HLW Engineering Group
Engineering Management

February 18, 2025

Mr. Chad Stobbe, Environmental Specialist Senior
Land Quality Bureau
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319-0034

RE: 2024 Annual Water Quality Report
Goose Lake Quarry BUD 23-BUD-15-03

Dear Mr. Stobbe:

Attached is a copy of the 2024 Annual Water Quality Report for the Goose Lake Quarry Beneficial Use Determination (BUD) project. This report is prepared as required in Special Provision 10.h. of the Permit (Doc #105560).

Sincerely,
HLW ENGINEERING GROUP

Todd Whipple, CPG
Project Manager

cc: Morgan Schuler, Environmental Specialist, Wendling Quarries, Inc.

2024 ANNUAL GROUNDWATER QUALITY REPORT

FOR THE
GOOSE LAKE QUARRY
BENEFICIAL USE DETERMINATION (BUD)
23-BUD-15-03P
GOOSE LAKE, IOWA

by:
HLW Engineering Group
204 West Broad Street
P.O. Box 314
Story City, Iowa 50248
(515) 733-4144

February, 2025

HLW Engineering Group
Engineering Management

6048-23A.320

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Certification

Prepared by: ______________________________________ Date: _2-18-2025____

Typed: Todd Whipple, CPG

Section 1.0 Background Information

1.1 Report Format

This report is prepared in accordance with Special Provision 10h of Beneficial Use Determination (BUD) Permit dated January 23, 2023 (Doc #105560). The statistical evaluation of water quality data is in accordance with Special Provisions 10c., 10.d., and 10.f.

IDNR Standardized Tables 1, 2, 4, 5, 6, and 7 are utilized as warranted in this report to convey data. Note that numerous IDNR Standardized tables do not apply to the Goose Lake BUD and are not required to be included. Also, the various IDNR Standardized Tables utilized may not be referenced in consecutive order in the text below.

1.2 Report Priority

This report is recommended to be considered low priority at the present time.

This report is prepared based on preliminary and incomplete water quality data for sample location "Sump". The sump sample warrants intrawell statistical evaluations in lieu of the interwell statistical evaluations, since the open water source should not be compared to background data collected from the bedrock formation at this site. The sump sample had 9 sample episodes of the desired 15 sample episodes completed by the end of 2024. When 15 sample episodes are complete, water quality evaluations will no longer be considered incomplete at the Sump.

The Monitoring wells (MW-1, MW-2, MW-3, and MW-4) had 15 sample collection episodes completed at the end of 2024. Water quality evaluations at MW-1, MW-2, MW-3, and MW-4 are considered comprehensive.

Supplemental water quality data collection over time is warranted at the Sump to satisfy the minimum data requirements and appropriate evaluation by both interwell and intrawell statistical methods.

1.3 Period of Report Coverage

Water quality data includes a running compilation of data beginning on August 28, 2018.

Interwell statistical evaluations herein are based upon comparison of the current year (2024) water quality result to the background data from MW-3 and MW-4.

Intrawell statistical evaluations reported herein are based on eight (8) rounds of data included in the background for each well, while the remaining datapoints (1 to 7 points depending upon compound and sampling point) are then compared to the background control limits established from the initial 8 rounds of data. Statistical evaluations will become more robust with each additional episode moving forward.

Based on the Statistical evaluation plan in place with the statistical subcontractor, the background at the monitoring wells will be expanded at the end of 2025 to include 14 to 15 datapoints in the background, while the 2025 results will then be compared to the control limits established based on the expanded background. The background for the Sump will not be expanded until approximately 13 to 15 datapoints are available for the background pool at the Sump (estimated for 2028).

1.4 Current Site Map

Figure 1 is attached illustrating the current site features and monitoring well locations.

1.5 Site Status and Applicable Rules

Site Location

The Goose Lake Quarry is located at 3715 – 137th Street, Goose Lake, Iowa (in SE¼ SE¼ Section 21 and SW¼SW¼ Section 22, T83N, R5E). The site encompasses approximately 80 acres. The facility is situated approximately 1 mile north-northeast of the corporate limits of Goose Lake, Iowa. The facility operates under the Iowa Department of Natural Resources (IDNR) Permit Number 23-BUD-15-03.

Site Layout

The site is situated in the uplands between tributaries to Deep Creek located to the north and to the south. The quarry is actively receiving beneficial use materials.

Applicable Rules

Iowa Administrative Code (IAC) 567-108 is applicable to the site.

1.6 Summary of Hydrologic Monitoring System Plan (HMSP)

The approved HMSP includes four (4) monitoring wells designated MW-1, MW-2, MW-3, and MW-4 and an open water body designated as the quarry sump (Sump-1). The Site Plan and the approved monitoring network is illustrated on Figure 1. The current HMSP water quality findings and the HMSP Implementation Schedule is itemized in Table 1 and Table 2.

A Water Table Contour Map (Figure 2) dated September 17, 2024 is included with this report. The Water Table Contour Map illustrates the water table surface and the effects of the topography and the dewatering sump located within the quarry. The excavated dewatering sump is 70 feet x 125 feet and is 29 feet deep. The quarry floor near the sump is at elevation 674.8.

The water surface in the quarry sump was estimated at elevation 665 on December 20, 2019. We note that the water surface in the sump has also historically been estimated at elevation 668. The interpretation is made that the water level in the sump varies between elevation 665 and 668.

Available water elevation data is included in Table 4 and Table 4A. The wells are interpreted to be appropriately located to detect impact, should it occur. No changes or modifications to the site monitoring wells themselves are recommended.

Section 2.0 Monitoring Activities & Data Evaluation

The "Results of Groundwater Statistics for Goose Lake Quarry, Semi-annual Monitoring Events in 2024" dated November 2024 is included in Appendix A. The report includes evaluations of May 15, 2024 data and the September 17, 2024 data. The statistical evaluations are prepared by Otter Creek Environmental Services, LLC.

A current year summary of Analytical Results for the site monitoring points is included in *Attachment A* of the November 2024 Otter Creek Report (Appendix A). A comprehensive summary of Analytical Results for the site monitoring points is included in *Attachment B* of the November 2024 Otter Creek Report (Appendix A).

2.1 Current Detection Monitoring Activities

Interwell - The background wells are MW-3 and MW-4. The downgradient monitoring points are MW-1, MW-2, Sump 1.

Intrawell - The background points in each monitoring well and in the sump include the initial eight (8) rounds of data available (dates varies by sampling point). The results collected during the subsequent sampling episodes are compared to the intrawell background (the Control Limits) established at each point.

As stated previously, the background for MW-1, MW-2, MW-3, and MW-4 will be expanded at the end of 2025 to include supplemental data (up to 15 datapoints). The background for the Sump will be expanded when approximately 13-15 points are available for the background (estimated for 2028).

2.2 Current Assessment Monitoring Activities

Not warranted at this time.

2.3 Current Corrective Action Monitoring Activities

Not warranted at this time.

The Analytical Reports for the May 15, 2024 and the September 17, 2024 sampling events are included in Appendix B.

The most current Time Series Plots for all compounds in each downgradient well (MW-1, MW-2, and Sump) are included in *Attachment C* (May results) and *Attachment E* (September results) of the November 2024 Otter Creek Report (Appendix A) and visually illustrate the detected compound concentrations over time in each well.

Groundwater Protection Standards (GWPS) have been defined as the drinking water MCL (USEPA 40-CFR-Part 141) or a health-based concentration published as a Statewide Standard for Protected Groundwater under IAC 567, Chapter 137, as designated in Special Provision 10.c. of the Permit.

Note that GWPS for some of the compounds tested (either as primary USEPA MCL (USEPA 40-CFR-Part 141) or Statewide Standards for Protected Groundwater (IAC 567, Chapter 137)) do not exist. Examples of compounds that are tested at the Goose Lake facility where a GWPS doesn't exist include aluminum*, COD, chloride*, iron*, magnesium, sulfate*, TOX, and TSS. Those compounds designated with an asterisk have USEPA National Secondary Drinking Water Regulations (NSDWRs) published. NSDWRs (or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water supply systems but does not require systems to comply with the standard.

INTERWELL METHODS

Upgradient Data, Table 1, *Attachment C* (Spring data) and Upgradient Data, Table 1, *Attachment E* (Fall data), to the November 2024 Statistical Evaluation Report (Appendix A) includes a summary of the most comprehensive background data. The calculated interwell Prediction Limits are summarized on Table 5.

STATISTICALLY SIGNIFICANT INCREASES (SSI)/EXCEEDANCES OF LIMITS

The detected concentration of each compound is compared to the current site prediction limit for each respective compound calculated based on the background data set. A detected concentration for a compound that is in excess of the calculated site prediction limit is recorded as a Statistically Significant Increase (SSI) at detection monitoring wells.

The evaluation of SSI is summarized in Table 6, where *current year* exceedances of the Prediction Limits are summarized. An ongoing summary of the compound concentrations that have inconsistently exceeded the prediction limit over time (beginning September 17, 2019) are summarized in Table 7 (for MW-1, MW-2, and Sump). All exceedances of the prediction limits are highlighted in brown.

INTRAWELL METHODS

It is deemed important to include Intrawell Statistical Evaluation at this site for two (2) reasons. First, intrawell statistical methods will better address anticipated future site conditions where discernible hydraulic gradients change and where limited wells exist. And second, where the Sump sample (an open water body that experiences both atmospheric impact and some surface water inflow) may not be readily compared to groundwater data from bedrock wells.

A summary of the Intrawell Statistics is included in Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts, *Attachment D* (Spring data), Table 1; and Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts, *Attachment F* (Fall Data), Table 1, to the November 2024 Statistical Evaluation Report (Appendix A).

STATISTICALLY SIGNIFICANT INCREASES (SSI)/EXCEEDANCES OF LIMITS
The detected concentration of each compound is compared to the control limit for each respective compound calculated based on the intrawell background data set. A detected concentration for a compound that is in excess of the control limit is recorded as a Statistically Significant Increase (SSI) at detection monitoring wells. *The Control Limits at MW-1, MW-2, MW-3, and MW-4 will be modified in 2025 when the background data pool will be expanded to 13-15 data points.*

There were no Intrawell Control Limit exceedances for the water samples collected in 2024 at any site monitoring point. It follows that there were no compounds in 2024 that were recorded as SSI by both Interwell and Intrawell methods.

It is further noted that all detected concentrations of compounds that are recorded as SSI by interwell statistical methods are well below the Groundwater Protection Standards (GWPS).

Table 1 is attached summarizing the findings of the statistical evaluations (Interwell and Intrawell).

IAC 567, Chapter 108 does not have a requirement to collect Appendix II samples in the event of a detected SSI. Additional testing requirements are at the discretion of the IDNR based on any perceived release from the facility. No release is interpreted based on water quality findings to date. Further all current compound detections are well below applicable GWPS.

CONFIDENCE INTERVAL EVALUATION/ STATISTICALLY SIGNIFICANT LEVELS (SSL)

The detections that exceed the current site prediction/control limits are utilized to calculate the 95% lower confidence limits (LCL) in accordance with the 2009 Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities by US EPA. The 95% LCL values are compared to applicable GWPS. Any 95% LCL value that exceeds an applicable GWPS is recorded as a Statistically Significant Level (SSL).

Table 7 includes a summary of the Confidence Limits (95% LCL) compared to the GWPS. *There are no Statistically Significant Levels (SSL) recorded to date.* Please note that this finding satisfies the requirements of Special Provision 10.f. of the Beneficial Use Determination (BUD) Permit, dated January 23, 2023 (Doc #105560).

RESPONSES TO WATER QUALITY RESULTS

Detected concentrations in groundwater and in the sump are well below applicable GWPS. There are no SSI recorded at the site by Intrawell statistical evaluation methods. The interwell statistical evaluation methods indicate tentative SSI at MW-2 (sulfate) and at the Sump. Although designated as SSI by interwell statistical evaluation methods, the actual detected concentrations for all compounds are well below applicable GWPS and are deemed to be relatively insignificant from both health-based and environmental perspectives.

The reported manganese concentration at MW-2 on September 28, 2021 (301 ug/L) slightly exceeded the Iowa Statewide Standard published in IAC 567, Chapter 137 (300 ug/L). The most recent manganese results reported in 2024 were both non-detected and reported as less than 20 ug/L.

It is noted that manganese does not have a published Federal Drinking Water Maximum Contaminant Limit (is not regulated under Federal Drinking Water rules). The Federal rule manages the compound manganese much the same way it manages COD, chloride, iron, magnesium, and sulfate where health effects are not sufficient to pose problems.

Based on the minor nature of the water quality findings to date, there is no recommendation to perform additional sampling (assessment monitoring) in accordance with IAC 113.10(6) at this time.

ASSESSMENT MONITORING

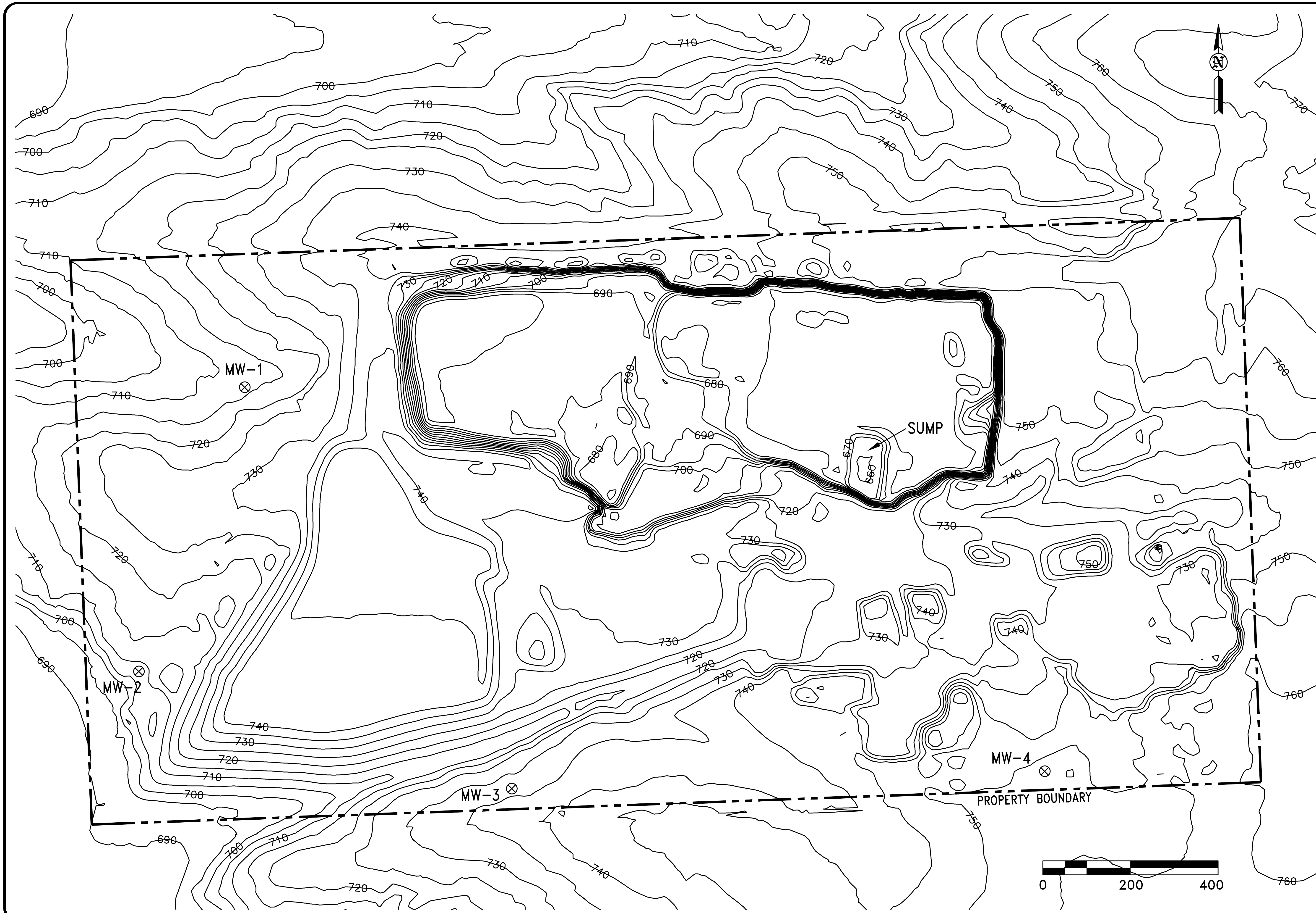
Assessment monitoring is not recommended at this time at any well.

Section 3.0 Recommendations

Continue semi-annual detection monitoring in accordance with the approved HMSP in accordance with Provision 10.d. of the Permit.

The intrawell background at MW-1, MW-2, MW-3, and MW-4 will be expanded in 2025 to include 13-15 datapoints. The Water Quality Report for 2025 will base findings upon the expanded background. The sampling and evaluations in the Spring and Fall of 2025 will be in accordance with Provision 10.h. of the Permit.

Figures



SITE PLAN

GOOSE LAKE #23-BUD-15-03
GOOSE LAKE, IOWA

FIGURE: 1

REVISION	NO.	DATE

DRAWN	PROJECT NO.	DATE
DRA	6048	12-20-24

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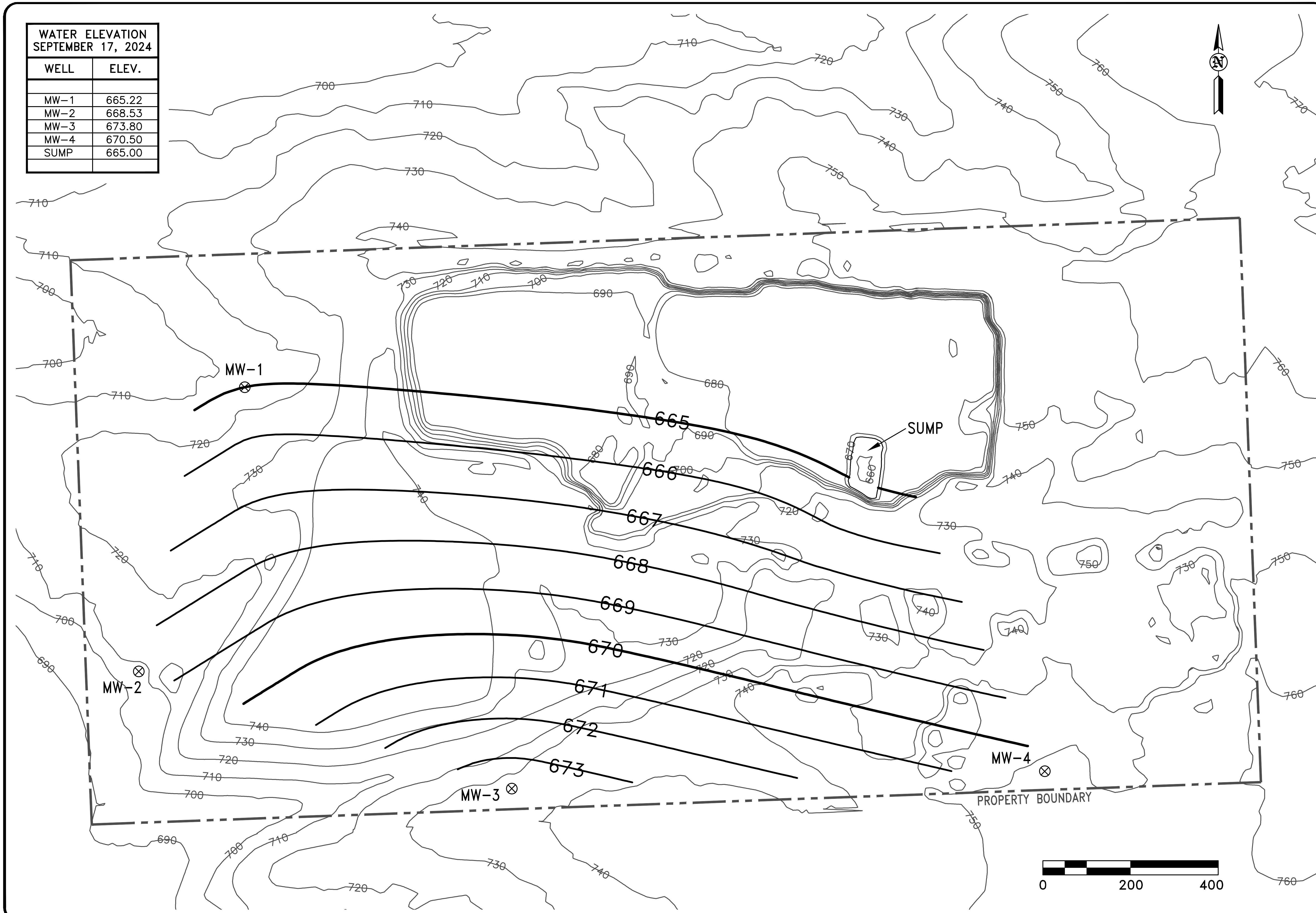
WATER ELEVATION SEPTEMBER 17, 2024	
WELL	ELEV.
MW-1	665.22
MW-2	668.53
MW-3	673.80
MW-4	670.50
SUMP	665.00



GROUNDWATER CONTOURS

GOOSE LAKE #23-BUD-15-03
GOOSE LAKE, IOWA

FIGURE: 2

REVISION	
NO.	DATE
DRAWN DRA	PROJECT NO. 6048
	DATE 12-20-24

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Tables
(in IDNR Format)

<u>Table Index</u>

Table 1 – Monitoring Program Summary – Interwell
&
Table 1A – Monitoring Program Summary – Intrawell

Table 1

Monitoring Program Summary - Interwell Statistical Evaluation

Annual Water Quality Report
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Monitoring Well	Formation	Current Monitoring Program	Change for next sampling event	Historic - Constituents w/ SSI	Spring 2024- Constituents w/ SSI	Fall 2024 - Constituents w/ SSI	Historic - Constituents w/ SSL	Spring 2024 - Constituents w/ SSL	Fall 2024 - Constituents w/ SSL	Total # of Samples in each monitoring program since August 28, 2018		
										Detection	Assessment	Corrective Action
MW-1	Limestone	Downgradient - Detection	None	Barium, selenium, sulfate	None	None	NA	NA	NA	15	0	0
MW-2	Limestone	Downgradient - Detection	None	sulfate	sulfate	sulfate	NA	NA	NA	15	0	0
MW-3	Limestone	Background	None	NA	NA	NA	NA	NA	NA	15	0	0
MW-4	Limestone	Background	None	NA	NA	NA	NA	NA	NA	15	0	0
Sump	Limestone	Downgradient - Detection	None	barium, boron, sulfate	barium, boron, sulfate (copper, zinc not verified)	barium, boron, sulfate (TOX not verified)	NA	NA	NA	9	0	0

Table 1A

Monitoring Program Summary - Intrawell Statistical Evaluation

Annual Water Quality Report
Goose Lake Quarry BUD
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Monitoring Well	Formation	Current Monitoring Program	Change for next sampling event	Historic - Constituents w/ SSI	Spring 2024- Constituents w/ SSI	Fall 2024 - Constituents w/ SSI	Historic - Constituents w/ SSL	Spring 2024 - Constituents w/ SSL	Fall 2024 - Constituents w/ SSL	Total # of Samples in each monitoring		
										Detection	Assessment	Corrective Action
MW-1	Limestone	Downgradient - Detection	None	cadmium -spring 2022	None	None	NA	NA	NA	15	0	0
MW-2	Limestone	Downgradient - Detection	None	cadmium, chromium -spring 2022	None	None	NA	NA	NA	15	0	0
MW-3	Limestone	Background	None	None	None	None	NA	NA	NA	15	0	0
MW-4	Limestone	Background	None	None	None	None	NA	NA	NA	15	0	0
Sump	Limestone	Downgradient - Detection	None	None	None	None	NA	NA	NA	9	0	0

Note - Cadmium & chromium results indicate a spike in concentration in the Spring 2022 which has not been recorded since.

Table 2 – Monitoring Program Implementation Schedule

Table 2
Monitoring Program Implementation Schedule
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

Monitoring Well	Recent Sampling Dates	Upcoming Sampling Dates and Constituents		Full Appendix II Sample Dates	
		March, 2025	September, 2025	Previously Collected	Next Event
MW-1	8-28-18; 11-14-18; 1-10-19; 4-1-19; 9-17-19; 4-6-20; 9-24-20; 4/27/2021; 9/28/2021; 5/11/2022; 9/14/2022; 5/10/2023; 9/13/2023, 5/15/2024, 9/17/2024	see Constituents List Below	see Constituents List Below	N/A	N/A
MW-2	8-28-18; 11-14-18; 1-10-19; 4-1-19; 9-17-19; 4-6-20; 9-24-20; 4/27/2021; 9/28/2021; 5/11/2022; 9/14/2022; 5/10/2023; 9/13/2023, 5/15/2024, 9/17/2024	see Constituents List Below	see Constituents List Below	N/A	N/A
MW-3	8-28-18; 11-14-18; 1-10-19; 4-1-19; 9-17-19; 4-6-20; 9-24-20; 4/27/2021; 9/28/2021; 5/11/2022; 9/14/2022; 5/10/2023; 9/13/2023, 5/15/2024, 9/17/2024	see Constituents List Below	see Constituents List Below	N/A	N/A
MW-4	8-28-18; 11-14-18; 1-10-19; 4-1-19; 9-17-19; 4-6-20; 9-24-20; 4/27/2021; 9/28/2021; 5/11/2022; 9/14/2022; 5/10/2023; 9/13/2023, 5/15/2024, 9/17/2024	see Constituents List Below	see Constituents List Below	N/A	N/A
Sump	4-6-20; 9-24-20; 4/27/2021; 9/28/2021; 5/11/2022; 9/14/2022; 5/10/2023; 9/13/2023, 5/15/2024, 9/17/2024	see Constituents List Below	see Constituents List Below	N/A	N/A

Constituent List		
Aluminum	Cobalt (Co)	Nickel (Ni)
Ammonia Nitrogen	Copper (Cu)	Phenols
Antimony (Sb)	Flouride (Fl)	Selenium (Se)
Arsenic (As)	Formaldehyde	Silver (Ag)
Barium (Ba)	Iron (Fe)	Sulfate
Beryllium (Be)	Lead (Pb)	Thallium (Tl)
Boron (B)	Magnesium (Mg)	TOX
Cadmium (Cd)	Manganese (Mn)	TSS
COD	Mercury (Hg)	Vanadium (V)
Chloride	Methyl Etyl Ketone	Zinc (Zn)
Chromium (Cr)	Molybdenum (Mo)	

Table 4 – Monitoring Well Data Summary

Table 4
Monitoring Well Maintenance and Performance Summary
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

Well	Top of casing	Top of Screen	Total Depth		Date of Measurements		Maximum Depth Discrepancy (ft)
					5/15/2024	9/17/2024	
MW-1	716.42	649.55	77.17	Groundwater Level (ft)	48.7	51.2	0
				Groundwater Elevation (Ft MSL)	667.72	665.22	
				Measured Well Depth (ft)	77.17	77.17	
				Submerged (+) or Exposed screen (-)	18.17	15.67	
MW-2	709.47	632.2	87.27	Groundwater Level (ft)	40.24	40.94	0.44
				Groundwater Elevation (Ft MSL)	669.23	668.53	
				Measured Well Depth (ft)	86.83	86.83	
				Submerged (+) or Exposed screen (-)	37.03	36.33	
MW-3	736.56	669.4	77.17	Groundwater Level (ft)	62.06	62.76	0
				Groundwater Elevation (Ft MSL)	674.5	673.8	
				Measured Well Depth (ft)	77.17	77.17	
				Submerged (+) or Exposed screen (-)	5.1	4.4	
MW-4	756.33	648.4	118	Groundwater Level (ft)	84.43	85.83	0
				Groundwater Elevation (Ft MSL)	671.9	670.5	
				Measured Well Depth (ft)	118	118	
				Submerged (+) or Exposed screen (-)	23.5	22.1	

Table 4A – Supplemental Water Elevation Data

Table 4A
Water Elevation Data
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

Well	Date	Top Casing Elevation	SWL	Water Elevation	Well	Date	Top Casing Elevation	SWL	Water Elevation	Well	Date	Top Casing Elevation	SWL	Water Elevation	Well	Date	Top Casing Elevation	SWL	Water Elevation
MW-1	12/20/2019	716.42	48.45	667.97	MW-2	12/20/2019	709.47	43.66	665.81	MW-3	12/20/2019	736.56	62.12	674.44	MW-4	12/20/2019	756.33	85.65	670.68
MW-1	4/6/2020	716.42	49.10	667.32	MW-2	4/6/2020	709.47	39.24	670.23	MW-3	4/6/2020	736.56	61.16	675.40	MW-4	4/6/2020	756.33	85.53	670.80
MW-1	9/24/2020	716.42	52.00	664.42	MW-2	9/24/2020	709.47	41.64	667.83	MW-3	9/24/2020	736.56	62.11	674.45	MW-4	9/24/2020	756.33	86.83	669.50
MW-1	4/27/2021	716.42	47.70	668.72	MW-2	4/27/2021	709.47	41.34	668.13	MW-3	4/27/2021	736.56	59.46	677.10	MW-4	4/27/2021	756.33	83.33	673.00
MW-1	9/28/2021	716.42	55.90	660.52	MW-2	9/28/2021	709.47	44.64	664.83	MW-3	9/28/2021	736.56	66.06	670.50	MW-4	9/28/2021	756.33	91.93	664.40
MW-1	5/11/2022	716.42	53.50	662.92	MW-2	5/11/2022	709.47	44.94	664.53	MW-3	5/11/2022	736.56	65.76	670.80	MW-4	5/11/2022	756.33	89.23	667.10
MW-1	9/14/2022	716.42	56.40	660.02	MW-2	9/14/2022	709.47	50.24	659.23	MW-3	9/14/2022	736.56	67.46	669.10	MW-4	9/14/2022	756.33	92.13	664.20
MW-1	5/10/2023	716.42	49.70	666.72	MW-2	5/10/2023	709.47	42.74	666.73	MW-3	5/10/2023	736.56	62.16	674.40	MW-4	5/10/2023	756.33	84.83	671.50
MW-1	9/13/2023	716.42	56.60	659.82	MW-2	9/13/2023	709.47	47.94	661.53	MW-3	9/13/2023	736.56	68.26	668.30	MW-4	9/13/2023	756.33	91.73	664.60
MW-1	5/15/2024	716.42	48.70	667.72	MW-2	5/15/2024	709.47	40.24	669.23	MW-3	5/15/2024	736.56	62.06	674.50	MW-4	5/15/2024	756.33	84.43	671.90
MW-1	9/17/2024	716.42	51.20	665.22	MW-2	9/17/2024	709.47	40.94	668.53	MW-3	9/17/2024	736.56	62.76	673.80	MW-4	9/17/2024	756.33	85.83	670.50

Table 5 – Background and GWPS Summary

Table 5
Background and GWPS Summary
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

Interwell Background Wells (MW-3 and MW-4)

Constituent	Units	Model Type	Samples - N	Detections	Mean	SD	Prediction Limit	Confidence	GWPS	Source
Aluminum	µg/l	nonparametric	26	16			870.0000	0.99	NA	SS
Ammonia Nitrogen	mg/L	nonparametric	28	2			0.2600	0.99	30	SS
Antimony (Sb)	µg/l	nonparametric	28	0			5.0000	0.99	6	SS
Arsenic (As)	µg/l	nonparametric	28	0			10.0000	0.99	10	SS
Barium (Ba)	µg/l	normal	28	28	38.5250	10.9567	66.0927		2000	SS
Beryllium (Be)	µg/l	nonparametric	28	0			1.0000	0.99	4	SS
Boron (B)	µg/l	nonparametric	27	4			31.0000	0.99	6000	SS
Cadmium (Cd)	µg/l	nonparametric	28	0			0.4000	0.99	5	SS
COD	mg/L	nonparametric	28	12			20.0000	0.99	NA	SS
Chloride	mg/L	nonparametric	27	27			34.1000	0.99	250	SS
Chromium (Cr)	µg/l	normal	28	26	7.8157	4.6195	19.4387		100	SS
Cobalt (Co)	µg/l	nonparametric	28	1			**3.3700**	0.99	2.1	SS
Copper (Cu)	µg/l	nonparametric	27	9			7.3300	0.99	1300	SS
Flouride (Fl)	mg/L	nonparametric	28	15			0.3000		4	SS
Formaldehyde	µg/l	nonparametric	28	0			100.0000	0.99	1000	SS
Iron (Fe)	µg/l	lognormal	27	27	4.9308	1.2435	3193.8598		NA	SS
Lead (Pb)	µg/l	nonparametric	28	3			3.0100	0.99	15	SS
Magnesium (Mg)	mg/L	nonparametric	28	28			72.0000		NA	SS
Manganese (Mn)	µg/l	nonparametric	26	8			145.0000	0.99	300	SS
Mercury (Hg)	µg/l	nonparametric	28	0			2.0000	0.99	2	SS
Methyl Etyl Ketone	µg/l	nonparametric	26	0			10.0000	0.99	4000	SS
Molybdenum (Mo)	µg/l	nonparametric	28	4			10.0000	0.99	40	SS
Nickel (Ni)	µg/l	nonparametric	26	5			2.5100	0.99	100	SS
Phenols	µg/l	nonparametric	27	5			25.0000	0.99	2000	SS
Selenium (Se)	µg/l	nonparametric	28	0			5.0000	0.99	50	SS
Silver (Ag)	µg/l	nonparametric	28	0			0.5000	0.99	100	SS
Sulfate	mg/L	normal	27	27	1.8701	0.4300	19.2059		NA	SS
Thallium (Tl)	µg/l	nonparametric	28	0			2.0000	0.99	2	SS
TOX	mg/L	nonparametric	25	9			0.0270	0.99	NA	SS
TSS	mg/L	lognormal	28	28	3.7493	1.3107	1149.6087		NA	SS
Vanadium (V)	µg/l	nonparametric	27	3			1.9200	0.99	35	SS
Zinc (Zn)	µg/l	normal	28	22	9.6511	7.6104	28.7993		2000	SS

Intrawell Background

Constituent	Units	Model Type	Samples - N	Detections	Mean	SD	Prediction Limit	Confidence	GWPS	Source
See Following Pages for INTRAWELL Control Limits										

[yellow box] = Prediction limit exceeds the GWPS. A Site-Specific GWPS is warranted

Table 6 – Summary of Current Year Detections

Table 6
Summary of Well/Detected Constituent Pairs that Exceed the Prediction Limit (Interwell)
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

Well	Date	Compound	Result (ug/L)	Prediction Limit (ug/L)	GWPS (ug/L)	Monitoring Program
MW-2	5/15/2024	Sulfate	27.0	19.2	250*	Detection Monitoring
MW-2	9/17/2024	Sulfate	25.2	18.5	250*	Detection Monitoring
Sump	5/15/2024	Barium	97.60	68.4	2000	Detection Monitoring
Sump	9/17/2024	Barium	133.00	67.2	2000	Detection Monitoring
Sump	5/15/2024	Boron	60.5	31.0	6000	Detection Monitoring
Sump	9/17/2024	Boron	81.1	31.0	6000	Detection Monitoring
Sump	5/15/2024	Copper	15.1	7.3	1300	Detection Monitoring
Sump	5/15/2024	Sulfate	76.7	20.5	250*	Detection Monitoring
Sump	9/17/2024	Sulfate	20.1	18.6	250*	Detection Monitoring
Sump	5/15/2024	Zinc	53.8	28.8	2000	Detection Monitoring
Sump	9/17/2024	TOX	0.071	0.050	N/A	Detection Monitoring

* = USEPA Recommendation as a Secondary MCL (non binding).

Table 7 – Summary of Ongoing and Newly Identified SSI *(Interwell)*

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-1	Barium	ug/L	9/17/2019	87.50	65.4320	---	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	4/6/2020	72.80	63.4396	---	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	9/24/2020	45.90	61.9617	---	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	4/27/2021	43.00	60.0740	43.6805	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	9/28/2021	41.80	73.5207	38.1291	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	5/11/2022	49.10	71.7596	42.128	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	9/14/2022	40.70	69.7633	40.400	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	5/10/2023	32.30	68.3582	35.016	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	9/13/2023	44.10	67.2065	35.431	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	5/15/2024	46.40	66.0927	35.525	2,000	9/17/2019	NA	9/17/2019
MW-1	Barium	ug/L	9/17/2024	36.10	65.0791	33.981	2,000	9/17/2019	NA	9/17/2019

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Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-1	Cadmium	ug/L	9/17/2019	<0.4	0.4000	---	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	4/6/2020	<0.4	0.4000	---	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	9/24/2020	<0.4	0.4000	---	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	4/27/2021	<0.4	0.4000	0.200	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	9/28/2021	<0.4	0.4000	0.200	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	5/11/2022	1.02	0.4000	0.050	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	9/14/2022	<0.4	0.4000	0.050	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	5/10/2023	<0.4	0.4000	0.050	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	9/13/2023	<0.4	0.4000	0.050	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	5/15/2024	<0.4	0.4000	0.200	5	5/11/2022	NA	9/17/2019
MW-1	Cadmium	ug/L	9/17/2024	<0.4	0.4000	0.200	5	5/11/2022	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-1	Selenium	ug/L	9/17/2019	7.45	5.0000	---	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	4/6/2020	6.73	5.0000	---	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	9/24/2020	<5.00	5.0000	---	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	4/27/2021	<5.00	5.0000	2.4859	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	9/28/2021	<5.00	5.0000	1.7259	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	5/11/2022	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	9/14/2022	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	5/10/2023	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	9/13/2023	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	5/15/2024	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019
MW-1	Selenium	ug/L	9/17/2024	<5.00	5.0000	2.500	50	9/17/2019	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-1	Sulfate	mg/L	9/17/2019	82.80	27.7099	---	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	4/6/2020	30.40	24.8692	---	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	9/24/2020	12.00	22.9755	---	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	4/27/2021	7.72	21.5802	3.3692	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	9/28/2021	10.80	21.9178	6.3336	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	5/11/2022	11.90	20.1254	8.874	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	9/14/2022	8.97	21.2893	8.234	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	5/10/2023	13.80	20.5351	9.616	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	9/13/2023	10.90	18.6454	9.649	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	5/15/2024	19.10	19.2059	9.373	**250***	9/17/2019	NA	9/17/2019
MW-1	Sulfate	mg/L	9/17/2024	8.47	19.2059	9.106	**250***	9/17/2019	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-1	Vanadium	ug/L	9/17/2019	1.88	1.4100	---	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	4/6/2020	<1.00	1.4100	---	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	9/24/2020	<1.00	1.4100	---	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	4/27/2021	<1.00	1.4100	0.2474	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	9/28/2021	<1.00	5.7600	0.500	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	5/11/2022	1.27	1.9200	0.359	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	9/14/2022	<1.00	1.9200	0.359	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	5/10/2023	<1.00	1.9200	0.359	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	9/13/2023	<1.00	1.9200	0.359	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	5/15/2024	<1.00	1.9200	0.500	35	9/17/2019	NA	9/17/2019
MW-1	Vanadium	ug/L	9/17/2024	<1.00	1.9200	0.500	35	9/17/2019	NA	9/17/2019

*** = USEPA Reccommendation as a Secondary MCL (non binding).**

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Barium	ug/L	9/17/2019	58.60	65.4320	---	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	4/6/2020	64.80	63.4396	---	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	9/24/2020	56.60	61.9617	---	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	4/27/2021	57.10	60.0740	56.001	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	9/28/2021	75.00	73.5207	55.918	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	5/11/2022	63.00	71.7596	55.513	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	9/14/2022	54.10	69.7633	54.299	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	5/10/2023	61.00	68.3582	55.743	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	9/13/2023	60.00	67.2065	56.212	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	5/15/2024	57.60	66.0927	55.518	2,000	4/6/2020	NA	9/17/2019
MW-2	Barium	ug/L	9/17/2024	61.10	65.0791	58.515	2,000	4/6/2020	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

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Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Cadmium	ug/L	9/17/2019	<0.4	0.400	---	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	4/6/2020	<0.4	0.400	---	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	9/24/2020	<0.4	0.400	---	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	4/27/2021	<0.4	0.400	0.200	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	9/28/2021	<0.4	0.400	0.200	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	5/11/2022	0.67	0.400	0.114	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	9/14/2022	<0.4	0.400	0.114	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	5/10/2023	<0.4	0.400	0.114	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	9/13/2023	<0.4	0.400	0.114	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	5/15/2024	<0.4	0.400	0.200	5	5/11/2022	NA	9/17/2019
MW-2	Cadmium	ug/L	9/17/2024	<0.4	0.400	0.200	5	5/11/2022	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Chromium	ug/L	9/17/2019	7.46	22.5591	---	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	4/6/2020	6.65	22.0413	---	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	9/24/2020	5.13	20.3033	---	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	4/27/2021	6.87	22.2996	5.668	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	9/28/2021	23.00	22.6783	3.114	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	5/11/2022	15.00	21.8168	5.385	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	9/14/2022	5.96	20.9272	5.801	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	5/10/2023	5.13	20.2469	4.969	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	9/13/2023	3.48	19.9970	2.911	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	5/15/2024	1.49	19.4387	2.306	100	9/28/2021	NA	9/17/2019
MW-2	Chromium	ug/L	9/17/2024	7.19	19.4387	2.224	100	9/28/2021	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Fluoride	mg/L	9/17/2019	0.430	0.3000	---	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	4/6/2020	0.229	0.3000	---	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	9/24/2020	0.128	0.3763	---	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	4/27/2021	0.151	0.3577	0.116	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	9/28/2021	0.228	0.3464	0.139	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	5/11/2022	0.122	0.3329	0.115	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	9/14/2022	0.158	0.3241	0.126	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	5/10/2023	0.136	0.3000	0.120	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	9/13/2023	0.114	0.0300	0.116	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	5/15/2024	0.128	0.0300	0.118	4	9/17/2019	NA	9/17/2019
MW-2	Fluoride	mg/L	9/17/2024	0.129	0.0300	0.119	4	9/17/2019	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Manganese	ug/L	9/17/2019	57.00	102.0000	---	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	4/6/2020	108.00	102.0000	---	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	9/24/2020	<20.0	102.0000	---	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	4/27/2021	95.00	102.0000	29.379	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	9/28/2021	301.00	102.0000	22.033	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	5/11/2022	70.90	145.0000	9.801	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	9/14/2022	37.60	145.0000	23.124	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	5/10/2023	<20.0	145.0000	0.000	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	9/13/2023	23.50	145.0000	12.851	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	5/15/2024	<20.0	145.0000	8.855	300	4/6/2020	NA	9/17/2019
MW-2	Manganese	ug/L	9/17/2024	<20.0	145.0000	7.529	300	4/6/2020	NA	9/17/2019

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
MW-2	Sulfate	mg/L	9/17/2019	23.40	27.7099	---	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	4/6/2020	24.30	24.8692	---	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	9/24/2020	24.00	22.9755	---	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	4/27/2021	24.40	21.5802	23.6353	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	9/28/2021	25.40	21.9178	23.9988	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	5/11/2022	25.70	20.1254	24.177	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	9/14/2022	24.40	21.2893	24.390	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	5/10/2023	23.80	20.5351	24.062	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	9/13/2023	20.70	18.6454	21.814	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	5/15/2024	27.00	19.2059	21.734	**250***	9/24/2020	NA	9/17/2019
MW-2	Sulfate	mg/L	9/17/2024	25.20	19.2059	21.870	**250***	9/24/2020	NA	9/17/2019

*** = USEPA Reccommendation as a Secondary MCL (non binding).**

Table 7
Summary of Ongoing & Newly Identified SSI
Annual Water Quality Report
Goose Lake Quarry BUD
Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Barium	ug/L	4/6/2020	109.00	63.4396	---	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	9/24/2020	108.00	61.9617	---	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	4/27/2021	93.10	60.0740	---	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	9/28/2021	127.00	73.5207	97.259	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	5/11/2022	98.80	71.7596	93.869	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	9/14/2022	79.00	69.7633	82.025	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	5/10/2023	97.60	68.3582	83.455	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	9/13/2023	133.00	67.2065	82.609	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	5/15/2024	119.00	66.0927	86.5814	2000	4/6/2020	NA	5/11/2022
Sump	Barium	ug/L	9/17/2024	127.00	65.0791	105.7535	2000	4/6/2020	NA	5/11/2022

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Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Boron	ug/L	4/6/2020	40.50	31.0000	---	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	9/24/2020	54.80	31.0000	---	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	4/27/2021	34.20	31.0000	---	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	9/28/2021	30.40	31.0000	30.687	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	5/11/2022	36.60	31.0000	29.614	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	9/14/2022	63.50	31.0000	28.097	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	5/10/2023	60.50	31.0000	33.293	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	9/13/2023	81.10	31.0000	44.578	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	5/15/2024	83.20	31.0000	61.9172	6000	4/6/2020	NA	5/11/2022
Sump	Boron	ug/L	9/17/2024	90.00	31.0000	67.6893	6000	4/6/2020	NA	5/11/2022

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Permit No. 23-BUD-15-03

KEY:	SSI	SSL LCL>GWPS

Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Chloride	mg/L	4/6/2020	35.500	34.1000	---	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	9/24/2020	29.300	34.1000	---	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	4/27/2021	23.600	34.1000	---	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	9/28/2021	19.000	34.1000	20.665	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	5/11/2022	13.000	34.1000	15.237	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	9/14/2022	11.900	34.1000	12.144	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	5/10/2023	22.400	34.1000	12.261	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	9/13/2023	22.900	34.1000	12.432	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	5/15/2024	18.200	34.1000	14.4418	**250***	4/6/2020	NA	5/11/2022
Sump	Chloride	mg/L	9/17/2024	23.700	34.1000	19.6704	**250***	4/6/2020	NA	5/11/2022

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Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Copper	mg/L	4/6/2020	<2.0	7.6800	---	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	9/24/2020	11.200	7.6800	---	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	4/27/2021	<3.0	7.6800	---	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	9/28/2021	5.680	7.6800	0.7506	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	5/11/2022	11.000	7.6800	3.3090	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	9/14/2022	<3.0	7.6800	1.0169	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	5/10/2023	<3.0	7.6800	1.0169	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	9/13/2023	<3.0	7.6800	0.0000	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	5/15/2024	15.100	7.6800	0.0000	1,300	9/24/2020	NA	5/11/2022
Sump	Copper	mg/L	9/17/2024	<3.0	7.6800	0.0000	1,300	9/24/2020	NA	5/11/2022

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Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Manganese	ug/L	4/6/2020	<20	102.0000	---	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	9/24/2020	103.00	102.0000	---	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	4/27/2021	<20	102.0000	---	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	9/28/2021	21.50	102.0000	0.000	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	5/11/2022	<20	145.0000	0.000	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	9/14/2022	<20	145.0000	7.895	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	5/10/2023	<20	145.0000	7.895	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	9/13/2023	<20	145.0000	10.000	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	5/15/2024	<20	145.0000	10.000	300	9/24/2020	NA	5/11/2022
Sump	Manganese	ug/L	9/17/2024	<20	145.0000	10.000	300	9/24/2020	NA	5/11/2022

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Note: The absence of shading indicates that the condition does not exist.

Monitoring Well	Compound	Units	Sample Date	Each Result	Prediction Limit	95% LCL (ug/L)	GWPS Limit	SSI Initial Exceedance	Resamples Due	5th Background Sample
Sump	Sulfate	mg/L	4/6/2020	122.00	24.8692	---	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	9/24/2020	66.80	22.9755	---	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	4/27/2021	120.00	21.5802	---	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	9/28/2021	33.60	21.9178	48.298	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	5/11/2022	39.00	20.1254	30.608	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	9/14/2022	43.60	21.2893	23.683	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	5/10/2023	76.70	20.5351	31.408	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	9/13/2023	20.10	18.6454	24.461	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	5/15/2024	75.20	19.2059	30.3306	**250***	4/6/2020	NA	5/11/2022
Sump	Sulfate	mg/L	9/17/2024	100.00	19.2059	38.6489	**250***	4/6/2020	NA	5/11/2022

*** = USEPA Reccommendation as a Secondary MCL (non binding).**

Appendix A

Statistical Report
(Combined Spring & Fall Data)

Results of the Ground Water Statistics

for Goose Lake Quarry

Semi-Annual Monitoring Events in 2024

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INTRODUCTION

This report contains the results of the statistical analyses used to evaluate the ground water data obtained during the 2024 semi-annual monitoring events at Goose Lake Quarry. The ground water at Goose Lake Quarry is monitored by wells MW-1, MW-2, MW-3, MW-4, and Sump Grab/Sump Composite. These monitoring wells were sampled on May 15, 2024 and September 17, 2024 and analyzed for the parameters required by permit.

The statistical plan is designed to detect a release from the facility at the earliest indication so that it is protective of human health and the environment. Both interwell and intrawell methodologies are described and then applied to the Goose Lake Quarry data. The statistical plan conforms with IAC 567, Chapter 113.10, USEPA Guidance document ("*Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Unified Guidance"*, March 2009), and the American Society for Testing and Materials (ASTM) standard D6312-98, *Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Programs*.

Ground Water Monitoring Program

The groundwater monitoring network for Goose Lake Quarry includes wells MW-1, MW-2, MW-3, MW-4, and Sump Grab/Sump Composite. Each of the groundwater monitoring wells is to be sampled at least semiannually and analyzed for the detection monitoring parameters listed below.

Detection monitoring constituents for Goose Lake Quarry

Aluminum, Total	Fluoride	Thallium, Total
Antimony, Total	Iron, Total	Vanadium, Total
Arsenic, Total	Lead, Total	Zinc, Total
Barium, Total	Magnesium, Total	Total suspended solids (TSS)
Beryllium, Total	Manganese, Total	Chemical oxygen demand (COD)
Boron, Total	Mercury, Total	Total Organic Halogen (TOX)
Cadmium, Total	Molybdenum, Total	Phenols
Chloride	Nickel, Total	Nitrogen ammonia
Chromium, Total	Selenium, Total	Formaldehyde
Cobalt, Total	Silver, Total	Methyl ethyl ketone
Copper, Total	Sulfate	

The ground water data obtained during the first and second semi-annual monitoring events in 2024 are summarized in Attachment A. The historical ground water data obtained from August 2018 through 2024 are summarized in Attachment B.

STATISTICAL METHODOLOGIES FOR DETECTION MONITORING

IAC 567, Chapter 113.10(4) provides several options for statistically evaluating the ground water data at those wells that monitor the open cells or contiguous MSWLF units. The preferred methods for comparing ground water data are using either prediction limits or using control charts. Both of these methods were applied to the Goose Lake Quarry data using the DUMPStat® statistical program. DUMPStat® is a program for the statistical analysis of groundwater monitoring data using methods described in "Statistical Methods for Groundwater Monitoring" by Dr. Robert D. Gibbons. The DUMPStat program is completely consistent with all USEPA regulations and guidance and the ASTM D6312-98 guidance. Ground water statistics are to be done on the constituents listed.

Interwell Statistics: Upgradient versus Downgradient Comparisons

Interwell statistics are appropriate when the upgradient and downgradient wells monitor the same ground water formation and there is similar variability in the upgradient and downgradient zones. Site prediction limits are determined by pooling the historical ground water data from hydraulically upgradient wells. This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances. The type of prediction limit utilized (e.g., parametric or nonparametric) is based on the detection frequency and the data distribution of each parameter in the background data. The distribution of the background data is tested for normality using the Shapiro-Wilk test (Gibbons, 1994 and USEPA 1992). If the constituent is normally distributed, a normal prediction limit is used. If normality is rejected by the Shapiro-Wilk test, the background data is transformed by taking the natural logarithm. The Shapiro-Wilk test is then reapplied on the transformed data. If it is not rejected, lognormal prediction limits are used. If after transforming the data, normality is still rejected, nonparametric prediction limits are used for that analyte. The nonparametric prediction limit is the largest determination in the background measurements. For constituents where the background detection frequency is greater than 0% but less than 50%, nonparametric prediction limits will be used. If the detection frequency is 0% after thirteen samples have been collected, the practical quantitation limit (PQL) becomes the nonparametric prediction limit.

Intrawell statistics

Intrawell statistics are appropriate for facilities where the upgradient wells do not accurately characterize the natural ground water conditions downgradient from the facility. This may be due to different hydrogeological conditions where the wells are screened, having too few upgradient wells to account for the spatial variability, or the site exhibiting no definable hydraulic gradient. Intrawell statistics compare new measurements to the historical data at each ground water monitoring well independently. It is recommended that at least eight background samples be obtained prior to performing the statistics.

The most useful technique for intrawell comparisons is the combined Shewhart-CUSUM control chart. This control chart procedure is useful because it will detect releases both in terms of the constituent concentration and cumulative increases. This method is also extremely sensitive to sudden and gradual releases. A requirement for constructing these control charts is that the parameter is detected at a frequency greater than or equal to 25%, otherwise the data variance is not properly defined.

The combined Shewhart-CUSUM control chart assumes that the data are independent and normally distributed with a fixed mean and a constant variance. Independent data is much more critical than the normality assumption. To achieve independence, it is recommended that data are collected no more frequently than quarterly to account for seasonal variation. The combined Shewhart-CUSUM control chart is extremely robust to deviations from normality. Because the control charts do not use a specific multiplier based on a normal distribution, it is more conservative to assume normality.

It is recommended that at least eight rounds of data be available to provide a reliable estimate of the mean and standard deviation of the parameter concentration, although the control charts will be generated with as few as four data points. Having only four data points may produce greater uncertainty in the mean and standard deviation of the background data, leading to higher control limits, thus having a potentially high false negative rate.

Many groundwater monitoring parameters are not detected at a frequency great enough to generate the combined Shewhart-CUSUM control charts. For constituents that are detected less than 25% of the time at a particular well, the data should be plotted as a time series until a sufficient number of data points are available to provide a 99% confidence nonparametric prediction limit. Thirteen independent measurements (with 1 resample) are necessary to achieve a 99% confidence (1% false positive rate) nonparametric prediction limit. Eight independent measurements (for pass 1 of 2 resamples) are necessary to achieve a 99% confidence nonparametric prediction limit. The nonparametric prediction limit is the largest determination out of the data set collected for that well and parameter. If the detection frequency is 0% after thirteen samples have been collected, the practical quantitation limit (PQL) becomes the nonparametric prediction limit.

In developing the statistical background, the historical data must be thoroughly screened for anomalous data due to sampling error, analytical error, or simply by chance alone. An erroneous data point, if not removed prior to the mean and variance computations, would yield a larger control limit thus increasing the false negative rate. The DUMPStat® program screens for outliers using the Dixon test. Anomalous data will still be plotted on the graphs (with a unique symbol) but will not be included in the calculations.

The verification resample plan is an integral function of the statistical plan to reduce the probability that anomalous data obtained after the background has been established, is indicative of a release.

The background data for each well and constituent is tested for existing trends using Sen's nonparametric estimate of trend. If contamination exists prior to completing the background, the control limits could be potentially high and this control chart method would not be able to detect an increasing trend unless the increase is severe.

First Semi-Annual Monitoring Event in 2024

Results of the Interwell Statistics

The background data used in this statistical analysis includes the ground water data collected from ground water wells MW-3 and MW-4 during the period from August 2018 through the May 2024 data. A summary of the background data from monitoring wells MW-3 and MW-4 is listed in Attachment C, Table 1 “Upgradient Data”. This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances.

Table 2 “Most Current Downgradient Monitoring Data”, summarizes the May 2024 data from downgradient wells MW-1, MW-2, and Sump Grab compared to the site prediction limits. Prediction limit exceedances are flagged with asterisks. For the most current data, the site prediction limit exceedances detected are summarized in the table below.

Prediction Limit Exceedances at Goose Lake Quarry during the First Semi-Annual Monitoring Event in 2024

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-2	Sulfate, mg/L	27.0	19.2059	Lognormal	Verified
Sump Comp	Barium, µg/L	119	66.0927	Normal	Verified
	Boron, µg/L	83.2	31.0000	Nonparametric	Verified
	Copper, µg/L	15.1	7.3300	Nonparametric	Awaiting verification
	Sulfate, mg/L	75.2	19.2059	Lognormal	Verified
	Zinc, µg/L	53.8	28.7993	Normal	Awaiting verification

The detection frequencies of the parameters in the up and down gradient monitoring wells are summarized in Table 3. The constituents rarely detected (less than 50% in the upgradient wells) use nonparametric prediction limits.

Table 4 summarizes the results of the Shapiro-Wilk test. Table 5 is a summary of the statistics and prediction limits determined. Time series graphs of each of the parameters at each well with the corresponding prediction limits are attached.

A statistical power curve indicates the expected false assessments for the site as a whole. The false positive rate for interwell analyses is the percentage of failures when the upgradient versus downgradient true mean difference equals zero. False negative rate indicates the chance of missing contamination at a single well for a single constituent. The statistical power is a function of the number of wells included, the number of constituents compared, the detection frequencies, and the data distributions involved. For interwell analysis, the site-wide false positive rate is 6% and the test becomes sensitive to 4 standard deviation unit increases over background.

<u>Results of the Intrawell Statistics</u>

The monitoring constituents at wells MW-1, MW-2, MW-3, MW-4, and Sump Grab were evaluated using the combined Shewhart-CUSUM control chart method. The previous background included the five rounds of data obtained from 2018 through 2019. These comparisons should not be considered binding since a minimum of eight rounds of data is recommended. The background was updated to include the eight rounds of data from 2018 through April 2021. The background at Sump Grab to includes the rounds of data from 2018 through May 2024.

A summary of the intrawell statistics is included in Attachment D, Table 1 “Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts.” The control charts or time series graphs follow the summary table. For the May 2024 data, there were no control limit exceedances detected. An increasing trend was detected in the updated background data for chromium at MW-1.

A control chart factor was selected to provide a balance of the site-wide false positive and false negative rates. A statistical power curve indicates the expected false assessments for the site as a whole. The site-wide false positive rate is 13% and the test becomes sensitive to 4 standard deviation units over background.

Second Semi-Annual Monitoring Event in 2024

Results of the Interwell Statistics

The background data used in this statistical analysis includes the ground water data collected from ground water wells MW-3 and MW-4 during the period from August 2018 through the current data. A summary of the background data from monitoring wells MW-3 and MW-4 is listed in Attachment E, Table 1 "Upgradient Data". This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances.

Table 2 "Most Current Downgradient Monitoring Data", summarizes the current data from downgradient wells MW-1, MW-2, and Sump Grab compared to the site prediction limits. Prediction limit exceedances are flagged with asterisks. For the most current data, the site prediction limit exceedances detected are summarized in the table below.

Prediction Limit Exceedances at Goose Lake Quarry
during the Second Semi-Annual Monitoring Event in 2024

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-2	Sulfate, mg/L	25.2	18.5067	Lognormal	Verified
Sump Grab	Barium, μg/L	127	65.0791	Normal	Verified
	Boron, μg/L	90.0	31.0000	Nonparametric	Verified
	Sulfate, mg/L	100	18.5067	Lognormal	Verified
	TOX, mg/L	0.071	0.0500	Nonparametric	Awaiting verification

The detection frequencies of the parameters in the up and down gradient monitoring wells are summarized in Table 3. The constituents rarely detected (less than 50% in the upgradient wells) use nonparametric prediction limits.

Table 4 summarizes the results of the Shapiro-Wilk test. Table 5 is a summary of the statistics and prediction limits determined. Time series graphs of each of the parameters at each well with the corresponding prediction limits are attached.

A statistical power curve indicates the expected false assessments for the site as a whole. The false positive rate for interwell analyses is the percentage of failures when the upgradient versus downgradient true mean difference equals zero. False negative rate indicates the chance of missing contamination at a single well for a single constituent. The statistical power is a function of the number of wells included, the number of constituents compared, the detection frequencies, and the data distributions involved. For interwell analysis, the site-wide false positive rate is 3% and the test becomes sensitive to 4 standard deviation unit increases over background.

<u>Results of the Intrawell Statistics</u>

The monitoring constituents at wells MW-1, MW-2, MW-3, MW-4, and Sump Grab were evaluated using the combined Shewhart-CUSUM control chart method. The background includes the eight rounds of data from 2018 through April 2021. The background at Sump Grab to includes the rounds of data from 2018 through May 2024.

A summary of the intrawell statistics is included in Attachment F, Table 1 "Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts." The control charts or time series graphs follow the summary table. For the most current data, there were no control limit exceedances detected. An increasing trend was detected in the background data for chromium at MW-1.

A control chart factor was selected to provide a balance of the site-wide false positive and false negative rates. A statistical power curve indicates the expected false assessments for the site as a whole. The site-wide false positive rate is 13% and the test becomes sensitive to 4 standard deviation units over background.

CONCLUSIONS

This document describes a comprehensive statistical plan designated for the Goose Lake Quarry. The groundwater monitoring network for Goose Lake Quarry includes wells MW-1, MW-2, MW-3, MW-4, and Sump Grab/Sump Composite. The ground water data was compared to background using prediction limits (interwell) and using control charts (intrawell). Following both semi-annual monitoring events in 2024, the only current statistical exceedances are verified site prediction limit exceedances for sulfate at MW-2 and barium, boron, and sulfate at Sump Grab. Using intrawell comparisons, there are no current control limit exceedances detected.

Attachment A

Ground Water Data

Table 1

Analytical Data Summary for 5/15/2024

Constituents	Units	MW-1	MW-2	MW-3	MW-4	Sump Grab
Aluminum, total	ug/L	<100	<100	<100	<100	107
Ammonia nitrogen	mg/L	<.1	<.1	<.1	<.1	<.1
Antimony, total	ug/L	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10
Barium, total	ug/L	46.4	57.6	31.7	42.2	119.0
Beryllium, total	ug/L	<1	<1	<1	<1	<1
Boron, total	ug/L	<20.0	<20.0	<20.0	<20.0	83.2
Cadmium, total	ug/L	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	mg/L	<10	<10	<10	<10	<10
Chloride	mg/L	13.900	3.540	.607	2.910	18.200
Chromium, total	ug/L	4.37	1.49	7.70	7.20	<1.00
Cobalt, total	ug/L	<2	<2	<2	<2	<2
Copper, total	ug/L	<3.0	<3.0	<3.0	<3.0	15.1
Field Temperature	F	55.8	55.2	54.1	53.6	62.0
Fluoride	mg/L	.105	.128	<.100	.105	.129
Formaldehyde	ug/L	<100	<100	<100	<100	<100
Iron, total	ug/L	38.2	<10.0	41.7	38.1	48.8
Lead, total	ug/L	<2	<2	<2	<2	<2
Magnesium, total	mg/L	38.4	54.2	25.8	49.1	42.2
Manganese, total	ug/L	<20	<20	<20	<20	<20
Mercury, total	ug/L	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L	<10	<10	<10	<10	<10
Molybdenum, total	ug/L	<10	<10	<10	<10	<10
Nickel, total	ug/L	<1	<1	<1	<1	<1
pH (Field)	SU	8.4	8.1	8.2	7.9	8.3
Phenols	ug/L	<10	<10	<10	<10	<10
Selenium, total	ug/L	<5	<5	<5	<5	<5
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS	530	490	316	490	540
Sulfate	mg/L	19.10	27.00	5.16	8.82	75.20
Thallium, total	ug/L	<3	<3	<3	<3	<3
Total organic halogen	mg/L	<.01	<.01	<.01	<.01	<.01
Total suspended solids	mg/L	5	1	7	3	3
Vanadium, total	ug/L	<1	<1	<1	<1	<1
Zinc, total	ug/L	9.64	<5.00	9.15	9.86	53.80

* - The displayed value is the arithmetic mean of multiple database matches.

Table 2

Analytical Data Summary for 9/17/2024

Constituents	Units	MW-1	MW-2	MW-3	MW-4	Sump Grab
Aluminum, total	ug/L	<100	<100	<100	<100	<100
Ammonia nitrogen	mg/L	<.1	<.1	<.1	<.1	<.1
Antimony, total	ug/L	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10
Barium, total	ug/L	36.1	61.1	27.6	38.4	127.0
Beryllium, total	ug/L	<1	<1	<1	<1	<1
Boron, total	ug/L	<20	<20	<20	<20	90
Cadmium, total	ug/L	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	mg/L	<10	<10	<10	<10	<10
Chloride	mg/L	3.420	2.910	.608	2.600	23.700
Chromium, total	ug/L	2.88	7.19	5.90	5.60	<1.00
Cobalt, total	ug/L	<2	<2	<2	<2	<2
Copper, total	ug/L	<3.00	<3.00	<3.00	7.68	<3.00
Field Temperature	F	56.3	55.6	56.5	54.3	73.9
Fluoride	mg/L	.136	.129	<.100	.149	.147
Formaldehyde	ug/L	<100	<100	<100	<100	<100
Iron, total	ug/L	24.4	37.1	43.0	23.8	21.7
Lead, total	ug/L	<2	<2	<2	<2	<2
Magnesium, total	mg/L	48.7	46.5	21.3	40.6	37.4
Manganese, total	ug/L	<20	<20	<20	<20	<20
Mercury, total	ug/L	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L	<10	<10	<10	<10	<10
Molybdenum, total	ug/L	<10	<10	<10	<10	<10
Nickel, total	ug/L	<1	<1	<1	<1	<1
pH (Field)	SU	8.2	8.0	8.0	7.9	8.4
Phenols	ug/L	<10	<10	<10	17	<10
Selenium, total	ug/L	<5	<5	<5	<5	<5
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS	539	528	323	499	774
Sulfate	mg/L	8.47	25.20	5.52	7.93	100.00
Thallium, total	ug/L	<3	<3	<3	<3	<3
Total organic halogen	mg/L	<.010	<.010	.019	.014	.071
Total suspended solids	mg/L	2	<1	2	<1	3
Vanadium, total	ug/L	<1	<1	<1	<1	<1
Zinc, total	ug/L	5.68	6.41	6.99	9.82	<5.00

* - The displayed value is the arithmetic mean of multiple database matches.

Attachment B

Historical Ground Water Data

Table 1

Analytical Data Summary for MW-1

Constituents	Units	8/23/2018	11/14/2018	1/10/2019	4/1/2019	9/17/2019	4/6/2020	9/24/2020	4/27/2021	9/28/2021
Aluminum, total	ug/L	1070.0	26.2	47.0	65.7	877.0	89.5	53.5	134.0	<100.0
Ammonia nitrogen	mg/L	<.10	<.10	.13	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium, total	ug/L	77.8	51.6	49.0	54.6	87.5	72.8	45.9	43.0	41.8
Beryllium, total	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron, total	ug/L	21.3	<20.0	21.8	<20.0	<20.0	31.0	<20.0	<20.0	<20.0
Cadmium, total	ug/L	<.40	<.40	<.40	<.40	<.40	<.40	<.40	<.40	<.40
Chemical oxygen demand	mg/L	10	9	15	7	<6	<7	7	<7	<7
Chloride	mg/L	6.47	6.75	5.14	4.77	11.20	5.35	3.77	3.11	3.75
Chromium, total	ug/L	1.68	<1.00	1.58	3.46	8.86	9.68	4.83	11.30	2.44
Cobalt, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Copper, total	ug/L	3.85	2.75	<2.00	6.80	3.44	4.17	<2.00	6.72	<3.00
Field Temperature	F									55.2
Fluoride	mg/L	<.100	<.100	<.100	.102	.270	.212	.137	.104	.141
Formaldehyde	ug/L	<100	<100	<100	<100	<100	<50	<50	<100	<100
Iron, total	ug/L	562.0	38.8	62.1	164.0	710.0	142.0	56.2	122.0	46.4
Lead, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium, total	mg/L	34.1	30.9	33.3	34.9	46.3	31.9	47.9	55.2	49.9
Manganese, total	ug/L	57.5	<20.0	<20.0	<20.0	73.6	<20.0	<20.0	<20.0	<20.0
Mercury, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L	<10	<10	<10	<10	<100	<5	<5	<10	<5
Molybdenum, total	ug/L	2.22	<2.00	2.49	<2.00	<2.00	<2.00	<2.00	<10.00	<10.00
Nickel, total	ug/L	<1.00	<1.00	1.00	<1.00	1.47	<1.00	<1.00	3.08	<1.00
pH (Field)	SU							8.0		8.5
Phenols	ug/L	<5	<5	6	27	13	<5	13	<5	8
Selenium, total	ug/L	<5.00	<5.00	5.15	<5.00	7.45	6.73	<5.00	<5.00	<5.00
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS							520		530
Sulfate	mg/L	14.70	44.80	15.80	15.90	82.80	30.40	12.00	7.72	10.80
Thallium, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<3	<3
Total organic halogen	mg/L	<.0050	.0066	.0094	<.0050	.0910	<.0100	<.0100	.0100	<.0200
Total Organic Halogens-1	mg/L								.016	
Total Organic Halogens-2	mg/L								<.01	
Total suspended solids	mg/L	8	60	21	59	48	12	20	21	18
Vanadium, total	ug/L	1.87	<1.00	<1.00	<1.00	1.88	<1.00	<1.00	<1.00	<1.00
Zinc, total	ug/L	<5.00	<5.00	<5.00	22.40	23.40	30.50	9.57	14.00	<5.00

* - The displayed value is the arithmetic mean of multiple database matches.

Table 1

Analytical Data Summary for MW-1

Constituents	5/11/2022	9/14/2022	5/10/2023	9/13/2023	5/15/2024	9/17/2024
Aluminum, total	330.0	125.0	<100.0	<100.0	<100.0	<100.0
Ammonia nitrogen	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	<5	<5	<5	<5	<5	<5
Arsenic, total	<10	<10	<10	<10	<10	<10
Barium, total	49.1	40.7	32.3	44.1	46.4	36.1
Beryllium, total	<1	<1	<1	<1	<1	<1
Boron, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Cadmium, total	1.02	<.40	<.40	<.40	<.40	<.40
Chemical oxygen demand	8	<7	6	<10	<10	<10
Chloride	3.88	3.57	11.60	4.81	13.90	3.42
Chromium, total	12.30	8.33	2.59	7.12	4.37	2.88
Cobalt, total	<2	<2	<2	<2	<2	<2
Copper, total	3.50	<3.00	<3.00	<3.00	<3.00	<3.00
Field Temperature				54.7	55.8	56.3
Fluoride	<.100	.108	.138	.101	.105	.136
Formaldehyde	<100	<100	<100	<100	<100	<100
Iron, total	338.0	140.0	<10.0	79.4	38.2	24.4
Lead, total	<2	<2	<2	<2	<2	<2
Magnesium, total	54.9	45.3	34.0	50.3	38.4	48.7
Manganese, total	31.4	<20.0	<20.0	<20.0	<20.0	<20.0
Mercury, total	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	<10	<10	<10	<10	<10	<10
Molybdenum, total	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00
Nickel, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
pH (Field)	8.4	8.6		8.3	8.4	8.2
Phenols	8	<5	<8	<8	<10	<10
Selenium, total	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Silver, total	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	544	459		475	530	539
Sulfate	11.90	8.97	13.80	10.90	19.10	8.47
Thallium, total	<3	<3	<3	<3	<3	<3
Total organic halogen	<.0100	<.0100	<.0100	.0120	<.0100	<.0100
Total Organic Halogens-1						
Total Organic Halogens-2						
Total suspended solids	34	14	11	9	5	2
Vanadium, total	1.27	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	15.00	11.10	8.50	13.50	9.64	5.68

* - The displayed value is the arithmetic mean of multiple database matches.

Table 2

Analytical Data Summary for MW-2

Constituents	Units	8/23/2018	11/14/2018	1/10/2019	4/1/2019	9/17/2019	4/6/2020	9/24/2020	4/27/2021	9/28/2021
Aluminum, total	ug/L	111.0	547.0	550.0	18.4	134.0	59.8	20.1	<100.0	431.0
Ammonia nitrogen	mg/L	<.10	<.10	.23	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium, total	ug/L	151.0	75.3	61.2	59.1	58.6	64.8	56.6	57.1	75.0
Beryllium, total	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron, total	ug/L	22.2	49.6	49.3	41.3	20.6	<20.0	<20.0	<20.0	<20.0
Cadmium, total	ug/L	<.40	<.40	<.40	<.40	<.40	<.40	<.40	<.40	<.40
Chemical oxygen demand	mg/L	8	11	16	<6	<6	8	<7	<7	<7
Chloride	mg/L	59.40	60.80	63.10	32.70	7.79	3.18	2.89	3.48	2.99
Chromium, total	ug/L	<1.00	4.32	6.77	<1.00	7.46	6.65	5.13	6.87	23.00
Cobalt, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Copper, total	ug/L	4.95	4.10	2.33	<2.00	<2.00	<2.00	<2.00	<3.00	5.45
Field Temperature	F									55.0
Fluoride	mg/L	<.100	<.100	<.100	.187	.430	.229	.128	.151	.228
Formaldehyde	ug/L	<100	<100	<100	<100	<100	<50	<50	<100	<100
Iron, total	ug/L	391.0	1180.0	1230.0	37.2	231.0	119.0	19.7	109.0	699.0
Lead, total	ug/L	<2.00	<2.00	2.21	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Magnesium, total	mg/L	54.8	73.2	84.6	61.7	58.5	47.8	50.0	55.5	54.9
Manganese, total	ug/L	35.4	104.0	81.7	37.7	57.0	108.0	<20.0	95.0	301.0
Mercury, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L	<10	<10	<10	<10	<100	<5	<5	<10	<5
Molybdenum, total	ug/L	<2.00	3.77	7.53	4.74	<2.00	<2.00	<2.00	<10.00	<10.00
Nickel, total	ug/L	<1.00	1.50	3.22	<1.00	1.07	<1.00	<1.00	3.35	1.46
pH (Field)	SU							8.0		8.0
Phenols	ug/L	<5	<5	<5	18	6	<5	11	<5	8
Selenium, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS							573		548
Sulfate	mg/L	29.8	37.0	26.8	26.3	23.4	24.3	24.0	24.4	25.4
Thallium, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<3	<3
Total organic halogen	mg/L	<.005	.020	.067	.011	.093	<.010	<.010	<.010	<.020
Total Organic Halogens-1	mg/L								<.01	
Total Organic Halogens-2	mg/L								<.01	
Total suspended solids	mg/L	91	29	152	57	51	13	17	19	20
Vanadium, total	ug/L	<1.00	1.37	1.28	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	ug/L	<5.00	5.30	12.30	<5.00	12.10	9.28	5.48	<5.00	19.80

* - The displayed value is the arithmetic mean of multiple database matches.

Table 2

Analytical Data Summary for MW-2

Constituents	5/11/2022	9/14/2022	5/10/2023	9/13/2023	5/15/2024	9/17/2024
Aluminum, total	<100.0	<100.0	<100.0	<100.0	<100.0	<100.0
Ammonia nitrogen	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	<5	<5	<5	<5	<5	<5
Arsenic, total	<10	<10	<10	<10	<10	<10
Barium, total	63.0	54.1	61.0	60.0	57.6	61.1
Beryllium, total	<1	<1	<1	<1	<1	<1
Boron, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Cadmium, total	.67	<.40	<.40	<.40	<.40	<.40
Chemical oxygen demand	<7	<7	14	<10	<10	<10
Chloride	2.90	2.75	2.74	2.75	3.54	2.91
Chromium, total	15.00	5.96	5.13	3.48	1.49	7.19
Cobalt, total	<2	<2	<2	<2	<2	<2
Copper, total	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Field Temperature				54.0	55.2	55.6
Fluoride	.122	.158	.136	.114	.128	.129
Formaldehyde	<100	<100	<100	<100	<100	<100
Iron, total	162.0	68.9	18.3	15.4	<10.0	37.1
Lead, total	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Magnesium, total	51.6	44.6	52.6	49.9	54.2	46.5
Manganese, total	70.9	37.6	<20.0	23.5	<20.0	<20.0
Mercury, total	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	<10	<10	<10	<10	<10	<10
Molybdenum, total	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00
Nickel, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
pH (Field)	7.9	8.0		8.1	8.1	8.0
Phenols	<5	<5	<8	<8	<10	<10
Selenium, total	<5	<5	<5	<5	<5	<5
Silver, total	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	550	525		556	490	528
Sulfate	25.7	24.4	23.8	20.7	27.0	25.2
Thallium, total	<3	<3	<3	<3	<3	<3
Total organic halogen	.012	.024	<.010	.012	<.010	<.010
Total Organic Halogens-1						
Total Organic Halogens-2						
Total suspended solids	24	40	8	8	1	<1
Vanadium, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	11.20	<5.00	5.34	5.13	<5.00	6.41

* - The displayed value is the arithmetic mean of multiple database matches.

Table 3

Analytical Data Summary for MW-3

Constituents	Units	8/23/2018	11/14/2018	1/10/2019	4/1/2019	9/17/2019	4/6/2020	9/24/2020	4/27/2021	9/28/2021
Aluminum, total	ug/L	22.9	219.0	99.0	58.8	575.0	248.0	193.0	266.0	2720.0
Ammonia nitrogen	mg/L	<.10	<.10	.26	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium, total	ug/L	33.2	25.9	21.1	26.5	42.9	33.8	29.3	33.5	79.0
Beryllium, total	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron, total	ug/L	<20.0	<20.0	20.0	<20.0	<20.0	<20.0	<20.0	<20.0	21.3
Cadmium, total	ug/L	<.4	<.4	<.4	<.4	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	mg/L	7	14	11	13	7	<7	<7	<7	<7
Chloride	mg/L	.834	4.610	1.480	1.060	.762	.715	.751	.790	.666
Chromium, total	ug/L	<1.00	1.62	4.08	4.00	16.40	11.20	4.26	16.30	13.50
Cobalt, total	ug/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	3.37
Copper, total	ug/L	32.60	5.91	<2.00	3.08	7.33	<2.00	2.31	3.50	5.14
Field Temperature	F									54.5
Fluoride	mg/L	<.100	<.100	<.100	<.100	.220	.100	.144	<.100	<.100
Formaldehyde	ug/L	<100	<100	<100	<100	<100	<50	<50	<100	<100
Iron, total	ug/L	27.8	177.0	130.0	116.0	1740.0	541.0	663.0	492.0	4830.0
Lead, total	ug/L	<2.00	<2.00	<2.00	<2.00	2.41	<2.00	<2.00	<2.00	2.32
Magnesium, total	mg/L	22.0	22.2	24.2	25.5	36.6	27.1	24.7	30.2	62.8
Manganese, total	ug/L	<20.0	<20.0	<20.0	<20.0	102.0	45.2	38.4	39.4	451.0
Mercury, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L	<10	<10	<10	<10	<100	<5	<5	<10	<5
Molybdenum, total	ug/L	<2.00	4.03	3.06	<2.00	<2.00	<2.00	<2.00	<10.00	<10.00
Nickel, total	ug/L	<1.00	1.17	1.60	<1.00	2.51	<1.00	<1.00	3.52	5.05
pH (Field)	SU							8.2		8.2
Phenols	ug/L	<5	<5	22	<5	<5	<5	12	<5	<5
Selenium, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS							315		319
Sulfate	mg/L	4.69	5.18	4.76	4.42	3.63	4.89	4.11	4.82	4.97
Thallium, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<3	<3
Total organic halogen	mg/L	<.005	.009	.013	.017	.050	<.010	<.010	<.010	<.020
Total Organic Halogens-1	mg/L								<.01	
Total Organic Halogens-2	mg/L								<.01	
Total suspended solids	mg/L	75	41	29	97	138	144	48	93	126
Vanadium, total	ug/L	<1.00	<1.00	<1.00	<1.00	1.41	<1.00	<1.00	<1.00	5.76
Zinc, total	ug/L	<5.00	20.10	<5.00	12.10	22.80	10.80	6.67	7.16	8.45

* - The displayed value is the arithmetic mean of multiple database matches.

Table 3

Analytical Data Summary for MW-3

Constituents	5/11/2022	9/14/2022	5/10/2023	9/13/2023	5/15/2024	9/17/2024
Aluminum, total	870.0	124.0	<100.0	<100.0	<100.0	<100.0
Ammonia nitrogen	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	<5	<5	<5	<5	<5	<5
Arsenic, total	<10	<10	<10	<10	<10	<10
Barium, total	44.6	31.4	26.9	27.6	31.7	27.6
Beryllium, total	<1	<1	<1	<1	<1	<1
Boron, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Cadmium, total	<.4	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	<7	<7	20	<10	<10	<10
Chloride	.853	.787	.611	.633	.607	.608
Chromium, total	8.11	6.86	4.84	4.61	7.70	5.90
Cobalt, total	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Copper, total	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Field Temperature				52.9	54.1	56.5
Fluoride	<.100	<.100	.104	<.100	<.100	<.100
Formaldehyde	<100	<100	<100	<100	<100	<100
Iron, total	1900.0	135.0	22.9	35.1	41.7	43.0
Lead, total	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Magnesium, total	42.6	21.6	23.0	24.0	25.8	21.3
Manganese, total	145.0	<20.0	<20.0	<20.0	<20.0	<20.0
Mercury, total	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	<10	<10	<10	<10	<10	<10
Molybdenum, total	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00
Nickel, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
pH (Field)	8.3	8.0		8.2	8.2	8.0
Phenols	<5	<5	<8	<8	<10	<10
Selenium, total	<5	<5	<5	<5	<5	<5
Silver, total	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	290	332		320	316	323
Sulfate	5.31	4.92	5.12	5.57	5.16	5.52
Thallium, total	<3	<3	<3	<3	<3	<3
Total organic halogen	<.010	<.010	<.010	<.010	<.010	.019
Total Organic Halogens-1						
Total Organic Halogens-2						
Total suspended solids	632	315	15	29	7	2
Vanadium, total	1.92	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	<5.00	8.32	8.36	<5.00	9.15	6.99

* - The displayed value is the arithmetic mean of multiple database matches.

Table 4

Analytical Data Summary for MW-4

Constituents	Units	8/23/2018	8/28/2018	11/30/2018	1/10/2019	4/1/2019	9/17/2019	4/6/2020	9/24/2020	4/27/2021
Aluminum, total	ug/L	105.0		755.0	32.1	113.0	87.5	54.1	51.2	<100.0
Ammonia nitrogen	mg/L		<.10	<.10	.12	<.10	<.10	<.10	<.10	<.10
Antimony, total	ug/L		<5	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10		<10	<10	<10	<10	<10	<10	<10
Barium, total	ug/L	49.7		34.5	38.6	47.4	44.4	46.2	44.5	41.1
Beryllium, total	ug/L	<1		<1	<1	<1	<1	<1	<1	<1
Boron, total	ug/L		90.1	31.0	21.0	<20.0	<20.0	<20.0	<20.0	<20.0
Cadmium, total	ug/L	<.4		<.4	<.4	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	mg/L		15	17	15	7	<6	<7	10	<7
Chloride	mg/L	34.10		20.90	12.80	6.63	3.49	2.95	2.60	2.65
Chromium, total	ug/L	<1.00		4.82	2.12	9.75	13.30	10.00	6.73	13.00
Cobalt, total	ug/L		<2	<2	<2	<2	<2	<2	<2	<2
Copper, total	ug/L		<2.00	6.27	<2.00	6.40	<2.00	<2.00	<2.00	<3.00
Field Temperature	F									
Fluoride	mg/L		<.100	<.100	<.100	.145	.300	.200	.152	.141
Formaldehyde	ug/L		<100	<100	<100	<100	<100	<50	<50	<100
Iron, total	ug/L		193.0	1130.0	69.2	211.0	198.0	107.0	204.0	75.0
Lead, total	ug/L		<2.00	<2.00	<2.00	3.01	<2.00	<2.00	<2.00	<2.00
Magnesium, total	mg/L		55.3	72.0	48.9	52.9	49.3	43.2	45.4	46.8
Manganese, total	ug/L		25.7	100.0	<20.0	20.9	<20.0	22.8	<20.0	<20.0
Mercury, total	ug/L		<2	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L		<10	<10	<10	<10	<100	<5	<5	<10
Molybdenum, total	ug/L		3.81	<2.00	3.23	<2.00	<2.00	<2.00	<2.00	<10.00
Nickel, total	ug/L		<1.00	<1.00	1.51	<1.00	<1.00	<1.00	<1.00	2.48
pH (Field)	SU								8.0	
Phenols	ug/L		16.0	<5.0	25.0	.5	<5.0	<5.0	5.0	<5.0
Selenium, total	ug/L		<5	<5	<5	<5	<5	<5	<5	<5
Silver, total	ug/L		<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS								515	
Sulfate	mg/L		25.10	13.80	6.97	5.53	5.26	7.20	7.56	8.07
Thallium, total	ug/L		<2	<2	<2	<2	<2	<2	<2	<3
Total organic halogen	mg/L		.0609	.0230	.0150	.0130	.1100	<.0100	<.0100	.0140
Total Organic Halogens-1	mg/L									.021
Total Organic Halogens-2	mg/L									<.01
Total suspended solids	mg/L		500	237	38	20	44	18	19	21
Vanadium, total	ug/L		<1.00	1.26	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	ug/L		<5.00	18.80	<5.00	31.40	17.90	10.50	16.60	10.10

* - The displayed value is the arithmetic mean of multiple database matches.

Table 4

Analytical Data Summary for MW-4

Constituents	9/28/2021	5/11/2022	9/14/2022	5/10/2023	9/13/2023	5/15/2024	9/17/2024
Aluminum, total	<100.0	<100.0	<100.0	<100.0	<100.0	<100.0	<100.0
Ammonia nitrogen	<.10	<.10	<.10	<.10	<.10	<.10	<.10
Antimony, total	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	<10	<10	<10	<10	<10	<10	<10
Barium, total	44.3	41.8	36.3	38.9	41.4	42.2	38.4
Beryllium, total	<1	<1	<1	<1	<1	<1	<1
Boron, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Cadmium, total	<.4	<.4	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	<7	<7	<7	14	<10	<10	<10
Chloride	2.68	3.38	3.04	2.88	2.74	2.91	2.60
Chromium, total	12.90	9.66	5.18	8.60	12.10	7.20	5.60
Cobalt, total	<2	<2	<2	<2	<2	<2	<2
Copper, total	3.44	<3.00	<3.00	<3.00	<3.00	<3.00	7.68
Field Temperature	54.1				52.5	53.6	54.3
Fluoride	.160	.123	.144	.150	.124	.105	.149
Formaldehyde	<100	<100	<100	<100	<100	<100	<100
Iron, total	101.0	97.4	44.3	35.4	55.4	38.1	23.8
Lead, total	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Magnesium, total	44.7	47.4	40.6	45.1	46.7	49.1	40.6
Manganese, total	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Mercury, total	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	<5	<10	<10	<10	<10	<10	<10
Molybdenum, total	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00
Nickel, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
pH (Field)	7.9	7.8	7.8		7.9	7.9	7.9
Phenols	<5.0	<5.0	<5.0	<8.0	<8.0	<10.0	17.0
Selenium, total	<5	<5	<5	<5	<5	<5	<5
Silver, total	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	492	508	514		486	490	499
Sulfate	8.70	11.70	10.00	<.10	8.93	8.82	7.93
Thallium, total	<3	<3	<3	<3	<3	<3	<3
Total organic halogen	<.0200	<.0100	.0270	<.0100	.0100	<.0100	.0140
Total Organic Halogens-1							
Total Organic Halogens-2							
Total suspended solids	26	18	19	11	8	3	<1
Vanadium, total	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	9.33	7.59	7.58	8.85	7.81	9.86	9.82

* - The displayed value is the arithmetic mean of multiple database matches.

Table 5

Analytical Data Summary for Sump Comp

Constituents	Units	5/10/2023
Aluminum, total	ug/L	<100
Ammonia nitrogen	mg/L	.11
Antimony, total	ug/L	<5
Arsenic, total	ug/L	<10
Barium, total	ug/L	97.6
Beryllium, total	ug/L	<1
Boron, total	ug/L	60.5
Cadmium, total	ug/L	<.4
Chemical oxygen demand	mg/L	15
Chloride	mg/L	22.4
Chromium, total	ug/L	<1
Cobalt, total	ug/L	<2
Copper, total	ug/L	<3
Fluoride	mg/L	.167
Formaldehyde	ug/L	<100
Iron, total	ug/L	38.2
Lead, total	ug/L	<2
Magnesium, total	mg/L	40.8
Manganese, total	ug/L	<20
Mercury, total	ug/L	<2
Methyl ethyl ketone	ug/L	<10
Molybdenum, total	ug/L	<10
Nickel, total	ug/L	<1
pH (Field)	SU	8.4
Phenols	ug/L	<8
Selenium, total	ug/L	<5
Silver, total	ug/L	<.5
Specific conductivity (Field)	uS	654
Sulfate	mg/L	76.7
Thallium, total	ug/L	<3
Total organic halogen	mg/L	<.01
Total suspended solids	mg/L	6
Vanadium, total	ug/L	<1
Zinc, total	ug/L	<5

* - The displayed value is the arithmetic mean of multiple database matches.

Table 6

Analytical Data Summary for Sump Grab

Constituents	Units	4/6/2020	9/24/2020	4/27/2021	9/28/2021	5/11/2022	9/14/2022	9/13/2023	5/15/2024	9/17/2024
Aluminum, total	ug/L	47	158	<100	<100	<100	<100	<100	107	<100
Ammonia nitrogen	mg/L	<.10	<.10	<.10	.25	<.10	<.10	<.10	<.10	<.10
Antimony, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Arsenic, total	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10
Barium, total	ug/L	109.0	108.0	93.1	127.0	98.8	79.0	133.0	119.0	127.0
Beryllium, total	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron, total	ug/L	40.5	54.8	34.2	30.4	36.6	63.5	81.1	83.2	90.0
Cadmium, total	ug/L	<.4	<.4	<.4	<.4	<.4	<.4	<.4	<.4	<.4
Chemical oxygen demand	mg/L	7	9	<7	<7	<7	<7	<10	<10	<10
Chloride	mg/L	35.5	29.3	23.6	19.0	13.0	11.9	22.9	18.2	23.7
Chromium, total	ug/L	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cobalt, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Copper, total	ug/L	<2.00	11.20	<3.00	5.68	11.00	<3.00	<3.00	15.10	<3.00
Field Temperature	F				64.6			69.4	62.0	73.9
Fluoride	mg/L	.170	.159	.174	.136	.126	.147	.141	.129	.147
Formaldehyde	ug/L	<50	<50	<100	<100	<100	<100	<100	<100	<100
Iron, total	ug/L	55.0	3250.0	146.0	42.9	47.0	<10.0	<10.0	48.8	21.7
Lead, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium, total	mg/L	37.4	34.6	41.5	39.4	37.4	31.4	43.0	42.2	37.4
Manganese, total	ug/L	<20.0	103.0	<20.0	21.5	<20.0	<20.0	<20.0	<20.0	<20.0
Mercury, total	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2
Methyl ethyl ketone	ug/L		<5	<10	<5	<10	<10	<10	<10	<10
Molybdenum, total	ug/L	<2	<2	<10	<10	<10	<10	<10	<10	<10
Nickel, total	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH (Field)	SU		8.4		8.2	8.4	8.4	8.2	8.3	8.4
Phenols	ug/L	<5	6	5	9	<5	<5	<8	<10	<10
Selenium, total	ug/L	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver, total	ug/L	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Specific conductivity (Field)	uS		665		586	510	445	570	540	774
Sulfate	mg/L	122.0	66.8	120.0	33.6	39.0	43.6	20.1	75.2	100.0
Thallium, total	ug/L	<2	<2	<3	<3	<3	<3	<3	<3	<3
Total organic halogen	mg/L		<.010	.024	<.020	<.010	.039	<.010	<.010	.071
Total Organic Halogens-1	mg/L			.012						
Total Organic Halogens-2	mg/L			.036						
Total suspended solids	mg/L	7	10	6	4	5	5	1	3	3
Vanadium, total	ug/L	<1.00	1.71	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Zinc, total	ug/L	<5.0	22.5	<5.0	14.6	11.8	<5.0	<5.0	53.8	<5.0

* - The displayed value is the arithmetic mean of multiple database matches.

Attachment C

Summary Tables and Graphs for the Interwell Comparisons
First Semi-Annual Monitoring Event in 2024

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Aluminum, total	ug/L	MW-3	08/23/2018		22.9000		
Aluminum, total	ug/L	MW-3	11/14/2018		219.0000		
Aluminum, total	ug/L	MW-3	01/10/2019		99.0000		
Aluminum, total	ug/L	MW-3	04/01/2019		58.8000		
Aluminum, total	ug/L	MW-3	09/17/2019		575.0000		
Aluminum, total	ug/L	MW-3	04/06/2020		248.0000		
Aluminum, total	ug/L	MW-3	09/24/2020		193.0000		
Aluminum, total	ug/L	MW-3	04/27/2021		266.0000		
Aluminum, total	ug/L	MW-3	09/28/2021		2720.0000		*
Aluminum, total	ug/L	MW-3	05/11/2022		870.0000		
Aluminum, total	ug/L	MW-3	09/14/2022		124.0000		
Aluminum, total	ug/L	MW-3	05/10/2023	ND	100.0000		
Aluminum, total	ug/L	MW-3	09/13/2023	ND	100.0000		
Aluminum, total	ug/L	MW-3	05/15/2024	ND	100.0000		
Aluminum, total	ug/L	MW-4	08/23/2018		105.0000		
Aluminum, total	ug/L	MW-4	11/30/2018		755.0000		*
Aluminum, total	ug/L	MW-4	01/10/2019		32.1000		
Aluminum, total	ug/L	MW-4	04/01/2019		113.0000		
Aluminum, total	ug/L	MW-4	09/17/2019		87.5000		
Aluminum, total	ug/L	MW-4	04/06/2020		54.1000		
Aluminum, total	ug/L	MW-4	09/24/2020		51.2000		
Aluminum, total	ug/L	MW-4	04/27/2021	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/28/2021	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/11/2022	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/14/2022	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/10/2023	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/13/2023	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/15/2024	ND	100.0000		
Ammonia nitrogen	mg/L	MW-3	08/23/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	11/14/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	01/10/2019		0.2600		
Ammonia nitrogen	mg/L	MW-3	04/01/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/17/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	04/06/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/24/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	04/27/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/28/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/11/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/14/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/10/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/13/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/15/2024	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	08/28/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	11/30/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	01/10/2019		0.1200		
Ammonia nitrogen	mg/L	MW-4	04/01/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/17/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	04/06/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/24/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	04/27/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/28/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/11/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/14/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/10/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/13/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/15/2024	ND	0.1000		
Antimony, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Antimony, total	ug/L	MW-3	11/14/2018	ND	5.0000		
Antimony, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	04/01/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	09/17/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	04/06/2020	ND	5.0000		
Antimony, total	ug/L	MW-3	09/24/2020	ND	5.0000		
Antimony, total	ug/L	MW-3	04/27/2021	ND	5.0000		
Antimony, total	ug/L	MW-3	09/28/2021	ND	5.0000		
Antimony, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Antimony, total	ug/L	MW-3	09/14/2022	ND	5.0000		
Antimony, total	ug/L	MW-3	05/10/2023	ND	5.0000		
Antimony, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Antimony, total	ug/L	MW-3	05/15/2024	ND	5.0000		
Antimony, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Antimony, total	ug/L	MW-4	11/30/2018	ND	5.0000		
Antimony, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Antimony, total	ug/L	MW-4	04/01/2019	ND	5.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Antimony, total	ug/L	MW-4	09/17/2019	ND	5.0000		
Antimony, total	ug/L	MW-4	04/06/2020	ND	5.0000		
Antimony, total	ug/L	MW-4	09/24/2020	ND	5.0000		
Antimony, total	ug/L	MW-4	04/27/2021	ND	5.0000		
Antimony, total	ug/L	MW-4	09/28/2021	ND	5.0000		
Antimony, total	ug/L	MW-4	05/11/2022	ND	5.0000		
Antimony, total	ug/L	MW-4	09/14/2022	ND	5.0000		
Antimony, total	ug/L	MW-4	05/10/2023	ND	5.0000		
Antimony, total	ug/L	MW-4	09/13/2023	ND	5.0000		
Antimony, total	ug/L	MW-4	05/15/2024	ND	5.0000		
Arsenic, total	ug/L	MW-3	08/23/2018	ND	10.0000		
Arsenic, total	ug/L	MW-3	11/14/2018	ND	10.0000		
Arsenic, total	ug/L	MW-3	01/10/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/01/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/17/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/06/2020	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/24/2020	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/27/2021	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/28/2021	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/11/2022	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/14/2022	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/10/2023	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/13/2023	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/15/2024	ND	10.0000		
Arsenic, total	ug/L	MW-4	08/23/2018	ND	10.0000		
Arsenic, total	ug/L	MW-4	11/30/2018	ND	10.0000		
Arsenic, total	ug/L	MW-4	01/10/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/01/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/17/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/06/2020	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/24/2020	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/27/2021	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/28/2021	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/11/2022	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/14/2022	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/10/2023	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/13/2023	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/15/2024	ND	10.0000		
Barium, total	ug/L	MW-3	08/23/2018		33.2000		
Barium, total	ug/L	MW-3	11/14/2018		25.9000		
Barium, total	ug/L	MW-3	01/10/2019		21.1000		
Barium, total	ug/L	MW-3	04/01/2019		26.5000		
Barium, total	ug/L	MW-3	09/17/2019		42.9000		
Barium, total	ug/L	MW-3	04/06/2020		33.8000		
Barium, total	ug/L	MW-3	09/24/2020		29.3000		
Barium, total	ug/L	MW-3	04/27/2021		33.5000		
Barium, total	ug/L	MW-3	09/28/2021		79.0000		
Barium, total	ug/L	MW-3	05/11/2022		44.6000		
Barium, total	ug/L	MW-3	09/14/2022		31.4000		
Barium, total	ug/L	MW-3	05/10/2023		26.9000		
Barium, total	ug/L	MW-3	09/13/2023		27.6000		
Barium, total	ug/L	MW-3	05/15/2024		31.7000		
Barium, total	ug/L	MW-4	08/23/2018		49.7000		
Barium, total	ug/L	MW-4	11/30/2018		34.5000		
Barium, total	ug/L	MW-4	01/10/2019		38.6000		
Barium, total	ug/L	MW-4	04/01/2019		47.4000		
Barium, total	ug/L	MW-4	09/17/2019		44.4000		
Barium, total	ug/L	MW-4	04/06/2020		46.2000		
Barium, total	ug/L	MW-4	09/24/2020		44.5000		
Barium, total	ug/L	MW-4	04/27/2021		41.1000		
Barium, total	ug/L	MW-4	09/28/2021		44.3000		
Barium, total	ug/L	MW-4	05/11/2022		41.8000		
Barium, total	ug/L	MW-4	09/14/2022		36.3000		
Barium, total	ug/L	MW-4	05/10/2023		38.9000		
Barium, total	ug/L	MW-4	09/13/2023		41.4000		
Barium, total	ug/L	MW-4	05/15/2024		42.2000		
Beryllium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Beryllium, total	ug/L	MW-3	11/14/2018	ND	1.0000		
Beryllium, total	ug/L	MW-3	01/10/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/17/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/06/2020	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/27/2021	ND	1.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Beryllium, total	ug/L	MW-3	09/28/2021	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/11/2022	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Beryllium, total	ug/L	MW-4	08/23/2018	ND	1.0000		
Beryllium, total	ug/L	MW-4	11/30/2018	ND	1.0000		
Beryllium, total	ug/L	MW-4	01/10/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/27/2021	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Boron, total	ug/L	MW-3	08/23/2018	ND	20.0000		
Boron, total	ug/L	MW-3	11/14/2018	ND	20.0000		
Boron, total	ug/L	MW-3	01/10/2019		20.0000		
Boron, total	ug/L	MW-3	04/01/2019	ND	20.0000		
Boron, total	ug/L	MW-3	09/17/2019	ND	20.0000		
Boron, total	ug/L	MW-3	04/06/2020	ND	20.0000		
Boron, total	ug/L	MW-3	09/24/2020	ND	20.0000		
Boron, total	ug/L	MW-3	04/27/2021	ND	20.0000		
Boron, total	ug/L	MW-3	09/28/2021		21.3000		
Boron, total	ug/L	MW-3	05/11/2022	ND	20.0000		
Boron, total	ug/L	MW-3	09/14/2022	ND	20.0000		
Boron, total	ug/L	MW-3	05/10/2023	ND	20.0000		
Boron, total	ug/L	MW-3	09/13/2023	ND	20.0000		
Boron, total	ug/L	MW-3	05/15/2024	ND	20.0000		
Boron, total	ug/L	MW-4	08/28/2018		90.1000		*
Boron, total	ug/L	MW-4	11/30/2018		31.0000		
Boron, total	ug/L	MW-4	01/10/2019		21.0000		
Boron, total	ug/L	MW-4	04/01/2019	ND	20.0000		
Boron, total	ug/L	MW-4	09/17/2019	ND	20.0000		
Boron, total	ug/L	MW-4	04/06/2020	ND	20.0000		
Boron, total	ug/L	MW-4	09/24/2020	ND	20.0000		
Boron, total	ug/L	MW-4	04/27/2021	ND	20.0000		
Boron, total	ug/L	MW-4	09/28/2021	ND	20.0000		
Boron, total	ug/L	MW-4	05/11/2022	ND	20.0000		
Boron, total	ug/L	MW-4	09/14/2022	ND	20.0000		
Boron, total	ug/L	MW-4	05/10/2023	ND	20.0000		
Boron, total	ug/L	MW-4	09/13/2023	ND	20.0000		
Boron, total	ug/L	MW-4	05/15/2024	ND	20.0000		
Cadmium, total	ug/L	MW-3	08/23/2018	ND	0.4000		
Cadmium, total	ug/L	MW-3	11/14/2018	ND	0.4000		
Cadmium, total	ug/L	MW-3	01/10/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/01/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/17/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/06/2020	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/24/2020	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/27/2021	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/28/2021	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/11/2022	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/14/2022	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/10/2023	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/13/2023	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/15/2024	ND	0.4000		
Cadmium, total	ug/L	MW-4	08/23/2018	ND	0.4000		
Cadmium, total	ug/L	MW-4	11/30/2018	ND	0.4000		
Cadmium, total	ug/L	MW-4	01/10/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/01/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/17/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/06/2020	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/24/2020	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/27/2021	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/28/2021	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/11/2022	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/14/2022	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/10/2023	ND	0.4000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
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Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Cadmium, total	ug/L	MW-4	09/13/2023	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/15/2024	ND	0.4000		
Chemical oxygen demand	mg/L	MW-3	08/23/2018		7.0000		
Chemical oxygen demand	mg/L	MW-3	11/14/2018		14.0000		
Chemical oxygen demand	mg/L	MW-3	01/10/2019		11.0000		
Chemical oxygen demand	mg/L	MW-3	04/01/2019		13.0000		
Chemical oxygen demand	mg/L	MW-3	09/17/2019		7.0000		
Chemical oxygen demand	mg/L	MW-3	04/06/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/24/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	04/27/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/28/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	05/11/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/14/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	05/10/2023		20.0000		
Chemical oxygen demand	mg/L	MW-3	09/13/2023	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-3	05/15/2024	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	08/28/2018		15.0000		
Chemical oxygen demand	mg/L	MW-4	11/30/2018		17.0000		
Chemical oxygen demand	mg/L	MW-4	01/10/2019		15.0000		
Chemical oxygen demand	mg/L	MW-4	04/01/2019		7.0000		
Chemical oxygen demand	mg/L	MW-4	09/17/2019	ND	6.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	04/06/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/24/2020		10.0000		
Chemical oxygen demand	mg/L	MW-4	04/27/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/28/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	05/11/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/14/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	05/10/2023		14.0000		
Chemical oxygen demand	mg/L	MW-4	09/13/2023	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	05/15/2024	ND	10.0000	7.0000	**
Chloride	mg/L	MW-3	08/23/2018		0.8340		
Chloride	mg/L	MW-3	11/14/2018		4.6100		*
Chloride	mg/L	MW-3	01/10/2019		1.4800		
Chloride	mg/L	MW-3	04/01/2019		1.0600		
Chloride	mg/L	MW-3	09/17/2019		0.7620		
Chloride	mg/L	MW-3	04/06/2020		0.7150		
Chloride	mg/L	MW-3	09/24/2020		0.7510		
Chloride	mg/L	MW-3	04/27/2021		0.7900		
Chloride	mg/L	MW-3	09/28/2021		0.6660		
Chloride	mg/L	MW-3	05/11/2022		0.8530		
Chloride	mg/L	MW-3	09/14/2022		0.7870		
Chloride	mg/L	MW-3	05/10/2023		0.6110		
Chloride	mg/L	MW-3	09/13/2023		0.6330		
Chloride	mg/L	MW-3	05/15/2024		0.6070		
Chloride	mg/L	MW-4	08/23/2018		34.1000		
Chloride	mg/L	MW-4	11/30/2018		20.9000		
Chloride	mg/L	MW-4	01/10/2019		12.8000		
Chloride	mg/L	MW-4	04/01/2019		6.6300		
Chloride	mg/L	MW-4	09/17/2019		3.4900		
Chloride	mg/L	MW-4	04/06/2020		2.9500		
Chloride	mg/L	MW-4	09/24/2020		2.6000		
Chloride	mg/L	MW-4	04/27/2021		2.6500		
Chloride	mg/L	MW-4	09/28/2021		2.6800		
Chloride	mg/L	MW-4	05/11/2022		3.3800		
Chloride	mg/L	MW-4	09/14/2022		3.0400		
Chloride	mg/L	MW-4	05/10/2023		2.8800		
Chloride	mg/L	MW-4	09/13/2023		2.7400		
Chloride	mg/L	MW-4	05/15/2024		2.9100		
Chromium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Chromium, total	ug/L	MW-3	11/14/2018		1.6200		
Chromium, total	ug/L	MW-3	01/10/2019		4.0800		
Chromium, total	ug/L	MW-3	04/01/2019		4.0000		
Chromium, total	ug/L	MW-3	09/17/2019		16.4000		
Chromium, total	ug/L	MW-3	04/06/2020		11.2000		
Chromium, total	ug/L	MW-3	09/24/2020		4.2600		
Chromium, total	ug/L	MW-3	04/27/2021		16.3000		
Chromium, total	ug/L	MW-3	09/28/2021		13.5000		
Chromium, total	ug/L	MW-3	05/11/2022		8.1100		
Chromium, total	ug/L	MW-3	09/14/2022		6.8600		
Chromium, total	ug/L	MW-3	05/10/2023		4.8400		
Chromium, total	ug/L	MW-3	09/13/2023		4.6100		
Chromium, total	ug/L	MW-3	05/15/2024		7.7000		
Chromium, total	ug/L	MW-4	08/23/2018	ND	1.0000		
Chromium, total	ug/L	MW-4	11/30/2018		4.8200		

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Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Chromium, total	ug/L	MW-4	01/10/2019		2.1200		
Chromium, total	ug/L	MW-4	04/01/2019		9.7500		
Chromium, total	ug/L	MW-4	09/17/2019		13.3000		
Chromium, total	ug/L	MW-4	04/06/2020		10.0000		
Chromium, total	ug/L	MW-4	09/24/2020		6.7300		
Chromium, total	ug/L	MW-4	04/27/2021		13.0000		
Chromium, total	ug/L	MW-4	09/28/2021		12.9000		
Chromium, total	ug/L	MW-4	05/11/2022		9.6600		
Chromium, total	ug/L	MW-4	09/14/2022		5.1800		
Chromium, total	ug/L	MW-4	05/10/2023		8.6000		
Chromium, total	ug/L	MW-4	09/13/2023		12.1000		
Chromium, total	ug/L	MW-4	05/15/2024		7.2000		
Cobalt, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Cobalt, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Cobalt, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/17/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/28/2021		3.3700		
Cobalt, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Cobalt, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Cobalt, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Cobalt, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Cobalt, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Cobalt, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/01/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Copper, total	ug/L	MW-3	08/23/2018		32.6000		*
Copper, total	ug/L	MW-3	11/14/2018		5.9100		
Copper, total	ug/L	MW-3	01/10/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-3	04/01/2019		3.0800		
Copper, total	ug/L	MW-3	09/17/2019		7.3300		
Copper, total	ug/L	MW-3	04/06/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-3	09/24/2020		2.3100		
Copper, total	ug/L	MW-3	04/27/2021		3.5000		
Copper, total	ug/L	MW-3	09/28/2021		5.1400		
Copper, total	ug/L	MW-3	05/11/2022	ND	3.0000		
Copper, total	ug/L	MW-3	09/14/2022	ND	3.0000		
Copper, total	ug/L	MW-3	05/10/2023	ND	3.0000		
Copper, total	ug/L	MW-3	09/13/2023	ND	3.0000		
Copper, total	ug/L	MW-3	05/15/2024	ND	3.0000		
Copper, total	ug/L	MW-4	08/28/2018	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	11/30/2018		6.2700		
Copper, total	ug/L	MW-4	01/10/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/01/2019		6.4000		
Copper, total	ug/L	MW-4	09/17/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/06/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	09/24/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/27/2021	ND	3.0000		
Copper, total	ug/L	MW-4	09/28/2021		3.4400		
Copper, total	ug/L	MW-4	05/11/2022	ND	3.0000		
Copper, total	ug/L	MW-4	09/14/2022	ND	3.0000		
Copper, total	ug/L	MW-4	05/10/2023	ND	3.0000		
Copper, total	ug/L	MW-4	09/13/2023	ND	3.0000		
Copper, total	ug/L	MW-4	05/15/2024	ND	3.0000		
Fluoride	mg/L	MW-3	08/23/2018	ND	0.1000		
Fluoride	mg/L	MW-3	11/14/2018	ND	0.1000		
Fluoride	mg/L	MW-3	01/10/2019	ND	0.1000		
Fluoride	mg/L	MW-3	04/01/2019	ND	0.1000		
Fluoride	mg/L	MW-3	09/17/2019		0.2200		
Fluoride	mg/L	MW-3	04/06/2020		0.1000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Fluoride	mg/L	MW-3	09/24/2020		0.1440		
Fluoride	mg/L	MW-3	04/27/2021	ND	0.1000		
Fluoride	mg/L	MW-3	09/28/2021	ND	0.1000		
Fluoride	mg/L	MW-3	05/11/2022	ND	0.1000		
Fluoride	mg/L	MW-3	09/14/2022	ND	0.1000		
Fluoride	mg/L	MW-3	05/10/2023		0.1040		
Fluoride	mg/L	MW-3	09/13/2023	ND	0.1000		
Fluoride	mg/L	MW-3	05/15/2024	ND	0.1000		
Fluoride	mg/L	MW-4	08/28/2018	ND	0.1000		
Fluoride	mg/L	MW-4	11/30/2018	ND	0.1000		
Fluoride	mg/L	MW-4	01/10/2019	ND	0.1000		
Fluoride	mg/L	MW-4	04/01/2019		0.1450		
Fluoride	mg/L	MW-4	09/17/2019		0.3000		
Fluoride	mg/L	MW-4	04/06/2020		0.2000		
Fluoride	mg/L	MW-4	09/24/2020		0.1520		
Fluoride	mg/L	MW-4	04/27/2021		0.1410		
Fluoride	mg/L	MW-4	09/28/2021		0.1600		
Fluoride	mg/L	MW-4	05/11/2022		0.1230		
Fluoride	mg/L	MW-4	09/14/2022		0.1440		
Fluoride	mg/L	MW-4	05/10/2023		0.1500		
Fluoride	mg/L	MW-4	09/13/2023		0.1240		
Fluoride	mg/L	MW-4	05/15/2024		0.1050		
Formaldehyde	ug/L	MW-3	08/23/2018	ND	100.0000		
Formaldehyde	ug/L	MW-3	11/14/2018	ND	100.0000		
Formaldehyde	ug/L	MW-3	01/10/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	04/01/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/17/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	04/06/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-3	09/24/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-3	04/27/2021	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/28/2021	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/11/2022	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/14/2022	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/10/2023	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/13/2023	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/15/2024	ND	100.0000		
Formaldehyde	ug/L	MW-4	08/28/2018	ND	100.0000		
Formaldehyde	ug/L	MW-4	11/30/2018	ND	100.0000		
Formaldehyde	ug/L	MW-4	01/10/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	04/01/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/17/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	04/06/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-4	09/24/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-4	04/27/2021	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/28/2021	ND	100.0000		
Formaldehyde	ug/L	MW-4	05/11/2022	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/14/2022	ND	100.0000		
Formaldehyde	ug/L	MW-4	05/10/2023	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/13/2023	ND	100.0000		
Formaldehyde	ug/L	MW-4	05/15/2024	ND	100.0000		
Iron, total	ug/L	MW-3	08/23/2018		27.8000		
Iron, total	ug/L	MW-3	11/14/2018		177.0000		
Iron, total	ug/L	MW-3	01/10/2019		130.0000		
Iron, total	ug/L	MW-3	04/01/2019		116.0000		
Iron, total	ug/L	MW-3	09/17/2019		1740.0000		
Iron, total	ug/L	MW-3	04/06/2020		541.0000		
Iron, total	ug/L	MW-3	09/24/2020		663.0000		
Iron, total	ug/L	MW-3	04/27/2021		492.0000		
Iron, total	ug/L	MW-3	09/28/2021		4830.0000		*
Iron, total	ug/L	MW-3	05/11/2022		1900.0000		
Iron, total	ug/L	MW-3	09/14/2022		135.0000		
Iron, total	ug/L	MW-3	05/10/2023		22.9000		
Iron, total	ug/L	MW-3	09/13/2023		35.1000		
Iron, total	ug/L	MW-3	05/15/2024		41.7000		
Iron, total	ug/L	MW-4	08/28/2018		193.0000		
Iron, total	ug/L	MW-4	11/30/2018		1130.0000		
Iron, total	ug/L	MW-4	01/10/2019		69.2000		
Iron, total	ug/L	MW-4	04/01/2019		211.0000		
Iron, total	ug/L	MW-4	09/17/2019		198.0000		
Iron, total	ug/L	MW-4	04/06/2020		107.0000		
Iron, total	ug/L	MW-4	09/24/2020		204.0000		
Iron, total	ug/L	MW-4	04/27/2021		75.0000		
Iron, total	ug/L	MW-4	09/28/2021		101.0000		
Iron, total	ug/L	MW-4	05/11/2022		97.4000		

