472	k star (bias corrected MLE)	0.389
Theta hat (MLE)	333.1	Theta star (bias corrected MLE)	404.5
nu hat (MLE)	8.496	nu star (bias corrected)	6.997
MLE Mean (bias corrected)	157.2	MLE Sd (bias corrected)	252.2

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	828.7	90% Percentile	446.3
95% Hawkins Wixley (HW) Approx. Gamma UPL	997.1	95% Percentile	659.7
95% WH Approx. Gamma UTL with 95% Coverage	1807	99% Percentile	1198
95% HW Approx. Gamma UTL with 95% Coverage	2567		
95% WH USL	936	95% HW USL	1154

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.839	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.234	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	43433	90% Percentile (z)	773.3
95% UPL (t)	3689	95% Percentile (z)	1785
95% USL	5204	99% Percentile (z)	8574

Nonparametric Distribution Free Background Statistics

Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	9	95% UTL with 95% Coverage	490
Approx, f used to compute achieved CC	0.474	Approximate Actual Confidence Coefficient achieved by U	0.37
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	490	95% BCA Bootstrap UTL with 95% Coverage	490
95% UPL	490	90% Percentile	450
90% Chebyshev UPL	748.9	95% Percentile	470
95% Chebyshev UPL	1017	99% Percentile	486
95% USL	490		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

Mercury, Dissolved (ng/L)

General Statistics			
Total Number of Observations	9	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	7	Number of Non-Detects	2
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	0.667	Minimum Non-Detect	0.35
Maximum Detect	67.72	Maximum Non-Detect	3.715
Variance Detected	565.4	Percent Non-Detects	22.22%
Mean Detected	15.28	SD Detected	23.78
Mean of Detected Logged Data	1.815	SD of Detected Logged Data	1.494

Critical Values for Background Threshold Values (BTVs)			
Tolerance Factor K (For UTL)	3.031	d2max (for USL)	2.11

Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.65	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.803	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.365	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.304	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution			
KM Mean	12.11	KM SD	20.31
95% UTL95% Coverage	73.66	95% KM UPL (t)	51.91
90% KM Percentile (z)	38.13	95% KM Percentile (z)	45.51
99% KM Percentile (z)	59.35	95% KM USL	54.95

DL/2 Substitution Background Statistics Assuming Normal Distribution			
Mean	12.11	SD	21.54
95% UTL95% Coverage	77.39	95% UPL (t)	54.32
90% Percentile (z)	39.71	95% Percentile (z)	47.53
99% Percentile (z)	62.21	95% USL	57.54
DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons			

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.4	Anderson-Darling GOF Test
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.226	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.324	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	0.667	k star (bias corrected MLE)	0.476
Theta hat (MLE)	22.9	Theta star (bias corrected MLE)	32.07
nu hat (MLE)	9.34	nu star (bias corrected)	6.671
MLE Mean (bias corrected)	15.28		
MLE Sd (bias corrected)	22.14	95% Percentile of Chisquare (2kstar)	3.724

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11.89
Maximum	67.72	Median	3.095
SD	21.67	CV	1.823
k hat (MLE)	0.326	k star (bias corrected MLE)	0.291
Theta hat (MLE)	36.47	Theta star (bias corrected MLE)	40.8
nu hat (MLE)	5.866	nu star (bias corrected)	5.244
MLE Mean (bias corrected)	11.89	MLE Sd (bias corrected)	22.02
95% Percentile of Chisquare (2kstar)	2.691	90% Percentile	35.18
95% Percentile	54.89	99% Percentile	106.3

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	151.5	219.9	95% Approx. Gamma UPL	65.21	78.3
95% Gamma USL	74.47	91.99			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	12.11	SD (KM)	20.31
Variance (KM)	412.4	SE of Mean (KM)	7.313
k hat (KM)	0.356	k star (KM)	0.311
nu hat (KM)	6.402	nu star (KM)	5.601
theta hat (KM)	34.05	theta star (KM)	38.92
80% gamma percentile (KM)	18.73	90% gamma percentile (KM)	35.56
95% gamma percentile (KM)	54.75	99% gamma percentile (KM)	104.4

