

Appendix N Data Trend Analysis

Statistical Testing Summary

The following data sheets are outputs generated using ProUCL 4.0 (27). The output summary includes the mean for each variable, the percentage of nondetected samples and additional statistical outputs. The variables identified in the first column of the Summary Statistics Data Sheet are defined as follows:

CRVI or Residential CrVI $\mu\text{g/L}$ – Residential Hexavalent Chromium (CrVI) Concentration ($\mu\text{g/L}$) Analytical Data

Pb or Residential Lead Pb $\mu\text{g/L}$ – Residential Lead (Pb) Concentration ($\mu\text{g/L}$) Analytical Data

MwCrVI or Monitoring Well CrVI $\mu\text{g/L}$ – Monitoring Well Hexavalent Chromium (CrVI) Concentration ($\mu\text{g/L}$) Analytical Data

MwPb or Monitoring Well Pb $\mu\text{g/L}$ – Monitoring Well Lead (Pb) Concentration ($\mu\text{g/L}$) Analytical Data

Supply VI or Supply Well CrVI $\mu\text{g/L}$ – Monitoring Well Hexavalent Chromium (CrVI) Concentration ($\mu\text{g/L}$) Analytical Data

Supply Pb or Supply Well Pb $\mu\text{g/L}$ – Monitoring Well Lead (Pb) Concentration ($\mu\text{g/L}$) Analytical Data

Mean concentrations for each of the variables are identified on the General Upper Confidence Limit (UCL) Data Sheets and is a product of the Kaplan-Meier (KM) Method. Use of this methodology allows for the expression of the mean using nondetected concentrations as well as detected concentrations.

Hypothesis testing was performed using the Wilcoxon-Mann-Whitney test to identify potential differences between the data sets.

Summary Statistics Data Sheets

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

Variable	Num Ds	NumNDs	% NDs	Raw Statistics using Detected Observations							
				Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
CrVI	38	98	72.06%	0.022	0.152	0.0523	0.037	0.0344	0.0163	1.668	0.658
MwCrVI	32	25	43.86%	0.02	81.2	5.704	0.078	19.02	0.0712	3.668	3.335

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

Variable	Num Ds	NumNDs	% NDs	Raw Statistics using Detected Observations							
				Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
CrVI	38	98	72.06%	0.022	0.152	0.0523	0.037	0.0344	0.0163	1.668	0.658
MwCrVI	28	25	47.17%	0.02	0.596	0.126	0.063	0.143	0.0445	2.191	1.136

From File: M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst

Summary Statistics for Raw Dataset with NDs

Raw Statistics using Detected Observations

Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
MwPb	32	0	0.00%	1.1	36	6.209	2.05	8.957	1.112	2.129	1.442

From File: M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

Raw Statistics using Detected Observations

Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
Pb	85	52	37.96%	1	980	48	5.3	135.3	6.079	5.019	2.82
MwPb	33	0	0.00%	1.1	99	9.021	2.1	18.4	1.186	4.011	2.04

From File: M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
MwCrVI	53	0.02	0.596	0.0758	0.022	0.0134	0.116	0.00297	3.102	10.34	1.528

Wilcoxon-Mann-Whitney Comparison Data Sheets

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: CrVI

Raw Statistics

	Site	Background
Number of Valid Data	53	136
Number of Missing Values	9	29
Number of Non-Detect Data	25	98
Number of Detect Data	28	38
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	47.17%	72.06%
Minimum Detected	0.02	0.022
Maximum Detected	0.596	0.152
Mean of Detected Data	0.126	0.0523
Median of Detected Data	0.063	0.037
SD of Detected Data	0.143	0.0344

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background

Site Rank Sum W-Stat	6094
WMW Test U-Stat	3.135
WMW Critical Value (0.050)	-1.645
P-Value	0.999

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site >= Background

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: CrVI

Raw Statistics

	Site	Background
Number of Valid Data	53	136
Number of Missing Values	9	29
Number of Non-Detect Data	25	98
Number of Detect Data	28	38
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	47.17%	72.06%
Minimum Detected	0.02	0.022
Maximum Detected	0.596	0.152
Mean of Detected Data	0.126	0.0523
Median of Detected Data	0.063	0.037
SD of Detected Data	0.143	0.0344

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	6094
WMW Test U-Stat	3.132
WMW Critical Value (0.050)	1.645
P-Value	8.6873E-4

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Outlier Tests for Selected Variables

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgolstats3.wst

Full Precision OFF

Test for Suspected Outliers with Dixon test 1

Test for Suspected Outliers with Rosner test 10

Rosner's Outlier Test for Pb

Number of data: 137

Number of suspected outliers: 10

#	Mean	sd	Potential outlier	Test value	Critical value (5%)	Critical value (1%)
1	30.16	108.41	980.00	8.76	3.4836	3.8536
2	23.18	72.08	530.00	7.03	3.4762	3.8536
3	19.43	57.47	460.00	7.67	3.4762	3.8536
4	16.14	43.09	323.00	7.12	3.4736	3.8436
5	13.83	33.95	270.00	7.55	3.4736	3.8436
6	11.89	25.62	150.00	5.39	3.47108	3.84108
7	10.84	22.66	145.00	5.92	3.46856	3.83856
8	9.80	19.42	110.00	5.16	3.46604	3.83604
9	9.03	17.35	92.00	4.78	3.46352	3.83352
10	8.38	15.77	91.00	5.24	3.461	3.831

For 5% significance level, there are 10 Potential Outliers

Therefore, Potential Statistical Outliers are

980.00, 530.00, 460.00, 323.00, 270.00, 150.00, 145.00, 110.00, 92.00, 91.00

For 1% Significance Level, there are 10 Potential Outliers

Therefore, Potential Statistical Outliers are

980.00, 530.00, 460.00, 323.00, 270.00, 150.00, 145.00, 110.00, 92.00, 91.00

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: CrVI

Raw Statistics

	Site	Background
Number of Valid Data	57	136
Number of Missing Values	9	29
Number of Non-Detect Data	25	98
Number of Detect Data	32	38
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	43.86%	72.06%
Minimum Detected	0.02	0.022
Maximum Detected	81.2	0.152
Mean of Detected Data	5.704	0.0523
Median of Detected Data	0.078	0.037
SD of Detected Data	19.02	0.0344

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background

Site Rank Sum W-Stat	6860
WMW Test U-Stat	3.76
WMW Critical Value (0.050)	-1.645
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site >= Background

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: CrVI

Raw Statistics

	Site	Background
Number of Valid Data	57	136
Number of Missing Values	9	29
Number of Non-Detect Data	25	98
Number of Detect Data	32	38
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	43.86%	72.06%
Minimum Detected	0.02	0.022
Maximum Detected	81.2	0.152
Mean of Detected Data	5.704	0.0523
Median of Detected Data	0.078	0.037
SD of Detected Data	19.02	0.0344

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	6860
WMW Test U-Stat	3.757
WMW Critical Value (0.050)	1.645
P-Value	8.6001E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats3.wst

Full Precision OFF

Confidence Coefficient 95%

Substantial Difference (S) 0.000

Selected Null Hypothesis Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median (Form 2)

Alternative Hypothesis Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: CrVI 8 12

Background Data: CrVI

Raw Statistics

	Site	Background
Number of Valid Data	19	136
Number of Missing Values	1	29
Number of Non-Detect Data	6	98
Number of Detect Data	13	38
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	31.58%	72.06%
Minimum Detected	0.022	0.022
Maximum Detected	81.2	0.152
Mean of Detected Data	6.356	0.0523
Median of Detected Data	0.072	0.037
SD of Detected Data	22.49	0.0344

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

Site Rank Sum W-Stat	2110
WMW Test U-Stat	1920
WMW Critical Value (0.050)	131
Approximate P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site >= Background

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats3.wst
 Full Precision OFF
 Confidence Coefficient 95%
 Substantial Difference (S) 0.000
 Selected Null Hypothesis Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median (Form 2)
 Alternative Hypothesis Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: CrVI 8 12

Background Data: CrVI 8-9

Raw Statistics

	Site	Background
Number of Valid Data	19	66
Number of Missing Values	1	5
Number of Non-Detect Data	6	40
Number of Detect Data	13	26
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	31.58%	60.61%
Minimum Detected	0.022	0.024
Maximum Detected	81.2	0.108
Mean of Detected Data	6.356	0.0437
Median of Detected Data	0.072	0.035
SD of Detected Data	22.49	0.0204

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

Site Rank Sum W-Stat	1086
WMW Test U-Stat	896
WMW Critical Value (0.050)	131
Approximate P-Value:	0.998

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site >= Background

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgolstats2.wst

Full Precision OFF

Confidence Coefficient 95%

Substantial Difference (S) 0.000

Selected Null Hypothesis Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)

Alternative Hypothesis Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: MwPb