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Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Iron, total	ug/L	MW-4	09/14/2022		44.3000		
Iron, total	ug/L	MW-4	05/10/2023		35.4000		
Iron, total	ug/L	MW-4	09/13/2023		55.4000		
Iron, total	ug/L	MW-4	05/15/2024		38.1000		
Lead, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Lead, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Lead, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Lead, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Lead, total	ug/L	MW-3	09/17/2019		2.4100		
Lead, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Lead, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Lead, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Lead, total	ug/L	MW-3	09/28/2021		2.3200		
Lead, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Lead, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Lead, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Lead, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Lead, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Lead, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Lead, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Lead, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Lead, total	ug/L	MW-4	04/01/2019		3.0100		
Lead, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Lead, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Lead, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Lead, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Lead, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Lead, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Lead, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Lead, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Lead, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Lead, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Magnesium, total	mg/L	MW-3	08/23/2018		22.0000		
Magnesium, total	mg/L	MW-3	11/14/2018		22.2000		
Magnesium, total	mg/L	MW-3	01/10/2019		24.2000		
Magnesium, total	mg/L	MW-3	04/01/2019		25.5000		
Magnesium, total	mg/L	MW-3	09/17/2019		36.6000		
Magnesium, total	mg/L	MW-3	04/06/2020		27.1000		
Magnesium, total	mg/L	MW-3	09/24/2020		24.7000		
Magnesium, total	mg/L	MW-3	04/27/2021		30.2000		
Magnesium, total	mg/L	MW-3	09/28/2021		62.8000		
Magnesium, total	mg/L	MW-3	05/11/2022		42.6000		
Magnesium, total	mg/L	MW-3	09/14/2022		21.6000		
Magnesium, total	mg/L	MW-3	05/10/2023		23.0000		
Magnesium, total	mg/L	MW-3	09/13/2023		24.0000		
Magnesium, total	mg/L	MW-3	05/15/2024		25.8000		
Magnesium, total	mg/L	MW-4	08/28/2018		55.3000		
Magnesium, total	mg/L	MW-4	11/30/2018		72.0000		
Magnesium, total	mg/L	MW-4	01/10/2019		48.9000		
Magnesium, total	mg/L	MW-4	04/01/2019		52.9000		
Magnesium, total	mg/L	MW-4	09/17/2019		49.3000		
Magnesium, total	mg/L	MW-4	04/06/2020		43.2000		
Magnesium, total	mg/L	MW-4	09/24/2020		45.4000		
Magnesium, total	mg/L	MW-4	04/27/2021		46.8000		
Magnesium, total	mg/L	MW-4	09/28/2021		44.7000		
Magnesium, total	mg/L	MW-4	05/11/2022		47.4000		
Magnesium, total	mg/L	MW-4	09/14/2022		40.6000		
Magnesium, total	mg/L	MW-4	05/10/2023		45.1000		
Magnesium, total	mg/L	MW-4	09/13/2023		46.7000		
Magnesium, total	mg/L	MW-4	05/15/2024		49.1000		
Manganese, total	ug/L	MW-3	08/23/2018	ND	20.0000		
Manganese, total	ug/L	MW-3	11/14/2018	ND	20.0000		
Manganese, total	ug/L	MW-3	01/10/2019	ND	20.0000		
Manganese, total	ug/L	MW-3	04/01/2019	ND	20.0000		
Manganese, total	ug/L	MW-3	09/17/2019		102.0000		
Manganese, total	ug/L	MW-3	04/06/2020		45.2000		
Manganese, total	ug/L	MW-3	09/24/2020		38.4000		
Manganese, total	ug/L	MW-3	04/27/2021		39.4000		
Manganese, total	ug/L	MW-3	09/28/2021		451.0000		*
Manganese, total	ug/L	MW-3	05/11/2022		145.0000		
Manganese, total	ug/L	MW-3	09/14/2022	ND	20.0000		
Manganese, total	ug/L	MW-3	05/10/2023	ND	20.0000		
Manganese, total	ug/L	MW-3	09/13/2023	ND	20.0000		
Manganese, total	ug/L	MW-3	05/15/2024	ND	20.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Manganese, total	ug/L	MW-4	08/28/2018		25.7000		
Manganese, total	ug/L	MW-4	11/30/2018		100.0000		*
Manganese, total	ug/L	MW-4	01/10/2019	ND	20.0000		
Manganese, total	ug/L	MW-4	04/01/2019		20.9000		
Manganese, total	ug/L	MW-4	09/17/2019	ND	20.0000		
Manganese, total	ug/L	MW-4	04/06/2020		22.8000		
Manganese, total	ug/L	MW-4	09/24/2020	ND	20.0000		
Manganese, total	ug/L	MW-4	04/27/2021	ND	20.0000		
Manganese, total	ug/L	MW-4	09/28/2021	ND	20.0000		
Manganese, total	ug/L	MW-4	05/11/2022	ND	20.0000		
Manganese, total	ug/L	MW-4	09/14/2022	ND	20.0000		
Manganese, total	ug/L	MW-4	05/10/2023	ND	20.0000		
Manganese, total	ug/L	MW-4	09/13/2023	ND	20.0000		
Manganese, total	ug/L	MW-4	05/15/2024	ND	20.0000		
Mercury, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Mercury, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Mercury, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	09/17/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Mercury, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Mercury, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Mercury, total	ug/L	MW-3	09/28/2021	ND	2.0000		
Mercury, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Mercury, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Mercury, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Mercury, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Mercury, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Mercury, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Mercury, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Mercury, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	04/01/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Mercury, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Mercury, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Mercury, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Mercury, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Mercury, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Mercury, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Mercury, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Mercury, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Methyl ethyl ketone	ug/L	MW-3	08/23/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	11/14/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	01/10/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	04/01/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/17/2019	ND	100.0000		*
Methyl ethyl ketone	ug/L	MW-3	04/06/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	09/24/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	04/27/2021	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/28/2021	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	05/11/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/14/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	05/10/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/13/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	05/15/2024	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	08/28/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	11/30/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	01/10/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	04/01/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/17/2019	ND	100.0000		*
Methyl ethyl ketone	ug/L	MW-4	04/06/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	09/24/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	04/27/2021	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/28/2021	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	05/11/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/14/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	05/10/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/13/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	05/15/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-3	08/23/2018	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	11/14/2018		4.0300		
Molybdenum, total	ug/L	MW-3	01/10/2019		3.0600		
Molybdenum, total	ug/L	MW-3	04/01/2019	ND	2.0000	10.0000	**

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*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Molybdenum, total	ug/L	MW-3	09/17/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	04/06/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	09/24/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	04/27/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/28/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/11/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/14/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/10/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/13/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/15/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-4	08/28/2018		3.8100		
Molybdenum, total	ug/L	MW-4	11/30/2018	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	01/10/2019		3.2300		
Molybdenum, total	ug/L	MW-4	04/01/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	09/17/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	04/06/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	09/24/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	04/27/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/28/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/11/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/14/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/10/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/13/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/15/2024	ND	10.0000		
Nickel, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Nickel, total	ug/L	MW-3	11/14/2018		1.1700		
Nickel, total	ug/L	MW-3	01/10/2019		1.6000		
Nickel, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Nickel, total	ug/L	MW-3	09/17/2019		2.5100		
Nickel, total	ug/L	MW-3	04/06/2020	ND	1.0000		
Nickel, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Nickel, total	ug/L	MW-3	04/27/2021		3.5200		*
Nickel, total	ug/L	MW-3	09/28/2021		5.0500		*
Nickel, total	ug/L	MW-3	05/11/2022	ND	1.0000		
Nickel, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Nickel, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Nickel, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Nickel, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Nickel, total	ug/L	MW-4	08/28/2018	ND	1.0000		
Nickel, total	ug/L	MW-4	11/30/2018	ND	1.0000		
Nickel, total	ug/L	MW-4	01/10/2019		1.5100		
Nickel, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Nickel, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Nickel, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Nickel, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Nickel, total	ug/L	MW-4	04/27/2021		2.4800		
Nickel, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Nickel, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Nickel, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Nickel, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Nickel, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Nickel, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Phenols	ug/L	MW-3	08/23/2018	ND	5.0000		
Phenols	ug/L	MW-3	11/14/2018	ND	5.0000		
Phenols	ug/L	MW-3	01/10/2019		22.0000		
Phenols	ug/L	MW-3	04/01/2019	ND	5.0000		
Phenols	ug/L	MW-3	09/17/2019	ND	5.0000		
Phenols	ug/L	MW-3	04/06/2020	ND	5.0000		
Phenols	ug/L	MW-3	09/24/2020		12.0000		
Phenols	ug/L	MW-3	04/27/2021	ND	5.0000		
Phenols	ug/L	MW-3	09/28/2021	ND	5.0000		
Phenols	ug/L	MW-3	05/11/2022	ND	5.0000		
Phenols	ug/L	MW-3	09/14/2022	ND	5.0000		
Phenols	ug/L	MW-3	05/10/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-3	09/13/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-3	05/15/2024	ND	10.0000	5.0000	**
Phenols	ug/L	MW-4	08/28/2018		16.0000		
Phenols	ug/L	MW-4	11/30/2018	ND	5.0000		
Phenols	ug/L	MW-4	01/10/2019		25.0000		
Phenols	ug/L	MW-4	04/01/2019		0.5000		*
Phenols	ug/L	MW-4	09/17/2019	ND	5.0000		
Phenols	ug/L	MW-4	04/06/2020	ND	5.0000		
Phenols	ug/L	MW-4	09/24/2020		5.0000		
Phenols	ug/L	MW-4	04/27/2021	ND	5.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Phenols	ug/L	MW-4	09/28/2021	ND	5.0000		
Phenols	ug/L	MW-4	05/11/2022	ND	5.0000		
Phenols	ug/L	MW-4	09/14/2022	ND	5.0000		
Phenols	ug/L	MW-4	05/10/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-4	09/13/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-4	05/15/2024	ND	10.0000	5.0000	**
Selenium, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Selenium, total	ug/L	MW-3	11/14/2018	ND	5.0000		
Selenium, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	04/01/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	09/17/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	04/06/2020	ND	5.0000		
Selenium, total	ug/L	MW-3	09/24/2020	ND	5.0000		
Selenium, total	ug/L	MW-3	04/27/2021	ND	5.0000		
Selenium, total	ug/L	MW-3	09/28/2021	ND	5.0000		
Selenium, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Selenium, total	ug/L	MW-3	09/14/2022	ND	5.0000		
Selenium, total	ug/L	MW-3	05/10/2023	ND	5.0000		
Selenium, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Selenium, total	ug/L	MW-3	05/15/2024	ND	5.0000		
Selenium, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Selenium, total	ug/L	MW-4	11/30/2018	ND	5.0000		
Selenium, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Selenium, total	ug/L	MW-4	04/01/2019	ND	5.0000		
Selenium, total	ug/L	MW-4	09/17/2019	ND	5.0000		
Selenium, total	ug/L	MW-4	04/06/2020	ND	5.0000		
Selenium, total	ug/L	MW-4	09/24/2020	ND	5.0000		
Selenium, total	ug/L	MW-4	04/27/2021	ND	5.0000		
Selenium, total	ug/L	MW-4	09/28/2021	ND	5.0000		
Selenium, total	ug/L	MW-4	05/11/2022	ND	5.0000		
Selenium, total	ug/L	MW-4	09/14/2022	ND	5.0000		
Selenium, total	ug/L	MW-4	05/10/2023	ND	5.0000		
Selenium, total	ug/L	MW-4	09/13/2023	ND	5.0000		
Selenium, total	ug/L	MW-4	05/15/2024	ND	5.0000		
Silver, total	ug/L	MW-3	08/23/2018	ND	0.5000		
Silver, total	ug/L	MW-3	11/14/2018	ND	0.5000		
Silver, total	ug/L	MW-3	01/10/2019	ND	0.5000		
Silver, total	ug/L	MW-3	04/01/2019	ND	0.5000		
Silver, total	ug/L	MW-3	09/17/2019	ND	0.5000		
Silver, total	ug/L	MW-3	04/06/2020	ND	0.5000		
Silver, total	ug/L	MW-3	09/24/2020	ND	0.5000		
Silver, total	ug/L	MW-3	04/27/2021	ND	0.5000		
Silver, total	ug/L	MW-3	09/28/2021	ND	0.5000		
Silver, total	ug/L	MW-3	05/11/2022	ND	0.5000		
Silver, total	ug/L	MW-3	09/14/2022	ND	0.5000		
Silver, total	ug/L	MW-3	05/10/2023	ND	0.5000		
Silver, total	ug/L	MW-3	09/13/2023	ND	0.5000		
Silver, total	ug/L	MW-3	05/15/2024	ND	0.5000		
Silver, total	ug/L	MW-4	08/28/2018	ND	0.5000		
Silver, total	ug/L	MW-4	11/30/2018	ND	0.5000		
Silver, total	ug/L	MW-4	01/10/2019	ND	0.5000		
Silver, total	ug/L	MW-4	04/01/2019	ND	0.5000		
Silver, total	ug/L	MW-4	09/17/2019	ND	0.5000		
Silver, total	ug/L	MW-4	04/06/2020	ND	0.5000		
Silver, total	ug/L	MW-4	09/24/2020	ND	0.5000		
Silver, total	ug/L	MW-4	04/27/2021	ND	0.5000		
Silver, total	ug/L	MW-4	09/28/2021	ND	0.5000		
Silver, total	ug/L	MW-4	05/11/2022	ND	0.5000		
Silver, total	ug/L	MW-4	09/14/2022	ND	0.5000		
Silver, total	ug/L	MW-4	05/10/2023	ND	0.5000		
Silver, total	ug/L	MW-4	09/13/2023	ND	0.5000		
Silver, total	ug/L	MW-4	05/15/2024	ND	0.5000		
Sulfate	mg/L	MW-3	08/23/2018		4.6900		
Sulfate	mg/L	MW-3	11/14/2018		5.1800		
Sulfate	mg/L	MW-3	01/10/2019		4.7600		
Sulfate	mg/L	MW-3	04/01/2019		4.4200		
Sulfate	mg/L	MW-3	09/17/2019		3.6300		
Sulfate	mg/L	MW-3	04/06/2020		4.8900		
Sulfate	mg/L	MW-3	09/24/2020		4.1100		
Sulfate	mg/L	MW-3	04/27/2021		4.8200		
Sulfate	mg/L	MW-3	09/28/2021		4.9700		
Sulfate	mg/L	MW-3	05/11/2022		5.3100		
Sulfate	mg/L	MW-3	09/14/2022		4.9200		
Sulfate	mg/L	MW-3	05/10/2023		5.1200		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Sulfate	mg/L	MW-3	09/13/2023		5.5700		
Sulfate	mg/L	MW-3	05/15/2024		5.1600		
Sulfate	mg/L	MW-4	08/28/2018		25.1000		
Sulfate	mg/L	MW-4	11/30/2018		13.8000		
Sulfate	mg/L	MW-4	01/10/2019		6.9700		
Sulfate	mg/L	MW-4	04/01/2019		5.5300		
Sulfate	mg/L	MW-4	09/17/2019		5.2600		
Sulfate	mg/L	MW-4	04/06/2020		7.2000		
Sulfate	mg/L	MW-4	09/24/2020		7.5600		
Sulfate	mg/L	MW-4	04/27/2021		8.0700		
Sulfate	mg/L	MW-4	09/28/2021		8.7000		
Sulfate	mg/L	MW-4	05/11/2022		11.7000		
Sulfate	mg/L	MW-4	09/14/2022		10.0000		
Sulfate	mg/L	MW-4	05/10/2023	ND	0.1000		*
Sulfate	mg/L	MW-4	09/13/2023		8.9300		
Sulfate	mg/L	MW-4	05/15/2024		8.8200		
Thallium, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Thallium, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Thallium, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Thallium, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Thallium, total	ug/L	MW-3	09/17/2019	ND	2.0000		
Thallium, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Thallium, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Thallium, total	ug/L	MW-3	04/27/2021	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	09/28/2021	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	05/11/2022	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	09/14/2022	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	05/10/2023	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	09/13/2023	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-3	05/15/2024	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Thallium, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Thallium, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Thallium, total	ug/L	MW-4	04/01/2019	ND	2.0000		
Thallium, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Thallium, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Thallium, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Thallium, total	ug/L	MW-4	04/27/2021	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	09/28/2021	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	05/11/2022	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	09/14/2022	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	05/10/2023	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	09/13/2023	ND	3.0000	2.0000	**
Thallium, total	ug/L	MW-4	05/15/2024	ND	3.0000	2.0000	**
Total organic halogen	mg/L	MW-3	08/23/2018	ND	0.0050	0.0100	**
Total organic halogen	mg/L	MW-3	11/14/2018		0.0090		
Total organic halogen	mg/L	MW-3	01/10/2019		0.0130		
Total organic halogen	mg/L	MW-3	04/01/2019		0.0170		
Total organic halogen	mg/L	MW-3	09/17/2019		0.0500		*
Total organic halogen	mg/L	MW-3	04/06/2020	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/24/2020	ND	0.0100		
Total organic halogen	mg/L	MW-3	04/27/2021	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/28/2021	ND	0.0200	0.0100	**
Total organic halogen	mg/L	MW-3	05/11/2022	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/14/2022	ND	0.0100		
Total organic halogen	mg/L	MW-3	05/10/2023	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/13/2023	ND	0.0100		
Total organic halogen	mg/L	MW-3	05/15/2024	ND	0.0100		
Total organic halogen	mg/L	MW-4	08/28/2018		0.0609		*
Total organic halogen	mg/L	MW-4	11/30/2018		0.0230		
Total organic halogen	mg/L	MW-4	01/10/2019		0.0150		
Total organic halogen	mg/L	MW-4	04/01/2019		0.0130		
Total organic halogen	mg/L	MW-4	09/17/2019		0.1100		*
Total organic halogen	mg/L	MW-4	04/06/2020	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/24/2020	ND	0.0100		
Total organic halogen	mg/L	MW-4	04/27/2021		0.0140		
Total organic halogen	mg/L	MW-4	09/28/2021	ND	0.0200	0.0100	**
Total organic halogen	mg/L	MW-4	05/11/2022	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/14/2022		0.0270		
Total organic halogen	mg/L	MW-4	05/10/2023	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/13/2023		0.0100		
Total organic halogen	mg/L	MW-4	05/15/2024	ND	0.0100		
Total suspended solids	mg/L	MW-3	08/23/2018		75.0000		
Total suspended solids	mg/L	MW-3	11/14/2018		41.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Total suspended solids	mg/L	MW-3	01/10/2019		29.0000		
Total suspended solids	mg/L	MW-3	04/01/2019		97.0000		
Total suspended solids	mg/L	MW-3	09/17/2019		138.0000		
Total suspended solids	mg/L	MW-3	04/06/2020		144.0000		
Total suspended solids	mg/L	MW-3	09/24/2020		48.0000		
Total suspended solids	mg/L	MW-3	04/27/2021		93.0000		
Total suspended solids	mg/L	MW-3	09/28/2021		126.0000		
Total suspended solids	mg/L	MW-3	05/11/2022		632.0000		
Total suspended solids	mg/L	MW-3	09/14/2022		315.0000		
Total suspended solids	mg/L	MW-3	05/10/2023		15.0000		
Total suspended solids	mg/L	MW-3	09/13/2023		29.0000		
Total suspended solids	mg/L	MW-3	05/15/2024		7.0000		
Total suspended solids	mg/L	MW-4	08/28/2018		500.0000		
Total suspended solids	mg/L	MW-4	11/30/2018		237.0000		
Total suspended solids	mg/L	MW-4	01/10/2019		38.0000		
Total suspended solids	mg/L	MW-4	04/01/2019		20.0000		
Total suspended solids	mg/L	MW-4	09/17/2019		44.0000		
Total suspended solids	mg/L	MW-4	04/06/2020		18.0000		
Total suspended solids	mg/L	MW-4	09/24/2020		19.0000		
Total suspended solids	mg/L	MW-4	04/27/2021		21.0000		
Total suspended solids	mg/L	MW-4	09/28/2021		26.0000		
Total suspended solids	mg/L	MW-4	05/11/2022		18.0000		
Total suspended solids	mg/L	MW-4	09/14/2022		19.0000		
Total suspended solids	mg/L	MW-4	05/10/2023		11.0000		
Total suspended solids	mg/L	MW-4	09/13/2023		8.0000		
Total suspended solids	mg/L	MW-4	05/15/2024		3.0000		
Vanadium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Vanadium, total	ug/L	MW-3	11/14/2018	ND	1.0000		
Vanadium, total	ug/L	MW-3	01/10/2019	ND	1.0000		
Vanadium, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/17/2019		1.4100		
Vanadium, total	ug/L	MW-3	04/06/2020	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Vanadium, total	ug/L	MW-3	04/27/2021	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/28/2021		5.7600		*
Vanadium, total	ug/L	MW-3	05/11/2022		1.9200		
Vanadium, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Vanadium, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Vanadium, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Vanadium, total	ug/L	MW-4	08/28/2018	ND	1.0000		
Vanadium, total	ug/L	MW-4	11/30/2018		1.2600		
Vanadium, total	ug/L	MW-4	01/10/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/27/2021	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Zinc, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Zinc, total	ug/L	MW-3	11/14/2018		20.1000		
Zinc, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Zinc, total	ug/L	MW-3	04/01/2019		12.1000		
Zinc, total	ug/L	MW-3	09/17/2019		22.8000		
Zinc, total	ug/L	MW-3	04/06/2020		10.8000		
Zinc, total	ug/L	MW-3	09/24/2020		6.6700		
Zinc, total	ug/L	MW-3	04/27/2021		7.1600		
Zinc, total	ug/L	MW-3	09/28/2021		8.4500		
Zinc, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Zinc, total	ug/L	MW-3	09/14/2022		8.3200		
Zinc, total	ug/L	MW-3	05/10/2023		8.3600		
Zinc, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Zinc, total	ug/L	MW-3	05/15/2024		9.1500		
Zinc, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Zinc, total	ug/L	MW-4	11/30/2018		18.8000		
Zinc, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Zinc, total	ug/L	MW-4	04/01/2019		31.4000		
Zinc, total	ug/L	MW-4	09/17/2019		17.9000		
Zinc, total	ug/L	MW-4	04/06/2020		10.5000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Zinc, total	ug/L	MW-4	09/24/2020		16.6000		
Zinc, total	ug/L	MW-4	04/27/2021		10.1000		
Zinc, total	ug/L	MW-4	09/28/2021		9.3300		
Zinc, total	ug/L	MW-4	05/11/2022		7.5900		
Zinc, total	ug/L	MW-4	09/14/2022		7.5800		
Zinc, total	ug/L	MW-4	05/10/2023		8.8500		
Zinc, total	ug/L	MW-4	09/13/2023		7.8100		
Zinc, total	ug/L	MW-4	05/15/2024		9.8600		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Aluminum, total	ug/L	MW-1	05/15/2024	ND	100.0000		870.0000
Aluminum, total	ug/L	MW-2	05/15/2024	ND	100.0000		870.0000
Aluminum, total	ug/L	Sump Grab	05/15/2024		107.0000		870.0000
Ammonia nitrogen	mg/L	MW-1	05/15/2024	ND	0.1000		0.2600
Ammonia nitrogen	mg/L	MW-2	05/15/2024	ND	0.1000		0.2600
Ammonia nitrogen	mg/L	Sump Grab	05/15/2024	ND	0.1000		0.2600
Antimony, total	ug/L	MW-1	05/15/2024	ND	5.0000		5.0000
Antimony, total	ug/L	MW-2	05/15/2024	ND	5.0000		5.0000
Antimony, total	ug/L	Sump Grab	05/15/2024	ND	5.0000		5.0000
Arsenic, total	ug/L	MW-1	05/15/2024	ND	10.0000		10.0000
Arsenic, total	ug/L	MW-2	05/15/2024	ND	10.0000		10.0000
Arsenic, total	ug/L	Sump Grab	05/15/2024	ND	10.0000		10.0000
Barium, total	ug/L	MW-1	05/15/2024		46.4000		66.0927
Barium, total	ug/L	MW-2	05/15/2024		57.6000		66.0927
Barium, total	ug/L	Sump Grab	05/15/2024		119.0000	***	66.0927
Beryllium, total	ug/L	MW-1	05/15/2024	ND	1.0000		1.0000
Beryllium, total	ug/L	MW-2	05/15/2024	ND	1.0000		1.0000
Beryllium, total	ug/L	Sump Grab	05/15/2024	ND	1.0000		1.0000
Boron, total	ug/L	MW-1	05/15/2024	ND	20.0000		31.0000
Boron, total	ug/L	MW-2	05/15/2024	ND	20.0000		31.0000
Boron, total	ug/L	Sump Grab	05/15/2024		83.2000	***	31.0000
Cadmium, total	ug/L	MW-1	05/15/2024	ND	0.4000		0.4000
Cadmium, total	ug/L	MW-2	05/15/2024	ND	0.4000		0.4000
Cadmium, total	ug/L	Sump Grab	05/15/2024	ND	0.4000		0.4000
Chemical oxygen demand	mg/L	MW-1	05/15/2024	ND	10.0000		20.0000
Chemical oxygen demand	mg/L	MW-2	05/15/2024	ND	10.0000		20.0000
Chemical oxygen demand	mg/L	Sump Grab	05/15/2024	ND	10.0000		20.0000
Chloride	mg/L	MW-1	05/15/2024		13.9000		34.1000
Chloride	mg/L	MW-2	05/15/2024		3.5400		34.1000
Chloride	mg/L	Sump Grab	05/15/2024		18.2000		34.1000
Chromium, total	ug/L	MW-1	05/15/2024		4.3700		19.4387
Chromium, total	ug/L	MW-2	05/15/2024		1.4900		19.4387
Chromium, total	ug/L	Sump Grab	05/15/2024	ND	1.0000		19.4387
Cobalt, total	ug/L	MW-1	05/15/2024	ND	2.0000		3.3700
Cobalt, total	ug/L	MW-2	05/15/2024	ND	2.0000		3.3700
Cobalt, total	ug/L	Sump Grab	05/15/2024	ND	2.0000		3.3700
Copper, total	ug/L	MW-1	05/15/2024	ND	3.0000		7.3300
Copper, total	ug/L	MW-2	05/15/2024	ND	3.0000		7.3300
Copper, total	ug/L	Sump Grab	05/15/2024		15.1000	*	7.3300
Fluoride	mg/L	MW-1	05/15/2024		0.1050		0.3000
Fluoride	mg/L	MW-2	05/15/2024		0.1280		0.3000
Fluoride	mg/L	Sump Grab	05/15/2024		0.1290		0.3000
Formaldehyde	ug/L	MW-1	05/15/2024	ND	100.0000		100.0000
Formaldehyde	ug/L	MW-2	05/15/2024	ND	100.0000		100.0000
Formaldehyde	ug/L	Sump Grab	05/15/2024	ND	100.0000		100.0000
Iron, total	ug/L	MW-1	05/15/2024		38.2000		3193.8598
Iron, total	ug/L	MW-2	05/15/2024	ND	10.0000		3193.8598
Iron, total	ug/L	Sump Grab	05/15/2024		48.8000		3193.8598
Lead, total	ug/L	MW-1	05/15/2024	ND	2.0000		3.0100
Lead, total	ug/L	MW-2	05/15/2024	ND	2.0000		3.0100
Lead, total	ug/L	Sump Grab	05/15/2024	ND	2.0000		3.0100
Magnesium, total	mg/L	MW-1	05/15/2024		38.4000		72.0000
Magnesium, total	mg/L	MW-2	05/15/2024		54.2000		72.0000
Magnesium, total	mg/L	Sump Grab	05/15/2024		42.2000		72.0000
Manganese, total	ug/L	MW-1	05/15/2024	ND	20.0000		145.0000
Manganese, total	ug/L	MW-2	05/15/2024	ND	20.0000		145.0000
Manganese, total	ug/L	Sump Grab	05/15/2024	ND	20.0000		145.0000
Mercury, total	ug/L	MW-1	05/15/2024	ND	2.0000		2.0000
Mercury, total	ug/L	MW-2	05/15/2024	ND	2.0000		2.0000
Mercury, total	ug/L	Sump Grab	05/15/2024	ND	2.0000		2.0000
Methyl ethyl ketone	ug/L	MW-1	05/15/2024	ND	10.0000		10.0000
Methyl ethyl ketone	ug/L	MW-2	05/15/2024	ND	10.0000		10.0000
Methyl ethyl ketone	ug/L	Sump Grab	05/15/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	MW-1	05/15/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	MW-2	05/15/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	Sump Grab	05/15/2024	ND	10.0000		10.0000
Nickel, total	ug/L	MW-1	05/15/2024	ND	1.0000		2.5100
Nickel, total	ug/L	MW-2	05/15/2024	ND	1.0000		2.5100
Nickel, total	ug/L	Sump Grab	05/15/2024	ND	1.0000		2.5100
Phenols	ug/L	MW-1	05/15/2024	ND	10.0000		25.0000
Phenols	ug/L	MW-2	05/15/2024	ND	10.0000		25.0000
Phenols	ug/L	Sump Grab	05/15/2024	ND	10.0000		25.0000

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Selenium, total	ug/L	MW-1	05/15/2024	ND	5.0000		5.0000
Selenium, total	ug/L	MW-2	05/15/2024	ND	5.0000		5.0000
Selenium, total	ug/L	Sump Grab	05/15/2024	ND	5.0000		5.0000
Silver, total	ug/L	MW-1	05/15/2024	ND	0.5000		0.5000
Silver, total	ug/L	MW-2	05/15/2024	ND	0.5000		0.5000
Silver, total	ug/L	Sump Grab	05/15/2024	ND	0.5000		0.5000
Sulfate	mg/L	MW-1	05/15/2024		19.1000		19.2059
Sulfate	mg/L	MW-2	05/15/2024		27.0000	***	19.2059
Sulfate	mg/L	Sump Grab	05/15/2024		75.2000	***	19.2059
Thallium, total	ug/L	MW-1	05/15/2024	ND	3.0000		2.0000
Thallium, total	ug/L	MW-2	05/15/2024	ND	3.0000		2.0000
Thallium, total	ug/L	Sump Grab	05/15/2024	ND	3.0000		2.0000
Total organic halogen	mg/L	MW-1	05/15/2024	ND	0.0100		0.0270
Total organic halogen	mg/L	MW-2	05/15/2024	ND	0.0100		0.0270
Total organic halogen	mg/L	Sump Grab	05/15/2024	ND	0.0100		0.0270
Total suspended solids	mg/L	MW-1	05/15/2024		5.0000		1149.6087
Total suspended solids	mg/L	MW-2	05/15/2024		1.0000		1149.6087
Total suspended solids	mg/L	Sump Grab	05/15/2024		3.0000		1149.6087
Vanadium, total	ug/L	MW-1	05/15/2024	ND	1.0000		1.9200
Vanadium, total	ug/L	MW-2	05/15/2024	ND	1.0000		1.9200
Vanadium, total	ug/L	Sump Grab	05/15/2024	ND	1.0000		1.9200
Zinc, total	ug/L	MW-1	05/15/2024		9.6400		28.7993
Zinc, total	ug/L	MW-2	05/15/2024	ND	5.0000		28.7993
Zinc, total	ug/L	Sump Grab	05/15/2024		53.8000	*	28.7993

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 3

Detection Frequencies in Upgradient and Downgradient Wells

Constituent	Detect	Upgradient N	Proportion	Detect	Downgradient N	Proportion
Aluminum, total	16	26	0.615	21	36	0.583
Ammonia nitrogen	2	28	0.071	3	36	0.083
Antimony, total	0	28	0.000	0	36	0.000
Arsenic, total	0	28	0.000	0	36	0.000
Barium, total	28	28	1.000	36	36	1.000
Beryllium, total	0	28	0.000	0	36	0.000
Boron, total	4	27	0.148	16	36	0.444
Cadmium, total	0	28	0.000	2	36	0.056
Chemical oxygen demand	12	28	0.429	14	36	0.389
Chloride	27	27	1.000	36	36	1.000
Chromium, total	26	28	0.929	26	36	0.722
Cobalt, total	1	28	0.036	0	36	0.000
Copper, total	9	27	0.333	15	36	0.417
Fluoride	15	28	0.536	29	36	0.806
Formaldehyde	0	28	0.000	0	36	0.000
Iron, total	27	27	1.000	32	36	0.889
Lead, total	3	28	0.107	1	36	0.028
Magnesium, total	28	28	1.000	36	36	1.000
Manganese, total	8	26	0.308	16	36	0.444
Mercury, total	0	28	0.000	0	36	0.000
Methyl ethyl ketone	0	26	0.000	0	35	0.000
Molybdenum, total	4	28	0.143	5	36	0.139
Nickel, total	5	26	0.192	8	36	0.222
Phenols	5	27	0.185	13	36	0.361
Selenium, total	0	28	0.000	3	36	0.083
Silver, total	0	28	0.000	0	36	0.000
Sulfate	27	27	1.000	36	36	1.000
Thallium, total	0	28	0.000	0	36	0.000
Total organic halogen	9	25	0.360	14	35	0.400
Total suspended solids	28	28	1.000	36	36	1.000
Vanadium, total	3	27	0.111	6	36	0.167
Zinc, total	22	28	0.786	23	36	0.639

N = Total number of measurements in all wells.
Detect = Total number of detections in all wells.
Proportion = Detect/N.

Table 4

Shapiro-Wilk Multiple Group Test of Normality

Constituent	Detect	N	Detect Freq	G raw	G log	G cbrt	G sqrt	G sqr	G cub	Crit Value	Dist Form
Aluminum, total	16	26	0.615	3.878	5.019					2.326	non-norm
Ammonia nitrogen	2	28	0.071	28.752	28.752					2.326	non-norm
Antimony, total	0	28	0.000	5.876	5.876					2.326	non-norm
Arsenic, total	0	28	0.000	5.876	5.876					2.326	non-norm
Barium, total	28	28	1.000	1.055	0.215					2.326	normal
Beryllium, total	0	28	0.000	5.876	5.876					2.326	non-norm
Boron, total	4	27	0.148	8.790	8.998					2.326	non-norm
Cadmium, total	0	28	0.000	5.876	5.876					2.326	non-norm
Chemical oxygen demand	12	28	0.429	4.454	5.595					2.326	non-norm
Chloride	27	27	1.000	5.366	3.756					2.326	non-norm
Chromium, total	26	28	0.929	0.770	6.920					2.326	normal
Cobalt, total	1	28	0.036	17.314	17.314					2.326	non-norm
Copper, total	9	27	0.333	5.545	6.314					2.326	non-norm
Fluoride	15	28	0.536	4.100	6.387					2.326	non-norm
Formaldehyde	0	28	0.000	5.876	5.876					2.326	non-norm
Iron, total	27	27	1.000	6.463	1.104					2.326	lognor
Lead, total	3	28	0.107	18.997	19.027					2.326	non-norm
Magnesium, total	28	28	1.000	4.803	3.499					2.326	non-norm
Manganese, total	8	26	0.308	6.022	6.323					2.326	non-norm
Mercury, total	0	28	0.000	5.876	5.876					2.326	non-norm
Methyl ethyl ketone	0	26	0.000	5.566	5.566					2.326	non-norm
Molybdenum, total	4	28	0.143	9.005	9.242					2.326	non-norm
Nickel, total	5	26	0.192	7.527	7.823					2.326	non-norm
Phenols	5	27	0.185	8.134	8.033					2.326	non-norm
Selenium, total	0	28	0.000	5.876	5.876					2.326	non-norm
Silver, total	0	28	0.000	5.876	5.876					2.326	non-norm
Sulfate	27	27	1.000	2.689	1.589					2.326	lognor
Thallium, total	0	28	0.000	5.876	5.876					2.326	non-norm
Total organic halogen	9	25	0.360	4.878	5.868					2.326	non-norm
Total suspended solids	28	28	1.000	6.728	0.544					2.326	lognor
Vanadium, total	3	27	0.111	18.578	18.714					2.326	non-norm
Zinc, total	22	28	0.786	2.037	6.235					2.326	normal

* - Distribution override for that constituent.
Fit to distribution is confirmed if G <= critical value.
Model type may not match distributional form when detection frequency < 50%.

Table 4

Shapiro-Wilk Multiple Group Test of Normality

Constituent	Model Type
Aluminum, total	nonpar
Ammonia nitrogen	nonpar
Antimony, total	nonpar
Arsenic, total	nonpar
Barium, total	normal
Beryllium, total	nonpar
Boron, total	nonpar
Cadmium, total	nonpar
Chemical oxygen demand	nonpar
Chloride	nonpar
Chromium, total	normal
Cobalt, total	nonpar
Copper, total	nonpar
Fluoride	nonpar
Formaldehyde	nonpar
Iron, total	lognor
Lead, total	nonpar
Magnesium, total	nonpar
Manganese, total	nonpar
Mercury, total	nonpar
Methyl ethyl ketone	nonpar
Molybdenum, total	nonpar
Nickel, total	nonpar
Phenols	nonpar
Selenium, total	nonpar
Silver, total	nonpar
Sulfate	lognor
Thallium, total	nonpar
Total organic halogen	nonpar
Total suspended solids	lognor
Vanadium, total	nonpar
Zinc, total	normal

* - Distribution override for that constituent.
Fit to distribution is confirmed if G <= critical value.
Model type may not match distributional form when detection frequency < 50%.

Table 5

Summary Statistics and Prediction Limits

Constituent	Units	Detect	N	Mean	SD	alpha	Factor	Pred Limit	Type		Conf
Aluminum, total	ug/L	16	26					870.0000	nonpar		0.99
Ammonia nitrogen	mg/L	2	28					0.2600	nonpar		0.99
Antimony, total	ug/L	0	28					5.0000	nonpar	***	0.99
Arsenic, total	ug/L	0	28					10.0000	nonpar	***	0.99
Barium, total	ug/L	28	28	38.5250	10.9567	0.0100	2.5161	66.0927	normal		
Beryllium, total	ug/L	0	28					1.0000	nonpar	***	0.99
Boron, total	ug/L	4	27					31.0000	nonpar		0.99
Cadmium, total	ug/L	0	28					0.4000	nonpar	***	0.99
Chemical oxygen demand	mg/L	12	28					20.0000	nonpar		0.99
Chloride	mg/L	27	27					34.1000	nonpar		0.99
Chromium, total	ug/L	26	28	7.8157	4.6195	0.0100	2.5161	19.4387	normal		
Cobalt, total	ug/L	1	28					3.3700	nonpar		0.99
Copper, total	ug/L	9	27					7.3300	nonpar		0.99
Fluoride	mg/L	15	28					0.3000	nonpar		0.99
Formaldehyde	ug/L	0	28					100.0000	nonpar	***	0.99
Iron, total	ug/L	27	27	4.9308	1.2435	0.0100	2.5237	3193.8598	lognor		
Lead, total	ug/L	3	28					3.0100	nonpar		0.99
Magnesium, total	mg/L	28	28					72.0000	nonpar		0.99
Manganese, total	ug/L	8	26					145.0000	nonpar		0.99
Mercury, total	ug/L	0	28					2.0000	nonpar	***	0.99
Methyl ethyl ketone	ug/L	0	26					10.0000	nonpar	***	0.99
Molybdenum, total	ug/L	4	28					10.0000	nonpar	***	0.99
Nickel, total	ug/L	5	26					2.5100	nonpar		0.99
Phenols	ug/L	5	27					25.0000	nonpar		0.99
Selenium, total	ug/L	0	28					5.0000	nonpar	***	0.99
Silver, total	ug/L	0	28					0.5000	nonpar	***	0.99
Sulfate	mg/L	27	27	1.8701	0.4300	0.0100	2.5237	19.2059	lognor		
Thallium, total	ug/L	0	28					2.0000	nonpar	***	0.99
Total organic halogen	mg/L	9	25					0.0270	nonpar		0.99
Total suspended solids	mg/L	28	28	3.7493	1.3107	0.0100	2.5161	1149.6087	lognor		
Vanadium, total	ug/L	3	27					1.9200	nonpar		0.99
Zinc, total	ug/L	22	28	9.6511	7.6104	0.0100	2.5161	28.7993	normal		

Conf = confidence level for passing initial test or one of two verification resamples at all downgradient wells for a single constituent (nonparametric test only).
* - Insufficient Data.
** - Calculated limit raised to Manual Reporting Limit.
*** - Nonparametric limit based on ND value.
For transformed data, mean and SD in transformed units and prediction limit in original units.
All sample sizes and statistics are based on outlier free data.
For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Table 6

Dixon's Test Outliers
1% Significance Level

Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Aluminum, total	ug/L	MW-4	11/30/2018	755.0000		08/23/2018-05/15/2024	14	0.6403
Boron, total	ug/L	MW-4	08/28/2018	90.1000		08/28/2018-05/15/2024	14	0.6403
Chloride	mg/L	MW-3	11/14/2018	4.6100		08/23/2018-05/15/2024	14	0.6403
Copper, total	ug/L	MW-3	08/23/2018	32.6000		08/23/2018-05/15/2024	14	0.6403
Manganese, total	ug/L	MW-4	11/30/2018	100.0000		08/28/2018-05/15/2024	14	0.6403
Methyl ethyl ketone	ug/L	MW-3	09/17/2019	100.0000	< 100.0000	08/23/2018-05/15/2024	14	0.6403
Methyl ethyl ketone	ug/L	MW-4	09/17/2019	100.0000	< 100.0000	08/28/2018-05/15/2024	14	0.6403
Nickel, total	ug/L	MW-3	04/27/2021	3.5200		08/23/2018-05/15/2024	14	0.6174
Nickel, total	ug/L	MW-3	09/28/2021	5.0500		08/23/2018-05/15/2024	14	0.6174
Phenols	ug/L	MW-4	04/01/2019	0.5000		08/28/2018-05/15/2024	14	0.6403
Sulfate	mg/L	MW-4	05/10/2023	0.1000	< 0.1000	08/28/2018-05/15/2024	14	0.6403
Total organic halogen	mg/L	MW-3	09/17/2019	0.0500		08/23/2018-05/15/2024	14	0.6403
Vanadium, total	ug/L	MW-3	09/28/2021	5.7600		08/23/2018-05/15/2024	14	0.6403

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

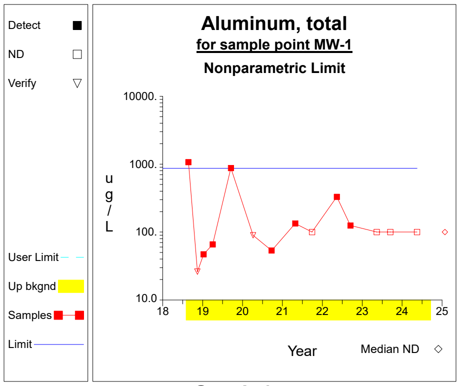
Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

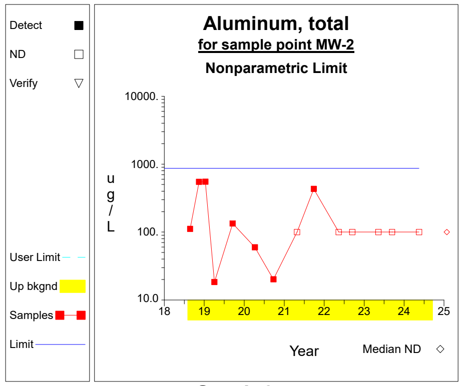
Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	Sump Grab	04/06/2020		109.0000	*	66.0927
Barium, total	ug/L	Sump Grab	09/24/2020		108.0000	*	66.0927
Barium, total	ug/L	Sump Grab	04/27/2021		93.1000	*	66.0927
Barium, total	ug/L	Sump Grab	09/28/2021		127.0000	*	66.0927
Barium, total	ug/L	Sump Grab	05/11/2022		98.8000	*	66.0927
Barium, total	ug/L	Sump Grab	09/14/2022		79.0000	*	66.0927
Barium, total	ug/L	Sump Grab	09/13/2023		133.0000	*	66.0927
Barium, total	ug/L	Sump Grab	05/15/2024		119.0000	*	66.0927
Boron, total	ug/L	Sump Grab	04/06/2020		40.5000	*	31.0000
Boron, total	ug/L	Sump Grab	09/24/2020		54.8000	*	31.0000
Boron, total	ug/L	Sump Grab	04/27/2021		34.2000	*	31.0000
Boron, total	ug/L	Sump Grab	09/28/2021		30.4000		31.0000
Boron, total	ug/L	Sump Grab	05/11/2022		36.6000	*	31.0000
Boron, total	ug/L	Sump Grab	09/14/2022		63.5000	*	31.0000
Boron, total	ug/L	Sump Grab	09/13/2023		81.1000	*	31.0000
Boron, total	ug/L	Sump Grab	05/15/2024		83.2000	*	31.0000
Copper, total	ug/L	Sump Grab	04/06/2020	ND	2.0000		7.3300
Copper, total	ug/L	Sump Grab	09/24/2020		11.2000	*	7.3300
Copper, total	ug/L	Sump Grab	04/27/2021	ND	3.0000		7.3300
Copper, total	ug/L	Sump Grab	09/28/2021		5.6800		7.3300
Copper, total	ug/L	Sump Grab	05/11/2022		11.0000	*	7.3300
Copper, total	ug/L	Sump Grab	09/14/2022	ND	3.0000		7.3300
Copper, total	ug/L	Sump Grab	09/13/2023	ND	3.0000		7.3300
Copper, total	ug/L	Sump Grab	05/15/2024		15.1000	*	7.3300
Sulfate	mg/L	MW-2	08/23/2018		29.8000	*	19.2059
Sulfate	mg/L	MW-2	11/14/2018		37.0000	*	19.2059
Sulfate	mg/L	MW-2	01/10/2019		26.8000	*	19.2059
Sulfate	mg/L	MW-2	04/01/2019		26.3000	*	19.2059
Sulfate	mg/L	MW-2	09/17/2019		23.4000	*	19.2059
Sulfate	mg/L	MW-2	04/06/2020		24.3000	*	19.2059
Sulfate	mg/L	MW-2	09/24/2020		24.0000	*	19.2059
Sulfate	mg/L	MW-2	04/27/2021		24.4000	*	19.2059
Sulfate	mg/L	MW-2	09/28/2021		25.4000	*	19.2059
Sulfate	mg/L	MW-2	05/11/2022		25.7000	*	19.2059
Sulfate	mg/L	MW-2	09/14/2022		24.4000	*	19.2059
Sulfate	mg/L	MW-2	05/10/2023		23.8000	*	19.2059
Sulfate	mg/L	MW-2	09/13/2023		20.7000	*	19.2059
Sulfate	mg/L	MW-2	05/15/2024		27.0000	*	19.2059
Sulfate	mg/L	Sump Grab	04/06/2020		122.0000	*	19.2059
Sulfate	mg/L	Sump Grab	09/24/2020		66.8000	*	19.2059
Sulfate	mg/L	Sump Grab	04/27/2021		120.0000	*	19.2059
Sulfate	mg/L	Sump Grab	09/28/2021		33.6000	*	19.2059
Sulfate	mg/L	Sump Grab	05/11/2022		39.0000	*	19.2059
Sulfate	mg/L	Sump Grab	09/14/2022		43.6000	*	19.2059
Sulfate	mg/L	Sump Grab	09/13/2023		20.1000	*	19.2059
Sulfate	mg/L	Sump Grab	05/15/2024		75.2000	*	19.2059
Zinc, total	ug/L	Sump Grab	04/06/2020	ND	5.0000		28.7993
Zinc, total	ug/L	Sump Grab	09/24/2020		22.5000		28.7993
Zinc, total	ug/L	Sump Grab	04/27/2021	ND	5.0000		28.7993
Zinc, total	ug/L	Sump Grab	09/28/2021		14.6000		28.7993
Zinc, total	ug/L	Sump Grab	05/11/2022		11.8000		28.7993
Zinc, total	ug/L	Sump Grab	09/14/2022	ND	5.0000		28.7993
Zinc, total	ug/L	Sump Grab	09/13/2023	ND	5.0000		28.7993
Zinc, total	ug/L	Sump Grab	05/15/2024		53.8000	*	28.7993

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

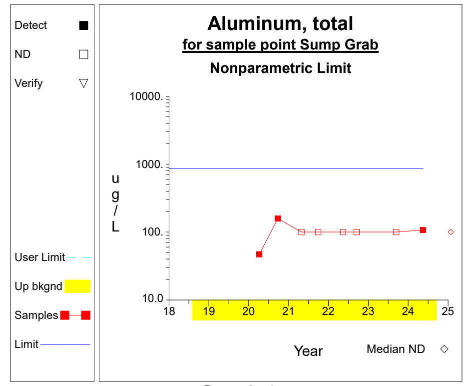
Up vs. Down Prediction Limits



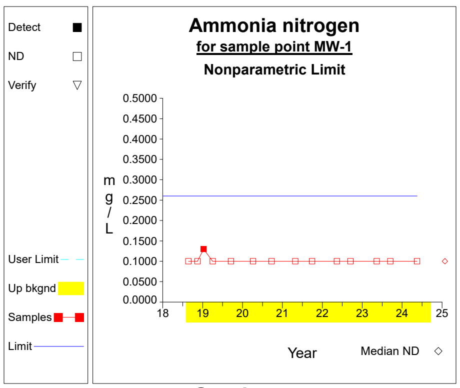
Graph 1



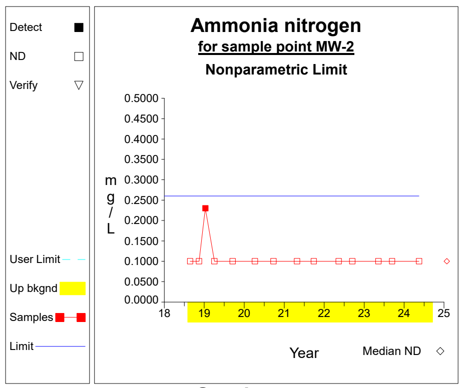
Graph 2



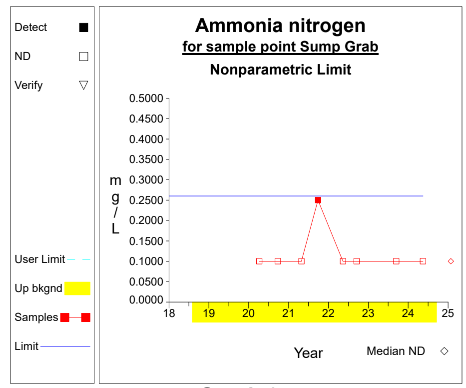
Graph 3



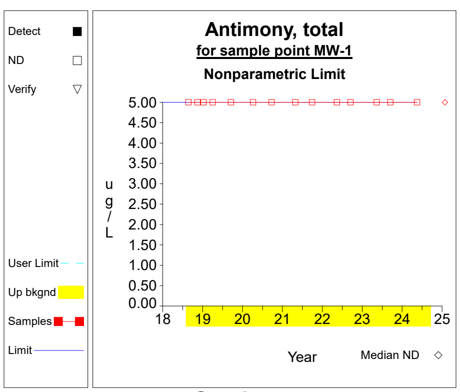
Graph 4



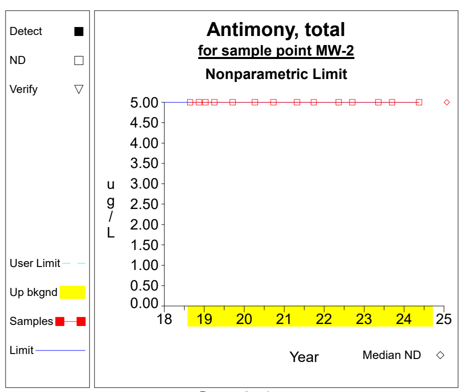
Graph 5



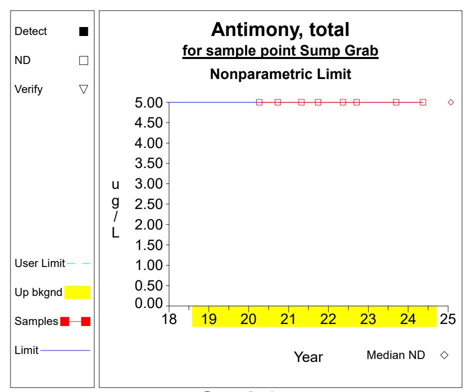
Graph 6



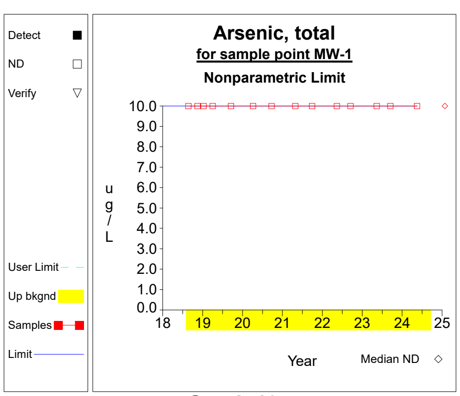
Graph 7



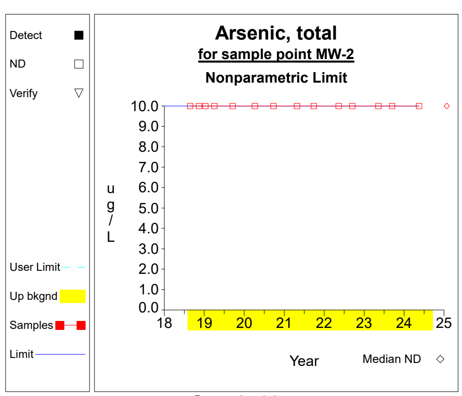
Graph 8



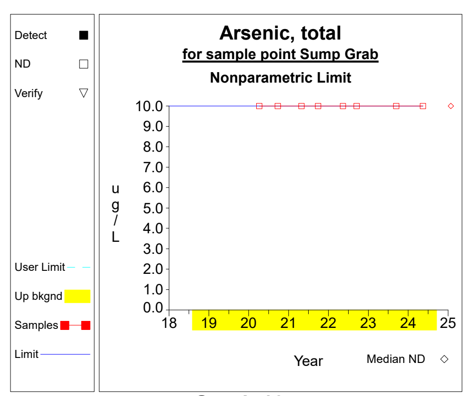
Graph 9



Graph 10



Graph 11

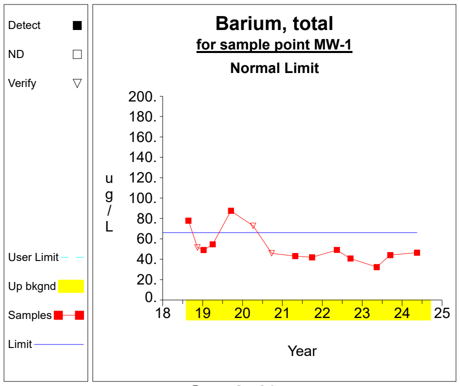


Graph 12

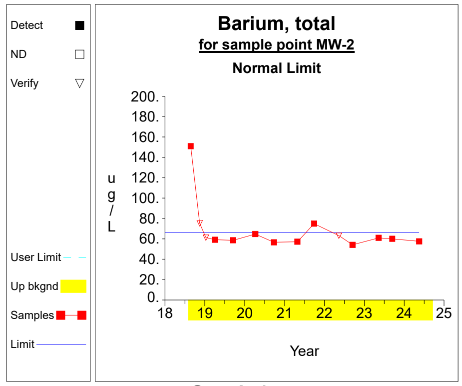
Prepared by: Otter Creek Environmental

Goose Lake Quarry November 2024

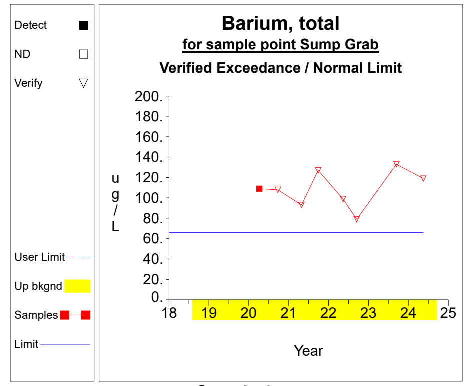
Up vs. Down Prediction Limits



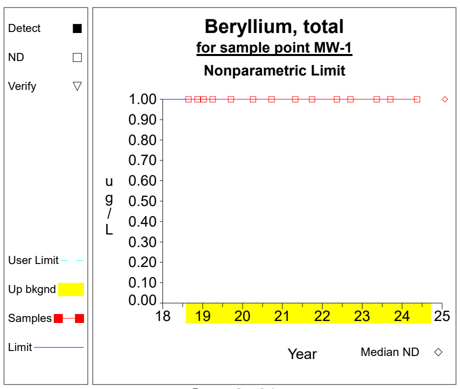
Graph 13



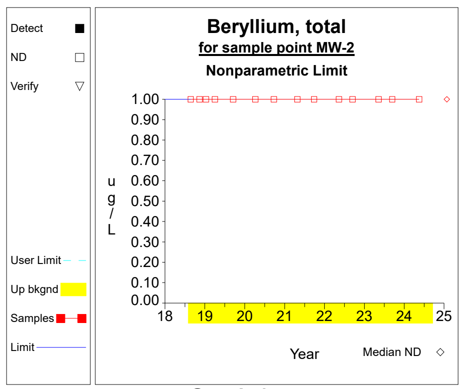
Graph 14



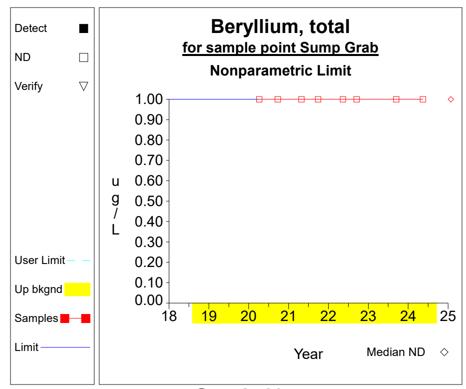
Graph 15



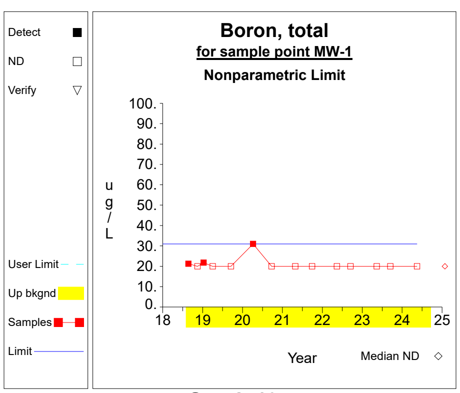
Graph 16



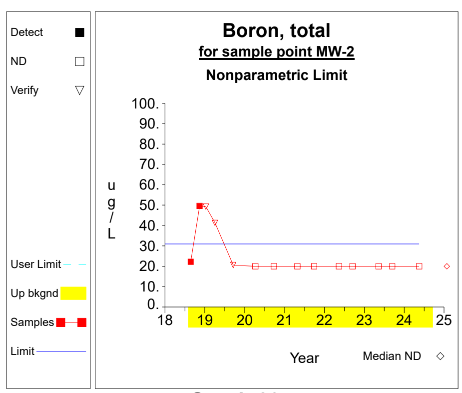
Graph 17



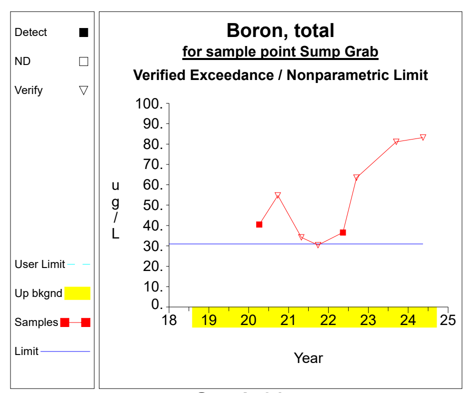
Graph 18



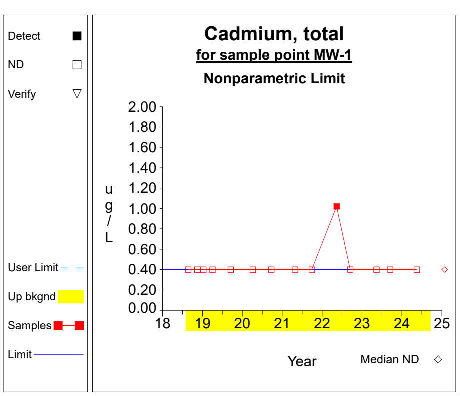
Graph 19



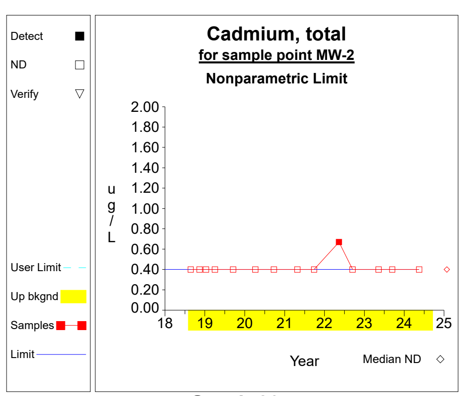
Graph 20



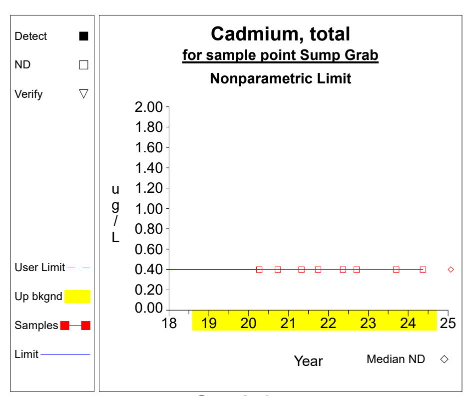
Graph 21



Graph 22



Graph 23



Graph 24

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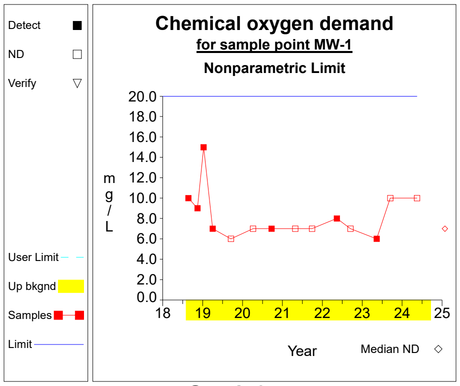
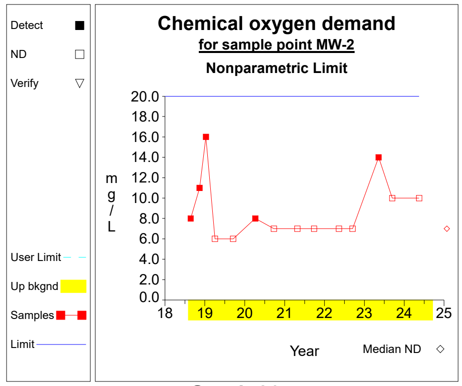
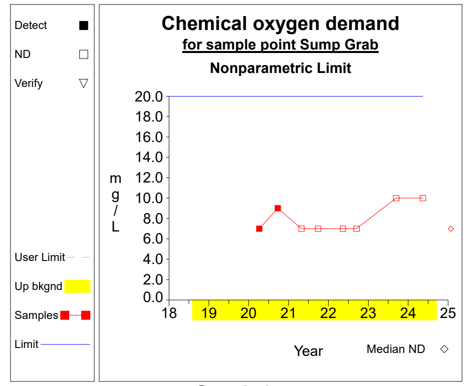
Up vs. Down Prediction Limits



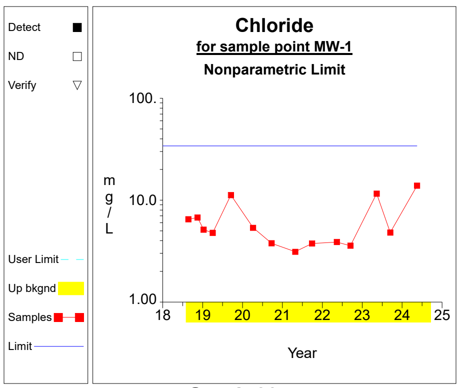
Graph 25



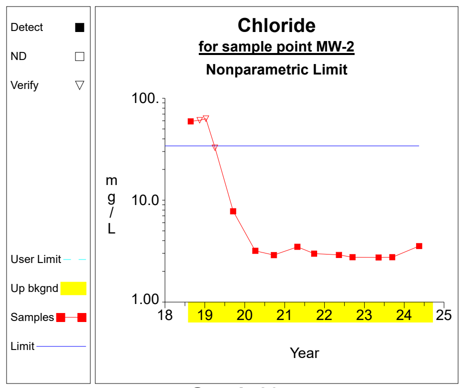
Graph 26



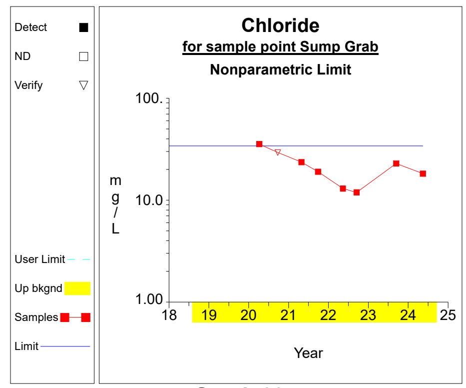
Graph 27



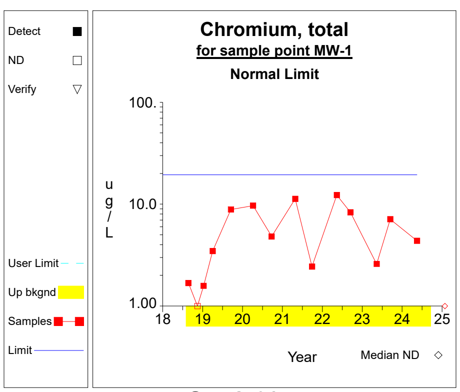
Graph 28



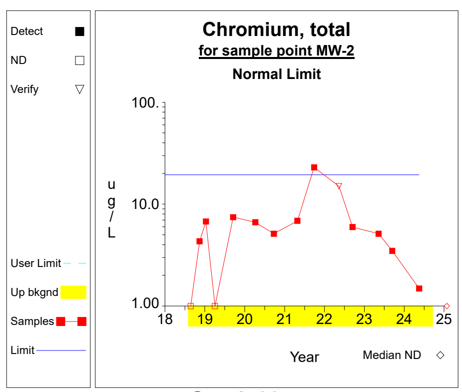
Graph 29



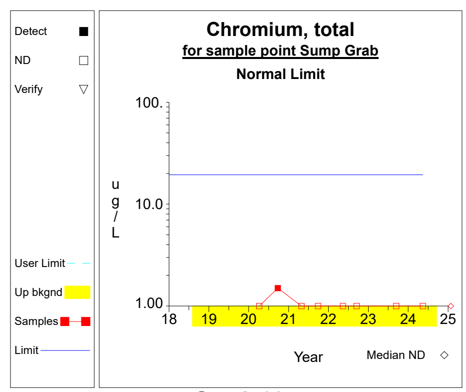
Graph 30



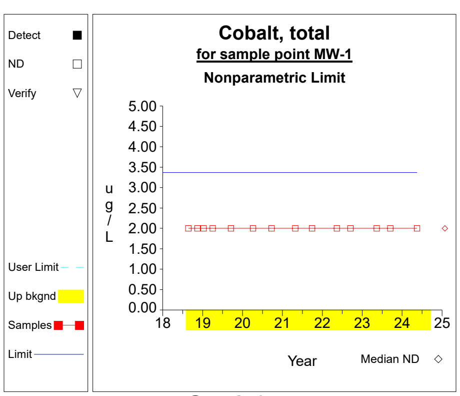
Graph 31



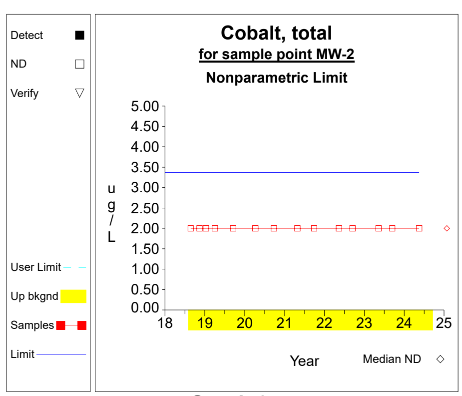
Graph 32



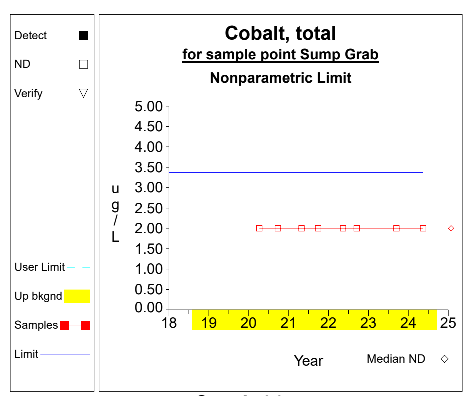
Graph 33



Graph 34

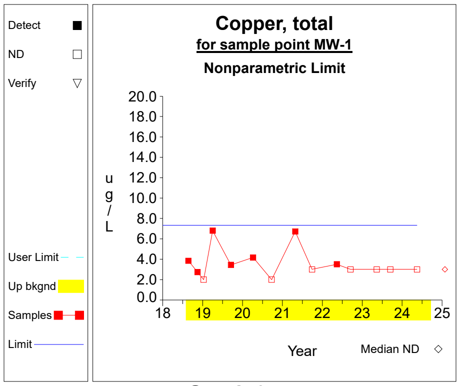


Graph 35

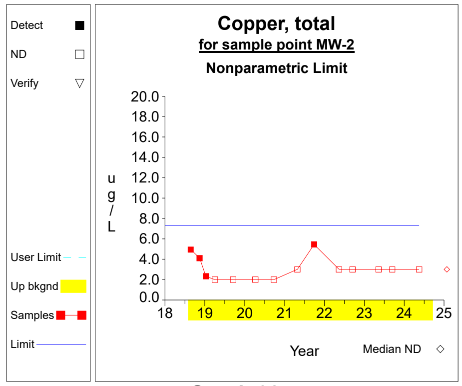


Graph 36

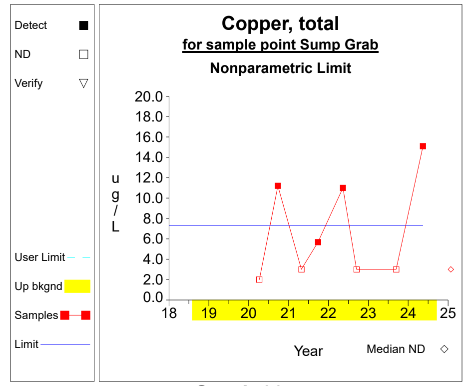
Up vs. Down Prediction Limits



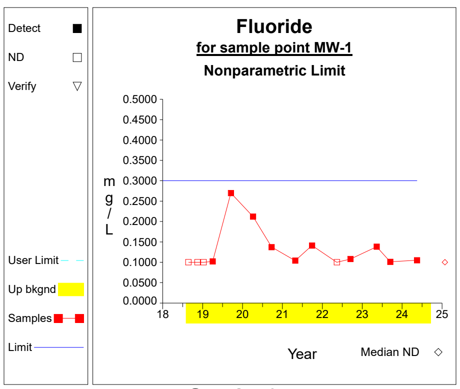
Graph 37



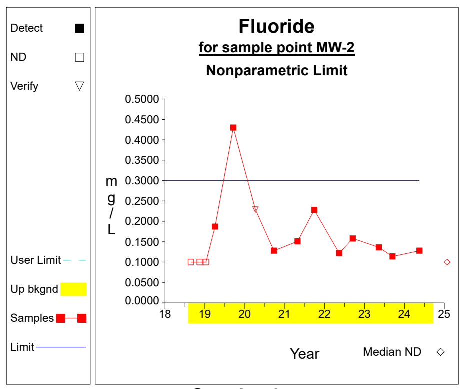
Graph 38



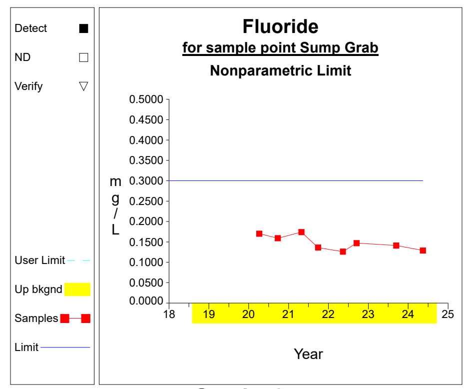
Graph 39



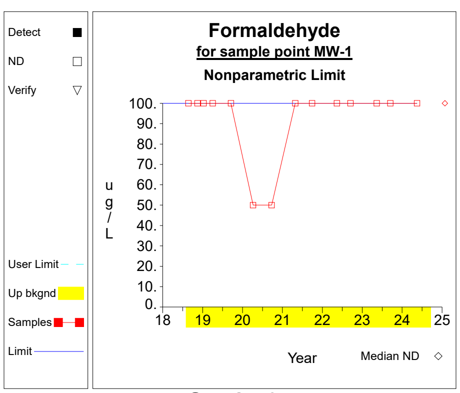
Graph 40



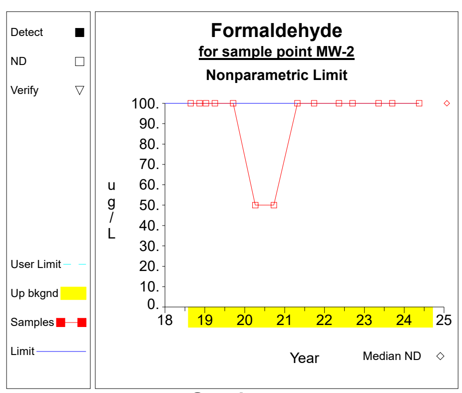
Graph 41



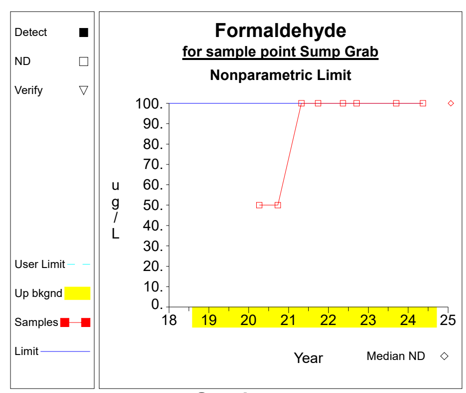
Graph 42



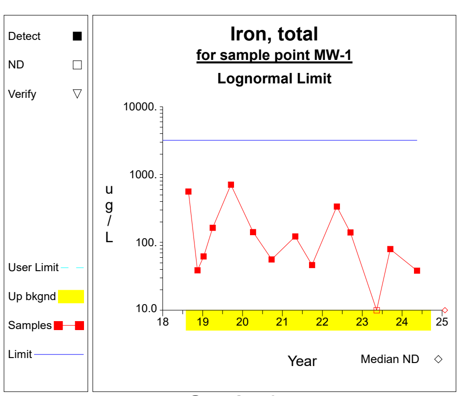
Graph 43



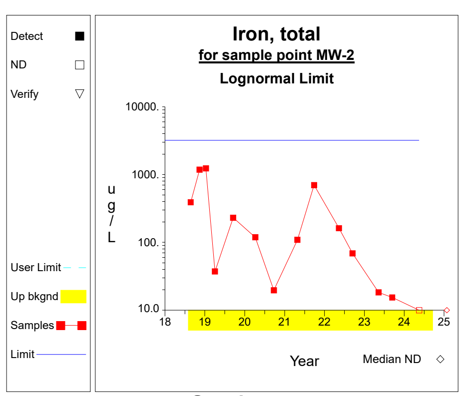
Graph 44



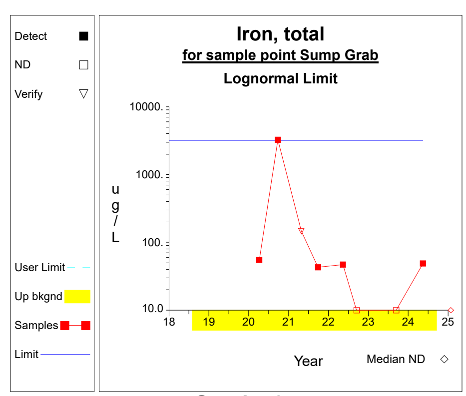
Graph 45



Graph 46

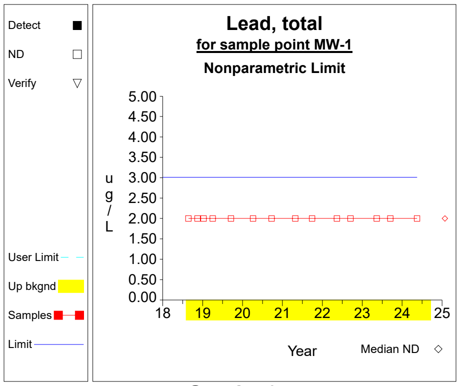


Graph 47

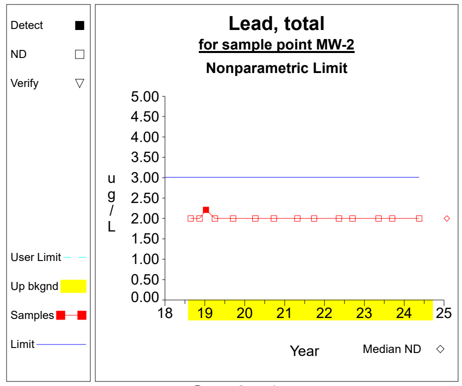


Graph 48

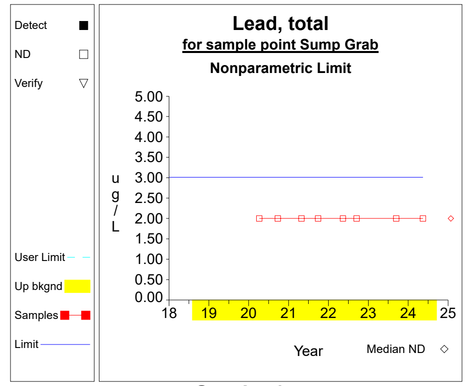
Up vs. Down Prediction Limits



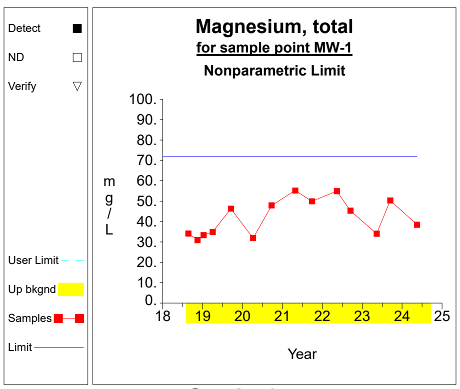
Graph 49



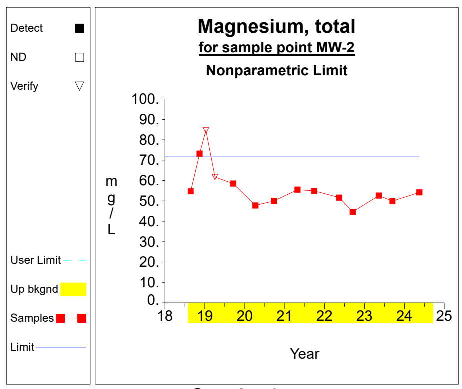
Graph 50



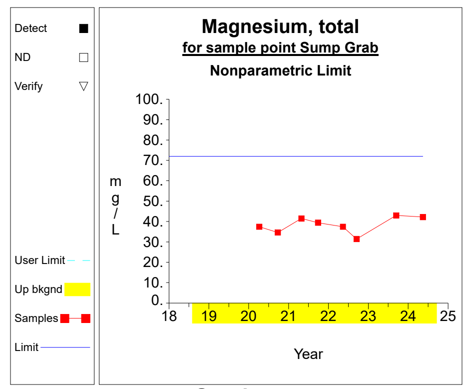
Graph 51



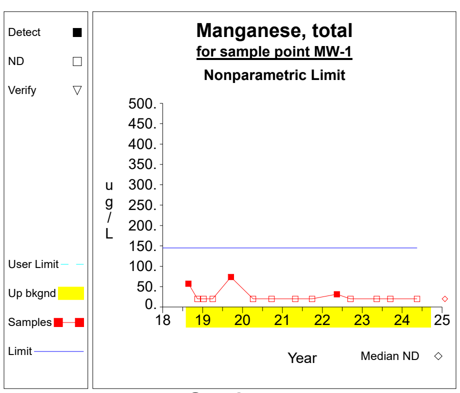
Graph 52



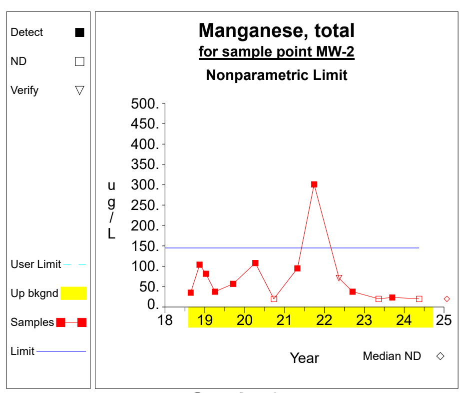
Graph 53



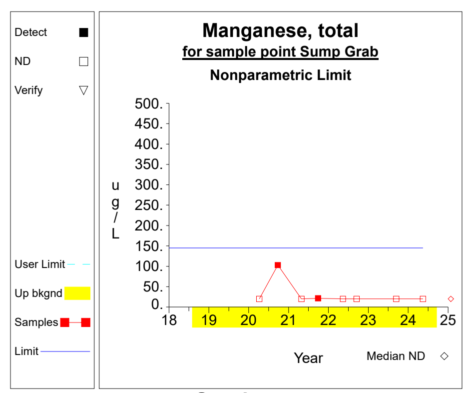
Graph 54



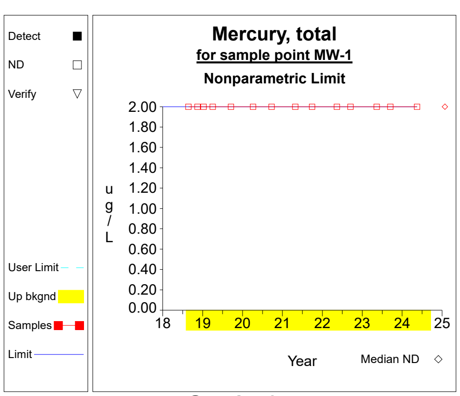
Graph 55



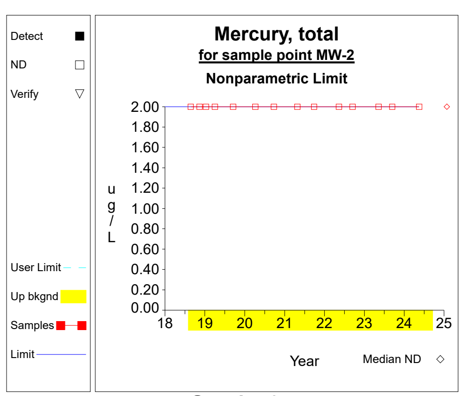
Graph 56



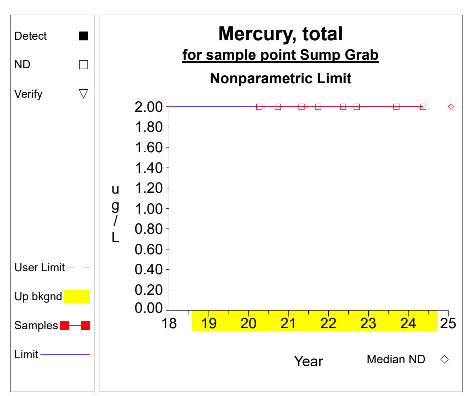
Graph 57



Graph 58



Graph 59



Graph 60

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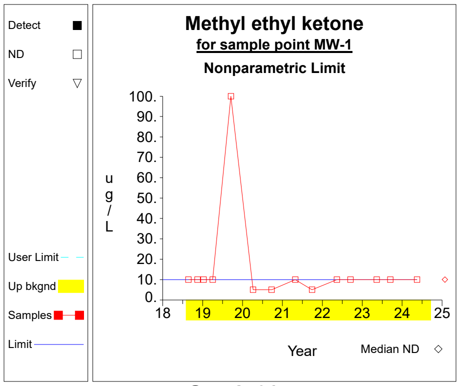
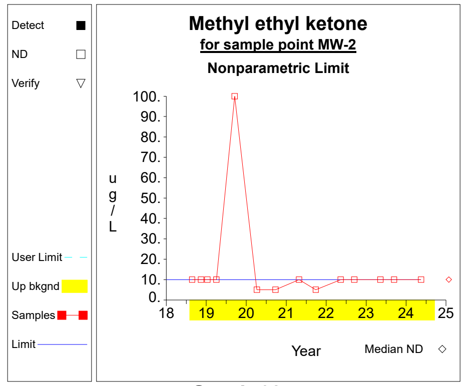
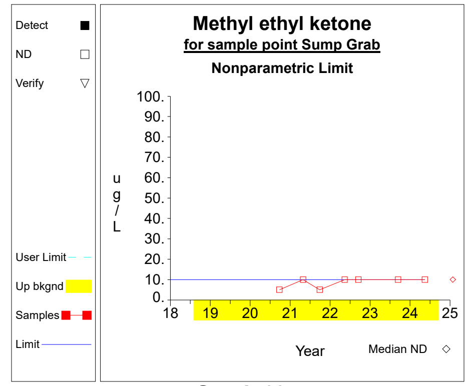
Up vs. Down Prediction Limits



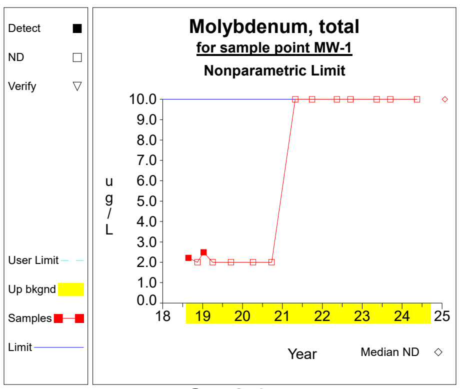
Graph 61



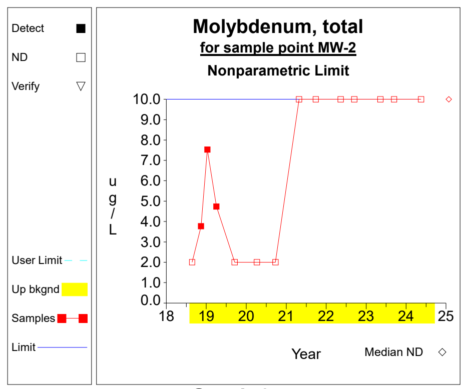
Graph 62



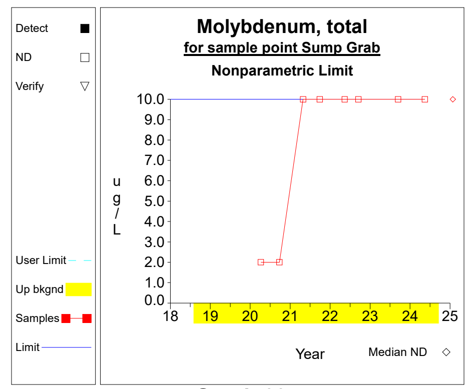
Graph 63



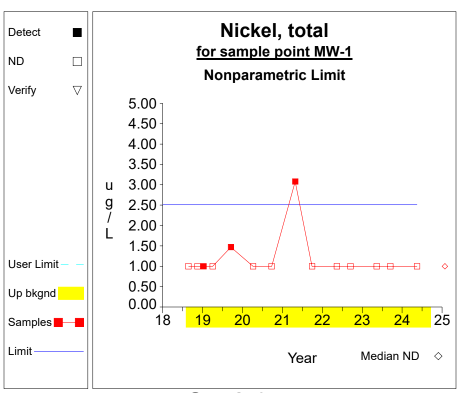
Graph 64



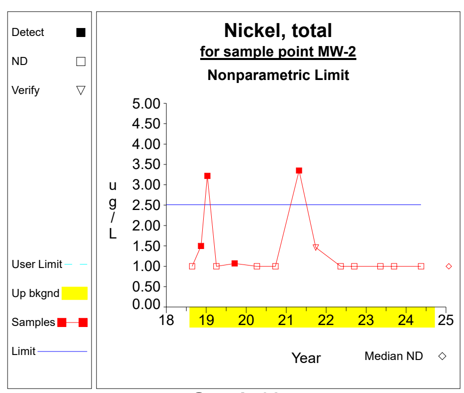
Graph 65



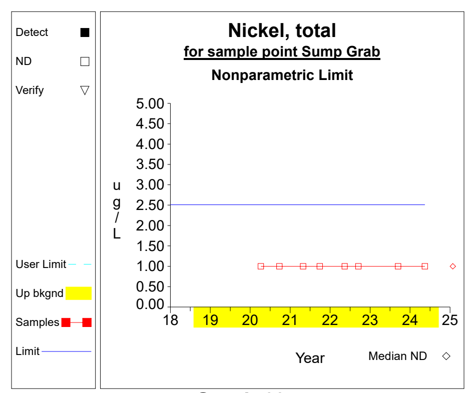
Graph 66



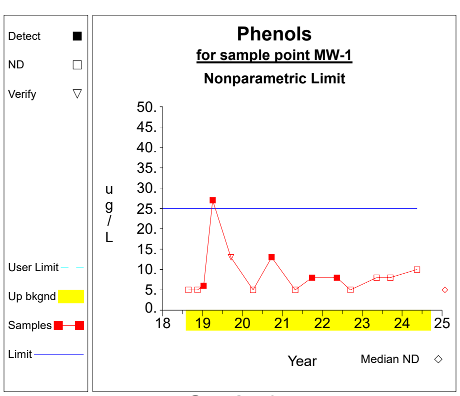
Graph 67



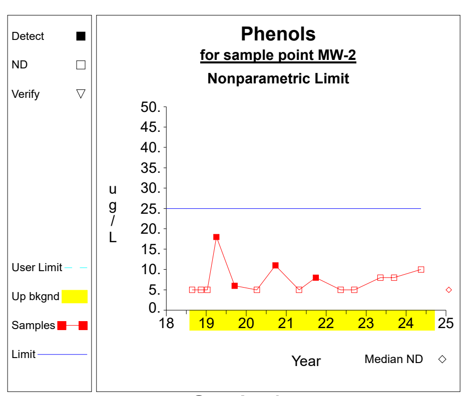
Graph 68



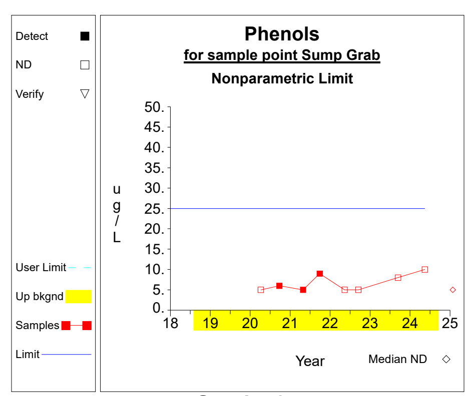
Graph 69



Graph 70

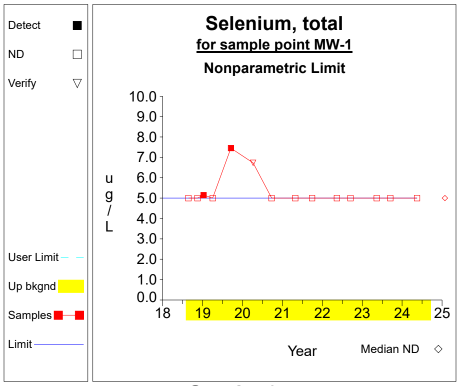


Graph 71

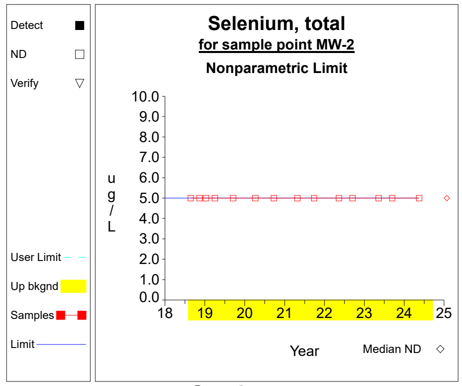


Graph 72

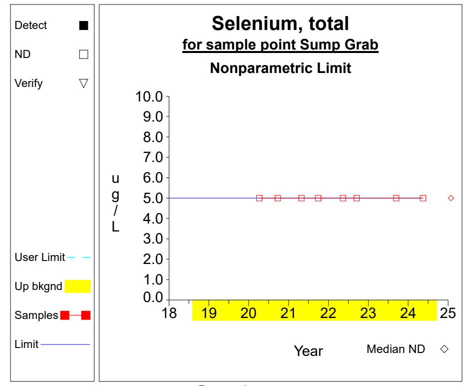
Up vs. Down Prediction Limits



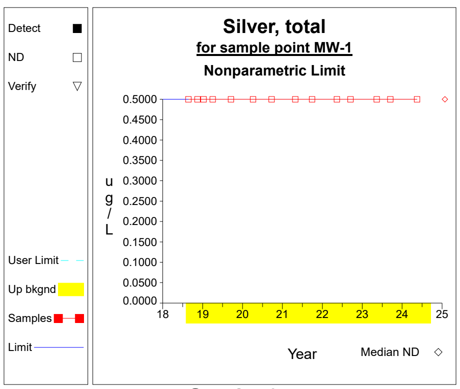
Graph 73



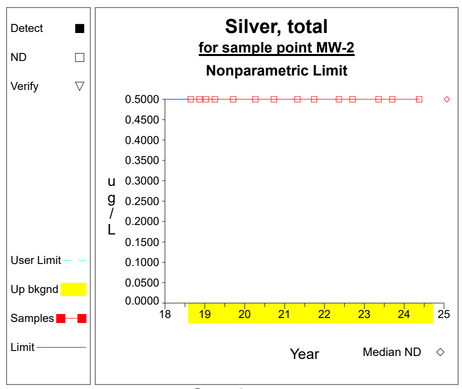
Graph 74



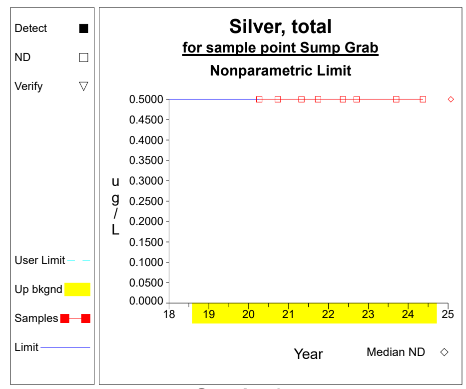
Graph 75



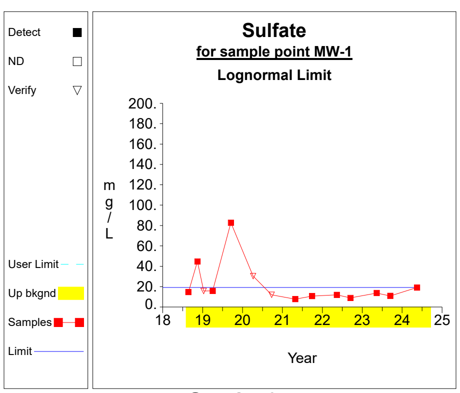
Graph 76



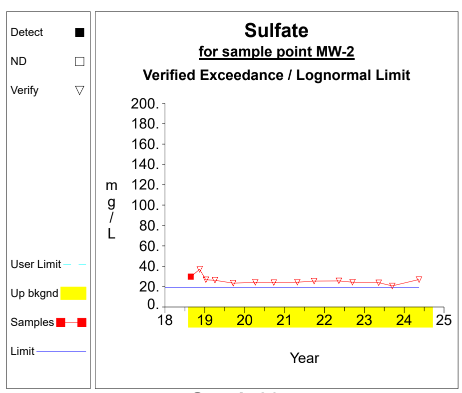
Graph 77



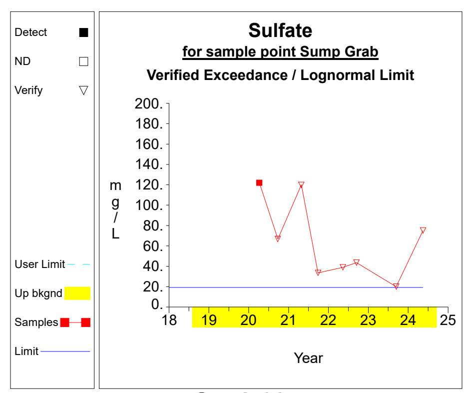
Graph 78



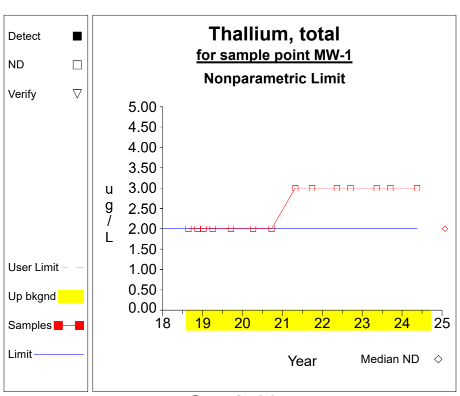
Graph 79



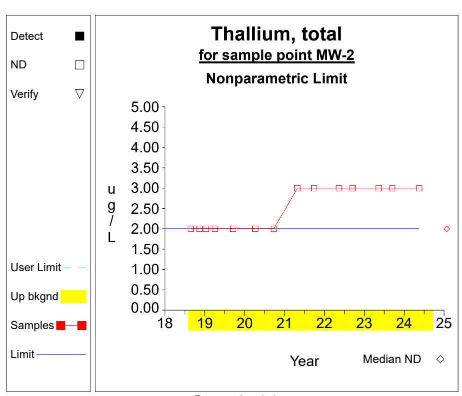
Graph 80



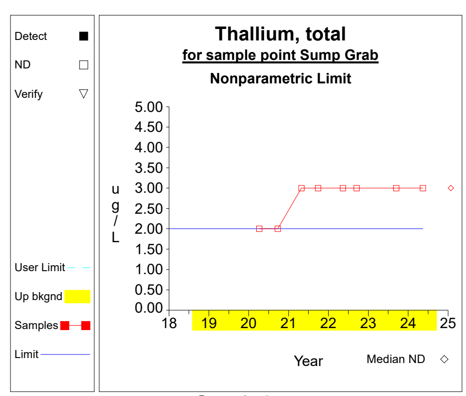
Graph 81



Graph 82



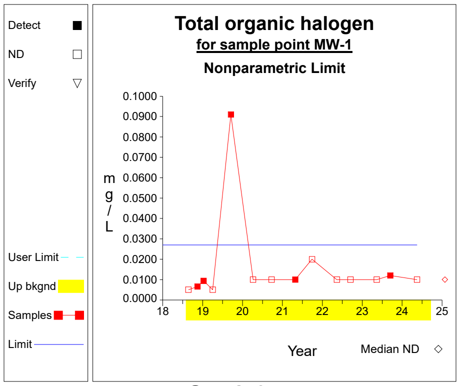
Graph 83



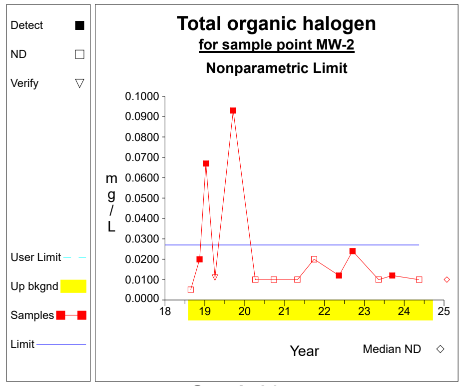
Graph 84

Prepared by: Otter Creek Environmental

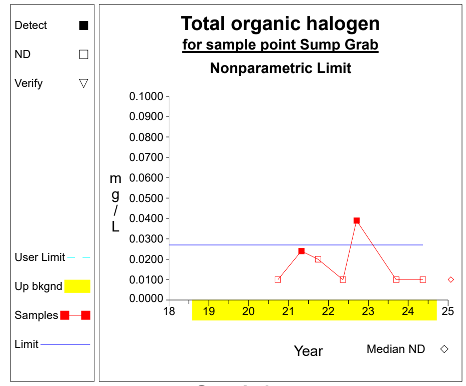
Up vs. Down Prediction Limits



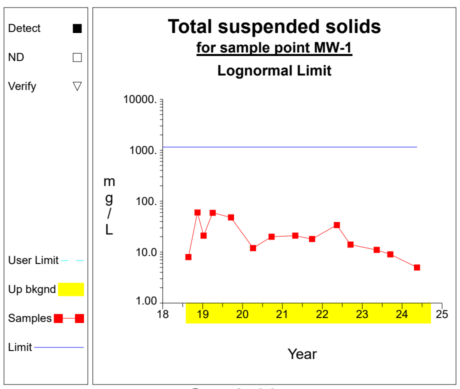
Graph 85



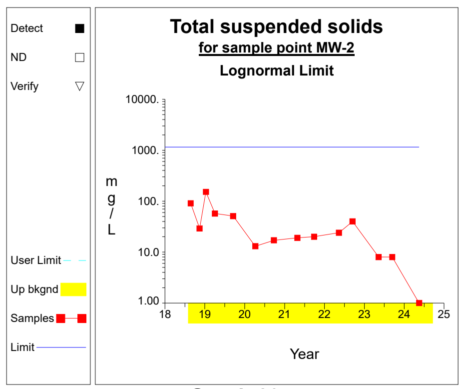
Graph 86



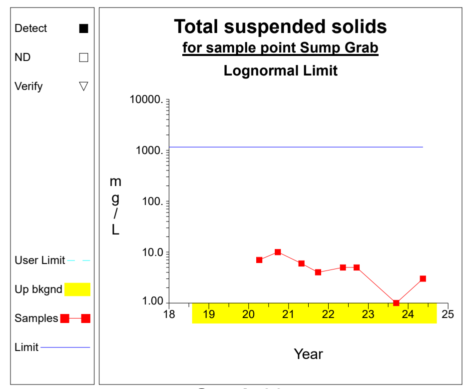
Graph 87



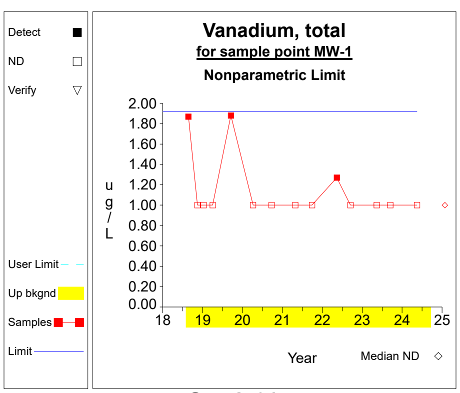
Graph 88



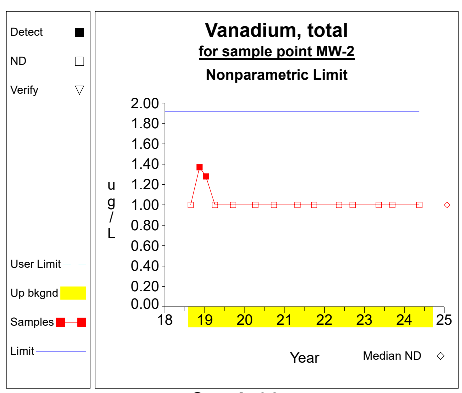
Graph 89



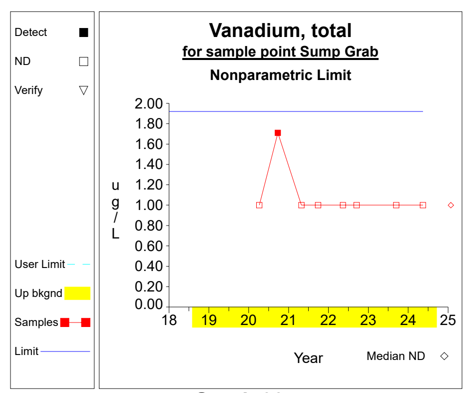
Graph 90



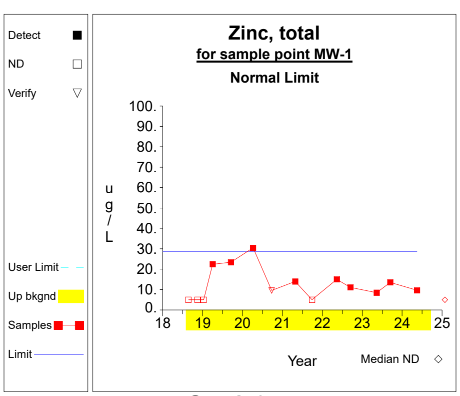
Graph 91



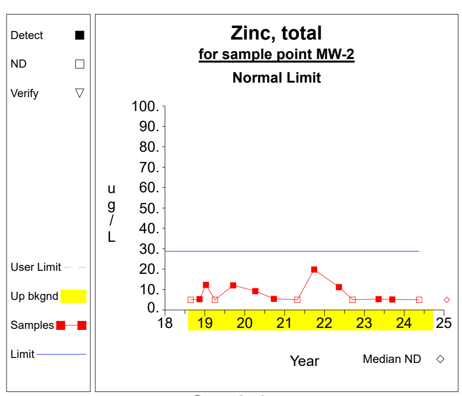
Graph 92



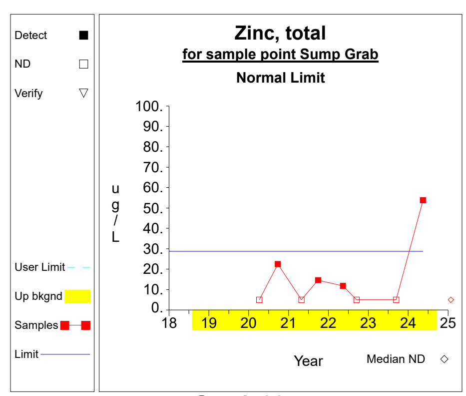
Graph 93



Graph 94

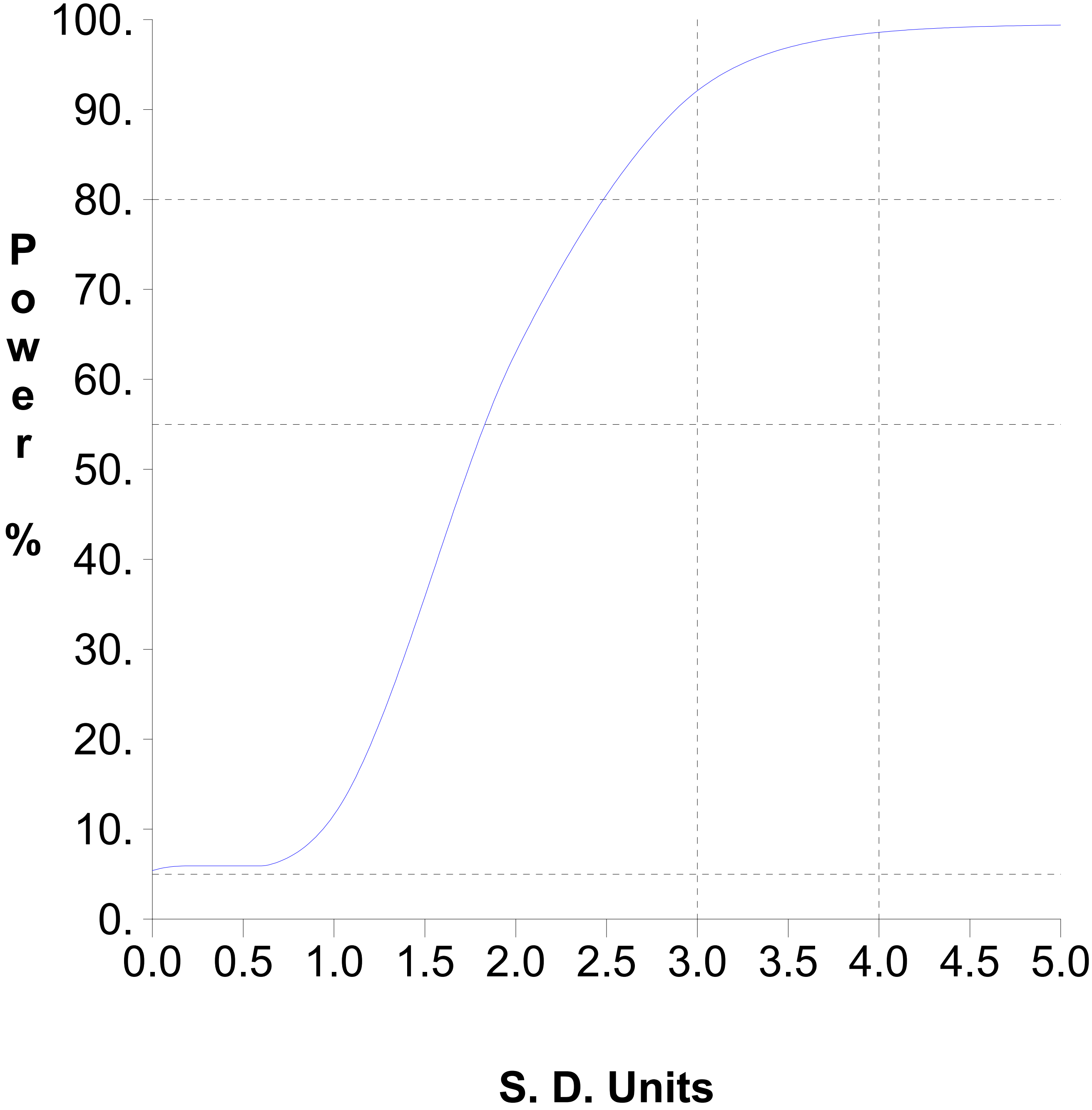


Graph 95



Graph 96

False Positive and False Negative Rates for Current Upgradient vs. Downgradient Monitoring Program



Worksheet 1 - Upgradient vs. Downgradient Comparisons
Aluminum, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **870.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Ammonia nitrogen (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.26**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Antimony, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Arsenic, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Barium, total (ug/L)
Normal Prediction Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **1078.7** / **28** = **38.525**	Compute upgradient mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**44798.23** - **1.16**x**10^6**/**28**) / (**28**-1))^{½} = **10.957**	Compute upgradient sd.
3	alpha = min[(1-.95$^{1/K}$)$^{1/3}$, .01] = min[(1-.95$^{1/96}$)$^{1/3}$, .01] = **0.01**	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
4	PL = $\bar{X}$ + **tS**(1+1/**N**)^{½} = **38.525** + (**2.472*****10.957**)(1+1/**28**)^{½} = **66.093**	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Beryllium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Boron, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **31.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Cadmium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chemical oxygen demand (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **20.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chloride (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **34.1**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chromium, total (ug/L)
Normal Prediction Limit