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	110.9	132	95% Approx. Gamma UPL	52.23	55.02
95% KM Gamma Percentile	40.15	40.81	95% Gamma USL	58.72	62.93

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.974	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	12.03	Mean in Log Scale	1.234
SD in Original Scale	21.58	SD in Log Scale	1.788
95% UTL95% Coverage	774.3	95% BCA UTL95% Coverage	67.72
95% Bootstrap (%) UTL95% Coverage	67.72	95% UPL (t)	114.2
90% Percentile (z)	33.94	95% Percentile (z)	64.98
99% Percentile (z)	219.7	95% USL	149.1

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	1.312	95% KM UTL (Lognormal)95% Coverage	468
KM SD of Logged Data	1.596	95% KM UPL (Lognormal)	84.77
95% KM Percentile Lognormal (z)	51.26	95% KM USL (Lognormal)	107.6

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	12.11	Mean in Log Scale	1.286
SD in Original Scale	21.54	SD in Log Scale	1.767
95% UTL95% Coverage	766.3	95% UPL (t)	115.5
90% Percentile (z)	34.84	95% Percentile (z)	66.19
99% Percentile (z)	220.7	95% USL	150.4

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	9	95% UTL with95% Coverage	67.72
Approx, f used to compute achieved CC	0.474	Approximate Actual Confidence Coefficient achieved by U	0.37
Approximate Sample Size needed to achieve specified CC	59	95% UPL	67.72
95% USL	67.72	95% KM Chebyshev UPL	105.4

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Mercury, Total (1631) (ng/L)

General Statistics

Total Number of Observations	9	Number of Missing Observations	0
Number of Distinct Observations	9		
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	17.83	Minimum Non-Detect	13.15
Maximum Detect	1130	Maximum Non-Detect	13.15
Variance Detected	154309	Percent Non-Detects	11.11%
Mean Detected	315.5	SD Detected	392.8
Mean of Detected Logged Data	5.045	SD of Detected Logged Data	1.331

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.031	d2max (for USL)	2.11

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.758	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.317	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	281.9	KM SD	359.2
95% UTL95% Coverage	1371	95% KM UPL (t)	986
90% KM Percentile (z)	742.2	95% KM Percentile (z)	872.7
99% KM Percentile (z)	1118	95% KM USL	1040

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	281.1	SD	381.6
95% UTL95% Coverage	1438	95% UPL (t)	1029
90% Percentile (z)	770.2	95% Percentile (z)	908.8
99% Percentile (z)	1169	95% USL	1086

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.441	Anderson-Darling GOF Test	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.272	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.303	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.833	k star (bias corrected MLE)	0.604
Theta hat (MLE)	378.7	Theta star (bias corrected MLE)	522.3
nu hat (MLE)	13.33	nu star (bias corrected)	9.664
MLE Mean (bias corrected)	315.5		
MLE Sd (bias corrected)	405.9	95% Percentile of Chisquare (2kstar)	4.336

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	280.4
Maximum	1130	Median	103.3
SD	382.2	CV	1.363
k hat (MLE)	0.396	k star (bias corrected MLE)	0.338
Theta hat (MLE)	707.7	Theta star (bias corrected MLE)	829
nu hat (MLE)	7.132	nu star (bias corrected)	6.088
MLE Mean (bias corrected)	280.4	MLE Sd (bias corrected)	482.2
95% Percentile of Chisquare (2kstar)	2.975	90% Percentile	813.9
95% Percentile	1233	99% Percentile	2308

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	3098	4602	95% Approx. Gamma UPL	1433	1788
95% Gamma USL	1616	2069			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	281.9	SD (KM)	359.2
Variance (KM)	129044	SE of Mean (KM)	128
k hat (KM)	0.616	k star (KM)	0.485
nu hat (KM)	11.08	nu star (KM)	8.722
theta hat (KM)	457.8	theta star (KM)	581.7
80% gamma percentile (KM)	462.2	90% gamma percentile (KM)	767.6
95% gamma percentile (KM)	1095	99% gamma percentile (KM)	1903

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	2304	2744	95% Approx. Gamma UPL	1149	1227
95% KM Gamma Percentile	903.6	935.5	95% Gamma USL	1279	1387