Background Data: Pb

Raw Statistics

	Site	Background
Number of Valid Data	55	137
Number of Missing Values	11	29
Number of Non-Detect Data	22	52
Number of Detect Data	33	85
Minimum Non-Detect	1	1
Maximum Non-Detect	1	1
Percent Non detects	40.00%	37.96%
Minimum Detected	1.1	1
Maximum Detected	99	980
Mean of Detected Data	9.021	48
Median of Detected Data	2.1	5.3
SD of Detected Data	18.4	135.3

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	4784
WMW Test U-Stat	-1.505
WMW Critical Value (0.050)	1.645
P-Value	0.934

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats2.wst

Full Precision OFF

Confidence Coefficient 95%

Substantial Difference (S) 0.000

Selected Null Hypothesis Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)

Alternative Hypothesis Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: MwPb

Background Data: Supply Pb

Raw Statistics

	Site	Background
Number of Valid Data	55	24
Number of Missing Values	11	0
Number of Non-Detect Data	22	10
Number of Detect Data	33	14
Minimum Non-Detect	1	1
Maximum Non-Detect	1	1
Percent Non detects	40.00%	41.67%
Minimum Detected	1.1	1.1
Maximum Detected	99	38
Mean of Detected Data	9.021	9.9
Median of Detected Data	2.1	5.75
SD of Detected Data	18.4	11.53

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	2132
WMW Test U-Stat	-0.736
WMW Critical Value (0.050)	1.645
P-Value	0.769

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats2.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than Or Equal to Background Mean/Median (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: MwPb

Background Data: Supply Pb

Raw Statistics

	Site	Background
Number of Valid Data	55	24
Number of Missing Values	11	0
Number of Non-Detect Data	22	10
Number of Detect Data	33	14
Minimum Non-Detect	1	1
Maximum Non-Detect	1	1
Percent Non detects	40.00%	41.67%
Minimum Detected	1.1	1.1
Maximum Detected	99	38
Mean of Detected Data	9.021	9.9
Median of Detected Data	2.1	5.75
SD of Detected Data	18.4	11.53

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background

Site Rank Sum W-Stat	2132
WMW Test U-Stat	-0.725
WMW Critical Value (0.050)	-1.645
P-Value	0.234

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site >= Background

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats2.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Site or AOC Mean/Median Greater Than or Equal to Background Mean/Median (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: Supply CrVI

Raw Statistics

	Site	Background
Number of Valid Data	57	24
Number of Missing Values	9	0
Number of Non-Detect Data	25	3
Number of Detect Data	32	21
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	43.86%	12.50%
Minimum Detected	0.02	0.021
Maximum Detected	81.2	4.68
Mean of Detected Data	5.704	0.944
Median of Detected Data	0.078	0.26
SD of Detected Data	19.02	1.274

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background

Site Rank Sum W-Stat	1995
WMW Test U-Stat	-3.532
WMW Critical Value (0.050)	-1.645
P-Value	2.0615E-4

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background

P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats2.wst
 Full Precision OFF
 Confidence Coefficient 95%
 Substantial Difference (S) 0.000
 Selected Null Hypothesis Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
 Alternative Hypothesis Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: MwCrVI

Background Data: Supply CrVI

Raw Statistics

	Site	Background
Number of Valid Data	57	24
Number of Missing Values	9	0
Number of Non-Detect Data	25	3
Number of Detect Data	32	21
Minimum Non-Detect	0.02	0.02
Maximum Non-Detect	0.02	0.02
Percent Non detects	43.86%	12.50%
Minimum Detected	0.02	0.021
Maximum Detected	81.2	4.68
Mean of Detected Data	5.704	0.944
Median of Detected Data	0.078	0.26
SD of Detected Data	19.02	1.274

Wilcoxon-Mann-Whitney Site vs Background Test

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1995
WMW Test U-Stat	-3.542
WMW Critical Value (0.050)	1.645
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.05)

General UCL Statistics Data Sheets

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgo\stats.wst

Full Precision OFF

Confidence Coefficient 95%

Number of Bootstrap Operations 2000

CrVI

General Statistics

Number of Valid Data	136	Number of Detected Data	38
Number of Distinct Detected Data	31	Number of Non-Detect Data	98
Number of Missing Values	29	Percent Non-Detects	72.06%

Raw Statistics

Log-transformed Statistics

Minimum Detected	0.022	Minimum Detected	-3.817
Maximum Detected	0.152	Maximum Detected	-1.884
Mean of Detected	0.0523	Mean of Detected	-3.112
SD of Detected	0.0344	SD of Detected	0.546
Minimum Non-Detect	0.02	Minimum Non-Detect	-3.912
Maximum Non-Detect	0.02	Maximum Non-Detect	-3.912

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.775	Lilliefors Test Statistic	0.902
5% Lilliefors Critical Value	0.938	5% Lilliefors Critical Value	0.938

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

DL/2 Substitution Method

DL/2 Substitution Method

Mean	0.0218	Mean	-4.188
SD	0.0262	SD	0.731
95% DL/2 (t) UCL	0.0256	95% H-Stat (DL/2) UCL	0.0196

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

MLE yields a negative mean

Mean in Log Scale -4.494

SD in Log Scale 1.138

Mean in Original Scale 0.0208

SD in Original Scale 0.0271

95% Percentile Bootstrap UCL 0.0249

95% BCA Bootstrap UCL 0.0254

Gamma Distribution Test with Detected Values Only

Data Distribution Test with Detected Values Only

k star (bias corrected) 2.997

Data do not follow a Discernable Distribution (0.05)

Theta Star 0.0175

nu star 227.7

A-D Test Statistic 1.67

Nonparametric Statistics

5% A-D Critical Value 0.754

Kaplan-Meier (KM) Method

K-S Test Statistic 0.754

Mean 0.0305

5% K-S Critical Value	0.144	SD	0.0225
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00196
		95% KM (t) UCL	0.0337
Assuming Gamma Distribution		95% KM (z) UCL	0.0337
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0332
Minimum	1.0000E-9	95% KM (bootstrap t) UCL	0.0344
Maximum	0.152	95% KM (BCA) UCL	0.0357
Mean	0.081	95% KM (Percentile Bootstrap) UCL	0.0344
Median	0.0833	95% KM (Chebyshev) UCL	0.039
SD	0.0405	97.5% KM (Chebyshev) UCL	0.0427
k star	1.337	99% KM (Chebyshev) UCL	0.05
Theta star	0.0606		
Nu star	363.7	Potential UCLs to Use	
AppChi2	320.5	95% KM (t) UCL	0.0337
95% Gamma Approximate UCL	0.0919	95% KM (% Bootstrap) UCL	0.0344
95% Adjusted Gamma UCL	0.092		

Note: DL/2 is not a recommended method.

Pb

General Statistics

Number of Valid Data	137	Number of Detected Data	85
Number of Distinct Detected Data	66	Number of Non-Detect Data	52
Number of Missing Values	29	Percent Non-Detects	37.96%

Raw Statistics

Log-transformed Statistics

Minimum Detected	1	Minimum Detected	0
Maximum Detected	980	Maximum Detected	6.888
Mean of Detected	48	Mean of Detected	2.193
SD of Detected	135.3	SD of Detected	1.682
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.364	Lilliefors Test Statistic	0.132
5% Lilliefors Critical Value	0.0961	5% Lilliefors Critical Value	0.0961
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution

Assuming Lognormal Distribution

DL/2 Substitution Method		DL/2 Substitution Method	
Mean	29.97	Mean	1.097
SD	108.9	SD	1.93
95% DL/2 (t) UCL	45.38	95% H-Stat (DL/2) UCL	20.51
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.6
		SD in Log Scale	2.573
		Mean in Original Scale	29.88
		SD in Original Scale	108.9

95% Percentile Bootstrap UCL 46.55
 95% BCA Bootstrap UCL 51.54

Gamma Distribution Test with Detected Values Only

Data Distribution Test with Detected Values Only
 Data do not follow a Discernable Distribution (0.05)

k star (bias corrected) 0.387
 Theta Star 124
 nu star 65.81

A-D Test Statistic 6.678
 5% A-D Critical Value 0.844
 K-S Test Statistic 0.844
 5% K-S Critical Value 0.104

Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method
 Mean 30.16
 SD 108.4
 SE of Mean 9.317
 95% KM (t) UCL 45.59
 95% KM (z) UCL 45.49
 95% KM (jackknife) UCL 45.56
 95% KM (bootstrap t) UCL 60.34
 95% KM (BCA) UCL 46.7
 95% KM (Percentile Bootstrap) UCL 45.98
 95% KM (Chebyshev) UCL 70.78
 97.5% KM (Chebyshev) UCL 88.35
 99% KM (Chebyshev) UCL 122.9

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum 1.0000E-9
 Maximum 980
 Mean 31.98
 Median 2.9
 SD 108.6
 k star 0.109
 Theta star 293.4
 Nu star 29.86
 AppChi2 18.38

95% Gamma Approximate UCL 51.94
 95% Adjusted Gamma UCL 52.22

Potential UCLs to Use

97.5% KM (Chebyshev) UCL 88.35

Note: DL2 is not a recommended method.

