



# ANNUAL CCR GROUNDWATER MONITORING & CORRECTIVE ACTION REPORT

Spurlock Landfill

January 31, 2023

Reporting Year – 2022



A Touchstone Energy Cooperative 

## Executive Summary

This annual report documents the status of the groundwater monitoring and corrective action program for Spurlock Station’s Coal Combustion Residual (CCR) Landfill (Areas A, B & C) (herein “Spurlock Landfill”, “Landfill”, or “the Unit”) pursuant to 40 Code of Federal Regulations (CFR) §257.90(e). **Table 1-1** provides an overview of the status of the groundwater monitoring and corrective action program for the Unit during the reporting period.

**Table 1-1 Overview of the Status of the Groundwater Monitoring & Corrective Action Program for the Unit**

Information Required by 40 CFR §257.90(e)(6)	Unit Information
Identify whether the unit was operating at the start of the reporting period under the detection monitoring program or the assessment monitoring program.	Detection monitoring
Identify whether the unit was operating at the end of the reporting period under the detection monitoring program or the assessment monitoring program.	Detection monitoring
If applicable, list all Appendix III (statistically significant increases (SSIs) pursuant to §257.94(e) and the associated monitoring location(s).	<u>MW-2B</u> : Sulfate (detected November 2021). Calcium and sulfate (detected May 2022)
If applicable, provide date when the assessment monitoring program was initiated.	Not Applicable. A successful Alternative Source Demonstration was completed thus, assessment monitoring was not initiated.
If applicable, list all Appendix IV statistically significant levels (SSLs) pursuant to §257.95(g) and the associated monitoring location(s).	Not Applicable
If applicable, provide the date when the assessment of corrective measures was initiated.	Not Applicable
If applicable, provide the date when the public meeting was held for the assessment of corrective measures.	Not Applicable
If applicable, provide the date when the assessment of corrective measures was completed.	Not Applicable
If applicable, provide the date when a remedy was selected pursuant to §257.97.	Not Applicable
If applicable, provide the date when remedial activities were initiated or identify if they are ongoing.	Not Applicable

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## 1.0 Introduction

On April 17, 2015, the EPA issued the final version of the federal Coal Combustion Residual (CCR) Rule to regulate the disposal of CCR materials generated at coal-fired units. The CCR Rule is administered as part of the Resource Conservation and Recovery Act (RCRA, 42 United States Code [U.S.C.] §6901 et seq.) using the Subtitle D approach.

East Kentucky Power Cooperative (EKPC) is subject to the CCR Rule and as such must prepare an annual groundwater monitoring and corrective action report for all CCR Units per 40 Code of Federal Regulations (CFR) §257.90(e). The annual report must document the status of the groundwater monitoring and corrective action program for the CCR Unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve problems, and project key activities for the upcoming year.

This document has been prepared to meet those requirements for the existing Spurlock CCR Landfill at H.L. Spurlock Power Station (Spurlock) located near Maysville, Kentucky. This report covers the 2022 reporting period, January 1, 2022 through December 31, 2022.

## 2.0 CCR Rule Compliance

In accordance with 40 CFR §257.90(e), EKPC is required to, at a minimum, provide the following information, to the extent available:

- A map, aerial image, or diagram showing the CCR unit and all background and downgradient monitoring wells/locations that are a part of the groundwater monitoring system, including identification numbers;
- Identify any monitoring wells/locations that were installed and/or decommissioned during the reporting period, along with a narrative description of why those actions were taken;
- Monitoring data obtained under §257.90 through §257.98, including a summary of the number of samples collected, the dates sampling occurred, and which program those samples were required by;
- A narrative description of any transition between monitoring programs (dates, circumstances, and identifying constituents detected at a SSI over background levels); and
- Other information required to be included in the annual report as specified in §257.90 through §257.98, such as:
  - Alternative monitoring frequency;
  - Alternate Source Demonstrations;
  - Assessment monitoring concentrations;
  - Demonstrations of additional time to complete the assessment of corrective measures due to site-specific conditions; and
  - A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the unit that contains all the information specified by §257.90(e)(6).

Other information being provided in this report includes, but is not limited to:

- Groundwater elevation data;
- Laboratory analytical reports and quantification limits; and

- Statistical analysis packages prepared for each compliance monitoring event during the reporting year.

### 3.0 Facility Information

The CCR Landfill at Spurlock is located along South Ripley Road in Mason, County. The site is located approximately five miles northwest of Maysville, Kentucky, and on the United States Geological Survey's Maysville West, Kentucky topographic map. The moderately rolling to hilly topography of the project area is typical for this region unless along a stream where erosion creates steeper slopes. Topographic relief across Spurlock Landfill is approximately 450 ft., with a natural topographic high of nearly 1060 ft. above mean sea level (AMSL) occurring along the western portion of Peg's Hill, and with a topographic low in the valley bottom at approximately 610 ft. AMSL just downgradient of the Landfill footprint. The Landfill is located within a stream valley and is situated in a tributary to Lawrence Creek. **Appendix A**, prepared by Tetra Tech, Inc., shows the Spurlock Station Landfill property, depicting the groundwater monitoring system present at the Spurlock CCR Landfill. Monitoring wells MW-6 and MW-7 are upgradient monitoring locations, and wells MW-2B, MW-3B, and MW-5B are downgradient monitoring locations.

### 4.0 Status of Groundwater Monitoring and Corrective Action Program

The CCR Unit did not undergo any program transition in 2022 and EKPC is implementing a detection monitoring program at Spurlock Landfill pursuant to 40 CFR §257.94. In order to comply with the requirements of detection monitoring, EKPC conducts semiannual groundwater sampling and utilizes an intra-well statistical approach for Appendix III constituents.

At the outset of implementation of the 2015 CCR Rule, EKPC interpreted the Rule's requirement for "semiannual" detection and assessment monitoring to mean two sampling events per year, with one in the first half of the year and one in the second half of the year (without necessarily being six months apart). To that end, detection monitoring occurred in May and November 2022. EKPC will continue to conduct semi-annual monitoring, as needed, approximately every six months and will conduct the annual Appendix IV constituents scan approximately every 12 months, if the unit initiates an assessment monitoring program.

### 5.0 Summary of Key Actions Completed

This Section provides a narrative of the key actions completed at the CCR Unit during the reporting period.

#### 5.1 Groundwater Monitoring Activities

The CCR Rule requires reporting of monitoring data obtained under 40 CFR §257.90 through §257.98 during the reporting year, including a summary of the number of samples collected, the dates sampling occurred, and which program those samples were required by (background, detection, or assessment). **Table 5-1** summarizes those sampling events that occurred during the reporting period. The analytical results received in 2022 and the analytical results from November 2021 (i.e., the second 2021 semi-annual detection monitoring event), which were not available during the 2021 reporting period, are summarized in **Table B-1** in **Appendix B**, while the laboratory analytical reports are included in **Appendix C**. Also included in these appendices are

the laboratory analytical results from an Alternate Source Demonstration (ASD) investigation, discussed further in Section 5.3.

During the 2022 reporting year at Spurlock Landfill, EKPC collected two semiannual detection monitoring samples, pursuant to 40 CFR §257.94, from all wells in the Spurlock Landfill monitoring system. The first semi-annual sample was collected on May 31, 2022, and the second sample was collected on November 21, 2022. The summary of the analytical results for the May 2022 detection monitoring event and the September ASD sampling event are found in **Appendix B**, with the full laboratory reports located in **Appendix C**. The November 2022 detection monitoring event analytical results were not available on or before December 31, 2022. Therefore, the results from the November 2022 sampling event will be included in the 2023 annual report. Groundwater flow maps and velocity calculations from the included sampling events are in **Appendix D**.

**Table 5-1: Annual Sampling & Analysis Summary**

Collection Date	Number of Samples Collected	Location of Collected Samples	Monitoring Program
05/31/22	5	MW-6, MW-7, MW-2B, MW-3B & MW-5B	Detection
09/06/22	5	MW-6, MW-7, MW-2B, MW-3B & MW-5B	ASD
11/21/22	5	MW-6, MW-7, MW-2B, MW-3B & MW-5B	Detection

## 5.2 Statistical Analysis and Statistically Significant Increase(s)

Pursuant to 40 CFR §257.93(h)(2), within 90 days after completing sampling and analysis, the owner or operator must determine whether there has been an SSI over background for any Appendix III constituent at each monitoring location. Detection monitoring results, background limits, and SSI(s), if any, are summarized in **Table 1** of the statistical analysis packages in **Appendix E1** and **Appendix E2**.

Because EKPC did not receive the laboratory analytical results for the second semi-annual 2021 detection monitoring event at Spurlock Landfill (which occurred in November 2021) until December 2021, the statistical analysis of those results was not completed until January 2022 (within 90 days after receipt of the laboratory analytical results). The analytical results for the November 2021 detection monitoring event were included in the 2021 annual report. The statistical analysis conducted for EKPC by Haley & Aldrich identified an SSI over the background value for sulfate at MW-2B. EKPC pursued an ASD for this SSI, which was successful and is described further in Section 5.3. Therefore, the Landfill remained in detection monitoring. The full statistical analysis package for the November 2021 event is provided in **Appendix E1**.

In July 2022 and within 90 days of receiving the laboratory analysis, Haley & Aldrich completed the statistical analysis of the detection monitoring sampling and analysis results from May 2022 (i.e., the first semi-annual 2022 detection monitoring event). SSIs for sulfate and calcium at MW-2B were identified. EKPC pursued an ASD for these SSIs, which was successful and is described further in Section 5.3. Therefore, the Landfill remained in detection monitoring. The full statistical analysis package for the May 2022 event is provided in **Appendix E2**.

The laboratory analysis of the November 2022 (i.e. the second semi-annual 2022 detection monitoring event) was not completed on or before December 31, 2022, and is not included in this report. The laboratory results and statistical package will be included in the 2023 annual report.

### 5.3 Alternate Source Demonstration(s)

Pursuant to 40 CFR §257.94(e)(2), if an SSI over background for any constituent is identified by the statistical analysis, an operator or owner may demonstrate that a source other than the CCR Unit caused the SSI(s), or the SSI(s) resulted from an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Otherwise, the operator or owner must establish an assessment monitoring program meeting the requirements of 40 CFR §257.95.

Geosyntec, on behalf of EKPC, prepared two separate ASDs for the sulfate SSI measured in well MW-2B during the November 2021 detection monitoring event and the sulfate and calcium SSIs measured in well MW-2B during the May 2022 detection monitoring event. The ASDs successfully demonstrated that both the sulfate and calcium concentrations found above background were not due to a leachate release and therefore, the Unit may continue with the detection monitoring program. These ASDs (dated April 2022 and October 2022) are provided in **Appendix F**.

## 6.0 Problems Encountered and Actions Taken

This section describes any problems encountered with the groundwater monitoring program during the reporting period and the actions taken in response.

No significant problems were encountered at the Spurlock CCR Landfill in 2022.

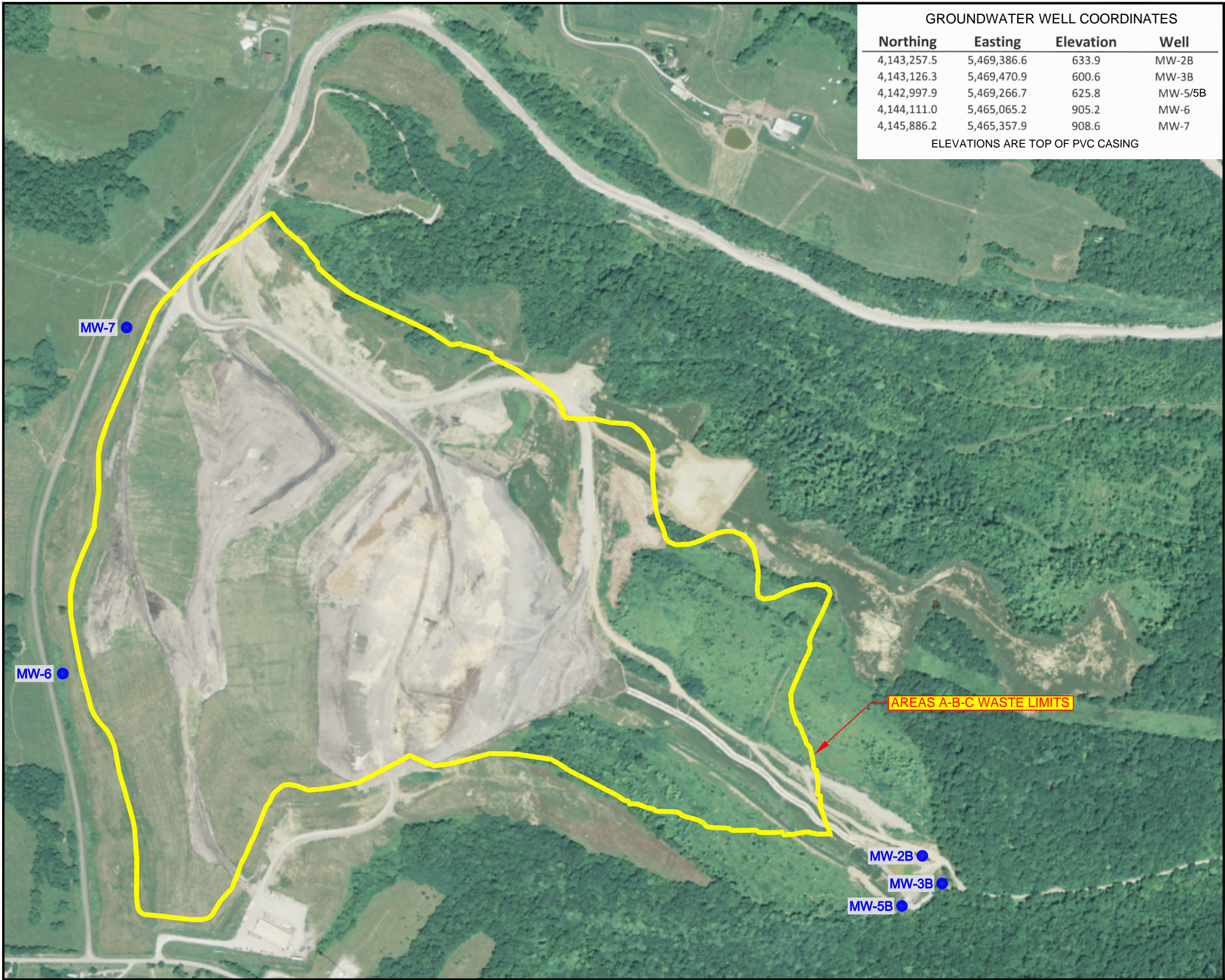
## 7.0 Key Activities Projected for 2023

EKPC will continue semi-annual detection monitoring in 2023.

Additionally, EKPC continues to evaluate the existing groundwater monitoring systems at its CCR units to identify opportunities for continuous improvement. This evaluation includes consideration of recent comments made by U.S. EPA concerning groundwater monitoring under the CCR Rule in the context of EPA's evaluation of demonstrations filed by various owners/operators pursuant to EPA's Part A (40 CFR 257.103(f)(1)) process, including the demonstration filed by EKPC for its Spurlock Impoundment. EKPC will provide updates on these efforts in the 2023 Groundwater Monitoring and Corrective Action annual reports for its CCR units.

## **APPENDIX A – Groundwater Monitoring Locations Map**





**GROUNDWATER WELL COORDINATES**

Northing	Easting	Elevation	Well
4,143,257.5	5,469,386.6	633.9	MW-2B
4,143,126.3	5,469,470.9	600.6	MW-3B
4,142,997.9	5,469,266.7	625.8	MW-5/5B
4,144,111.0	5,465,065.2	905.2	MW-6
4,145,886.2	5,465,357.9	908.6	MW-7

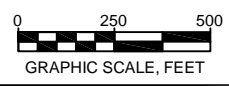
ELEVATIONS ARE TOP OF PVC CASING



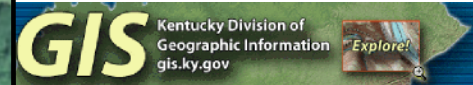
**LEGEND**

- GROUNDWATER MONITORING WELL
- SPURLOCK LANDFILL EXISTING A-B-C BOUNDARY

GROUNDWATER MONITORING WELLS  
INSTALLED AUGUST/SEPTEMBER 2016.



AERIAL PHOTOGRAPH, CIRCA 2014,  
OBTAINED FROM:



**FIGURE 6**

Groundwater Monitoring Well Locations  
East Kentucky Power Cooperative  
Spurlock Landfill  
Mason County, Kentucky



**TETRA TECH, INC.**

## **APPENDIX B – Summary of Analytical Results**

**H.L. Spurlock Station Landfill**

**Annual Reporting Year 2022  
Table B-1: Summary of Analytical Results**

Appendix 3 Constituents

Well ID	Sample Date	Event Type	GW Elevation (ft. MSL)	Boron (µg/L)	Calcium (µg/L)	Chloride (mg/L)	Fluoride (mg/L)	pH (S.U.)	Sulfate (mg/L)	TDS (mg/L)
SLF-MW-2B	5/31/2022	Detection	579.50	4010	76400	1820 D	1.1	7.70	500 D	4160
SLF-MW-2B	9/6/2022	ASD	679.75	3700 D	110000 D	1940 D	0.97 D	7.63	448 D	4410
SLF-MW-3B	5/31/2022	Detection	582.16	1800	200000	228 D	0.16	7.28	381 D	1220
SLF-MW-3B	9/6/2022	ASD	582.15	1760 D	182000 D	191 D	0.16	7.25	364 D	1180
SLF-MW-5R	5/31/2022	Detection	606.89	469	123000	26.2	0.13	7.20	159	586
SLF-MW-5R	9/6/2022	ASD	606.74	855 D	157000 D	44.1	0.15	7.12	209 D	732
SLF-MW-6	5/31/2022	Detection	786.51	1870	1350000	21300 D	< 0.50 D	7.16	164	37100
SLF-MW-6	9/6/2022	ASD	783.20	1580 D	1540000 D	20600 D	< 1.0 D	7.20	405 D	41600
SLF-MW-7	5/31/2022	Detection	756.74	5360	491000	14700 D	< 0.50 D	7.07	26.0	23500
SLF-MW-7	9/6/2022	ASD	756.78	4870 D	497000 D	14800 D	1.1 D	7.05	48.1 D	26300

Result Notes :	J - Estimated Value NA - Not available	R - Unusable (Quality Control Failure) D - Result reported from dilution
Result Units :	mg/L - milligram per liter ft. MSL - feet above mean sea level	µg/L - microgram per liter pCi/L - picocurie per liter S.U. - Standard Units
Event Type Abbreviations :	A3 - Appendix III Constituents for Detection Monitoring ASD - Alternative Source Demonstration	A4 - Appendix IV Constituents for Assessment Monitoring
Event Type Constituents :	Background - A3 and A4 Assessment - A3 (All) and A4 (Detected in annual screen).	Detection - A3 Annual Screen - A4 ASD - Tested A3 and A4 parameters

# APPENDIX C – Laboratory Analytical Reports

**Certificate of Analysis**

Station:	H.L. Spurlock Power Station	Sample Collection Date:	05/31/2022
Well ID No:	SLF-MW-2B	Sample Collection Time:	3:51 PM
AKGW No.:	8007-0267	Sample Collected By:	BTB
Well Depth (Ft.):	63.55	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	633.9	Laboratory Certification ID:	KY# 08012
Gradient:	Down		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
pH	7.70	S.U.	SM 4500-H+, B-2011	05/31/2022	3:51 PM	BTB

**EKPC - Central Laboratory Analyses**

Sample Received Date:	06/01/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	9:15 AM	Sample Received By:	JD

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Chloride	1820	D	mg/L	3.9	10.0	EPA 300.0 Rev 2.1 (1993)	6/14/2022	6:33 PM	JD
Fluoride	1.1		mg/L	0.10	0.10	EPA 300.0 Rev 2.1 (1993)	6/13/2022	7:50 PM	JD
Sulfate	500	D	mg/L	4.7	20.0	EPA 300.0 Rev 2.1 (1993)	6/14/2022	6:33 PM	JD
Solids, Total Dissolved	4160		mg/L		100	SM 2540, C-2011	6/2/2022	9:32 AM	JD

**ALS Environmental**

Sample Received Date:	6/7/2022	Sample Receipt Temperatures (°C):	> 6.0
Sample Received Time:	14:45	Sample Received By:	LYS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Boron	4010		µg/L	150	200	E200.8	6/15/2022	15:06	STP
Calcium	76400		µg/L	2200	5000	E200.8	6/14/2022	18:35	STP

## Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :



Jared Daugherty - Chemist

09:48 AM 07/06/2022



Eric Hamilton - QA/QC Chemist

10:05 AM 07/06/2022

**Certificate of Analysis**

Station:	H.L. Spurlock Power Station	Sample Collection Date:	05/31/2022
Well ID No:	SLF-MW-3B	Sample Collection Time:	2:37 PM
AKGW No.:	8007-0268	Sample Collected By:	BTB
Well Depth (Ft.):	33.32	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	600.64	Laboratory Certification ID:	KY# 08012
Gradient:	Down		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
pH	7.28	S.U.	SM 4500-H+, B-2011	05/31/2022	2:37 PM	BTB

**EKPC - Central Laboratory Analyses**

Sample Received Date:	06/01/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	9:15 AM	Sample Received By:	JD

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Chloride	228	D	mg/L	1.0	2.5	EPA 300.0 Rev 2.1 (1993)	6/14/2022	6:52 PM	JD
Fluoride	0.16		mg/L	0.10	0.10	EPA 300.0 Rev 2.1 (1993)	6/13/2022	8:09 PM	JD
Sulfate	381	D	mg/L	1.1	5.0	EPA 300.0 Rev 2.1 (1993)	6/14/2022	6:52 PM	JD
Solids, Total Dissolved	1220		mg/L		50.0	SM 2540, C-2011	6/2/2022	9:32 AM	JD

**ALS Environmental**

Sample Received Date:	6/7/2022	Sample Receipt Temperatures (°C):	> 6.0
Sample Received Time:	14:45	Sample Received By:	LYS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Boron	1800		µg/L	150	200	E200.8	6/15/2022	15:08	STP
Calcium	200000		µg/L	2200	5000	E200.8	6/14/2022	18:37	STP

## Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :



Jared Daugherty - Chemist

09:48 AM 07/06/2022



Eric Hamilton - QA/QC Chemist

10:04 AM 07/06/2022

### Certificate of Analysis

Station: H.L. Spurlock Power Station	Sample Collection Date: 05/31/2022
Well ID No: SLF-MW-5R/5B	Sample Collection Time: 4:34 PM
AKGW No.: 8007-0266	Sample Collected By: BTB
Well Depth (Ft.): 27.05	Sample Matrix: Ground Water
Well Elevation (Ft. MSL): 625.71	Laboratory Certification ID: KY# 08012
Gradient: Down	

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
pH	7.20	S.U.	SM 4500-H+, B-2011	05/31/2022	4:34 PM	BTB

**EKPC - Central Laboratory Analyses**

Sample Received Date: 06/01/2022	Sample Receipt Temperatures (°C): < 6
Sample Received Time: 9:15 AM	Sample Received By: JD

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Chloride	26.2		mg/L	0.1	0.5	EPA 300.0 Rev 2.1 (1993)	6/13/2022	8:28 PM	JD
Fluoride	0.13		mg/L	0.10	0.10	EPA 300.0 Rev 2.1 (1993)	6/13/2022	8:28 PM	JD
Sulfate	159		mg/L	0.04	1.0	EPA 300.0 Rev 2.1 (1993)	6/13/2022	8:28 PM	JD
Solids, Total Dissolved	586		mg/L		50.0	SM 2540, C-2011	6/2/2022	9:32 AM	JD

**ALS Environmental** Lab Identification #: 22060601-03

Sample Received Date: 6/7/2022	Sample Receipt Temperatures (°C): > 6.0
Sample Received Time: 14:45	Sample Received By: LYS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Boron	469		µg/L	150	200	E200.8	6/15/2022	15:19	STP
Calcium	123000		µg/L	2200	5000	E200.8	6/14/2022	18:45	STP

**Comments / Notes:**

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

**Electronically Approved By :**


Jared Daugherty - Chemist

09:48 AM 07/06/2022



Eric Hamilton - QA/QC Chemist

10:04 AM 07/06/2022



Report Date: 7/10/2022

### Certificate of Analysis

Station:	H.L. Spurlock Power Station	Sample Collection Date:	05/31/2022
Well ID No:	SLF-MW-6	Sample Collection Time:	11:41 AM
AKGW No.:	8003-8410	Sample Collected By:	BTB
Well Depth (Ft.):	163.15	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	905.18	Laboratory Certification ID:	KY# 08012
Gradient:	Up		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
pH	7.16	S.U.	SM 4500-H+, B-2011	05/31/2022	11:41 AM	BTB

EKPC - Central Laboratory Analyses						
Sample Received Date:	06/01/2022	Sample Receipt Temperatures (°C):	< 6			
Sample Received Time:	9:15 AM	Sample Received By:	JD			
		Lab Identification #:	2200477			


Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Chloride	21300	D	mg/L	97.0	250	EPA 300.0 Rev 2.1 (1993)	6/14/2022	7:11 PM	JD
Fluoride	< 0.50	D	mg/L	0.37	0.50	EPA 300.0 Rev 2.1 (1993)	6/14/2022	7:30 PM	JD
Sulfate	164		mg/L	0.04	1.0	EPA 300.0 Rev 2.1 (1993)	6/13/2022	8:47 PM	JD
Solids, Total Dissolved	37100		mg/L		1250	SM 2540, C-2011	6/2/2022	9:32 AM	JD
							Lab Identification #:	22060601-04	


ALS Environmental						
Sample Received Date:	6/7/2022	Sample Receipt Temperatures (°C):	> 6.0			
Sample Received Time:	14:45	Sample Received By:	LYS			

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Boron	1870		µg/L	150	200	E200.8	6/15/2022	15:21	STP
Calcium	1350000		µg/L	2200	5000	E200.8	6/14/2022	18:47	STP

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :   
 Jared Daugherty - Chemist  
 09:48 AM 07/06/2022

  
 Eric Hamilton - QA/QC Chemist  
 10:04 AM 07/06/2022



### Certificate of Analysis

Station: H.L. Spurlock Power Station	Sample Collection Date: 05/31/2022
Well ID No: SLF-MW-7	Sample Collection Time: 1:11 PM
AKGW No.: 8003-8409	Sample Collected By: BTB
Well Depth (Ft.): 163.51	Sample Matrix: Ground Water
Well Elevation (Ft. MSL): 908.58	Laboratory Certification ID: KY# 08012
Gradient: Up	

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
pH	7.07	S.U.	SM 4500-H+, B-2011	05/31/2022	1:11 PM	BTB

**EKPC - Central Laboratory Analyses**

Sample Received Date: 06/01/2022	Sample Receipt Temperatures (°C): < 6
Sample Received Time: 9:15 AM	Sample Received By: JD
Lab Identification #: 2200478	

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Chloride	14700	D	mg/L	97.0	250	EPA 300.0 Rev 2.1 (1993)	6/14/2022	10:07 PM	JD
Fluoride	< 0.50	D	mg/L	0.37	0.50	EPA 300.0 Rev 2.1 (1993)	6/14/2022	8:26 PM	JD
Sulfate	26.0		mg/L	0.04	1.0	EPA 300.0 Rev 2.1 (1993)	6/13/2022	9:06 PM	JD
Solids, Total Dissolved	23500		mg/L		1250	SM 2540, C-2011	6/2/2022	9:32 AM	JD
							Lab Identification #:	22060601-05	

**ALS Environmental**


Sample Received Date: 6/7/2022	Sample Receipt Temperatures (°C): > 6.0
Sample Received Time: 14:45	Sample Received By: LYS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Boron	5360		µg/L	150	200	E200.8	6/14/2022	18:48	STP
Calcium	491000		µg/L	2200	5000	E200.8	6/14/2022	18:48	STP

**Comments / Notes:**


Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

**Electronically Approved By :**


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 Jared Daugherty - Chemist  
 09:48 AM 07/06/2022


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 Eric Hamilton - QA/QC Chemist  
 10:04 AM 07/06/2022



Report Date: 10/18/2022

### Certificate of Analysis

Station:	H. L. Spurlock Power Station	Sample Collection Date:	09/06/2022
Well ID No:	SLF-MW-2B	Sample Collection Time:	4:44 PM
AKGW No.:	8007-0267	Sample Collected By:	BTB
Well Depth (Ft.):	63.55	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	633.9	Laboratory Certification ID:	KY# 08012
Gradient:	Down		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Groundwater Elevation	679.75	MSL		09/06/2022	4:44 PM	BTB
Turbidity	< 1.0	NTU	SM 2130, B-2001	09/06/2022	4:44 PM	BTB
Conductivity	7385	µS/cm	SM 2510, B-2011	09/06/2022	4:44 PM	BTB
Temperature	61.52	°F	SM 2550, B-2010	09/06/2022	4:44 PM	BTB
Oxidation-Reduction Potential	-97.4	mV	SM 2580, B-2011	09/06/2022	4:44 PM	BTB
pH	7.63	S.U.	SM 4500-H+, B-2011	09/06/2022	4:44 PM	BTB
Oxygen, dissolved	< 1.0	mg/L	SM 4500-O	09/06/2022	4:44 PM	BTB

**EKPC - Central Laboratory Analyses** Lab Identification #: 2200909

Sample Received Date:	09/07/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	2:55 PM	Sample Received By:	TY

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Antimony	< 1.0	D	µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Arsenic	1.1	D	µg/L	0.3	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Barium	130	D	µg/L	1.9	2.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Beryllium	< 1.0	D	µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Boron	3700	D	µg/L	14.4	100	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	1:49 PM	JD
Cadmium	< 0.25	D	µg/L	0.10	0.25	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:02 PM	JD
Calcium	110000	D	µg/L	11200	20000	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:36 PM	JD
Chromium	< 1.0	D	µg/L	0.4	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Cobalt	< 1.0	D	µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Lead	< 2.4	D	µg/L	2.2	2.4	EPA 200.8, Rev. 5.4 (1994)	9/30/2022	2:21 PM	JD
Lithium	345	D	µg/L	12.3	20.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:19 PM	JD
Magnesium	35600	D	µg/L	1370	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:36 PM	JD
Molybdenum	1.9	D	µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:02 PM	JD
Potassium	27400	D	µg/L	449	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:36 PM	JD
Selenium	2.3	D	µg/L	0.5	0.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	3:02 PM	JD
Sodium	1370000	D	µg/L	14400	25000	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	3:09 PM	JD
Thallium	< 0.40	D	µg/L	0.13	0.40	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	1:49 PM	JD
Mercury	< 0.0050	D	µg/L	0.0014	0.0050	EPA 245.7 Rev 2.0 (2005)	9/19/2022	11:54 AM	JD
Chloride	1940	D	mg/L	11.8	25.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	4:07 PM	JD
Fluoride	0.97	D	mg/L	0.24	0.25	EPA 300.0 Rev 2.1 (1993)	9/9/2022	4:26 PM	JD
Sulfate	448	D	mg/L	1.2	5.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	4:26 PM	JD
Solids, Total Dissolved	4410		mg/L		100	SM 2540, C-2011	9/9/2022	11:22 AM	JD

**ALS Environmental** Lab Identification #: 22090991-01

Sample Received Date:	9/12/2022	Sample Receipt Temperatures (°C):	<6.0
Sample Received Time:	14:18	Sample Received By:	DS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Alkalinity, Bicarbonate (as CaCO3)	250		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ
Alkalinity, Total (as CaCO3)	250		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ


**Pace** Lab Identification #: 30522300001

Sample Received Date:	9/15/2022	Sample Receipt Temperatures (°C):	NA
Sample Received Time:	9:35 AM	Sample Received By:	PN

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Radium-226	1.25 ± 0.869 ( 1.17 )		pCi/L			EPA 903.1	9/24/2022	1:21 PM	SLC
Radium-228	0.985 ± 0.629 ( 1.20 )		pCi/L			EPA 904.0	9/29/2022	3:53 PM	VAL
Total Radium Calculation	2.24 ± 1.50 ( 2.37 )		pCi/L			Total Radium Calculation	9/30/2022	2:40 PM	JAL

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :   
 Jared Daugherty - Chemist  
 06:38 AM 10/17/2022

  
 Eric Hamilton - QA/QC Chemist  
 10:09 AM 10/18/2022



Report Date: 10/18/2022

### Certificate of Analysis

Station:	H. L. Spurlock Power Station	Sample Collection Date:	09/06/2022
Well ID No:	SLF-MW-3B	Sample Collection Time:	3:34 PM
AKGW No.:	8007-0268	Sample Collected By:	BTB
Well Depth (Ft.):	33.32	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	600.64	Laboratory Certification ID:	KY# 08012
Gradient:	Down		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Groundwater Elevation	582.15	MSL		09/06/2022	3:34 PM	BTB
Turbidity	< 1.0	NTU	SM 2130, B-2001	09/06/2022	3:34 PM	BTB
Conductivity	1762	µS/cm	SM 2510, B-2011	09/06/2022	3:34 PM	BTB
Temperature	59.36	°F	SM 2550, B-2010	09/06/2022	3:34 PM	BTB
Oxidation-Reduction Potential	-54.7	mV	SM 2580, B-2011	09/06/2022	3:34 PM	BTB
pH	7.25	S.U.	SM 4500-H+, B-2011	09/06/2022	3:34 PM	BTB
Oxygen, dissolved	< 1.0	mg/L	SM 4500-O	09/06/2022	3:34 PM	BTB

**EKPC - Central Laboratory Analyses** Lab Identification #: 2200910

Sample Received Date:	09/07/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	2:55 PM	Sample Received By:	TY

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Antimony	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	2:24 PM	JD
Arsenic	< 1.0		µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Barium	57.5		µg/L	1.0	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Beryllium	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Boron	1760	D	µg/L	14.4	100	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	1:53 PM	JD
Cadmium	< 0.25		µg/L	0.10	0.25	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Calcium	182000	D	µg/L	11200	20000	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:40 PM	JD
Chromium	< 1.0		µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Cobalt	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Lead	< 1.0		µg/L	0.5	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Lithium	358		µg/L	6.2	10.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Magnesium	39600	D	µg/L	1370	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:40 PM	JD
Molybdenum	60.8		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	2:24 PM	JD
Potassium	8040	D	µg/L	449	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:40 PM	JD
Selenium	< 1.0		µg/L	0.5	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Sodium	127000	D	µg/L	1440	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:40 PM	JD
Thallium	< 0.10		µg/L	0.03	0.10	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:00 PM	JD
Mercury	< 0.0050	D	µg/L	0.0014	0.0050	EPA 245.7 Rev 2.0 (2005)	9/19/2022	11:57 AM	JD
Chloride	191	D	mg/L	1.2	2.5	EPA 300.0 Rev 2.1 (1993)	9/9/2022	4:45 PM	JD
Fluoride	0.16		mg/L	0.05	0.05	EPA 300.0 Rev 2.1 (1993)	9/9/2022	8:32 PM	JD
Sulfate	364	D	mg/L	1.2	5.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	4:45 PM	JD
Solids, Total Dissolved	1180		mg/L		50.0	SM 2540, C-2011	9/9/2022	11:22 AM	JD

**ALS Environmental** Lab Identification #: 22090991-02

Sample Received Date:	9/12/2022	Sample Receipt Temperatures (°C):	<6.0
Sample Received Time:	14:18	Sample Received By:	DS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Alkalinity, Bicarbonate (as CaCO3)	220		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ
Alkalinity, Total (as CaCO3)	220		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ

**Pace** Lab Identification #: 30522300002

Sample Received Date:	9/15/2022	Sample Receipt Temperatures (°C):	NA
Sample Received Time:	9:35 AM	Sample Received By:	PN

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Radium-226	-0.4 ± 0.538 ( 1.37 )		pCi/L			EPA 903.1	9/24/2022	1:21 PM	SLC
Radium-228	0.749 ± 0.571 ( 1.13 )		pCi/L			EPA 904.0	9/29/2022	3:53 PM	VAL
Total Radium Calculation	0.749 ± 1.11 ( 2.50 )		pCi/L			Total Radium Calculation	9/30/2022	2:40 PM	JAL

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :

Jared Daugherty - Chemist

06:38 AM 10/17/2022

Eric Hamilton - QA/QC Chemist

09:16 AM 10/18/2022



Report Date: 10/18/2022

### Certificate of Analysis

Station:	H.L. Spurlock Power Station	Sample Collection Date:	09/06/2022
Well ID No:	SLF-MW-5R/5B	Sample Collection Time:	5:22 PM
AKGW No.:	8007-0266	Sample Collected By:	BTB
Well Depth (Ft.):	27.05	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	625.71	Laboratory Certification ID:	KY# 08012
Gradient:	Down		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Groundwater Elevation	606.74	MSL		09/06/2022	5:22 PM	BTB
Turbidity	3.15	NTU	SM 2130, B-2001	09/06/2022	5:22 PM	BTB
Conductivity	1018	µS/cm	SM 2510, B-2011	09/06/2022	5:22 PM	BTB
Temperature	61.16	°F	SM 2550, B-2010	09/06/2022	5:22 PM	BTB
Oxidation-Reduction Potential	123.4	mV	SM 2580, B-2011	09/06/2022	5:22 PM	BTB
pH	7.12	S.U.	SM 4500-H+, B-2011	09/06/2022	5:22 PM	BTB
Oxygen, dissolved	3.4	mg/L	SM 4500-O	09/06/2022	5:22 PM	BTB

**EKPC - Central Laboratory Analyses** Lab Identification #: 2200911

Sample Received Date:	09/07/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	2:55 PM	Sample Received By:	TY

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Antimony	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	2:28 PM	JD
Arsenic	< 1.0		µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Barium	50.8		µg/L	1.0	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Beryllium	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Boron	855	D	µg/L	3.6	25.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	2:28 PM	JD
Cadmium	< 0.25		µg/L	0.10	0.25	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Calcium	157000	D	µg/L	11200	20000	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:44 PM	JD
Chromium	< 1.0		µg/L	0.2	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Cobalt	< 1.0		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Lead	< 1.0		µg/L	0.5	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Lithium	122		µg/L	6.2	10.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Magnesium	31800	D	µg/L	1370	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:44 PM	JD
Molybdenum	17.7		µg/L	0.1	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	2:28 PM	JD
Potassium	< 2500	D	µg/L	449	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:44 PM	JD
Selenium	< 1.0		µg/L	0.5	1.0	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Sodium	26000	D	µg/L	1440	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:44 PM	JD
Thallium	< 0.10		µg/L	0.03	0.10	EPA 200.8, Rev. 5.4 (1994)	9/20/2022	5:05 PM	JD
Mercury	< 0.0050	D	µg/L	0.0014	0.0050	EPA 245.7 Rev 2.0 (2005)	9/19/2022	12:00 PM	JD
Chloride	44.1		mg/L	0.2	0.5	EPA 300.0 Rev 2.1 (1993)	9/9/2022	8:51 PM	JD
Fluoride	0.15		mg/L	0.05	0.05	EPA 300.0 Rev 2.1 (1993)	9/9/2022	8:51 PM	JD
Sulfate	209	D	mg/L	1.2	5.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	5:04 PM	JD
Solids, Total Dissolved	732		mg/L		50.0	SM 2540, C-2011	9/9/2022	11:22 AM	JD

**ALS Environmental** Lab Identification #: 22090991-03

Sample Received Date:	9/12/2022	Sample Receipt Temperatures (°C):	<6.0
Sample Received Time:	14:18	Sample Received By:	DS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Alkalinity, Bicarbonate (as CaCO3)	270		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ
Alkalinity, Total (as CaCO3)	270		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ

**Pace** Lab Identification #: 30522300003

Sample Received Date:	9/15/2022	Sample Receipt Temperatures (°C):	NA
Sample Received Time:	9:35 AM	Sample Received By:	PN

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Radium-226	1.08 ± 0.759 (0.969)		pCi/L			EPA 903.1	9/24/2022	1:21 PM	SLC
Radium-228	0.277 ± 0.515 (1.13)		pCi/L			EPA 904.0	9/29/2022	3:53 PM	VAL
Total Radium Calculation	1.36 ± 1.27 (2.10)		pCi/L			Total Radium Calculation	9/30/2022	2:40 PM	JAL

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :

Jared Daugherty - Chemist

06:38 AM 10/17/2022

Eric Hamilton - QA/QC Chemist

09:16 AM 10/18/2022



Report Date: 10/18/2022

### Certificate of Analysis

Station:	H. L. Spurlock Power Station	Sample Collection Date:	09/06/2022
Well ID No:	SLF-MW-6	Sample Collection Time:	12:30 PM
AKGW No.:	8003-8410	Sample Collected By:	BTB
Well Depth (Ft.):	163.15	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	905.18	Laboratory Certification ID:	KY# 08012
Gradient:	Up		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Groundwater Elevation	783.20	MSL		09/06/2022	12:30 PM	BTB
Turbidity	1.22	NTU	SM 2130, B-2001	09/06/2022	12:30 PM	BTB
Conductivity	54630	µS/cm	SM 2510, B-2011	09/06/2022	12:30 PM	BTB
Temperature	67.46	°F	SM 2550, B-2010	09/06/2022	12:30 PM	BTB
Oxidation-Reduction Potential	-119	mV	SM 2580, B-2011	09/06/2022	12:30 PM	BTB
pH	7.20	S.U.	SM 4500-H+, B-2011	09/06/2022	12:30 PM	BTB
Oxygen, dissolved	< 1.0	mg/L	SM 4500-O	09/06/2022	12:30 PM	BTB

**EKPC - Central Laboratory Analyses** Lab Identification #: 2200912

Sample Received Date:	09/07/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	2:55 PM	Sample Received By:	TY

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Antimony	< 3.8	D	µg/L	1.8	3.8	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:35 AM	JD
Arsenic	4.1	D	µg/L	1.7	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Barium	316	D	µg/L	14.3	15.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:35 AM	JD
Beryllium	< 1.0	D	µg/L	0.7	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Boron	1580	D	µg/L	36.1	250	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Cadmium	< 2.5	D	µg/L	1.0	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Calcium	1540000	D	µg/L	112000	200000	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:24 AM	JD
Chromium	< 2.5	D	µg/L	2.2	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Cobalt	< 1.0	D	µg/L	0.8	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Lead	< 10.6	D	µg/L	9.9	10.6	EPA 200.8, Rev. 5.4 (1994)	9/30/2022	11:52 AM	JD
Lithium	1530	D	µg/L	61.7	100	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Magnesium	310000	D	µg/L	13700	25000	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:24 AM	JD
Molybdenum	< 2.5	D	µg/L	0.7	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Potassium	131000	D	µg/L	449	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:48 PM	JD
Selenium	24.4	D	µg/L	4.7	5.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:15 AM	JD
Sodium	11100000	D	µg/L	144000	250000	EPA 200.8, Rev. 5.4 (1994)	9/30/2022	10:16 AM	JD
Thallium	< 1.8	D	µg/L	0.61	1.8	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	10:43 AM	JD
Mercury	< 0.0050	D	µg/L	0.0014	0.0050	EPA 245.7 Rev 2.0 (2005)	9/19/2022	12:03 PM	JD
Chloride	20600	D	mg/L	118	250	EPA 300.0 Rev 2.1 (1993)	9/9/2022	5:23 PM	JD
Fluoride	< 1.0	D	mg/L	0.96	1.0	EPA 300.0 Rev 2.1 (1993)	9/16/2022	5:34 PM	JD
Sulfate	405	D	mg/L	1.2	5.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	6:00 PM	JD
Solids, Total Dissolved	41600		mg/L		1250	SM 2540, C-2011	9/9/2022	11:22 AM	JD

**ALS Environmental** Lab Identification #: 22090991-04

Sample Received Date:	9/12/2022	Sample Receipt Temperatures (°C):	<6.0
Sample Received Time:	14:18	Sample Received By:	DS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Alkalinity, Bicarbonate (as CaCO3)	100		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ
Alkalinity, Total (as CaCO3)	100		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ

**Pace** Lab Identification #: 30522300004

Sample Received Date:	9/15/2022	Sample Receipt Temperatures (°C):	NA
Sample Received Time:	9:35 AM	Sample Received By:	PN

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Radium-226	38.2 ± 5.67 ( 1.17 )		pCi/L			EPA 903.1	9/24/2022	1:21 PM	SLC
Radium-228	35.1 ± 6.52 ( 1.03 )		pCi/L			EPA 904.0	9/29/2022	3:53 PM	VAL
Total Radium Calculation	73.3 ± 12.2 ( 2.20 )		pCi/L			Total Radium Calculation	9/30/2022	2:40 PM	JAL

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By :

*Jared Daugherty*

Jared Daugherty - Chemist

09:14 AM 10/18/2022

*Eric Hamilton*

Eric Hamilton - QA/QC Chemist

09:16 AM 10/18/2022



Report Date: 10/18/2022

### Certificate of Analysis

Station:	H. L. Spurlock Power Station	Sample Collection Date:	09/06/2022
Well ID No:	SLF-MW-7	Sample Collection Time:	2:08 PM
AKGW No.:	8003-8409	Sample Collected By:	BTB
Well Depth (Ft.):	163.51	Sample Matrix:	Ground Water
Well Elevation (Ft. MSL):	908.58	Laboratory Certification ID:	KY# 08012
Gradient:	Up		

Field Analyses	Result	Units	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Groundwater Elevation	756.78	MSL		09/06/2022	2:08 PM	BTB
Turbidity	< 1.0	NTU	SM 2130, B-2001	09/06/2022	2:08 PM	BTB
Conductivity	37750	µS/cm	SM 2510, B-2011	09/06/2022	2:08 PM	BTB
Temperature	62.60	°F	SM 2550, B-2010	09/06/2022	2:08 PM	BTB
Oxidation-Reduction Potential	-72	mV	SM 2580, B-2011	09/06/2022	2:08 PM	BTB
pH	7.05	S.U.	SM 4500-H+, B-2011	09/06/2022	2:08 PM	BTB
Oxygen, dissolved	< 1.0	mg/L	SM 4500-O	09/06/2022	2:08 PM	BTB

**EKPC - Central Laboratory Analyses** Lab Identification #: 2200913

Sample Received Date:	09/07/2022	Sample Receipt Temperatures (°C):	< 6
Sample Received Time:	2:55 PM	Sample Received By:	TY

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Antimony	< 2.5	D	µg/L	1.2	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Arsenic	3.2	D	µg/L	1.7	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Barium	4710	D	µg/L	9.5	10.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Beryllium	< 1.0	D	µg/L	0.7	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Boron	4870	D	µg/L	36.1	250	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Cadmium	< 2.5	D	µg/L	1.0	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Calcium	497000	D	µg/L	112000	200000	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:20 AM	JD
Chromium	< 2.5	D	µg/L	2.2	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Cobalt	< 1.0	D	µg/L	0.8	1.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Lead	< 7.1	D	µg/L	6.6	7.1	EPA 200.8, Rev. 5.4 (1994)	9/30/2022	11:28 AM	JD
Lithium	1620	D	µg/L	61.7	100	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Magnesium	221000	D	µg/L	13700	25000	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:20 AM	JD
Molybdenum	< 2.5	D	µg/L	0.7	2.5	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Potassium	94900	D	µg/L	449	2500	EPA 200.8, Rev. 5.4 (1994)	9/15/2022	2:52 PM	JD
Selenium	16.3	D	µg/L	4.7	5.0	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:03 AM	JD
Sodium	8340000	D	µg/L	144000	250000	EPA 200.8, Rev. 5.4 (1994)	9/30/2022	10:20 AM	JD
Thallium	< 1.2	D	µg/L	0.40	1.2	EPA 200.8, Rev. 5.4 (1994)	9/29/2022	11:08 AM	JD
Mercury	< 0.0050	D	µg/L	0.0014	0.0050	EPA 245.7 Rev 2.0 (2005)	9/19/2022	12:06 PM	JD
Chloride	14800	D	mg/L	118	250	EPA 300.0 Rev 2.1 (1993)	9/9/2022	5:41 PM	JD
Fluoride	1.1	D	mg/L	0.96	1.0	EPA 300.0 Rev 2.1 (1993)	9/16/2022	6:30 PM	JD
Sulfate	48.1	D	mg/L	1.2	5.0	EPA 300.0 Rev 2.1 (1993)	9/9/2022	6:19 PM	JD
Solids, Total Dissolved	26300		mg/L		1250	SM 2540, C-2011	9/9/2022	11:22 AM	JD

**ALS Environmental** Lab Identification #: 22090991-05

Sample Received Date:	9/12/2022	Sample Receipt Temperatures (°C):	<6.0
Sample Received Time:	14:18	Sample Received By:	DS

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Alkalinity, Bicarbonate (as CaCO3)	210		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ
Alkalinity, Total (as CaCO3)	210		mg/L	8.4	10	A2320 B-11	9/16/2022	11:35	JMJ

**Pace** Lab Identification #: 30522300005

Sample Received Date:	9/15/2022	Sample Receipt Temperatures (°C):	NA
Sample Received Time:	9:35 AM	Sample Received By:	PN

Parameter	Result	Note	Units	MDL	Report Limit	Analysis Method	Date Analyzed:	Time Analyzed:	Analyst:
Radium-226	38.6 ± 5.84 (1.12)		pCi/L			EPA 903.1	9/24/2022	1:21 PM	SLC
Radium-228	33.4 ± 6.25 (1.14)		pCi/L			EPA 904.0	9/29/2022	3:53 PM	VAL
Total Radium Calculation	72.0 ± 12.1 (2.26)		pCi/L			Total Radium Calculation	9/30/2022	2:40 PM	JAL

Comments / Notes:

Sample Results are compliant with East Kentucky Power Cooperatives Quality Assurance program. Quality Control sample results achieved laboratory specification.  
 Result notes: D - Result from dilution, J - Estimated Value, R - Unusable Result (Quality Control Failure), NA - Not Available

Electronically Approved By:

*Jared Daugherty*

Jared Daugherty - Chemist

09:14 AM 10/18/2022

*Eric Hamilton*

Eric Hamilton - QA/QC Chemist

09:16 AM 10/18/2022

**APPENDIX D – Flow Calculations & Direction Maps**

## GROUNDWATER FLOW VELOCITY CALCULATION

Facility Name: Spurlock Landfill  
Sampling Event Date: May 31st, 2022

$$V = \frac{K_h * i}{n_e}$$

### INPUT VARIABLES:

Hydraulic Conductivity ( $K_h$ ) = 3.67E-08 ft/s  
Upgradient Water Elevation ( $h_1$ ) = 639 ft  
Downgradient Water Elevation ( $h_2$ ) = 583 ft  
Flow Length (L) = 865 ft  
Effective Porosity ( $n_e$ ) = 0.05 unitless

### CALCULATIONS:

dh = 56 ft  
Hydraulic Gradient (i) = 0.065 ft/ft  
GW Flow Velocity ( $K_h * i / n_e$ ) = 4.11E-03 ft/day

V = Groundwater flow velocity ( $\frac{\text{feet}}{\text{day}}$ )

$K_h$  = Horizontal Hydraulic Conductivity ( $\frac{\text{feet}}{\text{day}}$ )

i = Horizontal hydraulic gradient ( $\frac{\text{feet}}{\text{foot}}$ ) =  $\frac{h_1 - h_2}{L}$

$h_1$  and  $h_2$  = Groundwater elevation at location 1 and 2

L = Distance between location 1 and 2

$n_e$  = Effective porosity

### Notes:

1. Effective porosity estimates based on values from Ordovician limestone according to Groundwater Monitoring System and Hydrogeologic Investigation Report for Spurlock LF dated Oct. 2017 by Tetra Tech.
2. The location of  $h_1$  at SE corner of the permitted waste boundary, groundwater elevation of  $h_1$  based on creek bed prior to development.
3. The location of  $h_2$  is downgradient of the pond and monitoring wells in the creek bed, groundwater elevation of  $h_2$  based on creek bed prior to development.
4. Hydraulic conductivity estimates taken from the Groundwater Monitoring System and Hydrogeologic Investigation Report for Peg's Hill dated February 2019 by Geosyntec.
5. Calculations are based on available information and limited data points, therefore, the results reflect estimated values.
6. Flow Length distance is estimated using CAD software measuring from the SE corner of the permitted waste boundary to a location downstream of the pond just beyond the monitoring wells in the creek bed.

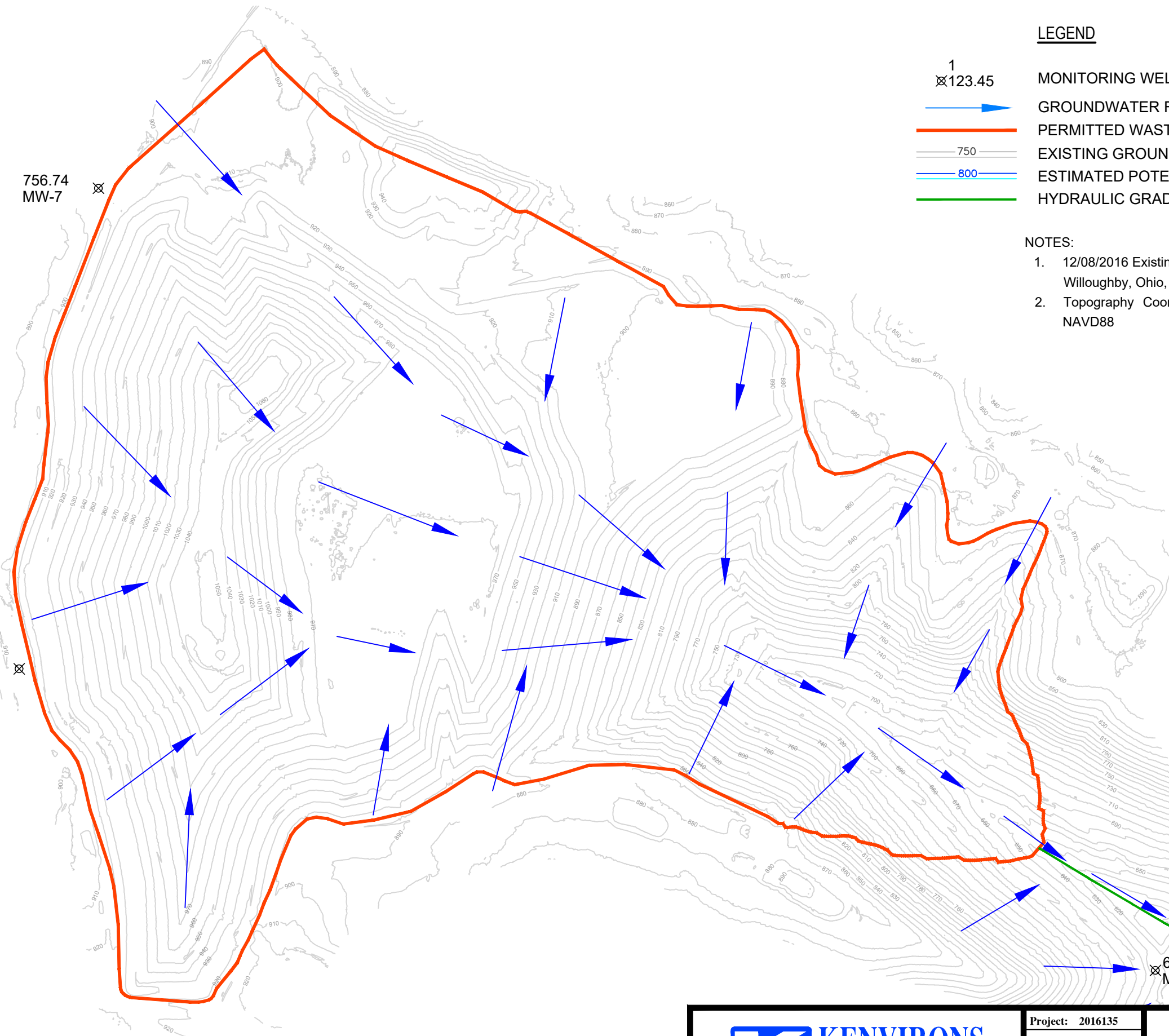






756.74  
MW-7

786.51  
MW-6

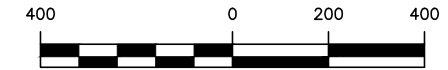


**LEGEND**

- 123.45 MONITORING WELL LOCATION AND WATER ELEVATION
- GROUNDWATER FLOW DIRECTION
- PERMITTED WASTE LIMIT
- 750 EXISTING GROUND CONTOURS
- 800 ESTIMATED POTENTIOMETRIC SURFACE CONTOURS
- HYDRAULIC GRADIENT FLOW LENGTH

**NOTES:**

1. 12/08/2016 Existing Topography prepared by Kucera International, Inc., Willoughby, Ohio, under subcontract to Mikon Corporation.
2. Topography Coordinate System is KY State Plane Single Zone, NAD83, NAVD88

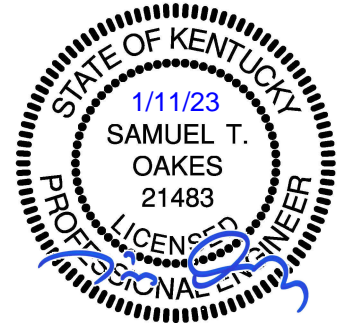


(SCALE IN FEET)  
1 inch = 400 ft.

579.50  
MW-2B

582.16  
MW-3B

606.89  
MW-5R



MAY 31, 2022 EVENT



Project: 2016135  
 Checked By: STO  
 Date: 01-09-23  
 Scale: 1"=400'

**SPURLOCK STATION LANDFILL**  
 MASON COUNTY, KENTUCKY  
 GROUNDWATER FLOW MAP



**GROUNDWATER FLOW VELOCITY CALCULATION**

**Facility Name:** Spurlock Landfill  
**Sampling Event Date:** September 9th, 2022

$$V = \frac{K_h * i}{n_e}$$

**INPUT VARIABLES:**

Hydraulic Conductivity ( $K_h$ ) = 3.67E-08 ft/s  
 Upgradient Water Elevation ( $h_1$ ) = 639 ft  
 Downgradient Water Elevation ( $h_2$ ) = 583 ft  
 Flow Length (L) = 865 ft  
 Effective Porosity ( $n_e$ ) = 0.05 unitless

V = Groundwater flow velocity ( $\frac{feet}{day}$ )

$K_h$  = Horizontal Hydraulic Conductivity ( $\frac{feet}{day}$ )

$i$  = Horizontal hydraulic gradient ( $\frac{feet}{foot}$ ) =  $\frac{h_1 - h_2}{L}$

$h_1$  and  $h_2$  = Groundwater elevation at location 1 and 2

L = Distance between location 1 and 2

$n_e$  = Effective porosity

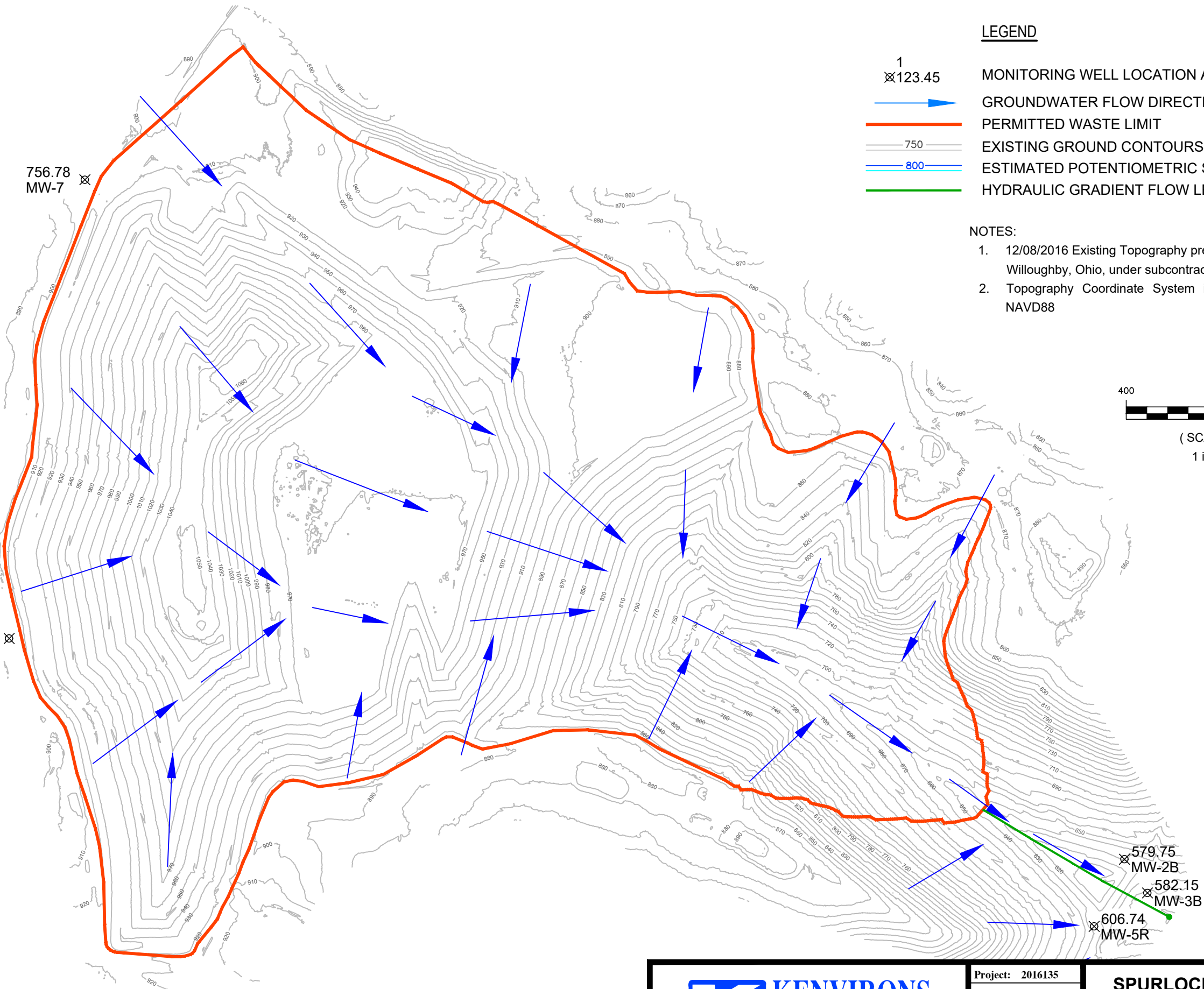
**CALCULATIONS:**

dh = 56 ft  
 Hydraulic Gradient (i) = 0.065 ft/ft  
 GW Flow Velocity ( $K_h * i / n_e$ ) = 4.11E-03 ft/day

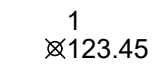



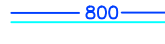

**Notes:**

1. Effective porosity estimates based on values from Ordovician limestone according to Groundwater Monitoring System and Hydrogeologic Investigation Report for Spurlock LF dated Oct. 2017 by Tetra Tech.
2. The location of h1 at SE corner of the permitted waste boundary, groundwater elevation of h1 based on creek bed prior to development.
3. The location of h2 is downgradient of the pond and monitoring wells in the creek bed, groundwater elevation of h2 based on creek bed prior to development.
4. Hydraulic conductivity estimates taken from the Groundwater Monitoring System and Hydrogeologic Investigation Report for Peg's Hill dated February 2019 by Geosyntec.
5. Calculations are based on available information and limited data points, therefore, the results reflect estimated values.
6. Flow Length distance is estimated using CAD software measuring from the SE corner of the permitted waste boundary to a location downstream of the pond just beyond the monitoring wells in the creek bed.



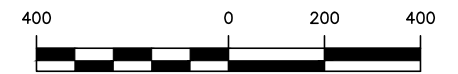


**LEGEND**

-  1  
123.45 MONITORING WELL LOCATION AND WATER ELEVATION
-  GROUNDWATER FLOW DIRECTION
-  PERMITTED WASTE LIMIT
-  750 EXISTING GROUND CONTOURS
-  800 ESTIMATED POTENTIOMETRIC SURFACE CONTOURS
-  HYDRAULIC GRADIENT FLOW LENGTH

**NOTES:**

1. 12/08/2016 Existing Topography prepared by Kucera International, Inc., Willoughby, Ohio, under subcontract to Mikon Corporation.
2. Topography Coordinate System is KY State Plane Single Zone, NAD83, NAVD88



(SCALE IN FEET)  
1 inch = 400 ft.



SEPTEMBER 6, 2022 EVENT



Project: 2016135  
 Checked By: STO  
 Date: 01-09-23  
 Scale: 1"=400'

**SPURLOCK STATION LANDFILL**  
 MASON COUNTY, KENTUCKY  
 GROUNDWATER FLOW MAP



**APPENDIX E1 – Statistical Analysis Package (November 2021)**



HALEY & ALDRICH, INC.  
6500 Rockside Road  
Suite 200  
Cleveland, OH 44131  
216.739.0555

21 April 2022  
File No. 130592-015

East Kentucky Power Cooperative  
4775 Lexington Road  
Winchester, KY 40392

Subject: Summary of Appendix III Semi-Annual  
Groundwater Detection Monitoring Statistical Evaluation  
East Kentucky Power Cooperative  
H.L. Spurlock Generating Station Landfill  
Maysville, Kentucky

East Kentucky Power Cooperative, Inc. (EKPC) is implementing the 17 April 2015 U.S. Environmental Protection Agency (U.S. EPA) Federal Coal Combustion Residuals (CCR) Rule (40 CFR §257 and 261) for the H.L. Spurlock Generating Station Landfill, located in Mason County, Kentucky. The CCR Rule establishes requirements for the operation, maintenance and closure of landfills and surface impoundments of CCR materials.

On 22 December 2021, EKPC provided Haley & Aldrich, Inc. (Haley & Aldrich) with analytical data from groundwater samples collected on 19 November 2021 from a groundwater monitoring system that meets the requirements of 40 CFR §257.91. Downgradient locations were defined in the *Groundwater Monitoring System and Hydrogeologic Investigation Report, Spurlock Landfill, H.L. Spurlock Generating Station, Maysville, Kentucky* (Tetra Tech, 10 October 2017). This memorandum summarizes the results of statistical evaluations conducted to determine if Appendix III groundwater monitoring constituents have been detected in downgradient wells at levels that exhibit a statistically significant increase (SSI) above background levels consistent with the requirements in 40 CFR § 257.94. The results presented herein were previously communicated orally to EKPC on 19 January 2022. Time-series graphs of data collected as part of the CCR Rule monitoring of H.L. Spurlock Generating Station Landfill are included in Attachment 1.

To identify SSIs, sample data from the most recent groundwater sampling event from the downgradient monitoring wells were compared to the Upper Prediction Limits (UPLs) calculated for each Appendix III constituent (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids) to represent background values within the given downgradient wells. Lower Prediction Limits (LPLs) were also calculated for pH<sup>1</sup>. Based on these comparisons, the statistical results show an SSI above background concentrations for sulfate at SLF-MW-2B. We note that sulfate at SLF-MW-2B was also identified as an SSI during the previous two sampling events. Successful Alternate Source Demonstrations (ASDs) for the

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<sup>1</sup> We note that for pH, the LPL was developed to monitor for significant increase or a decrease in pH.

previous SSIs were prepared and certified by Geosyntec Consultants in November 2020 and June 2021. The results of the groundwater detection monitoring evaluation are provided below.

## **Statistical Evaluation of Appendix III Constituents**

The Rule, 40 CFR §257.93(f) (1-4), provides four (4) specific options to statistically evaluate whether water quality downgradient of the CCR Unit represents an SSI of Appendix III parameters compared to background water quality of the CCR Unit. Background was determined by calculating intra-well UPL for each Appendix III constituent as well as the LPL for pH for each downgradient monitoring location (see footnote 1). The UPL was used to evaluate potential SSIs at each downgradient well.

### **UPL STATISTICAL ANALYSIS**

Prediction limits are used to predict the UPL of possible future values for each Appendix III constituent as well as the LPL for pH, based on the downgradient monitoring well dataset and a specified number of future statistical comparisons. The prediction limit method is an accepted statistical method identified in the CCR Rule to evaluate the groundwater analytical data at CCR Units. The prediction limits are calculated with minimum 95% confidence level for four (4) future observations to maintain acceptable statistical power while maintaining site-wide false positive rate (SWFPR) of 10% per year or less. Depending on the assumed distribution of background data, parametric or non-parametric procedures were used to develop the UPL for each Appendix III parameter at each of the downgradient locations that had enough sampling events. Parametric prediction limits utilize assumed distributions of the sample background data to develop the prediction limits, and non-parametric limits utilize order statistics or bootstrap methods to develop the prediction limits. The prediction limits were calculated after testing for outlier sample results that would warrant removal from the data set based on likely error in sampling or measurement. Based on initial statistical evaluation and subsequent discussions with laboratory personnel, the TDS sample result at MW-2B from 30 November 2016 was removed on the basis of a measurement error. The TDS result is inconsistent with the other analytes in the sample.

### **BACKGROUND DISTRIBUTIONS AND UPLS**

Prior to conducting the statistical analysis for the 2020 second semi-annual compliance event, the groundwater analytical results for samples collected from 21 October 2016 through May 2020 were used to calculate updated intra-well UPL and LPL (for pH) for each downgradient location (SLF-MW-2B, SLF-MW-3B, and SLF-MW-5R). Following four sampling events, the new sample results will be evaluated for incorporation into the background data set used for the calculation of the UPL. The variability and distribution of each downgradient well background dataset was evaluated to determine the method for UPL and LPL (for pH) calculation. The development of the UPL and LPL (for pH) for each of the Appendix III constituents is summarized in Table 1, and the supporting statistical software output is included in Attachment 2. The next time background will be reevaluated is prior to the statistical evaluation of the second semi-annual compliance event of 2022.

### RESULTS OF APPENDIX III DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations for each of the Appendix III constituents from the 2021 second semi-annual detection monitoring sampling event from each downgradient well were compared to their respective UPLs. A sample concentration greater than the UPL (or less than LPL for pH) is considered to represent an SSI over background. Based on these comparisons, an SSI over background was identified for sulfate at SLF-MW-2B for the 2021 second semi-annual detection monitoring event.

We appreciate the opportunity to provide environmental consulting services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely,  
**HALEY & ALDRICH, INC.**



Lloyd S. Ross  
Senior Scientist



Emily Guzik  
Project Manager

Enclosures:

- Table 1: Summary of Background Sample Results and Comparison of Downgradient Sample Results
- Attachment 1: Appendix III Time Series Graphs
- Attachment 2: Statistical Output

## TABLE



**TABLE 1**  
**SUMMARY OF BACKGROUND SAMPLE RESULTS AND COMPARISON OF DOWNGRAIDENT SAMPLE RESULTS**  
**JANUARY 2022**  
**EAST KENTUCKY POWER COOPERATIVE**  
**H. L. SPURLOCK GENERATING STATION LANDFILL**

Location ID	Background Data Set Summary																	Intra-well Analysis		
	Frequency of Detection	Percent Non-Detects	Range of Non-Detect	Mean	50th Percentile (Median)	95th Percentile	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	Outlier Presence	Outlier Removed	Trend	Distribution*	Background Limit (Upper Prediction Limit)	Compliance Round (November 2021)	Statistically Significant Increase (SSI) Present?			
<b>Boron, Total (mg/L)</b>																				
SLF-MW-2B	18 / 18	0%	N/A : N/A	4.009	3.936	4.836	4.94	3.39E-01	0.582	0.145	No	No	Stable	Normal	6.02	4.14	No			
SLF-MW-3B	18 / 18	0%	N/A : N/A	3.645	3.617	5.318	6.242	1.27E+00	1.125	0.309	No	No	Decreasing	Normal	7.53	1.9	No			
SLF-MW-5R	14 / 14	0%	N/A : N/A	0.441	0.45	0.639	0.653	1.69E-02	0.13	0.295	No	No	Stable	Normal	0.92	0.621	No			
<b>Calcium, Total (mg/L)</b>																				
SLF-MW-2B	19 / 19	0%	N/A : N/A	41.41	39.9	50.32	61.32	5.66E+01	7.526	0.182	Yes	No	Stable	Normal	67	42.5	No			
SLF-MW-3B	19 / 19	0%	N/A : N/A	201.6	200	249.7	255	8.99E+02	29.98	0.149	No	No	Decreasing	Normal	304	176	No			
SLF-MW-5R	15 / 15	0%	N/A : N/A	116.3	118	131.9	136.4	1.20E+02	10.95	0.0941	No	No	Stable	Normal	156	135	No			
<b>Chloride, Total (mg/L)</b>																				
SLF-MW-2B	19 / 19	0%	N/A : N/A	1665	1547	2449	2530	2.46E+05	495.5	0.298	Yes	No	Stable	Normal	3361	1680	No			
SLF-MW-3B	19 / 19	0%	N/A : N/A	167.6	160.2	246.7	262	2.55E+03	50.49	0.301	No	No	Stable	Normal	340	246	No			
SLF-MW-5R	15 / 15	0%	N/A : N/A	23.08	24.5	30.53	33.65	3.13E+01	5.597	0.243	No	No	Stable	Normal	43	26.9	No			
<b>Fluoride, Total (mg/L)</b>																				
SLF-MW-2B	16 / 18	11%	0.5 : 0.5	1.838	1.986	2.378	2.647	2.94E-01	0.542	0.295	Yes	No	Increasing	Non-parametric	2.65	2.0	No			
SLF-MW-3B	0 / 18	100%	0.5 : 0.5	N/A	0.5	0.5	N/A	N/A	N/A	N/A	No	No	NT	Non-parametric	0.50	0.5	No			
SLF-MW-5R	0 / 14	100%	0.5 : 0.5	N/A	0.5	0.5	N/A	N/A	N/A	N/A	No	No	NT	Non-parametric	0.50	0.5	No			
<b>pH, Field, Total (pH units)</b>																				
SLF-MW-2B	20 / 20	0%	N/A : N/A	7.814	7.64	8.934	9	2.09E-01	0.457	0.0584	No	No	Stable	Non-parametric	7.28, 9	7.82	No			
SLF-MW-3B	19 / 19	0%	N/A : N/A	7.177	7.11	7.538	7.61	3.51E-02	0.187	0.0261	No	No	Stable	Normal	6.49, 7.86	7.25	No			
SLF-MW-5R	15 / 15	0%	N/A : N/A	7.151	7.14	7.343	7.35	1.26E-02	0.112	0.0157	No	No	Stable	Normal	6.72, 7.58	7.08	No			
<b>Sulfate, Total (mg/L)</b>																				
SLF-MW-2B	19 / 19	0%	N/A : N/A	208.7	203	349	359	4.11E+03	64.12	0.307	Yes	No	Decreasing	Normal	428	469	Yes			
SLF-MW-3B	19 / 19	0%	N/A : N/A	495.6	483	604.2	614.5	5.29E+03	72.76	0.147	No	No	Decreasing	Normal	745	396	No			
SLF-MW-5R	15 / 15	0%	N/A : N/A	125.6	126	165.3	173	8.37E+02	28.94	0.23	No	No	Stable	Normal	230	178	No			
<b>Total Dissolved Solids (TDS) (mg/L)</b>																				
SLF-MW-2B	19 / 19	0%	N/A : N/A	3368	3400	4395	4530	7.90E+05	889.1	0.264	Yes	Yes	Increasing	Normal	5485	3900	No			
SLF-MW-3B	17 / 17	0%	N/A : N/A	1238	1232	1386	1410	8.73E+03	93.45	0.0755	No	No	Stable	Normal	1565	1210	No			
SLF-MW-5R	14 / 14	0%	N/A : N/A	486.4	473.5	598	611	4.92E+03	70.14	0.144	No	No	Stable	Normal	743	526	No			

**Notes and Abbreviations:**

mg/L - Milligram per liter

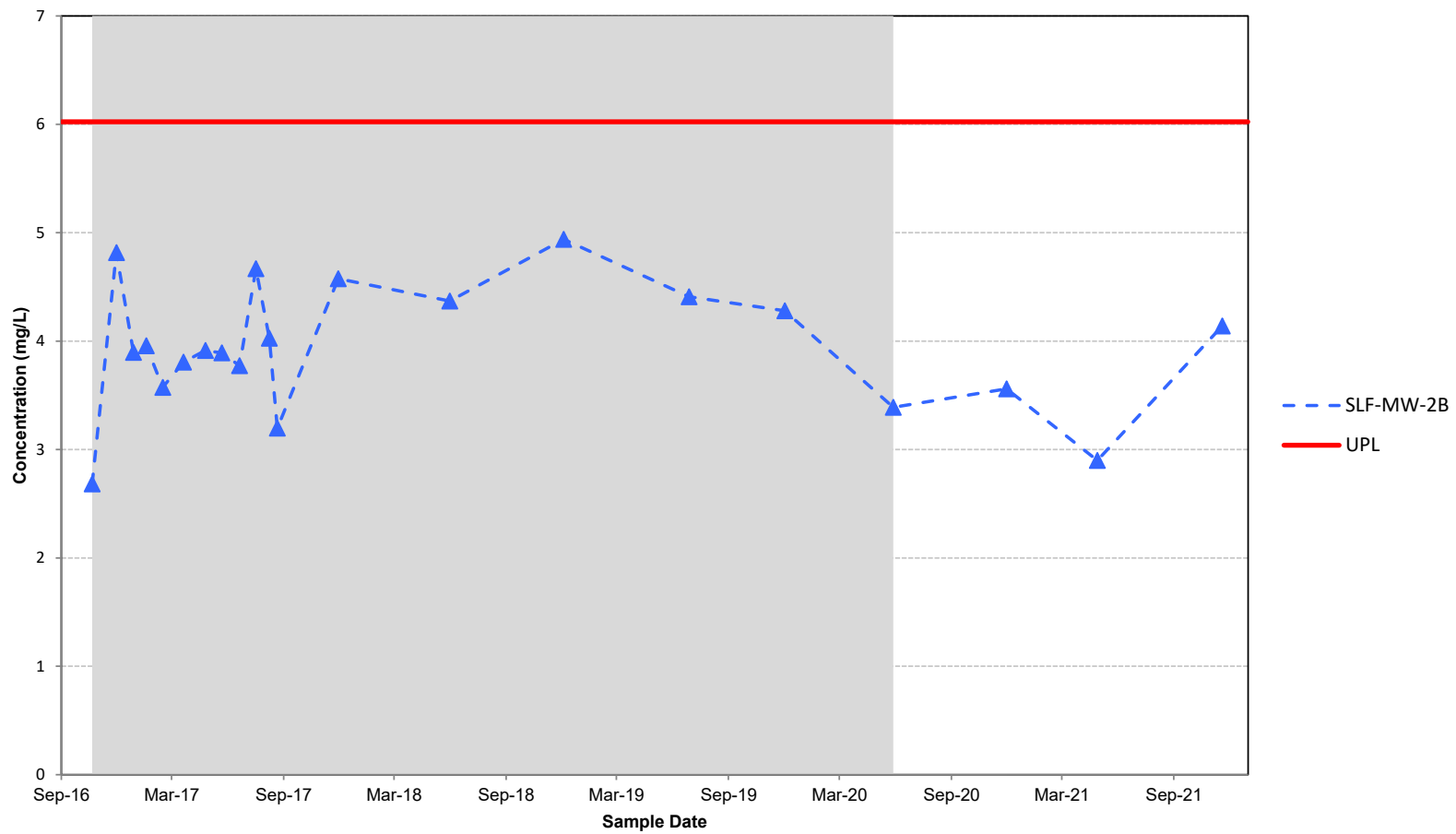
N/A - Not Applicable

NT - Not Tested

\* - Determined based on Shapiro-Wilks statistical test at 5% significance level and residual plot probability