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.95	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.204	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	281.1	Mean in Log Scale	4.683
SD in Original Scale	381.7	SD in Log Scale	1.653
95% UTL95% Coverage	16189	95% BCA UTL95% Coverage	1130
95% Bootstrap (%) UTL95% Coverage	1130	95% UPL (t)	2759
90% Percentile (z)	898.8	95% Percentile (z)	1638
99% Percentile (z)	5052	95% USL	3531

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	4.771	95% KM UTL (Lognormal)95% Coverage	8407
KM SD of Logged Data	1.407	95% KM UPL (Lognormal)	1863
95% KM Percentile Lognormal (z)	1195	95% KM USL (Lognormal)	2299

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	281.1	Mean in Log Scale	4.694
SD in Original Scale	381.6	SD in Log Scale	1.632
95% UTL95% Coverage	15357	95% UPL (t)	2676
90% Percentile (z)	884.4	95% Percentile (z)	1600
99% Percentile (z)	4864	95% USL	3415

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	9	95% UTL with95% Coverage	1130
Approx, f used to compute achieved CC	0.474	Approximate Actual Confidence Coefficient achieved by U	0.37
Approximate Sample Size needed to achieve specified CC	59	95% UPL	1130
95% USL	1130	95% KM Chebyshev UPL	1932

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

Mercury, Total (7470) (µg/L)

General Statistics

Total Number of Observations	9	Number of Missing Observations	0
Number of Distinct Observations	7		
Number of Detects	6	Number of Non-Detects	3
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.069	Minimum Non-Detect	0.15
Maximum Detect	0.57	Maximum Non-Detect	0.15
Variance Detected	0.0376	Percent Non-Detects	33.33%
Mean Detected	0.203	SD Detected	0.194
Mean of Detected Logged Data	-1.91	SD of Detected Logged Data	0.824

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.031	d2max (for USL)	2.11

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.765	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.293	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.167	KM SD	0.154
95% UTL95% Coverage	0.634	95% KM UPL (t)	0.469
90% KM Percentile (z)	0.364	95% KM Percentile (z)	0.42
99% KM Percentile (z)	0.525	95% KM USL	0.492

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.16	SD	0.166
95% UTL95% Coverage	0.663	95% UPL (t)	0.485
90% Percentile (z)	0.373	95% Percentile (z)	0.433
99% Percentile (z)	0.546	95% USL	0.51

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.462	Anderson-Darling GOF Test	
5% A-D Critical Value	0.706	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.244	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.337	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.744	k star (bias corrected MLE)	0.983
Theta hat (MLE)	0.116	Theta star (bias corrected MLE)	0.206
nu hat (MLE)	20.92	nu star (bias corrected)	11.79
MLE Mean (bias corrected)	0.203		
MLE Sd (bias corrected)	0.204	95% Percentile of Chisquare (2kstar)	5.925

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0225	Mean	0.166
Maximum	0.57	Median	0.0989
SD	0.167	CV	1.002
k hat (MLE)	1.511	k star (bias corrected MLE)	1.081
Theta hat (MLE)	0.11	Theta star (bias corrected MLE)	0.154
nu hat (MLE)	27.19	nu star (bias corrected)	19.46
MLE Mean (bias corrected)	0.166	MLE Sd (bias corrected)	0.16
95% Percentile of Chisquare (2kstar)	6.302	90% Percentile	0.376
95% Percentile	0.485	99% Percentile	0.737

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.951	1.054	95% Approx. Gamma UPL	0.541	0.562
95% Gamma USL	0.59	0.617			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.167	SD (KM)	0.154
Variance (KM)	0.0237	SE of Mean (KM)	0.0568
k hat (KM)	1.173	k star (KM)	0.856
nu hat (KM)	21.12	nu star (KM)	15.41
theta hat (KM)	0.142	theta star (KM)	0.195
80% gamma percentile (KM)	0.271	90% gamma percentile (KM)	0.399
95% gamma percentile (KM)	0.528	99% gamma percentile (KM)	0.831