MwCrVI

General Statistics

Number of Valid Data	57	Number of Detected Data	32
Number of Distinct Detected Data	30	Number of Non-Detect Data	25
Number of Missing Values	9	Percent Non-Detects	43.86%

Raw Statistics

Minimum Detected 0.02
 Maximum Detected 81.2
 Mean of Detected 5.704
 SD of Detected 19.02
 Minimum Non-Detect 0.02
 Maximum Non-Detect 0.02

Log-transformed Statistics

Minimum Detected -3.912
 Maximum Detected 4.397
 Mean of Detected -1.781
 SD of Detected 2.2
 Minimum Non-Detect -3.912
 Maximum Non-Detect -3.912

UCL Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic 0.334
 5% Lilliefors Critical Value 0.93

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic 0.752
 5% Lilliefors Critical Value 0.93

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	3.206
SD	14.44
95% DL/2 (t) UCL	6.404

Maximum Likelihood Estimate(MLE) Method

MLE yields a negative mean

N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean	-3.019
SD	2.163
95% H-Stat (DL/2) UCL	0.91

Log ROS Method

Mean in Log Scale	-4.175
SD in Log Scale	3.403
Mean in Original Scale	3.203
SD in Original Scale	14.44
95% Percentile Bootstrap UCL	6.614
95% BCA Bootstrap UCL	7.987

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.209
Theta Star	27.28
nu star	13.38

A-D Test Statistic	6.42
5% A-D Critical Value	0.895
K-S Test Statistic	0.895
5% K-S Critical Value	0.172

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1.0000E-9
Maximum	81.2
Mean	3.711
Median	0.044
SD	14.43
k star	0.0974
Theta star	38.08
Nu star	11.11
AppChi2	4.646
95% Gamma Approximate UCL	8.873
95% Adjusted Gamma UCL	9.085

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	3.211
SD	14.31
SE of Mean	1.925
95% KM (t) UCL	6.431
95% KM (z) UCL	6.378
95% KM (jackknife) UCL	6.408
95% KM (bootstrap t) UCL	21.2
95% KM (BCA) UCL	7.117
95% KM (Percentile Bootstrap) UCL	6.45
95% KM (Chebyshev) UCL	11.6
97.5% KM (Chebyshev) UCL	15.23
99% KM (Chebyshev) UCL	22.37

Potential UCLs to Use

99% KM (Chebyshev) UCL	22.37
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Note: DL/2 is not a recommended method.

MwPb

General Statistics

Number of Valid Data	55
Number of Distinct Detected Data	25
Number of Missing Values	11

Number of Detected Data	33
Number of Non-Detect Data	22
Percent Non-Detects	40.00%

Raw Statistics

Minimum Detected	1.1
Maximum Detected	99
Mean of Detected	9.021

Log-transformed Statistics

Minimum Detected	0.0953
Maximum Detected	4.595
Mean of Detected	1.274

SD of Detected	18.4	SD of Detected	1.174
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.47
5% Lilliefors Critical Value	0.931

Lilliefors Test Statistic	0.813
5% Lilliefors Critical Value	0.931

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean	5.613
SD	14.78
95% DL/2 (t) UCL	8.948

DL/2 Substitution Method

Mean	0.487
SD	1.328
95% H-Stat (DL/2) UCL	7.088

Maximum Likelihood Estimate(MLE) Method
MLE yields a negative mean

Log ROS Method

Mean in Log Scale	0.105
SD in Log Scale	1.801
Mean in Original Scale	5.519
SD in Original Scale	14.81
95% Percentile Bootstrap UCL	9.009
95% BCA Bootstrap UCL	11.17

Gamma Distribution Test with Detected Values Only

Data Distribution Test with Detected Values Only

k star (bias corrected)	0.619
Theta Star	14.57
nu star	40.86

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	3.889
5% A-D Critical Value	0.796
K-S Test Statistic	0.796
5% K-S Critical Value	0.16

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	5.853
SD	14.56
SE of Mean	1.994

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1.0000E-9
Maximum	99
Mean	6.73
Median	2
SD	14.7
k star	0.158
Theta star	42.58
Nu star	17.39
AppChi2	8.949
95% Gamma Approximate UCL	13.08
95% Adjusted Gamma UCL	13.32

95% KM (t) UCL	9.19
95% KM (z) UCL	9.133
95% KM (jackknife) UCL	9.133
95% KM (bootstrap t) UCL	13.49
95% KM (BCA) UCL	9.571
95% KM (Percentile Bootstrap) UCL	9.487
95% KM (Chebyshev) UCL	14.54
97.5% KM (Chebyshev) UCL	18.31
99% KM (Chebyshev) UCL	25.69

Potential UCLs to Use

95% KM (Chebyshev) UCL	14.54
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Note: DL/2 is not a recommended method.

General UCL Statistics for Full Data Sets

User Selected Options

From File	M:\MY DOCUMENTS\SITE FOLDER\Oil Control\Green Valley Citgol\stats2.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Supply CrVI

General Statistics

Number of Valid Observations	24	Number of Distinct Observations	22
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Raw Statistics

Log-transformed Statistics

Minimum	0.02	Minimum of Log Data	-3.912
Maximum	4.68	Maximum of Log Data	1.543
Mean	0.829	Mean of log Data	-1.4
Median	0.222	SD of log Data	1.755
SD	1.228		
Coefficient of Variation	1.482		
Skewness	1.876		

Relevant UCL Statistics

Normal Distribution Test

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.694	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

Assuming Lognormal Distribution

95% Student's-t UCL	1.258	95% H-UCL	4.319
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.966
95% Adjusted-CLT UCL	1.344	97.5% Chebyshev (MVUE) UCL	3.818
95% Modified-t UCL	1.274	99% Chebyshev (MVUE) UCL	5.49

Gamma Distribution Test

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

k star (bias corrected)	0.483
Theta Star	1.715
nu star	23.2
Approximate Chi Square Value (.05)	13.24
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	12.71
Anderson-Darling Test Statistic	0.764
Anderson-Darling 5% Critical Value	0.804
Kolmogorov-Smirnov Test Statistic	0.168
Kolmogorov-Smirnov 5% Critical Value	0.188

Nonparametric Statistics

Data appear Gamma Distributed at 5% Significance Level

95% CLT UCL	1.241
95% Jackknife UCL	1.258
95% Standard Bootstrap UCL	1.233
95% Bootstrap-t UCL	1.45
95% Hall's Bootstrap UCL	1.332
95% Percentile Bootstrap UCL	1.263
95% BCA Bootstrap UCL	1.321
95% Chebyshev(Mean, Sd) UCL	1.922
97.5% Chebyshev(Mean, Sd) UCL	2.394
99% Chebyshev(Mean, Sd) UCL	3.323

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.452
95% Adjusted Gamma UCL	1.512

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.452

Supply Pb

General Statistics

Number of Valid Observations: 24 Number of Distinct Observations: 15

Raw Statistics

Log-transformed Statistics

Minimum	1	Minimum of Log Data	0
Maximum	38	Maximum of Log Data	3.638
Mean	6.192	Mean of log Data	1.03
Median	1.9	SD of log Data	1.189
SD	9.756		
Coefficient of Variation	1.576		
Skewness	2.488		

Relevant UCL Statistics

Normal Distribution Test

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.587	Shapiro Wilk Test Statistic	0.819
Shapiro Wilk Critical Value	0.916	Shapiro Wilk Critical Value	0.916

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

95% Student's-t UCL	9.605	95% H-UCL	11.28
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12.15
95% Adjusted-CLT UCL	10.55	97.5% Chebyshev (MVUE) UCL	15.06
95% Modified-t UCL	9.773	99% Chebyshev (MVUE) UCL	20.77

Gamma Distribution Test

Data Distribution

k star (bias corrected)	0.688	Data do not follow a Discernable Distribution (0.05)	
Theta Star	9.003		
nu star	33.01		

Approximate Chi Square Value (.05)	20.88
Adjusted Level of Significance	0.0392
Adjusted Chi Square Value	20.2

Nonparametric Statistics

95% CLT UCL	9.467
95% Jackknife UCL	9.605
95% Standard Bootstrap UCL	9.491
95% Bootstrap-t UCL	13.43
95% Hall's Bootstrap UCL	10.91
95% Percentile Bootstrap UCL	9.504
95% BCA Bootstrap UCL	10.89
95% Chebyshev (Mean, Sd) UCL	14.87
97.5% Chebyshev (Mean, Sd) UCL	18.63
99% Chebyshev (Mean, Sd) UCL	26.01