**ATTACHMENT 1**

**Appendix III Time Series Graphs**



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

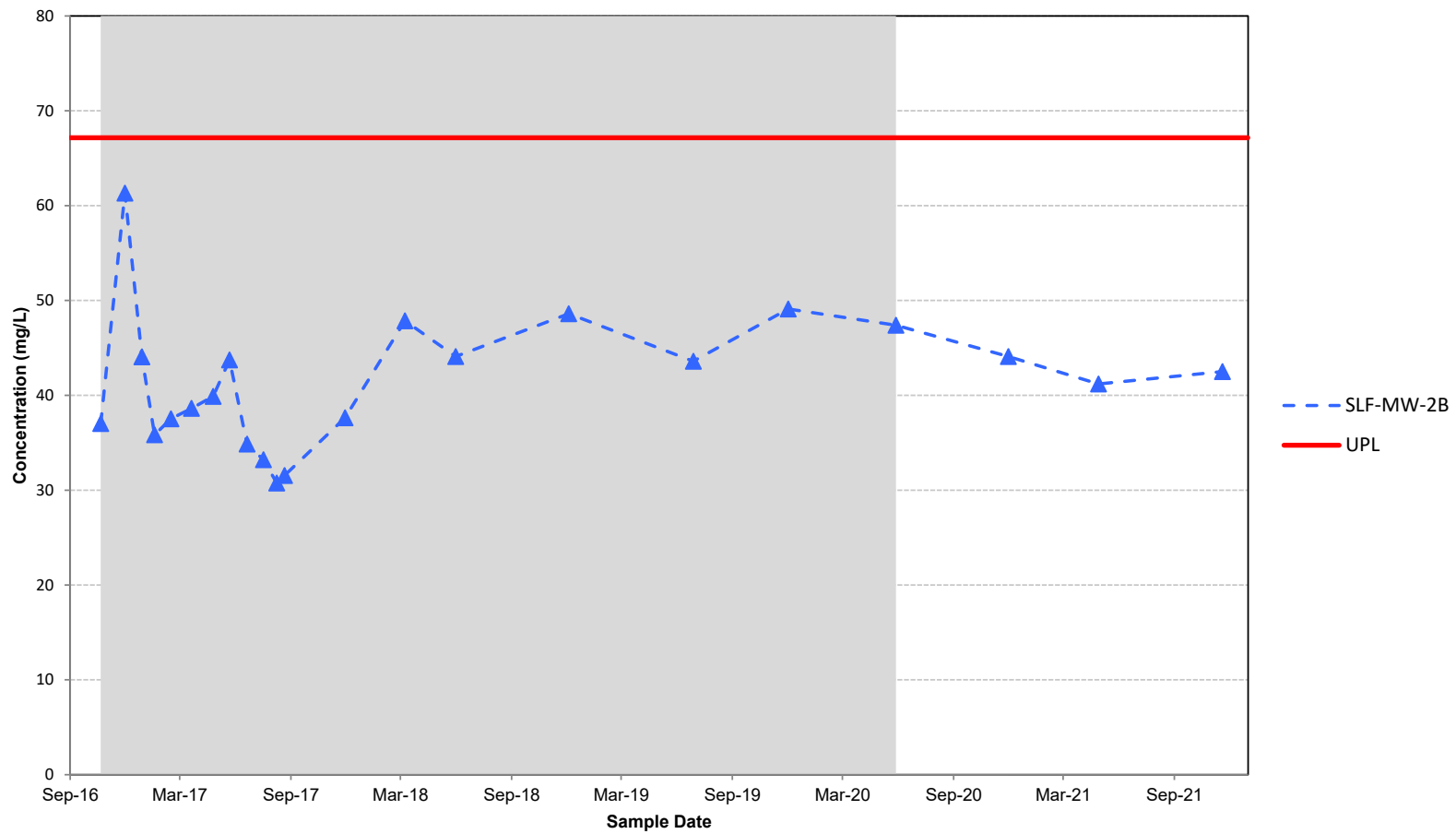


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

January 2022

Figure F-1



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

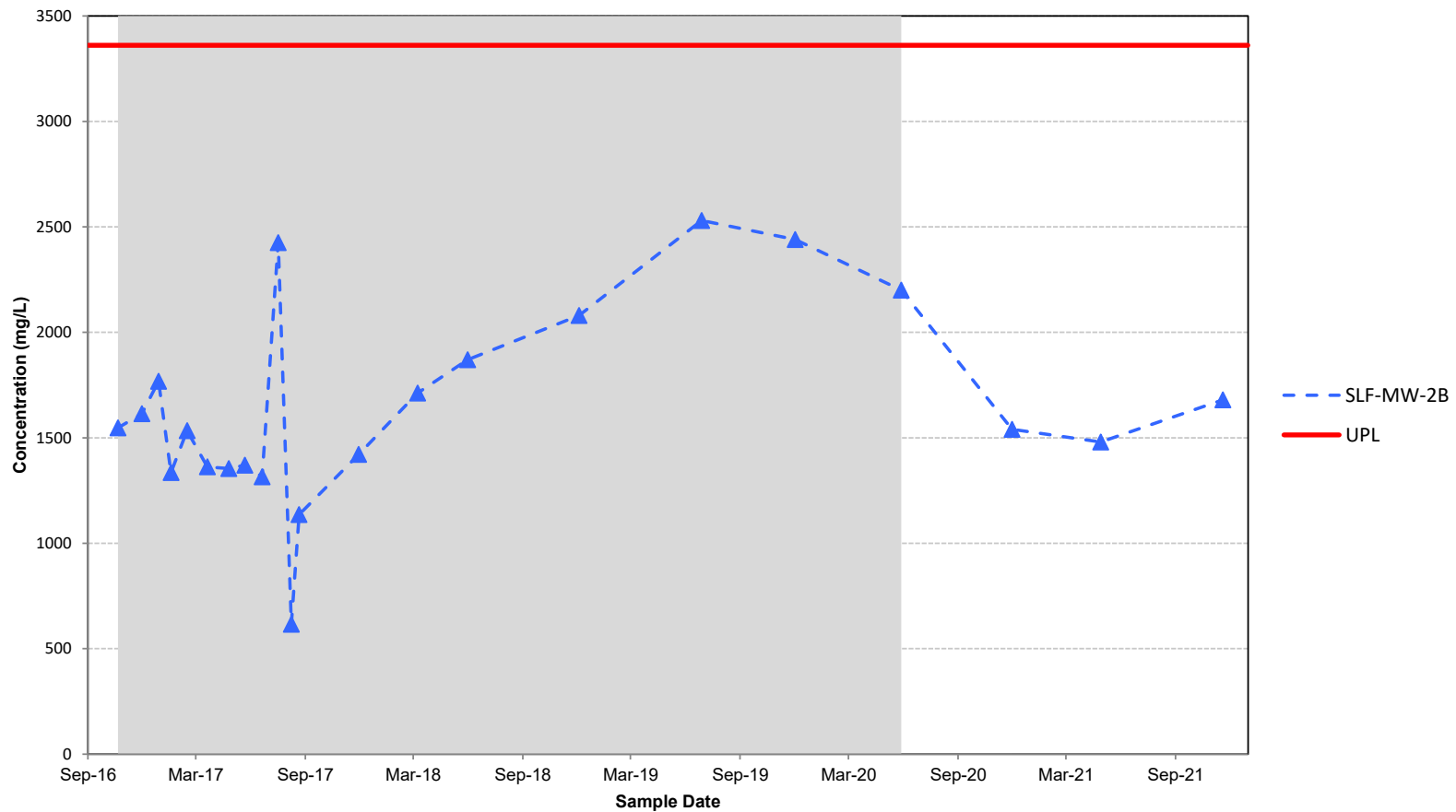


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

January 2022

Figure F-2



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

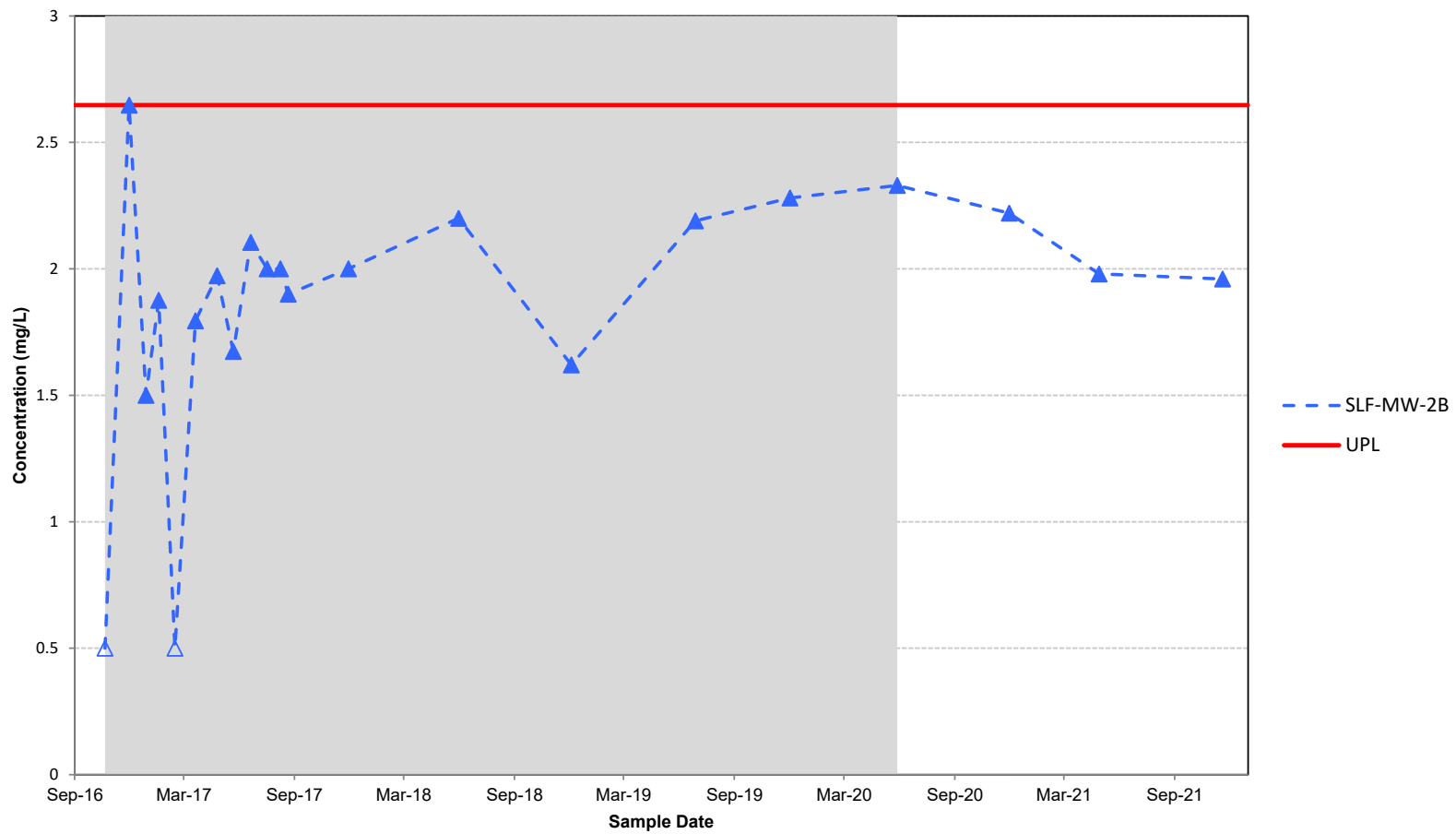


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-3



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

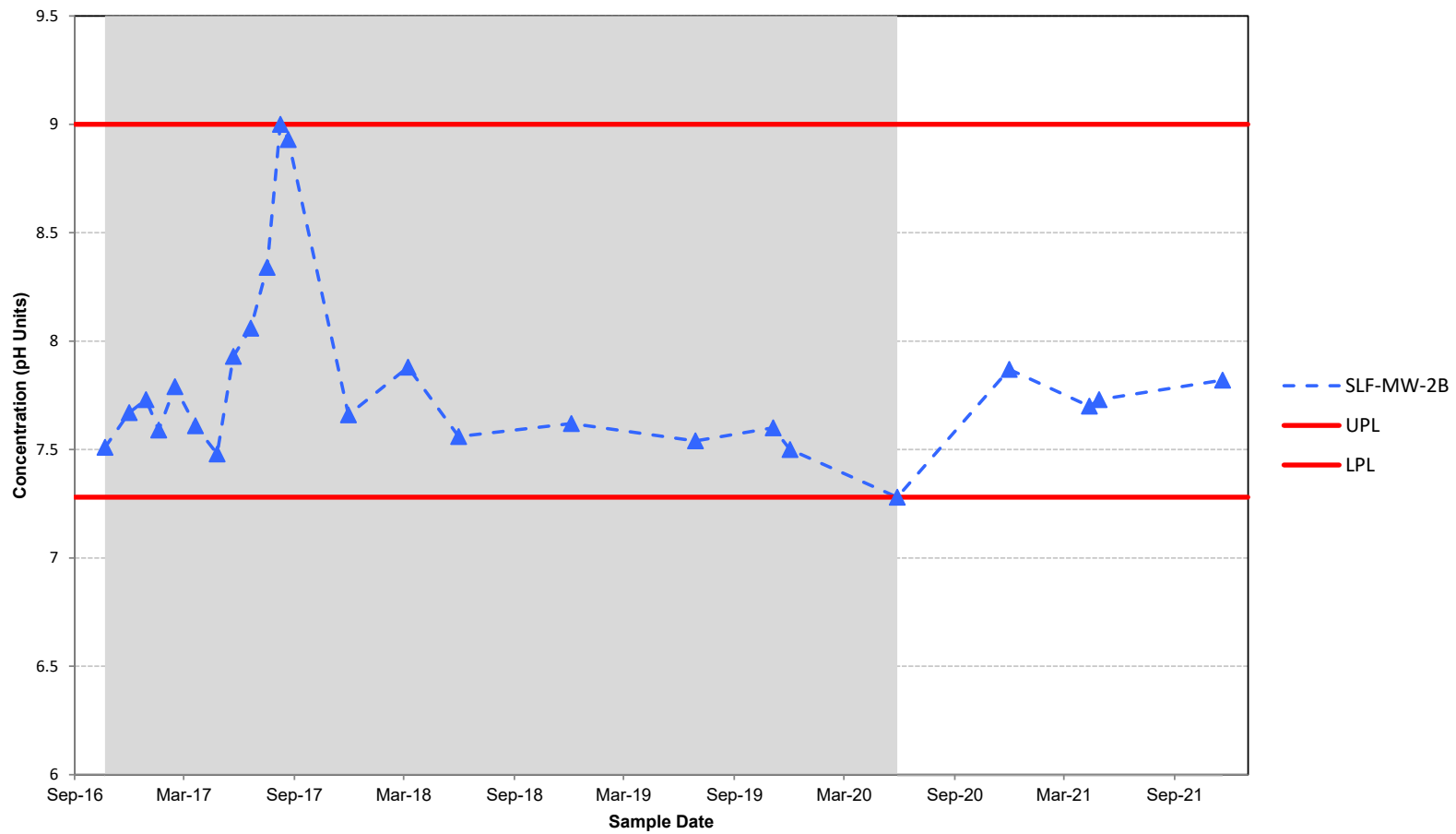


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-4



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

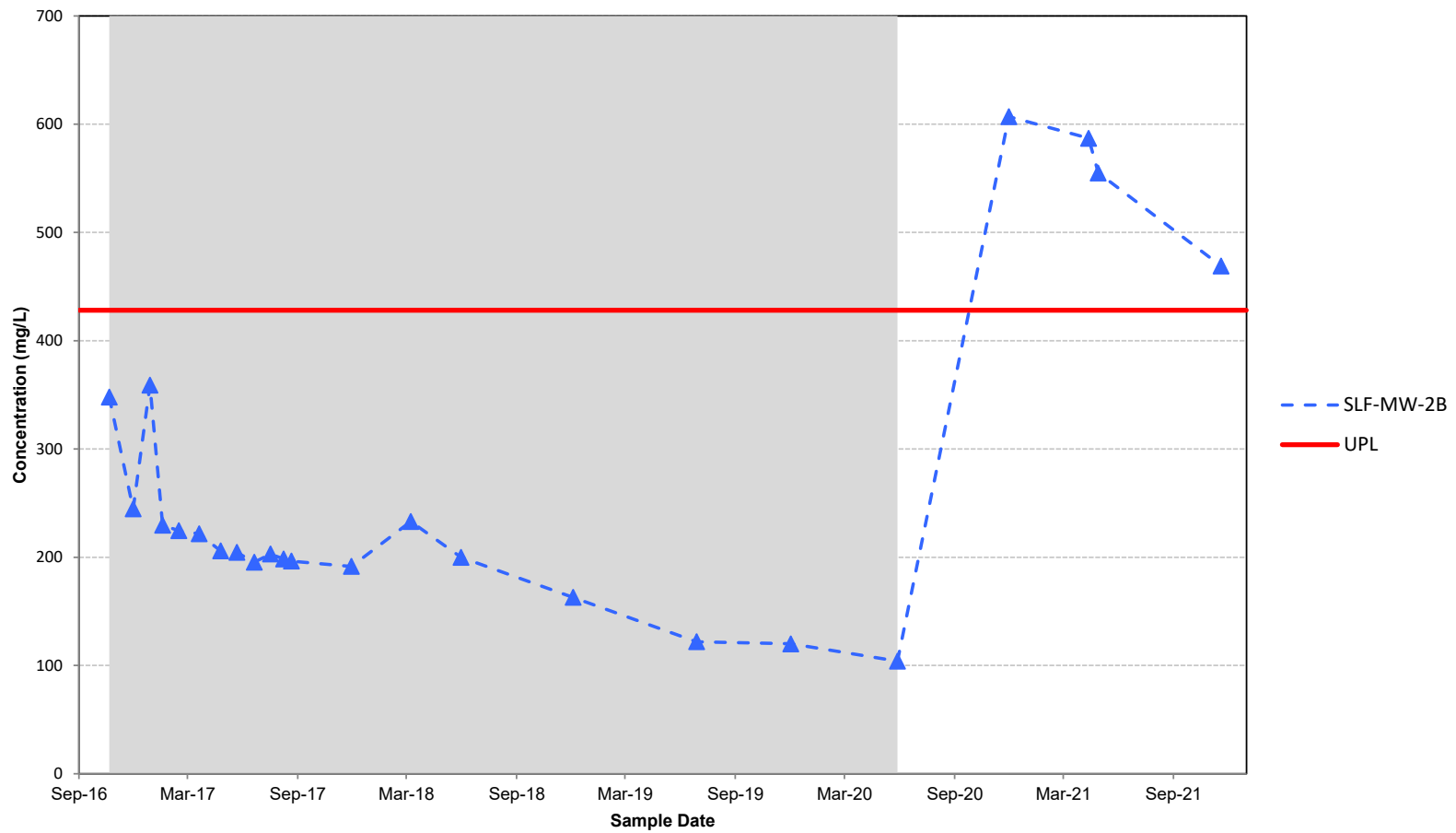


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

January 2022

Figure F-5



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



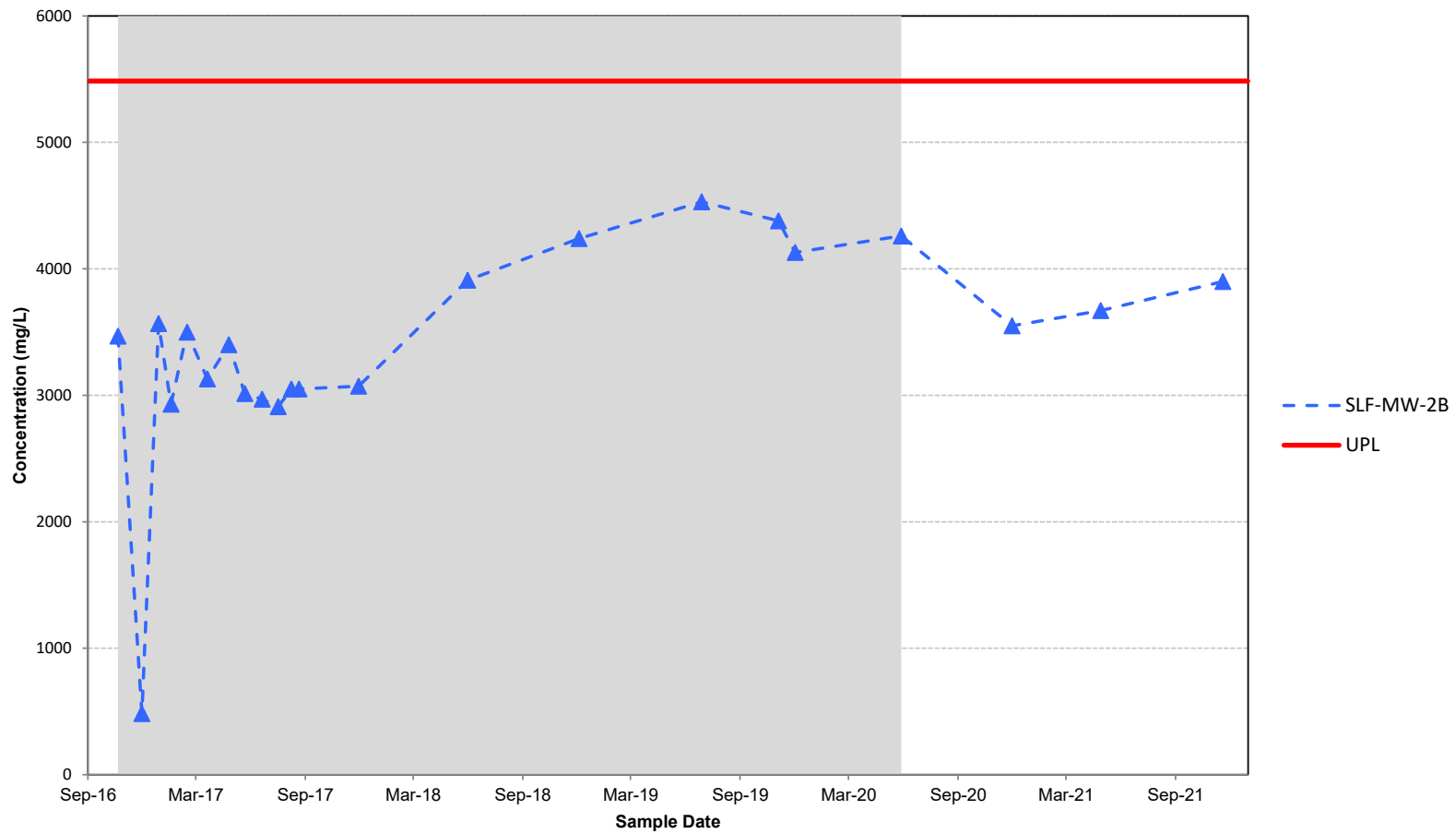
H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

January 2022

Figure F-6





**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

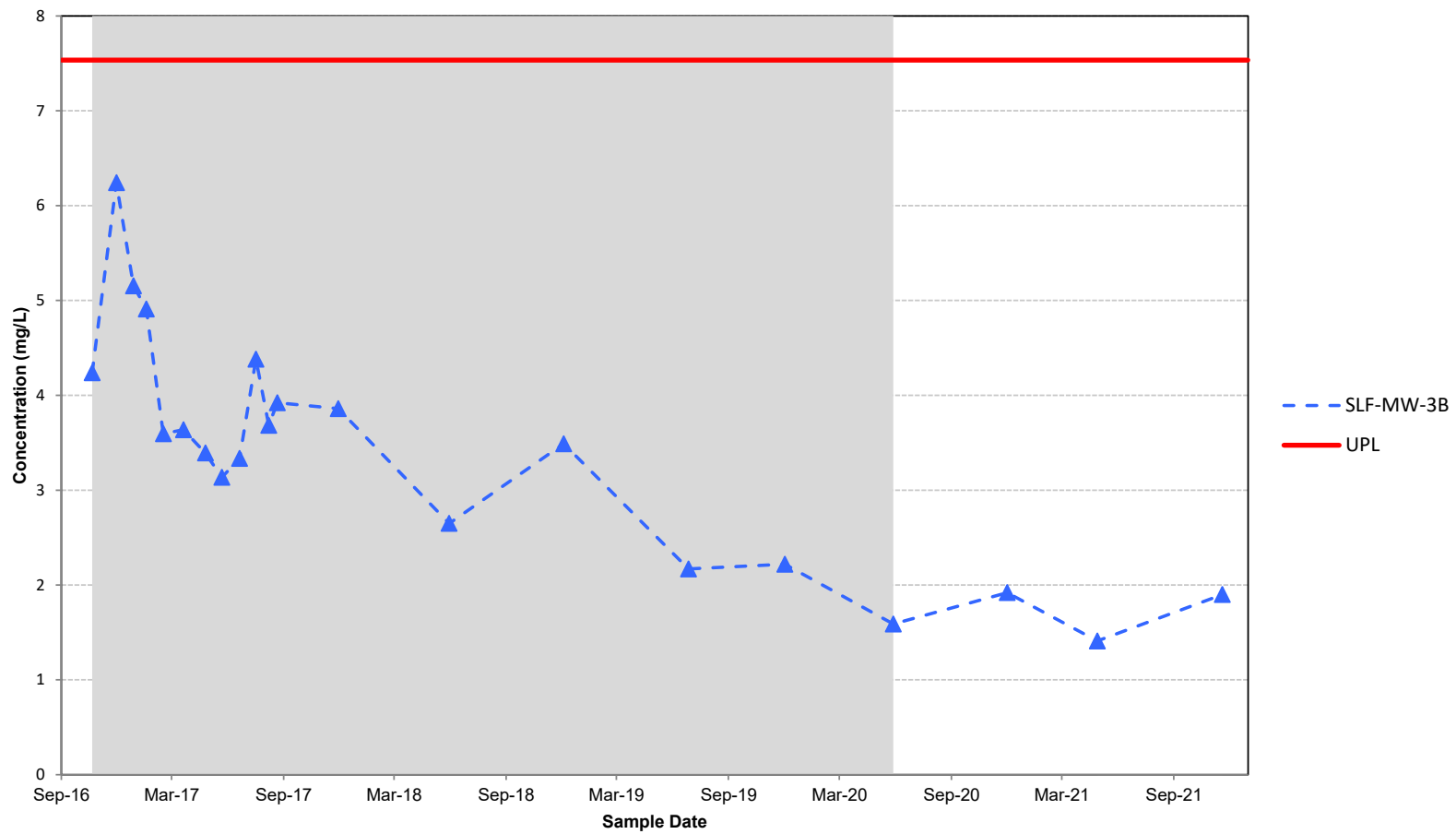


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

January 2022

Figure F-7



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

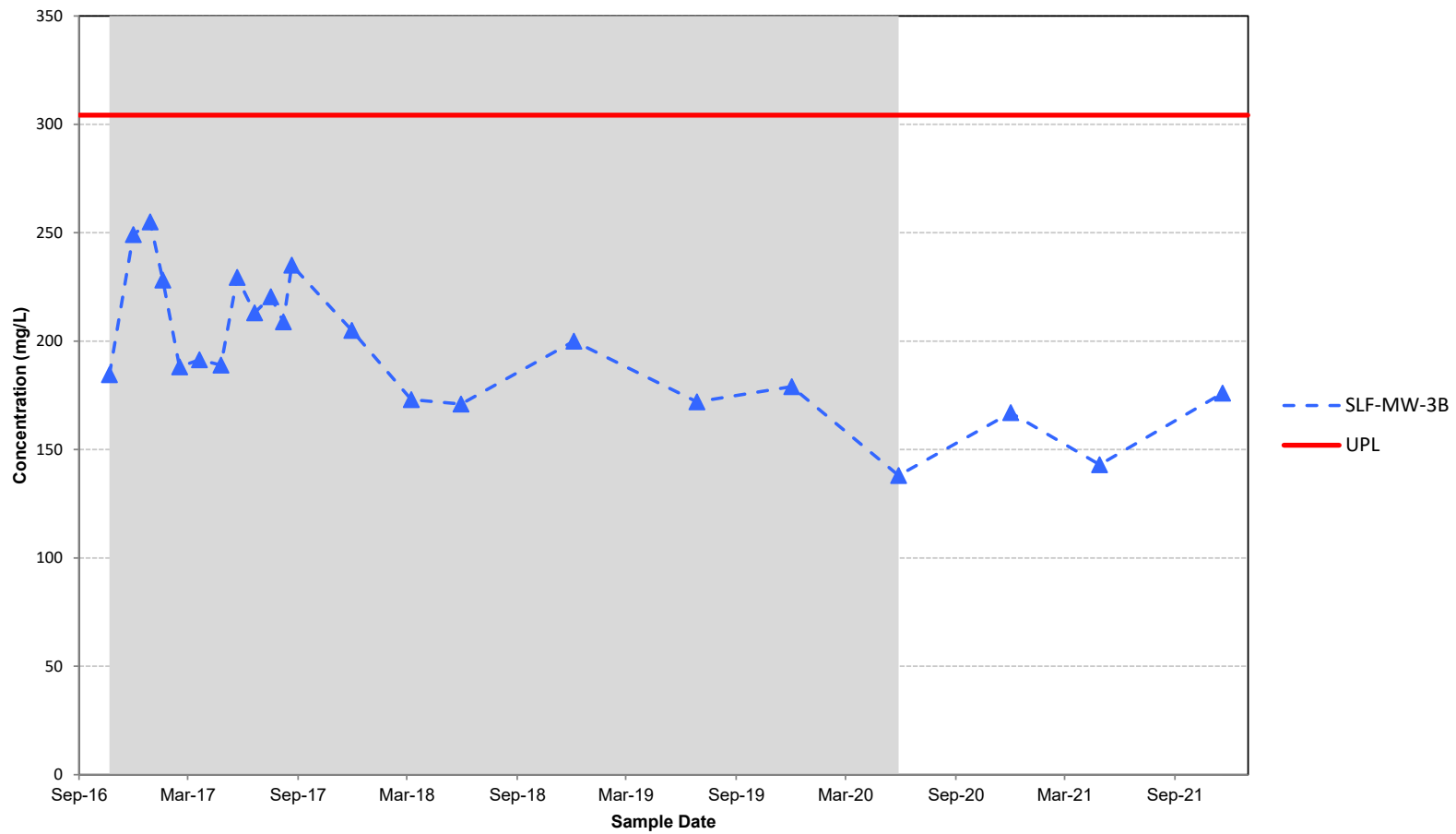


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

January 2022

Figure F-8



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

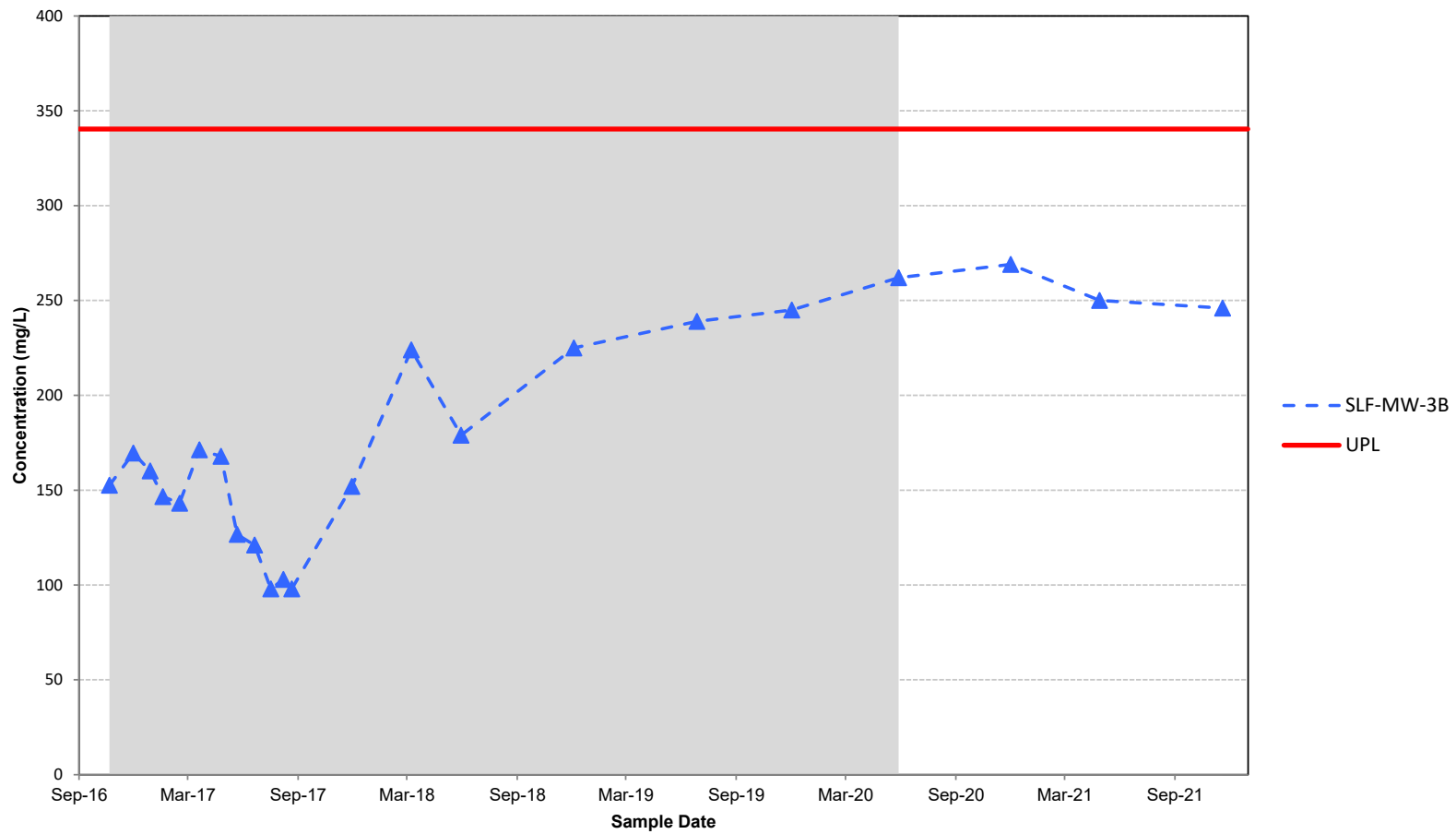


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

January 2022

Figure F-9



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

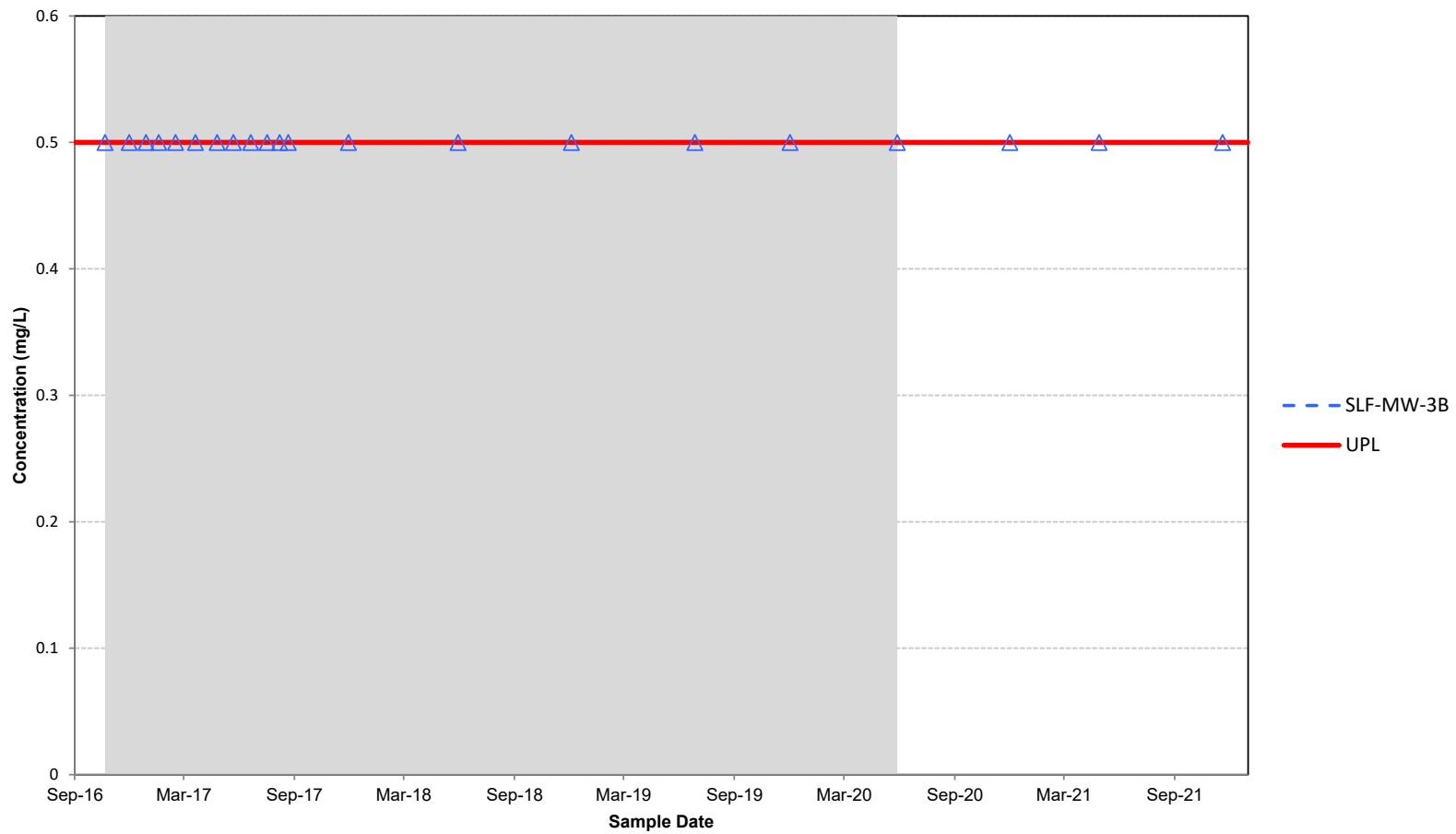


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-10



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

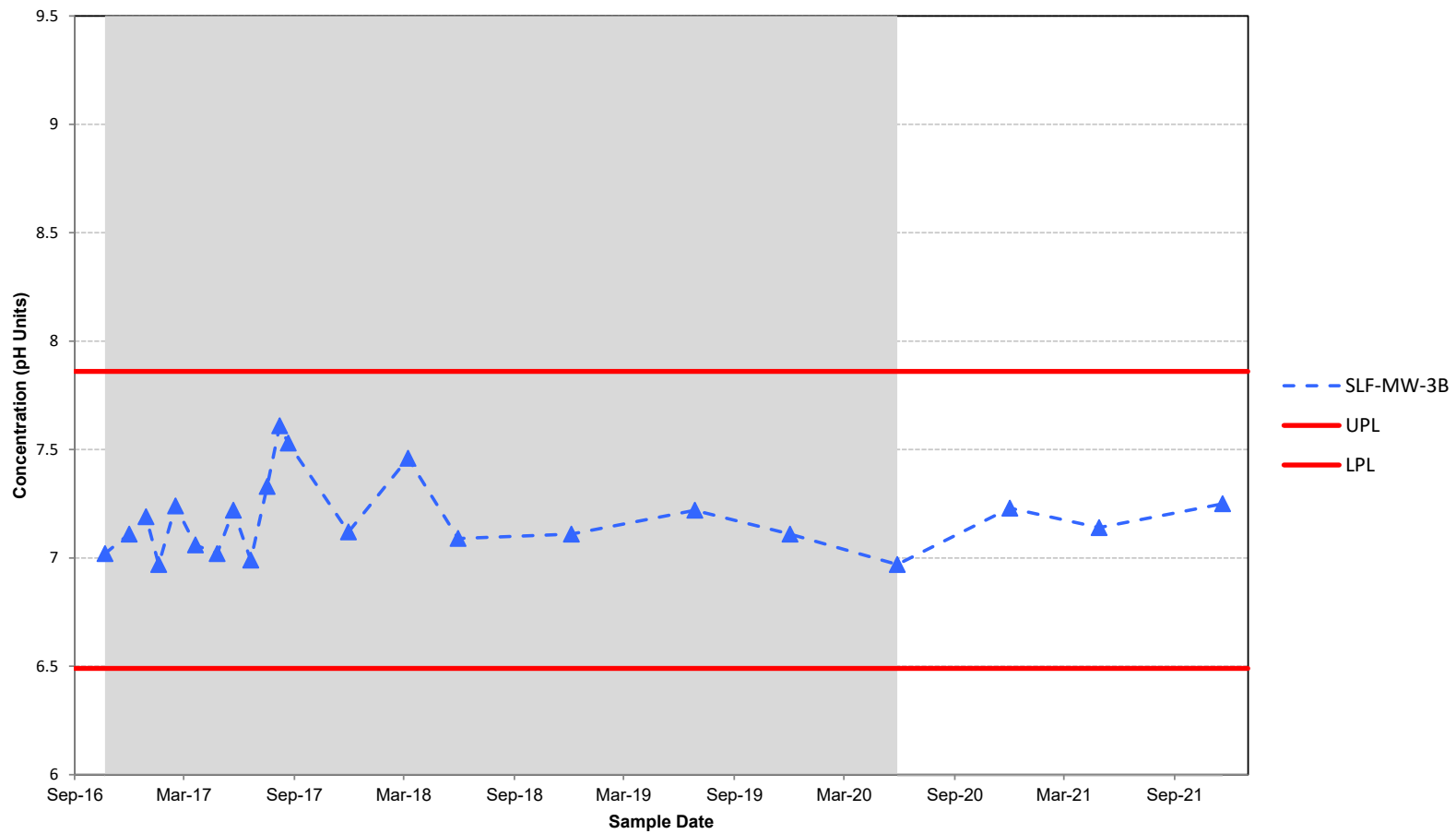


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-11



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

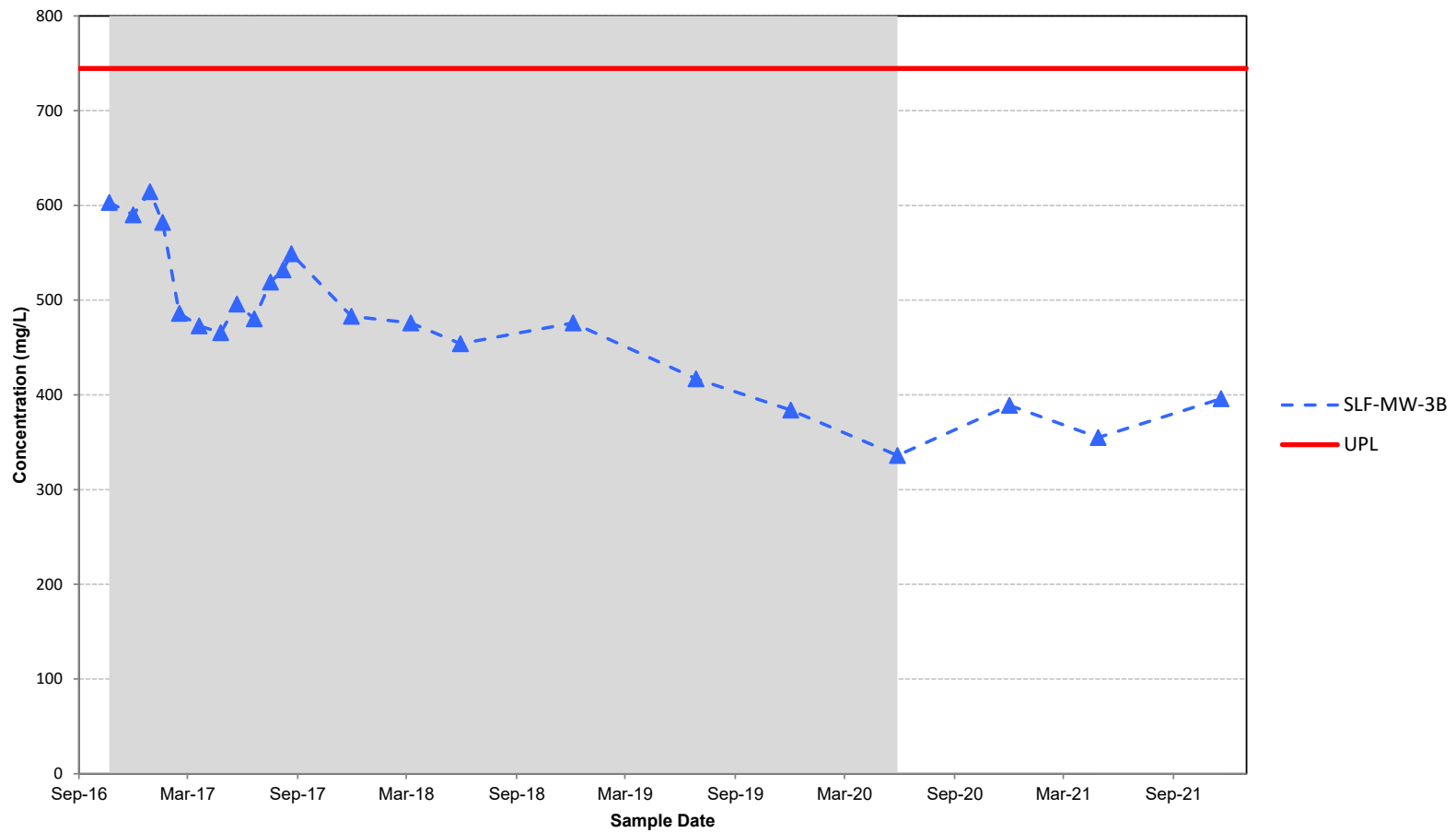


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

January 2022

Figure F-12



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

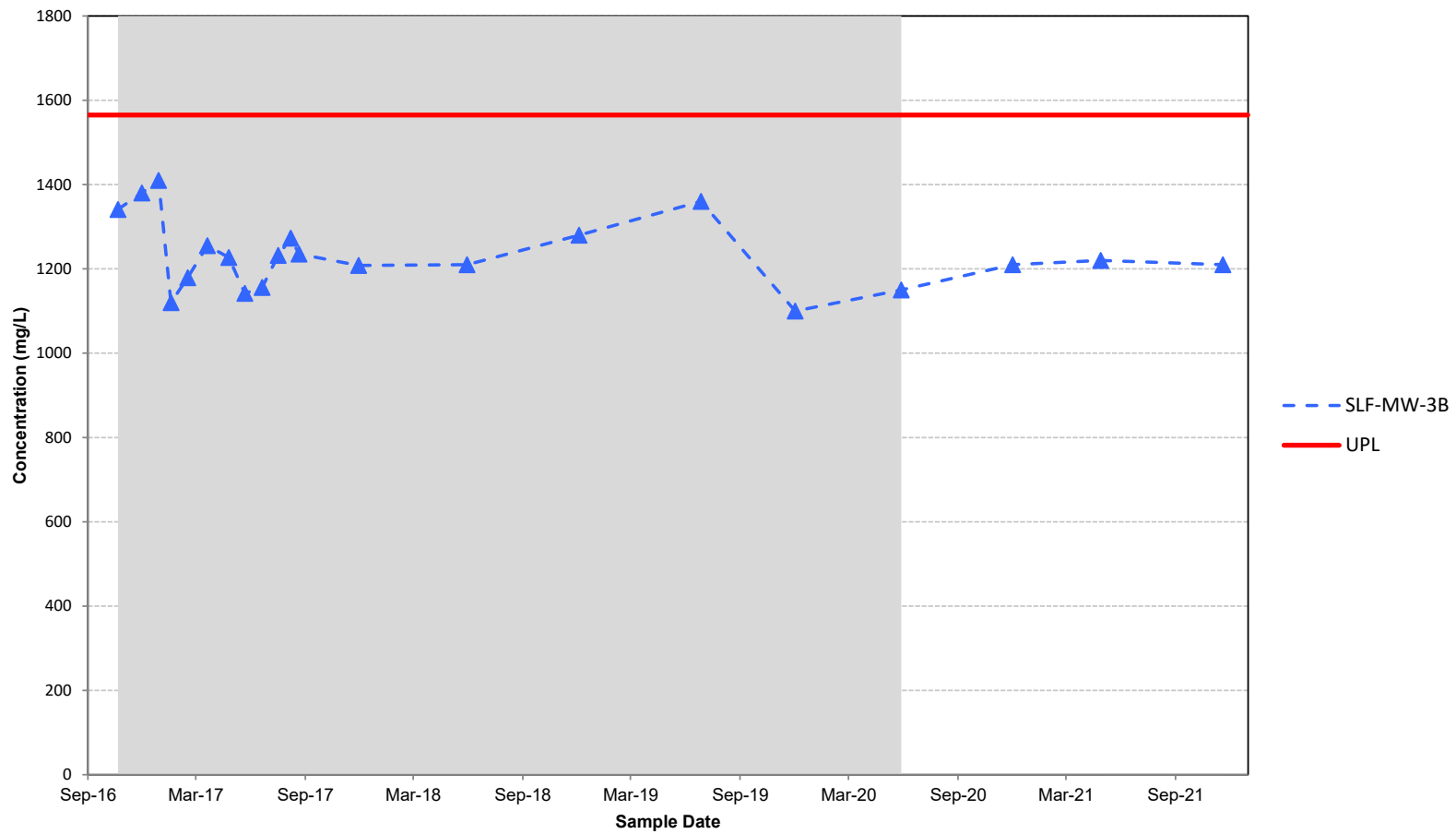


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

January 2022

Figure F-13



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



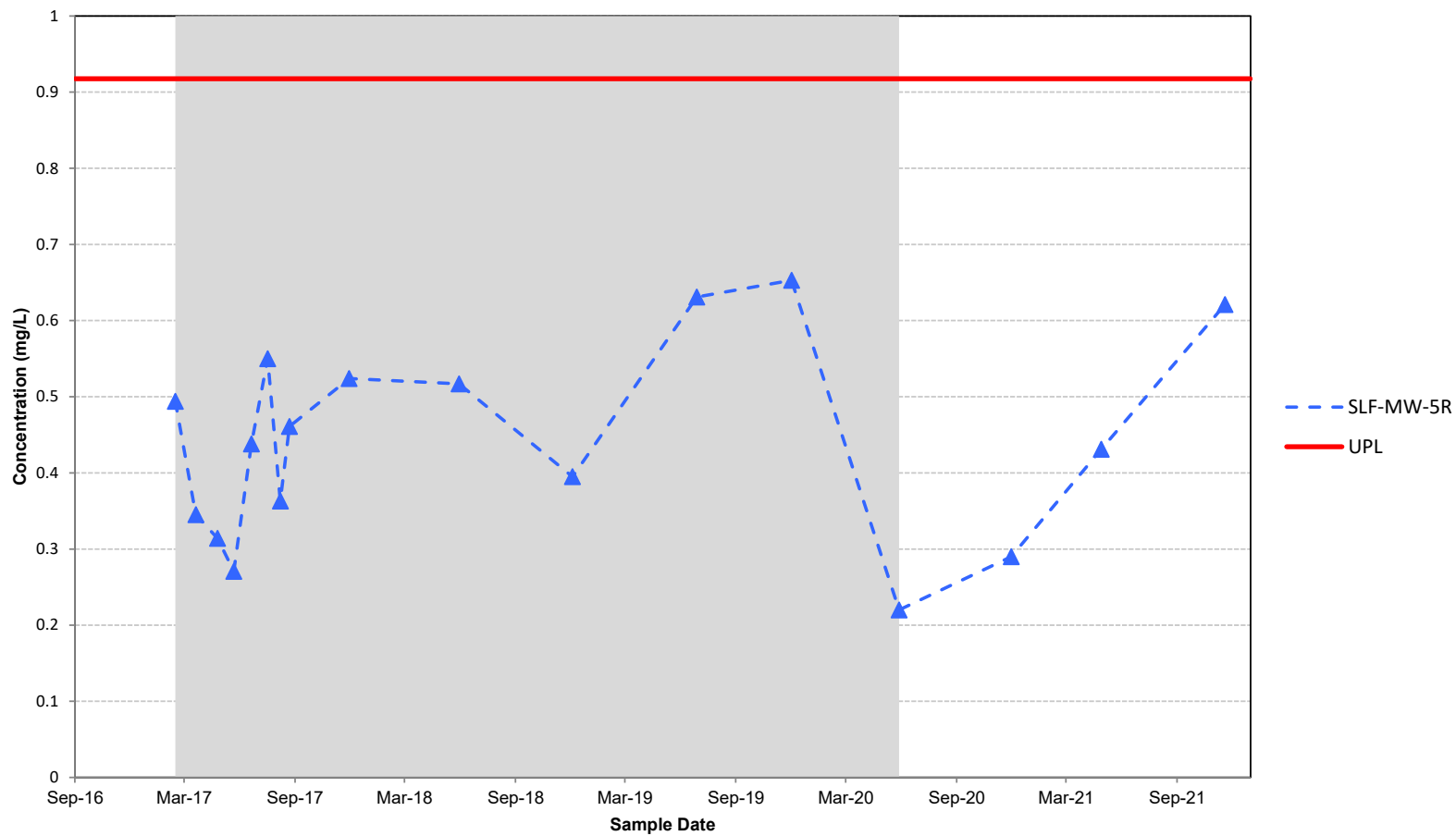
H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

January 2022

Figure F-14





**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

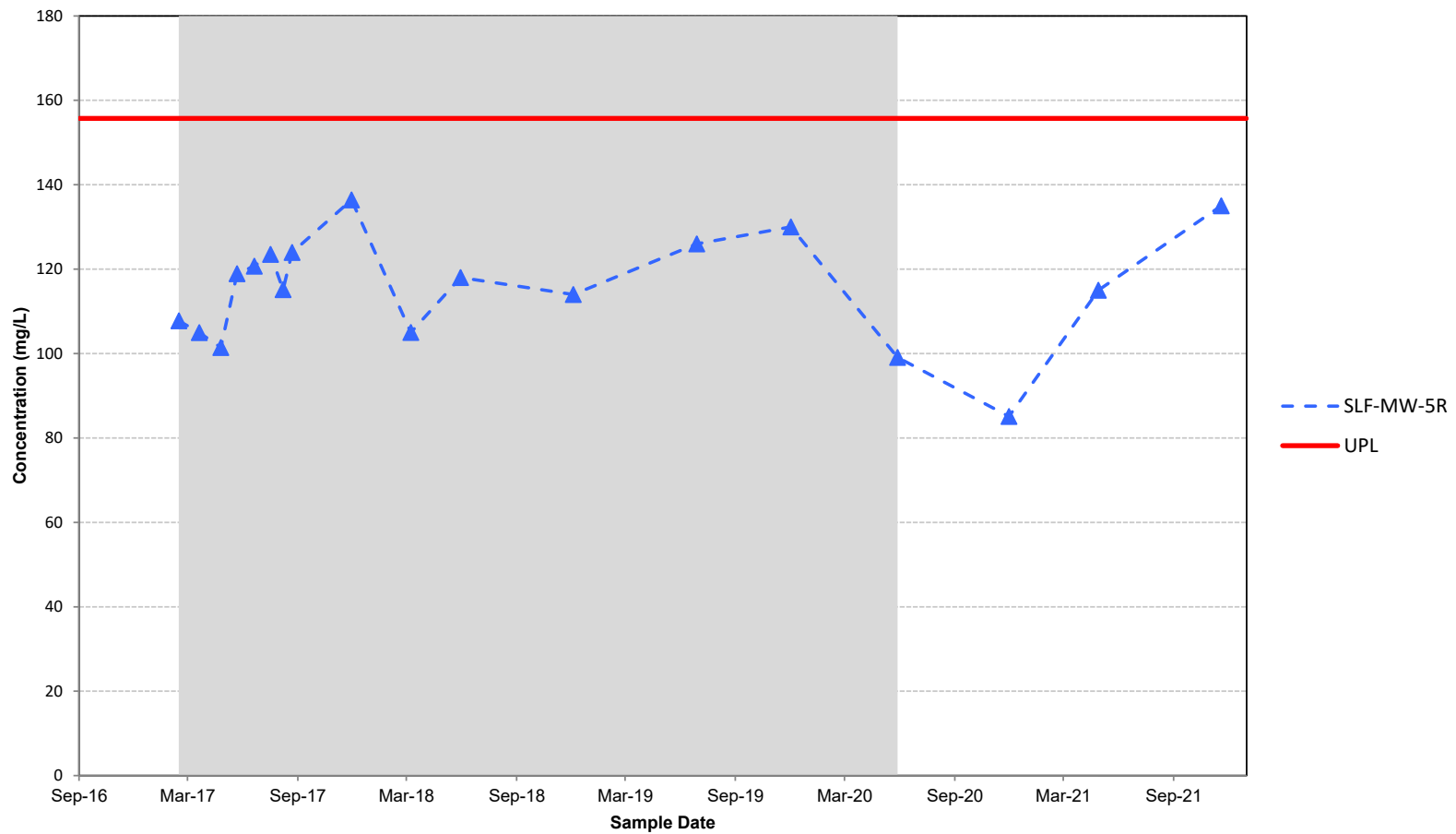


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

January 2022

Figure F-15



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

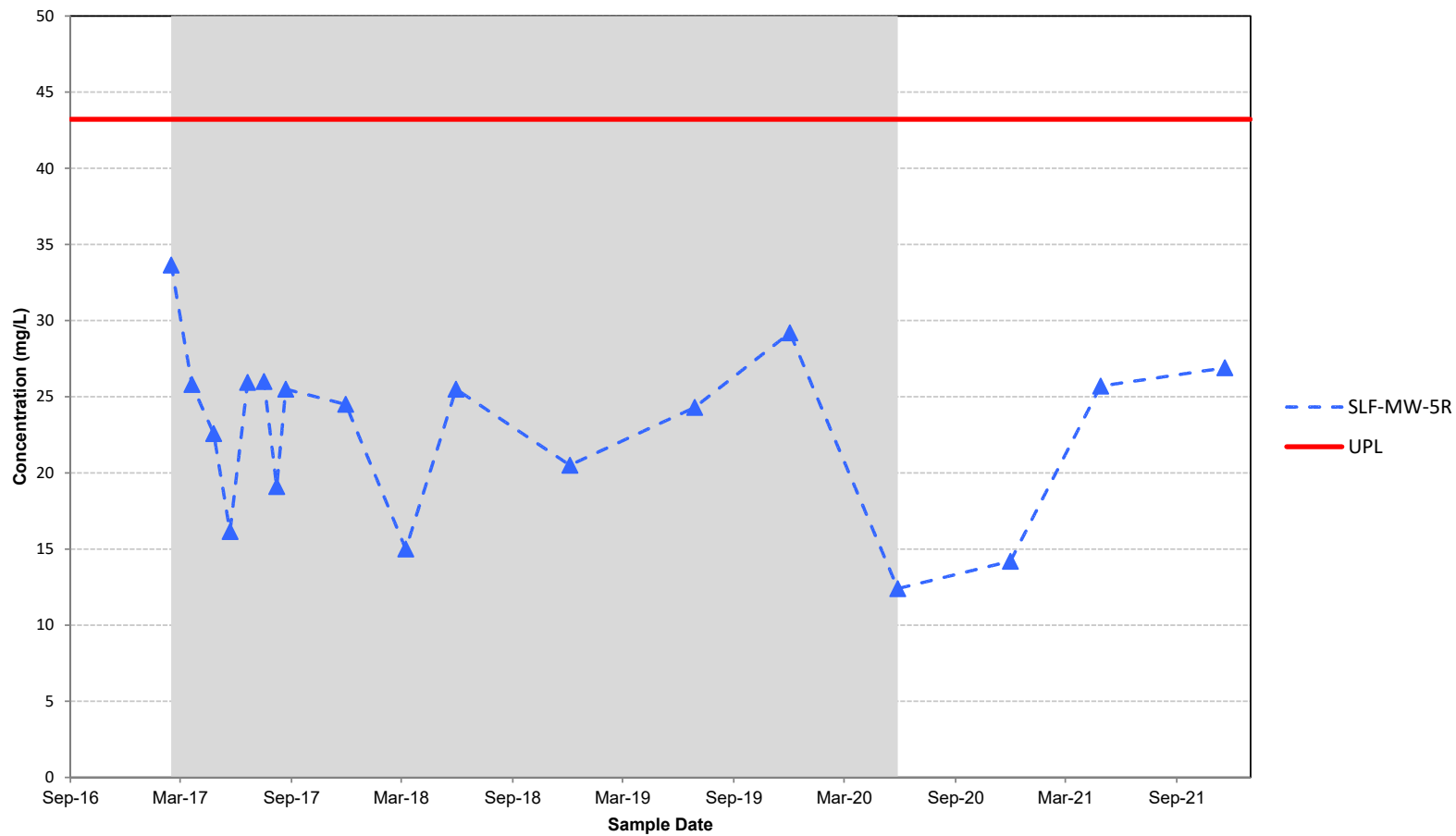


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

January 2022

Figure F-16



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

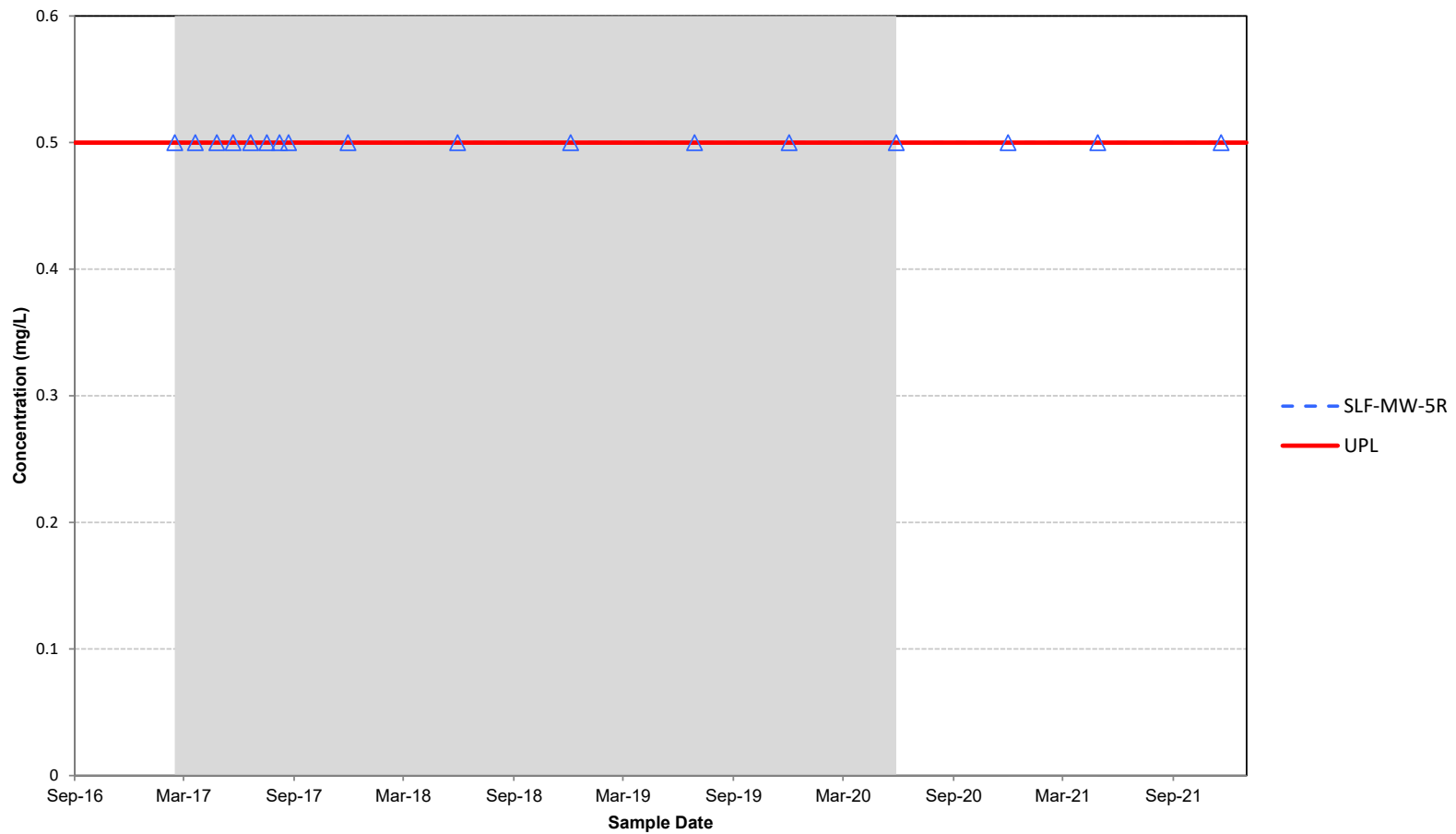


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-17



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

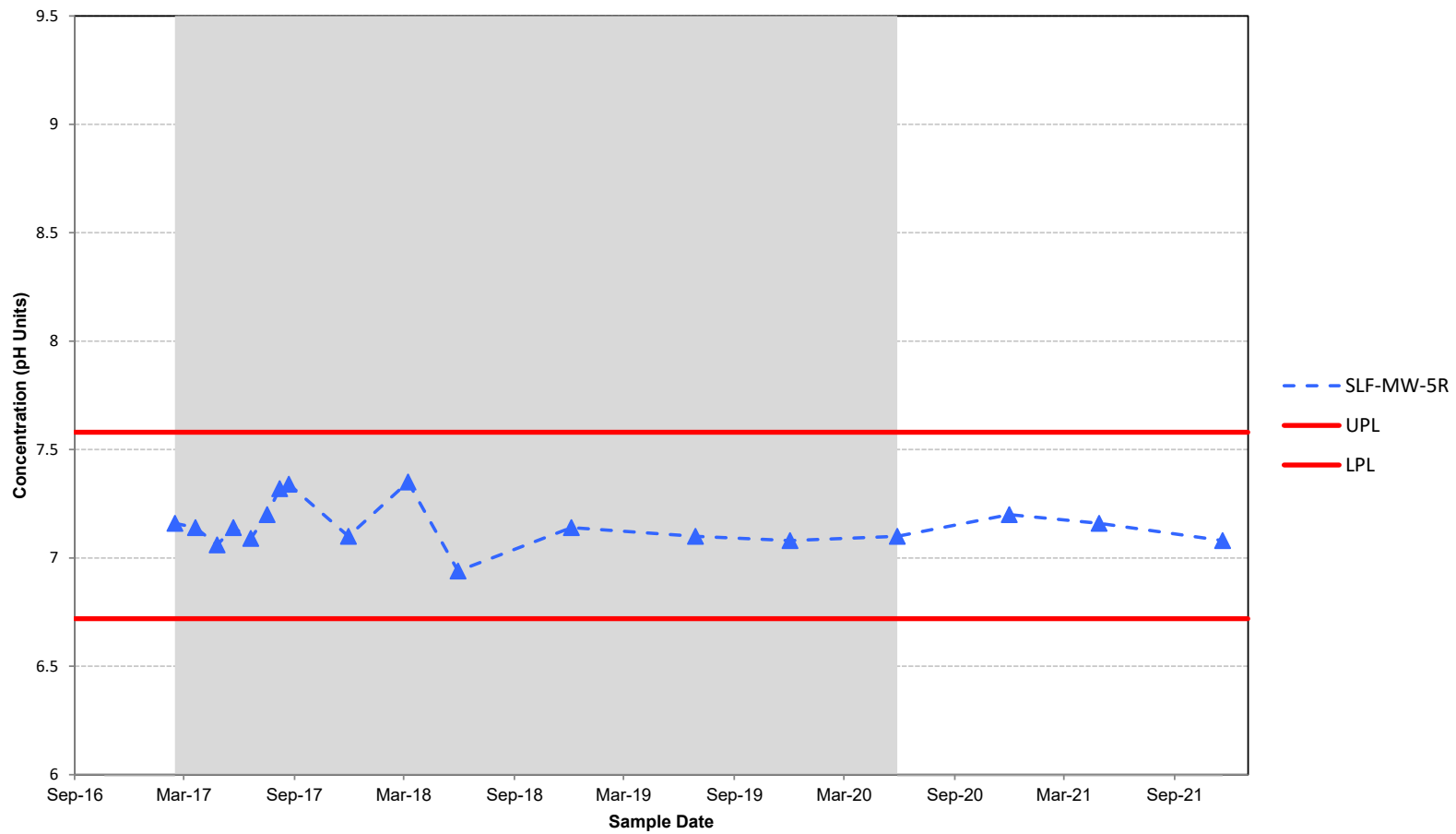


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

January 2022

Figure F-18



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

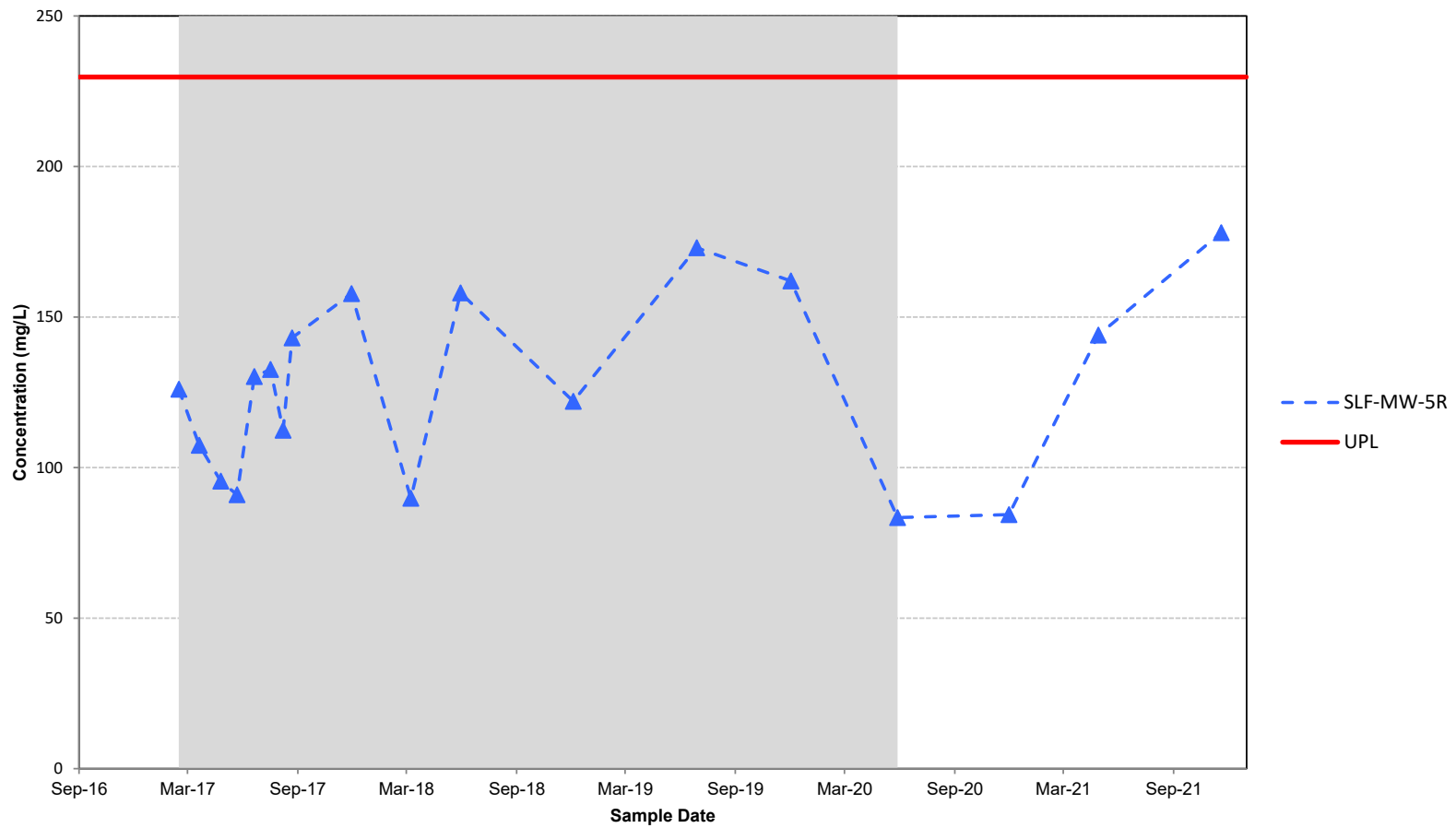


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

January 2022

Figure F-19



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

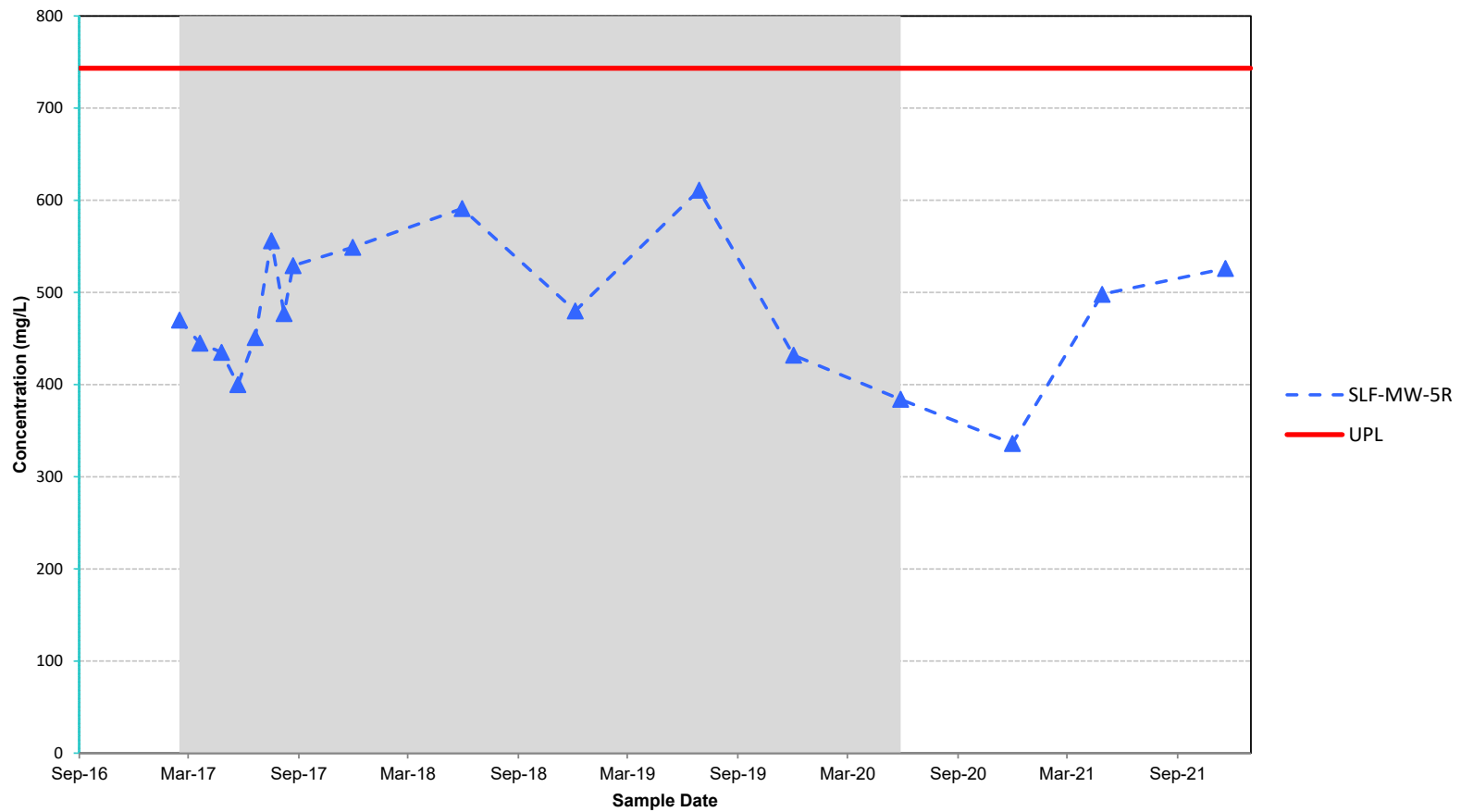


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

January 2022

Figure F-20



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

January 2022

Figure F-21

**ATTACHMENT 2**

**Statistical Output**



## Concentrations (ppb)

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

SLF-MW-2B	18	0 (0%)	10/21/2016	2683.12	2683.12
			11/30/2016	4817.2	4817.2
			12/28/2016	3895.84	3895.84
			1/18/2017	3956.91	3956.91
			2/14/2017	3573.57	3573.57
			3/20/2017	3806.16	3806.16
			4/25/2017	3914.41	3914.41
			5/22/2017	3891.56	3891.56
			6/20/2017	3773.44	3773.44
			7/17/2017	4668	4668
			8/8/2017	4027	4027
			8/21/2017	3197	3197
			11/29/2017	4576	4576
			5/31/2018	4370	4370
			12/4/2018	4940	4940
			6/28/2019	4410	4410
			12/2/2019	4280	4280
5/28/2020	3390	3390			
	<b>11/30/2020</b>		<b>3560</b>	<b>3560</b>	
	<b>4/28/2021</b>		<b>2900</b>	<b>2900</b>	

SLF-MW-3B	18	0 (0%)	10/21/2016	4238.42	4238.42
			11/30/2016	6242.46	6242.46
			12/28/2016	5154.49	5154.49
			1/18/2017	4910.63	4910.63
			2/15/2017	3595.68	3595.68
			3/20/2017	3637.76	3637.76
			4/25/2017	3392.27	3392.27
			5/22/2017	3135.58	3135.58
			6/20/2017	3335.63	3335.63
			7/17/2017	4381	4381
			8/7/2017	3684	3684
			8/21/2017	3922	3922
			11/29/2017	3860	3860
			5/30/2018	2650	2650
			12/4/2018	3490	3490
			6/27/2019	2170	2170
			12/2/2019	2220	2220
5/28/2020	1590	1590			
	<b>12/1/2020</b>		<b>1920</b>	<b>1920</b>	
	<b>4/28/2021</b>		<b>1410</b>	<b>1410</b>	

SLF-MW-5R	14	0 (0%)	2/14/2017	493.993	493.993
			3/20/2017	345.223	345.223
			4/25/2017	314.115	314.115
			5/22/2017	270.744	270.744
			6/20/2017	438.039	438.039
			7/17/2017	550	550
			8/7/2017	363	363
			8/22/2017	461	461
			11/29/2017	524	524
			5/30/2018	517	517
			12/4/2018	395	395
			6/28/2019	631	631
			12/2/2019	653	653
			5/28/2020	220	220
			<b>11/30/2020</b>	<b>290</b>	<b>290</b>
			<b>4/28/2021</b>	<b>431</b>	<b>431</b>

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.175484	0.356132	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	2683.12	FALSE
	11/30/2016	4817.2	FALSE
	12/28/2016	3895.84	FALSE
	1/18/2017	3956.91	FALSE
	2/14/2017	3573.57	FALSE
	3/20/2017	3806.16	FALSE
	4/25/2017	3914.41	FALSE
	5/22/2017	3891.56	FALSE
	6/20/2017	3773.44	FALSE
	7/17/2017	4668	FALSE
	8/8/2017	4027	FALSE
	8/21/2017	3197	FALSE
	11/29/2017	4576	FALSE
	5/31/2018	4370	FALSE
	12/4/2018	4940	FALSE
	6/28/2019	4410	FALSE
	12/2/2019	4280	FALSE
	5/28/2020	3390	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	2683.12	4940	2256.88	0.4886	1102.71
2	3197	4817.2	1620.2	0.3253	527.051
3	3390	4668	1278	0.2553	326.273
4	3573.57	4576	1002.43	0.2027	203.193
5	3773.44	4410	636.56	0.1587	101.022
6	3806.16	4370	563.84	0.1197	67.4916
7	3891.56	4280	388.44	0.0837	32.5124
8	3895.84	4027	131.16	0.0496	6.50554
9	3914.41	3956.91	42.5	0.0163	0.69275
10	3956.91	3914.41	-42.5		
11	4027	3895.84	-131.16		
12	4280	3891.56	-388.44		
13	4370	3806.16	-563.84		
14	4410	3773.44	-636.56		
15	4576	3573.57	-1002.43		
16	4668	3390	-1278		
17	4817.2	3197	-1620.2		
18	4940	2683.12	-2256.88		

---

Sum of b values = 2367.45

Sample Standard Deviation = 582.366

W Statistic = 0.972124

5% Critical value of 0.897 is less than 0.972124

Data is normally distributed at 95% level of significance

1% Critical value of 0.858 is less than 0.972124

Data is normally distributed at 99% level of significance

# Mann-Kendall Trend Analysis

Parameter: Boron

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
4817.2	2683.12	2134.08	1	0
3895.84	2683.12	1212.72	2	0
3956.91	2683.12	1273.79	3	0
3573.57	2683.12	890.45	4	0
3806.16	2683.12	1123.04	5	0
3914.41	2683.12	1231.29	6	0
3891.56	2683.12	1208.44	7	0
3773.44	2683.12	1090.32	8	0
4668	2683.12	1984.88	9	0
4027	2683.12	1343.88	10	0
3197	2683.12	513.88	11	0
4576	2683.12	1892.88	12	0
4370	2683.12	1686.88	13	0
4940	2683.12	2256.88	14	0
4410	2683.12	1726.88	15	0
4280	2683.12	1596.88	16	0
3390	2683.12	706.88	17	0
3895.84	4817.2	-921.36	17	1
3956.91	4817.2	-860.29	17	2
3573.57	4817.2	-1243.63	17	3
3806.16	4817.2	-1011.04	17	4
3914.41	4817.2	-902.79	17	5
3891.56	4817.2	-925.64	17	6
3773.44	4817.2	-1043.76	17	7
4668	4817.2	-149.2	17	8
4027	4817.2	-790.2	17	9
3197	4817.2	-1620.2	17	10
4576	4817.2	-241.2	17	11
4370	4817.2	-447.2	17	12
4940	4817.2	122.8	18	12
4410	4817.2	-407.2	18	13
4280	4817.2	-537.2	18	14
3390	4817.2	-1427.2	18	15
3956.91	3895.84	61.07	19	15
3573.57	3895.84	-322.27	19	16
3806.16	3895.84	-89.68	19	17
3914.41	3895.84	18.57	20	17
3891.56	3895.84	-4.28	20	18
3773.44	3895.84	-122.4	20	19
4668	3895.84	772.16	21	19
4027	3895.84	131.16	22	19
3197	3895.84	-698.84	22	20
4576	3895.84	680.16	23	20
4370	3895.84	474.16	24	20
4940	3895.84	1044.16	25	20

4410	3895.84	514.16	26	20
4280	3895.84	384.16	27	20
3390	3895.84	-505.84	27	21
3573.57	3956.91	-383.34	27	22
3806.16	3956.91	-150.75	27	23
3914.41	3956.91	-42.5	27	24
3891.56	3956.91	-65.35	27	25
3773.44	3956.91	-183.47	27	26
4668	3956.91	711.09	28	26
4027	3956.91	70.09	29	26
3197	3956.91	-759.91	29	27
4576	3956.91	619.09	30	27
4370	3956.91	413.09	31	27
4940	3956.91	983.09	32	27
4410	3956.91	453.09	33	27
4280	3956.91	323.09	34	27
3390	3956.91	-566.91	34	28
3806.16	3573.57	232.59	35	28
3914.41	3573.57	340.84	36	28
3891.56	3573.57	317.99	37	28
3773.44	3573.57	199.87	38	28
4668	3573.57	1094.43	39	28
4027	3573.57	453.43	40	28
3197	3573.57	-376.57	40	29
4576	3573.57	1002.43	41	29
4370	3573.57	796.43	42	29
4940	3573.57	1366.43	43	29
4410	3573.57	836.43	44	29
4280	3573.57	706.43	45	29
3390	3573.57	-183.57	45	30
3914.41	3806.16	108.25	46	30
3891.56	3806.16	85.4	47	30
3773.44	3806.16	-32.72	47	31
4668	3806.16	861.84	48	31
4027	3806.16	220.84	49	31
3197	3806.16	-609.16	49	32
4576	3806.16	769.84	50	32
4370	3806.16	563.84	51	32
4940	3806.16	1133.84	52	32
4410	3806.16	603.84	53	32
4280	3806.16	473.84	54	32
3390	3806.16	-416.16	54	33
3891.56	3914.41	-22.85	54	34
3773.44	3914.41	-140.97	54	35
4668	3914.41	753.59	55	35
4027	3914.41	112.59	56	35
3197	3914.41	-717.41	56	36
4576	3914.41	661.59	57	36
4370	3914.41	455.59	58	36
4940	3914.41	1025.59	59	36
4410	3914.41	495.59	60	36
4280	3914.41	365.59	61	36
3390	3914.41	-524.41	61	37

3773.44	3891.56	-118.12	61	38
4668	3891.56	776.44	62	38
4027	3891.56	135.44	63	38
3197	3891.56	-694.56	63	39
4576	3891.56	684.44	64	39
4370	3891.56	478.44	65	39
4940	3891.56	1048.44	66	39
4410	3891.56	518.44	67	39
4280	3891.56	388.44	68	39
3390	3891.56	-501.56	68	40
4668	3773.44	894.56	69	40
4027	3773.44	253.56	70	40
3197	3773.44	-576.44	70	41
4576	3773.44	802.56	71	41
4370	3773.44	596.56	72	41
4940	3773.44	1166.56	73	41
4410	3773.44	636.56	74	41
4280	3773.44	506.56	75	41
3390	3773.44	-383.44	75	42
4027	4668	-641	75	43
3197	4668	-1471	75	44
4576	4668	-92	75	45
4370	4668	-298	75	46
4940	4668	272	76	46
4410	4668	-258	76	47
4280	4668	-388	76	48
3390	4668	-1278	76	49
3197	4027	-830	76	50
4576	4027	549	77	50
4370	4027	343	78	50
4940	4027	913	79	50
4410	4027	383	80	50
4280	4027	253	81	50
3390	4027	-637	81	51
4576	3197	1379	82	51
4370	3197	1173	83	51
4940	3197	1743	84	51
4410	3197	1213	85	51
4280	3197	1083	86	51
3390	3197	193	87	51
4370	4576	-206	87	52
4940	4576	364	88	52
4410	4576	-166	88	53
4280	4576	-296	88	54
3390	4576	-1186	88	55
4940	4370	570	89	55
4410	4370	40	90	55
4280	4370	-90	90	56
3390	4370	-980	90	57

4410	4940	-530	90	58
4280	4940	-660	90	59
3390	4940	-1550	90	60
4280	4410	-130	90	61
3390	4410	-1020	90	62
3390	4280	-890	90	63

S Statistic = 90 - 63 = 27

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Tied Group	Value	Members
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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 12546

b = 44064

c = 612

Group Variance = 697

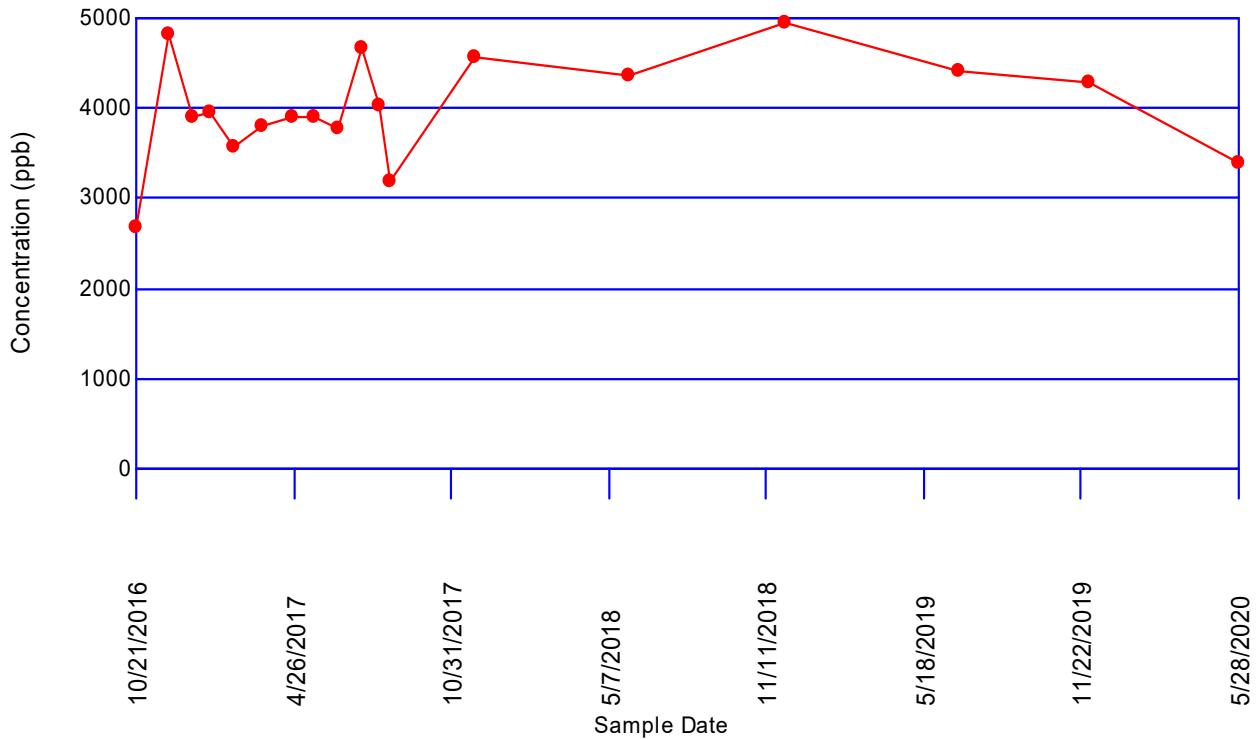
Z-Score = 0.98482

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|0.98482| <= 1.97737 indicating no evidence of a trend



### Boron Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.331098	0.189723	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	4238.42	FALSE
	11/30/2016	6242.46	FALSE
	12/28/2016	5154.49	FALSE
	1/18/2017	4910.63	FALSE
	2/15/2017	3595.68	FALSE
	3/20/2017	3637.76	FALSE
	4/25/2017	3392.27	FALSE
	5/22/2017	3135.58	FALSE
	6/20/2017	3335.63	FALSE
	7/17/2017	4381	FALSE
	8/7/2017	3684	FALSE
	8/21/2017	3922	FALSE
	11/29/2017	3860	FALSE
	5/30/2018	2650	FALSE
	12/4/2018	3490	FALSE
	6/27/2019	2170	FALSE
	12/2/2019	2220	FALSE
	5/28/2020	1590	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	1590	6242.46	4652.46	0.4886	2273.19
2	2170	5154.49	2984.49	0.3253	970.855
3	2220	4910.63	2690.63	0.2553	686.918
4	2650	4381	1731	0.2027	350.874
5	3135.58	4238.42	1102.84	0.1587	175.021
6	3335.63	3922	586.37	0.1197	70.1885
7	3392.27	3860	467.73	0.0837	39.149
8	3490	3684	194	0.0496	9.6224
9	3595.68	3637.76	42.08	0.0163	0.685904
10	3637.76	3595.68	-42.08		
11	3684	3490	-194		
12	3860	3392.27	-467.73		
13	3922	3335.63	-586.37		
14	4238.42	3135.58	-1102.84		
15	4381	2650	-1731		
16	4910.63	2220	-2690.63		
17	5154.49	2170	-2984.49		
18	6242.46	1590	-4652.46		

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Sum of b values = 4576.5

Sample Standard Deviation = 1124.86

W Statistic = 0.973687

5% Critical value of 0.897 is less than 0.973687

Data is normally distributed at 95% level of significance

1% Critical value of 0.858 is less than 0.973687

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Boron**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
6242.46	4238.42	2004.04	1	0
5154.49	4238.42	916.07	2	0
4910.63	4238.42	672.21	3	0
3595.68	4238.42	-642.74	3	1
3637.76	4238.42	-600.66	3	2
3392.27	4238.42	-846.15	3	3
3135.58	4238.42	-1102.84	3	4
3335.63	4238.42	-902.79	3	5
4381	4238.42	142.58	4	5
3684	4238.42	-554.42	4	6
3922	4238.42	-316.42	4	7
3860	4238.42	-378.42	4	8
2650	4238.42	-1588.42	4	9
3490	4238.42	-748.42	4	10
2170	4238.42	-2068.42	4	11
2220	4238.42	-2018.42	4	12
1590	4238.42	-2648.42	4	13
5154.49	6242.46	-1087.97	4	14
4910.63	6242.46	-1331.83	4	15
3595.68	6242.46	-2646.78	4	16
3637.76	6242.46	-2604.7	4	17
3392.27	6242.46	-2850.19	4	18
3135.58	6242.46	-3106.88	4	19
3335.63	6242.46	-2906.83	4	20
4381	6242.46	-1861.46	4	21
3684	6242.46	-2558.46	4	22
3922	6242.46	-2320.46	4	23
3860	6242.46	-2382.46	4	24
2650	6242.46	-3592.46	4	25
3490	6242.46	-2752.46	4	26
2170	6242.46	-4072.46	4	27
2220	6242.46	-4022.46	4	28
1590	6242.46	-4652.46	4	29
4910.63	5154.49	-243.86	4	30
3595.68	5154.49	-1558.81	4	31
3637.76	5154.49	-1516.73	4	32
3392.27	5154.49	-1762.22	4	33
3135.58	5154.49	-2018.91	4	34
3335.63	5154.49	-1818.86	4	35
4381	5154.49	-773.49	4	36
3684	5154.49	-1470.49	4	37
3922	5154.49	-1232.49	4	38
3860	5154.49	-1294.49	4	39
2650	5154.49	-2504.49	4	40
3490	5154.49	-1664.49	4	41

2170	5154.49	-2984.49	4	42
2220	5154.49	-2934.49	4	43
1590	5154.49	-3564.49	4	44
3595.68	4910.63	-1314.95	4	45
3637.76	4910.63	-1272.87	4	46
3392.27	4910.63	-1518.36	4	47
3135.58	4910.63	-1775.05	4	48
3335.63	4910.63	-1575	4	49
4381	4910.63	-529.63	4	50
3684	4910.63	-1226.63	4	51
3922	4910.63	-988.63	4	52
3860	4910.63	-1050.63	4	53
2650	4910.63	-2260.63	4	54
3490	4910.63	-1420.63	4	55
2170	4910.63	-2740.63	4	56
2220	4910.63	-2690.63	4	57
1590	4910.63	-3320.63	4	58
3637.76	3595.68	42.08	5	58
3392.27	3595.68	-203.41	5	59
3135.58	3595.68	-460.1	5	60
3335.63	3595.68	-260.05	5	61
4381	3595.68	785.32	6	61
3684	3595.68	88.32	7	61
3922	3595.68	326.32	8	61
3860	3595.68	264.32	9	61
2650	3595.68	-945.68	9	62
3490	3595.68	-105.68	9	63
2170	3595.68	-1425.68	9	64
2220	3595.68	-1375.68	9	65
1590	3595.68	-2005.68	9	66
3392.27	3637.76	-245.49	9	67
3135.58	3637.76	-502.18	9	68
3335.63	3637.76	-302.13	9	69
4381	3637.76	743.24	10	69
3684	3637.76	46.24	11	69
3922	3637.76	284.24	12	69
3860	3637.76	222.24	13	69
2650	3637.76	-987.76	13	70
3490	3637.76	-147.76	13	71
2170	3637.76	-1467.76	13	72
2220	3637.76	-1417.76	13	73
1590	3637.76	-2047.76	13	74
3135.58	3392.27	-256.69	13	75
3335.63	3392.27	-56.64	13	76
4381	3392.27	988.73	14	76
3684	3392.27	291.73	15	76
3922	3392.27	529.73	16	76
3860	3392.27	467.73	17	76
2650	3392.27	-742.27	17	77
3490	3392.27	97.73	18	77
2170	3392.27	-1222.27	18	78
2220	3392.27	-1172.27	18	79
1590	3392.27	-1802.27	18	80