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	0.762	0.797	95% Approx. Gamma UPL	0.461	0.463
95% KM Gamma Percentile	0.391	0.388	95% Gamma USL	0.498	0.502

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.9	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.193	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.169	Mean in Log Scale	-2.057
SD in Original Scale	0.163	SD in Log Scale	0.725
95% UTL95% Coverage	1.151	95% BCA UTL95% Coverage	0.57
95% Bootstrap (%) UTL95% Coverage	0.57	95% UPL (t)	0.53
90% Percentile (z)	0.324	95% Percentile (z)	0.421
99% Percentile (z)	0.691	95% USL	0.59

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-2.071	95% KM UTL (Lognormal)95% Coverage	0.975
KM SD of Logged Data	0.675	95% KM UPL (Lognormal)	0.473
95% KM Percentile Lognormal (z)	0.383	95% KM USL (Lognormal)	0.524

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.16	Mean in Log Scale	-2.137
SD in Original Scale	0.166	SD in Log Scale	0.735
95% UTL95% Coverage	1.095	95% UPL (t)	0.498
90% Percentile (z)	0.303	95% Percentile (z)	0.395
99% Percentile (z)	0.652	95% USL	0.556

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	9	95% UTL with95% Coverage	0.57
Approx, f used to compute achieved CC	0.474	Approximate Actual Confidence Coefficient achieved by U	0.37
Approximate Sample Size needed to achieve specified CC	59	95% UPL	0.57
95% USL	0.57	95% KM Chebyshev UPL	0.874

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

ProUCL Output - Trimmed Dataset

Background Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.16/2/2018 5:30:54 PM
From File	BTVs for GW from Minerlized Areas near RDM 06022018_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Observations	1
Number of Bootstrap Operations	2000

Antimony, Total
(µg/L)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	1
Minimum	0.13	First Quartile	0.416
Second Largest	7.45	Median	4.303
Maximum	8.9	Third Quartile	7.338
Mean	4.13	SD	3.864
Coefficient of Variation	0.936	Skewness	0.0343
Mean of logged Data	0.491	SD of logged Data	1.815

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.187	d2max (for USL)	2.032

Normal GOF Test

Shapiro Wilk Test Statistic	0.795	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.279	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	16.44	90% Percentile (z)	9.082
95% UPL (t)	11.89	95% Percentile (z)	10.49
95% USL	11.98	99% Percentile (z)	13.12

Gamma GOF Test

A-D Test Statistic	0.729	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.311	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.306	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.658	k star (bias corrected MLE)	0.494
Theta hat (MLE)	6.279	Theta star (bias corrected MLE)	8.354
nu hat (MLE)	10.52	nu star (bias corrected)	7.911
MLE Mean (bias corrected)	4.13	MLE Sd (bias corrected)	5.874

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	20.48	90% Percentile	11.2
95% Hawkins Wixley (HW) Approx. Gamma UPL	24.1	95% Percentile	15.93
95% WH Approx. Gamma UTL with 95% Coverage	44.49	99% Percentile	27.57
95% HW Approx. Gamma UTL with 95% Coverage	60.94		
95% WH USL	20.83	95% HW USL	24.58

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.819	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.291	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 95% Coverage	532.3	90% Percentile (z)	16.74
95% UPL (t)	62.77	95% Percentile (z)	32.38
95% USL	65.35	99% Percentile (z)	111.6

Nonparametric Distribution Free Background Statistics

Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	8	95% UTL with 95% Coverage	8.9
Approx, f used to compute achieved CC	0.421	Approximate Actual Confidence Coefficient achieved by U	0.337
		Approximate Sample Size needed to achieve specified CC	59
95% Percentile Bootstrap UTL with 95% Coverage	8.9	95% BCA Bootstrap UTL with 95% Coverage	8.9
95% UPL	8.9	90% Percentile	7.885
90% Chebyshev UPL	16.43	95% Percentile	8.392
95% Chebyshev UPL	21.99	99% Percentile	8.798
95% USL	8.9		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Mercury, Dissolved (ng/L)