Anderson-Darling Test Statistic	2.13
Anderson-Darling 5% Critical Value	0.782
Kolmogorov-Smirnov Test Statistic	0.247
Kolmogorov-Smirnov 5% Critical Value	0.185

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

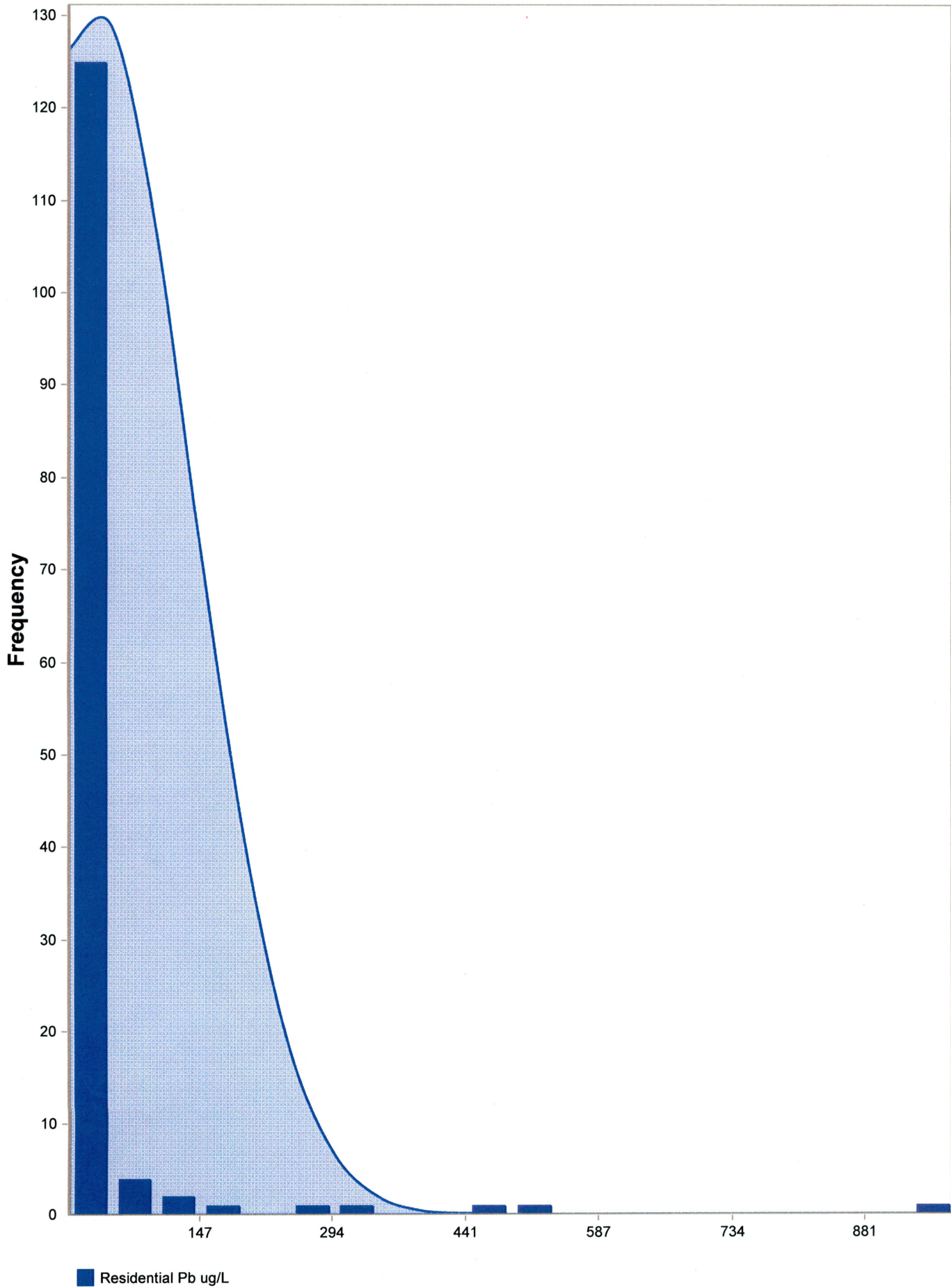
95% Approximate Gamma UCL	9.791
95% Adjusted Gamma UCL	10.12