3335.63	3135.58	200.05	19	80
4381	3135.58	1245.42	20	80
3684	3135.58	548.42	21	80
3922	3135.58	786.42	22	80
3860	3135.58	724.42	23	80
2650	3135.58	-485.58	23	81
3490	3135.58	354.42	24	81
2170	3135.58	-965.58	24	82
2220	3135.58	-915.58	24	83
1590	3135.58	-1545.58	24	84
4381	3335.63	1045.37	25	84
3684	3335.63	348.37	26	84
3922	3335.63	586.37	27	84
3860	3335.63	524.37	28	84
2650	3335.63	-685.63	28	85
3490	3335.63	154.37	29	85
2170	3335.63	-1165.63	29	86
2220	3335.63	-1115.63	29	87
1590	3335.63	-1745.63	29	88
3684	4381	-697	29	89
3922	4381	-459	29	90
3860	4381	-521	29	91
2650	4381	-1731	29	92
3490	4381	-891	29	93
2170	4381	-2211	29	94
2220	4381	-2161	29	95
1590	4381	-2791	29	96
3922	3684	238	30	96
3860	3684	176	31	96
2650	3684	-1034	31	97
3490	3684	-194	31	98
2170	3684	-1514	31	99
2220	3684	-1464	31	100
1590	3684	-2094	31	101
3860	3922	-62	31	102
2650	3922	-1272	31	103
3490	3922	-432	31	104
2170	3922	-1752	31	105
2220	3922	-1702	31	106
1590	3922	-2332	31	107
2650	3860	-1210	31	108
3490	3860	-370	31	109
2170	3860	-1690	31	110
2220	3860	-1640	31	111
1590	3860	-2270	31	112
3490	2650	840	32	112
2170	2650	-480	32	113
2220	2650	-430	32	114
1590	2650	-1060	32	115

2170	3490	-1320	32	116
2220	3490	-1270	32	117
1590	3490	-1900	32	118
2220	2170	50	33	118
1590	2170	-580	33	119
1590	2220	-630	33	120

S Statistic = 33 - 120 = -87

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Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
	10/21/2016	1
	11/30/2016	1
	12/28/2016	1
	1/18/2017	1
	2/15/2017	1
	3/20/2017	1
	4/25/2017	1
	5/22/2017	1
	6/20/2017	1
	7/17/2017	1
	8/7/2017	1
	8/21/2017	1
	11/29/2017	1
	5/30/2018	1
	12/4/2018	1
	6/27/2019	1
	12/2/2019	1
	5/28/2020	1
There are 0 time periods with multiple data		

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 12546

b = 44064

c = 612

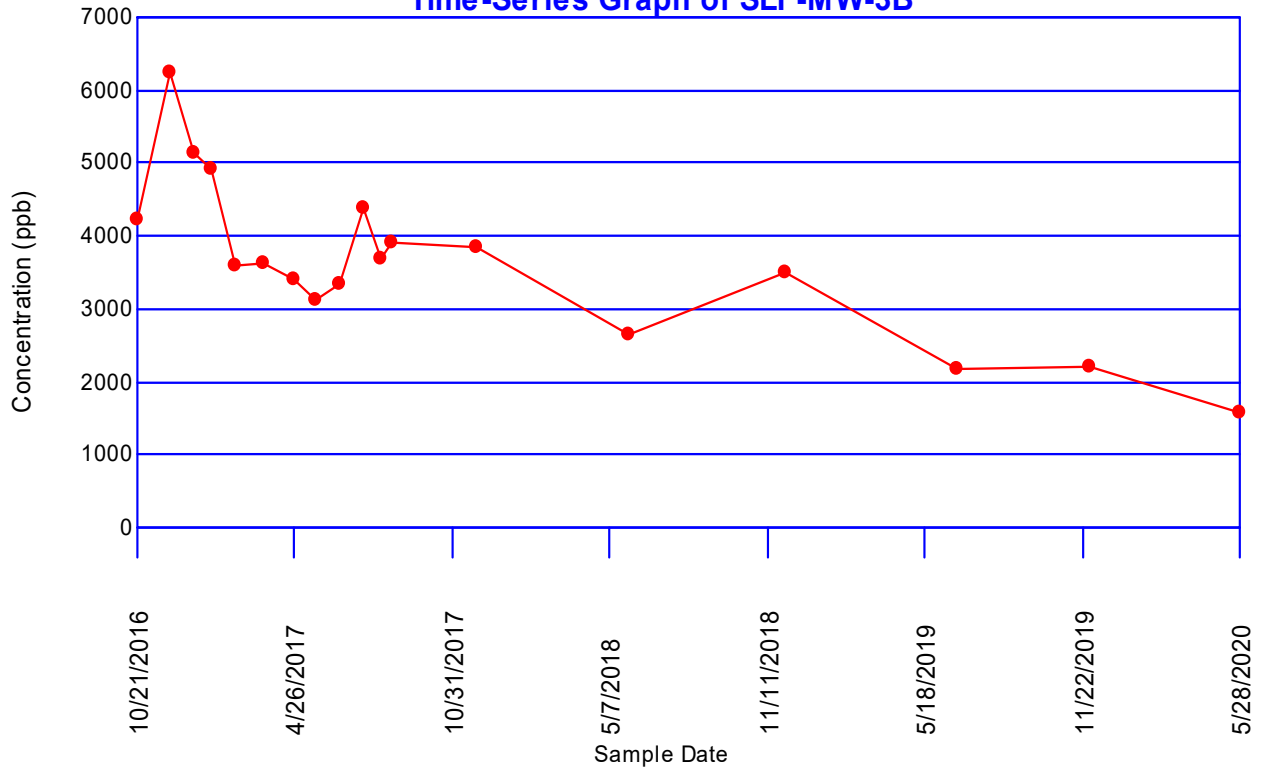
Group Variance = 697

Z-Score = -3.25748

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**| -3.25748 | > 1.97737 indicating a trend**

### Boron Time-Series Graph of SLF-MW-3B





## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.303938	0.285197	0.546	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	493.993	FALSE
	3/20/2017	345.223	FALSE
	4/25/2017	314.115	FALSE
	5/22/2017	270.744	FALSE
	6/20/2017	438.039	FALSE
	7/17/2017	550	FALSE
	8/7/2017	363	FALSE
	8/22/2017	461	FALSE
	11/29/2017	524	FALSE
	5/30/2018	517	FALSE
	12/4/2018	395	FALSE
	6/28/2019	631	FALSE
	12/2/2019	653	FALSE
	5/28/2020	220	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 14 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	220	653	433	0.5251	227.368
2	270.744	631	360.256	0.3318	119.533
3	314.115	550	235.885	0.246	58.0277
4	345.223	524	178.777	0.1802	32.2156
5	363	517	154	0.124	19.096
6	395	493.993	98.993	0.0727	7.19679
7	438.039	461	22.961	0.024	0.551064
8	461	438.039	-22.961		
9	493.993	395	-98.993		
10	517	363	-154		
11	524	345.223	-178.777		
12	550	314.115	-235.885		
13	631	270.744	-360.256		
14	653	220	-433		

---

Sum of b values = 463.988

Sample Standard Deviation = 130.121

W Statistic = 0.97809

5% Critical value of 0.874 is less than 0.97809

Data is normally distributed at 95% level of significance

1% Critical value of 0.825 is less than 0.97809

Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: Boron

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
345.223	493.993	-148.77	0	1
314.115	493.993	-179.878	0	2
270.744	493.993	-223.249	0	3
438.039	493.993	-55.954	0	4
550	493.993	56.007	1	4
363	493.993	-130.993	1	5
461	493.993	-32.993	1	6
524	493.993	30.007	2	6
517	493.993	23.007	3	6
395	493.993	-98.993	3	7
631	493.993	137.007	4	7
653	493.993	159.007	5	7
220	493.993	-273.993	5	8
314.115	345.223	-31.108	5	9
270.744	345.223	-74.479	5	10
438.039	345.223	92.816	6	10
550	345.223	204.777	7	10
363	345.223	17.777	8	10
461	345.223	115.777	9	10
524	345.223	178.777	10	10
517	345.223	171.777	11	10
395	345.223	49.777	12	10
631	345.223	285.777	13	10
653	345.223	307.777	14	10
220	345.223	-125.223	14	11
270.744	314.115	-43.371	14	12
438.039	314.115	123.924	15	12
550	314.115	235.885	16	12
363	314.115	48.885	17	12
461	314.115	146.885	18	12
524	314.115	209.885	19	12
517	314.115	202.885	20	12
395	314.115	80.885	21	12
631	314.115	316.885	22	12
653	314.115	338.885	23	12
220	314.115	-94.115	23	13
438.039	270.744	167.295	24	13
550	270.744	279.256	25	13
363	270.744	92.256	26	13
461	270.744	190.256	27	13
524	270.744	253.256	28	13
517	270.744	246.256	29	13
395	270.744	124.256	30	13
631	270.744	360.256	31	13

653	270.744	382.256	32	13
220	270.744	-50.744	32	14
550	438.039	111.961	33	14
363	438.039	-75.039	33	15
461	438.039	22.961	34	15
524	438.039	85.961	35	15
517	438.039	78.961	36	15
395	438.039	-43.039	36	16
631	438.039	192.961	37	16
653	438.039	214.961	38	16
220	438.039	-218.039	38	17
363	550	-187	38	18
461	550	-89	38	19
524	550	-26	38	20
517	550	-33	38	21
395	550	-155	38	22
631	550	81	39	22
653	550	103	40	22
220	550	-330	40	23
461	363	98	41	23
524	363	161	42	23
517	363	154	43	23
395	363	32	44	23
631	363	268	45	23
653	363	290	46	23
220	363	-143	46	24
524	461	63	47	24
517	461	56	48	24
395	461	-66	48	25
631	461	170	49	25
653	461	192	50	25
220	461	-241	50	26
517	524	-7	50	27
395	524	-129	50	28
631	524	107	51	28
653	524	129	52	28
220	524	-304	52	29
395	517	-122	52	30
631	517	114	53	30
653	517	136	54	30
220	517	-297	54	31
631	395	236	55	31
653	395	258	56	31
220	395	-175	56	32
653	631	22	57	32
220	631	-411	57	33
220	653	-433	57	34

S Statistic = 57 - 34 = 23

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Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/22/2017		1
11/29/2017		1
5/30/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 6006

b = 19656

c = 364

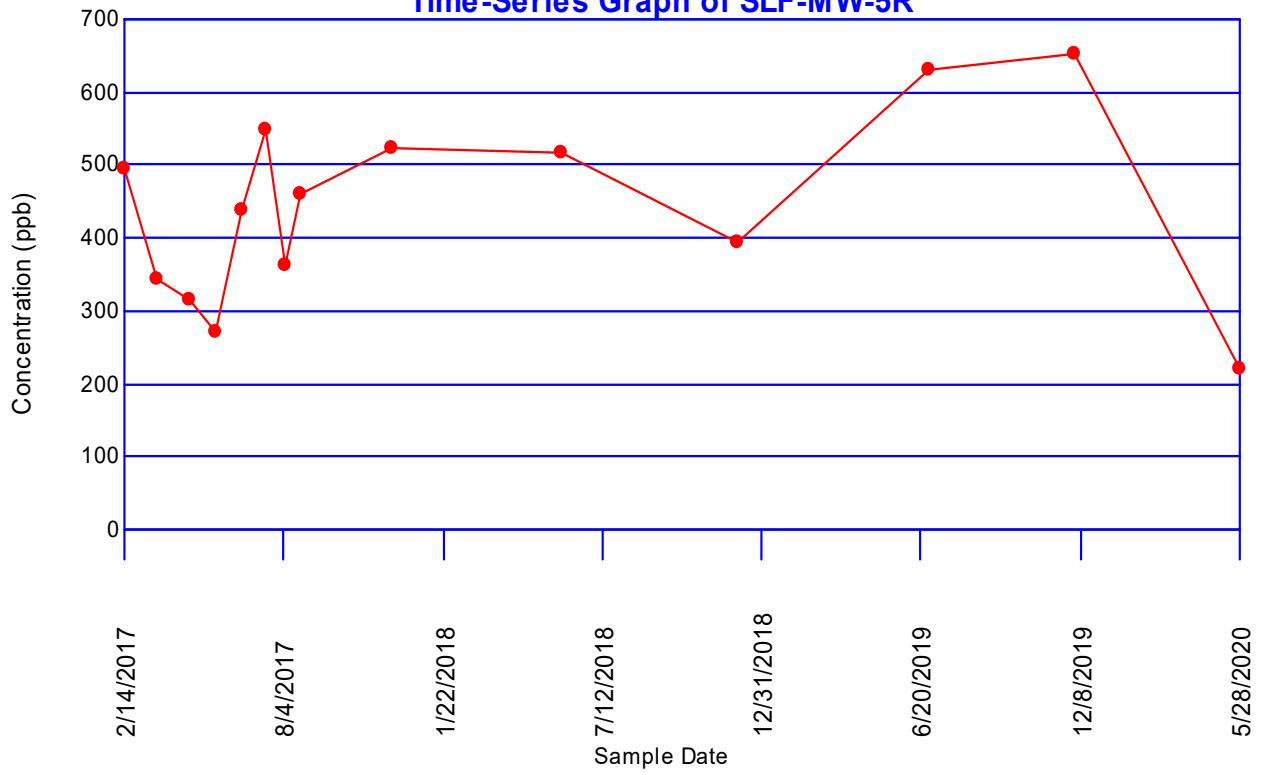
Group Variance = 333.667

Z-Score = 1.20439

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.20439| <= 1.97737 indicating no evidence of a trend

### Boron Time-Series Graph of SLF-MW-5R



## Concentrations (ppb)

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

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Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

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Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	37032.2	37032.2
			11/30/2016	61315.7	61315.7
			12/28/2016	44056.6	44056.6
			1/18/2017	35837.4	35837.4
			2/14/2017	37524.8	37524.8
			3/20/2017	38622.7	38622.7
			4/25/2017	39897.3	39897.3
			5/22/2017	43737.6	43737.6
			6/20/2017	34857	34857
			7/17/2017	33220	33220
			8/8/2017	30756	30756
			8/21/2017	31548	31548
			11/29/2017	37641	37641
			3/8/2018	47865	47865
			5/31/2018	44100	44100
			12/4/2018	48600	48600
			6/28/2019	43600	43600
			12/2/2019	49100	49100
			5/28/2020	47400	47400
				<b>11/30/2020</b>	<b>44100</b>
	<b>4/28/2021</b>	<b>41200</b>	<b>41200</b>		

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SLF-MW-3B	19	0 (0%)	10/21/2016	184501	184501
			11/30/2016	249120	249120
			12/28/2016	254980	254980
			1/18/2017	228148	228148
			2/15/2017	188140	188140
			3/20/2017	191435	191435
			4/25/2017	188976	188976
			5/22/2017	229431	229431
			6/20/2017	213067	213067
			7/17/2017	220459	220459
			8/7/2017	208907	208907
			8/21/2017	235062	235062
			11/29/2017	204990	204990
			3/8/2018	173000	173000
			5/30/2018	171000	171000
			12/4/2018	200000	200000
			6/27/2019	172000	172000
			12/2/2019	179000	179000
			5/28/2020	138000	138000

				<b>12/1/2020</b>	<b>167000</b>	<b>167000</b>
				<b>4/28/2021</b>	<b>143000</b>	<b>143000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	107763	107763	107763
			3/20/2017	104972	104972	104972
			4/25/2017	101443	101443	101443
			5/22/2017	118938	118938	118938
			6/20/2017	120726	120726	120726
			7/17/2017	123508	123508	123508
			8/7/2017	115159	115159	115159
			8/22/2017	123970	123970	123970
			11/29/2017	136418	136418	136418
			3/8/2018	105000	105000	105000
			5/30/2018	118000	118000	118000
			12/4/2018	114000	114000	114000
			6/28/2019	126000	126000	126000
			12/2/2019	130000	130000	130000
			5/28/2020	99100	99100	99100
			<b>11/30/2020</b>	<b>85100</b>	<b>85100</b>	<b>85100</b>
			<b>4/28/2021</b>	<b>115000</b>	<b>115000</b>	<b>115000</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.452585	0.138086	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	37032.2	FALSE
	11/30/2016	61315.7	FALSE
	12/28/2016	44056.6	FALSE
	1/18/2017	35837.4	FALSE
	2/14/2017	37524.8	FALSE
	3/20/2017	38622.7	FALSE
	4/25/2017	39897.3	FALSE
	5/22/2017	43737.6	FALSE
	6/20/2017	34857	FALSE
	7/17/2017	33220	FALSE
	8/8/2017	30756	FALSE
	8/21/2017	31548	FALSE
	11/29/2017	37641	FALSE
	3/8/2018	47865	FALSE
	5/31/2018	44100	FALSE
	12/4/2018	48600	FALSE
	6/28/2019	43600	FALSE
	12/2/2019	49100	FALSE
	5/28/2020	47400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	30756	61315.7	30559.7	0.4808	14693.1
2	31548	49100	17552	0.3232	5672.81
3	33220	48600	15380	0.2561	3938.82
4	34857	47865	13008	0.2059	2678.35
5	35837.4	47400	11562.6	0.1641	1897.42
6	37032.2	44100	7067.8	0.1271	898.317
7	37524.8	44056.6	6531.8	0.0932	608.764
8	37641	43737.6	6096.6	0.0612	373.112
9	38622.7	43600	4977.3	0.0303	150.812
10	39897.3	39897.3	0		
11	43600	38622.7	-4977.3		
12	43737.6	37641	-6096.6		
13	44056.6	37524.8	-6531.8		
14	44100	37032.2	-7067.8		
15	47400	35837.4	-11562.6		
16	47865	34857	-13008		
17	48600	33220	-15380		
18	49100	31548	-17552		
19	61315.7	30756	-30559.7		

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Sum of b values = 30911.5

Sample Standard Deviation = 7525.63

W Statistic = 0.937308

5% Critical value of 0.901 is less than 0.937308

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.937308

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
61315.7	37032.2	24283.5	1	0
44056.6	37032.2	7024.4	2	0
35837.4	37032.2	-1194.8	2	1
37524.8	37032.2	492.6	3	1
38622.7	37032.2	1590.5	4	1
39897.3	37032.2	2865.1	5	1
43737.6	37032.2	6705.4	6	1
34857	37032.2	-2175.2	6	2
33220	37032.2	-3812.2	6	3
30756	37032.2	-6276.2	6	4
31548	37032.2	-5484.2	6	5
37641	37032.2	608.8	7	5
47865	37032.2	10832.8	8	5
44100	37032.2	7067.8	9	5
48600	37032.2	11567.8	10	5
43600	37032.2	6567.8	11	5
49100	37032.2	12067.8	12	5
47400	37032.2	10367.8	13	5
44056.6	61315.7	-17259.1	13	6
35837.4	61315.7	-25478.3	13	7
37524.8	61315.7	-23790.9	13	8
38622.7	61315.7	-22693	13	9
39897.3	61315.7	-21418.4	13	10
43737.6	61315.7	-17578.1	13	11
34857	61315.7	-26458.7	13	12
33220	61315.7	-28095.7	13	13
30756	61315.7	-30559.7	13	14
31548	61315.7	-29767.7	13	15
37641	61315.7	-23674.7	13	16
47865	61315.7	-13450.7	13	17
44100	61315.7	-17215.7	13	18
48600	61315.7	-12715.7	13	19
43600	61315.7	-17715.7	13	20
49100	61315.7	-12215.7	13	21
47400	61315.7	-13915.7	13	22
35837.4	44056.6	-8219.2	13	23
37524.8	44056.6	-6531.8	13	24
38622.7	44056.6	-5433.9	13	25
39897.3	44056.6	-4159.3	13	26
43737.6	44056.6	-319	13	27
34857	44056.6	-9199.6	13	28
33220	44056.6	-10836.6	13	29
30756	44056.6	-13300.6	13	30
31548	44056.6	-12508.6	13	31
37641	44056.6	-6415.6	13	32

47865	44056.6	3808.4	14	32
44100	44056.6	43.4	15	32
48600	44056.6	4543.4	16	32
43600	44056.6	-456.6	16	33
49100	44056.6	5043.4	17	33
47400	44056.6	3343.4	18	33
37524.8	35837.4	1687.4	19	33
38622.7	35837.4	2785.3	20	33
39897.3	35837.4	4059.9	21	33
43737.6	35837.4	7900.2	22	33
34857	35837.4	-980.4	22	34
33220	35837.4	-2617.4	22	35
30756	35837.4	-5081.4	22	36
31548	35837.4	-4289.4	22	37
37641	35837.4	1803.6	23	37
47865	35837.4	12027.6	24	37
44100	35837.4	8262.6	25	37
48600	35837.4	12762.6	26	37
43600	35837.4	7762.6	27	37
49100	35837.4	13262.6	28	37
47400	35837.4	11562.6	29	37
38622.7	37524.8	1097.9	30	37
39897.3	37524.8	2372.5	31	37
43737.6	37524.8	6212.8	32	37
34857	37524.8	-2667.8	32	38
33220	37524.8	-4304.8	32	39
30756	37524.8	-6768.8	32	40
31548	37524.8	-5976.8	32	41
37641	37524.8	116.2	33	41
47865	37524.8	10340.2	34	41
44100	37524.8	6575.2	35	41
48600	37524.8	11075.2	36	41
43600	37524.8	6075.2	37	41
49100	37524.8	11575.2	38	41
47400	37524.8	9875.2	39	41
39897.3	38622.7	1274.6	40	41
43737.6	38622.7	5114.9	41	41
34857	38622.7	-3765.7	41	42
33220	38622.7	-5402.7	41	43
30756	38622.7	-7866.7	41	44
31548	38622.7	-7074.7	41	45
37641	38622.7	-981.7	41	46
47865	38622.7	9242.3	42	46
44100	38622.7	5477.3	43	46
48600	38622.7	9977.3	44	46
43600	38622.7	4977.3	45	46
49100	38622.7	10477.3	46	46
47400	38622.7	8777.3	47	46
43737.6	39897.3	3840.3	48	46
34857	39897.3	-5040.3	48	47
33220	39897.3	-6677.3	48	48
30756	39897.3	-9141.3	48	49
31548	39897.3	-8349.3	48	50

37641	39897.3	-2256.3	48	51
47865	39897.3	7967.7	49	51
44100	39897.3	4202.7	50	51
48600	39897.3	8702.7	51	51
43600	39897.3	3702.7	52	51
49100	39897.3	9202.7	53	51
47400	39897.3	7502.7	54	51
34857	43737.6	-8880.6	54	52
33220	43737.6	-10517.6	54	53
30756	43737.6	-12981.6	54	54
31548	43737.6	-12189.6	54	55
37641	43737.6	-6096.6	54	56
47865	43737.6	4127.4	55	56
44100	43737.6	362.4	56	56
48600	43737.6	4862.4	57	56
43600	43737.6	-137.6	57	57
49100	43737.6	5362.4	58	57
47400	43737.6	3662.4	59	57
33220	34857	-1637	59	58
30756	34857	-4101	59	59
31548	34857	-3309	59	60
37641	34857	2784	60	60
47865	34857	13008	61	60
44100	34857	9243	62	60
48600	34857	13743	63	60
43600	34857	8743	64	60
49100	34857	14243	65	60
47400	34857	12543	66	60
30756	33220	-2464	66	61
31548	33220	-1672	66	62
37641	33220	4421	67	62
47865	33220	14645	68	62
44100	33220	10880	69	62
48600	33220	15380	70	62
43600	33220	10380	71	62
49100	33220	15880	72	62
47400	33220	14180	73	62
31548	30756	792	74	62
37641	30756	6885	75	62
47865	30756	17109	76	62
44100	30756	13344	77	62
48600	30756	17844	78	62
43600	30756	12844	79	62
49100	30756	18344	80	62
47400	30756	16644	81	62
37641	31548	6093	82	62
47865	31548	16317	83	62
44100	31548	12552	84	62
48600	31548	17052	85	62
43600	31548	12052	86	62
49100	31548	17552	87	62
47400	31548	15852	88	62

47865	37641	10224	89	62
44100	37641	6459	90	62
48600	37641	10959	91	62
43600	37641	5959	92	62
49100	37641	11459	93	62
47400	37641	9759	94	62
44100	47865	-3765	94	63
48600	47865	735	95	63
43600	47865	-4265	95	64
49100	47865	1235	96	64
47400	47865	-465	96	65
48600	44100	4500	97	65
43600	44100	-500	97	66
49100	44100	5000	98	66
47400	44100	3300	99	66
43600	48600	-5000	99	67
49100	48600	500	100	67
47400	48600	-1200	100	68
49100	43600	5500	101	68
47400	43600	3800	102	68
47400	49100	-1700	102	69

S Statistic = 102 - 69 = 33

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<hr/>		
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/8/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/31/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

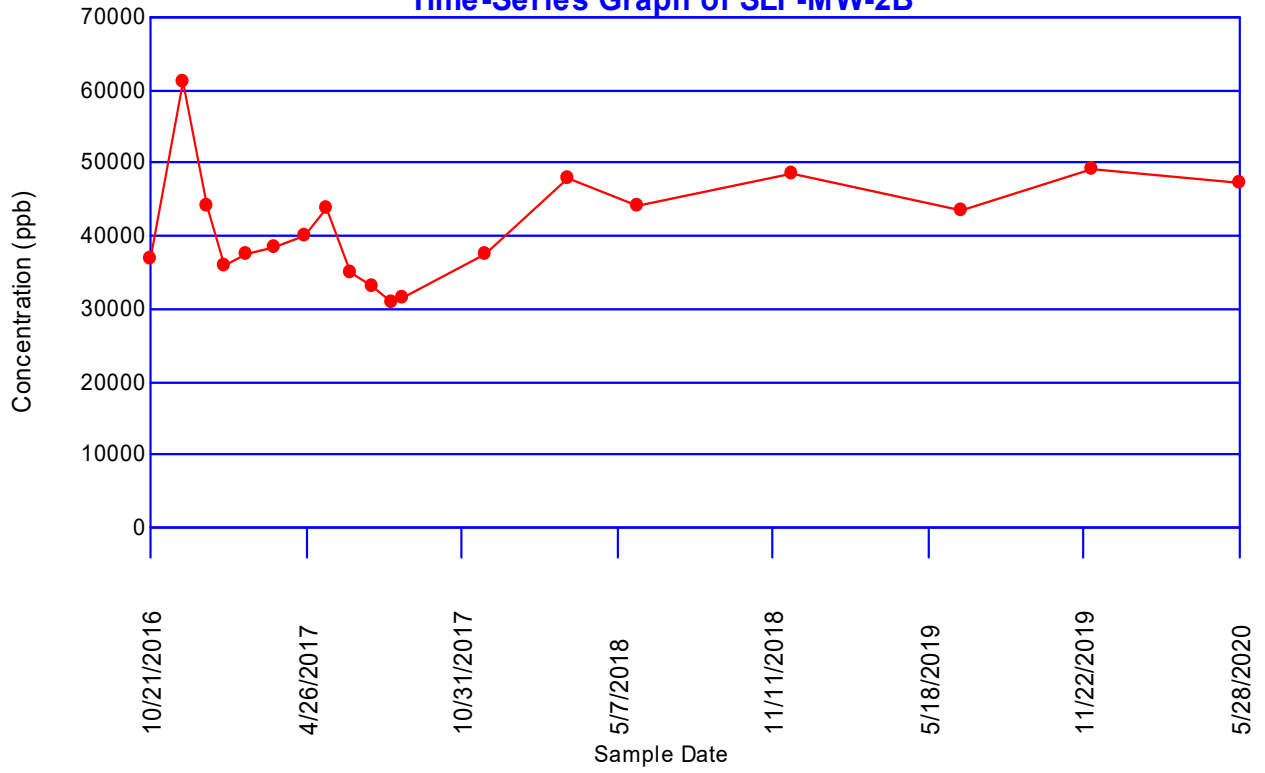
Group Variance = 817

Z-Score = 1.11954

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|1.11954| \leq 1.97737$  indicating no evidence of a trend

### Calcium Time-Series Graph of SLF-MW-2B





## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.240034	0.350292	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	184501	FALSE
	11/30/2016	249120	FALSE
	12/28/2016	254980	FALSE
	1/18/2017	228148	FALSE
	2/15/2017	188140	FALSE
	3/20/2017	191435	FALSE
	4/25/2017	188976	FALSE
	5/22/2017	229431	FALSE
	6/20/2017	213067	FALSE
	7/17/2017	220459	FALSE
	8/7/2017	208907	FALSE
	8/21/2017	235062	FALSE
	11/29/2017	204990	FALSE
	3/8/2018	173000	FALSE
	5/30/2018	171000	FALSE
	12/4/2018	200000	FALSE
	6/27/2019	172000	FALSE
	12/2/2019	179000	FALSE
	5/28/2020	138000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	138000	254980	116980	0.4808	56244
2	171000	249120	78120	0.3232	25248.4
3	172000	235062	63062	0.2561	16150.2
4	173000	229431	56431	0.2059	11619.1
5	179000	228148	49148	0.1641	8065.19
6	184501	220459	35958	0.1271	4570.26
7	188140	213067	24927	0.0932	2323.2
8	188976	208907	19931	0.0612	1219.78
9	191435	204990	13555	0.0303	410.717
10	200000	200000	0		
11	204990	191435	-13555		
12	208907	188976	-19931		
13	213067	188140	-24927		
14	220459	184501	-35958		
15	228148	179000	-49148		
16	229431	173000	-56431		
17	235062	172000	-63062		
18	249120	171000	-78120		
19	254980	138000	-116980		

---

Sum of b values = 125851

Sample Standard Deviation = 29984.9

W Statistic = 0.978667

5% Critical value of 0.901 is less than 0.978667

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.978667

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
249120	184501	64619	1	0
254980	184501	70479	2	0
228148	184501	43647	3	0
188140	184501	3639	4	0
191435	184501	6934	5	0
188976	184501	4475	6	0
229431	184501	44930	7	0
213067	184501	28566	8	0
220459	184501	35958	9	0
208907	184501	24406	10	0
235062	184501	50561	11	0
204990	184501	20489	12	0
173000	184501	-11501	12	1
171000	184501	-13501	12	2
200000	184501	15499	13	2
172000	184501	-12501	13	3
179000	184501	-5501	13	4
138000	184501	-46501	13	5
254980	249120	5860	14	5
228148	249120	-20972	14	6
188140	249120	-60980	14	7
191435	249120	-57685	14	8
188976	249120	-60144	14	9
229431	249120	-19689	14	10
213067	249120	-36053	14	11
220459	249120	-28661	14	12
208907	249120	-40213	14	13
235062	249120	-14058	14	14
204990	249120	-44130	14	15
173000	249120	-76120	14	16
171000	249120	-78120	14	17
200000	249120	-49120	14	18
172000	249120	-77120	14	19
179000	249120	-70120	14	20
138000	249120	-111120	14	21
228148	254980	-26832	14	22
188140	254980	-66840	14	23
191435	254980	-63545	14	24
188976	254980	-66004	14	25
229431	254980	-25549	14	26
213067	254980	-41913	14	27
220459	254980	-34521	14	28
208907	254980	-46073	14	29
235062	254980	-19918	14	30
204990	254980	-49990	14	31

173000	254980	-81980	14	32
171000	254980	-83980	14	33
200000	254980	-54980	14	34
172000	254980	-82980	14	35
179000	254980	-75980	14	36
138000	254980	-116980	14	37
188140	228148	-40008	14	38
191435	228148	-36713	14	39
188976	228148	-39172	14	40
229431	228148	1283	15	40
213067	228148	-15081	15	41
220459	228148	-7689	15	42
208907	228148	-19241	15	43
235062	228148	6914	16	43
204990	228148	-23158	16	44
173000	228148	-55148	16	45
171000	228148	-57148	16	46
200000	228148	-28148	16	47
172000	228148	-56148	16	48
179000	228148	-49148	16	49
138000	228148	-90148	16	50
191435	188140	3295	17	50
188976	188140	836	18	50
229431	188140	41291	19	50
213067	188140	24927	20	50
220459	188140	32319	21	50
208907	188140	20767	22	50
235062	188140	46922	23	50
204990	188140	16850	24	50
173000	188140	-15140	24	51
171000	188140	-17140	24	52
200000	188140	11860	25	52
172000	188140	-16140	25	53
179000	188140	-9140	25	54
138000	188140	-50140	25	55
188976	191435	-2459	25	56
229431	191435	37996	26	56
213067	191435	21632	27	56
220459	191435	29024	28	56
208907	191435	17472	29	56
235062	191435	43627	30	56
204990	191435	13555	31	56
173000	191435	-18435	31	57
171000	191435	-20435	31	58
200000	191435	8565	32	58
172000	191435	-19435	32	59
179000	191435	-12435	32	60
138000	191435	-53435	32	61
229431	188976	40455	33	61
213067	188976	24091	34	61
220459	188976	31483	35	61
208907	188976	19931	36	61
235062	188976	46086	37	61

204990	188976	16014	38	61
173000	188976	-15976	38	62
171000	188976	-17976	38	63
200000	188976	11024	39	63
172000	188976	-16976	39	64
179000	188976	-9976	39	65
138000	188976	-50976	39	66
213067	229431	-16364	39	67
220459	229431	-8972	39	68
208907	229431	-20524	39	69
235062	229431	5631	40	69
204990	229431	-24441	40	70
173000	229431	-56431	40	71
171000	229431	-58431	40	72
200000	229431	-29431	40	73
172000	229431	-57431	40	74
179000	229431	-50431	40	75
138000	229431	-91431	40	76
220459	213067	7392	41	76
208907	213067	-4160	41	77
235062	213067	21995	42	77
204990	213067	-8077	42	78
173000	213067	-40067	42	79
171000	213067	-42067	42	80
200000	213067	-13067	42	81
172000	213067	-41067	42	82
179000	213067	-34067	42	83
138000	213067	-75067	42	84
208907	220459	-11552	42	85
235062	220459	14603	43	85
204990	220459	-15469	43	86
173000	220459	-47459	43	87
171000	220459	-49459	43	88
200000	220459	-20459	43	89
172000	220459	-48459	43	90
179000	220459	-41459	43	91
138000	220459	-82459	43	92
235062	208907	26155	44	92
204990	208907	-3917	44	93
173000	208907	-35907	44	94
171000	208907	-37907	44	95
200000	208907	-8907	44	96
172000	208907	-36907	44	97
179000	208907	-29907	44	98
138000	208907	-70907	44	99
204990	235062	-30072	44	100
173000	235062	-62062	44	101
171000	235062	-64062	44	102
200000	235062	-35062	44	103
172000	235062	-63062	44	104
179000	235062	-56062	44	105
138000	235062	-97062	44	106

173000	204990	-31990	44	107
171000	204990	-33990	44	108
200000	204990	-4990	44	109
172000	204990	-32990	44	110
179000	204990	-25990	44	111
138000	204990	-66990	44	112
171000	173000	-2000	44	113
200000	173000	27000	45	113
172000	173000	-1000	45	114
179000	173000	6000	46	114
138000	173000	-35000	46	115
200000	171000	29000	47	115
172000	171000	1000	48	115
179000	171000	8000	49	115
138000	171000	-33000	49	116
172000	200000	-28000	49	117
179000	200000	-21000	49	118
138000	200000	-62000	49	119
179000	172000	7000	50	119
138000	172000	-34000	50	120
138000	179000	-41000	50	121

S Statistic = 50 - 121 = -71

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/15/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/30/2018		1
12/4/2018		1
6/27/2019		1
12/2/2019		1
5/28/2020		1
There are 0 time periods with multiple data		

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

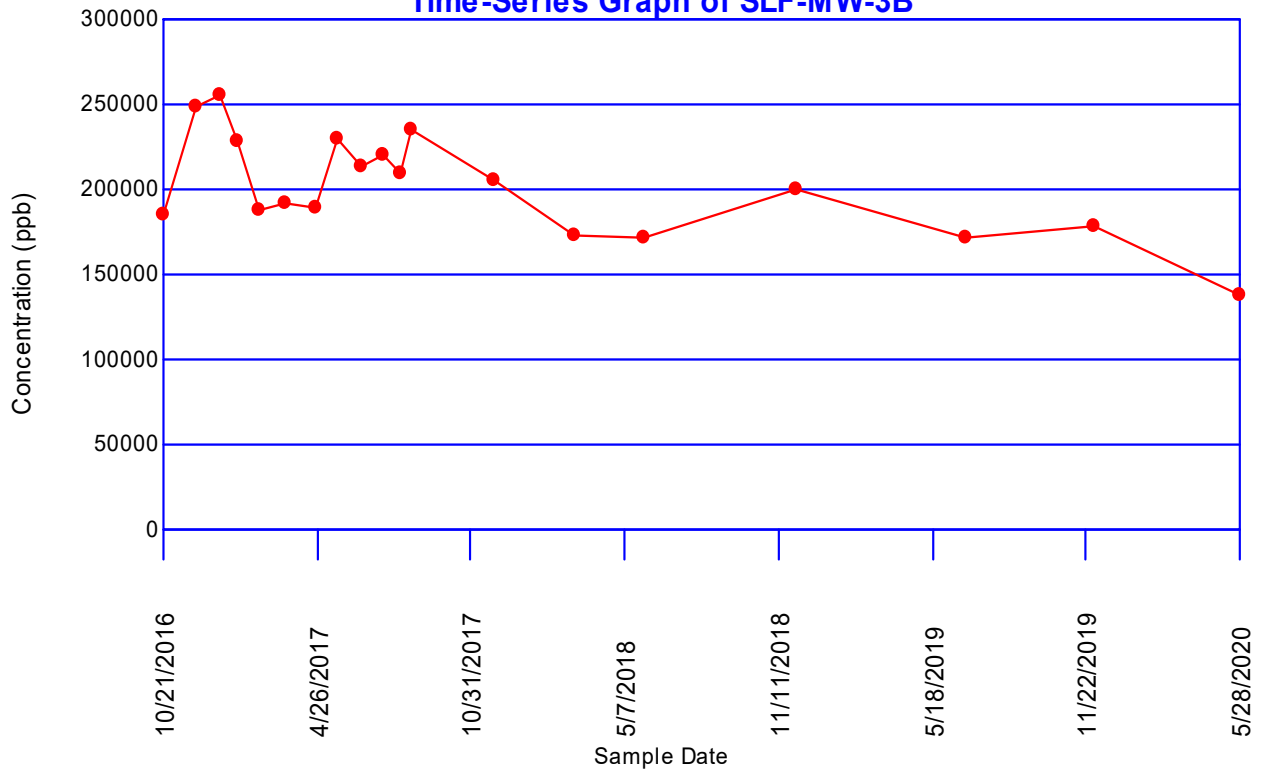
Group Variance = 817

Z-Score = -2.44899

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**| -2.44899 | > 1.97737 indicating a trend**

### Calcium Time-Series Graph of SLF-MW-3B





## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.331298	0.21829	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	107763	FALSE
	3/20/2017	104972	FALSE
	4/25/2017	101443	FALSE
	5/22/2017	118938	FALSE
	6/20/2017	120726	FALSE
	7/17/2017	123508	FALSE
	8/7/2017	115159	FALSE
	8/22/2017	123970	FALSE
	11/29/2017	136418	FALSE
	3/8/2018	105000	FALSE
	5/30/2018	118000	FALSE
	12/4/2018	114000	FALSE
	6/28/2019	126000	FALSE
	12/2/2019	130000	FALSE
	5/28/2020	99100	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	99100	136418	37318	0.515	19218.8
2	101443	130000	28557	0.3306	9440.94
3	104972	126000	21028	0.2495	5246.49
4	105000	123970	18970	0.1878	3562.57
5	107763	123508	15745	0.1353	2130.3
6	114000	120726	6726	0.088	591.888
7	115159	118938	3779	0.0433	163.631
8	118000	118000	0		
9	118938	115159	-3779		
10	120726	114000	-6726		
11	123508	107763	-15745		
12	123970	105000	-18970		
13	126000	104972	-21028		
14	130000	101443	-28557		
15	136418	99100	-37318		

---

Sum of b values = 40354.6

Sample Standard Deviation = 10950.5

W Statistic = 0.970047

5% Critical value of 0.881 is less than 0.970047

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.970047

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
104972	107763	-2791	0	1
101443	107763	-6320	0	2
118938	107763	11175	1	2
120726	107763	12963	2	2
123508	107763	15745	3	2
115159	107763	7396	4	2
123970	107763	16207	5	2
136418	107763	28655	6	2
105000	107763	-2763	6	3
118000	107763	10237	7	3
114000	107763	6237	8	3
126000	107763	18237	9	3
130000	107763	22237	10	3
99100	107763	-8663	10	4
101443	104972	-3529	10	5
118938	104972	13966	11	5
120726	104972	15754	12	5
123508	104972	18536	13	5
115159	104972	10187	14	5
123970	104972	18998	15	5
136418	104972	31446	16	5
105000	104972	28	17	5
118000	104972	13028	18	5
114000	104972	9028	19	5
126000	104972	21028	20	5
130000	104972	25028	21	5
99100	104972	-5872	21	6
118938	101443	17495	22	6
120726	101443	19283	23	6
123508	101443	22065	24	6
115159	101443	13716	25	6
123970	101443	22527	26	6
136418	101443	34975	27	6
105000	101443	3557	28	6
118000	101443	16557	29	6
114000	101443	12557	30	6
126000	101443	24557	31	6
130000	101443	28557	32	6
99100	101443	-2343	32	7
120726	118938	1788	33	7
123508	118938	4570	34	7
115159	118938	-3779	34	8
123970	118938	5032	35	8
136418	118938	17480	36	8

105000	118938	-13938	36	9
118000	118938	-938	36	10
114000	118938	-4938	36	11
126000	118938	7062	37	11
130000	118938	11062	38	11
99100	118938	-19838	38	12
123508	120726	2782	39	12
115159	120726	-5567	39	13
123970	120726	3244	40	13
136418	120726	15692	41	13
105000	120726	-15726	41	14
118000	120726	-2726	41	15
114000	120726	-6726	41	16
126000	120726	5274	42	16
130000	120726	9274	43	16
99100	120726	-21626	43	17
115159	123508	-8349	43	18
123970	123508	462	44	18
136418	123508	12910	45	18
105000	123508	-18508	45	19
118000	123508	-5508	45	20
114000	123508	-9508	45	21
126000	123508	2492	46	21
130000	123508	6492	47	21
99100	123508	-24408	47	22
123970	115159	8811	48	22
136418	115159	21259	49	22
105000	115159	-10159	49	23
118000	115159	2841	50	23
114000	115159	-1159	50	24
126000	115159	10841	51	24
130000	115159	14841	52	24
99100	115159	-16059	52	25
136418	123970	12448	53	25
105000	123970	-18970	53	26
118000	123970	-5970	53	27
114000	123970	-9970	53	28
126000	123970	2030	54	28
130000	123970	6030	55	28
99100	123970	-24870	55	29
105000	136418	-31418	55	30
118000	136418	-18418	55	31
114000	136418	-22418	55	32
126000	136418	-10418	55	33
130000	136418	-6418	55	34
99100	136418	-37318	55	35
118000	105000	13000	56	35
114000	105000	9000	57	35
126000	105000	21000	58	35
130000	105000	25000	59	35
99100	105000	-5900	59	36

114000	118000	-4000	59	37
126000	118000	8000	60	37
130000	118000	12000	61	37
99100	118000	-18900	61	38
126000	114000	12000	62	38
130000	114000	16000	63	38
99100	114000	-14900	63	39
130000	126000	4000	64	39
99100	126000	-26900	64	40
99100	130000	-30900	64	41

S Statistic = 64 - 41 = 23

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Tied Group	Value	Members
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Time Period	Observations
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2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 7350

b = 24570

c = 420

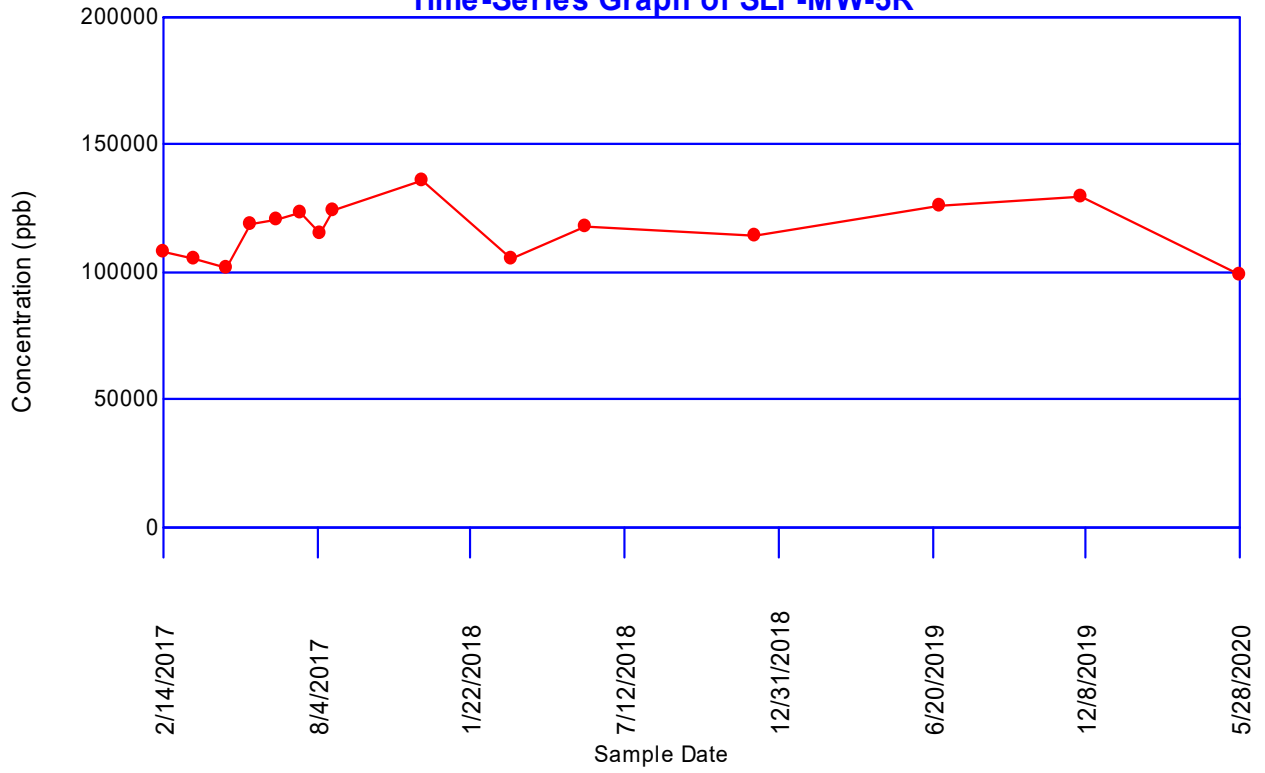
Group Variance = 408.333

Z-Score = 1.08872

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.08872| <= 1.97737 indicating no evidence of a trend

### Calcium Time-Series Graph of SLF-MW-5R



## Concentrations (ppb)

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	1.54749e+006	1.54749e+006
			11/30/2016	1.61454e+006	1.61454e+006
			12/28/2016	1.768e+006	1.768e+006
			1/18/2017	1.33503e+006	1.33503e+006
			2/14/2017	1.5337e+006	1.5337e+006
			3/20/2017	1.36241e+006	1.36241e+006
			4/25/2017	1.35437e+006	1.35437e+006
			5/22/2017	1.37044e+006	1.37044e+006
			6/20/2017	1.31495e+006	1.31495e+006
			7/17/2017	2.425e+006	2.425e+006
			8/8/2017	616000	616000
			8/21/2017	1.136e+006	1.136e+006
			11/29/2017	1.421e+006	1.421e+006
			3/8/2018	1.712e+006	1.712e+006
			5/31/2018	1.87e+006	1.87e+006
			12/4/2018	2.08e+006	2.08e+006
			6/28/2019	2.53e+006	2.53e+006
			12/2/2019	2.44e+006	2.44e+006
			5/28/2020	2.2e+006	2.2e+006
			<b>4/28/2021</b>	<b>1.48e+006</b>	<b>1.48e+006</b>

SLF-MW-3B	19	0 (0%)	10/21/2016	152574	152574
			11/30/2016	169582	169582
			12/28/2016	160177	160177
			1/18/2017	146634	146634
			2/15/2017	143113	143113
			3/20/2017	171319	171319
			4/25/2017	167869	167869
			5/22/2017	126662	126662
			6/20/2017	121058	121058
			7/17/2017	98000	98000
			8/7/2017	103000	103000
			8/21/2017	98000	98000
			11/29/2017	152000	152000
			3/8/2018	224000	224000
			5/30/2018	179000	179000
			12/4/2018	225000	225000
			6/27/2019	239000	239000
			12/2/2019	245000	245000
			5/28/2020	262000	262000

				<b>12/1/2020</b>	<b>269000</b>	<b>269000</b>
				<b>4/28/2021</b>	<b>250000</b>	<b>250000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	33649.2	33649.2	
			3/20/2017	25801.9	25801.9	
			4/25/2017	22580.8	22580.8	
			5/22/2017	16154	16154	
			6/20/2017	25945.6	25945.6	
			7/17/2017	26000	26000	
			8/7/2017	19100	19100	
			8/22/2017	25500	25500	
			11/29/2017	24500	24500	
			3/8/2018	15000	15000	
			5/30/2018	25500	25500	
			12/4/2018	20500	20500	
			6/28/2019	24300	24300	
			12/2/2019	29200	29200	
			5/28/2020	12400	12400	
			<b>11/30/2020</b>	<b>14200</b>	<b>14200</b>	
			<b>4/28/2021</b>	<b>25700</b>	<b>25700</b>	

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.0864162	0.386374	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	1.54749e+006	FALSE
	11/30/2016	1.61454e+006	FALSE
	12/28/2016	1.768e+006	FALSE
	1/18/2017	1.33503e+006	FALSE
	2/14/2017	1.5337e+006	FALSE
	3/20/2017	1.36241e+006	FALSE
	4/25/2017	1.35437e+006	FALSE
	5/22/2017	1.37044e+006	FALSE
	6/20/2017	1.31495e+006	FALSE
	7/17/2017	2.425e+006	FALSE
	8/8/2017	616000	FALSE
	8/21/2017	1.136e+006	FALSE
	11/29/2017	1.421e+006	FALSE
	3/8/2018	1.712e+006	FALSE
	5/31/2018	1.87e+006	FALSE
	12/4/2018	2.08e+006	FALSE
	6/28/2019	2.53e+006	FALSE
	12/2/2019	2.44e+006	FALSE
	5/28/2020	2.2e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	616000	2.53e+006	1.914e+006	0.4808	920251
2	1.136e+006	2.44e+006	1.304e+006	0.3232	421453
3	1.31495e+006	2.425e+006	1.11005e+006	0.2561	284284
4	1.33503e+006	2.2e+006	864970	0.2059	178097
5	1.35437e+006	2.08e+006	725630	0.1641	119076
6	1.36241e+006	1.87e+006	507590	0.1271	64514.7
7	1.37044e+006	1.768e+006	397560	0.0932	37052.6
8	1.421e+006	1.712e+006	291000	0.0612	17809.2
9	1.5337e+006	1.61454e+006	80840	0.0303	2449.45
10	1.54749e+006	1.54749e+006	0		
11	1.61454e+006	1.5337e+006	-80840		
12	1.712e+006	1.421e+006	-291000		
13	1.768e+006	1.37044e+006	-397560		
14	1.87e+006	1.36241e+006	-507590		
15	2.08e+006	1.35437e+006	-725630		
16	2.2e+006	1.33503e+006	-864970		
17	2.425e+006	1.31495e+006	-1.11005e+006		
18	2.44e+006	1.136e+006	-1.304e+006		
19	2.53e+006	616000	-1.914e+006		

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Sum of b values = 2.04499e+006

Sample Standard Deviation = 495499

W Statistic = 0.946287

5% Critical value of 0.901 is less than 0.946287

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.946287

Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: Chloride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1.61454e+006	1.54749e+006	67050	1	0
1.768e+006	1.54749e+006	220510	2	0
1.33503e+006	1.54749e+006	-212460	2	1
1.5337e+006	1.54749e+006	-13790	2	2
1.36241e+006	1.54749e+006	-185080	2	3
1.35437e+006	1.54749e+006	-193120	2	4
1.37044e+006	1.54749e+006	-177050	2	5
1.31495e+006	1.54749e+006	-232540	2	6
2.425e+006	1.54749e+006	877510	3	6
616000	1.54749e+006	-931490	3	7
1.136e+006	1.54749e+006	-411490	3	8
1.421e+006	1.54749e+006	-126490	3	9
1.712e+006	1.54749e+006	164510	4	9
1.87e+006	1.54749e+006	322510	5	9
2.08e+006	1.54749e+006	532510	6	9
2.53e+006	1.54749e+006	982510	7	9
2.44e+006	1.54749e+006	892510	8	9
2.2e+006	1.54749e+006	652510	9	9
1.768e+006	1.61454e+006	153460	10	9
1.33503e+006	1.61454e+006	-279510	10	10
1.5337e+006	1.61454e+006	-80840	10	11
1.36241e+006	1.61454e+006	-252130	10	12
1.35437e+006	1.61454e+006	-260170	10	13
1.37044e+006	1.61454e+006	-244100	10	14
1.31495e+006	1.61454e+006	-299590	10	15
2.425e+006	1.61454e+006	810460	11	15
616000	1.61454e+006	-998540	11	16
1.136e+006	1.61454e+006	-478540	11	17
1.421e+006	1.61454e+006	-193540	11	18
1.712e+006	1.61454e+006	97460	12	18
1.87e+006	1.61454e+006	255460	13	18
2.08e+006	1.61454e+006	465460	14	18
2.53e+006	1.61454e+006	915460	15	18
2.44e+006	1.61454e+006	825460	16	18
2.2e+006	1.61454e+006	585460	17	18
1.33503e+006	1.768e+006	-432970	17	19
1.5337e+006	1.768e+006	-234300	17	20
1.36241e+006	1.768e+006	-405590	17	21
1.35437e+006	1.768e+006	-413630	17	22
1.37044e+006	1.768e+006	-397560	17	23
1.31495e+006	1.768e+006	-453050	17	24
2.425e+006	1.768e+006	657000	18	24
616000	1.768e+006	-1.152e+006	18	25
1.136e+006	1.768e+006	-632000	18	26
1.421e+006	1.768e+006	-347000	18	27

1.712e+006	1.768e+006	-56000	18	28
1.87e+006	1.768e+006	102000	19	28
2.08e+006	1.768e+006	312000	20	28
2.53e+006	1.768e+006	762000	21	28
2.44e+006	1.768e+006	672000	22	28
2.2e+006	1.768e+006	432000	23	28
1.5337e+006	1.33503e+006	198670	24	28
1.36241e+006	1.33503e+006	27380	25	28
1.35437e+006	1.33503e+006	19340	26	28
1.37044e+006	1.33503e+006	35410	27	28
1.31495e+006	1.33503e+006	-20080	27	29
2.425e+006	1.33503e+006	1.08997e+006	28	29
616000	1.33503e+006	-719030	28	30
1.136e+006	1.33503e+006	-199030	28	31
1.421e+006	1.33503e+006	85970	29	31
1.712e+006	1.33503e+006	376970	30	31
1.87e+006	1.33503e+006	534970	31	31
2.08e+006	1.33503e+006	744970	32	31
2.53e+006	1.33503e+006	1.19497e+006	33	31
2.44e+006	1.33503e+006	1.10497e+006	34	31
2.2e+006	1.33503e+006	864970	35	31
1.36241e+006	1.5337e+006	-171290	35	32
1.35437e+006	1.5337e+006	-179330	35	33
1.37044e+006	1.5337e+006	-163260	35	34
1.31495e+006	1.5337e+006	-218750	35	35
2.425e+006	1.5337e+006	891300	36	35
616000	1.5337e+006	-917700	36	36
1.136e+006	1.5337e+006	-397700	36	37
1.421e+006	1.5337e+006	-112700	36	38
1.712e+006	1.5337e+006	178300	37	38
1.87e+006	1.5337e+006	336300	38	38
2.08e+006	1.5337e+006	546300	39	38
2.53e+006	1.5337e+006	996300	40	38
2.44e+006	1.5337e+006	906300	41	38
2.2e+006	1.5337e+006	666300	42	38
1.35437e+006	1.36241e+006	-8040	42	39
1.37044e+006	1.36241e+006	8030	43	39
1.31495e+006	1.36241e+006	-47460	43	40
2.425e+006	1.36241e+006	1.06259e+006	44	40
616000	1.36241e+006	-746410	44	41
1.136e+006	1.36241e+006	-226410	44	42
1.421e+006	1.36241e+006	58590	45	42
1.712e+006	1.36241e+006	349590	46	42
1.87e+006	1.36241e+006	507590	47	42
2.08e+006	1.36241e+006	717590	48	42
2.53e+006	1.36241e+006	1.16759e+006	49	42
2.44e+006	1.36241e+006	1.07759e+006	50	42
2.2e+006	1.36241e+006	837590	51	42
1.37044e+006	1.35437e+006	16070	52	42
1.31495e+006	1.35437e+006	-39420	52	43
2.425e+006	1.35437e+006	1.07063e+006	53	43
616000	1.35437e+006	-738370	53	44
1.136e+006	1.35437e+006	-218370	53	45

1.421e+006	1.35437e+006	66630	54	45
1.712e+006	1.35437e+006	357630	55	45
1.87e+006	1.35437e+006	515630	56	45
2.08e+006	1.35437e+006	725630	57	45
2.53e+006	1.35437e+006	1.17563e+006	58	45
2.44e+006	1.35437e+006	1.08563e+006	59	45
2.2e+006	1.35437e+006	845630	60	45
1.31495e+006	1.37044e+006	-55490	60	46
2.425e+006	1.37044e+006	1.05456e+006	61	46
616000	1.37044e+006	-754440	61	47
1.136e+006	1.37044e+006	-234440	61	48
1.421e+006	1.37044e+006	50560	62	48
1.712e+006	1.37044e+006	341560	63	48
1.87e+006	1.37044e+006	499560	64	48
2.08e+006	1.37044e+006	709560	65	48
2.53e+006	1.37044e+006	1.15956e+006	66	48
2.44e+006	1.37044e+006	1.06956e+006	67	48
2.2e+006	1.37044e+006	829560	68	48
2.425e+006	1.31495e+006	1.11005e+006	69	48
616000	1.31495e+006	-698950	69	49
1.136e+006	1.31495e+006	-178950	69	50
1.421e+006	1.31495e+006	106050	70	50
1.712e+006	1.31495e+006	397050	71	50
1.87e+006	1.31495e+006	555050	72	50
2.08e+006	1.31495e+006	765050	73	50
2.53e+006	1.31495e+006	1.21505e+006	74	50
2.44e+006	1.31495e+006	1.12505e+006	75	50
2.2e+006	1.31495e+006	885050	76	50
616000	2.425e+006	-1.809e+006	76	51
1.136e+006	2.425e+006	-1.289e+006	76	52
1.421e+006	2.425e+006	-1.004e+006	76	53
1.712e+006	2.425e+006	-713000	76	54
1.87e+006	2.425e+006	-555000	76	55
2.08e+006	2.425e+006	-345000	76	56
2.53e+006	2.425e+006	105000	77	56
2.44e+006	2.425e+006	15000	78	56
2.2e+006	2.425e+006	-225000	78	57
1.136e+006	616000	520000	79	57
1.421e+006	616000	805000	80	57
1.712e+006	616000	1.096e+006	81	57
1.87e+006	616000	1.254e+006	82	57
2.08e+006	616000	1.464e+006	83	57
2.53e+006	616000	1.914e+006	84	57
2.44e+006	616000	1.824e+006	85	57
2.2e+006	616000	1.584e+006	86	57
1.421e+006	1.136e+006	285000	87	57
1.712e+006	1.136e+006	576000	88	57
1.87e+006	1.136e+006	734000	89	57
2.08e+006	1.136e+006	944000	90	57
2.53e+006	1.136e+006	1.394e+006	91	57
2.44e+006	1.136e+006	1.304e+006	92	57
2.2e+006	1.136e+006	1.064e+006	93	57

1.712e+006	1.421e+006	291000	94	57
1.87e+006	1.421e+006	449000	95	57
2.08e+006	1.421e+006	659000	96	57
2.53e+006	1.421e+006	1.109e+006	97	57
2.44e+006	1.421e+006	1.019e+006	98	57
2.2e+006	1.421e+006	779000	99	57
1.87e+006	1.712e+006	158000	100	57
2.08e+006	1.712e+006	368000	101	57
2.53e+006	1.712e+006	818000	102	57
2.44e+006	1.712e+006	728000	103	57
2.2e+006	1.712e+006	488000	104	57
2.08e+006	1.87e+006	210000	105	57
2.53e+006	1.87e+006	660000	106	57
2.44e+006	1.87e+006	570000	107	57
2.2e+006	1.87e+006	330000	108	57
2.53e+006	2.08e+006	450000	109	57
2.44e+006	2.08e+006	360000	110	57
2.2e+006	2.08e+006	120000	111	57
2.44e+006	2.53e+006	-90000	111	58
2.2e+006	2.53e+006	-330000	111	59
2.2e+006	2.44e+006	-240000	111	60

S Statistic = 111 - 60 = 51

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/8/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/31/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

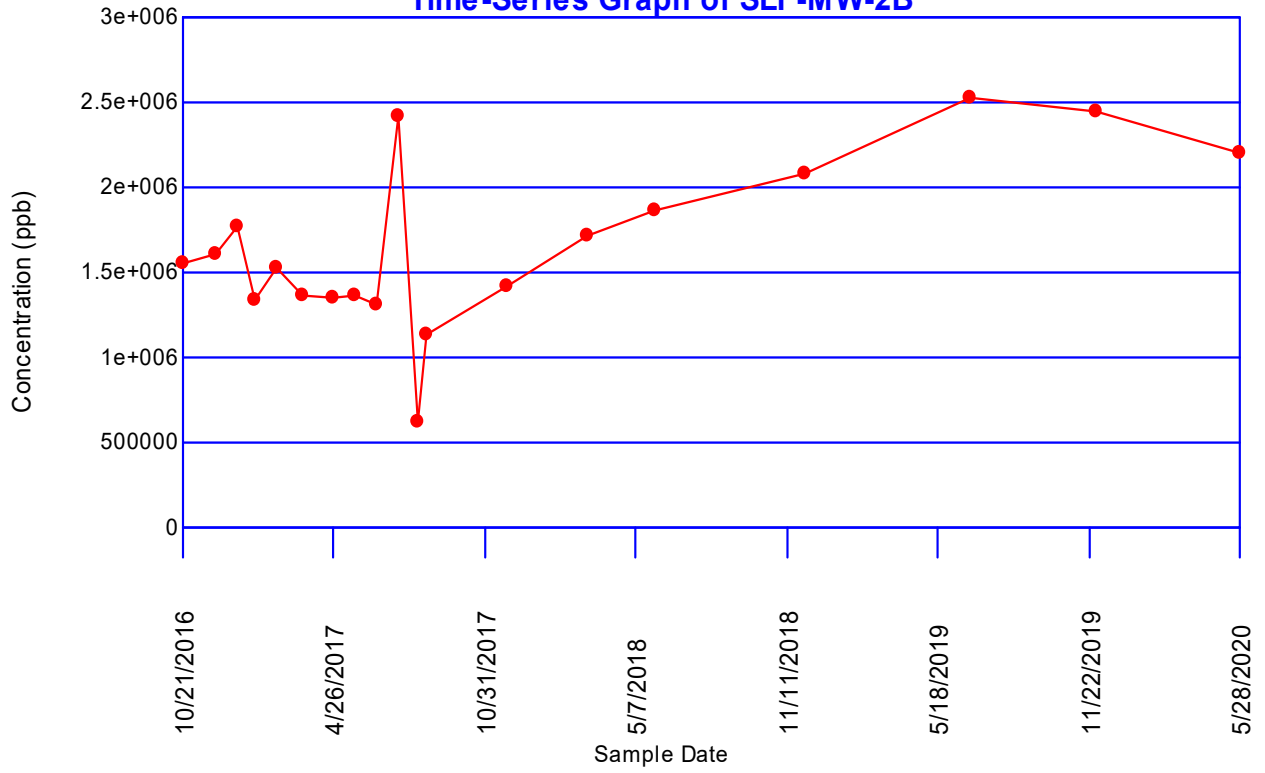
Group Variance = 817

Z-Score = 1.74928

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.74928| <= 1.97737 indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-2B





## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.144654	0.035461	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	152574	FALSE
	11/30/2016	169582	FALSE
	12/28/2016	160177	FALSE
	1/18/2017	146634	FALSE
	2/15/2017	143113	FALSE
	3/20/2017	171319	FALSE
	4/25/2017	167869	FALSE
	5/22/2017	126662	FALSE
	6/20/2017	121058	FALSE
	7/17/2017	98000	FALSE
	8/7/2017	103000	FALSE
	8/21/2017	98000	FALSE
	11/29/2017	152000	FALSE
	3/8/2018	224000	FALSE
	5/30/2018	179000	FALSE
	12/4/2018	225000	FALSE
	6/27/2019	239000	FALSE
	12/2/2019	245000	FALSE
	5/28/2020	262000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	98000	262000	164000	0.4808	78851.2
2	98000	245000	147000	0.3232	47510.4
3	103000	239000	136000	0.2561	34829.6
4	121058	225000	103942	0.2059	21401.7
5	126662	224000	97338	0.1641	15973.2
6	143113	179000	35887	0.1271	4561.24
7	146634	171319	24685	0.0932	2300.64
8	152000	169582	17582	0.0612	1076.02
9	152574	167869	15295	0.0303	463.439
10	160177	160177	0		
11	167869	152574	-15295		
12	169582	152000	-17582		
13	171319	146634	-24685		
14	179000	143113	-35887		
15	224000	126662	-97338		
16	225000	121058	-103942		
17	239000	103000	-136000		
18	245000	98000	-147000		
19	262000	98000	-164000		

---

Sum of b values = 206967

Sample Standard Deviation = 50492.3

W Statistic = 0.933427

5% Critical value of 0.901 is less than 0.933427

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.933427

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Chloride**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

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<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
169582	152574	17008	1	0
160177	152574	7603	2	0
146634	152574	-5940	2	1
143113	152574	-9461	2	2
171319	152574	18745	3	2
167869	152574	15295	4	2
126662	152574	-25912	4	3
121058	152574	-31516	4	4
98000	152574	-54574	4	5
103000	152574	-49574	4	6
98000	152574	-54574	4	7
152000	152574	-574	4	8
224000	152574	71426	5	8
179000	152574	26426	6	8
225000	152574	72426	7	8
239000	152574	86426	8	8
245000	152574	92426	9	8
262000	152574	109426	10	8
160177	169582	-9405	10	9
146634	169582	-22948	10	10
143113	169582	-26469	10	11
171319	169582	1737	11	11
167869	169582	-1713	11	12
126662	169582	-42920	11	13
121058	169582	-48524	11	14
98000	169582	-71582	11	15
103000	169582	-66582	11	16
98000	169582	-71582	11	17
152000	169582	-17582	11	18
224000	169582	54418	12	18
179000	169582	9418	13	18
225000	169582	55418	14	18
239000	169582	69418	15	18
245000	169582	75418	16	18
262000	169582	92418	17	18
146634	160177	-13543	17	19
143113	160177	-17064	17	20
171319	160177	11142	18	20
167869	160177	7692	19	20
126662	160177	-33515	19	21
121058	160177	-39119	19	22
98000	160177	-62177	19	23
103000	160177	-57177	19	24
98000	160177	-62177	19	25
152000	160177	-8177	19	26

224000	160177	63823	20	26
179000	160177	18823	21	26
225000	160177	64823	22	26
239000	160177	78823	23	26
245000	160177	84823	24	26
262000	160177	101823	25	26
143113	146634	-3521	25	27
171319	146634	24685	26	27
167869	146634	21235	27	27
126662	146634	-19972	27	28
121058	146634	-25576	27	29
98000	146634	-48634	27	30
103000	146634	-43634	27	31
98000	146634	-48634	27	32
152000	146634	5366	28	32
224000	146634	77366	29	32
179000	146634	32366	30	32
225000	146634	78366	31	32
239000	146634	92366	32	32
245000	146634	98366	33	32
262000	146634	115366	34	32
171319	143113	28206	35	32
167869	143113	24756	36	32
126662	143113	-16451	36	33
121058	143113	-22055	36	34
98000	143113	-45113	36	35
103000	143113	-40113	36	36
98000	143113	-45113	36	37
152000	143113	8887	37	37
224000	143113	80887	38	37
179000	143113	35887	39	37
225000	143113	81887	40	37
239000	143113	95887	41	37
245000	143113	101887	42	37
262000	143113	118887	43	37
167869	171319	-3450	43	38
126662	171319	-44657	43	39
121058	171319	-50261	43	40
98000	171319	-73319	43	41
103000	171319	-68319	43	42
98000	171319	-73319	43	43
152000	171319	-19319	43	44
224000	171319	52681	44	44
179000	171319	7681	45	44
225000	171319	53681	46	44
239000	171319	67681	47	44
245000	171319	73681	48	44
262000	171319	90681	49	44
126662	167869	-41207	49	45
121058	167869	-46811	49	46
98000	167869	-69869	49	47
103000	167869	-64869	49	48
98000	167869	-69869	49	49

152000	167869	-15869	49	50
224000	167869	56131	50	50
179000	167869	11131	51	50
225000	167869	57131	52	50
239000	167869	71131	53	50
245000	167869	77131	54	50
262000	167869	94131	55	50
121058	126662	-5604	55	51
98000	126662	-28662	55	52
103000	126662	-23662	55	53
98000	126662	-28662	55	54
152000	126662	25338	56	54
224000	126662	97338	57	54
179000	126662	52338	58	54
225000	126662	98338	59	54
239000	126662	112338	60	54
245000	126662	118338	61	54
262000	126662	135338	62	54
98000	121058	-23058	62	55
103000	121058	-18058	62	56
98000	121058	-23058	62	57
152000	121058	30942	63	57
224000	121058	102942	64	57
179000	121058	57942	65	57
225000	121058	103942	66	57
239000	121058	117942	67	57
245000	121058	123942	68	57
262000	121058	140942	69	57
103000	98000	5000	70	57
98000	98000	0	70	57
152000	98000	54000	71	57
224000	98000	126000	72	57
179000	98000	81000	73	57
225000	98000	127000	74	57
239000	98000	141000	75	57
245000	98000	147000	76	57
262000	98000	164000	77	57
98000	103000	-5000	77	58
152000	103000	49000	78	58
224000	103000	121000	79	58
179000	103000	76000	80	58
225000	103000	122000	81	58
239000	103000	136000	82	58
245000	103000	142000	83	58
262000	103000	159000	84	58
152000	98000	54000	85	58
224000	98000	126000	86	58
179000	98000	81000	87	58
225000	98000	127000	88	58
239000	98000	141000	89	58
245000	98000	147000	90	58
262000	98000	164000	91	58

224000	152000	72000	92	58
179000	152000	27000	93	58
225000	152000	73000	94	58
239000	152000	87000	95	58
245000	152000	93000	96	58
262000	152000	110000	97	58
179000	224000	-45000	97	59
225000	224000	1000	98	59
239000	224000	15000	99	59
245000	224000	21000	100	59
262000	224000	38000	101	59
225000	179000	46000	102	59
239000	179000	60000	103	59
245000	179000	66000	104	59
262000	179000	83000	105	59
239000	225000	14000	106	59
245000	225000	20000	107	59
262000	225000	37000	108	59
245000	239000	6000	109	59
262000	239000	23000	110	59
262000	245000	17000	111	59

S Statistic = 111 - 59 = 52

---

Tied Group	Value	Members
1	98000	2

---

Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 14706

b = 52326

c = 684

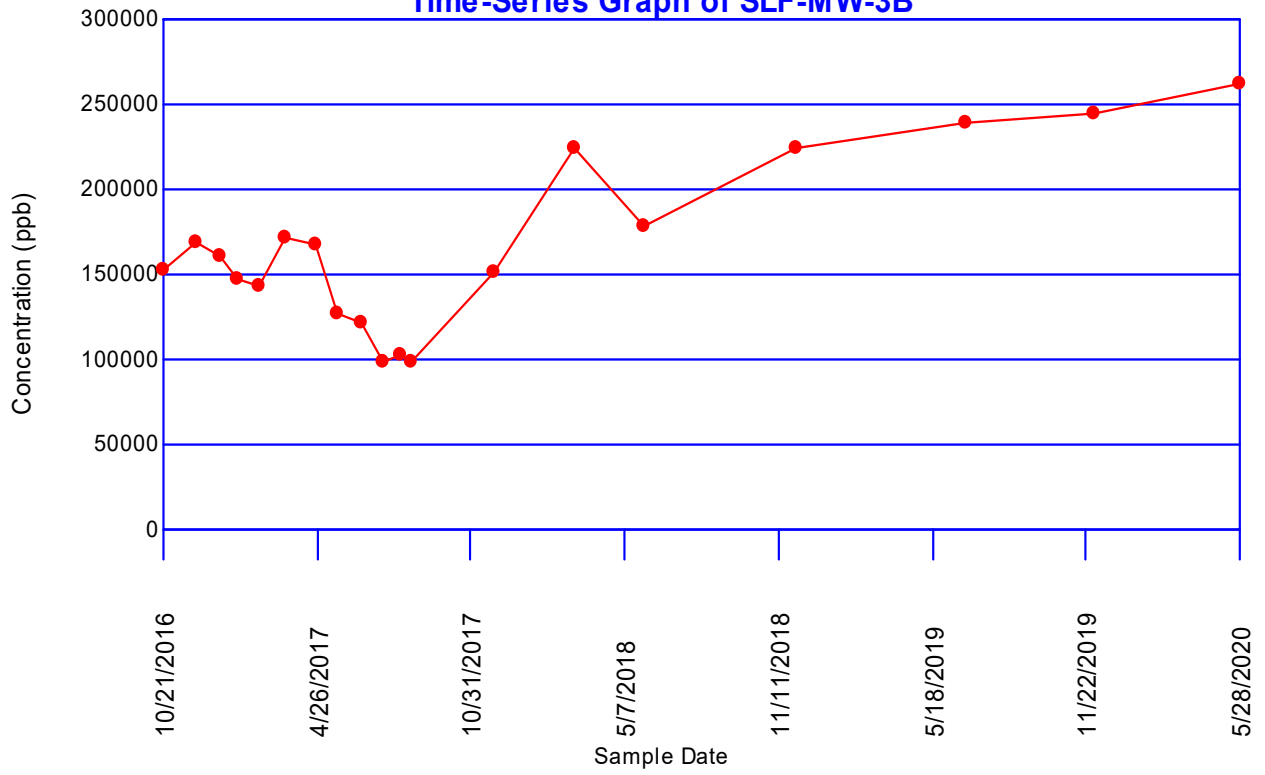
Group Variance = 816

Z-Score = 1.78536

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

|1.78536| <= 1.97737 indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-3B





## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.437217	0.276029	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	33649.2	FALSE
	3/20/2017	25801.9	FALSE
	4/25/2017	22580.8	FALSE
	5/22/2017	16154	FALSE
	6/20/2017	25945.6	FALSE
	7/17/2017	26000	FALSE
	8/7/2017	19100	FALSE
	8/22/2017	25500	FALSE
	11/29/2017	24500	FALSE
	3/8/2018	15000	FALSE
	5/30/2018	25500	FALSE
	12/4/2018	20500	FALSE
	6/28/2019	24300	FALSE
	12/2/2019	29200	FALSE
	5/28/2020	12400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	12400	33649.2	21249.2	0.515	10943.3
2	15000	29200	14200	0.3306	4694.52
3	16154	26000	9846	0.2495	2456.58
4	19100	25945.6	6845.6	0.1878	1285.6
5	20500	25801.9	5301.9	0.1353	717.347
6	22580.8	25500	2919.2	0.088	256.89
7	24300	25500	1200	0.0433	51.96
8	24500	24500	0		
9	25500	24300	-1200		
10	25500	22580.8	-2919.2		
11	25801.9	20500	-5301.9		
12	25945.6	19100	-6845.6		
13	26000	16154	-9846		
14	29200	15000	-14200		
15	33649.2	12400	-21249.2		

---

Sum of b values = 20406.2

Sample Standard Deviation = 5597.13

W Statistic = 0.949437

5% Critical value of 0.881 is less than 0.949437

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.949437

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Chloride**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
25801.9	33649.2	-7847.3	0	1
22580.8	33649.2	-11068.4	0	2
16154	33649.2	-17495.2	0	3
25945.6	33649.2	-7703.6	0	4
26000	33649.2	-7649.2	0	5
19100	33649.2	-14549.2	0	6
25500	33649.2	-8149.2	0	7
24500	33649.2	-9149.2	0	8
15000	33649.2	-18649.2	0	9
25500	33649.2	-8149.2	0	10
20500	33649.2	-13149.2	0	11
24300	33649.2	-9349.2	0	12
29200	33649.2	-4449.2	0	13
12400	33649.2	-21249.2	0	14
22580.8	25801.9	-3221.1	0	15
16154	25801.9	-9647.9	0	16
25945.6	25801.9	143.7	1	16
26000	25801.9	198.1	2	16
19100	25801.9	-6701.9	2	17
25500	25801.9	-301.9	2	18
24500	25801.9	-1301.9	2	19
15000	25801.9	-10801.9	2	20
25500	25801.9	-301.9	2	21
20500	25801.9	-5301.9	2	22
24300	25801.9	-1501.9	2	23
29200	25801.9	3398.1	3	23
12400	25801.9	-13401.9	3	24
16154	22580.8	-6426.8	3	25
25945.6	22580.8	3364.8	4	25
26000	22580.8	3419.2	5	25
19100	22580.8	-3480.8	5	26
25500	22580.8	2919.2	6	26
24500	22580.8	1919.2	7	26
15000	22580.8	-7580.8	7	27
25500	22580.8	2919.2	8	27
20500	22580.8	-2080.8	8	28
24300	22580.8	1719.2	9	28
29200	22580.8	6619.2	10	28
12400	22580.8	-10180.8	10	29
25945.6	16154	9791.6	11	29
26000	16154	9846	12	29
19100	16154	2946	13	29
25500	16154	9346	14	29
24500	16154	8346	15	29

15000	16154	-1154	15	30
25500	16154	9346	16	30
20500	16154	4346	17	30
24300	16154	8146	18	30
29200	16154	13046	19	30
12400	16154	-3754	19	31
26000	25945.6	54.4	20	31
19100	25945.6	-6845.6	20	32
25500	25945.6	-445.6	20	33
24500	25945.6	-1445.6	20	34
15000	25945.6	-10945.6	20	35
25500	25945.6	-445.6	20	36
20500	25945.6	-5445.6	20	37
24300	25945.6	-1645.6	20	38
29200	25945.6	3254.4	21	38
12400	25945.6	-13545.6	21	39
19100	26000	-6900	21	40
25500	26000	-500	21	41
24500	26000	-1500	21	42
15000	26000	-11000	21	43
25500	26000	-500	21	44
20500	26000	-5500	21	45
24300	26000	-1700	21	46
29200	26000	3200	22	46
12400	26000	-13600	22	47
25500	19100	6400	23	47
24500	19100	5400	24	47
15000	19100	-4100	24	48
25500	19100	6400	25	48
20500	19100	1400	26	48
24300	19100	5200	27	48
29200	19100	10100	28	48
12400	19100	-6700	28	49
24500	25500	-1000	28	50
15000	25500	-10500	28	51
25500	25500	0	28	51
20500	25500	-5000	28	52
24300	25500	-1200	28	53
29200	25500	3700	29	53
12400	25500	-13100	29	54
15000	24500	-9500	29	55
25500	24500	1000	30	55
20500	24500	-4000	30	56
24300	24500	-200	30	57
29200	24500	4700	31	57
12400	24500	-12100	31	58
25500	15000	10500	32	58
20500	15000	5500	33	58
24300	15000	9300	34	58
29200	15000	14200	35	58
12400	15000	-2600	35	59

20500	25500	-5000	35	60
24300	25500	-1200	35	61
29200	25500	3700	36	61
12400	25500	-13100	36	62
24300	20500	3800	37	62
29200	20500	8700	38	62
12400	20500	-8100	38	63
29200	24300	4900	39	63
12400	24300	-11900	39	64
12400	29200	-16800	39	65

S Statistic = 39 - 65 = -26

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Tied Group	Value	Members
1	25500	2

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Time Period	Observations
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 7350

b = 24570

c = 420

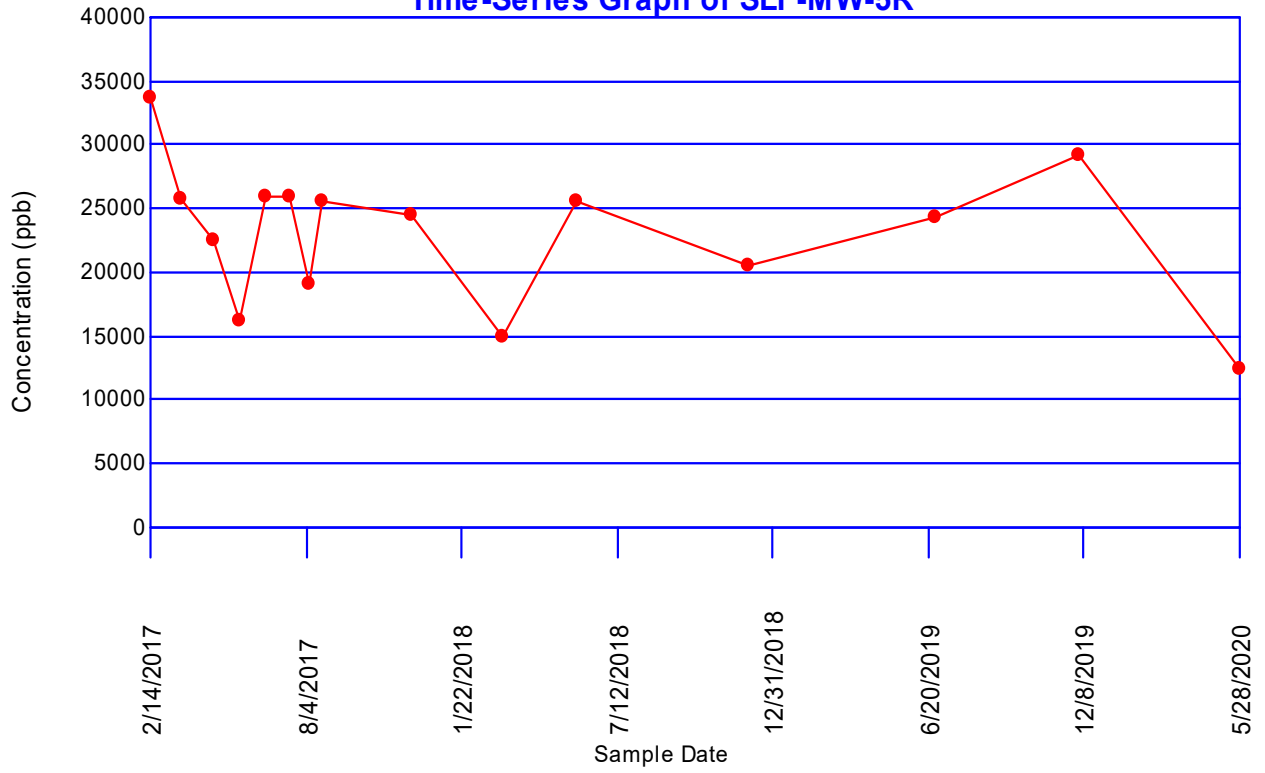
Group Variance = 407.333

Z-Score = -1.2387

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

$|-1.2387| \leq 1.97737$  indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-5R



## Concentrations (ppb)

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 34

Percent Non-Detects: 68%

Total Background Measurements: 0

There are 0 background locations

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Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

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Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	18	2 (11.1111%)	10/21/2016	ND<500	ND<500	
			11/30/2016	2647.4	2647.4	
			12/28/2016	1500	1500	
			1/18/2017	1875.9	1875.9	
			2/14/2017	ND<500	ND<500	
			3/20/2017	1794.9	1794.9	
			4/25/2017	1972.9	1972.9	
			5/22/2017	1673.4	1673.4	
			6/20/2017	2104.9	2104.9	
			7/17/2017	2000	2000	
			8/8/2017	2000	2000	
			8/21/2017	1900	1900	
			11/29/2017	2000	2000	
			5/31/2018	2200	2200	
			12/4/2018	1620	1620	
			6/28/2019	2190	2190	
			12/2/2019	2280	2280	
			5/28/2020	2330	2330	
				<b>11/30/2020</b>	<b>2220</b>	<b>2220</b>
				<b>4/28/2021</b>	<b>1980</b>	<b>1980</b>

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SLF-MW-3B	18	18 (100%)	10/21/2016	ND<500	ND<500	
			11/30/2016	ND<500	ND<500	
			12/28/2016	ND<500	ND<500	
			1/18/2017	ND<500	ND<500	
			2/15/2017	ND<500	ND<500	
			3/20/2017	ND<500	ND<500	
			4/25/2017	ND<500	ND<500	
			5/22/2017	ND<500	ND<500	
			6/20/2017	ND<500	ND<500	
			7/17/2017	ND<500	ND<500	
			8/7/2017	ND<500	ND<500	
			8/21/2017	ND<500	ND<500	
			11/29/2017	ND<500	ND<500	
			5/30/2018	ND<500	ND<500	
			12/4/2018	ND<500	ND<500	
			6/27/2019	ND<500	ND<500	
			12/2/2019	ND<500	ND<500	
			5/28/2020	ND<500	ND<500	
				<b>12/1/2020</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>
				<b>4/28/2021</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>