General Statistics

Total Number of Observations	8	Number of Missing Observations	1
Number of Distinct Observations	8		
Number of Detects	6	Number of Non-Detects	2
Number of Distinct Detects	6	Number of Distinct Non-Detects	2
Minimum Detect	0.667	Minimum Non-Detect	0.35
Maximum Detect	14.8	Maximum Non-Detect	3.715
Variance Detected	36.83	Percent Non-Detects	25%
Mean Detected	6.541	SD Detected	6.069
Mean of Detected Logged Data	1.414	SD of Detected Logged Data	1.155

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.187	d2max (for USL)	2.032

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.821	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.3	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	5.159	KM SD	5.388
95% UTL95% Coverage	22.33	95% KM UPL (t)	15.99
90% KM Percentile (z)	12.06	95% KM Percentile (z)	14.02
99% KM Percentile (z)	17.69	95% KM USL	16.11

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	5.159	SD	5.749
95% UTL95% Coverage	23.48	95% UPL (t)	16.71
90% Percentile (z)	12.53	95% Percentile (z)	14.62
99% Percentile (z)	18.53	95% USL	16.84

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.349	Anderson-Darling GOF Test	
5% A-D Critical Value	0.712	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.219	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.339	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.218	k star (bias corrected MLE)	0.72
Theta hat (MLE)	5.369	Theta star (bias corrected MLE)	9.081
nu hat (MLE)	14.62	nu star (bias corrected)	8.643
MLE Mean (bias corrected)	6.541		
MLE Sd (bias corrected)	7.707	95% Percentile of Chisquare (2kstar)	4.853

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.017
Maximum	14.8	Median	2.851
SD	5.858	CV	1.168
k hat (MLE)	0.548	k star (bias corrected MLE)	0.426
Theta hat (MLE)	9.155	Theta star (bias corrected MLE)	11.78
nu hat (MLE)	8.769	nu star (bias corrected)	6.814
MLE Mean (bias corrected)	5.017	MLE Sd (bias corrected)	7.689
95% Percentile of Chisquare (2kstar)	3.463	90% Percentile	14.01
95% Percentile	20.4	99% Percentile	36.35

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	56.51	80.91	95% Approx. Gamma UPL	25.54	30.95
95% Gamma USL	25.98	31.58			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	5.159	SD (KM)	5.388
Variance (KM)	29.03	SE of Mean (KM)	2.095
k hat (KM)	0.917	k star (KM)	0.656
nu hat (KM)	14.67	nu star (KM)	10.5
theta hat (KM)	5.627	theta star (KM)	7.861
80% gamma percentile (KM)	8.495	90% gamma percentile (KM)	13.15
95% gamma percentile (KM)	17.97	99% gamma percentile (KM)	29.56

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 95% Coverage	41.41	50.16	95% Approx. Gamma UPL	20.48	22.21
95% KM Gamma Percentile	15.85	16.62	95% Gamma USL	20.79	22.59

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.928	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.183	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	5.097	Mean in Log Scale	0.938
SD in Original Scale	5.789	SD in Log Scale	1.367
95% UTL95% Coverage	199.3	95% BCA UTL95% Coverage	14.8
95% Bootstrap (%) UTL95% Coverage	14.8	95% UPL (t)	39.86
90% Percentile (z)	14.73	95% Percentile (z)	24.21
99% Percentile (z)	61.46	95% USL	41.08

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	0.949	95% KM UTL (Lognormal)95% Coverage	160.6
KM SD of Logged Data	1.296	95% KM UPL (Lognormal)	34.93
95% KM Percentile Lognormal (z)	21.78	95% KM USL (Lognormal)	35.94

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	5.159	Mean in Log Scale	0.92
SD in Original Scale	5.749	SD in Log Scale	1.479
95% UTL95% Coverage	280.1	95% UPL (t)	49.07
90% Percentile (z)	16.72	95% Percentile (z)	28.61
99% Percentile (z)	78.41	95% USL	50.71

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	8	95% UTL with95% Coverage	14.8
Approx, f used to compute achieved CC	0.421	Approximate Actual Confidence Coefficient achieved by U	0.337
Approximate Sample Size needed to achieve specified CC	59	95% UPL	14.8
95% USL	14.8	95% KM Chebyshev UPL	30.07

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
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and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.