Potential UCL to Use

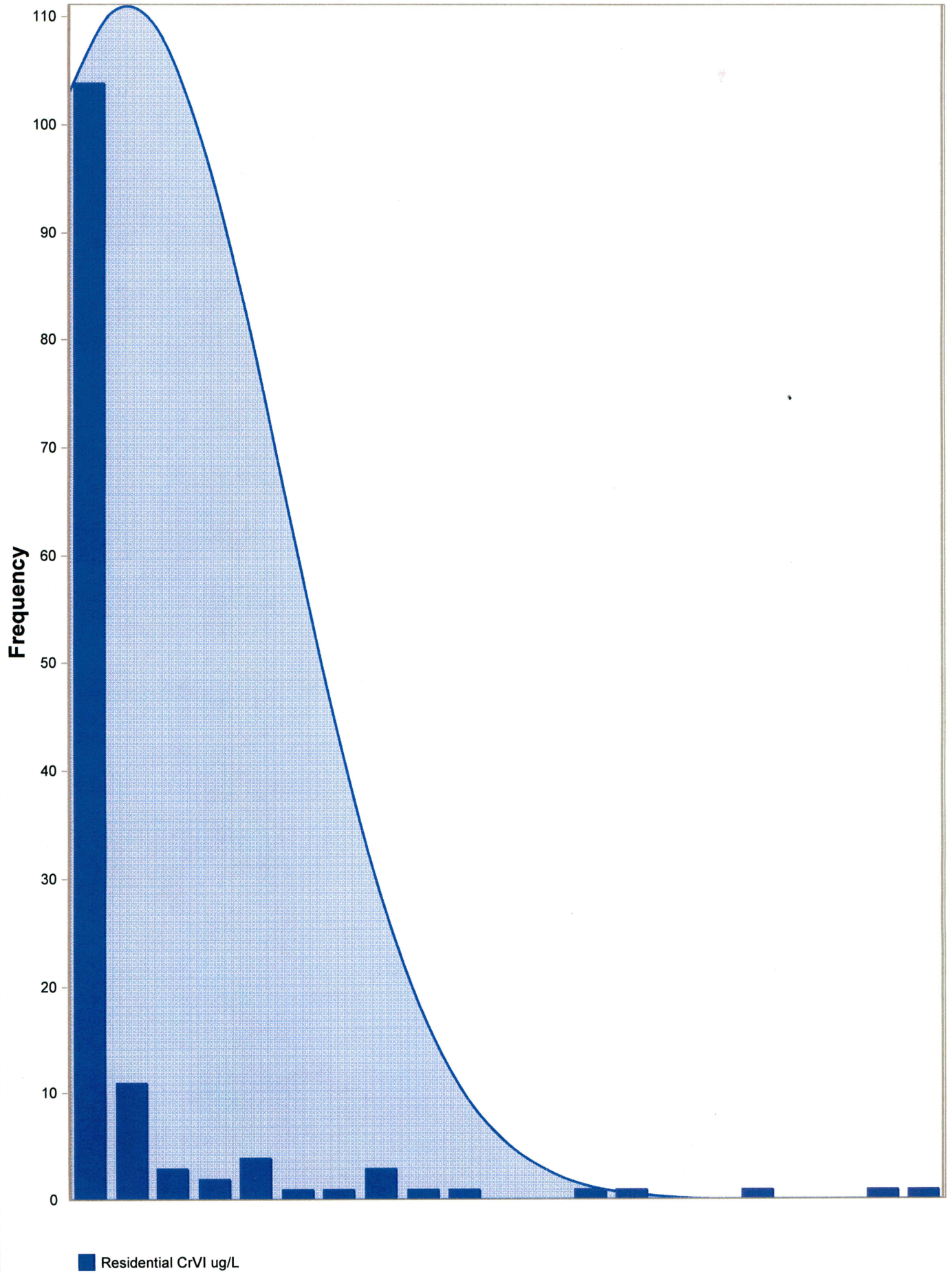
Use 99% Chebyshev (Mean, Sd) UCL 26.01

Histograms and Box Plots Water Data

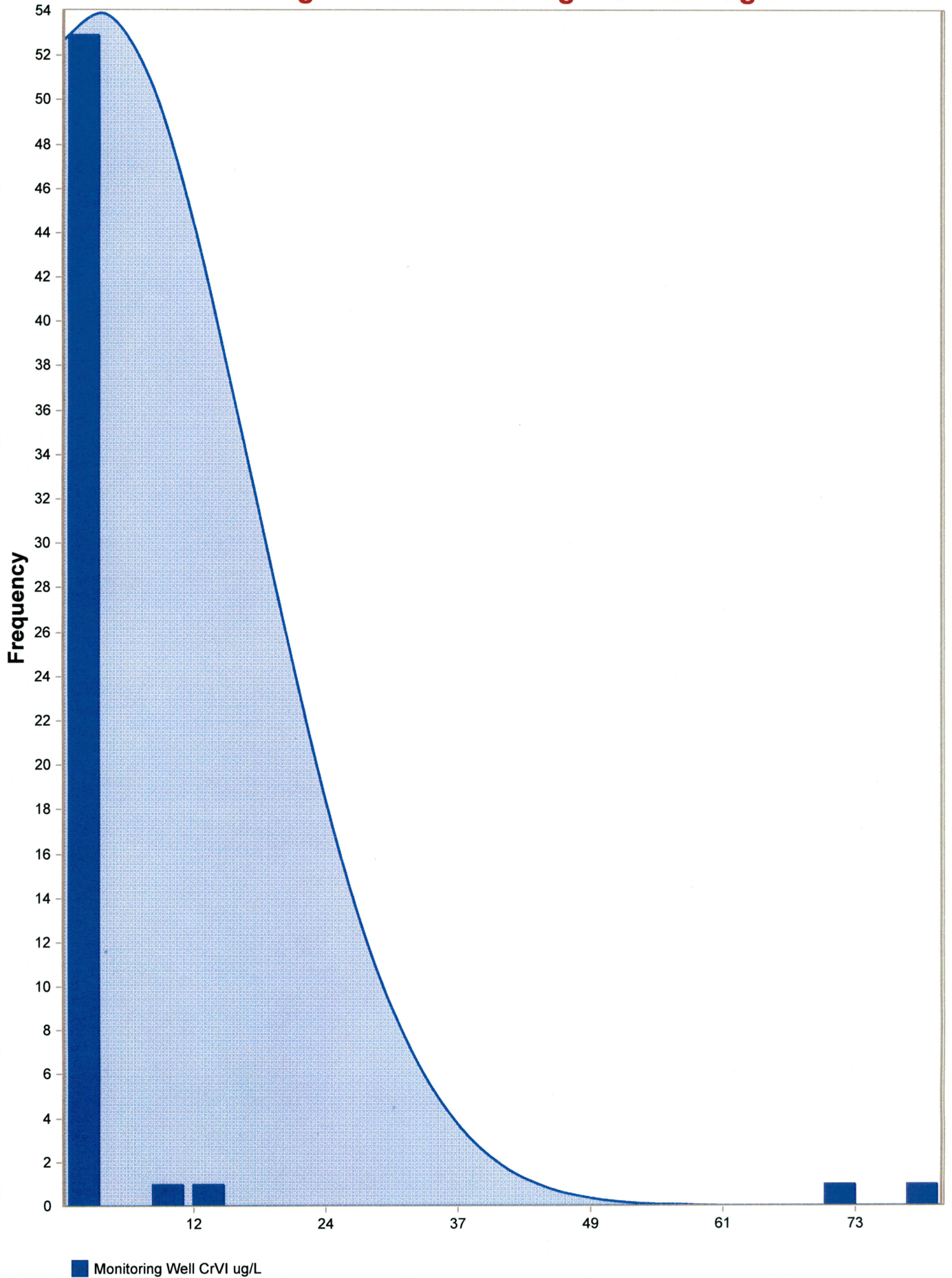
Histogram for Residential Pb ug/L



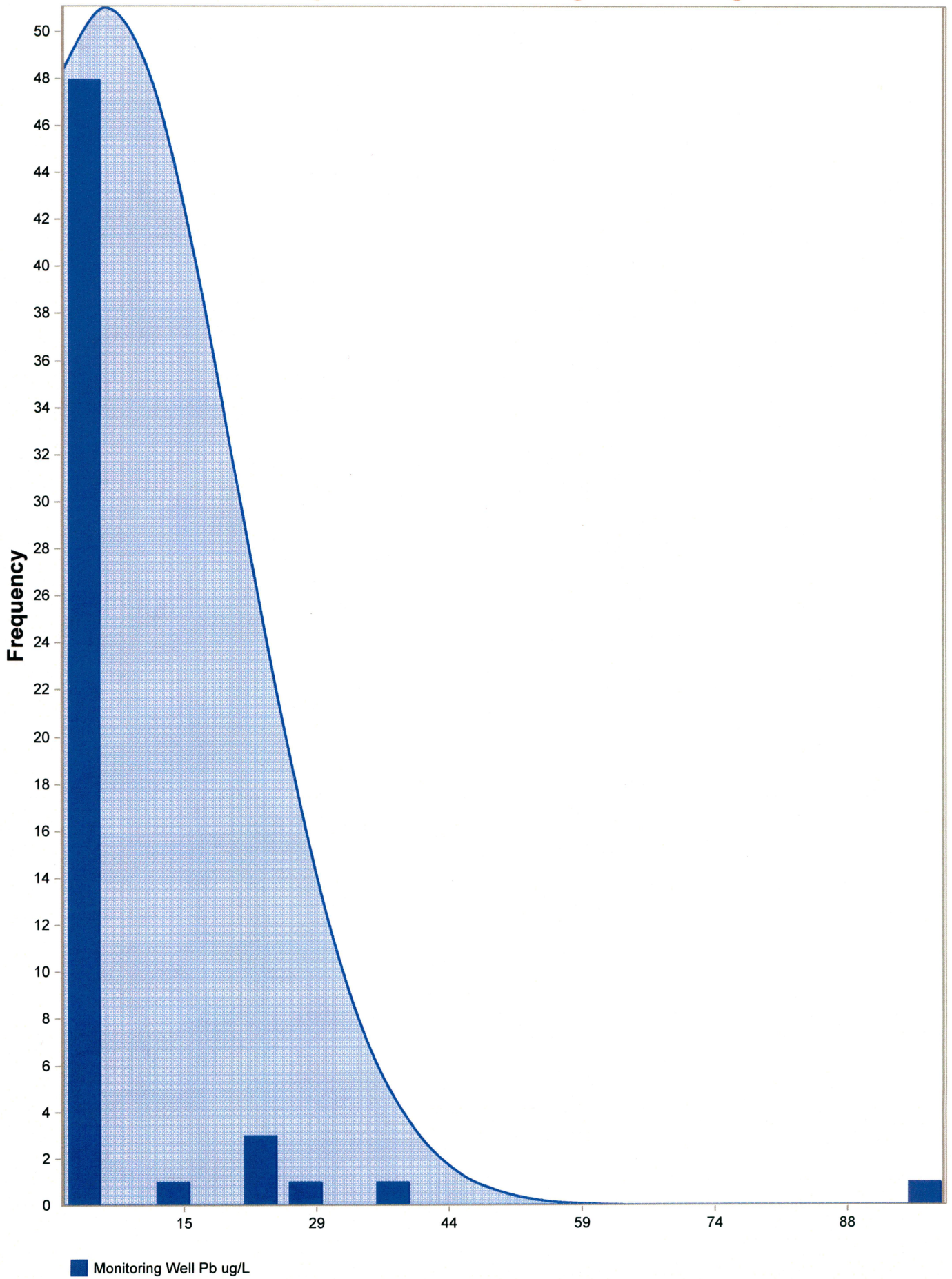