SLF-MW-5R	14	14 (100%)	2/14/2017	ND<500	ND<500
			3/20/2017	ND<500	ND<500
			4/25/2017	ND<500	ND<500
			5/22/2017	ND<500	ND<500
			6/20/2017	ND<500	ND<500
			7/17/2017	ND<500	ND<500
			8/7/2017	ND<500	ND<500
			8/22/2017	ND<500	ND<500
			11/29/2017	ND<500	ND<500
			5/30/2018	ND<500	ND<500
			12/4/2018	ND<500	ND<500
			6/28/2019	ND<500	ND<500
			12/2/2019	ND<500	ND<500
			5/28/2020	ND<500	ND<500
			<b>11/30/2020</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>
			<b>4/28/2021</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
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## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.320202	0.561798	0.475	500
2	0.357602	0.629213	0.49	500
3	0.377207	0.222308	0.507	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	ND<500	TRUE
	11/30/2016	2647.4	FALSE
	12/28/2016	1500	FALSE
	1/18/2017	1875.9	FALSE
	2/14/2017	ND<500	TRUE
	3/20/2017	1794.9	FALSE
	4/25/2017	1972.9	FALSE
	5/22/2017	1673.4	FALSE
	6/20/2017	2104.9	FALSE
	7/17/2017	2000	FALSE
	8/8/2017	2000	FALSE
	8/21/2017	1900	FALSE
	11/29/2017	2000	FALSE
	5/31/2018	2200	FALSE
	12/4/2018	1620	FALSE
	6/28/2019	2190	FALSE
	12/2/2019	2280	FALSE
	5/28/2020	2330	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Fluoride

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	500	2647.4	2147.4	0.4886	1049.22
2	500	2330	1830	0.3253	595.299
3	1500	2280	780	0.2553	199.134
4	1620	2200	580	0.2027	117.566
5	1673.4	2190	516.6	0.1587	81.9844
6	1794.9	2104.9	310	0.1197	37.107
7	1875.9	2000	124.1	0.0837	10.3872
8	1900	2000	100	0.0496	4.96
9	1972.9	2000	27.1	0.0163	0.44173
10	2000	1972.9	-27.1		
11	2000	1900	-100		
12	2000	1875.9	-124.1		
13	2104.9	1794.9	-310		
14	2190	1673.4	-516.6		
15	2200	1620	-580		
16	2280	1500	-780		
17	2330	500	-1830		
18	2647.4	500	-2147.4		

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Sum of b values = 2096.1

Sample Standard Deviation = 557.946

W Statistic = 0.830216

**5% Critical value of 0.897 exceeds 0.830216**  
**Evidence of non-normality at 95% level of significance**

**1% Critical value of 0.858 exceeds 0.830216**  
**Evidence of non-normality at 99% level of significance**

# Mann-Kendall Trend Analysis

Parameter: Fluoride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
2647.4	ND<500	2147.4	1	0
1500	ND<500	1000	2	0
1875.9	ND<500	1375.9	3	0
ND<500	ND<500	0	3	0
1794.9	ND<500	1294.9	4	0
1972.9	ND<500	1472.9	5	0
1673.4	ND<500	1173.4	6	0
2104.9	ND<500	1604.9	7	0
2000	ND<500	1500	8	0
2000	ND<500	1500	9	0
1900	ND<500	1400	10	0
2000	ND<500	1500	11	0
2200	ND<500	1700	12	0
1620	ND<500	1120	13	0
2190	ND<500	1690	14	0
2280	ND<500	1780	15	0
2330	ND<500	1830	16	0
1500	2647.4	-1147.4	16	1
1875.9	2647.4	-771.5	16	2
ND<500	2647.4	-2147.4	16	3
1794.9	2647.4	-852.5	16	4
1972.9	2647.4	-674.5	16	5
1673.4	2647.4	-974	16	6
2104.9	2647.4	-542.5	16	7
2000	2647.4	-647.4	16	8
2000	2647.4	-647.4	16	9
1900	2647.4	-747.4	16	10
2000	2647.4	-647.4	16	11
2200	2647.4	-447.4	16	12
1620	2647.4	-1027.4	16	13
2190	2647.4	-457.4	16	14
2280	2647.4	-367.4	16	15
2330	2647.4	-317.4	16	16
1875.9	1500	375.9	17	16
ND<500	1500	-1000	17	17
1794.9	1500	294.9	18	17
1972.9	1500	472.9	19	17
1673.4	1500	173.4	20	17
2104.9	1500	604.9	21	17
2000	1500	500	22	17
2000	1500	500	23	17
1900	1500	400	24	17
2000	1500	500	25	17
2200	1500	700	26	17
1620	1500	120	27	17

2190	1500	690	28	17
2280	1500	780	29	17
2330	1500	830	30	17
ND<500	1875.9	-1375.9	30	18
1794.9	1875.9	-81	30	19
1972.9	1875.9	97	31	19
1673.4	1875.9	-202.5	31	20
2104.9	1875.9	229	32	20
2000	1875.9	124.1	33	20
2000	1875.9	124.1	34	20
1900	1875.9	24.1	35	20
2000	1875.9	124.1	36	20
2200	1875.9	324.1	37	20
1620	1875.9	-255.9	37	21
2190	1875.9	314.1	38	21
2280	1875.9	404.1	39	21
2330	1875.9	454.1	40	21
1794.9	ND<500	1294.9	41	21
1972.9	ND<500	1472.9	42	21
1673.4	ND<500	1173.4	43	21
2104.9	ND<500	1604.9	44	21
2000	ND<500	1500	45	21
2000	ND<500	1500	46	21
1900	ND<500	1400	47	21
2000	ND<500	1500	48	21
2200	ND<500	1700	49	21
1620	ND<500	1120	50	21
2190	ND<500	1690	51	21
2280	ND<500	1780	52	21
2330	ND<500	1830	53	21
1972.9	1794.9	178	54	21
1673.4	1794.9	-121.5	54	22
2104.9	1794.9	310	55	22
2000	1794.9	205.1	56	22
2000	1794.9	205.1	57	22
1900	1794.9	105.1	58	22
2000	1794.9	205.1	59	22
2200	1794.9	405.1	60	22
1620	1794.9	-174.9	60	23
2190	1794.9	395.1	61	23
2280	1794.9	485.1	62	23
2330	1794.9	535.1	63	23
1673.4	1972.9	-299.5	63	24
2104.9	1972.9	132	64	24
2000	1972.9	27.1	65	24
2000	1972.9	27.1	66	24
1900	1972.9	-72.9	66	25
2000	1972.9	27.1	67	25
2200	1972.9	227.1	68	25
1620	1972.9	-352.9	68	26
2190	1972.9	217.1	69	26
2280	1972.9	307.1	70	26
2330	1972.9	357.1	71	26

2104.9	1673.4	431.5	72	26
2000	1673.4	326.6	73	26
2000	1673.4	326.6	74	26
1900	1673.4	226.6	75	26
2000	1673.4	326.6	76	26
2200	1673.4	526.6	77	26
1620	1673.4	-53.4	77	27
2190	1673.4	516.6	78	27
2280	1673.4	606.6	79	27
2330	1673.4	656.6	80	27
2000	2104.9	-104.9	80	28
2000	2104.9	-104.9	80	29
1900	2104.9	-204.9	80	30
2000	2104.9	-104.9	80	31
2200	2104.9	95.1	81	31
1620	2104.9	-484.9	81	32
2190	2104.9	85.1	82	32
2280	2104.9	175.1	83	32
2330	2104.9	225.1	84	32
2000	2000	0	84	32
1900	2000	-100	84	33
2000	2000	0	84	33
2200	2000	200	85	33
1620	2000	-380	85	34
2190	2000	190	86	34
2280	2000	280	87	34
2330	2000	330	88	34
1900	2000	-100	88	35
2000	2000	0	88	35
2200	2000	200	89	35
1620	2000	-380	89	36
2190	2000	190	90	36
2280	2000	280	91	36
2330	2000	330	92	36
2000	1900	100	93	36
2200	1900	300	94	36
1620	1900	-280	94	37
2190	1900	290	95	37
2280	1900	380	96	37
2330	1900	430	97	37
2200	2000	200	98	37
1620	2000	-380	98	38
2190	2000	190	99	38
2280	2000	280	100	38
2330	2000	330	101	38
1620	2200	-580	101	39
2190	2200	-10	101	40
2280	2200	80	102	40
2330	2200	130	103	40

2190	1620	570	104	40
2280	1620	660	105	40
2330	1620	710	106	40
2280	2190	90	107	40
2330	2190	140	108	40
2330	2280	50	109	40

S Statistic = 109 - 40 = 69

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Tied Group	Value	Members
1	500	2
2	2000	3

---

Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 84

B = 0

C = 6

D = 0

E = 8

F = 0

a = 12546

b = 44064

c = 612

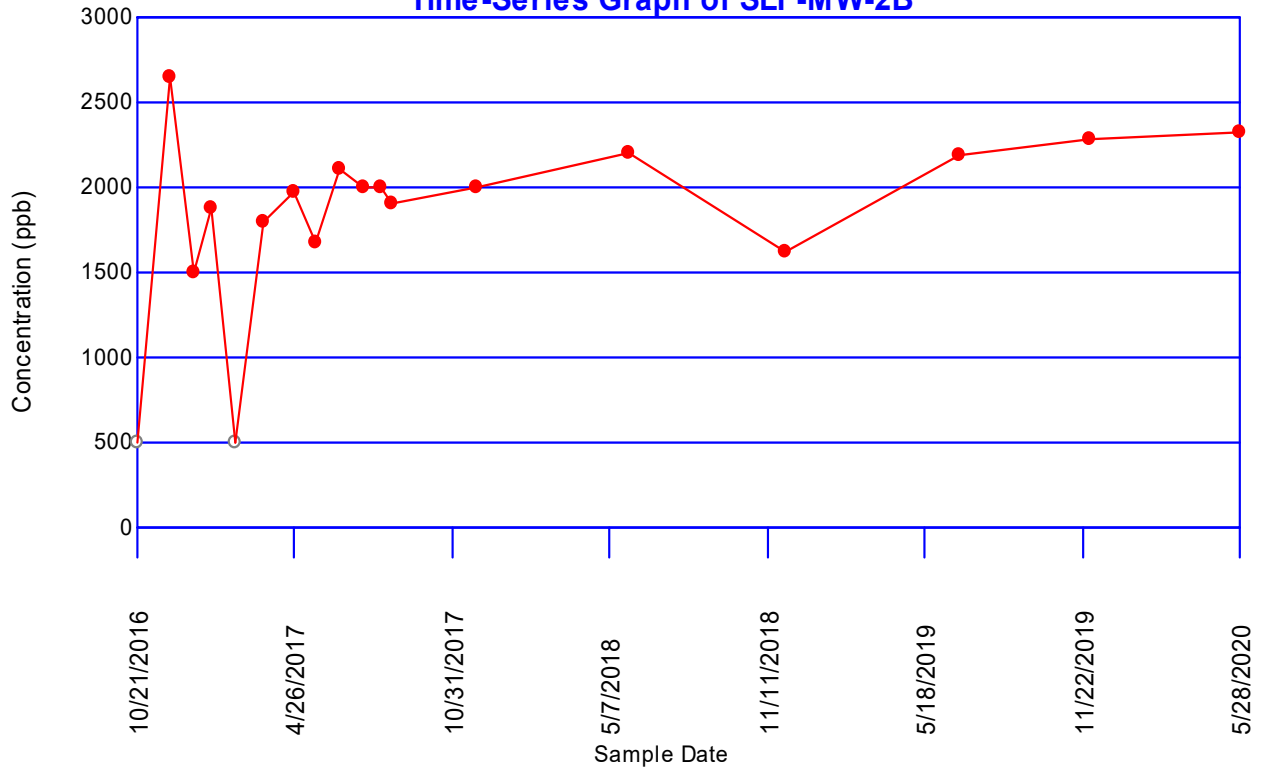
Group Variance = 692.333

Z-Score = 2.58435

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**|2.58435| > 1.97737 indicating a trend**

# Fluoride Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

**Iteration    Highest    Lowest    Critical    Outlier**

**A Divide-By-Zero error occurred in the calculations.**

**Additional Outliers May Exist.**

<b>Loc.</b>	<b>Date</b>	<b>Conc.</b>	<b>Outlier</b>
SLF-MW-3B	10/21/2016	ND<500	FALSE
	11/30/2016	ND<500	FALSE
	12/28/2016	ND<500	FALSE
	1/18/2017	ND<500	FALSE
	2/15/2017	ND<500	FALSE
	3/20/2017	ND<500	FALSE
	4/25/2017	ND<500	FALSE
	5/22/2017	ND<500	FALSE
	6/20/2017	ND<500	FALSE
	7/17/2017	ND<500	FALSE
	8/7/2017	ND<500	FALSE
	8/21/2017	ND<500	FALSE
	11/29/2017	ND<500	FALSE
	5/30/2018	ND<500	FALSE
	12/4/2018	ND<500	FALSE
	6/27/2019	ND<500	FALSE
	12/2/2019	ND<500	FALSE
	5/28/2020	ND<500	FALSE



## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

**Iteration    Highest    Lowest    Critical    Outlier**

**A Divide-By-Zero error occurred in the calculations.**

**Additional Outliers May Exist.**

<b>Loc.</b>	<b>Date</b>	<b>Conc.</b>	<b>Outlier</b>
SLF-MW-5R	2/14/2017	ND<500	FALSE
	3/20/2017	ND<500	FALSE
	4/25/2017	ND<500	FALSE
	5/22/2017	ND<500	FALSE
	6/20/2017	ND<500	FALSE
	7/17/2017	ND<500	FALSE
	8/7/2017	ND<500	FALSE
	8/22/2017	ND<500	FALSE
	11/29/2017	ND<500	FALSE
	5/30/2018	ND<500	FALSE
	12/4/2018	ND<500	FALSE
	6/28/2019	ND<500	FALSE
	12/2/2019	ND<500	FALSE
	5/28/2020	ND<500	FALSE

### Concentrations (ppb)

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 54

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	20	0 (0%)	10/21/2016	7510	7510
			11/30/2016	7670	7670
			12/28/2016	7730	7730
			1/18/2017	7590	7590
			2/14/2017	7790	7790
			3/20/2017	7610	7610
			4/25/2017	7480	7480
			5/22/2017	7930	7930
			6/20/2017	8060	8060
			7/17/2017	8340	8340
			8/8/2017	9000	9000
			8/21/2017	8930	8930
			11/29/2017	7660	7660
			3/8/2018	7880	7880
			5/31/2018	7560	7560
			12/4/2018	7620	7620
			6/28/2019	7540	7540
			11/4/2019	7600	7600
			12/2/2019	7500	7500
			5/28/2020	7280	7280
	<b>11/30/2020</b>		<b>7870</b>	<b>7870</b>	
	<b>4/28/2021</b>		<b>7730</b>	<b>7730</b>	

SLF-MW-3B	19	0 (0%)	10/21/2016	7020	7020
			11/30/2016	7110	7110
			12/28/2016	7190	7190
			1/18/2017	6970	6970
			2/15/2017	7240	7240
			3/20/2017	7060	7060
			4/25/2017	7020	7020
			5/22/2017	7220	7220
			6/20/2017	6990	6990
			7/17/2017	7330	7330
			8/7/2017	7610	7610
			8/21/2017	7530	7530
			11/29/2017	7120	7120
			3/8/2018	7460	7460
			5/30/2018	7090	7090
			12/4/2018	7110	7110
			6/27/2019	7220	7220
12/2/2019	7110	7110			

			5/28/2020	6970	6970
			<b>12/1/2020</b>	<b>7230</b>	<b>7230</b>
			<b>4/28/2021</b>	<b>7140</b>	<b>7140</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	7160	7160
			3/20/2017	7140	7140
			4/25/2017	7060	7060
			5/22/2017	7140	7140
			6/20/2017	7090	7090
			7/17/2017	7200	7200
			8/7/2017	7320	7320
			8/22/2017	7340	7340
			11/29/2017	7100	7100
			3/8/2018	7350	7350
			5/30/2018	6940	6940
			12/4/2018	7140	7140
			6/28/2019	7100	7100
			12/2/2019	7080	7080
			5/28/2020	7100	7100
			<b>11/30/2020</b>	<b>7200</b>	<b>7200</b>
			<b>4/28/2021</b>	<b>7160</b>	<b>7160</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 20 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.44	0.207547	0.45	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	7.51	FALSE
	11/30/2016	7.67	FALSE
	12/28/2016	7.73	FALSE
	1/18/2017	7.59	FALSE
	2/14/2017	7.79	FALSE
	3/20/2017	7.61	FALSE
	4/25/2017	7.48	FALSE
	5/22/2017	7.93	FALSE
	6/20/2017	8.06	FALSE
	7/17/2017	8.34	FALSE
	8/8/2017	9	FALSE
	8/21/2017	8.93	FALSE
	11/29/2017	7.66	FALSE
	3/8/2018	7.88	FALSE
	5/31/2018	7.56	FALSE
	12/4/2018	7.62	FALSE
	6/28/2019	7.54	FALSE
	11/4/2019	7.6	FALSE
	12/2/2019	7.5	FALSE
	5/28/2020	7.28	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 10 for 20 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	7.28	9	1.72	0.4734	0.814248
2	7.48	8.93	1.45	0.3211	0.465595
3	7.5	8.34	0.84	0.2565	0.21546
4	7.51	8.06	0.55	0.2085	0.114675
5	7.54	7.93	0.39	0.1686	0.065754
6	7.56	7.88	0.32	0.1334	0.042688
7	7.59	7.79	0.2	0.1013	0.02026
8	7.6	7.73	0.13	0.0711	0.009243
9	7.61	7.67	0.06	0.0422	0.002532
10	7.62	7.66	0.04	0.014	0.00056
11	7.66	7.62	-0.04		
12	7.67	7.61	-0.06		
13	7.73	7.6	-0.13		
14	7.79	7.59	-0.2		
15	7.88	7.56	-0.32		
16	7.93	7.54	-0.39		
17	8.06	7.51	-0.55		
18	8.34	7.5	-0.84		
19	8.93	7.48	-1.45		
20	9	7.28	-1.72		

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Sum of b values = 1.75101

Sample Standard Deviation = 0.456628

W Statistic = 0.773928

**5% Critical value of 0.905 exceeds 0.773928**  
**Evidence of non-normality at 95% level of significance**

**1% Critical value of 0.868 exceeds 0.773928**  
**Evidence of non-normality at 99% level of significance**

**Mann-Kendall Trend Analysis**  
**Parameter: pH, Field**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.67	7.51	0.16	1	0
7.73	7.51	0.22	2	0
7.59	7.51	0.08	3	0
7.79	7.51	0.28	4	0
7.61	7.51	0.1	5	0
7.48	7.51	-0.03	5	1
7.93	7.51	0.42	6	1
8.06	7.51	0.55	7	1
8.34	7.51	0.83	8	1
9	7.51	1.49	9	1
8.93	7.51	1.42	10	1
7.66	7.51	0.15	11	1
7.88	7.51	0.37	12	1
7.56	7.51	0.05	13	1
7.62	7.51	0.11	14	1
7.54	7.51	0.03	15	1
7.6	7.51	0.09	16	1
7.5	7.51	-0.01	16	2
7.28	7.51	-0.23	16	3
7.73	7.67	0.06	17	3
7.59	7.67	-0.08	17	4
7.79	7.67	0.12	18	4
7.61	7.67	-0.06	18	5
7.48	7.67	-0.19	18	6
7.93	7.67	0.26	19	6
8.06	7.67	0.39	20	6
8.34	7.67	0.67	21	6
9	7.67	1.33	22	6
8.93	7.67	1.26	23	6
7.66	7.67	-0.01	23	7
7.88	7.67	0.21	24	7
7.56	7.67	-0.11	24	8
7.62	7.67	-0.05	24	9
7.54	7.67	-0.13	24	10
7.6	7.67	-0.07	24	11
7.5	7.67	-0.17	24	12
7.28	7.67	-0.39	24	13
7.59	7.73	-0.14	24	14
7.79	7.73	0.06	25	14
7.61	7.73	-0.12	25	15
7.48	7.73	-0.25	25	16
7.93	7.73	0.2	26	16
8.06	7.73	0.33	27	16
8.34	7.73	0.61	28	16
9	7.73	1.27	29	16

8.93	7.73	1.2	30	16
7.66	7.73	-0.07	30	17
7.88	7.73	0.15	31	17
7.56	7.73	-0.17	31	18
7.62	7.73	-0.11	31	19
7.54	7.73	-0.19	31	20
7.6	7.73	-0.13	31	21
7.5	7.73	-0.23	31	22
7.28	7.73	-0.45	31	23
7.79	7.59	0.2	32	23
7.61	7.59	0.02	33	23
7.48	7.59	-0.11	33	24
7.93	7.59	0.34	34	24
8.06	7.59	0.47	35	24
8.34	7.59	0.75	36	24
9	7.59	1.41	37	24
8.93	7.59	1.34	38	24
7.66	7.59	0.07	39	24
7.88	7.59	0.29	40	24
7.56	7.59	-0.03	40	25
7.62	7.59	0.03	41	25
7.54	7.59	-0.05	41	26
7.6	7.59	0.01	42	26
7.5	7.59	-0.09	42	27
7.28	7.59	-0.31	42	28
7.61	7.79	-0.18	42	29
7.48	7.79	-0.31	42	30
7.93	7.79	0.14	43	30
8.06	7.79	0.27	44	30
8.34	7.79	0.55	45	30
9	7.79	1.21	46	30
8.93	7.79	1.14	47	30
7.66	7.79	-0.13	47	31
7.88	7.79	0.09	48	31
7.56	7.79	-0.23	48	32
7.62	7.79	-0.17	48	33
7.54	7.79	-0.25	48	34
7.6	7.79	-0.19	48	35
7.5	7.79	-0.29	48	36
7.28	7.79	-0.51	48	37
7.48	7.61	-0.13	48	38
7.93	7.61	0.32	49	38
8.06	7.61	0.45	50	38
8.34	7.61	0.73	51	38
9	7.61	1.39	52	38
8.93	7.61	1.32	53	38
7.66	7.61	0.05	54	38
7.88	7.61	0.27	55	38
7.56	7.61	-0.05	55	39
7.62	7.61	0.01	56	39
7.54	7.61	-0.07	56	40
7.6	7.61	-0.01	56	41
7.5	7.61	-0.11	56	42
7.28	7.61	-0.33	56	43

7.93	7.48	0.45	57	43
8.06	7.48	0.58	58	43
8.34	7.48	0.86	59	43
9	7.48	1.52	60	43
8.93	7.48	1.45	61	43
7.66	7.48	0.18	62	43
7.88	7.48	0.4	63	43
7.56	7.48	0.08	64	43
7.62	7.48	0.14	65	43
7.54	7.48	0.06	66	43
7.6	7.48	0.12	67	43
7.5	7.48	0.02	68	43
7.28	7.48	-0.2	68	44
8.06	7.93	0.13	69	44
8.34	7.93	0.41	70	44
9	7.93	1.07	71	44
8.93	7.93	1	72	44
7.66	7.93	-0.27	72	45
7.88	7.93	-0.05	72	46
7.56	7.93	-0.37	72	47
7.62	7.93	-0.31	72	48
7.54	7.93	-0.39	72	49
7.6	7.93	-0.33	72	50
7.5	7.93	-0.43	72	51
7.28	7.93	-0.65	72	52
8.34	8.06	0.28	73	52
9	8.06	0.94	74	52
8.93	8.06	0.87	75	52
7.66	8.06	-0.4	75	53
7.88	8.06	-0.18	75	54
7.56	8.06	-0.5	75	55
7.62	8.06	-0.44	75	56
7.54	8.06	-0.52	75	57
7.6	8.06	-0.46	75	58
7.5	8.06	-0.56	75	59
7.28	8.06	-0.78	75	60
9	8.34	0.66	76	60
8.93	8.34	0.59	77	60
7.66	8.34	-0.68	77	61
7.88	8.34	-0.46	77	62
7.56	8.34	-0.78	77	63
7.62	8.34	-0.72	77	64
7.54	8.34	-0.8	77	65
7.6	8.34	-0.74	77	66
7.5	8.34	-0.84	77	67
7.28	8.34	-1.06	77	68
8.93	9	-0.07	77	69
7.66	9	-1.34	77	70
7.88	9	-1.12	77	71
7.56	9	-1.44	77	72
7.62	9	-1.38	77	73
7.54	9	-1.46	77	74



7.6	9	-1.4	77	75
7.5	9	-1.5	77	76
7.28	9	-1.72	77	77
7.66	8.93	-1.27	77	78
7.88	8.93	-1.05	77	79
7.56	8.93	-1.37	77	80
7.62	8.93	-1.31	77	81
7.54	8.93	-1.39	77	82
7.6	8.93	-1.33	77	83
7.5	8.93	-1.43	77	84
7.28	8.93	-1.65	77	85
7.88	7.66	0.22	78	85
7.56	7.66	-0.1	78	86
7.62	7.66	-0.04	78	87
7.54	7.66	-0.12	78	88
7.6	7.66	-0.06	78	89
7.5	7.66	-0.16	78	90
7.28	7.66	-0.38	78	91
7.56	7.88	-0.32	78	92
7.62	7.88	-0.26	78	93
7.54	7.88	-0.34	78	94
7.6	7.88	-0.28	78	95
7.5	7.88	-0.38	78	96
7.28	7.88	-0.6	78	97
7.62	7.56	0.06	79	97
7.54	7.56	-0.02	79	98
7.6	7.56	0.04	80	98
7.5	7.56	-0.06	80	99
7.28	7.56	-0.28	80	100
7.54	7.62	-0.08	80	101
7.6	7.62	-0.02	80	102
7.5	7.62	-0.12	80	103
7.28	7.62	-0.34	80	104
7.6	7.54	0.06	81	104
7.5	7.54	-0.04	81	105
7.28	7.54	-0.26	81	106
7.5	7.6	-0.1	81	107
7.28	7.6	-0.32	81	108
7.28	7.5	-0.22	81	109

S Statistic = 81 - 109 = -28

---

Tied Group	Value	Members
Time Period		Observations
10/21/2016		1
11/30/2016		1
12/28/2016		1

1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
11/4/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

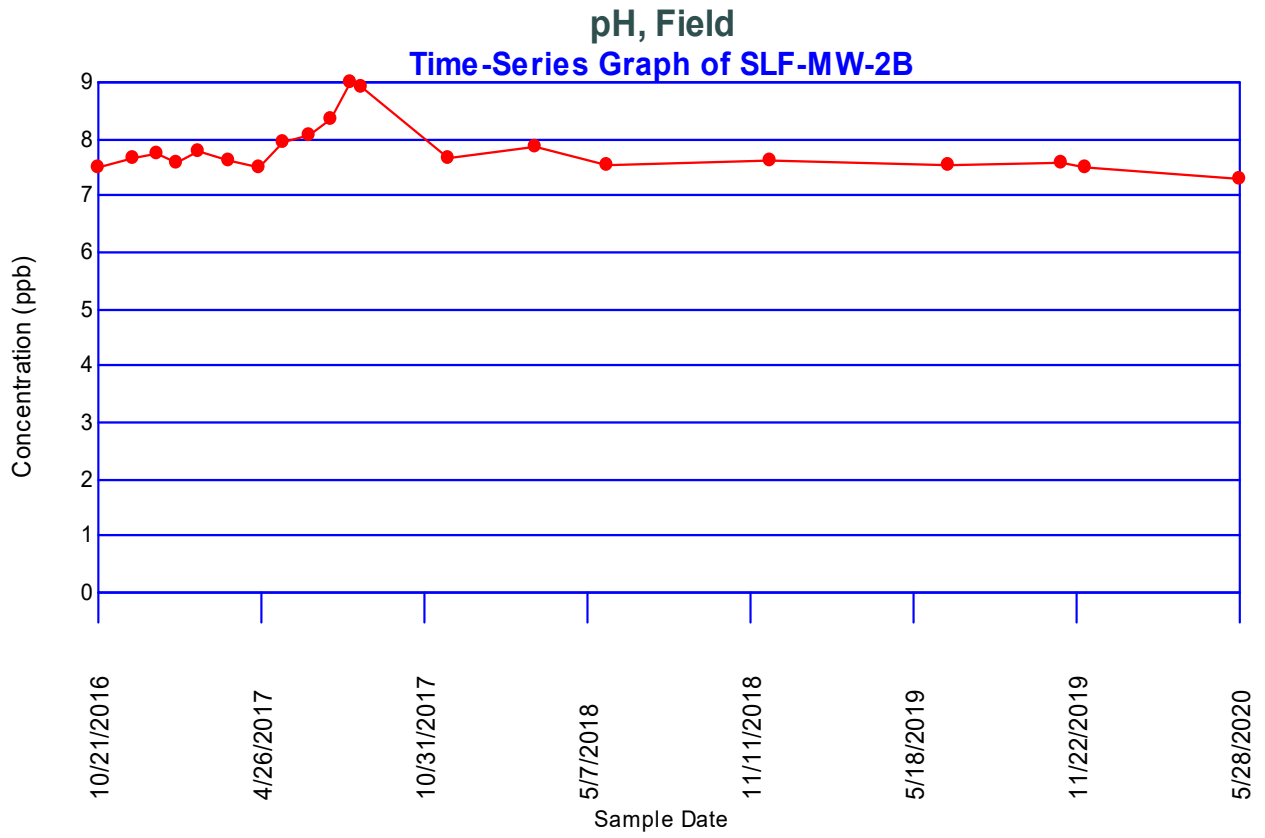
c = 760

Group Variance = 950

Z-Score = -0.875996

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|-0.875996| \leq 1.97737$  indicating no evidence of a trend



## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.241935	0.0408163	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	7.02	FALSE
	11/30/2016	7.11	FALSE
	12/28/2016	7.19	FALSE
	1/18/2017	6.97	FALSE
	2/15/2017	7.24	FALSE
	3/20/2017	7.06	FALSE
	4/25/2017	7.02	FALSE
	5/22/2017	7.22	FALSE
	6/20/2017	6.99	FALSE
	7/17/2017	7.33	FALSE
	8/7/2017	7.61	FALSE
	8/21/2017	7.53	FALSE
	11/29/2017	7.12	FALSE
	3/8/2018	7.46	FALSE
	5/30/2018	7.09	FALSE
	12/4/2018	7.11	FALSE
	6/27/2019	7.22	FALSE
	12/2/2019	7.11	FALSE
	5/28/2020	6.97	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	6.97	7.61	0.64	0.4808	0.307712
2	6.97	7.53	0.56	0.3232	0.180992
3	6.99	7.46	0.47	0.2561	0.120367
4	7.02	7.33	0.31	0.2059	0.063829
5	7.02	7.24	0.22	0.1641	0.036102
6	7.06	7.22	0.16	0.1271	0.020336
7	7.09	7.22	0.13	0.0932	0.012116
8	7.11	7.19	0.08	0.0612	0.004896
9	7.11	7.12	0.01	0.0303	0.000303
10	7.11	7.11	0		
11	7.12	7.11	-0.01		
12	7.19	7.11	-0.08		
13	7.22	7.09	-0.13		
14	7.22	7.06	-0.16		
15	7.24	7.02	-0.22		
16	7.33	7.02	-0.31		
17	7.46	6.99	-0.47		
18	7.53	6.97	-0.56		
19	7.61	6.97	-0.64		

---

Sum of b values = 0.746653

Sample Standard Deviation = 0.187286

W Statistic = 0.882988

**5% Critical value of 0.901 exceeds 0.882988**  
**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.863 is less than 0.882988  
Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: pH, Field

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.11	7.02	0.09	1	0
7.19	7.02	0.17	2	0
6.97	7.02	-0.05	2	1
7.24	7.02	0.22	3	1
7.06	7.02	0.04	4	1
7.02	7.02	0	4	1
7.22	7.02	0.2	5	1
6.99	7.02	-0.03	5	2
7.33	7.02	0.31	6	2
7.61	7.02	0.59	7	2
7.53	7.02	0.51	8	2
7.12	7.02	0.1	9	2
7.46	7.02	0.44	10	2
7.09	7.02	0.07	11	2
7.11	7.02	0.09	12	2
7.22	7.02	0.2	13	2
7.11	7.02	0.09	14	2
6.97	7.02	-0.05	14	3
7.19	7.11	0.08	15	3
6.97	7.11	-0.14	15	4
7.24	7.11	0.13	16	4
7.06	7.11	-0.05	16	5
7.02	7.11	-0.09	16	6
7.22	7.11	0.11	17	6
6.99	7.11	-0.12	17	7
7.33	7.11	0.22	18	7
7.61	7.11	0.5	19	7
7.53	7.11	0.42	20	7
7.12	7.11	0.01	21	7
7.46	7.11	0.35	22	7
7.09	7.11	-0.02	22	8
7.11	7.11	0	22	8
7.22	7.11	0.11	23	8
7.11	7.11	0	23	8
6.97	7.11	-0.14	23	9
6.97	7.19	-0.22	23	10
7.24	7.19	0.05	24	10
7.06	7.19	-0.13	24	11
7.02	7.19	-0.17	24	12
7.22	7.19	0.03	25	12
6.99	7.19	-0.2	25	13
7.33	7.19	0.14	26	13
7.61	7.19	0.42	27	13
7.53	7.19	0.34	28	13
7.12	7.19	-0.07	28	14

7.46	7.19	0.27	29	14
7.09	7.19	-0.1	29	15
7.11	7.19	-0.08	29	16
7.22	7.19	0.03	30	16
7.11	7.19	-0.08	30	17
6.97	7.19	-0.22	30	18
7.24	6.97	0.27	31	18
7.06	6.97	0.09	32	18
7.02	6.97	0.05	33	18
7.22	6.97	0.25	34	18
6.99	6.97	0.02	35	18
7.33	6.97	0.36	36	18
7.61	6.97	0.64	37	18
7.53	6.97	0.56	38	18
7.12	6.97	0.15	39	18
7.46	6.97	0.49	40	18
7.09	6.97	0.12	41	18
7.11	6.97	0.14	42	18
7.22	6.97	0.25	43	18
7.11	6.97	0.14	44	18
6.97	6.97	0	44	18
7.06	7.24	-0.18	44	19
7.02	7.24	-0.22	44	20
7.22	7.24	-0.02	44	21
6.99	7.24	-0.25	44	22
7.33	7.24	0.09	45	22
7.61	7.24	0.37	46	22
7.53	7.24	0.29	47	22
7.12	7.24	-0.12	47	23
7.46	7.24	0.22	48	23
7.09	7.24	-0.15	48	24
7.11	7.24	-0.13	48	25
7.22	7.24	-0.02	48	26
7.11	7.24	-0.13	48	27
6.97	7.24	-0.27	48	28
7.02	7.06	-0.04	48	29
7.22	7.06	0.16	49	29
6.99	7.06	-0.07	49	30
7.33	7.06	0.27	50	30
7.61	7.06	0.55	51	30
7.53	7.06	0.47	52	30
7.12	7.06	0.06	53	30
7.46	7.06	0.4	54	30
7.09	7.06	0.03	55	30
7.11	7.06	0.05	56	30
7.22	7.06	0.16	57	30
7.11	7.06	0.05	58	30
6.97	7.06	-0.09	58	31
7.22	7.02	0.2	59	31
6.99	7.02	-0.03	59	32
7.33	7.02	0.31	60	32
7.61	7.02	0.59	61	32
7.53	7.02	0.51	62	32

7.12	7.02	0.1	63	32
7.46	7.02	0.44	64	32
7.09	7.02	0.07	65	32
7.11	7.02	0.09	66	32
7.22	7.02	0.2	67	32
7.11	7.02	0.09	68	32
6.97	7.02	-0.05	68	33
6.99	7.22	-0.23	68	34
7.33	7.22	0.11	69	34
7.61	7.22	0.39	70	34
7.53	7.22	0.31	71	34
7.12	7.22	-0.1	71	35
7.46	7.22	0.24	72	35
7.09	7.22	-0.13	72	36
7.11	7.22	-0.11	72	37
7.22	7.22	0	72	37
7.11	7.22	-0.11	72	38
6.97	7.22	-0.25	72	39
7.33	6.99	0.34	73	39
7.61	6.99	0.62	74	39
7.53	6.99	0.54	75	39
7.12	6.99	0.13	76	39
7.46	6.99	0.47	77	39
7.09	6.99	0.1	78	39
7.11	6.99	0.12	79	39
7.22	6.99	0.23	80	39
7.11	6.99	0.12	81	39
6.97	6.99	-0.02	81	40
7.61	7.33	0.28	82	40
7.53	7.33	0.2	83	40
7.12	7.33	-0.21	83	41
7.46	7.33	0.13	84	41
7.09	7.33	-0.24	84	42
7.11	7.33	-0.22	84	43
7.22	7.33	-0.11	84	44
7.11	7.33	-0.22	84	45
6.97	7.33	-0.36	84	46
7.53	7.61	-0.08	84	47
7.12	7.61	-0.49	84	48
7.46	7.61	-0.15	84	49
7.09	7.61	-0.52	84	50
7.11	7.61	-0.5	84	51
7.22	7.61	-0.39	84	52
7.11	7.61	-0.5	84	53
6.97	7.61	-0.64	84	54
7.12	7.53	-0.41	84	55
7.46	7.53	-0.07	84	56
7.09	7.53	-0.44	84	57
7.11	7.53	-0.42	84	58
7.22	7.53	-0.31	84	59
7.11	7.53	-0.42	84	60
6.97	7.53	-0.56	84	61



7.46	7.12	0.34	85	61
7.09	7.12	-0.03	85	62
7.11	7.12	-0.01	85	63
7.22	7.12	0.1	86	63
7.11	7.12	-0.01	86	64
6.97	7.12	-0.15	86	65
7.09	7.46	-0.37	86	66
7.11	7.46	-0.35	86	67
7.22	7.46	-0.24	86	68
7.11	7.46	-0.35	86	69
6.97	7.46	-0.49	86	70
7.11	7.09	0.02	87	70
7.22	7.09	0.13	88	70
7.11	7.09	0.02	89	70
6.97	7.09	-0.12	89	71
7.22	7.11	0.11	90	71
7.11	7.11	0	90	71
6.97	7.11	-0.14	90	72
7.11	7.22	-0.11	90	73
6.97	7.22	-0.25	90	74
6.97	7.11	-0.14	90	75

S Statistic = 90 - 75 = 15

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Tied Group	Value	Members
1	7.02	2
2	7.11	3
3	6.97	2
4	7.22	2

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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 120

B = 0

C = 6

D = 0

E = 12

F = 0

a = 14706

b = 52326

c = 684

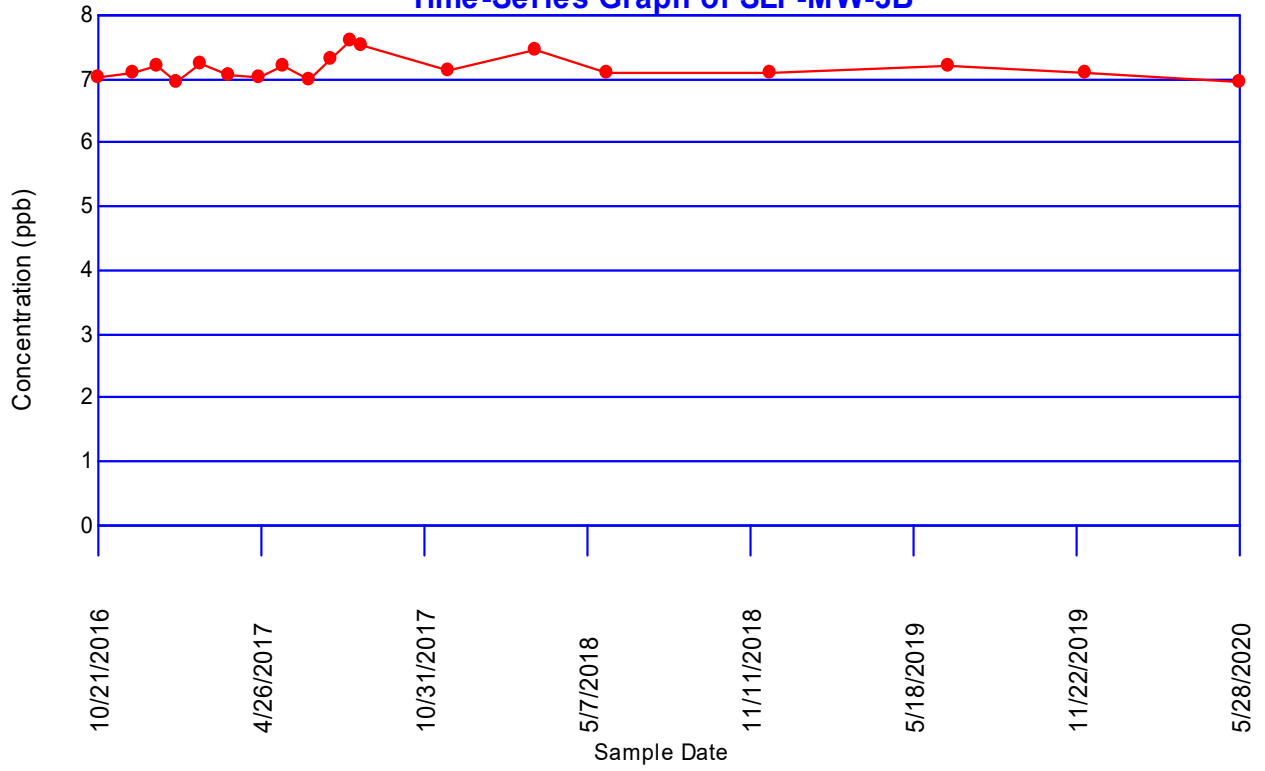
Group Variance = 810.333

Z-Score = 0.491809

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

|0.491809| <= 1.97737 indicating no evidence of a trend

pH, Field  
Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.111111	0.368421	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	7.16	FALSE
	3/20/2017	7.14	FALSE
	4/25/2017	7.06	FALSE
	5/22/2017	7.14	FALSE
	6/20/2017	7.09	FALSE
	7/17/2017	7.2	FALSE
	8/7/2017	7.32	FALSE
	8/22/2017	7.34	FALSE
	11/29/2017	7.1	FALSE
	3/8/2018	7.35	FALSE
	5/30/2018	6.94	FALSE
	12/4/2018	7.14	FALSE
	6/28/2019	7.1	FALSE
	12/2/2019	7.08	FALSE
	5/28/2020	7.1	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	6.94	7.35	0.41	0.515	0.21115
2	7.06	7.34	0.28	0.3306	0.092568
3	7.08	7.32	0.24	0.2495	0.05988
4	7.09	7.2	0.11	0.1878	0.020658
5	7.1	7.16	0.06	0.1353	0.008118
6	7.1	7.14	0.04	0.088	0.00352
7	7.1	7.14	0.04	0.0433	0.001732
8	7.14	7.14	0		
9	7.14	7.1	-0.04		
10	7.14	7.1	-0.04		
11	7.16	7.1	-0.06		
12	7.2	7.09	-0.11		
13	7.32	7.08	-0.24		
14	7.34	7.06	-0.28		
15	7.35	6.94	-0.41		

---

Sum of b values = 0.397626

Sample Standard Deviation = 0.112152

W Statistic = 0.897856

5% Critical value of 0.881 is less than 0.897856  
Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.897856  
Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: pH, Field

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.14	7.16	-0.02	0	1
7.06	7.16	-0.1	0	2
7.14	7.16	-0.02	0	3
7.09	7.16	-0.07	0	4
7.2	7.16	0.04	1	4
7.32	7.16	0.16	2	4
7.34	7.16	0.18	3	4
7.1	7.16	-0.06	3	5
7.35	7.16	0.19	4	5
6.94	7.16	-0.22	4	6
7.14	7.16	-0.02	4	7
7.1	7.16	-0.06	4	8
7.08	7.16	-0.08	4	9
7.1	7.16	-0.06	4	10
7.06	7.14	-0.08	4	11
7.14	7.14	0	4	11
7.09	7.14	-0.05	4	12
7.2	7.14	0.06	5	12
7.32	7.14	0.18	6	12
7.34	7.14	0.2	7	12
7.1	7.14	-0.04	7	13
7.35	7.14	0.21	8	13
6.94	7.14	-0.2	8	14
7.14	7.14	0	8	14
7.1	7.14	-0.04	8	15
7.08	7.14	-0.06	8	16
7.1	7.14	-0.04	8	17
7.14	7.06	0.08	9	17
7.09	7.06	0.03	10	17
7.2	7.06	0.14	11	17
7.32	7.06	0.26	12	17
7.34	7.06	0.28	13	17
7.1	7.06	0.04	14	17
7.35	7.06	0.29	15	17
6.94	7.06	-0.12	15	18
7.14	7.06	0.08	16	18
7.1	7.06	0.04	17	18
7.08	7.06	0.02	18	18
7.1	7.06	0.04	19	18
7.09	7.14	-0.05	19	19
7.2	7.14	0.06	20	19
7.32	7.14	0.18	21	19
7.34	7.14	0.2	22	19
7.1	7.14	-0.04	22	20

7.35	7.14	0.21	23	20
6.94	7.14	-0.2	23	21
7.14	7.14	0	23	21
7.1	7.14	-0.04	23	22
7.08	7.14	-0.06	23	23
7.1	7.14	-0.04	23	24
7.2	7.09	0.11	24	24
7.32	7.09	0.23	25	24
7.34	7.09	0.25	26	24
7.1	7.09	0.01	27	24
7.35	7.09	0.26	28	24
6.94	7.09	-0.15	28	25
7.14	7.09	0.05	29	25
7.1	7.09	0.01	30	25
7.08	7.09	-0.01	30	26
7.1	7.09	0.01	31	26
7.32	7.2	0.12	32	26
7.34	7.2	0.14	33	26
7.1	7.2	-0.1	33	27
7.35	7.2	0.15	34	27
6.94	7.2	-0.26	34	28
7.14	7.2	-0.06	34	29
7.1	7.2	-0.1	34	30
7.08	7.2	-0.12	34	31
7.1	7.2	-0.1	34	32
7.34	7.32	0.02	35	32
7.1	7.32	-0.22	35	33
7.35	7.32	0.03	36	33
6.94	7.32	-0.38	36	34
7.14	7.32	-0.18	36	35
7.1	7.32	-0.22	36	36
7.08	7.32	-0.24	36	37
7.1	7.32	-0.22	36	38
7.1	7.34	-0.24	36	39
7.35	7.34	0.01	37	39
6.94	7.34	-0.4	37	40
7.14	7.34	-0.2	37	41
7.1	7.34	-0.24	37	42
7.08	7.34	-0.26	37	43
7.1	7.34	-0.24	37	44
7.35	7.1	0.25	38	44
6.94	7.1	-0.16	38	45
7.14	7.1	0.04	39	45
7.1	7.1	0	39	45
7.08	7.1	-0.02	39	46
7.1	7.1	0	39	46
6.94	7.35	-0.41	39	47
7.14	7.35	-0.21	39	48
7.1	7.35	-0.25	39	49
7.08	7.35	-0.27	39	50
7.1	7.35	-0.25	39	51

7.14	6.94	0.2	40	51
7.1	6.94	0.16	41	51
7.08	6.94	0.14	42	51
7.1	6.94	0.16	43	51
7.1	7.14	-0.04	43	52
7.08	7.14	-0.06	43	53
7.1	7.14	-0.04	43	54
7.08	7.1	-0.02	43	55
7.1	7.1	0	43	55
7.1	7.08	0.02	44	55

S Statistic = 44 - 55 = -11

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Tied Group	Value	Members
1	7.14	3
2	7.1	3

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Time Period	Observations
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 132

B = 0

C = 12

D = 0

E = 12

F = 0

a = 7350

b = 24570

c = 420

Group Variance = 401

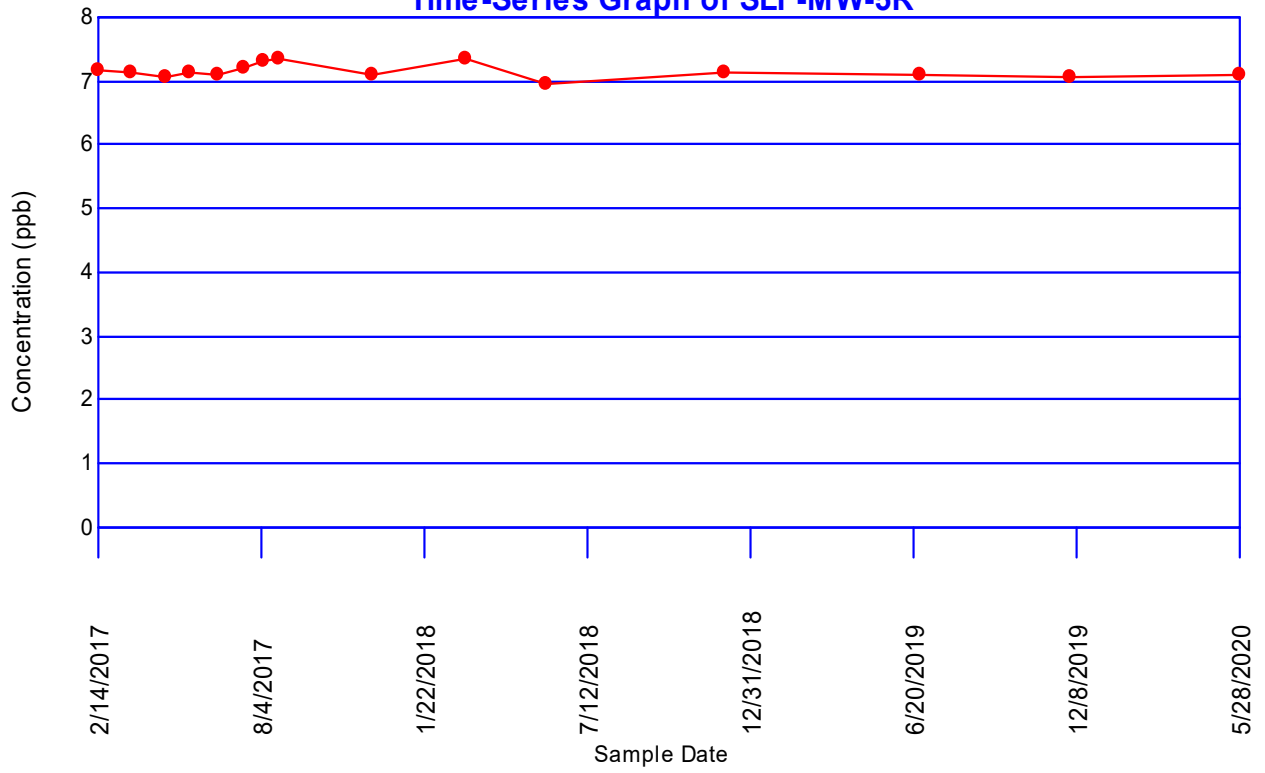
Z-Score = -0.499376

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|**-0.499376**| <= 1.97737 indicating no evidence of a trend



pH, Field  
Time-Series Graph of SLF-MW-5R



## Concentrations (ppb)

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	347901	347901
			11/30/2016	244670	244670
			12/28/2016	359044	359044
			1/18/2017	229595	229595
			2/14/2017	224624	224624
			3/20/2017	221785	221785
			4/25/2017	205884	205884
			5/22/2017	204497	204497
			6/20/2017	195436	195436
			7/17/2017	203000	203000
			8/8/2017	198500	198500
			8/21/2017	196500	196500
			11/29/2017	191600	191600
			3/8/2018	233000	233000
			5/31/2018	200000	200000
			12/4/2018	163000	163000
			6/28/2019	122000	122000
			12/2/2019	120000	120000
			5/28/2020	104000	104000
				<b>11/30/2020</b>	
	<b>4/28/2021</b>		<b>555000</b>	<b>555000</b>	

SLF-MW-3B	19	0 (0%)	10/21/2016	603053	603053
			11/30/2016	589957	589957
			12/28/2016	614466	614466
			1/18/2017	582135	582135
			2/15/2017	486076	486076
			3/20/2017	472830	472830
			4/25/2017	465682	465682
			5/22/2017	495843	495843
			6/20/2017	480297	480297
			7/17/2017	519000	519000
			8/7/2017	532000	532000
			8/21/2017	549000	549000
			11/29/2017	483000	483000
			3/8/2018	476000	476000
			5/30/2018	454000	454000
			12/4/2018	476000	476000
			6/27/2019	417000	417000
			12/2/2019	384000	384000
			5/28/2020	336000	336000

				<b>12/1/2020</b>	<b>389000</b>	<b>389000</b>
				<b>4/28/2021</b>	<b>355000</b>	<b>355000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	126012	126012	126012
			3/20/2017	107411	107411	107411
			4/25/2017	95475.3	95475.3	95475.3
			5/22/2017	90985.1	90985.1	90985.1
			6/20/2017	130226	130226	130226
			7/17/2017	132600	132600	132600
			8/7/2017	112400	112400	112400
			8/22/2017	143100	143100	143100
			11/29/2017	157800	157800	157800
			3/8/2018	89800	89800	89800
			5/30/2018	158000	158000	158000
			12/4/2018	122000	122000	122000
			6/28/2019	173000	173000	173000
			12/2/2019	162000	162000	162000
			5/28/2020	83400	83400	83400
			<b>11/30/2020</b>	<b>84400</b>	<b>84400</b>	<b>84400</b>
			<b>4/28/2021</b>	<b>144000</b>	<b>144000</b>	<b>144000</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.482501	0.127959	0.462	359044
2	0.508634	0.139535	0.475	347901
3	0.122891	0.143318	0.49	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	<b>347901</b>	<b>TRUE</b>
	11/30/2016	244670	FALSE
	12/28/2016	<b>359044</b>	<b>TRUE</b>
	1/18/2017	229595	FALSE
	2/14/2017	224624	FALSE
	3/20/2017	221785	FALSE
	4/25/2017	205884	FALSE
	5/22/2017	204497	FALSE
	6/20/2017	195436	FALSE
	7/17/2017	203000	FALSE
	8/8/2017	198500	FALSE
	8/21/2017	196500	FALSE
	11/29/2017	191600	FALSE
	3/8/2018	233000	FALSE
	5/31/2018	200000	FALSE
	12/4/2018	163000	FALSE
	6/28/2019	122000	FALSE
	12/2/2019	120000	FALSE
	5/28/2020	104000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	104000	359044	255044	0.4808	122625
2	120000	347901	227901	0.3232	73657.6
3	122000	244670	122670	0.2561	31415.8
4	163000	233000	70000	0.2059	14413
5	191600	229595	37995	0.1641	6234.98
6	195436	224624	29188	0.1271	3709.79
7	196500	221785	25285	0.0932	2356.56
8	198500	205884	7384	0.0612	451.901
9	200000	204497	4497	0.0303	136.259
10	203000	203000	0		
11	204497	200000	-4497		
12	205884	198500	-7384		
13	221785	196500	-25285		
14	224624	195436	-29188		
15	229595	191600	-37995		
16	233000	163000	-70000		
17	244670	122000	-122670		
18	347901	120000	-227901		
19	359044	104000	-255044		

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Sum of b values = 255001

Sample Standard Deviation = 64124.9

W Statistic = 0.878532

**5% Critical value of 0.901 exceeds 0.878532**  
**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.863 is less than 0.878532  
Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
244670	347901	-103231	0	1
359044	347901	11143	1	1
229595	347901	-118306	1	2
224624	347901	-123277	1	3
221785	347901	-126116	1	4
205884	347901	-142017	1	5
204497	347901	-143404	1	6
195436	347901	-152465	1	7
203000	347901	-144901	1	8
198500	347901	-149401	1	9
196500	347901	-151401	1	10
191600	347901	-156301	1	11
233000	347901	-114901	1	12
200000	347901	-147901	1	13
163000	347901	-184901	1	14
122000	347901	-225901	1	15
120000	347901	-227901	1	16
104000	347901	-243901	1	17
359044	244670	114374	2	17
229595	244670	-15075	2	18
224624	244670	-20046	2	19
221785	244670	-22885	2	20
205884	244670	-38786	2	21
204497	244670	-40173	2	22
195436	244670	-49234	2	23
203000	244670	-41670	2	24
198500	244670	-46170	2	25
196500	244670	-48170	2	26
191600	244670	-53070	2	27
233000	244670	-11670	2	28
200000	244670	-44670	2	29
163000	244670	-81670	2	30
122000	244670	-122670	2	31
120000	244670	-124670	2	32
104000	244670	-140670	2	33
229595	359044	-129449	2	34
224624	359044	-134420	2	35
221785	359044	-137259	2	36
205884	359044	-153160	2	37
204497	359044	-154547	2	38
195436	359044	-163608	2	39
203000	359044	-156044	2	40
198500	359044	-160544	2	41
196500	359044	-162544	2	42
191600	359044	-167444	2	43

233000	359044	-126044	2	44
200000	359044	-159044	2	45
163000	359044	-196044	2	46
122000	359044	-237044	2	47
120000	359044	-239044	2	48
104000	359044	-255044	2	49
224624	229595	-4971	2	50
221785	229595	-7810	2	51
205884	229595	-23711	2	52
204497	229595	-25098	2	53
195436	229595	-34159	2	54
203000	229595	-26595	2	55
198500	229595	-31095	2	56
196500	229595	-33095	2	57
191600	229595	-37995	2	58
233000	229595	3405	3	58
200000	229595	-29595	3	59
163000	229595	-66595	3	60
122000	229595	-107595	3	61
120000	229595	-109595	3	62
104000	229595	-125595	3	63
221785	224624	-2839	3	64
205884	224624	-18740	3	65
204497	224624	-20127	3	66
195436	224624	-29188	3	67
203000	224624	-21624	3	68
198500	224624	-26124	3	69
196500	224624	-28124	3	70
191600	224624	-33024	3	71
233000	224624	8376	4	71
200000	224624	-24624	4	72
163000	224624	-61624	4	73
122000	224624	-102624	4	74
120000	224624	-104624	4	75
104000	224624	-120624	4	76
205884	221785	-15901	4	77
204497	221785	-17288	4	78
195436	221785	-26349	4	79
203000	221785	-18785	4	80
198500	221785	-23285	4	81
196500	221785	-25285	4	82
191600	221785	-30185	4	83
233000	221785	11215	5	83
200000	221785	-21785	5	84
163000	221785	-58785	5	85
122000	221785	-99785	5	86
120000	221785	-101785	5	87
104000	221785	-117785	5	88
204497	205884	-1387	5	89
195436	205884	-10448	5	90
203000	205884	-2884	5	91
198500	205884	-7384	5	92
196500	205884	-9384	5	93

191600	205884	-14284	5	94
233000	205884	27116	6	94
200000	205884	-5884	6	95
163000	205884	-42884	6	96
122000	205884	-83884	6	97
120000	205884	-85884	6	98
104000	205884	-101884	6	99
195436	204497	-9061	6	100
203000	204497	-1497	6	101
198500	204497	-5997	6	102
196500	204497	-7997	6	103
191600	204497	-12897	6	104
233000	204497	28503	7	104
200000	204497	-4497	7	105
163000	204497	-41497	7	106
122000	204497	-82497	7	107
120000	204497	-84497	7	108
104000	204497	-100497	7	109
203000	195436	7564	8	109
198500	195436	3064	9	109
196500	195436	1064	10	109
191600	195436	-3836	10	110
233000	195436	37564	11	110
200000	195436	4564	12	110
163000	195436	-32436	12	111
122000	195436	-73436	12	112
120000	195436	-75436	12	113
104000	195436	-91436	12	114
198500	203000	-4500	12	115
196500	203000	-6500	12	116
191600	203000	-11400	12	117
233000	203000	30000	13	117
200000	203000	-3000	13	118
163000	203000	-40000	13	119
122000	203000	-81000	13	120
120000	203000	-83000	13	121
104000	203000	-99000	13	122
196500	198500	-2000	13	123
191600	198500	-6900	13	124
233000	198500	34500	14	124
200000	198500	1500	15	124
163000	198500	-35500	15	125
122000	198500	-76500	15	126
120000	198500	-78500	15	127
104000	198500	-94500	15	128
191600	196500	-4900	15	129
233000	196500	36500	16	129
200000	196500	3500	17	129
163000	196500	-33500	17	130
122000	196500	-74500	17	131
120000	196500	-76500	17	132
104000	196500	-92500	17	133



233000	191600	41400	18	133
200000	191600	8400	19	133
163000	191600	-28600	19	134
122000	191600	-69600	19	135
120000	191600	-71600	19	136
104000	191600	-87600	19	137
200000	233000	-33000	19	138
163000	233000	-70000	19	139
122000	233000	-111000	19	140
120000	233000	-113000	19	141
104000	233000	-129000	19	142
163000	200000	-37000	19	143
122000	200000	-78000	19	144
120000	200000	-80000	19	145
104000	200000	-96000	19	146
122000	163000	-41000	19	147
120000	163000	-43000	19	148
104000	163000	-59000	19	149
120000	122000	-2000	19	150
104000	122000	-18000	19	151
104000	120000	-16000	19	152

S Statistic = 19 - 152 = -133

---

<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/8/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/31/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1
There are 0 time periods with multiple data		

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

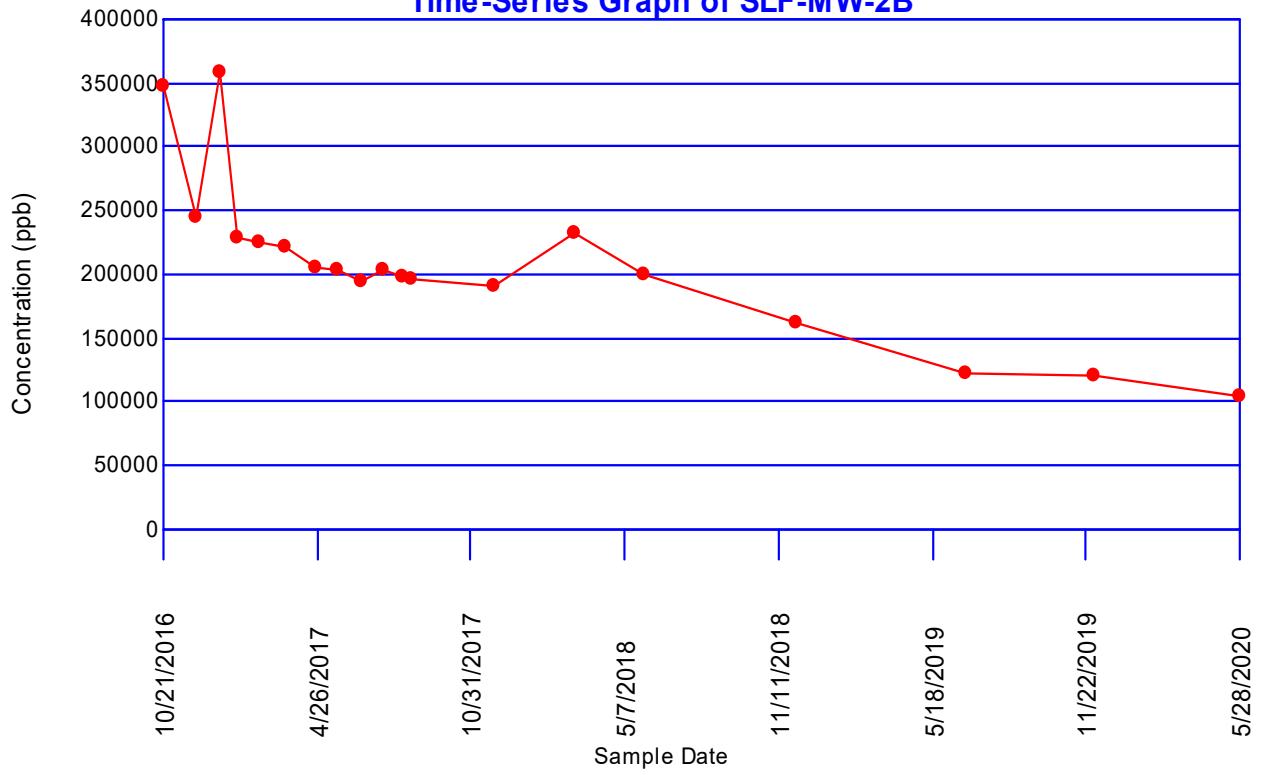
Group Variance = 817

Z-Score = -4.6181

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

**$|-4.6181| > 1.97737$  indicating a trend**

### Sulfate Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.124118	0.318952	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	603053	FALSE
	11/30/2016	589957	FALSE
	12/28/2016	614466	FALSE
	1/18/2017	582135	FALSE
	2/15/2017	486076	FALSE
	3/20/2017	472830	FALSE
	4/25/2017	465682	FALSE
	5/22/2017	495843	FALSE
	6/20/2017	480297	FALSE
	7/17/2017	519000	FALSE
	8/7/2017	532000	FALSE
	8/21/2017	549000	FALSE
	11/29/2017	483000	FALSE
	3/8/2018	476000	FALSE
	5/30/2018	454000	FALSE
	12/4/2018	476000	FALSE
	6/27/2019	417000	FALSE
	12/2/2019	384000	FALSE
	5/28/2020	336000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	336000	614466	278466	0.4808	133886
2	384000	603053	219053	0.3232	70797.9
3	417000	589957	172957	0.2561	44294.3
4	454000	582135	128135	0.2059	26383
5	465682	549000	83318	0.1641	13672.5
6	472830	532000	59170	0.1271	7520.51
7	476000	519000	43000	0.0932	4007.6
8	476000	495843	19843	0.0612	1214.39
9	480297	486076	5779	0.0303	175.104
10	483000	483000	0		
11	486076	480297	-5779		
12	495843	476000	-19843		
13	519000	476000	-43000		
14	532000	472830	-59170		
15	549000	465682	-83318		
16	582135	454000	-128135		
17	589957	417000	-172957		
18	603053	384000	-219053		
19	614466	336000	-278466		

---

Sum of b values = 301952

Sample Standard Deviation = 72759.8

W Statistic = 0.956797

5% Critical value of 0.901 is less than 0.956797

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.956797

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Sulfate**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
589957	603053	-13096	0	1
614466	603053	11413	1	1
582135	603053	-20918	1	2
486076	603053	-116977	1	3
472830	603053	-130223	1	4
465682	603053	-137371	1	5
495843	603053	-107210	1	6
480297	603053	-122756	1	7
519000	603053	-84053	1	8
532000	603053	-71053	1	9
549000	603053	-54053	1	10
483000	603053	-120053	1	11
476000	603053	-127053	1	12
454000	603053	-149053	1	13
476000	603053	-127053	1	14
417000	603053	-186053	1	15
384000	603053	-219053	1	16
336000	603053	-267053	1	17
614466	589957	24509	2	17
582135	589957	-7822	2	18
486076	589957	-103881	2	19
472830	589957	-117127	2	20
465682	589957	-124275	2	21
495843	589957	-94114	2	22
480297	589957	-109660	2	23
519000	589957	-70957	2	24
532000	589957	-57957	2	25
549000	589957	-40957	2	26
483000	589957	-106957	2	27
476000	589957	-113957	2	28
454000	589957	-135957	2	29
476000	589957	-113957	2	30
417000	589957	-172957	2	31
384000	589957	-205957	2	32
336000	589957	-253957	2	33
582135	614466	-32331	2	34
486076	614466	-128390	2	35
472830	614466	-141636	2	36
465682	614466	-148784	2	37
495843	614466	-118623	2	38
480297	614466	-134169	2	39
519000	614466	-95466	2	40
532000	614466	-82466	2	41
549000	614466	-65466	2	42
483000	614466	-131466	2	43

476000	614466	-138466	2	44
454000	614466	-160466	2	45
476000	614466	-138466	2	46
417000	614466	-197466	2	47
384000	614466	-230466	2	48
336000	614466	-278466	2	49
486076	582135	-96059	2	50
472830	582135	-109305	2	51
465682	582135	-116453	2	52
495843	582135	-86292	2	53
480297	582135	-101838	2	54
519000	582135	-63135	2	55
532000	582135	-50135	2	56
549000	582135	-33135	2	57
483000	582135	-99135	2	58
476000	582135	-106135	2	59
454000	582135	-128135	2	60
476000	582135	-106135	2	61
417000	582135	-165135	2	62
384000	582135	-198135	2	63
336000	582135	-246135	2	64
472830	486076	-13246	2	65
465682	486076	-20394	2	66
495843	486076	9767	3	66
480297	486076	-5779	3	67
519000	486076	32924	4	67
532000	486076	45924	5	67
549000	486076	62924	6	67
483000	486076	-3076	6	68
476000	486076	-10076	6	69
454000	486076	-32076	6	70
476000	486076	-10076	6	71
417000	486076	-69076	6	72
384000	486076	-102076	6	73
336000	486076	-150076	6	74
465682	472830	-7148	6	75
495843	472830	23013	7	75
480297	472830	7467	8	75
519000	472830	46170	9	75
532000	472830	59170	10	75
549000	472830	76170	11	75
483000	472830	10170	12	75
476000	472830	3170	13	75
454000	472830	-18830	13	76
476000	472830	3170	14	76
417000	472830	-55830	14	77
384000	472830	-88830	14	78
336000	472830	-136830	14	79
495843	465682	30161	15	79
480297	465682	14615	16	79
519000	465682	53318	17	79
532000	465682	66318	18	79
549000	465682	83318	19	79

483000	465682	17318	20	79
476000	465682	10318	21	79
454000	465682	-11682	21	80
476000	465682	10318	22	80
417000	465682	-48682	22	81
384000	465682	-81682	22	82
336000	465682	-129682	22	83
480297	495843	-15546	22	84
519000	495843	23157	23	84
532000	495843	36157	24	84
549000	495843	53157	25	84
483000	495843	-12843	25	85
476000	495843	-19843	25	86
454000	495843	-41843	25	87
476000	495843	-19843	25	88
417000	495843	-78843	25	89
384000	495843	-111843	25	90
336000	495843	-159843	25	91
519000	480297	38703	26	91
532000	480297	51703	27	91
549000	480297	68703	28	91
483000	480297	2703	29	91
476000	480297	-4297	29	92
454000	480297	-26297	29	93
476000	480297	-4297	29	94
417000	480297	-63297	29	95
384000	480297	-96297	29	96
336000	480297	-144297	29	97
532000	519000	13000	30	97
549000	519000	30000	31	97
483000	519000	-36000	31	98
476000	519000	-43000	31	99
454000	519000	-65000	31	100
476000	519000	-43000	31	101
417000	519000	-102000	31	102
384000	519000	-135000	31	103
336000	519000	-183000	31	104
549000	532000	17000	32	104
483000	532000	-49000	32	105
476000	532000	-56000	32	106
454000	532000	-78000	32	107
476000	532000	-56000	32	108
417000	532000	-115000	32	109
384000	532000	-148000	32	110
336000	532000	-196000	32	111
483000	549000	-66000	32	112
476000	549000	-73000	32	113
454000	549000	-95000	32	114
476000	549000	-73000	32	115
417000	549000	-132000	32	116
384000	549000	-165000	32	117
336000	549000	-213000	32	118



476000	483000	-7000	32	119
454000	483000	-29000	32	120
476000	483000	-7000	32	121
417000	483000	-66000	32	122
384000	483000	-99000	32	123
336000	483000	-147000	32	124
454000	476000	-22000	32	125
476000	476000	0	32	125
417000	476000	-59000	32	126
384000	476000	-92000	32	127
336000	476000	-140000	32	128
476000	454000	22000	33	128
417000	454000	-37000	33	129
384000	454000	-70000	33	130
336000	454000	-118000	33	131
417000	476000	-59000	33	132
384000	476000	-92000	33	133
336000	476000	-140000	33	134
384000	417000	-33000	33	135
336000	417000	-81000	33	136
336000	384000	-48000	33	137

S Statistic = 33 - 137 = -104

---

Tied Group	Value	Members
1	476000	2

---

Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 14706

b = 52326

c = 684

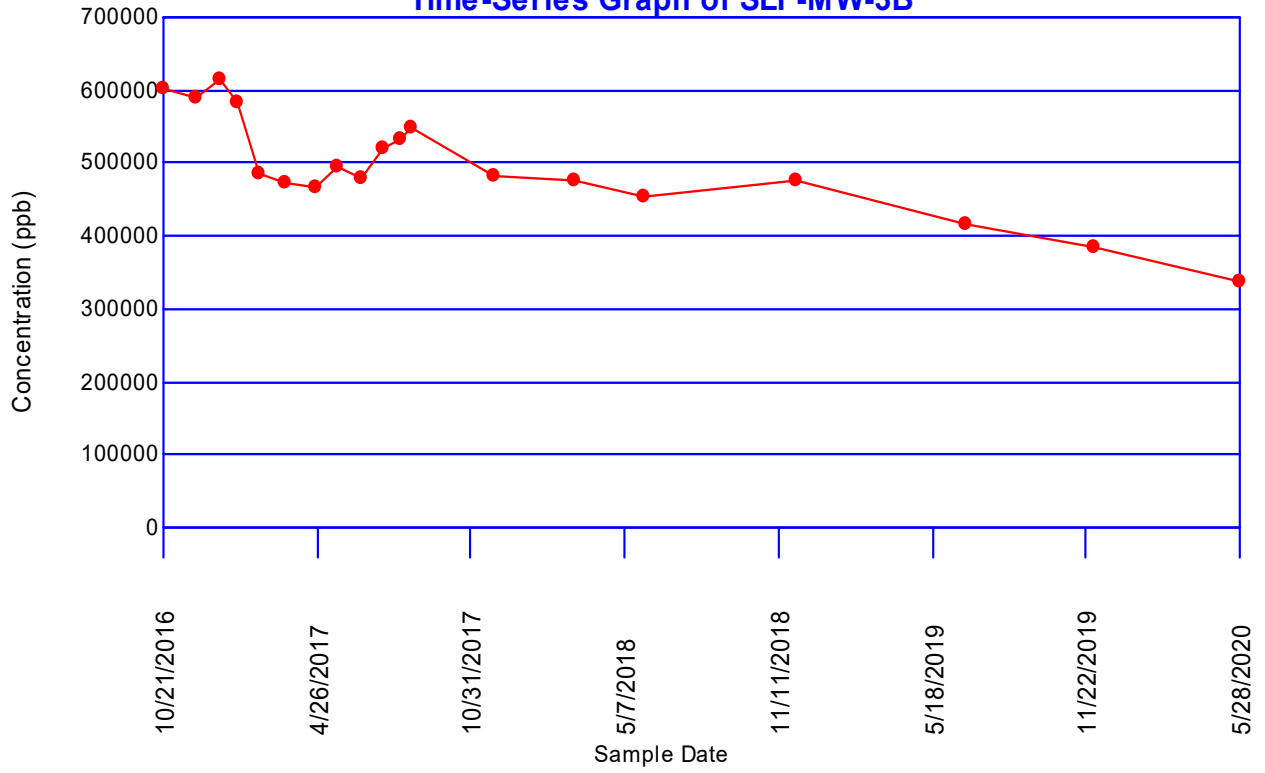
Group Variance = 816

Z-Score = -3.60572

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

**$|-3.60572| > 1.97737$  indicating a trend**

### Sulfate Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.182894	0.101677	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	126012	FALSE
	3/20/2017	107411	FALSE
	4/25/2017	95475.3	FALSE
	5/22/2017	90985.1	FALSE
	6/20/2017	130226	FALSE
	7/17/2017	132600	FALSE
	8/7/2017	112400	FALSE
	8/22/2017	143100	FALSE
	11/29/2017	157800	FALSE
	3/8/2018	89800	FALSE
	5/30/2018	158000	FALSE
	12/4/2018	122000	FALSE
	6/28/2019	173000	FALSE
	12/2/2019	162000	FALSE
	5/28/2020	83400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	83400	173000	89600	0.515	46144
2	89800	162000	72200	0.3306	23869.3
3	90985.1	158000	67014.9	0.2495	16720.2
4	95475.3	157800	62324.7	0.1878	11704.6
5	107411	143100	35689	0.1353	4828.72
6	112400	132600	20200	0.088	1777.6
7	122000	130226	8226	0.0433	356.186
8	126012	126012	0		
9	130226	122000	-8226		
10	132600	112400	-20200		
11	143100	107411	-35689		
12	157800	95475.3	-62324.7		
13	158000	90985.1	-67014.9		
14	162000	89800	-72200		
15	173000	83400	-89600		

---

Sum of b values = 105401

Sample Standard Deviation = 28935.1

W Statistic = 0.947783

5% Critical value of 0.881 is less than 0.947783

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.947783

Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
107411	126012	-18601	0	1
95475.3	126012	-30536.7	0	2
90985.1	126012	-35026.9	0	3
130226	126012	4214	1	3
132600	126012	6588	2	3
112400	126012	-13612	2	4
143100	126012	17088	3	4
157800	126012	31788	4	4
89800	126012	-36212	4	5
158000	126012	31988	5	5
122000	126012	-4012	5	6
173000	126012	46988	6	6
162000	126012	35988	7	6
83400	126012	-42612	7	7
95475.3	107411	-11935.7	7	8
90985.1	107411	-16425.9	7	9
130226	107411	22815	8	9
132600	107411	25189	9	9
112400	107411	4989	10	9
143100	107411	35689	11	9
157800	107411	50389	12	9
89800	107411	-17611	12	10
158000	107411	50589	13	10
122000	107411	14589	14	10
173000	107411	65589	15	10
162000	107411	54589	16	10
83400	107411	-24011	16	11
90985.1	95475.3	-4490.2	16	12
130226	95475.3	34750.7	17	12
132600	95475.3	37124.7	18	12
112400	95475.3	16924.7	19	12
143100	95475.3	47624.7	20	12
157800	95475.3	62324.7	21	12
89800	95475.3	-5675.3	21	13
158000	95475.3	62524.7	22	13
122000	95475.3	26524.7	23	13
173000	95475.3	77524.7	24	13
162000	95475.3	66524.7	25	13
83400	95475.3	-12075.3	25	14
130226	90985.1	39240.9	26	14
132600	90985.1	41614.9	27	14
112400	90985.1	21414.9	28	14
143100	90985.1	52114.9	29	14
157800	90985.1	66814.9	30	14

89800	90985.1	-1185.1	30	15
158000	90985.1	67014.9	31	15
122000	90985.1	31014.9	32	15
173000	90985.1	82014.9	33	15
162000	90985.1	71014.9	34	15
83400	90985.1	-7585.1	34	16
132600	130226	2374	35	16
112400	130226	-17826	35	17
143100	130226	12874	36	17
157800	130226	27574	37	17
89800	130226	-40426	37	18
158000	130226	27774	38	18
122000	130226	-8226	38	19
173000	130226	42774	39	19
162000	130226	31774	40	19
83400	130226	-46826	40	20
112400	132600	-20200	40	21
143100	132600	10500	41	21
157800	132600	25200	42	21
89800	132600	-42800	42	22
158000	132600	25400	43	22
122000	132600	-10600	43	23
173000	132600	40400	44	23
162000	132600	29400	45	23
83400	132600	-49200	45	24
143100	112400	30700	46	24
157800	112400	45400	47	24
89800	112400	-22600	47	25
158000	112400	45600	48	25
122000	112400	9600	49	25
173000	112400	60600	50	25
162000	112400	49600	51	25
83400	112400	-29000	51	26
157800	143100	14700	52	26
89800	143100	-53300	52	27
158000	143100	14900	53	27
122000	143100	-21100	53	28
173000	143100	29900	54	28
162000	143100	18900	55	28
83400	143100	-59700	55	29
89800	157800	-68000	55	30
158000	157800	200	56	30
122000	157800	-35800	56	31
173000	157800	15200	57	31
162000	157800	4200	58	31
83400	157800	-74400	58	32
158000	89800	68200	59	32
122000	89800	32200	60	32
173000	89800	83200	61	32
162000	89800	72200	62	32
83400	89800	-6400	62	33

122000	158000	-36000	62	34
173000	158000	15000	63	34
162000	158000	4000	64	34
83400	158000	-74600	64	35
173000	122000	51000	65	35
162000	122000	40000	66	35
83400	122000	-38600	66	36
162000	173000	-11000	66	37
83400	173000	-89600	66	38
83400	162000	-78600	66	39

S Statistic = 66 - 39 = 27

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Tied Group	Value	Members
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Time Period	Observations
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2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 7350

b = 24570

c = 420

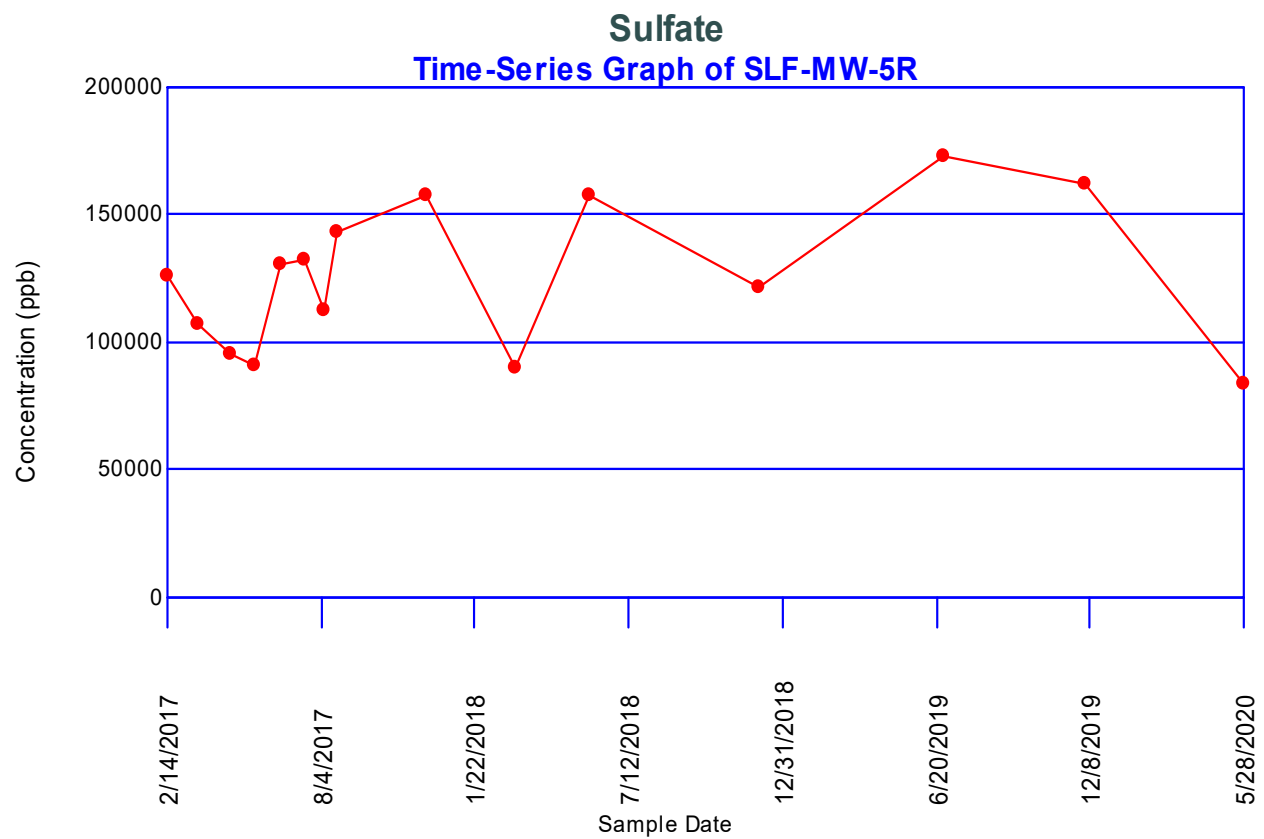
Group Variance = 408.333

Z-Score = 1.28667

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.28667| <= 1.97737 indicating no evidence of a trend





## Concentrations (ppb)

### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	3.468e+006	3.468e+006
			11/30/2016	483000	483000
			12/28/2016	3.5667e+006	3.5667e+006
			1/18/2017	2.93e+006	2.93e+006
			2/14/2017	3.5e+006	3.5e+006
			3/20/2017	3.13e+006	3.13e+006
			4/25/2017	3.4e+006	3.4e+006
			5/22/2017	3.014e+006	3.014e+006
			6/20/2017	2.97e+006	2.97e+006
			7/17/2017	2.91e+006	2.91e+006
			8/8/2017	3.05e+006	3.05e+006
			8/21/2017	3.05e+006	3.05e+006
			11/29/2017	3.072e+006	3.072e+006
			5/31/2018	3.91e+006	3.91e+006
			12/4/2018	4.24e+006	4.24e+006
			6/28/2019	4.53e+006	4.53e+006
			11/4/2019	4.38e+006	4.38e+006
			12/2/2019	4.13e+006	4.13e+006
			5/28/2020	4.26e+006	4.26e+006
			<b>4/28/2021</b>	<b>3.67e+006</b>	<b>3.67e+006</b>

SLF-MW-3B	17	0 (0%)	10/21/2016	1.341e+006	1.341e+006			
			11/30/2016	1.38e+006	1.38e+006			
			12/28/2016	1.41e+006	1.41e+006			
			1/18/2017	1.12e+006	1.12e+006			
			2/15/2017	1.179e+006	1.179e+006			
			3/20/2017	1.255e+006	1.255e+006			
			4/25/2017	1.227e+006	1.227e+006			
			5/22/2017	1.142e+006	1.142e+006			
			6/20/2017	1.156e+006	1.156e+006			
			7/17/2017	1.232e+006	1.232e+006			
			8/7/2017	1.273e+006	1.273e+006			
			8/21/2017	1.235e+006	1.235e+006			
			11/29/2017	1.208e+006	1.208e+006			
			12/4/2018	1.28e+006	1.28e+006			
			6/27/2019	1.36e+006	1.36e+006			
			12/2/2019	1.1e+006	1.1e+006			
			5/28/2020	1.15e+006	1.15e+006			
						<b>12/1/2020</b>	<b>1.21e+006</b>	<b>1.21e+006</b>
						<b>4/28/2021</b>	<b>1.22e+006</b>	<b>1.22e+006</b>

SLF-MW-5R	14	0 (0%)	2/14/2017	470000	470000
			3/20/2017	445000	445000
			4/25/2017	435000	435000
			5/22/2017	400000	400000
			6/20/2017	451000	451000
			7/17/2017	556000	556000
			8/7/2017	477000	477000
			8/22/2017	529000	529000
			11/29/2017	549000	549000
			5/30/2018	591000	591000
			12/4/2018	480000	480000
			6/28/2019	611000	611000
			12/2/2019	432000	432000
			5/28/2020	384000	384000
			<b>11/30/2020</b>	<b>336000</b>	<b>336000</b>
			<b>4/28/2021</b>	<b>498000</b>	<b>498000</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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### Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.16875	0.647869	0.462	483000
2	0.173077	0.0444444	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	3.468e+006	FALSE
	11/30/2016	<b>483000</b>	<b>TRUE</b>
	12/28/2016	3.5667e+006	FALSE
	1/18/2017	2.93e+006	FALSE
	2/14/2017	3.5e+006	FALSE
	3/20/2017	3.13e+006	FALSE
	4/25/2017	3.4e+006	FALSE
	5/22/2017	3.014e+006	FALSE
	6/20/2017	2.97e+006	FALSE
	7/17/2017	2.91e+006	FALSE
	8/8/2017	3.05e+006	FALSE
	8/21/2017	3.05e+006	FALSE
	11/29/2017	3.072e+006	FALSE
	5/31/2018	3.91e+006	FALSE
	12/4/2018	4.24e+006	FALSE
	6/28/2019	4.53e+006	FALSE
	11/4/2019	4.38e+006	FALSE
	12/2/2019	4.13e+006	FALSE
	5/28/2020	4.26e+006	FALSE

## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.173077	0.0444444	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	3.468e+006	FALSE
	12/28/2016	3.5667e+006	FALSE
	1/18/2017	2.93e+006	FALSE
	2/14/2017	3.5e+006	FALSE
	3/20/2017	3.13e+006	FALSE
	4/25/2017	3.4e+006	FALSE
	5/22/2017	3.014e+006	FALSE
	6/20/2017	2.97e+006	FALSE
	7/17/2017	2.91e+006	FALSE
	8/8/2017	3.05e+006	FALSE
	8/21/2017	3.05e+006	FALSE
	11/29/2017	3.072e+006	FALSE
	5/31/2018	3.91e+006	FALSE
	12/4/2018	4.24e+006	FALSE
	6/28/2019	4.53e+006	FALSE
	11/4/2019	4.38e+006	FALSE
	12/2/2019	4.13e+006	FALSE
	5/28/2020	4.26e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	2.91e+006	4.53e+006	1.62e+006	0.4886	791532
2	2.93e+006	4.38e+006	1.45e+006	0.3253	471685
3	2.97e+006	4.26e+006	1.29e+006	0.2553	329337
4	3.014e+006	4.24e+006	1.226e+006	0.2027	248510
5	3.05e+006	4.13e+006	1.08e+006	0.1587	171396
6	3.05e+006	3.91e+006	860000	0.1197	102942
7	3.072e+006	3.5667e+006	494700	0.0837	41406.4
8	3.13e+006	3.5e+006	370000	0.0496	18352
9	3.4e+006	3.468e+006	68000	0.0163	1108.4
10	3.468e+006	3.4e+006	-68000		
11	3.5e+006	3.13e+006	-370000		
12	3.5667e+006	3.072e+006	-494700		
13	3.91e+006	3.05e+006	-860000		
14	4.13e+006	3.05e+006	-1.08e+006		
15	4.24e+006	3.014e+006	-1.226e+006		
16	4.26e+006	2.97e+006	-1.29e+006		
17	4.38e+006	2.93e+006	-1.45e+006		
18	4.53e+006	2.91e+006	-1.62e+006		

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Sum of b values = 2.17627e+006

Sample Standard Deviation = 565772

W Statistic = 0.870349

**5% Critical value of 0.897 exceeds 0.870349**

**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.858 is less than 0.870349

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
3.5667e+006	3.468e+006	98700	1	0
2.93e+006	3.468e+006	-538000	1	1
3.5e+006	3.468e+006	32000	2	1
3.13e+006	3.468e+006	-338000	2	2
3.4e+006	3.468e+006	-68000	2	3
3.014e+006	3.468e+006	-454000	2	4
2.97e+006	3.468e+006	-498000	2	5
2.91e+006	3.468e+006	-558000	2	6
3.05e+006	3.468e+006	-418000	2	7
3.05e+006	3.468e+006	-418000	2	8
3.072e+006	3.468e+006	-396000	2	9
3.91e+006	3.468e+006	442000	3	9
4.24e+006	3.468e+006	772000	4	9
4.53e+006	3.468e+006	1.062e+006	5	9
4.38e+006	3.468e+006	912000	6	9
4.13e+006	3.468e+006	662000	7	9
4.26e+006	3.468e+006	792000	8	9
2.93e+006	3.5667e+006	-636700	8	10
3.5e+006	3.5667e+006	-66700	8	11
3.13e+006	3.5667e+006	-436700	8	12
3.4e+006	3.5667e+006	-166700	8	13
3.014e+006	3.5667e+006	-552700	8	14
2.97e+006	3.5667e+006	-596700	8	15
2.91e+006	3.5667e+006	-656700	8	16
3.05e+006	3.5667e+006	-516700	8	17
3.05e+006	3.5667e+006	-516700	8	18
3.072e+006	3.5667e+006	-494700	8	19
3.91e+006	3.5667e+006	343300	9	19
4.24e+006	3.5667e+006	673300	10	19
4.53e+006	3.5667e+006	963300	11	19
4.38e+006	3.5667e+006	813300	12	19
4.13e+006	3.5667e+006	563300	13	19
4.26e+006	3.5667e+006	693300	14	19
3.5e+006	2.93e+006	570000	15	19
3.13e+006	2.93e+006	200000	16	19
3.4e+006	2.93e+006	470000	17	19
3.014e+006	2.93e+006	84000	18	19
2.97e+006	2.93e+006	40000	19	19
2.91e+006	2.93e+006	-20000	19	20
3.05e+006	2.93e+006	120000	20	20
3.05e+006	2.93e+006	120000	21	20
3.072e+006	2.93e+006	142000	22	20
3.91e+006	2.93e+006	980000	23	20
4.24e+006	2.93e+006	1.31e+006	24	20
4.53e+006	2.93e+006	1.6e+006	25	20

4.38e+006	2.93e+006	1.45e+006	26	20
4.13e+006	2.93e+006	1.2e+006	27	20
4.26e+006	2.93e+006	1.33e+006	28	20
3.13e+006	3.5e+006	-370000	28	21
3.4e+006	3.5e+006	-100000	28	22
3.014e+006	3.5e+006	-486000	28	23
2.97e+006	3.5e+006	-530000	28	24
2.91e+006	3.5e+006	-590000	28	25
3.05e+006	3.5e+006	-450000	28	26
3.05e+006	3.5e+006	-450000	28	27
3.072e+006	3.5e+006	-428000	28	28
3.91e+006	3.5e+006	410000	29	28
4.24e+006	3.5e+006	740000	30	28
4.53e+006	3.5e+006	1.03e+006	31	28
4.38e+006	3.5e+006	880000	32	28
4.13e+006	3.5e+006	630000	33	28
4.26e+006	3.5e+006	760000	34	28
3.4e+006	3.13e+006	270000	35	28
3.014e+006	3.13e+006	-116000	35	29
2.97e+006	3.13e+006	-160000	35	30
2.91e+006	3.13e+006	-220000	35	31
3.05e+006	3.13e+006	-80000	35	32
3.05e+006	3.13e+006	-80000	35	33
3.072e+006	3.13e+006	-58000	35	34
3.91e+006	3.13e+006	780000	36	34
4.24e+006	3.13e+006	1.11e+006	37	34
4.53e+006	3.13e+006	1.4e+006	38	34
4.38e+006	3.13e+006	1.25e+006	39	34
4.13e+006	3.13e+006	1e+006	40	34
4.26e+006	3.13e+006	1.13e+006	41	34
3.014e+006	3.4e+006	-386000	41	35
2.97e+006	3.4e+006	-430000	41	36
2.91e+006	3.4e+006	-490000	41	37
3.05e+006	3.4e+006	-350000	41	38
3.05e+006	3.4e+006	-350000	41	39
3.072e+006	3.4e+006	-328000	41	40
3.91e+006	3.4e+006	510000	42	40
4.24e+006	3.4e+006	840000	43	40
4.53e+006	3.4e+006	1.13e+006	44	40
4.38e+006	3.4e+006	980000	45	40
4.13e+006	3.4e+006	730000	46	40
4.26e+006	3.4e+006	860000	47	40
2.97e+006	3.014e+006	-44000	47	41
2.91e+006	3.014e+006	-104000	47	42
3.05e+006	3.014e+006	36000	48	42
3.05e+006	3.014e+006	36000	49	42
3.072e+006	3.014e+006	58000	50	42
3.91e+006	3.014e+006	896000	51	42
4.24e+006	3.014e+006	1.226e+006	52	42
4.53e+006	3.014e+006	1.516e+006	53	42
4.38e+006	3.014e+006	1.366e+006	54	42
4.13e+006	3.014e+006	1.116e+006	55	42
4.26e+006	3.014e+006	1.246e+006	56	42



2.91e+006	2.97e+006	-60000	56	43
3.05e+006	2.97e+006	80000	57	43
3.05e+006	2.97e+006	80000	58	43
3.072e+006	2.97e+006	102000	59	43
3.91e+006	2.97e+006	940000	60	43
4.24e+006	2.97e+006	1.27e+006	61	43
4.53e+006	2.97e+006	1.56e+006	62	43
4.38e+006	2.97e+006	1.41e+006	63	43
4.13e+006	2.97e+006	1.16e+006	64	43
4.26e+006	2.97e+006	1.29e+006	65	43
3.05e+006	2.91e+006	140000	66	43
3.05e+006	2.91e+006	140000	67	43
3.072e+006	2.91e+006	162000	68	43
3.91e+006	2.91e+006	1e+006	69	43
4.24e+006	2.91e+006	1.33e+006	70	43
4.53e+006	2.91e+006	1.62e+006	71	43
4.38e+006	2.91e+006	1.47e+006	72	43
4.13e+006	2.91e+006	1.22e+006	73	43
4.26e+006	2.91e+006	1.35e+006	74	43
3.05e+006	3.05e+006	0	74	43
3.072e+006	3.05e+006	22000	75	43
3.91e+006	3.05e+006	860000	76	43
4.24e+006	3.05e+006	1.19e+006	77	43
4.53e+006	3.05e+006	1.48e+006	78	43
4.38e+006	3.05e+006	1.33e+006	79	43
4.13e+006	3.05e+006	1.08e+006	80	43
4.26e+006	3.05e+006	1.21e+006	81	43
3.072e+006	3.05e+006	22000	82	43
3.91e+006	3.05e+006	860000	83	43
4.24e+006	3.05e+006	1.19e+006	84	43
4.53e+006	3.05e+006	1.48e+006	85	43
4.38e+006	3.05e+006	1.33e+006	86	43
4.13e+006	3.05e+006	1.08e+006	87	43
4.26e+006	3.05e+006	1.21e+006	88	43
3.91e+006	3.072e+006	838000	89	43
4.24e+006	3.072e+006	1.168e+006	90	43
4.53e+006	3.072e+006	1.458e+006	91	43
4.38e+006	3.072e+006	1.308e+006	92	43
4.13e+006	3.072e+006	1.058e+006	93	43
4.26e+006	3.072e+006	1.188e+006	94	43
4.24e+006	3.91e+006	330000	95	43
4.53e+006	3.91e+006	620000	96	43
4.38e+006	3.91e+006	470000	97	43
4.13e+006	3.91e+006	220000	98	43
4.26e+006	3.91e+006	350000	99	43
4.53e+006	4.24e+006	290000	100	43
4.38e+006	4.24e+006	140000	101	43
4.13e+006	4.24e+006	-110000	101	44
4.26e+006	4.24e+006	20000	102	44

4.38e+006	4.53e+006	-150000	102	45
4.13e+006	4.53e+006	-400000	102	46
4.26e+006	4.53e+006	-270000	102	47
4.13e+006	4.38e+006	-250000	102	48
4.26e+006	4.38e+006	-120000	102	49
4.26e+006	4.13e+006	130000	103	49

S Statistic = 103 - 49 = 54

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Tied Group	Value	Members
1	3.05e+006	2

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Time Period	Observations
10/21/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
11/4/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 12546

b = 44064

c = 612

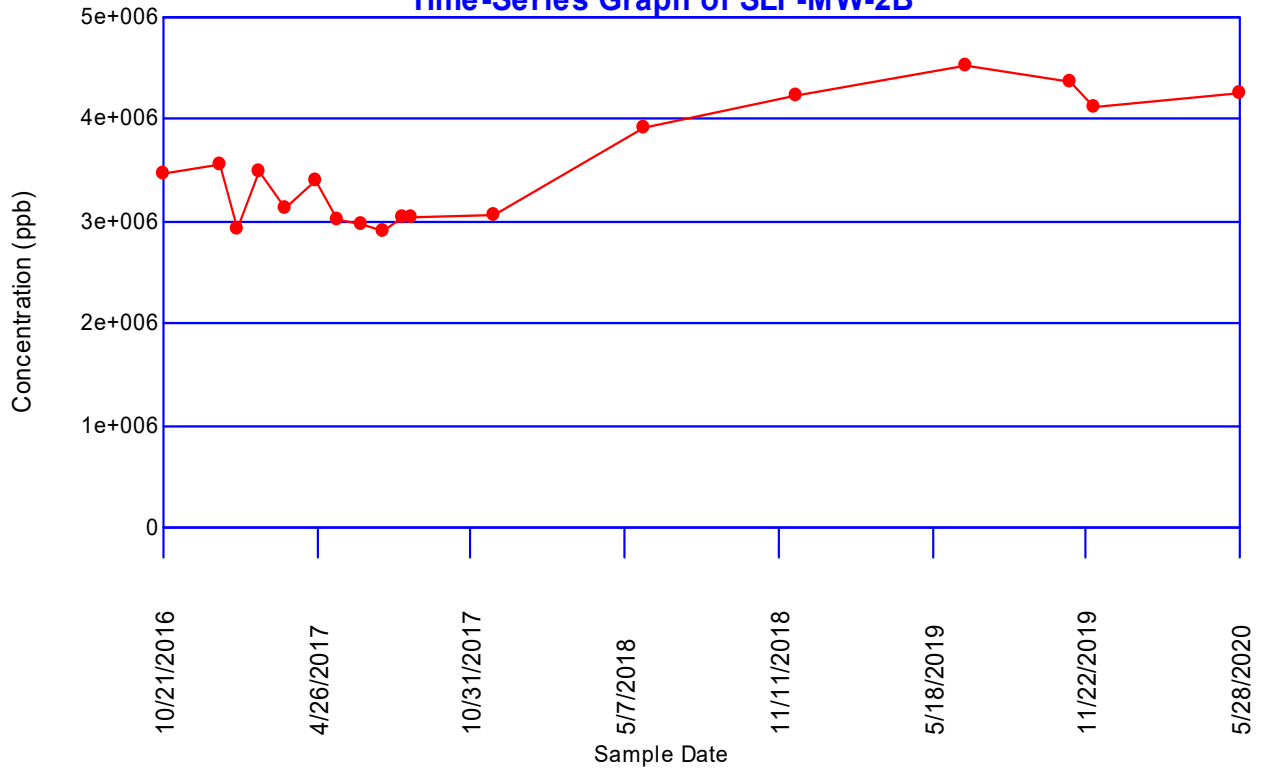
Group Variance = 696

Z-Score = 2.00896

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**|2.00896| > 1.97737 indicating a trend**

### Total Dissolved Solids (TDS) Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 17 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.186567	0.161538	0.49	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	1.341e+006	FALSE
	11/30/2016	1.38e+006	FALSE
	12/28/2016	1.41e+006	FALSE
	1/18/2017	1.12e+006	FALSE
	2/15/2017	1.179e+006	FALSE
	3/20/2017	1.255e+006	FALSE
	4/25/2017	1.227e+006	FALSE
	5/22/2017	1.142e+006	FALSE
	6/20/2017	1.156e+006	FALSE
	7/17/2017	1.232e+006	FALSE
	8/7/2017	1.273e+006	FALSE
	8/21/2017	1.235e+006	FALSE
	11/29/2017	1.208e+006	FALSE
	12/4/2018	1.28e+006	FALSE
	6/27/2019	1.36e+006	FALSE
	12/2/2019	1.1e+006	FALSE
	5/28/2020	1.15e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 8 for 17 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	1.1e+006	1.41e+006	310000	0.4968	154008
2	1.12e+006	1.38e+006	260000	0.3273	85098
3	1.142e+006	1.36e+006	218000	0.254	55372
4	1.15e+006	1.341e+006	191000	0.1988	37970.8
5	1.156e+006	1.28e+006	124000	0.1524	18897.6
6	1.179e+006	1.273e+006	94000	0.1109	10424.6
7	1.208e+006	1.255e+006	47000	0.0725	3407.5
8	1.227e+006	1.235e+006	8000	0.0359	287.2
9	1.232e+006	1.232e+006	0		
10	1.235e+006	1.227e+006	-8000		
11	1.255e+006	1.208e+006	-47000		
12	1.273e+006	1.179e+006	-94000		
13	1.28e+006	1.156e+006	-124000		
14	1.341e+006	1.15e+006	-191000		
15	1.36e+006	1.142e+006	-218000		
16	1.38e+006	1.12e+006	-260000		
17	1.41e+006	1.1e+006	-310000		

---

Sum of b values = 365466

Sample Standard Deviation = 93447.1

W Statistic = 0.955964

5% Critical value of 0.892 is less than 0.955964  
Data is normally distributed at 95% level of significance

1% Critical value of 0.851 is less than 0.955964  
Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
1.38e+006	1.341e+006	39000	1	0
1.41e+006	1.341e+006	69000	2	0
1.12e+006	1.341e+006	-221000	2	1
1.179e+006	1.341e+006	-162000	2	2
1.255e+006	1.341e+006	-86000	2	3
1.227e+006	1.341e+006	-114000	2	4
1.142e+006	1.341e+006	-199000	2	5
1.156e+006	1.341e+006	-185000	2	6
1.232e+006	1.341e+006	-109000	2	7
1.273e+006	1.341e+006	-68000	2	8
1.235e+006	1.341e+006	-106000	2	9
1.208e+006	1.341e+006	-133000	2	10
1.28e+006	1.341e+006	-61000	2	11
1.36e+006	1.341e+006	19000	3	11
1.1e+006	1.341e+006	-241000	3	12
1.15e+006	1.341e+006	-191000	3	13
1.41e+006	1.38e+006	30000	4	13
1.12e+006	1.38e+006	-260000	4	14
1.179e+006	1.38e+006	-201000	4	15
1.255e+006	1.38e+006	-125000	4	16
1.227e+006	1.38e+006	-153000	4	17
1.142e+006	1.38e+006	-238000	4	18
1.156e+006	1.38e+006	-224000	4	19
1.232e+006	1.38e+006	-148000	4	20
1.273e+006	1.38e+006	-107000	4	21
1.235e+006	1.38e+006	-145000	4	22
1.208e+006	1.38e+006	-172000	4	23
1.28e+006	1.38e+006	-100000	4	24
1.36e+006	1.38e+006	-20000	4	25
1.1e+006	1.38e+006	-280000	4	26
1.15e+006	1.38e+006	-230000	4	27
1.12e+006	1.41e+006	-290000	4	28
1.179e+006	1.41e+006	-231000	4	29
1.255e+006	1.41e+006	-155000	4	30
1.227e+006	1.41e+006	-183000	4	31
1.142e+006	1.41e+006	-268000	4	32
1.156e+006	1.41e+006	-254000	4	33
1.232e+006	1.41e+006	-178000	4	34
1.273e+006	1.41e+006	-137000	4	35
1.235e+006	1.41e+006	-175000	4	36
1.208e+006	1.41e+006	-202000	4	37
1.28e+006	1.41e+006	-130000	4	38
1.36e+006	1.41e+006	-50000	4	39
1.1e+006	1.41e+006	-310000	4	40
1.15e+006	1.41e+006	-260000	4	41

1.179e+006	1.12e+006	59000	5	41
1.255e+006	1.12e+006	135000	6	41
1.227e+006	1.12e+006	107000	7	41
1.142e+006	1.12e+006	22000	8	41
1.156e+006	1.12e+006	36000	9	41
1.232e+006	1.12e+006	112000	10	41
1.273e+006	1.12e+006	153000	11	41
1.235e+006	1.12e+006	115000	12	41
1.208e+006	1.12e+006	88000	13	41
1.28e+006	1.12e+006	160000	14	41
1.36e+006	1.12e+006	240000	15	41
1.1e+006	1.12e+006	-20000	15	42
1.15e+006	1.12e+006	30000	16	42
1.255e+006	1.179e+006	76000	17	42
1.227e+006	1.179e+006	48000	18	42
1.142e+006	1.179e+006	-37000	18	43
1.156e+006	1.179e+006	-23000	18	44
1.232e+006	1.179e+006	53000	19	44
1.273e+006	1.179e+006	94000	20	44
1.235e+006	1.179e+006	56000	21	44
1.208e+006	1.179e+006	29000	22	44
1.28e+006	1.179e+006	101000	23	44
1.36e+006	1.179e+006	181000	24	44
1.1e+006	1.179e+006	-79000	24	45
1.15e+006	1.179e+006	-29000	24	46
1.227e+006	1.255e+006	-28000	24	47
1.142e+006	1.255e+006	-113000	24	48
1.156e+006	1.255e+006	-99000	24	49
1.232e+006	1.255e+006	-23000	24	50
1.273e+006	1.255e+006	18000	25	50
1.235e+006	1.255e+006	-20000	25	51
1.208e+006	1.255e+006	-47000	25	52
1.28e+006	1.255e+006	25000	26	52
1.36e+006	1.255e+006	105000	27	52
1.1e+006	1.255e+006	-155000	27	53
1.15e+006	1.255e+006	-105000	27	54
1.142e+006	1.227e+006	-85000	27	55
1.156e+006	1.227e+006	-71000	27	56
1.232e+006	1.227e+006	5000	28	56
1.273e+006	1.227e+006	46000	29	56
1.235e+006	1.227e+006	8000	30	56
1.208e+006	1.227e+006	-19000	30	57
1.28e+006	1.227e+006	53000	31	57
1.36e+006	1.227e+006	133000	32	57
1.1e+006	1.227e+006	-127000	32	58
1.15e+006	1.227e+006	-77000	32	59
1.156e+006	1.142e+006	14000	33	59
1.232e+006	1.142e+006	90000	34	59
1.273e+006	1.142e+006	131000	35	59
1.235e+006	1.142e+006	93000	36	59
1.208e+006	1.142e+006	66000	37	59
1.28e+006	1.142e+006	138000	38	59

1.36e+006	1.142e+006	218000	39	59
1.1e+006	1.142e+006	-42000	39	60
1.15e+006	1.142e+006	8000	40	60
1.232e+006	1.156e+006	76000	41	60
1.273e+006	1.156e+006	117000	42	60
1.235e+006	1.156e+006	79000	43	60
1.208e+006	1.156e+006	52000	44	60
1.28e+006	1.156e+006	124000	45	60
1.36e+006	1.156e+006	204000	46	60
1.1e+006	1.156e+006	-56000	46	61
1.15e+006	1.156e+006	-6000	46	62
1.273e+006	1.232e+006	41000	47	62
1.235e+006	1.232e+006	3000	48	62
1.208e+006	1.232e+006	-24000	48	63
1.28e+006	1.232e+006	48000	49	63
1.36e+006	1.232e+006	128000	50	63
1.1e+006	1.232e+006	-132000	50	64
1.15e+006	1.232e+006	-82000	50	65
1.235e+006	1.273e+006	-38000	50	66
1.208e+006	1.273e+006	-65000	50	67
1.28e+006	1.273e+006	7000	51	67
1.36e+006	1.273e+006	87000	52	67
1.1e+006	1.273e+006	-173000	52	68
1.15e+006	1.273e+006	-123000	52	69
1.208e+006	1.235e+006	-27000	52	70
1.28e+006	1.235e+006	45000	53	70
1.36e+006	1.235e+006	125000	54	70
1.1e+006	1.235e+006	-135000	54	71
1.15e+006	1.235e+006	-85000	54	72
1.28e+006	1.208e+006	72000	55	72
1.36e+006	1.208e+006	152000	56	72
1.1e+006	1.208e+006	-108000	56	73
1.15e+006	1.208e+006	-58000	56	74
1.36e+006	1.28e+006	80000	57	74
1.1e+006	1.28e+006	-180000	57	75
1.15e+006	1.28e+006	-130000	57	76
1.1e+006	1.36e+006	-260000	57	77
1.15e+006	1.36e+006	-210000	57	78
1.15e+006	1.1e+006	50000	58	78

S Statistic = 58 - 78 = -20

---

Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1



1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 10608

b = 36720

c = 544

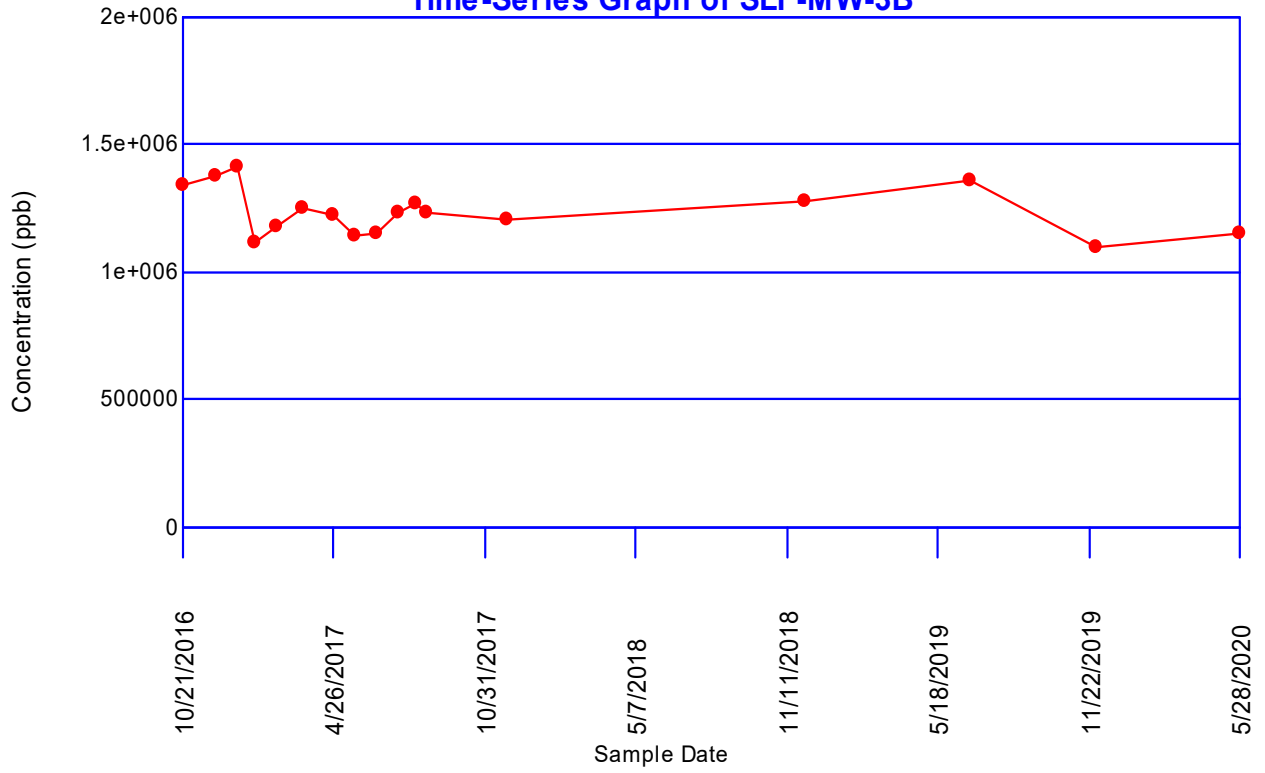
Group Variance = 589.333

Z-Score = -0.78266

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|-0.78266| \leq 1.97737$  indicating no evidence of a trend

### Total Dissolved Solids (TDS) Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.307263	0.27907	0.546	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	470000	FALSE
	3/20/2017	445000	FALSE
	4/25/2017	435000	FALSE
	5/22/2017	400000	FALSE
	6/20/2017	451000	FALSE
	7/17/2017	556000	FALSE
	8/7/2017	477000	FALSE
	8/22/2017	529000	FALSE
	11/29/2017	549000	FALSE
	5/30/2018	591000	FALSE
	12/4/2018	480000	FALSE
	6/28/2019	611000	FALSE
	12/2/2019	432000	FALSE
	5/28/2020	384000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 14 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	384000	611000	227000	0.5251	119198
2	400000	591000	191000	0.3318	63373.8
3	432000	556000	124000	0.246	30504
4	435000	549000	114000	0.1802	20542.8
5	445000	529000	84000	0.124	10416
6	451000	480000	29000	0.0727	2108.3
7	470000	477000	7000	0.024	168
8	477000	470000	-7000		
9	480000	451000	-29000		
10	529000	445000	-84000		
11	549000	435000	-114000		
12	556000	432000	-124000		
13	591000	400000	-191000		
14	611000	384000	-227000		

---

Sum of b values = 246311

Sample Standard Deviation = 70143.5

W Statistic = 0.948523

5% Critical value of 0.874 is less than 0.948523  
Data is normally distributed at 95% level of significance

1% Critical value of 0.825 is less than 0.948523  
Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

---

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
445000	470000	-25000	0	1
435000	470000	-35000	0	2
400000	470000	-70000	0	3
451000	470000	-19000	0	4
556000	470000	86000	1	4
477000	470000	7000	2	4
529000	470000	59000	3	4
549000	470000	79000	4	4
591000	470000	121000	5	4
480000	470000	10000	6	4
611000	470000	141000	7	4
432000	470000	-38000	7	5
384000	470000	-86000	7	6
435000	445000	-10000	7	7
400000	445000	-45000	7	8
451000	445000	6000	8	8
556000	445000	111000	9	8
477000	445000	32000	10	8
529000	445000	84000	11	8
549000	445000	104000	12	8
591000	445000	146000	13	8
480000	445000	35000	14	8
611000	445000	166000	15	8
432000	445000	-13000	15	9
384000	445000	-61000	15	10
400000	435000	-35000	15	11
451000	435000	16000	16	11
556000	435000	121000	17	11
477000	435000	42000	18	11
529000	435000	94000	19	11
549000	435000	114000	20	11
591000	435000	156000	21	11
480000	435000	45000	22	11
611000	435000	176000	23	11
432000	435000	-3000	23	12
384000	435000	-51000	23	13
451000	400000	51000	24	13
556000	400000	156000	25	13
477000	400000	77000	26	13
529000	400000	129000	27	13
549000	400000	149000	28	13
591000	400000	191000	29	13
480000	400000	80000	30	13
611000	400000	211000	31	13

432000	400000	32000	32	13
384000	400000	-16000	32	14
556000	451000	105000	33	14
477000	451000	26000	34	14
529000	451000	78000	35	14
549000	451000	98000	36	14
591000	451000	140000	37	14
480000	451000	29000	38	14
611000	451000	160000	39	14
432000	451000	-19000	39	15
384000	451000	-67000	39	16
477000	556000	-79000	39	17
529000	556000	-27000	39	18
549000	556000	-7000	39	19
591000	556000	35000	40	19
480000	556000	-76000	40	20
611000	556000	55000	41	20
432000	556000	-124000	41	21
384000	556000	-172000	41	22
529000	477000	52000	42	22
549000	477000	72000	43	22
591000	477000	114000	44	22
480000	477000	3000	45	22
611000	477000	134000	46	22
432000	477000	-45000	46	23
384000	477000	-93000	46	24
549000	529000	20000	47	24
591000	529000	62000	48	24
480000	529000	-49000	48	25
611000	529000	82000	49	25
432000	529000	-97000	49	26
384000	529000	-145000	49	27
591000	549000	42000	50	27
480000	549000	-69000	50	28
611000	549000	62000	51	28
432000	549000	-117000	51	29
384000	549000	-165000	51	30
480000	591000	-111000	51	31
611000	591000	20000	52	31
432000	591000	-159000	52	32
384000	591000	-207000	52	33
611000	480000	131000	53	33
432000	480000	-48000	53	34
384000	480000	-96000	53	35
432000	611000	-179000	53	36
384000	611000	-227000	53	37
384000	432000	-48000	53	38

S Statistic = 53 - 38 = 15

---

Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/22/2017		1
11/29/2017		1
5/30/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 6006

b = 19656

c = 364

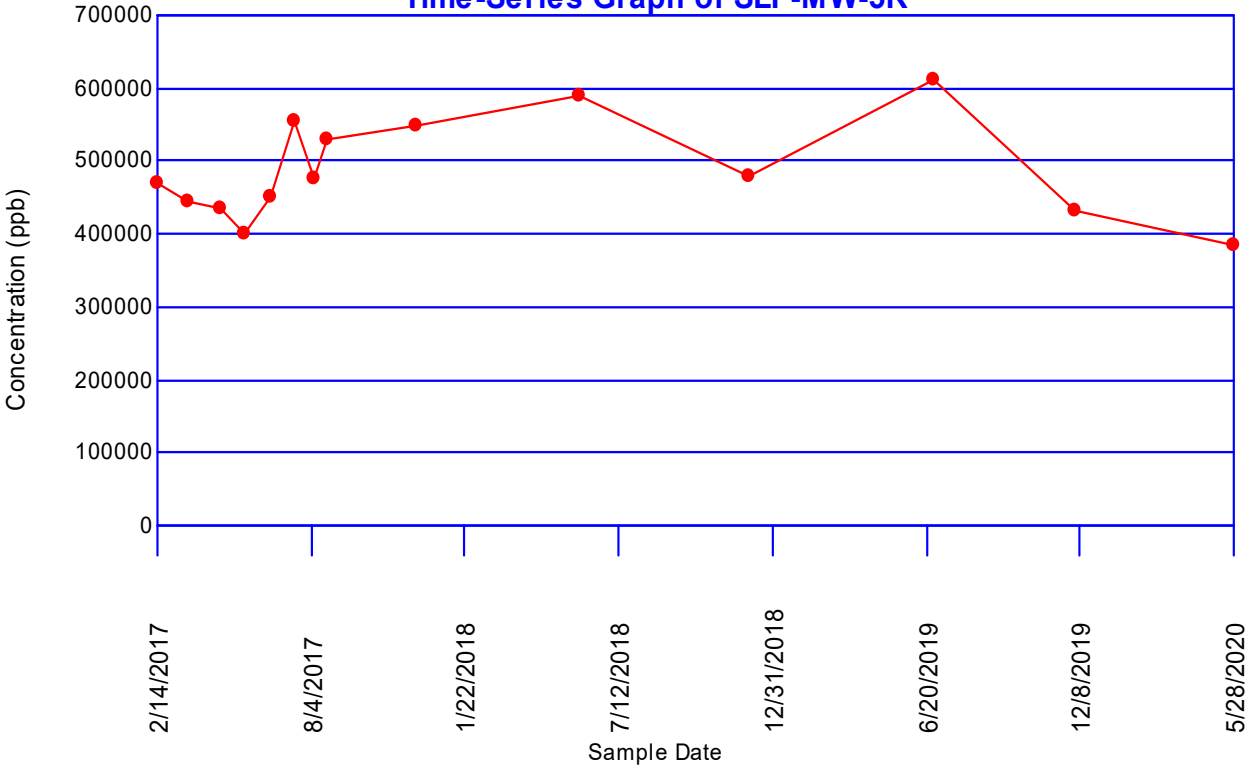
Group Variance = 333.667

Z-Score = 0.766428

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|0.766428| \leq 1.97737$  indicating no evidence of a trend

**Total Dissolved Solids (TDS)**  
**Time-Series Graph of SLF-MW-5R**





## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	2683.12
	11/30/2016	4817.2
	12/28/2016	3895.84
	1/18/2017	3956.91
	2/14/2017	3573.57
	3/20/2017	3806.16
	4/25/2017	3914.41
	5/22/2017	3891.56
	6/20/2017	3773.44
	7/17/2017	4668
	8/8/2017	4027
	8/21/2017	3197
	11/29/2017	4576
	5/31/2018	4370
	12/4/2018	4940
	6/28/2019	4410
	12/2/2019	4280
	5/28/2020	3390

From 18 baseline samples  
 Baseline mean = 4009.46  
 Baseline std Dev = 582.366

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 18 (background observations) - 1  
 $t(0.9975, 17) = 3.36544$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	2900	[0, 6023.08]	FALSE
11/30/2020	1	3560	[0, 6023.08]	FALSE
5/28/2020	1	3390	[0, 6023.08]	FALSE
12/2/2019	1	4280	[0, 6023.08]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	4238.42
	11/30/2016	6242.46
	12/28/2016	5154.49
	1/18/2017	4910.63
	2/15/2017	3595.68
	3/20/2017	3637.76
	4/25/2017	3392.27
	5/22/2017	3135.58
	6/20/2017	3335.63
	7/17/2017	4381
	8/7/2017	3684
	8/21/2017	3922
	11/29/2017	3860
	5/30/2018	2650
	12/4/2018	3490
	6/27/2019	2170
	12/2/2019	2220
	5/28/2020	1590

From 18 baseline samples

Baseline mean = 3645

Baseline std Dev = 1124.86

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$

t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$

Degrees of Freedom = 18 (background observations) - 1

$t(0.9975, 17) = 3.36544$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1410	[0, 7534.39]	FALSE
12/1/2020	1	1920	[0, 7534.39]	FALSE
5/28/2020	1	1590	[0, 7534.39]	FALSE
12/2/2019	1	2220	[0, 7534.39]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	493.993
	3/20/2017	345.223
	4/25/2017	314.115
	5/22/2017	270.744
	6/20/2017	438.039
	7/17/2017	550
	8/7/2017	363
	8/22/2017	461
	11/29/2017	524
	5/30/2018	517
	12/4/2018	395
	6/28/2019	631
	12/2/2019	653
	5/28/2020	220

From 14 baseline samples  
Baseline mean = 441.151  
Baseline std Dev = 130.121

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 14 (background observations) - 1  
 $t(0.9975, 13) = 3.53713$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	431	[0, 917.559]	FALSE
11/30/2020	1	290	[0, 917.559]	FALSE
5/28/2020	1	220	[0, 917.559]	FALSE
12/2/2019	1	653	[0, 917.559]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	37032.2
	11/30/2016	61315.7
	12/28/2016	44056.6
	1/18/2017	35837.4
	2/14/2017	37524.8
	3/20/2017	38622.7
	4/25/2017	39897.3
	5/22/2017	43737.6
	6/20/2017	34857
	7/17/2017	33220
	8/8/2017	30756
	8/21/2017	31548
	11/29/2017	37641
	3/8/2018	47865
	5/31/2018	44100
	12/4/2018	48600
	6/28/2019	43600
	12/2/2019	49100
	5/28/2020	47400

From 19 baseline samples  
 Baseline mean = 41405.9  
 Baseline std Dev = 7525.63

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	41200	[0, 67163.3]	FALSE
11/30/2020	1	44100	[0, 67163.3]	FALSE
5/28/2020	1	47400	[0, 67163.3]	FALSE
12/2/2019	1	49100	[0, 67163.3]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	184501
	11/30/2016	249120
	12/28/2016	254980
	1/18/2017	228148
	2/15/2017	188140
	3/20/2017	191435
	4/25/2017	188976
	5/22/2017	229431
	6/20/2017	213067
	7/17/2017	220459
	8/7/2017	208907
	8/21/2017	235062
	11/29/2017	204990
	3/8/2018	173000
	5/30/2018	171000
	12/4/2018	200000
	6/27/2019	172000
	12/2/2019	179000
	5/28/2020	138000

From 19 baseline samples  
 Baseline mean = 201590  
 Baseline std Dev = 29984.9

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	143000	[0, 304217]	FALSE
12/1/2020	1	167000	[0, 304217]	FALSE
5/28/2020	1	138000	[0, 304217]	FALSE
12/2/2019	1	179000	[0, 304217]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	107763
	3/20/2017	104972
	4/25/2017	101443
	5/22/2017	118938
	6/20/2017	120726
	7/17/2017	123508
	8/7/2017	115159
	8/22/2017	123970
	11/29/2017	136418
	3/8/2018	105000
	5/30/2018	118000
	12/4/2018	114000
	6/28/2019	126000
	12/2/2019	130000
	5/28/2020	99100

From 15 baseline samples

Baseline mean = 116333

Baseline std Dev = 10950.5

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$

t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$

Degrees of Freedom = 15 (background observations) - 1

$t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	115000	[0, 155730]	FALSE
11/30/2020	1	85100	[0, 155730]	FALSE
5/28/2020	1	99100	[0, 155730]	FALSE
12/2/2019	1	130000	[0, 155730]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	1.54749e+006
	11/30/2016	1.61454e+006
	12/28/2016	1.768e+006
	1/18/2017	1.33503e+006
	2/14/2017	1.5337e+006
	3/20/2017	1.36241e+006
	4/25/2017	1.35437e+006
	5/22/2017	1.37044e+006
	6/20/2017	1.31495e+006
	7/17/2017	2.425e+006
	8/8/2017	616000
	8/21/2017	1.136e+006
	11/29/2017	1.421e+006
	3/8/2018	1.712e+006
	5/31/2018	1.87e+006
	12/4/2018	2.08e+006
	6/28/2019	2.53e+006
	12/2/2019	2.44e+006
	5/28/2020	2.2e+006

From 19 baseline samples  
 Baseline mean = 1.66479e+006  
 Baseline std Dev = 495499

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1.48e+006	[0, 3.36069e+006]	FALSE
11/30/2020	1	1.54e+006	[0, 3.36069e+006]	FALSE
5/28/2020	1	2.2e+006	[0, 3.36069e+006]	FALSE
12/2/2019	1	2.44e+006	[0, 3.36069e+006]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	152574
	11/30/2016	169582
	12/28/2016	160177
	1/18/2017	146634
	2/15/2017	143113
	3/20/2017	171319
	4/25/2017	167869
	5/22/2017	126662
	6/20/2017	121058
	7/17/2017	98000
	8/7/2017	103000
	8/21/2017	98000
	11/29/2017	152000
	3/8/2018	224000
	5/30/2018	179000
	12/4/2018	225000
	6/27/2019	239000
	12/2/2019	245000
	5/28/2020	262000

From 19 baseline samples  
 Baseline mean = 167578  
 Baseline std Dev = 50492.3

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	250000	[0, 340395]	FALSE
12/1/2020	1	269000	[0, 340395]	FALSE
5/28/2020	1	262000	[0, 340395]	FALSE
12/2/2019	1	245000	[0, 340395]	FALSE



## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	33649.2
	3/20/2017	25801.9
	4/25/2017	22580.8
	5/22/2017	16154
	6/20/2017	25945.6
	7/17/2017	26000
	8/7/2017	19100
	8/22/2017	25500
	11/29/2017	24500
	3/8/2018	15000
	5/30/2018	25500
	12/4/2018	20500
	6/28/2019	24300
	12/2/2019	29200
	5/28/2020	12400

From 15 baseline samples  
Baseline mean = 23075.4  
Baseline std Dev = 5597.13

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 15 (background observations) - 1  
 $t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	25700	[0, 43212.3]	FALSE
11/30/2020	1	14200	[0, 43212.3]	FALSE
5/28/2020	1	12400	[0, 43212.3]	FALSE
12/2/2019	1	29200	[0, 43212.3]	FALSE

**Non-Parametric Prediction Interval**  
**Intra-Well Comparison for SLF-MW-2B**  
**Parameter: Fluoride**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

Total Percent Non-Detects = 11.1111%  
 Future Samples (k) = 4  
 Recent Dates = 4  
 Baseline Measurements (n) = 18  
**Maximum Baseline Concentration = 2647.4**  
 Confidence Level = 81.8%  
 False Positive Rate = 18.2%

---

<b>Baseline Measurements</b>	<b>Date</b>	<b>Value</b>
	10/21/2016	ND<500
	11/30/2016	2647.4
	12/28/2016	1500
	1/18/2017	1875.9
	2/14/2017	ND<500
	3/20/2017	1794.9
	4/25/2017	1972.9
	5/22/2017	1673.4
	6/20/2017	2104.9
	7/17/2017	2000
	8/8/2017	2000
	8/21/2017	1900
	11/29/2017	2000
	5/31/2018	2200
	12/4/2018	1620
	6/28/2019	2190
	12/2/2019	2280
	5/28/2020	2330

---

<b>Date</b>	<b>Count</b>	<b>Mean</b>	<b>Significant</b>
4/28/2021	1	1980	FALSE
11/30/2020	1	2220	FALSE
5/28/2020	1	2330	FALSE
12/2/2019	1	2280	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-3B

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 18

Maximum Baseline Concentration = 500

Confidence Level = 81.8%

False Positive Rate = 18.2%

---

Baseline Measurements	Date	Value
	10/21/2016	ND<500
	11/30/2016	ND<500
	12/28/2016	ND<500
	1/18/2017	ND<500
	2/15/2017	ND<500
	3/20/2017	ND<500
	4/25/2017	ND<500
	5/22/2017	ND<500
	6/20/2017	ND<500
	7/17/2017	ND<500
	8/7/2017	ND<500
	8/21/2017	ND<500
	11/29/2017	ND<500
	5/30/2018	ND<500
	12/4/2018	ND<500
	6/27/2019	ND<500
	12/2/2019	ND<500
	5/28/2020	ND<500

---

Date	Count	Mean	Significant
4/28/2021	1	500	FALSE
12/1/2020	1	500	FALSE
5/28/2020	1	500	FALSE
12/2/2019	1	500	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-5R

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 14

Maximum Baseline Concentration = 500

Confidence Level = 77.8%

False Positive Rate = 22.2%

---

Baseline Measurements	Date	Value
	2/14/2017	ND<500
	3/20/2017	ND<500
	4/25/2017	ND<500
	5/22/2017	ND<500
	6/20/2017	ND<500
	7/17/2017	ND<500
	8/7/2017	ND<500
	8/22/2017	ND<500
	11/29/2017	ND<500
	5/30/2018	ND<500
	12/4/2018	ND<500
	6/28/2019	ND<500
	12/2/2019	ND<500
	5/28/2020	ND<500

---

Date	Count	Mean	Significant
4/28/2021	1	500	FALSE
11/30/2020	1	500	FALSE
5/28/2020	1	500	FALSE
12/2/2019	1	500	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-2B

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 20

Maximum Baseline Concentration = 9

Confidence Level = 83.3%

False Positive Rate = 16.7%

---

Baseline Measurements	Date	Value
	10/21/2016	7.51
	11/30/2016	7.67
	12/28/2016	7.73
	1/18/2017	7.59
	2/14/2017	7.79
	3/20/2017	7.61
	4/25/2017	7.48
	5/22/2017	7.93
	6/20/2017	8.06
	7/17/2017	8.34
	8/8/2017	9
	8/21/2017	8.93
	11/29/2017	7.66
	3/8/2018	7.88
	5/31/2018	7.56
	12/4/2018	7.62
	6/28/2019	7.54
	11/4/2019	7.6
	12/2/2019	7.5
	5/28/2020	7.28

---

Date	Count	Mean	Significant
4/28/2021	1	7.73	FALSE
11/30/2020	1	7.87	FALSE
5/28/2020	1	7.28	FALSE
12/2/2019	1	7.5	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% Two-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	7.02
	11/30/2016	7.11
	12/28/2016	7.19
	1/18/2017	6.97
	2/15/2017	7.24
	3/20/2017	7.06
	4/25/2017	7.02
	5/22/2017	7.22
	6/20/2017	6.99
	7/17/2017	7.33
	8/7/2017	7.61
	8/21/2017	7.53
	11/29/2017	7.12
	3/8/2018	7.46
	5/30/2018	7.09
	12/4/2018	7.11
	6/27/2019	7.22
	12/2/2019	7.11
	5/28/2020	6.97

From 19 baseline samples

Baseline mean = 7.17737

Baseline std Dev = 0.187286

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.05/4)/2 = 99.875\%$

t is Percentile of Student's T-Test  $(0.99/4/2) = 0.99875$

Degrees of Freedom = 19 (background observations) - 1

$t(0.99875, 19) = 3.56472$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	7.14	[6.49, 7.86]	FALSE
12/1/2020	1	7.23	[6.49, 7.86]	FALSE
5/28/2020	1	6.97	[6.49, 7.86]	FALSE
12/2/2019	1	7.11	[6.49, 7.86]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% Two-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	7.16
	3/20/2017	7.14
	4/25/2017	7.06
	5/22/2017	7.14
	6/20/2017	7.09
	7/17/2017	7.2
	8/7/2017	7.32
	8/22/2017	7.34
	11/29/2017	7.1
	3/8/2018	7.35
	5/30/2018	6.94
	12/4/2018	7.14
	6/28/2019	7.1
	12/2/2019	7.08
	5/28/2020	7.1

From 15 baseline samples

Baseline mean = 7.15067

Baseline std Dev = 0.112152

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.05/4)/2 = 99.875\%$

t is Percentile of Student's T-Test  $(0.99/4)/2 = 0.99875$

Degrees of Freedom = 15 (background observations) - 1

$t(0.99875, 15) = 3.73677$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	7.16	[6.72, 7.58]	FALSE
11/30/2020	1	7.2	[6.72, 7.58]	FALSE
5/28/2020	1	7.1	[6.72, 7.58]	FALSE
12/2/2019	1	7.08	[6.72, 7.58]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	347901
	11/30/2016	244670
	12/28/2016	359044
	1/18/2017	229595
	2/14/2017	224624
	3/20/2017	221785
	4/25/2017	205884
	5/22/2017	204497
	6/20/2017	195436
	7/17/2017	203000
	8/8/2017	198500
	8/21/2017	196500
	11/29/2017	191600
	3/8/2018	233000
	5/31/2018	200000
	12/4/2018	163000
	6/28/2019	122000
	12/2/2019	120000
	5/28/2020	104000

From 19 baseline samples  
 Baseline mean = 208686  
 Baseline std Dev = 64124.9

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	555000	[0, 428162]	TRUE
11/30/2020	1	607000	[0, 428162]	TRUE
5/28/2020	1	104000	[0, 428162]	FALSE
12/2/2019	1	120000	[0, 428162]	FALSE



## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	603053
	11/30/2016	589957
	12/28/2016	614466
	1/18/2017	582135
	2/15/2017	486076
	3/20/2017	472830
	4/25/2017	465682
	5/22/2017	495843
	6/20/2017	480297
	7/17/2017	519000
	8/7/2017	532000
	8/21/2017	549000
	11/29/2017	483000
	3/8/2018	476000
	5/30/2018	454000
	12/4/2018	476000
	6/27/2019	417000
	12/2/2019	384000
	5/28/2020	336000

From 19 baseline samples  
Baseline mean = 495597  
Baseline std Dev = 72759.8

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	355000	[0, 744626]	FALSE
12/1/2020	1	389000	[0, 744626]	FALSE
5/28/2020	1	336000	[0, 744626]	FALSE
12/2/2019	1	384000	[0, 744626]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	126012
	3/20/2017	107411
	4/25/2017	95475.3
	5/22/2017	90985.1
	6/20/2017	130226
	7/17/2017	132600
	8/7/2017	112400
	8/22/2017	143100
	11/29/2017	157800
	3/8/2018	89800
	5/30/2018	158000
	12/4/2018	122000
	6/28/2019	173000
	12/2/2019	162000
	5/28/2020	83400

From 15 baseline samples  
Baseline mean = 125614  
Baseline std Dev = 28935.1

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 15 (background observations) - 1  
 $t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	144000	[0, 229714]	FALSE
11/30/2020	1	84400	[0, 229714]	FALSE
5/28/2020	1	83400	[0, 229714]	FALSE
12/2/2019	1	162000	[0, 229714]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

#### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	3.468e+006
	12/28/2016	3.5667e+006
	1/18/2017	2.93e+006
	2/14/2017	3.5e+006
	3/20/2017	3.13e+006
	4/25/2017	3.4e+006
	5/22/2017	3.014e+006
	6/20/2017	2.97e+006
	7/17/2017	2.91e+006
	8/8/2017	3.05e+006
	8/21/2017	3.05e+006
	11/29/2017	3.072e+006
	5/31/2018	3.91e+006
	12/4/2018	4.24e+006
	6/28/2019	4.53e+006
	11/4/2019	4.38e+006
	12/2/2019	4.13e+006
	5/28/2020	4.26e+006

From 18 baseline samples  
 Baseline mean = 3.52837e+006  
 Baseline std Dev = 565772

For 4 recent sampling event(s)  
 Actual confidence level is 1.0 - (0.01/4) = 99.75 %  
 t is Percentile of Student's T-Test (0.9975) = 0.9975  
 Degrees of Freedom = 18 (background observations) - 1  
 t(0.9975, 17) = 3.36544

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	3.67e+006	[0, 5.48462e+006]	FALSE
11/30/2020	1	3.55e+006	[0, 5.48462e+006]	FALSE
5/28/2020	1	4.26e+006	[0, 5.48462e+006]	FALSE
12/2/2019	1	4.13e+006	[0, 5.48462e+006]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

#### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	1.341e+006
	11/30/2016	1.38e+006
	12/28/2016	1.41e+006
	1/18/2017	1.12e+006
	2/15/2017	1.179e+006
	3/20/2017	1.255e+006
	4/25/2017	1.227e+006
	5/22/2017	1.142e+006
	6/20/2017	1.156e+006
	7/17/2017	1.232e+006
	8/7/2017	1.273e+006
	8/21/2017	1.235e+006
	11/29/2017	1.208e+006
	12/4/2018	1.28e+006
	6/27/2019	1.36e+006
	12/2/2019	1.1e+006
	5/28/2020	1.15e+006

From 17 baseline samples  
 Baseline mean = 1.23812e+006  
 Baseline std Dev = 93447.1

For 4 recent sampling event(s)  
 Actual confidence level is 1.0 - (0.01/4) = 99.75 %  
 t is Percentile of Student's T-Test (0.9975) = 0.9975  
 Degrees of Freedom = 17 (background observations) - 1  
 t(0.9975, 16) = 3.39914

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1.22e+006	[0, 1.56497e+006]	FALSE
12/1/2020	1	1.21e+006	[0, 1.56497e+006]	FALSE
5/28/2020	1	1.15e+006	[0, 1.56497e+006]	FALSE
12/2/2019	1	1.1e+006	[0, 1.56497e+006]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

#### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	470000
	3/20/2017	445000
	4/25/2017	435000
	5/22/2017	400000
	6/20/2017	451000
	7/17/2017	556000
	8/7/2017	477000
	8/22/2017	529000
	11/29/2017	549000
	5/30/2018	591000
	12/4/2018	480000
	6/28/2019	611000
	12/2/2019	432000
	5/28/2020	384000

From 14 baseline samples  
 Baseline mean = 486429  
 Baseline std Dev = 70143.5

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 14 (background observations) - 1  
 $t(0.9975, 13) = 3.53713$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	498000	[0, 743243]	FALSE
11/30/2020	1	336000	[0, 743243]	FALSE
5/28/2020	1	384000	[0, 743243]	FALSE
12/2/2019	1	432000	[0, 743243]	FALSE

**APPENDIX E2 – Statistical Analysis Package (May 2022)**



HALEY & ALDRICH, INC.  
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216.739.0555

4 October 2022  
File No. 130592-015

East Kentucky Power Cooperative  
4775 Lexington Road  
Winchester, KY 40392

Subject: Summary of Appendix III Semi-Annual  
Groundwater Detection Monitoring Statistical Evaluation  
East Kentucky Power Cooperative  
H.L. Spurlock Generating Station Landfill  
Maysville, Kentucky

East Kentucky Power Cooperative, Inc. (EKPC) is implementing the 17 April 2015 U.S. Environmental Protection Agency (U.S. EPA) Federal Coal Combustion Residuals (CCR) Rule (40 CFR §257 and 261) for the H.L. Spurlock Generating Station Landfill, located in Mason County, Kentucky. The CCR Rule establishes requirements for the operation, maintenance and closure of landfills and surface impoundments of CCR materials.

On 11 July 2022, EKPC provided Haley & Aldrich, Inc. (Haley & Aldrich) with analytical data from groundwater samples collected on 31 May 2022 from a groundwater monitoring system that meets the requirements of 40 CFR §257.91. Downgradient locations were defined in the *Groundwater Monitoring System and Hydrogeologic Investigation Report, Spurlock Landfill, H.L. Spurlock Generating Station, Maysville, Kentucky* (Tetra Tech, 10 October 2017). This memorandum summarizes the results of statistical evaluations conducted to determine if Appendix III groundwater monitoring constituents have been detected in downgradient wells at levels that exhibit a statistically significant increase (SSI) above background levels, as required by 40 CFR § 257.94. The results presented herein were previously communicated orally to EKPC on 20 July 2022. Time-series graphs of data collected as part of the CCR Rule monitoring of H.L. Spurlock Generating Station Landfill are included in Attachment 1.

To identify SSIs, sample data from the most recent groundwater sampling event from the downgradient monitoring wells were compared to the Upper Prediction Limits (UPLs) calculated for each Appendix III constituent (boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids) to represent background values within the given downgradient wells. Lower Prediction Limits (LPLs) were also calculated for pH<sup>1</sup>. Based on these comparisons, the statistical results identify SSIs above background concentrations for calcium and sulfate, both at SLF-MW-2B. We note that sulfate at SLF-MW-2B was also identified as an SSI during the previous three sampling events. Successful Alternate Source Demonstrations (ASDs) for the previous SSIs were prepared and certified by Geosyntec Consultants in November 2020, June 2021, and April 2022. The results of the groundwater detection monitoring evaluation are provided herein.

---

<sup>1</sup> We note that for pH, the LPL was developed to monitor for significant increase or a decrease in pH.

## Statistical Evaluation of Appendix III Constituents

The Rule, 40 CFR §257.93(f) (1-4), provides four (4) specific options to statistically evaluate whether water quality downgradient of the CCR Unit represents an SSI of Appendix III parameters compared to background water quality of the CCR Unit. Background was determined by calculating intra-well UPL for each Appendix III constituent as well as the LPL for pH for each downgradient monitoring location (see footnote 1). The UPL was used to evaluate potential SSIs at each downgradient well.

### UPL STATISTICAL ANALYSIS

Prediction limits are used to predict the UPL of possible future values for each Appendix III constituent as well as the LPL for pH, based on the downgradient monitoring well dataset and a specified number of future statistical comparisons. The prediction limit method is an accepted statistical method identified in the CCR Rule to evaluate the groundwater analytical data at CCR Units. The prediction limits are calculated with minimum 95% confidence level for four (4) future observations to maintain acceptable statistical power while maintaining site-wide false positive rate (SWFPR) of 10% per year or less. Depending on the assumed distribution of background data, parametric or non-parametric procedures were used to develop the UPL for each Appendix III parameter at each of the downgradient locations that had enough sampling events. Parametric prediction limits utilize assumed distributions of the sample background data to develop the prediction limits, and non-parametric limits utilize order statistics or bootstrap methods to develop the prediction limits. The prediction limits were calculated after testing for outlier sample results that would warrant removal from the data set based on likely error in sampling or measurement. Based on initial statistical evaluation and subsequent discussions with laboratory personnel, the TDS sample result at MW-2B from 30 November 2016 was removed on the basis of a measurement error. The TDS result is inconsistent with the other analytes in the sample.

### BACKGROUND DISTRIBUTIONS AND UPLS

Prior to conducting the statistical analysis for the 2020 second semi-annual compliance event, the groundwater analytical results for samples collected from 21 October 2016 through May 2020 were used to calculate updated intra-well UPL and LPL (for pH) for each downgradient location (SLF-MW-2B, SLF-MW-3B, and SLF-MW-5R). Following four subsequent sampling events, the new sample results will be evaluated for incorporation into the background data set used for the calculation of the UPL. The variability and distribution of each downgradient well background dataset was evaluated to determine the method for UPL and LPL (for pH) calculation. The development of the UPL and LPL (for pH) for each of the Appendix III constituents is summarized in Table 1, and the supporting statistical software output is included in Attachment 2. The next time background will be reevaluated is prior to the statistical evaluation of the second semi-annual compliance event of 2022.



### RESULTS OF APPENDIX III DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations for each of the Appendix III constituents from the 2022 first semi-annual detection monitoring sampling event from each downgradient well were compared to their respective UPLs. A sample concentration greater than the UPL (or less than LPL for pH) is considered to represent an SSI over background. Based on these comparisons, SSIs over background were identified for calcium and sulfate at SLF-MW-2B for the 2022 first semi-annual detection monitoring event.

We appreciate the opportunity to provide environmental consulting services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely,

**HALEY & ALDRICH, INC.**



Lloyd S. Ross  
Senior Scientist



Emily Guzik  
Project Manager

Enclosures:

- Table 1: Summary of Background Sample Results and Comparison of Downgradient Sample Results
- Attachment 1: Appendix III Time Series Graphs
- Attachment 2: Statistical Output

## TABLE

TABLE 1  
SUMMARY OF BACKGROUND SAMPLE RESULTS AND COMPARISON OF DOWNGRAIDENT SAMPLE RESULTS  
JULY 2022  
EAST KENTUCKY POWER COOPERATIVE  
H. L. SPURLOCK GENERATING STATION LANDFILL

Location ID	Background Data Set Summary																	Intra-well Analysis			
	Frequency of Detection			Percent Non-Detects	Range of Non-Detect			Mean	50th Percentile (Median)	95th Percentile	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	Outlier Presence	Outlier Removed	Trend	Distribution*	Background Limit (Upper Prediction Limit)	Compliance Round (May 2022)	Statistically Significant Increase (SSI) Present?
<b>Boron, Total (mg/L)</b>																					
SLF-MW-2B	18	/	18	0%	N/A	:	N/A	4.009	3.936	4.836	4.94	3.39E-01	0.582	0.145	No	No	Stable	Normal	6.02	4.01	No
SLF-MW-3B	18	/	18	0%	N/A	:	N/A	3.645	3.617	5.318	6.242	1.27E+00	1.125	0.309	No	No	Decreasing	Normal	7.53	1.8	No
SLF-MW-5R	14	/	14	0%	N/A	:	N/A	0.441	0.45	0.639	0.653	1.69E-02	0.13	0.295	No	No	Stable	Normal	0.92	0.469	No
<b>Calcium, Total (mg/L)</b>																					
SLF-MW-2B	19	/	19	0%	N/A	:	N/A	41.41	39.9	50.32	61.32	5.66E+01	7.526	0.182	Yes	No	Stable	Normal	67	76.4	Yes
SLF-MW-3B	19	/	19	0%	N/A	:	N/A	201.6	200	249.7	255	8.99E+02	29.98	0.149	No	No	Decreasing	Normal	304	200	No
SLF-MW-5R	15	/	15	0%	N/A	:	N/A	116.3	118	131.9	136.4	1.20E+02	10.95	0.0941	No	No	Stable	Normal	156	123	No
<b>Chloride, Total (mg/L)</b>																					
SLF-MW-2B	19	/	19	0%	N/A	:	N/A	1665	1547	2449	2530	2.46E+05	495.5	0.298	Yes	No	Stable	Normal	3361	1820	No
SLF-MW-3B	19	/	19	0%	N/A	:	N/A	167.6	160.2	246.7	262	2.55E+03	50.49	0.301	No	No	Stable	Normal	340	228	No
SLF-MW-5R	15	/	15	0%	N/A	:	N/A	23.08	24.5	30.53	33.65	3.13E+01	5.597	0.243	No	No	Stable	Normal	43	26.2	No
<b>Fluoride, Total (mg/L)</b>																					
SLF-MW-2B	16	/	18	11%	0.5	:	0.5	1.838	1.986	2.378	2.647	2.94E-01	0.542	0.295	Yes	No	Increasing	Non-parametric	2.65	1.1	No
SLF-MW-3B	0	/	18	100%	0.5	:	0.5	N/A	0.5	0.5	N/A	N/A	N/A	N/A	No	No	NT	Non-parametric	0.50	0.16	No
SLF-MW-5R	0	/	14	100%	0.5	:	0.5	N/A	0.5	0.5	N/A	N/A	N/A	N/A	No	No	NT	Non-parametric	0.50	0.13	No
<b>pH, Field, Total (pH units)</b>																					
SLF-MW-2B	20	/	20	0%	N/A	:	N/A	7.814	7.64	8.934	9	2.09E-01	0.457	0.0584	No	No	Stable	Non-parametric	7.28, 9	7.7	No
SLF-MW-3B	19	/	19	0%	N/A	:	N/A	7.177	7.11	7.538	7.61	3.51E-02	0.187	0.0261	No	No	Stable	Normal	6.49, 7.86	7.28	No
SLF-MW-5R	15	/	15	0%	N/A	:	N/A	7.151	7.14	7.343	7.35	1.26E-02	0.112	0.0157	No	No	Stable	Normal	6.72, 7.58	7.2	No
<b>Sulfate, Total (mg/L)</b>																					
SLF-MW-2B	19	/	19	0%	N/A	:	N/A	208.7	203	349	359	4.11E+03	64.12	0.307	Yes	No	Decreasing	Normal	428	500	Yes
SLF-MW-3B	19	/	19	0%	N/A	:	N/A	495.6	483	604.2	614.5	5.29E+03	72.76	0.147	No	No	Decreasing	Normal	745	381	No
SLF-MW-5R	15	/	15	0%	N/A	:	N/A	125.6	126	165.3	173	8.37E+02	28.94	0.23	No	No	Stable	Normal	230	159	No
<b>Total Dissolved Solids (TDS) (mg/L)</b>																					
SLF-MW-2B	19	/	19	0%	N/A	:	N/A	3368	3400	4395	4530	7.90E+05	889.1	0.264	Yes	Yes	Increasing	Normal	5485	4160	No
SLF-MW-3B	17	/	17	0%	N/A	:	N/A	1238	1232	1386	1410	8.73E+03	93.45	0.0755	No	No	Stable	Normal	1565	1220	No
SLF-MW-5R	14	/	14	0%	N/A	:	N/A	486.4	473.5	598	611	4.92E+03	70.14	0.144	No	No	Stable	Normal	743	586	No

**Notes and Abbreviations:**

mg/L - Milligram per liter

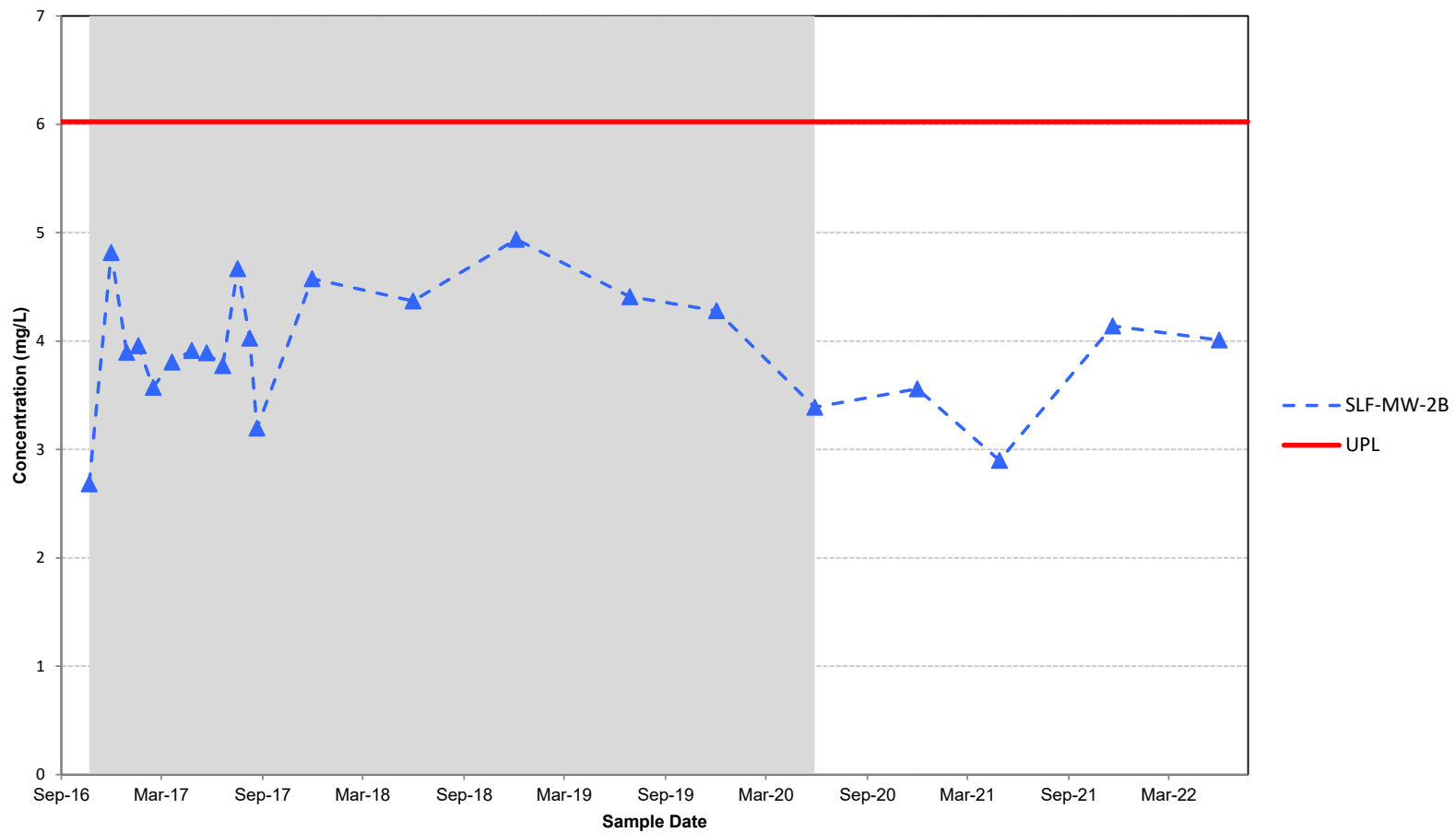
N/A - Not Applicable

NT - Not Tested

\* - Determined based on Shapiro-Wilks statistical test at 5% significance level and residual plot probability

**ATTACHMENT 1**

**Appendix III Time Series Graphs**



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

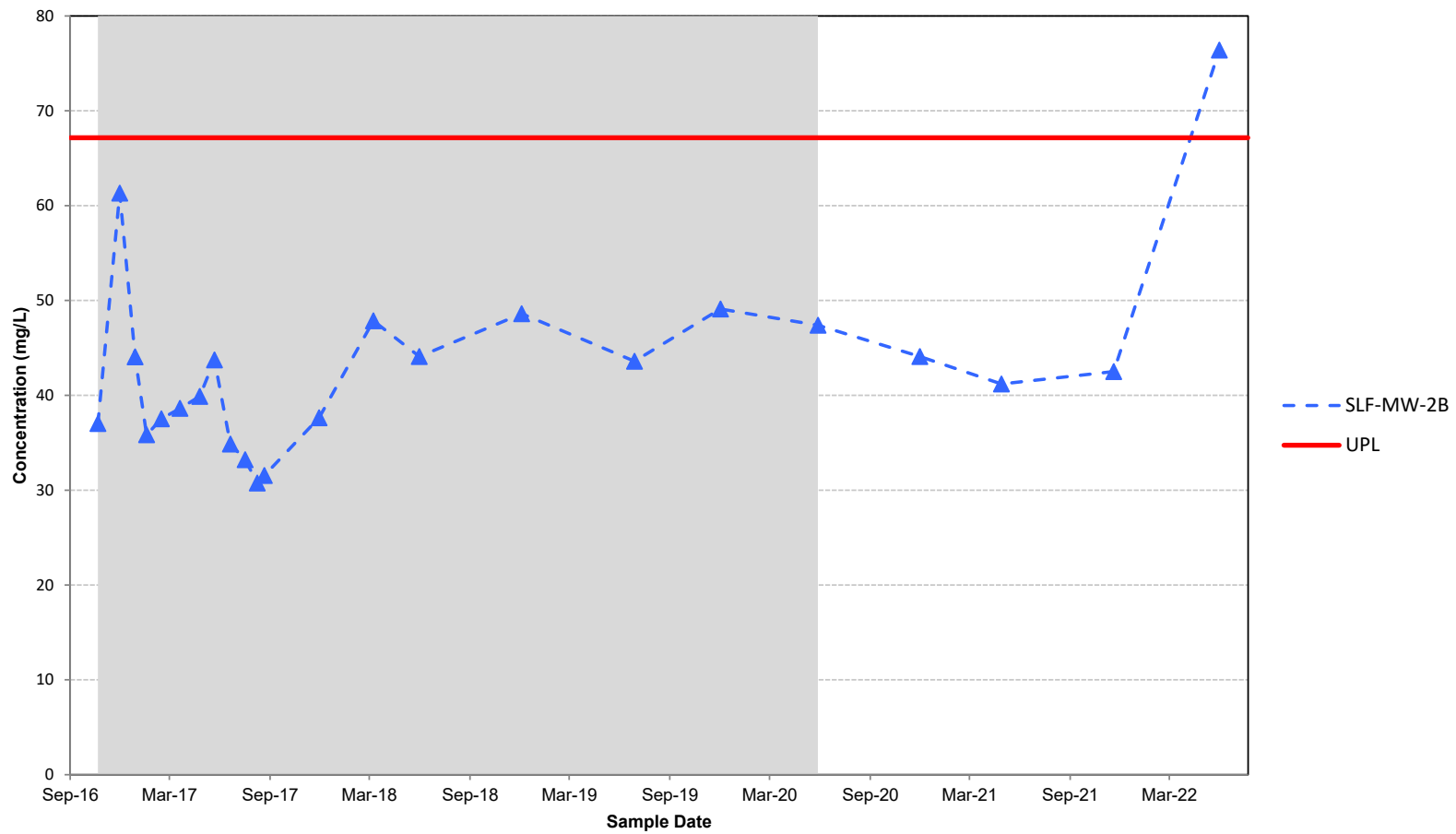


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

July 2022

Figure F-1



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

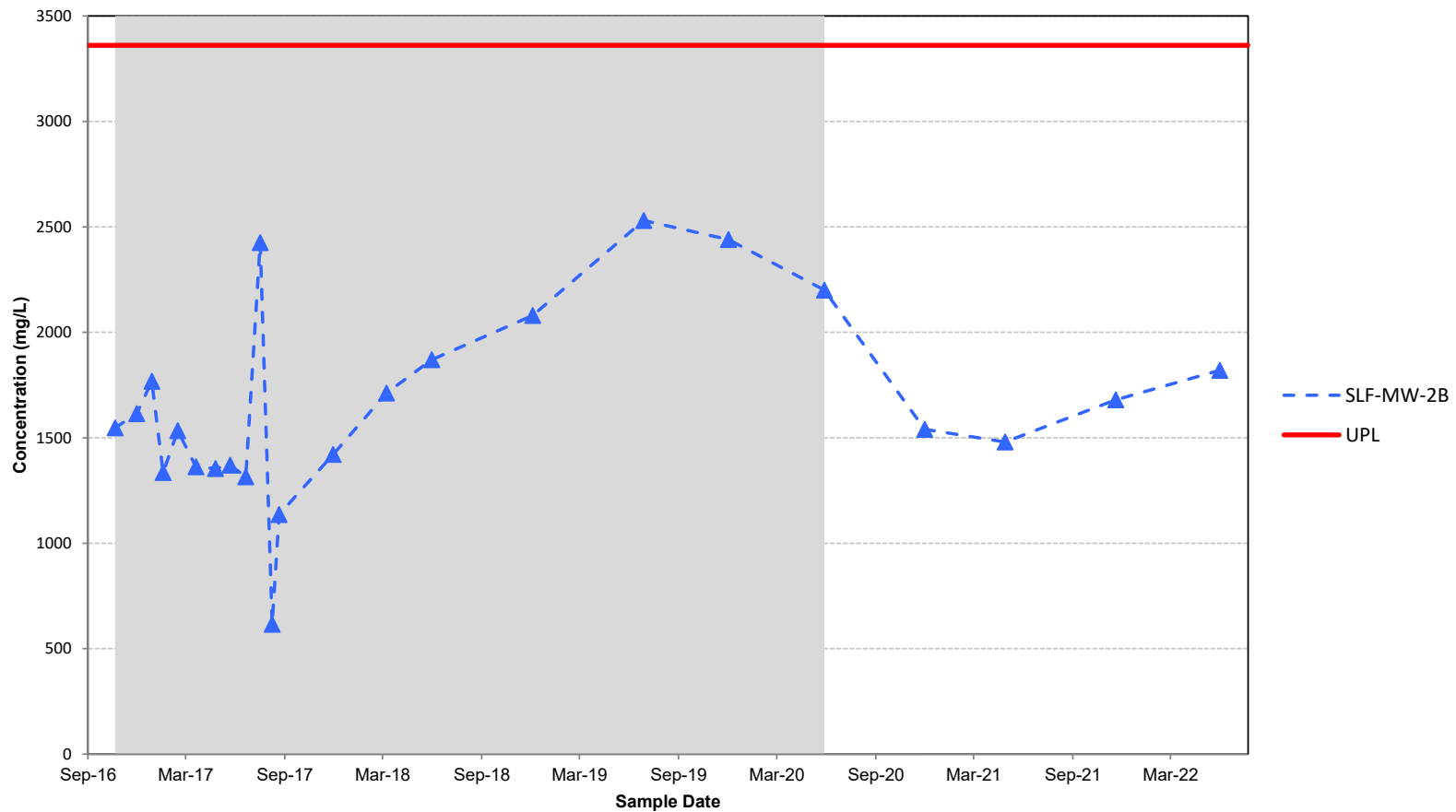


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

July 2022

Figure F-2



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

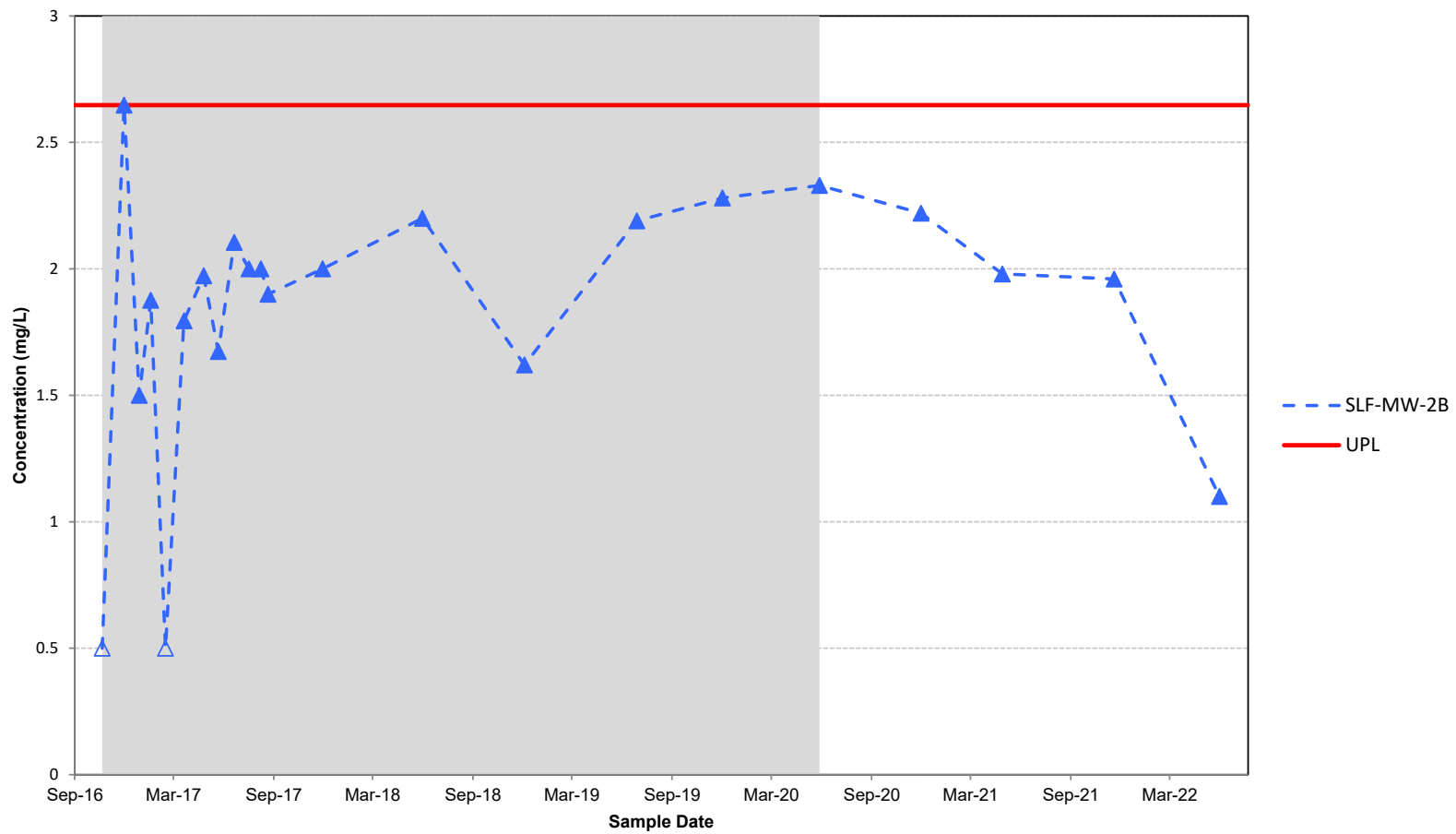


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-3



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



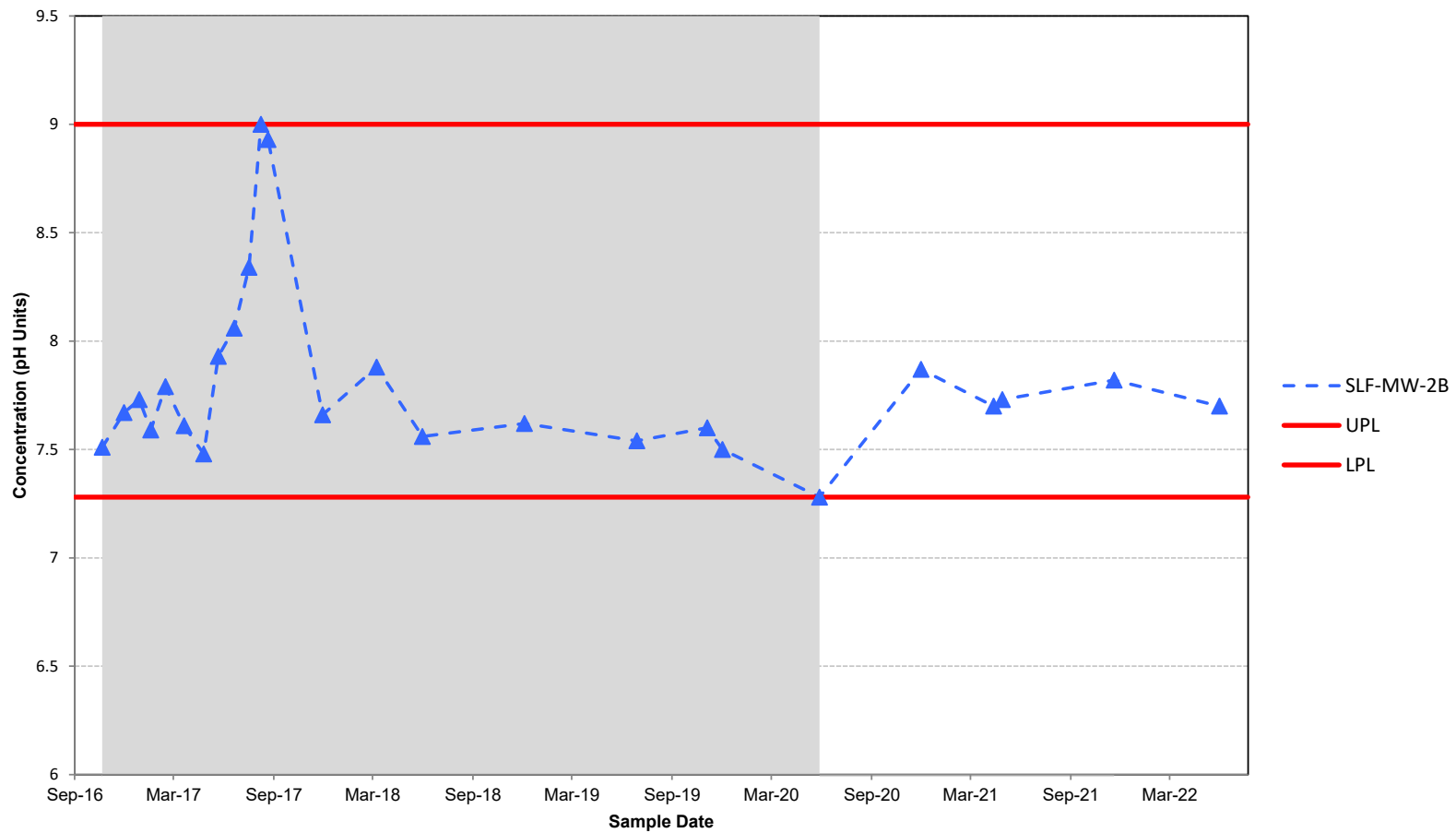
H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-4