Step	Equation	Description
1	$\bar{X}_1 = \mathbf{sum[X_1]} / \mathbf{N_1}$ $= \mathbf{218.84} / \mathbf{26}$ $= \mathbf{8.417}$	Compute mean of N_1 detected measurements.
2	$S_1 = ((\mathbf{sum[X_1{}^2]} - \mathbf{sum[X_1]}^2/\mathbf{N_1}) / (\mathbf{N_1}-1))^{½}$ $= ((\mathbf{2285.298}-\mathbf{47890.946}/\mathbf{26}) / (\mathbf{26}-1))^{½}$ $= \mathbf{4.211}$	Compute sd of N_1 detected measurements.
3	$\bar{X} = (1 - \mathbf{N_0}/\mathbf{N})\, \bar{\mathbf{X}}_\mathbf{1}$ $= (1 - \mathbf{2}/\mathbf{28})\ \mathbf{8.417}$ $= \mathbf{7.816}$	Use Aitchison's method to adjust mean for presence of nondetects.
4	$S = [(1 - \mathbf{N_0}/\mathbf{N}) * \mathbf{S_1}^2 +$ $(\mathbf{N_0}/\mathbf{N}) (1 - (\mathbf{N_0}-1)/(\mathbf{N}-1))\ \bar{\mathbf{X}}_\mathbf{1}^2]^{½}$ $= [(1 - \mathbf{2}/\mathbf{28}) * \mathbf{4.211}^2 +$ $(\mathbf{2}/\mathbf{28}) (1 - (\mathbf{2}-1)/(\mathbf{28}-1))\ \mathbf{8.417}^2]^{½}$ $= \mathbf{4.619}$	Use Aitchison's method to adjust sd for presence of nondetects.
5	$alpha = min[(1-.95^{1/\mathbf{K}})^{1/3}, .01]$ $= min[(1-.95^{1/\mathbf{96}})^{1/3}, .01]$ $= \mathbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
6	$PL = \bar{\mathbf{X}} + \mathbf{tS}(1+1/\mathbf{N})^{½}$ $= \mathbf{7.816}$ $+ (\mathbf{2.472}*\mathbf{4.619})(1+1/\mathbf{28})^{½}$ $= \mathbf{19.439}$	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Cobalt, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.37**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Copper, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **7.33**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Fluoride (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.3**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Formaldehyde (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Iron, total (ug/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y} = \textbf{sum[Y]} / \textbf{N}$ $= \textbf{133.132} / \textbf{27}$ $= \textbf{4.931}$	Compute mean on a natural log scale.
3	$S_Y = ((\textbf{sum[Y}^2\textbf{]} - \textbf{sum[Y]}^2/\textbf{N}) / (\textbf{N}-1))^{1/2}$ $= ((\textbf{696.651} - \textbf{17724.132}/\textbf{27}) / (\textbf{27}-1))^{1/2}$ $= \textbf{1.243}$	Compute sd on a natural log scale.
4	alpha = $\min[(1-.95^{1/\textbf{K}})^{1/3}, .01]$ $= \min[(1-.95^{1/\textbf{96}})^{1/3}, .01]$ $= \textbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
5	$PL = \exp[\bar{Y} + tS_Y(1+1/\textbf{N})^{1/2}]$ $= \exp[\textbf{4.931} + (\textbf{2.478}*\textbf{1.243})(1+1/\textbf{27})^{1/2}]$ $= \textbf{3193.86}$	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Lead, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.01**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Magnesium, total (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **72.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Manganese, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **145.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Mercury, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Methyl ethyl ketone (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Molybdenum, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **10.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Nickel, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **2.51**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Phenols (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **25.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Selenium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Silver, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Sulfate (mg/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y}$ = **sum[Y]** / **N** = **50.494** / **27** = **1.87**	Compute mean on a natural log scale.
3	$S_Y = ((\mathbf{sum[Y^2]} - \mathbf{sum[Y]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{99.236} - \mathbf{2549.6/27}) / (\mathbf{27}-1))^{1/2}$ = **0.43**	Compute sd on a natural log scale.
4	alpha $= \min[(1-.95^{1/\mathbf{K}})^{1/3}, .01]$ $= \min[(1-.95^{1/\mathbf{96}})^{1/3}, .01]$ = **0.01**	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
5	$PL = \exp[\bar{\mathbf{Y}} + \mathbf{tS_Y}(1+1/\mathbf{N})^{1/2}]$ $= \exp[\mathbf{1.87}$ $+ (\mathbf{2.478}*\mathbf{0.43})(1+1/\mathbf{27})^{1/2}]$ = **19.206**	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Thallium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Total organic halogen (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.027**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Total suspended solids (mg/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y} = \textbf{sum[Y]} / \textbf{N}$ $= \textbf{104.981} / \textbf{28}$ $= \textbf{3.749}$	Compute mean on a natural log scale.
3	$S_Y = ((\textbf{sum[Y}^{\textbf{2}}\textbf{]} - \textbf{sum[Y]}^2/\textbf{N}) / (\textbf{N}-1))^{½}$ $= ((\textbf{439.995} - \textbf{11021.073}/\textbf{28}) / (\textbf{28}-1))^{½}$ $= \textbf{1.311}$	Compute sd on a natural log scale.
4	$\text{alpha} = \min[(1-.95^{1/\textbf{K}})^{1/3}, .01]$ $= \min[(1-.95^{1/\textbf{96}})^{1/3}, .01]$ $= \textbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
5	$PL = \exp[\bar{\textbf{Y}} + \textbf{t}\textbf{S}_\textbf{Y}(1+1/\textbf{N})^{½}]$ $= \exp[\textbf{3.749}$ $+ (\textbf{2.472}*\textbf{1.311})(1+1/\textbf{28})^{½}]$ $= \textbf{1149.609}$	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Vanadium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.92**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Zinc, total (ug/L)
Normal Prediction Limit

Step	Equation	Description
1	$\bar{X}_1 = \mathbf{sum[X_1]} / \mathbf{N_1}$ $= \mathbf{270.23} / \mathbf{22}$ $= \mathbf{12.283}$	Compute mean of N_1 detected measurements.
2	$S_1 = ((\mathbf{sum[X_1^2]} - \mathbf{sum[X_1]^2} / \mathbf{N_1}) / (\mathbf{N_1}-1))^{1/2}$ $= ((\mathbf{4163.173} - \mathbf{73024.253}/\mathbf{22}) / (\mathbf{22}-1))^{1/2}$ $= \mathbf{6.339}$	Compute sd of N_1 detected measurements.
3	$\bar{X} = (1 - \mathbf{N_0}/\mathbf{N})\ \bar{\mathbf{X}}_1$ $= (1 - \mathbf{6}/\mathbf{28})\ \mathbf{12.283}$ $= \mathbf{9.651}$	Use Aitchison's method to adjust mean for presence of nondetects.
4	$S = [(1 - \mathbf{N_0}/\mathbf{N}) * \mathbf{S_1}^2 + (\mathbf{N_0}/\mathbf{N}) (1 - (\mathbf{N_0}-1)/(\mathbf{N}-1))\ \bar{\mathbf{X}}_1^2]^{1/2}$ $= [(1 - \mathbf{6}/\mathbf{28}) * \mathbf{6.339}^2 + (\mathbf{6}/\mathbf{28}) (1 - (\mathbf{6}-1)/(\mathbf{28}-1))\ \mathbf{12.283}^2]^{1/2}$ $= \mathbf{7.61}$	Use Aitchison's method to adjust sd for presence of nondetects.
5	$\text{alpha} = \min[(1-.95^{1/\mathbf{K}})^{1/3}, .01]$ $= \min[(1-.95^{1/\mathbf{96}})^{1/3}, .01]$ $= \mathbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 of 2 resamples.
6	$PL = \bar{\mathbf{X}} + \mathbf{tS}(1+1/\mathbf{N})^{1/2}$ $= \mathbf{9.651} + (\mathbf{2.472}*\mathbf{7.61})(1+1/\mathbf{28})^{1/2}$ $= \mathbf{28.799}$	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Attachment D

Summary Tables and Graphs for the Intrawell Comparisons
First Semi-Annual Monitoring Event in 2024

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Aluminum, total	ug/L	MW-1	8	6	14	295.3625	422.9416	100.0000	100.0000	295.3625	295.3625	3044.4831	normal		
Aluminum, total	ug/L	MW-2	8	6	14	192.5375	223.5234	100.0000	100.0000	192.5375	192.5375	1645.4399	normal		
Aluminum, total	ug/L	MW-3	8	5	14	210.2125	172.5289	100.0000	100.0000	210.2125	210.2125	1331.6502	normal		
Aluminum, total	ug/L	MW-4	7	6	14	77.5571	31.4196	100.0000	100.0000	77.5571	77.5571	281.7844	normal		
Aluminum, total	ug/L	Sump Grab	8	0	8	101.5000	29.7706	100.0000	107.0000			295.0086	normal		
Ammonia nitrogen	mg/L	MW-1	8	6	14			0.1000	0.1000			0.1300	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-2	8	6	14			0.1000	0.1000			0.2300	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-3	8	6	14			0.1000	0.1000			0.2600	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-4	8	6	14			0.1000	0.1000			0.1200	nonpar	.99	**
Ammonia nitrogen	mg/L	Sump Grab	8	0	8			0.1000	0.1000			0.2500	nonpar	.99	**
Antimony, total	ug/L	MW-1	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-2	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-3	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-4	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	Sump Grab	8	0	8			5.0000	5.0000			5.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-1	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-2	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-3	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-4	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	Sump Grab	8	0	8			10.0000	10.0000			10.0000	nonpar	.99	**
Barium, total	ug/L	MW-1	8	6	14	60.2750	16.6684	44.1000	46.4000	60.2750	60.2750	168.6198	normal		
Barium, total	ug/L	MW-2	8	6	14	72.9625	32.1116	60.0000	57.6000	72.9625	72.9625	281.6881	normal		
Barium, total	ug/L	MW-3	8	6	14	30.7750	6.6257	27.6000	31.7000	46.0724	40.3717	73.8417	normal		
Barium, total	ug/L	MW-4	8	6	14	43.3000	4.9742	41.4000	42.2000	43.3000	43.3000	75.6324	normal		
Barium, total	ug/L	Sump Grab	8	0	8	108.3625	17.9467	133.0000	119.0000			225.0163	normal		
Beryllium, total	ug/L	MW-1	8	6	14			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-2	8	6	14			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-3	8	6	14			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-4	8	6	14			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	Sump Grab	8	0	8			1.0000	1.0000			1.0000	nonpar	.99	**
Boron, total	ug/L	MW-1	8	6	14	21.7625	3.8000	20.0000	20.0000	21.7625	21.7625	46.4623	normal		
Boron, total	ug/L	MW-2	8	6	14	30.3750	13.7966	20.0000	20.0000	30.3750	30.3750	120.0526	normal		
Boron, total	ug/L	MW-3	8	6	14			20.0000	20.0000			20.0000	nonpar	.99	**
Boron, total	ug/L	MW-4	7	6	14	21.7143	4.1115	20.0000	20.0000	21.7143	21.7143	48.4393	normal		
Boron, total	ug/L	Sump Grab	8	0	8	53.0375	21.0596	81.1000	83.2000			189.9247	normal		
Cadmium, total	ug/L	MW-1	8	6	14			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-2	8	6	14			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-3	8	6	14			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-4	8	6	14			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	Sump Grab	8	0	8			0.4000	0.4000			0.4000	nonpar	.99	**
Chemical oxygen demand	mg/L	MW-1	8	6	14	8.6250	2.8253	10.0000	10.0000	8.6250	8.6250	26.9892	normal		
Chemical oxygen demand	mg/L	MW-2	8	6	14	8.3750	3.5431	10.0000	10.0000	8.3750	8.3750	31.4052	normal		
Chemical oxygen demand	mg/L	MW-3	8	6	14	9.1250	3.0443	10.0000	10.0000	9.1250	9.1250	28.9131	normal		
Chemical oxygen demand	mg/L	MW-4	8	6	14	10.6250	4.3404	10.0000	10.0000	10.6250	10.6250	38.8378	normal		
Chemical oxygen demand	mg/L	Sump Grab	8	0	8	7.2500	0.7071	7.0000	7.0000			11.8462	normal		
Chloride	mg/L	MW-1	8	6	14	5.8200	2.4947	4.8100	13.9000	5.8200	11.4053	22.0355	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Chloride	mg/L	MW-2	8	6	14	29.1675	28.1862	2.7500	3.5400	29.1675	29.1675	212.3775	normal		
Chloride	mg/L	MW-3	8	6	14	1.3752	1.3315	0.6330	0.6070	1.3752	1.3752	10.0303	normal		
Chloride	mg/L	MW-4	8	6	14	10.7650	11.4330	2.7400	2.9100	10.7650	10.7650	85.0797	normal		
Chloride	mg/L	Sump Grab	8	0	8	21.6750	7.9688	22.9000	18.2000			73.4724	normal		
Chromium, total	ug/L	MW-1	8	6	14	5.2988	4.0865	7.1200	4.3700	5.2988	5.2988	31.8611	normal		
Chromium, total	ug/L	MW-2	6	6	14	6.2000	1.2036	3.4800	1.4900	6.2000	6.2000	14.0234	normal		
Chromium, total	ug/L	MW-3	8	6	14	7.3575	6.3409	4.6100	7.7000	7.3575	7.3575	48.5731	normal		
Chromium, total	ug/L	MW-4	8	6	14	7.5900	4.6921	12.1000	7.2000	7.5900	7.5900	38.0883	normal		
Chromium, total	ug/L	Sump Grab	8	0	8			1.0000	1.0000			1.5000	nonpar	.99	**
Cobalt, total	ug/L	MW-1	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-2	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-3	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-4	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	Sump Grab	8	0	8			2.0000	2.0000			2.0000	nonpar	.99	**
Copper, total	ug/L	MW-1	8	6	14	3.9662	1.8957	3.0000	3.0000	3.9662	3.9662	16.2886	normal		
Copper, total	ug/L	MW-2	8	6	14	2.6725	1.1713	3.0000	3.0000	2.6725	2.6725	10.2858	normal		
Copper, total	ug/L	MW-3	8	6	14	7.3413	10.3878	3.0000	3.0000	7.3413	7.3413	74.8616	normal		
Copper, total	ug/L	MW-4	8	6	14	3.0838	2.0070	3.0000	3.0000	3.0838	3.0838	16.1294	normal		
Copper, total	ug/L	Sump Grab	8	0	8	6.8725	4.8530	3.0000	15.1000			38.4171	normal		
Fluoride	mg/L	MW-1	8	6	14	0.1406	0.0651	0.1010	0.1050	0.1406	0.1406	0.5635	normal		
Fluoride	mg/L	MW-2	8	6	14	0.1781	0.1119	0.1140	0.1280	0.1781	0.1781	0.9055	normal		
Fluoride	mg/L	MW-3	8	6	14	0.1205	0.0431	0.1000	0.1000	0.1205	0.1205	0.4003	normal		
Fluoride	mg/L	MW-4	8	6	14	0.1548	0.0681	0.1240	0.1050	0.1548	0.1548	0.5972	normal		
Fluoride	mg/L	Sump Grab	8	0	8	0.1478	0.0182	0.1410	0.1290			0.2661	normal		
Formaldehyde	ug/L	MW-1	8	6	14			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-2	8	6	14			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-3	8	6	14			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-4	8	6	14			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	Sump Grab	8	0	8			100.0000	100.0000			100.0000	nonpar	.99	**
Iron, total	ug/L	MW-1	8	6	14	232.1375	256.1545	79.4000	38.2000	232.1375	232.1375	1897.1415	normal		
Iron, total	ug/L	MW-2	8	6	14	414.6125	502.0142	15.4000	10.0000	414.6125	414.6125	3677.7047	normal		
Iron, total	ug/L	MW-3	8	5	14	485.8500	557.5418	35.1000	41.7000	485.8500	485.8500	4109.8717	normal		
Iron, total	ug/L	MW-4	8	6	14	273.4000	351.1964	55.4000	38.1000	273.4000	273.4000	2556.1763	normal		
Iron, total	ug/L	Sump Grab	8	0	8	451.2125	1131.6694	10.0000	48.8000			7807.0639	normal		
Lead, total	ug/L	MW-1	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Lead, total	ug/L	MW-2	8	6	14			2.0000	2.0000			2.2100	nonpar	.99	**
Lead, total	ug/L	MW-3	8	6	14			2.0000	2.0000			2.4100	nonpar	.99	**
Lead, total	ug/L	MW-4	8	6	14			2.0000	2.0000			3.0100	nonpar	.99	**
Lead, total	ug/L	Sump Grab	8	0	8			2.0000	2.0000			2.0000	nonpar	.99	**
Magnesium, total	mg/L	MW-1	8	6	14	39.3125	9.1299	50.3000	38.4000	41.1701	39.3125	98.6570	normal		
Magnesium, total	mg/L	MW-2	8	6	14	60.7625	12.3983	49.9000	54.2000	60.7625	60.7625	141.3512	normal		
Magnesium, total	mg/L	MW-3	8	6	14	26.5625	4.8447	24.0000	25.8000	32.3336	26.7264	58.0531	normal		
Magnesium, total	mg/L	MW-4	8	6	14	51.7250	9.0714	46.7000	49.1000	51.7250	51.7250	110.6892	normal		
Magnesium, total	mg/L	Sump Grab	8	0	8	38.3625	3.9935	43.0000	42.2000			64.3205	normal		
Manganese, total	ug/L	MW-1	8	6	14	31.3875	21.5201	20.0000	20.0000	31.3875	31.3875	171.2683	normal		
Manganese, total	ug/L	MW-2	8	6	14	67.3500	34.2578	23.5000	20.0000	67.3500	67.3500	290.0255	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Manganese, total	ug/L	MW-3	8	5	14	38.1250	27.8922	20.0000	20.0000	38.1250	38.1250	219.4245	normal		
Manganese, total	ug/L	MW-4	7	6	14	21.3429	2.1801	20.0000	20.0000	21.3429	21.3429	35.5135	normal		
Manganese, total	ug/L	Sump Grab	8	0	8	30.5625	29.2739	20.0000	20.0000			220.8427	normal		
Mercury, total	ug/L	MW-1	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-2	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-3	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-4	8	6	14			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	Sump Grab	8	0	8			2.0000	2.0000			2.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-1	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-2	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-3	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-4	8	6	14			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	Sump Grab	7	0	7								nonpar *		**
Molybdenum, total	ug/L	MW-1	8	6	14	2.0888	0.1795	10.0000	10.0000	2.0888	2.0888	3.2554	normal		
Molybdenum, total	ug/L	MW-2	8	6	14	3.2550	2.0221	10.0000	10.0000	3.2550	3.2550	16.3984	normal		
Molybdenum, total	ug/L	MW-3	8	6	14	2.3863	0.7607	10.0000	10.0000	2.3863	2.3863	7.3310	normal		
Molybdenum, total	ug/L	MW-4	8	6	14	2.3800	0.7205	10.0000	10.0000	2.3800	2.3800	7.0632	normal		
Molybdenum, total	ug/L	Sump Grab	8	0	8			10.0000	10.0000			10.0000	nonpar	.99	**
Nickel, total	ug/L	MW-1	8	6	14	1.3188	0.7304	1.0000	1.0000	1.3188	1.3188	6.0664	normal		
Nickel, total	ug/L	MW-2	6	6	14	1.0950	0.2004	1.0000	1.0000	1.0950	1.0950	2.3974	normal		
Nickel, total	ug/L	MW-3	8	6	14	1.6000	0.9365	1.0000	1.0000	1.6000	1.6000	7.6873	normal		
Nickel, total	ug/L	MW-4	8	6	14	1.2488	0.5285	1.0000	1.0000	1.2488	1.2488	4.6843	normal		
Nickel, total	ug/L	Sump Grab	8	0	8			1.0000	1.0000			1.0000	nonpar	.99	**
Phenols	ug/L	MW-1	8	6	14	9.8750	7.7724	8.0000	10.0000	9.8750	9.8750	60.3958	normal		
Phenols	ug/L	MW-2	8	6	14	7.5000	4.7208	8.0000	10.0000	7.5000	7.5000	38.1850	normal		
Phenols	ug/L	MW-3	8	6	14	8.0000	6.1644	8.0000	10.0000	8.0000	8.0000	48.0687	normal		
Phenols	ug/L	MW-4	8	6	14	8.3125	8.0487	8.0000	10.0000	8.3125	8.3125	60.6289	normal		
Phenols	ug/L	Sump Grab	8	0	8	5.6250	1.4079	5.0000	5.0000			14.7763	normal		
Selenium, total	ug/L	MW-1	8	6	14	5.5413	0.9765	5.0000	5.0000	5.5413	5.5413	11.8882	normal		
Selenium, total	ug/L	MW-2	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	MW-3	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	MW-4	8	6	14			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	Sump Grab	8	0	8			5.0000	5.0000			5.0000	nonpar	.99	**
Silver, total	ug/L	MW-1	8	6	14			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-2	8	6	14			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-3	8	6	14			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-4	8	6	14			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	Sump Grab	8	0	8			0.5000	0.5000			0.5000	nonpar	.99	**
Sulfate	mg/L	MW-1	8	6	14	28.0150	25.1579	10.9000	19.1000	28.0150	28.0150	191.5417	normal		
Sulfate	mg/L	MW-2	8	6	14	27.0000	4.5416	20.7000	27.0000	27.0000	27.0000	56.5201	normal		
Sulfate	mg/L	MW-3	8	6	14	4.5625	0.4935	5.5700	5.1600	5.2585	5.3625	7.7702	normal		
Sulfate	mg/L	MW-4	8	6	14	9.9363	6.6715	8.9300	8.8200	9.9363	9.9363	53.3012	normal		
Sulfate	mg/L	Sump Grab	8	0	8	65.0375	38.7615	20.1000	75.2000			316.9875	normal		
Thallium, total	ug/L	MW-1	8	6	14			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	MW-2	8	6	14			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	MW-3	8	6	14			3.0000	3.0000			2.0000	nonpar	.99	**

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Thallium, total	ug/L	MW-4	8	6	14			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	Sump Grab	8	0	8			3.0000	3.0000			3.0000	nonpar	.99	**
Total organic halogen	mg/L	MW-1	7	6	14	0.0066	0.0022	0.0120	0.0100	0.0098	0.0066	0.0210	normal		
Total organic halogen	mg/L	MW-2	8	6	14	0.0289	0.0325	0.0120	0.0100	0.0289	0.0289	0.2401	normal		
Total organic halogen	mg/L	MW-3	8	6	14	0.0161	0.0139	0.0100	0.0100	0.0161	0.0161	0.1067	normal		
Total organic halogen	mg/L	MW-4	6	6	14	0.0142	0.0048	0.0100	0.0100	0.0142	0.0142	0.0453	normal		
Total organic halogen	mg/L	Sump Grab	7	0	7	0.0161	0.0113	0.0100	0.0100			0.0899	normal		
Total suspended solids	mg/L	MW-1	8	6	14	31.1250	21.1284	9.0000	5.0000	31.1250	31.1250	168.4598	normal		
Total suspended solids	mg/L	MW-2	8	6	14	53.6250	47.6443	8.0000	1.0000	53.6250	53.6250	363.3131	normal		
Total suspended solids	mg/L	MW-3	8	6	14	83.1250	43.1126	29.0000	7.0000	83.1250	83.1250	363.3569	normal		
Total suspended solids	mg/L	MW-4	6	6	14	26.6667	11.3078	8.0000	3.0000	26.6667	26.6667	100.1675	normal		
Total suspended solids	mg/L	Sump Grab	8	0	8	5.1250	2.6959	1.0000	3.0000			22.6483	normal		
Vanadium, total	ug/L	MW-1	8	6	14	1.2188	0.4051	1.0000	1.0000	1.2188	1.2188	3.8516	normal		
Vanadium, total	ug/L	MW-2	8	6	14	1.0813	0.1524	1.0000	1.0000	1.0813	1.0813	2.0716	normal		
Vanadium, total	ug/L	MW-3	8	6	14			1.0000	1.0000			1.4100	nonpar	.99	**
Vanadium, total	ug/L	MW-4	8	6	14			1.0000	1.0000			1.2600	nonpar	.99	**
Vanadium, total	ug/L	Sump Grab	8	0	8			1.0000	1.0000			1.7100	nonpar	.99	**
Zinc, total	ug/L	MW-1	8	6	14	14.3588	9.9482	13.5000	9.6400	14.3588	14.3588	79.0220	normal		
Zinc, total	ug/L	MW-2	8	6	14	7.4325	3.2733	5.1300	5.0000	7.4325	7.4325	28.7091	normal		
Zinc, total	ug/L	MW-3	8	6	14	11.2038	6.8501	5.0000	9.1500	11.2038	11.2038	55.7291	normal		
Zinc, total	ug/L	MW-4	8	6	14	14.4125	8.7494	7.8100	9.8600	14.4125	14.4125	71.2839	normal		
Zinc, total	ug/L	Sump Grab	8	0	8	15.3375	16.7809	5.0000	53.8000			124.4130	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
*   - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 4

Dixon's Test Outliers
1% Significance Level

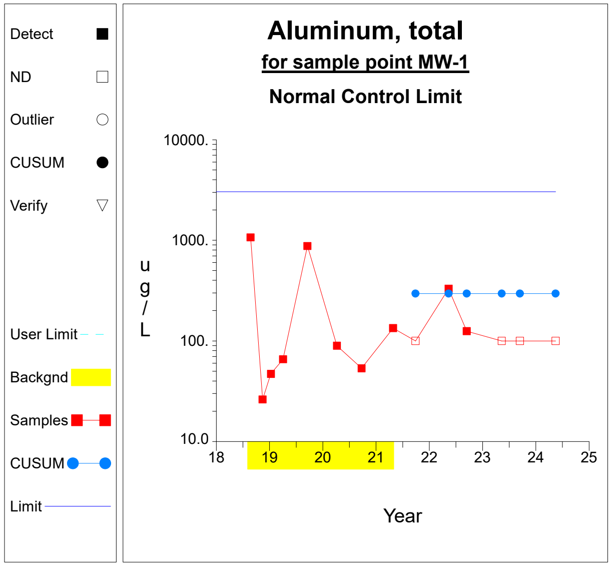
Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Aluminum, total	ug/L	MW-4	11/30/2018	755.0000		08/23/2018-04/27/2021	8	0.6808
Boron, total	ug/L	MW-4	08/28/2018	90.1000		08/28/2018-04/27/2021	8	0.6808
Chromium, total	ug/L	MW-2	08/23/2018	1.0000	< 1.0000	08/23/2018-04/27/2021	8	0.6371
Chromium, total	ug/L	MW-2	04/01/2019	1.0000	< 1.0000	08/23/2018-04/27/2021	8	0.6371
Manganese, total	ug/L	MW-4	11/30/2018	100.0000		08/28/2018-04/27/2021	8	0.6808
Nickel, total	ug/L	MW-2	01/10/2019	3.2200		08/23/2018-04/27/2021	8	0.6371
Nickel, total	ug/L	MW-2	04/27/2021	3.3500		08/23/2018-04/27/2021	8	0.6371
Total organic halogen	mg/L	MW-1	09/17/2019	0.0910		08/23/2018-04/27/2021	8	0.6808
Total suspended solids	mg/L	MW-4	08/28/2018	500.0000		08/28/2018-04/27/2021	8	0.6371
Total suspended solids	mg/L	MW-4	11/30/2018	237.0000		08/28/2018-04/27/2021	8	0.6371

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

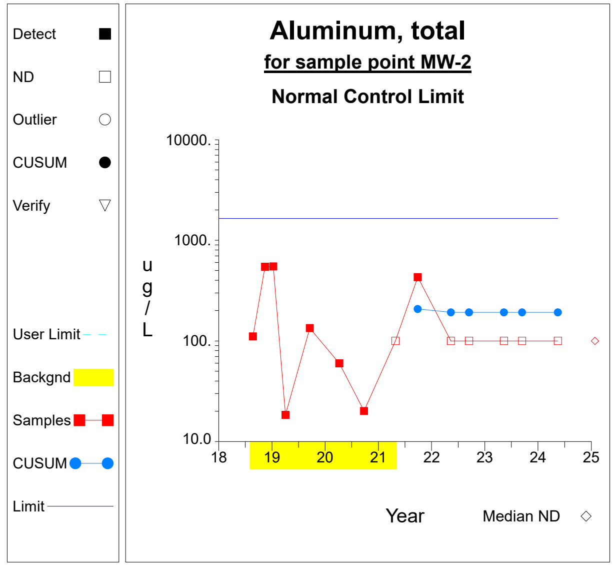
Goose Lake Quarry

November 2024

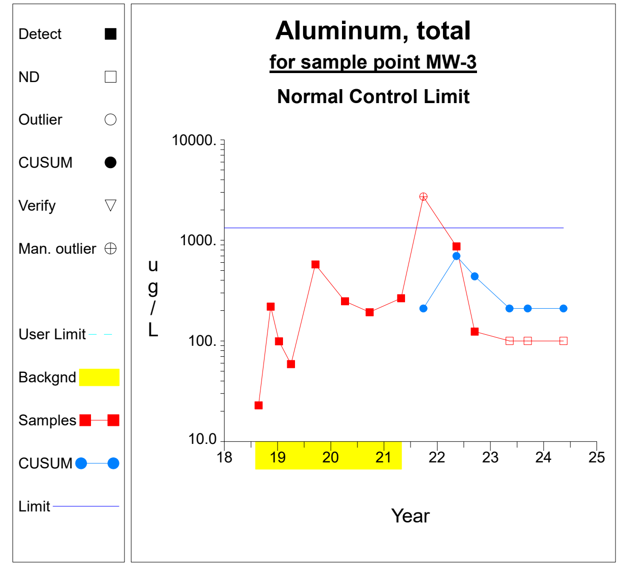
Intra-Well Control Charts / Prediction Limits



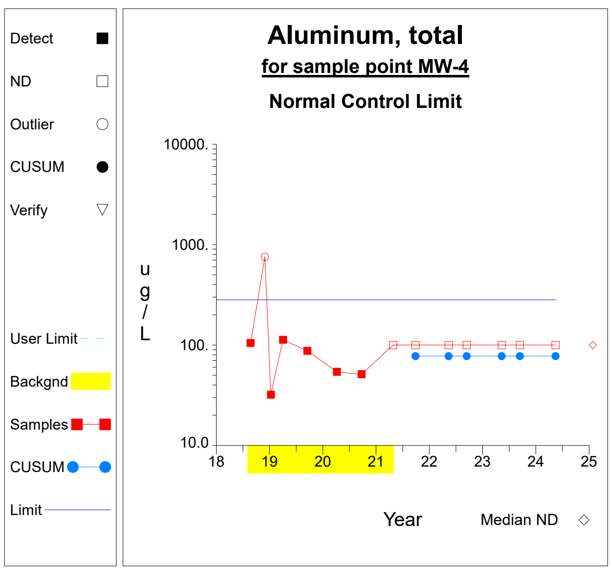
Graph 1



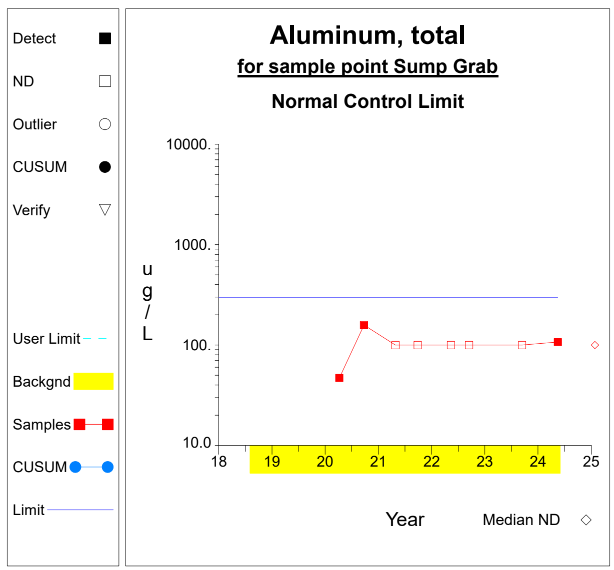
Graph 2



Graph 3



Graph 4



Graph 5

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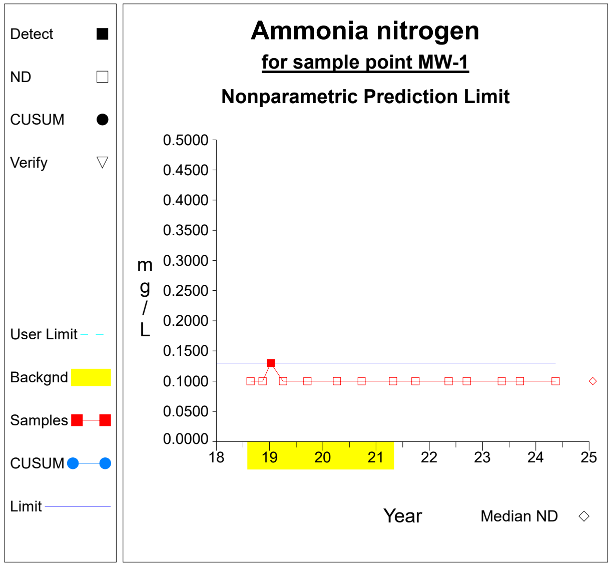
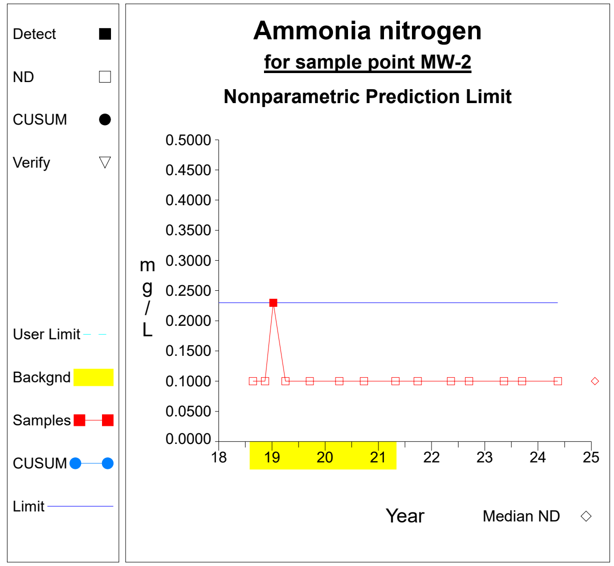
Goose Lake Quarry

November 2024

Intra-Well Control Charts / Prediction Limits



Graph 6



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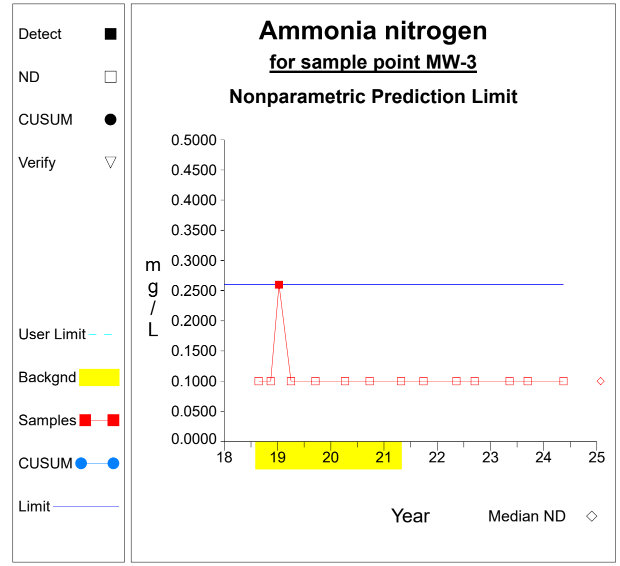

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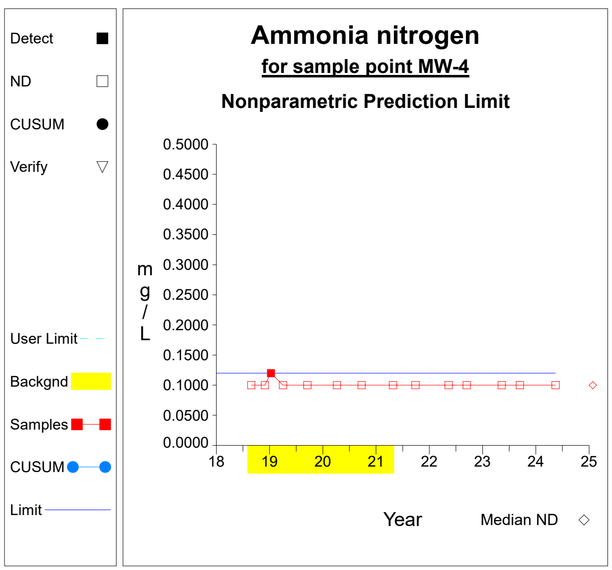

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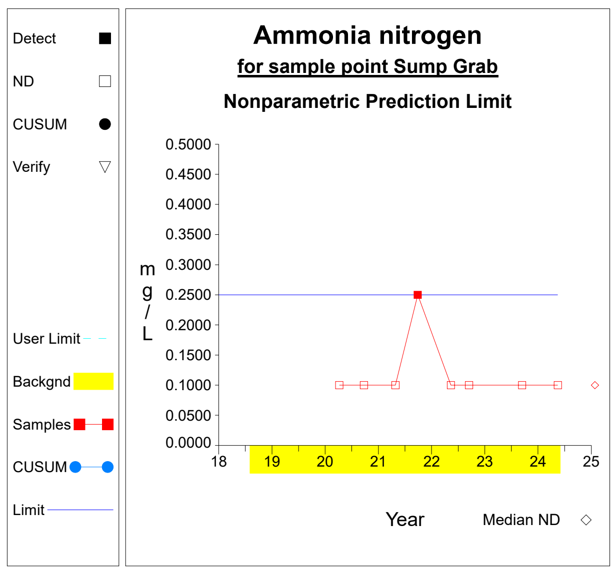

Graph 10

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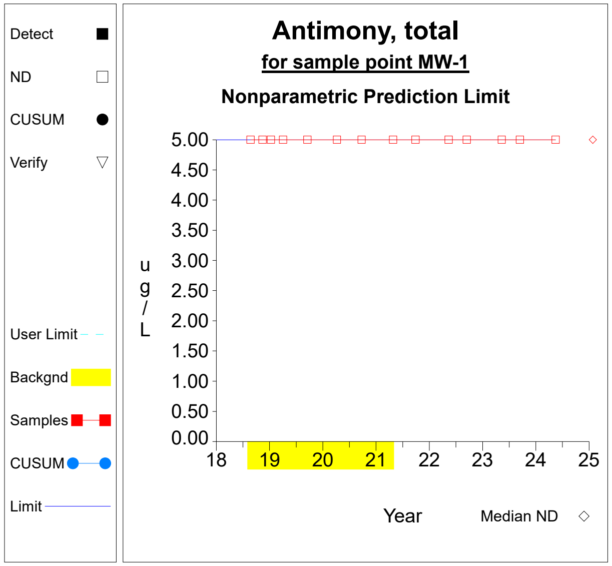
Intra-Well Control Charts / Prediction Limits



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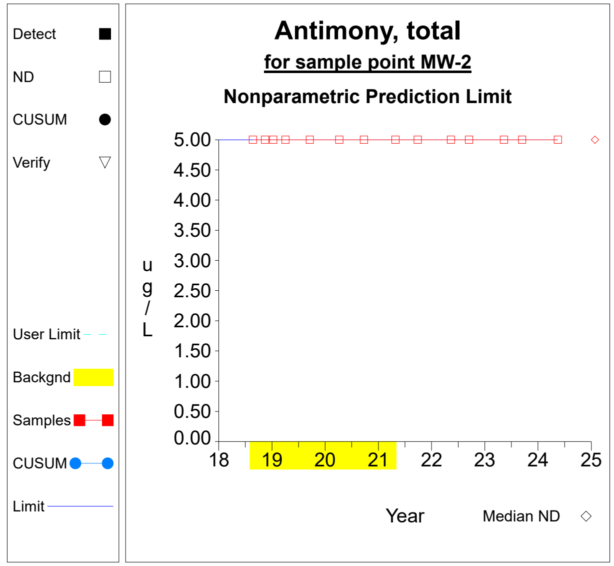

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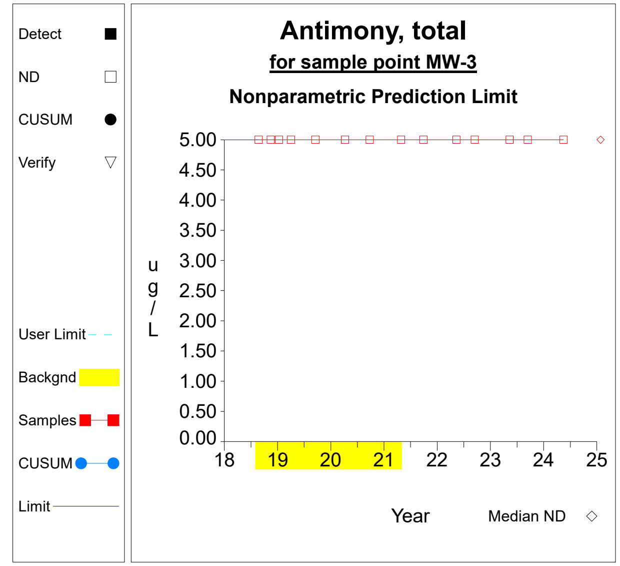

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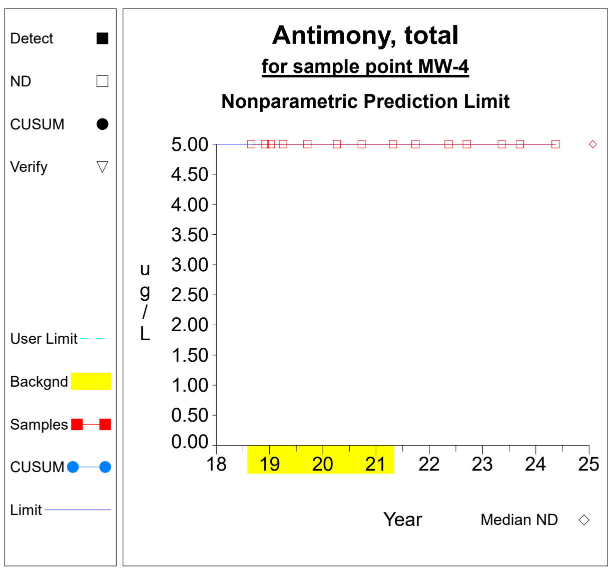

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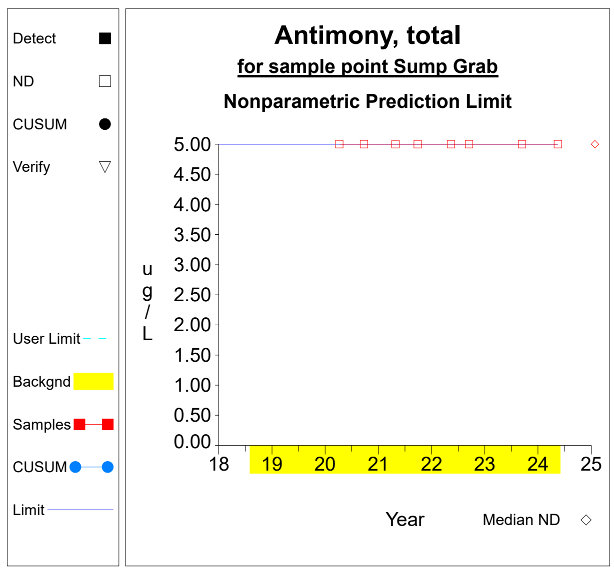
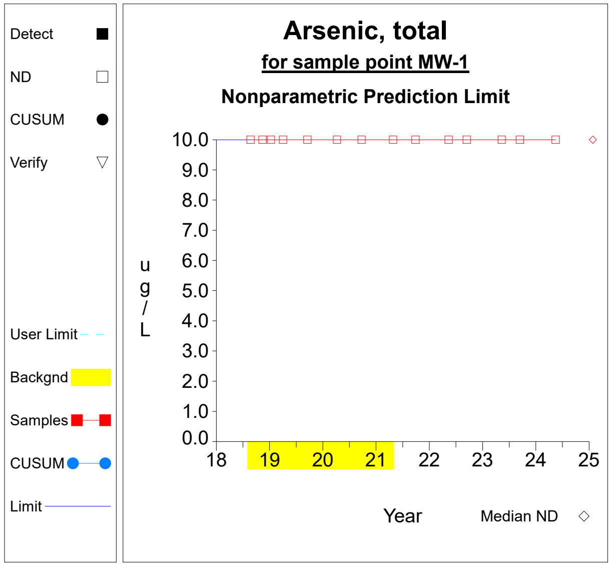


Graph 15

Intra-Well Control Charts / Prediction Limits



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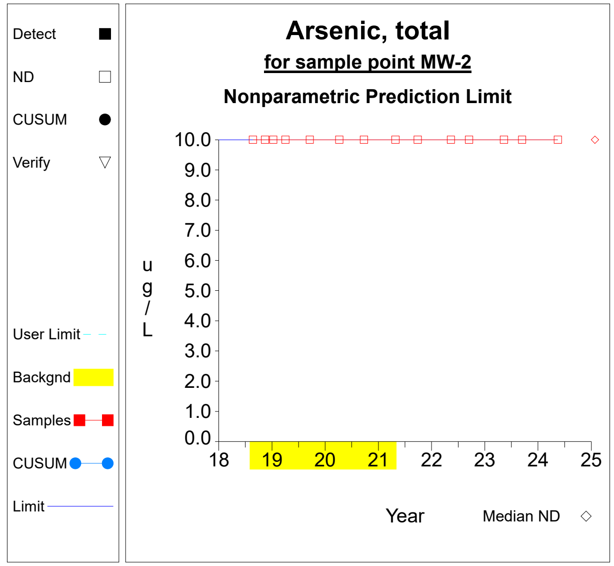

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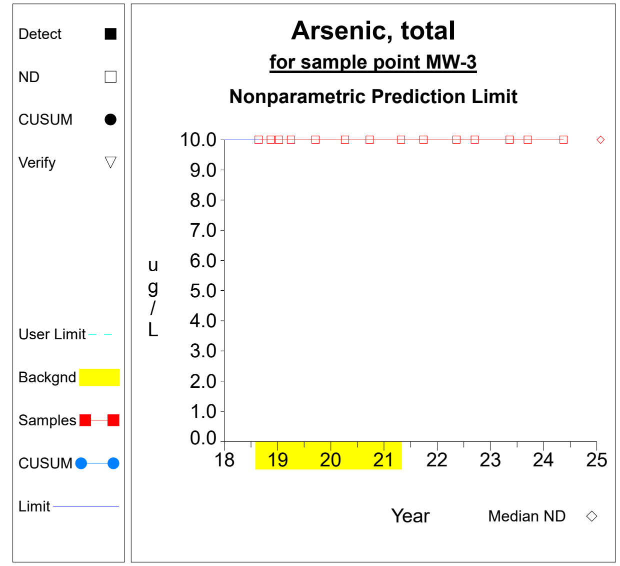

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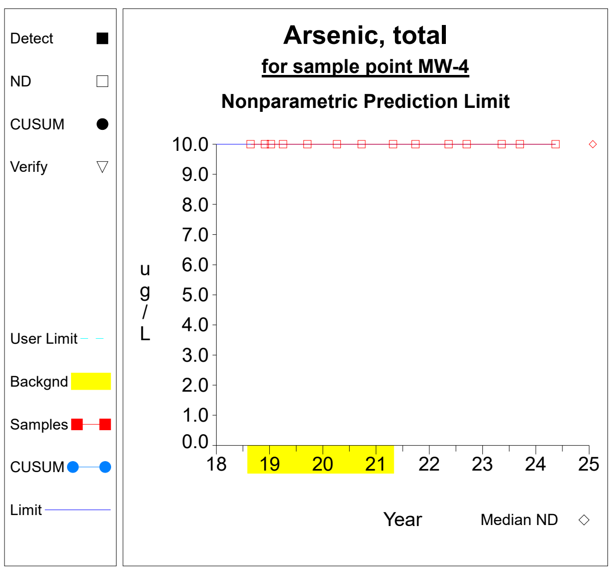

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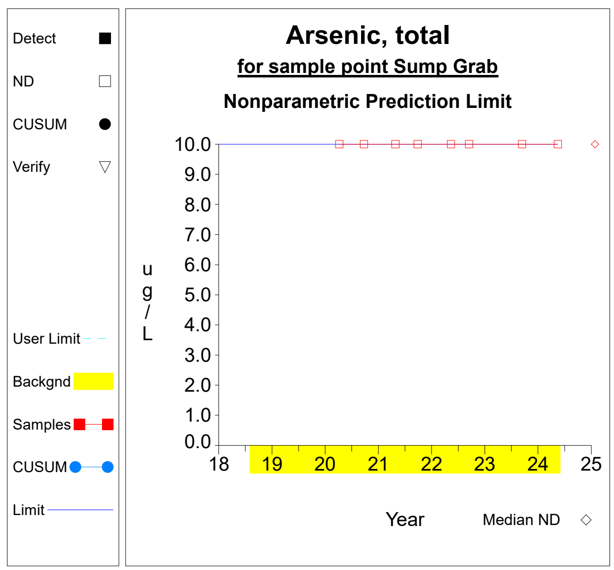
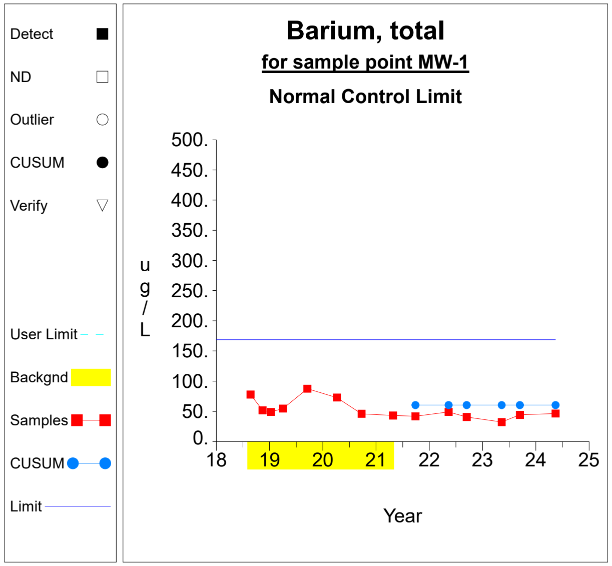
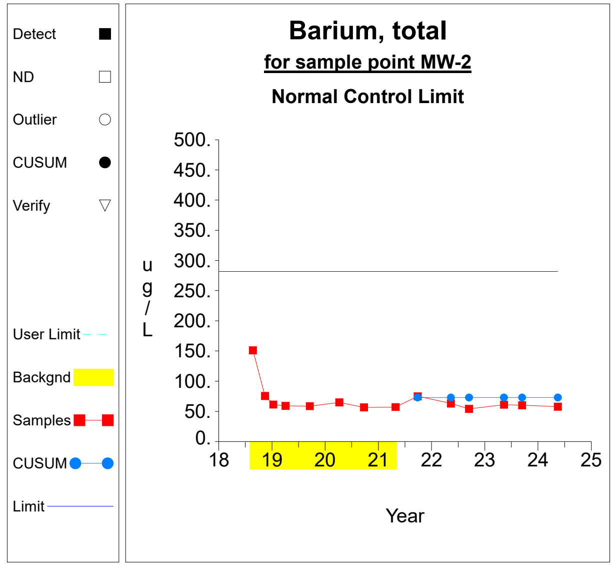


Graph 20

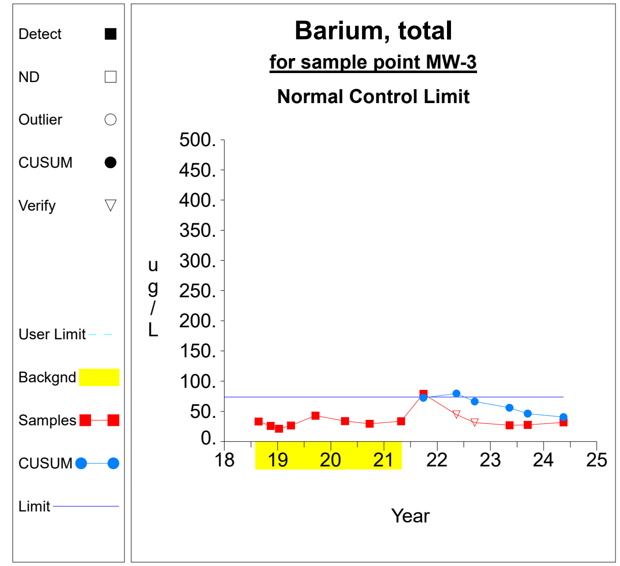
Intra-Well Control Charts / Prediction Limits



Graph 21



Graph 22



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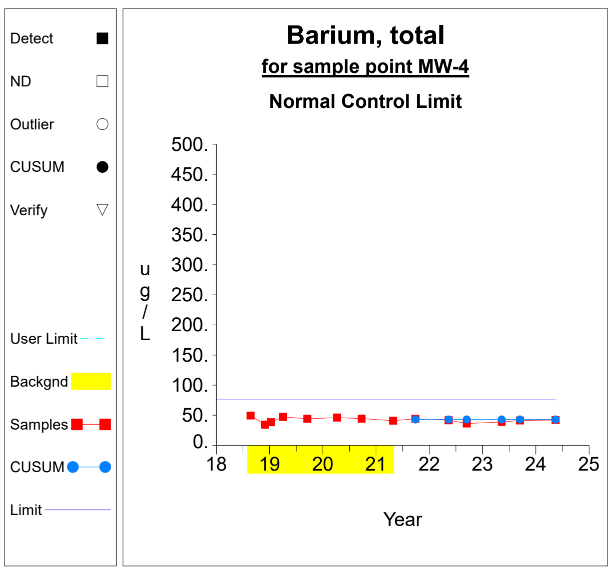

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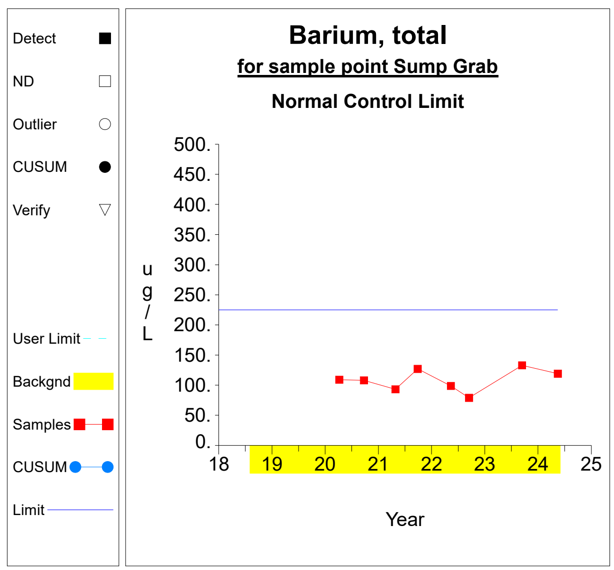
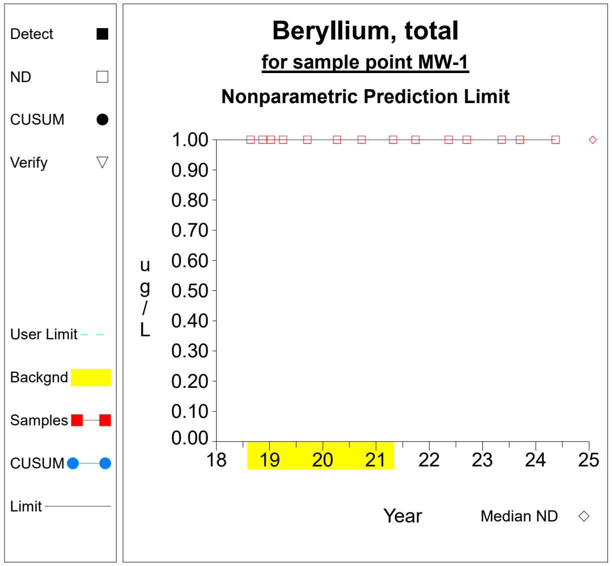
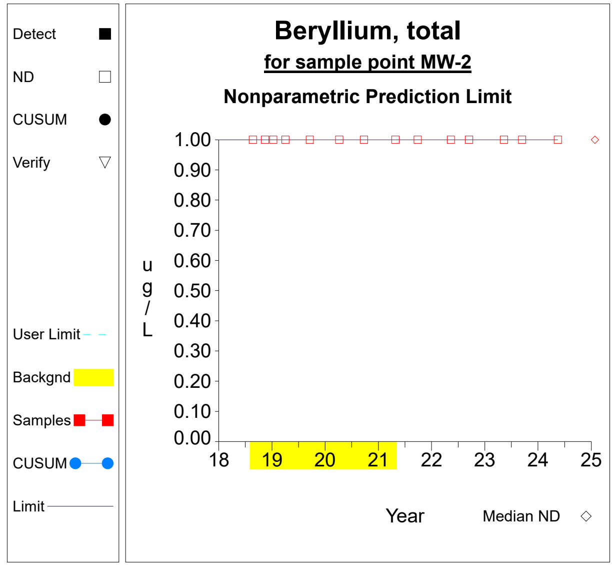


Graph 25

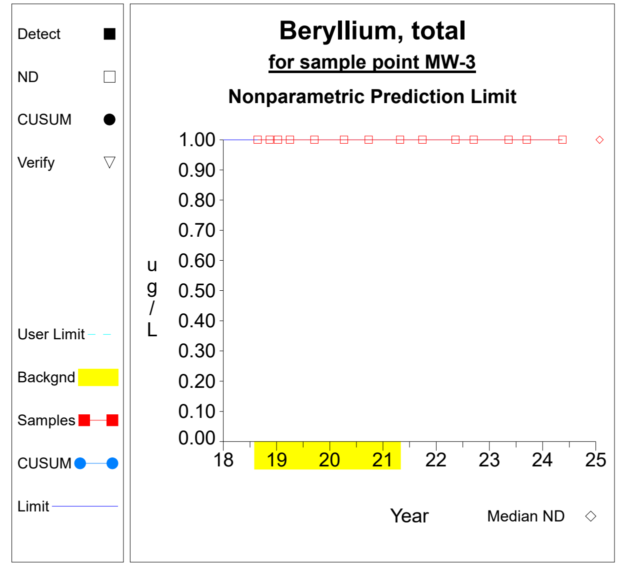
Intra-Well Control Charts / Prediction Limits



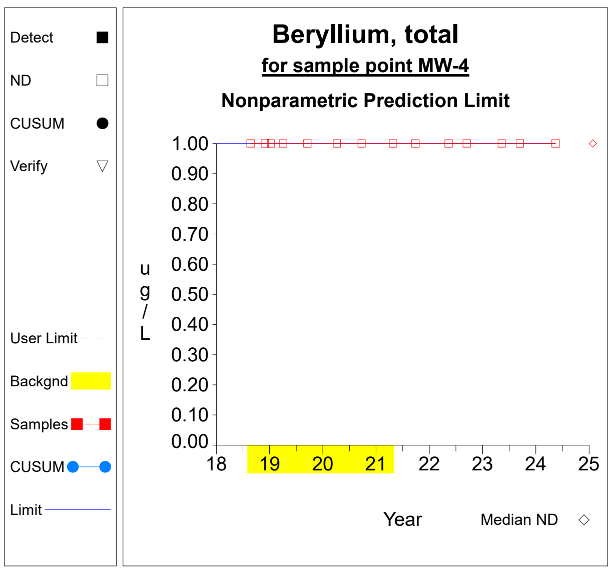
Graph 26



Graph 27



Graph 28



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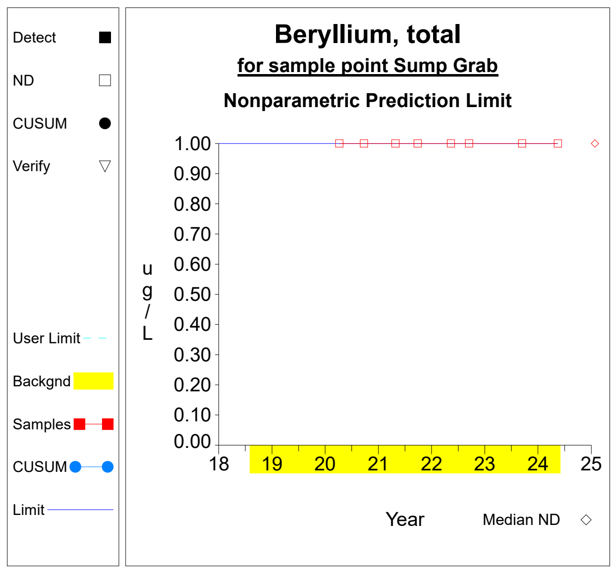
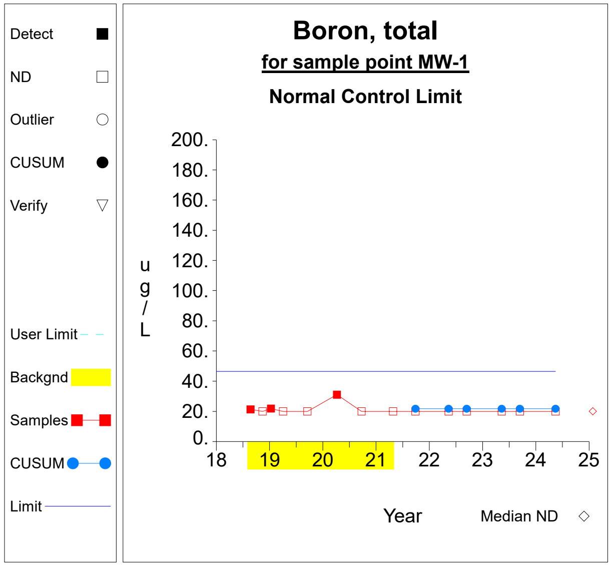
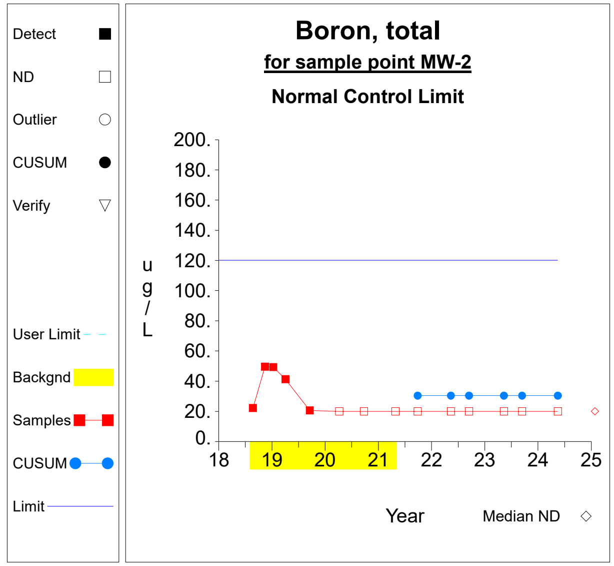


Graph 30

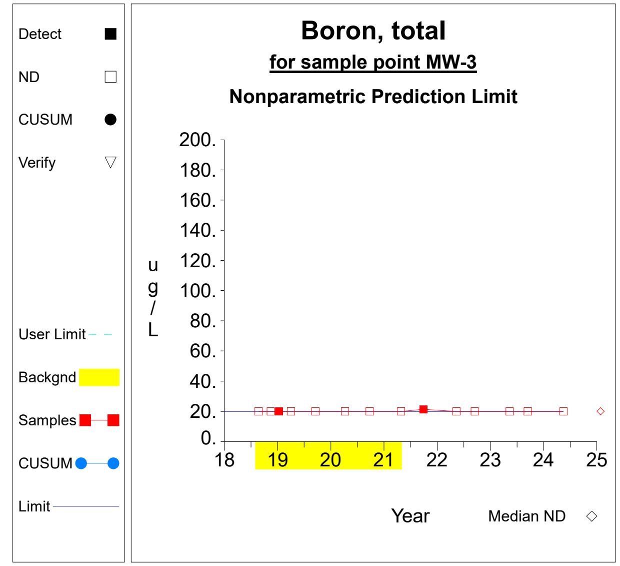
Intra-Well Control Charts / Prediction Limits



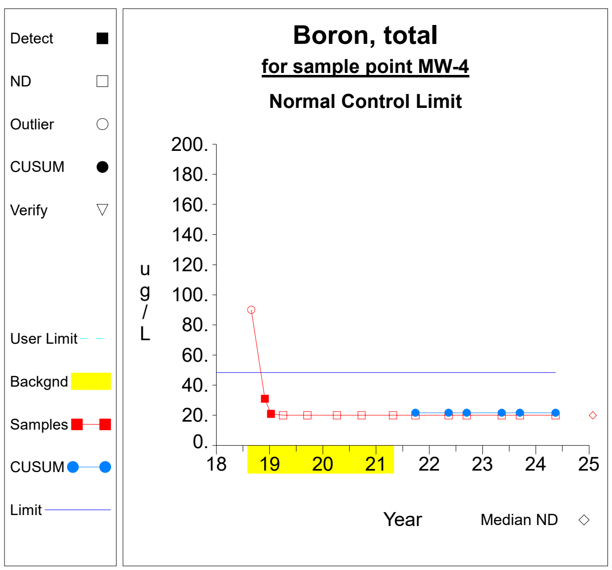
Graph 31



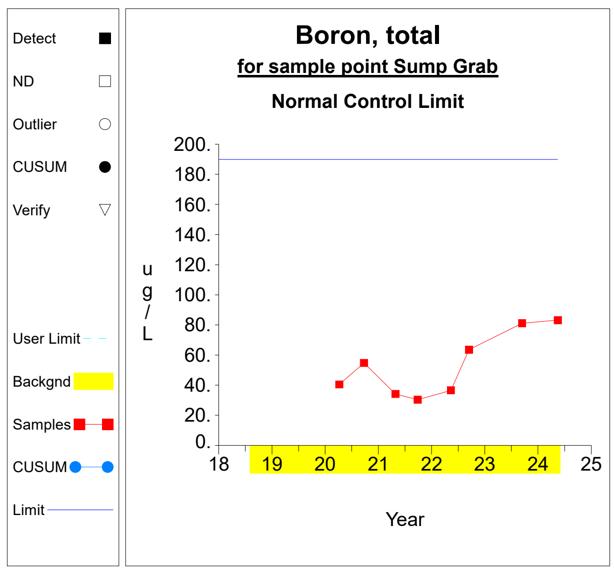
Graph 32



Graph 33

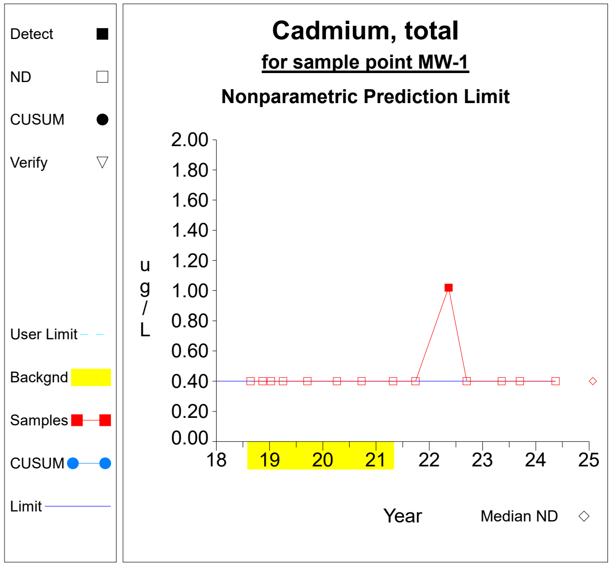


Graph 34

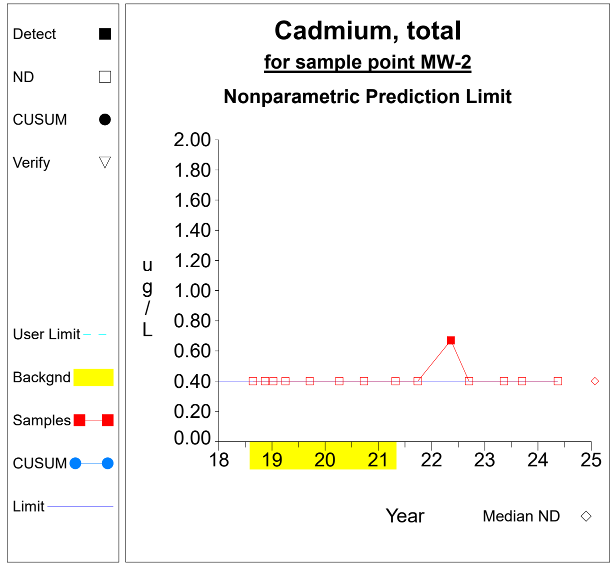


Graph 35

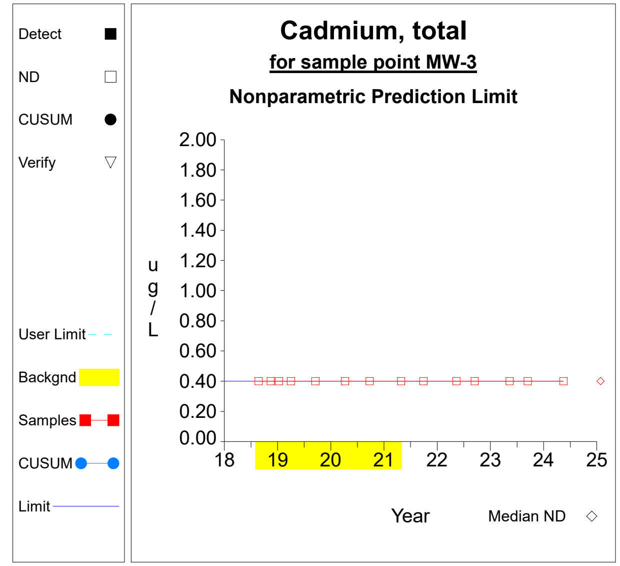
Intra-Well Control Charts / Prediction Limits



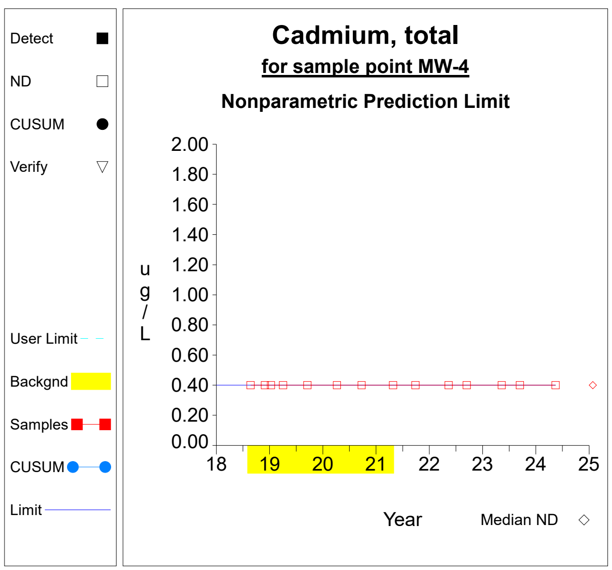
Graph 36



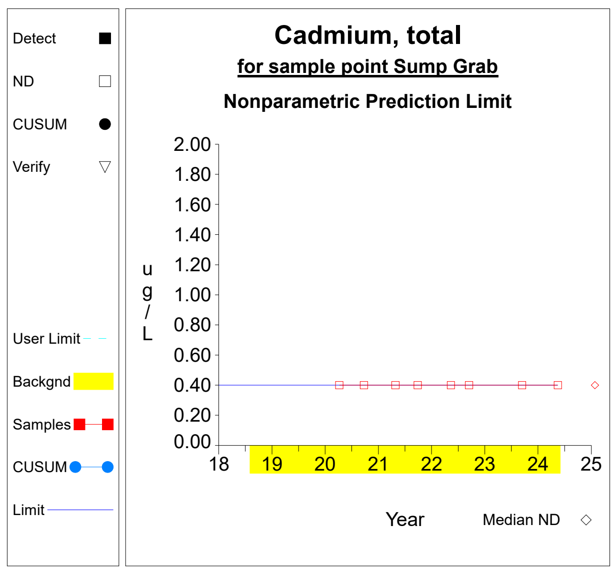
Graph 37



Graph 38

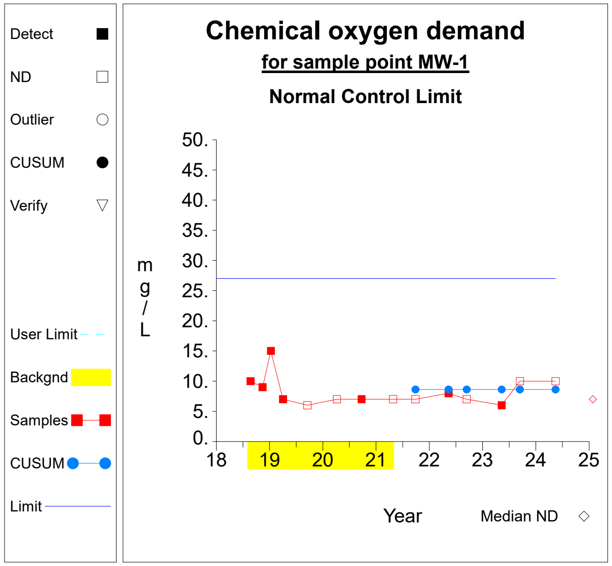


Graph 39



Graph 40

Intra-Well Control Charts / Prediction Limits



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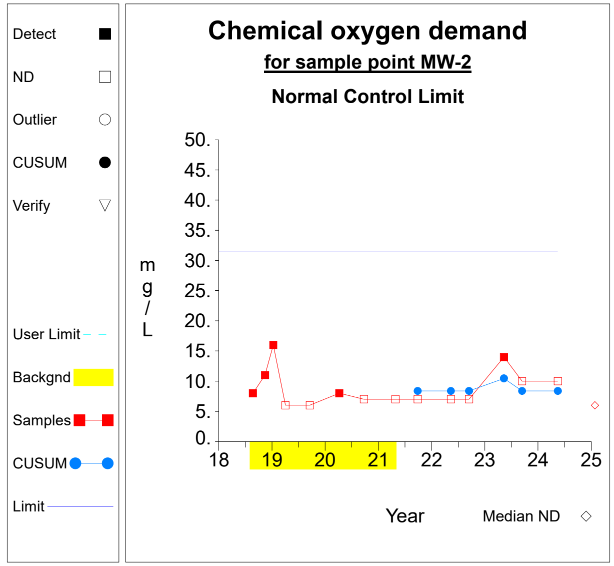
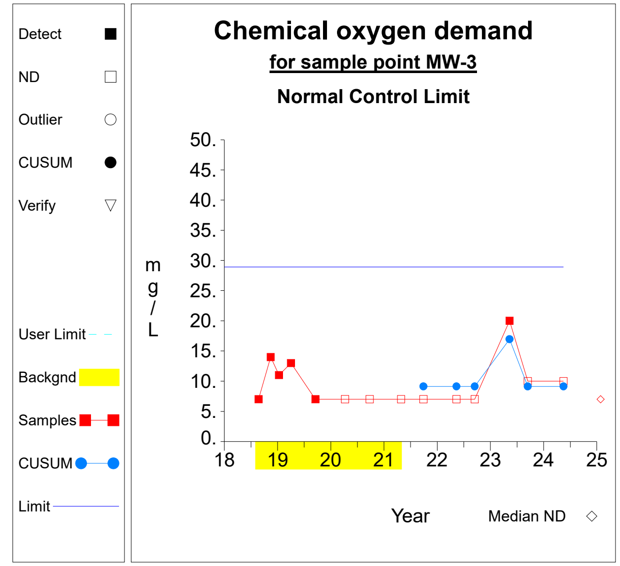
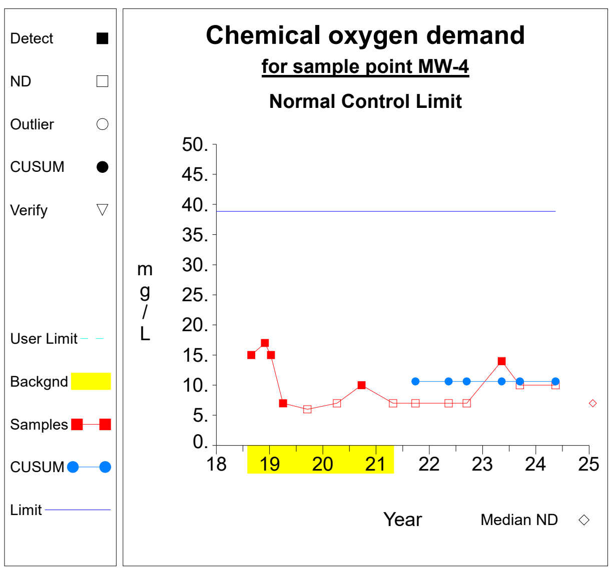


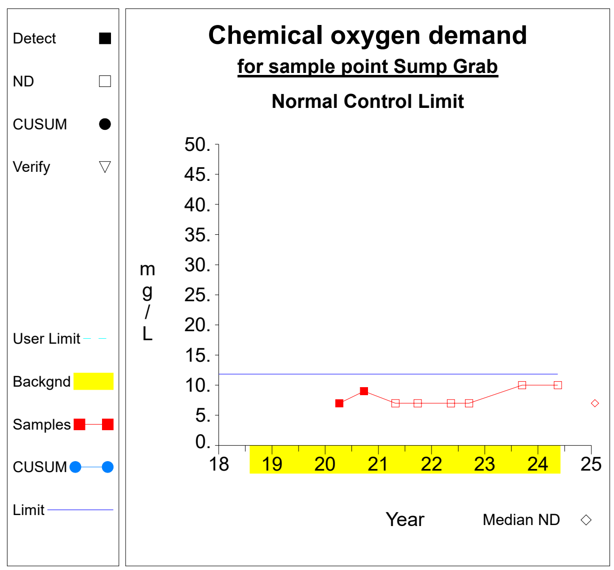
Graph 42



Graph 43



Graph 44



Graph 45

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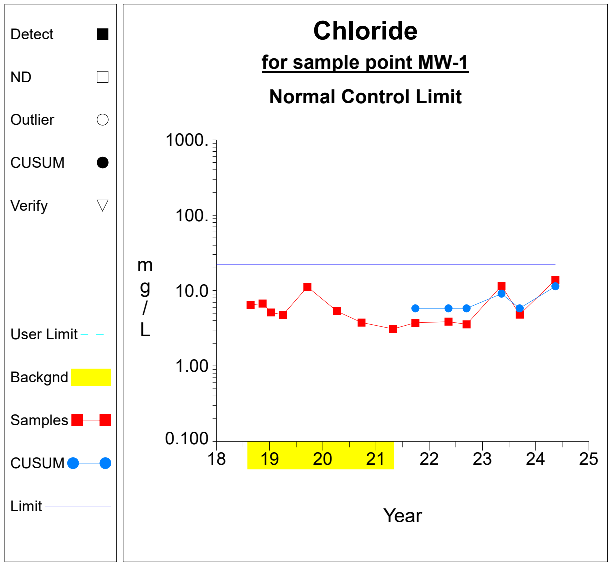
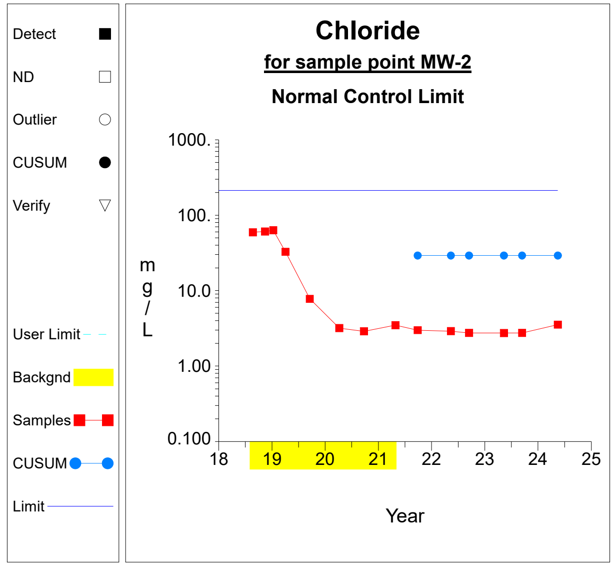
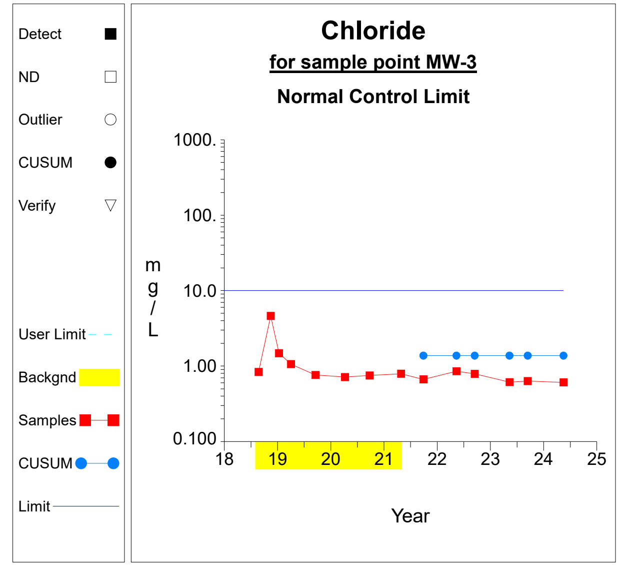
Intra-Well Control Charts / Prediction Limits



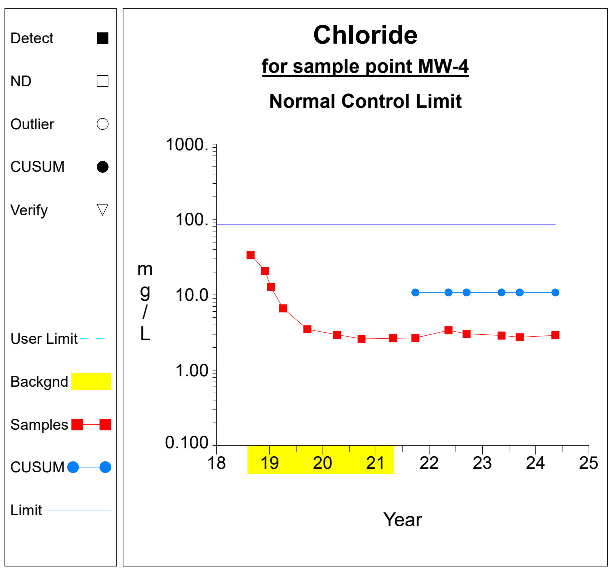
Graph 46



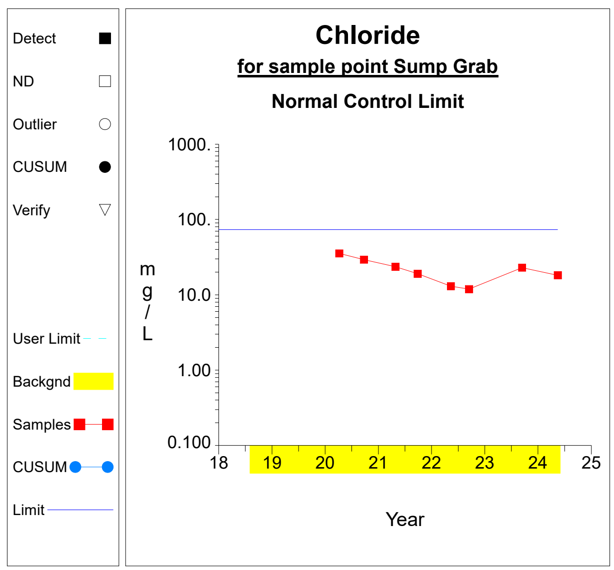
Graph 47



Graph 48

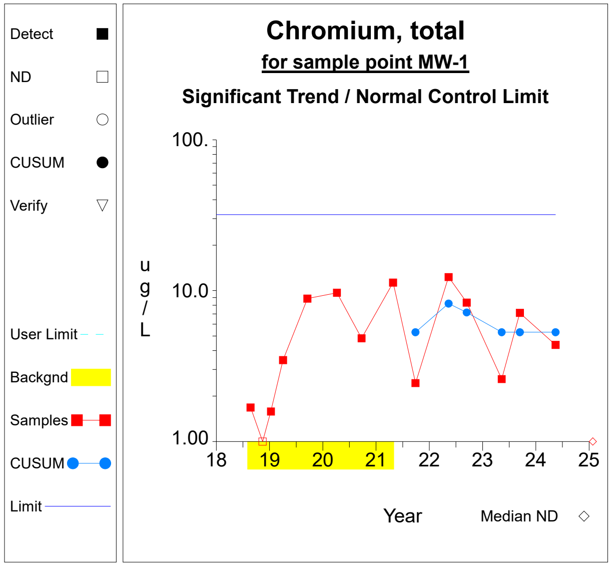


Graph 49

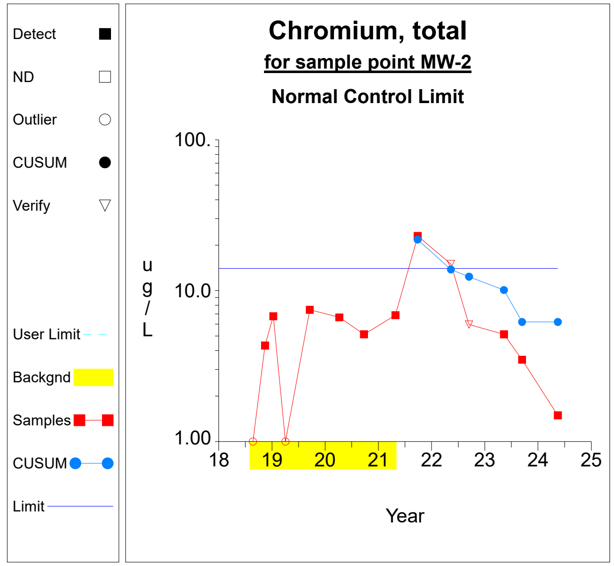


Graph 50

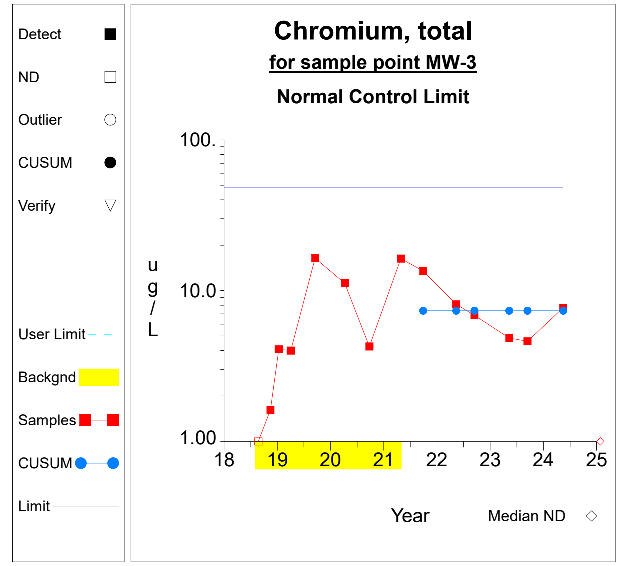
Intra-Well Control Charts / Prediction Limits



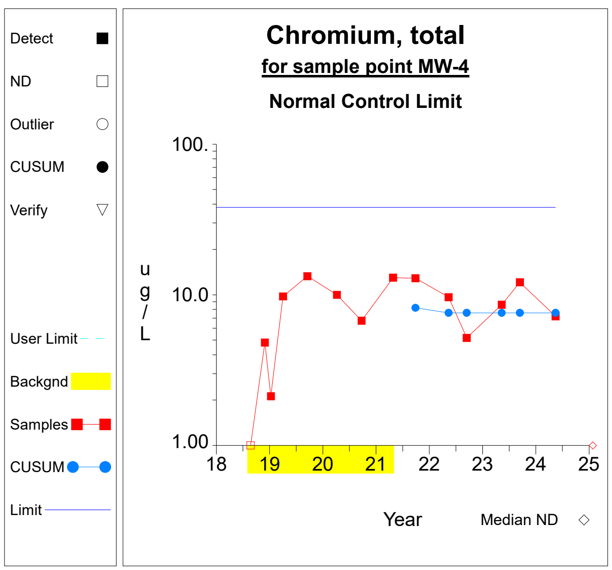
Graph 51



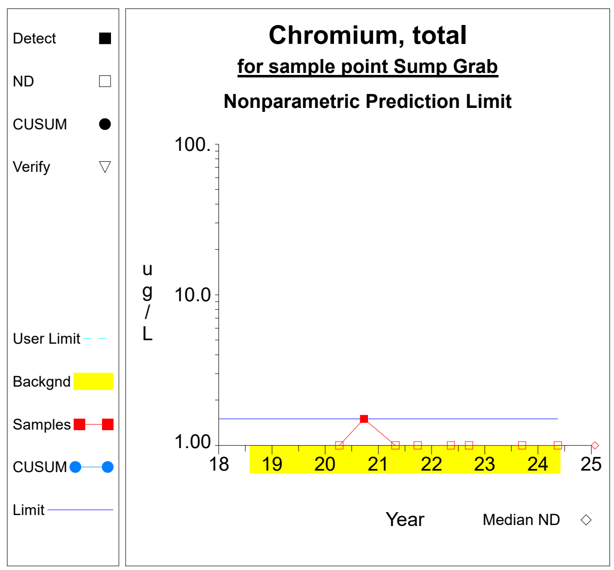
Graph 52



Graph 53



Graph 54



Graph 55

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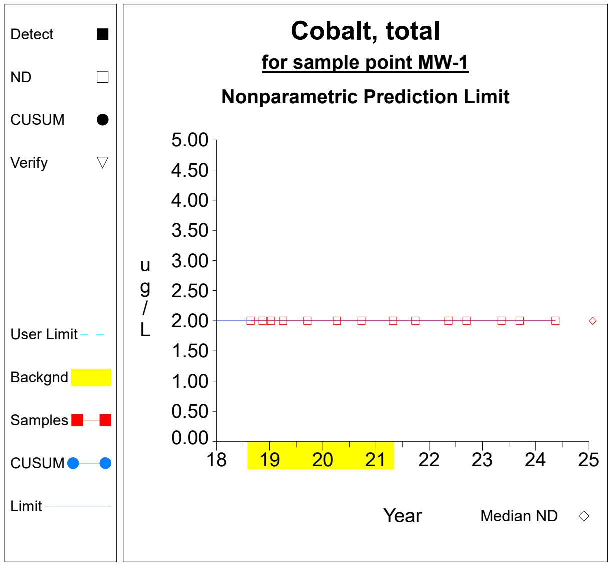
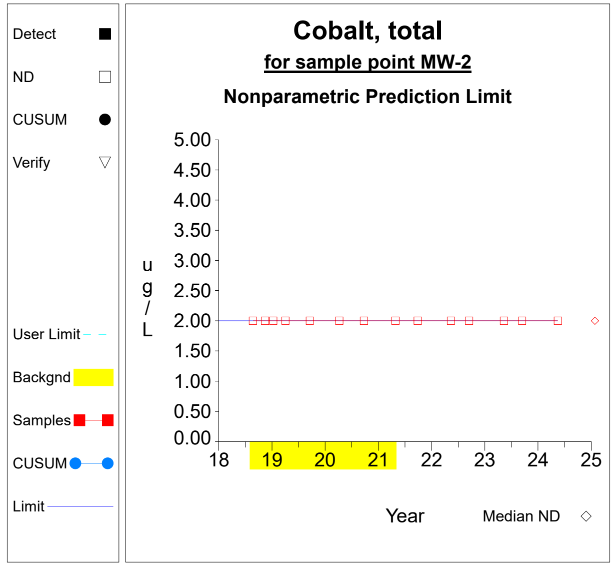
Intra-Well Control Charts / Prediction Limits



Graph 56



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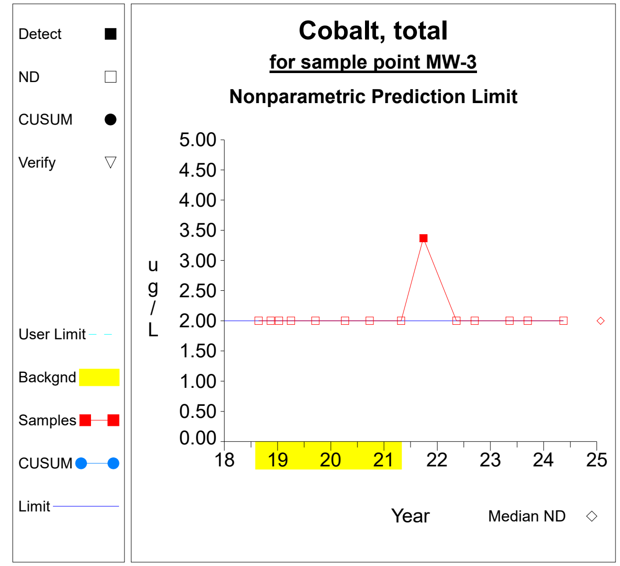
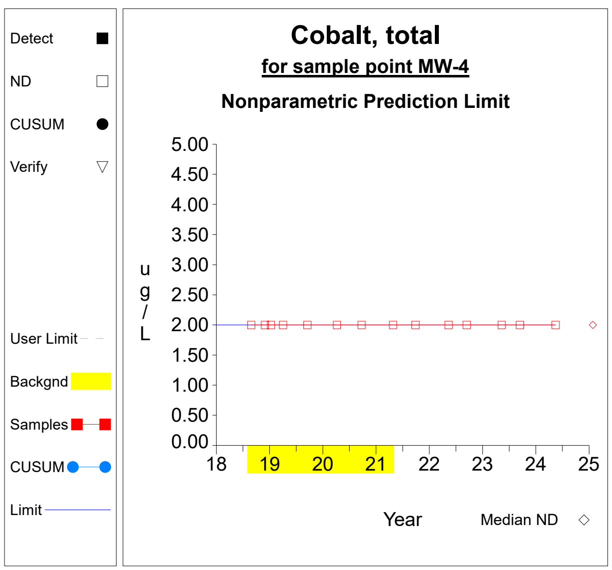
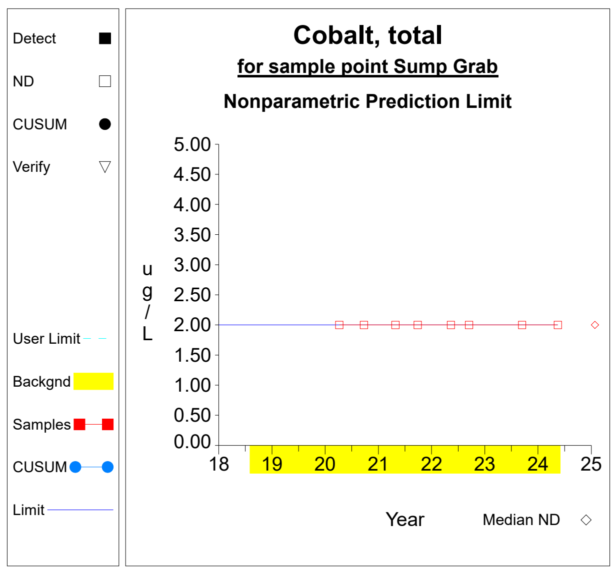


Graph 58



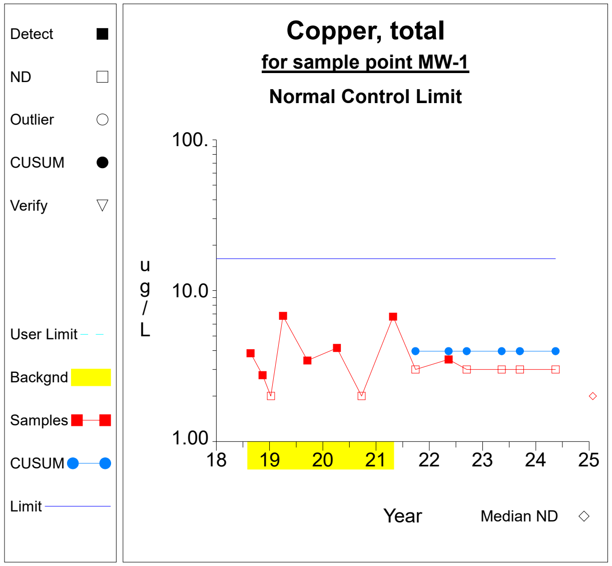
Graph 59



Graph 60

Goose Lake Quarry November 2024

Intra-Well Control Charts / Prediction Limits



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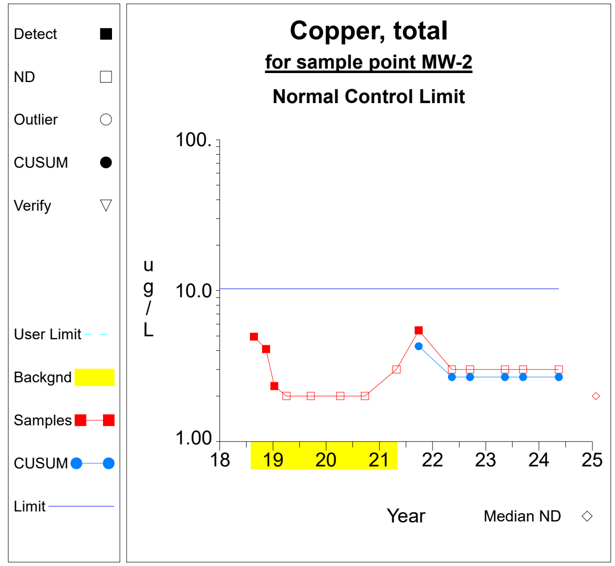
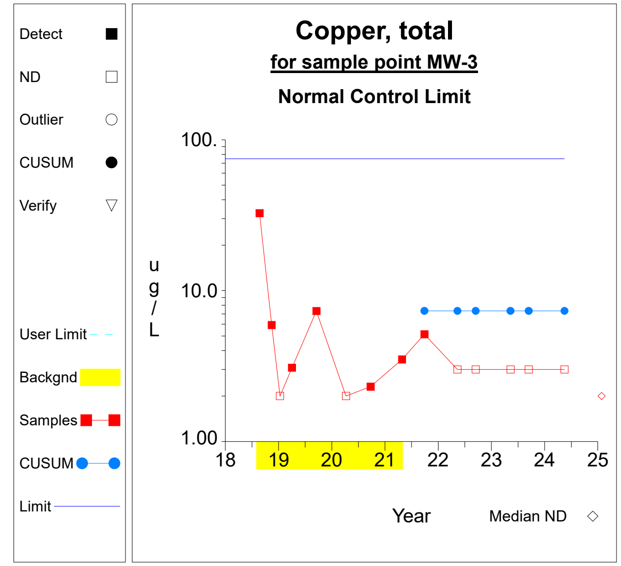
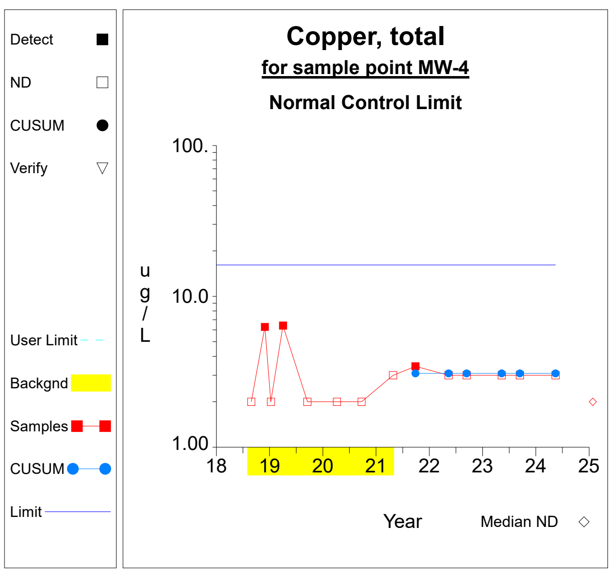


Graph 62



Graph 63



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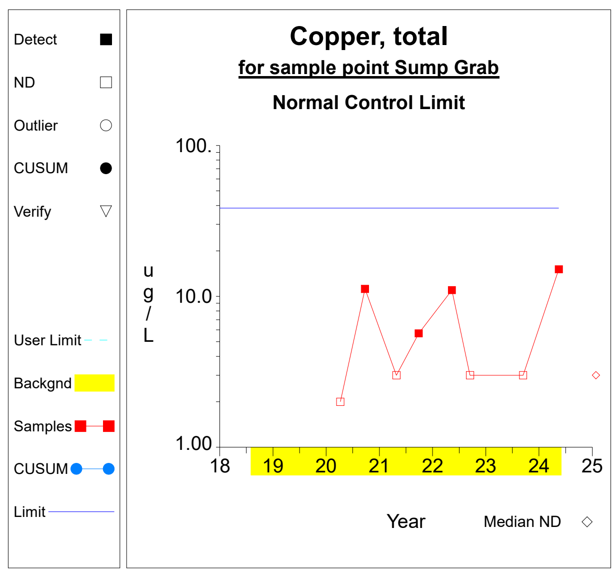

Graph 65

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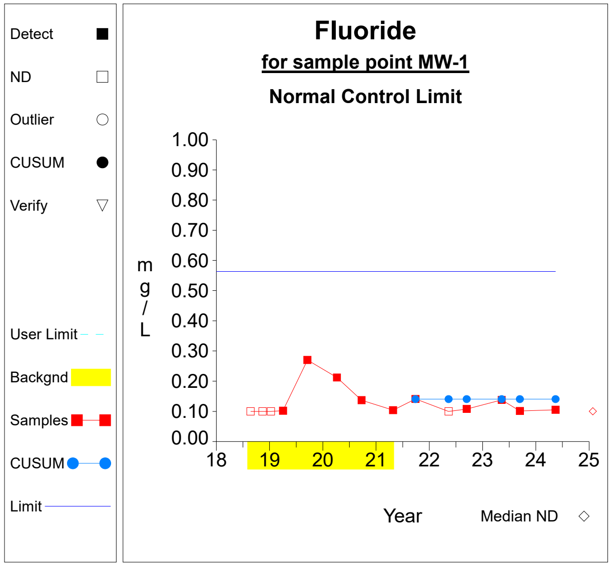
Intra-Well Control Charts / Prediction Limits



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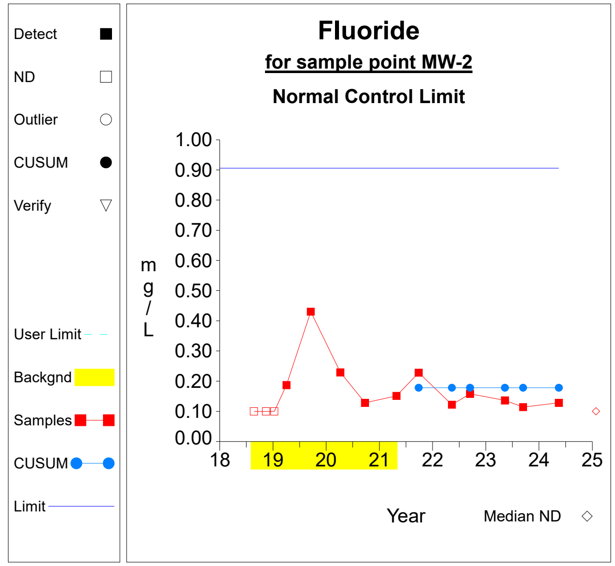

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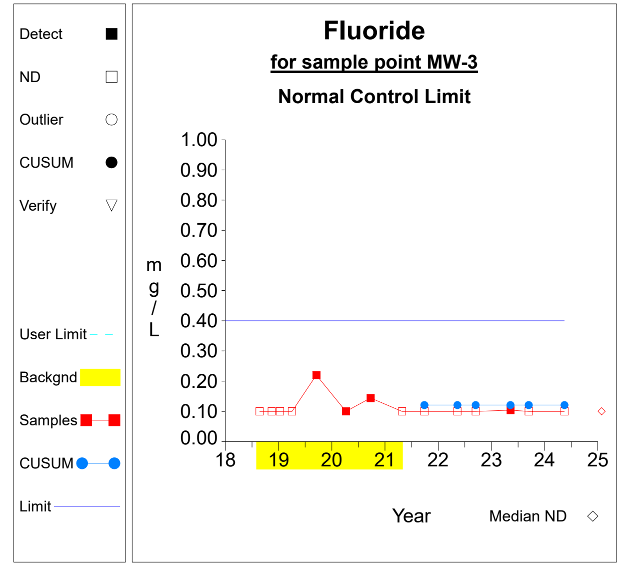

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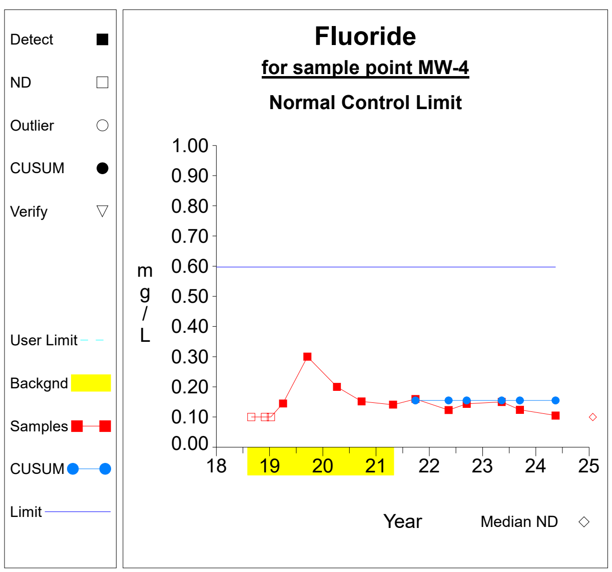
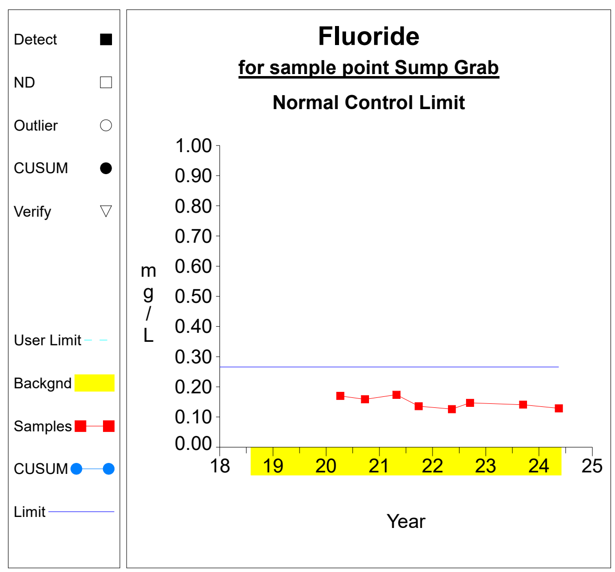
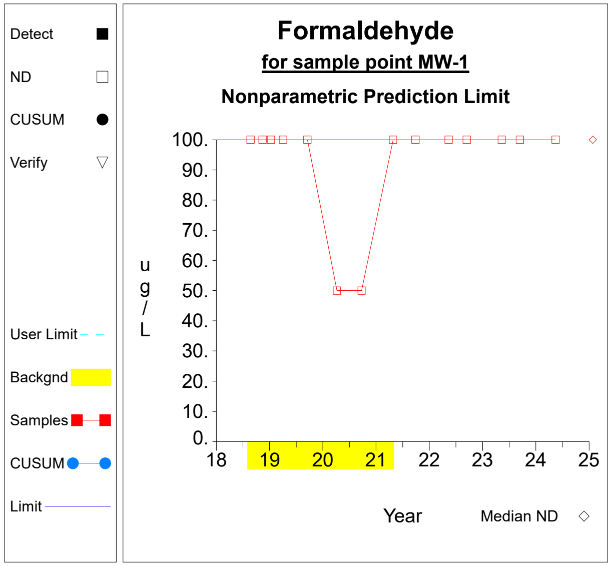


Graph 69



Graph 70

Intra-Well Control Charts / Prediction Limits



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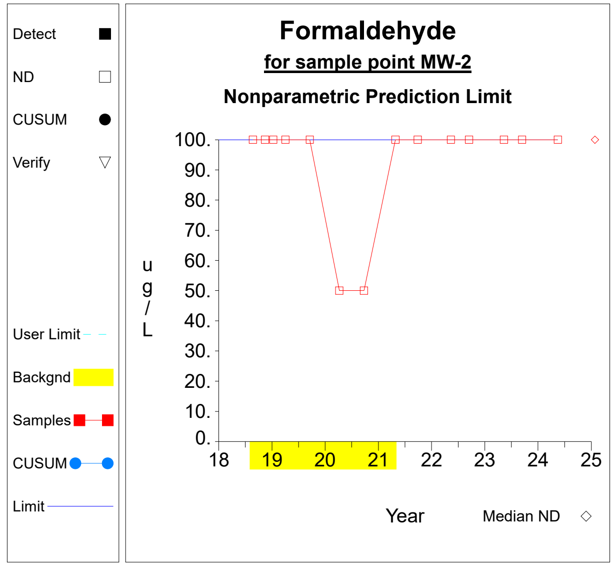

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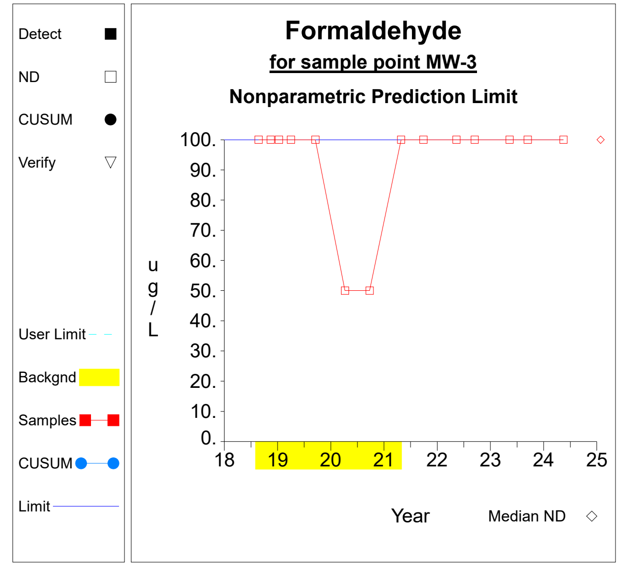

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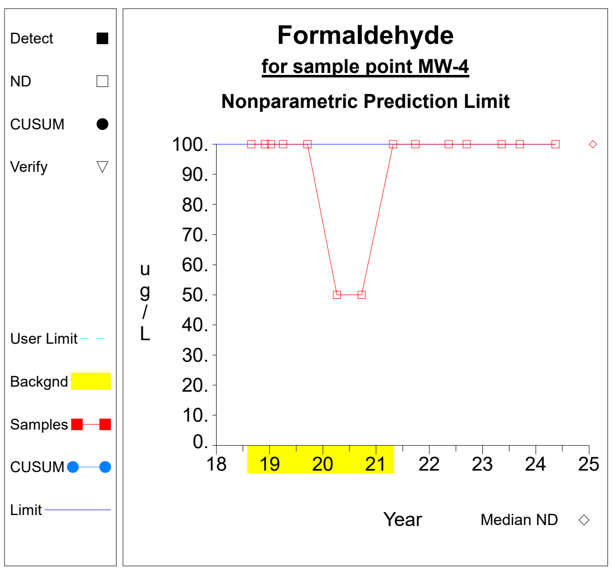