Histogram for Residential CrVI ug/L



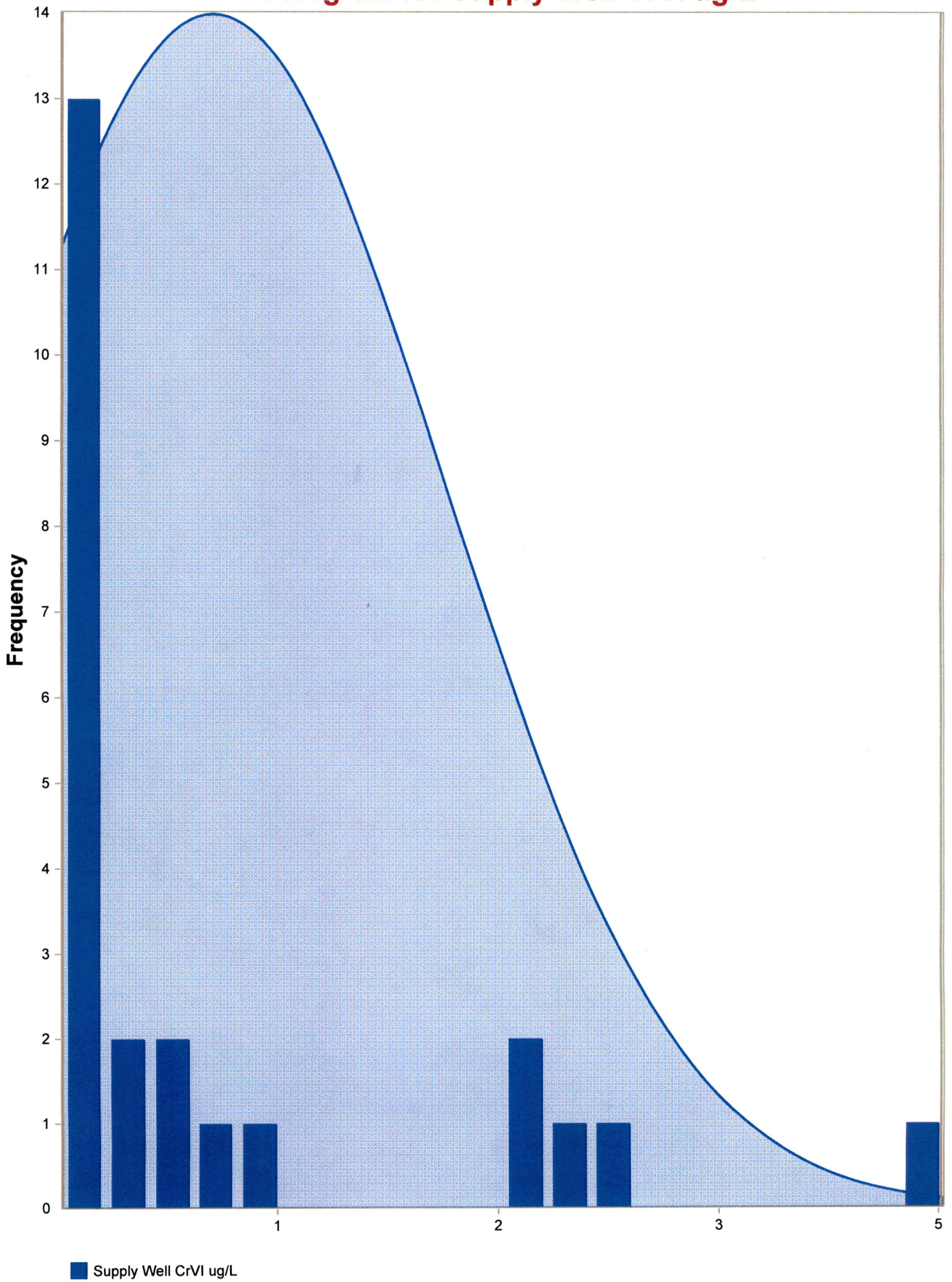
Histogram for Monitoring Well CrVI ug/L



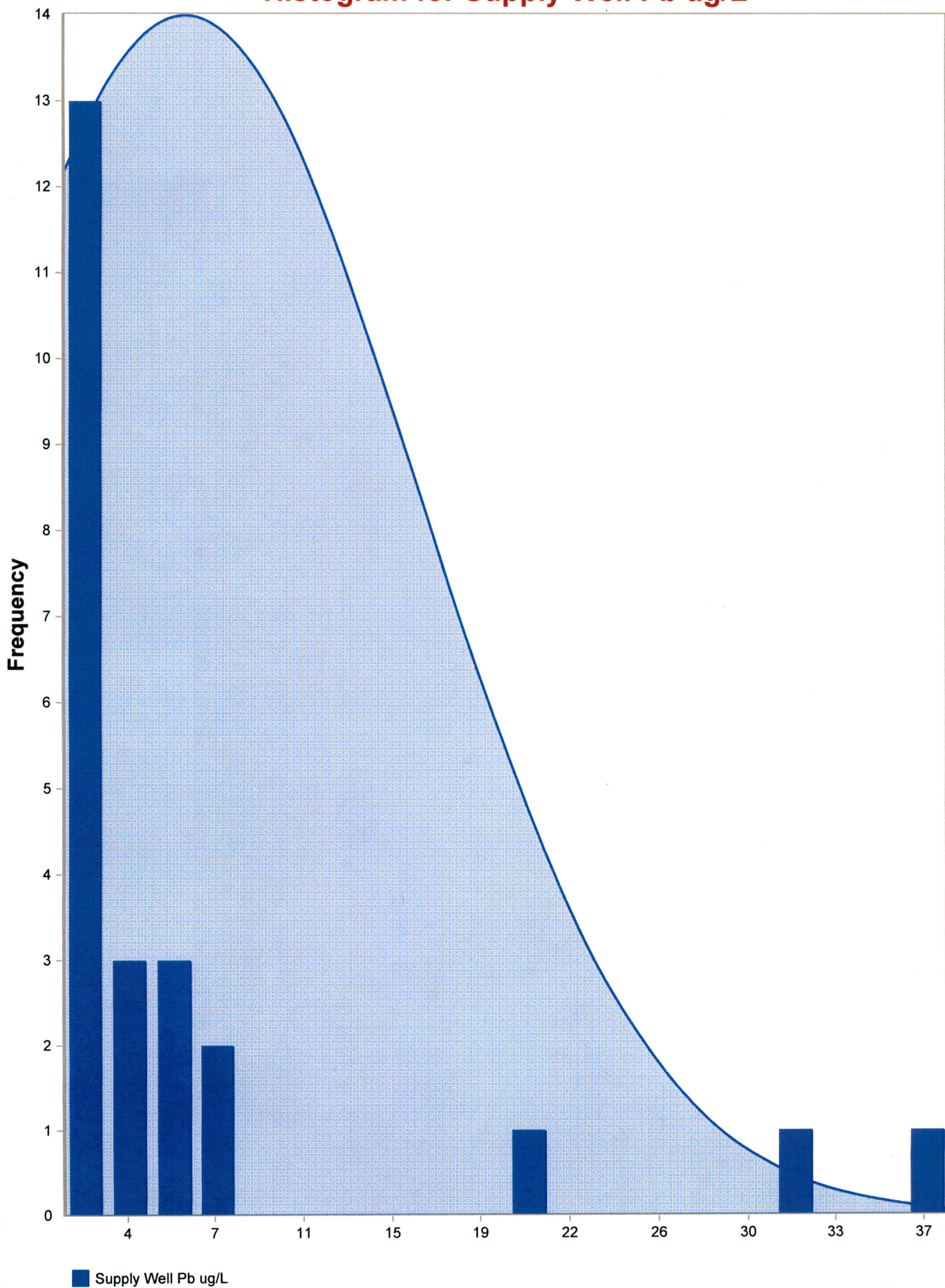
Histogram for Monitoring Well Pb ug/L



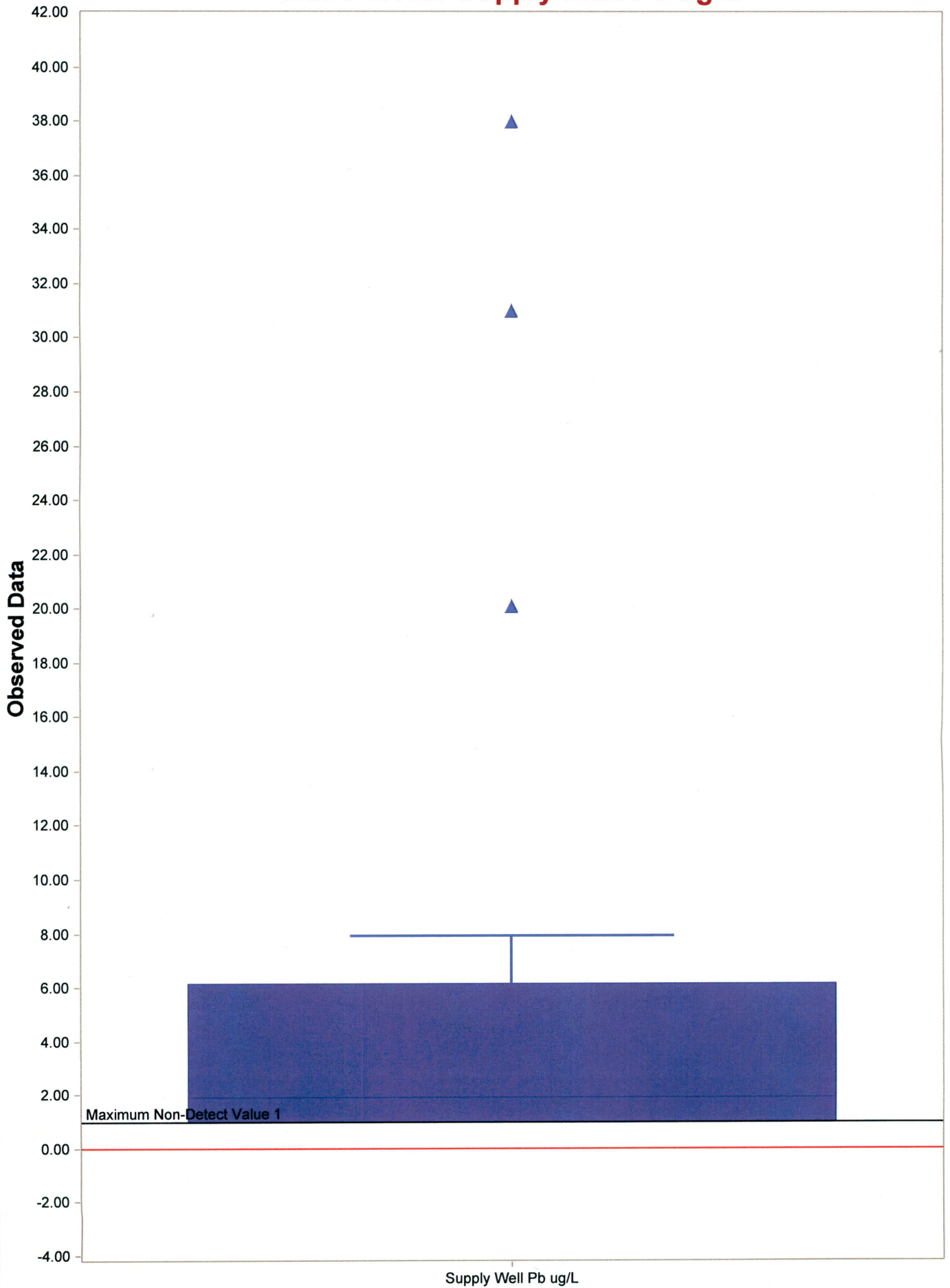