**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

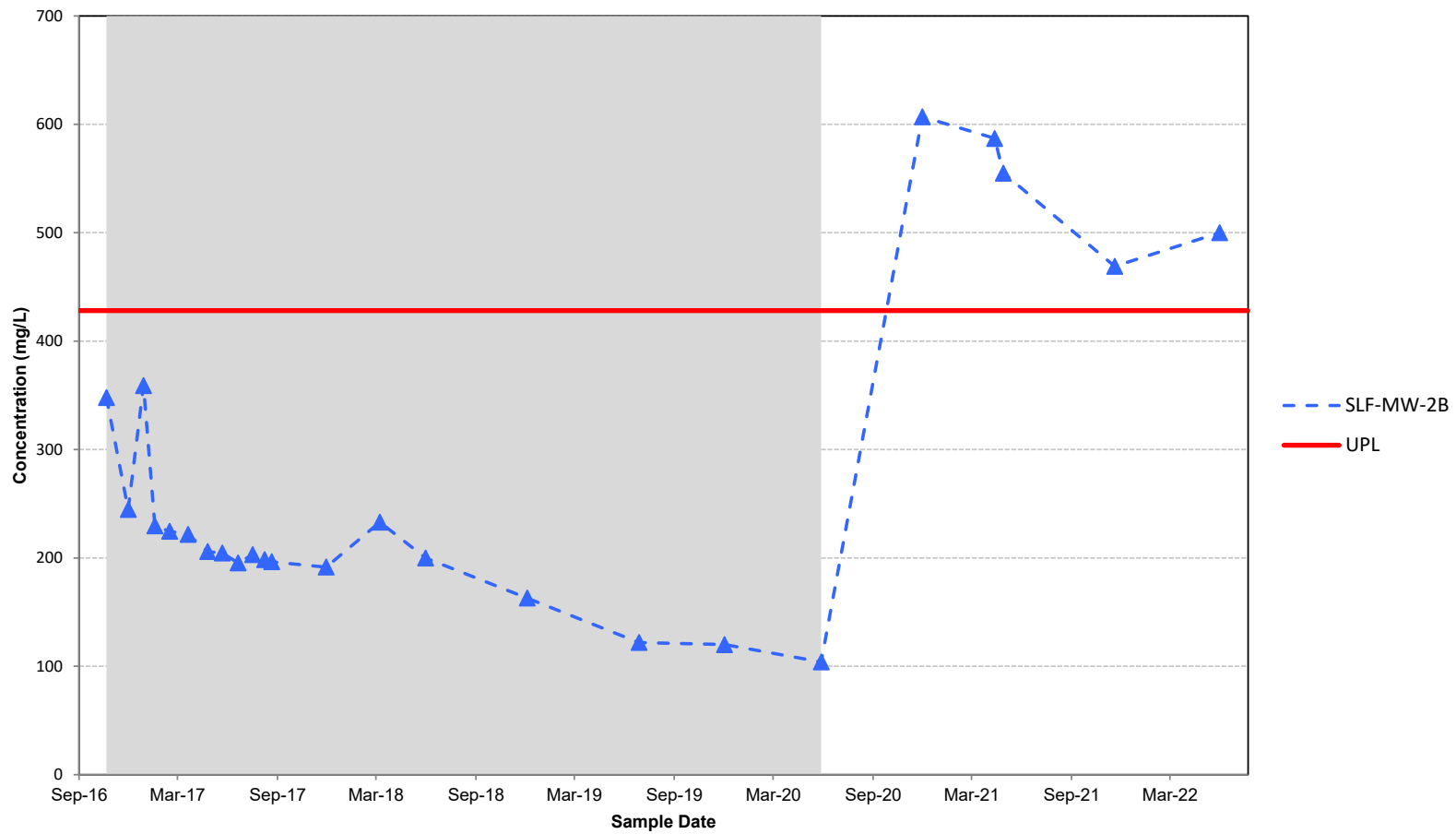


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

July 2022

Figure F-5



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

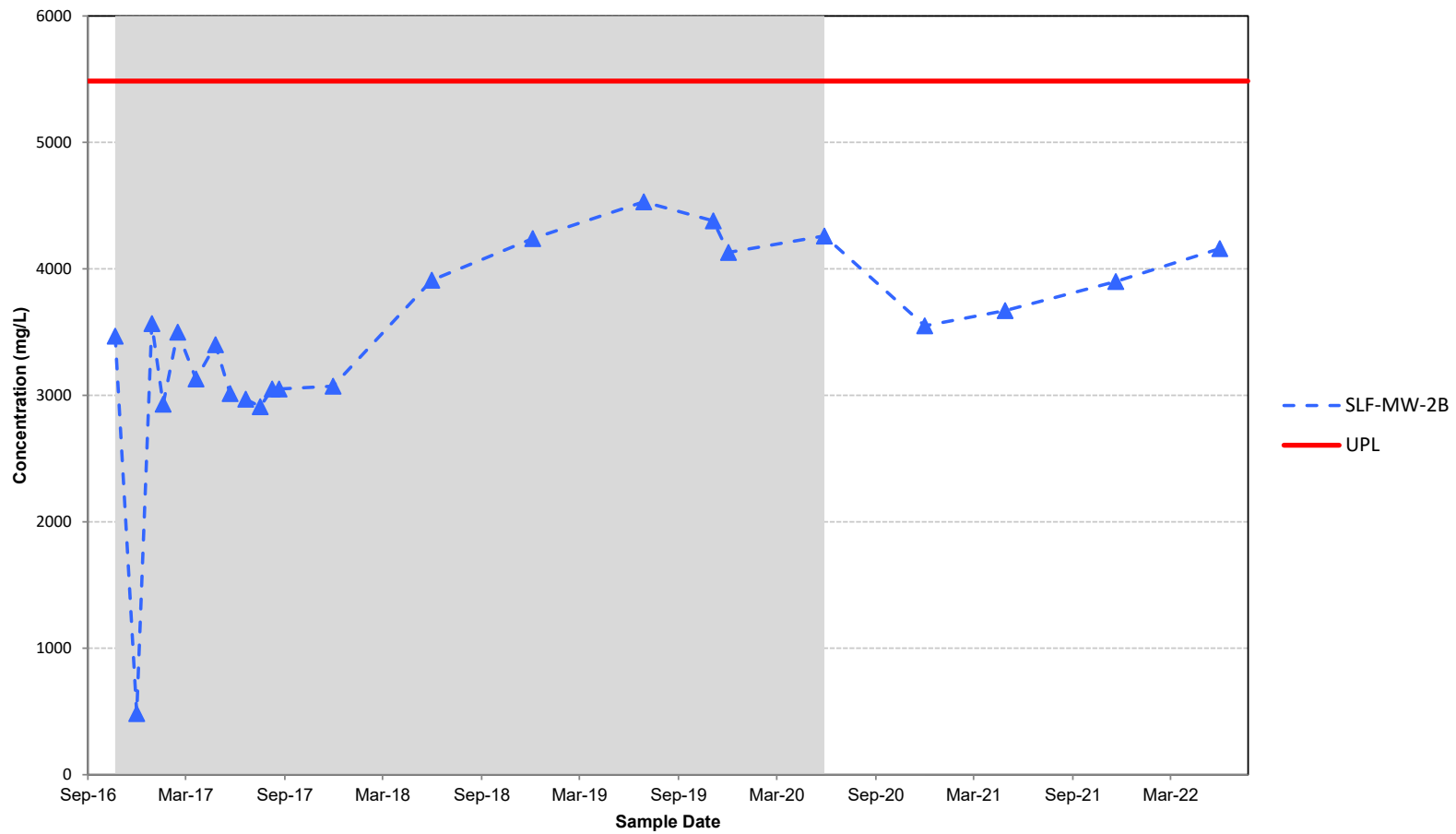


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

July 2022

Figure F-6



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

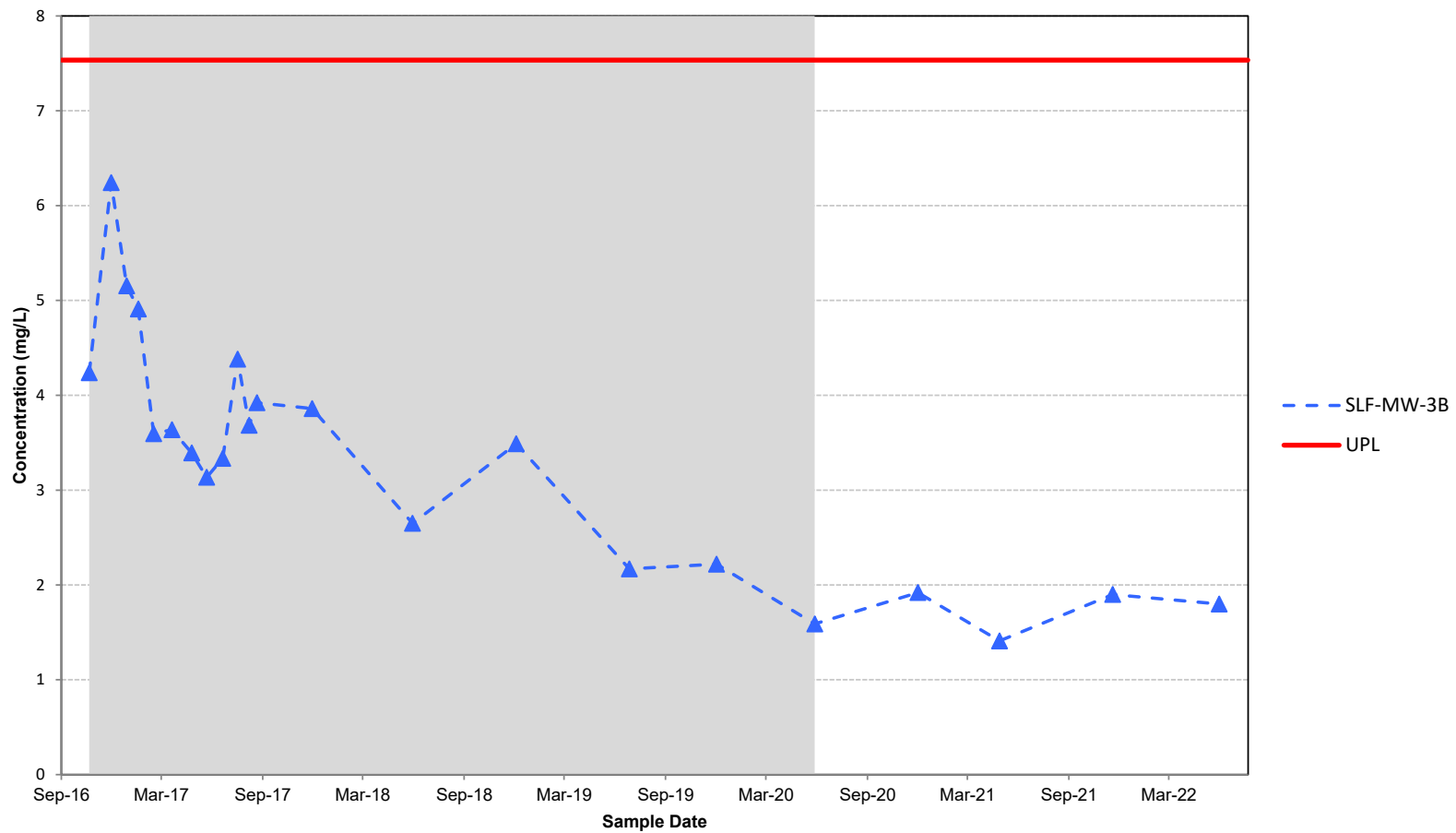


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

July 2022

Figure F-7



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

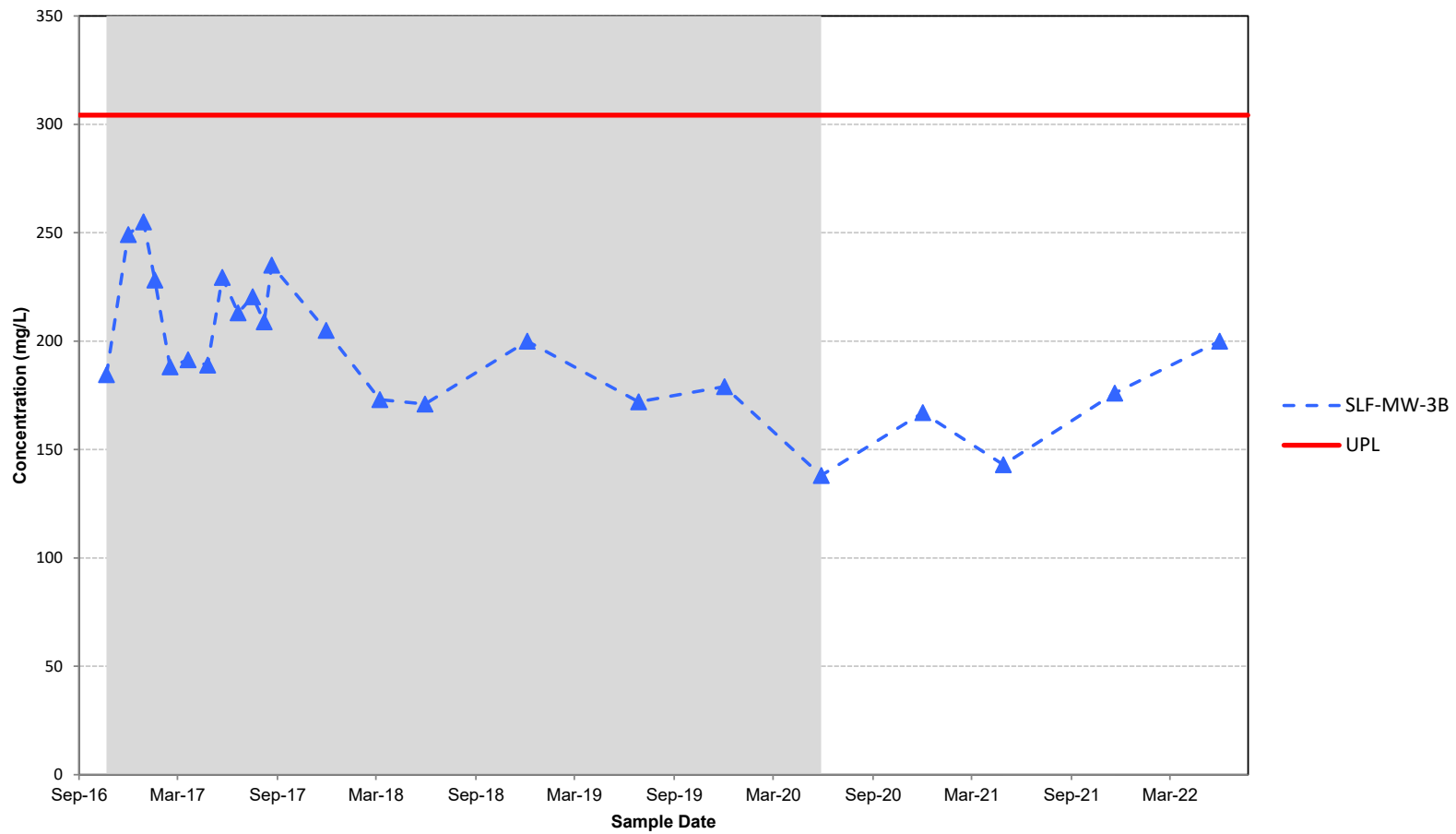


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

July 2022

Figure F-8



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

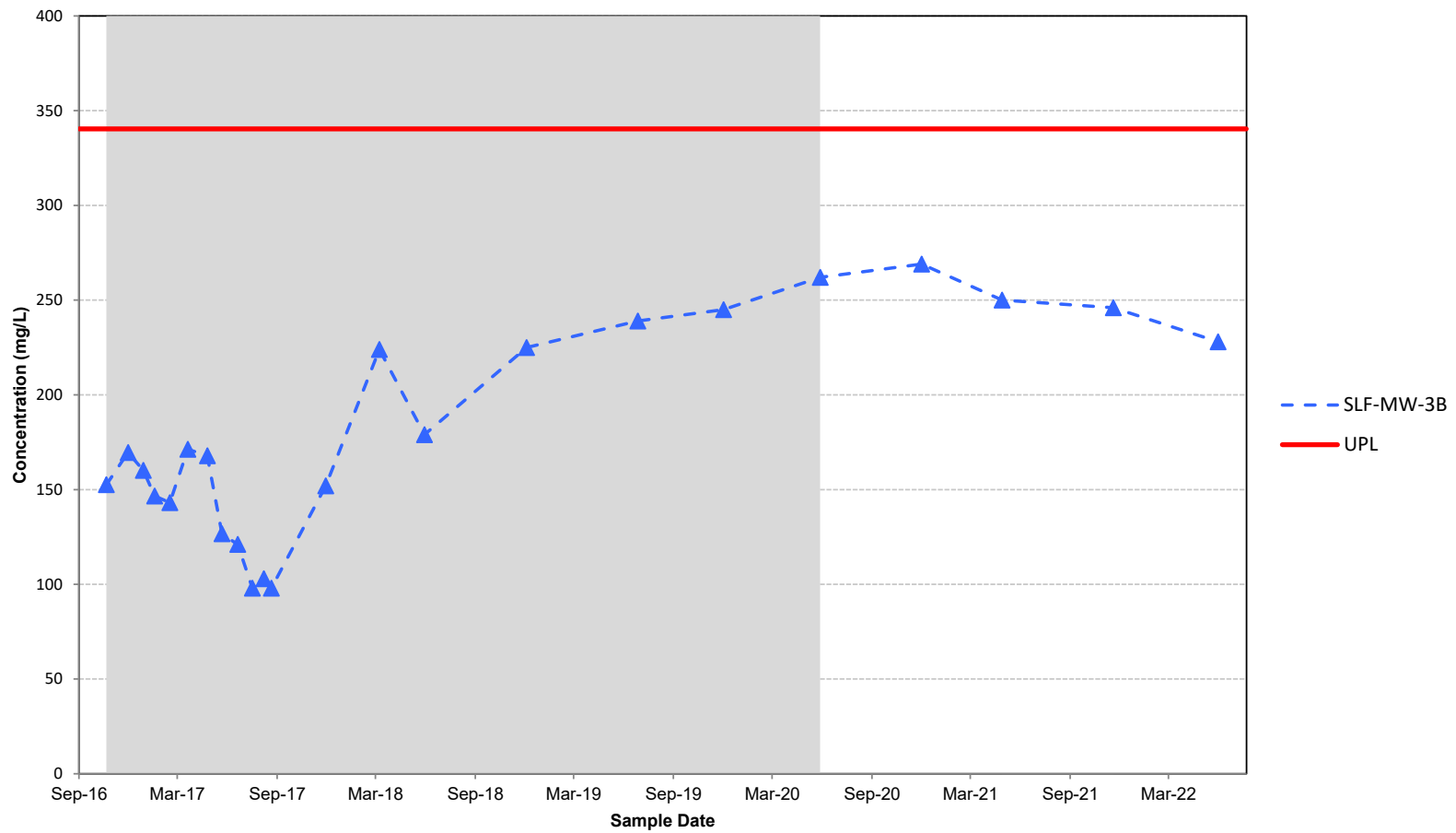


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

July 2022

Figure F-9



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

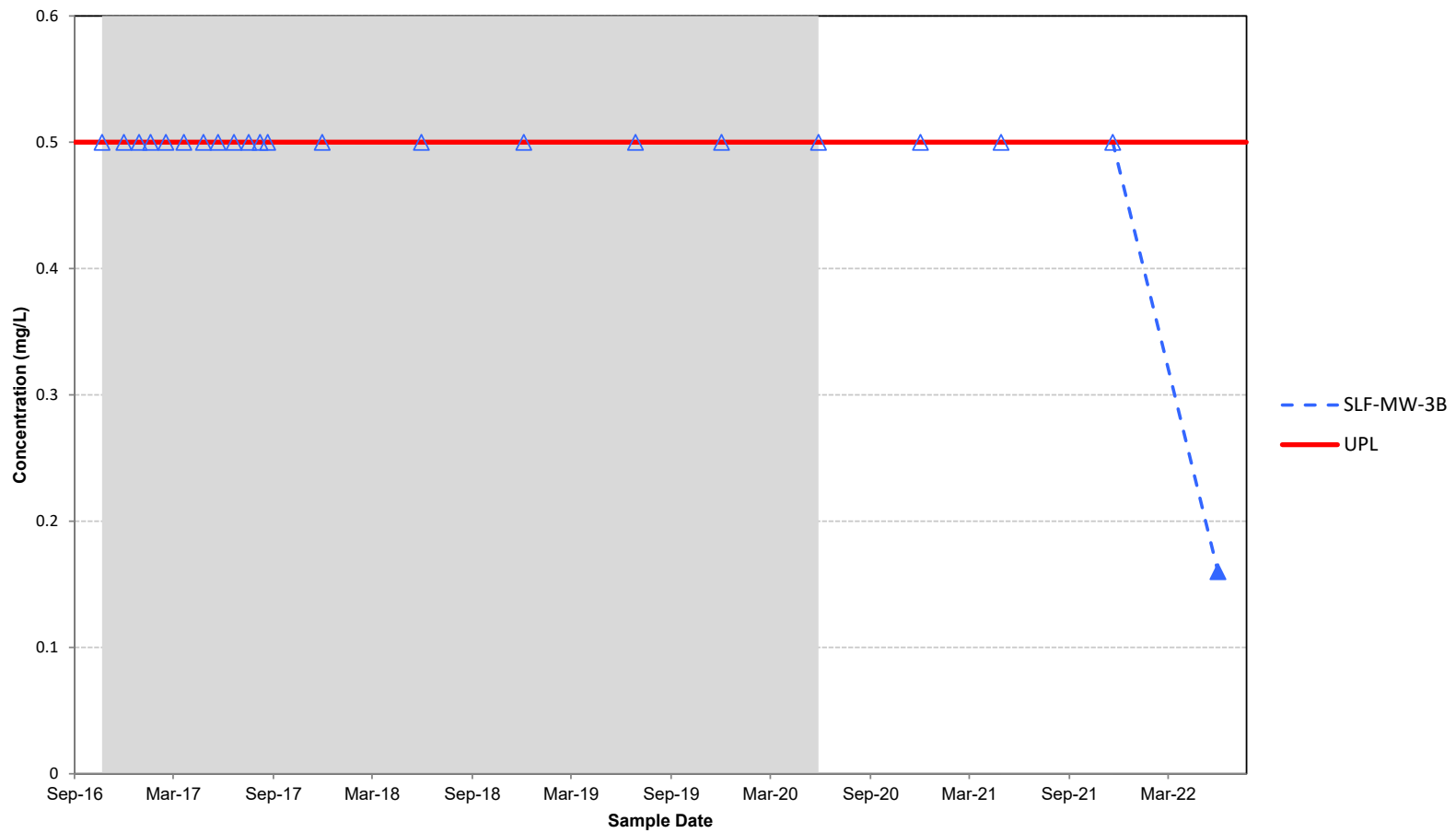


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-10



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

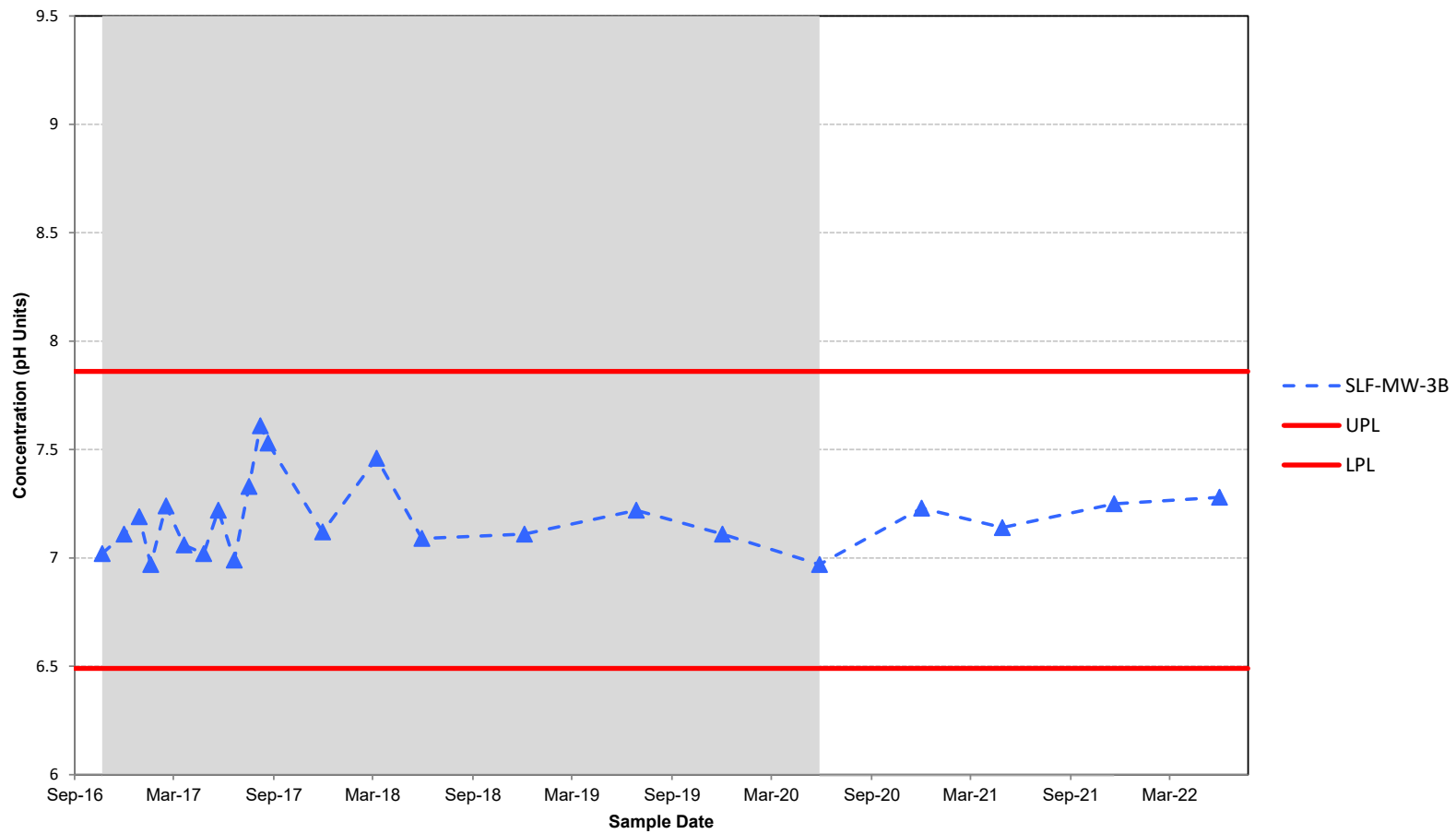


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-11



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



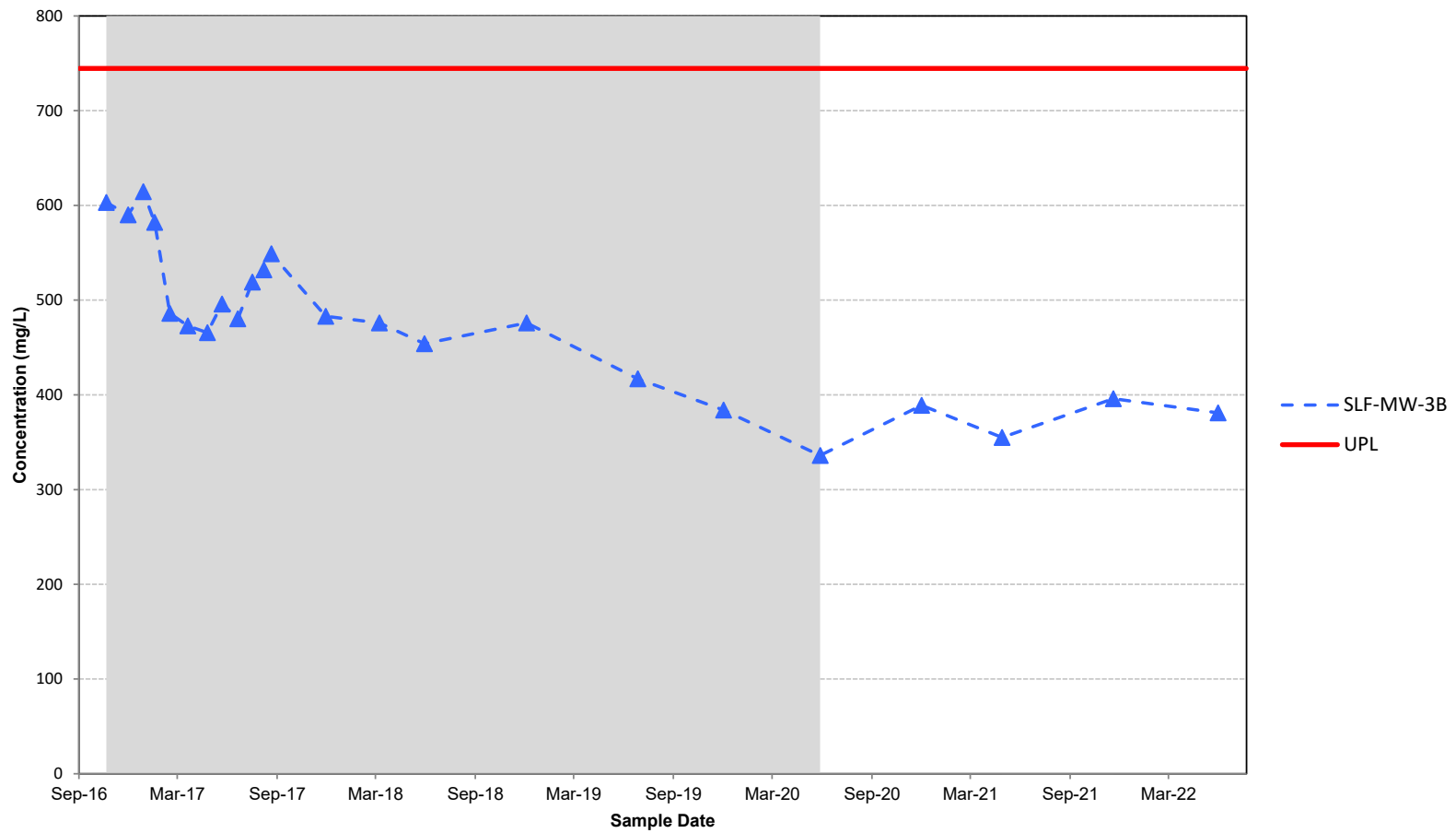
H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

July 2022

Figure F-12





**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

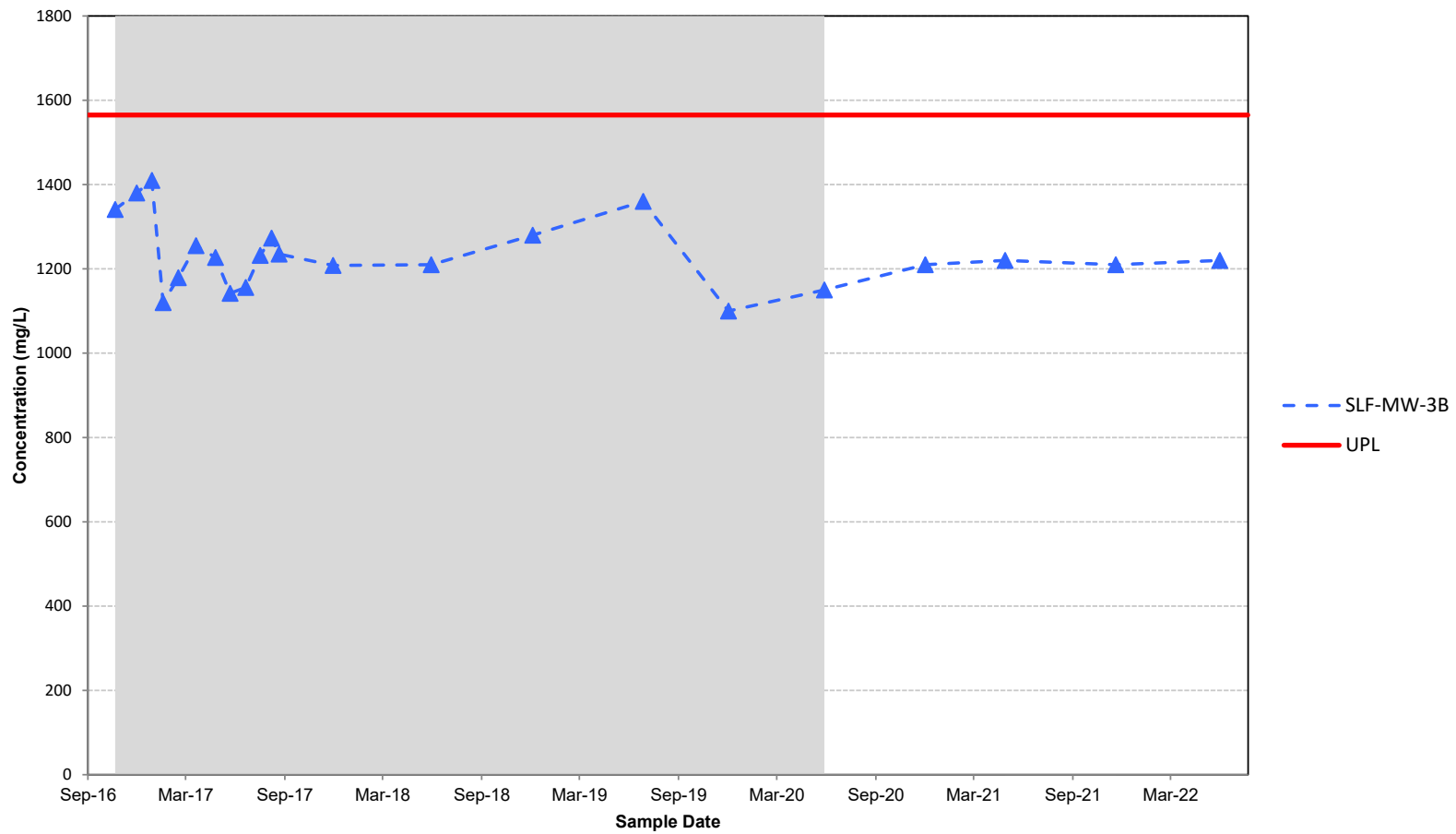


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

July 2022

Figure F-13



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

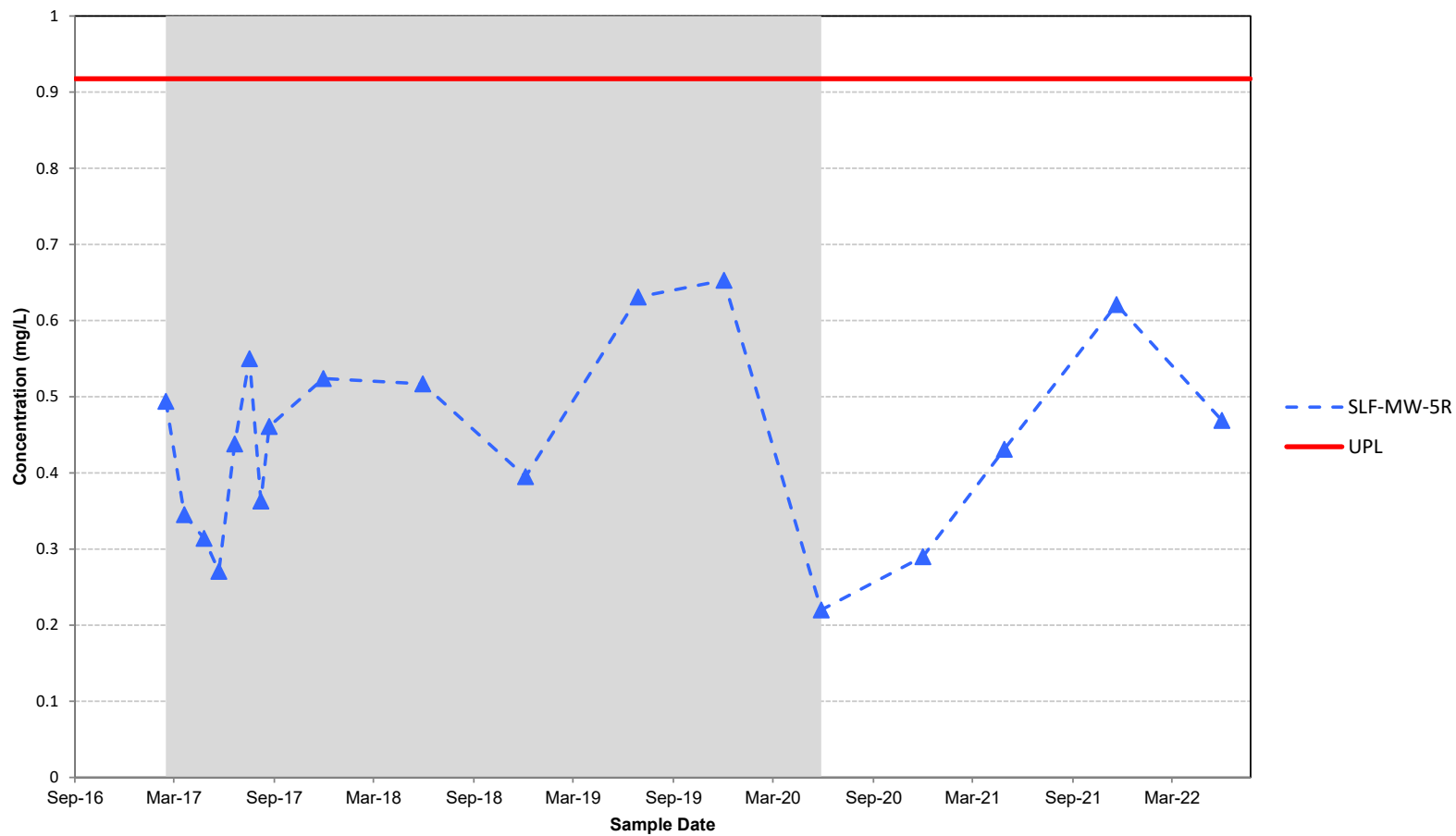


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

July 2022

Figure F-14



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

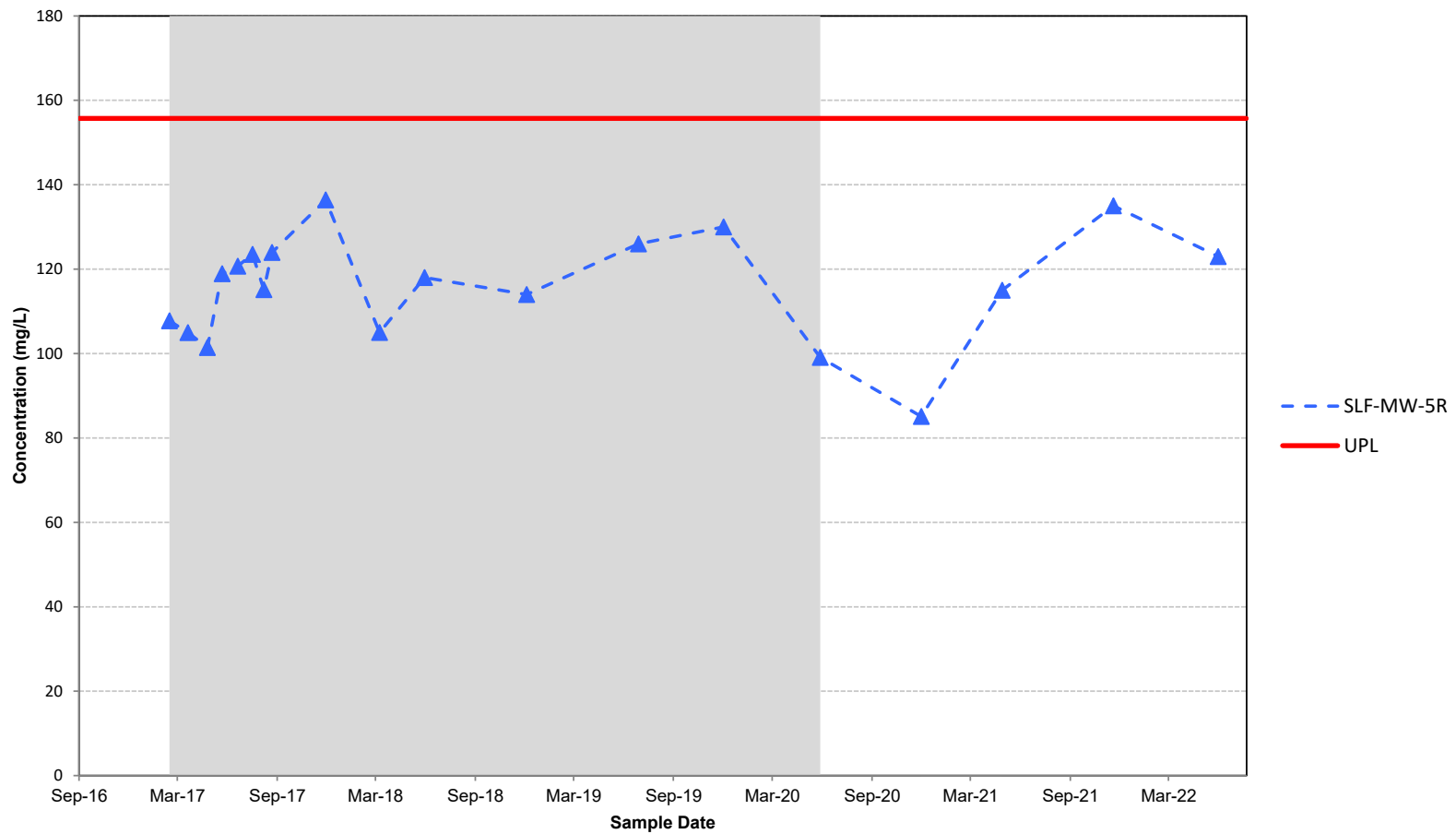


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**BORON  
CONCENTRATION VS. TIME**

July 2022

Figure F-15



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

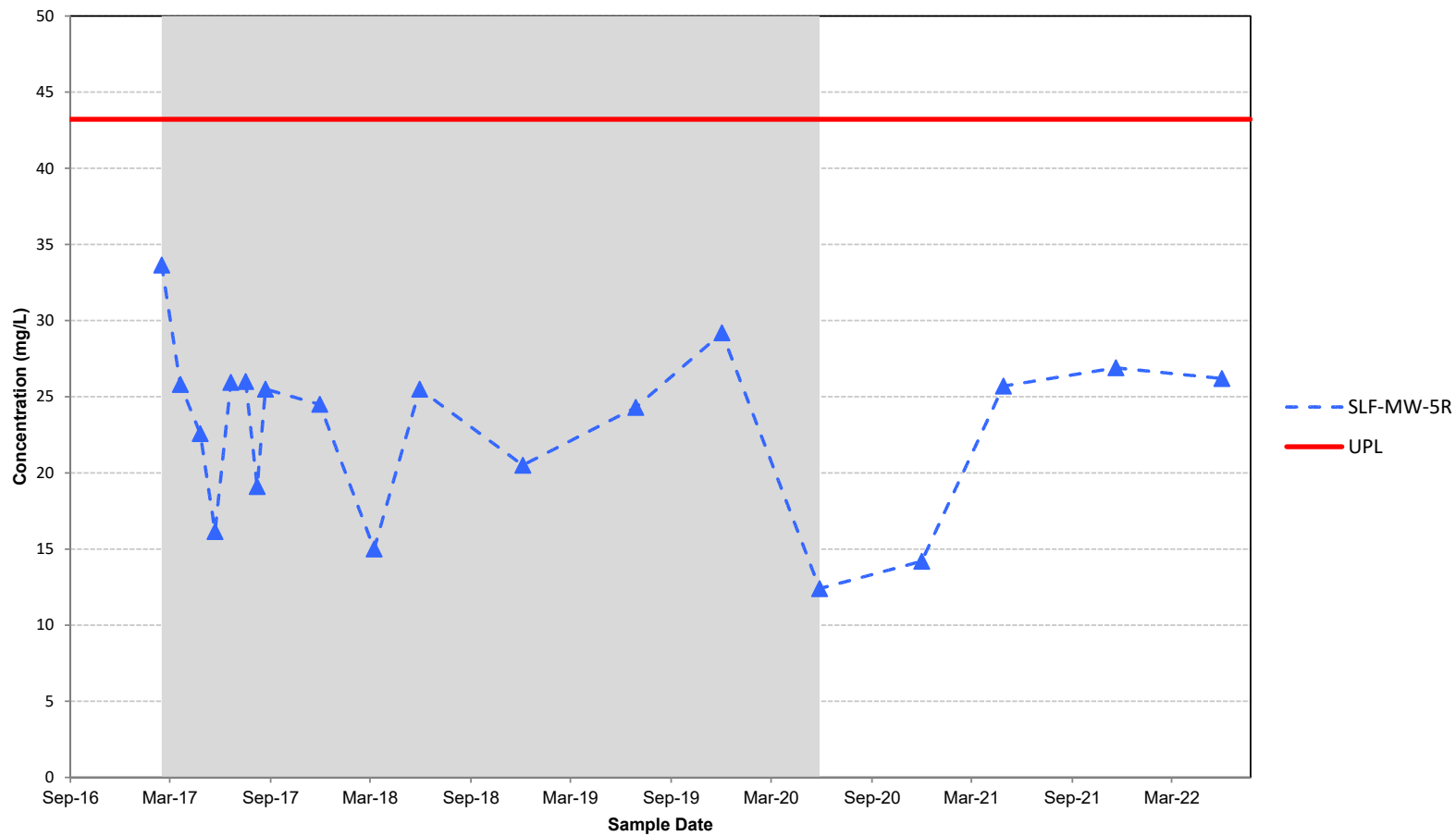


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CALCIUM  
CONCENTRATION VS. TIME**

July 2022

Figure F-16



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

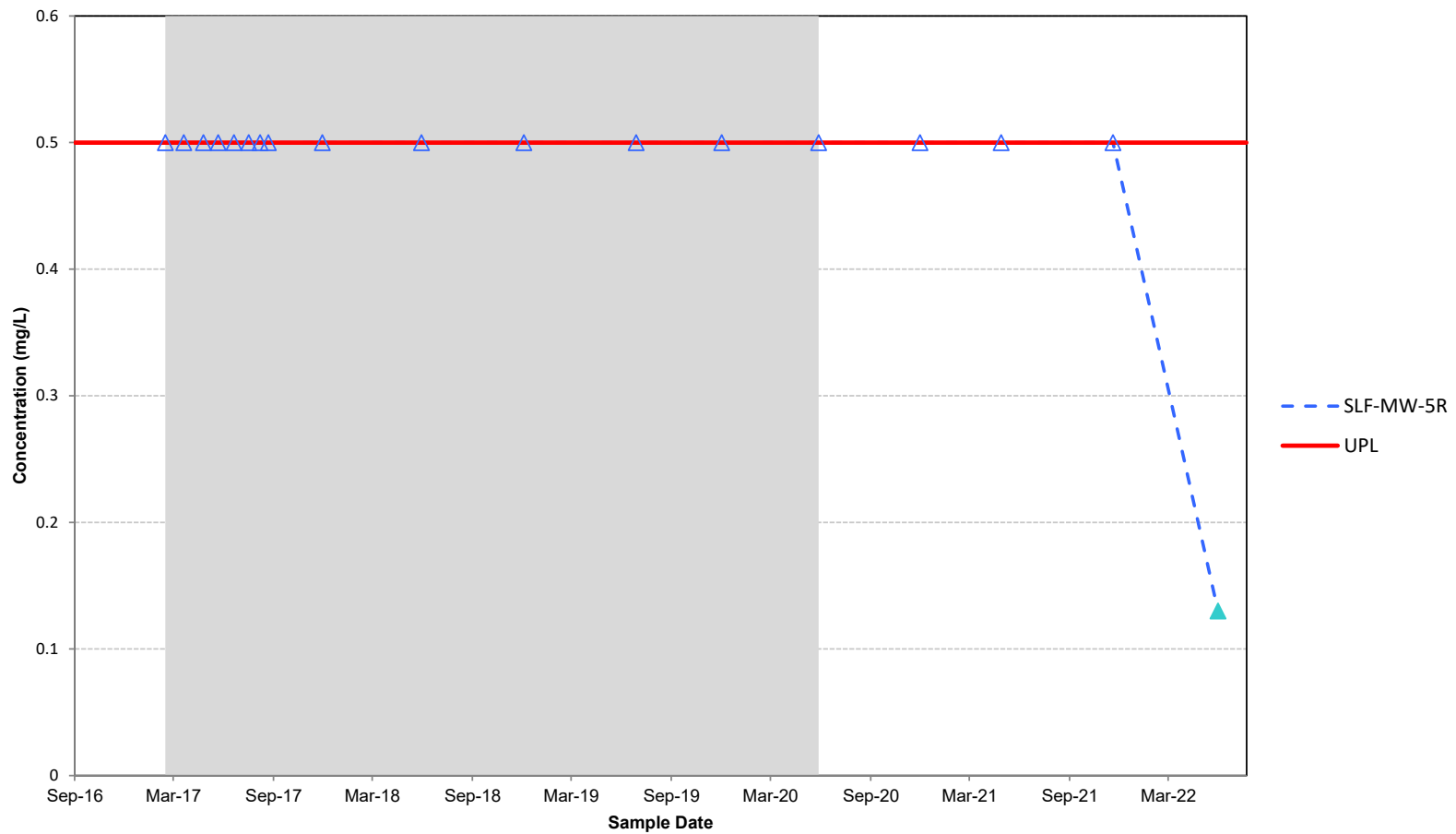


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**CHLORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-17



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

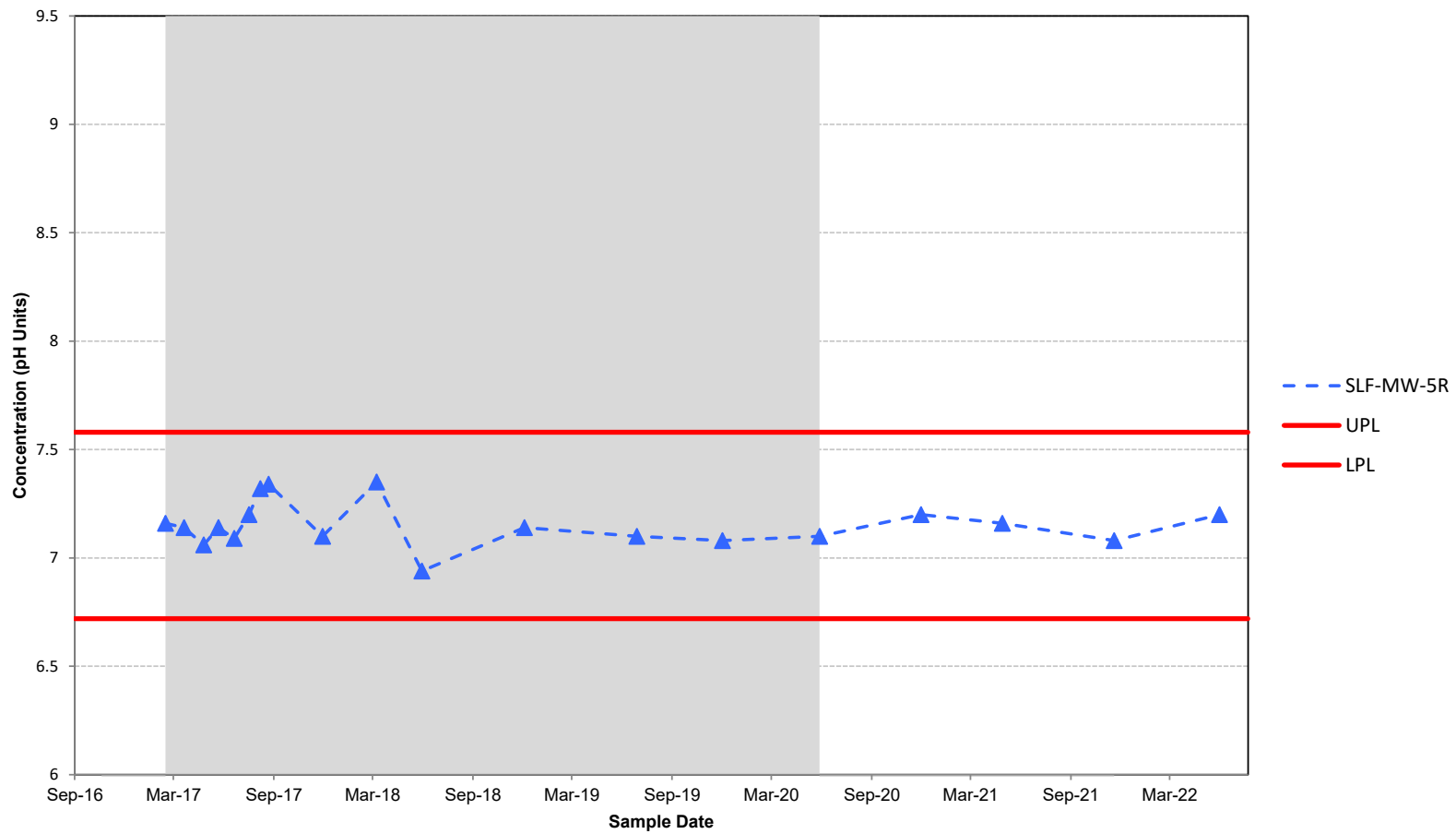


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**FLUORIDE  
CONCENTRATION VS. TIME**

July 2022

Figure F-18



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper and Lower Prediction Limit (UPL and LPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.

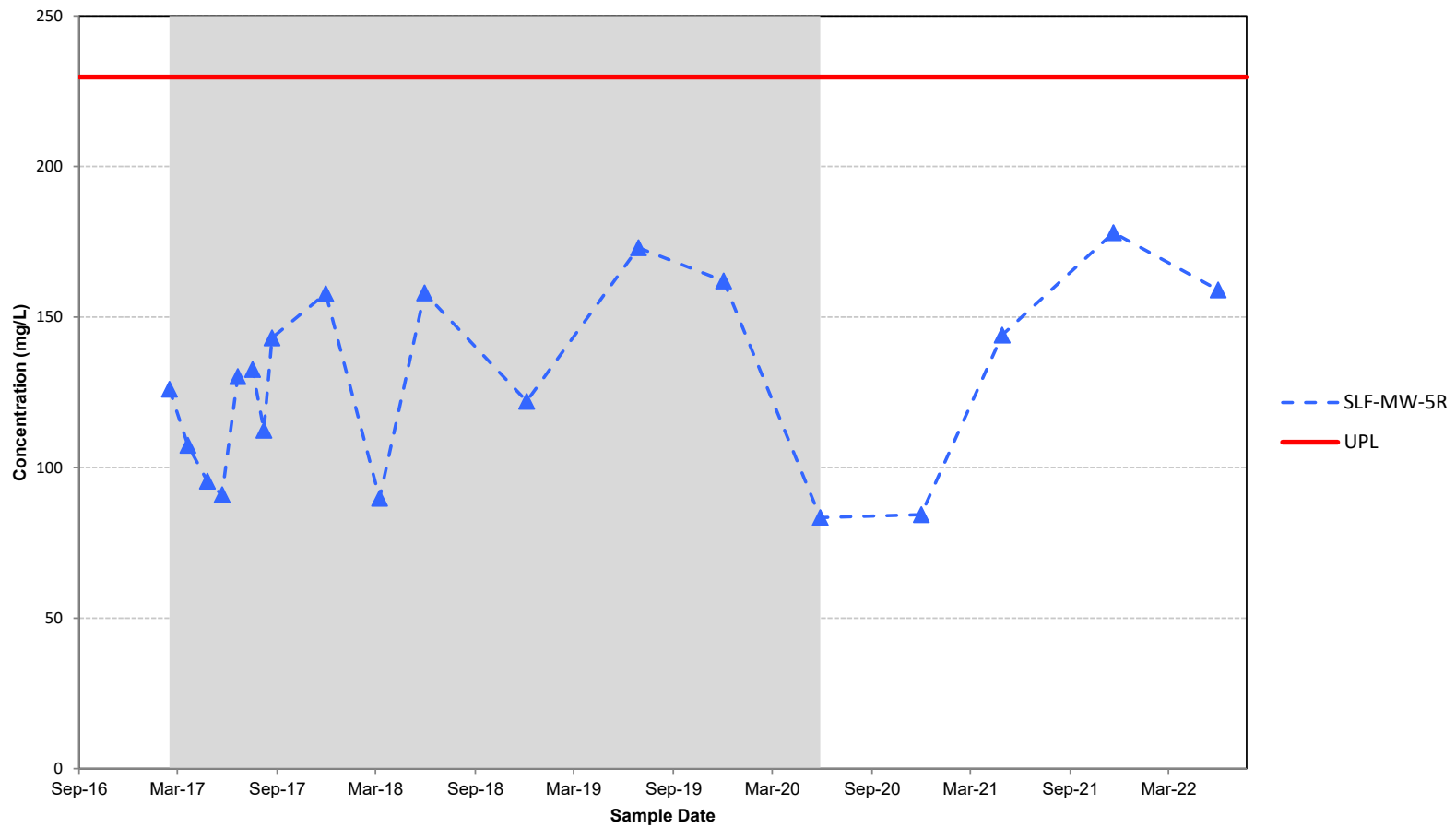


H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**PH, FIELD  
CONCENTRATION VS. TIME**

July 2022

Figure F-19



**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



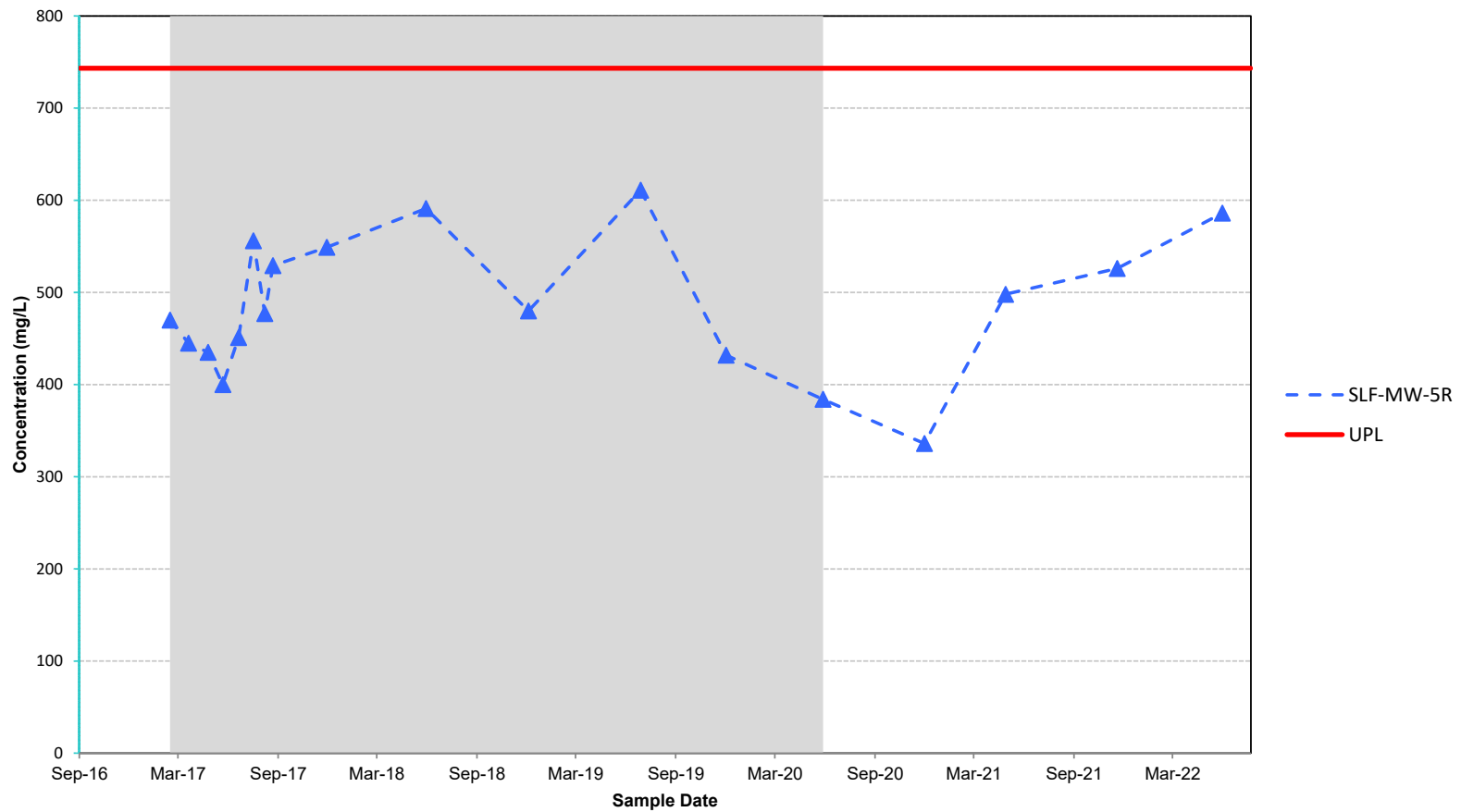
H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**SULFATE  
CONCENTRATION VS. TIME**

July 2022

Figure F-20





**NOTES:**

1. Solid symbol indicates a detected concentration. Open symbol indicates a non-detect, the laboratory reporting limit is graphed.
2. Screening Level shown is the Upper Prediction Limit (UPL).
3. Shading denotes data used to calculate Statistical Background limits.
4. Detection Monitoring was initiated on October 17, 2017.



H.L. SPURLOCK GENERATING STATION  
MAYSVILLE, KENTUCKY

**TOTAL DISSOLVED SOLIDS (TDS)  
CONCENTRATION VS. TIME**

July 2022

Figure F-21

**ATTACHMENT 2**

**Statistical Output**

## Concentrations (ppb)

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

SLF-MW-2B	18	0 (0%)	10/21/2016	2683.12	2683.12
			11/30/2016	4817.2	4817.2
			12/28/2016	3895.84	3895.84
			1/18/2017	3956.91	3956.91
			2/14/2017	3573.57	3573.57
			3/20/2017	3806.16	3806.16
			4/25/2017	3914.41	3914.41
			5/22/2017	3891.56	3891.56
			6/20/2017	3773.44	3773.44
			7/17/2017	4668	4668
			8/8/2017	4027	4027
			8/21/2017	3197	3197
			11/29/2017	4576	4576
			5/31/2018	4370	4370
			12/4/2018	4940	4940
			6/28/2019	4410	4410
			12/2/2019	4280	4280
5/28/2020	3390	3390			
	<b>11/30/2020</b>		<b>3560</b>	<b>3560</b>	
	<b>4/28/2021</b>		<b>2900</b>	<b>2900</b>	

SLF-MW-3B	18	0 (0%)	10/21/2016	4238.42	4238.42
			11/30/2016	6242.46	6242.46
			12/28/2016	5154.49	5154.49
			1/18/2017	4910.63	4910.63
			2/15/2017	3595.68	3595.68
			3/20/2017	3637.76	3637.76
			4/25/2017	3392.27	3392.27
			5/22/2017	3135.58	3135.58
			6/20/2017	3335.63	3335.63
			7/17/2017	4381	4381
			8/7/2017	3684	3684
			8/21/2017	3922	3922
			11/29/2017	3860	3860
			5/30/2018	2650	2650
			12/4/2018	3490	3490
			6/27/2019	2170	2170
			12/2/2019	2220	2220
5/28/2020	1590	1590			
	<b>12/1/2020</b>		<b>1920</b>	<b>1920</b>	
	<b>4/28/2021</b>		<b>1410</b>	<b>1410</b>	

SLF-MW-5R	14	0 (0%)	2/14/2017	493.993	493.993
			3/20/2017	345.223	345.223
			4/25/2017	314.115	314.115
			5/22/2017	270.744	270.744
			6/20/2017	438.039	438.039
			7/17/2017	550	550
			8/7/2017	363	363
			8/22/2017	461	461
			11/29/2017	524	524
			5/30/2018	517	517
			12/4/2018	395	395
			6/28/2019	631	631
			12/2/2019	653	653
			5/28/2020	220	220
			<b>11/30/2020</b>	<b>290</b>	<b>290</b>
			<b>4/28/2021</b>	<b>431</b>	<b>431</b>

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
------	-------	----	------	-------	----------

## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.175484	0.356132	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	2683.12	FALSE
	11/30/2016	4817.2	FALSE
	12/28/2016	3895.84	FALSE
	1/18/2017	3956.91	FALSE
	2/14/2017	3573.57	FALSE
	3/20/2017	3806.16	FALSE
	4/25/2017	3914.41	FALSE
	5/22/2017	3891.56	FALSE
	6/20/2017	3773.44	FALSE
	7/17/2017	4668	FALSE
	8/8/2017	4027	FALSE
	8/21/2017	3197	FALSE
	11/29/2017	4576	FALSE
	5/31/2018	4370	FALSE
	12/4/2018	4940	FALSE
	6/28/2019	4410	FALSE
	12/2/2019	4280	FALSE
	5/28/2020	3390	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	2683.12	4940	2256.88	0.4886	1102.71
2	3197	4817.2	1620.2	0.3253	527.051
3	3390	4668	1278	0.2553	326.273
4	3573.57	4576	1002.43	0.2027	203.193
5	3773.44	4410	636.56	0.1587	101.022
6	3806.16	4370	563.84	0.1197	67.4916
7	3891.56	4280	388.44	0.0837	32.5124
8	3895.84	4027	131.16	0.0496	6.50554
9	3914.41	3956.91	42.5	0.0163	0.69275
10	3956.91	3914.41	-42.5		
11	4027	3895.84	-131.16		
12	4280	3891.56	-388.44		
13	4370	3806.16	-563.84		
14	4410	3773.44	-636.56		
15	4576	3573.57	-1002.43		
16	4668	3390	-1278		
17	4817.2	3197	-1620.2		
18	4940	2683.12	-2256.88		

---

Sum of b values = 2367.45

Sample Standard Deviation = 582.366

W Statistic = 0.972124

5% Critical value of 0.897 is less than 0.972124

Data is normally distributed at 95% level of significance

1% Critical value of 0.858 is less than 0.972124

Data is normally distributed at 99% level of significance

# Mann-Kendall Trend Analysis

Parameter: Boron

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
4817.2	2683.12	2134.08	1	0
3895.84	2683.12	1212.72	2	0
3956.91	2683.12	1273.79	3	0
3573.57	2683.12	890.45	4	0
3806.16	2683.12	1123.04	5	0
3914.41	2683.12	1231.29	6	0
3891.56	2683.12	1208.44	7	0
3773.44	2683.12	1090.32	8	0
4668	2683.12	1984.88	9	0
4027	2683.12	1343.88	10	0
3197	2683.12	513.88	11	0
4576	2683.12	1892.88	12	0
4370	2683.12	1686.88	13	0
4940	2683.12	2256.88	14	0
4410	2683.12	1726.88	15	0
4280	2683.12	1596.88	16	0
3390	2683.12	706.88	17	0
3895.84	4817.2	-921.36	17	1
3956.91	4817.2	-860.29	17	2
3573.57	4817.2	-1243.63	17	3
3806.16	4817.2	-1011.04	17	4
3914.41	4817.2	-902.79	17	5
3891.56	4817.2	-925.64	17	6
3773.44	4817.2	-1043.76	17	7
4668	4817.2	-149.2	17	8
4027	4817.2	-790.2	17	9
3197	4817.2	-1620.2	17	10
4576	4817.2	-241.2	17	11
4370	4817.2	-447.2	17	12
4940	4817.2	122.8	18	12
4410	4817.2	-407.2	18	13
4280	4817.2	-537.2	18	14
3390	4817.2	-1427.2	18	15
3956.91	3895.84	61.07	19	15
3573.57	3895.84	-322.27	19	16
3806.16	3895.84	-89.68	19	17
3914.41	3895.84	18.57	20	17
3891.56	3895.84	-4.28	20	18
3773.44	3895.84	-122.4	20	19
4668	3895.84	772.16	21	19
4027	3895.84	131.16	22	19
3197	3895.84	-698.84	22	20
4576	3895.84	680.16	23	20
4370	3895.84	474.16	24	20
4940	3895.84	1044.16	25	20

4410	3895.84	514.16	26	20
4280	3895.84	384.16	27	20
3390	3895.84	-505.84	27	21
3573.57	3956.91	-383.34	27	22
3806.16	3956.91	-150.75	27	23
3914.41	3956.91	-42.5	27	24
3891.56	3956.91	-65.35	27	25
3773.44	3956.91	-183.47	27	26
4668	3956.91	711.09	28	26
4027	3956.91	70.09	29	26
3197	3956.91	-759.91	29	27
4576	3956.91	619.09	30	27
4370	3956.91	413.09	31	27
4940	3956.91	983.09	32	27
4410	3956.91	453.09	33	27
4280	3956.91	323.09	34	27
3390	3956.91	-566.91	34	28
3806.16	3573.57	232.59	35	28
3914.41	3573.57	340.84	36	28
3891.56	3573.57	317.99	37	28
3773.44	3573.57	199.87	38	28
4668	3573.57	1094.43	39	28
4027	3573.57	453.43	40	28
3197	3573.57	-376.57	40	29
4576	3573.57	1002.43	41	29
4370	3573.57	796.43	42	29
4940	3573.57	1366.43	43	29
4410	3573.57	836.43	44	29
4280	3573.57	706.43	45	29
3390	3573.57	-183.57	45	30
3914.41	3806.16	108.25	46	30
3891.56	3806.16	85.4	47	30
3773.44	3806.16	-32.72	47	31
4668	3806.16	861.84	48	31
4027	3806.16	220.84	49	31
3197	3806.16	-609.16	49	32
4576	3806.16	769.84	50	32
4370	3806.16	563.84	51	32
4940	3806.16	1133.84	52	32
4410	3806.16	603.84	53	32
4280	3806.16	473.84	54	32
3390	3806.16	-416.16	54	33
3891.56	3914.41	-22.85	54	34
3773.44	3914.41	-140.97	54	35
4668	3914.41	753.59	55	35
4027	3914.41	112.59	56	35
3197	3914.41	-717.41	56	36
4576	3914.41	661.59	57	36
4370	3914.41	455.59	58	36
4940	3914.41	1025.59	59	36
4410	3914.41	495.59	60	36
4280	3914.41	365.59	61	36
3390	3914.41	-524.41	61	37



3773.44	3891.56	-118.12	61	38
4668	3891.56	776.44	62	38
4027	3891.56	135.44	63	38
3197	3891.56	-694.56	63	39
4576	3891.56	684.44	64	39
4370	3891.56	478.44	65	39
4940	3891.56	1048.44	66	39
4410	3891.56	518.44	67	39
4280	3891.56	388.44	68	39
3390	3891.56	-501.56	68	40
4668	3773.44	894.56	69	40
4027	3773.44	253.56	70	40
3197	3773.44	-576.44	70	41
4576	3773.44	802.56	71	41
4370	3773.44	596.56	72	41
4940	3773.44	1166.56	73	41
4410	3773.44	636.56	74	41
4280	3773.44	506.56	75	41
3390	3773.44	-383.44	75	42
4027	4668	-641	75	43
3197	4668	-1471	75	44
4576	4668	-92	75	45
4370	4668	-298	75	46
4940	4668	272	76	46
4410	4668	-258	76	47
4280	4668	-388	76	48
3390	4668	-1278	76	49
3197	4027	-830	76	50
4576	4027	549	77	50
4370	4027	343	78	50
4940	4027	913	79	50
4410	4027	383	80	50
4280	4027	253	81	50
3390	4027	-637	81	51
4576	3197	1379	82	51
4370	3197	1173	83	51
4940	3197	1743	84	51
4410	3197	1213	85	51
4280	3197	1083	86	51
3390	3197	193	87	51
4370	4576	-206	87	52
4940	4576	364	88	52
4410	4576	-166	88	53
4280	4576	-296	88	54
3390	4576	-1186	88	55
4940	4370	570	89	55
4410	4370	40	90	55
4280	4370	-90	90	56
3390	4370	-980	90	57

4410	4940	-530	90	58
4280	4940	-660	90	59
3390	4940	-1550	90	60
4280	4410	-130	90	61
3390	4410	-1020	90	62
3390	4280	-890	90	63

S Statistic = 90 - 63 = 27

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Tied Group	Value	Members
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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 12546

b = 44064

c = 612

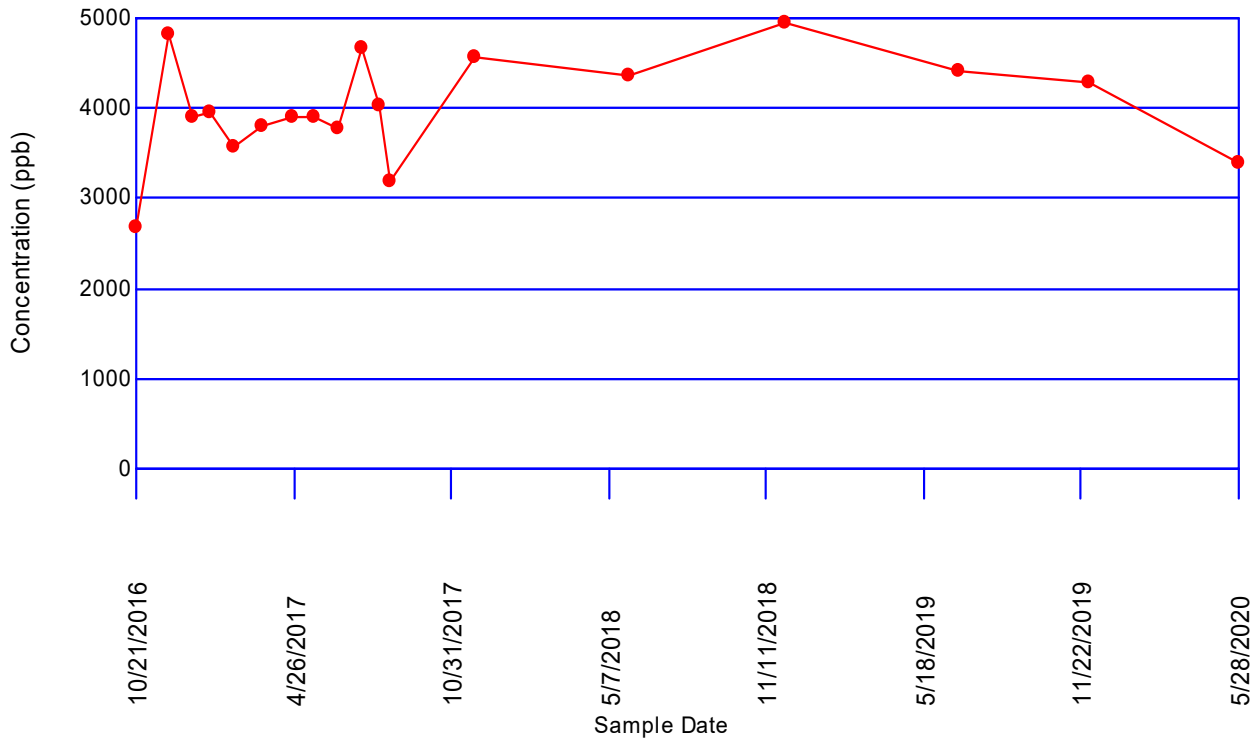
Group Variance = 697

Z-Score = 0.98482

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|0.98482| <= 1.97737 indicating no evidence of a trend

### Boron Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.331098	0.189723	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	4238.42	FALSE
	11/30/2016	6242.46	FALSE
	12/28/2016	5154.49	FALSE
	1/18/2017	4910.63	FALSE
	2/15/2017	3595.68	FALSE
	3/20/2017	3637.76	FALSE
	4/25/2017	3392.27	FALSE
	5/22/2017	3135.58	FALSE
	6/20/2017	3335.63	FALSE
	7/17/2017	4381	FALSE
	8/7/2017	3684	FALSE
	8/21/2017	3922	FALSE
	11/29/2017	3860	FALSE
	5/30/2018	2650	FALSE
	12/4/2018	3490	FALSE
	6/27/2019	2170	FALSE
	12/2/2019	2220	FALSE
	5/28/2020	1590	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	1590	6242.46	4652.46	0.4886	2273.19
2	2170	5154.49	2984.49	0.3253	970.855
3	2220	4910.63	2690.63	0.2553	686.918
4	2650	4381	1731	0.2027	350.874
5	3135.58	4238.42	1102.84	0.1587	175.021
6	3335.63	3922	586.37	0.1197	70.1885
7	3392.27	3860	467.73	0.0837	39.149
8	3490	3684	194	0.0496	9.6224
9	3595.68	3637.76	42.08	0.0163	0.685904
10	3637.76	3595.68	-42.08		
11	3684	3490	-194		
12	3860	3392.27	-467.73		
13	3922	3335.63	-586.37		
14	4238.42	3135.58	-1102.84		
15	4381	2650	-1731		
16	4910.63	2220	-2690.63		
17	5154.49	2170	-2984.49		
18	6242.46	1590	-4652.46		

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Sum of b values = 4576.5

Sample Standard Deviation = 1124.86

W Statistic = 0.973687

5% Critical value of 0.897 is less than 0.973687

Data is normally distributed at 95% level of significance

1% Critical value of 0.858 is less than 0.973687

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Boron**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
6242.46	4238.42	2004.04	1	0
5154.49	4238.42	916.07	2	0
4910.63	4238.42	672.21	3	0
3595.68	4238.42	-642.74	3	1
3637.76	4238.42	-600.66	3	2
3392.27	4238.42	-846.15	3	3
3135.58	4238.42	-1102.84	3	4
3335.63	4238.42	-902.79	3	5
4381	4238.42	142.58	4	5
3684	4238.42	-554.42	4	6
3922	4238.42	-316.42	4	7
3860	4238.42	-378.42	4	8
2650	4238.42	-1588.42	4	9
3490	4238.42	-748.42	4	10
2170	4238.42	-2068.42	4	11
2220	4238.42	-2018.42	4	12
1590	4238.42	-2648.42	4	13
5154.49	6242.46	-1087.97	4	14
4910.63	6242.46	-1331.83	4	15
3595.68	6242.46	-2646.78	4	16
3637.76	6242.46	-2604.7	4	17
3392.27	6242.46	-2850.19	4	18
3135.58	6242.46	-3106.88	4	19
3335.63	6242.46	-2906.83	4	20
4381	6242.46	-1861.46	4	21
3684	6242.46	-2558.46	4	22
3922	6242.46	-2320.46	4	23
3860	6242.46	-2382.46	4	24
2650	6242.46	-3592.46	4	25
3490	6242.46	-2752.46	4	26
2170	6242.46	-4072.46	4	27
2220	6242.46	-4022.46	4	28
1590	6242.46	-4652.46	4	29
4910.63	5154.49	-243.86	4	30
3595.68	5154.49	-1558.81	4	31
3637.76	5154.49	-1516.73	4	32
3392.27	5154.49	-1762.22	4	33
3135.58	5154.49	-2018.91	4	34
3335.63	5154.49	-1818.86	4	35
4381	5154.49	-773.49	4	36
3684	5154.49	-1470.49	4	37
3922	5154.49	-1232.49	4	38
3860	5154.49	-1294.49	4	39
2650	5154.49	-2504.49	4	40
3490	5154.49	-1664.49	4	41

2170	5154.49	-2984.49	4	42
2220	5154.49	-2934.49	4	43
1590	5154.49	-3564.49	4	44
3595.68	4910.63	-1314.95	4	45
3637.76	4910.63	-1272.87	4	46
3392.27	4910.63	-1518.36	4	47
3135.58	4910.63	-1775.05	4	48
3335.63	4910.63	-1575	4	49
4381	4910.63	-529.63	4	50
3684	4910.63	-1226.63	4	51
3922	4910.63	-988.63	4	52
3860	4910.63	-1050.63	4	53
2650	4910.63	-2260.63	4	54
3490	4910.63	-1420.63	4	55
2170	4910.63	-2740.63	4	56
2220	4910.63	-2690.63	4	57
1590	4910.63	-3320.63	4	58
3637.76	3595.68	42.08	5	58
3392.27	3595.68	-203.41	5	59
3135.58	3595.68	-460.1	5	60
3335.63	3595.68	-260.05	5	61
4381	3595.68	785.32	6	61
3684	3595.68	88.32	7	61
3922	3595.68	326.32	8	61
3860	3595.68	264.32	9	61
2650	3595.68	-945.68	9	62
3490	3595.68	-105.68	9	63
2170	3595.68	-1425.68	9	64
2220	3595.68	-1375.68	9	65
1590	3595.68	-2005.68	9	66
3392.27	3637.76	-245.49	9	67
3135.58	3637.76	-502.18	9	68
3335.63	3637.76	-302.13	9	69
4381	3637.76	743.24	10	69
3684	3637.76	46.24	11	69
3922	3637.76	284.24	12	69
3860	3637.76	222.24	13	69
2650	3637.76	-987.76	13	70
3490	3637.76	-147.76	13	71
2170	3637.76	-1467.76	13	72
2220	3637.76	-1417.76	13	73
1590	3637.76	-2047.76	13	74
3135.58	3392.27	-256.69	13	75
3335.63	3392.27	-56.64	13	76
4381	3392.27	988.73	14	76
3684	3392.27	291.73	15	76
3922	3392.27	529.73	16	76
3860	3392.27	467.73	17	76
2650	3392.27	-742.27	17	77
3490	3392.27	97.73	18	77
2170	3392.27	-1222.27	18	78
2220	3392.27	-1172.27	18	79
1590	3392.27	-1802.27	18	80

3335.63	3135.58	200.05	19	80
4381	3135.58	1245.42	20	80
3684	3135.58	548.42	21	80
3922	3135.58	786.42	22	80
3860	3135.58	724.42	23	80
2650	3135.58	-485.58	23	81
3490	3135.58	354.42	24	81
2170	3135.58	-965.58	24	82
2220	3135.58	-915.58	24	83
1590	3135.58	-1545.58	24	84
4381	3335.63	1045.37	25	84
3684	3335.63	348.37	26	84
3922	3335.63	586.37	27	84
3860	3335.63	524.37	28	84
2650	3335.63	-685.63	28	85
3490	3335.63	154.37	29	85
2170	3335.63	-1165.63	29	86
2220	3335.63	-1115.63	29	87
1590	3335.63	-1745.63	29	88
3684	4381	-697	29	89
3922	4381	-459	29	90
3860	4381	-521	29	91
2650	4381	-1731	29	92
3490	4381	-891	29	93
2170	4381	-2211	29	94
2220	4381	-2161	29	95
1590	4381	-2791	29	96
3922	3684	238	30	96
3860	3684	176	31	96
2650	3684	-1034	31	97
3490	3684	-194	31	98
2170	3684	-1514	31	99
2220	3684	-1464	31	100
1590	3684	-2094	31	101
3860	3922	-62	31	102
2650	3922	-1272	31	103
3490	3922	-432	31	104
2170	3922	-1752	31	105
2220	3922	-1702	31	106
1590	3922	-2332	31	107
2650	3860	-1210	31	108
3490	3860	-370	31	109
2170	3860	-1690	31	110
2220	3860	-1640	31	111
1590	3860	-2270	31	112
3490	2650	840	32	112
2170	2650	-480	32	113
2220	2650	-430	32	114
1590	2650	-1060	32	115



2170	3490	-1320	32	116
2220	3490	-1270	32	117
1590	3490	-1900	32	118
2220	2170	50	33	118
1590	2170	-580	33	119
1590	2220	-630	33	120

S Statistic = 33 - 120 = -87

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Tied Group	Value	Members
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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 12546

b = 44064

c = 612

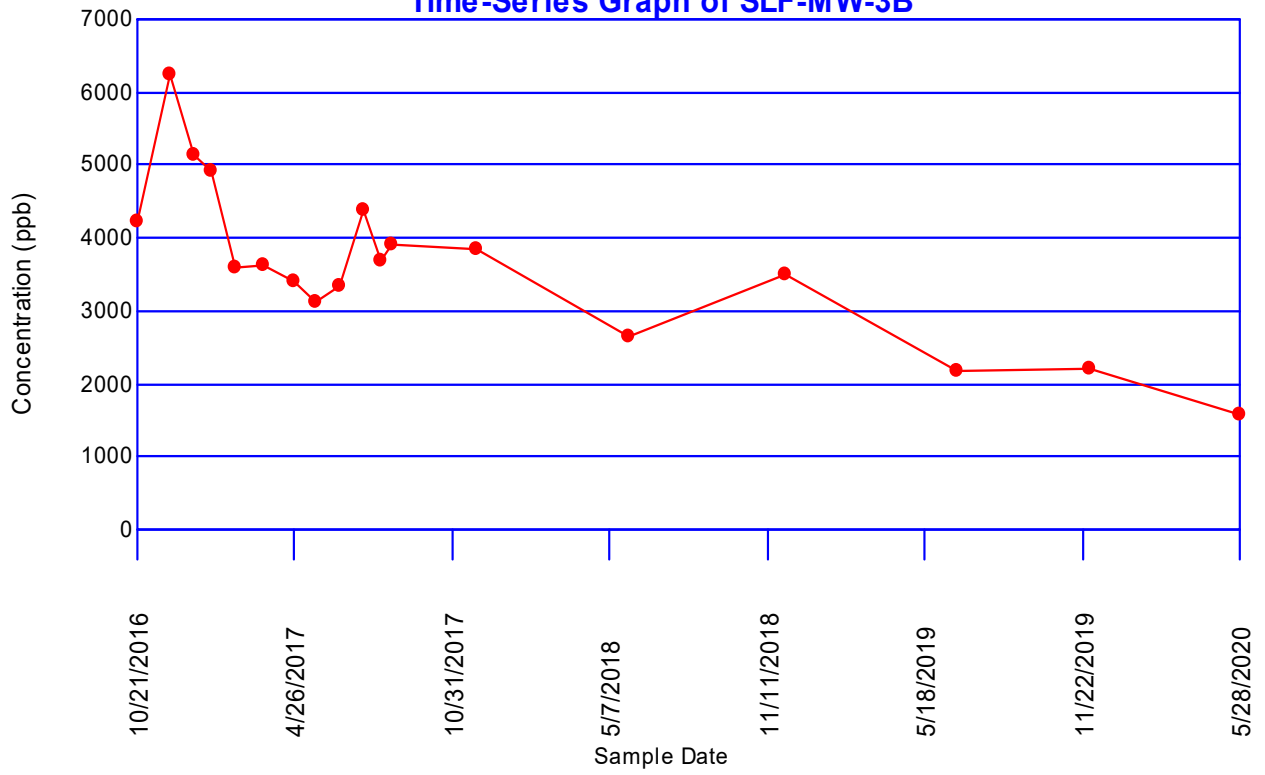
Group Variance = 697

Z-Score = -3.25748

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**|-3.25748| > 1.97737 indicating a trend**

### Boron Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Boron

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.303938	0.285197	0.546	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	493.993	FALSE
	3/20/2017	345.223	FALSE
	4/25/2017	314.115	FALSE
	5/22/2017	270.744	FALSE
	6/20/2017	438.039	FALSE
	7/17/2017	550	FALSE
	8/7/2017	363	FALSE
	8/22/2017	461	FALSE
	11/29/2017	524	FALSE
	5/30/2018	517	FALSE
	12/4/2018	395	FALSE
	6/28/2019	631	FALSE
	12/2/2019	653	FALSE
	5/28/2020	220	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Boron

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 14 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	220	653	433	0.5251	227.368
2	270.744	631	360.256	0.3318	119.533
3	314.115	550	235.885	0.246	58.0277
4	345.223	524	178.777	0.1802	32.2156
5	363	517	154	0.124	19.096
6	395	493.993	98.993	0.0727	7.19679
7	438.039	461	22.961	0.024	0.551064
8	461	438.039	-22.961		
9	493.993	395	-98.993		
10	517	363	-154		
11	524	345.223	-178.777		
12	550	314.115	-235.885		
13	631	270.744	-360.256		
14	653	220	-433		

---

Sum of b values = 463.988

Sample Standard Deviation = 130.121

W Statistic = 0.97809

5% Critical value of 0.874 is less than 0.97809

Data is normally distributed at 95% level of significance

1% Critical value of 0.825 is less than 0.97809

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Boron**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
345.223	493.993	-148.77	0	1
314.115	493.993	-179.878	0	2
270.744	493.993	-223.249	0	3
438.039	493.993	-55.954	0	4
550	493.993	56.007	1	4
363	493.993	-130.993	1	5
461	493.993	-32.993	1	6
524	493.993	30.007	2	6
517	493.993	23.007	3	6
395	493.993	-98.993	3	7
631	493.993	137.007	4	7
653	493.993	159.007	5	7
220	493.993	-273.993	5	8
314.115	345.223	-31.108	5	9
270.744	345.223	-74.479	5	10
438.039	345.223	92.816	6	10
550	345.223	204.777	7	10
363	345.223	17.777	8	10
461	345.223	115.777	9	10
524	345.223	178.777	10	10
517	345.223	171.777	11	10
395	345.223	49.777	12	10
631	345.223	285.777	13	10
653	345.223	307.777	14	10
220	345.223	-125.223	14	11
270.744	314.115	-43.371	14	12
438.039	314.115	123.924	15	12
550	314.115	235.885	16	12
363	314.115	48.885	17	12
461	314.115	146.885	18	12
524	314.115	209.885	19	12
517	314.115	202.885	20	12
395	314.115	80.885	21	12
631	314.115	316.885	22	12
653	314.115	338.885	23	12
220	314.115	-94.115	23	13
438.039	270.744	167.295	24	13
550	270.744	279.256	25	13
363	270.744	92.256	26	13
461	270.744	190.256	27	13
524	270.744	253.256	28	13
517	270.744	246.256	29	13
395	270.744	124.256	30	13
631	270.744	360.256	31	13

653	270.744	382.256	32	13
220	270.744	-50.744	32	14
550	438.039	111.961	33	14
363	438.039	-75.039	33	15
461	438.039	22.961	34	15
524	438.039	85.961	35	15
517	438.039	78.961	36	15
395	438.039	-43.039	36	16
631	438.039	192.961	37	16
653	438.039	214.961	38	16
220	438.039	-218.039	38	17
363	550	-187	38	18
461	550	-89	38	19
524	550	-26	38	20
517	550	-33	38	21
395	550	-155	38	22
631	550	81	39	22
653	550	103	40	22
220	550	-330	40	23
461	363	98	41	23
524	363	161	42	23
517	363	154	43	23
395	363	32	44	23
631	363	268	45	23
653	363	290	46	23
220	363	-143	46	24
524	461	63	47	24
517	461	56	48	24
395	461	-66	48	25
631	461	170	49	25
653	461	192	50	25
220	461	-241	50	26
517	524	-7	50	27
395	524	-129	50	28
631	524	107	51	28
653	524	129	52	28
220	524	-304	52	29
395	517	-122	52	30
631	517	114	53	30
653	517	136	54	30
220	517	-297	54	31
631	395	236	55	31
653	395	258	56	31
220	395	-175	56	32
653	631	22	57	32
220	631	-411	57	33
220	653	-433	57	34