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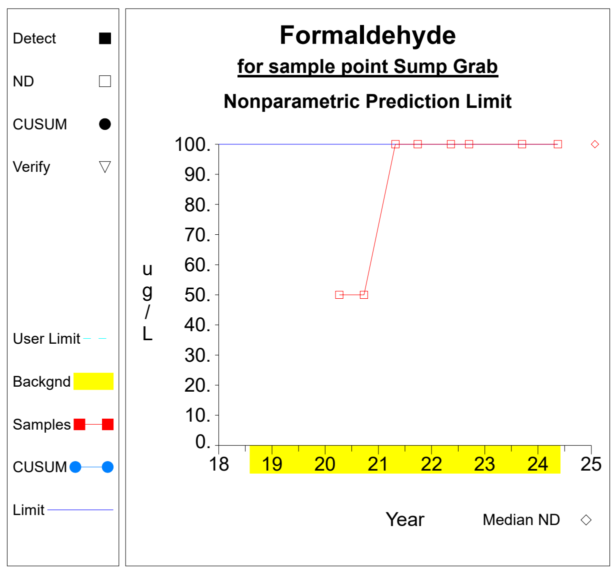
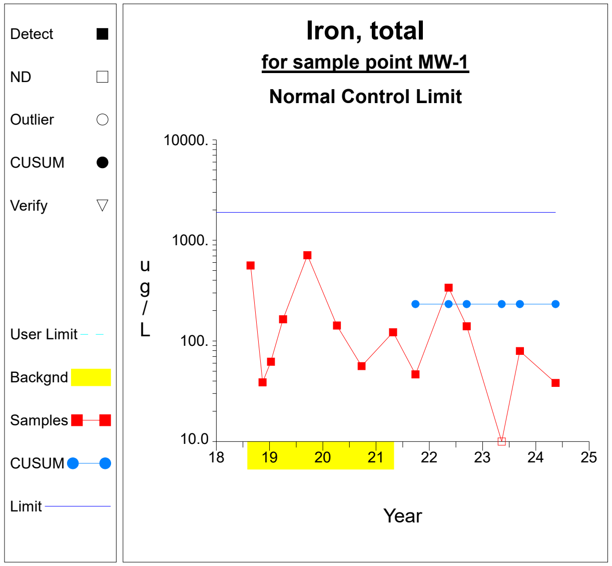


Graph 75

Intra-Well Control Charts / Prediction Limits



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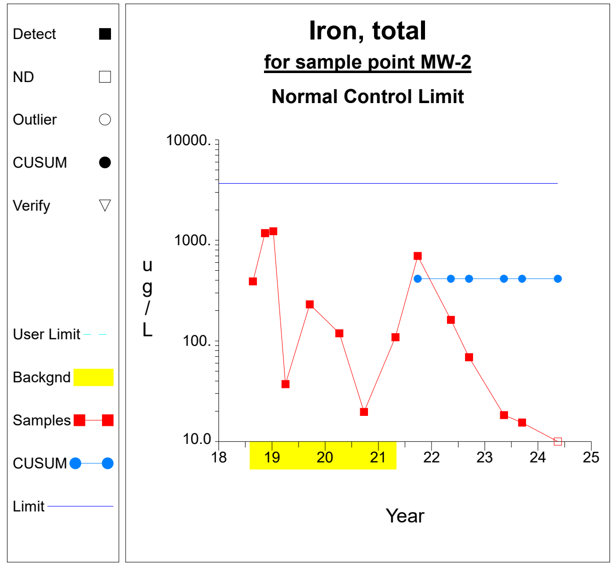

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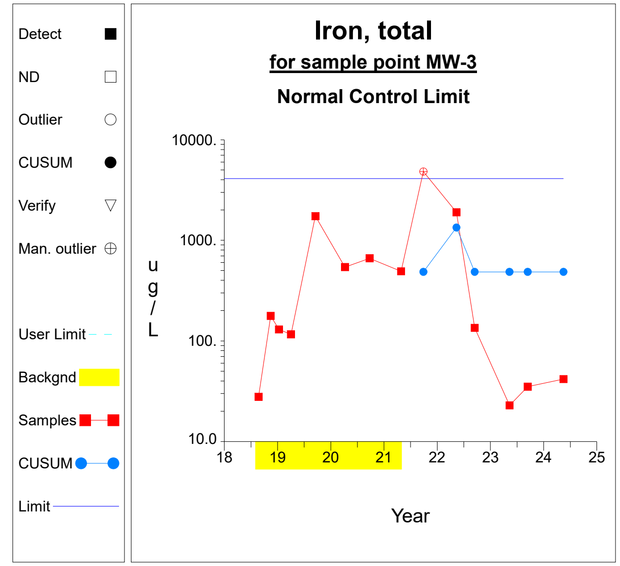

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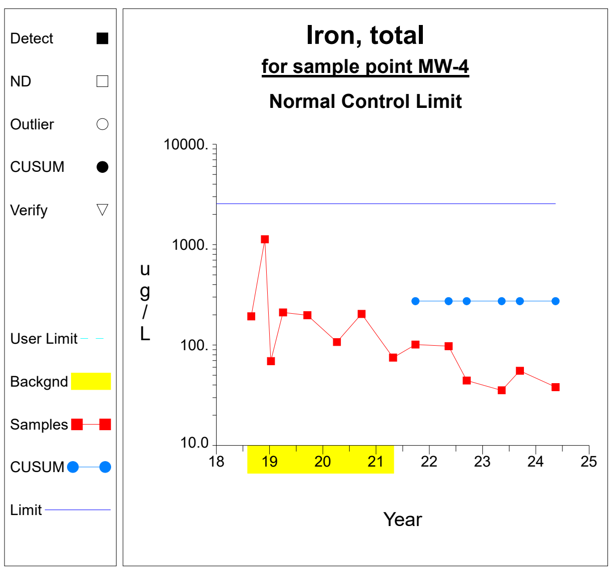

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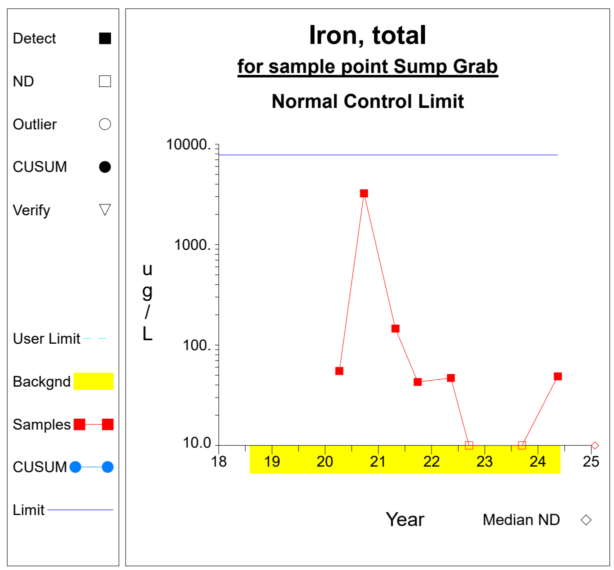
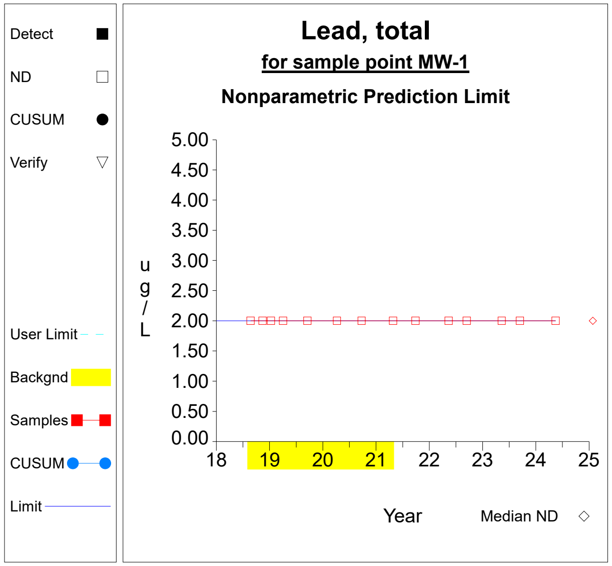
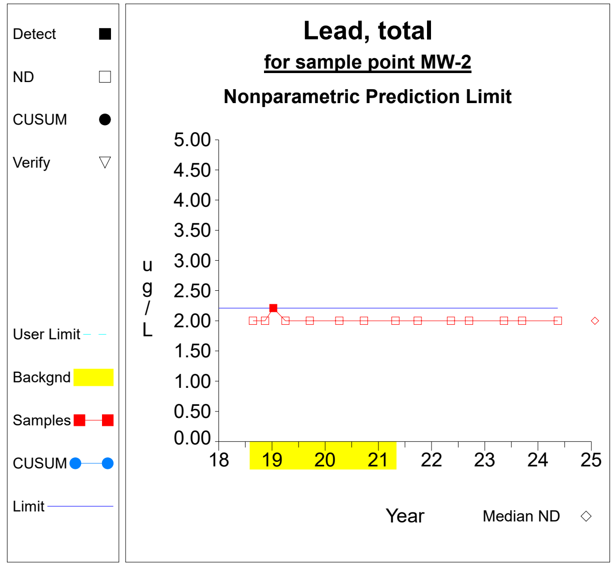


Graph 80

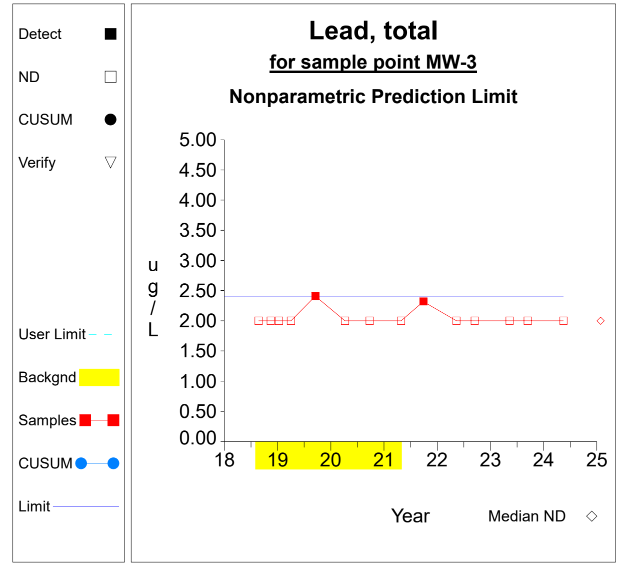
Intra-Well Control Charts / Prediction Limits



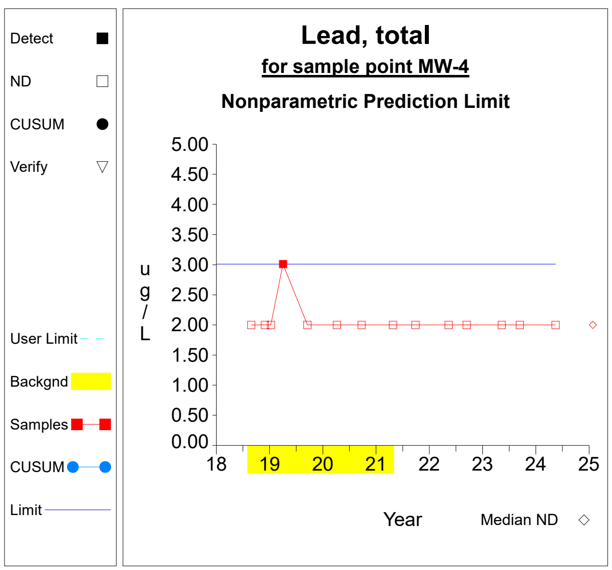
Graph 81



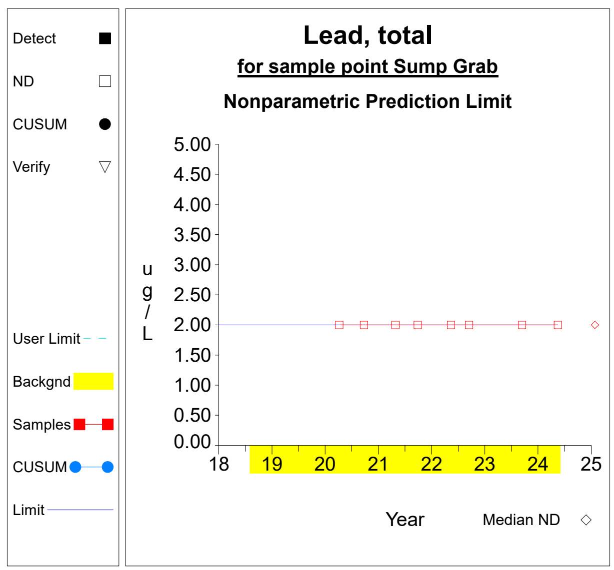
Graph 82



Graph 83



Graph 84



Graph 85

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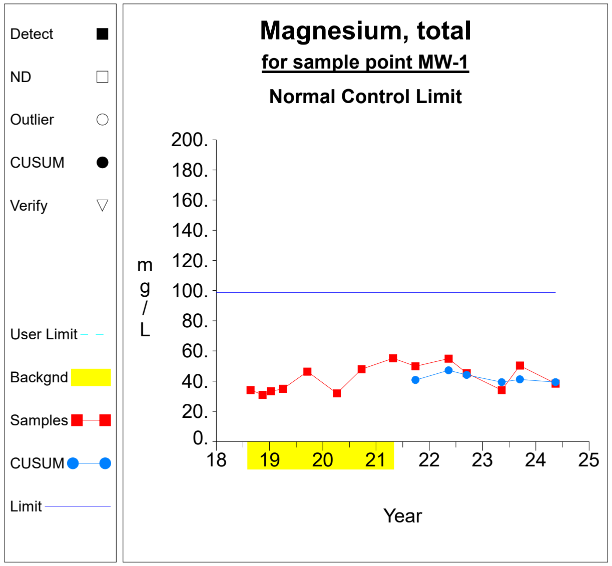

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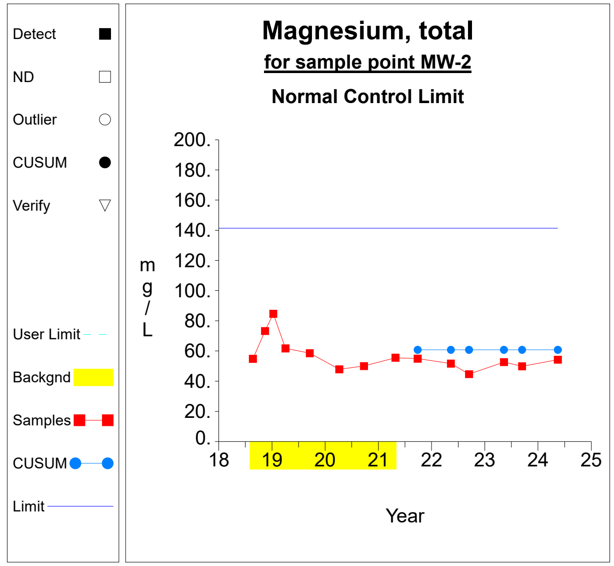
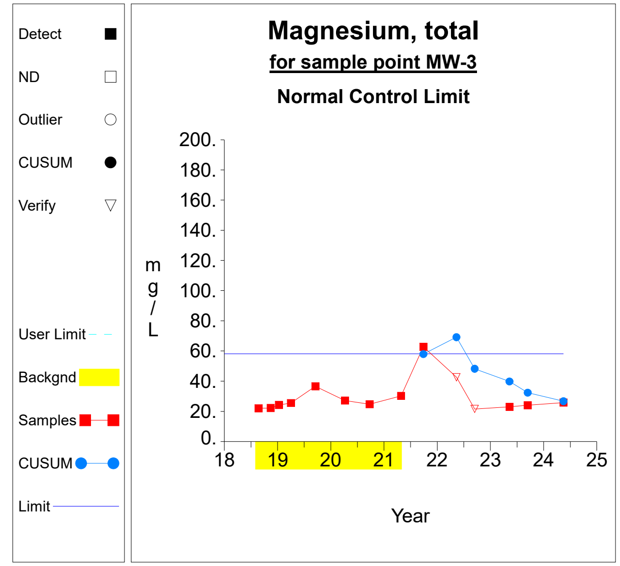


Graph 87



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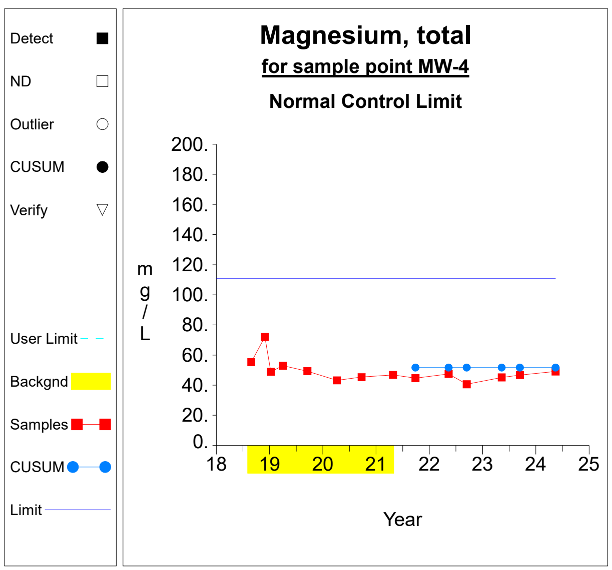

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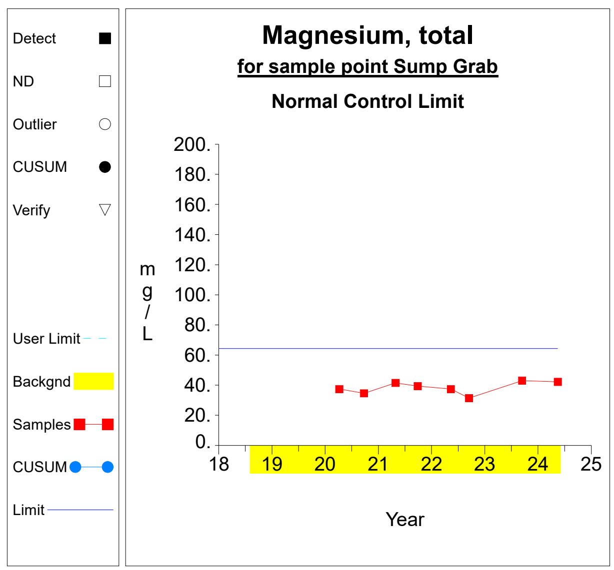
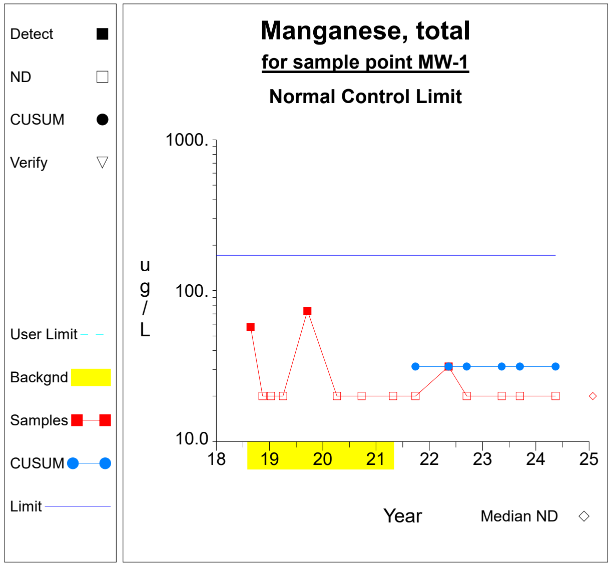


Graph 90

Intra-Well Control Charts / Prediction Limits



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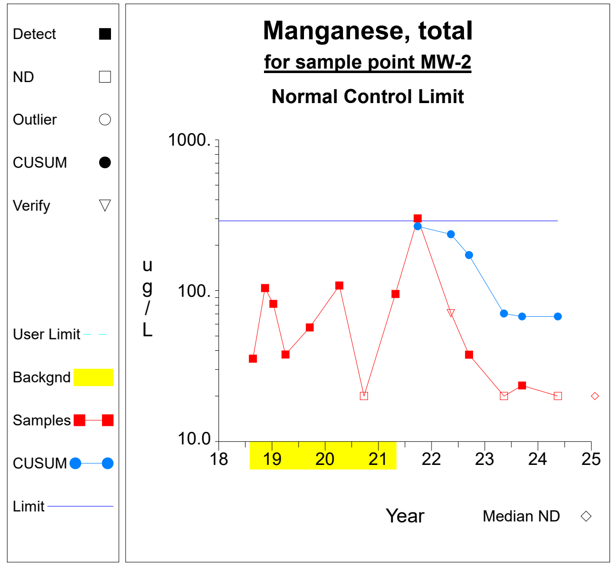

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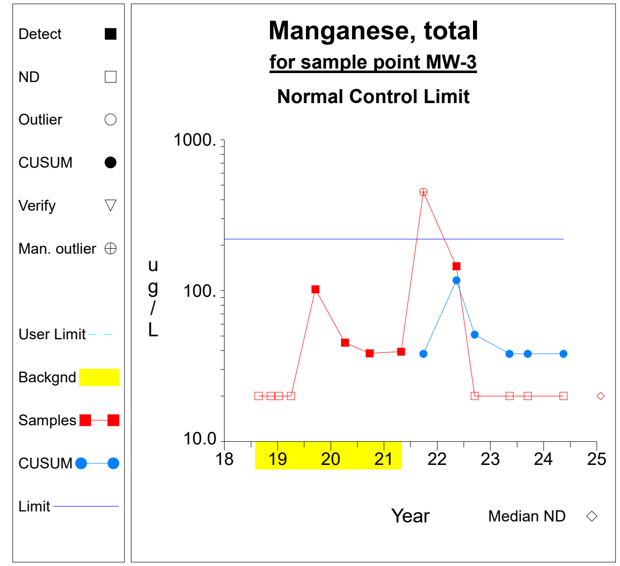

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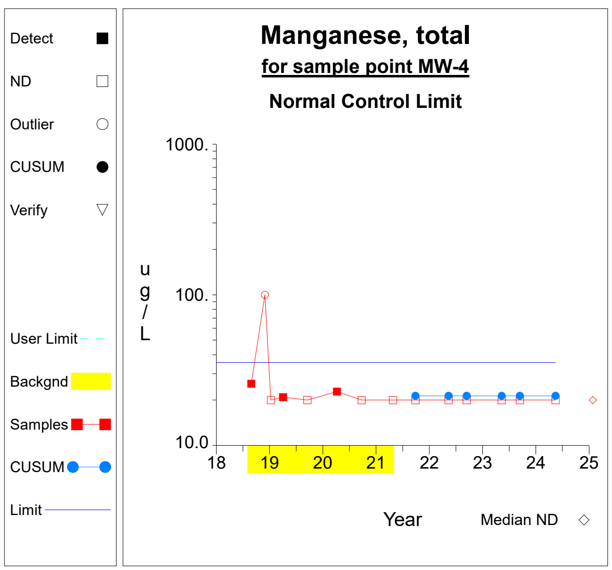
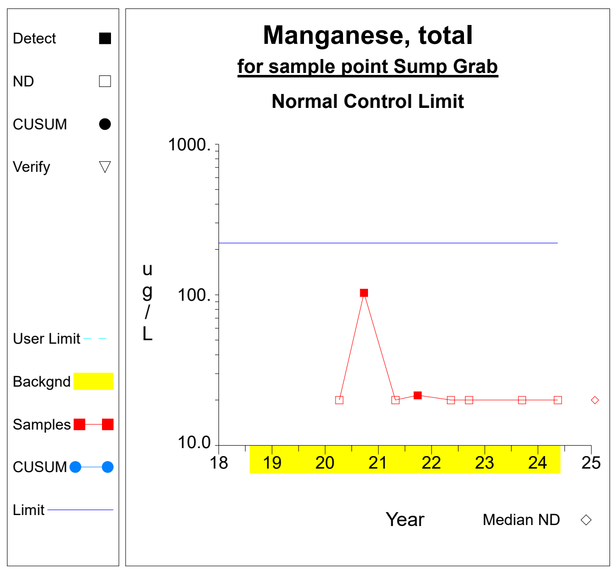
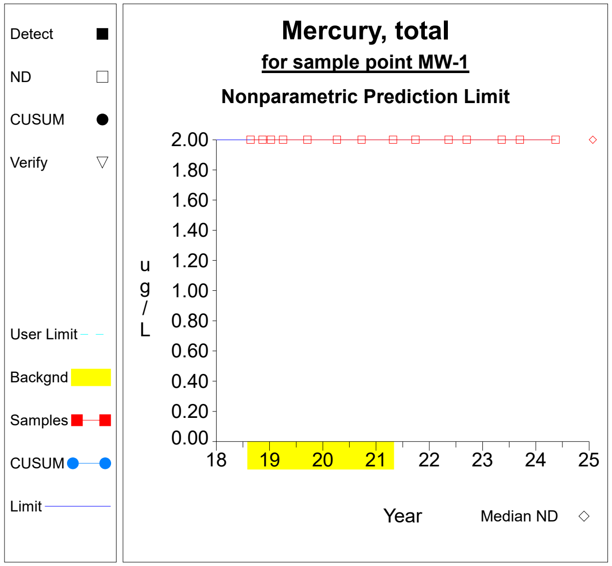


Graph 94

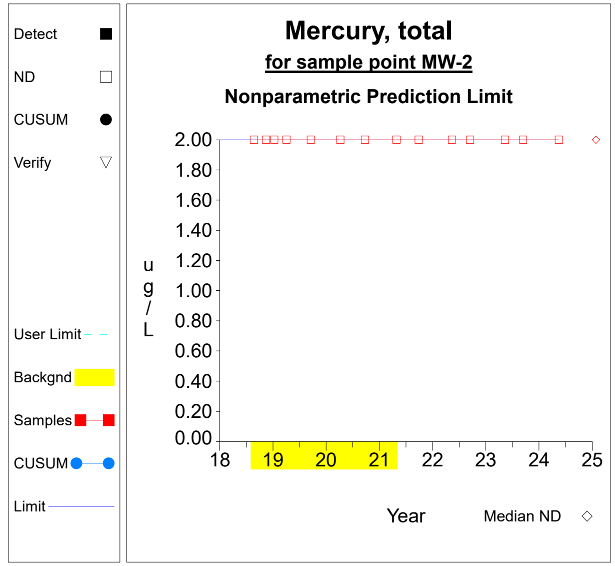


Graph 95

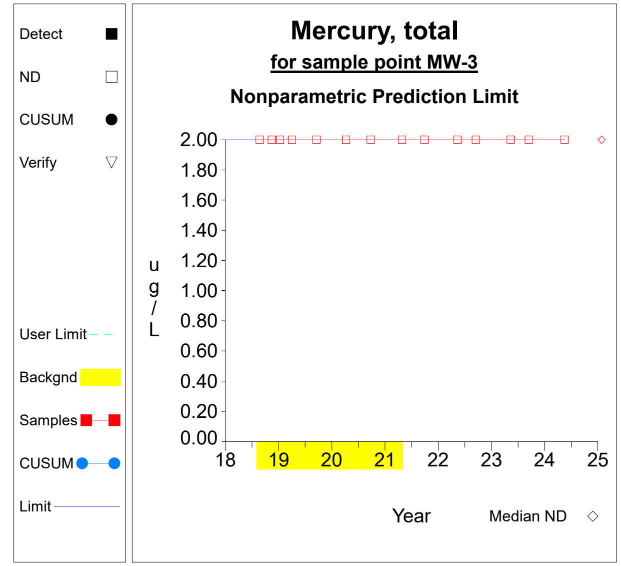
Intra-Well Control Charts / Prediction Limits



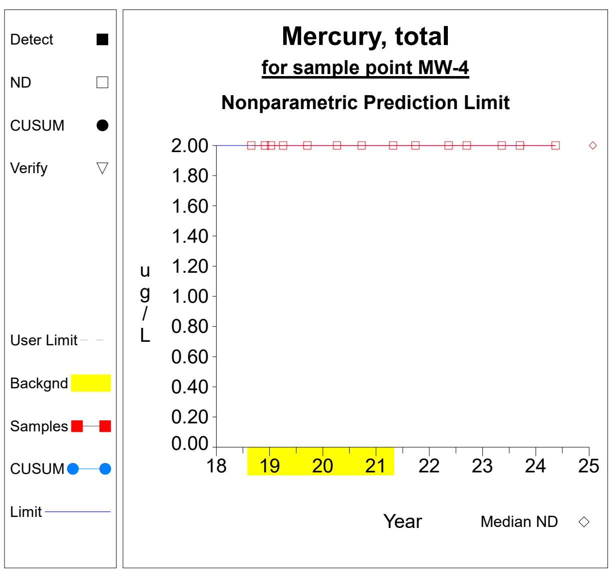
Graph 96



Graph 97



Graph 98



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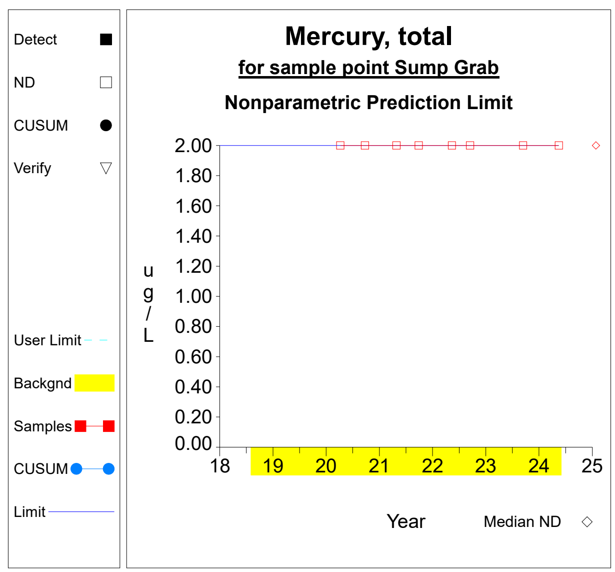
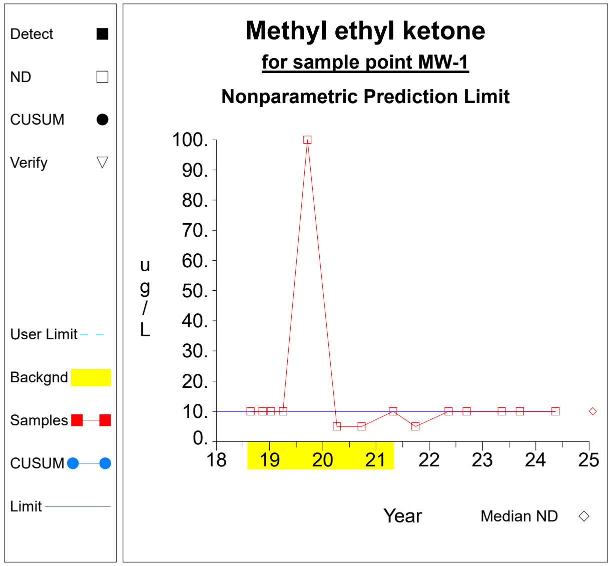
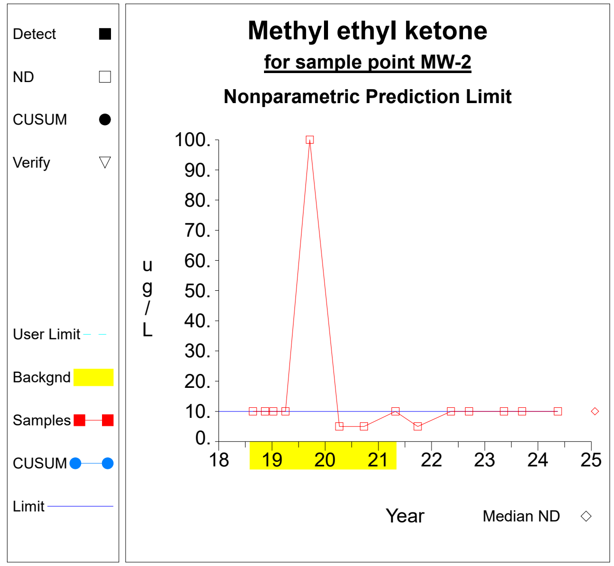


Graph 100

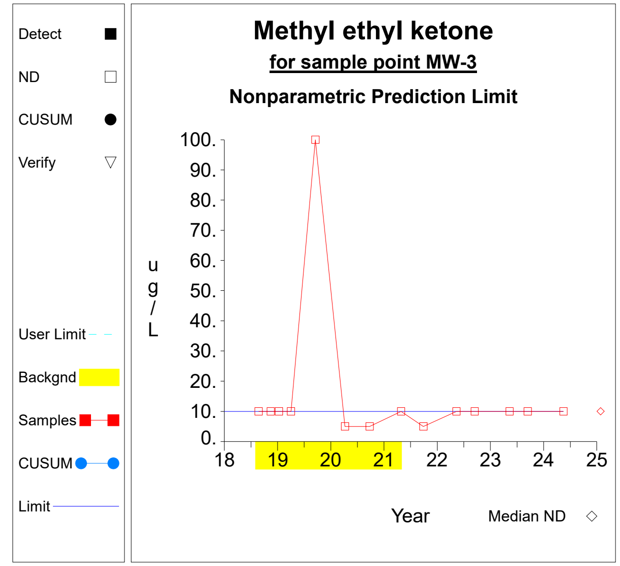
Intra-Well Control Charts / Prediction Limits



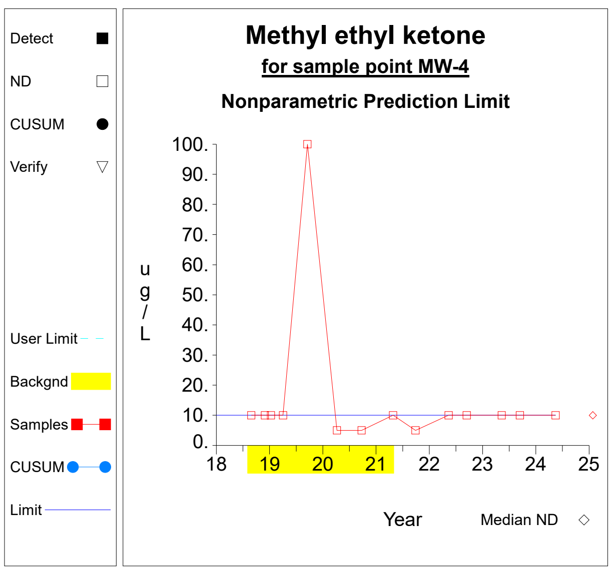
Graph 101



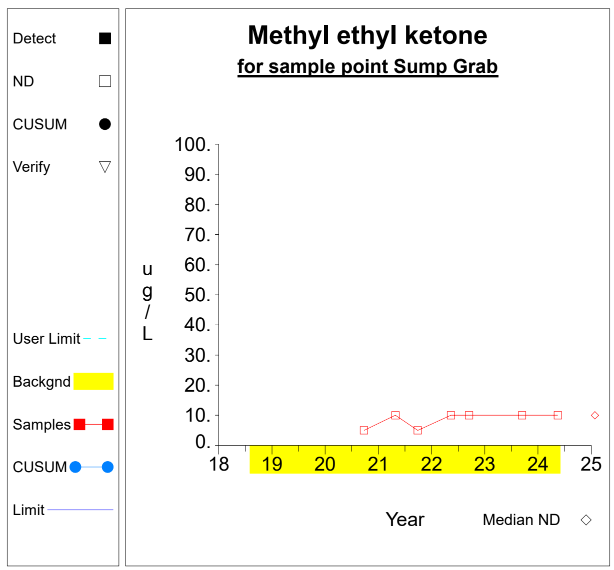
Graph 102



Graph 103



Graph 104



Graph 105

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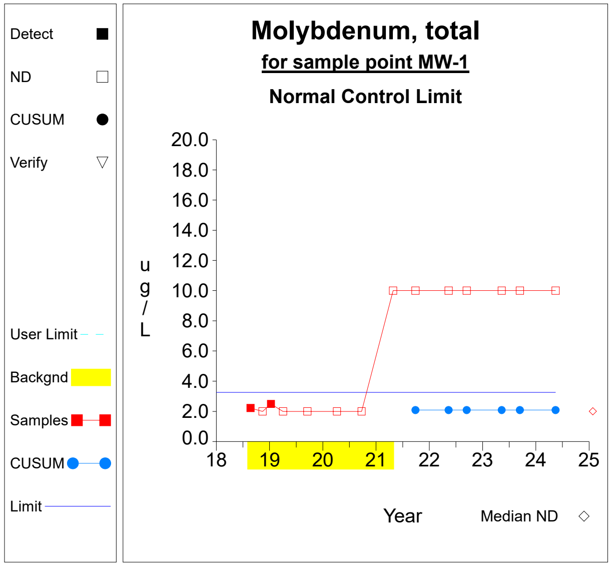
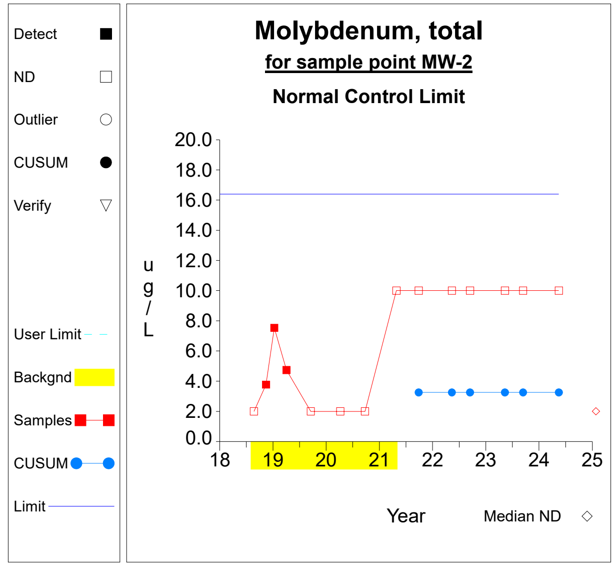


Graph 106



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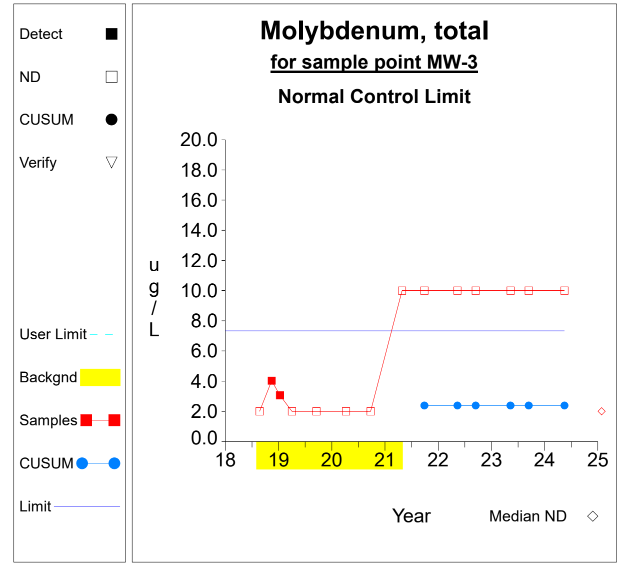

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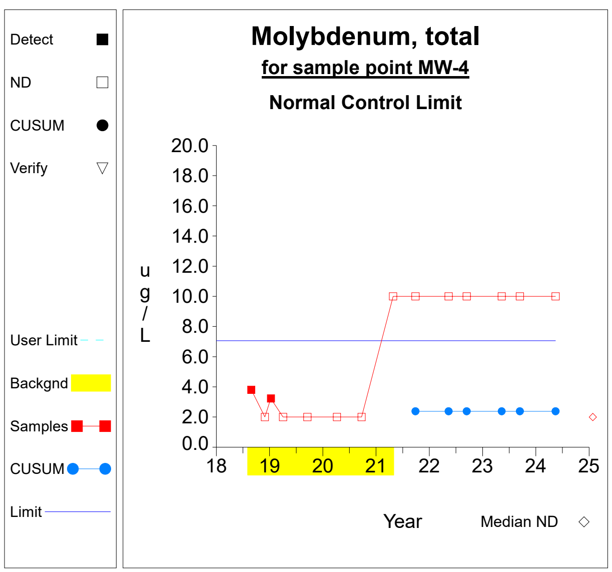

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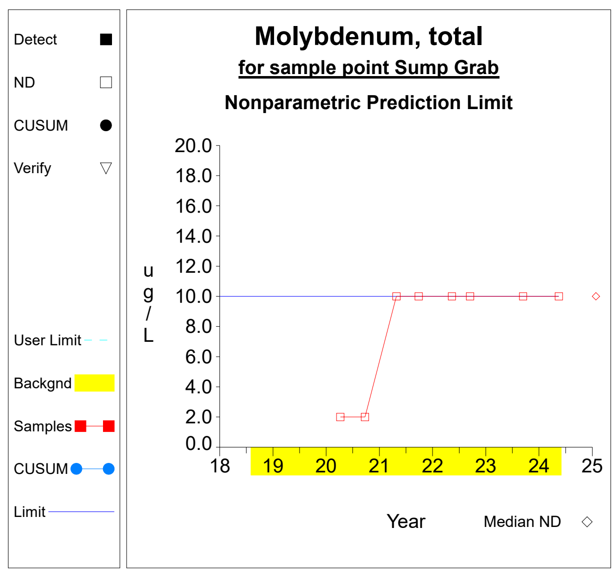

Graph 110

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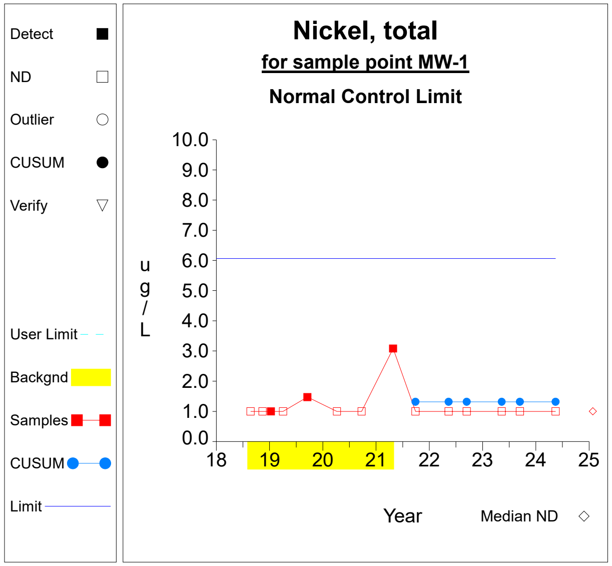
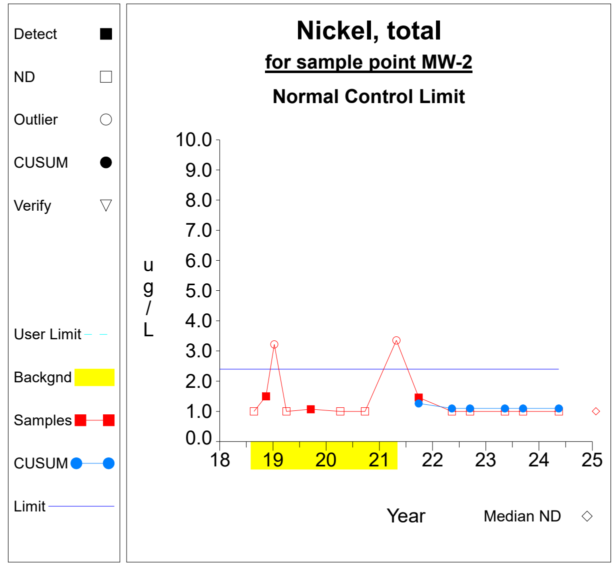
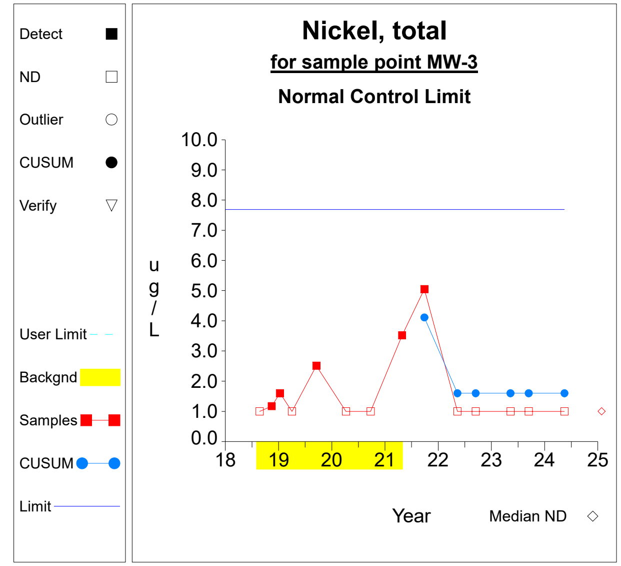
Intra-Well Control Charts / Prediction Limits



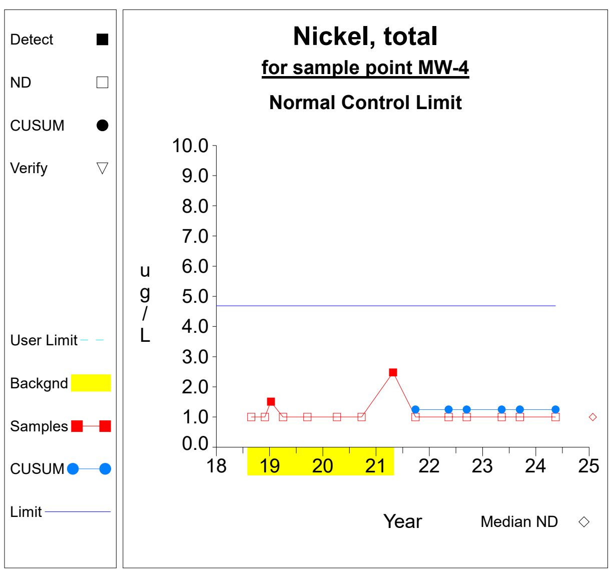
Graph 111



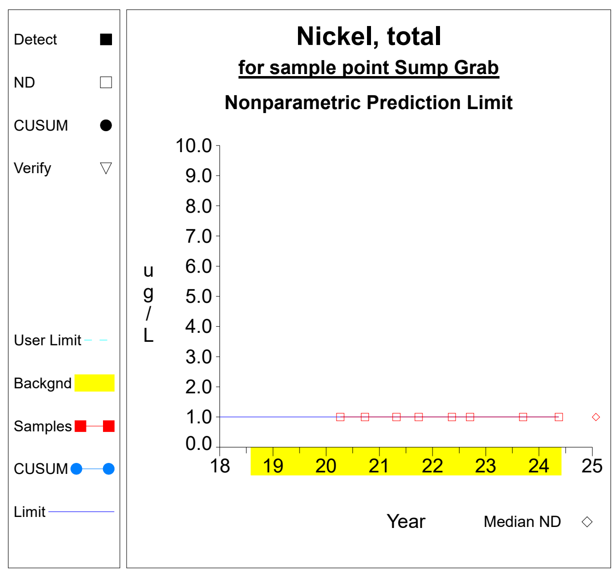
Graph 112



Graph 113



Graph 114



Graph 115

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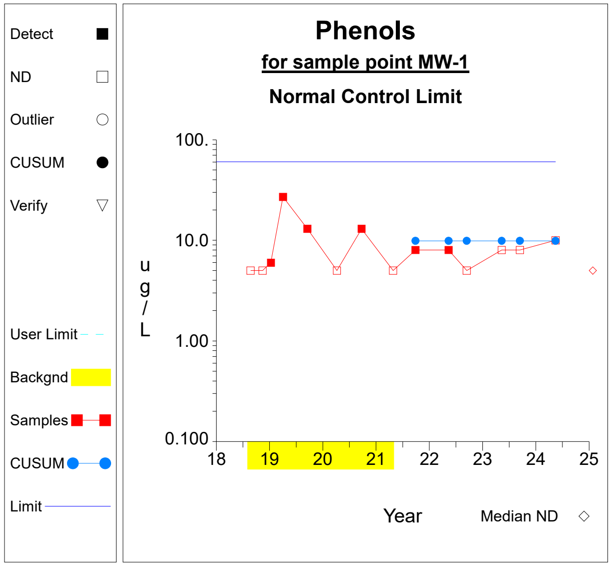
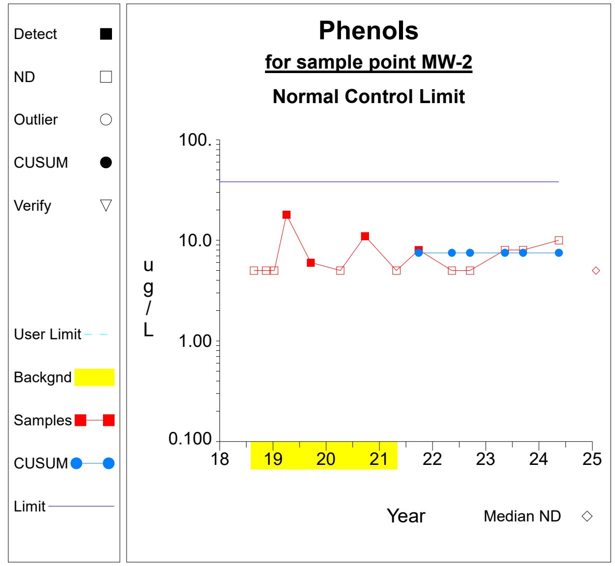
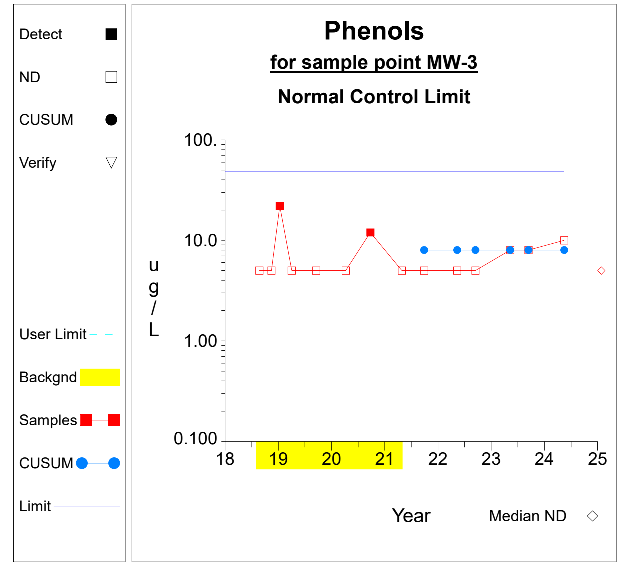
Intra-Well Control Charts / Prediction Limits



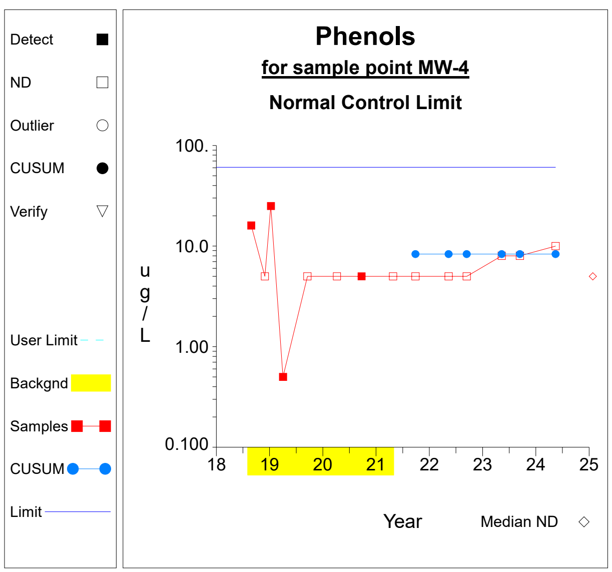
Graph 116



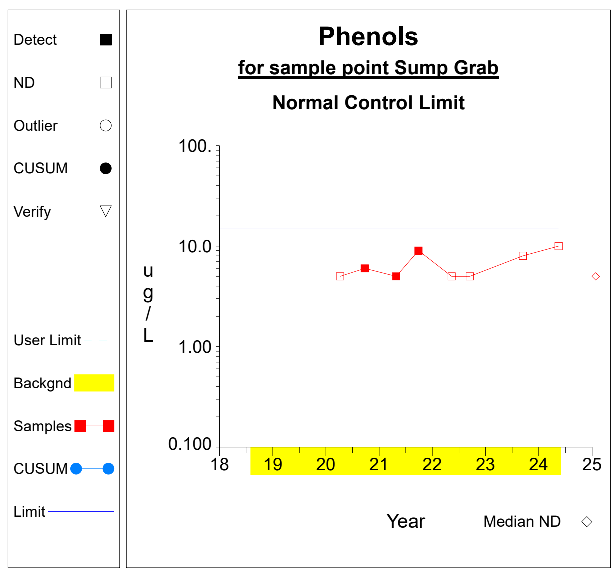
Graph 117



Graph 118



Graph 119



Graph 120

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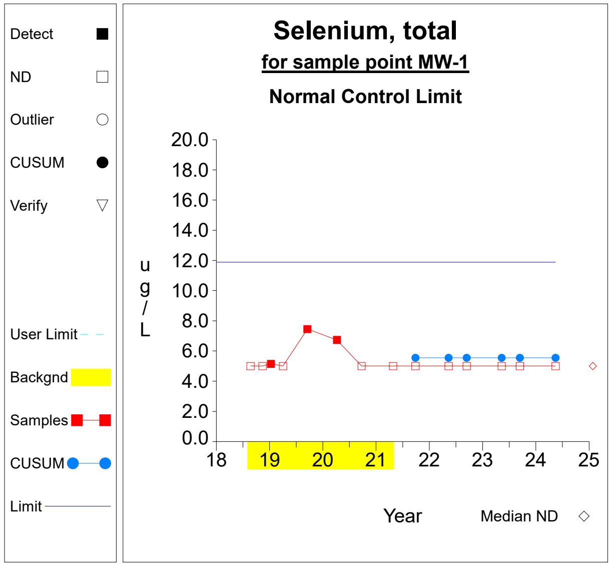
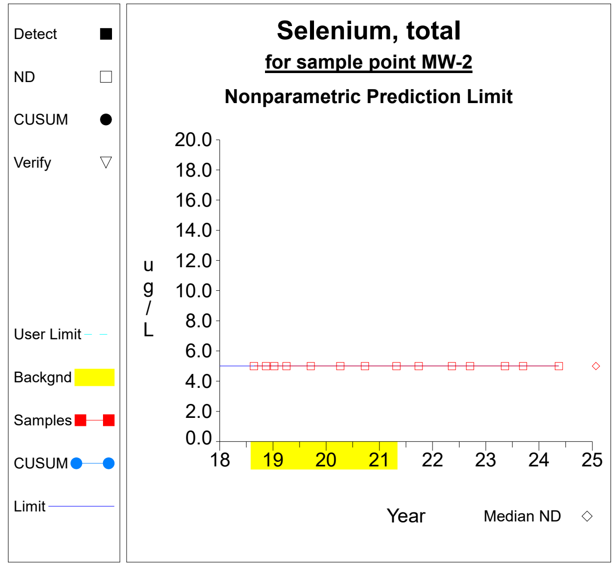
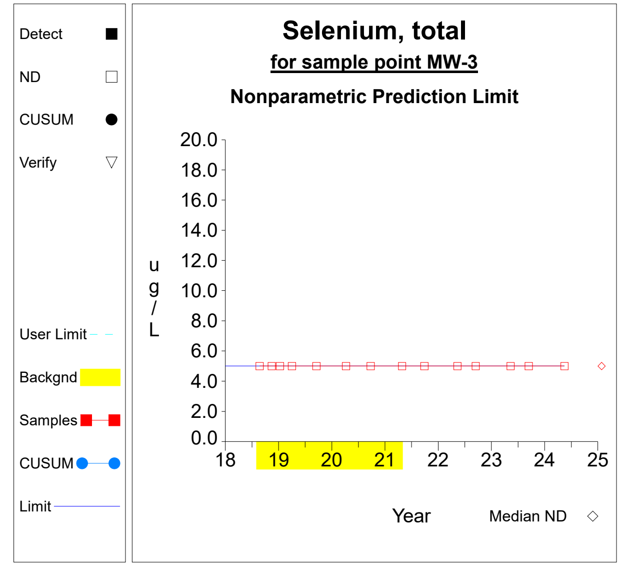


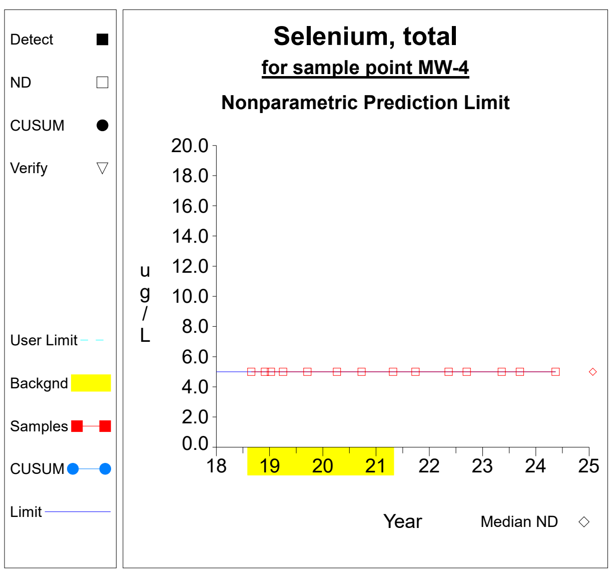
Graph 121



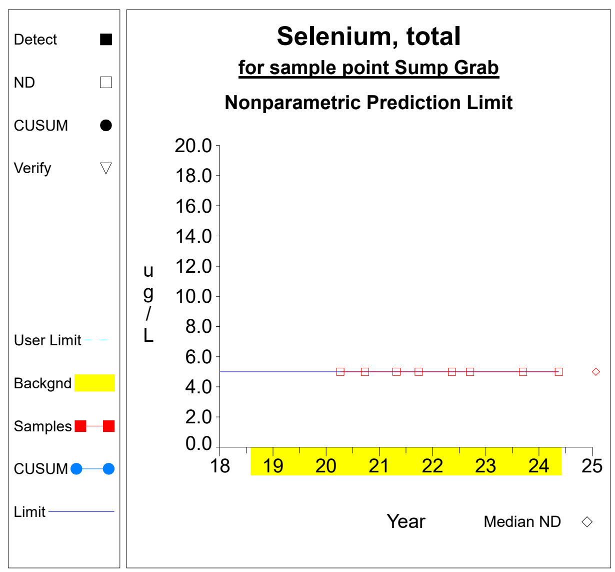
Graph 122



Graph 123



Graph 124



Graph 125

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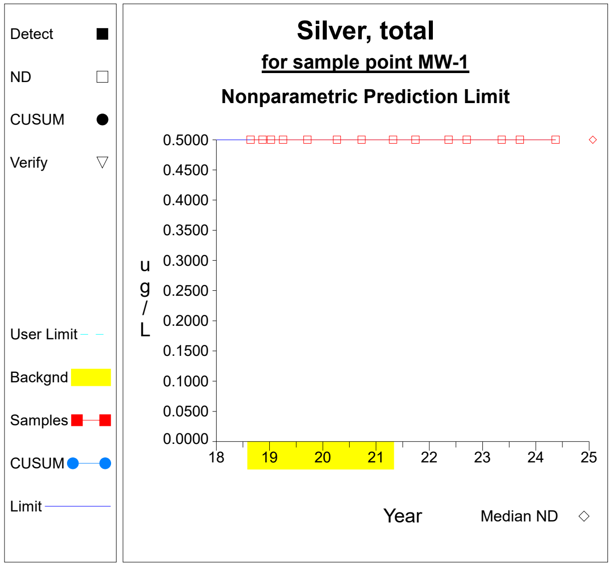
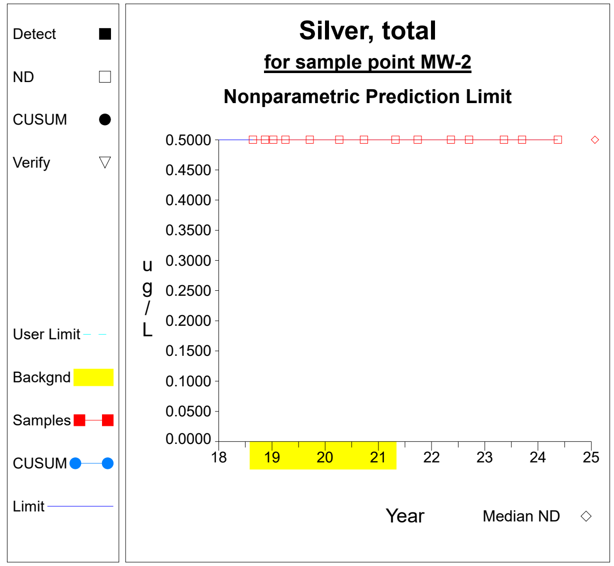
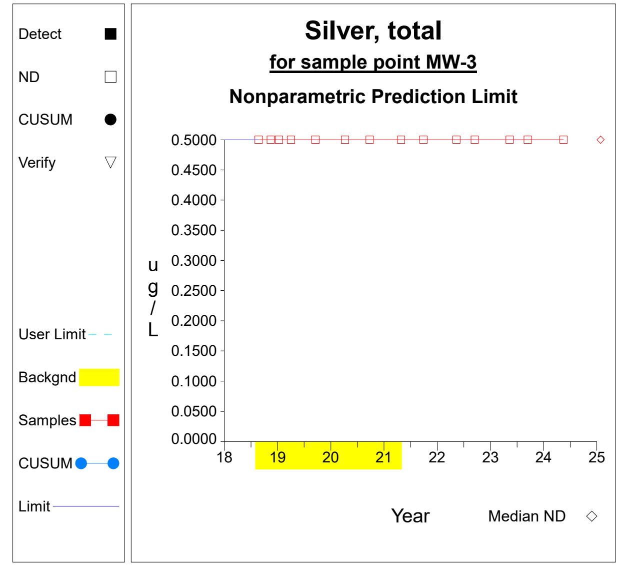
Intra-Well Control Charts / Prediction Limits



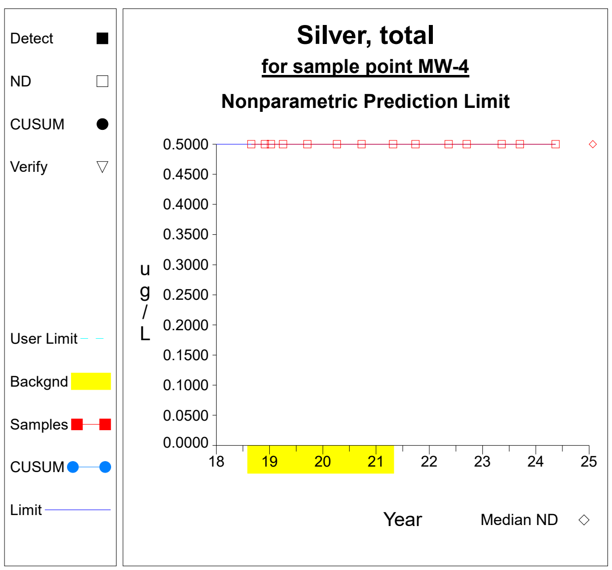
Graph 126



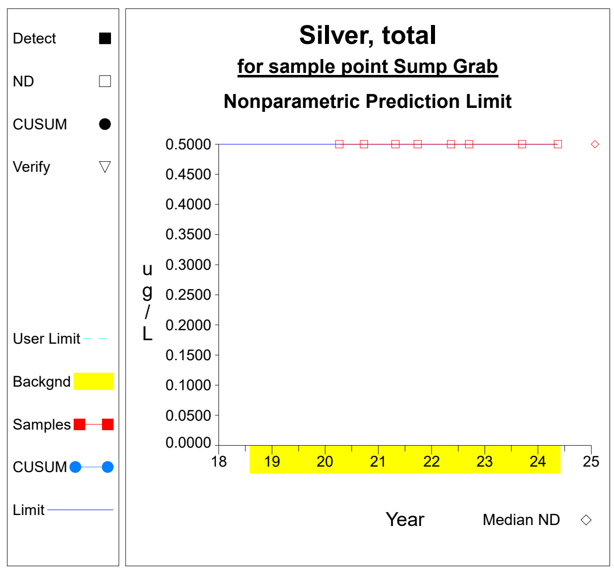
Graph 127



Graph 128



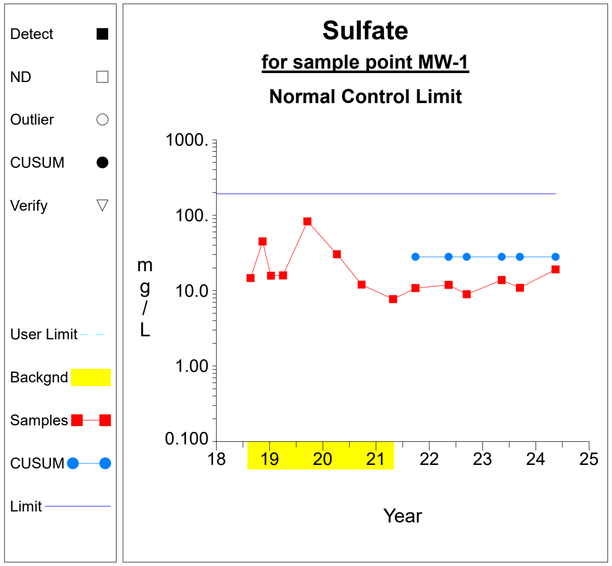
Graph 129



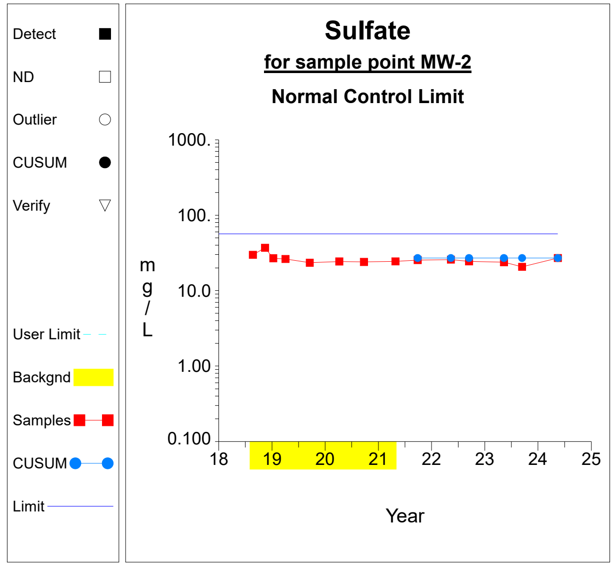
Graph 130

Goose Lake Quarry November 2024

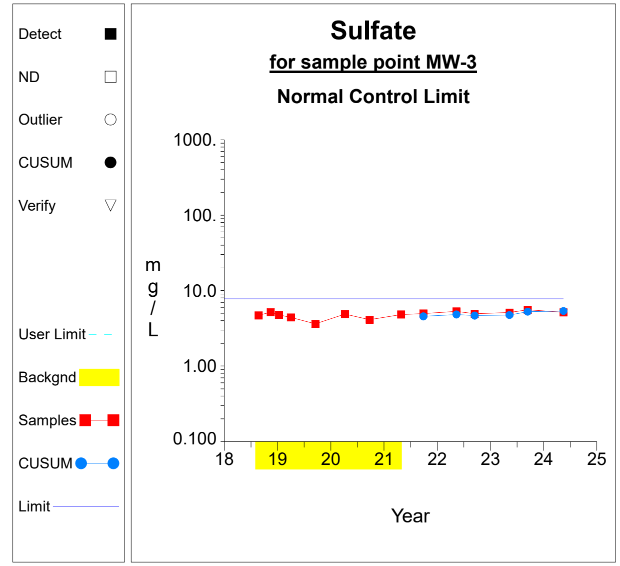
Intra-Well Control Charts / Prediction Limits



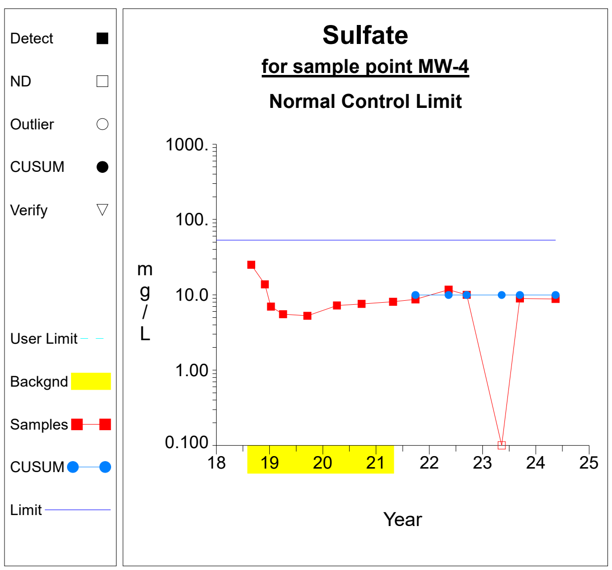
Graph 131



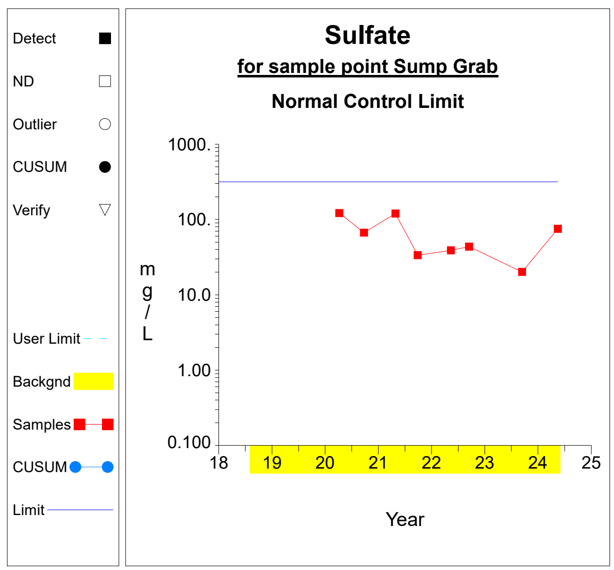
Graph 132



Graph 133



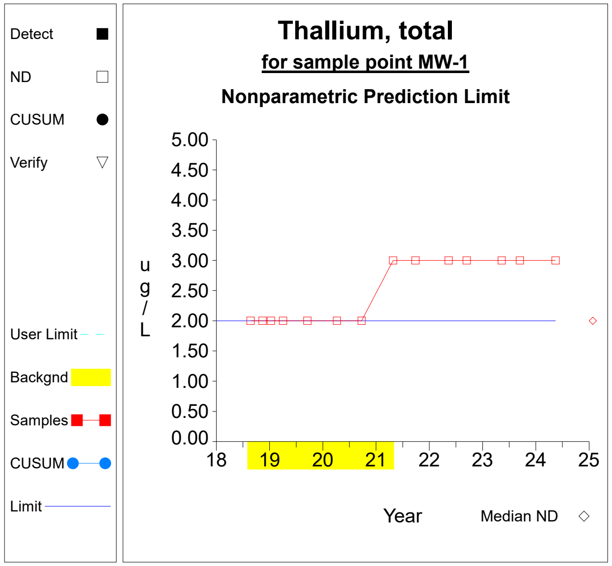
Graph 134



Graph 135

Prepared by: Otter Creek Environmental

Intra-Well Control Charts / Prediction Limits



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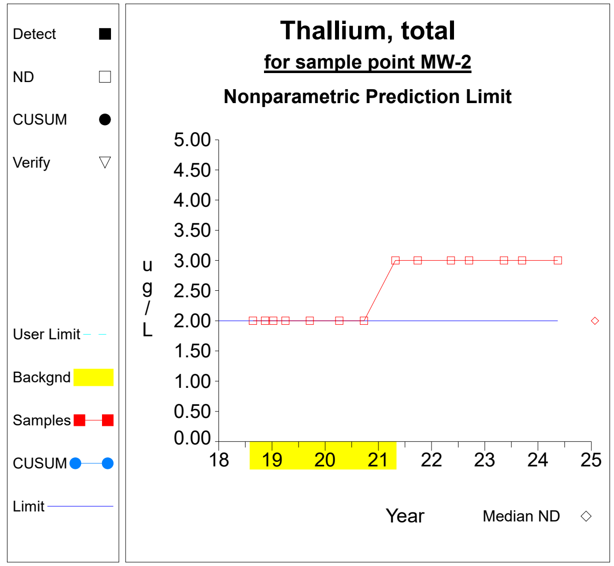
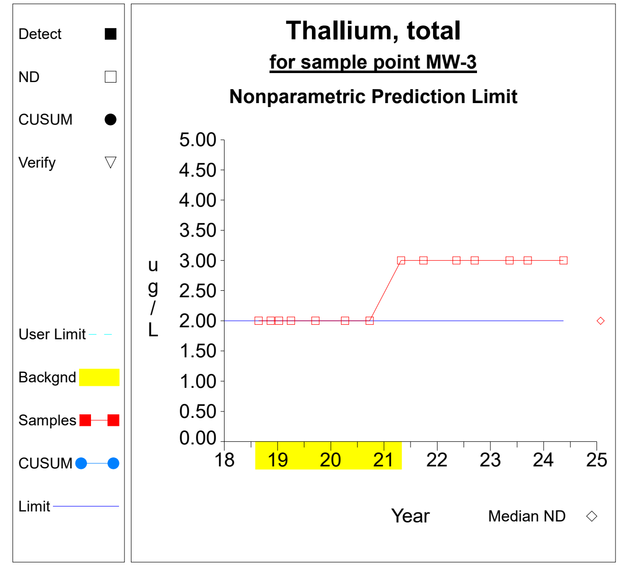
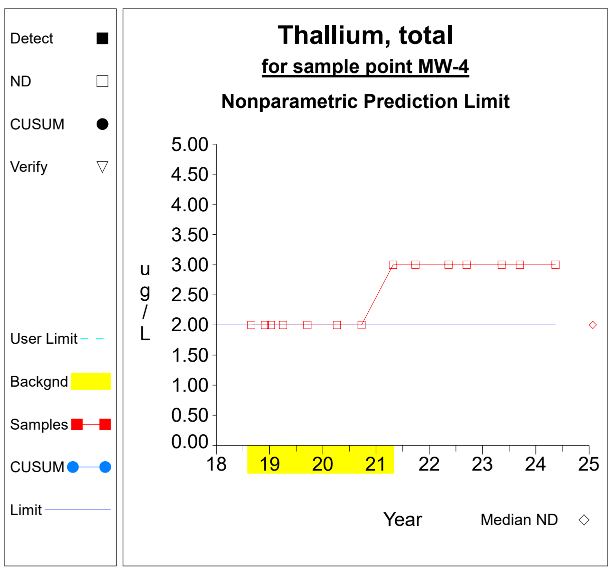


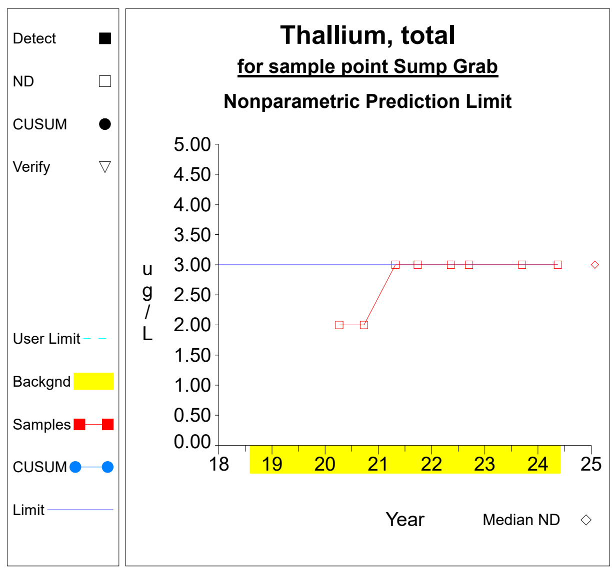
Graph 137



Graph 138

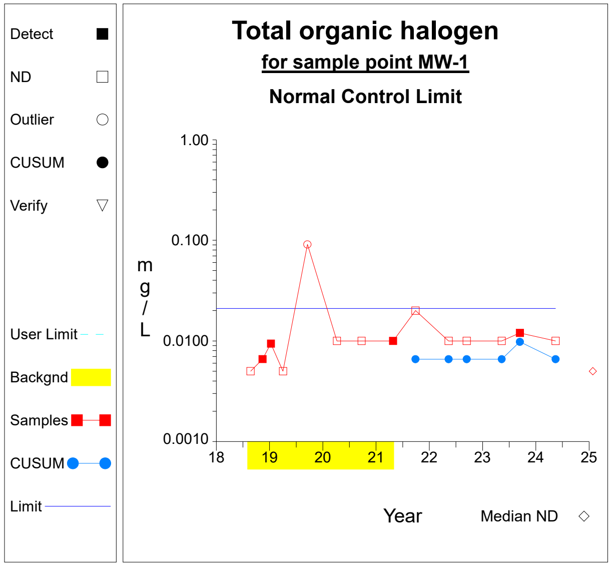


Graph 139

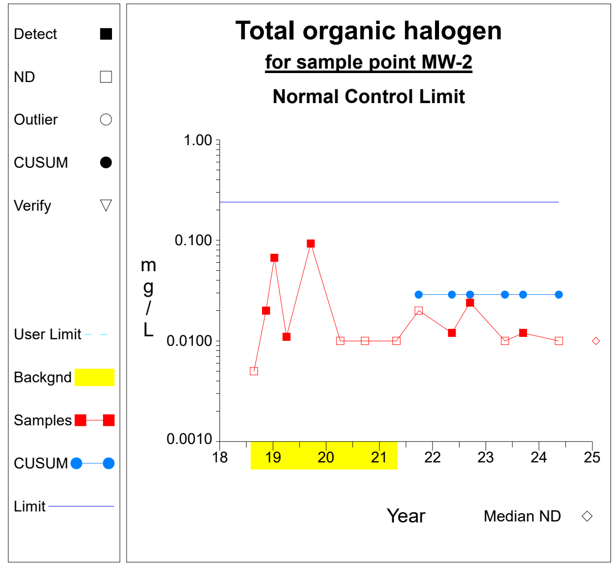


Graph 140

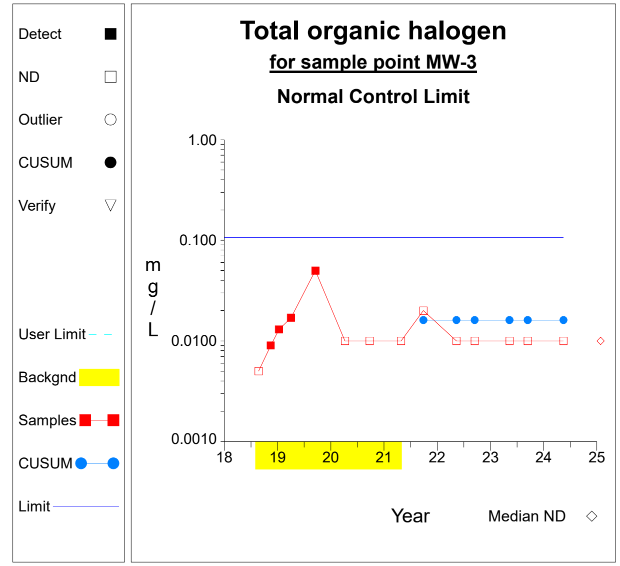
Intra-Well Control Charts / Prediction Limits



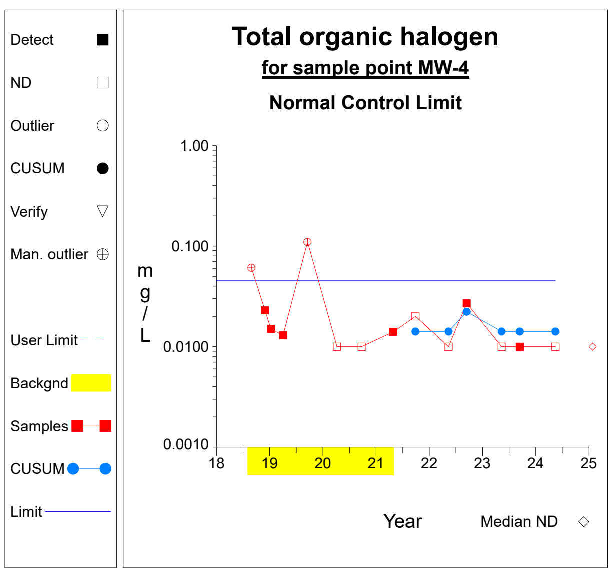
Graph 141



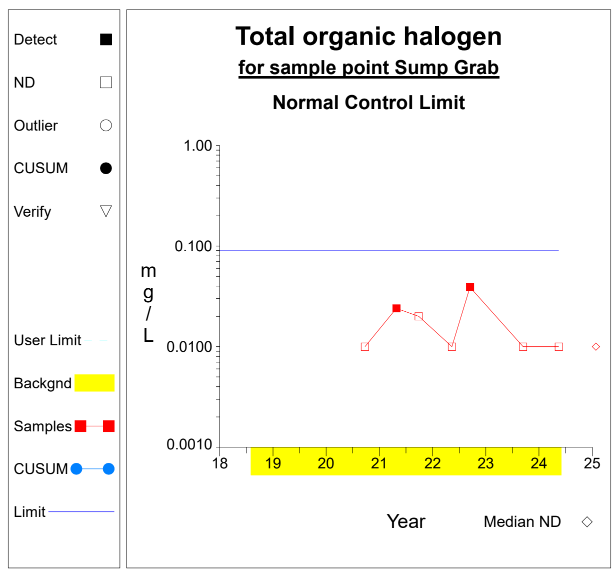
Graph 142



Graph 143



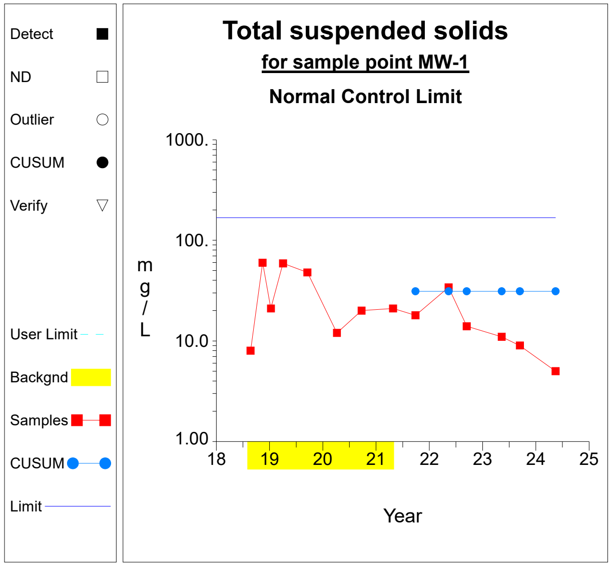
Graph 144



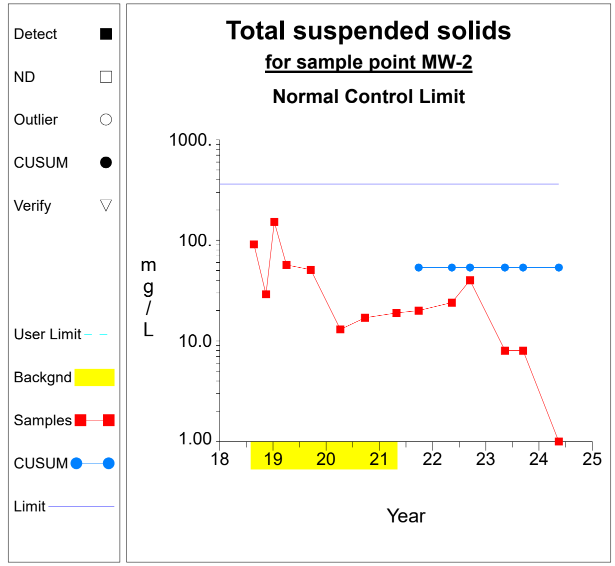
Graph 145

Prepared by: Otter Creek Environmental

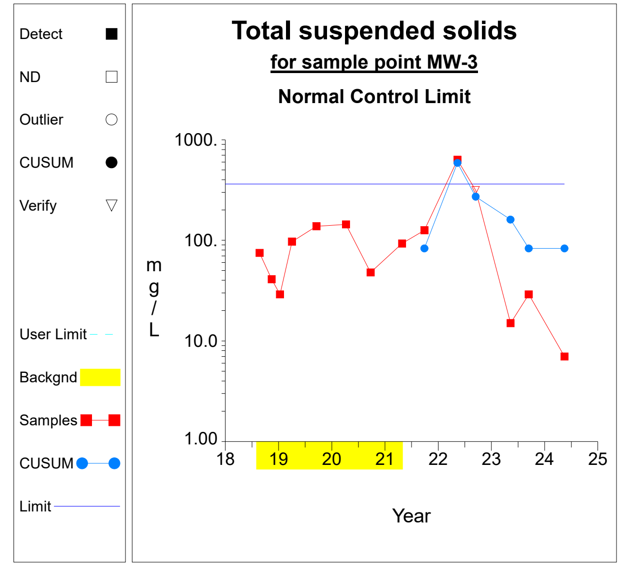
Intra-Well Control Charts / Prediction Limits



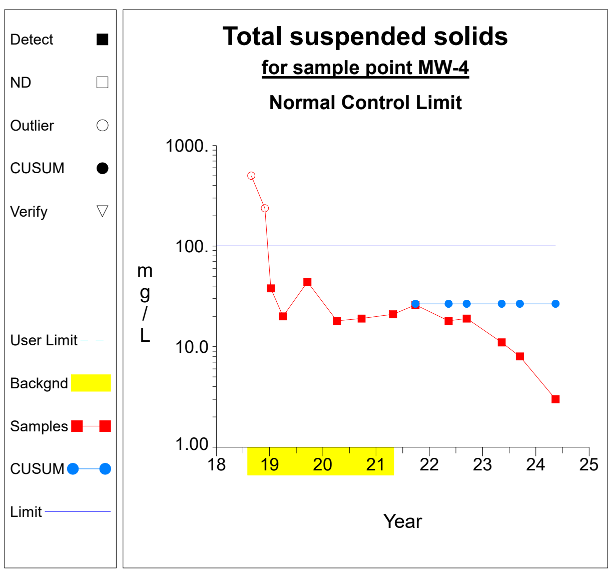
Graph 146



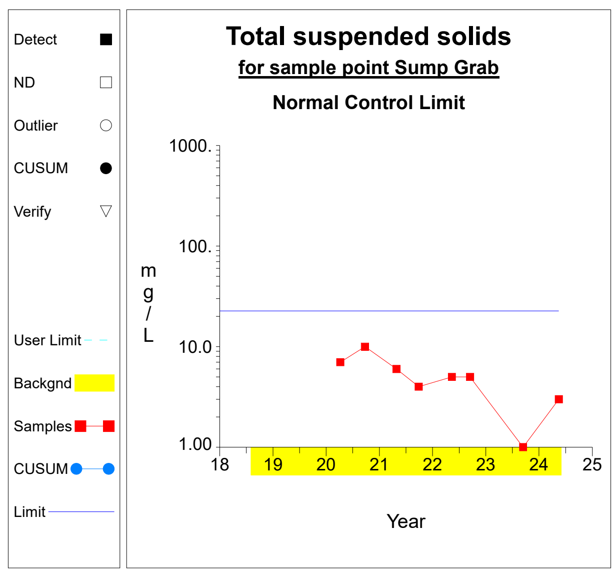
Graph 147



Graph 148

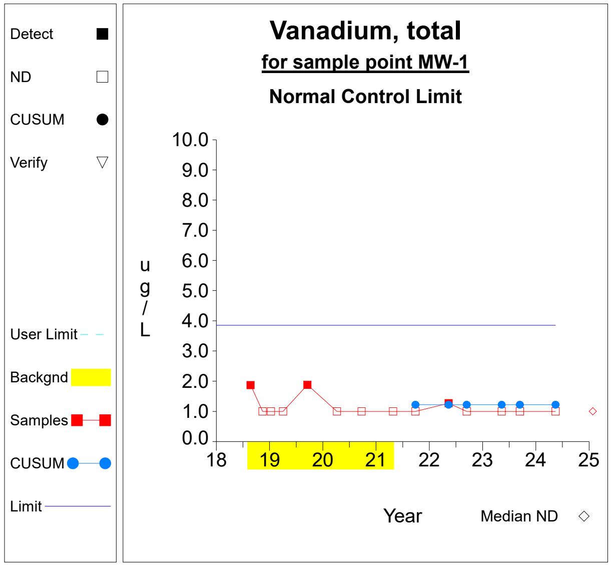


Graph 149

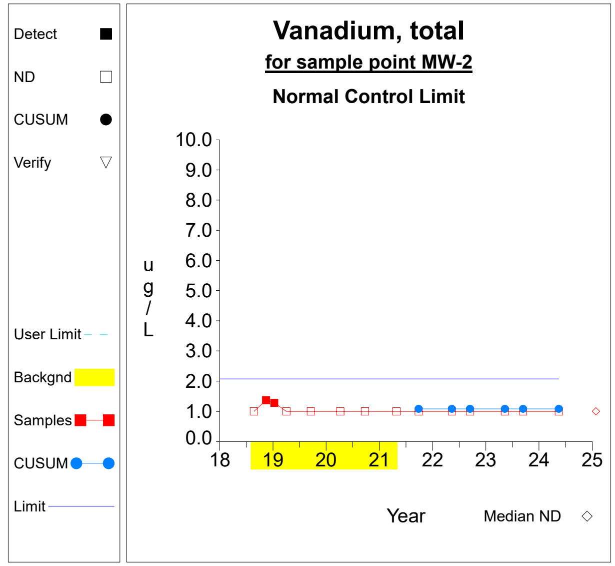


Graph 150

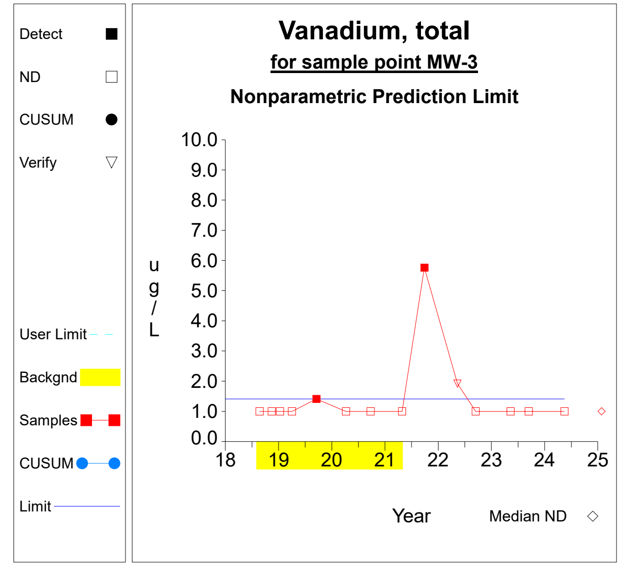
Intra-Well Control Charts / Prediction Limits



Graph 151



Graph 152



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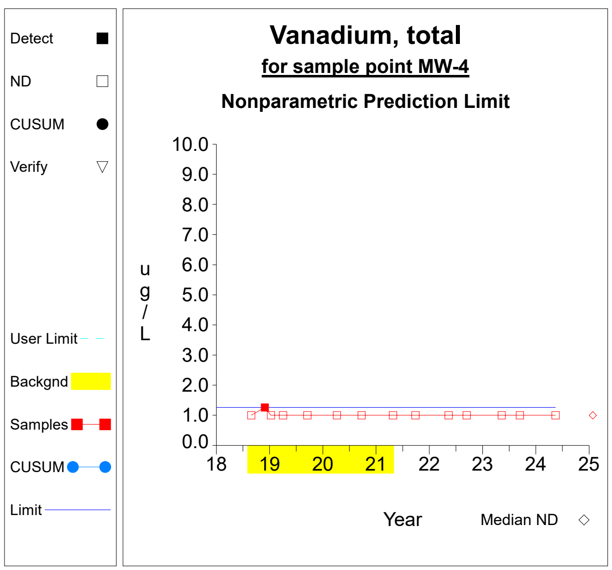

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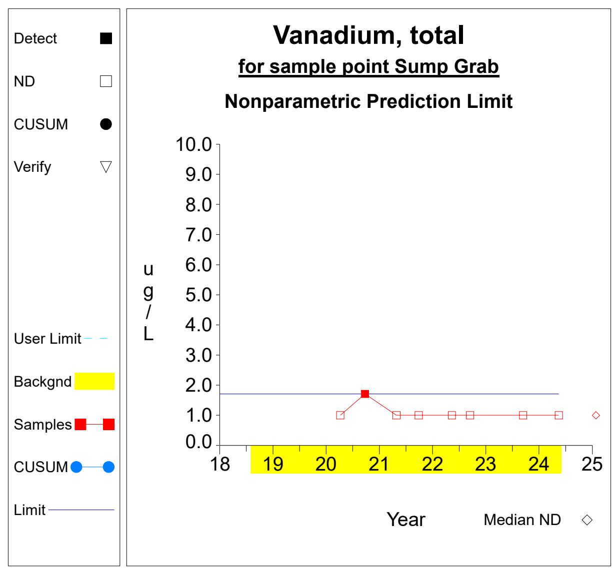
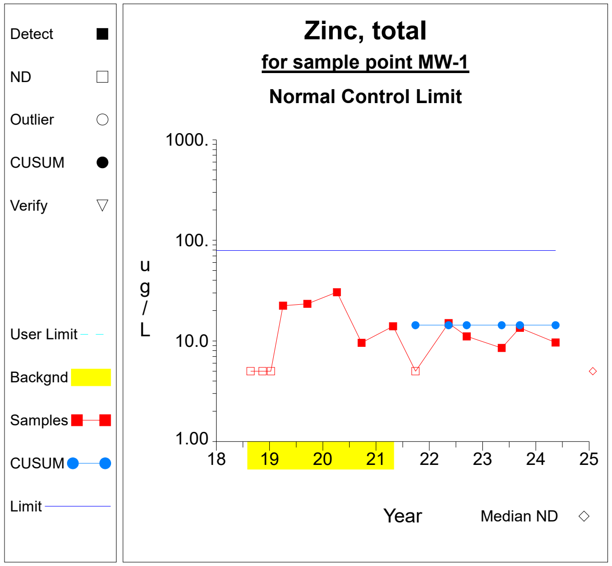
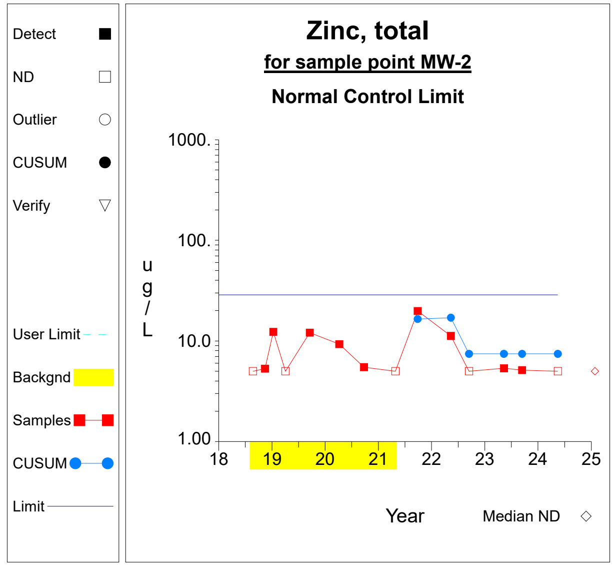


Graph 155

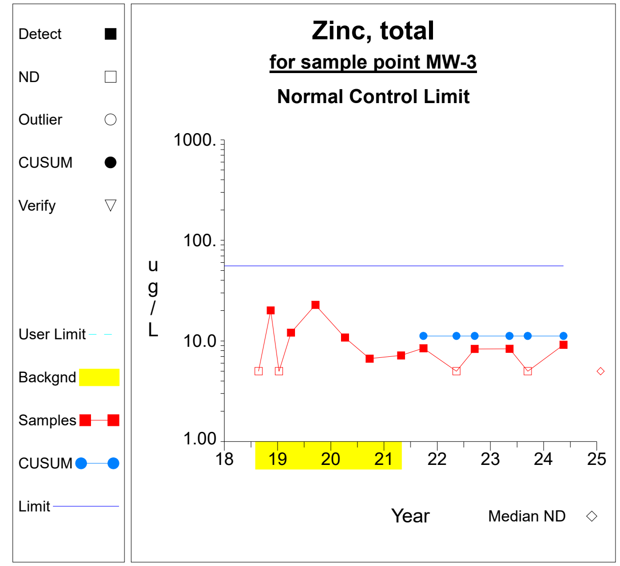
Intra-Well Control Charts / Prediction Limits



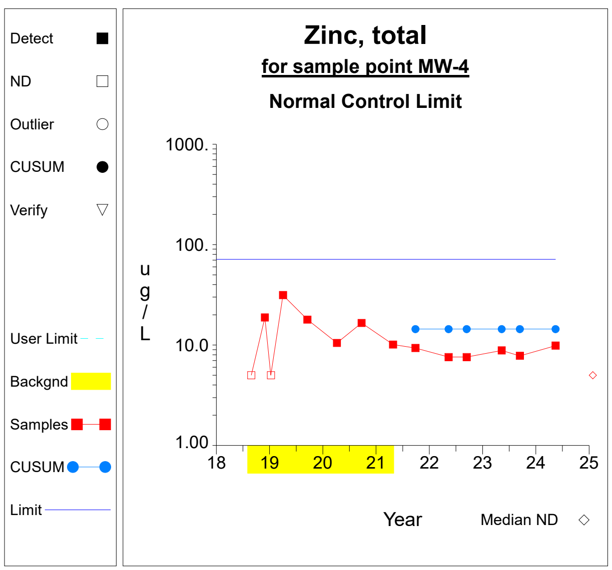
Graph 156



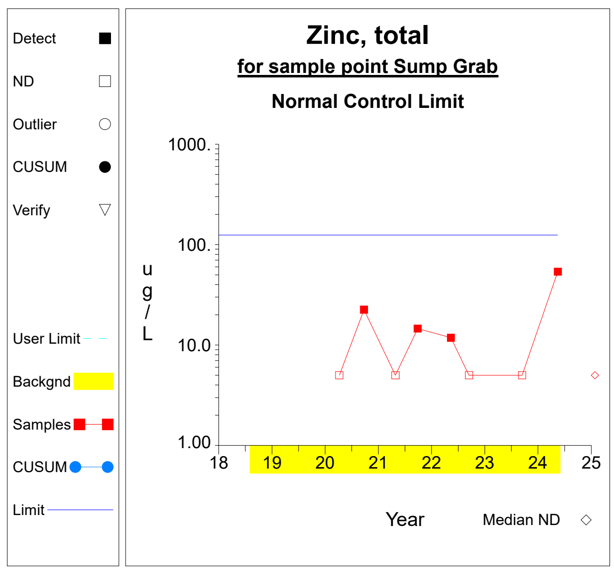
Graph 157



Graph 158

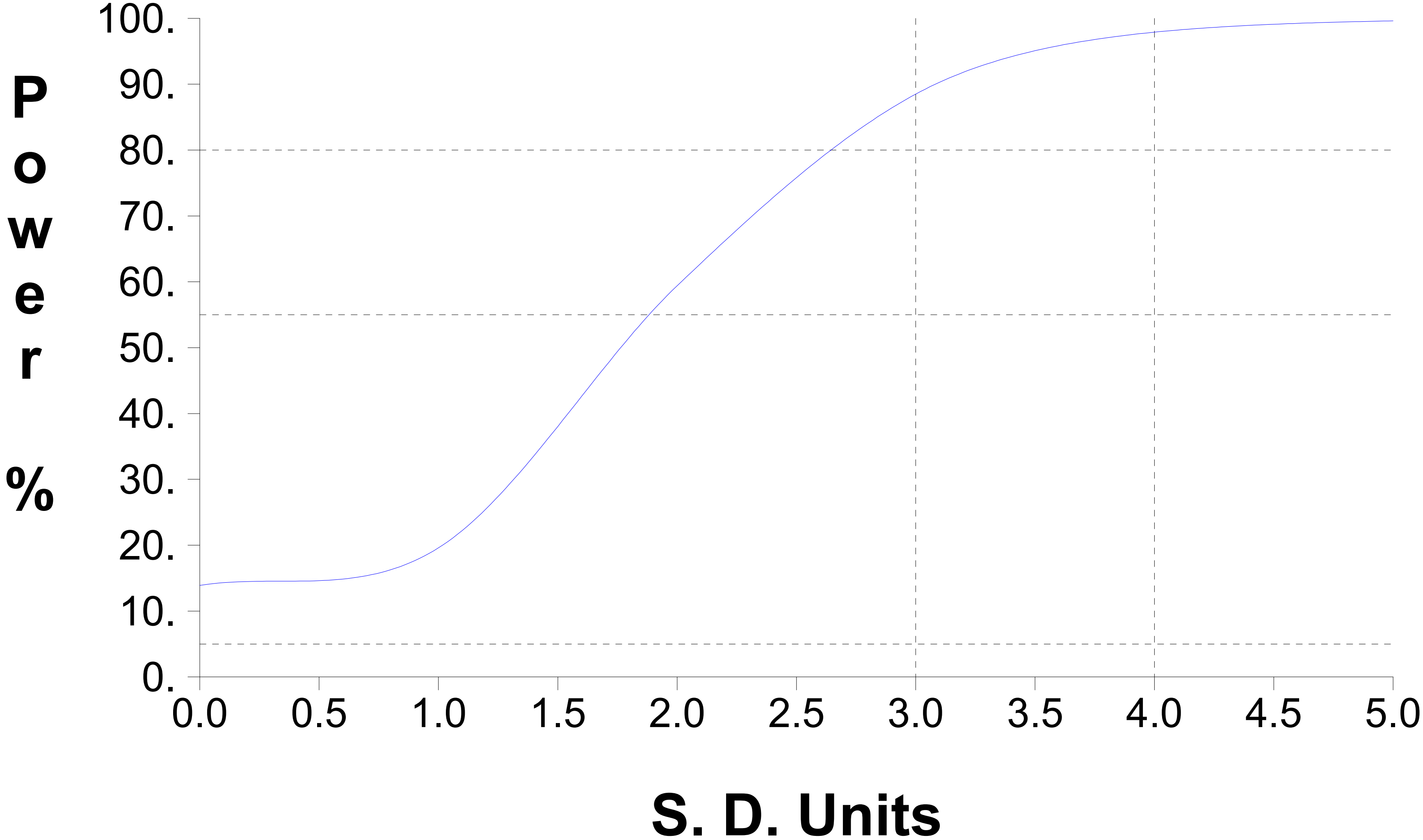


Graph 159



Graph 160

False Positive and False Negative Rates for Current Intra-Well Control Charts Monitoring Program



Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **2362.9** / **8** = **295.363**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{1.95 \times 10^6} - \mathbf{5.58 \times 10^6}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ = **422.942**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **295.363** + **6.5** * **422.942** = **3044.483**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **19.051**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{1/2}) / 2$ = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1054.631**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X] / N** = **1540.3** / **8** = **192.538**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**646304.61 - 2.37x10^6/8**) / (**8**-1))^{½} = **223.523**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **192.538** + **6.5** * **223.523** = **1645.44**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-64.249**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$ * var(S)^{½}**) / 2 = (**28 - 2.326 * 65.333^{½}**) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-434.096**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **1681.7** / **8** = **210.213**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2**/**N**) / (**N**-1))^{½} = ((**561877.85 - 2.83**x**10^6**/**8**) / (**8**-1))^{½} = **172.529**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **210.213** + **6.5** * **172.529** = **1331.65**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **77.138**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-265.175**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **542.9** / **7** = **77.557**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**48028.91** - **294740.41**/**7**) / (**7**-1))$^{1/2}$ = **31.42**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **77.557** + **6.5** * **31.42** = **281.784**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **-6.207**	Sen's estimator of trend.
6	var(S) = **44.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**21** - **2.326** * **44.333**$^{1/2}$) / 2 = **2.756**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-58.583**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **812.0** / **8**	
	= **101.5**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**88622.0** - **659344.0**/**8**) / (**8**-1))^{½}	
	= **29.771**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **101.5** + **6.5** * **29.771**	
	= **295.009**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**^{½}) / 2	
	= **5.887**	
8	LCL(S) = **-14.639**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.13**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.23**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.26**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.12**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.25**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **482.2** / **8** = **60.275**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**31009.46** - **232516.84**/**8**) / (**8**-1))^{½} = **16.668**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **60.275** + **6.5** * **16.668** = **168.62**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-4.22**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-39.306**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **583.7** / **8** = **72.963**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**49806.31** - **340705.69**/**8**) / (**8**-1))^{½} = **32.112**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **72.963** + **6.5** * **32.112** = **281.688**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-7.482**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-88.004**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **246.2** / **8**	
	= **30.775**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**7884.1** - **60614.44**/**8**) / (**8**-1))$^{1/2}$	
	= **6.626**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **30.775** + **6.5** * **6.626**	
	= **73.842**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **1.858**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**$^{1/2}$) / 2	
	= **4.6**	
8	LCL(S) = **-14.588**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **346.4** / **8** = **43.3**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**15172.32** - **119992.96/8**) / (**8**-1))$^{1/2}$ = **4.974**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **43.3** + **6.5** * **4.974** = **75.632**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.569**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.288**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **866.9** / **8**	
	= **108.363**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$	Compute background sd.
	$= ((\mathbf{96194.05} - \mathbf{751515.61/8}) / (\mathbf{8}-1))^{1/2}$	
	= **17.947**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **108.363** + **6.5** * **17.947**	
	= **225.016**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **2.729**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{1/2}) / 2$	
	= **4.6**	
8	LCL(S) = **-22.666**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **1.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **174.1** / **8**	
	= **21.763**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**3889.93** - **30310.81**/**8**) / (**8**-1))^{½}	
	= **3.8**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **21.763** + **6.5** * **3.8**	
	= **46.462**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**^{½}) / 2	
	= **5.887**	
8	LCL(S) = **-2.202**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **243.0** / **8**	
	= **30.375**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**8713.54** - **59049.0**/**8**) / (**8**-1))^{½}	
	= **13.797**	
3	SCL = **$\overline{X}$** + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **30.375** + **6.5** * **13.797**	
	= **120.053**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-6.102**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **61.667**^{½}) / 2	
	= **4.867**	
8	LCL(S) = **-25.109**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **20.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **152.0** / **7** = **21.714**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**3402.0** - **23104.0/7**) / (**7**-1))^{½} = **4.112**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **21.714** + **6.5** * **4.112** = **48.439**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **-0.436**	Sen's estimator of trend.
6	var(S) = **27.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**21** - **2.326** * **27.667**^{½}) / 2 = **4.383**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.347**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **424.3** / **8** = **53.038**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**25608.35** - **180030.49/8**) / (**8**-1))^{½} = **21.06**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **53.038** + **6.5** * **21.06** = **189.925**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **10.228**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.705**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **69.0** / **8** = **8.625**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**651.0** - **4761.0**/**8**) / (**8**-1))$^{1/2}$ = **2.825**	Compute background sd.
3	SCL = **$\overline{X}$** + **F** * **S** = **8.625** + **6.5** * **2.825** = **26.989**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.098**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **48.667**$^{1/2}$) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.722**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **67.0** / **8** = **8.375**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**649.0** - **4489.0**/**8**) / (**8**-1))^{½} = **3.543**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **8.375** + **6.5** * **3.543** = **31.405**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.415**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $\mathbf{Z}_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **55.667**^{½}) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.919**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **73.0** / **8** = **9.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**731.0** - **5329.0**/**8**) / (**8**-1))$^{1/2}$ = **3.044**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **9.125** + **6.5** * **3.044** = **28.913**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.872**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **48.667**$^{1/2}$) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.115**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **85.0** / **8** = **10.625**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**1035.0** - **7225.0**/**8**) / (**8**-1))^{½} = **4.34**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **10.625** + **6.5** * **4.34** = **38.838**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-3.246**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **55.667**^{½}) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-12.264**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X} = \textbf{sum[X]} / \textbf{N}$ $= \textbf{58.0} / \textbf{8}$ $= \textbf{7.25}$	Compute background mean.
2	$S = ((\textbf{sum[X}^2\textbf{]} - \textbf{sum[X]}^2/\textbf{N}) / (\textbf{N}-1))^{1/2}$ $= ((\textbf{424.0} - \textbf{3364.0}/\textbf{8}) / (\textbf{8}-1))^{1/2}$ $= \textbf{0.707}$	Compute background sd.
3	$SCL = \overline{\textbf{X}} + \textbf{F} * \textbf{S}$ $= \textbf{7.25} + \textbf{6.5} * \textbf{0.707}$ $= \textbf{11.846}$	Compute combined Shewhart-CUSUM normal control limit.
4	$N' = \textbf{N} * (\textbf{N}-1) / 2$ $= \textbf{8} * (\textbf{8}-1) / 2$ $= \textbf{28}$	Number of sample pairs during trend detection period.
5	$S = \textbf{0.0}$	Sen's estimator of trend.
6	$var(S) = \textbf{21.0}$	Variance estimate for slope.
7	$M_1(S) = (\textbf{N'} - \textbf{Z}_{.99} * \textbf{var(S)}^{1/2}) / 2$ $= (\textbf{28} - \textbf{2.326} * \textbf{21.0}^{1/2}) / 2$ $= \textbf{8.67}$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	$LCL(S) = \textbf{0.0}$	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **46.56** / **8** = **5.82**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**314.543** - **2167.834/8**) / (**8**-1))^{½} = **2.495**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **5.82** + **6.5** * **2.495** = **22.035**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.189**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.113**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **233.34** / **8** = **29.168**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**12367.159** - **54447.556**/**8**) / (**8**-1))^{½} = **28.186**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **29.168** + **6.5** * **28.186** = **212.377**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-26.529**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-57.494**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **11.002** / **8** = **1.375**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**27.542** - **121.044**/**8**) / (**8**-1))^{½} = **1.332**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **1.375** + **6.5** * **1.332** = **10.03**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.169**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.362**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **86.12** / **8** = **10.765**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**1842.082** - **7416.654**/**8**) / (**8**-1))$^{1/2}$ = **11.433**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **10.765** + **6.5** * **11.433** = **85.08**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-9.015**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-43.765**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **173.4** / **8**	
	= **21.675**	
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**4202.96** - **30067.56**/**8**) / (**8**-1))$^{1/2}$	
	= **7.969**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **21.675** + **6.5** * **7.969**	
	= **73.472**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-7.198**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**$^{1/2}$) / 2	
	= **4.6**	
8	LCL(S) = **-10.808**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **42.39** / **8** = **5.299**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**341.511** - **1796.912**/**8**) / (**8**-1))$^{1/2}$ = **4.087**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **5.299** + **6.5** * **4.087** = **31.861**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.75**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.45**	One-sided lower confidence limit for slope.
9	LCL(S) > 0	**Significant increasing trend.**