Histogram for Supply Well CrVI ug/L



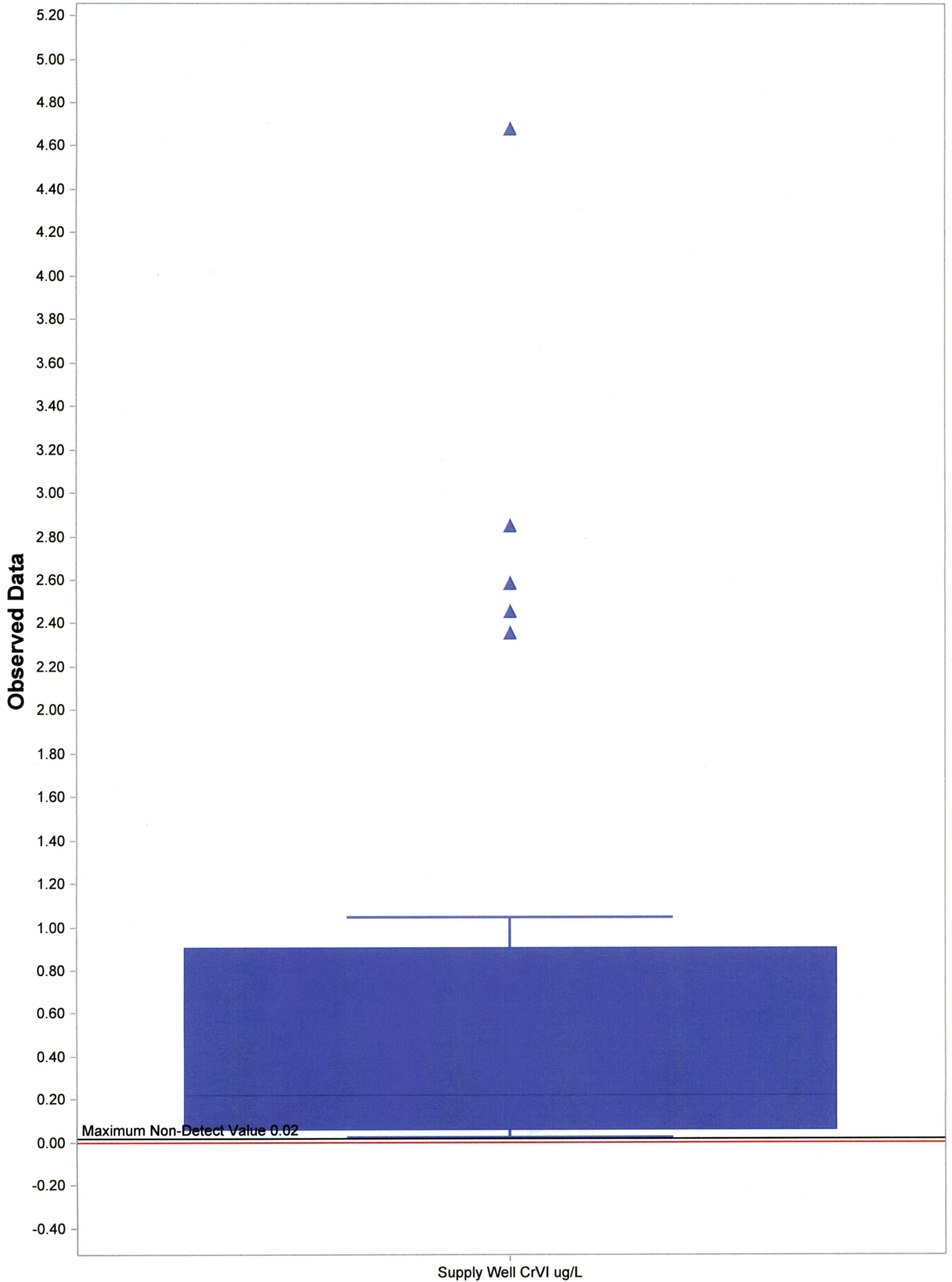
Histogram for Supply Well Pb ug/L



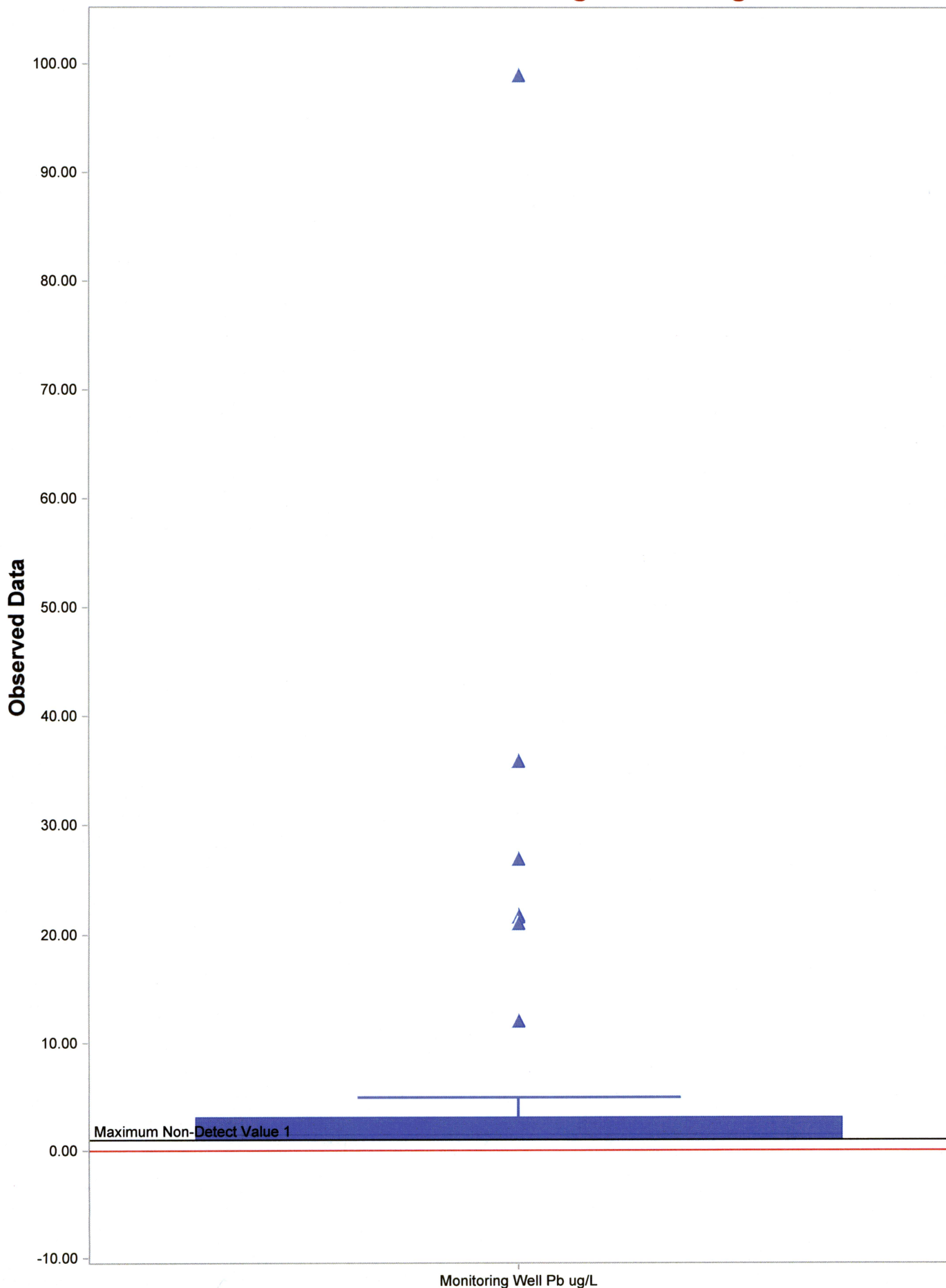
Box Plot for Supply Well Pb ug/L



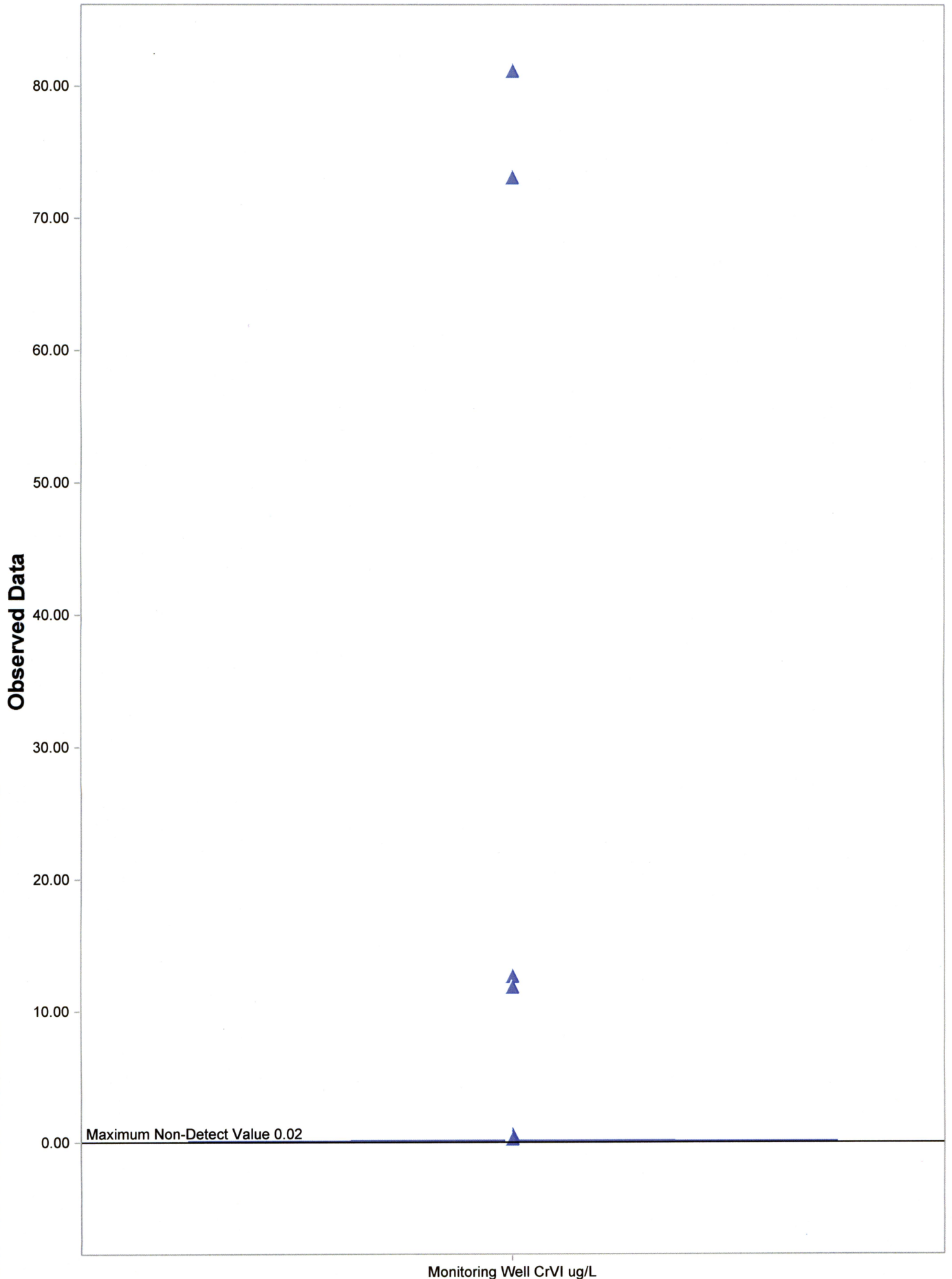