S Statistic = 57 - 34 = 23

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Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/22/2017		1
11/29/2017		1
5/30/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 6006

b = 19656

c = 364

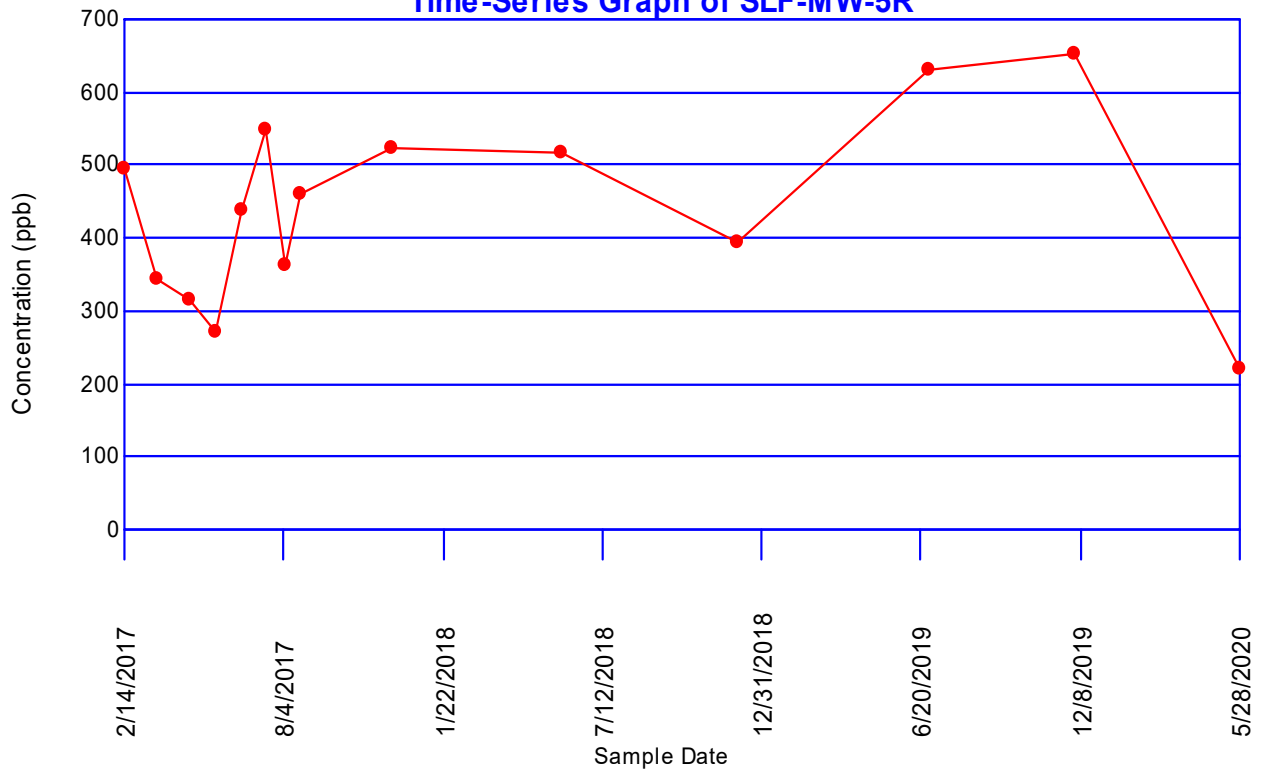
Group Variance = 333.667

Z-Score = 1.20439

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.20439| <= 1.97737 indicating no evidence of a trend

### Boron Time-Series Graph of SLF-MW-5R





## Concentrations (ppb)

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

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Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

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Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	37032.2	37032.2
			11/30/2016	61315.7	61315.7
			12/28/2016	44056.6	44056.6
			1/18/2017	35837.4	35837.4
			2/14/2017	37524.8	37524.8
			3/20/2017	38622.7	38622.7
			4/25/2017	39897.3	39897.3
			5/22/2017	43737.6	43737.6
			6/20/2017	34857	34857
			7/17/2017	33220	33220
			8/8/2017	30756	30756
			8/21/2017	31548	31548
			11/29/2017	37641	37641
			3/8/2018	47865	47865
			5/31/2018	44100	44100
			12/4/2018	48600	48600
			6/28/2019	43600	43600
			12/2/2019	49100	49100
			5/28/2020	47400	47400
				<b>11/30/2020</b>	<b>44100</b>
	<b>4/28/2021</b>	<b>41200</b>	<b>41200</b>		

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SLF-MW-3B	19	0 (0%)	10/21/2016	184501	184501
			11/30/2016	249120	249120
			12/28/2016	254980	254980
			1/18/2017	228148	228148
			2/15/2017	188140	188140
			3/20/2017	191435	191435
			4/25/2017	188976	188976
			5/22/2017	229431	229431
			6/20/2017	213067	213067
			7/17/2017	220459	220459
			8/7/2017	208907	208907
			8/21/2017	235062	235062
			11/29/2017	204990	204990
			3/8/2018	173000	173000
			5/30/2018	171000	171000
			12/4/2018	200000	200000
			6/27/2019	172000	172000
			12/2/2019	179000	179000
			5/28/2020	138000	138000

				<b>12/1/2020</b>	<b>167000</b>	<b>167000</b>
				<b>4/28/2021</b>	<b>143000</b>	<b>143000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	107763	107763	107763
			3/20/2017	104972	104972	104972
			4/25/2017	101443	101443	101443
			5/22/2017	118938	118938	118938
			6/20/2017	120726	120726	120726
			7/17/2017	123508	123508	123508
			8/7/2017	115159	115159	115159
			8/22/2017	123970	123970	123970
			11/29/2017	136418	136418	136418
			3/8/2018	105000	105000	105000
			5/30/2018	118000	118000	118000
			12/4/2018	114000	114000	114000
			6/28/2019	126000	126000	126000
			12/2/2019	130000	130000	130000
			5/28/2020	99100	99100	99100
			<b>11/30/2020</b>	<b>85100</b>	<b>85100</b>	<b>85100</b>
			<b>4/28/2021</b>	<b>115000</b>	<b>115000</b>	<b>115000</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.452585	0.138086	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	37032.2	FALSE
	11/30/2016	61315.7	FALSE
	12/28/2016	44056.6	FALSE
	1/18/2017	35837.4	FALSE
	2/14/2017	37524.8	FALSE
	3/20/2017	38622.7	FALSE
	4/25/2017	39897.3	FALSE
	5/22/2017	43737.6	FALSE
	6/20/2017	34857	FALSE
	7/17/2017	33220	FALSE
	8/8/2017	30756	FALSE
	8/21/2017	31548	FALSE
	11/29/2017	37641	FALSE
	3/8/2018	47865	FALSE
	5/31/2018	44100	FALSE
	12/4/2018	48600	FALSE
	6/28/2019	43600	FALSE
	12/2/2019	49100	FALSE
	5/28/2020	47400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	30756	61315.7	30559.7	0.4808	14693.1
2	31548	49100	17552	0.3232	5672.81
3	33220	48600	15380	0.2561	3938.82
4	34857	47865	13008	0.2059	2678.35
5	35837.4	47400	11562.6	0.1641	1897.42
6	37032.2	44100	7067.8	0.1271	898.317
7	37524.8	44056.6	6531.8	0.0932	608.764
8	37641	43737.6	6096.6	0.0612	373.112
9	38622.7	43600	4977.3	0.0303	150.812
10	39897.3	39897.3	0		
11	43600	38622.7	-4977.3		
12	43737.6	37641	-6096.6		
13	44056.6	37524.8	-6531.8		
14	44100	37032.2	-7067.8		
15	47400	35837.4	-11562.6		
16	47865	34857	-13008		
17	48600	33220	-15380		
18	49100	31548	-17552		
19	61315.7	30756	-30559.7		

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Sum of b values = 30911.5

Sample Standard Deviation = 7525.63

W Statistic = 0.937308

5% Critical value of 0.901 is less than 0.937308

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.937308

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
61315.7	37032.2	24283.5	1	0
44056.6	37032.2	7024.4	2	0
35837.4	37032.2	-1194.8	2	1
37524.8	37032.2	492.6	3	1
38622.7	37032.2	1590.5	4	1
39897.3	37032.2	2865.1	5	1
43737.6	37032.2	6705.4	6	1
34857	37032.2	-2175.2	6	2
33220	37032.2	-3812.2	6	3
30756	37032.2	-6276.2	6	4
31548	37032.2	-5484.2	6	5
37641	37032.2	608.8	7	5
47865	37032.2	10832.8	8	5
44100	37032.2	7067.8	9	5
48600	37032.2	11567.8	10	5
43600	37032.2	6567.8	11	5
49100	37032.2	12067.8	12	5
47400	37032.2	10367.8	13	5
44056.6	61315.7	-17259.1	13	6
35837.4	61315.7	-25478.3	13	7
37524.8	61315.7	-23790.9	13	8
38622.7	61315.7	-22693	13	9
39897.3	61315.7	-21418.4	13	10
43737.6	61315.7	-17578.1	13	11
34857	61315.7	-26458.7	13	12
33220	61315.7	-28095.7	13	13
30756	61315.7	-30559.7	13	14
31548	61315.7	-29767.7	13	15
37641	61315.7	-23674.7	13	16
47865	61315.7	-13450.7	13	17
44100	61315.7	-17215.7	13	18
48600	61315.7	-12715.7	13	19
43600	61315.7	-17715.7	13	20
49100	61315.7	-12215.7	13	21
47400	61315.7	-13915.7	13	22
35837.4	44056.6	-8219.2	13	23
37524.8	44056.6	-6531.8	13	24
38622.7	44056.6	-5433.9	13	25
39897.3	44056.6	-4159.3	13	26
43737.6	44056.6	-319	13	27
34857	44056.6	-9199.6	13	28
33220	44056.6	-10836.6	13	29
30756	44056.6	-13300.6	13	30
31548	44056.6	-12508.6	13	31
37641	44056.6	-6415.6	13	32

47865	44056.6	3808.4	14	32
44100	44056.6	43.4	15	32
48600	44056.6	4543.4	16	32
43600	44056.6	-456.6	16	33
49100	44056.6	5043.4	17	33
47400	44056.6	3343.4	18	33
37524.8	35837.4	1687.4	19	33
38622.7	35837.4	2785.3	20	33
39897.3	35837.4	4059.9	21	33
43737.6	35837.4	7900.2	22	33
34857	35837.4	-980.4	22	34
33220	35837.4	-2617.4	22	35
30756	35837.4	-5081.4	22	36
31548	35837.4	-4289.4	22	37
37641	35837.4	1803.6	23	37
47865	35837.4	12027.6	24	37
44100	35837.4	8262.6	25	37
48600	35837.4	12762.6	26	37
43600	35837.4	7762.6	27	37
49100	35837.4	13262.6	28	37
47400	35837.4	11562.6	29	37
38622.7	37524.8	1097.9	30	37
39897.3	37524.8	2372.5	31	37
43737.6	37524.8	6212.8	32	37
34857	37524.8	-2667.8	32	38
33220	37524.8	-4304.8	32	39
30756	37524.8	-6768.8	32	40
31548	37524.8	-5976.8	32	41
37641	37524.8	116.2	33	41
47865	37524.8	10340.2	34	41
44100	37524.8	6575.2	35	41
48600	37524.8	11075.2	36	41
43600	37524.8	6075.2	37	41
49100	37524.8	11575.2	38	41
47400	37524.8	9875.2	39	41
39897.3	38622.7	1274.6	40	41
43737.6	38622.7	5114.9	41	41
34857	38622.7	-3765.7	41	42
33220	38622.7	-5402.7	41	43
30756	38622.7	-7866.7	41	44
31548	38622.7	-7074.7	41	45
37641	38622.7	-981.7	41	46
47865	38622.7	9242.3	42	46
44100	38622.7	5477.3	43	46
48600	38622.7	9977.3	44	46
43600	38622.7	4977.3	45	46
49100	38622.7	10477.3	46	46
47400	38622.7	8777.3	47	46
43737.6	39897.3	3840.3	48	46
34857	39897.3	-5040.3	48	47
33220	39897.3	-6677.3	48	48
30756	39897.3	-9141.3	48	49
31548	39897.3	-8349.3	48	50

37641	39897.3	-2256.3	48	51
47865	39897.3	7967.7	49	51
44100	39897.3	4202.7	50	51
48600	39897.3	8702.7	51	51
43600	39897.3	3702.7	52	51
49100	39897.3	9202.7	53	51
47400	39897.3	7502.7	54	51
34857	43737.6	-8880.6	54	52
33220	43737.6	-10517.6	54	53
30756	43737.6	-12981.6	54	54
31548	43737.6	-12189.6	54	55
37641	43737.6	-6096.6	54	56
47865	43737.6	4127.4	55	56
44100	43737.6	362.4	56	56
48600	43737.6	4862.4	57	56
43600	43737.6	-137.6	57	57
49100	43737.6	5362.4	58	57
47400	43737.6	3662.4	59	57
33220	34857	-1637	59	58
30756	34857	-4101	59	59
31548	34857	-3309	59	60
37641	34857	2784	60	60
47865	34857	13008	61	60
44100	34857	9243	62	60
48600	34857	13743	63	60
43600	34857	8743	64	60
49100	34857	14243	65	60
47400	34857	12543	66	60
30756	33220	-2464	66	61
31548	33220	-1672	66	62
37641	33220	4421	67	62
47865	33220	14645	68	62
44100	33220	10880	69	62
48600	33220	15380	70	62
43600	33220	10380	71	62
49100	33220	15880	72	62
47400	33220	14180	73	62
31548	30756	792	74	62
37641	30756	6885	75	62
47865	30756	17109	76	62
44100	30756	13344	77	62
48600	30756	17844	78	62
43600	30756	12844	79	62
49100	30756	18344	80	62
47400	30756	16644	81	62
37641	31548	6093	82	62
47865	31548	16317	83	62
44100	31548	12552	84	62
48600	31548	17052	85	62
43600	31548	12052	86	62
49100	31548	17552	87	62
47400	31548	15852	88	62

47865	37641	10224	89	62
44100	37641	6459	90	62
48600	37641	10959	91	62
43600	37641	5959	92	62
49100	37641	11459	93	62
47400	37641	9759	94	62
44100	47865	-3765	94	63
48600	47865	735	95	63
43600	47865	-4265	95	64
49100	47865	1235	96	64
47400	47865	-465	96	65
48600	44100	4500	97	65
43600	44100	-500	97	66
49100	44100	5000	98	66
47400	44100	3300	99	66
43600	48600	-5000	99	67
49100	48600	500	100	67
47400	48600	-1200	100	68
49100	43600	5500	101	68
47400	43600	3800	102	68
47400	49100	-1700	102	69

S Statistic = 102 - 69 = 33

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<hr/>		
<b>Time Period</b>	<b>Observations</b>	
10/21/2016	1	
11/30/2016	1	
12/28/2016	1	
1/18/2017	1	
2/14/2017	1	
3/20/2017	1	
4/25/2017	1	
5/22/2017	1	
6/20/2017	1	
7/17/2017	1	
8/8/2017	1	
8/21/2017	1	
11/29/2017	1	
3/8/2018	1	
5/31/2018	1	
12/4/2018	1	
6/28/2019	1	
12/2/2019	1	
5/28/2020	1	
There are 0 time periods with multiple data		

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A = 0

B = 0



C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

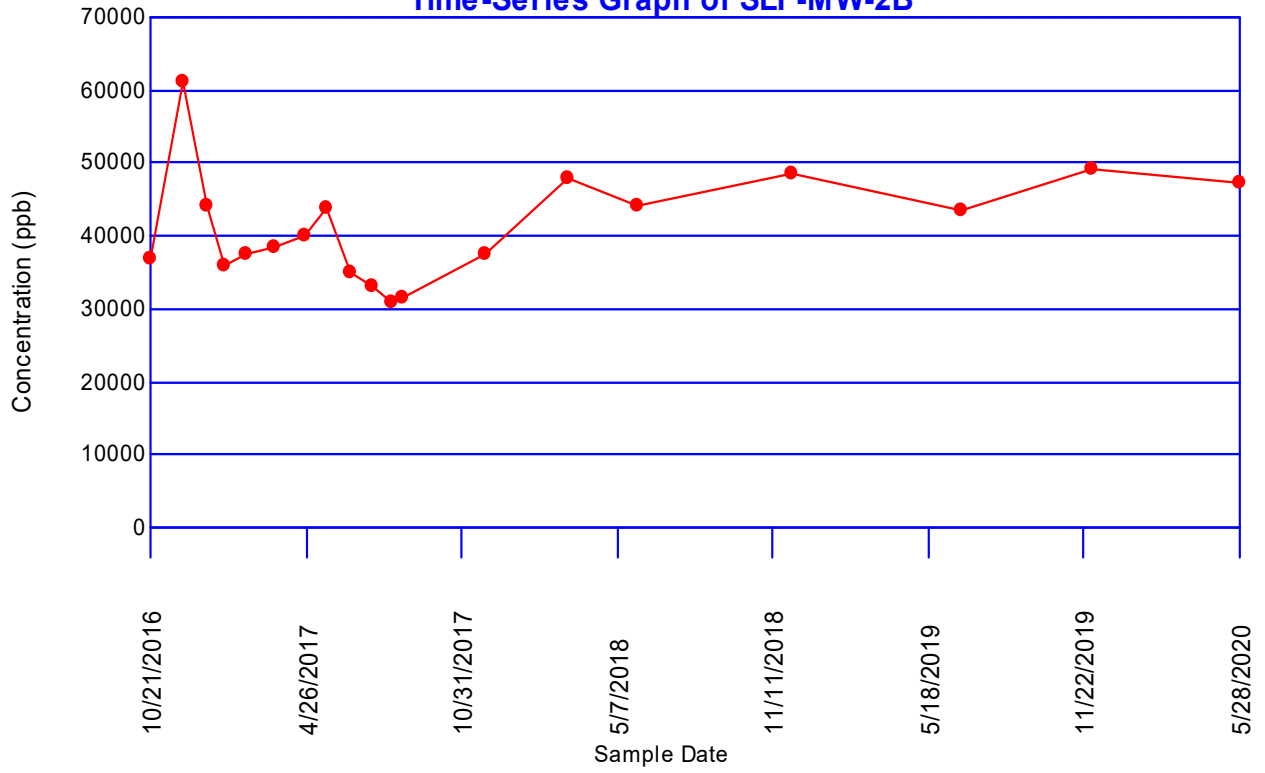
Group Variance = 817

Z-Score = 1.11954

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.11954| <= 1.97737 indicating no evidence of a trend

### Calcium Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.240034	0.350292	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	184501	FALSE
	11/30/2016	249120	FALSE
	12/28/2016	254980	FALSE
	1/18/2017	228148	FALSE
	2/15/2017	188140	FALSE
	3/20/2017	191435	FALSE
	4/25/2017	188976	FALSE
	5/22/2017	229431	FALSE
	6/20/2017	213067	FALSE
	7/17/2017	220459	FALSE
	8/7/2017	208907	FALSE
	8/21/2017	235062	FALSE
	11/29/2017	204990	FALSE
	3/8/2018	173000	FALSE
	5/30/2018	171000	FALSE
	12/4/2018	200000	FALSE
	6/27/2019	172000	FALSE
	12/2/2019	179000	FALSE
	5/28/2020	138000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	138000	254980	116980	0.4808	56244
2	171000	249120	78120	0.3232	25248.4
3	172000	235062	63062	0.2561	16150.2
4	173000	229431	56431	0.2059	11619.1
5	179000	228148	49148	0.1641	8065.19
6	184501	220459	35958	0.1271	4570.26
7	188140	213067	24927	0.0932	2323.2
8	188976	208907	19931	0.0612	1219.78
9	191435	204990	13555	0.0303	410.717
10	200000	200000	0		
11	204990	191435	-13555		
12	208907	188976	-19931		
13	213067	188140	-24927		
14	220459	184501	-35958		
15	228148	179000	-49148		
16	229431	173000	-56431		
17	235062	172000	-63062		
18	249120	171000	-78120		
19	254980	138000	-116980		

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Sum of b values = 125851

Sample Standard Deviation = 29984.9

W Statistic = 0.978667

5% Critical value of 0.901 is less than 0.978667

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.978667

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
249120	184501	64619	1	0
254980	184501	70479	2	0
228148	184501	43647	3	0
188140	184501	3639	4	0
191435	184501	6934	5	0
188976	184501	4475	6	0
229431	184501	44930	7	0
213067	184501	28566	8	0
220459	184501	35958	9	0
208907	184501	24406	10	0
235062	184501	50561	11	0
204990	184501	20489	12	0
173000	184501	-11501	12	1
171000	184501	-13501	12	2
200000	184501	15499	13	2
172000	184501	-12501	13	3
179000	184501	-5501	13	4
138000	184501	-46501	13	5
254980	249120	5860	14	5
228148	249120	-20972	14	6
188140	249120	-60980	14	7
191435	249120	-57685	14	8
188976	249120	-60144	14	9
229431	249120	-19689	14	10
213067	249120	-36053	14	11
220459	249120	-28661	14	12
208907	249120	-40213	14	13
235062	249120	-14058	14	14
204990	249120	-44130	14	15
173000	249120	-76120	14	16
171000	249120	-78120	14	17
200000	249120	-49120	14	18
172000	249120	-77120	14	19
179000	249120	-70120	14	20
138000	249120	-111120	14	21
228148	254980	-26832	14	22
188140	254980	-66840	14	23
191435	254980	-63545	14	24
188976	254980	-66004	14	25
229431	254980	-25549	14	26
213067	254980	-41913	14	27
220459	254980	-34521	14	28
208907	254980	-46073	14	29
235062	254980	-19918	14	30
204990	254980	-49990	14	31

173000	254980	-81980	14	32
171000	254980	-83980	14	33
200000	254980	-54980	14	34
172000	254980	-82980	14	35
179000	254980	-75980	14	36
138000	254980	-116980	14	37
188140	228148	-40008	14	38
191435	228148	-36713	14	39
188976	228148	-39172	14	40
229431	228148	1283	15	40
213067	228148	-15081	15	41
220459	228148	-7689	15	42
208907	228148	-19241	15	43
235062	228148	6914	16	43
204990	228148	-23158	16	44
173000	228148	-55148	16	45
171000	228148	-57148	16	46
200000	228148	-28148	16	47
172000	228148	-56148	16	48
179000	228148	-49148	16	49
138000	228148	-90148	16	50
191435	188140	3295	17	50
188976	188140	836	18	50
229431	188140	41291	19	50
213067	188140	24927	20	50
220459	188140	32319	21	50
208907	188140	20767	22	50
235062	188140	46922	23	50
204990	188140	16850	24	50
173000	188140	-15140	24	51
171000	188140	-17140	24	52
200000	188140	11860	25	52
172000	188140	-16140	25	53
179000	188140	-9140	25	54
138000	188140	-50140	25	55
188976	191435	-2459	25	56
229431	191435	37996	26	56
213067	191435	21632	27	56
220459	191435	29024	28	56
208907	191435	17472	29	56
235062	191435	43627	30	56
204990	191435	13555	31	56
173000	191435	-18435	31	57
171000	191435	-20435	31	58
200000	191435	8565	32	58
172000	191435	-19435	32	59
179000	191435	-12435	32	60
138000	191435	-53435	32	61
229431	188976	40455	33	61
213067	188976	24091	34	61
220459	188976	31483	35	61
208907	188976	19931	36	61
235062	188976	46086	37	61

204990	188976	16014	38	61
173000	188976	-15976	38	62
171000	188976	-17976	38	63
200000	188976	11024	39	63
172000	188976	-16976	39	64
179000	188976	-9976	39	65
138000	188976	-50976	39	66
213067	229431	-16364	39	67
220459	229431	-8972	39	68
208907	229431	-20524	39	69
235062	229431	5631	40	69
204990	229431	-24441	40	70
173000	229431	-56431	40	71
171000	229431	-58431	40	72
200000	229431	-29431	40	73
172000	229431	-57431	40	74
179000	229431	-50431	40	75
138000	229431	-91431	40	76
220459	213067	7392	41	76
208907	213067	-4160	41	77
235062	213067	21995	42	77
204990	213067	-8077	42	78
173000	213067	-40067	42	79
171000	213067	-42067	42	80
200000	213067	-13067	42	81
172000	213067	-41067	42	82
179000	213067	-34067	42	83
138000	213067	-75067	42	84
208907	220459	-11552	42	85
235062	220459	14603	43	85
204990	220459	-15469	43	86
173000	220459	-47459	43	87
171000	220459	-49459	43	88
200000	220459	-20459	43	89
172000	220459	-48459	43	90
179000	220459	-41459	43	91
138000	220459	-82459	43	92
235062	208907	26155	44	92
204990	208907	-3917	44	93
173000	208907	-35907	44	94
171000	208907	-37907	44	95
200000	208907	-8907	44	96
172000	208907	-36907	44	97
179000	208907	-29907	44	98
138000	208907	-70907	44	99
204990	235062	-30072	44	100
173000	235062	-62062	44	101
171000	235062	-64062	44	102
200000	235062	-35062	44	103
172000	235062	-63062	44	104
179000	235062	-56062	44	105
138000	235062	-97062	44	106

173000	204990	-31990	44	107
171000	204990	-33990	44	108
200000	204990	-4990	44	109
172000	204990	-32990	44	110
179000	204990	-25990	44	111
138000	204990	-66990	44	112
171000	173000	-2000	44	113
200000	173000	27000	45	113
172000	173000	-1000	45	114
179000	173000	6000	46	114
138000	173000	-35000	46	115
200000	171000	29000	47	115
172000	171000	1000	48	115
179000	171000	8000	49	115
138000	171000	-33000	49	116
172000	200000	-28000	49	117
179000	200000	-21000	49	118
138000	200000	-62000	49	119
179000	172000	7000	50	119
138000	172000	-34000	50	120
138000	179000	-41000	50	121

S Statistic = 50 - 121 = -71

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/15/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/30/2018		1
12/4/2018		1
6/27/2019		1
12/2/2019		1
5/28/2020		1
There are 0 time periods with multiple data		

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A = 0

B = 0



C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

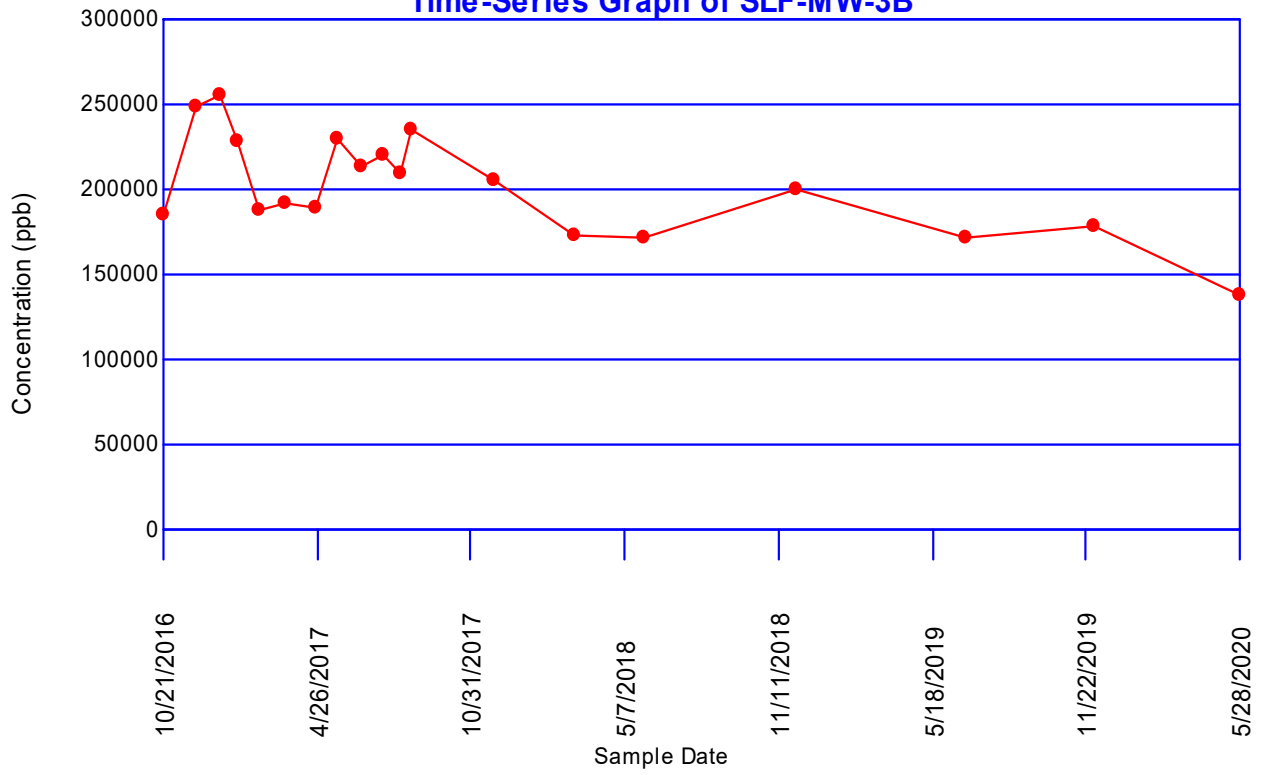
Group Variance = 817

Z-Score = -2.44899

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**| -2.44899 | > 1.97737 indicating a trend**

### Calcium Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Calcium

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.331298	0.21829	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	107763	FALSE
	3/20/2017	104972	FALSE
	4/25/2017	101443	FALSE
	5/22/2017	118938	FALSE
	6/20/2017	120726	FALSE
	7/17/2017	123508	FALSE
	8/7/2017	115159	FALSE
	8/22/2017	123970	FALSE
	11/29/2017	136418	FALSE
	3/8/2018	105000	FALSE
	5/30/2018	118000	FALSE
	12/4/2018	114000	FALSE
	6/28/2019	126000	FALSE
	12/2/2019	130000	FALSE
	5/28/2020	99100	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Calcium

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	99100	136418	37318	0.515	19218.8
2	101443	130000	28557	0.3306	9440.94
3	104972	126000	21028	0.2495	5246.49
4	105000	123970	18970	0.1878	3562.57
5	107763	123508	15745	0.1353	2130.3
6	114000	120726	6726	0.088	591.888
7	115159	118938	3779	0.0433	163.631
8	118000	118000	0		
9	118938	115159	-3779		
10	120726	114000	-6726		
11	123508	107763	-15745		
12	123970	105000	-18970		
13	126000	104972	-21028		
14	130000	101443	-28557		
15	136418	99100	-37318		

---

Sum of b values = 40354.6

Sample Standard Deviation = 10950.5

W Statistic = 0.970047

5% Critical value of 0.881 is less than 0.970047

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.970047

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Calcium**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

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<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
104972	107763	-2791	0	1
101443	107763	-6320	0	2
118938	107763	11175	1	2
120726	107763	12963	2	2
123508	107763	15745	3	2
115159	107763	7396	4	2
123970	107763	16207	5	2
136418	107763	28655	6	2
105000	107763	-2763	6	3
118000	107763	10237	7	3
114000	107763	6237	8	3
126000	107763	18237	9	3
130000	107763	22237	10	3
99100	107763	-8663	10	4
101443	104972	-3529	10	5
118938	104972	13966	11	5
120726	104972	15754	12	5
123508	104972	18536	13	5
115159	104972	10187	14	5
123970	104972	18998	15	5
136418	104972	31446	16	5
105000	104972	28	17	5
118000	104972	13028	18	5
114000	104972	9028	19	5
126000	104972	21028	20	5
130000	104972	25028	21	5
99100	104972	-5872	21	6
118938	101443	17495	22	6
120726	101443	19283	23	6
123508	101443	22065	24	6
115159	101443	13716	25	6
123970	101443	22527	26	6
136418	101443	34975	27	6
105000	101443	3557	28	6
118000	101443	16557	29	6
114000	101443	12557	30	6
126000	101443	24557	31	6
130000	101443	28557	32	6
99100	101443	-2343	32	7
120726	118938	1788	33	7
123508	118938	4570	34	7
115159	118938	-3779	34	8
123970	118938	5032	35	8
136418	118938	17480	36	8

105000	118938	-13938	36	9
118000	118938	-938	36	10
114000	118938	-4938	36	11
126000	118938	7062	37	11
130000	118938	11062	38	11
99100	118938	-19838	38	12
123508	120726	2782	39	12
115159	120726	-5567	39	13
123970	120726	3244	40	13
136418	120726	15692	41	13
105000	120726	-15726	41	14
118000	120726	-2726	41	15
114000	120726	-6726	41	16
126000	120726	5274	42	16
130000	120726	9274	43	16
99100	120726	-21626	43	17
115159	123508	-8349	43	18
123970	123508	462	44	18
136418	123508	12910	45	18
105000	123508	-18508	45	19
118000	123508	-5508	45	20
114000	123508	-9508	45	21
126000	123508	2492	46	21
130000	123508	6492	47	21
99100	123508	-24408	47	22
123970	115159	8811	48	22
136418	115159	21259	49	22
105000	115159	-10159	49	23
118000	115159	2841	50	23
114000	115159	-1159	50	24
126000	115159	10841	51	24
130000	115159	14841	52	24
99100	115159	-16059	52	25
136418	123970	12448	53	25
105000	123970	-18970	53	26
118000	123970	-5970	53	27
114000	123970	-9970	53	28
126000	123970	2030	54	28
130000	123970	6030	55	28
99100	123970	-24870	55	29
105000	136418	-31418	55	30
118000	136418	-18418	55	31
114000	136418	-22418	55	32
126000	136418	-10418	55	33
130000	136418	-6418	55	34
99100	136418	-37318	55	35
118000	105000	13000	56	35
114000	105000	9000	57	35
126000	105000	21000	58	35
130000	105000	25000	59	35
99100	105000	-5900	59	36

114000	118000	-4000	59	37
126000	118000	8000	60	37
130000	118000	12000	61	37
99100	118000	-18900	61	38
126000	114000	12000	62	38
130000	114000	16000	63	38
99100	114000	-14900	63	39
130000	126000	4000	64	39
99100	126000	-26900	64	40
99100	130000	-30900	64	41

S Statistic = 64 - 41 = 23

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Tied Group	Value	Members
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Time Period	Observations
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2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 7350

b = 24570

c = 420

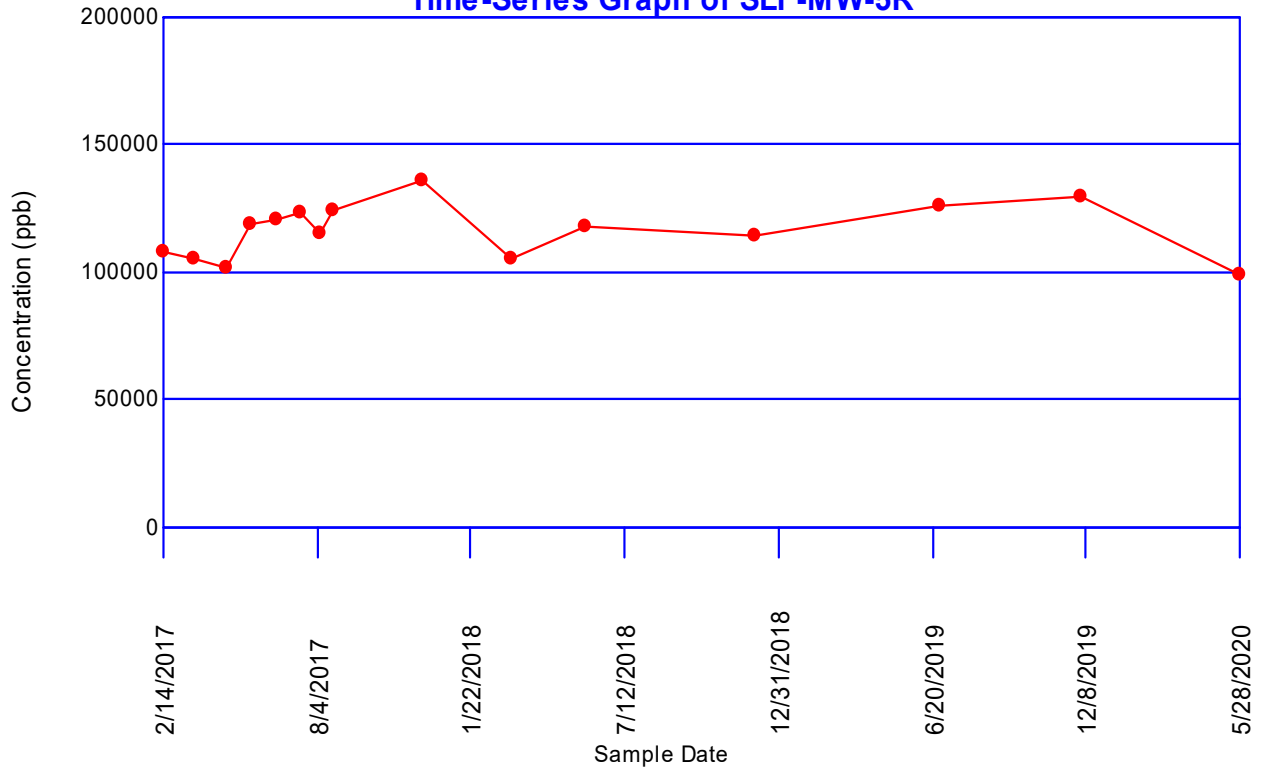
Group Variance = 408.333

Z-Score = 1.08872

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.08872| <= 1.97737 indicating no evidence of a trend

### Calcium Time-Series Graph of SLF-MW-5R





## Concentrations (ppb)

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	1.54749e+006	1.54749e+006
			11/30/2016	1.61454e+006	1.61454e+006
			12/28/2016	1.768e+006	1.768e+006
			1/18/2017	1.33503e+006	1.33503e+006
			2/14/2017	1.5337e+006	1.5337e+006
			3/20/2017	1.36241e+006	1.36241e+006
			4/25/2017	1.35437e+006	1.35437e+006
			5/22/2017	1.37044e+006	1.37044e+006
			6/20/2017	1.31495e+006	1.31495e+006
			7/17/2017	2.425e+006	2.425e+006
			8/8/2017	616000	616000
			8/21/2017	1.136e+006	1.136e+006
			11/29/2017	1.421e+006	1.421e+006
			3/8/2018	1.712e+006	1.712e+006
			5/31/2018	1.87e+006	1.87e+006
			12/4/2018	2.08e+006	2.08e+006
			6/28/2019	2.53e+006	2.53e+006
			12/2/2019	2.44e+006	2.44e+006
			5/28/2020	2.2e+006	2.2e+006
			<b>4/28/2021</b>	<b>1.48e+006</b>	<b>1.48e+006</b>

SLF-MW-3B	19	0 (0%)	10/21/2016	152574	152574
			11/30/2016	169582	169582
			12/28/2016	160177	160177
			1/18/2017	146634	146634
			2/15/2017	143113	143113
			3/20/2017	171319	171319
			4/25/2017	167869	167869
			5/22/2017	126662	126662
			6/20/2017	121058	121058
			7/17/2017	98000	98000
			8/7/2017	103000	103000
			8/21/2017	98000	98000
			11/29/2017	152000	152000
			3/8/2018	224000	224000
			5/30/2018	179000	179000
			12/4/2018	225000	225000
			6/27/2019	239000	239000
			12/2/2019	245000	245000
			5/28/2020	262000	262000

				<b>12/1/2020</b>	<b>269000</b>	<b>269000</b>
				<b>4/28/2021</b>	<b>250000</b>	<b>250000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	33649.2	33649.2	
			3/20/2017	25801.9	25801.9	
			4/25/2017	22580.8	22580.8	
			5/22/2017	16154	16154	
			6/20/2017	25945.6	25945.6	
			7/17/2017	26000	26000	
			8/7/2017	19100	19100	
			8/22/2017	25500	25500	
			11/29/2017	24500	24500	
			3/8/2018	15000	15000	
			5/30/2018	25500	25500	
			12/4/2018	20500	20500	
			6/28/2019	24300	24300	
			12/2/2019	29200	29200	
			5/28/2020	12400	12400	
			<b>11/30/2020</b>	<b>14200</b>	<b>14200</b>	
			<b>4/28/2021</b>	<b>25700</b>	<b>25700</b>	

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.0864162	0.386374	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	1.54749e+006	FALSE
	11/30/2016	1.61454e+006	FALSE
	12/28/2016	1.768e+006	FALSE
	1/18/2017	1.33503e+006	FALSE
	2/14/2017	1.5337e+006	FALSE
	3/20/2017	1.36241e+006	FALSE
	4/25/2017	1.35437e+006	FALSE
	5/22/2017	1.37044e+006	FALSE
	6/20/2017	1.31495e+006	FALSE
	7/17/2017	2.425e+006	FALSE
	8/8/2017	616000	FALSE
	8/21/2017	1.136e+006	FALSE
	11/29/2017	1.421e+006	FALSE
	3/8/2018	1.712e+006	FALSE
	5/31/2018	1.87e+006	FALSE
	12/4/2018	2.08e+006	FALSE
	6/28/2019	2.53e+006	FALSE
	12/2/2019	2.44e+006	FALSE
	5/28/2020	2.2e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	616000	2.53e+006	1.914e+006	0.4808	920251
2	1.136e+006	2.44e+006	1.304e+006	0.3232	421453
3	1.31495e+006	2.425e+006	1.11005e+006	0.2561	284284
4	1.33503e+006	2.2e+006	864970	0.2059	178097
5	1.35437e+006	2.08e+006	725630	0.1641	119076
6	1.36241e+006	1.87e+006	507590	0.1271	64514.7
7	1.37044e+006	1.768e+006	397560	0.0932	37052.6
8	1.421e+006	1.712e+006	291000	0.0612	17809.2
9	1.5337e+006	1.61454e+006	80840	0.0303	2449.45
10	1.54749e+006	1.54749e+006	0		
11	1.61454e+006	1.5337e+006	-80840		
12	1.712e+006	1.421e+006	-291000		
13	1.768e+006	1.37044e+006	-397560		
14	1.87e+006	1.36241e+006	-507590		
15	2.08e+006	1.35437e+006	-725630		
16	2.2e+006	1.33503e+006	-864970		
17	2.425e+006	1.31495e+006	-1.11005e+006		
18	2.44e+006	1.136e+006	-1.304e+006		
19	2.53e+006	616000	-1.914e+006		

---

Sum of b values = 2.04499e+006

Sample Standard Deviation = 495499

W Statistic = 0.946287

5% Critical value of 0.901 is less than 0.946287

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.946287

Data is normally distributed at 99% level of significance

# Mann-Kendall Trend Analysis

Parameter: Chloride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1.61454e+006	1.54749e+006	67050	1	0
1.768e+006	1.54749e+006	220510	2	0
1.33503e+006	1.54749e+006	-212460	2	1
1.5337e+006	1.54749e+006	-13790	2	2
1.36241e+006	1.54749e+006	-185080	2	3
1.35437e+006	1.54749e+006	-193120	2	4
1.37044e+006	1.54749e+006	-177050	2	5
1.31495e+006	1.54749e+006	-232540	2	6
2.425e+006	1.54749e+006	877510	3	6
616000	1.54749e+006	-931490	3	7
1.136e+006	1.54749e+006	-411490	3	8
1.421e+006	1.54749e+006	-126490	3	9
1.712e+006	1.54749e+006	164510	4	9
1.87e+006	1.54749e+006	322510	5	9
2.08e+006	1.54749e+006	532510	6	9
2.53e+006	1.54749e+006	982510	7	9
2.44e+006	1.54749e+006	892510	8	9
2.2e+006	1.54749e+006	652510	9	9
1.768e+006	1.61454e+006	153460	10	9
1.33503e+006	1.61454e+006	-279510	10	10
1.5337e+006	1.61454e+006	-80840	10	11
1.36241e+006	1.61454e+006	-252130	10	12
1.35437e+006	1.61454e+006	-260170	10	13
1.37044e+006	1.61454e+006	-244100	10	14
1.31495e+006	1.61454e+006	-299590	10	15
2.425e+006	1.61454e+006	810460	11	15
616000	1.61454e+006	-998540	11	16
1.136e+006	1.61454e+006	-478540	11	17
1.421e+006	1.61454e+006	-193540	11	18
1.712e+006	1.61454e+006	97460	12	18
1.87e+006	1.61454e+006	255460	13	18
2.08e+006	1.61454e+006	465460	14	18
2.53e+006	1.61454e+006	915460	15	18
2.44e+006	1.61454e+006	825460	16	18
2.2e+006	1.61454e+006	585460	17	18
1.33503e+006	1.768e+006	-432970	17	19
1.5337e+006	1.768e+006	-234300	17	20
1.36241e+006	1.768e+006	-405590	17	21
1.35437e+006	1.768e+006	-413630	17	22
1.37044e+006	1.768e+006	-397560	17	23
1.31495e+006	1.768e+006	-453050	17	24
2.425e+006	1.768e+006	657000	18	24
616000	1.768e+006	-1.152e+006	18	25
1.136e+006	1.768e+006	-632000	18	26
1.421e+006	1.768e+006	-347000	18	27

1.712e+006	1.768e+006	-56000	18	28
1.87e+006	1.768e+006	102000	19	28
2.08e+006	1.768e+006	312000	20	28
2.53e+006	1.768e+006	762000	21	28
2.44e+006	1.768e+006	672000	22	28
2.2e+006	1.768e+006	432000	23	28
1.5337e+006	1.33503e+006	198670	24	28
1.36241e+006	1.33503e+006	27380	25	28
1.35437e+006	1.33503e+006	19340	26	28
1.37044e+006	1.33503e+006	35410	27	28
1.31495e+006	1.33503e+006	-20080	27	29
2.425e+006	1.33503e+006	1.08997e+006	28	29
616000	1.33503e+006	-719030	28	30
1.136e+006	1.33503e+006	-199030	28	31
1.421e+006	1.33503e+006	85970	29	31
1.712e+006	1.33503e+006	376970	30	31
1.87e+006	1.33503e+006	534970	31	31
2.08e+006	1.33503e+006	744970	32	31
2.53e+006	1.33503e+006	1.19497e+006	33	31
2.44e+006	1.33503e+006	1.10497e+006	34	31
2.2e+006	1.33503e+006	864970	35	31
1.36241e+006	1.5337e+006	-171290	35	32
1.35437e+006	1.5337e+006	-179330	35	33
1.37044e+006	1.5337e+006	-163260	35	34
1.31495e+006	1.5337e+006	-218750	35	35
2.425e+006	1.5337e+006	891300	36	35
616000	1.5337e+006	-917700	36	36
1.136e+006	1.5337e+006	-397700	36	37
1.421e+006	1.5337e+006	-112700	36	38
1.712e+006	1.5337e+006	178300	37	38
1.87e+006	1.5337e+006	336300	38	38
2.08e+006	1.5337e+006	546300	39	38
2.53e+006	1.5337e+006	996300	40	38
2.44e+006	1.5337e+006	906300	41	38
2.2e+006	1.5337e+006	666300	42	38
1.35437e+006	1.36241e+006	-8040	42	39
1.37044e+006	1.36241e+006	8030	43	39
1.31495e+006	1.36241e+006	-47460	43	40
2.425e+006	1.36241e+006	1.06259e+006	44	40
616000	1.36241e+006	-746410	44	41
1.136e+006	1.36241e+006	-226410	44	42
1.421e+006	1.36241e+006	58590	45	42
1.712e+006	1.36241e+006	349590	46	42
1.87e+006	1.36241e+006	507590	47	42
2.08e+006	1.36241e+006	717590	48	42
2.53e+006	1.36241e+006	1.16759e+006	49	42
2.44e+006	1.36241e+006	1.07759e+006	50	42
2.2e+006	1.36241e+006	837590	51	42
1.37044e+006	1.35437e+006	16070	52	42
1.31495e+006	1.35437e+006	-39420	52	43
2.425e+006	1.35437e+006	1.07063e+006	53	43
616000	1.35437e+006	-738370	53	44
1.136e+006	1.35437e+006	-218370	53	45

1.421e+006	1.35437e+006	66630	54	45
1.712e+006	1.35437e+006	357630	55	45
1.87e+006	1.35437e+006	515630	56	45
2.08e+006	1.35437e+006	725630	57	45
2.53e+006	1.35437e+006	1.17563e+006	58	45
2.44e+006	1.35437e+006	1.08563e+006	59	45
2.2e+006	1.35437e+006	845630	60	45
1.31495e+006	1.37044e+006	-55490	60	46
2.425e+006	1.37044e+006	1.05456e+006	61	46
616000	1.37044e+006	-754440	61	47
1.136e+006	1.37044e+006	-234440	61	48
1.421e+006	1.37044e+006	50560	62	48
1.712e+006	1.37044e+006	341560	63	48
1.87e+006	1.37044e+006	499560	64	48
2.08e+006	1.37044e+006	709560	65	48
2.53e+006	1.37044e+006	1.15956e+006	66	48
2.44e+006	1.37044e+006	1.06956e+006	67	48
2.2e+006	1.37044e+006	829560	68	48
2.425e+006	1.31495e+006	1.11005e+006	69	48
616000	1.31495e+006	-698950	69	49
1.136e+006	1.31495e+006	-178950	69	50
1.421e+006	1.31495e+006	106050	70	50
1.712e+006	1.31495e+006	397050	71	50
1.87e+006	1.31495e+006	555050	72	50
2.08e+006	1.31495e+006	765050	73	50
2.53e+006	1.31495e+006	1.21505e+006	74	50
2.44e+006	1.31495e+006	1.12505e+006	75	50
2.2e+006	1.31495e+006	885050	76	50
616000	2.425e+006	-1.809e+006	76	51
1.136e+006	2.425e+006	-1.289e+006	76	52
1.421e+006	2.425e+006	-1.004e+006	76	53
1.712e+006	2.425e+006	-713000	76	54
1.87e+006	2.425e+006	-555000	76	55
2.08e+006	2.425e+006	-345000	76	56
2.53e+006	2.425e+006	105000	77	56
2.44e+006	2.425e+006	15000	78	56
2.2e+006	2.425e+006	-225000	78	57
1.136e+006	616000	520000	79	57
1.421e+006	616000	805000	80	57
1.712e+006	616000	1.096e+006	81	57
1.87e+006	616000	1.254e+006	82	57
2.08e+006	616000	1.464e+006	83	57
2.53e+006	616000	1.914e+006	84	57
2.44e+006	616000	1.824e+006	85	57
2.2e+006	616000	1.584e+006	86	57
1.421e+006	1.136e+006	285000	87	57
1.712e+006	1.136e+006	576000	88	57
1.87e+006	1.136e+006	734000	89	57
2.08e+006	1.136e+006	944000	90	57
2.53e+006	1.136e+006	1.394e+006	91	57
2.44e+006	1.136e+006	1.304e+006	92	57
2.2e+006	1.136e+006	1.064e+006	93	57

1.712e+006	1.421e+006	291000	94	57
1.87e+006	1.421e+006	449000	95	57
2.08e+006	1.421e+006	659000	96	57
2.53e+006	1.421e+006	1.109e+006	97	57
2.44e+006	1.421e+006	1.019e+006	98	57
2.2e+006	1.421e+006	779000	99	57
1.87e+006	1.712e+006	158000	100	57
2.08e+006	1.712e+006	368000	101	57
2.53e+006	1.712e+006	818000	102	57
2.44e+006	1.712e+006	728000	103	57
2.2e+006	1.712e+006	488000	104	57
2.08e+006	1.87e+006	210000	105	57
2.53e+006	1.87e+006	660000	106	57
2.44e+006	1.87e+006	570000	107	57
2.2e+006	1.87e+006	330000	108	57
2.53e+006	2.08e+006	450000	109	57
2.44e+006	2.08e+006	360000	110	57
2.2e+006	2.08e+006	120000	111	57
2.44e+006	2.53e+006	-90000	111	58
2.2e+006	2.53e+006	-330000	111	59
2.2e+006	2.44e+006	-240000	111	60

S Statistic = 111 - 60 = 51

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<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/8/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/31/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

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A = 0

B = 0



C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

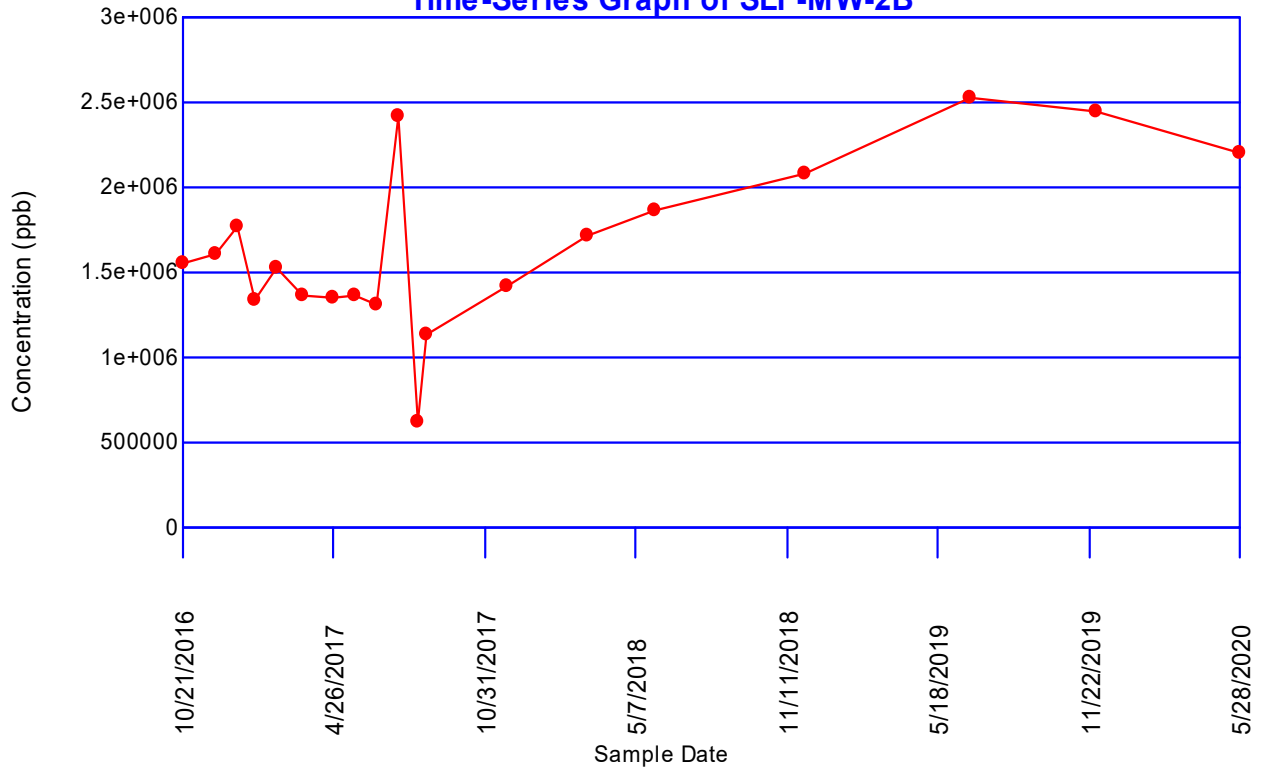
Group Variance = 817

Z-Score = 1.74928

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.74928| <= 1.97737 indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.144654	0.035461	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	152574	FALSE
	11/30/2016	169582	FALSE
	12/28/2016	160177	FALSE
	1/18/2017	146634	FALSE
	2/15/2017	143113	FALSE
	3/20/2017	171319	FALSE
	4/25/2017	167869	FALSE
	5/22/2017	126662	FALSE
	6/20/2017	121058	FALSE
	7/17/2017	98000	FALSE
	8/7/2017	103000	FALSE
	8/21/2017	98000	FALSE
	11/29/2017	152000	FALSE
	3/8/2018	224000	FALSE
	5/30/2018	179000	FALSE
	12/4/2018	225000	FALSE
	6/27/2019	239000	FALSE
	12/2/2019	245000	FALSE
	5/28/2020	262000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	98000	262000	164000	0.4808	78851.2
2	98000	245000	147000	0.3232	47510.4
3	103000	239000	136000	0.2561	34829.6
4	121058	225000	103942	0.2059	21401.7
5	126662	224000	97338	0.1641	15973.2
6	143113	179000	35887	0.1271	4561.24
7	146634	171319	24685	0.0932	2300.64
8	152000	169582	17582	0.0612	1076.02
9	152574	167869	15295	0.0303	463.439
10	160177	160177	0		
11	167869	152574	-15295		
12	169582	152000	-17582		
13	171319	146634	-24685		
14	179000	143113	-35887		
15	224000	126662	-97338		
16	225000	121058	-103942		
17	239000	103000	-136000		
18	245000	98000	-147000		
19	262000	98000	-164000		

---

Sum of b values = 206967

Sample Standard Deviation = 50492.3

W Statistic = 0.933427

5% Critical value of 0.901 is less than 0.933427

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.933427

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Chloride**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
169582	152574	17008	1	0
160177	152574	7603	2	0
146634	152574	-5940	2	1
143113	152574	-9461	2	2
171319	152574	18745	3	2
167869	152574	15295	4	2
126662	152574	-25912	4	3
121058	152574	-31516	4	4
98000	152574	-54574	4	5
103000	152574	-49574	4	6
98000	152574	-54574	4	7
152000	152574	-574	4	8
224000	152574	71426	5	8
179000	152574	26426	6	8
225000	152574	72426	7	8
239000	152574	86426	8	8
245000	152574	92426	9	8
262000	152574	109426	10	8
160177	169582	-9405	10	9
146634	169582	-22948	10	10
143113	169582	-26469	10	11
171319	169582	1737	11	11
167869	169582	-1713	11	12
126662	169582	-42920	11	13
121058	169582	-48524	11	14
98000	169582	-71582	11	15
103000	169582	-66582	11	16
98000	169582	-71582	11	17
152000	169582	-17582	11	18
224000	169582	54418	12	18
179000	169582	9418	13	18
225000	169582	55418	14	18
239000	169582	69418	15	18
245000	169582	75418	16	18
262000	169582	92418	17	18
146634	160177	-13543	17	19
143113	160177	-17064	17	20
171319	160177	11142	18	20
167869	160177	7692	19	20
126662	160177	-33515	19	21
121058	160177	-39119	19	22
98000	160177	-62177	19	23
103000	160177	-57177	19	24
98000	160177	-62177	19	25
152000	160177	-8177	19	26

224000	160177	63823	20	26
179000	160177	18823	21	26
225000	160177	64823	22	26
239000	160177	78823	23	26
245000	160177	84823	24	26
262000	160177	101823	25	26
143113	146634	-3521	25	27
171319	146634	24685	26	27
167869	146634	21235	27	27
126662	146634	-19972	27	28
121058	146634	-25576	27	29
98000	146634	-48634	27	30
103000	146634	-43634	27	31
98000	146634	-48634	27	32
152000	146634	5366	28	32
224000	146634	77366	29	32
179000	146634	32366	30	32
225000	146634	78366	31	32
239000	146634	92366	32	32
245000	146634	98366	33	32
262000	146634	115366	34	32
171319	143113	28206	35	32
167869	143113	24756	36	32
126662	143113	-16451	36	33
121058	143113	-22055	36	34
98000	143113	-45113	36	35
103000	143113	-40113	36	36
98000	143113	-45113	36	37
152000	143113	8887	37	37
224000	143113	80887	38	37
179000	143113	35887	39	37
225000	143113	81887	40	37
239000	143113	95887	41	37
245000	143113	101887	42	37
262000	143113	118887	43	37
167869	171319	-3450	43	38
126662	171319	-44657	43	39
121058	171319	-50261	43	40
98000	171319	-73319	43	41
103000	171319	-68319	43	42
98000	171319	-73319	43	43
152000	171319	-19319	43	44
224000	171319	52681	44	44
179000	171319	7681	45	44
225000	171319	53681	46	44
239000	171319	67681	47	44
245000	171319	73681	48	44
262000	171319	90681	49	44
126662	167869	-41207	49	45
121058	167869	-46811	49	46
98000	167869	-69869	49	47
103000	167869	-64869	49	48
98000	167869	-69869	49	49

152000	167869	-15869	49	50
224000	167869	56131	50	50
179000	167869	11131	51	50
225000	167869	57131	52	50
239000	167869	71131	53	50
245000	167869	77131	54	50
262000	167869	94131	55	50
121058	126662	-5604	55	51
98000	126662	-28662	55	52
103000	126662	-23662	55	53
98000	126662	-28662	55	54
152000	126662	25338	56	54
224000	126662	97338	57	54
179000	126662	52338	58	54
225000	126662	98338	59	54
239000	126662	112338	60	54
245000	126662	118338	61	54
262000	126662	135338	62	54
98000	121058	-23058	62	55
103000	121058	-18058	62	56
98000	121058	-23058	62	57
152000	121058	30942	63	57
224000	121058	102942	64	57
179000	121058	57942	65	57
225000	121058	103942	66	57
239000	121058	117942	67	57
245000	121058	123942	68	57
262000	121058	140942	69	57
103000	98000	5000	70	57
98000	98000	0	70	57
152000	98000	54000	71	57
224000	98000	126000	72	57
179000	98000	81000	73	57
225000	98000	127000	74	57
239000	98000	141000	75	57
245000	98000	147000	76	57
262000	98000	164000	77	57
98000	103000	-5000	77	58
152000	103000	49000	78	58
224000	103000	121000	79	58
179000	103000	76000	80	58
225000	103000	122000	81	58
239000	103000	136000	82	58
245000	103000	142000	83	58
262000	103000	159000	84	58
152000	98000	54000	85	58
224000	98000	126000	86	58
179000	98000	81000	87	58
225000	98000	127000	88	58
239000	98000	141000	89	58
245000	98000	147000	90	58
262000	98000	164000	91	58

224000	152000	72000	92	58
179000	152000	27000	93	58
225000	152000	73000	94	58
239000	152000	87000	95	58
245000	152000	93000	96	58
262000	152000	110000	97	58
179000	224000	-45000	97	59
225000	224000	1000	98	59
239000	224000	15000	99	59
245000	224000	21000	100	59
262000	224000	38000	101	59
225000	179000	46000	102	59
239000	179000	60000	103	59
245000	179000	66000	104	59
262000	179000	83000	105	59
239000	225000	14000	106	59
245000	225000	20000	107	59
262000	225000	37000	108	59
245000	239000	6000	109	59
262000	239000	23000	110	59
262000	245000	17000	111	59

S Statistic = 111 - 59 = 52

---

Tied Group	Value	Members
1	98000	2

---

Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18



B = 0

C = 0

D = 0

E = 2

F = 0

a = 14706

b = 52326

c = 684

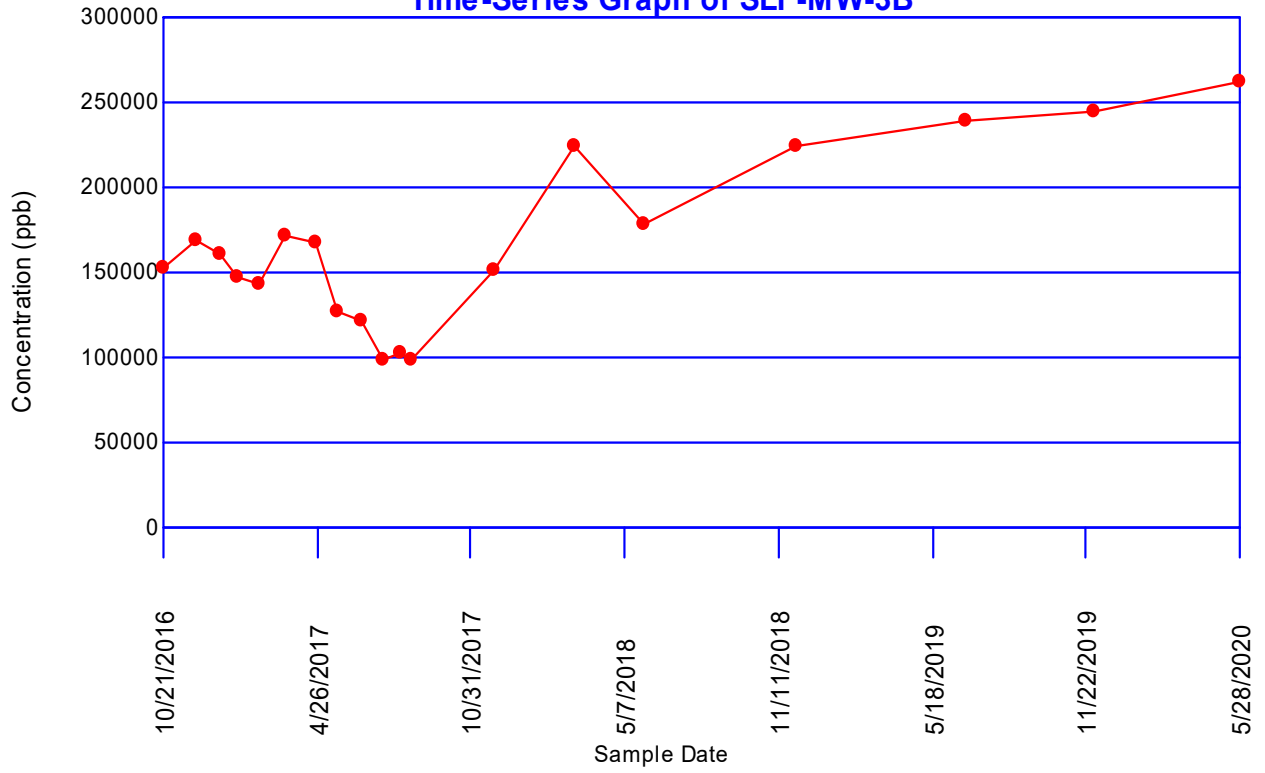
Group Variance = 816

Z-Score = 1.78536

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

|1.78536| <= 1.97737 indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Chloride

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.437217	0.276029	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	33649.2	FALSE
	3/20/2017	25801.9	FALSE
	4/25/2017	22580.8	FALSE
	5/22/2017	16154	FALSE
	6/20/2017	25945.6	FALSE
	7/17/2017	26000	FALSE
	8/7/2017	19100	FALSE
	8/22/2017	25500	FALSE
	11/29/2017	24500	FALSE
	3/8/2018	15000	FALSE
	5/30/2018	25500	FALSE
	12/4/2018	20500	FALSE
	6/28/2019	24300	FALSE
	12/2/2019	29200	FALSE
	5/28/2020	12400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Chloride

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	12400	33649.2	21249.2	0.515	10943.3
2	15000	29200	14200	0.3306	4694.52
3	16154	26000	9846	0.2495	2456.58
4	19100	25945.6	6845.6	0.1878	1285.6
5	20500	25801.9	5301.9	0.1353	717.347
6	22580.8	25500	2919.2	0.088	256.89
7	24300	25500	1200	0.0433	51.96
8	24500	24500	0		
9	25500	24300	-1200		
10	25500	22580.8	-2919.2		
11	25801.9	20500	-5301.9		
12	25945.6	19100	-6845.6		
13	26000	16154	-9846		
14	29200	15000	-14200		
15	33649.2	12400	-21249.2		

---

Sum of b values = 20406.2

Sample Standard Deviation = 5597.13

W Statistic = 0.949437

5% Critical value of 0.881 is less than 0.949437

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.949437

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Chloride**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
25801.9	33649.2	-7847.3	0	1
22580.8	33649.2	-11068.4	0	2
16154	33649.2	-17495.2	0	3
25945.6	33649.2	-7703.6	0	4
26000	33649.2	-7649.2	0	5
19100	33649.2	-14549.2	0	6
25500	33649.2	-8149.2	0	7
24500	33649.2	-9149.2	0	8
15000	33649.2	-18649.2	0	9
25500	33649.2	-8149.2	0	10
20500	33649.2	-13149.2	0	11
24300	33649.2	-9349.2	0	12
29200	33649.2	-4449.2	0	13
12400	33649.2	-21249.2	0	14
22580.8	25801.9	-3221.1	0	15
16154	25801.9	-9647.9	0	16
25945.6	25801.9	143.7	1	16
26000	25801.9	198.1	2	16
19100	25801.9	-6701.9	2	17
25500	25801.9	-301.9	2	18
24500	25801.9	-1301.9	2	19
15000	25801.9	-10801.9	2	20
25500	25801.9	-301.9	2	21
20500	25801.9	-5301.9	2	22
24300	25801.9	-1501.9	2	23
29200	25801.9	3398.1	3	23
12400	25801.9	-13401.9	3	24
16154	22580.8	-6426.8	3	25
25945.6	22580.8	3364.8	4	25
26000	22580.8	3419.2	5	25
19100	22580.8	-3480.8	5	26
25500	22580.8	2919.2	6	26
24500	22580.8	1919.2	7	26
15000	22580.8	-7580.8	7	27
25500	22580.8	2919.2	8	27
20500	22580.8	-2080.8	8	28
24300	22580.8	1719.2	9	28
29200	22580.8	6619.2	10	28
12400	22580.8	-10180.8	10	29
25945.6	16154	9791.6	11	29
26000	16154	9846	12	29
19100	16154	2946	13	29
25500	16154	9346	14	29
24500	16154	8346	15	29

15000	16154	-1154	15	30
25500	16154	9346	16	30
20500	16154	4346	17	30
24300	16154	8146	18	30
29200	16154	13046	19	30
12400	16154	-3754	19	31
26000	25945.6	54.4	20	31
19100	25945.6	-6845.6	20	32
25500	25945.6	-445.6	20	33
24500	25945.6	-1445.6	20	34
15000	25945.6	-10945.6	20	35
25500	25945.6	-445.6	20	36
20500	25945.6	-5445.6	20	37
24300	25945.6	-1645.6	20	38
29200	25945.6	3254.4	21	38
12400	25945.6	-13545.6	21	39
19100	26000	-6900	21	40
25500	26000	-500	21	41
24500	26000	-1500	21	42
15000	26000	-11000	21	43
25500	26000	-500	21	44
20500	26000	-5500	21	45
24300	26000	-1700	21	46
29200	26000	3200	22	46
12400	26000	-13600	22	47
25500	19100	6400	23	47
24500	19100	5400	24	47
15000	19100	-4100	24	48
25500	19100	6400	25	48
20500	19100	1400	26	48
24300	19100	5200	27	48
29200	19100	10100	28	48
12400	19100	-6700	28	49
24500	25500	-1000	28	50
15000	25500	-10500	28	51
25500	25500	0	28	51
20500	25500	-5000	28	52
24300	25500	-1200	28	53
29200	25500	3700	29	53
12400	25500	-13100	29	54
15000	24500	-9500	29	55
25500	24500	1000	30	55
20500	24500	-4000	30	56
24300	24500	-200	30	57
29200	24500	4700	31	57
12400	24500	-12100	31	58
25500	15000	10500	32	58
20500	15000	5500	33	58
24300	15000	9300	34	58
29200	15000	14200	35	58
12400	15000	-2600	35	59

20500	25500	-5000	35	60
24300	25500	-1200	35	61
29200	25500	3700	36	61
12400	25500	-13100	36	62
24300	20500	3800	37	62
29200	20500	8700	38	62
12400	20500	-8100	38	63
29200	24300	4900	39	63
12400	24300	-11900	39	64
12400	29200	-16800	39	65

S Statistic = 39 - 65 = -26

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Tied Group	Value	Members
1	25500	2

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Time Period	Observations
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 7350

b = 24570

c = 420

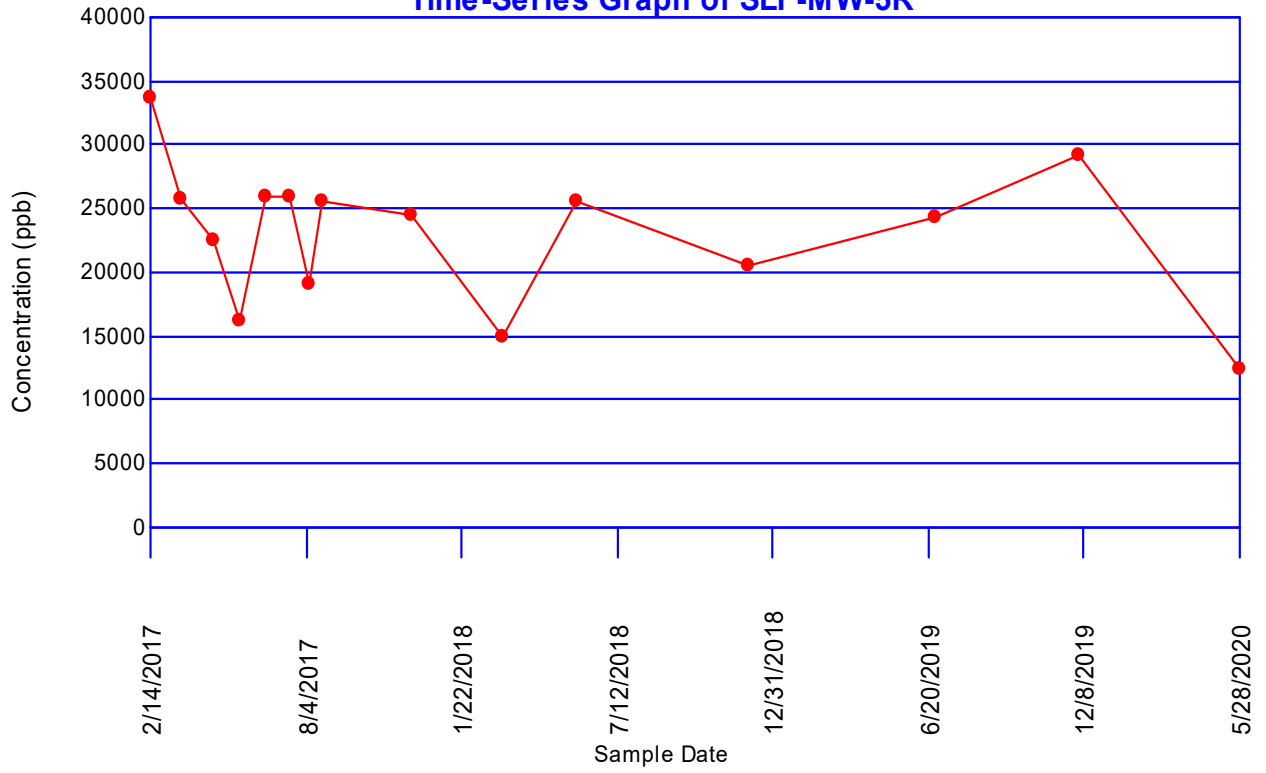
Group Variance = 407.333

Z-Score = -1.2387

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

$|-1.2387| \leq 1.97737$  indicating no evidence of a trend

### Chloride Time-Series Graph of SLF-MW-5R





### Concentrations (ppb)

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 34

Percent Non-Detects: 68%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	18	2 (11.1111%)	10/21/2016	ND<500	ND<500
			11/30/2016	2647.4	2647.4
			12/28/2016	1500	1500
			1/18/2017	1875.9	1875.9
			2/14/2017	ND<500	ND<500
			3/20/2017	1794.9	1794.9
			4/25/2017	1972.9	1972.9
			5/22/2017	1673.4	1673.4
			6/20/2017	2104.9	2104.9
			7/17/2017	2000	2000
			8/8/2017	2000	2000
			8/21/2017	1900	1900
			11/29/2017	2000	2000
			5/31/2018	2200	2200
			12/4/2018	1620	1620
			6/28/2019	2190	2190
			12/2/2019	2280	2280
			5/28/2020	2330	2330
			<b>11/30/2020</b>	<b>2220</b>	<b>2220</b>
			<b>4/28/2021</b>	<b>1980</b>	<b>1980</b>

SLF-MW-3B	18	18 (100%)	10/21/2016	ND<500	ND<500
			11/30/2016	ND<500	ND<500
			12/28/2016	ND<500	ND<500
			1/18/2017	ND<500	ND<500
			2/15/2017	ND<500	ND<500
			3/20/2017	ND<500	ND<500
			4/25/2017	ND<500	ND<500
			5/22/2017	ND<500	ND<500
			6/20/2017	ND<500	ND<500
			7/17/2017	ND<500	ND<500
			8/7/2017	ND<500	ND<500
			8/21/2017	ND<500	ND<500
			11/29/2017	ND<500	ND<500
			5/30/2018	ND<500	ND<500
			12/4/2018	ND<500	ND<500
			6/27/2019	ND<500	ND<500
			12/2/2019	ND<500	ND<500
			5/28/2020	ND<500	ND<500
			<b>12/1/2020</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>
			<b>4/28/2021</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>

SLF-MW-5R	14	14 (100%)	2/14/2017	ND<500	ND<500
			3/20/2017	ND<500	ND<500
			4/25/2017	ND<500	ND<500
			5/22/2017	ND<500	ND<500
			6/20/2017	ND<500	ND<500
			7/17/2017	ND<500	ND<500
			8/7/2017	ND<500	ND<500
			8/22/2017	ND<500	ND<500
			11/29/2017	ND<500	ND<500
			5/30/2018	ND<500	ND<500
			12/4/2018	ND<500	ND<500
			6/28/2019	ND<500	ND<500
			12/2/2019	ND<500	ND<500
			5/28/2020	ND<500	ND<500
			<b>11/30/2020</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>
			<b>4/28/2021</b>	<b>ND&lt;500</b>	<b>ND&lt;500</b>

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
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## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.320202	0.561798	0.475	500
2	0.357602	0.629213	0.49	500
3	0.377207	0.222308	0.507	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	ND<500	TRUE
	11/30/2016	2647.4	FALSE
	12/28/2016	1500	FALSE
	1/18/2017	1875.9	FALSE
	2/14/2017	ND<500	TRUE
	3/20/2017	1794.9	FALSE
	4/25/2017	1972.9	FALSE
	5/22/2017	1673.4	FALSE
	6/20/2017	2104.9	FALSE
	7/17/2017	2000	FALSE
	8/8/2017	2000	FALSE
	8/21/2017	1900	FALSE
	11/29/2017	2000	FALSE
	5/31/2018	2200	FALSE
	12/4/2018	1620	FALSE
	6/28/2019	2190	FALSE
	12/2/2019	2280	FALSE
	5/28/2020	2330	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Fluoride

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	500	2647.4	2147.4	0.4886	1049.22
2	500	2330	1830	0.3253	595.299
3	1500	2280	780	0.2553	199.134
4	1620	2200	580	0.2027	117.566
5	1673.4	2190	516.6	0.1587	81.9844
6	1794.9	2104.9	310	0.1197	37.107
7	1875.9	2000	124.1	0.0837	10.3872
8	1900	2000	100	0.0496	4.96
9	1972.9	2000	27.1	0.0163	0.44173
10	2000	1972.9	-27.1		
11	2000	1900	-100		
12	2000	1875.9	-124.1		
13	2104.9	1794.9	-310		
14	2190	1673.4	-516.6		
15	2200	1620	-580		
16	2280	1500	-780		
17	2330	500	-1830		
18	2647.4	500	-2147.4		

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Sum of b values = 2096.1

Sample Standard Deviation = 557.946

W Statistic = 0.830216

**5% Critical value of 0.897 exceeds 0.830216**  
**Evidence of non-normality at 95% level of significance**

**1% Critical value of 0.858 exceeds 0.830216**  
**Evidence of non-normality at 99% level of significance**

## Mann-Kendall Trend Analysis

Parameter: Fluoride

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
2647.4	ND<500	2147.4	1	0
1500	ND<500	1000	2	0
1875.9	ND<500	1375.9	3	0
ND<500	ND<500	0	3	0
1794.9	ND<500	1294.9	4	0
1972.9	ND<500	1472.9	5	0
1673.4	ND<500	1173.4	6	0
2104.9	ND<500	1604.9	7	0
2000	ND<500	1500	8	0
2000	ND<500	1500	9	0
1900	ND<500	1400	10	0
2000	ND<500	1500	11	0
2200	ND<500	1700	12	0
1620	ND<500	1120	13	0
2190	ND<500	1690	14	0
2280	ND<500	1780	15	0
2330	ND<500	1830	16	0
1500	2647.4	-1147.4	16	1
1875.9	2647.4	-771.5	16	2
ND<500	2647.4	-2147.4	16	3
1794.9	2647.4	-852.5	16	4
1972.9	2647.4	-674.5	16	5
1673.4	2647.4	-974	16	6
2104.9	2647.4	-542.5	16	7
2000	2647.4	-647.4	16	8
2000	2647.4	-647.4	16	9
1900	2647.4	-747.4	16	10
2000	2647.4	-647.4	16	11
2200	2647.4	-447.4	16	12
1620	2647.4	-1027.4	16	13
2190	2647.4	-457.4	16	14
2280	2647.4	-367.4	16	15
2330	2647.4	-317.4	16	16
1875.9	1500	375.9	17	16
ND<500	1500	-1000	17	17
1794.9	1500	294.9	18	17
1972.9	1500	472.9	19	17
1673.4	1500	173.4	20	17
2104.9	1500	604.9	21	17
2000	1500	500	22	17
2000	1500	500	23	17
1900	1500	400	24	17
2000	1500	500	25	17
2200	1500	700	26	17
1620	1500	120	27	17

2190	1500	690	28	17
2280	1500	780	29	17
2330	1500	830	30	17
ND<500	1875.9	-1375.9	30	18
1794.9	1875.9	-81	30	19
1972.9	1875.9	97	31	19
1673.4	1875.9	-202.5	31	20
2104.9	1875.9	229	32	20
2000	1875.9	124.1	33	20
2000	1875.9	124.1	34	20
1900	1875.9	24.1	35	20
2000	1875.9	124.1	36	20
2200	1875.9	324.1	37	20
1620	1875.9	-255.9	37	21
2190	1875.9	314.1	38	21
2280	1875.9	404.1	39	21
2330	1875.9	454.1	40	21
1794.9	ND<500	1294.9	41	21
1972.9	ND<500	1472.9	42	21
1673.4	ND<500	1173.4	43	21
2104.9	ND<500	1604.9	44	21
2000	ND<500	1500	45	21
2000	ND<500	1500	46	21
1900	ND<500	1400	47	21
2000	ND<500	1500	48	21
2200	ND<500	1700	49	21
1620	ND<500	1120	50	21
2190	ND<500	1690	51	21
2280	ND<500	1780	52	21
2330	ND<500	1830	53	21
1972.9	1794.9	178	54	21
1673.4	1794.9	-121.5	54	22
2104.9	1794.9	310	55	22
2000	1794.9	205.1	56	22
2000	1794.9	205.1	57	22
1900	1794.9	105.1	58	22
2000	1794.9	205.1	59	22
2200	1794.9	405.1	60	22
1620	1794.9	-174.9	60	23
2190	1794.9	395.1	61	23
2280	1794.9	485.1	62	23
2330	1794.9	535.1	63	23
1673.4	1972.9	-299.5	63	24
2104.9	1972.9	132	64	24
2000	1972.9	27.1	65	24
2000	1972.9	27.1	66	24
1900	1972.9	-72.9	66	25
2000	1972.9	27.1	67	25
2200	1972.9	227.1	68	25
1620	1972.9	-352.9	68	26
2190	1972.9	217.1	69	26
2280	1972.9	307.1	70	26
2330	1972.9	357.1	71	26

2104.9	1673.4	431.5	72	26
2000	1673.4	326.6	73	26
2000	1673.4	326.6	74	26
1900	1673.4	226.6	75	26
2000	1673.4	326.6	76	26
2200	1673.4	526.6	77	26
1620	1673.4	-53.4	77	27
2190	1673.4	516.6	78	27
2280	1673.4	606.6	79	27
2330	1673.4	656.6	80	27
2000	2104.9	-104.9	80	28
2000	2104.9	-104.9	80	29
1900	2104.9	-204.9	80	30
2000	2104.9	-104.9	80	31
2200	2104.9	95.1	81	31
1620	2104.9	-484.9	81	32
2190	2104.9	85.1	82	32
2280	2104.9	175.1	83	32
2330	2104.9	225.1	84	32
2000	2000	0	84	32
1900	2000	-100	84	33
2000	2000	0	84	33
2200	2000	200	85	33
1620	2000	-380	85	34
2190	2000	190	86	34
2280	2000	280	87	34
2330	2000	330	88	34
1900	2000	-100	88	35
2000	2000	0	88	35
2200	2000	200	89	35
1620	2000	-380	89	36
2190	2000	190	90	36
2280	2000	280	91	36
2330	2000	330	92	36
2000	1900	100	93	36
2200	1900	300	94	36
1620	1900	-280	94	37
2190	1900	290	95	37
2280	1900	380	96	37
2330	1900	430	97	37
2200	2000	200	98	37
1620	2000	-380	98	38
2190	2000	190	99	38
2280	2000	280	100	38
2330	2000	330	101	38
1620	2200	-580	101	39
2190	2200	-10	101	40
2280	2200	80	102	40
2330	2200	130	103	40

2190	1620	570	104	40
2280	1620	660	105	40
2330	1620	710	106	40
2280	2190	90	107	40
2330	2190	140	108	40
2330	2280	50	109	40

S Statistic = 109 - 40 = 69

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Tied Group	Value	Members
1	500	2
2	2000	3

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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 84

B = 0

C = 6

D = 0

E = 8

F = 0

a = 12546

b = 44064

c = 612

Group Variance = 692.333

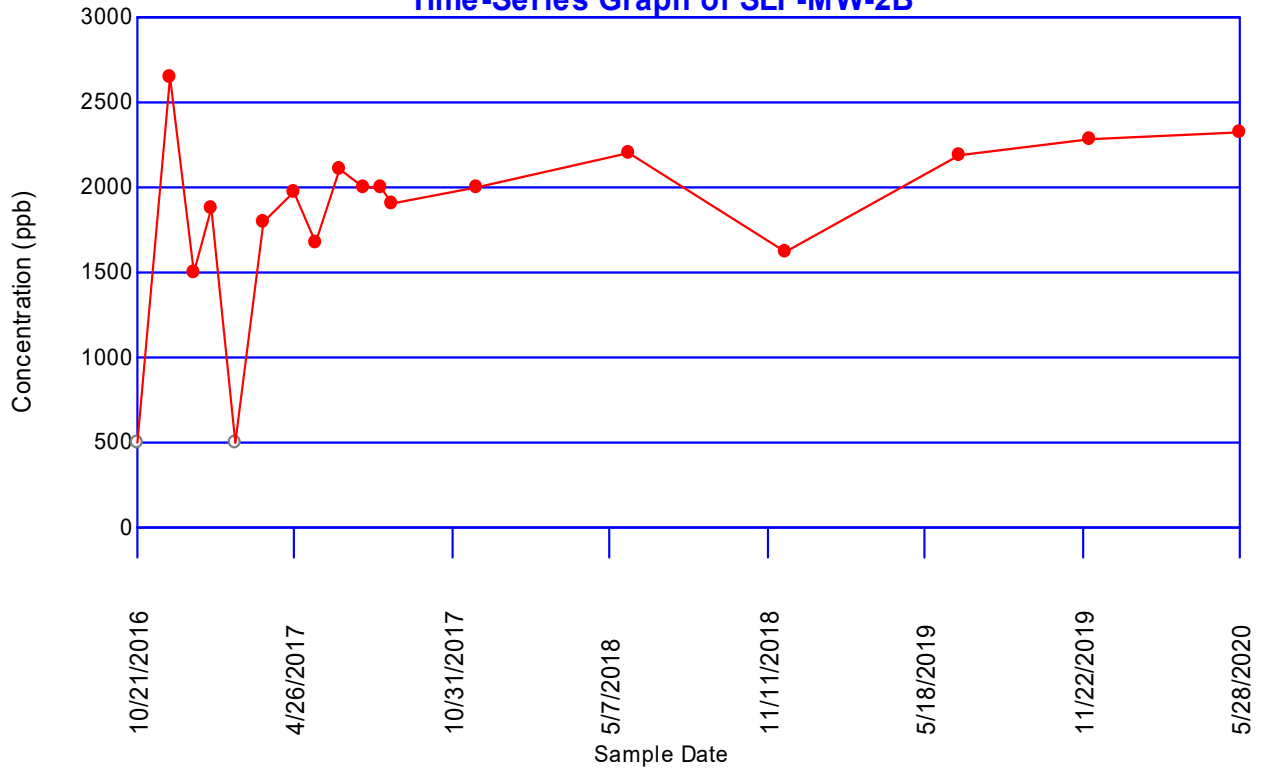
Z-Score = 2.58435

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**|2.58435| > 1.97737 indicating a trend**