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **37.2** / **6** = **6.2**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**237.883** - **1383.84**/**6**) / (**6**-1))^{½} = **1.204**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **6.2** + **6.5** * **1.204** = **14.023**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **0.208**	Sen's estimator of trend.
6	var(S) = **28.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z$_{.99}$** * **var(S)**^{½}) / 2 = (**15** - **2.326** * **28.333**^{½}) / 2 = **1.309**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.954**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **58.86** / **8** = **7.358**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{714.508} - \mathbf{3464.5}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ = **6.341**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **7.358** + **6.5** * **6.341** = **48.573**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **5.734**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{1/2}) / 2$ = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.182**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **60.72** / **8** = **7.59**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**614.972** - **3686.918**/**8**) / (**8**-1))^{½} = **4.692**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **7.59** + **6.5** * **4.692** = **38.088**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.619**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-3.612**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.5**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **31.73** / **8** = **3.966**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**151.006** - **1006.793**/**8**) / (**8**-1))$^{1/2}$ = **1.896**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **3.966** + **6.5** * **1.896** = **16.289**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.509**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.696**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X] / N**	Compute background mean.
	= **21.38** / **8**	
	= **2.673**	
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$	Compute background sd.
	$= ((66.741 - 457.104/8) / (8-1))^{1/2}$	
	= **1.171**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **2.673** + **6.5** * **1.171**	
	= **10.286**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-0.67**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	$M_1(S) = (N' - Z_{.99} * \text{var}(S)^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (28 - 2.326 * 48.667^{1/2}) / 2$	
	= **5.887**	
8	LCL(S) = **-2.872**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **58.73** / **8**	
	= **7.341**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**1186.49** - **3449.213**/**8**) / (**8**-1))^{½}	
	= **10.388**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **7.341** + **6.5** * **10.388**	
	= **74.862**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-1.499**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **64.333**^{½}) / 2	
	= **4.672**	
8	LCL(S) = **-24.106**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **24.67** / **8** = **3.084**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**104.273** - **608.609/8**) / (**8**-1))^{½} = **2.007**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **3.084** + **6.5** * **2.007** = **16.129**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.396**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **54.98** / **8** = **6.873**	Compute background mean.
2	S = ((**sum[X²] - sum[X]**²/**N**) / (**N**-1))^{½} = ((**542.712** - **3022.8/8**) / (**8**-1))^{½} = **4.853**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **6.873** + **6.5** * **4.853** = **38.417**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-3.822**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **1.125** / **8**	
	= **0.141**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**0.188** - **1.266**/**8**) / (**8**-1))^{½}	
	= **0.065**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **0.141** + **6.5** * **0.065**	
	= **0.564**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.004**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **61.667**^{½}) / 2	
	= **4.867**	
8	LCL(S) = **-0.102**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **1.425** / **8** = **0.178**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**0.341** - **2.031**/**8**) / (**8**-1))$^{1/2}$ = **0.112**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **0.178** + **6.5** * **0.112** = **0.906**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.02**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **61.667**$^{1/2}$) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.087**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **0.964** / **8** = **0.121**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**0.129** - **0.929**/**8**) / (**8**-1))^{½} = **0.043**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **0.121** + **6.5** * **0.043** = **0.4**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **1.238** / **8**	
	= **0.155**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**0.224** - **1.533**/**8**) / (**8**-1))$^{1/2}$	
	= **0.068**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **0.155** + **6.5** * **0.068**	
	= **0.597**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.021**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **61.667**$^{1/2}$) / 2	
	= **4.867**	
8	LCL(S) = **-0.062**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **1.182** / **8** = **0.148**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.177** - **1.397**/**8**) / (**8**-1))^{½} = **0.018**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **0.148** + **6.5** * **0.018** = **0.266**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.01**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.023**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **100.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **100.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **100.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **100.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **1857.1** / **8** = **232.138**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**890408.29** - **3.45**x**10^6**/**8**) / (**8**-1))^{½} = **256.154**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **232.138** + **6.5** * **256.154** = **1897.141**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-11.204**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-647.558**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **3316.9** / **8** = **414.613**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**3.14**x**10^6** - **1.10**x**10^7**/**8**) / (**8**-1))$^{1/2}$ = **502.014**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **414.613** + **6.5** * **502.014** = **3677.705**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-190.215**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-990.019**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **3886.8** / **8** = **485.85**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**4.06**x**10^6** - **1.51**x**10^7**/**8**) / (**8**-1))^{½} = **557.542**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **485.85** + **6.5** * **557.542** = **4109.872**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **261.135**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-294.791**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **2187.2** / **8** = **273.4**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**1.46x10^6** - **4.78x10^6**/**8**) / (**8**-1))^{½} = **351.196**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **273.4** + **6.5** * **351.196** = **2556.176**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-37.314**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-608.971**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **3609.7** / **8**	
	= **451.213**	
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$	Compute background sd.
	$= ((1.06\times10^7 - 1.30\times10^7/8) / (8-1))^{1/2}$	
	= **1131.669**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **451.213** + **6.5** * **1131.669**	
	= **7807.064**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-23.005**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	$M_1(S) = (N' - Z_{.99} * \text{var}(S)^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (28 - 2.326 * 64.333^{1/2}) / 2$	
	= **4.672**	
8	LCL(S) = **-1272.359**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **2.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **2.21**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **2.41**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.01**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **314.5** / **8** = **39.313**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**12947.27** - **98910.25**/**8**) / (**8**-1))^{½} = **9.13**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **39.313** + **6.5** * **9.13** = **98.657**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **8.665**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.649**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **486.1** / **8** = **60.763**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))$^{1/2}$ = ((**30612.67** - **236293.21**/**8**) / (**8**-1))$^{1/2}$ = **12.398**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **60.763** + **6.5** * **12.398** = **141.351**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-7.069**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-24.075**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **212.5** / **8**	
	= **26.563**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{½}$	Compute background sd.
	$= ((\mathbf{5808.83} - \mathbf{45156.25/8}) / (\mathbf{8}-1))^{½}$	
	= **4.845**	
3	SCL = $\mathbf{\overline{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **26.563** + **6.5** * **4.845**	
	= **58.053**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **3.0**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{½}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{½}) / 2$	
	= **4.6**	
8	LCL(S) = **-1.917**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **413.8** / **8** = **51.725**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**21979.84** - **171230.44/8**) / (**8**-1))^{½} = **9.071**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **51.725** + **6.5** * **9.071** = **110.689**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-4.689**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-18.917**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **306.9** / **8**	
	= **38.363**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**11885.09** - **94187.61**/**8**) / (**8**-1))^{½}	
	= **3.994**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **38.363** + **6.5** * **3.994**	
	= **64.321**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **1.117**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **64.333**^{½}) / 2	
	= **4.672**	
8	LCL(S) = **-5.311**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **251.1** / **8**	
	= **31.388**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**11123.21** - **63051.21**/**8**) / (**8**-1))^{½}	
	= **21.52**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **31.388** + **6.5** * **21.52**	
	= **171.268**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **-23.888**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **538.8** / **8** = **67.35**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**44503.34** - **290305.44**/**8**) / (**8**-1))^{½} = **34.258**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **67.35** + **6.5** * **34.258** = **290.025**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.334**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-90.683**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **305.0** / **8** = **38.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**17073.96** - **93025.0**/**8**) / (**8**-1))$^{1/2}$ = **27.892**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **38.125** + **6.5** * **27.892** = **219.424**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **8.19**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **56.667**$^{1/2}$) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.147**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **149.4** / **7** = **21.343**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**3217.14** - **22320.36**/**7**) / (**7**-1))^{½} = **2.18**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **21.343** + **6.5** * **2.18** = **35.514**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **-0.435**	Sen's estimator of trend.
6	var(S) = **35.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**21** - **2.326** * **35.667**^{½}) / 2 = **3.554**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.666**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **244.5** / **8**	
	= **30.563**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**13471.25** - **59780.25**/**8**) / (**8**-1))^{½}	
	= **29.274**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **30.563** + **6.5** * **29.274**	
	= **220.843**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **-3.946**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **2.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **16.71** / **8** = **2.089**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**35.129** - **279.224**/**8**) / (**8**-1))^{½} = **0.179**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **2.089** + **6.5** * **0.179** = **3.255**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.219**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **26.04** / **8** = **3.255**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**113.381** - **678.082/8**) / (**8**-1))^{½} = **2.022**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **3.255** + **6.5** * **2.022** = **16.398**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **48.667**^{½}) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.759**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **19.09** / **8** = **2.386**	Compute background mean.
2	S = ((**sum[X²] - sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**49.605** - **364.428**/**8**) / (**8**-1))$^{1/2}$ = **0.761**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **2.386** + **6.5** * **0.761** = **7.331**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.118**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **19.04** / **8** = **2.38**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**48.949** - **362.522**/**8**) / (**8**-1))$^{1/2}$ = **0.72**	Compute background sd.
3	SCL = **$\bar{X}$** + **F** * **S** = **2.38** + **6.5** * **0.72** = **7.063**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.159**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **10.55** / **8** = **1.319**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**17.647** - **111.303**/**8**) / (**8**-1))^{½} = **0.73**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **1.319** + **6.5** * **0.73** = **6.066**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **6.57** / **6** = **1.095**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**7.395** - **43.165**/**6**) / (**6**-1))^{½} = **0.2**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **1.095** + **6.5** * **0.2** = **2.397**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **19.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**15** - **2.326** * **19.667**^{½}) / 2 = **2.342**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.459**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **12.8** / **8** = **1.6**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**26.619** - **163.84**/**8**) / (**8**-1))^{½} = **0.937**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **1.6** + **6.5** * **0.937** = **7.687**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.314**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.426**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **9.99** / **8**	
	= **1.249**	
2	S = ((**sum[X²] - sum[X]²/N**) / (**N**-1))^{½}	Compute background sd.
	= ((**14.431** - **99.8**/**8**) / (**8**-1))^{½}	
	= **0.529**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **1.249** + **6.5** * **0.529**	
	= **4.684**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **1.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **79.0** / **8** = **9.875**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**1203.0** - **6241.0**/**8**) / (**8**-1))^{½} = **7.772**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **9.875** + **6.5** * **7.772** = **60.396**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **55.667**^{½}) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-10.24**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **60.0** / **8**	
	= **7.5**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**606.0** - **3600.0**/**8**) / (**8**-1))$^{1/2}$	
	= **4.721**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **7.5** + **6.5** * **4.721**	
	= **38.185**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**$^{1/2}$) / 2	
	= **5.887**	
8	LCL(S) = **-2.139**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **64.0** / **8** = **8.0**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**778.0** - **4096.0/8**) / (**8**-1))$^{1/2}$ = **6.164**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **8.0** + **6.5** * **6.164** = **48.069**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.436**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **66.5** / **8**	
	= **8.313**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$	Compute background sd.
	$= ((\mathbf{1006.25} - \mathbf{4422.25/8}) / (\mathbf{8}-1))^{1/2}$	
	= **8.049**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **8.313** + **6.5** * **8.049**	
	= **60.629**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{28} - \mathbf{2.326} * \mathbf{48.667}^{1/2}) / 2$	
	= **5.887**	
8	LCL(S) = **-13.769**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **45.0** / **8** = **5.625**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**267.0 - 2025.0/8**) / (**8**-1))^{½} = **1.408**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **5.625** + **6.5** * **1.408** = **14.776**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28 - 2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.515**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **44.33** / **8** = **5.541**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**252.318** - **1965.149**/**8**) / (**8**-1))^{½} = **0.976**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **5.541** + **6.5** * **0.976** = **11.888**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **48.667**^{½}) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.747**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **0.5**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **0.5**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **0.5**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **0.5**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **224.12** / **8** = **28.015**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**10709.178** - **50229.774**/**8**) / (**8**-1))^{½} = **25.158**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **28.015** + **6.5** * **25.158** = **191.542**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.619**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-55.787**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **216.0** / **8** = **27.0**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**5976.38** - **46656.0**/**8**) / (**8**-1))^{½} = **4.542**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **27.0** + **6.5** * **4.542** = **56.52**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.137**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-8.338**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **36.5** / **8** = **4.563**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**168.236** - **1332.25/8**) / (**8**-1))^{½} = **0.493**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **4.563** + **6.5** * **0.493** = **7.77**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.178**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.684**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **79.49** / **8** = **9.936**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**1101.398** - **6318.66**/**8**) / (**8**-1))$^{1/2}$ = **6.672**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **9.936** + **6.5** * **6.672** = **53.301**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.439**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-28.077**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **520.3** / **8**	
	= **65.038**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**44356.21** - **270712.09**/**8**) / (**8**-1))$^{1/2}$	
	= **38.762**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **65.038** + **6.5** * **38.762**	
	= **316.988**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-14.381**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**$^{1/2}$) / 2	
	= **4.6**	
8	LCL(S) = **-57.067**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **2.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **3.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **0.046** / **7** = **0.007**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**3.32x10^{-4}** - **0.002**/**7**) / (**7**-1))$^{1/2}$ = **0.002**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.007** + **6.5** * **0.002** = **0.021**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **35.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**21** - **2.326** * **35.667**$^{1/2}$) / 2 = **3.554**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.003**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **0.231** / **8** = **0.029**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.014** - **0.053**/**8**) / (**8**-1))^{½} = **0.032**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **0.029** + **6.5** * **0.032** = **0.24**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.41**x**10**$^{-4}$	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.043**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X} = \mathbf{sum[X]} / \mathbf{N}$ $= \mathbf{0.129} / \mathbf{8}$ $= \mathbf{0.016}$	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{0.003} - \mathbf{0.017}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ $= \mathbf{0.014}$	Compute background sd.
3	$SCL = \bar{\mathbf{X}} + \mathbf{F} * \mathbf{S}$ $= \mathbf{0.016} + \mathbf{6.5} * \mathbf{0.014}$ $= \mathbf{0.107}$	Compute combined Shewhart-CUSUM normal control limit.
4	$N' = \mathbf{N} * (\mathbf{N}-1) / 2$ $= \mathbf{8} * (\mathbf{8}-1) / 2$ $= \mathbf{28}$	Number of sample pairs during trend detection period.
5	$S = \mathbf{0.0}$	Sen's estimator of trend.
6	$var(S) = \mathbf{56.667}$	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{56.667}^{1/2}) / 2$ $= \mathbf{5.245}$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	$LCL(S) = \mathbf{-0.005}$	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **0.085** / **6** = **0.014**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.001** - **0.007**/**6**) / (**6**-1))^{½} = **0.005**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.014** + **6.5** * **0.005** = **0.045**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **-0.003**	Sen's estimator of trend.
6	var(S) = **27.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**15** - **2.326** * **27.333**^{½}) / 2 = **1.42**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.054**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **0.113** / **7**	
	= **0.016**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**0.003** - **0.013**/**7**) / (**7**-1))$^{1/2}$	
	= **0.011**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **0.016** + **6.5** * **0.011**	
	= **0.09**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **7** * (**7**-1) / 2	
	= **21**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **27.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**21** - **2.326** * **27.667**$^{1/2}$) / 2	
	= **4.383**	
8	LCL(S) = **-0.011**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **249.0** / **8** = **31.125**	Compute background mean.
2	S = ((**sum[X²]** - **sum[X]**²/**N**) / (**N**-1))$^{1/2}$ = ((**10875.0** - **62001.0/8**) / (**8**-1))$^{1/2}$ = **21.128**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **31.125** + **6.5** * **21.128** = **168.46**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.616**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-29.746**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **429.0** / **8** = **53.625**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**38895.0** - **184041.0**/**8**) / (**8**-1))$^{1/2}$ = **47.644**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **53.625** + **6.5** * **47.644** = **363.313**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-26.936**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-92.45**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **665.0** / **8** = **83.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**68289.0** - **442225.0**/**8**) / (**8**-1))^{½} = **43.113**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **83.125** + **6.5** * **43.113** = **363.357**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **16.188**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-81.407**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **160.0** / **6**	
	= **26.667**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{½}$	Compute background sd.
	$= ((\mathbf{4906.0} - \mathbf{25600.0/6}) / (\mathbf{6}-1))^{½}$	
	= **11.308**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **26.667** + **6.5** * **11.308**	
	= **100.167**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **6** * (**6**-1) / 2	
	= **15**	
5	S = **-1.969**	Sen's estimator of trend.
6	var(S) = **28.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{½}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{15} - \mathbf{2.326} * \mathbf{28.333}^{½}) / 2$	
	= **1.309**	
8	LCL(S) = **-70.568**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X} = \mathbf{sum[X]} / \mathbf{N}$ $= \mathbf{41.0} / \mathbf{8}$ $= \mathbf{5.125}$	Compute background mean.
2	$S = ((\mathbf{sum[X^2] - sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{261.0} - \mathbf{1681.0}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ $= \mathbf{2.696}$	Compute background sd.
3	$SCL = \bar{\mathbf{X}} + \mathbf{F} * \mathbf{S}$ $= \mathbf{5.125} + \mathbf{6.5} * \mathbf{2.696}$ $= \mathbf{22.648}$	Compute combined Shewhart-CUSUM normal control limit.
4	$N' = \mathbf{N} * (\mathbf{N}-1) / 2$ $= \mathbf{8} * (\mathbf{8}-1) / 2$ $= \mathbf{28}$	Number of sample pairs during trend detection period.
5	$S = \mathbf{-1.097}$	Sen's estimator of trend.
6	$var(S) = \mathbf{64.333}$	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{64.333}^{1/2}) / 2$ $= \mathbf{4.672}$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	$LCL(S) = \mathbf{-3.381}$	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **9.75** / **8** = **1.219**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**13.031** - **95.063**/**8**) / (**8**-1))^{½} = **0.405**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **1.219** + **6.5** * **0.405** = **3.852**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.537**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **8.65** / **8** = **1.081**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**9.515** - **74.823/8**) / (**8**-1))^{½} = **0.152**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **1.081** + **6.5** * **0.152** = **2.072**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.229**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.41**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.26**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.71**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **114.87** / **8** = **14.359**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**2342.155** - **13195.117/8**) / (**8**-1))$^{1/2}$ = **9.948**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **14.359** + **6.5** * **9.948** = **79.022**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.518**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **61.667**$^{1/2}$) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-6.218**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **59.46** / **8** = **7.433**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**516.939** - **3535.492**/**8**) / (**8**-1))$^{1/2}$ = **3.273**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **7.433** + **6.5** * **3.273** = **28.709**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **61.667**$^{1/2}$) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.506**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **89.63** / **8** = **11.204**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))$^{1/2}$ = ((**1332.655** - **8033.537**/**8**) / (**8**-1))$^{1/2}$ = **6.85**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **11.204** + **6.5** * **6.85** = **55.729**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.4**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-11.724**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **115.3** / **8** = **14.413**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**2197.63** - **13294.09**/**8**) / (**8**-1))^{½} = **8.749**	Compute background sd.
3	SCL = **$\bar{X}$** + **F** * **S** = **14.413** + **6.5** * **8.749** = **71.284**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.189**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **64.333**^{½}) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-11.817**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **122.7** / **8** = **15.338**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**3853.09** - **15055.29**/**8**) / (**8**-1))$^{1/2}$ = **16.781**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **15.338** + **6.5** * **16.781** = **124.413**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **56.667**$^{1/2}$) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.515**	One-sided lower confidence limit for slope.

Attachment E

Summary Tables and Graphs for the Interwell Comparisons
Second Semi-Annual Monitoring Event in 2024

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Aluminum, total	ug/L	MW-3	08/23/2018		22.9000		
Aluminum, total	ug/L	MW-3	11/14/2018		219.0000		
Aluminum, total	ug/L	MW-3	01/10/2019		99.0000		
Aluminum, total	ug/L	MW-3	04/01/2019		58.8000		
Aluminum, total	ug/L	MW-3	09/17/2019		575.0000		
Aluminum, total	ug/L	MW-3	04/06/2020		248.0000		
Aluminum, total	ug/L	MW-3	09/24/2020		193.0000		
Aluminum, total	ug/L	MW-3	04/27/2021		266.0000		
Aluminum, total	ug/L	MW-3	09/28/2021		2720.0000		*
Aluminum, total	ug/L	MW-3	05/11/2022		870.0000		
Aluminum, total	ug/L	MW-3	09/14/2022		124.0000		
Aluminum, total	ug/L	MW-3	05/10/2023	ND	100.0000		
Aluminum, total	ug/L	MW-3	09/13/2023	ND	100.0000		
Aluminum, total	ug/L	MW-3	05/15/2024	ND	100.0000		
Aluminum, total	ug/L	MW-3	09/17/2024	ND	100.0000		
Aluminum, total	ug/L	MW-4	08/23/2018		105.0000		
Aluminum, total	ug/L	MW-4	11/30/2018		755.0000		*
Aluminum, total	ug/L	MW-4	01/10/2019		32.1000		
Aluminum, total	ug/L	MW-4	04/01/2019		113.0000		
Aluminum, total	ug/L	MW-4	09/17/2019		87.5000		
Aluminum, total	ug/L	MW-4	04/06/2020		54.1000		
Aluminum, total	ug/L	MW-4	09/24/2020		51.2000		
Aluminum, total	ug/L	MW-4	04/27/2021	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/28/2021	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/11/2022	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/14/2022	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/10/2023	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/13/2023	ND	100.0000		
Aluminum, total	ug/L	MW-4	05/15/2024	ND	100.0000		
Aluminum, total	ug/L	MW-4	09/17/2024	ND	100.0000		
Ammonia nitrogen	mg/L	MW-3	08/23/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	11/14/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	01/10/2019		0.2600		
Ammonia nitrogen	mg/L	MW-3	04/01/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/17/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	04/06/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/24/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	04/27/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/28/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/11/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/14/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/10/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/13/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	05/15/2024	ND	0.1000		
Ammonia nitrogen	mg/L	MW-3	09/17/2024	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	08/28/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	11/30/2018	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	01/10/2019		0.1200		
Ammonia nitrogen	mg/L	MW-4	04/01/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/17/2019	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	04/06/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/24/2020	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	04/27/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/28/2021	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/11/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/14/2022	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/10/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/13/2023	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	05/15/2024	ND	0.1000		
Ammonia nitrogen	mg/L	MW-4	09/17/2024	ND	0.1000		
Antimony, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Antimony, total	ug/L	MW-3	11/14/2018	ND	5.0000		
Antimony, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	04/01/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	09/17/2019	ND	5.0000		
Antimony, total	ug/L	MW-3	04/06/2020	ND	5.0000		
Antimony, total	ug/L	MW-3	09/24/2020	ND	5.0000		
Antimony, total	ug/L	MW-3	04/27/2021	ND	5.0000		
Antimony, total	ug/L	MW-3	09/28/2021	ND	5.0000		
Antimony, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Antimony, total	ug/L	MW-3	09/14/2022	ND	5.0000		
Antimony, total	ug/L	MW-3	05/10/2023	ND	5.0000		
Antimony, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Antimony, total	ug/L	MW-3	05/15/2024	ND	5.0000		

*   - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Antimony, total	ug/L	MW-3	09/17/2024	ND	5.0000		
Antimony, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Antimony, total	ug/L	MW-4	11/30/2018	ND	5.0000		
Antimony, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Antimony, total	ug/L	MW-4	04/01/2019	ND	5.0000		
Antimony, total	ug/L	MW-4	09/17/2019	ND	5.0000		
Antimony, total	ug/L	MW-4	04/06/2020	ND	5.0000		
Antimony, total	ug/L	MW-4	09/24/2020	ND	5.0000		
Antimony, total	ug/L	MW-4	04/27/2021	ND	5.0000		
Antimony, total	ug/L	MW-4	09/28/2021	ND	5.0000		
Antimony, total	ug/L	MW-4	05/11/2022	ND	5.0000		
Antimony, total	ug/L	MW-4	09/14/2022	ND	5.0000		
Antimony, total	ug/L	MW-4	05/10/2023	ND	5.0000		
Antimony, total	ug/L	MW-4	09/13/2023	ND	5.0000		
Antimony, total	ug/L	MW-4	05/15/2024	ND	5.0000		
Antimony, total	ug/L	MW-4	09/17/2024	ND	5.0000		
Arsenic, total	ug/L	MW-3	08/23/2018	ND	10.0000		
Arsenic, total	ug/L	MW-3	11/14/2018	ND	10.0000		
Arsenic, total	ug/L	MW-3	01/10/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/01/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/17/2019	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/06/2020	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/24/2020	ND	10.0000		
Arsenic, total	ug/L	MW-3	04/27/2021	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/28/2021	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/11/2022	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/14/2022	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/10/2023	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/13/2023	ND	10.0000		
Arsenic, total	ug/L	MW-3	05/15/2024	ND	10.0000		
Arsenic, total	ug/L	MW-3	09/17/2024	ND	10.0000		
Arsenic, total	ug/L	MW-4	08/23/2018	ND	10.0000		
Arsenic, total	ug/L	MW-4	11/30/2018	ND	10.0000		
Arsenic, total	ug/L	MW-4	01/10/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/01/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/17/2019	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/06/2020	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/24/2020	ND	10.0000		
Arsenic, total	ug/L	MW-4	04/27/2021	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/28/2021	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/11/2022	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/14/2022	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/10/2023	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/13/2023	ND	10.0000		
Arsenic, total	ug/L	MW-4	05/15/2024	ND	10.0000		
Arsenic, total	ug/L	MW-4	09/17/2024	ND	10.0000		
Barium, total	ug/L	MW-3	08/23/2018		33.2000		
Barium, total	ug/L	MW-3	11/14/2018		25.9000		
Barium, total	ug/L	MW-3	01/10/2019		21.1000		
Barium, total	ug/L	MW-3	04/01/2019		26.5000		
Barium, total	ug/L	MW-3	09/17/2019		42.9000		
Barium, total	ug/L	MW-3	04/06/2020		33.8000		
Barium, total	ug/L	MW-3	09/24/2020		29.3000		
Barium, total	ug/L	MW-3	04/27/2021		33.5000		
Barium, total	ug/L	MW-3	09/28/2021		79.0000		
Barium, total	ug/L	MW-3	05/11/2022		44.6000		
Barium, total	ug/L	MW-3	09/14/2022		31.4000		
Barium, total	ug/L	MW-3	05/10/2023		26.9000		
Barium, total	ug/L	MW-3	09/13/2023		27.6000		
Barium, total	ug/L	MW-3	05/15/2024		31.7000		
Barium, total	ug/L	MW-3	09/17/2024		27.6000		
Barium, total	ug/L	MW-4	08/23/2018		49.7000		
Barium, total	ug/L	MW-4	11/30/2018		34.5000		
Barium, total	ug/L	MW-4	01/10/2019		38.6000		
Barium, total	ug/L	MW-4	04/01/2019		47.4000		
Barium, total	ug/L	MW-4	09/17/2019		44.4000		
Barium, total	ug/L	MW-4	04/06/2020		46.2000		
Barium, total	ug/L	MW-4	09/24/2020		44.5000		
Barium, total	ug/L	MW-4	04/27/2021		41.1000		
Barium, total	ug/L	MW-4	09/28/2021		44.3000		
Barium, total	ug/L	MW-4	05/11/2022		41.8000		
Barium, total	ug/L	MW-4	09/14/2022		36.3000		
Barium, total	ug/L	MW-4	05/10/2023		38.9000		
Barium, total	ug/L	MW-4	09/13/2023		41.4000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Barium, total	ug/L	MW-4	05/15/2024		42.2000		
Barium, total	ug/L	MW-4	09/17/2024		38.4000		
Beryllium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Beryllium, total	ug/L	MW-3	11/14/2018	ND	1.0000		
Beryllium, total	ug/L	MW-3	01/10/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/17/2019	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/06/2020	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Beryllium, total	ug/L	MW-3	04/27/2021	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/28/2021	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/11/2022	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Beryllium, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Beryllium, total	ug/L	MW-3	09/17/2024	ND	1.0000		
Beryllium, total	ug/L	MW-4	08/23/2018	ND	1.0000		
Beryllium, total	ug/L	MW-4	11/30/2018	ND	1.0000		
Beryllium, total	ug/L	MW-4	01/10/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Beryllium, total	ug/L	MW-4	04/27/2021	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Beryllium, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Beryllium, total	ug/L	MW-4	09/17/2024	ND	1.0000		
Boron, total	ug/L	MW-3	08/23/2018	ND	20.0000		
Boron, total	ug/L	MW-3	11/14/2018	ND	20.0000		
Boron, total	ug/L	MW-3	01/10/2019		20.0000		
Boron, total	ug/L	MW-3	04/01/2019	ND	20.0000		
Boron, total	ug/L	MW-3	09/17/2019	ND	20.0000		
Boron, total	ug/L	MW-3	04/06/2020	ND	20.0000		
Boron, total	ug/L	MW-3	09/24/2020	ND	20.0000		
Boron, total	ug/L	MW-3	04/27/2021	ND	20.0000		
Boron, total	ug/L	MW-3	09/28/2021		21.3000		
Boron, total	ug/L	MW-3	05/11/2022	ND	20.0000		
Boron, total	ug/L	MW-3	09/14/2022	ND	20.0000		
Boron, total	ug/L	MW-3	05/10/2023	ND	20.0000		
Boron, total	ug/L	MW-3	09/13/2023	ND	20.0000		
Boron, total	ug/L	MW-3	05/15/2024	ND	20.0000		
Boron, total	ug/L	MW-3	09/17/2024	ND	20.0000		
Boron, total	ug/L	MW-4	08/28/2018		90.1000		*
Boron, total	ug/L	MW-4	11/30/2018		31.0000		
Boron, total	ug/L	MW-4	01/10/2019		21.0000		
Boron, total	ug/L	MW-4	04/01/2019	ND	20.0000		
Boron, total	ug/L	MW-4	09/17/2019	ND	20.0000		
Boron, total	ug/L	MW-4	04/06/2020	ND	20.0000		
Boron, total	ug/L	MW-4	09/24/2020	ND	20.0000		
Boron, total	ug/L	MW-4	04/27/2021	ND	20.0000		
Boron, total	ug/L	MW-4	09/28/2021	ND	20.0000		
Boron, total	ug/L	MW-4	05/11/2022	ND	20.0000		
Boron, total	ug/L	MW-4	09/14/2022	ND	20.0000		
Boron, total	ug/L	MW-4	05/10/2023	ND	20.0000		
Boron, total	ug/L	MW-4	09/13/2023	ND	20.0000		
Boron, total	ug/L	MW-4	05/15/2024	ND	20.0000		
Boron, total	ug/L	MW-4	09/17/2024	ND	20.0000		
Cadmium, total	ug/L	MW-3	08/23/2018	ND	0.4000		
Cadmium, total	ug/L	MW-3	11/14/2018	ND	0.4000		
Cadmium, total	ug/L	MW-3	01/10/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/01/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/17/2019	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/06/2020	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/24/2020	ND	0.4000		
Cadmium, total	ug/L	MW-3	04/27/2021	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/28/2021	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/11/2022	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/14/2022	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/10/2023	ND	0.4000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Cadmium, total	ug/L	MW-3	09/13/2023	ND	0.4000		
Cadmium, total	ug/L	MW-3	05/15/2024	ND	0.4000		
Cadmium, total	ug/L	MW-3	09/17/2024	ND	0.4000		
Cadmium, total	ug/L	MW-4	08/23/2018	ND	0.4000		
Cadmium, total	ug/L	MW-4	11/30/2018	ND	0.4000		
Cadmium, total	ug/L	MW-4	01/10/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/01/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/17/2019	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/06/2020	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/24/2020	ND	0.4000		
Cadmium, total	ug/L	MW-4	04/27/2021	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/28/2021	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/11/2022	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/14/2022	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/10/2023	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/13/2023	ND	0.4000		
Cadmium, total	ug/L	MW-4	05/15/2024	ND	0.4000		
Cadmium, total	ug/L	MW-4	09/17/2024	ND	0.4000		
Chemical oxygen demand	mg/L	MW-3	08/23/2018		7.0000		
Chemical oxygen demand	mg/L	MW-3	11/14/2018		14.0000		
Chemical oxygen demand	mg/L	MW-3	01/10/2019		11.0000		
Chemical oxygen demand	mg/L	MW-3	04/01/2019		13.0000		
Chemical oxygen demand	mg/L	MW-3	09/17/2019		7.0000		
Chemical oxygen demand	mg/L	MW-3	04/06/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/24/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	04/27/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/28/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	05/11/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	09/14/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-3	05/10/2023		20.0000		
Chemical oxygen demand	mg/L	MW-3	09/13/2023	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-3	05/15/2024	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-3	09/17/2024	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	08/28/2018		15.0000		
Chemical oxygen demand	mg/L	MW-4	11/30/2018		17.0000		
Chemical oxygen demand	mg/L	MW-4	01/10/2019		15.0000		
Chemical oxygen demand	mg/L	MW-4	04/01/2019		7.0000		
Chemical oxygen demand	mg/L	MW-4	09/17/2019	ND	6.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	04/06/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/24/2020		10.0000		
Chemical oxygen demand	mg/L	MW-4	04/27/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/28/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	05/11/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	09/14/2022	ND	7.0000		
Chemical oxygen demand	mg/L	MW-4	05/10/2023		14.0000		
Chemical oxygen demand	mg/L	MW-4	09/13/2023	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	05/15/2024	ND	10.0000	7.0000	**
Chemical oxygen demand	mg/L	MW-4	09/17/2024	ND	10.0000	7.0000	**
Chloride	mg/L	MW-3	08/23/2018		0.8340		
Chloride	mg/L	MW-3	11/14/2018		4.6100		*
Chloride	mg/L	MW-3	01/10/2019		1.4800		
Chloride	mg/L	MW-3	04/01/2019		1.0600		
Chloride	mg/L	MW-3	09/17/2019		0.7620		
Chloride	mg/L	MW-3	04/06/2020		0.7150		
Chloride	mg/L	MW-3	09/24/2020		0.7510		
Chloride	mg/L	MW-3	04/27/2021		0.7900		
Chloride	mg/L	MW-3	09/28/2021		0.6660		
Chloride	mg/L	MW-3	05/11/2022		0.8530		
Chloride	mg/L	MW-3	09/14/2022		0.7870		
Chloride	mg/L	MW-3	05/10/2023		0.6110		
Chloride	mg/L	MW-3	09/13/2023		0.6330		
Chloride	mg/L	MW-3	05/15/2024		0.6070		
Chloride	mg/L	MW-3	09/17/2024		0.6080		
Chloride	mg/L	MW-4	08/23/2018		34.1000		
Chloride	mg/L	MW-4	11/30/2018		20.9000		
Chloride	mg/L	MW-4	01/10/2019		12.8000		
Chloride	mg/L	MW-4	04/01/2019		6.6300		
Chloride	mg/L	MW-4	09/17/2019		3.4900		
Chloride	mg/L	MW-4	04/06/2020		2.9500		
Chloride	mg/L	MW-4	09/24/2020		2.6000		
Chloride	mg/L	MW-4	04/27/2021		2.6500		
Chloride	mg/L	MW-4	09/28/2021		2.6800		
Chloride	mg/L	MW-4	05/11/2022		3.3800		
Chloride	mg/L	MW-4	09/14/2022		3.0400		

*   - Outlier for that well and constituent.
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ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Chloride	mg/L	MW-4	05/10/2023		2.8800		
Chloride	mg/L	MW-4	09/13/2023		2.7400		
Chloride	mg/L	MW-4	05/15/2024		2.9100		
Chloride	mg/L	MW-4	09/17/2024		2.6000		
Chromium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Chromium, total	ug/L	MW-3	11/14/2018		1.6200		
Chromium, total	ug/L	MW-3	01/10/2019		4.0800		
Chromium, total	ug/L	MW-3	04/01/2019		4.0000		
Chromium, total	ug/L	MW-3	09/17/2019		16.4000		
Chromium, total	ug/L	MW-3	04/06/2020		11.2000		
Chromium, total	ug/L	MW-3	09/24/2020		4.2600		
Chromium, total	ug/L	MW-3	04/27/2021		16.3000		
Chromium, total	ug/L	MW-3	09/28/2021		13.5000		
Chromium, total	ug/L	MW-3	05/11/2022		8.1100		
Chromium, total	ug/L	MW-3	09/14/2022		6.8600		
Chromium, total	ug/L	MW-3	05/10/2023		4.8400		
Chromium, total	ug/L	MW-3	09/13/2023		4.6100		
Chromium, total	ug/L	MW-3	05/15/2024		7.7000		
Chromium, total	ug/L	MW-3	09/17/2024		5.9000		
Chromium, total	ug/L	MW-4	08/23/2018	ND	1.0000		
Chromium, total	ug/L	MW-4	11/30/2018		4.8200		
Chromium, total	ug/L	MW-4	01/10/2019		2.1200		
Chromium, total	ug/L	MW-4	04/01/2019		9.7500		
Chromium, total	ug/L	MW-4	09/17/2019		13.3000		
Chromium, total	ug/L	MW-4	04/06/2020		10.0000		
Chromium, total	ug/L	MW-4	09/24/2020		6.7300		
Chromium, total	ug/L	MW-4	04/27/2021		13.0000		
Chromium, total	ug/L	MW-4	09/28/2021		12.9000		
Chromium, total	ug/L	MW-4	05/11/2022		9.6600		
Chromium, total	ug/L	MW-4	09/14/2022		5.1800		
Chromium, total	ug/L	MW-4	05/10/2023		8.6000		
Chromium, total	ug/L	MW-4	09/13/2023		12.1000		
Chromium, total	ug/L	MW-4	05/15/2024		7.2000		
Chromium, total	ug/L	MW-4	09/17/2024		5.6000		
Cobalt, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Cobalt, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Cobalt, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/17/2019	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Cobalt, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/28/2021		3.3700		
Cobalt, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Cobalt, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Cobalt, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Cobalt, total	ug/L	MW-3	09/17/2024	ND	2.0000		
Cobalt, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Cobalt, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Cobalt, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/01/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Cobalt, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Cobalt, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Cobalt, total	ug/L	MW-4	09/17/2024	ND	2.0000		
Copper, total	ug/L	MW-3	08/23/2018		32.6000		*
Copper, total	ug/L	MW-3	11/14/2018		5.9100		
Copper, total	ug/L	MW-3	01/10/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-3	04/01/2019		3.0800		
Copper, total	ug/L	MW-3	09/17/2019		7.3300		
Copper, total	ug/L	MW-3	04/06/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-3	09/24/2020		2.3100		
Copper, total	ug/L	MW-3	04/27/2021		3.5000		
Copper, total	ug/L	MW-3	09/28/2021		5.1400		
Copper, total	ug/L	MW-3	05/11/2022	ND	3.0000		

*   - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Copper, total	ug/L	MW-3	09/14/2022	ND	3.0000		
Copper, total	ug/L	MW-3	05/10/2023	ND	3.0000		
Copper, total	ug/L	MW-3	09/13/2023	ND	3.0000		
Copper, total	ug/L	MW-3	05/15/2024	ND	3.0000		
Copper, total	ug/L	MW-3	09/17/2024	ND	3.0000		
Copper, total	ug/L	MW-4	08/28/2018	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	11/30/2018		6.2700		
Copper, total	ug/L	MW-4	01/10/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/01/2019		6.4000		
Copper, total	ug/L	MW-4	09/17/2019	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/06/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	09/24/2020	ND	2.0000	3.0000	**
Copper, total	ug/L	MW-4	04/27/2021	ND	3.0000		
Copper, total	ug/L	MW-4	09/28/2021		3.4400		
Copper, total	ug/L	MW-4	05/11/2022	ND	3.0000		
Copper, total	ug/L	MW-4	09/14/2022	ND	3.0000		
Copper, total	ug/L	MW-4	05/10/2023	ND	3.0000		
Copper, total	ug/L	MW-4	09/13/2023	ND	3.0000		
Copper, total	ug/L	MW-4	05/15/2024	ND	3.0000		
Copper, total	ug/L	MW-4	09/17/2024		7.6800		
Fluoride	mg/L	MW-3	08/23/2018	ND	0.1000		
Fluoride	mg/L	MW-3	11/14/2018	ND	0.1000		
Fluoride	mg/L	MW-3	01/10/2019	ND	0.1000		
Fluoride	mg/L	MW-3	04/01/2019	ND	0.1000		
Fluoride	mg/L	MW-3	09/17/2019		0.2200		
Fluoride	mg/L	MW-3	04/06/2020		0.1000		
Fluoride	mg/L	MW-3	09/24/2020		0.1440		
Fluoride	mg/L	MW-3	04/27/2021	ND	0.1000		
Fluoride	mg/L	MW-3	09/28/2021	ND	0.1000		
Fluoride	mg/L	MW-3	05/11/2022	ND	0.1000		
Fluoride	mg/L	MW-3	09/14/2022	ND	0.1000		
Fluoride	mg/L	MW-3	05/10/2023		0.1040		
Fluoride	mg/L	MW-3	09/13/2023	ND	0.1000		
Fluoride	mg/L	MW-3	05/15/2024	ND	0.1000		
Fluoride	mg/L	MW-3	09/17/2024	ND	0.1000		
Fluoride	mg/L	MW-4	08/28/2018	ND	0.1000		
Fluoride	mg/L	MW-4	11/30/2018	ND	0.1000		
Fluoride	mg/L	MW-4	01/10/2019	ND	0.1000		
Fluoride	mg/L	MW-4	04/01/2019		0.1450		
Fluoride	mg/L	MW-4	09/17/2019		0.3000		
Fluoride	mg/L	MW-4	04/06/2020		0.2000		
Fluoride	mg/L	MW-4	09/24/2020		0.1520		
Fluoride	mg/L	MW-4	04/27/2021		0.1410		
Fluoride	mg/L	MW-4	09/28/2021		0.1600		
Fluoride	mg/L	MW-4	05/11/2022		0.1230		
Fluoride	mg/L	MW-4	09/14/2022		0.1440		
Fluoride	mg/L	MW-4	05/10/2023		0.1500		
Fluoride	mg/L	MW-4	09/13/2023		0.1240		
Fluoride	mg/L	MW-4	05/15/2024		0.1050		
Fluoride	mg/L	MW-4	09/17/2024		0.1490		
Formaldehyde	ug/L	MW-3	08/23/2018	ND	100.0000		
Formaldehyde	ug/L	MW-3	11/14/2018	ND	100.0000		
Formaldehyde	ug/L	MW-3	01/10/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	04/01/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/17/2019	ND	100.0000		
Formaldehyde	ug/L	MW-3	04/06/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-3	09/24/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-3	04/27/2021	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/28/2021	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/11/2022	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/14/2022	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/10/2023	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/13/2023	ND	100.0000		
Formaldehyde	ug/L	MW-3	05/15/2024	ND	100.0000		
Formaldehyde	ug/L	MW-3	09/17/2024	ND	100.0000		
Formaldehyde	ug/L	MW-4	08/28/2018	ND	100.0000		
Formaldehyde	ug/L	MW-4	11/30/2018	ND	100.0000		
Formaldehyde	ug/L	MW-4	01/10/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	04/01/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/17/2019	ND	100.0000		
Formaldehyde	ug/L	MW-4	04/06/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-4	09/24/2020	ND	50.0000	100.0000	**
Formaldehyde	ug/L	MW-4	04/27/2021	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/28/2021	ND	100.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Formaldehyde	ug/L	MW-4	05/11/2022	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/14/2022	ND	100.0000		
Formaldehyde	ug/L	MW-4	05/10/2023	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/13/2023	ND	100.0000		
Formaldehyde	ug/L	MW-4	05/15/2024	ND	100.0000		
Formaldehyde	ug/L	MW-4	09/17/2024	ND	100.0000		
Iron, total	ug/L	MW-3	08/23/2018		27.8000		
Iron, total	ug/L	MW-3	11/14/2018		177.0000		
Iron, total	ug/L	MW-3	01/10/2019		130.0000		
Iron, total	ug/L	MW-3	04/01/2019		116.0000		
Iron, total	ug/L	MW-3	09/17/2019		1740.0000		
Iron, total	ug/L	MW-3	04/06/2020		541.0000		
Iron, total	ug/L	MW-3	09/24/2020		663.0000		
Iron, total	ug/L	MW-3	04/27/2021		492.0000		
Iron, total	ug/L	MW-3	09/28/2021		4830.0000		*
Iron, total	ug/L	MW-3	05/11/2022		1900.0000		
Iron, total	ug/L	MW-3	09/14/2022		135.0000		
Iron, total	ug/L	MW-3	05/10/2023		22.9000		
Iron, total	ug/L	MW-3	09/13/2023		35.1000		
Iron, total	ug/L	MW-3	05/15/2024		41.7000		
Iron, total	ug/L	MW-3	09/17/2024		43.0000		
Iron, total	ug/L	MW-4	08/28/2018		193.0000		
Iron, total	ug/L	MW-4	11/30/2018		1130.0000		
Iron, total	ug/L	MW-4	01/10/2019		69.2000		
Iron, total	ug/L	MW-4	04/01/2019		211.0000		
Iron, total	ug/L	MW-4	09/17/2019		198.0000		
Iron, total	ug/L	MW-4	04/06/2020		107.0000		
Iron, total	ug/L	MW-4	09/24/2020		204.0000		
Iron, total	ug/L	MW-4	04/27/2021		75.0000		
Iron, total	ug/L	MW-4	09/28/2021		101.0000		
Iron, total	ug/L	MW-4	05/11/2022		97.4000		
Iron, total	ug/L	MW-4	09/14/2022		44.3000		
Iron, total	ug/L	MW-4	05/10/2023		35.4000		
Iron, total	ug/L	MW-4	09/13/2023		55.4000		
Iron, total	ug/L	MW-4	05/15/2024		38.1000		
Iron, total	ug/L	MW-4	09/17/2024		23.8000		
Lead, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Lead, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Lead, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Lead, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Lead, total	ug/L	MW-3	09/17/2019		2.4100		
Lead, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Lead, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Lead, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Lead, total	ug/L	MW-3	09/28/2021		2.3200		
Lead, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Lead, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Lead, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Lead, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Lead, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Lead, total	ug/L	MW-3	09/17/2024	ND	2.0000		
Lead, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Lead, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Lead, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Lead, total	ug/L	MW-4	04/01/2019		3.0100		
Lead, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Lead, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Lead, total	ug/L	MW-4	09/24/2020	ND	2.0000		
Lead, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Lead, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Lead, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Lead, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Lead, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Lead, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Lead, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Lead, total	ug/L	MW-4	09/17/2024	ND	2.0000		
Magnesium, total	mg/L	MW-3	08/23/2018		22.0000		
Magnesium, total	mg/L	MW-3	11/14/2018		22.2000		
Magnesium, total	mg/L	MW-3	01/10/2019		24.2000		
Magnesium, total	mg/L	MW-3	04/01/2019		25.5000		
Magnesium, total	mg/L	MW-3	09/17/2019		36.6000		
Magnesium, total	mg/L	MW-3	04/06/2020		27.1000		
Magnesium, total	mg/L	MW-3	09/24/2020		24.7000		
Magnesium, total	mg/L	MW-3	04/27/2021		30.2000		

* - Outlier for that well and constituent.
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*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Magnesium, total	mg/L	MW-3	09/28/2021		62.8000		
Magnesium, total	mg/L	MW-3	05/11/2022		42.6000		
Magnesium, total	mg/L	MW-3	09/14/2022		21.6000		
Magnesium, total	mg/L	MW-3	05/10/2023		23.0000		
Magnesium, total	mg/L	MW-3	09/13/2023		24.0000		
Magnesium, total	mg/L	MW-3	05/15/2024		25.8000		
Magnesium, total	mg/L	MW-3	09/17/2024		21.3000		
Magnesium, total	mg/L	MW-4	08/28/2018		55.3000		
Magnesium, total	mg/L	MW-4	11/30/2018		72.0000		
Magnesium, total	mg/L	MW-4	01/10/2019		48.9000		
Magnesium, total	mg/L	MW-4	04/01/2019		52.9000		
Magnesium, total	mg/L	MW-4	09/17/2019		49.3000		
Magnesium, total	mg/L	MW-4	04/06/2020		43.2000		
Magnesium, total	mg/L	MW-4	09/24/2020		45.4000		
Magnesium, total	mg/L	MW-4	04/27/2021		46.8000		
Magnesium, total	mg/L	MW-4	09/28/2021		44.7000		
Magnesium, total	mg/L	MW-4	05/11/2022		47.4000		
Magnesium, total	mg/L	MW-4	09/14/2022		40.6000		
Magnesium, total	mg/L	MW-4	05/10/2023		45.1000		
Magnesium, total	mg/L	MW-4	09/13/2023		46.7000		
Magnesium, total	mg/L	MW-4	05/15/2024		49.1000		
Magnesium, total	mg/L	MW-4	09/17/2024		40.6000		
Manganese, total	ug/L	MW-3	08/23/2018	ND	20.0000		
Manganese, total	ug/L	MW-3	11/14/2018	ND	20.0000		
Manganese, total	ug/L	MW-3	01/10/2019	ND	20.0000		
Manganese, total	ug/L	MW-3	04/01/2019	ND	20.0000		
Manganese, total	ug/L	MW-3	09/17/2019		102.0000		
Manganese, total	ug/L	MW-3	04/06/2020		45.2000		
Manganese, total	ug/L	MW-3	09/24/2020		38.4000		
Manganese, total	ug/L	MW-3	04/27/2021		39.4000		
Manganese, total	ug/L	MW-3	09/28/2021		451.0000		*
Manganese, total	ug/L	MW-3	05/11/2022		145.0000		
Manganese, total	ug/L	MW-3	09/14/2022	ND	20.0000		
Manganese, total	ug/L	MW-3	05/10/2023	ND	20.0000		
Manganese, total	ug/L	MW-3	09/13/2023	ND	20.0000		
Manganese, total	ug/L	MW-3	05/15/2024	ND	20.0000		
Manganese, total	ug/L	MW-3	09/17/2024	ND	20.0000		
Manganese, total	ug/L	MW-4	08/28/2018		25.7000		
Manganese, total	ug/L	MW-4	11/30/2018		100.0000		*
Manganese, total	ug/L	MW-4	01/10/2019	ND	20.0000		
Manganese, total	ug/L	MW-4	04/01/2019		20.9000		
Manganese, total	ug/L	MW-4	09/17/2019	ND	20.0000		
Manganese, total	ug/L	MW-4	04/06/2020		22.8000		
Manganese, total	ug/L	MW-4	09/24/2020	ND	20.0000		
Manganese, total	ug/L	MW-4	04/27/2021	ND	20.0000		
Manganese, total	ug/L	MW-4	09/28/2021	ND	20.0000		
Manganese, total	ug/L	MW-4	05/11/2022	ND	20.0000		
Manganese, total	ug/L	MW-4	09/14/2022	ND	20.0000		
Manganese, total	ug/L	MW-4	05/10/2023	ND	20.0000		
Manganese, total	ug/L	MW-4	09/13/2023	ND	20.0000		
Manganese, total	ug/L	MW-4	05/15/2024	ND	20.0000		
Manganese, total	ug/L	MW-4	09/17/2024	ND	20.0000		
Mercury, total	ug/L	MW-3	08/23/2018	ND	2.0000		
Mercury, total	ug/L	MW-3	11/14/2018	ND	2.0000		
Mercury, total	ug/L	MW-3	01/10/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	04/01/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	09/17/2019	ND	2.0000		
Mercury, total	ug/L	MW-3	04/06/2020	ND	2.0000		
Mercury, total	ug/L	MW-3	09/24/2020	ND	2.0000		
Mercury, total	ug/L	MW-3	04/27/2021	ND	2.0000		
Mercury, total	ug/L	MW-3	09/28/2021	ND	2.0000		
Mercury, total	ug/L	MW-3	05/11/2022	ND	2.0000		
Mercury, total	ug/L	MW-3	09/14/2022	ND	2.0000		
Mercury, total	ug/L	MW-3	05/10/2023	ND	2.0000		
Mercury, total	ug/L	MW-3	09/13/2023	ND	2.0000		
Mercury, total	ug/L	MW-3	05/15/2024	ND	2.0000		
Mercury, total	ug/L	MW-3	09/17/2024	ND	2.0000		
Mercury, total	ug/L	MW-4	08/28/2018	ND	2.0000		
Mercury, total	ug/L	MW-4	11/30/2018	ND	2.0000		
Mercury, total	ug/L	MW-4	01/10/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	04/01/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	09/17/2019	ND	2.0000		
Mercury, total	ug/L	MW-4	04/06/2020	ND	2.0000		
Mercury, total	ug/L	MW-4	09/24/2020	ND	2.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Mercury, total	ug/L	MW-4	04/27/2021	ND	2.0000		
Mercury, total	ug/L	MW-4	09/28/2021	ND	2.0000		
Mercury, total	ug/L	MW-4	05/11/2022	ND	2.0000		
Mercury, total	ug/L	MW-4	09/14/2022	ND	2.0000		
Mercury, total	ug/L	MW-4	05/10/2023	ND	2.0000		
Mercury, total	ug/L	MW-4	09/13/2023	ND	2.0000		
Mercury, total	ug/L	MW-4	05/15/2024	ND	2.0000		
Mercury, total	ug/L	MW-4	09/17/2024	ND	2.0000		
Methyl ethyl ketone	ug/L	MW-3	08/23/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	11/14/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	01/10/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	04/01/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/17/2019	ND	100.0000		*
Methyl ethyl ketone	ug/L	MW-3	04/06/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	09/24/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	04/27/2021	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/28/2021	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-3	05/11/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/14/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	05/10/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/13/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	05/15/2024	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-3	09/17/2024	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	08/28/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	11/30/2018	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	01/10/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	04/01/2019	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/17/2019	ND	100.0000		*
Methyl ethyl ketone	ug/L	MW-4	04/06/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	09/24/2020	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	04/27/2021	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/28/2021	ND	5.0000	10.0000	**
Methyl ethyl ketone	ug/L	MW-4	05/11/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/14/2022	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	05/10/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/13/2023	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	05/15/2024	ND	10.0000		
Methyl ethyl ketone	ug/L	MW-4	09/17/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-3	08/23/2018	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	11/14/2018		4.0300		
Molybdenum, total	ug/L	MW-3	01/10/2019		3.0600		
Molybdenum, total	ug/L	MW-3	04/01/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	09/17/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	04/06/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	09/24/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-3	04/27/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/28/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/11/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/14/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/10/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/13/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-3	05/15/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-3	09/17/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-4	08/28/2018		3.8100		
Molybdenum, total	ug/L	MW-4	11/30/2018	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	01/10/2019		3.2300		
Molybdenum, total	ug/L	MW-4	04/01/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	09/17/2019	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	04/06/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	09/24/2020	ND	2.0000	10.0000	**
Molybdenum, total	ug/L	MW-4	04/27/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/28/2021	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/11/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/14/2022	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/10/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/13/2023	ND	10.0000		
Molybdenum, total	ug/L	MW-4	05/15/2024	ND	10.0000		
Molybdenum, total	ug/L	MW-4	09/17/2024	ND	10.0000		
Nickel, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Nickel, total	ug/L	MW-3	11/14/2018		1.1700		
Nickel, total	ug/L	MW-3	01/10/2019		1.6000		
Nickel, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Nickel, total	ug/L	MW-3	09/17/2019		2.5100		
Nickel, total	ug/L	MW-3	04/06/2020	ND	1.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Nickel, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Nickel, total	ug/L	MW-3	04/27/2021		3.5200		
Nickel, total	ug/L	MW-3	09/28/2021		5.0500		
Nickel, total	ug/L	MW-3	05/11/2022	ND	1.0000		
Nickel, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Nickel, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Nickel, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Nickel, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Nickel, total	ug/L	MW-3	09/17/2024	ND	1.0000		
Nickel, total	ug/L	MW-4	08/28/2018	ND	1.0000		
Nickel, total	ug/L	MW-4	11/30/2018	ND	1.0000		
Nickel, total	ug/L	MW-4	01/10/2019		1.5100		
Nickel, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Nickel, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Nickel, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Nickel, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Nickel, total	ug/L	MW-4	04/27/2021		2.4800		
Nickel, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Nickel, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Nickel, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Nickel, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Nickel, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Nickel, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Nickel, total	ug/L	MW-4	09/17/2024	ND	1.0000		
Phenols	ug/L	MW-3	08/23/2018	ND	5.0000		
Phenols	ug/L	MW-3	11/14/2018	ND	5.0000		
Phenols	ug/L	MW-3	01/10/2019		22.0000		
Phenols	ug/L	MW-3	04/01/2019	ND	5.0000		
Phenols	ug/L	MW-3	09/17/2019	ND	5.0000		
Phenols	ug/L	MW-3	04/06/2020	ND	5.0000		
Phenols	ug/L	MW-3	09/24/2020		12.0000		
Phenols	ug/L	MW-3	04/27/2021	ND	5.0000		
Phenols	ug/L	MW-3	09/28/2021	ND	5.0000		
Phenols	ug/L	MW-3	05/11/2022	ND	5.0000		
Phenols	ug/L	MW-3	09/14/2022	ND	5.0000		
Phenols	ug/L	MW-3	05/10/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-3	09/13/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-3	05/15/2024	ND	10.0000	5.0000	**
Phenols	ug/L	MW-3	09/17/2024	ND	10.0000	5.0000	**
Phenols	ug/L	MW-4	08/28/2018		16.0000		
Phenols	ug/L	MW-4	11/30/2018	ND	5.0000		
Phenols	ug/L	MW-4	01/10/2019		25.0000		
Phenols	ug/L	MW-4	04/01/2019		0.5000		*
Phenols	ug/L	MW-4	09/17/2019	ND	5.0000		
Phenols	ug/L	MW-4	04/06/2020	ND	5.0000		
Phenols	ug/L	MW-4	09/24/2020		5.0000		
Phenols	ug/L	MW-4	04/27/2021	ND	5.0000		
Phenols	ug/L	MW-4	09/28/2021	ND	5.0000		
Phenols	ug/L	MW-4	05/11/2022	ND	5.0000		
Phenols	ug/L	MW-4	09/14/2022	ND	5.0000		
Phenols	ug/L	MW-4	05/10/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-4	09/13/2023	ND	8.0000	5.0000	**
Phenols	ug/L	MW-4	05/15/2024	ND	10.0000	5.0000	**
Phenols	ug/L	MW-4	09/17/2024		17.0000		
Selenium, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Selenium, total	ug/L	MW-3	11/14/2018	ND	5.0000		
Selenium, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	04/01/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	09/17/2019	ND	5.0000		
Selenium, total	ug/L	MW-3	04/06/2020	ND	5.0000		
Selenium, total	ug/L	MW-3	09/24/2020	ND	5.0000		
Selenium, total	ug/L	MW-3	04/27/2021	ND	5.0000		
Selenium, total	ug/L	MW-3	09/28/2021	ND	5.0000		
Selenium, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Selenium, total	ug/L	MW-3	09/14/2022	ND	5.0000		
Selenium, total	ug/L	MW-3	05/10/2023	ND	5.0000		
Selenium, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Selenium, total	ug/L	MW-3	05/15/2024	ND	5.0000		
Selenium, total	ug/L	MW-3	09/17/2024	ND	5.0000		
Selenium, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Selenium, total	ug/L	MW-4	11/30/2018	ND	5.0000		
Selenium, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Selenium, total	ug/L	MW-4	04/01/2019	ND	5.0000		
Selenium, total	ug/L	MW-4	09/17/2019	ND	5.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Selenium, total	ug/L	MW-4	04/06/2020	ND	5.0000		
Selenium, total	ug/L	MW-4	09/24/2020	ND	5.0000		
Selenium, total	ug/L	MW-4	04/27/2021	ND	5.0000		
Selenium, total	ug/L	MW-4	09/28/2021	ND	5.0000		
Selenium, total	ug/L	MW-4	05/11/2022	ND	5.0000		
Selenium, total	ug/L	MW-4	09/14/2022	ND	5.0000		
Selenium, total	ug/L	MW-4	05/10/2023	ND	5.0000		
Selenium, total	ug/L	MW-4	09/13/2023	ND	5.0000		
Selenium, total	ug/L	MW-4	05/15/2024	ND	5.0000		
Selenium, total	ug/L	MW-4	09/17/2024	ND	5.0000		
Silver, total	ug/L	MW-3	08/23/2018	ND	0.5000		
Silver, total	ug/L	MW-3	11/14/2018	ND	0.5000		
Silver, total	ug/L	MW-3	01/10/2019	ND	0.5000		
Silver, total	ug/L	MW-3	04/01/2019	ND	0.5000		
Silver, total	ug/L	MW-3	09/17/2019	ND	0.5000		
Silver, total	ug/L	MW-3	04/06/2020	ND	0.5000		
Silver, total	ug/L	MW-3	09/24/2020	ND	0.5000		
Silver, total	ug/L	MW-3	04/27/2021	ND	0.5000		
Silver, total	ug/L	MW-3	09/28/2021	ND	0.5000		
Silver, total	ug/L	MW-3	05/11/2022	ND	0.5000		
Silver, total	ug/L	MW-3	09/14/2022	ND	0.5000		
Silver, total	ug/L	MW-3	05/10/2023	ND	0.5000		
Silver, total	ug/L	MW-3	09/13/2023	ND	0.5000		
Silver, total	ug/L	MW-3	05/15/2024	ND	0.5000		
Silver, total	ug/L	MW-3	09/17/2024	ND	0.5000		
Silver, total	ug/L	MW-4	08/28/2018	ND	0.5000		
Silver, total	ug/L	MW-4	11/30/2018	ND	0.5000		
Silver, total	ug/L	MW-4	01/10/2019	ND	0.5000		
Silver, total	ug/L	MW-4	04/01/2019	ND	0.5000		
Silver, total	ug/L	MW-4	09/17/2019	ND	0.5000		
Silver, total	ug/L	MW-4	04/06/2020	ND	0.5000		
Silver, total	ug/L	MW-4	09/24/2020	ND	0.5000		
Silver, total	ug/L	MW-4	04/27/2021	ND	0.5000		
Silver, total	ug/L	MW-4	09/28/2021	ND	0.5000		
Silver, total	ug/L	MW-4	05/11/2022	ND	0.5000		
Silver, total	ug/L	MW-4	09/14/2022	ND	0.5000		
Silver, total	ug/L	MW-4	05/10/2023	ND	0.5000		
Silver, total	ug/L	MW-4	09/13/2023	ND	0.5000		
Silver, total	ug/L	MW-4	05/15/2024	ND	0.5000		
Silver, total	ug/L	MW-4	09/17/2024	ND	0.5000		
Sulfate	mg/L	MW-3	08/23/2018		4.6900		
Sulfate	mg/L	MW-3	11/14/2018		5.1800		
Sulfate	mg/L	MW-3	01/10/2019		4.7600		
Sulfate	mg/L	MW-3	04/01/2019		4.4200		
Sulfate	mg/L	MW-3	09/17/2019		3.6300		
Sulfate	mg/L	MW-3	04/06/2020		4.8900		
Sulfate	mg/L	MW-3	09/24/2020		4.1100		
Sulfate	mg/L	MW-3	04/27/2021		4.8200		
Sulfate	mg/L	MW-3	09/28/2021		4.9700		
Sulfate	mg/L	MW-3	05/11/2022		5.3100		
Sulfate	mg/L	MW-3	09/14/2022		4.9200		
Sulfate	mg/L	MW-3	05/10/2023		5.1200		
Sulfate	mg/L	MW-3	09/13/2023		5.5700		
Sulfate	mg/L	MW-3	05/15/2024		5.1600		
Sulfate	mg/L	MW-3	09/17/2024		5.5200		
Sulfate	mg/L	MW-4	08/28/2018		25.1000		
Sulfate	mg/L	MW-4	11/30/2018		13.8000		
Sulfate	mg/L	MW-4	01/10/2019		6.9700		
Sulfate	mg/L	MW-4	04/01/2019		5.5300		
Sulfate	mg/L	MW-4	09/17/2019		5.2600		
Sulfate	mg/L	MW-4	04/06/2020		7.2000		
Sulfate	mg/L	MW-4	09/24/2020		7.5600		
Sulfate	mg/L	MW-4	04/27/2021		8.0700		
Sulfate	mg/L	MW-4	09/28/2021		8.7000		
Sulfate	mg/L	MW-4	05/11/2022		11.7000		
Sulfate	mg/L	MW-4	09/14/2022		10.0000		
Sulfate	mg/L	MW-4	05/10/2023	ND	0.1000		*
Sulfate	mg/L	MW-4	09/13/2023		8.9300		
Sulfate	mg/L	MW-4	05/15/2024		8.8200		
Sulfate	mg/L	MW-4	09/17/2024		7.9300		
Thallium, total	ug/L	MW-3	08/23/2018	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	11/14/2018	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	01/10/2019	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	04/01/2019	ND	2.0000	3.0000	**

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Thallium, total	ug/L	MW-3	09/17/2019	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	04/06/2020	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	09/24/2020	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-3	04/27/2021	ND	3.0000		
Thallium, total	ug/L	MW-3	09/28/2021	ND	3.0000		
Thallium, total	ug/L	MW-3	05/11/2022	ND	3.0000		
Thallium, total	ug/L	MW-3	09/14/2022	ND	3.0000		
Thallium, total	ug/L	MW-3	05/10/2023	ND	3.0000		
Thallium, total	ug/L	MW-3	09/13/2023	ND	3.0000		
Thallium, total	ug/L	MW-3	05/15/2024	ND	3.0000		
Thallium, total	ug/L	MW-3	09/17/2024	ND	3.0000		
Thallium, total	ug/L	MW-4	08/28/2018	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	11/30/2018	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	01/10/2019	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	04/01/2019	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	09/17/2019	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	04/06/2020	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	09/24/2020	ND	2.0000	3.0000	**
Thallium, total	ug/L	MW-4	04/27/2021	ND	3.0000		
Thallium, total	ug/L	MW-4	09/28/2021	ND	3.0000		
Thallium, total	ug/L	MW-4	05/11/2022	ND	3.0000		
Thallium, total	ug/L	MW-4	09/14/2022	ND	3.0000		
Thallium, total	ug/L	MW-4	05/10/2023	ND	3.0000		
Thallium, total	ug/L	MW-4	09/13/2023	ND	3.0000		
Thallium, total	ug/L	MW-4	05/15/2024	ND	3.0000		
Thallium, total	ug/L	MW-4	09/17/2024	ND	3.0000		
Total organic halogen	mg/L	MW-3	08/23/2018	ND	0.0050	0.0100	**
Total organic halogen	mg/L	MW-3	11/14/2018		0.0090		
Total organic halogen	mg/L	MW-3	01/10/2019		0.0130		
Total organic halogen	mg/L	MW-3	04/01/2019		0.0170		
Total organic halogen	mg/L	MW-3	09/17/2019		0.0500		
Total organic halogen	mg/L	MW-3	04/06/2020	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/24/2020	ND	0.0100		
Total organic halogen	mg/L	MW-3	04/27/2021	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/28/2021	ND	0.0200	0.0100	**
Total organic halogen	mg/L	MW-3	05/11/2022	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/14/2022	ND	0.0100		
Total organic halogen	mg/L	MW-3	05/10/2023	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/13/2023	ND	0.0100		
Total organic halogen	mg/L	MW-3	05/15/2024	ND	0.0100		
Total organic halogen	mg/L	MW-3	09/17/2024		0.0190		
Total organic halogen	mg/L	MW-4	08/28/2018		0.0609		*
Total organic halogen	mg/L	MW-4	11/30/2018		0.0230		
Total organic halogen	mg/L	MW-4	01/10/2019		0.0150		
Total organic halogen	mg/L	MW-4	04/01/2019		0.0130		
Total organic halogen	mg/L	MW-4	09/17/2019		0.1100		*
Total organic halogen	mg/L	MW-4	04/06/2020	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/24/2020	ND	0.0100		
Total organic halogen	mg/L	MW-4	04/27/2021		0.0140		
Total organic halogen	mg/L	MW-4	09/28/2021	ND	0.0200	0.0100	**
Total organic halogen	mg/L	MW-4	05/11/2022	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/14/2022		0.0270		
Total organic halogen	mg/L	MW-4	05/10/2023	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/13/2023		0.0100		
Total organic halogen	mg/L	MW-4	05/15/2024	ND	0.0100		
Total organic halogen	mg/L	MW-4	09/17/2024		0.0140		
Total suspended solids	mg/L	MW-3	08/23/2018		75.0000		
Total suspended solids	mg/L	MW-3	11/14/2018		41.0000		
Total suspended solids	mg/L	MW-3	01/10/2019		29.0000		
Total suspended solids	mg/L	MW-3	04/01/2019		97.0000		
Total suspended solids	mg/L	MW-3	09/17/2019		138.0000		
Total suspended solids	mg/L	MW-3	04/06/2020		144.0000		
Total suspended solids	mg/L	MW-3	09/24/2020		48.0000		
Total suspended solids	mg/L	MW-3	04/27/2021		93.0000		
Total suspended solids	mg/L	MW-3	09/28/2021		126.0000		
Total suspended solids	mg/L	MW-3	05/11/2022		632.0000		
Total suspended solids	mg/L	MW-3	09/14/2022		315.0000		
Total suspended solids	mg/L	MW-3	05/10/2023		15.0000		
Total suspended solids	mg/L	MW-3	09/13/2023		29.0000		
Total suspended solids	mg/L	MW-3	05/15/2024		7.0000		
Total suspended solids	mg/L	MW-3	09/17/2024		2.0000		
Total suspended solids	mg/L	MW-4	08/28/2018		500.0000		
Total suspended solids	mg/L	MW-4	11/30/2018		237.0000		
Total suspended solids	mg/L	MW-4	01/10/2019		38.0000		

* - Outlier for that well and constituent.
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*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Total suspended solids	mg/L	MW-4	04/01/2019		20.0000		
Total suspended solids	mg/L	MW-4	09/17/2019		44.0000		
Total suspended solids	mg/L	MW-4	04/06/2020		18.0000		
Total suspended solids	mg/L	MW-4	09/24/2020		19.0000		
Total suspended solids	mg/L	MW-4	04/27/2021		21.0000		
Total suspended solids	mg/L	MW-4	09/28/2021		26.0000		
Total suspended solids	mg/L	MW-4	05/11/2022		18.0000		
Total suspended solids	mg/L	MW-4	09/14/2022		19.0000		
Total suspended solids	mg/L	MW-4	05/10/2023		11.0000		
Total suspended solids	mg/L	MW-4	09/13/2023		8.0000		
Total suspended solids	mg/L	MW-4	05/15/2024		3.0000		
Total suspended solids	mg/L	MW-4	09/17/2024	ND	1.0000		
Vanadium, total	ug/L	MW-3	08/23/2018	ND	1.0000		
Vanadium, total	ug/L	MW-3	11/14/2018	ND	1.0000		
Vanadium, total	ug/L	MW-3	01/10/2019	ND	1.0000		
Vanadium, total	ug/L	MW-3	04/01/2019	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/17/2019		1.4100		
Vanadium, total	ug/L	MW-3	04/06/2020	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/24/2020	ND	1.0000		
Vanadium, total	ug/L	MW-3	04/27/2021	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/28/2021		5.7600		*
Vanadium, total	ug/L	MW-3	05/11/2022		1.9200		
Vanadium, total	ug/L	MW-3	09/14/2022	ND	1.0000		
Vanadium, total	ug/L	MW-3	05/10/2023	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/13/2023	ND	1.0000		
Vanadium, total	ug/L	MW-3	05/15/2024	ND	1.0000		
Vanadium, total	ug/L	MW-3	09/17/2024	ND	1.0000		
Vanadium, total	ug/L	MW-4	08/28/2018	ND	1.0000		
Vanadium, total	ug/L	MW-4	11/30/2018		1.2600		
Vanadium, total	ug/L	MW-4	01/10/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/01/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/17/2019	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/06/2020	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/24/2020	ND	1.0000		
Vanadium, total	ug/L	MW-4	04/27/2021	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/28/2021	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/11/2022	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/14/2022	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/10/2023	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/13/2023	ND	1.0000		
Vanadium, total	ug/L	MW-4	05/15/2024	ND	1.0000		
Vanadium, total	ug/L	MW-4	09/17/2024	ND	1.0000		
Zinc, total	ug/L	MW-3	08/23/2018	ND	5.0000		
Zinc, total	ug/L	MW-3	11/14/2018		20.1000		
Zinc, total	ug/L	MW-3	01/10/2019	ND	5.0000		
Zinc, total	ug/L	MW-3	04/01/2019		12.1000		
Zinc, total	ug/L	MW-3	09/17/2019		22.8000		
Zinc, total	ug/L	MW-3	04/06/2020		10.8000		
Zinc, total	ug/L	MW-3	09/24/2020		6.6700		
Zinc, total	ug/L	MW-3	04/27/2021		7.1600		
Zinc, total	ug/L	MW-3	09/28/2021		8.4500		
Zinc, total	ug/L	MW-3	05/11/2022	ND	5.0000		
Zinc, total	ug/L	MW-3	09/14/2022		8.3200		
Zinc, total	ug/L	MW-3	05/10/2023		8.3600		
Zinc, total	ug/L	MW-3	09/13/2023	ND	5.0000		
Zinc, total	ug/L	MW-3	05/15/2024		9.1500		
Zinc, total	ug/L	MW-3	09/17/2024		6.9900		
Zinc, total	ug/L	MW-4	08/28/2018	ND	5.0000		
Zinc, total	ug/L	MW-4	11/30/2018		18.8000		
Zinc, total	ug/L	MW-4	01/10/2019	ND	5.0000		
Zinc, total	ug/L	MW-4	04/01/2019		31.4000		
Zinc, total	ug/L	MW-4	09/17/2019		17.9000		
Zinc, total	ug/L	MW-4	04/06/2020		10.5000		
Zinc, total	ug/L	MW-4	09/24/2020		16.6000		
Zinc, total	ug/L	MW-4	04/27/2021		10.1000		
Zinc, total	ug/L	MW-4	09/28/2021		9.3300		
Zinc, total	ug/L	MW-4	05/11/2022		7.5900		
Zinc, total	ug/L	MW-4	09/14/2022		7.5800		
Zinc, total	ug/L	MW-4	05/10/2023		8.8500		
Zinc, total	ug/L	MW-4	09/13/2023		7.8100		
Zinc, total	ug/L	MW-4	05/15/2024		9.8600		
Zinc, total	ug/L	MW-4	09/17/2024		9.8200		

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*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Aluminum, total	ug/L	MW-1	09/17/2024	ND	100.0000		870.0000
Aluminum, total	ug/L	MW-2	09/17/2024	ND	100.0000		870.0000
Aluminum, total	ug/L	Sump Grab	09/17/2024	ND	100.0000		870.0000
Ammonia nitrogen	mg/L	MW-1	09/17/2024	ND	0.1000		0.2600
Ammonia nitrogen	mg/L	MW-2	09/17/2024	ND	0.1000		0.2600
Ammonia nitrogen	mg/L	Sump Grab	09/17/2024	ND	0.1000		0.2600
Antimony, total	ug/L	MW-1	09/17/2024	ND	5.0000		5.0000
Antimony, total	ug/L	MW-2	09/17/2024	ND	5.0000		5.0000
Antimony, total	ug/L	Sump Grab	09/17/2024	ND	5.0000		5.0000
Arsenic, total	ug/L	MW-1	09/17/2024	ND	10.0000		10.0000
Arsenic, total	ug/L	MW-2	09/17/2024	ND	10.0000		10.0000
Arsenic, total	ug/L	Sump Grab	09/17/2024	ND	10.0000		10.0000
Barium, total	ug/L	MW-1	09/17/2024		36.1000		65.0791
Barium, total	ug/L	MW-2	09/17/2024		61.1000		65.0791
Barium, total	ug/L	Sump Grab	09/17/2024		127.0000	***	65.0791
Beryllium, total	ug/L	MW-1	09/17/2024	ND	1.0000		1.0000
Beryllium, total	ug/L	MW-2	09/17/2024	ND	1.0000		1.0000
Beryllium, total	ug/L	Sump Grab	09/17/2024	ND	1.0000		1.0000
Boron, total	ug/L	MW-1	09/17/2024	ND	20.0000		31.0000
Boron, total	ug/L	MW-2	09/17/2024	ND	20.0000		31.0000
Boron, total	ug/L	Sump Grab	09/17/2024		90.0000	***	31.0000
Cadmium, total	ug/L	MW-1	09/17/2024	ND	0.4000		0.4000
Cadmium, total	ug/L	MW-2	09/17/2024	ND	0.4000		0.4000
Cadmium, total	ug/L	Sump Grab	09/17/2024	ND	0.4000		0.4000
Chemical oxygen demand	mg/L	MW-1	09/17/2024	ND	10.0000		20.0000
Chemical oxygen demand	mg/L	MW-2	09/17/2024	ND	10.0000		20.0000
Chemical oxygen demand	mg/L	Sump Grab	09/17/2024	ND	10.0000		20.0000
Chloride	mg/L	MW-1	09/17/2024		3.4200		34.1000
Chloride	mg/L	MW-2	09/17/2024		2.9100		34.1000
Chloride	mg/L	Sump Grab	09/17/2024		23.7000		34.1000
Chromium, total	ug/L	MW-1	09/17/2024		2.8800		18.9082
Chromium, total	ug/L	MW-2	09/17/2024		7.1900		18.9082
Chromium, total	ug/L	Sump Grab	09/17/2024	ND	1.0000		18.9082
Cobalt, total	ug/L	MW-1	09/17/2024	ND	2.0000		3.3700
Cobalt, total	ug/L	MW-2	09/17/2024	ND	2.0000		3.3700
Cobalt, total	ug/L	Sump Grab	09/17/2024	ND	2.0000		3.3700
Copper, total	ug/L	MW-1	09/17/2024	ND	3.0000		7.6800
Copper, total	ug/L	MW-2	09/17/2024	ND	3.0000		7.6800
Copper, total	ug/L	Sump Grab	09/17/2024	ND	3.0000	**	7.6800
Fluoride	mg/L	MW-1	09/17/2024		0.1360		0.3000
Fluoride	mg/L	MW-2	09/17/2024		0.1290		0.3000
Fluoride	mg/L	Sump Grab	09/17/2024		0.1470		0.3000
Formaldehyde	ug/L	MW-1	09/17/2024	ND	100.0000		100.0000
Formaldehyde	ug/L	MW-2	09/17/2024	ND	100.0000		100.0000
Formaldehyde	ug/L	Sump Grab	09/17/2024	ND	100.0000		100.0000
Iron, total	ug/L	MW-1	09/17/2024		24.4000		2946.3849
Iron, total	ug/L	MW-2	09/17/2024		37.1000		2946.3849
Iron, total	ug/L	Sump Grab	09/17/2024		21.7000		2946.3849
Lead, total	ug/L	MW-1	09/17/2024	ND	2.0000		3.0100
Lead, total	ug/L	MW-2	09/17/2024	ND	2.0000		3.0100
Lead, total	ug/L	Sump Grab	09/17/2024	ND	2.0000		3.0100
Magnesium, total	mg/L	MW-1	09/17/2024		48.7000		72.0000
Magnesium, total	mg/L	MW-2	09/17/2024		46.5000		72.0000
Magnesium, total	mg/L	Sump Grab	09/17/2024		37.4000		72.0000
Manganese, total	ug/L	MW-1	09/17/2024	ND	20.0000		145.0000
Manganese, total	ug/L	MW-2	09/17/2024	ND	20.0000		145.0000
Manganese, total	ug/L	Sump Grab	09/17/2024	ND	20.0000		145.0000
Mercury, total	ug/L	MW-1	09/17/2024	ND	2.0000		2.0000
Mercury, total	ug/L	MW-2	09/17/2024	ND	2.0000		2.0000
Mercury, total	ug/L	Sump Grab	09/17/2024	ND	2.0000		2.0000
Methyl ethyl ketone	ug/L	MW-1	09/17/2024	ND	10.0000		10.0000
Methyl ethyl ketone	ug/L	MW-2	09/17/2024	ND	10.0000		10.0000
Methyl ethyl ketone	ug/L	Sump Grab	09/17/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	MW-1	09/17/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	MW-2	09/17/2024	ND	10.0000		10.0000
Molybdenum, total	ug/L	Sump Grab	09/17/2024	ND	10.0000		10.0000
Nickel, total	ug/L	MW-1	09/17/2024	ND	1.0000		5.0500
Nickel, total	ug/L	MW-2	09/17/2024	ND	1.0000		5.0500
Nickel, total	ug/L	Sump Grab	09/17/2024	ND	1.0000		5.0500
Phenols	ug/L	MW-1	09/17/2024	ND	10.0000		25.0000
Phenols	ug/L	MW-2	09/17/2024	ND	10.0000		25.0000
Phenols	ug/L	Sump Grab	09/17/2024	ND	10.0000		25.0000

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Selenium, total	ug/L	MW-1	09/17/2024	ND	5.0000		5.0000
Selenium, total	ug/L	MW-2	09/17/2024	ND	5.0000		5.0000
Selenium, total	ug/L	Sump Grab	09/17/2024	ND	5.0000		5.0000
Silver, total	ug/L	MW-1	09/17/2024	ND	0.5000		0.5000
Silver, total	ug/L	MW-2	09/17/2024	ND	0.5000		0.5000
Silver, total	ug/L	Sump Grab	09/17/2024	ND	0.5000		0.5000
Sulfate	mg/L	MW-1	09/17/2024		8.4700	**	18.5067
Sulfate	mg/L	MW-2	09/17/2024		25.2000	***	18.5067
Sulfate	mg/L	Sump Grab	09/17/2024		100.0000	***	18.5067
Thallium, total	ug/L	MW-1	09/17/2024	ND	3.0000		3.0000
Thallium, total	ug/L	MW-2	09/17/2024	ND	3.0000		3.0000
Thallium, total	ug/L	Sump Grab	09/17/2024	ND	3.0000		3.0000
Total organic halogen	mg/L	MW-1	09/17/2024	ND	0.0100		0.0500
Total organic halogen	mg/L	MW-2	09/17/2024	ND	0.0100		0.0500
Total organic halogen	mg/L	Sump Grab	09/17/2024		0.0710	*	0.0500
Total suspended solids	mg/L	MW-1	09/17/2024		2.0000		1576.5531
Total suspended solids	mg/L	MW-2	09/17/2024	ND	1.0000		1576.5531
Total suspended solids	mg/L	Sump Grab	09/17/2024		3.0000		1576.5531
Vanadium, total	ug/L	MW-1	09/17/2024	ND	1.0000		1.9200
Vanadium, total	ug/L	MW-2	09/17/2024	ND	1.0000		1.9200
Vanadium, total	ug/L	Sump Grab	09/17/2024	ND	1.0000		1.9200
Zinc, total	ug/L	MW-1	09/17/2024		5.6800		31.4000
Zinc, total	ug/L	MW-2	09/17/2024		6.4100		31.4000
Zinc, total	ug/L	Sump Grab	09/17/2024	ND	5.0000	**	31.4000

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 3

Detection Frequencies in Upgradient and Downgradient Wells

Constituent	Detect	Upgradient N	Proportion	Detect	Downgradient N	Proportion
Aluminum, total	16	28	0.571	21	39	0.538
Ammonia nitrogen	2	30	0.067	3	39	0.077
Antimony, total	0	30	0.000	0	39	0.000
Arsenic, total	0	30	0.000	0	39	0.000
Barium, total	30	30	1.000	39	39	1.000
Beryllium, total	0	30	0.000	0	39	0.000
Boron, total	4	29	0.138	17	39	0.436
Cadmium, total	0	30	0.000	2	39	0.051
Chemical oxygen demand	12	30	0.400	14	39	0.359
Chloride	29	29	1.000	39	39	1.000
Chromium, total	28	30	0.933	28	39	0.718
Cobalt, total	1	30	0.033	0	39	0.000
Copper, total	10	29	0.345	15	39	0.385
Fluoride	16	30	0.533	32	39	0.821
Formaldehyde	0	30	0.000	0	39	0.000
Iron, total	29	29	1.000	35	39	0.897
Lead, total	3	30	0.100	1	39	0.026
Magnesium, total	30	30	1.000	39	39	1.000
Manganese, total	8	28	0.286	16	39	0.410
Mercury, total	0	30	0.000	0	39	0.000
Methyl ethyl ketone	0	28	0.000	0	38	0.000
Molybdenum, total	4	30	0.133	5	39	0.128
Nickel, total	7	30	0.233	8	39	0.205
Phenols	6	29	0.207	13	39	0.333
Selenium, total	0	30	0.000	3	39	0.077
Silver, total	0	30	0.000	0	39	0.000
Sulfate	29	29	1.000	39	39	1.000
Thallium, total	0	30	0.000	0	39	0.000
Total organic halogen	12	28	0.429	15	38	0.395
Total suspended solids	29	30	0.967	38	39	0.974
Vanadium, total	3	29	0.103	6	39	0.154
Zinc, total	24	30	0.800	25	39	0.641

N = Total number of measurements in all wells.
Detect = Total number of detections in all wells.
Proportion = Detect/N.

Table 4

Shapiro-Wilk Multiple Group Test of Normality

Constituent	Detect	N	Detect Freq	G raw	G log	G cbrt	G sqrt	G sqr	G cub	Crit Value	Dist Form	Model Type
Aluminum, total	16	28	0.571	4.394	5.197					2.326	non-norm	nonpar
Ammonia nitrogen	2	30	0.067	6.184	6.184					2.326	non-norm	nonpar
Antimony, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Arsenic, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Barium, total	30	30	1.000	1.302	0.216					2.326	normal	normal
Beryllium, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Boron, total	4	29	0.138	9.321	9.517					2.326	non-norm	nonpar
Cadmium, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Chemical oxygen demand	12	30	0.400	4.970	5.968					2.326	non-norm	nonpar
Chloride	29	29	1.000	5.784	4.182					2.326	non-norm	nonpar
Chromium, total	28	30	0.933	0.715	7.249					2.326	normal	normal
Cobalt, total	1	30	0.033	6.184	6.184					2.326	non-norm	nonpar
Copper, total	10	29	0.345	5.470	6.251					2.326	non-norm	nonpar
Fluoride	16	30	0.533	4.599	6.848					2.326	non-norm	nonpar
Formaldehyde	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Iron, total	29	29	1.000	6.838	0.912					2.326	lognor	lognor
Lead, total	3	30	0.100	7.971	8.001					2.326	non-norm	nonpar
Magnesium, total	30	30	1.000	4.967	3.596					2.326	non-norm	nonpar
Manganese, total	8	28	0.286	6.540	6.772					2.326	non-norm	nonpar
Mercury, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Methyl ethyl ketone	0	28	0.000	5.876	5.876					2.326	non-norm	nonpar
Molybdenum, total	4	30	0.133	9.532	9.759					2.326	non-norm	nonpar
Nickel, total	7	30	0.233	7.679	7.891					2.326	non-norm	nonpar
Phenols	6	29	0.207	7.968	8.087					2.326	non-norm	nonpar
Selenium, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Silver, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Sulfate	29	29	1.000	2.940	1.867					2.326	lognor	lognor
Thallium, total	0	30	0.000	6.184	6.184					2.326	non-norm	nonpar
Total organic halogen	12	28	0.429	4.819	5.472					2.326	non-norm	nonpar
Total suspended solids	29	30	0.967	7.034	1.805					2.326	lognor	lognor
Vanadium, total	3	29	0.103	7.564	7.693					2.326	non-norm	nonpar
Zinc, total	24	30	0.800	2.395	6.641					2.326	non-norm	nonpar

* - Distribution override for that constituent.
Fit to distribution is confirmed if G <= critical value.
Model type may not match distributional form when detection frequency < 50%.

Table 5

Summary Statistics and Prediction Limits

Constituent	Units	Detect	N	Mean	SD	alpha	Factor	Pred Limit	Type		Conf
Aluminum, total	ug/L	16	28					870.0000	nonpar		0.99
Ammonia nitrogen	mg/L	2	30					0.2600	nonpar		0.99
Antimony, total	ug/L	0	30					5.0000	nonpar	***	0.99
Arsenic, total	ug/L	0	30					10.0000	nonpar	***	0.99
Barium, total	ug/L	30	30	38.1567	10.7585	0.0100	2.5024	65.0791	normal		
Beryllium, total	ug/L	0	30					1.0000	nonpar	***	0.99
Boron, total	ug/L	4	29					31.0000	nonpar		0.99
Cadmium, total	ug/L	0	30					0.4000	nonpar	***	0.99
Chemical oxygen demand	mg/L	12	30					20.0000	nonpar		0.99
Chloride	mg/L	29	29					34.1000	nonpar		0.99
Chromium, total	ug/L	28	30	7.6780	4.4877	0.0100	2.5024	18.9082	normal		
Cobalt, total	ug/L	1	30					3.3700	nonpar		0.99
Copper, total	ug/L	10	29					7.6800	nonpar		0.99
Fluoride	mg/L	16	30					0.3000	nonpar		0.99
Formaldehyde	ug/L	0	30					100.0000	nonpar	***	0.99
Iron, total	ug/L	29	29	4.8298	1.2589	0.0100	2.5090	2946.3849	lognor		
Lead, total	ug/L	3	30					3.0100	nonpar		0.99
Magnesium, total	mg/L	30	30					72.0000	nonpar		0.99
Manganese, total	ug/L	8	28					145.0000	nonpar		0.99
Mercury, total	ug/L	0	30					2.0000	nonpar	***	0.99
Methyl ethyl ketone	ug/L	0	28					10.0000	nonpar	***	0.99
Molybdenum, total	ug/L	4	30					10.0000	nonpar	***	0.99
Nickel, total	ug/L	7	30					5.0500	nonpar		0.99
Phenols	ug/L	6	29					25.0000	nonpar		0.99
Selenium, total	ug/L	0	30					5.0000	nonpar	***	0.99
Silver, total	ug/L	0	30					0.5000	nonpar	***	0.99
Sulfate	mg/L	29	29	1.8715	0.4172	0.0100	2.5090	18.5067	lognor		
Thallium, total	ug/L	0	30					3.0000	nonpar	***	0.99
Total organic halogen	mg/L	12	28					0.0500	nonpar		0.99
Total suspended solids	mg/L	29	30	3.5225	1.5347	0.0100	2.5024	1576.5531	lognor		
Vanadium, total	ug/L	3	29					1.9200	nonpar		0.99
Zinc, total	ug/L	24	30					31.4000	nonpar		0.99

Conf = confidence level for passing initial test or one verification resample at all downgradient wells for a single constituent (nonparametric test only).
* - Insufficient Data.
** - Calculated limit raised to Manual Reporting Limit.
*** - Nonparametric limit based on ND value.
For transformed data, mean and SD in transformed units and prediction limit in original units.
All sample sizes and statistics are based on outlier free data.
For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Table 6

Dixon's Test Outliers
1% Significance Level

Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Aluminum, total	ug/L	MW-4	11/30/2018	755.0000		08/23/2018-09/17/2024	15	0.6177
Boron, total	ug/L	MW-4	08/28/2018	90.1000		08/28/2018-09/17/2024	15	0.6177
Chloride	mg/L	MW-3	11/14/2018	4.6100		08/23/2018-09/17/2024	15	0.6177
Copper, total	ug/L	MW-3	08/23/2018	32.6000		08/23/2018-09/17/2024	15	0.6177
Manganese, total	ug/L	MW-4	11/30/2018	100.0000		08/28/2018-09/17/2024	15	0.6177
Methyl ethyl ketone	ug/L	MW-3	09/17/2019	100.0000	< 100.0000	08/23/2018-09/17/2024	15	0.6177
Methyl ethyl ketone	ug/L	MW-4	09/17/2019	100.0000	< 100.0000	08/28/2018-09/17/2024	15	0.6177
Phenols	ug/L	MW-4	04/01/2019	0.5000		08/28/2018-09/17/2024	15	0.6177
Sulfate	mg/L	MW-4	05/10/2023	0.1000	< 0.1000	08/28/2018-09/17/2024	15	0.6177
Vanadium, total	ug/L	MW-3	09/28/2021	5.7600		08/23/2018-09/17/2024	15	0.6177

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	Sump Grab	04/06/2020		109.0000	*	65.0791
Barium, total	ug/L	Sump Grab	09/24/2020		108.0000	*	65.0791
Barium, total	ug/L	Sump Grab	04/27/2021		93.1000	*	65.0791
Barium, total	ug/L	Sump Grab	09/28/2021		127.0000	*	65.0791
Barium, total	ug/L	Sump Grab	05/11/2022		98.8000	*	65.0791
Barium, total	ug/L	Sump Grab	09/14/2022		79.0000	*	65.0791
Barium, total	ug/L	Sump Grab	09/13/2023		133.0000	*	65.0791
Barium, total	ug/L	Sump Grab	05/15/2024		119.0000	*	65.0791
Barium, total	ug/L	Sump Grab	09/17/2024		127.0000	*	65.0791
Boron, total	ug/L	Sump Grab	04/06/2020		40.5000	*	31.0000
Boron, total	ug/L	Sump Grab	09/24/2020		54.8000	*	31.0000
Boron, total	ug/L	Sump Grab	04/27/2021		34.2000	*	31.0000
Boron, total	ug/L	Sump Grab	09/28/2021		30.4000		31.0000
Boron, total	ug/L	Sump Grab	05/11/2022		36.6000	*	31.0000
Boron, total	ug/L	Sump Grab	09/14/2022		63.5000	*	31.0000
Boron, total	ug/L	Sump Grab	09/13/2023		81.1000	*	31.0000
Boron, total	ug/L	Sump Grab	05/15/2024		83.2000	*	31.0000
Boron, total	ug/L	Sump Grab	09/17/2024		90.0000	*	31.0000
Copper, total	ug/L	Sump Grab	04/06/2020	ND	2.0000		7.6800
Copper, total	ug/L	Sump Grab	09/24/2020		11.2000	*	7.6800
Copper, total	ug/L	Sump Grab	04/27/2021	ND	3.0000		7.6800
Copper, total	ug/L	Sump Grab	09/28/2021		5.6800		7.6800
Copper, total	ug/L	Sump Grab	05/11/2022		11.0000	*	7.6800
Copper, total	ug/L	Sump Grab	09/14/2022	ND	3.0000		7.6800
Copper, total	ug/L	Sump Grab	09/13/2023	ND	3.0000		7.6800
Copper, total	ug/L	Sump Grab	05/15/2024		15.1000	*	7.6800
Copper, total	ug/L	Sump Grab	09/17/2024	ND	3.0000		7.6800
Sulfate	mg/L	MW-1	08/23/2018		14.7000		18.5067
Sulfate	mg/L	MW-1	11/14/2018		44.8000	*	18.5067
Sulfate	mg/L	MW-1	01/10/2019		15.8000		18.5067
Sulfate	mg/L	MW-1	04/01/2019		15.9000		18.5067
Sulfate	mg/L	MW-1	09/17/2019		82.8000	*	18.5067
Sulfate	mg/L	MW-1	04/06/2020		30.4000	*	18.5067
Sulfate	mg/L	MW-1	09/24/2020		12.0000		18.5067
Sulfate	mg/L	MW-1	04/27/2021		7.7200		18.5067
Sulfate	mg/L	MW-1	09/28/2021		10.8000		18.5067
Sulfate	mg/L	MW-1	05/11/2022		11.9000		18.5067
Sulfate	mg/L	MW-1	09/14/2022		8.9700		18.5067
Sulfate	mg/L	MW-1	05/10/2023		13.8000		18.5067
Sulfate	mg/L	MW-1	09/13/2023		10.9000		18.5067
Sulfate	mg/L	MW-1	05/15/2024		19.1000	*	18.5067
Sulfate	mg/L	MW-1	09/17/2024		8.4700		18.5067
Sulfate	mg/L	MW-2	08/23/2018		29.8000	*	18.5067
Sulfate	mg/L	MW-2	11/14/2018		37.0000	*	18.5067
Sulfate	mg/L	MW-2	01/10/2019		26.8000	*	18.5067
Sulfate	mg/L	MW-2	04/01/2019		26.3000	*	18.5067
Sulfate	mg/L	MW-2	09/17/2019		23.4000	*	18.5067
Sulfate	mg/L	MW-2	04/06/2020		24.3000	*	18.5067
Sulfate	mg/L	MW-2	09/24/2020		24.0000	*	18.5067
Sulfate	mg/L	MW-2	04/27/2021		24.4000	*	18.5067
Sulfate	mg/L	MW-2	09/28/2021		25.4000	*	18.5067
Sulfate	mg/L	MW-2	05/11/2022		25.7000	*	18.5067
Sulfate	mg/L	MW-2	09/14/2022		24.4000	*	18.5067
Sulfate	mg/L	MW-2	05/10/2023		23.8000	*	18.5067
Sulfate	mg/L	MW-2	09/13/2023		20.7000	*	18.5067
Sulfate	mg/L	MW-2	05/15/2024		27.0000	*	18.5067
Sulfate	mg/L	MW-2	09/17/2024		25.2000	*	18.5067
Sulfate	mg/L	Sump Grab	04/06/2020		122.0000	*	18.5067
Sulfate	mg/L	Sump Grab	09/24/2020		66.8000	*	18.5067
Sulfate	mg/L	Sump Grab	04/27/2021		120.0000	*	18.5067
Sulfate	mg/L	Sump Grab	09/28/2021		33.6000	*	18.5067
Sulfate	mg/L	Sump Grab	05/11/2022		39.0000	*	18.5067
Sulfate	mg/L	Sump Grab	09/14/2022		43.6000	*	18.5067
Sulfate	mg/L	Sump Grab	09/13/2023		20.1000	*	18.5067
Sulfate	mg/L	Sump Grab	05/15/2024		75.2000	*	18.5067
Sulfate	mg/L	Sump Grab	09/17/2024		100.0000	*	18.5067
Total organic halogen	mg/L	Sump Grab	09/24/2020	ND	0.0100		0.0500
Total organic halogen	mg/L	Sump Grab	04/27/2021		0.0240		0.0500
Total organic halogen	mg/L	Sump Grab	09/28/2021	ND	0.0200		0.0500
Total organic halogen	mg/L	Sump Grab	05/11/2022	ND	0.0100		0.0500
Total organic halogen	mg/L	Sump Grab	09/14/2022		0.0390		0.0500

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

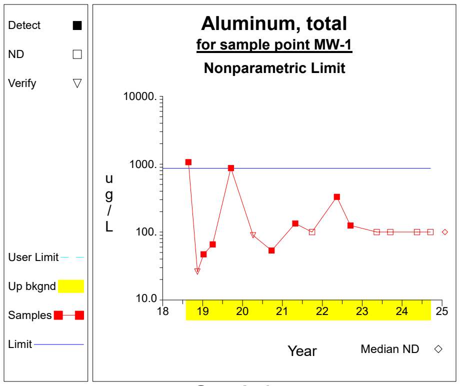
Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

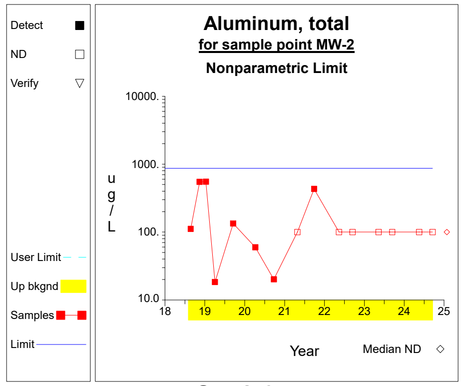
Constituent	Units	Well	Date		Result		Pred. Limit
Total organic halogen	mg/L	Sump Grab	09/13/2023	ND	0.0100		0.0500
Total organic halogen	mg/L	Sump Grab	05/15/2024	ND	0.0100		0.0500
Total organic halogen	mg/L	Sump Grab	09/17/2024		0.0710	*	0.0500
Zinc, total	ug/L	Sump Grab	04/06/2020	ND	5.0000		31.4000
Zinc, total	ug/L	Sump Grab	09/24/2020		22.5000		31.4000
Zinc, total	ug/L	Sump Grab	04/27/2021	ND	5.0000		31.4000
Zinc, total	ug/L	Sump Grab	09/28/2021		14.6000		31.4000
Zinc, total	ug/L	Sump Grab	05/11/2022		11.8000		31.4000
Zinc, total	ug/L	Sump Grab	09/14/2022	ND	5.0000		31.4000
Zinc, total	ug/L	Sump Grab	09/13/2023	ND	5.0000		31.4000
Zinc, total	ug/L	Sump Grab	05/15/2024		53.8000	*	31.4000
Zinc, total	ug/L	Sump Grab	09/17/2024	ND	5.0000		31.4000

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

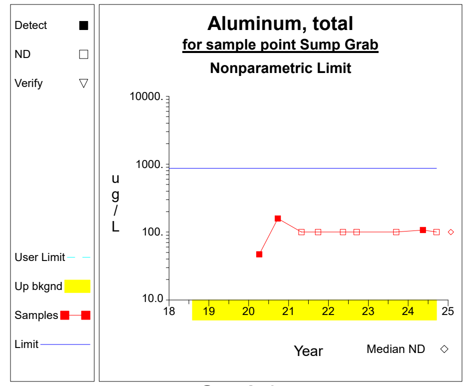
Up vs. Down Prediction Limits



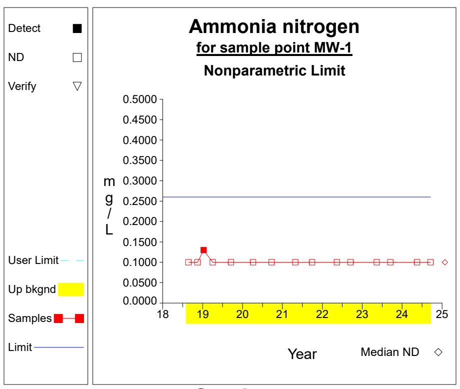
Graph 1



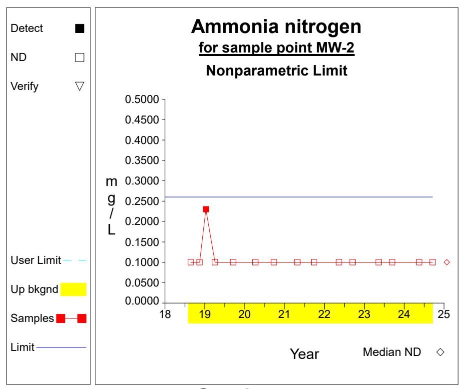
Graph 2



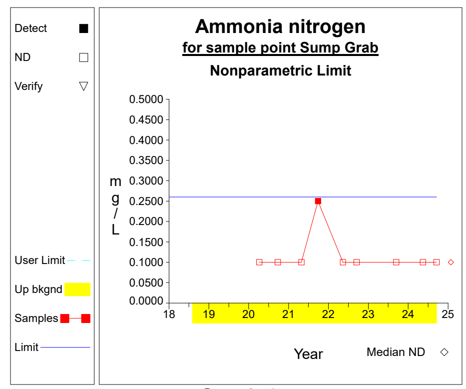
Graph 3



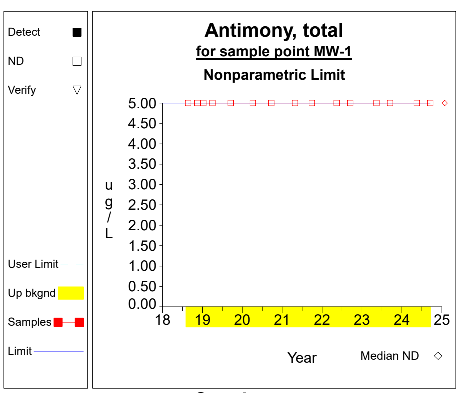
Graph 4



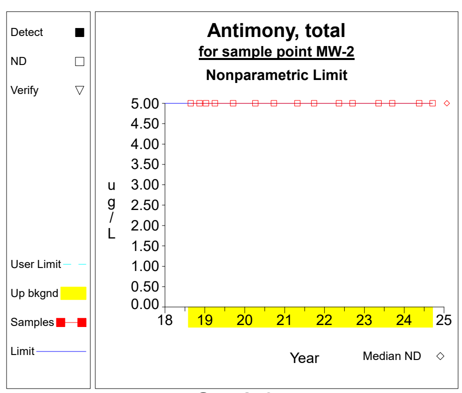
Graph 5



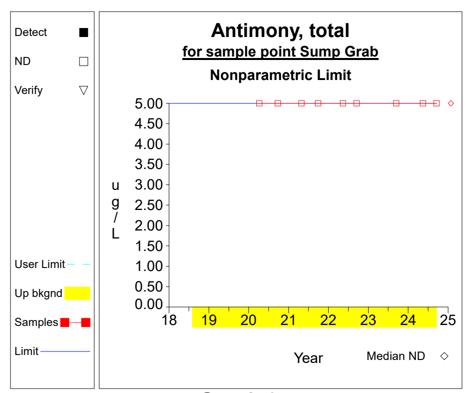
Graph 6



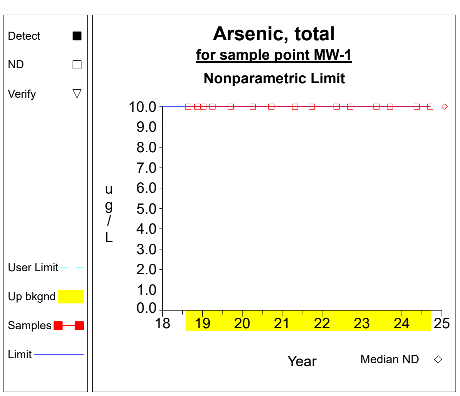
Graph 7



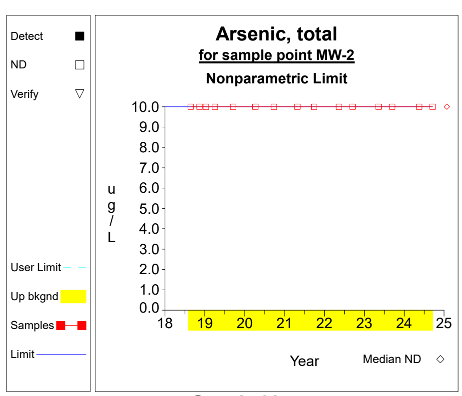
Graph 8



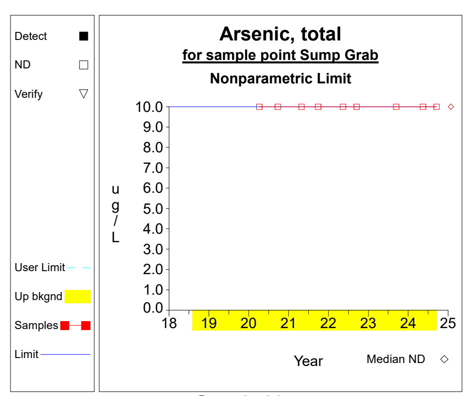
Graph 9



Graph 10

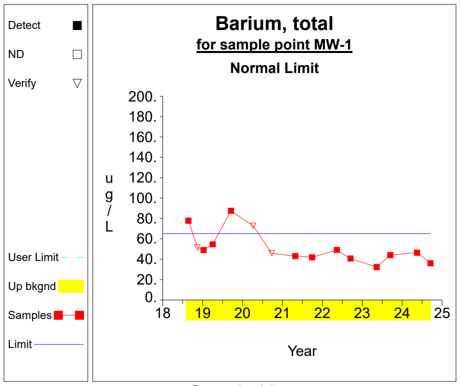


Graph 11

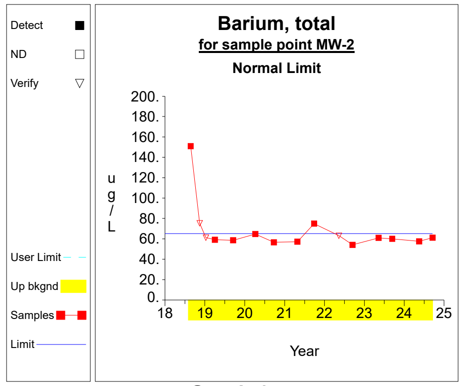


Graph 12

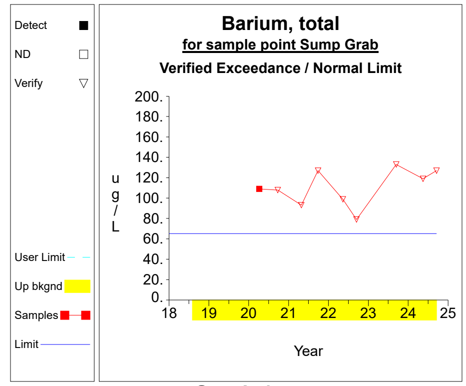
Up vs. Down Prediction Limits



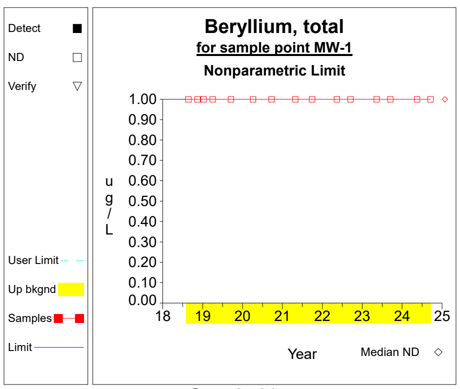
Graph 13



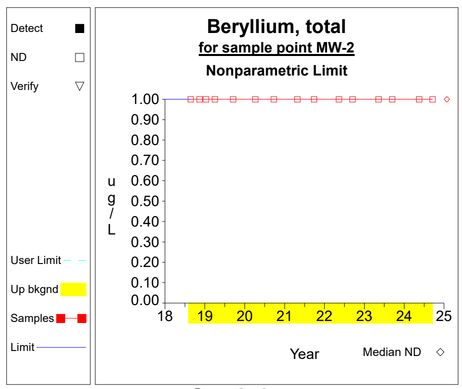
Graph 14



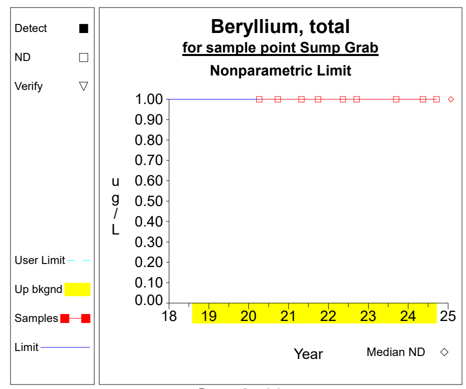
Graph 15



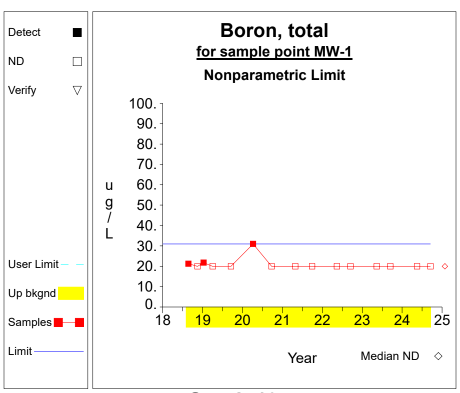
Graph 16



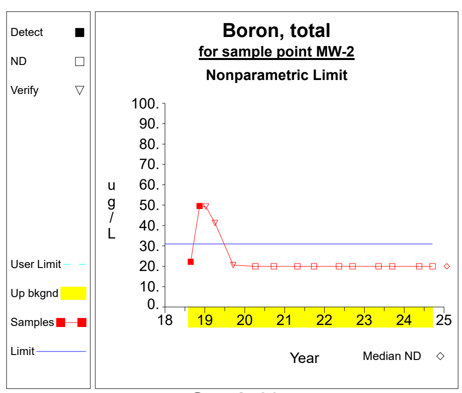
Graph 17



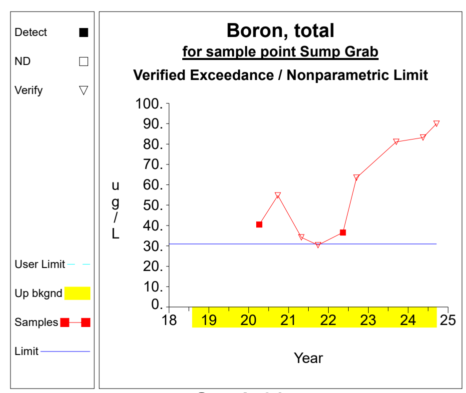
Graph 18



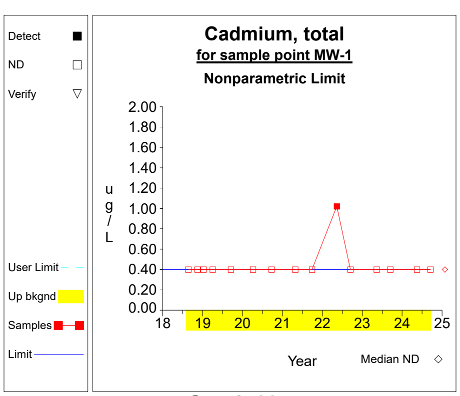
Graph 19



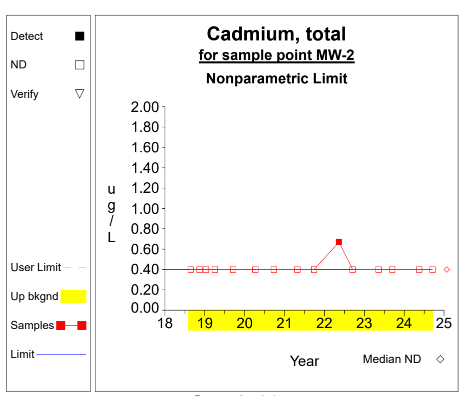
Graph 20



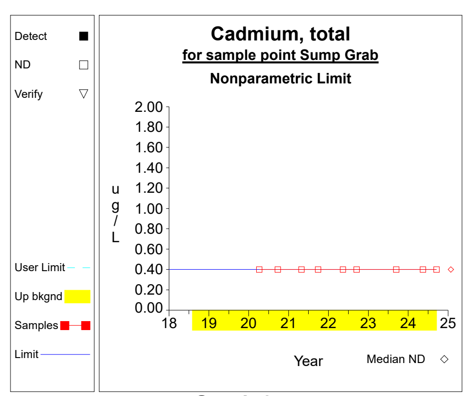
Graph 21



Graph 22



Graph 23



Graph 24

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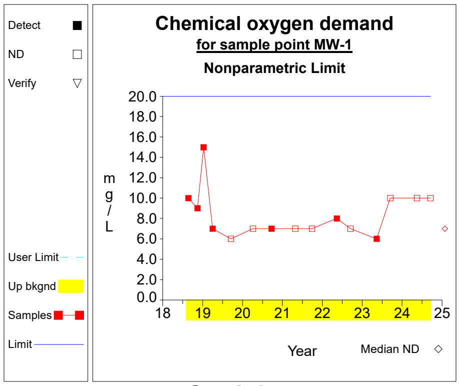
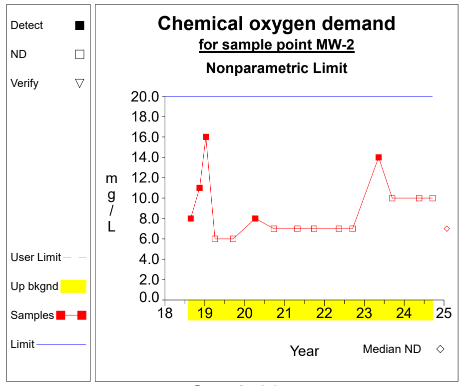
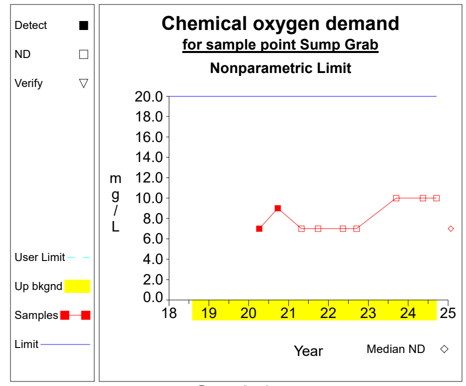
Up vs. Down Prediction Limits