Box Plot for Supply Well CrVI ug/L



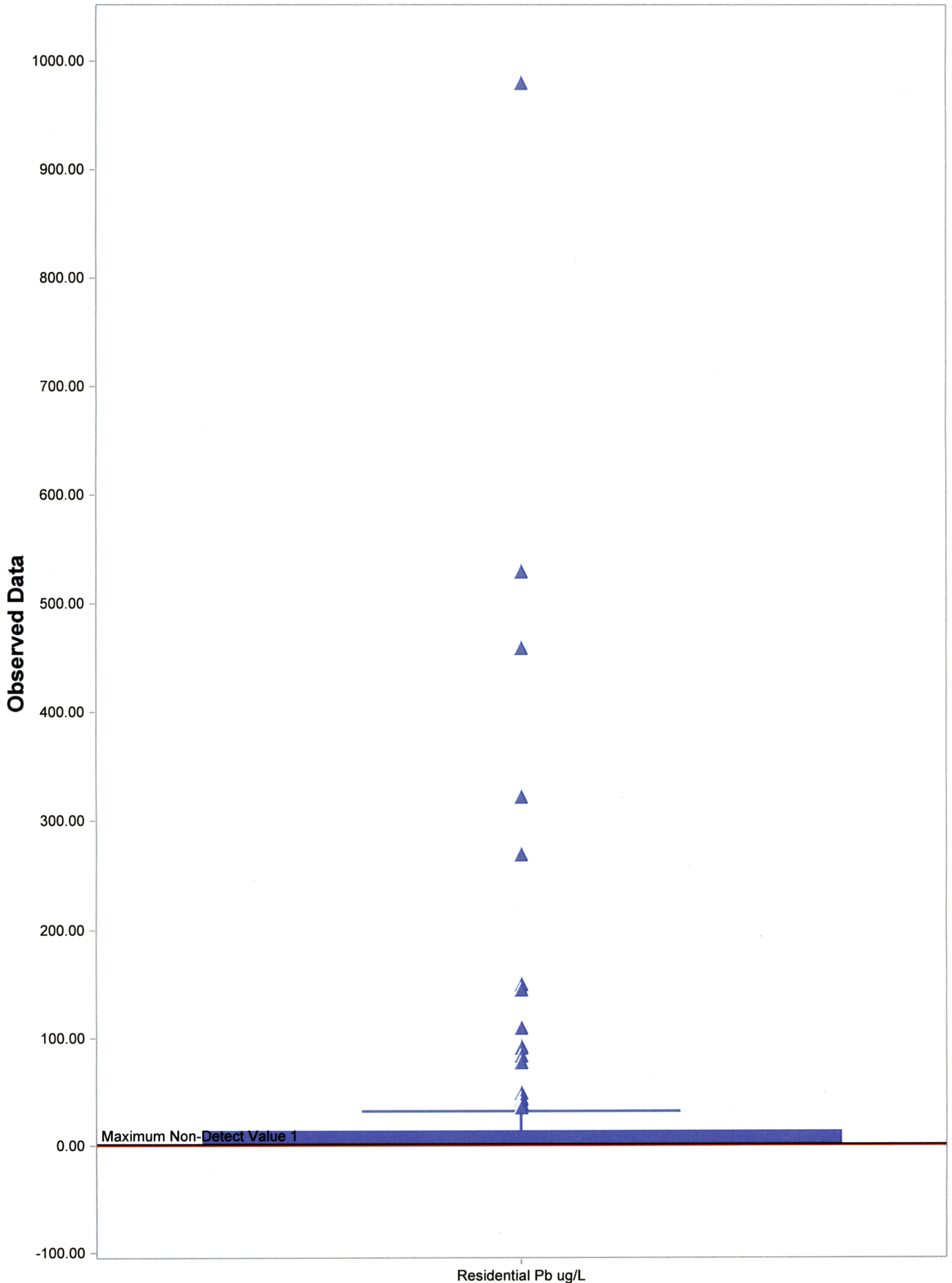
Box Plot for Monitoring Well Pb ug/L



Box Plot for Monitoring Well CrVI ug/L



Box Plot for Residential Pb ug/L



Box Plot for Residential CrVI ug/L