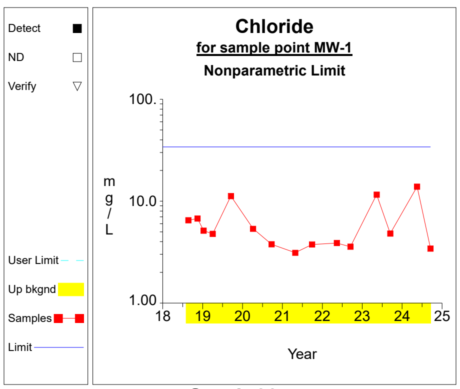
Graph 25



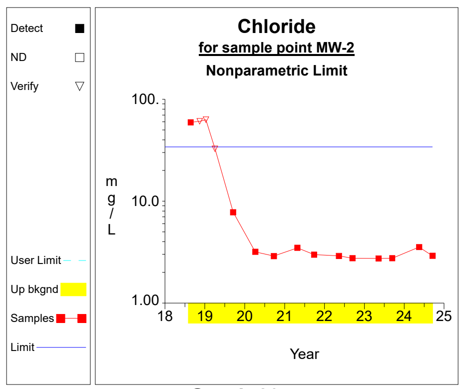
Graph 26



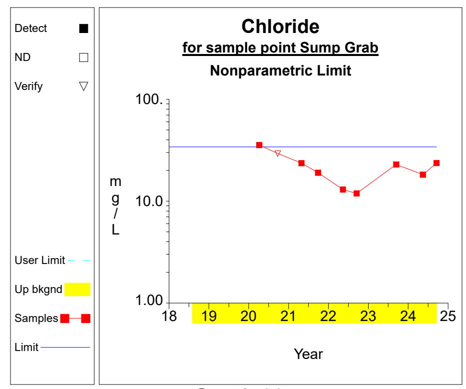
Graph 27



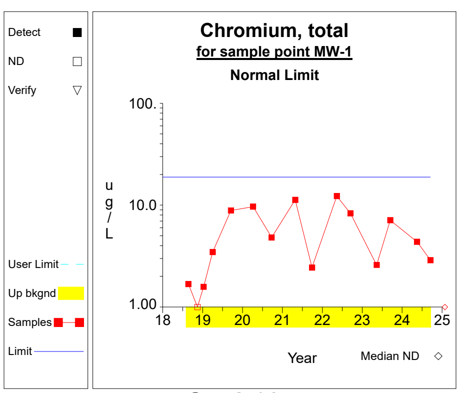
Graph 28



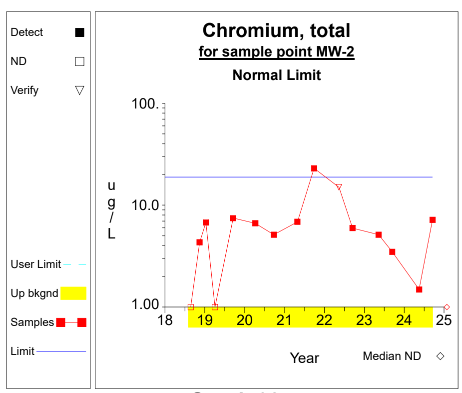
Graph 29



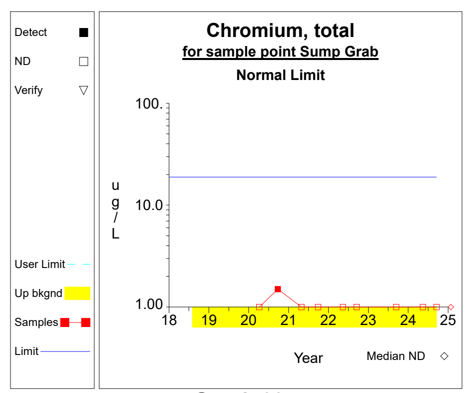
Graph 30



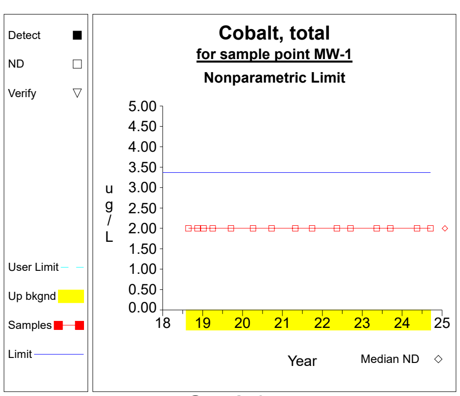
Graph 31



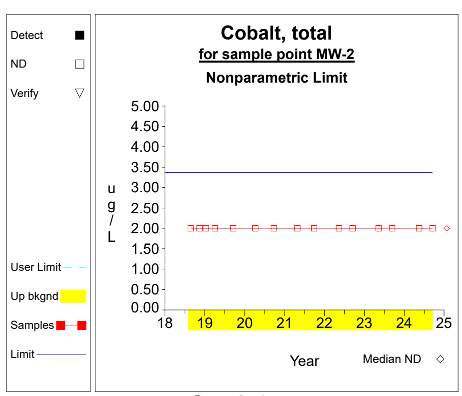
Graph 32



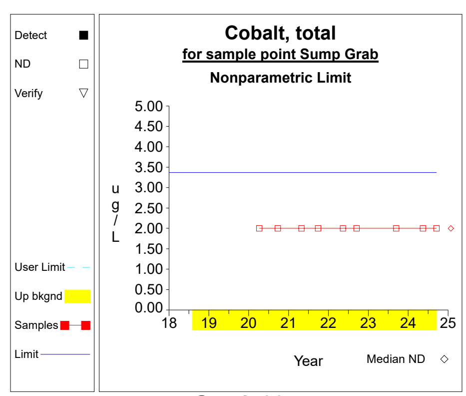
Graph 33



Graph 34

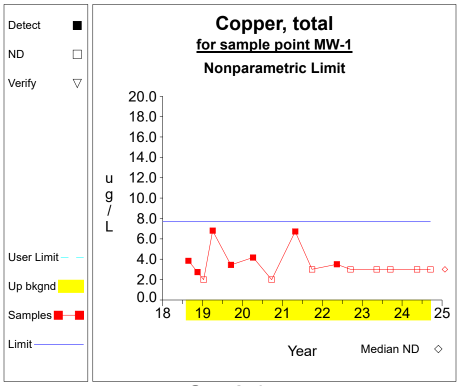


Graph 35

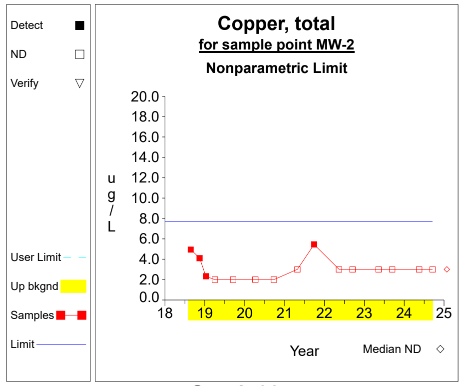


Graph 36

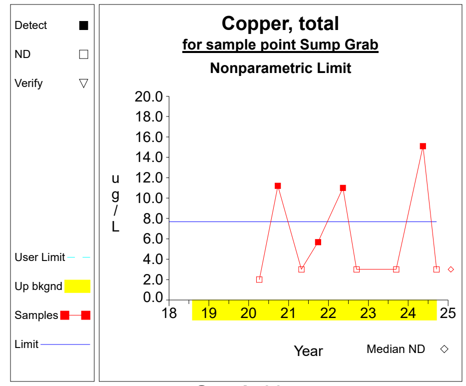
Up vs. Down Prediction Limits



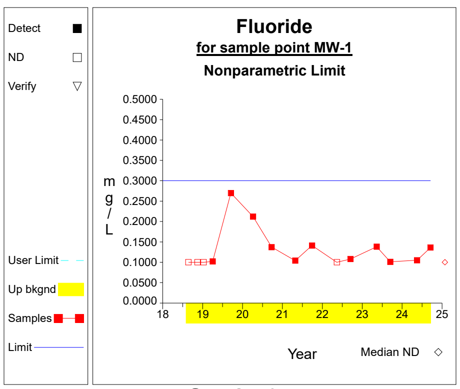
Graph 37



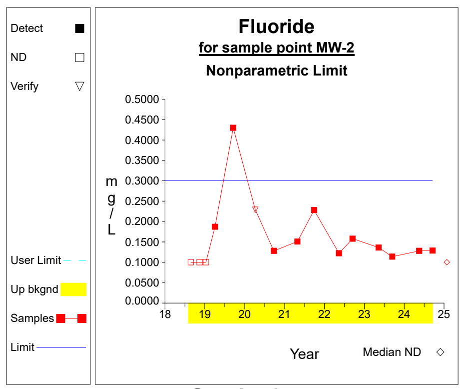
Graph 38



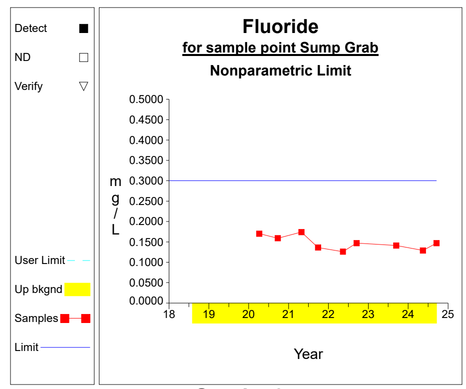
Graph 39



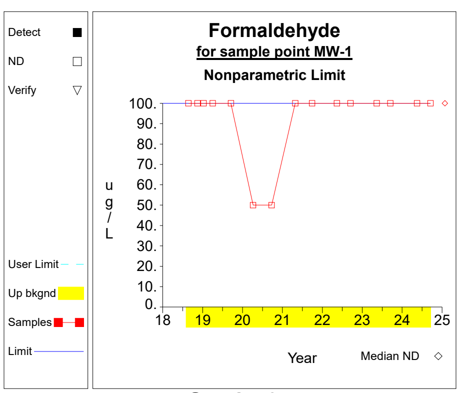
Graph 40



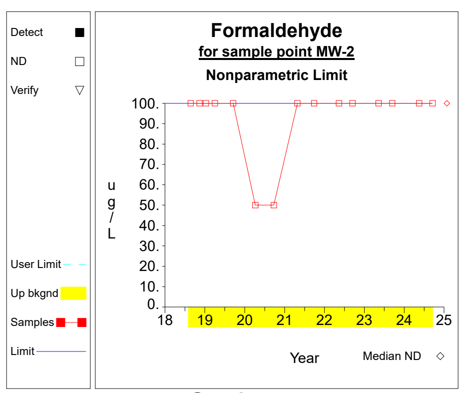
Graph 41



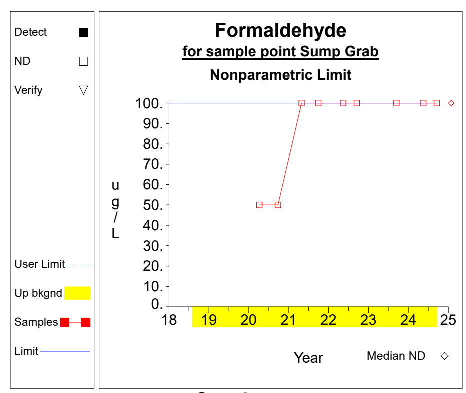
Graph 42



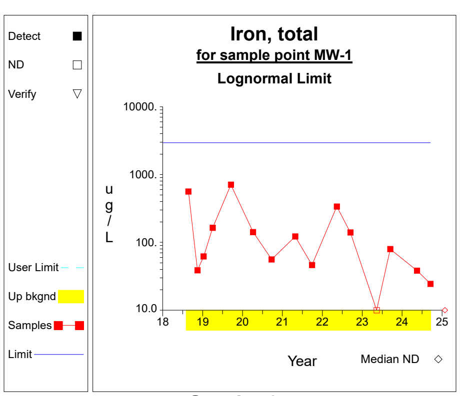
Graph 43



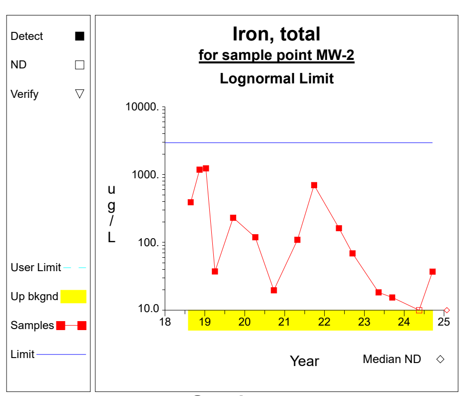
Graph 44



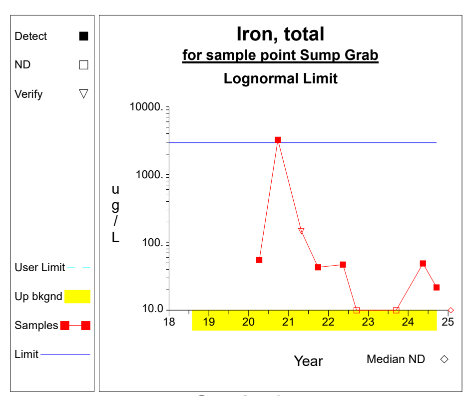
Graph 45



Graph 46



Graph 47



Graph 48

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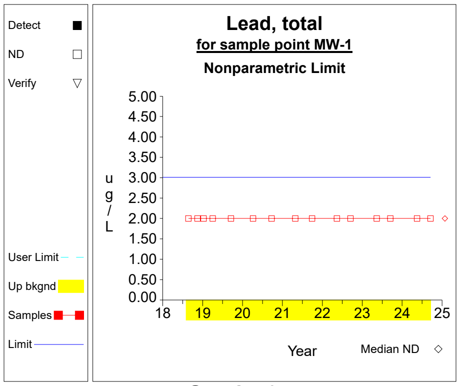
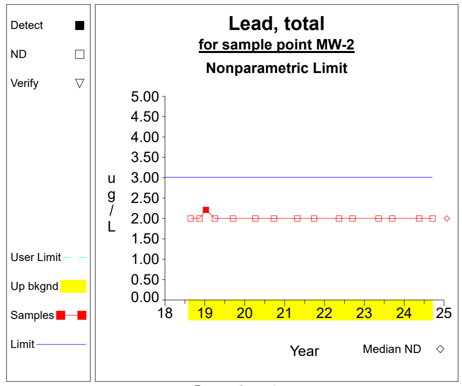
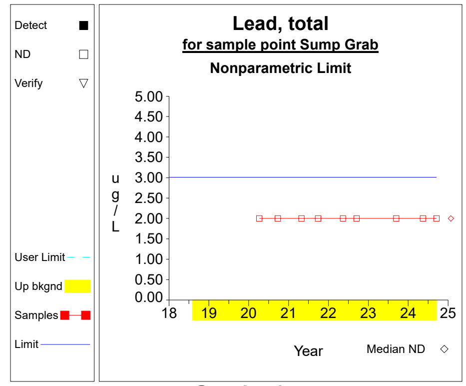
Up vs. Down Prediction Limits



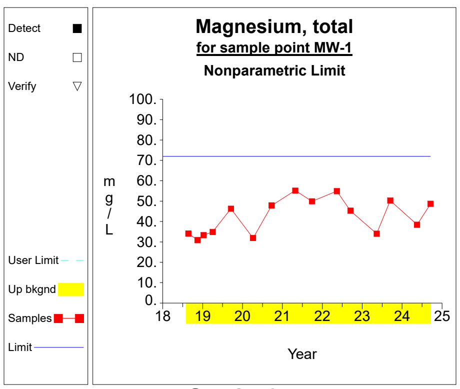
Graph 49



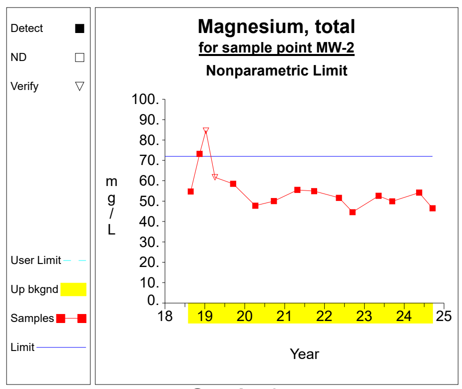
Graph 50



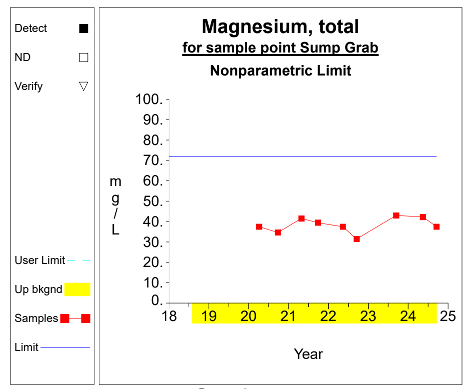
Graph 51



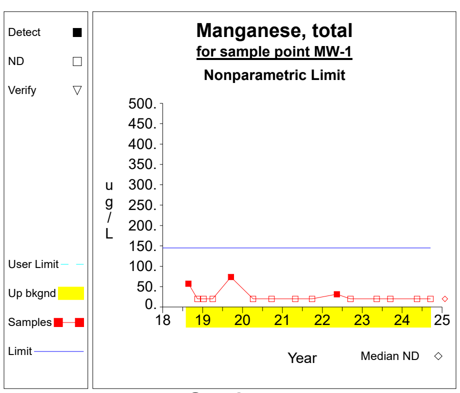
Graph 52



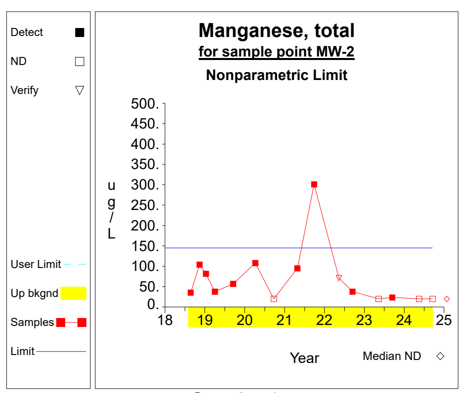
Graph 53



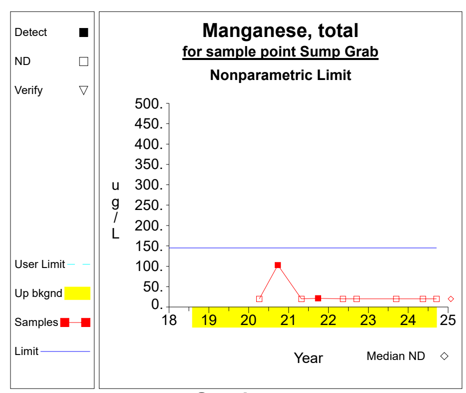
Graph 54



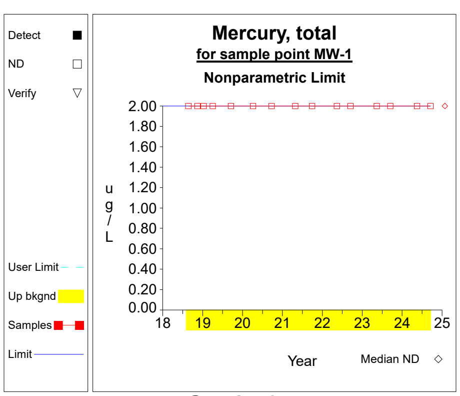
Graph 55



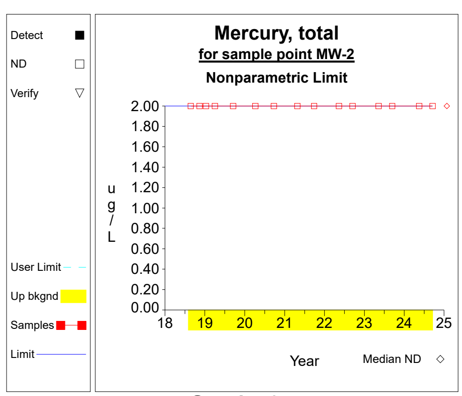
Graph 56



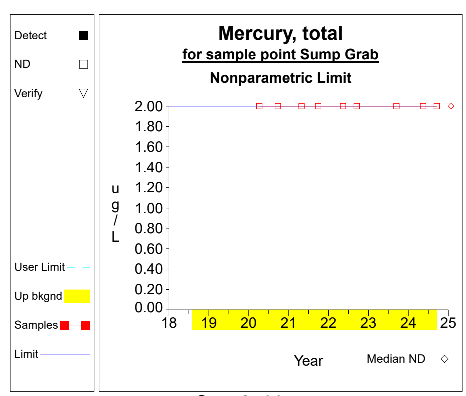
Graph 57



Graph 58



Graph 59



Graph 60

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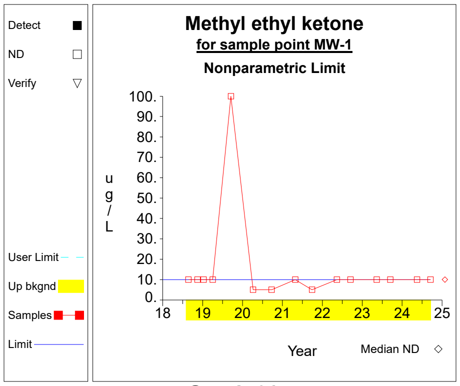
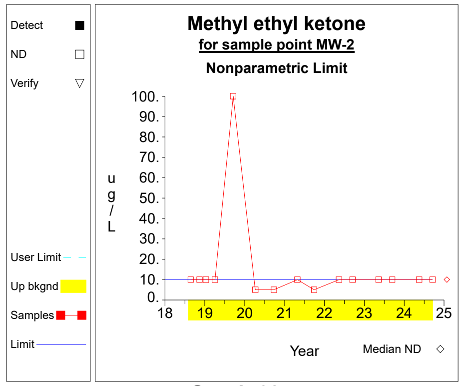
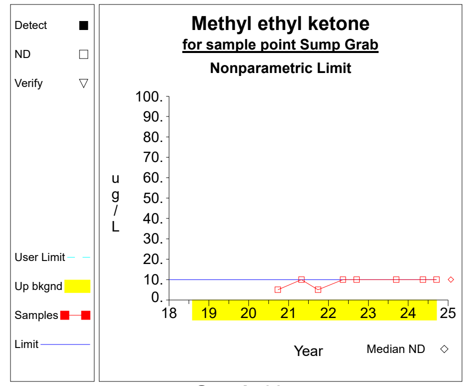
Up vs. Down Prediction Limits



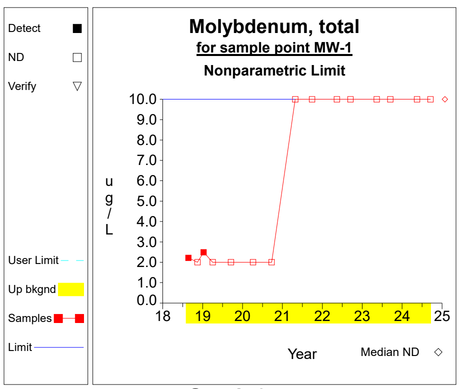
Graph 61



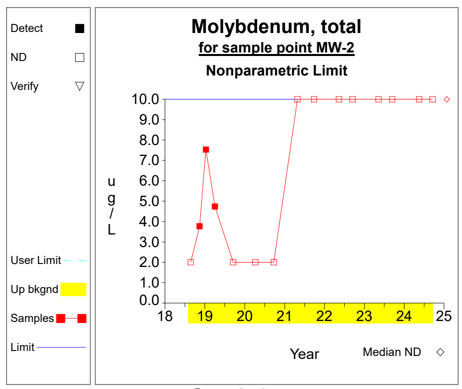
Graph 62



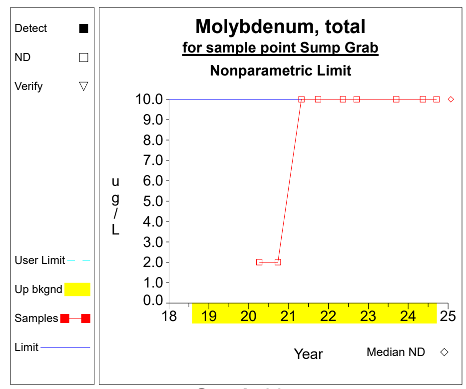
Graph 63



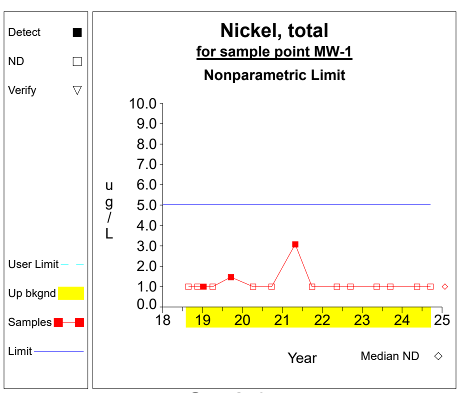
Graph 64



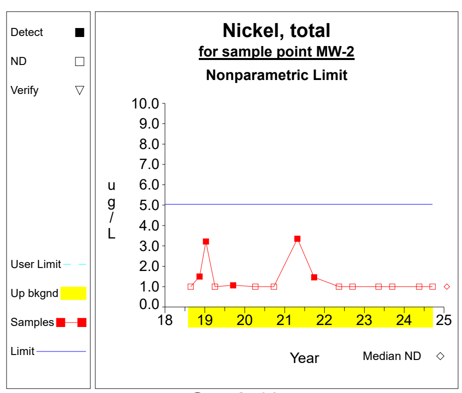
Graph 65



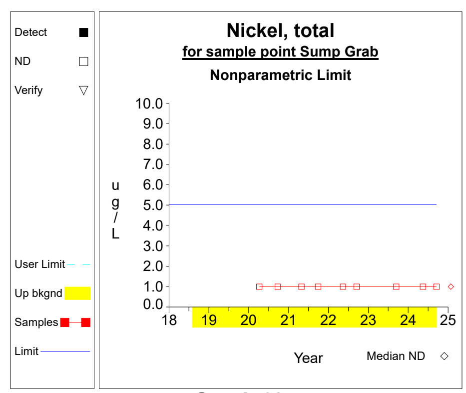
Graph 66



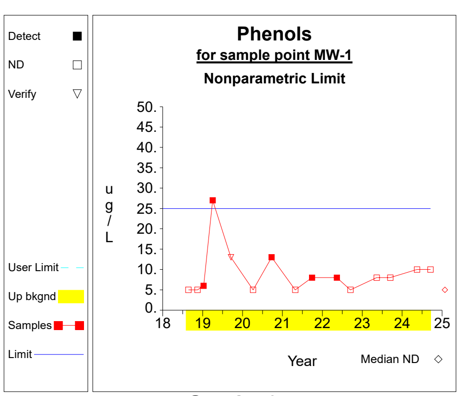
Graph 67



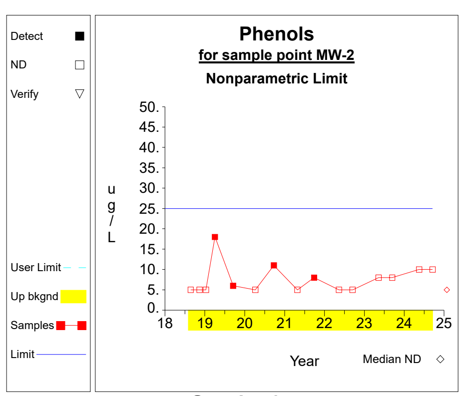
Graph 68



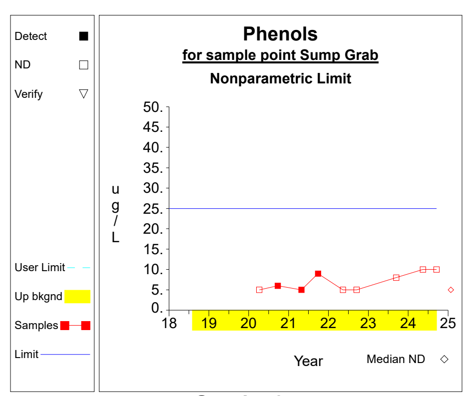
Graph 69



Graph 70

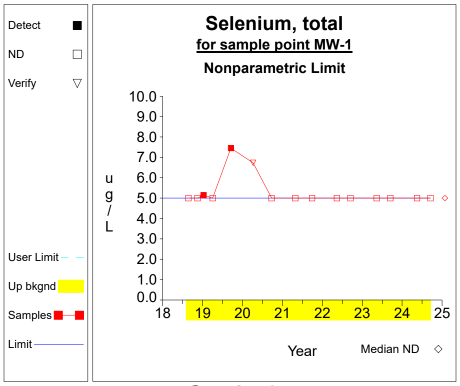


Graph 71

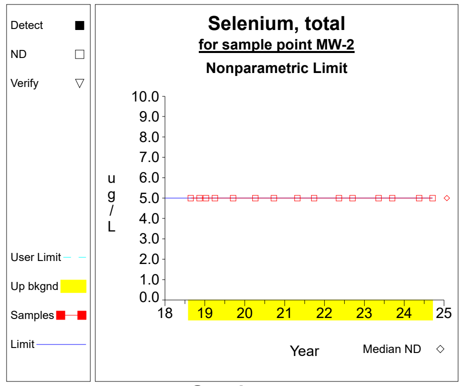


Graph 72

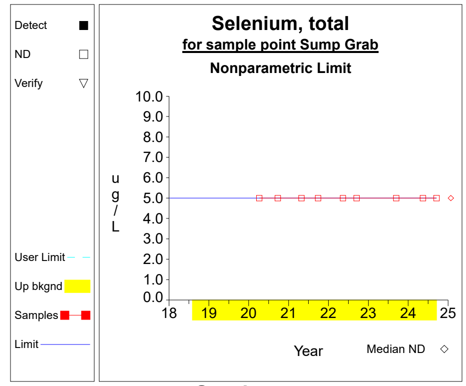
Up vs. Down Prediction Limits



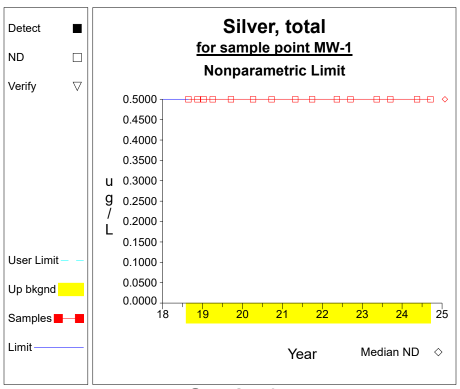
Graph 73



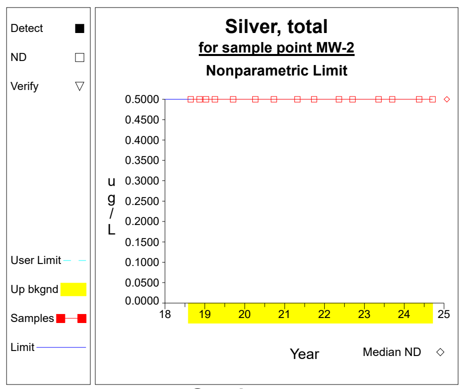
Graph 74



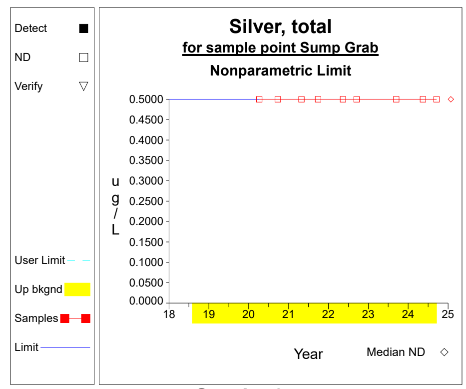
Graph 75



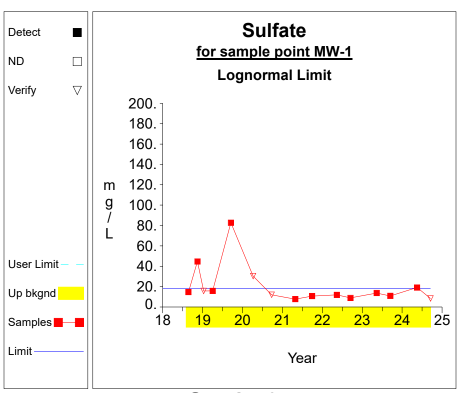
Graph 76



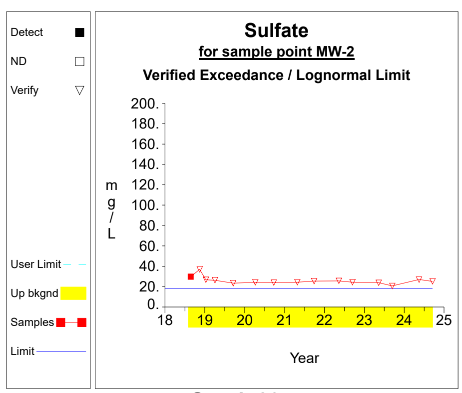
Graph 77



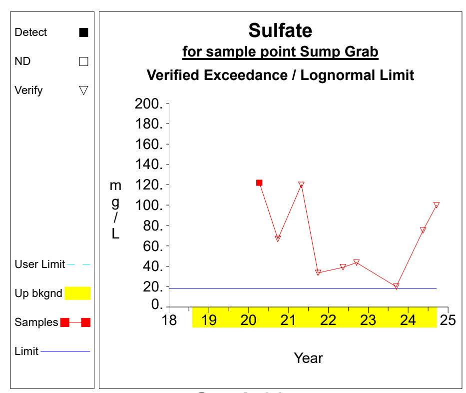
Graph 78



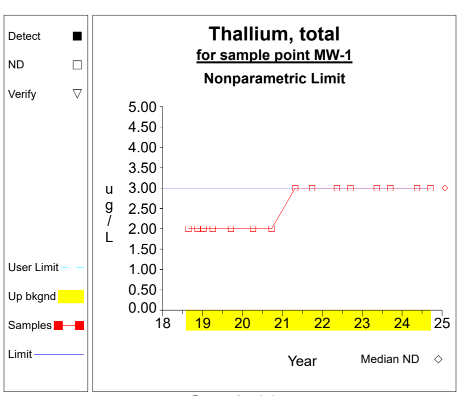
Graph 79



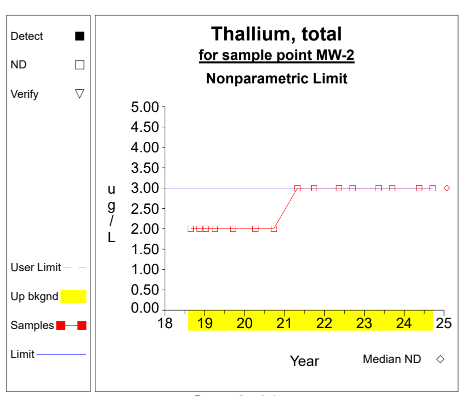
Graph 80



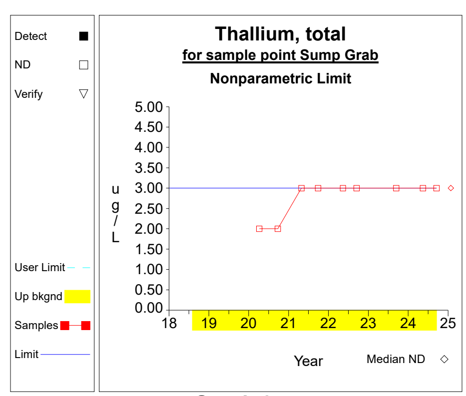
Graph 81



Graph 82

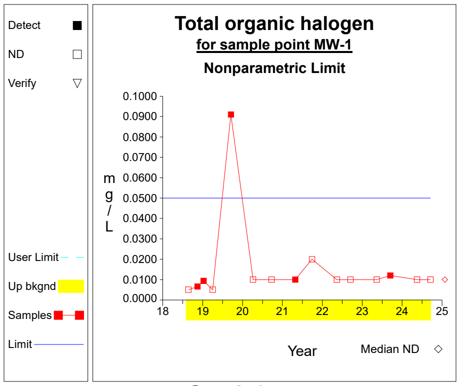


Graph 83

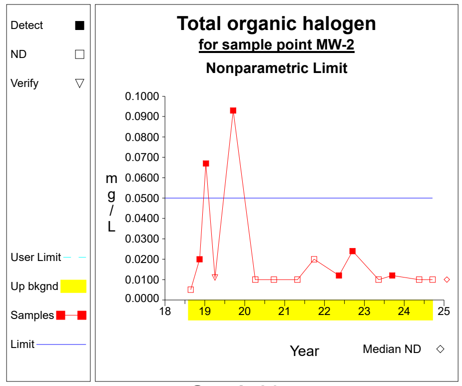


Graph 84

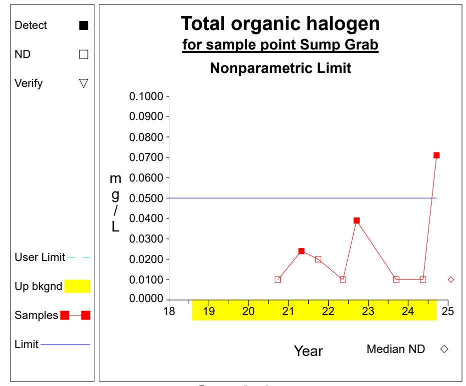
Up vs. Down Prediction Limits



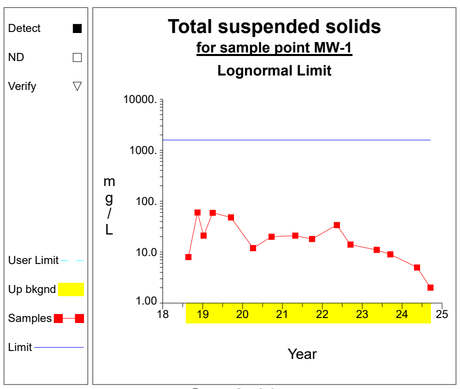
Graph 85



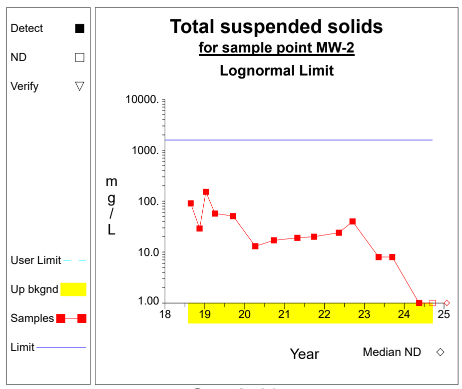
Graph 86



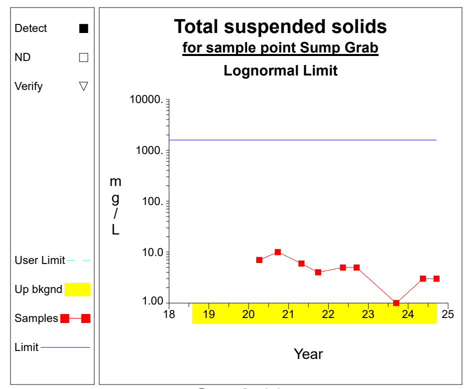
Graph 87



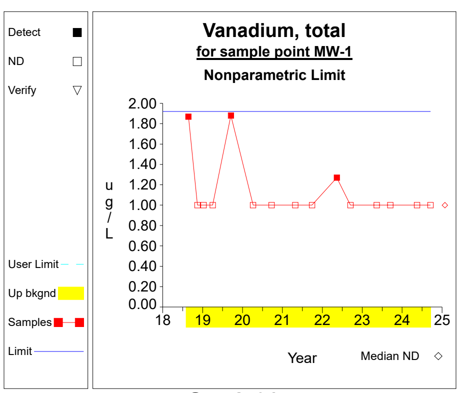
Graph 88



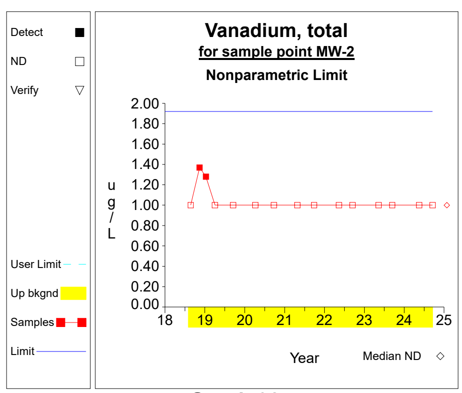
Graph 89



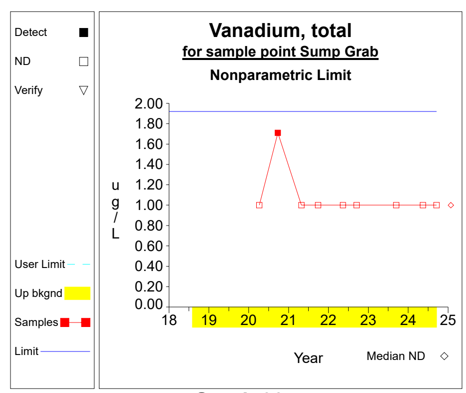
Graph 90



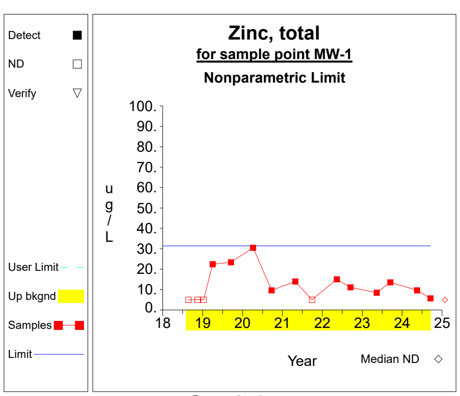
Graph 91



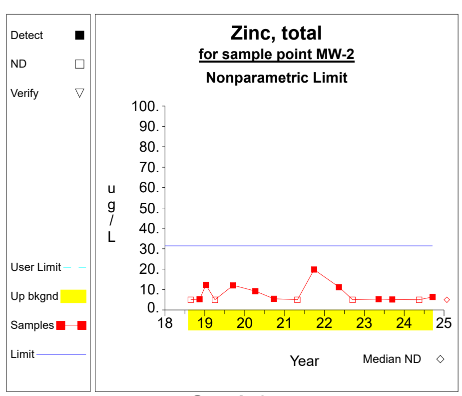
Graph 92



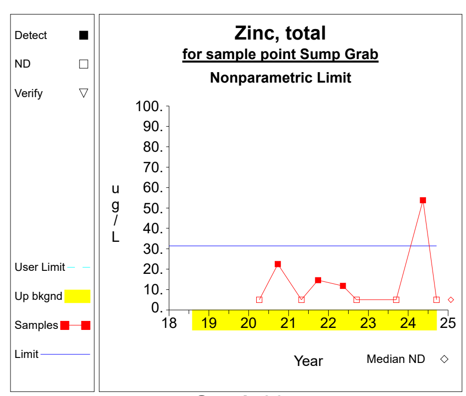
Graph 93



Graph 94

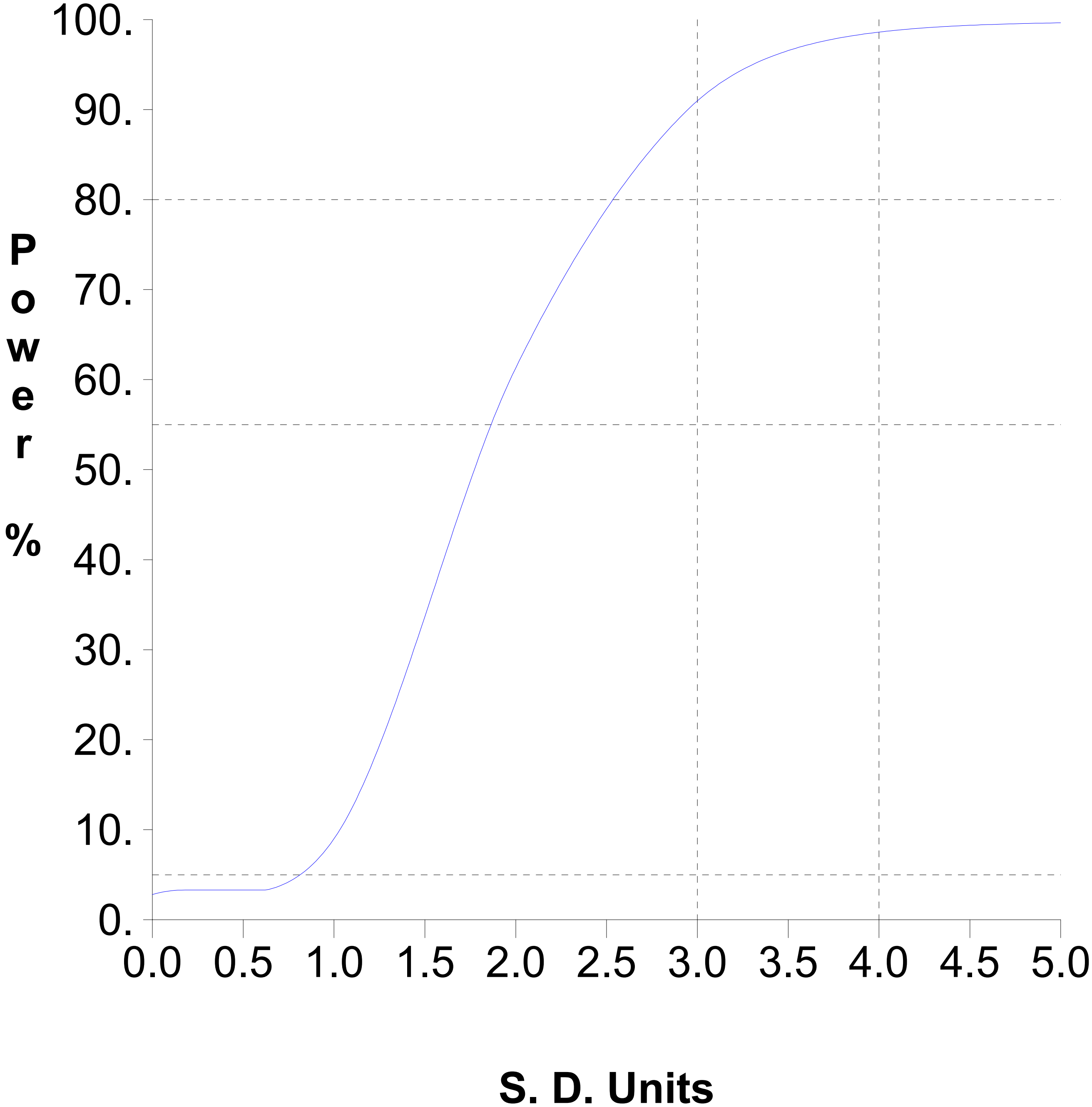


Graph 95



Graph 96

False Positive and False Negative Rates for Current Upgradient vs. Downgradient Monitoring Program



Worksheet 1 - Upgradient vs. Downgradient Comparisons
Aluminum, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **870.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Ammonia nitrogen (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.26**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Antimony, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Arsenic, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Barium, total (ug/L)
Normal Prediction Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **1144.7** / **30** = **38.157**	Compute upgradient mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**47034.55** - **1.31**x**10^6**/**30**) / (**30**-1))^{½} = **10.758**	Compute upgradient sd.
3	alpha = min[(1-.95$^{1/K}$)^{½}, .01] = min[(1-.95$^{1/96}$)^{½}, .01] = **0.01**	Adjusted per comparison false positive rate. Pass initial or 1 resample.
4	PL = $\bar{X}$ + **tS**(1+1/**N**)^{½} = **38.157** + (**2.462***10.758**)(1+1/**30**)^{½} = **65.079**	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Beryllium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Boron, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **31.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Cadmium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **0.4**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chemical oxygen demand (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **20.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chloride (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **34.1**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Chromium, total (ug/L)
Normal Prediction Limit

Step	Equation	Description
1	$\bar{X}_1 = \mathbf{sum[X_1] / N_1}$ $= \mathbf{230.34} / \mathbf{28}$ $= \mathbf{8.226}$	Compute mean of N_1 detected measurements.
2	$S_1 = ((\mathbf{sum[X_1^2]}\text{-}\mathbf{sum[X_1]}^2/\mathbf{N_1}) / (\mathbf{N_1}\text{-}1))^{½}$ $= ((\mathbf{2351.468}\text{-}\mathbf{53056.516}/\mathbf{28}) / (\mathbf{28}\text{-}1))^{½}$ $= \mathbf{4.112}$	Compute sd of N_1 detected measurements.
3	$\bar{X} = (1 - \mathbf{N_0}/\mathbf{N})\, \bar{\mathbf{X}}_1$ $= (1 - \mathbf{2}/\mathbf{30})\ \mathbf{8.226}$ $= \mathbf{7.678}$	Use Aitchison's method to adjust mean for presence of nondetects.
4	$S = [(1 - \mathbf{N_0}/\mathbf{N}) * \mathbf{S_1}^2 + (\mathbf{N_0}/\mathbf{N}) (1 - (\mathbf{N_0}\text{-}1)/(\mathbf{N}\text{-}1))\ \bar{\mathbf{X}}_1^2]^{½}$ $= [(1 - \mathbf{2}/\mathbf{30}) * \mathbf{4.112}^2 + (\mathbf{2}/\mathbf{30}) (1 - (\mathbf{2}\text{-}1)/(\mathbf{30}\text{-}1))\ \mathbf{8.226}^2]^{½}$ $= \mathbf{4.488}$	Use Aitchison's method to adjust sd for presence of nondetects.
5	$\text{alpha} = \min[(1\text{-}.95^{1/\mathbf{K}})^{½}, .01]$ $= \min[(1\text{-}.95^{1/\mathbf{96}})^{½}, .01]$ $= \mathbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 resample.
6	$PL = \bar{\mathbf{X}} + \mathbf{tS}(1+1/\mathbf{N})^{½}$ $= \mathbf{7.678} + (\mathbf{2.462}*\mathbf{4.488})(1+1/\mathbf{30})^{½}$ $= \mathbf{18.908}$	One-sided normal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Cobalt, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.37**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Copper, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **7.68**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Fluoride (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.3**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Formaldehyde (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Iron, total (ug/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y} = \textbf{sum[Y]} / \textbf{N}$ $= \textbf{140.063} / \textbf{29}$ $= \textbf{4.83}$	Compute mean on a natural log scale.
3	$S_Y = ((\textbf{sum[Y}^2\textbf{]} - \textbf{sum[Y]}^2/\textbf{N}) / (\textbf{N}-1))^{1/2}$ $= ((\textbf{720.845} - \textbf{19617.615}/\textbf{29}) / (\textbf{29}-1))^{1/2}$ $= \textbf{1.259}$	Compute sd on a natural log scale.
4	alpha = $\min[(1-.95^{1/\textbf{K}})^{1/2}, .01]$ $= \min[(1-.95^{1/\textbf{96}})^{1/2}, .01]$ $= \textbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 resample.
5	$PL = \exp[\bar{\textbf{Y}} + \textbf{t}\textbf{S}_\textbf{Y}(1+1/\textbf{N})^{1/2}]$ $= \exp[\textbf{4.83} + (\textbf{2.467}*\textbf{1.259})(1+1/\textbf{29})^{1/2}]$ $= \textbf{2946.385}$	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Lead, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.01**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Magnesium, total (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **72.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Manganese, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **145.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Mercury, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Methyl ethyl ketone (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Molybdenum, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **10.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Nickel, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **5.05**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Phenols (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **25.0**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Selenium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Silver, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Sulfate (mg/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y} = \textbf{sum[Y]} / \textbf{N}$ $= \textbf{54.273} / \textbf{29}$ $= \textbf{1.871}$	Compute mean on a natural log scale.
3	$S_Y = ((\textbf{sum[Y}^2\textbf{]} - \textbf{sum[Y]}^2/\textbf{N}) / (\textbf{N}-1))^{1/2}$ $= ((\textbf{106.442} - \textbf{2945.515}/\textbf{29}) / (\textbf{29}-1))^{1/2}$ $= \textbf{0.417}$	Compute sd on a natural log scale.
4	$\text{alpha} = \min[(1-.95^{1/\textbf{K}})^{1/2}, .01]$ $= \min[(1-.95^{1/\textbf{96}})^{1/2}, .01]$ $= \textbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 resample.
5	$PL = \exp[\bar{\textbf{Y}} + \textbf{t}\textbf{S}_\textbf{Y}(1+1/\textbf{N})^{1/2}]$ $= \exp[\textbf{1.871} + (\textbf{2.467}*\textbf{0.417})(1+1/\textbf{29})^{1/2}]$ $= \textbf{18.507}$	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Thallium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **3.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Total organic halogen (mg/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.05**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Total suspended solids (mg/L)
Lognormal Prediction Limit

Step	Equation	Description
1	$Y = \log_e(X)$	Transform to natural logarithmic scale.
2	$\bar{Y}_1 = \mathbf{sum[Y_1] / N_1}$ $= \mathbf{105.674 / 29}$ $= \mathbf{3.644}$	Compute mean of N_1 detected log transformed measurements.
3	$S_{Y_1} = ((\mathbf{sum[Y_1{}^2]-sum[Y_1]^2/N_1}) / (\mathbf{N_1}-1))^{½}$ $= ((\mathbf{440.475-11167.089/29}) / (\mathbf{29}-1))^{½}$ $= \mathbf{1.407}$	Compute sd of N_1 detected log transformed measurements.
4	$\bar{Y} = (1 - \mathbf{N_0/N})\ \mathbf{\bar{Y}_1}$ $= (1 - \mathbf{1/30})\ \mathbf{3.644}$ $= \mathbf{3.522}$	Use Aitchison's method to adjust mean for presence of nondetects (log scale).
5	$S_Y = [(1 - \mathbf{N_0/N}) * \mathbf{S_{Y_1}}^2 + (\mathbf{N_0/N}) (1 - (\mathbf{N_0}-1)/(\mathbf{N}-1))\ \mathbf{\bar{Y}_1}^2]^{½}$ $= [(1 - \mathbf{1/30}) * \mathbf{1.407}^2 + (\mathbf{1/30}) (1 - (\mathbf{1}-1)/(\mathbf{30}-1))\ \mathbf{3.644}^2]^{½}$ $= \mathbf{1.535}$	Use Aitchison's method to adjust sd for presence of nondetects (log scale).
6	$alpha = \min[(1-.95^{1/\mathbf{K}})^{½}, .01]$ $= \min[(1-.95^{1/\mathbf{96}})^{½}, .01]$ $= \mathbf{0.01}$	Adjusted per comparison false positive rate. Pass initial or 1 resample.
7	$PL = \exp[\mathbf{\bar{Y}} + \mathbf{tS_Y}(1+1/\mathbf{N})^{½}]$ $= \exp[\mathbf{3.522} + (\mathbf{2.462*1.535})(1+1/\mathbf{30})^{½}]$ $= \mathbf{1576.553}$	One-sided lognormal prediction limit (t is Student's t on N-1 degrees of freedom and 1-alpha confidence level).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Vanadium, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.92**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 1 - Upgradient vs. Downgradient Comparisons
Zinc, total (ug/L)
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **31.4**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Attachment F

Summary Tables and Graphs for the Intrawell Comparisons
Second Semi-Annual Monitoring Event in 2024

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Aluminum, total	ug/L	MW-1	8	7	15	295.3625	422.9416	100.0000	100.0000	295.3625	295.3625	3044.4831	normal		
Aluminum, total	ug/L	MW-2	8	7	15	192.5375	223.5234	100.0000	100.0000	192.5375	192.5375	1645.4399	normal		
Aluminum, total	ug/L	MW-3	8	6	15	210.2125	172.5289	100.0000	100.0000	210.2125	210.2125	1331.6502	normal		
Aluminum, total	ug/L	MW-4	7	7	15	77.5571	31.4196	100.0000	100.0000	77.5571	77.5571	281.7844	normal		
Aluminum, total	ug/L	Sump Grab	8	1	9	101.5000	29.7706	107.0000	100.0000		101.5000	295.0086	normal		
Ammonia nitrogen	mg/L	MW-1	8	7	15			0.1000	0.1000			0.1300	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-2	8	7	15			0.1000	0.1000			0.2300	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-3	8	7	15			0.1000	0.1000			0.2600	nonpar	.99	**
Ammonia nitrogen	mg/L	MW-4	8	7	15			0.1000	0.1000			0.1200	nonpar	.99	**
Ammonia nitrogen	mg/L	Sump Grab	8	1	9			0.1000	0.1000			0.2500	nonpar	.99	**
Antimony, total	ug/L	MW-1	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-2	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-3	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	MW-4	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Antimony, total	ug/L	Sump Grab	8	1	9			5.0000	5.0000			5.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-1	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-2	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-3	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	MW-4	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Arsenic, total	ug/L	Sump Grab	8	1	9			10.0000	10.0000			10.0000	nonpar	.99	**
Barium, total	ug/L	MW-1	8	7	15	60.2750	16.6684	46.4000	36.1000	60.2750	60.2750	168.6198	normal		
Barium, total	ug/L	MW-2	8	7	15	72.9625	32.1116	57.6000	61.1000	72.9625	72.9625	281.6881	normal		
Barium, total	ug/L	MW-3	8	7	15	30.7750	6.6257	31.7000	27.6000	40.3717	30.7750	73.8417	normal		
Barium, total	ug/L	MW-4	8	7	15	43.3000	4.9742	42.2000	38.4000	43.3000	43.3000	75.6324	normal		
Barium, total	ug/L	Sump Grab	8	1	9	108.3625	17.9467	119.0000	127.0000		109.0533	225.0163	normal		
Beryllium, total	ug/L	MW-1	8	7	15			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-2	8	7	15			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-3	8	7	15			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	MW-4	8	7	15			1.0000	1.0000			1.0000	nonpar	.99	**
Beryllium, total	ug/L	Sump Grab	8	1	9			1.0000	1.0000			1.0000	nonpar	.99	**
Boron, total	ug/L	MW-1	8	7	15	21.7625	3.8000	20.0000	20.0000	21.7625	21.7625	46.4623	normal		
Boron, total	ug/L	MW-2	8	7	15	30.3750	13.7966	20.0000	20.0000	30.3750	30.3750	120.0526	normal		
Boron, total	ug/L	MW-3	8	7	15			20.0000	20.0000			20.0000	nonpar	.99	**
Boron, total	ug/L	MW-4	7	7	15	21.7143	4.1115	20.0000	20.0000	21.7143	21.7143	48.4393	normal		
Boron, total	ug/L	Sump Grab	8	1	9	53.0375	21.0596	83.2000	90.0000		68.9404	189.9247	normal		
Cadmium, total	ug/L	MW-1	8	7	15			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-2	8	7	15			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-3	8	7	15			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	MW-4	8	7	15			0.4000	0.4000			0.4000	nonpar	.99	**
Cadmium, total	ug/L	Sump Grab	8	1	9			0.4000	0.4000			0.4000	nonpar	.99	**
Chemical oxygen demand	mg/L	MW-1	8	7	15	8.6250	2.8253	10.0000	10.0000	8.6250	8.6250	26.9892	normal		
Chemical oxygen demand	mg/L	MW-2	8	7	15	8.3750	3.5431	10.0000	10.0000	8.3750	8.3750	31.4052	normal		
Chemical oxygen demand	mg/L	MW-3	8	7	15	9.1250	3.0443	10.0000	10.0000	9.1250	9.1250	28.9131	normal		
Chemical oxygen demand	mg/L	MW-4	8	7	15	10.6250	4.3404	10.0000	10.0000	10.6250	10.6250	38.8378	normal		
Chemical oxygen demand	mg/L	Sump Grab	8	1	9	7.2500	0.7071	7.0000	10.0000		7.2500	11.8462	normal		
Chloride	mg/L	MW-1	8	7	15	5.8200	2.4947	13.9000	3.4200	11.4053	6.5106	22.0355	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
*   - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Chloride	mg/L	MW-2	8	7	15	29.1675	28.1862	3.5400	2.9100	29.1675	29.1675	212.3775	normal		
Chloride	mg/L	MW-3	8	7	15	1.3752	1.3315	0.6070	0.6080	1.3752	1.3752	10.0303	normal		
Chloride	mg/L	MW-4	8	7	15	10.7650	11.4330	2.9100	2.6000	10.7650	10.7650	85.0797	normal		
Chloride	mg/L	Sump Grab	8	1	9	21.6750	7.9688	18.2000	23.7000		21.6750	73.4724	normal		
Chromium, total	ug/L	MW-1	8	7	15	5.2988	4.0865	4.3700	2.8800	5.2988	5.2988	31.8611	normal		
Chromium, total	ug/L	MW-2	6	7	15	6.2000	1.2036	1.4900	7.1900	6.2000	6.2000	14.0234	normal		
Chromium, total	ug/L	MW-3	8	7	15	7.3575	6.3409	7.7000	5.9000	7.3575	7.3575	48.5731	normal		
Chromium, total	ug/L	MW-4	8	7	15	7.5900	4.6921	7.2000	5.6000	7.5900	7.5900	38.0883	normal		
Chromium, total	ug/L	Sump Grab	8	1	9			1.0000	1.0000			1.5000	nonpar	.99	**
Cobalt, total	ug/L	MW-1	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-2	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-3	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	MW-4	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Cobalt, total	ug/L	Sump Grab	8	1	9			2.0000	2.0000			2.0000	nonpar	.99	**
Copper, total	ug/L	MW-1	8	7	15	3.9662	1.8957	3.0000	3.0000	3.9662	3.9662	16.2886	normal		
Copper, total	ug/L	MW-2	8	7	15	2.6725	1.1713	3.0000	3.0000	2.6725	2.6725	10.2858	normal		
Copper, total	ug/L	MW-3	8	7	15	7.3413	10.3878	3.0000	3.0000	7.3413	7.3413	74.8616	normal		
Copper, total	ug/L	MW-4	8	7	15	3.0838	2.0070	3.0000	7.6800	3.0838	5.6730	16.1294	normal		
Copper, total	ug/L	Sump Grab	8	1	9	6.8725	4.8530	15.1000	3.0000		6.8725	38.4171	normal		
Fluoride	mg/L	MW-1	8	7	15	0.1406	0.0651	0.1050	0.1360	0.1406	0.1406	0.5635	normal		
Fluoride	mg/L	MW-2	8	7	15	0.1781	0.1119	0.1280	0.1290	0.1781	0.1781	0.9055	normal		
Fluoride	mg/L	MW-3	8	7	15	0.1205	0.0431	0.1000	0.1000	0.1205	0.1205	0.4003	normal		
Fluoride	mg/L	MW-4	8	7	15	0.1548	0.0681	0.1050	0.1490	0.1548	0.1548	0.5972	normal		
Fluoride	mg/L	Sump Grab	8	1	9	0.1478	0.0182	0.1290	0.1470		0.1478	0.2661	normal		
Formaldehyde	ug/L	MW-1	8	7	15			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-2	8	7	15			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-3	8	7	15			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	MW-4	8	7	15			100.0000	100.0000			100.0000	nonpar	.99	**
Formaldehyde	ug/L	Sump Grab	8	1	9			100.0000	100.0000			100.0000	nonpar	.99	**
Iron, total	ug/L	MW-1	8	7	15	232.1375	256.1545	38.2000	24.4000	232.1375	232.1375	1897.1415	normal		
Iron, total	ug/L	MW-2	8	7	15	414.6125	502.0142	10.0000	37.1000	414.6125	414.6125	3677.7047	normal		
Iron, total	ug/L	MW-3	8	6	15	485.8500	557.5418	41.7000	43.0000	485.8500	485.8500	4109.8717	normal		
Iron, total	ug/L	MW-4	8	7	15	273.4000	351.1964	38.1000	23.8000	273.4000	273.4000	2556.1763	normal		
Iron, total	ug/L	Sump Grab	8	1	9	451.2125	1131.6694	48.8000	21.7000		451.2125	7807.0639	normal		
Lead, total	ug/L	MW-1	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Lead, total	ug/L	MW-2	8	7	15			2.0000	2.0000			2.2100	nonpar	.99	**
Lead, total	ug/L	MW-3	8	7	15			2.0000	2.0000			2.4100	nonpar	.99	**
Lead, total	ug/L	MW-4	8	7	15			2.0000	2.0000			3.0100	nonpar	.99	**
Lead, total	ug/L	Sump Grab	8	1	9			2.0000	2.0000			2.0000	nonpar	.99	**
Magnesium, total	mg/L	MW-1	8	7	15	39.3125	9.1299	38.4000	48.7000	39.3125	39.5701	98.6570	normal		
Magnesium, total	mg/L	MW-2	8	7	15	60.7625	12.3983	54.2000	46.5000	60.7625	60.7625	141.3512	normal		
Magnesium, total	mg/L	MW-3	8	7	15	26.5625	4.8447	25.8000	21.3000	26.7264	26.5625	58.0531	normal		
Magnesium, total	mg/L	MW-4	8	7	15	51.7250	9.0714	49.1000	40.6000	51.7250	51.7250	110.6892	normal		
Magnesium, total	mg/L	Sump Grab	8	1	9	38.3625	3.9935	42.2000	37.4000		38.3625	64.3205	normal		
Manganese, total	ug/L	MW-1	8	7	15	31.3875	21.5201	20.0000	20.0000	31.3875	31.3875	171.2683	normal		
Manganese, total	ug/L	MW-2	8	7	15	67.3500	34.2578	20.0000	20.0000	67.3500	67.3500	290.0255	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Manganese, total	ug/L	MW-3	8	6	15	38.1250	27.8922	20.0000	20.0000	38.1250	38.1250	219.4245	normal		
Manganese, total	ug/L	MW-4	7	7	15	21.3429	2.1801	20.0000	20.0000	21.3429	21.3429	35.5135	normal		
Manganese, total	ug/L	Sump Grab	8	1	9	30.5625	29.2739	20.0000	20.0000		30.5625	220.8427	normal		
Mercury, total	ug/L	MW-1	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-2	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-3	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	MW-4	8	7	15			2.0000	2.0000			2.0000	nonpar	.99	**
Mercury, total	ug/L	Sump Grab	8	1	9			2.0000	2.0000			2.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-1	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-2	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-3	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	MW-4	8	7	15			10.0000	10.0000			10.0000	nonpar	.99	**
Methyl ethyl ketone	ug/L	Sump Grab	7	1	8								nonpar *		**
Molybdenum, total	ug/L	MW-1	8	7	15	2.0888	0.1795	10.0000	10.0000	2.0888	2.0888	3.2554	normal		
Molybdenum, total	ug/L	MW-2	8	7	15	3.2550	2.0221	10.0000	10.0000	3.2550	3.2550	16.3984	normal		
Molybdenum, total	ug/L	MW-3	8	7	15	2.3863	0.7607	10.0000	10.0000	2.3863	2.3863	7.3310	normal		
Molybdenum, total	ug/L	MW-4	8	7	15	2.3800	0.7205	10.0000	10.0000	2.3800	2.3800	7.0632	normal		
Molybdenum, total	ug/L	Sump Grab	8	1	9			10.0000	10.0000			10.0000	nonpar	.99	**
Nickel, total	ug/L	MW-1	8	7	15	1.3188	0.7304	1.0000	1.0000	1.3188	1.3188	6.0664	normal		
Nickel, total	ug/L	MW-2	6	7	15	1.0950	0.2004	1.0000	1.0000	1.0950	1.0950	2.3974	normal		
Nickel, total	ug/L	MW-3	8	7	15	1.6000	0.9365	1.0000	1.0000	1.6000	1.6000	7.6873	normal		
Nickel, total	ug/L	MW-4	8	7	15	1.2488	0.5285	1.0000	1.0000	1.2488	1.2488	4.6843	normal		
Nickel, total	ug/L	Sump Grab	8	1	9			1.0000	1.0000			1.0000	nonpar	.99	**
Phenols	ug/L	MW-1	8	7	15	9.8750	7.7724	10.0000	10.0000	9.8750	9.8750	60.3958	normal		
Phenols	ug/L	MW-2	8	7	15	7.5000	4.7208	10.0000	10.0000	7.5000	7.5000	38.1850	normal		
Phenols	ug/L	MW-3	8	7	15	8.0000	6.1644	10.0000	10.0000	8.0000	8.0000	48.0687	normal		
Phenols	ug/L	MW-4	8	7	15	8.3125	8.0487	10.0000	17.0000	8.3125	8.9513	60.6289	normal		
Phenols	ug/L	Sump Grab	8	1	9	5.6250	1.4079	5.0000	10.0000		5.6250	14.7763	normal		
Selenium, total	ug/L	MW-1	8	7	15	5.5413	0.9765	5.0000	5.0000	5.5413	5.5413	11.8882	normal		
Selenium, total	ug/L	MW-2	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	MW-3	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	MW-4	8	7	15			5.0000	5.0000			5.0000	nonpar	.99	**
Selenium, total	ug/L	Sump Grab	8	1	9			5.0000	5.0000			5.0000	nonpar	.99	**
Silver, total	ug/L	MW-1	8	7	15			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-2	8	7	15			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-3	8	7	15			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	MW-4	8	7	15			0.5000	0.5000			0.5000	nonpar	.99	**
Silver, total	ug/L	Sump Grab	8	1	9			0.5000	0.5000			0.5000	nonpar	.99	**
Sulfate	mg/L	MW-1	8	7	15	28.0150	25.1579	19.1000	8.4700	28.0150	28.0150	191.5417	normal		
Sulfate	mg/L	MW-2	8	7	15	27.0000	4.5416	27.0000	25.2000	27.0000	27.0000	56.5201	normal		
Sulfate	mg/L	MW-3	8	7	15	4.5625	0.4935	5.1600	5.5200	5.3625	5.8265	7.7702	normal		
Sulfate	mg/L	MW-4	8	7	15	9.9363	6.6715	8.8200	7.9300	9.9363	9.9363	53.3012	normal		
Sulfate	mg/L	Sump Grab	8	1	9	65.0375	38.7615	75.2000	100.0000		65.0375	316.9875	normal		
Thallium, total	ug/L	MW-1	8	7	15			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	MW-2	8	7	15			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	MW-3	8	7	15			3.0000	3.0000			2.0000	nonpar	.99	**

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Thallium, total	ug/L	MW-4	8	7	15			3.0000	3.0000			2.0000	nonpar	.99	**
Thallium, total	ug/L	Sump Grab	8	1	9			3.0000	3.0000			3.0000	nonpar	.99	**
Total organic halogen	mg/L	MW-1	7	7	15	0.0066	0.0022	0.0100	0.0100	0.0066	0.0066	0.0210	normal		
Total organic halogen	mg/L	MW-2	8	7	15	0.0289	0.0325	0.0100	0.0100	0.0289	0.0289	0.2401	normal		
Total organic halogen	mg/L	MW-3	8	7	15	0.0161	0.0139	0.0100	0.0190	0.0161	0.0161	0.1067	normal		
Total organic halogen	mg/L	MW-4	6	7	15	0.0142	0.0048	0.0100	0.0140	0.0142	0.0142	0.0453	normal		
Total organic halogen	mg/L	Sump Grab	7	1	8	0.0161	0.0113	0.0100	0.0710		0.0597	0.0899	normal		
Total suspended solids	mg/L	MW-1	8	7	15	31.1250	21.1284	5.0000	2.0000	31.1250	31.1250	168.4598	normal		
Total suspended solids	mg/L	MW-2	8	7	15	53.6250	47.6443	1.0000	1.0000	53.6250	53.6250	363.3131	normal		
Total suspended solids	mg/L	MW-3	8	7	15	83.1250	43.1126	7.0000	2.0000	83.1250	83.1250	363.3569	normal		
Total suspended solids	mg/L	MW-4	6	7	15	26.6667	11.3078	3.0000	1.0000	26.6667	26.6667	100.1675	normal		
Total suspended solids	mg/L	Sump Grab	8	1	9	5.1250	2.6959	3.0000	3.0000		5.1250	22.6483	normal		
Vanadium, total	ug/L	MW-1	8	7	15	1.2188	0.4051	1.0000	1.0000	1.2188	1.2188	3.8516	normal		
Vanadium, total	ug/L	MW-2	8	7	15	1.0813	0.1524	1.0000	1.0000	1.0813	1.0813	2.0716	normal		
Vanadium, total	ug/L	MW-3	8	7	15			1.0000	1.0000			1.4100	nonpar	.99	**
Vanadium, total	ug/L	MW-4	8	7	15			1.0000	1.0000			1.2600	nonpar	.99	**
Vanadium, total	ug/L	Sump Grab	8	1	9			1.0000	1.0000			1.7100	nonpar	.99	**
Zinc, total	ug/L	MW-1	8	7	15	14.3588	9.9482	9.6400	5.6800	14.3588	14.3588	79.0220	normal		
Zinc, total	ug/L	MW-2	8	7	15	7.4325	3.2733	5.0000	6.4100	7.4325	7.4325	28.7091	normal		
Zinc, total	ug/L	MW-3	8	7	15	11.2038	6.8501	9.1500	6.9900	11.2038	11.2038	55.7291	normal		
Zinc, total	ug/L	MW-4	8	7	15	14.4125	8.7494	9.8600	9.8200	14.4125	14.4125	71.2839	normal		
Zinc, total	ug/L	Sump Grab	8	1	9	15.3375	16.7809	53.8000	5.0000		15.3375	124.4130	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one of two verification resamples (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 4

Dixon's Test Outliers
1% Significance Level

Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Aluminum, total	ug/L	MW-4	11/30/2018	755.0000		08/23/2018-04/27/2021	8	0.6808
Boron, total	ug/L	MW-4	08/28/2018	90.1000		08/28/2018-04/27/2021	8	0.6808
Chromium, total	ug/L	MW-2	08/23/2018	1.0000	< 1.0000	08/23/2018-04/27/2021	8	0.6371
Chromium, total	ug/L	MW-2	04/01/2019	1.0000	< 1.0000	08/23/2018-04/27/2021	8	0.6371
Manganese, total	ug/L	MW-4	11/30/2018	100.0000		08/28/2018-04/27/2021	8	0.6808
Nickel, total	ug/L	MW-2	01/10/2019	3.2200		08/23/2018-04/27/2021	8	0.6371
Nickel, total	ug/L	MW-2	04/27/2021	3.3500		08/23/2018-04/27/2021	8	0.6371
Total organic halogen	mg/L	MW-1	09/17/2019	0.0910		08/23/2018-04/27/2021	8	0.6808
Total suspended solids	mg/L	MW-4	08/28/2018	500.0000		08/28/2018-04/27/2021	8	0.6371
Total suspended solids	mg/L	MW-4	11/30/2018	237.0000		08/28/2018-04/27/2021	8	0.6371

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

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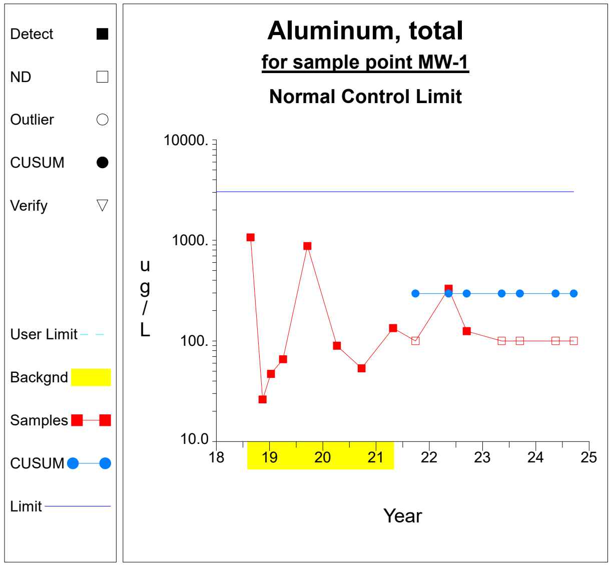
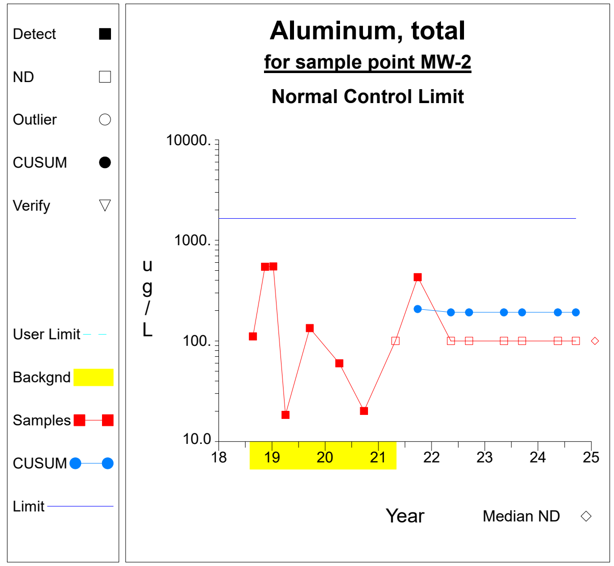
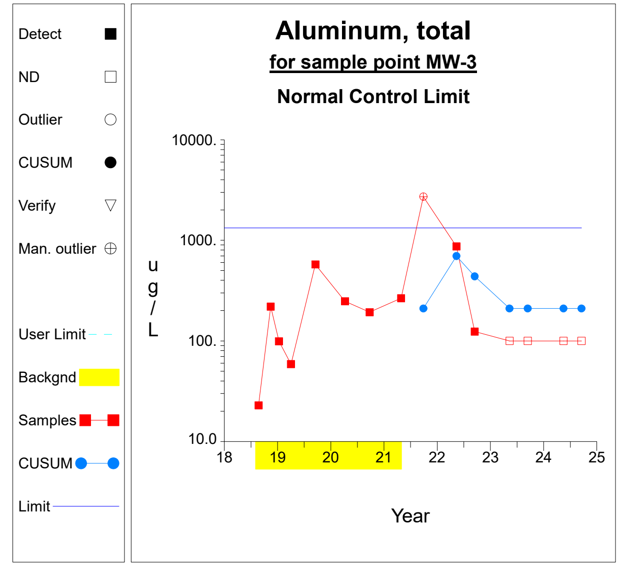


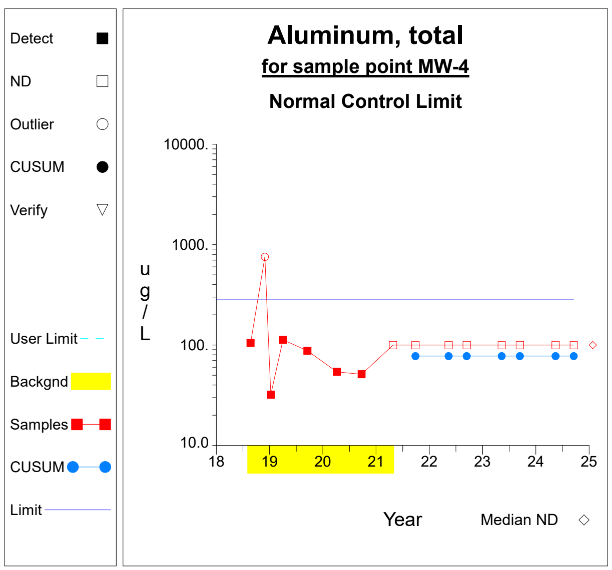
Graph 1



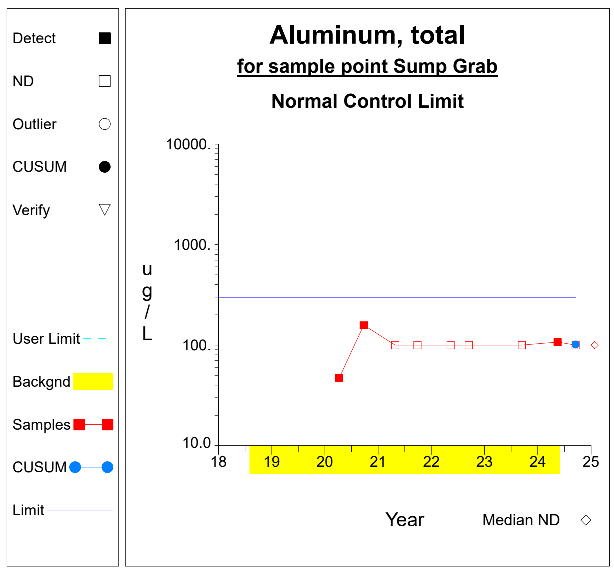
Graph 2



Graph 3



Graph 4



Graph 5

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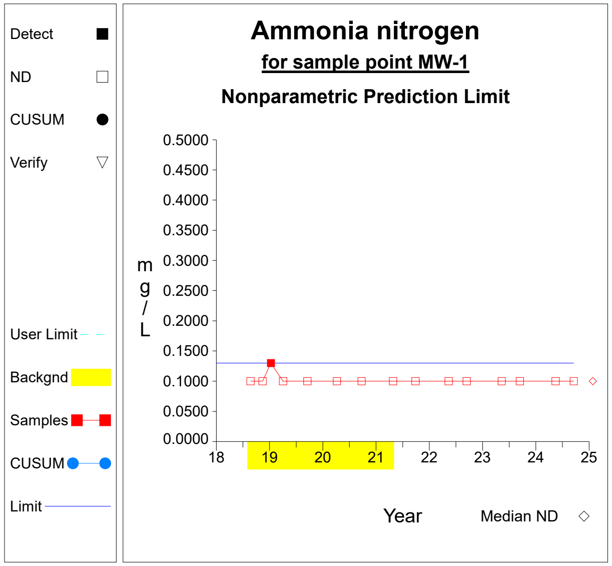
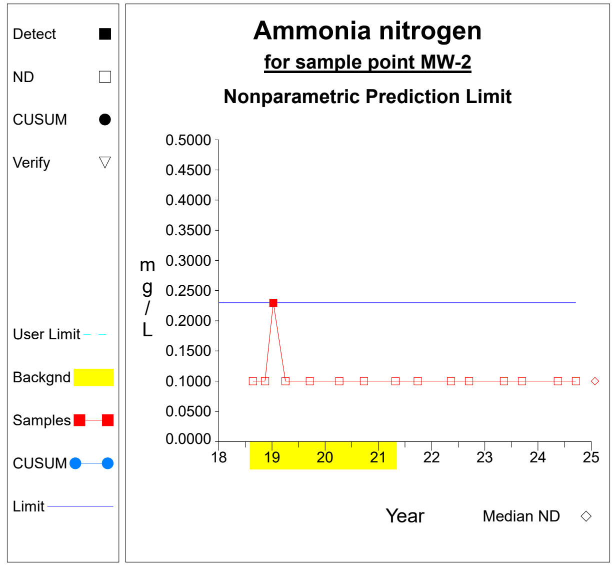
Intra-Well Control Charts / Prediction Limits



Graph 6



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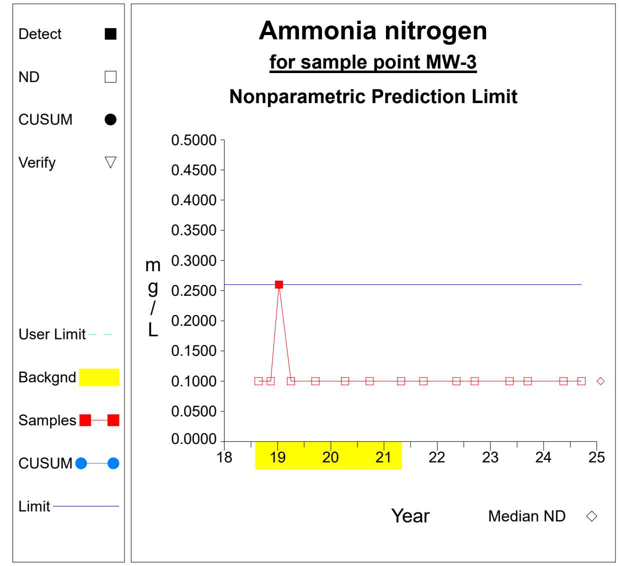

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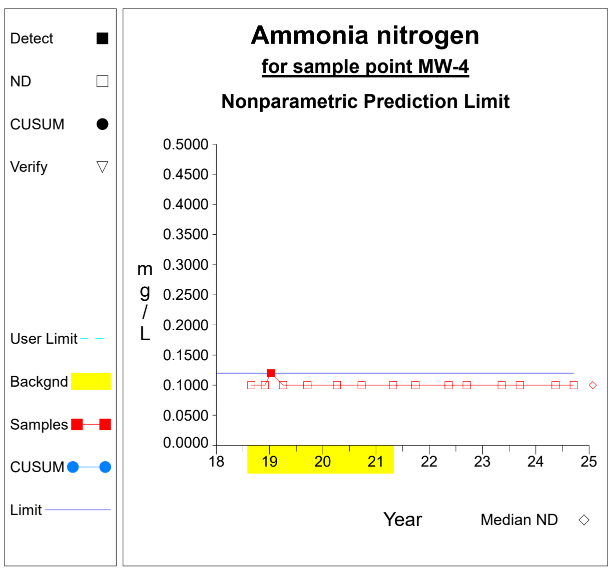

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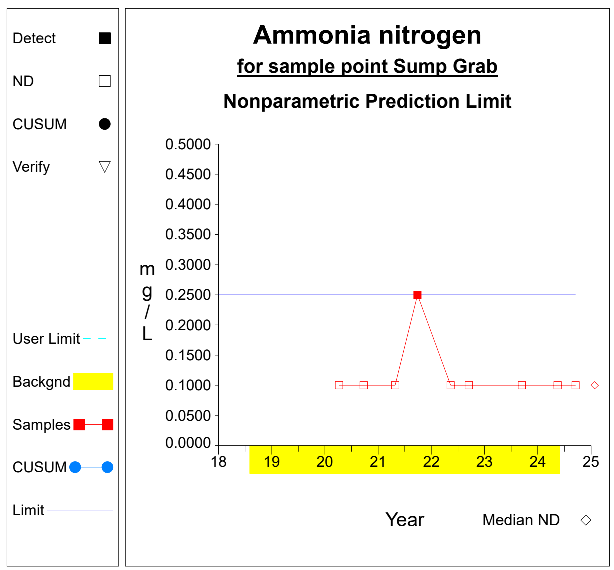

Graph 10

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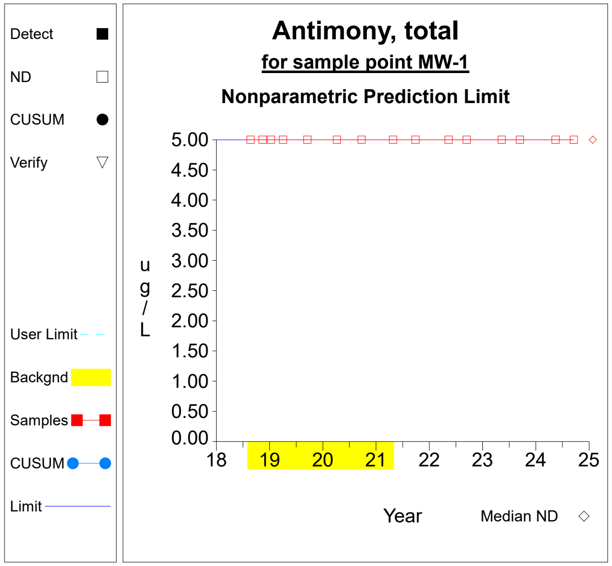
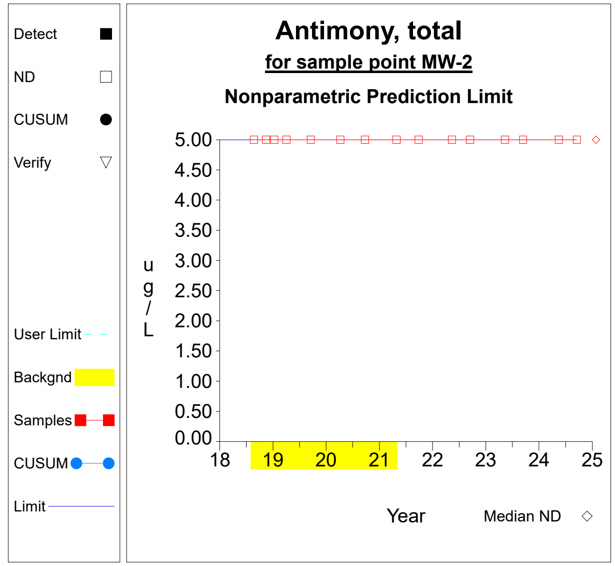
Intra-Well Control Charts / Prediction Limits



Graph 11



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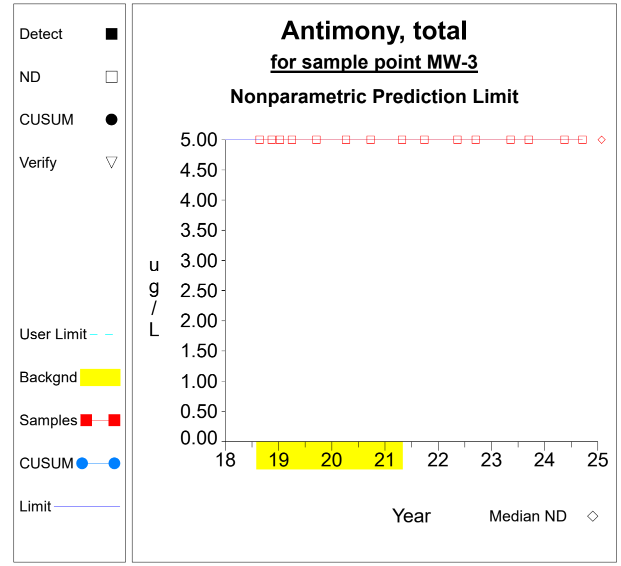

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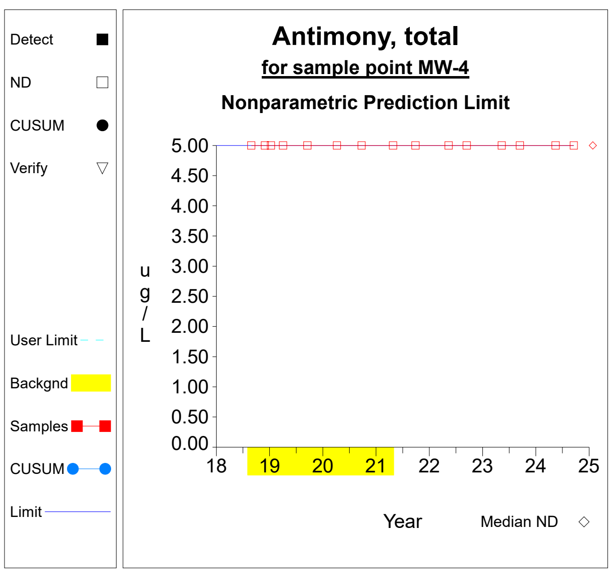
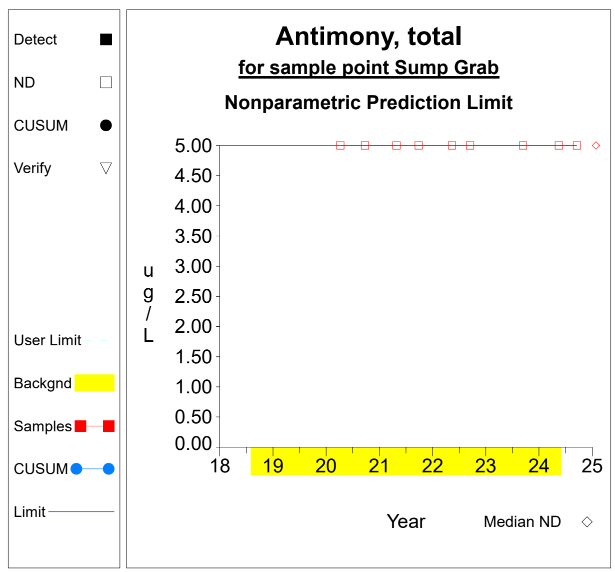


Graph 14



Graph 15

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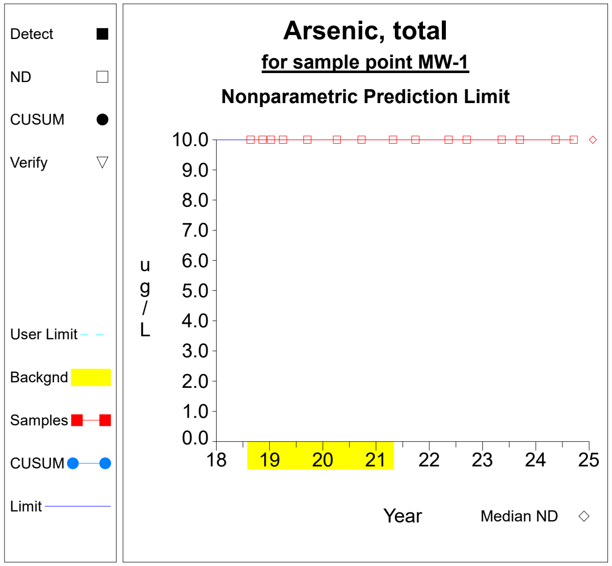

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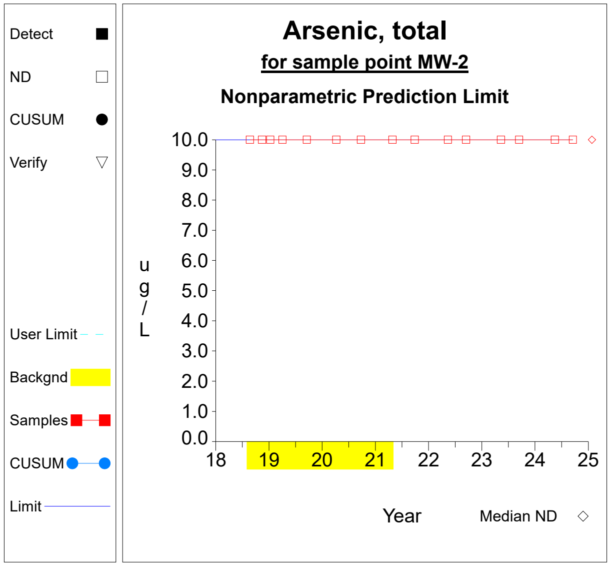

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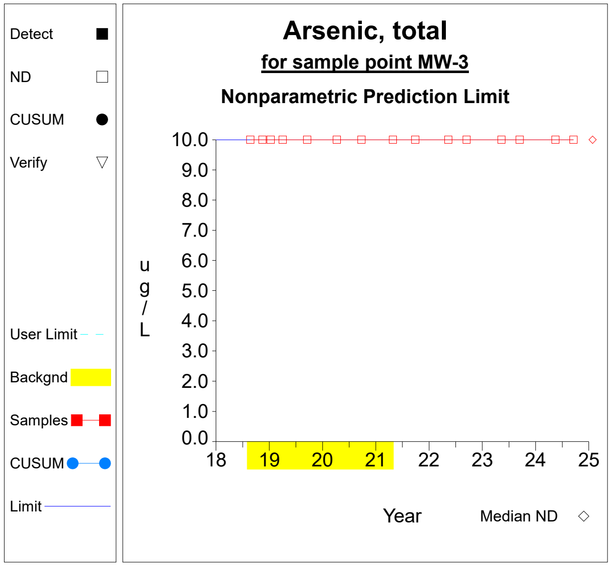

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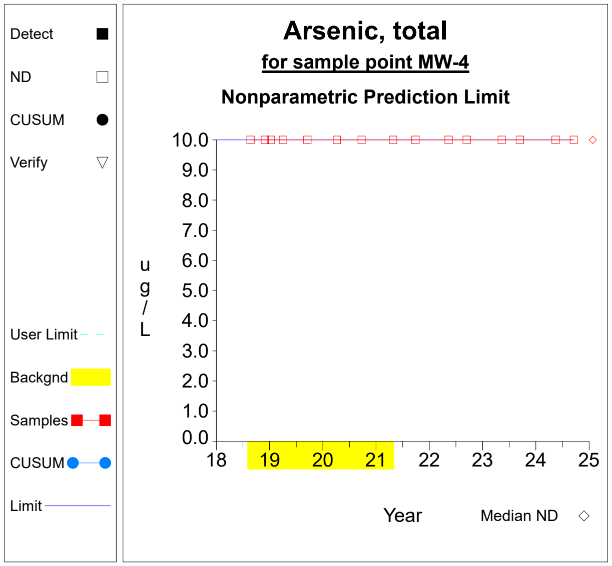

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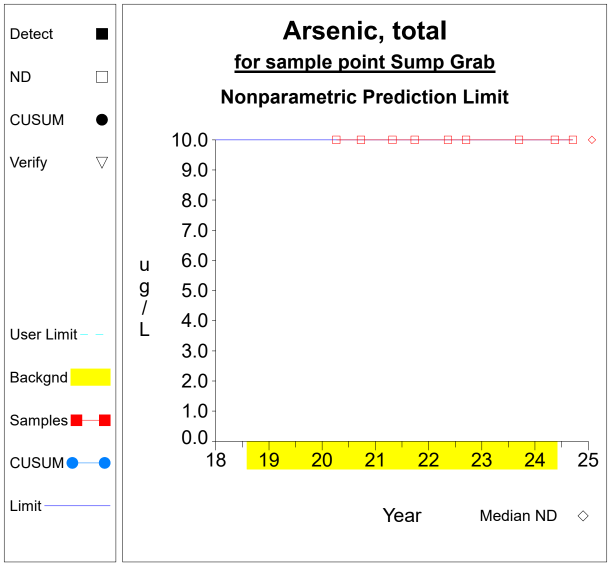

Graph 20

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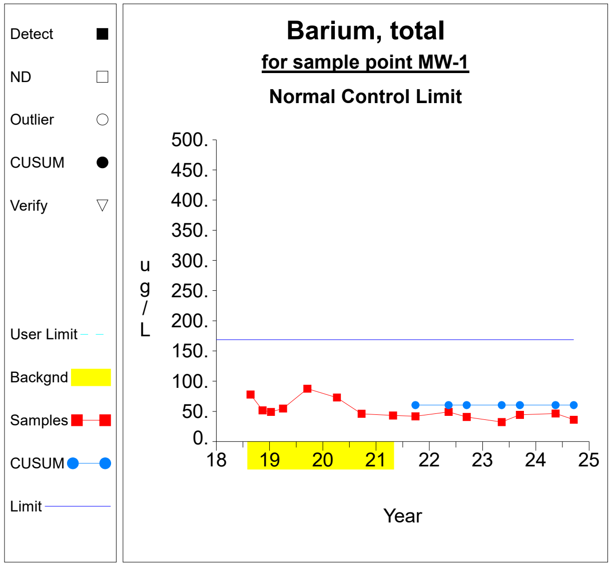
Intra-Well Control Charts / Prediction Limits



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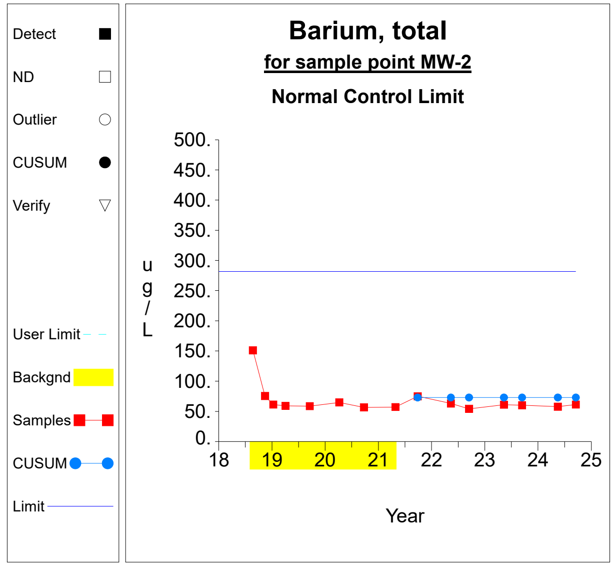

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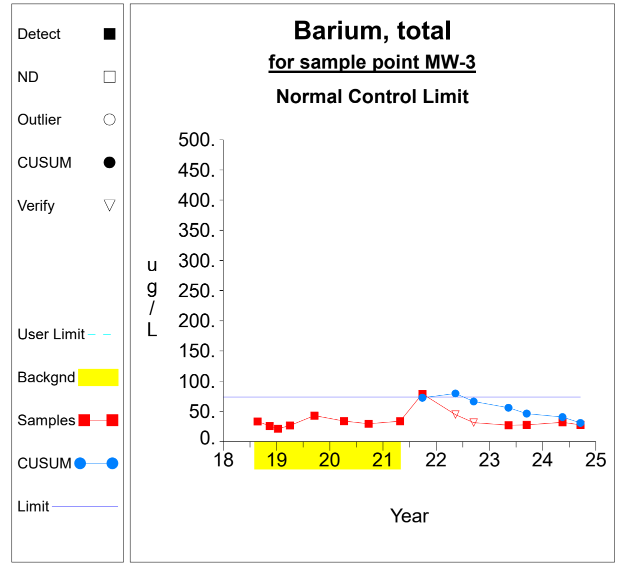

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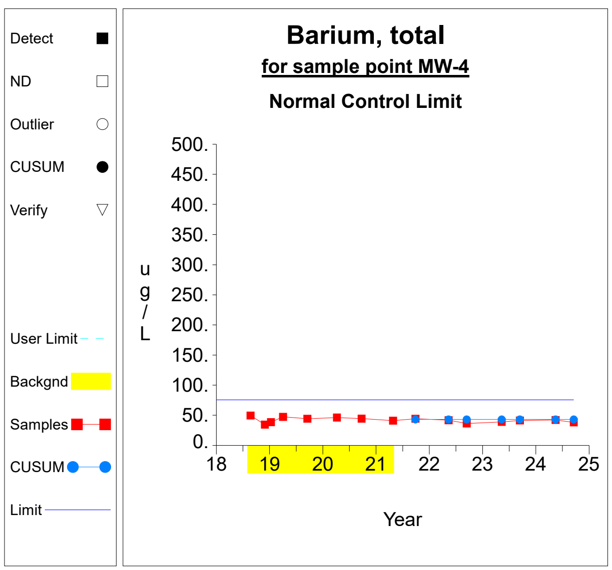

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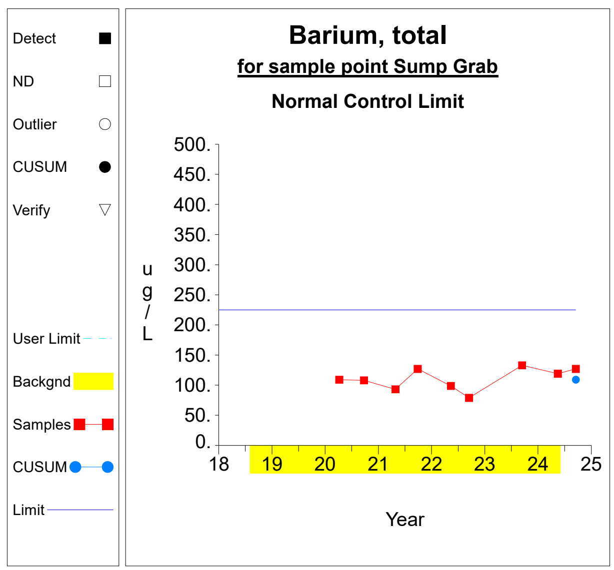

Graph 25

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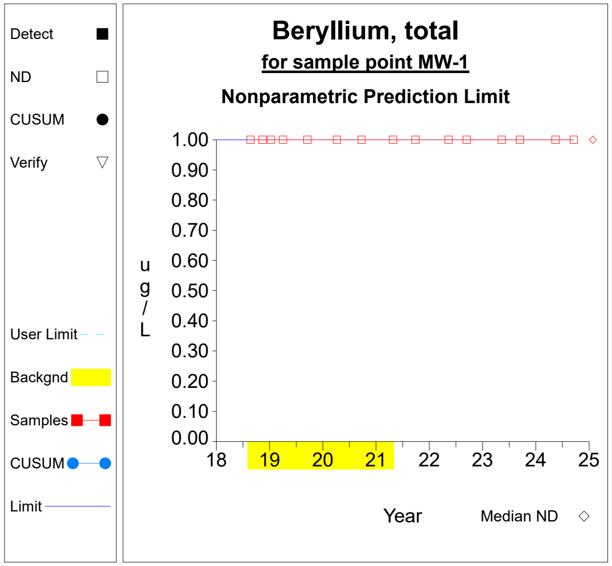
Intra-Well Control Charts / Prediction Limits



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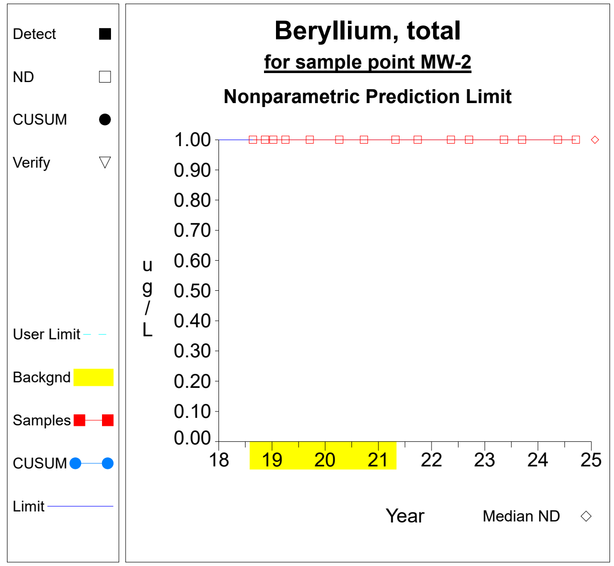

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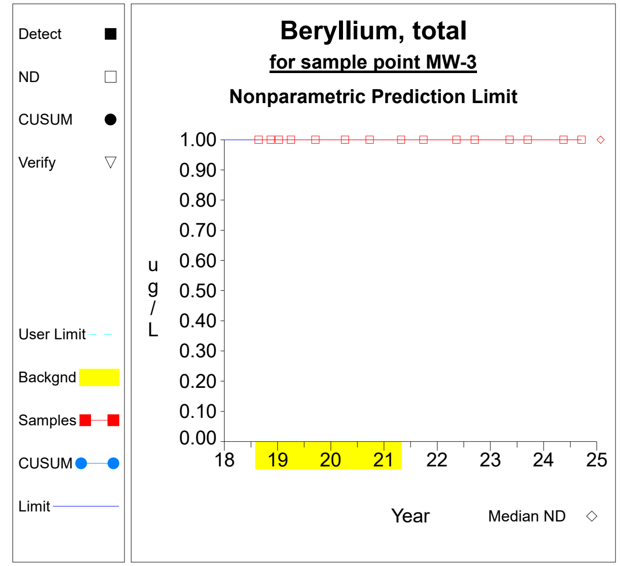

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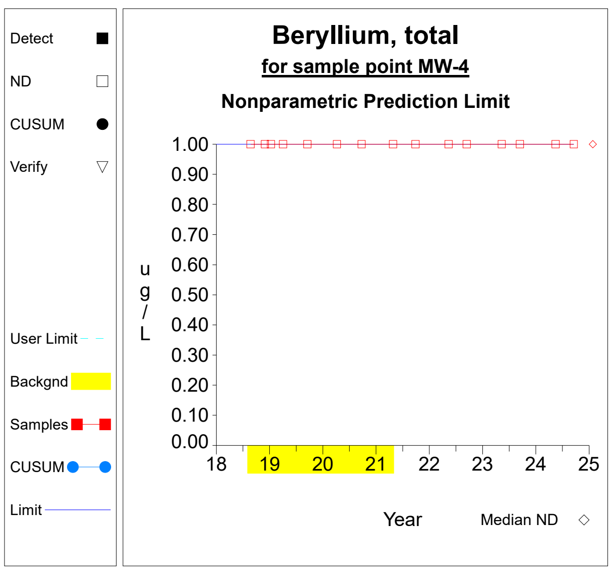

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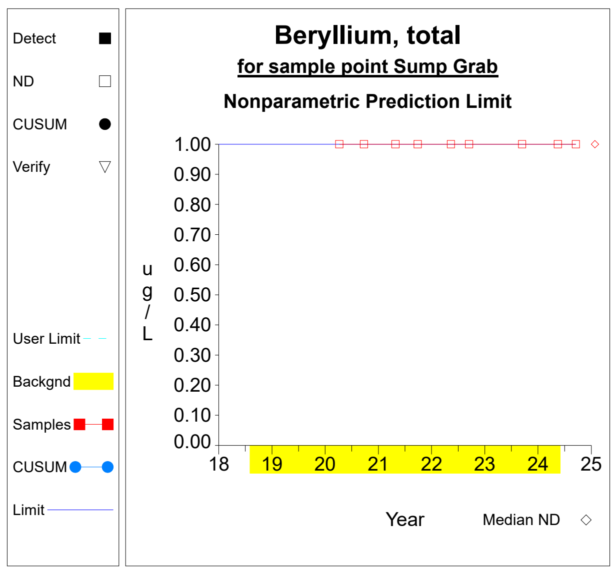

Graph 30

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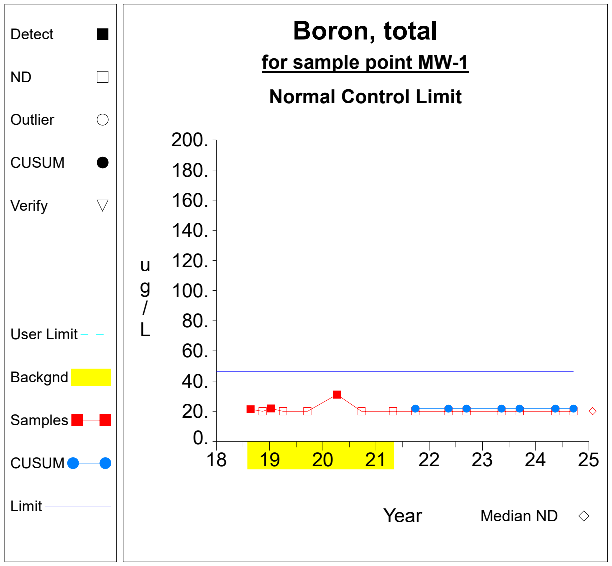
Intra-Well Control Charts / Prediction Limits



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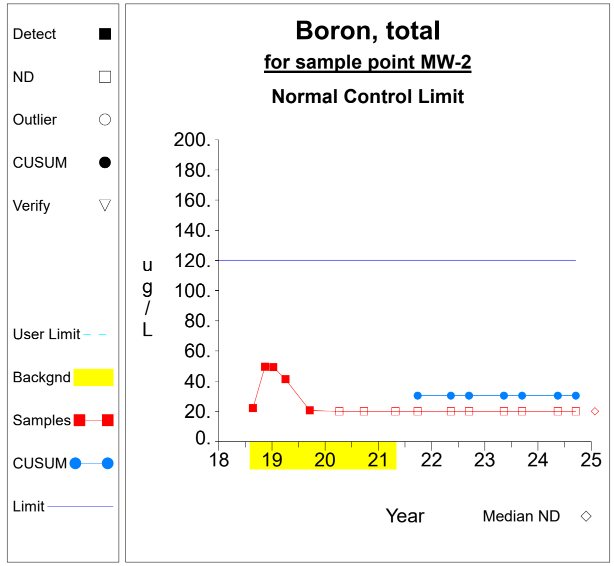

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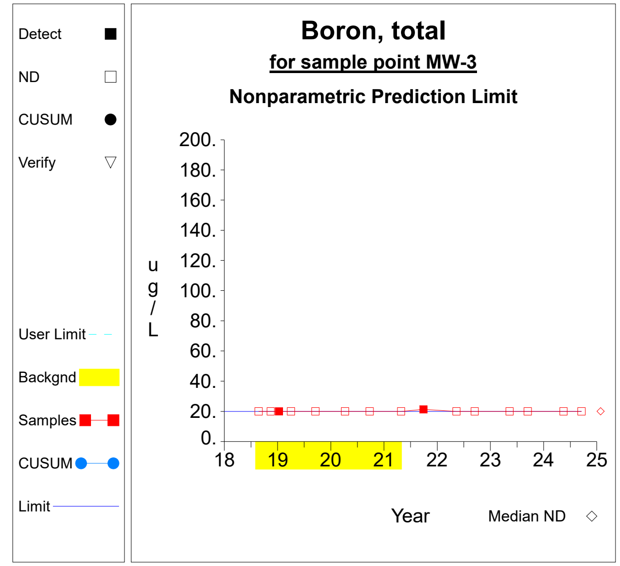

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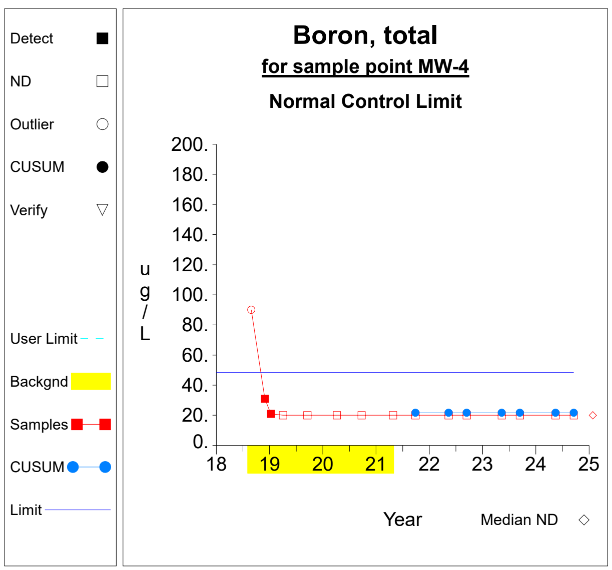

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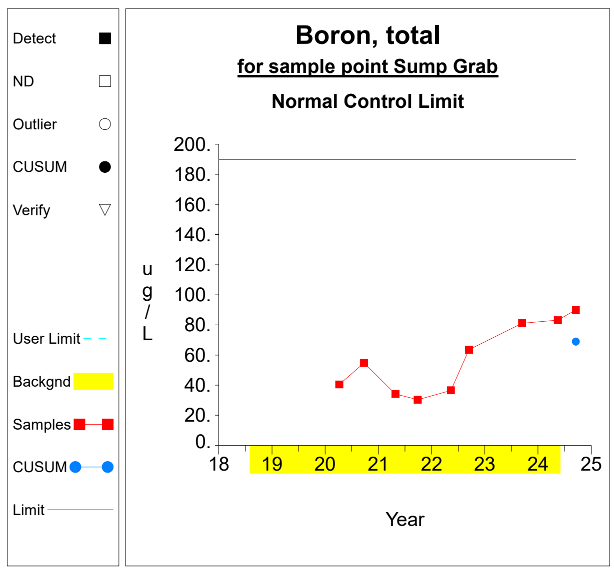

Graph 35

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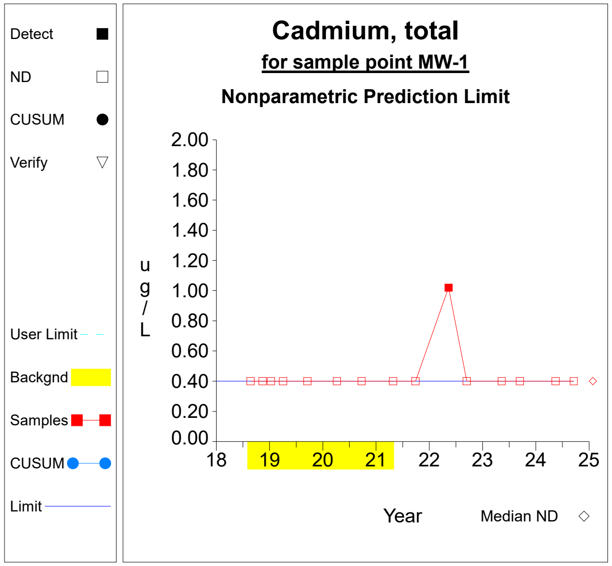
Intra-Well Control Charts / Prediction Limits



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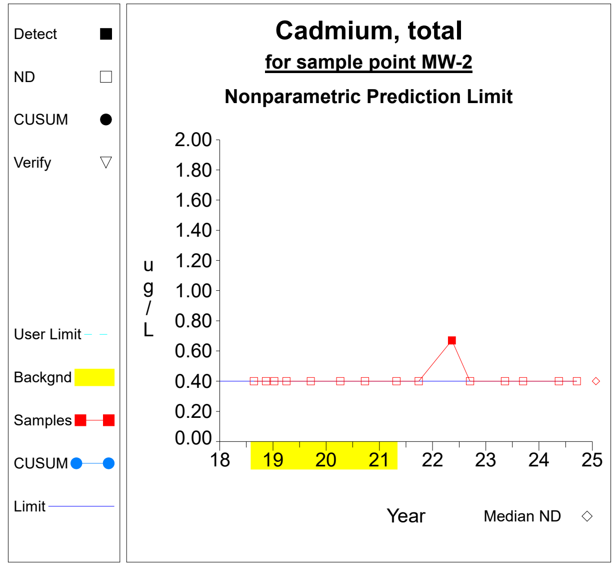

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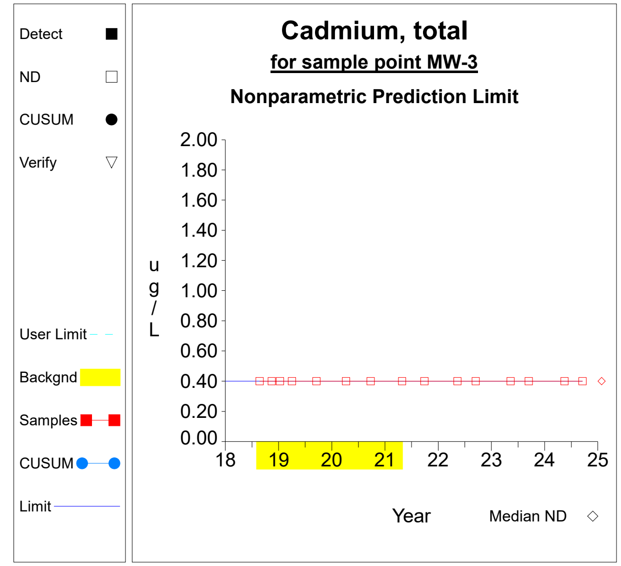

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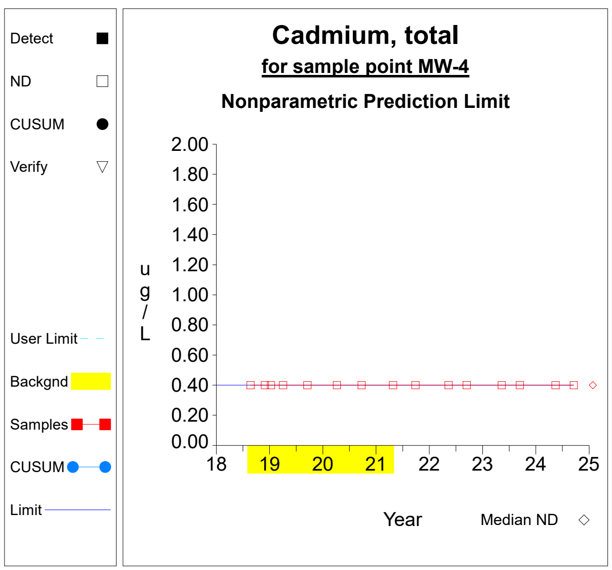
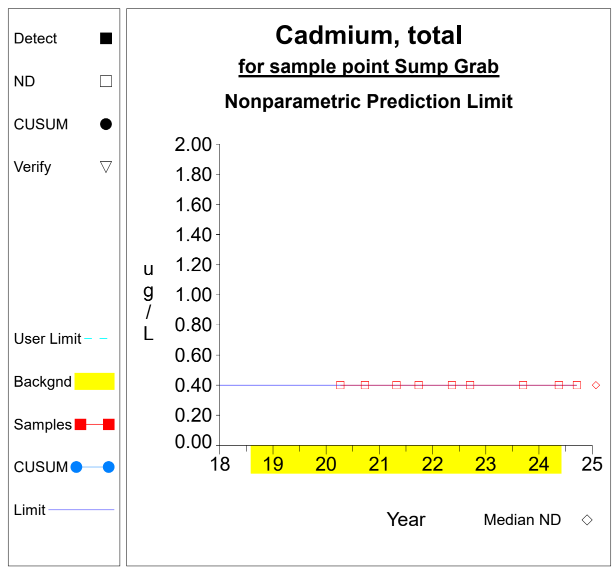
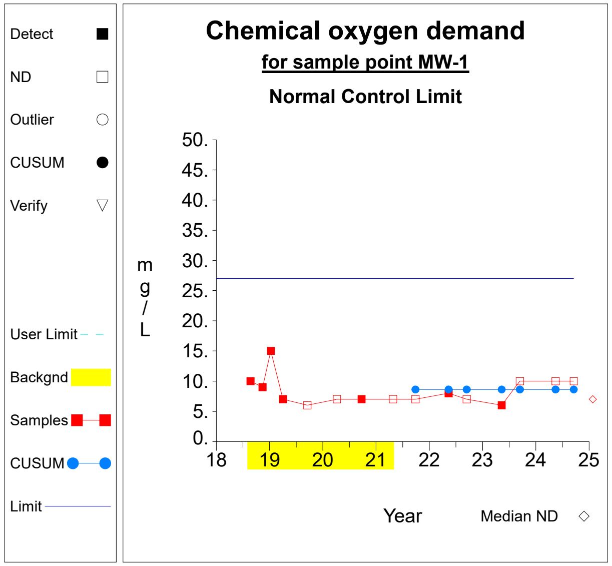


Graph 39

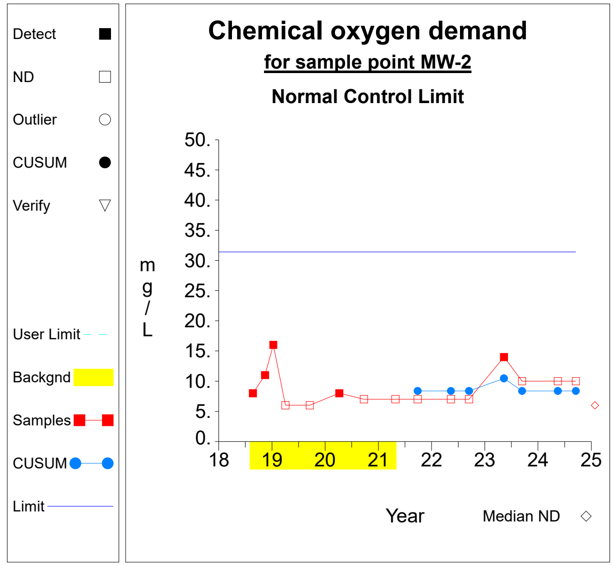


Graph 40

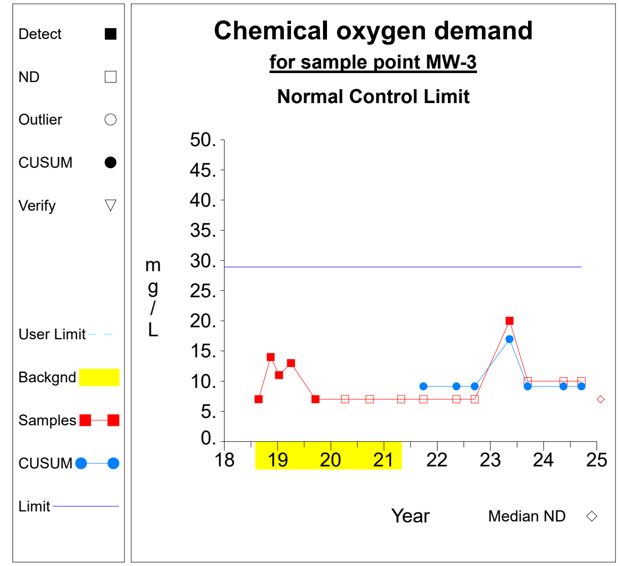
Intra-Well Control Charts / Prediction Limits



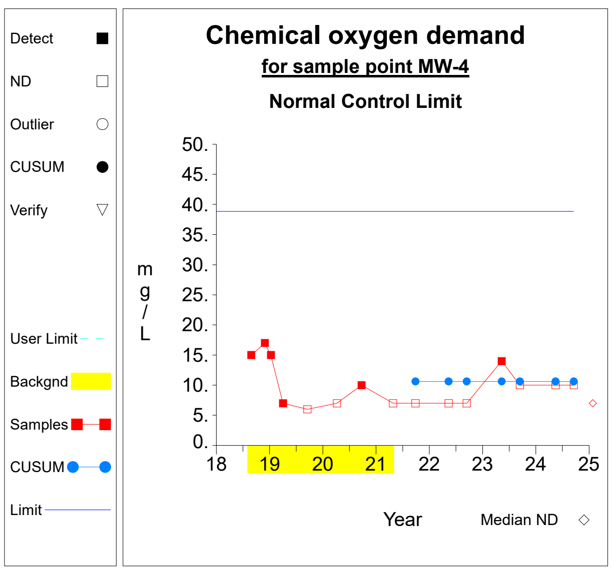
Graph 41



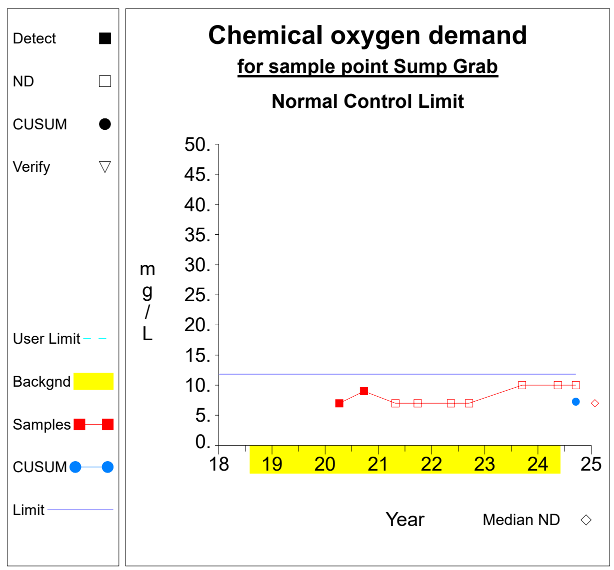
Graph 42



Graph 43



Graph 44



Graph 45

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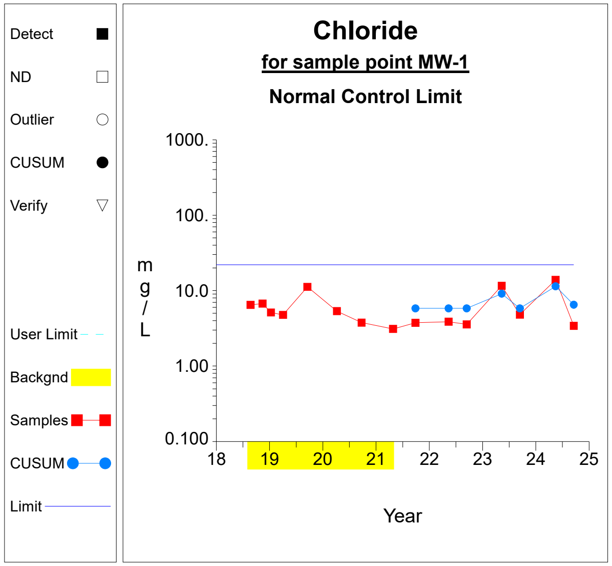

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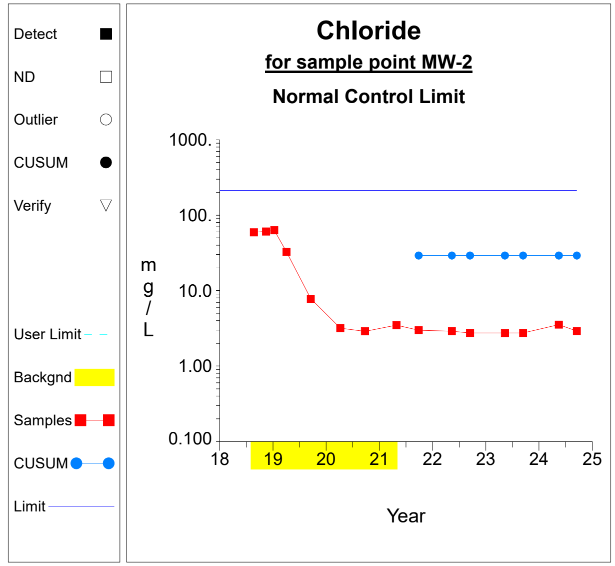

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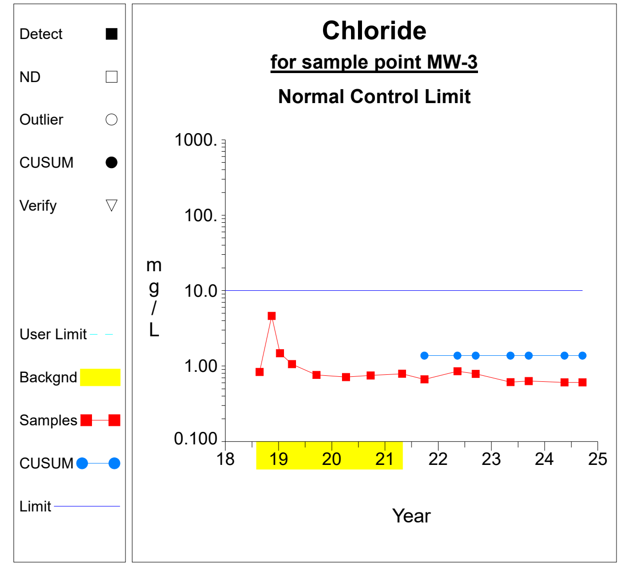

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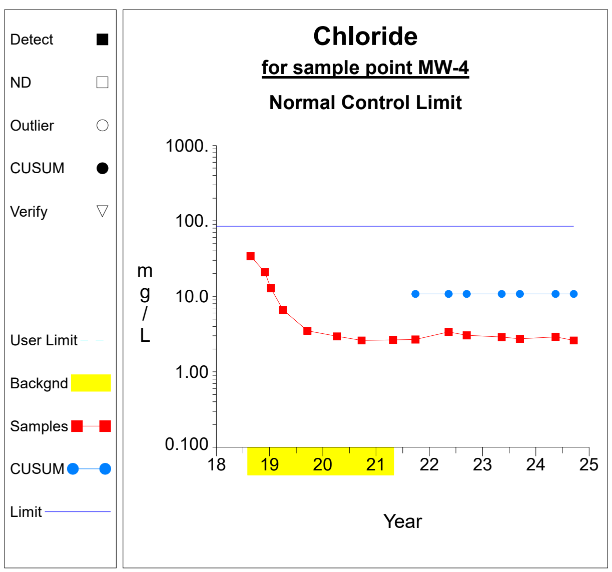
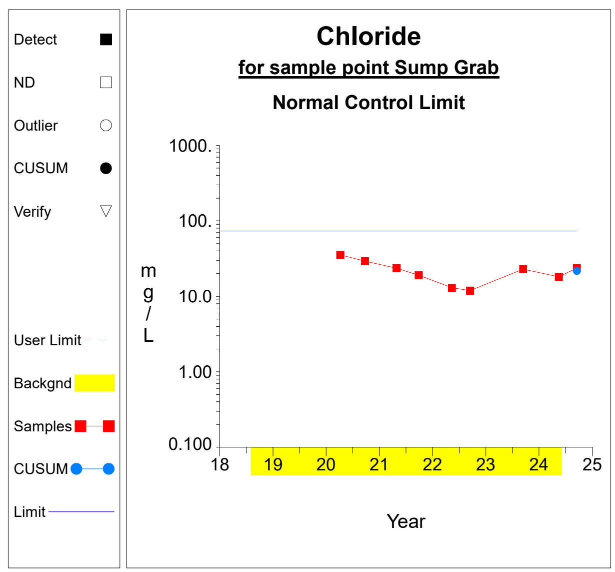


Graph 49



Graph 50

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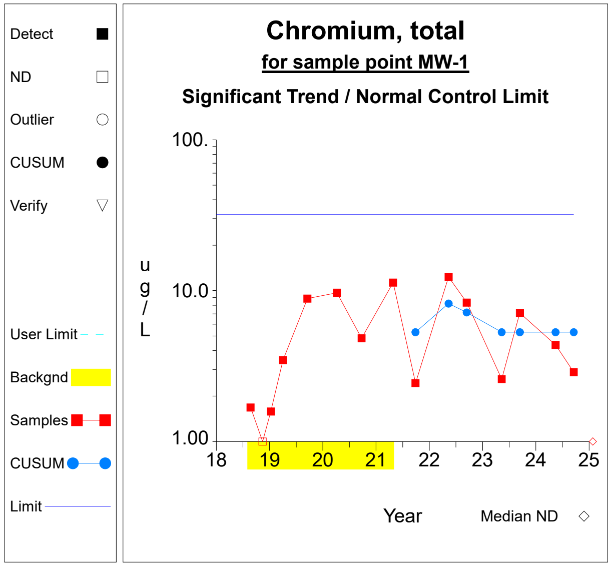
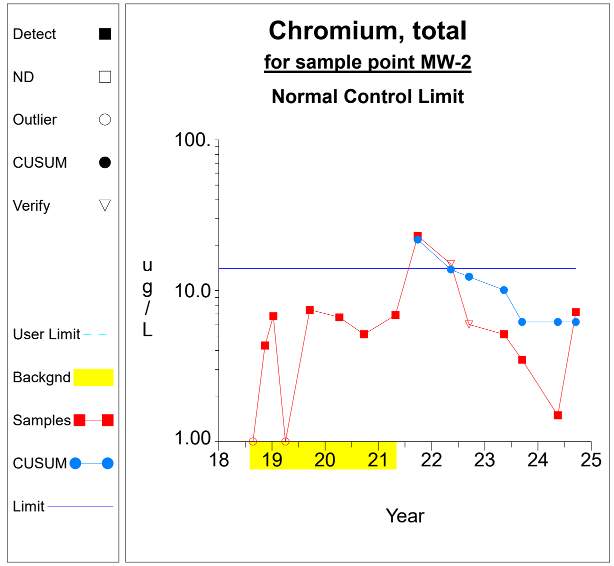
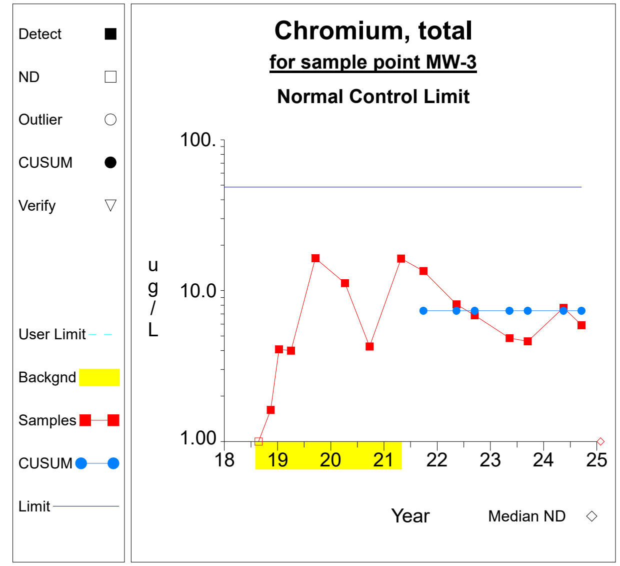
Intra-Well Control Charts / Prediction Limits



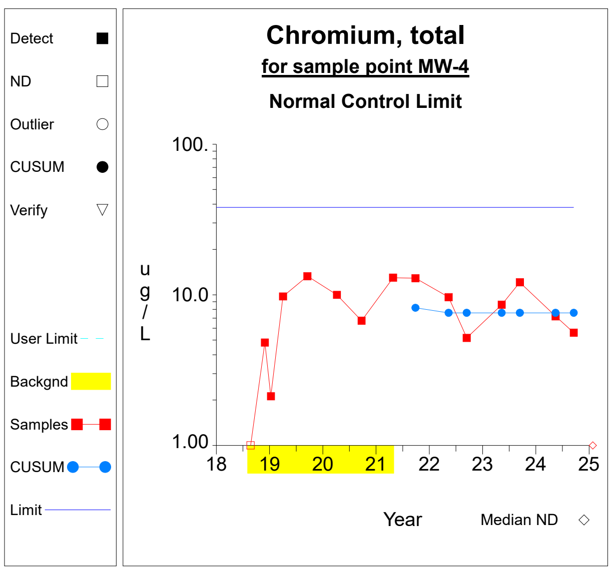
Graph 51



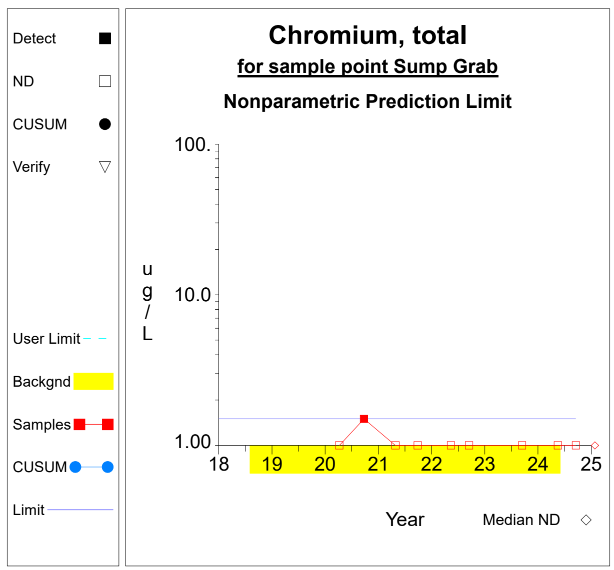
Graph 52



Graph 53



Graph 54



Graph 55

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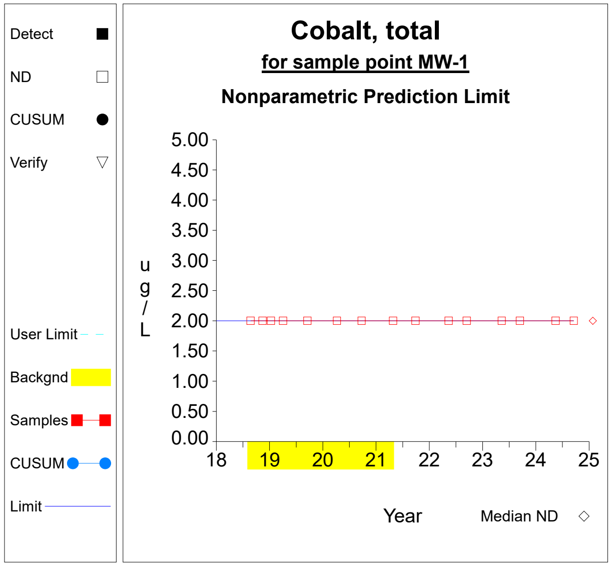
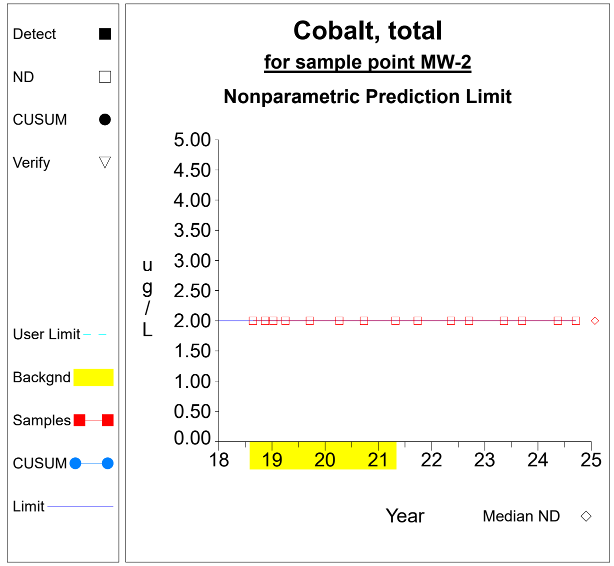
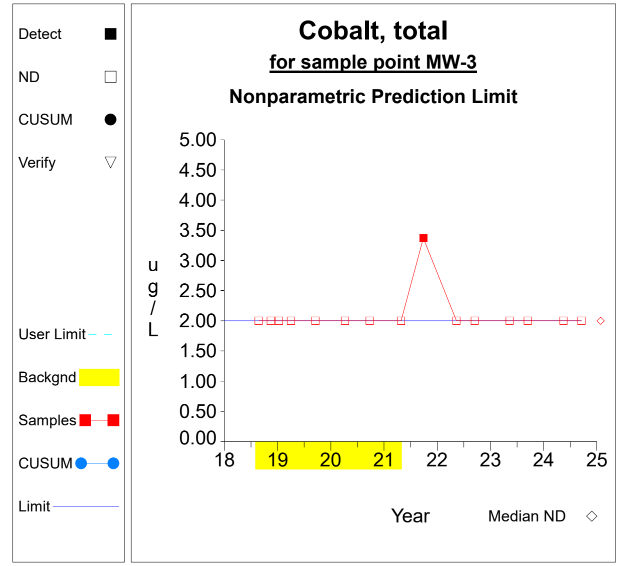
Intra-Well Control Charts / Prediction Limits



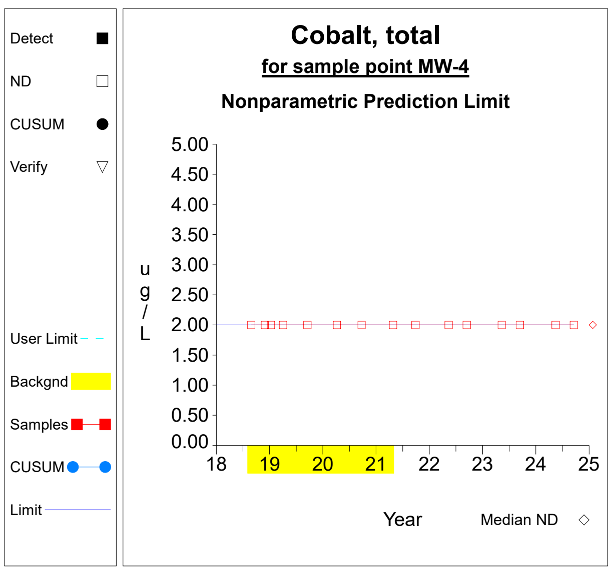
Graph 56



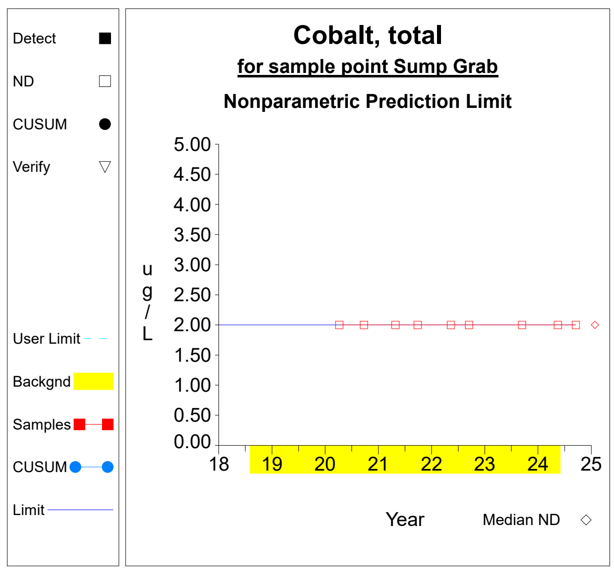
Graph 57



Graph 58



Graph 59



Graph 60

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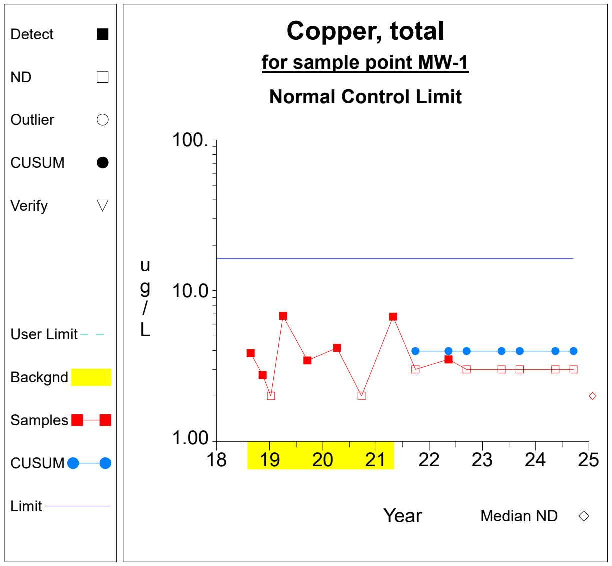
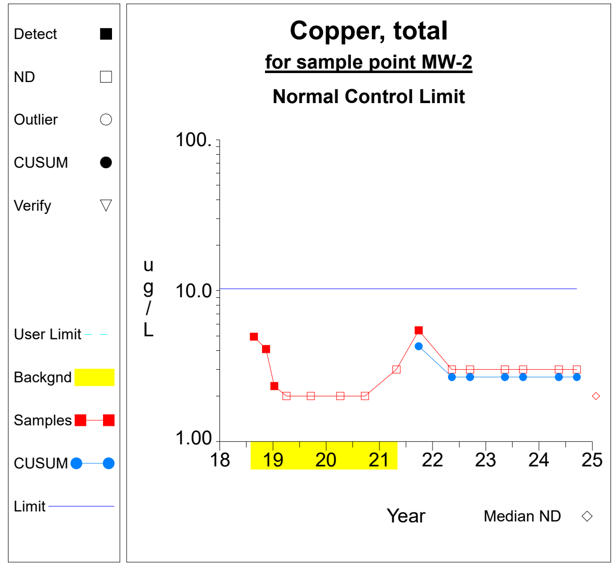
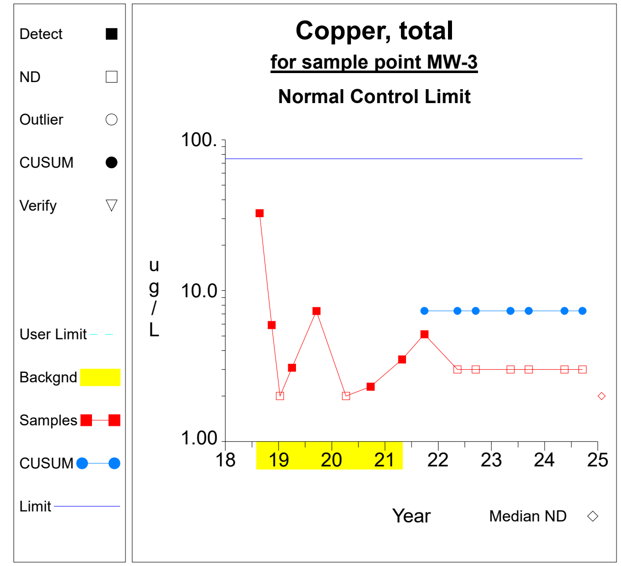
Intra-Well Control Charts / Prediction Limits



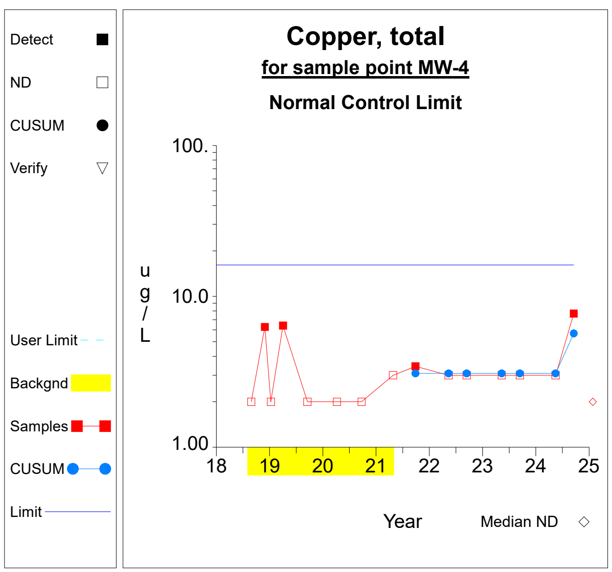
Graph 61



Graph 62



Graph 63



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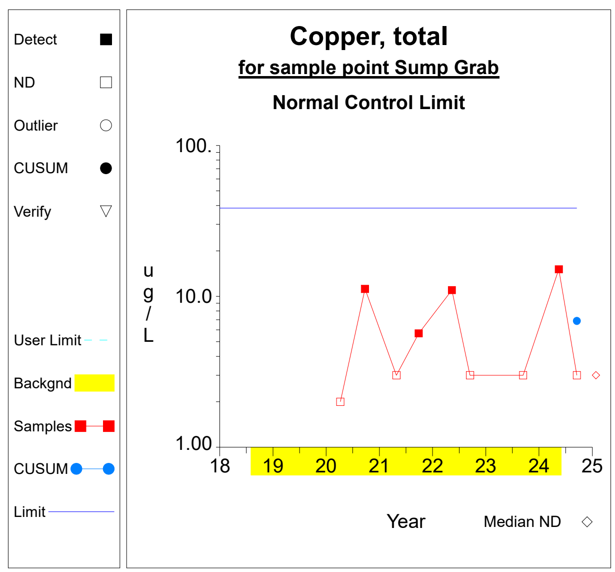

Graph 65

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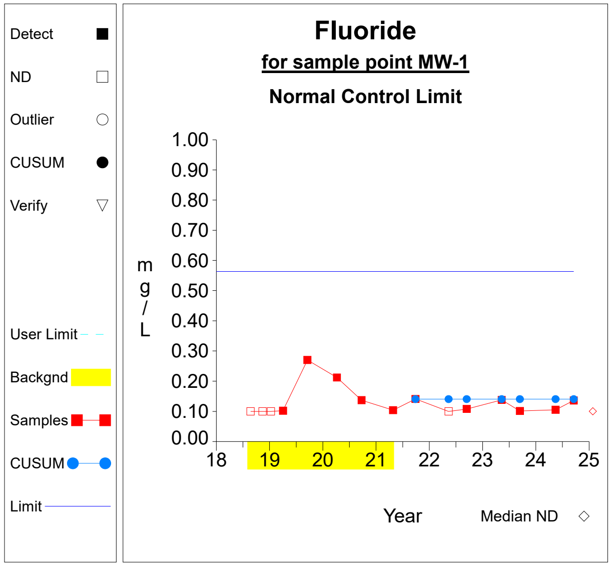
Intra-Well Control Charts / Prediction Limits



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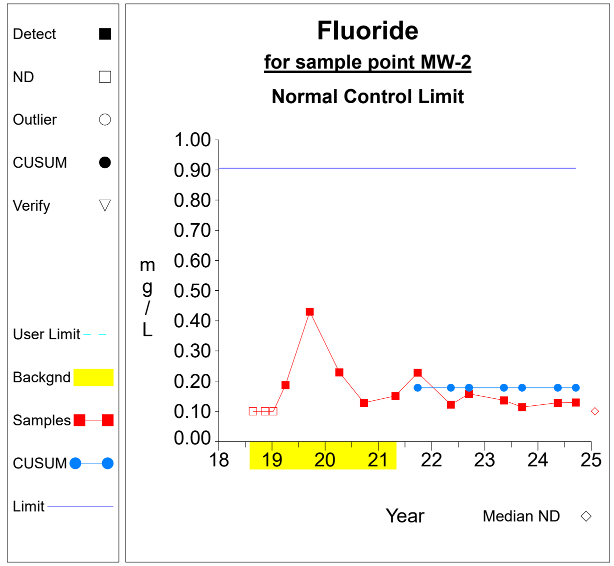

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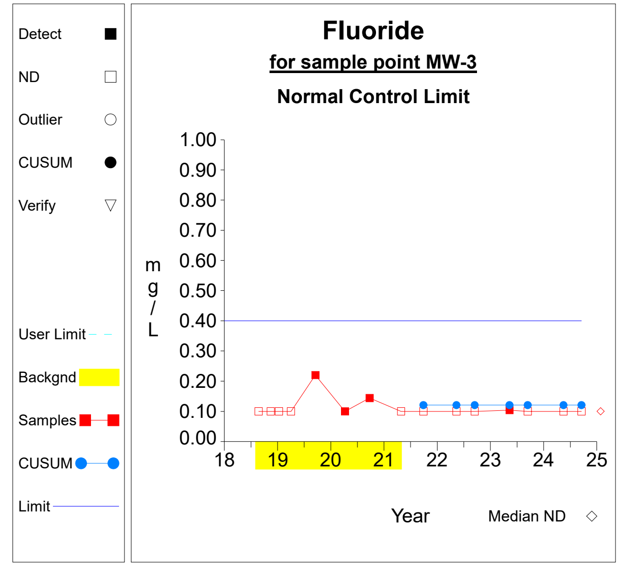

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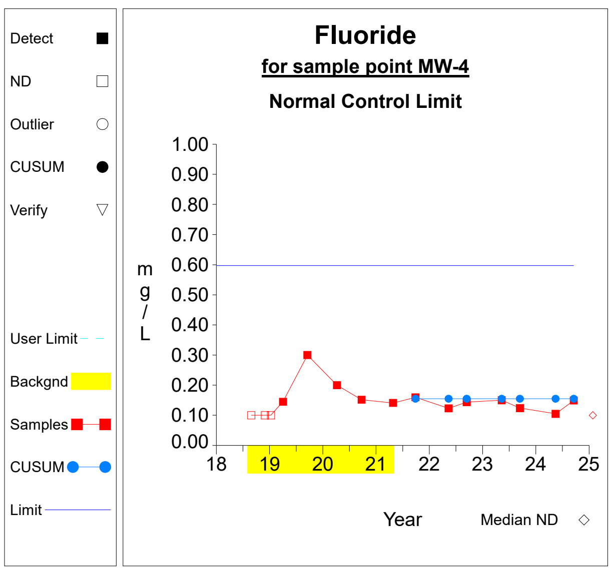

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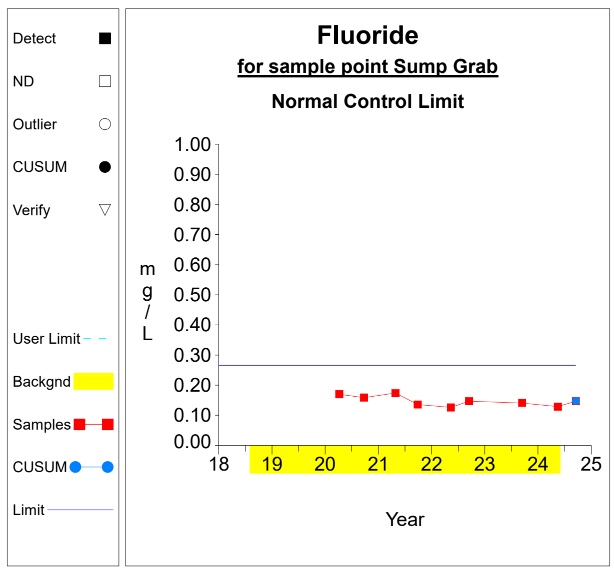

Graph 70

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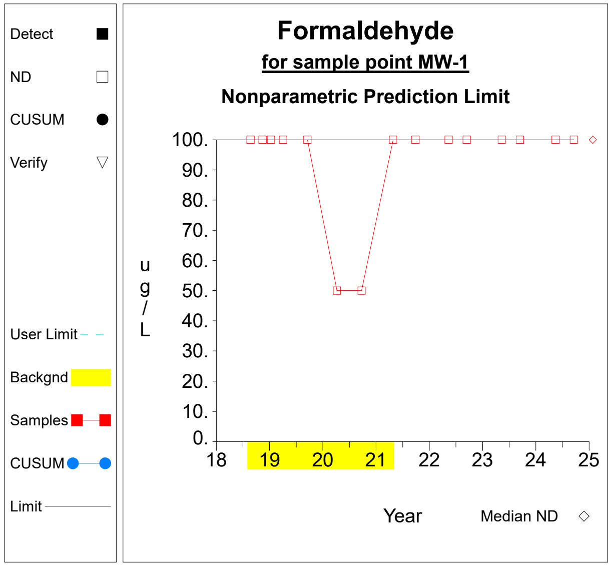
Intra-Well Control Charts / Prediction Limits



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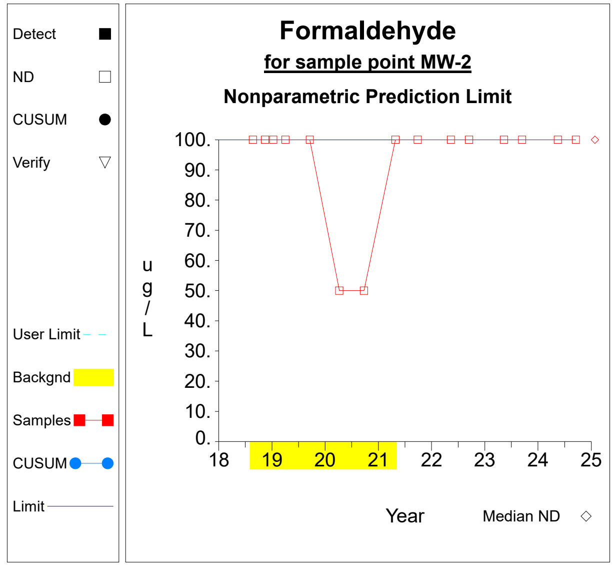

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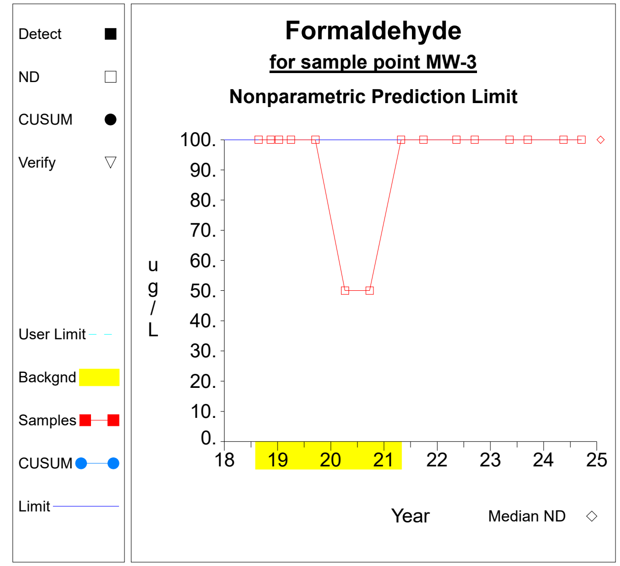

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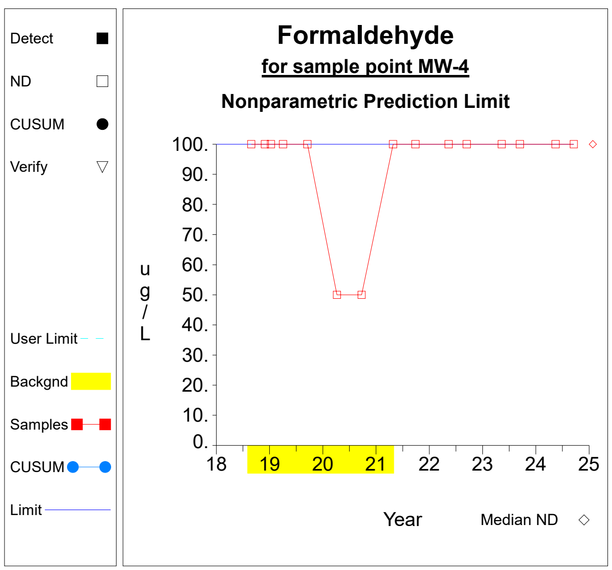

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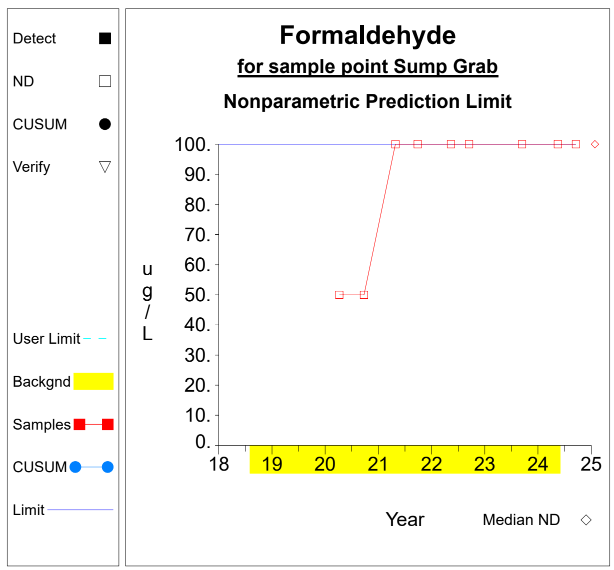
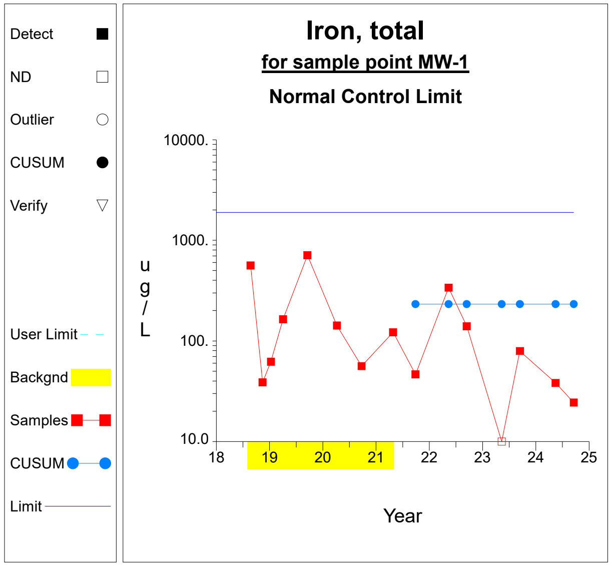


Graph 75

Intra-Well Control Charts / Prediction Limits



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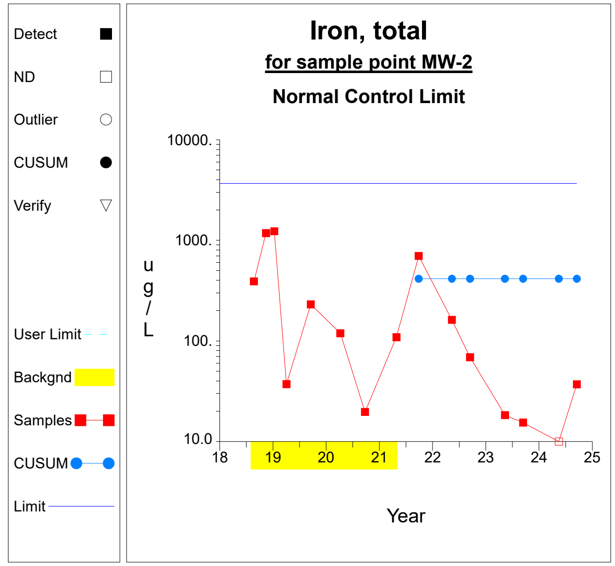

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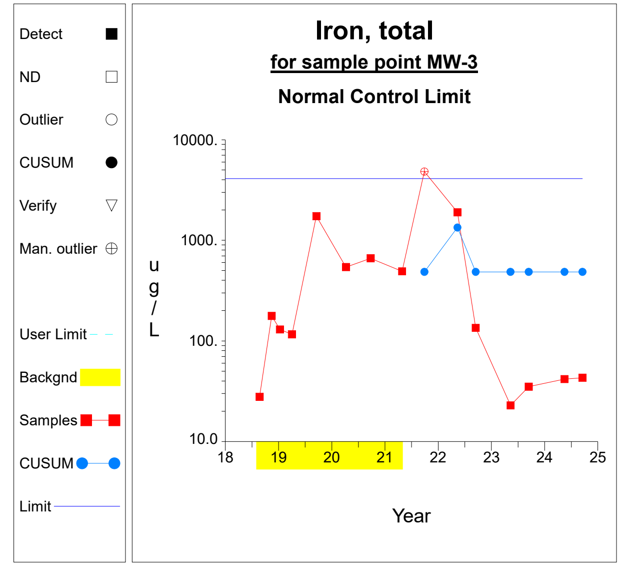

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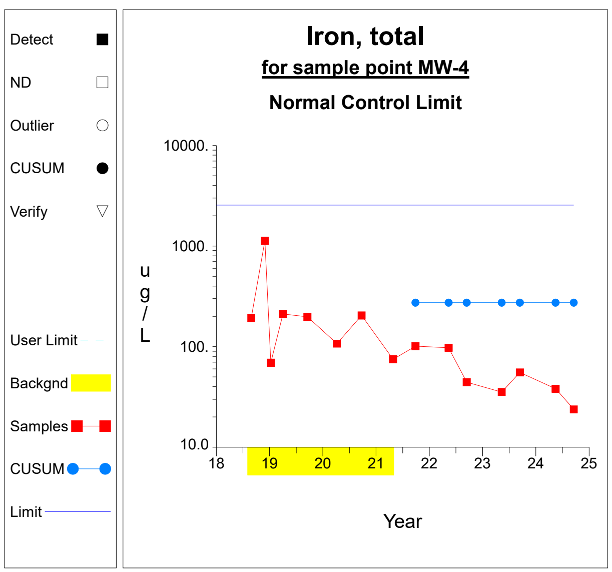

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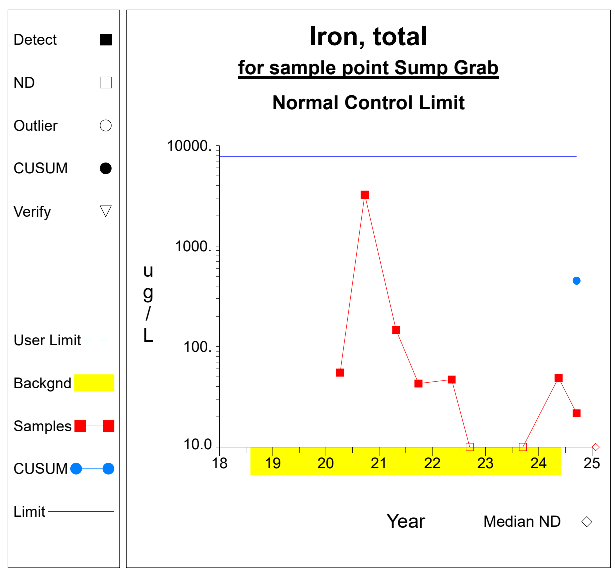

Graph 80

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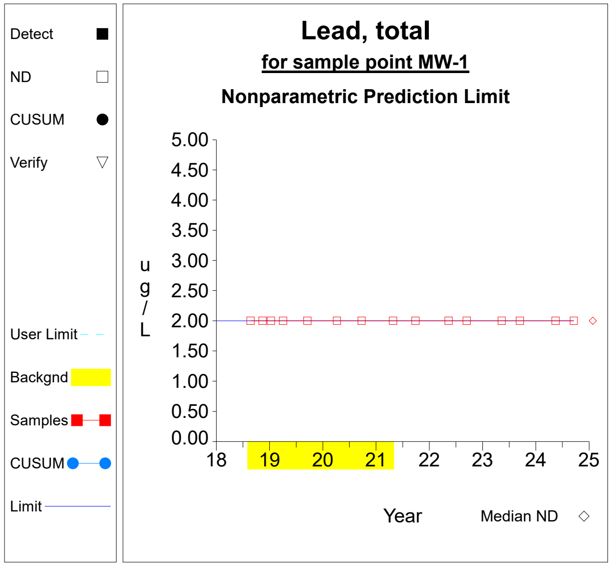

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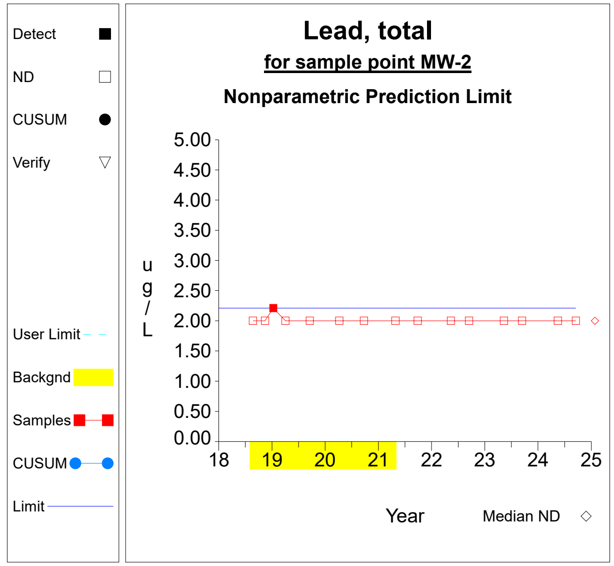

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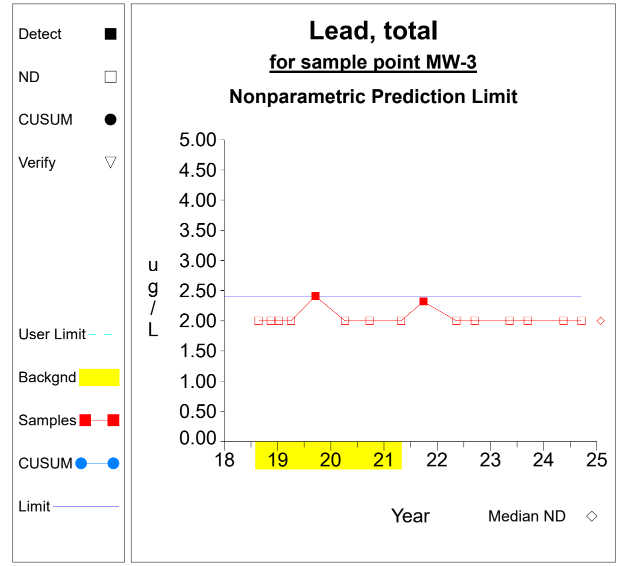

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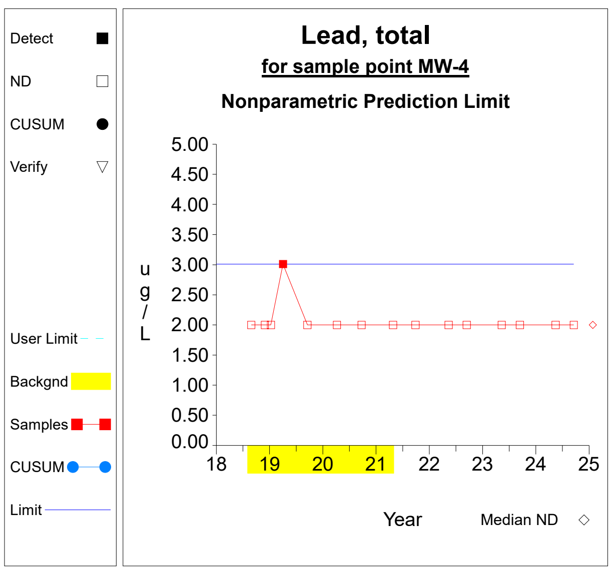

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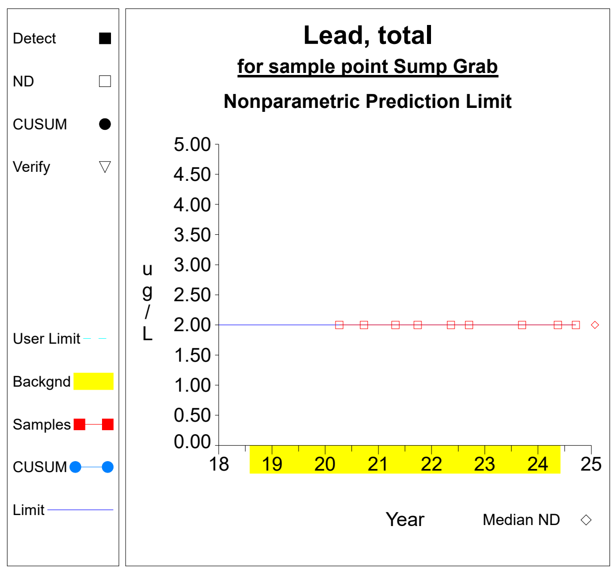

Graph 85

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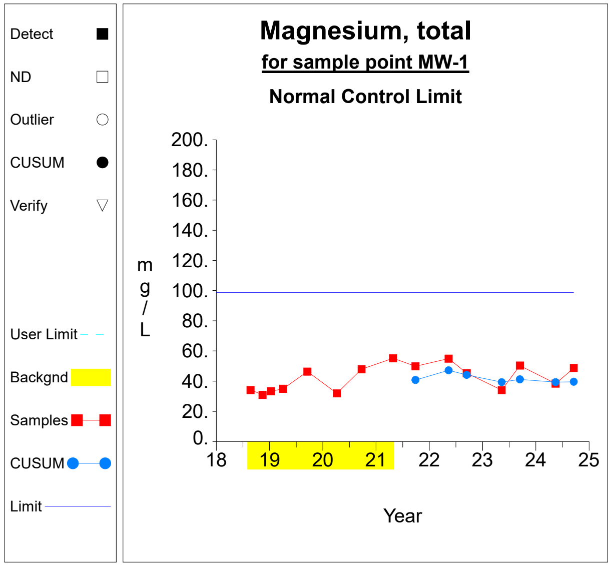
Intra-Well Control Charts / Prediction Limits



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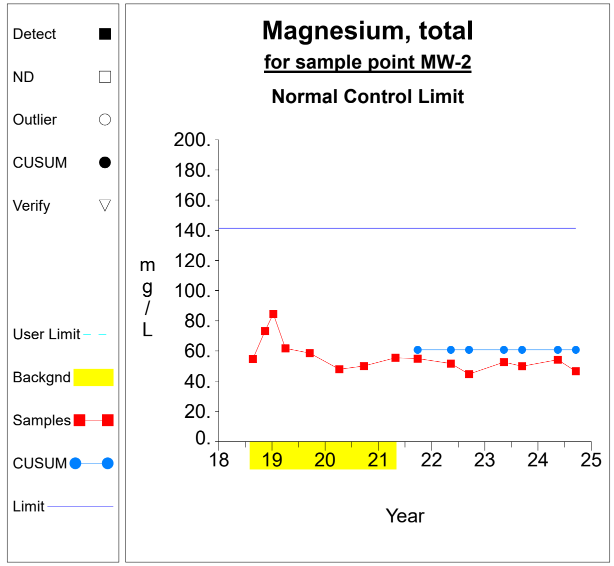

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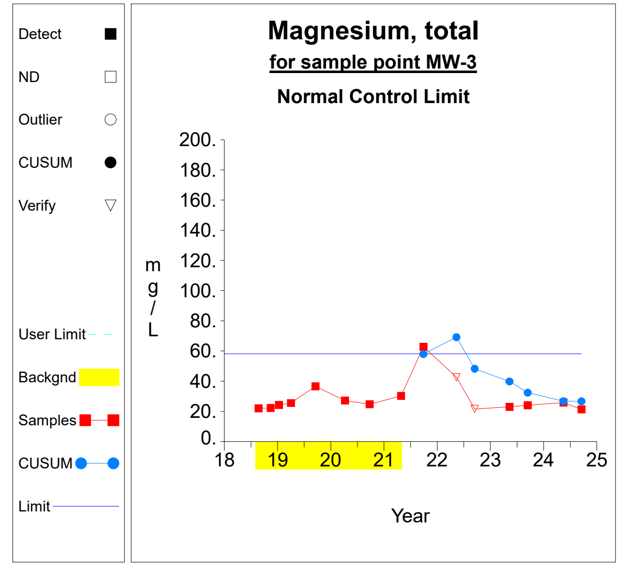

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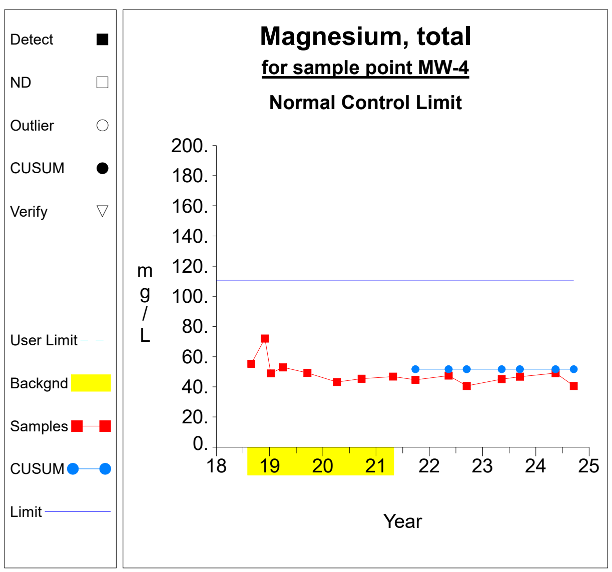

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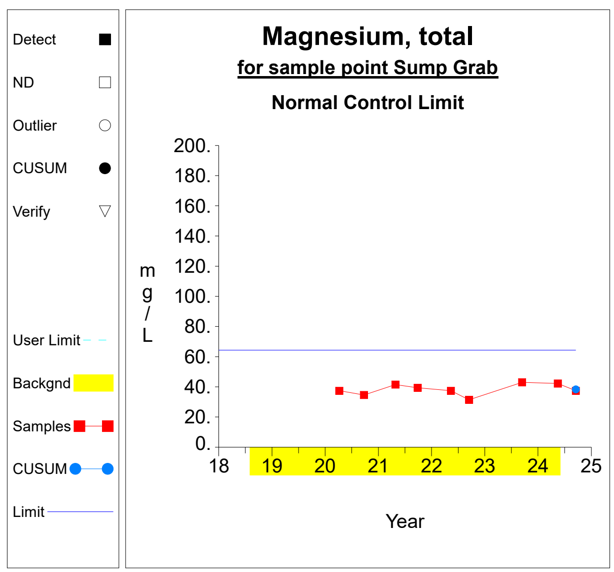

Graph 90

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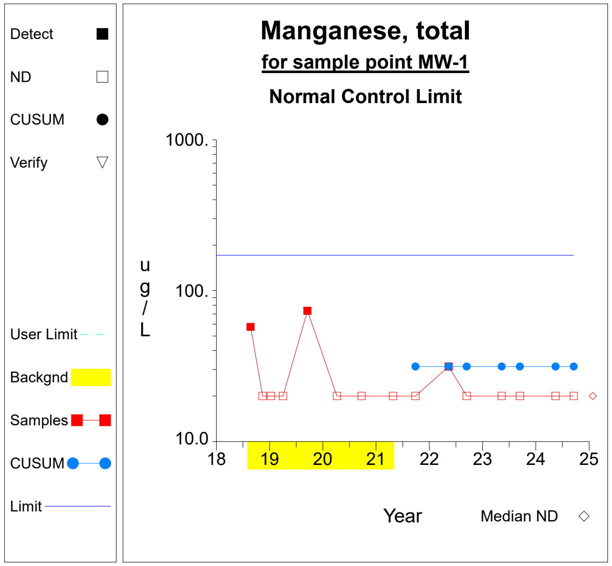
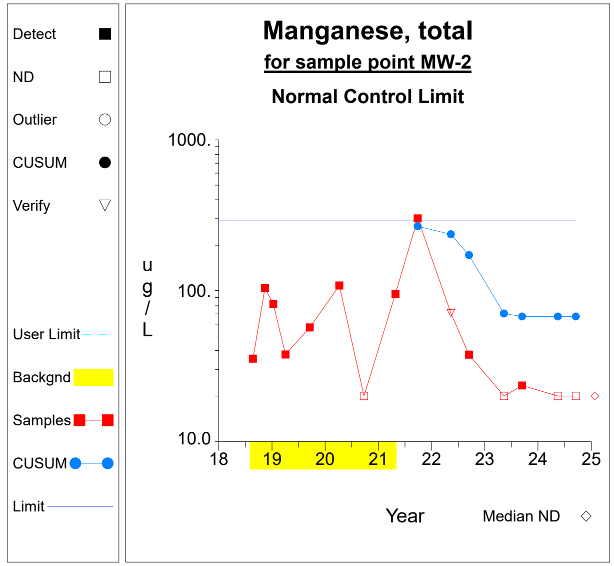
Intra-Well Control Charts / Prediction Limits



Graph 91



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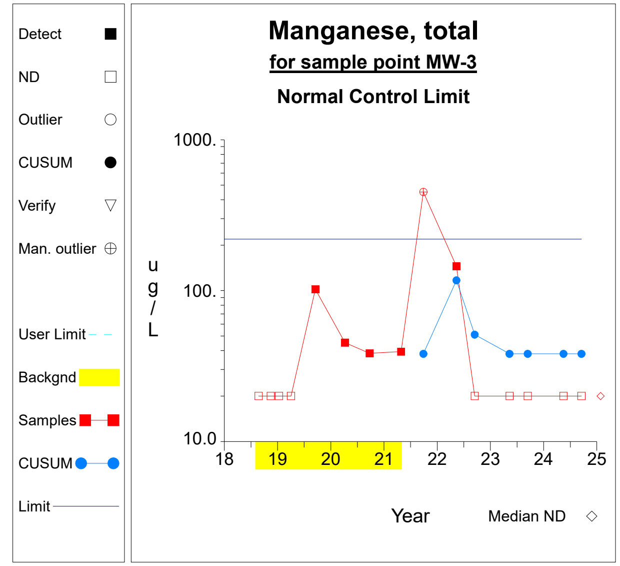

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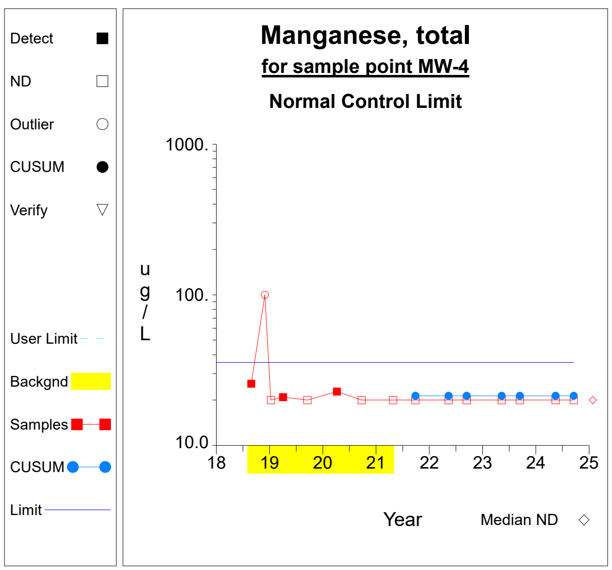
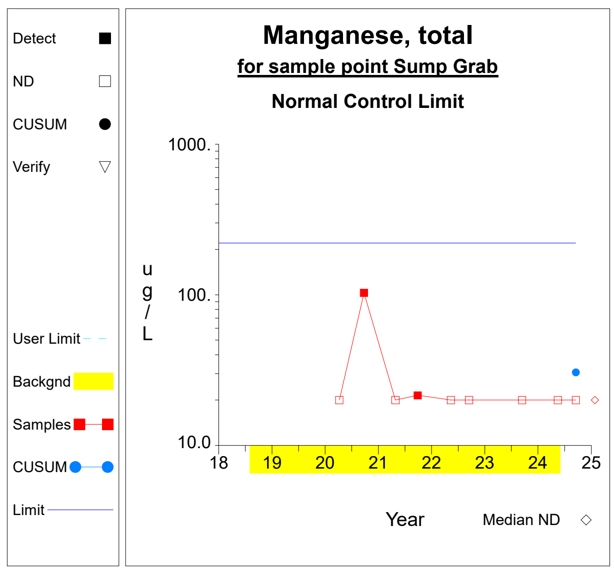
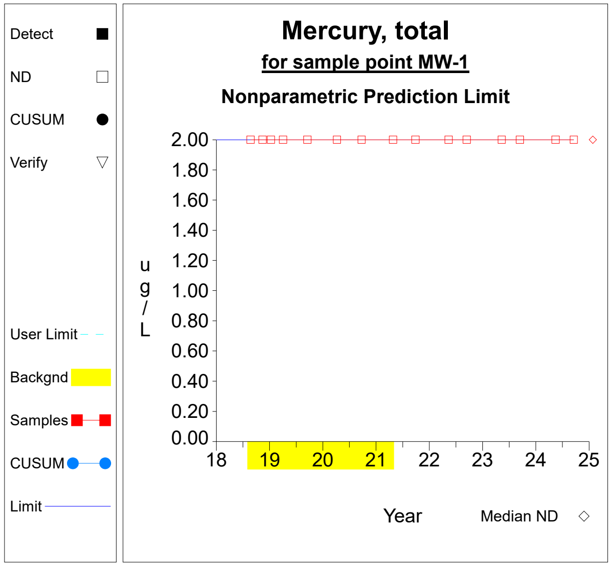


Graph 94

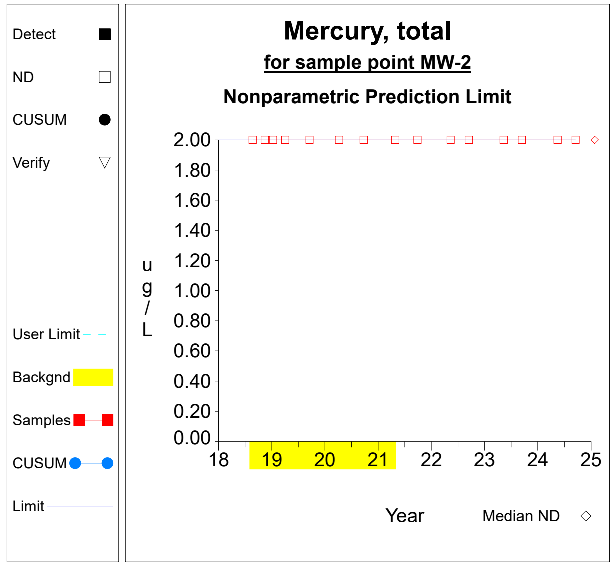


Graph 95

Intra-Well Control Charts / Prediction Limits



Graph 96



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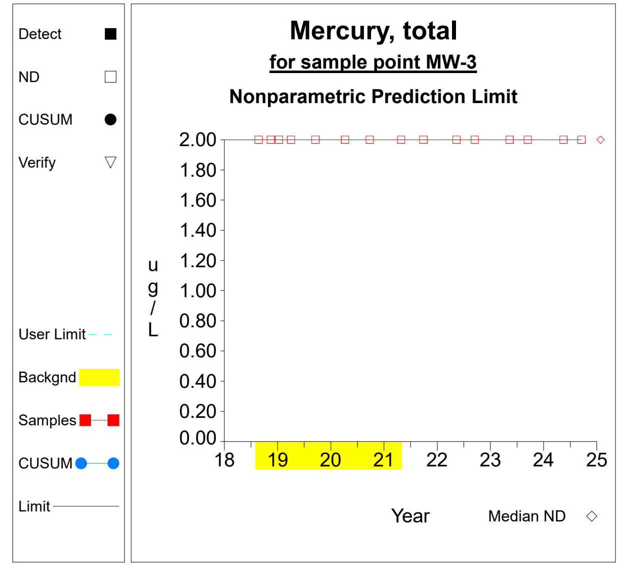

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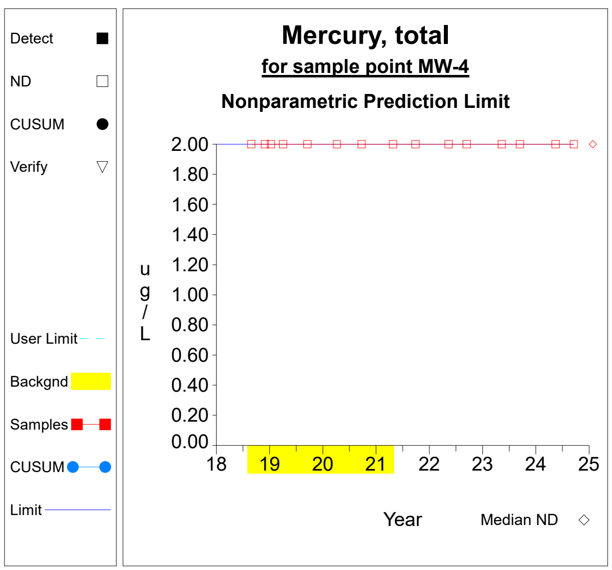

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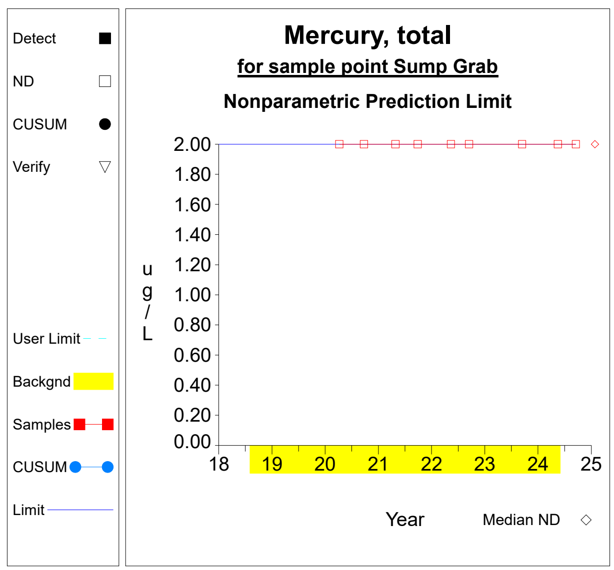

Graph 100

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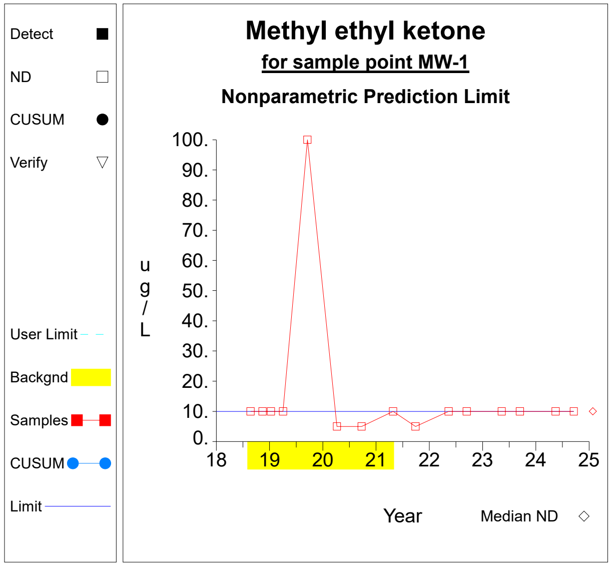
Intra-Well Control Charts / Prediction Limits



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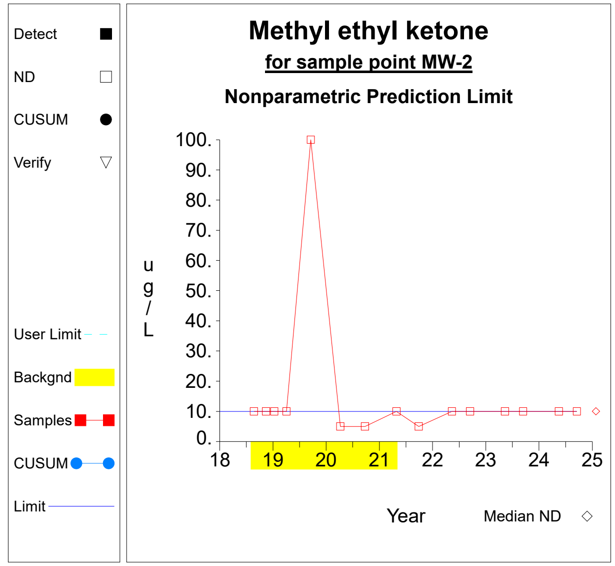

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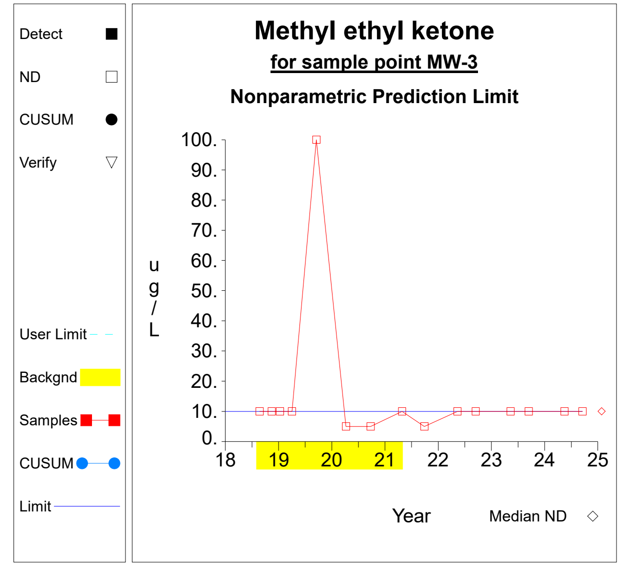

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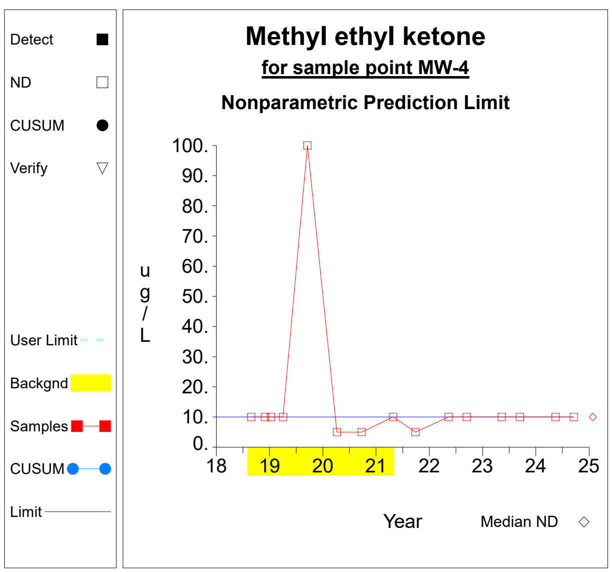

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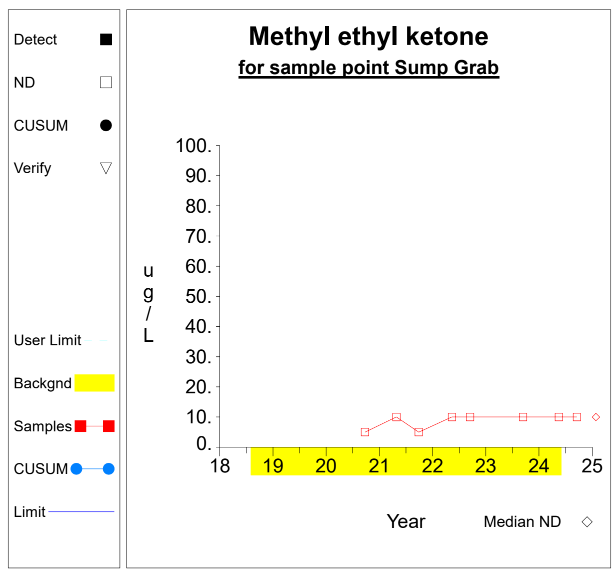
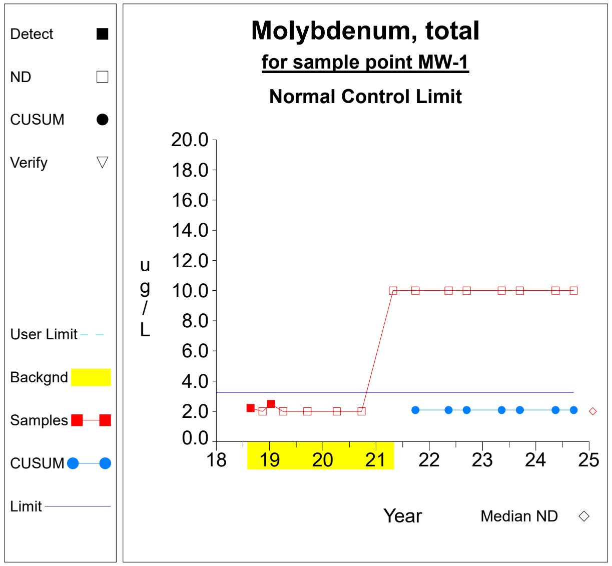


Graph 105

Intra-Well Control Charts / Prediction Limits



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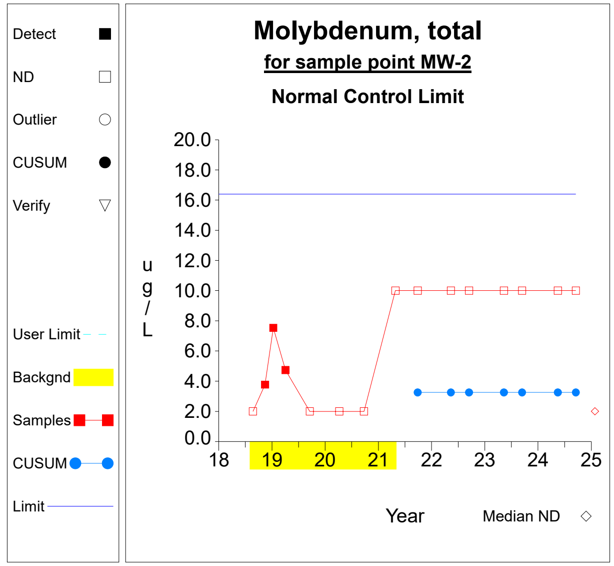

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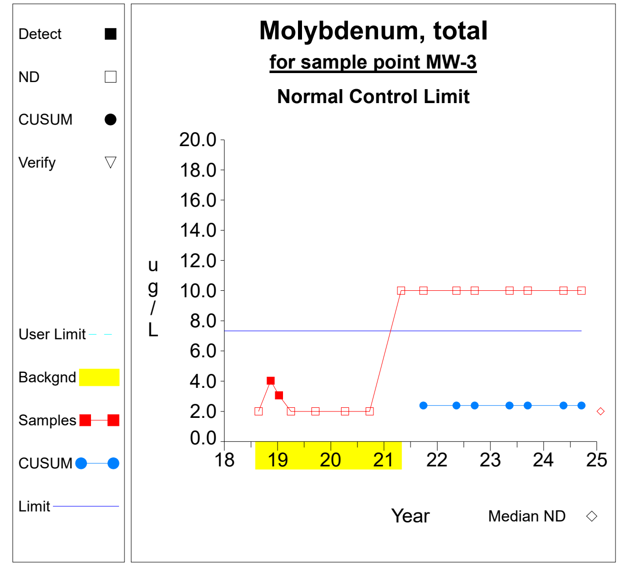

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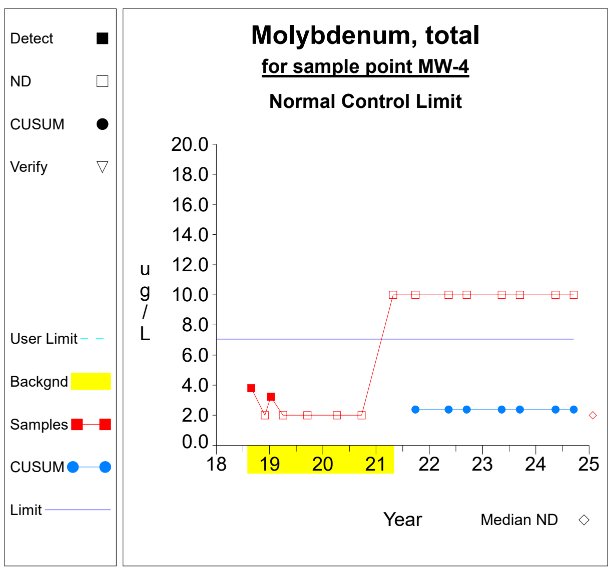

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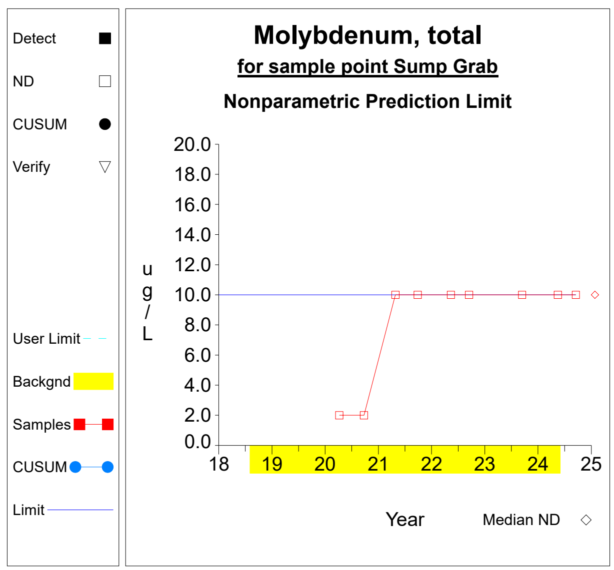
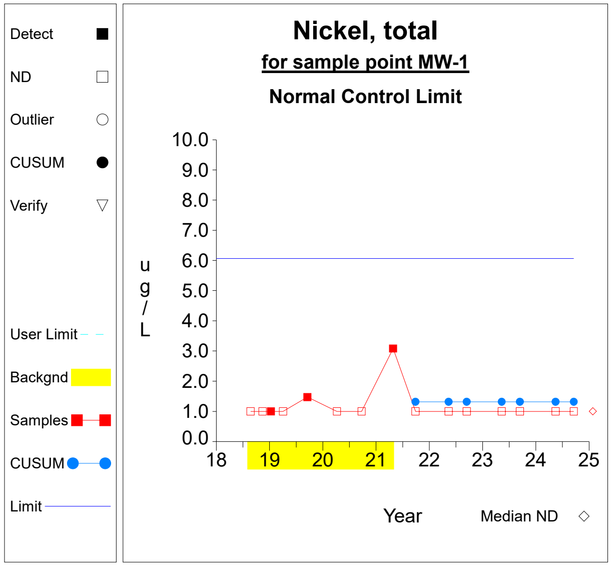
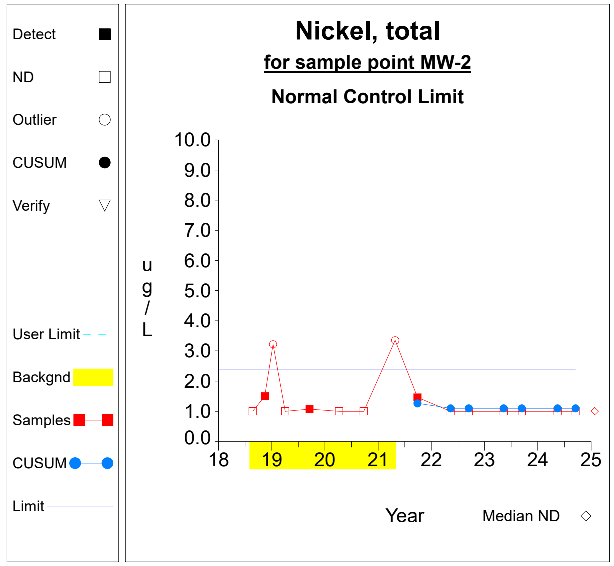


Graph 110

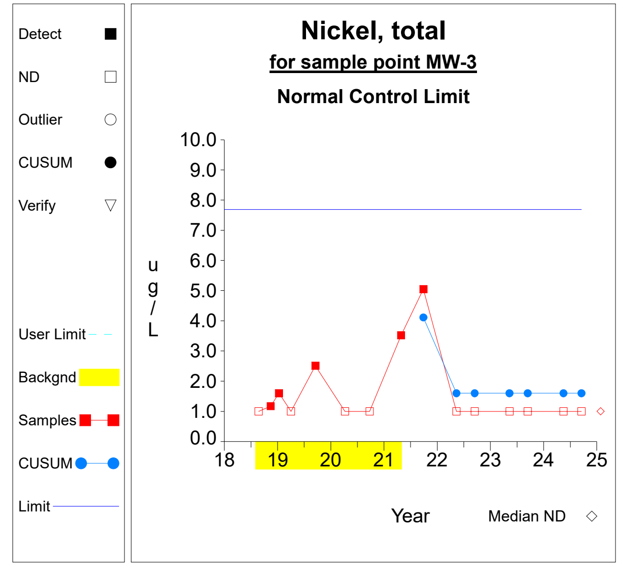
Intra-Well Control Charts / Prediction Limits



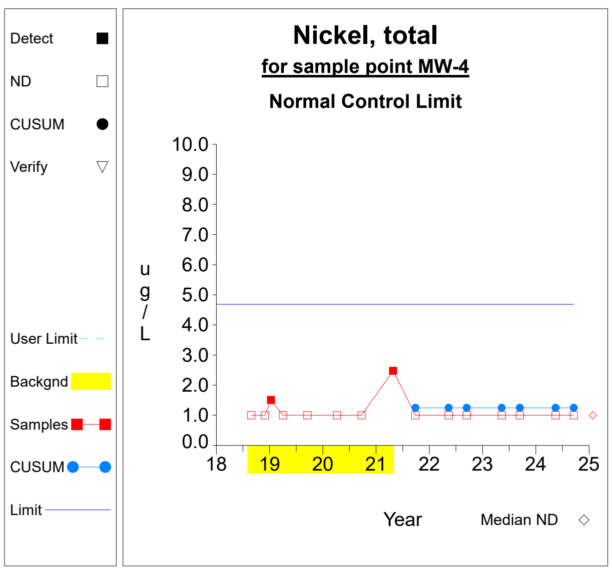
Graph 111



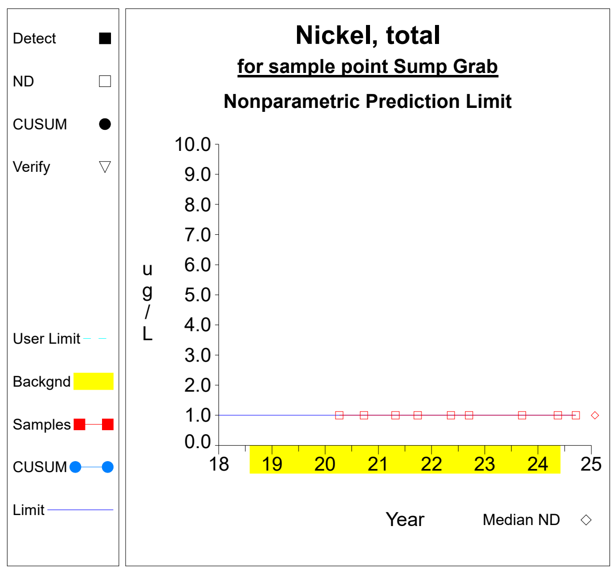
Graph 112



Graph 113



Graph 114



Graph 115

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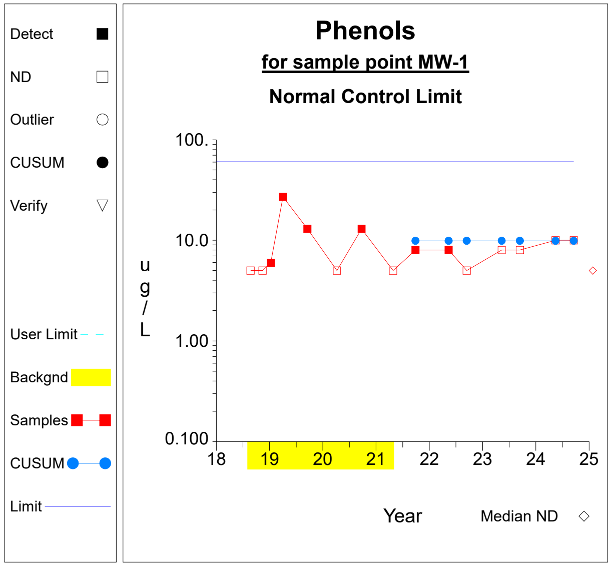
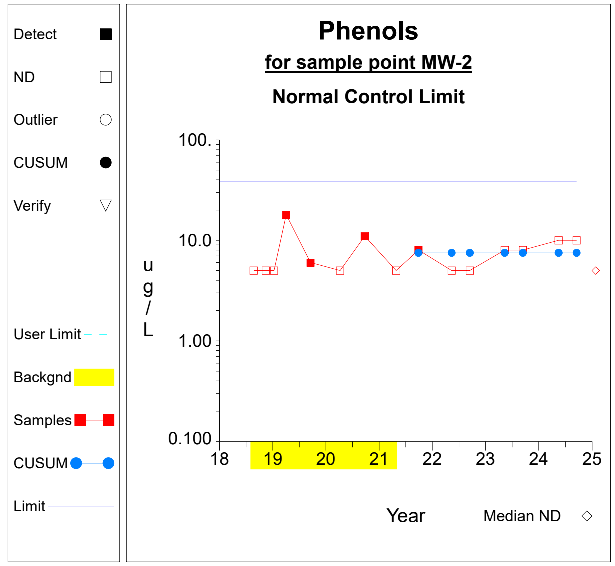
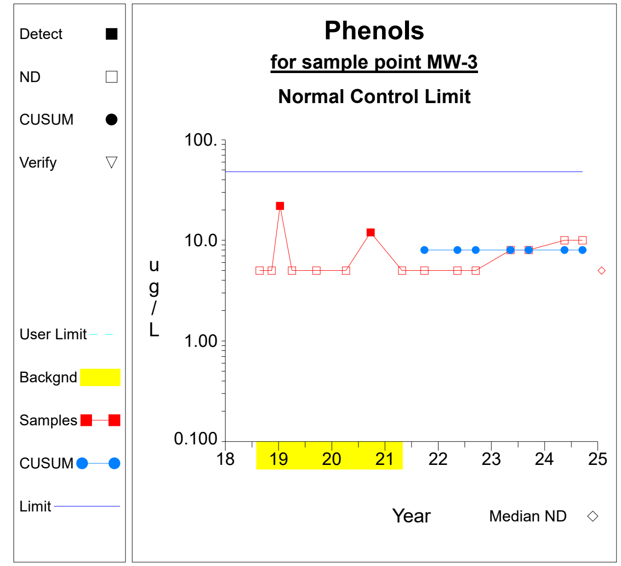


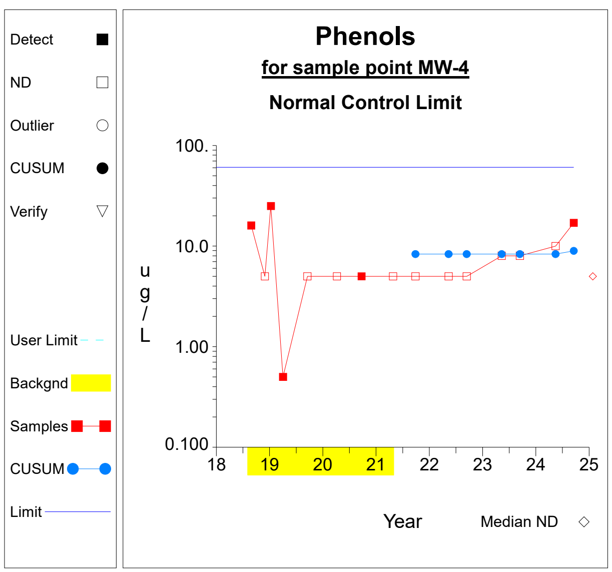
Graph 116



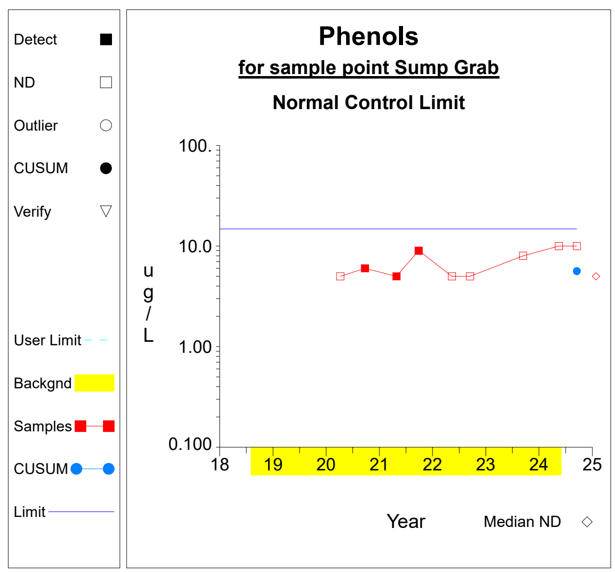
Graph 117



Graph 118



Graph 119



Graph 120

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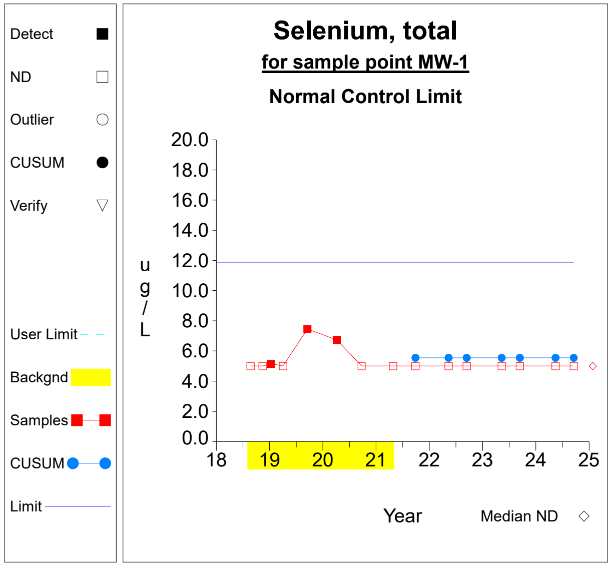
Intra-Well Control Charts / Prediction Limits



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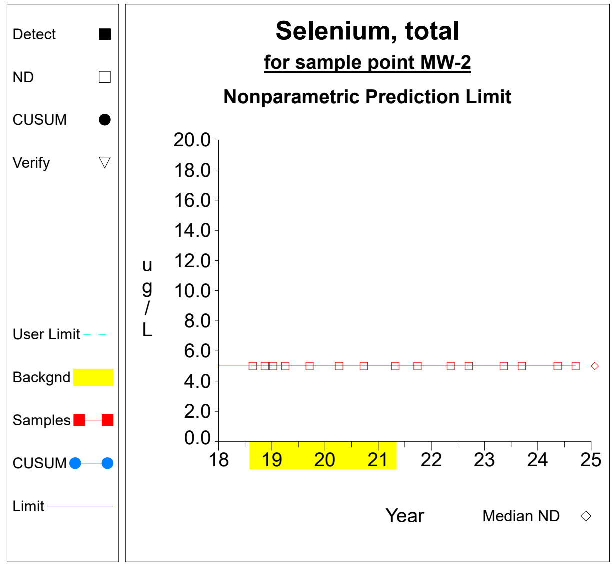

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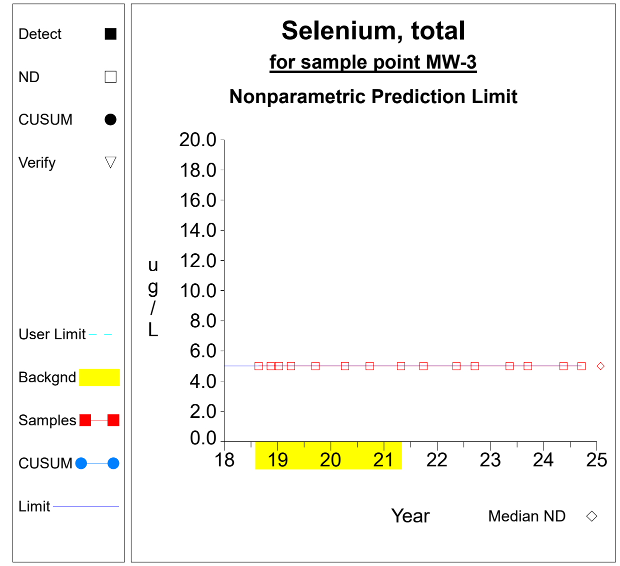

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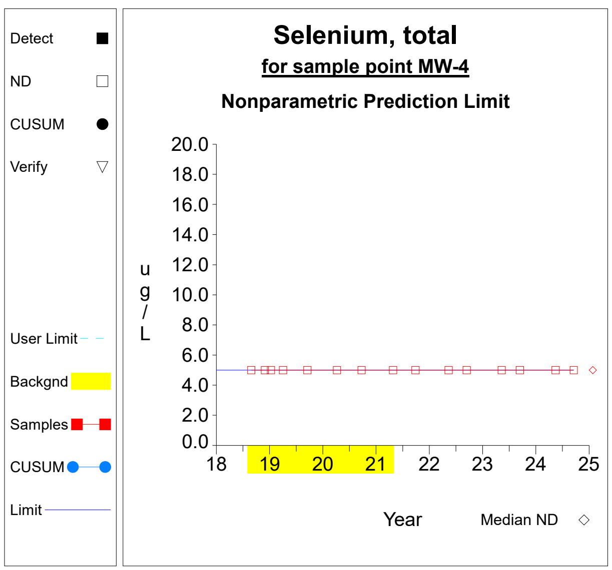
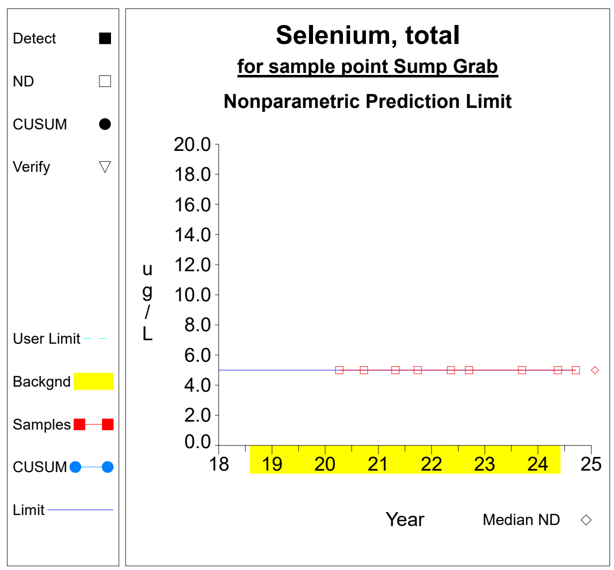
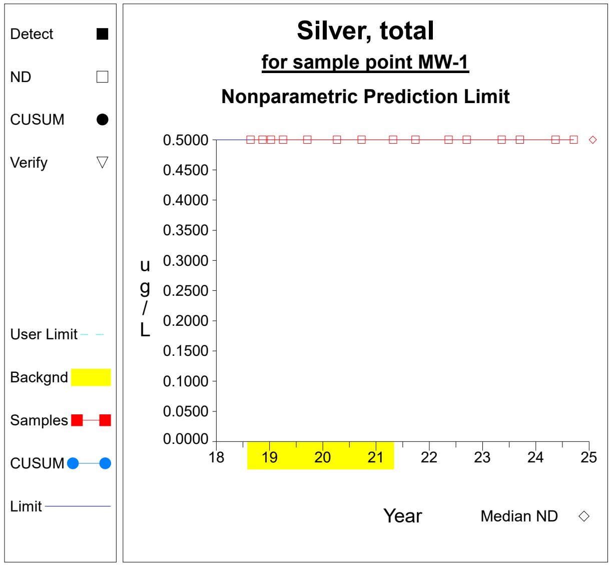


Graph 124

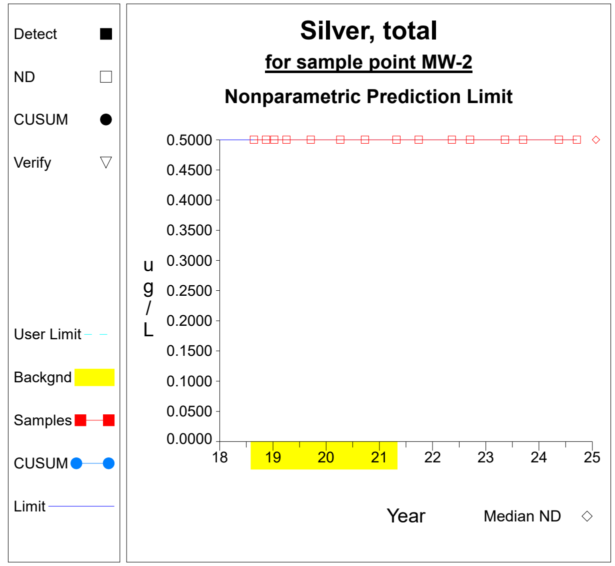


Graph 125

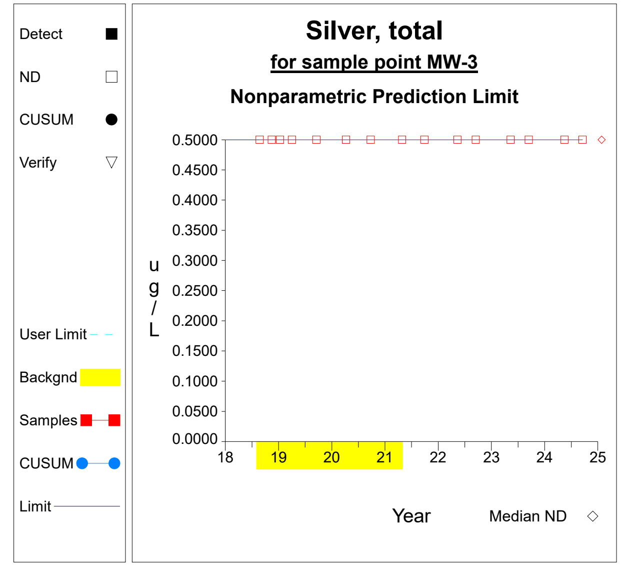
Intra-Well Control Charts / Prediction Limits



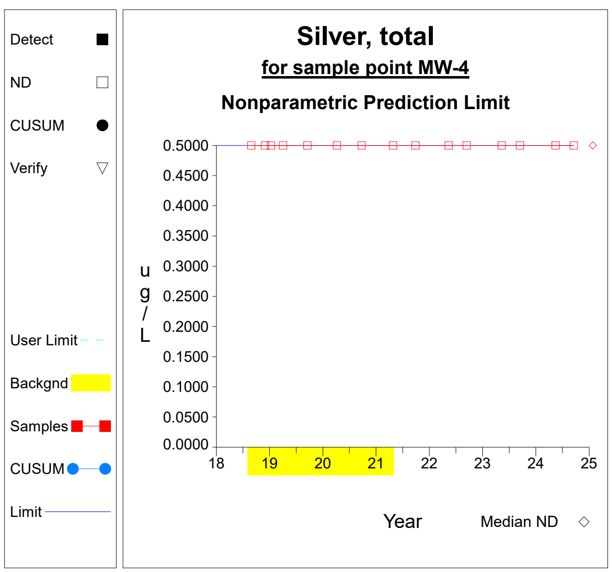
Graph 126



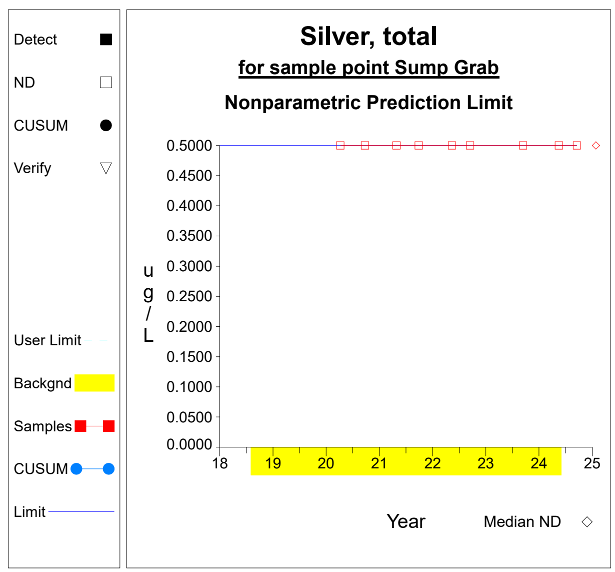
Graph 127



Graph 128

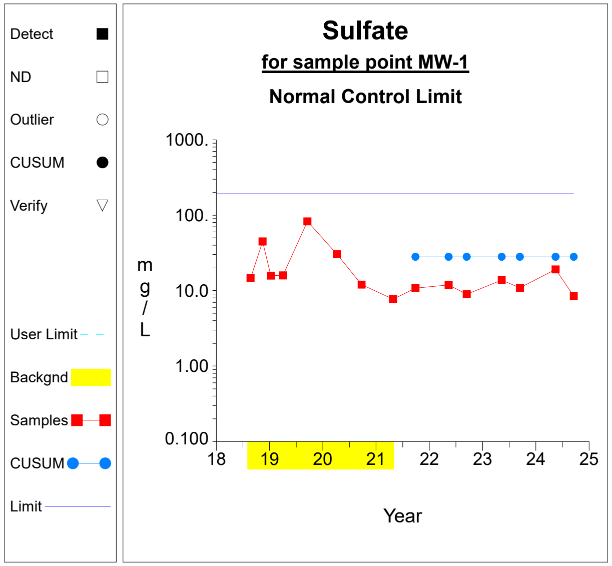


Graph 129

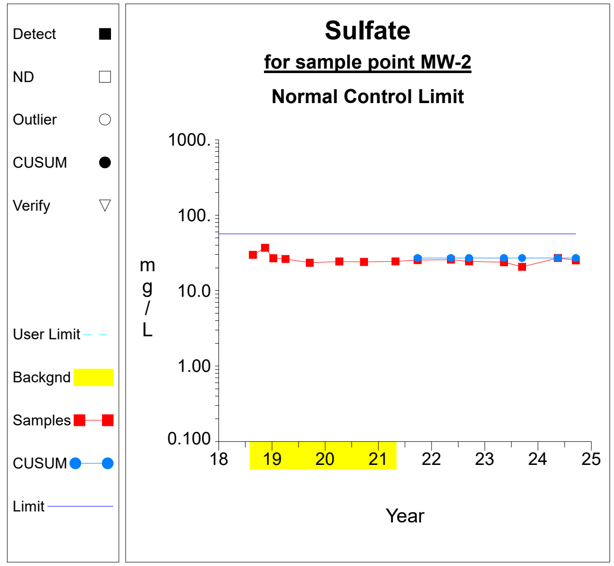


Graph 130

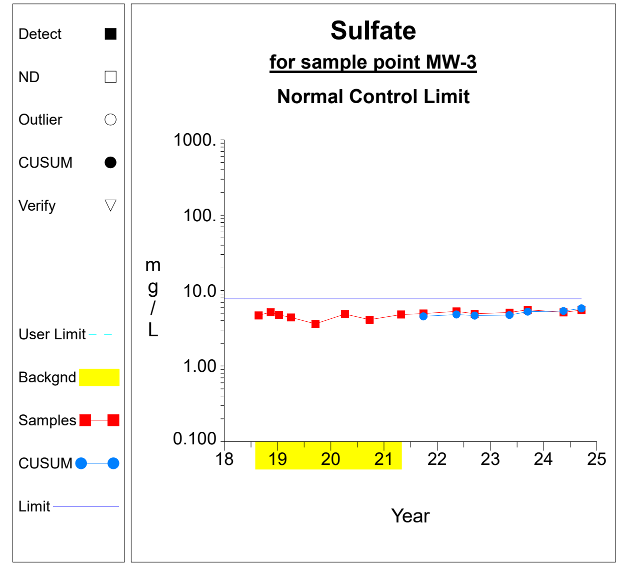
Intra-Well Control Charts / Prediction Limits



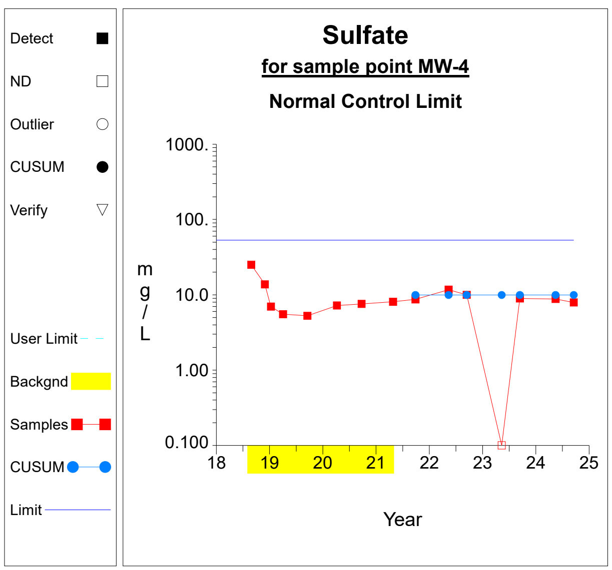
Graph 131



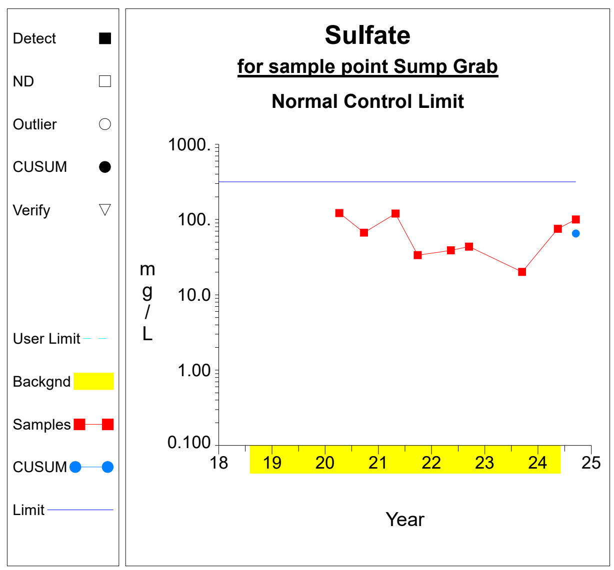
Graph 132



Graph 133



Graph 134



Graph 135

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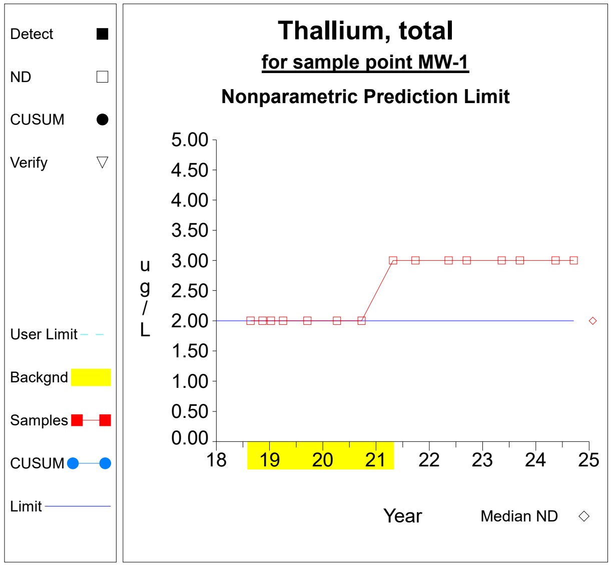
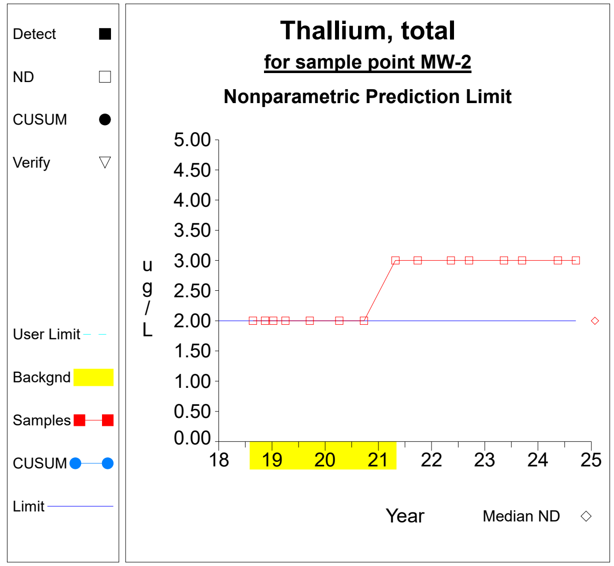
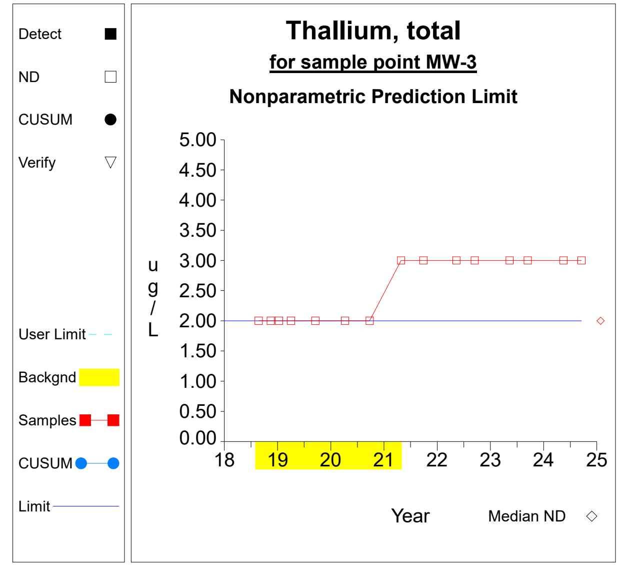
Intra-Well Control Charts / Prediction Limits



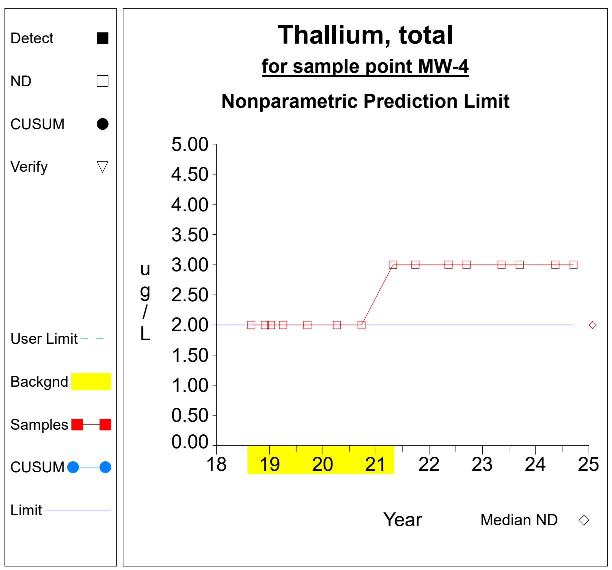
Graph 136



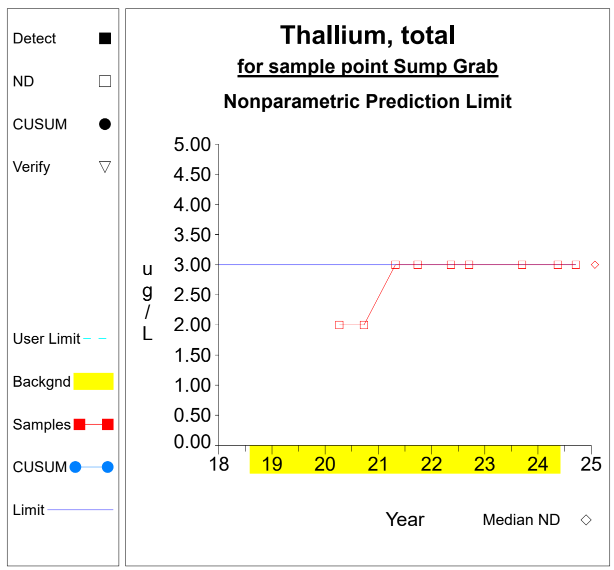
Graph 137



Graph 138



Graph 139



Graph 140

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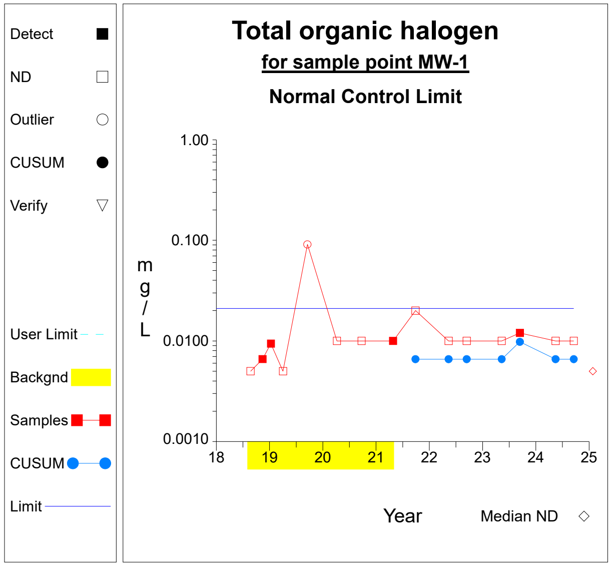
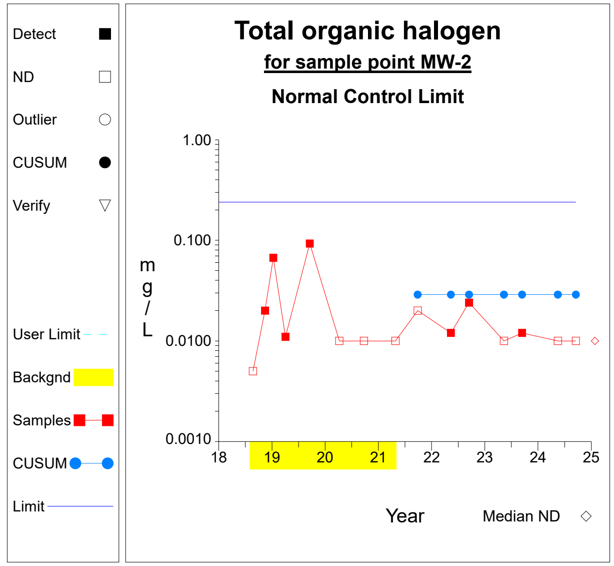
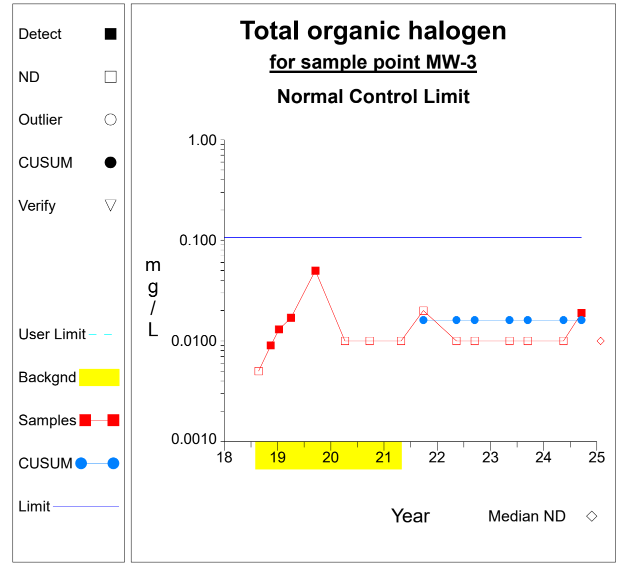
Intra-Well Control Charts / Prediction Limits



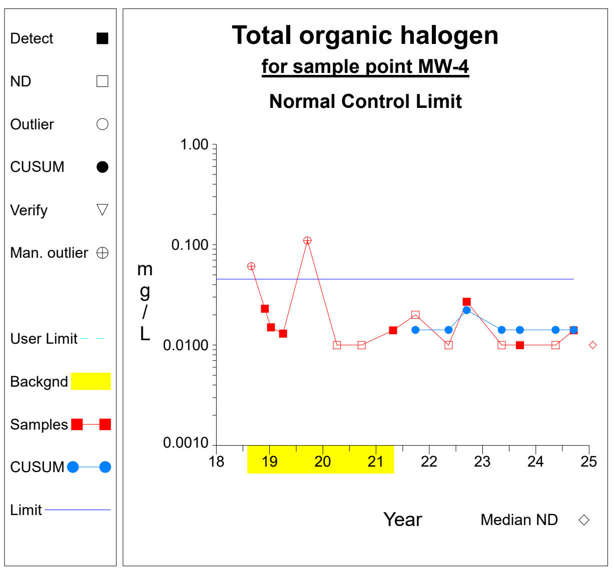
Graph 141



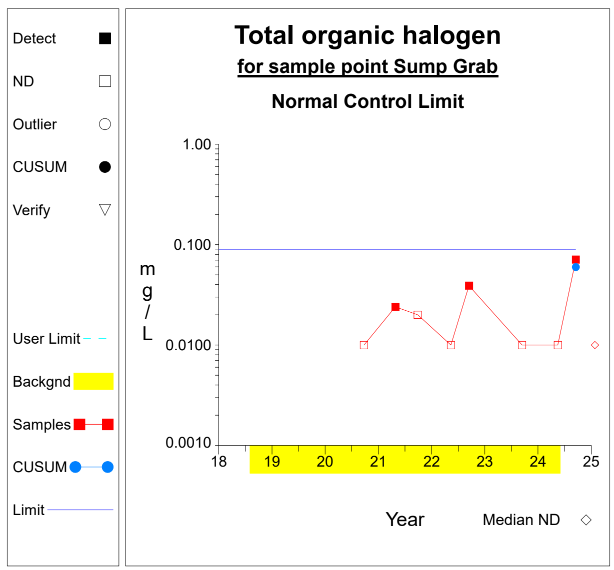
Graph 142



Graph 143



Graph 144



Graph 145

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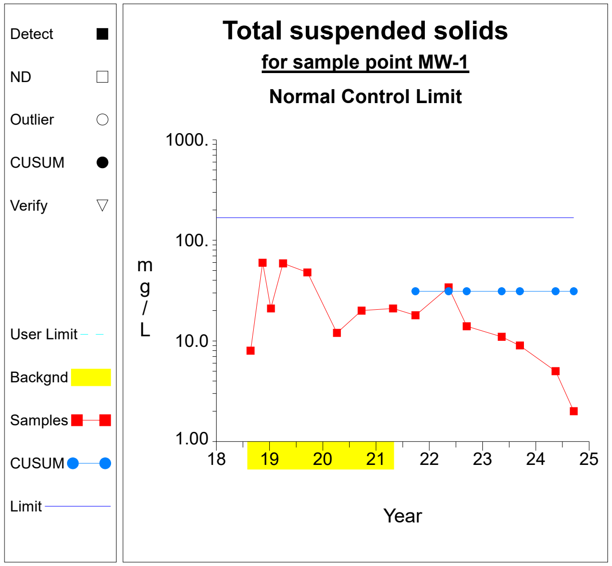
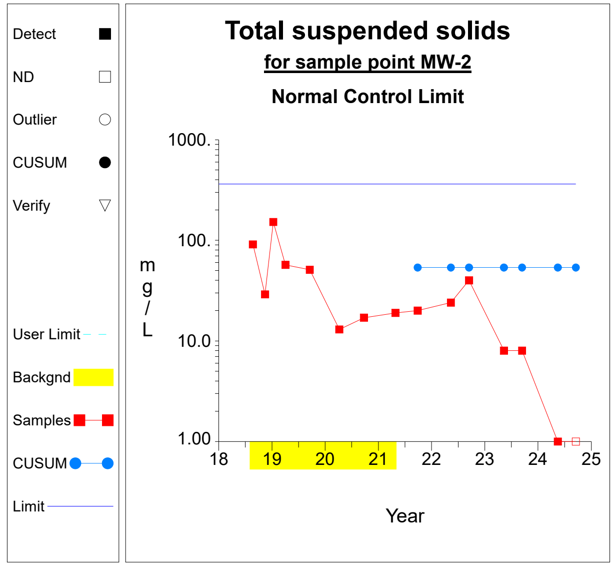
Goose Lake Quarry | November 2024

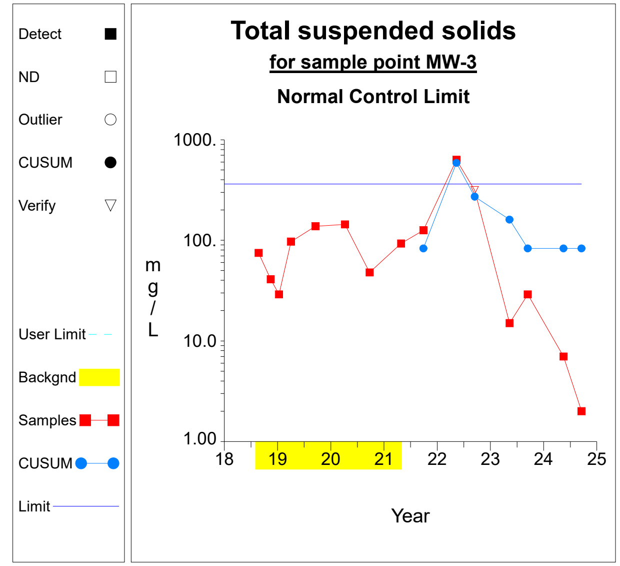
Intra-Well Control Charts / Prediction Limits



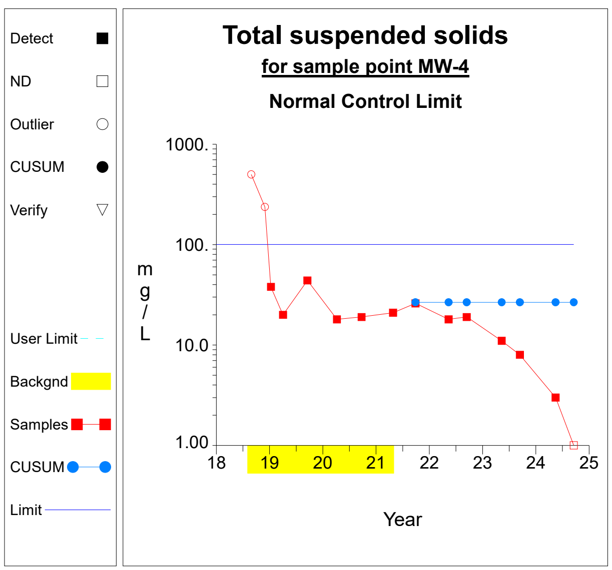
Graph 146



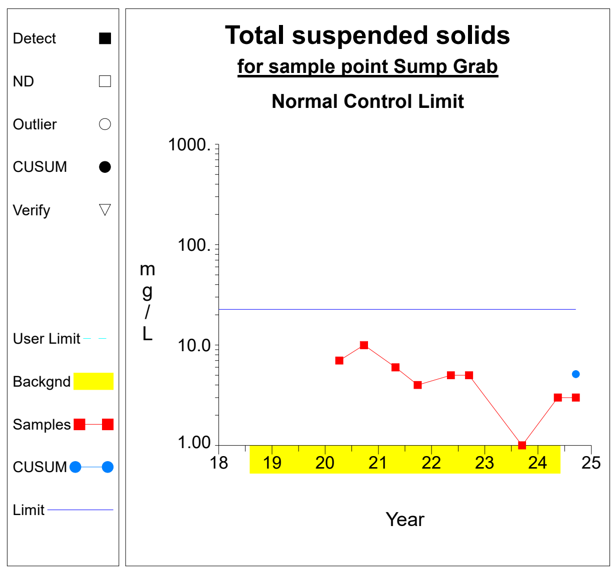
Graph 147



Graph 148



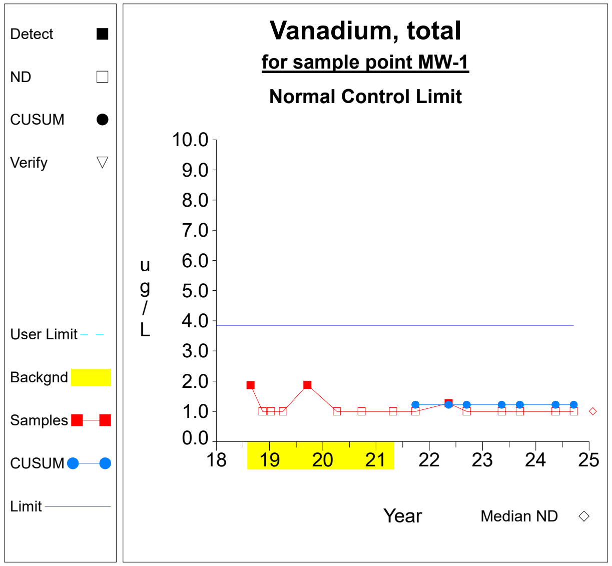
Graph 149



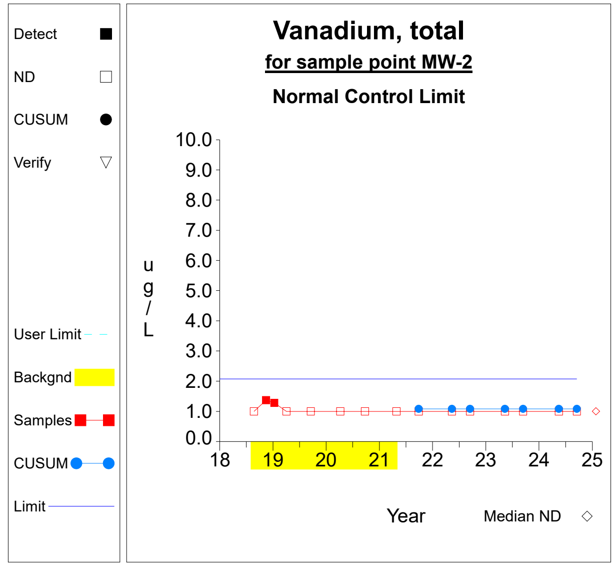
Graph 150

Prepared by: Otter Creek Environmental

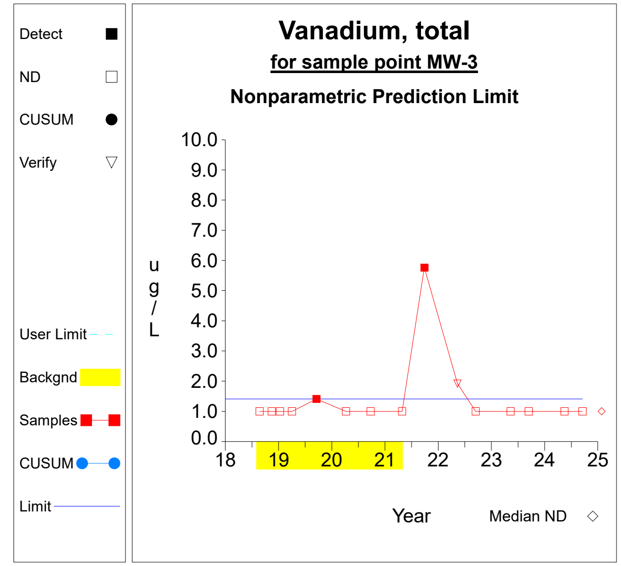
Intra-Well Control Charts / Prediction Limits



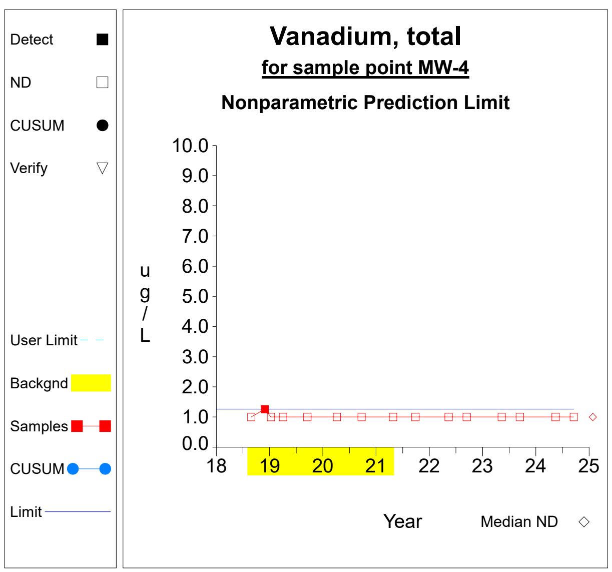
Graph 151



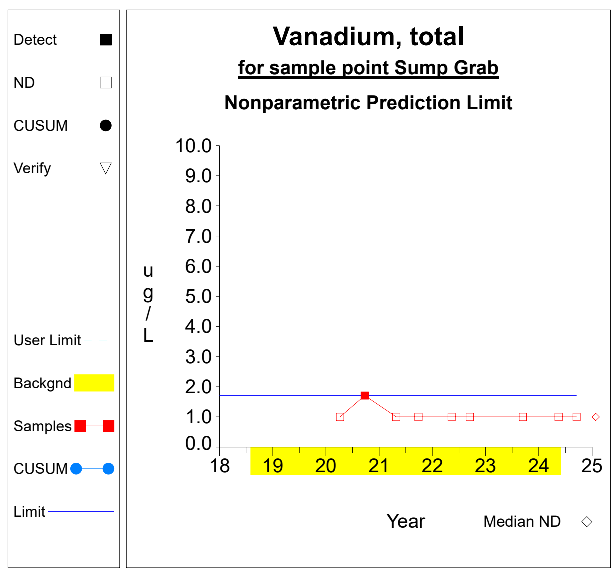
Graph 152



Graph 153

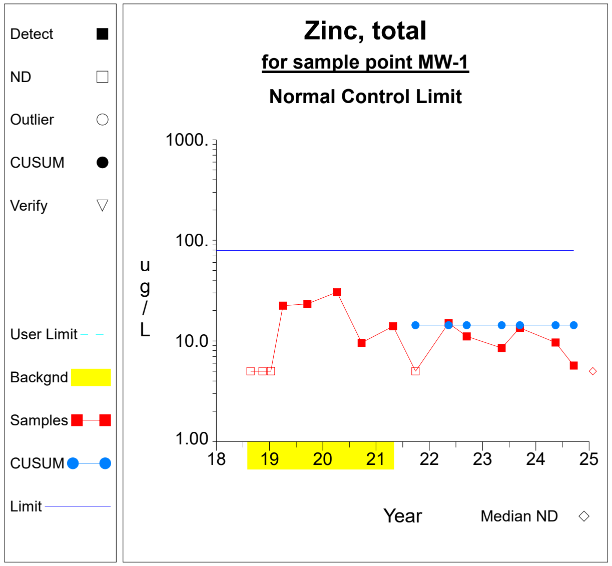


Graph 154

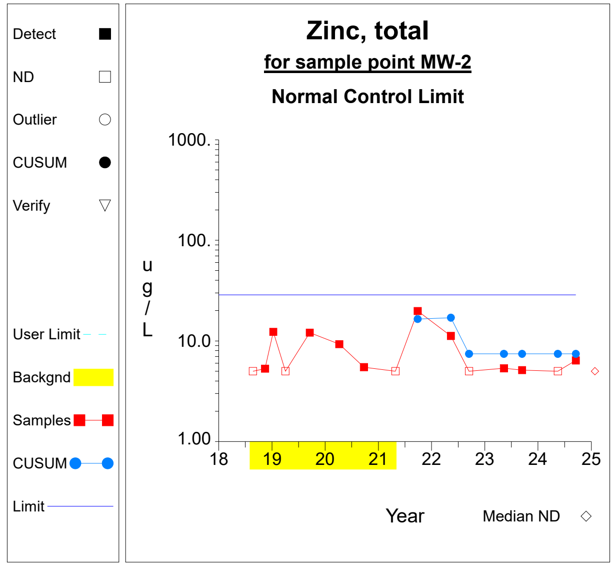


Graph 155

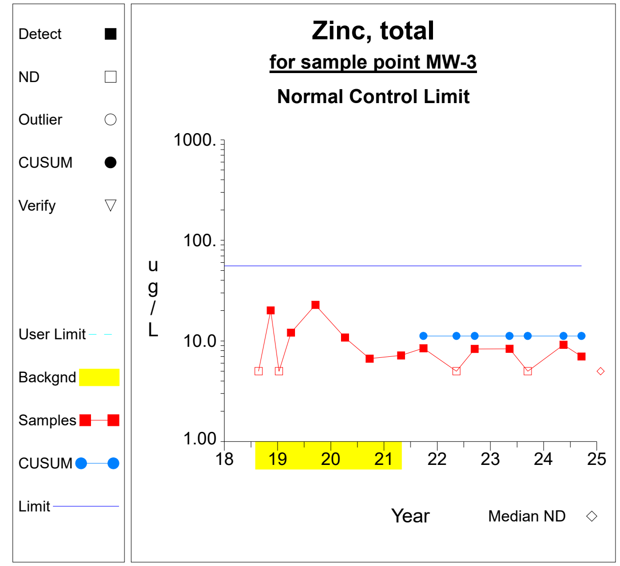
Intra-Well Control Charts / Prediction Limits



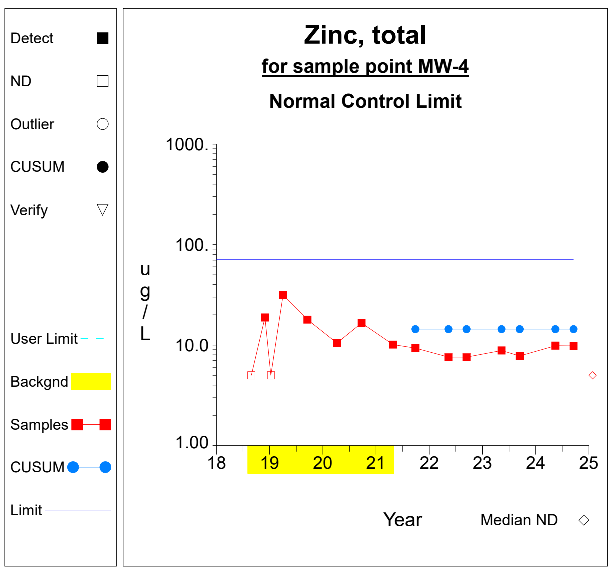
Graph 156



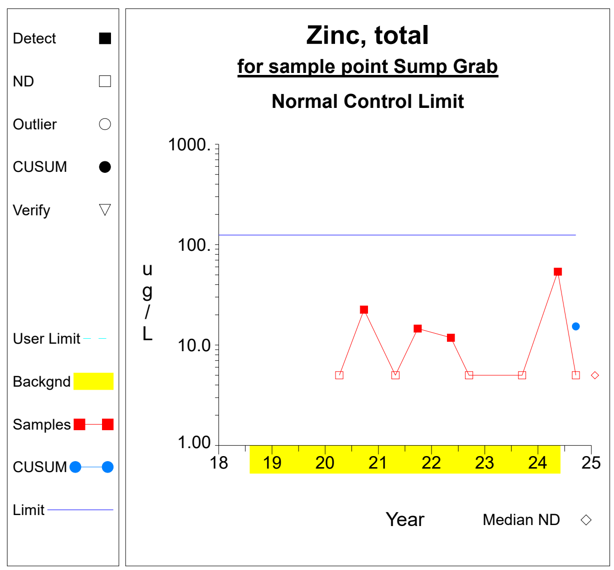
Graph 157



Graph 158

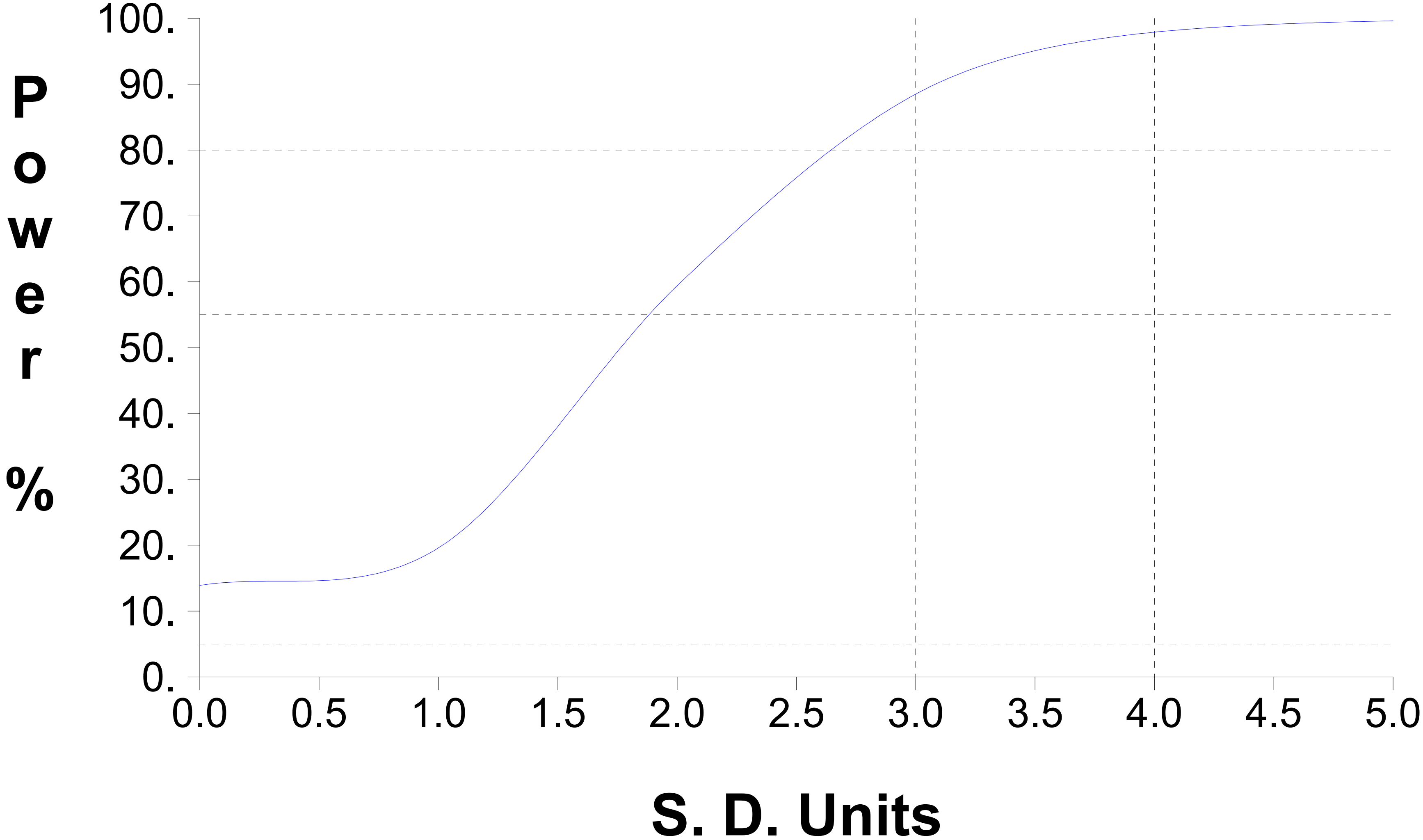


Graph 159



Graph 160

False Positive and False Negative Rates for Current Intra-Well Control Charts Monitoring Program



Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **2362.9** / **8** = **295.363**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{½}$ $= ((\mathbf{1.95}\times\mathbf{10^6} - \mathbf{5.58}\times\mathbf{10^6}/\mathbf{8}) / (\mathbf{8}-1))^{½}$ = **422.942**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **295.363** + **6.5** * **422.942** = **3044.483**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **19.051**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{½}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{½}) / 2$ = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1054.631**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X} = \mathbf{sum[X]} / \mathbf{N}$ $= \mathbf{1540.3} / \mathbf{8}$ $= \mathbf{192.538}$	Compute background mean.
2	$S = ((\mathbf{sum[X^2] - sum[X]^2/N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{646304.61 - 2.37 \times 10^6/8}) / (\mathbf{8}-1))^{1/2}$ $= \mathbf{223.523}$	Compute background sd.
3	$SCL = \bar{\mathbf{X}} + \mathbf{F} * \mathbf{S}$ $= \mathbf{192.538} + \mathbf{6.5} * \mathbf{223.523}$ $= \mathbf{1645.44}$	Compute combined Shewhart-CUSUM normal control limit.
4	$N' = \mathbf{N} * (\mathbf{N}-1) / 2$ $= \mathbf{8} * (\mathbf{8}-1) / 2$ $= \mathbf{28}$	Number of sample pairs during trend detection period.
5	$S = \mathbf{-64.249}$	Sen's estimator of trend.
6	$var(S) = \mathbf{65.333}$	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{1/2}) / 2$ $= \mathbf{4.6}$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	$LCL(S) = \mathbf{-434.096}$	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **1681.7** / **8**	
	= **210.213**	
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½}	Compute background sd.
	= ((**561877.85 - 2.83x10^6/8**) / (**8**-1))^{½}	
	= **172.529**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **210.213** + **6.5** * **172.529**	
	= **1331.65**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **77.138**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)^{½}**) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333^{½}**) / 2	
	= **4.6**	
8	LCL(S) = **-265.175**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **542.9** / **7**	
	= **77.557**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**48028.91** - **294740.41**/**7**) / (**7**-1))^{½}	
	= **31.42**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **77.557** + **6.5** * **31.42**	
	= **281.784**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **7** * (**7**-1) / 2	
	= **21**	
5	S = **-6.207**	Sen's estimator of trend.
6	var(S) = **44.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**21** - **2.326** * **44.333**^{½}) / 2	
	= **2.756**	
8	LCL(S) = **-58.583**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Aluminum, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **812.0** / **8**	
	= **101.5**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**88622.0** - **659344.0**/**8**) / (**8**-1))^{½}	
	= **29.771**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **101.5** + **6.5** * **29.771**	
	= **295.009**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**^{½}) / 2	
	= **5.887**	
8	LCL(S) = **-14.639**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **0.13**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.23**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.26**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.12**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Ammonia nitrogen (mg/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **0.25**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **5.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **5.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **5.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **5.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Antimony, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Arsenic, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **482.2** / **8** = **60.275**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**31009.46** - **232516.84**/**8**) / (**8**-1))^{½} = **16.668**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **60.275** + **6.5** * **16.668** = **168.62**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-4.22**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-39.306**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **583.7** / **8** = **72.963**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**49806.31** - **340705.69**/**8**) / (**8**-1))^{½} = **32.112**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **72.963** + **6.5** * **32.112** = **281.688**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-7.482**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-88.004**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **246.2** / **8** = **30.775**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**7884.1** - **60614.44**/**8**) / (**8**-1))^{½} = **6.626**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **30.775** + **6.5** * **6.626** = **73.842**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **1.858**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-14.588**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **346.4** / **8** = **43.3**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**15172.32** - **119992.96**/**8**) / (**8**-1))^{½} = **4.974**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **43.3** + **6.5** * **4.974** = **75.632**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.569**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.288**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Barium, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **866.9** / **8**	
	= **108.363**	
2	$S = ((\textbf{sum[X}^2\textbf{]} - \textbf{sum[X]}^2/\textbf{N}) / (\textbf{N}-1))^{1/2}$	Compute background sd.
	$= ((\textbf{96194.05} - \textbf{751515.61}/\textbf{8}) / (\textbf{8}-1))^{1/2}$	
	= **17.947**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **108.363** + **6.5** * **17.947**	
	= **225.016**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **2.729**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\textbf{N'} - \textbf{Z}_{.99} * \textbf{var(S)}^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\textbf{28} - \textbf{2.326} * \textbf{65.333}^{1/2}) / 2$	
	= **4.6**	
8	LCL(S) = **-22.666**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **1.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Beryllium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **174.1** / **8**	
	= **21.763**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$	Compute background sd.
	$= ((\mathbf{3889.93} - \mathbf{30310.81/8}) / (\mathbf{8}-1))^{1/2}$	
	= **3.8**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **21.763** + **6.5** * **3.8**	
	= **46.462**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1 th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{28} - \mathbf{2.326} * \mathbf{48.667}^{1/2}) / 2$	
	= **5.887**	
8	LCL(S) = **-2.202**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **243.0** / **8**	
	= **30.375**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**8713.54** - **59049.0**/**8**) / (**8**-1))^{½}	
	= **13.797**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **30.375** + **6.5** * **13.797**	
	= **120.053**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-6.102**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **61.667**^{½}) / 2	
	= **4.867**	
8	LCL(S) = **-25.109**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X)	Compute nonparametric prediction limit as largest background measurement.
	= **20.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **152.0** / **7** = **21.714**	Compute background mean.
2	S = ((**sum[X²] - sum[X]²/N**) / (**N**-1))$^{1/2}$ = ((**3402.0** - **23104.0/7**) / (**7**-1))$^{1/2}$ = **4.112**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **21.714** + **6.5** * **4.112** = **48.439**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **-0.436**	Sen's estimator of trend.
6	var(S) = **27.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**21** - **2.326** * **27.667**$^{1/2}$) / 2 = **4.383**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.347**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Boron, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **424.3** / **8** = **53.038**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**25608.35** - **180030.49/8**) / (**8**-1))^{½} = **21.06**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **53.038** + **6.5** * **21.06** = **189.925**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **10.228**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.705**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cadmium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.4**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **69.0** / **8**	
	= **8.625**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**651.0** - **4761.0**/**8**) / (**8**-1))$^{1/2}$	
	= **2.825**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **8.625** + **6.5** * **2.825**	
	= **26.989**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-1.098**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**$^{1/2}$) / 2	
	= **5.887**	
8	LCL(S) = **-4.722**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **67.0** / **8** = **8.375**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**649.0** - **4489.0**/**8**) / (**8**-1))$^{1/2}$ = **3.543**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **8.375** + **6.5** * **3.543** = **31.405**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.415**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **55.667**$^{1/2}$) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.919**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **73.0** / **8** = **9.125**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**731.0** - **5329.0**/**8**) / (**8**-1))$^{1/2}$ = **3.044**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **9.125** + **6.5** * **3.044** = **28.913**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.872**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **48.667**$^{1/2}$) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.115**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **85.0** / **8** = **10.625**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**1035.0** - **7225.0**/**8**) / (**8**-1))$^{1/2}$ = **4.34**	Compute background sd.
3	SCL = **$\overline{X}$** + **F** * **S** = **10.625** + **6.5** * **4.34** = **38.838**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-3.246**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **55.667**$^{1/2}$) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-12.264**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chemical oxygen demand (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **58.0** / **8** = **7.25**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{424.0} - \mathbf{3364.0}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ = **0.707**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **7.25** + **6.5** * **0.707** = **11.846**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **21.0**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{21.0}^{1/2}) / 2$ = **8.67**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **46.56** / **8** = **5.82**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**314.543** - **2167.834**/**8**) / (**8**-1))$^{1/2}$ = **2.495**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **5.82** + **6.5** * **2.495** = **22.035**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.189**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.113**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **233.34** / **8** = **29.168**	Compute background mean.
2	S = ((**sum[X²]** - **sum[X]²**/**N**) / (**N**-1))^½ = ((**12367.159** - **54447.556**/**8**) / (**8**-1))^½ = **28.186**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **29.168** + **6.5** * **28.186** = **212.377**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-26.529**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^½) / 2 = (**28** - **2.326** * **65.333**^½) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-57.494**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **11.002** / **8**	
	= **1.375**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**27.542** - **121.044**/**8**) / (**8**-1))$^{1/2}$	
	= **1.332**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **1.375** + **6.5** * **1.332**	
	= **10.03**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-0.169**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**$^{1/2}$) / 2	
	= **4.6**	
8	LCL(S) = **-2.362**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **86.12** / **8** = **10.765**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**1842.082** - **7416.654**/**8**) / (**8**-1))^{½} = **11.433**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **10.765** + **6.5** * **11.433** = **85.08**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-9.015**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-43.765**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chloride (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **173.4** / **8** = **21.675**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**4202.96** - **30067.56**/**8**) / (**8**-1))^{½} = **7.969**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **21.675** + **6.5** * **7.969** = **73.472**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-7.198**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-10.808**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **42.39** / **8** = **5.299**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**341.511** - **1796.912**/**8**) / (**8**-1))^{½} = **4.087**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **5.299** + **6.5** * **4.087** = **31.861**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.75**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.45**	One-sided lower confidence limit for slope.
9	LCL(S) > 0	**Significant increasing trend.**

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **37.2** / **6** = **6.2**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**237.883** - **1383.84/6**) / (**6**-1))^{½} = **1.204**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **6.2** + **6.5** * **1.204** = **14.023**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **0.208**	Sen's estimator of trend.
6	var(S) = **28.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**15** - **2.326** * **28.333**^{½}) / 2 = **1.309**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.954**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **58.86** / **8**	
	= **7.358**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**714.508** - **3464.5**/**8**) / (**8**-1))^{½}	
	= **6.341**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **7.358** + **6.5** * **6.341**	
	= **48.573**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **5.734**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**^{½}) / 2	
	= **4.6**	
8	LCL(S) = **-0.182**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **60.72** / **8** = **7.59**	Compute background mean.
2	S = ((**sum[X²] - sum[X]²/N**) / (**N**-1))$^{1/2}$ = ((**614.972** - **3686.918**/**8**) / (**8**-1))$^{1/2}$ = **4.692**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **7.59** + **6.5** * **4.692** = **38.088**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.619**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-3.612**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Chromium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.5**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Cobalt, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **31.73** / **8** = **3.966**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$ $= ((\mathbf{151.006} - \mathbf{1006.793}/\mathbf{8}) / (\mathbf{8}-1))^{1/2}$ = **1.896**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **3.966** + **6.5** * **1.896** = **16.289**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.509**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{64.333}^{1/2}) / 2$ = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1 th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.696**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **21.38** / **8** = **2.673**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**66.741** - **457.104**/**8**) / (**8**-1))^{½} = **1.171**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **2.673** + **6.5** * **1.171** = **10.286**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.67**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **48.667**^{½}) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.872**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **58.73** / **8** = **7.341**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**1186.49** - **3449.213**/**8**) / (**8**-1))$^{1/2}$ = **10.388**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **7.341** + **6.5** * **10.388** = **74.862**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.499**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-24.106**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **24.67** / **8**	
	= **3.084**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**104.273** - **608.609**/**8**) / (**8**-1))$^{1/2}$	
	= **2.007**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **3.084** + **6.5** * **2.007**	
	= **16.129**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**$^{1/2}$) / 2	
	= **6.926**	
8	LCL(S) = **-2.396**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Copper, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **54.98** / **8** = **6.873**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**542.712** - **3022.8/8**) / (**8**-1))^{½} = **4.853**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **6.873** + **6.5** * **4.853** = **38.417**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-3.822**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **1.125** / **8** = **0.141**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**0.188** - **1.266/8**) / (**8**-1))^{½} = **0.065**	Compute background sd.
3	SCL = **$\bar{X}$** + **F** * **S** = **0.141** + **6.5** * **0.065** = **0.564**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.004**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **61.667**^{½}) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.102**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **1.425** / **8** = **0.178**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.341** - **2.031**/**8**) / (**8**-1))^{½} = **0.112**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.178** + **6.5** * **0.112** = **0.906**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.02**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **61.667**^{½}) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.087**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **0.964** / **8** = **0.121**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**0.129** - **0.929**/**8**) / (**8**-1))$^{1/2}$ = **0.043**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.121** + **6.5** * **0.043** = **0.4**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **1.238** / **8** = **0.155**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**0.224** - **1.533/8**) / (**8**-1))$^{1/2}$ = **0.068**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **0.155** + **6.5** * **0.068** = **0.597**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.021**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **61.667**$^{1/2}$) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.062**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Fluoride (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **1.182** / **8** = **0.148**	Compute background mean.
2	S = ((**sum[X²] - sum[X]²**/**N**) / (**N**-1))^{½} = ((**0.177** - **1.397**/**8**) / (**8**-1))^{½} = **0.018**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.148** + **6.5** * **0.018** = **0.266**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.01**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.023**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Formaldehyde (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **100.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **1857.1** / **8**	
	= **232.138**	
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{1/2}$	Compute background sd.
	$= ((\mathbf{890408.29} - \mathbf{3.45 \times 10^6/8}) / (\mathbf{8}-1))^{1/2}$	
	= **256.154**	
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **232.138** + **6.5** * **256.154**	
	= **1897.141**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-11.204**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{1/2}) / 2$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	$= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{1/2}) / 2$	
	= **4.6**	
8	LCL(S) = **-647.558**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **3316.9** / **8** = **414.613**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**3.14**x**10^6** - **1.10**x**10^7**/**8**) / (**8**-1))^{½} = **502.014**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **414.613** + **6.5** * **502.014** = **3677.705**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-190.215**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-990.019**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **3886.8** / **8** = **485.85**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**4.06**x**10^6** - **1.51**x**10^7**/**8**) / (**8**-1))^{½} = **557.542**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **485.85** + **6.5** * **557.542** = **4109.872**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **261.135**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-294.791**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **2187.2** / **8** = **273.4**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))$^{1/2}$ = ((**1.46x10^6** - **4.78x10^6**/**8**) / (**8**-1))$^{1/2}$ = **351.196**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **273.4** + **6.5** * **351.196** = **2556.176**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-37.314**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-608.971**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Iron, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **3609.7** / **8**	
	= **451.213**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**1.06**x**10^7** - **1.30**x**10^7**/**8**) / (**8**-1))^{½}	
	= **1131.669**	
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **451.213** + **6.5** * **1131.669**	
	= **7807.064**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-23.005**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **64.333**^{½}) / 2	
	= **4.672**	
8	LCL(S) = **-1272.359**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **2.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **2.21**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **2.41**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **3.01**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Lead, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **314.5** / **8** = **39.313**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**12947.27** - **98910.25**/**8**) / (**8**-1))^{½} = **9.13**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **39.313** + **6.5** * **9.13** = **98.657**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **8.665**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.649**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **486.1** / **8**	
	= **60.763**	
2	S = ((**sum[X²]** - **sum[X]**²/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**30612.67** - **236293.21**/**8**) / (**8**-1))^{½}	
	= **12.398**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **60.763** + **6.5** * **12.398**	
	= **141.351**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-7.069**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**^{½}) / 2	
	= **4.6**	
8	LCL(S) = **-24.075**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **212.5** / **8**	
	= **26.563**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**5808.83** - **45156.25/8**) / (**8**-1))^{½}	
	= **4.845**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **26.563** + **6.5** * **4.845**	
	= **58.053**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **3.0**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**^{½}) / 2	
	= **4.6**	
8	LCL(S) = **-1.917**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **413.8** / **8** = **51.725**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**21979.84** - **171230.44/8**) / (**8**-1))^{½} = **9.071**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **51.725** + **6.5** * **9.071** = **110.689**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-4.689**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-18.917**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Magnesium, total (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **306.9** / **8** = **38.363**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**11885.09** - **94187.61**/**8**) / (**8**-1))$^{1/2}$ = **3.994**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **38.363** + **6.5** * **3.994** = **64.321**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **1.117**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.311**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **251.1** / **8**	
	= **31.388**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**11123.21** - **63051.21**/**8**) / (**8**-1))$^{1/2}$	
	= **21.52**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **31.388** + **6.5** * **21.52**	
	= **171.268**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**$^{1/2}$) / 2	
	= **6.926**	
8	LCL(S) = **-23.888**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **538.8** / **8** = **67.35**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))$^{1/2}$ = ((**44503.34** - **290305.44**/**8**) / (**8**-1))$^{1/2}$ = **34.258**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **67.35** + **6.5** * **34.258** = **290.025**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.334**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-90.683**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **305.0** / **8** = **38.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**17073.96** - **93025.0**/**8**) / (**8**-1))^{½} = **27.892**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **38.125** + **6.5** * **27.892** = **219.424**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **8.19**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.147**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **149.4** / **7** = **21.343**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**3217.14** - **22320.36/7**) / (**7**-1))^{½} = **2.18**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **21.343** + **6.5** * **2.18** = **35.514**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **-0.435**	Sen's estimator of trend.
6	var(S) = **35.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**21** - **2.326** * **35.667**^{½}) / 2 = **3.554**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-5.666**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Manganese, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **244.5** / **8**	
	= **30.563**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**13471.25** - **59780.25**/**8**) / (**8**-1))^{½}	
	= **29.274**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **30.563** + **6.5** * **29.274**	
	= **220.843**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **-3.946**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **2.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Mercury, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Methyl ethyl ketone (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X)	Compute nonparametric prediction limit as median reporting limit in background.
	= **10.0**	
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **16.71** / **8** = **2.089**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**35.129** - **279.224**/**8**) / (**8**-1))$^{1/2}$ = **0.179**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **2.089** + **6.5** * **0.179** = **3.255**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.219**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **26.04** / **8** = **3.255**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**113.381** - **678.082/8**) / (**8**-1))^{½} = **2.022**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **3.255** + **6.5** * **2.022** = **16.398**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **48.667**^{½}) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-2.759**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **19.09** / **8** = **2.386**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**49.605** - **364.428**/**8**) / (**8**-1))$^{1/2}$ = **0.761**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **2.386** + **6.5** * **0.761** = **7.331**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.118**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **19.04** / **8** = **2.38**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**48.949** - **362.522/8**) / (**8**-1))$^{1/2}$ = **0.72**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **2.38** + **6.5** * **0.72** = **7.063**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.159**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Molybdenum, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **10.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **10.55** / **8**	
	= **1.319**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½}	Compute background sd.
	= ((**17.647** - **111.303**/**8**) / (**8**-1))^{½}	
	= **0.73**	
3	SCL = **$\bar{X}$** + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **1.319** + **6.5** * **0.73**	
	= **6.066**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **6.57** / **6** = **1.095**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**7.395** - **43.165**/**6**) / (**6**-1))^{½} = **0.2**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **1.095** + **6.5** * **0.2** = **2.397**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **19.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**15** - **2.326** * **19.667**^{½}) / 2 = **2.342**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.459**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **12.8** / **8** = **1.6**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**26.619** - **163.84**/**8**) / (**8**-1))^{½} = **0.937**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **1.6** + **6.5** * **0.937** = **7.687**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.314**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.426**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **9.99** / **8** = **1.249**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**14.431** - **99.8**/**8**) / (**8**-1))^{½} = **0.529**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **1.249** + **6.5** * **0.529** = **4.684**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **0.0**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Nickel, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **1.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **79.0** / **8** = **9.875**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**1203.0** - **6241.0**/**8**) / (**8**-1))^{½} = **7.772**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **9.875** + **6.5** * **7.772** = **60.396**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **55.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **55.667**^{½}) / 2 = **5.323**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-10.24**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **60.0** / **8**	
	= **7.5**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**606.0** - **3600.0**/**8**) / (**8**-1))$^{1/2}$	
	= **4.721**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **7.5** + **6.5** * **4.721**	
	= **38.185**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**$^{1/2}$) / 2	
	= **5.887**	
8	LCL(S) = **-2.139**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **64.0** / **8**	
	= **8.0**	
2	S = ((**sum[X²] - sum[X]²/N**) / (**N**-1))^{½}	Compute background sd.
	= ((**778.0** - **4096.0**/**8**) / (**8**-1))^{½}	
	= **6.164**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **8.0** + **6.5** * **6.164**	
	= **48.069**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **37.0**^{½}) / 2	
	= **6.926**	
8	LCL(S) = **-0.436**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **66.5** / **8**	
	= **8.313**	
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½}	Compute background sd.
	= ((**1006.25** - **4422.25/8**) / (**8**-1))^{½}	
	= **8.049**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **8.313** + **6.5** * **8.049**	
	= **60.629**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **48.667**^{½}) / 2	
	= **5.887**	
8	LCL(S) = **-13.769**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Phenols (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **45.0** / **8** = **5.625**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**267.0 - 2025.0/8**) / (**8**-1))$^{1/2}$ = **1.408**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **5.625** + **6.5** * **1.408** = **14.776**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28 - 2.326** * **37.0**$^{1/2}$) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.515**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **44.33** / **8** = **5.541**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**252.318** - **1965.149**/**8**) / (**8**-1))$^{1/2}$ = **0.976**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **5.541** + **6.5** * **0.976** = **11.888**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **48.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **48.667**$^{1/2}$) / 2 = **5.887**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.747**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Selenium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **5.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Silver, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **0.5**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X} = \mathbf{sum[X]} / \mathbf{N}$ $= \mathbf{224.12} / \mathbf{8}$ $= \mathbf{28.015}$	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{½}$ $= ((\mathbf{10709.178} - \mathbf{50229.774}/\mathbf{8}) / (\mathbf{8}-1))^{½}$ $= \mathbf{25.158}$	Compute background sd.
3	$SCL = \mathbf{\overline{X}} + \mathbf{F} * \mathbf{S}$ $= \mathbf{28.015} + \mathbf{6.5} * \mathbf{25.158}$ $= \mathbf{191.542}$	Compute combined Shewhart-CUSUM normal control limit.
4	$N' = \mathbf{N} * (\mathbf{N}-1) / 2$ $= \mathbf{8} * (\mathbf{8}-1) / 2$ $= \mathbf{28}$	Number of sample pairs during trend detection period.
5	$S = \mathbf{-2.619}$	Sen's estimator of trend.
6	$var(S) = \mathbf{65.333}$	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{½}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{65.333}^{½}) / 2$ $= \mathbf{4.6}$	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	$LCL(S) = \mathbf{-55.787}$	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **216.0** / **8** = **27.0**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**5976.38** - **46656.0**/**8**) / (**8**-1))^{½} = **4.542**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **27.0** + **6.5** * **4.542** = **56.52**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.137**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-8.338**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **36.5** / **8** = **4.563**	Compute background mean.
2	$S = ((\text{sum}[X^2] - \text{sum}[X]^2/N) / (N-1))^{1/2}$ $= ((168.236 - 1332.25/8) / (8-1))^{1/2}$ = **0.493**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **4.563** + **6.5** * **0.493** = **7.77**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.178**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	$M_1(S) = (N' - Z_{.99} * \text{var}(S)^{1/2}) / 2$ $= (28 - 2.326 * 65.333^{1/2}) / 2$ = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-1.684**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **79.49** / **8** = **9.936**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2**/**N**) / (**N**-1))$^{1/2}$ = ((**1101.398** - **6318.66**/**8**) / (**8**-1))$^{1/2}$ = **6.672**	Compute background sd.
3	SCL = **$\overline{X}$** + **F** * **S** = **9.936** + **6.5** * **6.672** = **53.301**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.439**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **65.333**$^{1/2}$) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-28.077**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Sulfate (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **520.3** / **8** = **65.038**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**44356.21** - **270712.09**/**8**) / (**8**-1))^{½} = **38.762**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **65.038** + **6.5** * **38.762** = **316.988**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-14.381**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-57.067**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-1
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-2
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **2.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Thallium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = median(X) = **3.0**	Compute nonparametric prediction limit as median reporting limit in background.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **0.046** / **7** = **0.007**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))$^{1/2}$ = ((**3.32x10^{-4}** - **0.002/7**) / (**7**-1))$^{1/2}$ = **0.002**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **0.007** + **6.5** * **0.002** = **0.021**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **7** * (**7**-1) / 2 = **21**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **35.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**21** - **2.326** * **35.667**$^{1/2}$) / 2 = **3.554**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.003**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **0.231** / **8** = **0.029**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**0.014** - **0.053**/**8**) / (**8**-1))^{½} = **0.032**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **0.029** + **6.5** * **0.032** = **0.24**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-2.41**x**10^{-4}**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z$_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.043**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **0.129** / **8** = **0.016**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.003** - **0.017**/**8**) / (**8**-1))^{½} = **0.014**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **0.016** + **6.5** * **0.014** = **0.107**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.005**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **0.085** / **6** = **0.014**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**0.001** - **0.007**/**6**) / (**6**-1))^{½} = **0.005**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **0.014** + **6.5** * **0.005** = **0.045**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **-0.003**	Sen's estimator of trend.
6	var(S) = **27.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**15** - **2.326** * **27.333**^{½}) / 2 = **1.42**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.054**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total organic halogen (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N**	Compute background mean.
	= **0.113** / **7**	
	= **0.016**	
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$	Compute background sd.
	= ((**0.003** - **0.013**/**7**) / (**7**-1))$^{1/2}$	
	= **0.011**	
3	SCL = $\bar{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **0.016** + **6.5** * **0.011**	
	= **0.09**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **7** * (**7**-1) / 2	
	= **21**	
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **27.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - $Z_{.99}$ * **var(S)**$^{1/2}$) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**21** - **2.326** * **27.667**$^{1/2}$) / 2	
	= **4.383**	
8	LCL(S) = **-0.011**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **249.0** / **8** = **31.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**10875.0** - **62001.0/8**) / (**8**-1))^{½} = **21.128**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **31.125** + **6.5** * **21.128** = **168.46**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.616**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **64.333**^{½}) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-29.746**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N**	Compute background mean.
	= **429.0** / **8**	
	= **53.625**	
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½}	Compute background sd.
	= ((**38895.0** - **184041.0/8**) / (**8**-1))^{½}	
	= **47.644**	
3	SCL = $\overline{X}$ + **F** * **S**	Compute combined Shewhart-CUSUM normal control limit.
	= **53.625** + **6.5** * **47.644**	
	= **363.313**	
4	N' = **N** * (**N**-1) / 2	Number of sample pairs during trend detection period.
	= **8** * (**8**-1) / 2	
	= **28**	
5	S = **-26.936**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
	= (**28** - **2.326** * **65.333**^{½}) / 2	
	= **4.6**	
8	LCL(S) = **-92.45**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **665.0** / **8** = **83.125**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**68289.0** - **442225.0**/**8**) / (**8**-1))^{½} = **43.113**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **83.125** + **6.5** * **43.113** = **363.357**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **16.188**	Sen's estimator of trend.
6	var(S) = **65.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **65.333**^{½}) / 2 = **4.6**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-81.407**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X] / N** = **160.0** / **6** = **26.667**	Compute background mean.
2	S = ((**sum[X^2] - sum[X]^2/N**) / (**N**-1))^{½} = ((**4906.0** - **25600.0/6**) / (**6**-1))^{½} = **11.308**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **26.667** + **6.5** * **11.308** = **100.167**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **6** * (**6**-1) / 2 = **15**	Number of sample pairs during trend detection period.
5	S = **-1.969**	Sen's estimator of trend.
6	var(S) = **28.333**	Variance estimate for slope.
7	M_1(S) = (**N' - $Z_{.99}$** * **var(S)**^{½}) / 2 = (**15** - **2.326** * **28.333**^{½}) / 2 = **1.309**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-70.568**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Total suspended solids (mg/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **41.0** / **8** = **5.125**	Compute background mean.
2	$S = ((\mathbf{sum[X^2]} - \mathbf{sum[X]}^2/\mathbf{N}) / (\mathbf{N}-1))^{½}$ $= ((\mathbf{261.0} - \mathbf{1681.0}/\mathbf{8}) / (\mathbf{8}-1))^{½}$ = **2.696**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **5.125** + **6.5** * **2.696** = **22.648**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-1.097**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	$M_1(S) = (\mathbf{N'} - \mathbf{Z}_{.99} * \mathbf{var(S)}^{½}) / 2$ $= (\mathbf{28} - \mathbf{2.326} * \mathbf{64.333}^{½}) / 2$ = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-3.381**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **9.75** / **8** = **1.219**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**13.031** - **95.063**/**8**) / (**8**-1))^{½} = **0.405**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **1.219** + **6.5** * **0.405** = **3.852**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.537**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **8.65** / **8** = **1.081**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**9.515** - **74.823**/**8**) / (**8**-1))^{½} = **0.152**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **1.081** + **6.5** * **0.152** = **2.072**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **37.0**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **37.0**^{½}) / 2 = **6.926**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-0.229**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-3
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.41**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at MW-4
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.26**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Vanadium, total (ug/L) at Sump Grab
Nonparametric Prediction Limit

Step	Equation	Description
1	PL = max(X) = **1.71**	Compute nonparametric prediction limit as largest background measurement.
2	Conf = **0.99**	Confidence level is based on N, K and resampling strategy (see Gibbons 1994).

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-1
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **114.87** / **8** = **14.359**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**2342.155** - **13195.117**/**8**) / (**8**-1))^{½} = **9.948**	Compute background sd.
3	SCL = **$\bar{X}$** + **F** * **S** = **14.359** + **6.5** * **9.948** = **79.022**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **3.518**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **61.667**^{½}) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-6.218**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-2
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **59.46** / **8** = **7.433**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**516.939** - **3535.492**/**8**) / (**8**-1))^{½} = **3.273**	Compute background sd.
3	SCL = $\overline{\mathbf{X}}$ + **F** * **S** = **7.433** + **6.5** * **3.273** = **28.709**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **61.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**^{½}) / 2 = (**28** - **2.326** * **61.667**^{½}) / 2 = **4.867**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-4.506**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-3
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **89.63** / **8** = **11.204**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]^2**/**N**) / (**N**-1))^{½} = ((**1332.655** - **8033.537**/**8**) / (**8**-1))^{½} = **6.85**	Compute background sd.
3	SCL = $\bar{X}$ + **F** * **S** = **11.204** + **6.5** * **6.85** = **55.729**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.4**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **64.333**^{½}) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1^{th} largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-11.724**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at MW-4
Normal Control Limit

Step	Equation	Description
1	$\overline{X}$ = **sum[X]** / **N** = **115.3** / **8** = **14.413**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))$^{1/2}$ = ((**2197.63** - **13294.09**/**8**) / (**8**-1))$^{1/2}$ = **8.749**	Compute background sd.
3	SCL = $\overline{X}$ + **F** * **S** = **14.413** + **6.5** * **8.749** = **71.284**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **-0.189**	Sen's estimator of trend.
6	var(S) = **64.333**	Variance estimate for slope.
7	M_1(S) = (**N'** - **Z**$_{.99}$ * **var(S)**$^{1/2}$) / 2 = (**28** - **2.326** * **64.333**$^{1/2}$) / 2 = **4.672**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-11.817**	One-sided lower confidence limit for slope.

Worksheet 2 - Intra-Well Control Charts / Prediction Limits
Zinc, total (ug/L) at Sump Grab
Normal Control Limit

Step	Equation	Description
1	$\bar{X}$ = **sum[X]** / **N** = **122.7** / **8** = **15.338**	Compute background mean.
2	S = ((**sum[X^2]** - **sum[X]**^{2}/**N**) / (**N**-1))^{½} = ((**3853.09** - **15055.29**/**8**) / (**8**-1))^{½} = **16.781**	Compute background sd.
3	SCL = $\bar{\mathbf{X}}$ + **F** * **S** = **15.338** + **6.5** * **16.781** = **124.413**	Compute combined Shewhart-CUSUM normal control limit.
4	N' = **N** * (**N**-1) / 2 = **8** * (**8**-1) / 2 = **28**	Number of sample pairs during trend detection period.
5	S = **0.0**	Sen's estimator of trend.
6	var(S) = **56.667**	Variance estimate for slope.
7	M_1(S) = (**N'** - **$Z_{.99}$** * **var(S)**^{½}) / 2 = (**28** - **2.326** * **56.667**^{½}) / 2 = **5.245**	Ordinal position for one-sided lower confidence limit for slope. The LCL is the M_1th largest slope estimate. When M_1 is not an integer, interpolation is used.
8	LCL(S) = **-7.515**	One-sided lower confidence limit for slope.

Appendix B

Laboratory Analytical Reports

Spring

QCAnalytical Services, LLC
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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 05/15/24 15:21
Date Reported: 06/11/24 04:59
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Case Narrative

Sample ID: Goose Lake Well #1 Grab
Lab No.: 24E1567-01

Analyte	Result	Units	Analyzed	Analyst	Method
Total Organic Halogens (TOX)	<0.010	mg/L	6/07/24 8:32	BDF	EPA 9020
2-Butanone (MEK)	<0.010	mg/L	5/28/24 16:38	LNH	EPA 624

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 05/15/24 10:15**	**Date Received: 05/15/24 15:21**		
Lab No.: 24E1567-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	05/24/24 14:27	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	05/16/24 10:44	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	05/20/24 17:17	EV	SM 5220D-1997	
Chloride	13.9	mg/L	05/17/24 15:22	EV	EPA 300.0	
Fluoride	0.105	mg/L	05/17/24 15:22	EV	EPA 300.0	
Sulfate as SO4	19.1	mg/L	05/17/24 15:22	EV	EPA 300.0	
Phenolics	<0.010	mg/L	05/24/24 15:33	kc	EPA 420.1 rev1978	
Total Suspended Solids	5	mg/L	05/21/24 9:09	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	05/17/24 13:52	kc	EPA 200.7	
Aluminum	<0.100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Boron	<0.0200	mg/L	05/17/24 13:52	kc	EPA 200.7	
Barium	0.0464	mg/L	05/17/24 13:52	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	05/17/24 13:52	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	05/17/24 13:52	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Randal Wanke, Laboratory Director

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	06/11/24 04:59

Sample ID: Goose Lake Well #1 Grab — **Date Sampled: 05/15/24 10:15** — **Date Received: 05/15/24 15:21**

Lab No.: 24E1567-01 — **Sampled by: Morgan Schuler**

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Chromium	0.00437	mg/L	05/17/24 13:52	kc	EPA 200.7	
Copper	<0.00300	mg/L	05/17/24 13:52	kc	EPA 200.7	
Iron	0.0382	mg/L	05/17/24 13:52	kc	EPA 200.7	
Magnesium	38.4	mg/L	05/17/24 13:52	kc	EPA 200.7	
Manganese	<0.0200	mg/L	05/17/24 13:52	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Nickel	<0.00100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Lead	<0.00200	mg/L	05/17/24 13:52	kc	EPA 200.7	
Antimony	<0.00500	mg/L	05/17/24 13:52	kc	EPA 200.7	
Selenium	<0.00500	mg/L	05/17/24 13:52	kc	EPA 200.7	
Thallium	<0.00300	mg/L	05/17/24 13:52	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	05/17/24 13:52	kc	EPA 200.7	
Zinc	0.00964	mg/L	05/17/24 13:52	kc	EPA 200.7	
Mercury	<0.00200	mg/L	05/28/24 16:30	kc	EPA 245.1 rev 3-1994	
Field pH	8.4	pH Units	05/15/24 10:15	Morgan S	SM 4500 H + B	
Field Temperature	55.8	ºF	05/15/24 10:15	Morgan S	SM 2550 B	
Field Conductivity	530	uS	05/15/24 10:15	Morgan S	EPA 150	

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 05/15/24 15:30
Date Reported: 06/12/24 04:01
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Case Narrative

Sample ID: Goose Lake Well #2 Grab
Lab No.: 24E1569-01

Analyte	Result	Units	Analyzed	Analyst	Method
Total Organic Halogens (TOX)	<0.010	mg/L	6/07/24 8:32	BDF	EPA 9020
2-Butanone (MEK)	<0.010	mg/L	5/28/24 17:01	LNH	EPA 624

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #2 Grab			**Date Sampled: 05/15/24 11:30**		**Date Received: 05/15/24 15:30**	
Lab No.: 24E1569-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	05/24/24 14:27	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	05/16/24 10:47	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	05/20/24 17:17	EV	SM 5220D-1997	
Chloride	3.54	mg/L	05/17/24 15:22	EV	EPA 300.0	
Fluoride	0.128	mg/L	05/17/24 15:22	EV	EPA 300.0	
Sulfate as SO4	27.0	mg/L	05/17/24 15:22	EV	EPA 300.0	
Phenolics	<0.010	mg/L	05/24/24 15:33	kc	EPA 420.1 rev1978	
Total Suspended Solids	1	mg/L	05/21/24 9:09	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	05/17/24 13:55	kc	EPA 200.7	
Aluminum	<0.100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Boron	<0.0200	mg/L	05/17/24 13:55	kc	EPA 200.7	
Barium	0.0576	mg/L	05/17/24 13:55	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	05/17/24 13:55	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	05/17/24 13:55	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Randal Wanke, Laboratory Director

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	06/12/24 04:01

Sample ID: Goose Lake Well #2 Grab — **Date Sampled: 05/15/24 11:30** — **Date Received: 05/15/24 15:30**

Lab No.: 24E1569-01 — **Sampled by: Morgan Schuler**

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Chromium	0.00149	mg/L	05/17/24 13:55	kc	EPA 200.7	
Copper	<0.00300	mg/L	05/17/24 13:55	kc	EPA 200.7	
Iron	<0.0100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Magnesium	54.2	mg/L	05/17/24 13:55	kc	EPA 200.7	
Manganese	<0.0200	mg/L	05/17/24 13:55	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Nickel	<0.00100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Lead	<0.00200	mg/L	05/17/24 13:55	kc	EPA 200.7	
Antimony	<0.00500	mg/L	05/17/24 13:55	kc	EPA 200.7	
Selenium	<0.00500	mg/L	05/17/24 13:55	kc	EPA 200.7	
Thallium	<0.00300	mg/L	05/17/24 13:55	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	05/17/24 13:55	kc	EPA 200.7	
Zinc	<0.00500	mg/L	05/17/24 13:55	kc	EPA 200.7	
Mercury	<0.00200	mg/L	05/28/24 16:30	kc	EPA 245.1 rev 3-1994	
Field pH	8.1	pH Units	05/15/24 11:30	Morgan S	SM 4500 H + B	
Field Temperature	55.2	ºF	05/15/24 11:30	Morgan S	SM 2550 B	
Field Conductivity	490	uS	05/15/24 11:30	Morgan S	EPA 150	

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 05/15/24 15:35
Date Reported: 06/12/24 04:48
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Case Narrative

Sample ID: Goose Lake Well #3 Grab
Lab No.: 24E1571-01

Analyte	Result	Units	Analyzed	Analyst	Method
Total Organic Halogens (TOX)	<0.010	mg/L	6/07/24 8:32	BDF	EPA 9020
2-Butanone (MEK)	<0.010	mg/L	5/28/24 16:38	LNH	EPA 624

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 05/15/24 12:30**	**Date Received: 05/15/24 15:35**		
Lab No.: 24E1571-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	05/24/24 14:27	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	05/16/24 10:49	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	05/20/24 17:17	EV	SM 5220D-1997	
Chloride	0.607	mg/L	05/17/24 15:22	EV	EPA 300.0	
Fluoride	<0.100	mg/L	05/17/24 15:22	EV	EPA 300.0	
Sulfate as SO4	5.16	mg/L	05/17/24 15:22	EV	EPA 300.0	
Phenolics	<0.010	mg/L	05/24/24 15:33	kc	EPA 420.1 rev1978	
Total Suspended Solids	7	mg/L	05/21/24 9:09	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	05/17/24 13:58	kc	EPA 200.7	
Aluminum	<0.100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Boron	<0.0200	mg/L	05/17/24 13:58	kc	EPA 200.7	
Barium	0.0317	mg/L	05/17/24 13:58	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	05/17/24 13:58	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	05/17/24 13:58	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Randal Wanke, Laboratory Director

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Wendling Quarries Inc. 2647 225th Street P.O. Box 230 Dewitt IA, 52742	Project: Monitoring wells-Goose Lake BiAnnual include Excel data file Client Contact: Morgan Schuler	**Reported:** 06/12/24 04:48

Sample ID: Goose Lake Well #3 Grab — **Date Sampled: 05/15/24 12:30** — **Date Received: 05/15/24 15:35**

Lab No.: 24E1571-01 — **Sampled by: Morgan Schuler**

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Chromium	0.00770	mg/L	05/17/24 13:58	kc	EPA 200.7	
Copper	<0.00300	mg/L	05/17/24 13:58	kc	EPA 200.7	
Iron	0.0417	mg/L	05/17/24 13:58	kc	EPA 200.7	
Magnesium	25.8	mg/L	05/17/24 13:58	kc	EPA 200.7	
Manganese	<0.0200	mg/L	05/17/24 13:58	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Nickel	<0.00100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Lead	<0.00200	mg/L	05/17/24 13:58	kc	EPA 200.7	
Antimony	<0.00500	mg/L	05/17/24 13:58	kc	EPA 200.7	
Selenium	<0.00500	mg/L	05/17/24 13:58	kc	EPA 200.7	
Thallium	<0.00300	mg/L	05/17/24 13:58	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	05/17/24 13:58	kc	EPA 200.7	
Zinc	0.00915	mg/L	05/17/24 13:58	kc	EPA 200.7	
Mercury	<0.00200	mg/L	05/28/24 16:30	kc	EPA 245.1 rev 3-1994	
Field pH	8.2	pH Units	05/15/24 12:30	Morgan S	SM 4500 H + B	
Field Temperature	54.1	ºF	05/15/24 12:30	Morgan S	SM 2550 B	
Field Conductivity	316	uS	05/15/24 12:30	Morgan S	EPA 150	

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 05/15/24 15:38
Date Reported: 06/12/24 04:56
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Case Narrative

Sample ID: Goose Lake Well #4 Grab
Lab No.: 24E1573-01

Analyte	Result	Units	Analyzed	Analyst	Method
Total Organic Halogens (TOX)	<0.010	mg/L	6/07/24 8:32	BDF	EPA 9020
2-Butanone (MEK)	<0.010	mg/L	5/28/24 17:46	LNH	EPA 624

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 05/15/24 13:25**		**Date Received: 05/15/24 15:38**	
Lab No.: 24E1573-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	05/24/24 14:27	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	05/16/24 10:52	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	05/20/24 17:17	EV	SM 5220D-1997	
Chloride	2.91	mg/L	05/17/24 15:22	EV	EPA 300.0	
Fluoride	0.105	mg/L	05/17/24 15:22	EV	EPA 300.0	
Sulfate as SO4	8.82	mg/L	05/17/24 15:22	EV	EPA 300.0	
Phenolics	<0.010	mg/L	05/24/24 15:33	kc	EPA 420.1 rev1978	
Total Suspended Solids	3	mg/L	05/21/24 9:09	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	05/17/24 14:01	kc	EPA 200.7	
Aluminum	<0.100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Boron	<0.0200	mg/L	05/17/24 14:01	kc	EPA 200.7	
Barium	0.0422	mg/L	05/17/24 14:01	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	05/17/24 14:01	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	05/17/24 14:01	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Randal Wanke, Laboratory Director

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	06/12/24 04:56

Sample ID: Goose Lake Well #4 Grab — **Date Sampled: 05/15/24 13:25** — **Date Received: 05/15/24 15:38**

Lab No.: 24E1573-01 — **Sampled by: Morgan Schuler**

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Chromium	0.00720	mg/L	05/17/24 14:01	kc	EPA 200.7	
Copper	<0.00300	mg/L	05/17/24 14:01	kc	EPA 200.7	
Iron	0.0381	mg/L	05/17/24 14:01	kc	EPA 200.7	
Magnesium	49.1	mg/L	05/17/24 14:01	kc	EPA 200.7	
Manganese	<0.0200	mg/L	05/17/24 14:01	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Nickel	<0.00100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Lead	<0.00200	mg/L	05/17/24 14:01	kc	EPA 200.7	
Antimony	<0.00500	mg/L	05/17/24 14:01	kc	EPA 200.7	
Selenium	<0.00500	mg/L	05/17/24 14:01	kc	EPA 200.7	
Thallium	<0.00300	mg/L	05/17/24 14:01	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	05/17/24 14:01	kc	EPA 200.7	
Zinc	0.00986	mg/L	05/17/24 14:01	kc	EPA 200.7	
Mercury	<0.00200	mg/L	05/28/24 16:30	kc	EPA 245.1 rev 3-1994	
Field pH	7.9	pH Units	05/15/24 13:25	Morgan S	SM 4500 H + B	
Field Temperature	53.6	ºF	05/15/24 13:25	Morgan S	SM 2550 B	
Field Conductivity	490	uS	05/15/24 13:25	Morgan S	EPA 150	

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 05/15/24 15:41
Date Reported: 06/12/24 05:02
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Case Narrative

Sample ID: Goose Lake Sump Grab
Lab No.: 24E1574-01

Analyte	Result	Units	Analyzed	Analyst	Method
Total Organic Halogens (TOX)	<0.010	mg/L	6/07/24 8:32	BDF	EPA 9020
2-Butanone (MEK)	<0.010	mg/L	5/28/24 18:08	LNH	EPA 624

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 05/15/24 14:00**		**Date Received: 05/15/24 15:41**	
Lab No.: 24E1574-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	05/24/24 14:27	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	05/16/24 14:19	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	05/20/24 17:17	EV	SM 5220D-1997	
Chloride	18.2	mg/L	05/17/24 15:22	EV	EPA 300.0	
Fluoride	0.129	mg/L	05/17/24 15:22	EV	EPA 300.0	
Sulfate as SO4	75.2	mg/L	05/17/24 15:22	EV	EPA 300.0	
Phenolics	<0.010	mg/L	05/24/24 15:33	kc	EPA 420.1 rev1978	
Total Suspended Solids	3	mg/L	05/21/24 9:09	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	05/17/24 14:04	kc	EPA 200.7	
Aluminum	0.107	mg/L	05/17/24 14:04	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Boron	0.0832	mg/L	05/17/24 14:04	kc	EPA 200.7	
Barium	0.119	mg/L	05/17/24 14:04	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	05/17/24 14:04	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	05/17/24 14:04	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Randal Wanke, Laboratory Director

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	06/12/24 05:02

Sample ID: Goose Lake Sump Grab — **Date Sampled: 05/15/24 14:00** — **Date Received: 05/15/24 15:41**
Lab No.: 24E1574-01 — **Sampled by: Morgan Schuler**

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Chromium	<0.00100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Copper	0.0151	mg/L	05/17/24 14:04	kc	EPA 200.7	
Iron	0.0488	mg/L	05/17/24 14:04	kc	EPA 200.7	
Magnesium	42.2	mg/L	05/17/24 14:04	kc	EPA 200.7	
Manganese	<0.0200	mg/L	05/17/24 14:04	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Nickel	<0.00100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Lead	<0.00200	mg/L	05/17/24 14:04	kc	EPA 200.7	
Antimony	<0.00500	mg/L	05/17/24 14:04	kc	EPA 200.7	
Selenium	<0.00500	mg/L	05/17/24 14:04	kc	EPA 200.7	
Thallium	<0.00300	mg/L	05/17/24 14:04	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	05/17/24 14:04	kc	EPA 200.7	
Zinc	0.0538	mg/L	05/17/24 14:04	kc	EPA 200.7	
Mercury	<0.00200	mg/L	05/28/24 16:30	kc	EPA 245.1 rev 3-1994	
Field pH	8.3	pH Units	05/15/24 14:00	Morgan S	SM 4500 H + B	
Field Temperature	62	ºF	05/15/24 14:00	Morgan S	SM 2550 B	
Field Conductivity	540	uS	05/15/24 14:00	Morgan S	EPA 150	

Fall

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 09/17/24 15:05
Date Reported: 10/10/24 17:00
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	09/25/24 14:32	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	09/24/24 12:00	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	09/17/24 15:17	EV	SM 5220D-1997	
Field pH	8.2	pH Units	09/17/24 9:20	Morgan S	SM 4500 H + B	
Field Temperature	56.3	ºF	09/17/24 9:20	Morgan S	SM 2550 B	
Field Conductivity	539	uS	09/17/24 9:20	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
Determination of Volatile Organic Compounds						
Surrogate: 1,2-Dichloroethane-d4	*56-130*	*141 %*	10/01/24 14:22	BDF	*EPA 624*	*S1*
Field pH	8.2	pH Units	09/17/24 9:20	Morgan S	SM 4500 H + B	
Field Temperature	56.3	ºF	09/17/24 9:20	Morgan S	SM 2550 B	
Field Conductivity	539	uS	09/17/24 9:20	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
Classical Chemistry Parameters						
Chloride	3.42	mg/L	09/17/24 17:48	EV	EPA 300.0	
Fluoride	0.136	mg/L	09/17/24 17:48	EV	EPA 300.0	

Analysis Certified by:

Randall Wanke, Ph.D.

Amy Dobbelare For Randall Wanke, Laboratory Director

Randal Wanke, Laboratory Director

IA DNR lab #113

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	10/10/24 17:00

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
Sulfate as SO4	8.47	mg/L	09/17/24 17:48	EV	EPA 300.0	
Phenolics	<0.010	mg/L	09/27/24 17:39	kc	EPA 420.1 rev1978	
Total Suspended Solids	2	mg/L	09/20/24 13:37	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	09/23/24 13:10	kc	EPA 200.7	
Aluminum	<0.100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Boron	<0.0200	mg/L	09/23/24 13:10	kc	EPA 200.7	
Barium	0.0361	mg/L	09/23/24 13:10	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	09/23/24 13:10	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	09/23/24 13:10	kc	EPA 200.7	
Chromium	0.00288	mg/L	09/23/24 13:10	kc	EPA 200.7	
Copper	<0.00300	mg/L	09/23/24 13:10	kc	EPA 200.7	
Iron	0.0244	mg/L	09/23/24 13:10	kc	EPA 200.7	
Magnesium	48.7	mg/L	09/23/24 13:10	kc	EPA 200.7	
Manganese	<0.0200	mg/L	09/23/24 13:10	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Nickel	<0.00100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Lead	<0.00200	mg/L	09/23/24 13:10	kc	EPA 200.7	
Antimony	<0.00500	mg/L	09/23/24 13:10	kc	EPA 200.7	
Selenium	<0.00500	mg/L	09/23/24 13:10	kc	EPA 200.7	
Thallium	<0.00300	mg/L	09/23/24 13:10	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	09/23/24 13:10	kc	EPA 200.7	
Zinc	0.00568	mg/L	09/23/24 13:10	kc	EPA 200.7	
Mercury	<0.00200	mg/L	09/23/24 16:06	kc	EPA 245.1 rev 3-1994	
Field pH	8.2	pH Units	09/17/24 9:20	Morgan S	SM 4500 H + B	
Field Temperature	56.3	ºF	09/17/24 9:20	Morgan S	SM 2550 B	
Field Conductivity	539	uS	09/17/24 9:20	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
Determination of Conventional Chemistry Parameters						
Total Organic Halogens (TOX)	<0.010	mg/L	10/03/24 13:39	BDF	EPA 9020	

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Wendling Quarries Inc.	Project:	Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230		include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact:	Morgan Schuler	10/10/24 17:00

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #1 Grab			**Date Sampled: 09/17/24 9:20**		**Date Received: 09/17/24 15:05**	
Lab No.: 24I1731-01			**Sampled by: Morgan Schuler**			
Determination of Volatile Organic Compounds						
2-Butanone (MEK)	<10.0	ug/L	10/01/24 14:22	BDF	EPA 624	
Surrogate: Dibromofluoromethane	*59-123*	*151 %*	10/01/24 14:22	BDF	*EPA 624*	*S1*
Surrogate: Toluene-d8	*85-113*	*111 %*	10/01/24 14:22	BDF	*EPA 624*	
Surrogate: 4-Bromofluorobenzene	*82-112*	*98.4 %*	10/01/24 14:22	BDF	*EPA 624*	
Field pH	8.2	pH Units	09/17/24 9:20	Morgan S	SM 4500 H + B	
Field Temperature	56.3	ºF	09/17/24 9:20	Morgan S	SM 2550 B	
Field Conductivity	539	uS	09/17/24 9:20	Morgan S	EPA 150	

S1 Surrogate recovery is above acceptance limits.
S Spike recovery outside of acceptance limits.

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 09/17/24 15:10
Date Reported: 10/10/24 17:00
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #2 Grab			**Date Sampled: 09/17/24 10:30**	**Date Received: 09/17/24 15:10**		
Lab No.: 24I1732-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	09/25/24 14:32	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	09/24/24 12:03	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	09/17/24 15:17	EV	SM 5220D-1997	
Chloride	2.91	mg/L	09/17/24 17:48	EV	EPA 300.0	
Fluoride	0.129	mg/L	09/17/24 17:48	EV	EPA 300.0	
Sulfate as SO4	25.2	mg/L	09/17/24 17:48	EV	EPA 300.0	
Phenolics	<0.010	mg/L	09/27/24 17:39	kc	EPA 420.1 rev1978	
Total Suspended Solids	<1	mg/L	09/20/24 13:37	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	09/23/24 13:13	kc	EPA 200.7	
Aluminum	<0.100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Boron	<0.0200	mg/L	09/23/24 13:13	kc	EPA 200.7	
Barium	0.0611	mg/L	09/23/24 13:13	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	09/23/24 13:13	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	09/23/24 13:13	kc	EPA 200.7	
Chromium	0.00719	mg/L	09/23/24 13:13	kc	EPA 200.7	
Copper	<0.00300	mg/L	09/23/24 13:13	kc	EPA 200.7	
Iron	0.0371	mg/L	09/23/24 13:13	kc	EPA 200.7	
Magnesium	46.5	mg/L	09/23/24 13:13	kc	EPA 200.7	
Manganese	<0.0200	mg/L	09/23/24 13:13	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Nickel	<0.00100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Lead	<0.00200	mg/L	09/23/24 13:13	kc	EPA 200.7	
Antimony	<0.00500	mg/L	09/23/24 13:13	kc	EPA 200.7	
Selenium	<0.00500	mg/L	09/23/24 13:13	kc	EPA 200.7	
Thallium	<0.00300	mg/L	09/23/24 13:13	kc	EPA 200.7	

Analysis Certified by:

Randall Wanke, Ph.D.

Amy Dobbelare For Randall Wanke, Laboratory Director

Randal Wanke, Laboratory Director

IA DNR lab #113

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	10/10/24 17:00

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #2 Grab			**Date Sampled: 09/17/24 10:30**	**Date Received: 09/17/24 15:10**		
Lab No.: 24I1732-01			**Sampled by: Morgan Schuler**			
Vanadium	<0.00100	mg/L	09/23/24 13:13	kc	EPA 200.7	
Zinc	0.00641	mg/L	09/23/24 13:13	kc	EPA 200.7	
Mercury	<0.00200	mg/L	09/23/24 16:06	kc	EPA 245.1 rev 3-1994	
Field pH	8	pH Units	09/17/24 10:30	Morgan S	SM 4500 H + B	
Field Temperature	55.6	ºF	09/17/24 10:30	Morgan S	SM 2550 B	
Field Conductivity	528	uS	09/17/24 10:30	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #2 Grab			**Date Sampled: 09/17/24 10:30**	**Date Received: 09/17/24 15:10**		
Lab No.: 24I1732-01			**Sampled by: Morgan Schuler**			
Determination of Conventional Chemistry Parameters						
Total Organic Halogens (TOX)	<0.010	mg/L	10/03/24 13:39	BDF	EPA 9020	
Determination of Volatile Organic Compounds						
2-Butanone (MEK)	<10.0	ug/L	10/01/24 15:51	BDF	EPA 624	
Surrogate: Dibromofluoromethane	*59-123*	*143 %*	10/01/24 15:51	BDF	*EPA 624*	
Surrogate: 1,2-Dichloroethane-d4	*56-130*	*138 %*	10/01/24 15:51	BDF	*EPA 624*	
Surrogate: Toluene-d8	*85-113*	*111 %*	10/01/24 15:51	BDF	*EPA 624*	
Surrogate: 4-Bromofluorobenzene	*82-112*	*99.9 %*	10/01/24 15:51	BDF	*EPA 624*	
Field pH	8	pH Units	09/17/24 10:30	Morgan S	SM 4500 H + B	
Field Temperature	55.6	ºF	09/17/24 10:30	Morgan S	SM 2550 B	
Field Conductivity	528	uS	09/17/24 10:30	Morgan S	EPA 150	

S1	Surrogate recovery is above acceptance limits.
S	Spike recovery outside of acceptance limits.

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 09/17/24 15:13
Date Reported: 10/10/24 16:59
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 09/17/24 11:35**		**Date Received: 09/17/24 15:13**	
Lab No.: 24I1733-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	09/25/24 14:32	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	09/24/24 12:05	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	09/17/24 15:17	EV	SM 5220D-1997	
Field pH	8	pH Units	09/17/24 11:35	Morgan S	SM 4500 H + B	
Field Temperature	56.5	ºF	09/17/24 11:35	Morgan S	SM 2550 B	
Field Conductivity	323	uS	09/17/24 11:35	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 09/17/24 11:35**		**Date Received: 09/17/24 15:13**	
Lab No.: 24I1733-01			**Sampled by: Morgan Schuler**			
Determination of Volatile Organic Compounds						
Surrogate: 1,2-Dichloroethane-d4	*56-130*	*109 %*	10/01/24 12:52	BDF	*EPA 624*	
Surrogate: 4-Bromofluorobenzene	*82-112*	*93.0 %*	10/01/24 12:52	BDF	*EPA 624*	
Field pH	8	pH Units	09/17/24 11:35	Morgan S	SM 4500 H + B	
Field Temperature	56.5	ºF	09/17/24 11:35	Morgan S	SM 2550 B	
Field Conductivity	323	uS	09/17/24 11:35	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 09/17/24 11:35**		**Date Received: 09/17/24 15:13**	
Lab No.: 24I1733-01			**Sampled by: Morgan Schuler**			
Classical Chemistry Parameters						
Chloride	0.608	mg/L	09/17/24 17:48	EV	EPA 300.0	

Analysis Certified by:

Randall Wanke, Ph.D.

Amy Dobbelare For Randall Wanke, Laboratory Director

Randal Wanke, Laboratory Director

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Wendling Quarries Inc.	Project:	Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230		include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact:	Morgan Schuler	10/10/24 16:59

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 09/17/24 11:35**	**Date Received: 09/17/24 15:13**		
Lab No.: 24I1733-01			**Sampled by: Morgan Schuler**			
Fluoride	<0.100	mg/L	09/17/24 17:48	EV	EPA 300.0	
Sulfate as SO4	5.52	mg/L	09/17/24 17:48	EV	EPA 300.0	
Phenolics	<0.010	mg/L	09/27/24 17:39	kc	EPA 420.1 rev1978	
Total Suspended Solids	2	mg/L	09/20/24 13:37	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	09/23/24 13:16	kc	EPA 200.7	
Aluminum	<0.100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Boron	<0.0200	mg/L	09/23/24 13:16	kc	EPA 200.7	
Barium	0.0276	mg/L	09/23/24 13:16	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	09/23/24 13:16	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	09/23/24 13:16	kc	EPA 200.7	
Chromium	0.00590	mg/L	09/23/24 13:16	kc	EPA 200.7	
Copper	<0.00300	mg/L	09/23/24 13:16	kc	EPA 200.7	
Iron	0.0430	mg/L	09/23/24 13:16	kc	EPA 200.7	
Magnesium	21.3	mg/L	09/23/24 13:16	kc	EPA 200.7	
Manganese	<0.0200	mg/L	09/23/24 13:16	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Nickel	<0.00100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Lead	<0.00200	mg/L	09/23/24 13:16	kc	EPA 200.7	
Antimony	<0.00500	mg/L	09/23/24 13:16	kc	EPA 200.7	
Selenium	<0.00500	mg/L	09/23/24 13:16	kc	EPA 200.7	
Thallium	<0.00300	mg/L	09/23/24 13:16	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	09/23/24 13:16	kc	EPA 200.7	
Zinc	0.00699	mg/L	09/23/24 13:16	kc	EPA 200.7	
Mercury	<0.00200	mg/L	09/23/24 16:06	kc	EPA 245.1 rev 3-1994	
Field pH	8	pH Units	09/17/24 11:35	Morgan S	SM 4500 H + B	
Field Temperature	56.5	ºF	09/17/24 11:35	Morgan S	SM 2550 B	
Field Conductivity	323	uS	09/17/24 11:35	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #3 Grab			**Date Sampled: 09/17/24 11:35**	**Date Received: 09/17/24 15:13**		
Lab No.: 24I1733-01			**Sampled by: Morgan Schuler**			
Determination of Conventional Chemistry Parameters						
Total Organic Halogens (TOX)	0.019	mg/L	10/03/24 13:39	BDF	EPA 9020	TX1

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	10/10/24 16:59

Sample ID: Goose Lake Well #3 Grab **Date Sampled: 09/17/24 11:35** **Date Received: 09/17/24 15:13**
Lab No.: 24I1733-01 **Sampled by: Morgan Schuler**

Determination of Volatile Organic Compounds

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
2-Butanone (MEK)	<10.0	ug/L	10/01/24 12:52	BDF	EPA 624	
Surrogate: Dibromofluoromethane	*59-123*	*129 %*	10/01/24 12:52	BDF	*EPA 624*	*S1*
Surrogate: Toluene-d8	*85-113*	*118 %*	10/01/24 12:52	BDF	*EPA 624*	*S1*
Field pH	8	pH Units	09/17/24 11:35	Morgan S	SM 4500 H + B	
Field Temperature	56.5	ºF	09/17/24 11:35	Morgan S	SM 2550 B	
Field Conductivity	323	uS	09/17/24 11:35	Morgan S	EPA 150	

TX1	Repeated analysis of this sample consistently exceeded greater than 10% breakthrough to the second column.
S1	Surrogate recovery is above acceptance limits.
S	Spike recovery outside of acceptance limits.

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 09/17/24 15:17
Date Reported: 10/10/24 16:59
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 09/17/24 12:40**		**Date Received: 09/17/24 15:17**	
Lab No.: 24I1734-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	09/25/24 14:32	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	09/24/24 12:07	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	09/17/24 15:17	EV	SM 5220D-1997	
Field pH	7.9	pH Units	09/17/24 12:40	Morgan S	SM 4500 H + B	
Field Temperature	54.3	ºF	09/17/24 12:40	Morgan S	SM 2550 B	
Field Conductivity	499	uS	09/17/24 12:40	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 09/17/24 12:40**		**Date Received: 09/17/24 15:17**	
Lab No.: 24I1734-01			**Sampled by: Morgan Schuler**			
Determination of Volatile Organic Compounds						
Surrogate: 1,2-Dichloroethane-d4	*56-130*	*142 %*	10/01/24 15:06	BDF	*EPA 624*	*S1*
Field pH	7.9	pH Units	09/17/24 12:40	Morgan S	SM 4500 H + B	
Field Temperature	54.3	ºF	09/17/24 12:40	Morgan S	SM 2550 B	
Field Conductivity	499	uS	09/17/24 12:40	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 09/17/24 12:40**		**Date Received: 09/17/24 15:17**	
Lab No.: 24I1734-01			**Sampled by: Morgan Schuler**			
Classical Chemistry Parameters						
Chloride	2.60	mg/L	09/17/24 17:48	EV	EPA 300.0	
Fluoride	0.149	mg/L	09/17/24 17:48	EV	EPA 300.0	

Analysis Certified by:

Randall Wanke, Ph.D.

Amy Dobbelare For Randall Wanke, Laboratory Director

Randal Wanke, Laboratory Director

IA DNR lab #113

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	10/10/24 16:59

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 09/17/24 12:40**		**Date Received: 09/17/24 15:17**	
Lab No.: 24I1734-01			**Sampled by: Morgan Schuler**			
Sulfate as SO4	7.93	mg/L	09/17/24 17:48	EV	EPA 300.0	
Phenolics	0.017	mg/L	09/27/24 17:39	kc	EPA 420.1 rev1978	
Total Suspended Solids	<1	mg/L	09/20/24 13:37	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	09/23/24 13:19	kc	EPA 200.7	
Aluminum	<0.100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Boron	<0.0200	mg/L	09/23/24 13:19	kc	EPA 200.7	
Barium	0.0384	mg/L	09/23/24 13:19	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	09/23/24 13:19	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	09/23/24 13:19	kc	EPA 200.7	
Chromium	0.00560	mg/L	09/23/24 13:19	kc	EPA 200.7	
Copper	0.00768	mg/L	09/23/24 13:19	kc	EPA 200.7	
Iron	0.0238	mg/L	09/23/24 13:19	kc	EPA 200.7	
Magnesium	40.6	mg/L	09/23/24 13:19	kc	EPA 200.7	
Manganese	<0.0200	mg/L	09/23/24 13:19	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Nickel	<0.00100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Lead	<0.00200	mg/L	09/23/24 13:19	kc	EPA 200.7	
Antimony	<0.00500	mg/L	09/23/24 13:19	kc	EPA 200.7	
Selenium	<0.00500	mg/L	09/23/24 13:19	kc	EPA 200.7	
Thallium	<0.00300	mg/L	09/23/24 13:19	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	09/23/24 13:19	kc	EPA 200.7	
Zinc	0.00982	mg/L	09/23/24 13:19	kc	EPA 200.7	
Mercury	<0.00200	mg/L	09/23/24 16:06	kc	EPA 245.1 rev 3-1994	
Field pH	7.9	pH Units	09/17/24 12:40	Morgan S	SM 4500 H + B	
Field Temperature	54.3	ºF	09/17/24 12:40	Morgan S	SM 2550 B	
Field Conductivity	499	uS	09/17/24 12:40	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Well #4 Grab			**Date Sampled: 09/17/24 12:40**		**Date Received: 09/17/24 15:17**	
Lab No.: 24I1734-01			**Sampled by: Morgan Schuler**			
Determination of Conventional Chemistry Parameters						
Total Organic Halogens (TOX)	0.014	mg/L	10/03/24 13:39	BDF	EPA 9020	

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Wendling Quarries Inc.	Project: Monitoring wells-Goose Lake BiAnnual	
2647 225th Street P.O. Box 230	include Excel data file	**Reported:**
Dewitt IA, 52742	Client Contact: Morgan Schuler	10/10/24 16:59

Sample ID: Goose Lake Well #4 Grab — **Date Sampled: 09/17/24 12:40** — **Date Received: 09/17/24 15:17**

Lab No.: 24I1734-01 — **Sampled by: Morgan Schuler**

Determination of Volatile Organic Compounds

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
2-Butanone (MEK)	<10.0	ug/L	10/01/24 15:06	BDF	EPA 624	
Surrogate: Dibromofluoromethane	*59-123*	*152 %*	10/01/24 15:06	BDF	*EPA 624*	*S1*
Surrogate: Toluene-d8	*85-113*	*117 %*	10/01/24 15:06	BDF	*EPA 624*	*S1*
Surrogate: 4-Bromofluorobenzene	*82-112*	*99.6 %*	10/01/24 15:06	BDF	*EPA 624*	
Field pH	7.9	pH Units	09/17/24 12:40	Morgan S	SM 4500 H + B	
Field Temperature	54.3	ºF	09/17/24 12:40	Morgan S	SM 2550 B	
Field Conductivity	499	uS	09/17/24 12:40	Morgan S	EPA 150	

S1	Surrogate recovery is above acceptance limits.
S	Spike recovery outside of acceptance limits.

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Laboratory Report

Wendling Quarries Inc.
Morgan Schuler
2647 225th Street P.O. Box 230
Dewitt,IA 52742

Date Received: 09/17/24 15:21
Date Reported: 10/10/24 16:59
Project: Monitoring wells-Goose Lake BiAnnual include Excel data file

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**		**Date Received: 09/17/24 15:21**	
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			
****** DEFAULT GENERAL METHOD ******						
Formaldehyde	<0.100	mg/L	09/25/24 14:32	kc	GC-MS	
Classical Chemistry Parameters						
Ammonia as N	<0.10	mg/L	09/24/24 12:10	jc	Timberline	
Chemical Oxygen Demand	<10	mg/L	09/17/24 15:17	EV	SM 5220D-1997	
Field pH	8.4	pH Units	09/17/24 13:15	Morgan S	SM 4500 H + B	
Field Temperature	73.9	ºF	09/17/24 13:15	Morgan S	SM 2550 B	
Field Conductivity	774	uS	09/17/24 13:15	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**		**Date Received: 09/17/24 15:21**	
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			
Determination of Volatile Organic Compounds						
Surrogate: Dibromofluoromethane	*59-123*	*143 %*	10/01/24 13:37	BDF	*EPA 624*	*S1*
Surrogate: 1,2-Dichloroethane-d4	*56-130*	*136 %*	10/01/24 13:37	BDF	*EPA 624*	*S1*
Surrogate: Toluene-d8	*85-113*	*111 %*	10/01/24 13:37	BDF	*EPA 624*	
Surrogate: 4-Bromofluorobenzene	*82-112*	*97.6 %*	10/01/24 13:37	BDF	*EPA 624*	
Field pH	8.4	pH Units	09/17/24 13:15	Morgan S	SM 4500 H + B	
Field Temperature	73.9	ºF	09/17/24 13:15	Morgan S	SM 2550 B	
Field Conductivity	774	uS	09/17/24 13:15	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**		**Date Received: 09/17/24 15:21**	
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			

Analysis Certified by:

Randall Wanke, Ph.D.

Amy Dobbelare For Randall Wanke, Laboratory Director

Randal Wanke, Laboratory Director

IA DNR lab #113

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Wendling Quarries Inc. 2647 225th Street P.O. Box 230 Dewitt IA, 52742	Project: Monitoring wells-Goose Lake BiAnnual include Excel data file Client Contact: Morgan Schuler	**Reported:** 10/10/24 16:59

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**		**Date Received: 09/17/24 15:21**	
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			
Classical Chemistry Parameters						
Chloride	23.7	mg/L	09/17/24 17:48	EV	EPA 300.0	
Fluoride	0.147	mg/L	09/17/24 17:48	EV	EPA 300.0	
Sulfate as SO4	100	mg/L	09/17/24 17:48	EV	EPA 300.0	
Phenolics	<0.010	mg/L	09/27/24 17:39	kc	EPA 420.1 rev1978	
Total Suspended Solids	3	mg/L	09/20/24 13:37	kt	USGS I-3765-85	
Metals by EPA 200 Series Methods						
Silver	<0.000500	mg/L	09/23/24 13:27	kc	EPA 200.7	
Aluminum	<0.100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Arsenic	<0.0100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Boron	0.0900	mg/L	09/23/24 13:27	kc	EPA 200.7	
Barium	0.127	mg/L	09/23/24 13:27	kc	EPA 200.7	
Beryllium	<0.00100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Cadmium	<0.000400	mg/L	09/23/24 13:27	kc	EPA 200.7	
Cobalt	<0.00200	mg/L	09/23/24 13:27	kc	EPA 200.7	
Chromium	<0.00100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Copper	<0.00300	mg/L	09/23/24 13:27	kc	EPA 200.7	
Iron	0.0217	mg/L	09/23/24 13:27	kc	EPA 200.7	
Magnesium	37.4	mg/L	09/23/24 13:27	kc	EPA 200.7	
Manganese	<0.0200	mg/L	09/23/24 13:27	kc	EPA 200.7	
Molybdenum	<0.0100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Nickel	<0.00100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Lead	<0.00200	mg/L	09/23/24 13:27	kc	EPA 200.7	
Antimony	<0.00500	mg/L	09/23/24 13:27	kc	EPA 200.7	
Selenium	<0.00500	mg/L	09/23/24 13:27	kc	EPA 200.7	
Thallium	<0.00300	mg/L	09/23/24 13:27	kc	EPA 200.7	
Vanadium	<0.00100	mg/L	09/23/24 13:27	kc	EPA 200.7	
Zinc	<0.00500	mg/L	09/23/24 13:27	kc	EPA 200.7	
Mercury	<0.00200	mg/L	09/23/24 16:06	kc	EPA 245.1 rev 3-1994	
Field pH	8.4	pH Units	09/17/24 13:15	Morgan S	SM 4500 H + B	
Field Temperature	73.9	ºF	09/17/24 13:15	Morgan S	SM 2550 B	
Field Conductivity	774	uS	09/17/24 13:15	Morgan S	EPA 150	

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**		**Date Received: 09/17/24 15:21**	
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			

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Wendling Quarries Inc. 2647 225th Street P.O. Box 230 Dewitt IA, 52742	Project: Monitoring wells-Goose Lake BiAnnual include Excel data file Client Contact: Morgan Schuler	**Reported:** 10/10/24 16:59

Analyte	Result	Units	Analyzed	Analyst	Method	Notes
Sample ID: Goose Lake Sump Grab			**Date Sampled: 09/17/24 13:15**	**Date Received: 09/17/24 15:21**		
Lab No.: 24I1735-01			**Sampled by: Morgan Schuler**			
Determination of Conventional Chemistry Parameters						
Total Organic Halogens (TOX)	0.071	mg/L	10/03/24 13:39	BDF	EPA 9020	TX1, TX2
Determination of Volatile Organic Compounds						
2-Butanone (MEK)	<10.0	ug/L	10/01/24 13:37	BDF	EPA 624	
Field pH	8.4	pH Units	09/17/24 13:15	Morgan S	SM 4500 H + B	
Field Temperature	73.9	ºF	09/17/24 13:15	Morgan S	SM 2550 B	
Field Conductivity	774	uS	09/17/24 13:15	Morgan S	EPA 150	

TX2	The RPD value for the sample duplicates are outside of acceptance limits due to matrix interference. The reported value is an average of all test measurements.
TX1	Repeated analysis of this sample consistently exceeded greater than 10% breakthrough to the second column.
S1	Surrogate recovery is above acceptance limits.
S	Spike recovery outside of acceptance limits.