### Fluoride Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

**Iteration    Highest    Lowest    Critical    Outlier**

**A Divide-By-Zero error occurred in the calculations.**

**Additional Outliers May Exist.**

<b>Loc.</b>	<b>Date</b>	<b>Conc.</b>	<b>Outlier</b>
SLF-MW-3B	10/21/2016	ND<500	FALSE
	11/30/2016	ND<500	FALSE
	12/28/2016	ND<500	FALSE
	1/18/2017	ND<500	FALSE
	2/15/2017	ND<500	FALSE
	3/20/2017	ND<500	FALSE
	4/25/2017	ND<500	FALSE
	5/22/2017	ND<500	FALSE
	6/20/2017	ND<500	FALSE
	7/17/2017	ND<500	FALSE
	8/7/2017	ND<500	FALSE
	8/21/2017	ND<500	FALSE
	11/29/2017	ND<500	FALSE
	5/30/2018	ND<500	FALSE
	12/4/2018	ND<500	FALSE
	6/27/2019	ND<500	FALSE
	12/2/2019	ND<500	FALSE
	5/28/2020	ND<500	FALSE

## Dixon's Test for Outliers

Parameter: Fluoride

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

**Iteration    Highest    Lowest    Critical    Outlier**

**A Divide-By-Zero error occurred in the calculations.**

**Additional Outliers May Exist.**

<b>Loc.</b>	<b>Date</b>	<b>Conc.</b>	<b>Outlier</b>
SLF-MW-5R	2/14/2017	ND<500	FALSE
	3/20/2017	ND<500	FALSE
	4/25/2017	ND<500	FALSE
	5/22/2017	ND<500	FALSE
	6/20/2017	ND<500	FALSE
	7/17/2017	ND<500	FALSE
	8/7/2017	ND<500	FALSE
	8/22/2017	ND<500	FALSE
	11/29/2017	ND<500	FALSE
	5/30/2018	ND<500	FALSE
	12/4/2018	ND<500	FALSE
	6/28/2019	ND<500	FALSE
	12/2/2019	ND<500	FALSE
	5/28/2020	ND<500	FALSE

### Concentrations (ppb)

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 54

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	20	0 (0%)	10/21/2016	7510	7510
			11/30/2016	7670	7670
			12/28/2016	7730	7730
			1/18/2017	7590	7590
			2/14/2017	7790	7790
			3/20/2017	7610	7610
			4/25/2017	7480	7480
			5/22/2017	7930	7930
			6/20/2017	8060	8060
			7/17/2017	8340	8340
			8/8/2017	9000	9000
			8/21/2017	8930	8930
			11/29/2017	7660	7660
			3/8/2018	7880	7880
			5/31/2018	7560	7560
			12/4/2018	7620	7620
			6/28/2019	7540	7540
			11/4/2019	7600	7600
			12/2/2019	7500	7500
			5/28/2020	7280	7280
	<b>11/30/2020</b>		<b>7870</b>	<b>7870</b>	
	<b>4/28/2021</b>		<b>7730</b>	<b>7730</b>	

SLF-MW-3B	19	0 (0%)	10/21/2016	7020	7020
			11/30/2016	7110	7110
			12/28/2016	7190	7190
			1/18/2017	6970	6970
			2/15/2017	7240	7240
			3/20/2017	7060	7060
			4/25/2017	7020	7020
			5/22/2017	7220	7220
			6/20/2017	6990	6990
			7/17/2017	7330	7330
			8/7/2017	7610	7610
			8/21/2017	7530	7530
			11/29/2017	7120	7120
			3/8/2018	7460	7460
			5/30/2018	7090	7090
			12/4/2018	7110	7110
			6/27/2019	7220	7220
12/2/2019	7110	7110			

			5/28/2020	6970	6970
			<b>12/1/2020</b>	<b>7230</b>	<b>7230</b>
			<b>4/28/2021</b>	<b>7140</b>	<b>7140</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	7160	7160
			3/20/2017	7140	7140
			4/25/2017	7060	7060
			5/22/2017	7140	7140
			6/20/2017	7090	7090
			7/17/2017	7200	7200
			8/7/2017	7320	7320
			8/22/2017	7340	7340
			11/29/2017	7100	7100
			3/8/2018	7350	7350
			5/30/2018	6940	6940
			12/4/2018	7140	7140
			6/28/2019	7100	7100
			12/2/2019	7080	7080
			5/28/2020	7100	7100
			<b>11/30/2020</b>	<b>7200</b>	<b>7200</b>
			<b>4/28/2021</b>	<b>7160</b>	<b>7160</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 20 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.44	0.207547	0.45	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	7.51	FALSE
	11/30/2016	7.67	FALSE
	12/28/2016	7.73	FALSE
	1/18/2017	7.59	FALSE
	2/14/2017	7.79	FALSE
	3/20/2017	7.61	FALSE
	4/25/2017	7.48	FALSE
	5/22/2017	7.93	FALSE
	6/20/2017	8.06	FALSE
	7/17/2017	8.34	FALSE
	8/8/2017	9	FALSE
	8/21/2017	8.93	FALSE
	11/29/2017	7.66	FALSE
	3/8/2018	7.88	FALSE
	5/31/2018	7.56	FALSE
	12/4/2018	7.62	FALSE
	6/28/2019	7.54	FALSE
	11/4/2019	7.6	FALSE
	12/2/2019	7.5	FALSE
	5/28/2020	7.28	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 10 for 20 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	7.28	9	1.72	0.4734	0.814248
2	7.48	8.93	1.45	0.3211	0.465595
3	7.5	8.34	0.84	0.2565	0.21546
4	7.51	8.06	0.55	0.2085	0.114675
5	7.54	7.93	0.39	0.1686	0.065754
6	7.56	7.88	0.32	0.1334	0.042688
7	7.59	7.79	0.2	0.1013	0.02026
8	7.6	7.73	0.13	0.0711	0.009243
9	7.61	7.67	0.06	0.0422	0.002532
10	7.62	7.66	0.04	0.014	0.00056
11	7.66	7.62	-0.04		
12	7.67	7.61	-0.06		
13	7.73	7.6	-0.13		
14	7.79	7.59	-0.2		
15	7.88	7.56	-0.32		
16	7.93	7.54	-0.39		
17	8.06	7.51	-0.55		
18	8.34	7.5	-0.84		
19	8.93	7.48	-1.45		
20	9	7.28	-1.72		

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Sum of b values = 1.75101

Sample Standard Deviation = 0.456628

W Statistic = 0.773928

**5% Critical value of 0.905 exceeds 0.773928**  
**Evidence of non-normality at 95% level of significance**

**1% Critical value of 0.868 exceeds 0.773928**  
**Evidence of non-normality at 99% level of significance**

**Mann-Kendall Trend Analysis**  
**Parameter: pH, Field**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.67	7.51	0.16	1	0
7.73	7.51	0.22	2	0
7.59	7.51	0.08	3	0
7.79	7.51	0.28	4	0
7.61	7.51	0.1	5	0
7.48	7.51	-0.03	5	1
7.93	7.51	0.42	6	1
8.06	7.51	0.55	7	1
8.34	7.51	0.83	8	1
9	7.51	1.49	9	1
8.93	7.51	1.42	10	1
7.66	7.51	0.15	11	1
7.88	7.51	0.37	12	1
7.56	7.51	0.05	13	1
7.62	7.51	0.11	14	1
7.54	7.51	0.03	15	1
7.6	7.51	0.09	16	1
7.5	7.51	-0.01	16	2
7.28	7.51	-0.23	16	3
7.73	7.67	0.06	17	3
7.59	7.67	-0.08	17	4
7.79	7.67	0.12	18	4
7.61	7.67	-0.06	18	5
7.48	7.67	-0.19	18	6
7.93	7.67	0.26	19	6
8.06	7.67	0.39	20	6
8.34	7.67	0.67	21	6
9	7.67	1.33	22	6
8.93	7.67	1.26	23	6
7.66	7.67	-0.01	23	7
7.88	7.67	0.21	24	7
7.56	7.67	-0.11	24	8
7.62	7.67	-0.05	24	9
7.54	7.67	-0.13	24	10
7.6	7.67	-0.07	24	11
7.5	7.67	-0.17	24	12
7.28	7.67	-0.39	24	13
7.59	7.73	-0.14	24	14
7.79	7.73	0.06	25	14
7.61	7.73	-0.12	25	15
7.48	7.73	-0.25	25	16
7.93	7.73	0.2	26	16
8.06	7.73	0.33	27	16
8.34	7.73	0.61	28	16
9	7.73	1.27	29	16



8.93	7.73	1.2	30	16
7.66	7.73	-0.07	30	17
7.88	7.73	0.15	31	17
7.56	7.73	-0.17	31	18
7.62	7.73	-0.11	31	19
7.54	7.73	-0.19	31	20
7.6	7.73	-0.13	31	21
7.5	7.73	-0.23	31	22
7.28	7.73	-0.45	31	23
7.79	7.59	0.2	32	23
7.61	7.59	0.02	33	23
7.48	7.59	-0.11	33	24
7.93	7.59	0.34	34	24
8.06	7.59	0.47	35	24
8.34	7.59	0.75	36	24
9	7.59	1.41	37	24
8.93	7.59	1.34	38	24
7.66	7.59	0.07	39	24
7.88	7.59	0.29	40	24
7.56	7.59	-0.03	40	25
7.62	7.59	0.03	41	25
7.54	7.59	-0.05	41	26
7.6	7.59	0.01	42	26
7.5	7.59	-0.09	42	27
7.28	7.59	-0.31	42	28
7.61	7.79	-0.18	42	29
7.48	7.79	-0.31	42	30
7.93	7.79	0.14	43	30
8.06	7.79	0.27	44	30
8.34	7.79	0.55	45	30
9	7.79	1.21	46	30
8.93	7.79	1.14	47	30
7.66	7.79	-0.13	47	31
7.88	7.79	0.09	48	31
7.56	7.79	-0.23	48	32
7.62	7.79	-0.17	48	33
7.54	7.79	-0.25	48	34
7.6	7.79	-0.19	48	35
7.5	7.79	-0.29	48	36
7.28	7.79	-0.51	48	37
7.48	7.61	-0.13	48	38
7.93	7.61	0.32	49	38
8.06	7.61	0.45	50	38
8.34	7.61	0.73	51	38
9	7.61	1.39	52	38
8.93	7.61	1.32	53	38
7.66	7.61	0.05	54	38
7.88	7.61	0.27	55	38
7.56	7.61	-0.05	55	39
7.62	7.61	0.01	56	39
7.54	7.61	-0.07	56	40
7.6	7.61	-0.01	56	41
7.5	7.61	-0.11	56	42
7.28	7.61	-0.33	56	43

7.93	7.48	0.45	57	43
8.06	7.48	0.58	58	43
8.34	7.48	0.86	59	43
9	7.48	1.52	60	43
8.93	7.48	1.45	61	43
7.66	7.48	0.18	62	43
7.88	7.48	0.4	63	43
7.56	7.48	0.08	64	43
7.62	7.48	0.14	65	43
7.54	7.48	0.06	66	43
7.6	7.48	0.12	67	43
7.5	7.48	0.02	68	43
7.28	7.48	-0.2	68	44
8.06	7.93	0.13	69	44
8.34	7.93	0.41	70	44
9	7.93	1.07	71	44
8.93	7.93	1	72	44
7.66	7.93	-0.27	72	45
7.88	7.93	-0.05	72	46
7.56	7.93	-0.37	72	47
7.62	7.93	-0.31	72	48
7.54	7.93	-0.39	72	49
7.6	7.93	-0.33	72	50
7.5	7.93	-0.43	72	51
7.28	7.93	-0.65	72	52
8.34	8.06	0.28	73	52
9	8.06	0.94	74	52
8.93	8.06	0.87	75	52
7.66	8.06	-0.4	75	53
7.88	8.06	-0.18	75	54
7.56	8.06	-0.5	75	55
7.62	8.06	-0.44	75	56
7.54	8.06	-0.52	75	57
7.6	8.06	-0.46	75	58
7.5	8.06	-0.56	75	59
7.28	8.06	-0.78	75	60
9	8.34	0.66	76	60
8.93	8.34	0.59	77	60
7.66	8.34	-0.68	77	61
7.88	8.34	-0.46	77	62
7.56	8.34	-0.78	77	63
7.62	8.34	-0.72	77	64
7.54	8.34	-0.8	77	65
7.6	8.34	-0.74	77	66
7.5	8.34	-0.84	77	67
7.28	8.34	-1.06	77	68
8.93	9	-0.07	77	69
7.66	9	-1.34	77	70
7.88	9	-1.12	77	71
7.56	9	-1.44	77	72
7.62	9	-1.38	77	73
7.54	9	-1.46	77	74

7.6	9	-1.4	77	75
7.5	9	-1.5	77	76
7.28	9	-1.72	77	77
7.66	8.93	-1.27	77	78
7.88	8.93	-1.05	77	79
7.56	8.93	-1.37	77	80
7.62	8.93	-1.31	77	81
7.54	8.93	-1.39	77	82
7.6	8.93	-1.33	77	83
7.5	8.93	-1.43	77	84
7.28	8.93	-1.65	77	85
7.88	7.66	0.22	78	85
7.56	7.66	-0.1	78	86
7.62	7.66	-0.04	78	87
7.54	7.66	-0.12	78	88
7.6	7.66	-0.06	78	89
7.5	7.66	-0.16	78	90
7.28	7.66	-0.38	78	91
7.56	7.88	-0.32	78	92
7.62	7.88	-0.26	78	93
7.54	7.88	-0.34	78	94
7.6	7.88	-0.28	78	95
7.5	7.88	-0.38	78	96
7.28	7.88	-0.6	78	97
7.62	7.56	0.06	79	97
7.54	7.56	-0.02	79	98
7.6	7.56	0.04	80	98
7.5	7.56	-0.06	80	99
7.28	7.56	-0.28	80	100
7.54	7.62	-0.08	80	101
7.6	7.62	-0.02	80	102
7.5	7.62	-0.12	80	103
7.28	7.62	-0.34	80	104
7.6	7.54	0.06	81	104
7.5	7.54	-0.04	81	105
7.28	7.54	-0.26	81	106
7.5	7.6	-0.1	81	107
7.28	7.6	-0.32	81	108
7.28	7.5	-0.22	81	109

S Statistic = 81 - 109 = -28

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Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1

1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
11/4/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 17100

b = 61560

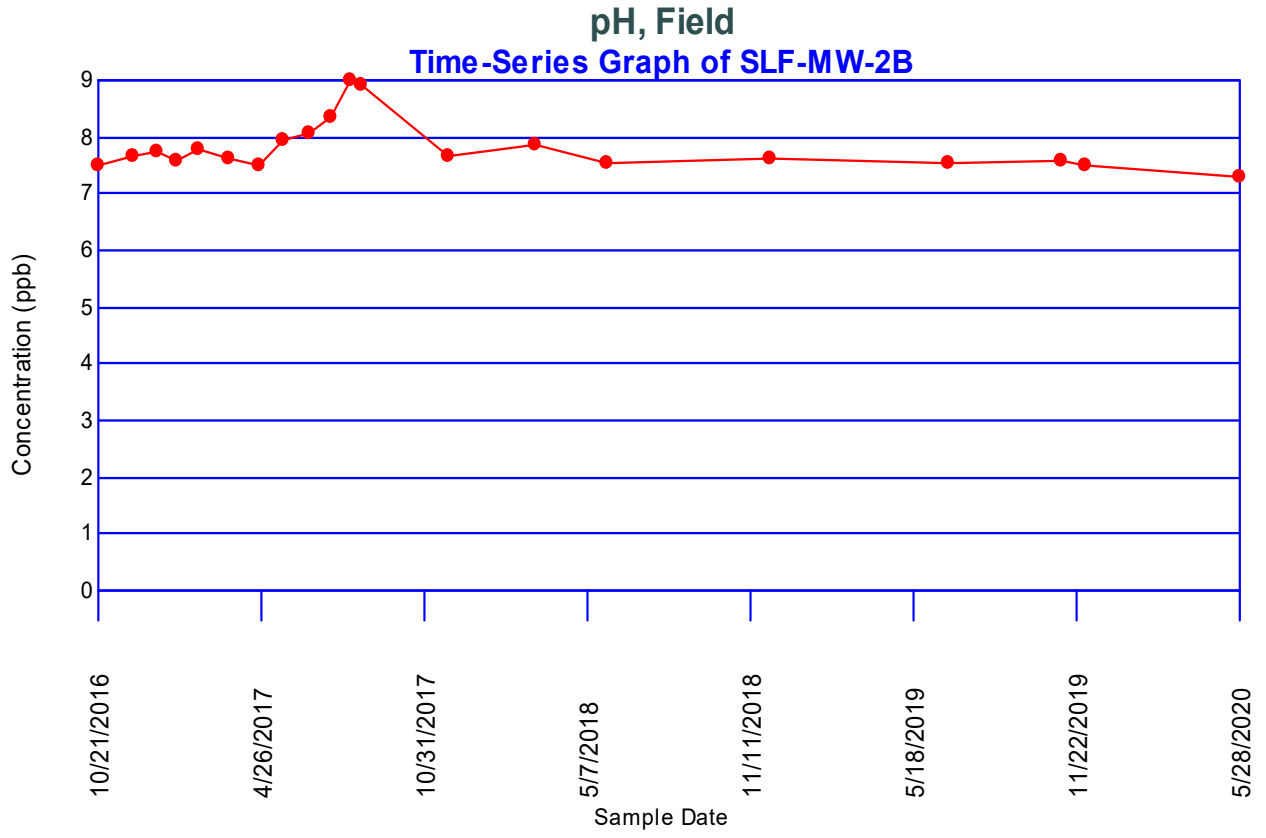
c = 760

Group Variance = 950

Z-Score = -0.875996

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|-0.875996| <= 1.97737$  indicating no evidence of a trend



## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.241935	0.0408163	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	7.02	FALSE
	11/30/2016	7.11	FALSE
	12/28/2016	7.19	FALSE
	1/18/2017	6.97	FALSE
	2/15/2017	7.24	FALSE
	3/20/2017	7.06	FALSE
	4/25/2017	7.02	FALSE
	5/22/2017	7.22	FALSE
	6/20/2017	6.99	FALSE
	7/17/2017	7.33	FALSE
	8/7/2017	7.61	FALSE
	8/21/2017	7.53	FALSE
	11/29/2017	7.12	FALSE
	3/8/2018	7.46	FALSE
	5/30/2018	7.09	FALSE
	12/4/2018	7.11	FALSE
	6/27/2019	7.22	FALSE
	12/2/2019	7.11	FALSE
	5/28/2020	6.97	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	6.97	7.61	0.64	0.4808	0.307712
2	6.97	7.53	0.56	0.3232	0.180992
3	6.99	7.46	0.47	0.2561	0.120367
4	7.02	7.33	0.31	0.2059	0.063829
5	7.02	7.24	0.22	0.1641	0.036102
6	7.06	7.22	0.16	0.1271	0.020336
7	7.09	7.22	0.13	0.0932	0.012116
8	7.11	7.19	0.08	0.0612	0.004896
9	7.11	7.12	0.01	0.0303	0.000303
10	7.11	7.11	0		
11	7.12	7.11	-0.01		
12	7.19	7.11	-0.08		
13	7.22	7.09	-0.13		
14	7.22	7.06	-0.16		
15	7.24	7.02	-0.22		
16	7.33	7.02	-0.31		
17	7.46	6.99	-0.47		
18	7.53	6.97	-0.56		
19	7.61	6.97	-0.64		

---

Sum of b values = 0.746653

Sample Standard Deviation = 0.187286

W Statistic = 0.882988

**5% Critical value of 0.901 exceeds 0.882988**  
**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.863 is less than 0.882988  
Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: pH, Field

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.11	7.02	0.09	1	0
7.19	7.02	0.17	2	0
6.97	7.02	-0.05	2	1
7.24	7.02	0.22	3	1
7.06	7.02	0.04	4	1
7.02	7.02	0	4	1
7.22	7.02	0.2	5	1
6.99	7.02	-0.03	5	2
7.33	7.02	0.31	6	2
7.61	7.02	0.59	7	2
7.53	7.02	0.51	8	2
7.12	7.02	0.1	9	2
7.46	7.02	0.44	10	2
7.09	7.02	0.07	11	2
7.11	7.02	0.09	12	2
7.22	7.02	0.2	13	2
7.11	7.02	0.09	14	2
6.97	7.02	-0.05	14	3
7.19	7.11	0.08	15	3
6.97	7.11	-0.14	15	4
7.24	7.11	0.13	16	4
7.06	7.11	-0.05	16	5
7.02	7.11	-0.09	16	6
7.22	7.11	0.11	17	6
6.99	7.11	-0.12	17	7
7.33	7.11	0.22	18	7
7.61	7.11	0.5	19	7
7.53	7.11	0.42	20	7
7.12	7.11	0.01	21	7
7.46	7.11	0.35	22	7
7.09	7.11	-0.02	22	8
7.11	7.11	0	22	8
7.22	7.11	0.11	23	8
7.11	7.11	0	23	8
6.97	7.11	-0.14	23	9
6.97	7.19	-0.22	23	10
7.24	7.19	0.05	24	10
7.06	7.19	-0.13	24	11
7.02	7.19	-0.17	24	12
7.22	7.19	0.03	25	12
6.99	7.19	-0.2	25	13
7.33	7.19	0.14	26	13
7.61	7.19	0.42	27	13
7.53	7.19	0.34	28	13
7.12	7.19	-0.07	28	14



7.46	7.19	0.27	29	14
7.09	7.19	-0.1	29	15
7.11	7.19	-0.08	29	16
7.22	7.19	0.03	30	16
7.11	7.19	-0.08	30	17
6.97	7.19	-0.22	30	18
7.24	6.97	0.27	31	18
7.06	6.97	0.09	32	18
7.02	6.97	0.05	33	18
7.22	6.97	0.25	34	18
6.99	6.97	0.02	35	18
7.33	6.97	0.36	36	18
7.61	6.97	0.64	37	18
7.53	6.97	0.56	38	18
7.12	6.97	0.15	39	18
7.46	6.97	0.49	40	18
7.09	6.97	0.12	41	18
7.11	6.97	0.14	42	18
7.22	6.97	0.25	43	18
7.11	6.97	0.14	44	18
6.97	6.97	0	44	18
7.06	7.24	-0.18	44	19
7.02	7.24	-0.22	44	20
7.22	7.24	-0.02	44	21
6.99	7.24	-0.25	44	22
7.33	7.24	0.09	45	22
7.61	7.24	0.37	46	22
7.53	7.24	0.29	47	22
7.12	7.24	-0.12	47	23
7.46	7.24	0.22	48	23
7.09	7.24	-0.15	48	24
7.11	7.24	-0.13	48	25
7.22	7.24	-0.02	48	26
7.11	7.24	-0.13	48	27
6.97	7.24	-0.27	48	28
7.02	7.06	-0.04	48	29
7.22	7.06	0.16	49	29
6.99	7.06	-0.07	49	30
7.33	7.06	0.27	50	30
7.61	7.06	0.55	51	30
7.53	7.06	0.47	52	30
7.12	7.06	0.06	53	30
7.46	7.06	0.4	54	30
7.09	7.06	0.03	55	30
7.11	7.06	0.05	56	30
7.22	7.06	0.16	57	30
7.11	7.06	0.05	58	30
6.97	7.06	-0.09	58	31
7.22	7.02	0.2	59	31
6.99	7.02	-0.03	59	32
7.33	7.02	0.31	60	32
7.61	7.02	0.59	61	32
7.53	7.02	0.51	62	32

7.12	7.02	0.1	63	32
7.46	7.02	0.44	64	32
7.09	7.02	0.07	65	32
7.11	7.02	0.09	66	32
7.22	7.02	0.2	67	32
7.11	7.02	0.09	68	32
6.97	7.02	-0.05	68	33
6.99	7.22	-0.23	68	34
7.33	7.22	0.11	69	34
7.61	7.22	0.39	70	34
7.53	7.22	0.31	71	34
7.12	7.22	-0.1	71	35
7.46	7.22	0.24	72	35
7.09	7.22	-0.13	72	36
7.11	7.22	-0.11	72	37
7.22	7.22	0	72	37
7.11	7.22	-0.11	72	38
6.97	7.22	-0.25	72	39
7.33	6.99	0.34	73	39
7.61	6.99	0.62	74	39
7.53	6.99	0.54	75	39
7.12	6.99	0.13	76	39
7.46	6.99	0.47	77	39
7.09	6.99	0.1	78	39
7.11	6.99	0.12	79	39
7.22	6.99	0.23	80	39
7.11	6.99	0.12	81	39
6.97	6.99	-0.02	81	40
7.61	7.33	0.28	82	40
7.53	7.33	0.2	83	40
7.12	7.33	-0.21	83	41
7.46	7.33	0.13	84	41
7.09	7.33	-0.24	84	42
7.11	7.33	-0.22	84	43
7.22	7.33	-0.11	84	44
7.11	7.33	-0.22	84	45
6.97	7.33	-0.36	84	46
7.53	7.61	-0.08	84	47
7.12	7.61	-0.49	84	48
7.46	7.61	-0.15	84	49
7.09	7.61	-0.52	84	50
7.11	7.61	-0.5	84	51
7.22	7.61	-0.39	84	52
7.11	7.61	-0.5	84	53
6.97	7.61	-0.64	84	54
7.12	7.53	-0.41	84	55
7.46	7.53	-0.07	84	56
7.09	7.53	-0.44	84	57
7.11	7.53	-0.42	84	58
7.22	7.53	-0.31	84	59
7.11	7.53	-0.42	84	60
6.97	7.53	-0.56	84	61

7.46	7.12	0.34	85	61
7.09	7.12	-0.03	85	62
7.11	7.12	-0.01	85	63
7.22	7.12	0.1	86	63
7.11	7.12	-0.01	86	64
6.97	7.12	-0.15	86	65
7.09	7.46	-0.37	86	66
7.11	7.46	-0.35	86	67
7.22	7.46	-0.24	86	68
7.11	7.46	-0.35	86	69
6.97	7.46	-0.49	86	70
7.11	7.09	0.02	87	70
7.22	7.09	0.13	88	70
7.11	7.09	0.02	89	70
6.97	7.09	-0.12	89	71
7.22	7.11	0.11	90	71
7.11	7.11	0	90	71
6.97	7.11	-0.14	90	72
7.11	7.22	-0.11	90	73
6.97	7.22	-0.25	90	74
6.97	7.11	-0.14	90	75

S Statistic = 90 - 75 = 15

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Tied Group	Value	Members
1	7.02	2
2	7.11	3
3	6.97	2
4	7.22	2

---

Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 120

B = 0

C = 6

D = 0

E = 12

F = 0

a = 14706

b = 52326

c = 684

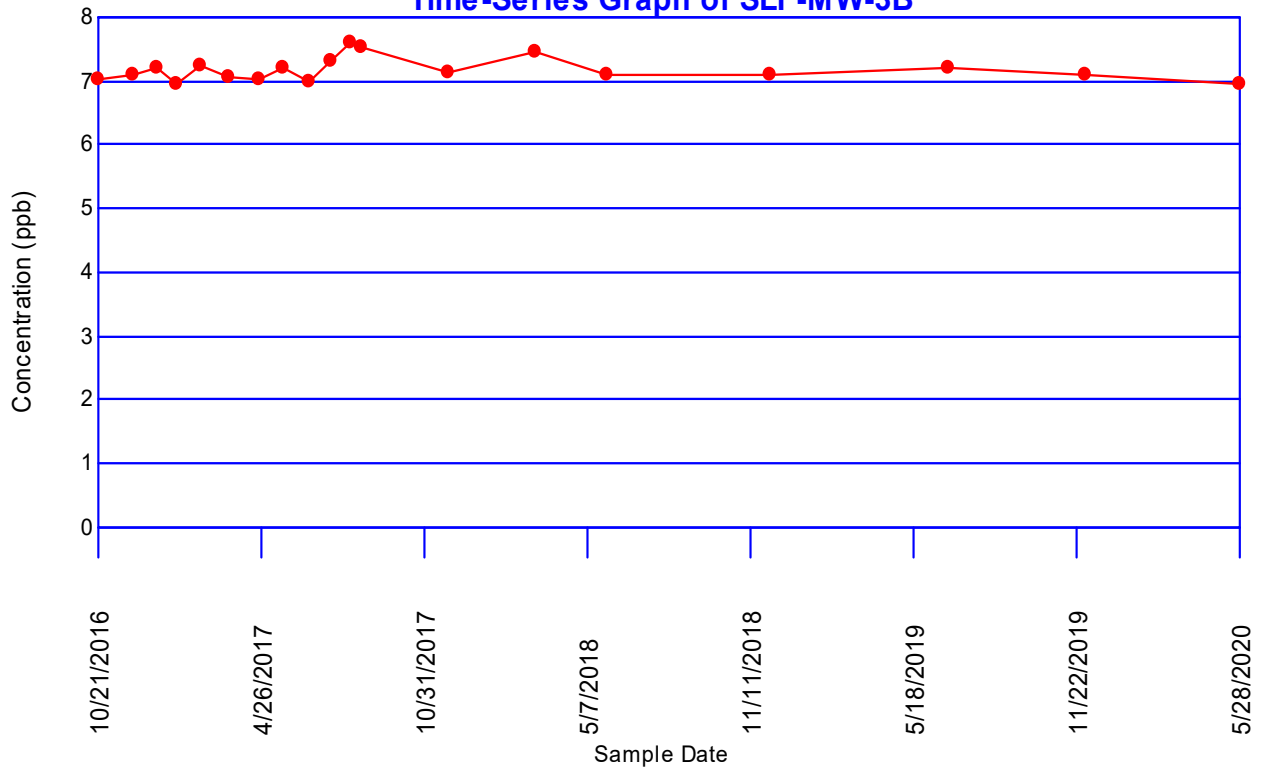
Group Variance = 810.333

Z-Score = 0.491809

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

|0.491809| <= 1.97737 indicating no evidence of a trend

pH, Field  
Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: pH, Field

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.111111	0.368421	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	7.16	FALSE
	3/20/2017	7.14	FALSE
	4/25/2017	7.06	FALSE
	5/22/2017	7.14	FALSE
	6/20/2017	7.09	FALSE
	7/17/2017	7.2	FALSE
	8/7/2017	7.32	FALSE
	8/22/2017	7.34	FALSE
	11/29/2017	7.1	FALSE
	3/8/2018	7.35	FALSE
	5/30/2018	6.94	FALSE
	12/4/2018	7.14	FALSE
	6/28/2019	7.1	FALSE
	12/2/2019	7.08	FALSE
	5/28/2020	7.1	FALSE

## Shapiro-Wilks Test of Normality

Parameter: pH, Field

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	6.94	7.35	0.41	0.515	0.21115
2	7.06	7.34	0.28	0.3306	0.092568
3	7.08	7.32	0.24	0.2495	0.05988
4	7.09	7.2	0.11	0.1878	0.020658
5	7.1	7.16	0.06	0.1353	0.008118
6	7.1	7.14	0.04	0.088	0.00352
7	7.1	7.14	0.04	0.0433	0.001732
8	7.14	7.14	0		
9	7.14	7.1	-0.04		
10	7.14	7.1	-0.04		
11	7.16	7.1	-0.06		
12	7.2	7.09	-0.11		
13	7.32	7.08	-0.24		
14	7.34	7.06	-0.28		
15	7.35	6.94	-0.41		

---

Sum of b values = 0.397626

Sample Standard Deviation = 0.112152

W Statistic = 0.897856

5% Critical value of 0.881 is less than 0.897856  
Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.897856  
Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: pH, Field

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
7.14	7.16	-0.02	0	1
7.06	7.16	-0.1	0	2
7.14	7.16	-0.02	0	3
7.09	7.16	-0.07	0	4
7.2	7.16	0.04	1	4
7.32	7.16	0.16	2	4
7.34	7.16	0.18	3	4
7.1	7.16	-0.06	3	5
7.35	7.16	0.19	4	5
6.94	7.16	-0.22	4	6
7.14	7.16	-0.02	4	7
7.1	7.16	-0.06	4	8
7.08	7.16	-0.08	4	9
7.1	7.16	-0.06	4	10
7.06	7.14	-0.08	4	11
7.14	7.14	0	4	11
7.09	7.14	-0.05	4	12
7.2	7.14	0.06	5	12
7.32	7.14	0.18	6	12
7.34	7.14	0.2	7	12
7.1	7.14	-0.04	7	13
7.35	7.14	0.21	8	13
6.94	7.14	-0.2	8	14
7.14	7.14	0	8	14
7.1	7.14	-0.04	8	15
7.08	7.14	-0.06	8	16
7.1	7.14	-0.04	8	17
7.14	7.06	0.08	9	17
7.09	7.06	0.03	10	17
7.2	7.06	0.14	11	17
7.32	7.06	0.26	12	17
7.34	7.06	0.28	13	17
7.1	7.06	0.04	14	17
7.35	7.06	0.29	15	17
6.94	7.06	-0.12	15	18
7.14	7.06	0.08	16	18
7.1	7.06	0.04	17	18
7.08	7.06	0.02	18	18
7.1	7.06	0.04	19	18
7.09	7.14	-0.05	19	19
7.2	7.14	0.06	20	19
7.32	7.14	0.18	21	19
7.34	7.14	0.2	22	19
7.1	7.14	-0.04	22	20



7.35	7.14	0.21	23	20
6.94	7.14	-0.2	23	21
7.14	7.14	0	23	21
7.1	7.14	-0.04	23	22
7.08	7.14	-0.06	23	23
7.1	7.14	-0.04	23	24
7.2	7.09	0.11	24	24
7.32	7.09	0.23	25	24
7.34	7.09	0.25	26	24
7.1	7.09	0.01	27	24
7.35	7.09	0.26	28	24
6.94	7.09	-0.15	28	25
7.14	7.09	0.05	29	25
7.1	7.09	0.01	30	25
7.08	7.09	-0.01	30	26
7.1	7.09	0.01	31	26
7.32	7.2	0.12	32	26
7.34	7.2	0.14	33	26
7.1	7.2	-0.1	33	27
7.35	7.2	0.15	34	27
6.94	7.2	-0.26	34	28
7.14	7.2	-0.06	34	29
7.1	7.2	-0.1	34	30
7.08	7.2	-0.12	34	31
7.1	7.2	-0.1	34	32
7.34	7.32	0.02	35	32
7.1	7.32	-0.22	35	33
7.35	7.32	0.03	36	33
6.94	7.32	-0.38	36	34
7.14	7.32	-0.18	36	35
7.1	7.32	-0.22	36	36
7.08	7.32	-0.24	36	37
7.1	7.32	-0.22	36	38
7.1	7.34	-0.24	36	39
7.35	7.34	0.01	37	39
6.94	7.34	-0.4	37	40
7.14	7.34	-0.2	37	41
7.1	7.34	-0.24	37	42
7.08	7.34	-0.26	37	43
7.1	7.34	-0.24	37	44
7.35	7.1	0.25	38	44
6.94	7.1	-0.16	38	45
7.14	7.1	0.04	39	45
7.1	7.1	0	39	45
7.08	7.1	-0.02	39	46
7.1	7.1	0	39	46
6.94	7.35	-0.41	39	47
7.14	7.35	-0.21	39	48
7.1	7.35	-0.25	39	49
7.08	7.35	-0.27	39	50
7.1	7.35	-0.25	39	51

7.14	6.94	0.2	40	51
7.1	6.94	0.16	41	51
7.08	6.94	0.14	42	51
7.1	6.94	0.16	43	51
7.1	7.14	-0.04	43	52
7.08	7.14	-0.06	43	53
7.1	7.14	-0.04	43	54
7.08	7.1	-0.02	43	55
7.1	7.1	0	43	55
7.1	7.08	0.02	44	55

S Statistic = 44 - 55 = -11

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Tied Group	Value	Members
1	7.14	3
2	7.1	3

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Time Period	Observations
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

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A = 132

B = 0

C = 12

D = 0

E = 12

F = 0

a = 7350

b = 24570

c = 420

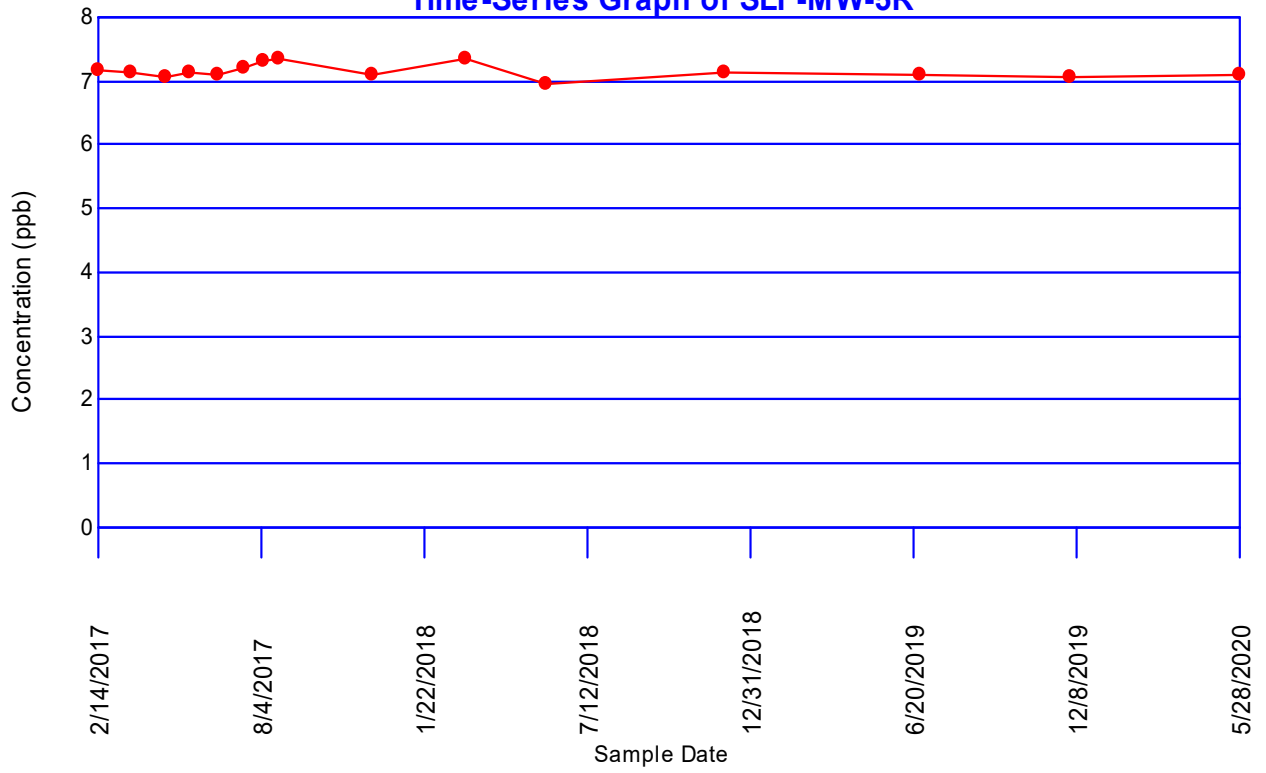
Group Variance = 401

Z-Score = -0.499376

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|**-0.499376**| <= 1.97737 indicating no evidence of a trend

pH, Field  
Time-Series Graph of SLF-MW-5R



## Concentrations (ppb)

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 53

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	347901	347901
			11/30/2016	244670	244670
			12/28/2016	359044	359044
			1/18/2017	229595	229595
			2/14/2017	224624	224624
			3/20/2017	221785	221785
			4/25/2017	205884	205884
			5/22/2017	204497	204497
			6/20/2017	195436	195436
			7/17/2017	203000	203000
			8/8/2017	198500	198500
			8/21/2017	196500	196500
			11/29/2017	191600	191600
			3/8/2018	233000	233000
			5/31/2018	200000	200000
			12/4/2018	163000	163000
			6/28/2019	122000	122000
			12/2/2019	120000	120000
			5/28/2020	104000	104000
				<b>11/30/2020</b>	
	<b>4/28/2021</b>		<b>555000</b>	<b>555000</b>	

SLF-MW-3B	19	0 (0%)	10/21/2016	603053	603053
			11/30/2016	589957	589957
			12/28/2016	614466	614466
			1/18/2017	582135	582135
			2/15/2017	486076	486076
			3/20/2017	472830	472830
			4/25/2017	465682	465682
			5/22/2017	495843	495843
			6/20/2017	480297	480297
			7/17/2017	519000	519000
			8/7/2017	532000	532000
			8/21/2017	549000	549000
			11/29/2017	483000	483000
			3/8/2018	476000	476000
			5/30/2018	454000	454000
			12/4/2018	476000	476000
			6/27/2019	417000	417000
			12/2/2019	384000	384000
			5/28/2020	336000	336000

			<b>12/1/2020</b>	<b>389000</b>	<b>389000</b>
			<b>4/28/2021</b>	<b>355000</b>	<b>355000</b>
SLF-MW-5R	15	0 (0%)	2/14/2017	126012	126012
			3/20/2017	107411	107411
			4/25/2017	95475.3	95475.3
			5/22/2017	90985.1	90985.1
			6/20/2017	130226	130226
			7/17/2017	132600	132600
			8/7/2017	112400	112400
			8/22/2017	143100	143100
			11/29/2017	157800	157800
			3/8/2018	89800	89800
			5/30/2018	158000	158000
			12/4/2018	122000	122000
			6/28/2019	173000	173000
			12/2/2019	162000	162000
			5/28/2020	83400	83400
			<b>11/30/2020</b>	<b>84400</b>	<b>84400</b>
			<b>4/28/2021</b>	<b>144000</b>	<b>144000</b>

There are 0 unused locations

<b>Loc.</b>	<b>Meas.</b>	<b>ND</b>	<b>Date</b>	<b>Conc.</b>	<b>Original</b>
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## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.482501	0.127959	0.462	359044
2	0.508634	0.139535	0.475	347901
3	0.122891	0.143318	0.49	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	<b>347901</b>	<b>TRUE</b>
	11/30/2016	244670	FALSE
	12/28/2016	<b>359044</b>	<b>TRUE</b>
	1/18/2017	229595	FALSE
	2/14/2017	224624	FALSE
	3/20/2017	221785	FALSE
	4/25/2017	205884	FALSE
	5/22/2017	204497	FALSE
	6/20/2017	195436	FALSE
	7/17/2017	203000	FALSE
	8/8/2017	198500	FALSE
	8/21/2017	196500	FALSE
	11/29/2017	191600	FALSE
	3/8/2018	233000	FALSE
	5/31/2018	200000	FALSE
	12/4/2018	163000	FALSE
	6/28/2019	122000	FALSE
	12/2/2019	120000	FALSE
	5/28/2020	104000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	104000	359044	255044	0.4808	122625
2	120000	347901	227901	0.3232	73657.6
3	122000	244670	122670	0.2561	31415.8
4	163000	233000	70000	0.2059	14413
5	191600	229595	37995	0.1641	6234.98
6	195436	224624	29188	0.1271	3709.79
7	196500	221785	25285	0.0932	2356.56
8	198500	205884	7384	0.0612	451.901
9	200000	204497	4497	0.0303	136.259
10	203000	203000	0		
11	204497	200000	-4497		
12	205884	198500	-7384		
13	221785	196500	-25285		
14	224624	195436	-29188		
15	229595	191600	-37995		
16	233000	163000	-70000		
17	244670	122000	-122670		
18	347901	120000	-227901		
19	359044	104000	-255044		

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Sum of b values = 255001

Sample Standard Deviation = 64124.9

W Statistic = 0.878532

**5% Critical value of 0.901 exceeds 0.878532**  
**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.863 is less than 0.878532  
Data is normally distributed at 99% level of significance

# Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

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<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
244670	347901	-103231	0	1
359044	347901	11143	1	1
229595	347901	-118306	1	2
224624	347901	-123277	1	3
221785	347901	-126116	1	4
205884	347901	-142017	1	5
204497	347901	-143404	1	6
195436	347901	-152465	1	7
203000	347901	-144901	1	8
198500	347901	-149401	1	9
196500	347901	-151401	1	10
191600	347901	-156301	1	11
233000	347901	-114901	1	12
200000	347901	-147901	1	13
163000	347901	-184901	1	14
122000	347901	-225901	1	15
120000	347901	-227901	1	16
104000	347901	-243901	1	17
359044	244670	114374	2	17
229595	244670	-15075	2	18
224624	244670	-20046	2	19
221785	244670	-22885	2	20
205884	244670	-38786	2	21
204497	244670	-40173	2	22
195436	244670	-49234	2	23
203000	244670	-41670	2	24
198500	244670	-46170	2	25
196500	244670	-48170	2	26
191600	244670	-53070	2	27
233000	244670	-11670	2	28
200000	244670	-44670	2	29
163000	244670	-81670	2	30
122000	244670	-122670	2	31
120000	244670	-124670	2	32
104000	244670	-140670	2	33
229595	359044	-129449	2	34
224624	359044	-134420	2	35
221785	359044	-137259	2	36
205884	359044	-153160	2	37
204497	359044	-154547	2	38
195436	359044	-163608	2	39
203000	359044	-156044	2	40
198500	359044	-160544	2	41
196500	359044	-162544	2	42
191600	359044	-167444	2	43



233000	359044	-126044	2	44
200000	359044	-159044	2	45
163000	359044	-196044	2	46
122000	359044	-237044	2	47
120000	359044	-239044	2	48
104000	359044	-255044	2	49
224624	229595	-4971	2	50
221785	229595	-7810	2	51
205884	229595	-23711	2	52
204497	229595	-25098	2	53
195436	229595	-34159	2	54
203000	229595	-26595	2	55
198500	229595	-31095	2	56
196500	229595	-33095	2	57
191600	229595	-37995	2	58
233000	229595	3405	3	58
200000	229595	-29595	3	59
163000	229595	-66595	3	60
122000	229595	-107595	3	61
120000	229595	-109595	3	62
104000	229595	-125595	3	63
221785	224624	-2839	3	64
205884	224624	-18740	3	65
204497	224624	-20127	3	66
195436	224624	-29188	3	67
203000	224624	-21624	3	68
198500	224624	-26124	3	69
196500	224624	-28124	3	70
191600	224624	-33024	3	71
233000	224624	8376	4	71
200000	224624	-24624	4	72
163000	224624	-61624	4	73
122000	224624	-102624	4	74
120000	224624	-104624	4	75
104000	224624	-120624	4	76
205884	221785	-15901	4	77
204497	221785	-17288	4	78
195436	221785	-26349	4	79
203000	221785	-18785	4	80
198500	221785	-23285	4	81
196500	221785	-25285	4	82
191600	221785	-30185	4	83
233000	221785	11215	5	83
200000	221785	-21785	5	84
163000	221785	-58785	5	85
122000	221785	-99785	5	86
120000	221785	-101785	5	87
104000	221785	-117785	5	88
204497	205884	-1387	5	89
195436	205884	-10448	5	90
203000	205884	-2884	5	91
198500	205884	-7384	5	92
196500	205884	-9384	5	93

191600	205884	-14284	5	94
233000	205884	27116	6	94
200000	205884	-5884	6	95
163000	205884	-42884	6	96
122000	205884	-83884	6	97
120000	205884	-85884	6	98
104000	205884	-101884	6	99
195436	204497	-9061	6	100
203000	204497	-1497	6	101
198500	204497	-5997	6	102
196500	204497	-7997	6	103
191600	204497	-12897	6	104
233000	204497	28503	7	104
200000	204497	-4497	7	105
163000	204497	-41497	7	106
122000	204497	-82497	7	107
120000	204497	-84497	7	108
104000	204497	-100497	7	109
203000	195436	7564	8	109
198500	195436	3064	9	109
196500	195436	1064	10	109
191600	195436	-3836	10	110
233000	195436	37564	11	110
200000	195436	4564	12	110
163000	195436	-32436	12	111
122000	195436	-73436	12	112
120000	195436	-75436	12	113
104000	195436	-91436	12	114
198500	203000	-4500	12	115
196500	203000	-6500	12	116
191600	203000	-11400	12	117
233000	203000	30000	13	117
200000	203000	-3000	13	118
163000	203000	-40000	13	119
122000	203000	-81000	13	120
120000	203000	-83000	13	121
104000	203000	-99000	13	122
196500	198500	-2000	13	123
191600	198500	-6900	13	124
233000	198500	34500	14	124
200000	198500	1500	15	124
163000	198500	-35500	15	125
122000	198500	-76500	15	126
120000	198500	-78500	15	127
104000	198500	-94500	15	128
191600	196500	-4900	15	129
233000	196500	36500	16	129
200000	196500	3500	17	129
163000	196500	-33500	17	130
122000	196500	-74500	17	131
120000	196500	-76500	17	132
104000	196500	-92500	17	133

233000	191600	41400	18	133
200000	191600	8400	19	133
163000	191600	-28600	19	134
122000	191600	-69600	19	135
120000	191600	-71600	19	136
104000	191600	-87600	19	137
200000	233000	-33000	19	138
163000	233000	-70000	19	139
122000	233000	-111000	19	140
120000	233000	-113000	19	141
104000	233000	-129000	19	142
163000	200000	-37000	19	143
122000	200000	-78000	19	144
120000	200000	-80000	19	145
104000	200000	-96000	19	146
122000	163000	-41000	19	147
120000	163000	-43000	19	148
104000	163000	-59000	19	149
120000	122000	-2000	19	150
104000	122000	-18000	19	151
104000	120000	-16000	19	152

S Statistic = 19 - 152 = -133

---

<b>Tied Group</b>	<b>Value</b>	<b>Members</b>
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1
1/18/2017		1
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/8/2017		1
8/21/2017		1
11/29/2017		1
3/8/2018		1
5/31/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1
There are 0 time periods with multiple data		

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 14706

b = 52326

c = 684

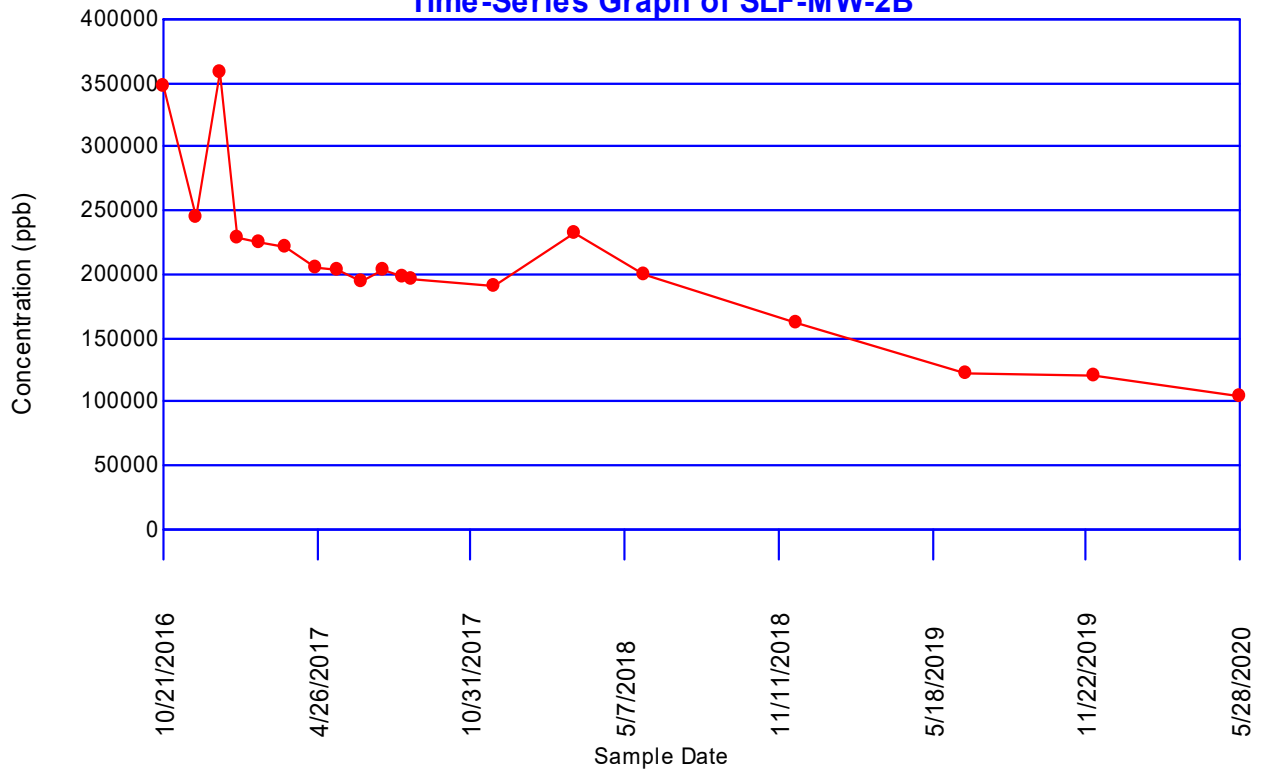
Group Variance = 817

Z-Score = -4.6181

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

**$|-4.6181| > 1.97737$  indicating a trend**

### Sulfate Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.124118	0.318952	0.462	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	603053	FALSE
	11/30/2016	589957	FALSE
	12/28/2016	614466	FALSE
	1/18/2017	582135	FALSE
	2/15/2017	486076	FALSE
	3/20/2017	472830	FALSE
	4/25/2017	465682	FALSE
	5/22/2017	495843	FALSE
	6/20/2017	480297	FALSE
	7/17/2017	519000	FALSE
	8/7/2017	532000	FALSE
	8/21/2017	549000	FALSE
	11/29/2017	483000	FALSE
	3/8/2018	476000	FALSE
	5/30/2018	454000	FALSE
	12/4/2018	476000	FALSE
	6/27/2019	417000	FALSE
	12/2/2019	384000	FALSE
	5/28/2020	336000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 19 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	336000	614466	278466	0.4808	133886
2	384000	603053	219053	0.3232	70797.9
3	417000	589957	172957	0.2561	44294.3
4	454000	582135	128135	0.2059	26383
5	465682	549000	83318	0.1641	13672.5
6	472830	532000	59170	0.1271	7520.51
7	476000	519000	43000	0.0932	4007.6
8	476000	495843	19843	0.0612	1214.39
9	480297	486076	5779	0.0303	175.104
10	483000	483000	0		
11	486076	480297	-5779		
12	495843	476000	-19843		
13	519000	476000	-43000		
14	532000	472830	-59170		
15	549000	465682	-83318		
16	582135	454000	-128135		
17	589957	417000	-172957		
18	603053	384000	-219053		
19	614466	336000	-278466		

---

Sum of b values = 301952

Sample Standard Deviation = 72759.8

W Statistic = 0.956797

5% Critical value of 0.901 is less than 0.956797

Data is normally distributed at 95% level of significance

1% Critical value of 0.863 is less than 0.956797

Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Sulfate**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
589957	603053	-13096	0	1
614466	603053	11413	1	1
582135	603053	-20918	1	2
486076	603053	-116977	1	3
472830	603053	-130223	1	4
465682	603053	-137371	1	5
495843	603053	-107210	1	6
480297	603053	-122756	1	7
519000	603053	-84053	1	8
532000	603053	-71053	1	9
549000	603053	-54053	1	10
483000	603053	-120053	1	11
476000	603053	-127053	1	12
454000	603053	-149053	1	13
476000	603053	-127053	1	14
417000	603053	-186053	1	15
384000	603053	-219053	1	16
336000	603053	-267053	1	17
614466	589957	24509	2	17
582135	589957	-7822	2	18
486076	589957	-103881	2	19
472830	589957	-117127	2	20
465682	589957	-124275	2	21
495843	589957	-94114	2	22
480297	589957	-109660	2	23
519000	589957	-70957	2	24
532000	589957	-57957	2	25
549000	589957	-40957	2	26
483000	589957	-106957	2	27
476000	589957	-113957	2	28
454000	589957	-135957	2	29
476000	589957	-113957	2	30
417000	589957	-172957	2	31
384000	589957	-205957	2	32
336000	589957	-253957	2	33
582135	614466	-32331	2	34
486076	614466	-128390	2	35
472830	614466	-141636	2	36
465682	614466	-148784	2	37
495843	614466	-118623	2	38
480297	614466	-134169	2	39
519000	614466	-95466	2	40
532000	614466	-82466	2	41
549000	614466	-65466	2	42
483000	614466	-131466	2	43



476000	614466	-138466	2	44
454000	614466	-160466	2	45
476000	614466	-138466	2	46
417000	614466	-197466	2	47
384000	614466	-230466	2	48
336000	614466	-278466	2	49
486076	582135	-96059	2	50
472830	582135	-109305	2	51
465682	582135	-116453	2	52
495843	582135	-86292	2	53
480297	582135	-101838	2	54
519000	582135	-63135	2	55
532000	582135	-50135	2	56
549000	582135	-33135	2	57
483000	582135	-99135	2	58
476000	582135	-106135	2	59
454000	582135	-128135	2	60
476000	582135	-106135	2	61
417000	582135	-165135	2	62
384000	582135	-198135	2	63
336000	582135	-246135	2	64
472830	486076	-13246	2	65
465682	486076	-20394	2	66
495843	486076	9767	3	66
480297	486076	-5779	3	67
519000	486076	32924	4	67
532000	486076	45924	5	67
549000	486076	62924	6	67
483000	486076	-3076	6	68
476000	486076	-10076	6	69
454000	486076	-32076	6	70
476000	486076	-10076	6	71
417000	486076	-69076	6	72
384000	486076	-102076	6	73
336000	486076	-150076	6	74
465682	472830	-7148	6	75
495843	472830	23013	7	75
480297	472830	7467	8	75
519000	472830	46170	9	75
532000	472830	59170	10	75
549000	472830	76170	11	75
483000	472830	10170	12	75
476000	472830	3170	13	75
454000	472830	-18830	13	76
476000	472830	3170	14	76
417000	472830	-55830	14	77
384000	472830	-88830	14	78
336000	472830	-136830	14	79
495843	465682	30161	15	79
480297	465682	14615	16	79
519000	465682	53318	17	79
532000	465682	66318	18	79
549000	465682	83318	19	79

483000	465682	17318	20	79
476000	465682	10318	21	79
454000	465682	-11682	21	80
476000	465682	10318	22	80
417000	465682	-48682	22	81
384000	465682	-81682	22	82
336000	465682	-129682	22	83
480297	495843	-15546	22	84
519000	495843	23157	23	84
532000	495843	36157	24	84
549000	495843	53157	25	84
483000	495843	-12843	25	85
476000	495843	-19843	25	86
454000	495843	-41843	25	87
476000	495843	-19843	25	88
417000	495843	-78843	25	89
384000	495843	-111843	25	90
336000	495843	-159843	25	91
519000	480297	38703	26	91
532000	480297	51703	27	91
549000	480297	68703	28	91
483000	480297	2703	29	91
476000	480297	-4297	29	92
454000	480297	-26297	29	93
476000	480297	-4297	29	94
417000	480297	-63297	29	95
384000	480297	-96297	29	96
336000	480297	-144297	29	97
532000	519000	13000	30	97
549000	519000	30000	31	97
483000	519000	-36000	31	98
476000	519000	-43000	31	99
454000	519000	-65000	31	100
476000	519000	-43000	31	101
417000	519000	-102000	31	102
384000	519000	-135000	31	103
336000	519000	-183000	31	104
549000	532000	17000	32	104
483000	532000	-49000	32	105
476000	532000	-56000	32	106
454000	532000	-78000	32	107
476000	532000	-56000	32	108
417000	532000	-115000	32	109
384000	532000	-148000	32	110
336000	532000	-196000	32	111
483000	549000	-66000	32	112
476000	549000	-73000	32	113
454000	549000	-95000	32	114
476000	549000	-73000	32	115
417000	549000	-132000	32	116
384000	549000	-165000	32	117
336000	549000	-213000	32	118

476000	483000	-7000	32	119
454000	483000	-29000	32	120
476000	483000	-7000	32	121
417000	483000	-66000	32	122
384000	483000	-99000	32	123
336000	483000	-147000	32	124
454000	476000	-22000	32	125
476000	476000	0	32	125
417000	476000	-59000	32	126
384000	476000	-92000	32	127
336000	476000	-140000	32	128
476000	454000	22000	33	128
417000	454000	-37000	33	129
384000	454000	-70000	33	130
336000	454000	-118000	33	131
417000	476000	-59000	33	132
384000	476000	-92000	33	133
336000	476000	-140000	33	134
384000	417000	-33000	33	135
336000	417000	-81000	33	136
336000	384000	-48000	33	137

S Statistic = 33 - 137 = -104

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Tied Group	Value	Members
1	476000	2

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Time Period	Observations
10/21/2016	1
11/30/2016	1
12/28/2016	1
1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 14706

b = 52326

c = 684

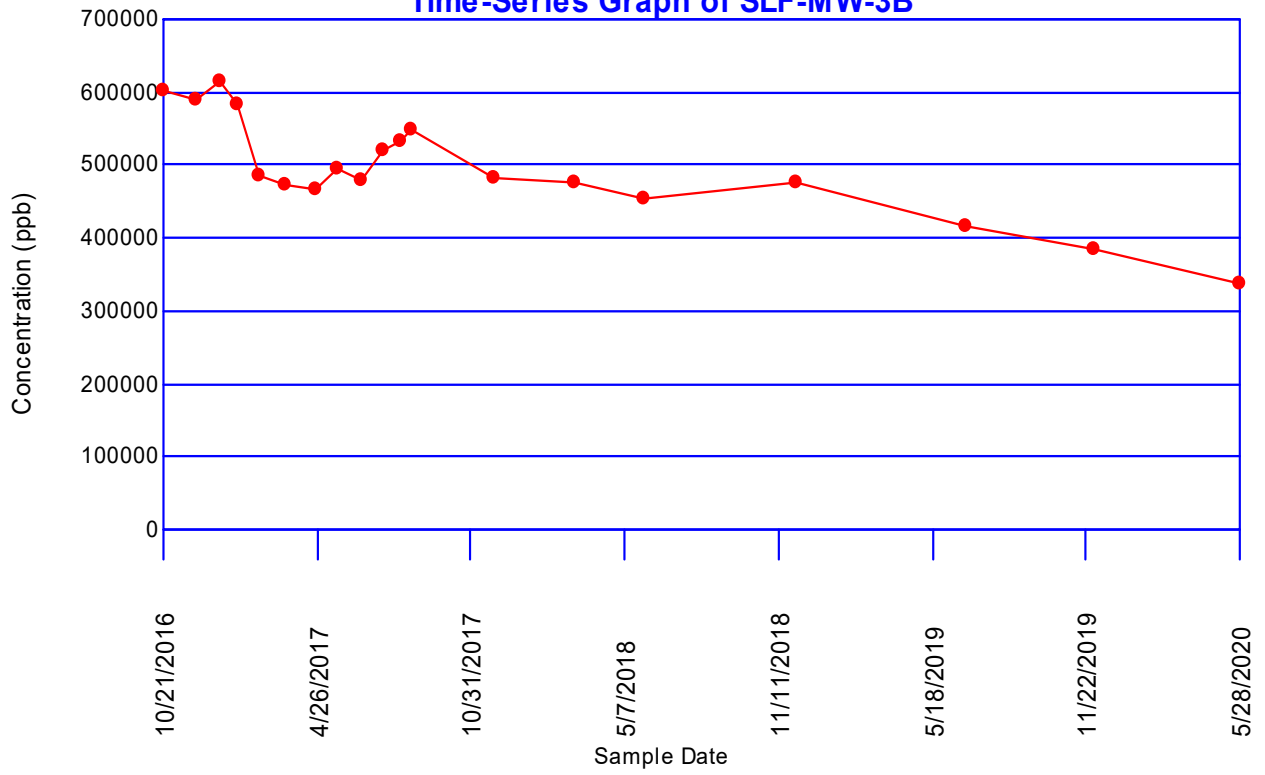
Group Variance = 816

Z-Score = -3.60572

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

**$|-3.60572| > 1.97737$  indicating a trend**

### Sulfate Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Sulfate

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 15 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.182894	0.101677	0.525	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	126012	FALSE
	3/20/2017	107411	FALSE
	4/25/2017	95475.3	FALSE
	5/22/2017	90985.1	FALSE
	6/20/2017	130226	FALSE
	7/17/2017	132600	FALSE
	8/7/2017	112400	FALSE
	8/22/2017	143100	FALSE
	11/29/2017	157800	FALSE
	3/8/2018	89800	FALSE
	5/30/2018	158000	FALSE
	12/4/2018	122000	FALSE
	6/28/2019	173000	FALSE
	12/2/2019	162000	FALSE
	5/28/2020	83400	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Sulfate

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 15 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	83400	173000	89600	0.515	46144
2	89800	162000	72200	0.3306	23869.3
3	90985.1	158000	67014.9	0.2495	16720.2
4	95475.3	157800	62324.7	0.1878	11704.6
5	107411	143100	35689	0.1353	4828.72
6	112400	132600	20200	0.088	1777.6
7	122000	130226	8226	0.0433	356.186
8	126012	126012	0		
9	130226	122000	-8226		
10	132600	112400	-20200		
11	143100	107411	-35689		
12	157800	95475.3	-62324.7		
13	158000	90985.1	-67014.9		
14	162000	89800	-72200		
15	173000	83400	-89600		

---

Sum of b values = 105401

Sample Standard Deviation = 28935.1

W Statistic = 0.947783

5% Critical value of 0.881 is less than 0.947783

Data is normally distributed at 95% level of significance

1% Critical value of 0.835 is less than 0.947783

Data is normally distributed at 99% level of significance

## Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
107411	126012	-18601	0	1
95475.3	126012	-30536.7	0	2
90985.1	126012	-35026.9	0	3
130226	126012	4214	1	3
132600	126012	6588	2	3
112400	126012	-13612	2	4
143100	126012	17088	3	4
157800	126012	31788	4	4
89800	126012	-36212	4	5
158000	126012	31988	5	5
122000	126012	-4012	5	6
173000	126012	46988	6	6
162000	126012	35988	7	6
83400	126012	-42612	7	7
95475.3	107411	-11935.7	7	8
90985.1	107411	-16425.9	7	9
130226	107411	22815	8	9
132600	107411	25189	9	9
112400	107411	4989	10	9
143100	107411	35689	11	9
157800	107411	50389	12	9
89800	107411	-17611	12	10
158000	107411	50589	13	10
122000	107411	14589	14	10
173000	107411	65589	15	10
162000	107411	54589	16	10
83400	107411	-24011	16	11
90985.1	95475.3	-4490.2	16	12
130226	95475.3	34750.7	17	12
132600	95475.3	37124.7	18	12
112400	95475.3	16924.7	19	12
143100	95475.3	47624.7	20	12
157800	95475.3	62324.7	21	12
89800	95475.3	-5675.3	21	13
158000	95475.3	62524.7	22	13
122000	95475.3	26524.7	23	13
173000	95475.3	77524.7	24	13
162000	95475.3	66524.7	25	13
83400	95475.3	-12075.3	25	14
130226	90985.1	39240.9	26	14
132600	90985.1	41614.9	27	14
112400	90985.1	21414.9	28	14
143100	90985.1	52114.9	29	14
157800	90985.1	66814.9	30	14



89800	90985.1	-1185.1	30	15
158000	90985.1	67014.9	31	15
122000	90985.1	31014.9	32	15
173000	90985.1	82014.9	33	15
162000	90985.1	71014.9	34	15
83400	90985.1	-7585.1	34	16
132600	130226	2374	35	16
112400	130226	-17826	35	17
143100	130226	12874	36	17
157800	130226	27574	37	17
89800	130226	-40426	37	18
158000	130226	27774	38	18
122000	130226	-8226	38	19
173000	130226	42774	39	19
162000	130226	31774	40	19
83400	130226	-46826	40	20
112400	132600	-20200	40	21
143100	132600	10500	41	21
157800	132600	25200	42	21
89800	132600	-42800	42	22
158000	132600	25400	43	22
122000	132600	-10600	43	23
173000	132600	40400	44	23
162000	132600	29400	45	23
83400	132600	-49200	45	24
143100	112400	30700	46	24
157800	112400	45400	47	24
89800	112400	-22600	47	25
158000	112400	45600	48	25
122000	112400	9600	49	25
173000	112400	60600	50	25
162000	112400	49600	51	25
83400	112400	-29000	51	26
157800	143100	14700	52	26
89800	143100	-53300	52	27
158000	143100	14900	53	27
122000	143100	-21100	53	28
173000	143100	29900	54	28
162000	143100	18900	55	28
83400	143100	-59700	55	29
89800	157800	-68000	55	30
158000	157800	200	56	30
122000	157800	-35800	56	31
173000	157800	15200	57	31
162000	157800	4200	58	31
83400	157800	-74400	58	32
158000	89800	68200	59	32
122000	89800	32200	60	32
173000	89800	83200	61	32
162000	89800	72200	62	32
83400	89800	-6400	62	33

122000	158000	-36000	62	34
173000	158000	15000	63	34
162000	158000	4000	64	34
83400	158000	-74600	64	35
173000	122000	51000	65	35
162000	122000	40000	66	35
83400	122000	-38600	66	36
162000	173000	-11000	66	37
83400	173000	-89600	66	38
83400	162000	-78600	66	39

S Statistic = 66 - 39 = 27

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Tied Group	Value	Members
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Time Period	Observations
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/22/2017	1
11/29/2017	1
3/8/2018	1
5/30/2018	1
12/4/2018	1
6/28/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 7350

b = 24570

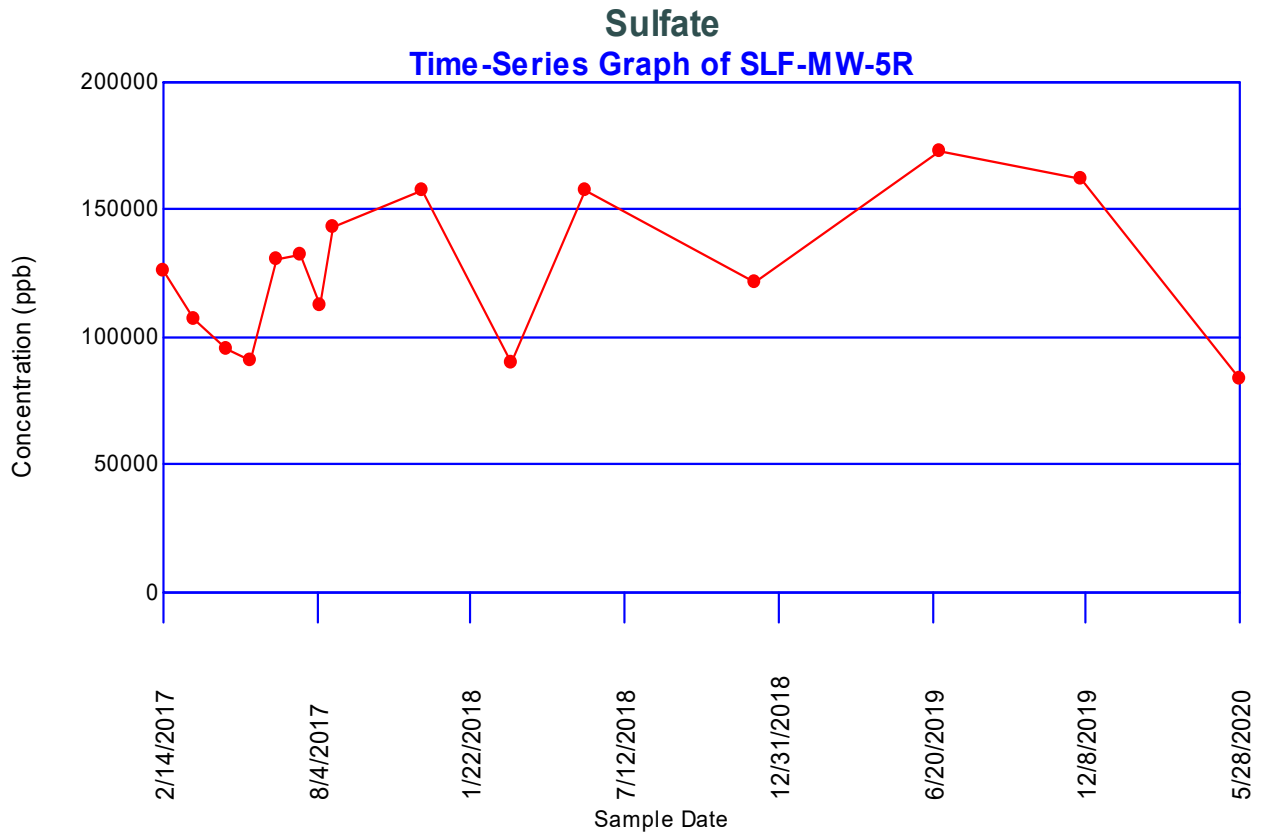
c = 420

Group Variance = 408.333

Z-Score = 1.28667

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

|1.28667| <= 1.97737 indicating no evidence of a trend



## Concentrations (ppb)

### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Measurements: 50

Total Non-Detect: 0

Percent Non-Detects: 0%

Total Background Measurements: 0

There are 0 background locations

Loc.	Meas.	ND	Date	Conc.	Original
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There are 3 compliance locations

Loc.	Meas.	ND	Date	Conc.	Original
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SLF-MW-2B	19	0 (0%)	10/21/2016	3.468e+006	3.468e+006
			11/30/2016	483000	483000
			12/28/2016	3.5667e+006	3.5667e+006
			1/18/2017	2.93e+006	2.93e+006
			2/14/2017	3.5e+006	3.5e+006
			3/20/2017	3.13e+006	3.13e+006
			4/25/2017	3.4e+006	3.4e+006
			5/22/2017	3.014e+006	3.014e+006
			6/20/2017	2.97e+006	2.97e+006
			7/17/2017	2.91e+006	2.91e+006
			8/8/2017	3.05e+006	3.05e+006
			8/21/2017	3.05e+006	3.05e+006
			11/29/2017	3.072e+006	3.072e+006
			5/31/2018	3.91e+006	3.91e+006
			12/4/2018	4.24e+006	4.24e+006
			6/28/2019	4.53e+006	4.53e+006
			11/4/2019	4.38e+006	4.38e+006
			12/2/2019	4.13e+006	4.13e+006
			5/28/2020	4.26e+006	4.26e+006
			<b>4/28/2021</b>	<b>3.67e+006</b>	<b>3.67e+006</b>

SLF-MW-3B	17	0 (0%)	10/21/2016	1.341e+006	1.341e+006			
			11/30/2016	1.38e+006	1.38e+006			
			12/28/2016	1.41e+006	1.41e+006			
			1/18/2017	1.12e+006	1.12e+006			
			2/15/2017	1.179e+006	1.179e+006			
			3/20/2017	1.255e+006	1.255e+006			
			4/25/2017	1.227e+006	1.227e+006			
			5/22/2017	1.142e+006	1.142e+006			
			6/20/2017	1.156e+006	1.156e+006			
			7/17/2017	1.232e+006	1.232e+006			
			8/7/2017	1.273e+006	1.273e+006			
			8/21/2017	1.235e+006	1.235e+006			
			11/29/2017	1.208e+006	1.208e+006			
			12/4/2018	1.28e+006	1.28e+006			
			6/27/2019	1.36e+006	1.36e+006			
			12/2/2019	1.1e+006	1.1e+006			
			5/28/2020	1.15e+006	1.15e+006			
						<b>12/1/2020</b>	<b>1.21e+006</b>	<b>1.21e+006</b>
						<b>4/28/2021</b>	<b>1.22e+006</b>	<b>1.22e+006</b>

SLF-MW-5R	14	0 (0%)	2/14/2017	470000	470000
			3/20/2017	445000	445000
			4/25/2017	435000	435000
			5/22/2017	400000	400000
			6/20/2017	451000	451000
			7/17/2017	556000	556000
			8/7/2017	477000	477000
			8/22/2017	529000	529000
			11/29/2017	549000	549000
			5/30/2018	591000	591000
			12/4/2018	480000	480000
			6/28/2019	611000	611000
			12/2/2019	432000	432000
			5/28/2020	384000	384000
			<b>11/30/2020</b>	<b>336000</b>	<b>336000</b>
			<b>4/28/2021</b>	<b>498000</b>	<b>498000</b>

There are 0 unused locations

Loc.	Meas.	ND	Date	Conc.	Original
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## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 19 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.16875	0.647869	0.462	483000
2	0.173077	0.0444444	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	3.468e+006	FALSE
	11/30/2016	<b>483000</b>	<b>TRUE</b>
	12/28/2016	3.5667e+006	FALSE
	1/18/2017	2.93e+006	FALSE
	2/14/2017	3.5e+006	FALSE
	3/20/2017	3.13e+006	FALSE
	4/25/2017	3.4e+006	FALSE
	5/22/2017	3.014e+006	FALSE
	6/20/2017	2.97e+006	FALSE
	7/17/2017	2.91e+006	FALSE
	8/8/2017	3.05e+006	FALSE
	8/21/2017	3.05e+006	FALSE
	11/29/2017	3.072e+006	FALSE
	5/31/2018	3.91e+006	FALSE
	12/4/2018	4.24e+006	FALSE
	6/28/2019	4.53e+006	FALSE
	11/4/2019	4.38e+006	FALSE
	12/2/2019	4.13e+006	FALSE
	5/28/2020	4.26e+006	FALSE

## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 18 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.173077	0.0444444	0.475	None

Loc.	Date	Conc.	Outlier
SLF-MW-2B	10/21/2016	3.468e+006	FALSE
	12/28/2016	3.5667e+006	FALSE
	1/18/2017	2.93e+006	FALSE
	2/14/2017	3.5e+006	FALSE
	3/20/2017	3.13e+006	FALSE
	4/25/2017	3.4e+006	FALSE
	5/22/2017	3.014e+006	FALSE
	6/20/2017	2.97e+006	FALSE
	7/17/2017	2.91e+006	FALSE
	8/8/2017	3.05e+006	FALSE
	8/21/2017	3.05e+006	FALSE
	11/29/2017	3.072e+006	FALSE
	5/31/2018	3.91e+006	FALSE
	12/4/2018	4.24e+006	FALSE
	6/28/2019	4.53e+006	FALSE
	11/4/2019	4.38e+006	FALSE
	12/2/2019	4.13e+006	FALSE
	5/28/2020	4.26e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-2B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 9 for 18 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	2.91e+006	4.53e+006	1.62e+006	0.4886	791532
2	2.93e+006	4.38e+006	1.45e+006	0.3253	471685
3	2.97e+006	4.26e+006	1.29e+006	0.2553	329337
4	3.014e+006	4.24e+006	1.226e+006	0.2027	248510
5	3.05e+006	4.13e+006	1.08e+006	0.1587	171396
6	3.05e+006	3.91e+006	860000	0.1197	102942
7	3.072e+006	3.5667e+006	494700	0.0837	41406.4
8	3.13e+006	3.5e+006	370000	0.0496	18352
9	3.4e+006	3.468e+006	68000	0.0163	1108.4
10	3.468e+006	3.4e+006	-68000		
11	3.5e+006	3.13e+006	-370000		
12	3.5667e+006	3.072e+006	-494700		
13	3.91e+006	3.05e+006	-860000		
14	4.13e+006	3.05e+006	-1.08e+006		
15	4.24e+006	3.014e+006	-1.226e+006		
16	4.26e+006	2.97e+006	-1.29e+006		
17	4.38e+006	2.93e+006	-1.45e+006		
18	4.53e+006	2.91e+006	-1.62e+006		

---

Sum of b values = 2.17627e+006

Sample Standard Deviation = 565772

W Statistic = 0.870349

**5% Critical value of 0.897 exceeds 0.870349**  
**Evidence of non-normality at 95% level of significance**

1% Critical value of 0.858 is less than 0.870349  
Data is normally distributed at 99% level of significance



**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-2B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
3.5667e+006	3.468e+006	98700	1	0
2.93e+006	3.468e+006	-538000	1	1
3.5e+006	3.468e+006	32000	2	1
3.13e+006	3.468e+006	-338000	2	2
3.4e+006	3.468e+006	-68000	2	3
3.014e+006	3.468e+006	-454000	2	4
2.97e+006	3.468e+006	-498000	2	5
2.91e+006	3.468e+006	-558000	2	6
3.05e+006	3.468e+006	-418000	2	7
3.05e+006	3.468e+006	-418000	2	8
3.072e+006	3.468e+006	-396000	2	9
3.91e+006	3.468e+006	442000	3	9
4.24e+006	3.468e+006	772000	4	9
4.53e+006	3.468e+006	1.062e+006	5	9
4.38e+006	3.468e+006	912000	6	9
4.13e+006	3.468e+006	662000	7	9
4.26e+006	3.468e+006	792000	8	9
2.93e+006	3.5667e+006	-636700	8	10
3.5e+006	3.5667e+006	-66700	8	11
3.13e+006	3.5667e+006	-436700	8	12
3.4e+006	3.5667e+006	-166700	8	13
3.014e+006	3.5667e+006	-552700	8	14
2.97e+006	3.5667e+006	-596700	8	15
2.91e+006	3.5667e+006	-656700	8	16
3.05e+006	3.5667e+006	-516700	8	17
3.05e+006	3.5667e+006	-516700	8	18
3.072e+006	3.5667e+006	-494700	8	19
3.91e+006	3.5667e+006	343300	9	19
4.24e+006	3.5667e+006	673300	10	19
4.53e+006	3.5667e+006	963300	11	19
4.38e+006	3.5667e+006	813300	12	19
4.13e+006	3.5667e+006	563300	13	19
4.26e+006	3.5667e+006	693300	14	19
3.5e+006	2.93e+006	570000	15	19
3.13e+006	2.93e+006	200000	16	19
3.4e+006	2.93e+006	470000	17	19
3.014e+006	2.93e+006	84000	18	19
2.97e+006	2.93e+006	40000	19	19
2.91e+006	2.93e+006	-20000	19	20
3.05e+006	2.93e+006	120000	20	20
3.05e+006	2.93e+006	120000	21	20
3.072e+006	2.93e+006	142000	22	20
3.91e+006	2.93e+006	980000	23	20
4.24e+006	2.93e+006	1.31e+006	24	20
4.53e+006	2.93e+006	1.6e+006	25	20

4.38e+006	2.93e+006	1.45e+006	26	20
4.13e+006	2.93e+006	1.2e+006	27	20
4.26e+006	2.93e+006	1.33e+006	28	20
3.13e+006	3.5e+006	-370000	28	21
3.4e+006	3.5e+006	-100000	28	22
3.014e+006	3.5e+006	-486000	28	23
2.97e+006	3.5e+006	-530000	28	24
2.91e+006	3.5e+006	-590000	28	25
3.05e+006	3.5e+006	-450000	28	26
3.05e+006	3.5e+006	-450000	28	27
3.072e+006	3.5e+006	-428000	28	28
3.91e+006	3.5e+006	410000	29	28
4.24e+006	3.5e+006	740000	30	28
4.53e+006	3.5e+006	1.03e+006	31	28
4.38e+006	3.5e+006	880000	32	28
4.13e+006	3.5e+006	630000	33	28
4.26e+006	3.5e+006	760000	34	28
3.4e+006	3.13e+006	270000	35	28
3.014e+006	3.13e+006	-116000	35	29
2.97e+006	3.13e+006	-160000	35	30
2.91e+006	3.13e+006	-220000	35	31
3.05e+006	3.13e+006	-80000	35	32
3.05e+006	3.13e+006	-80000	35	33
3.072e+006	3.13e+006	-58000	35	34
3.91e+006	3.13e+006	780000	36	34
4.24e+006	3.13e+006	1.11e+006	37	34
4.53e+006	3.13e+006	1.4e+006	38	34
4.38e+006	3.13e+006	1.25e+006	39	34
4.13e+006	3.13e+006	1e+006	40	34
4.26e+006	3.13e+006	1.13e+006	41	34
3.014e+006	3.4e+006	-386000	41	35
2.97e+006	3.4e+006	-430000	41	36
2.91e+006	3.4e+006	-490000	41	37
3.05e+006	3.4e+006	-350000	41	38
3.05e+006	3.4e+006	-350000	41	39
3.072e+006	3.4e+006	-328000	41	40
3.91e+006	3.4e+006	510000	42	40
4.24e+006	3.4e+006	840000	43	40
4.53e+006	3.4e+006	1.13e+006	44	40
4.38e+006	3.4e+006	980000	45	40
4.13e+006	3.4e+006	730000	46	40
4.26e+006	3.4e+006	860000	47	40
2.97e+006	3.014e+006	-44000	47	41
2.91e+006	3.014e+006	-104000	47	42
3.05e+006	3.014e+006	36000	48	42
3.05e+006	3.014e+006	36000	49	42
3.072e+006	3.014e+006	58000	50	42
3.91e+006	3.014e+006	896000	51	42
4.24e+006	3.014e+006	1.226e+006	52	42
4.53e+006	3.014e+006	1.516e+006	53	42
4.38e+006	3.014e+006	1.366e+006	54	42
4.13e+006	3.014e+006	1.116e+006	55	42
4.26e+006	3.014e+006	1.246e+006	56	42

2.91e+006	2.97e+006	-60000	56	43
3.05e+006	2.97e+006	80000	57	43
3.05e+006	2.97e+006	80000	58	43
3.072e+006	2.97e+006	102000	59	43
3.91e+006	2.97e+006	940000	60	43
4.24e+006	2.97e+006	1.27e+006	61	43
4.53e+006	2.97e+006	1.56e+006	62	43
4.38e+006	2.97e+006	1.41e+006	63	43
4.13e+006	2.97e+006	1.16e+006	64	43
4.26e+006	2.97e+006	1.29e+006	65	43
3.05e+006	2.91e+006	140000	66	43
3.05e+006	2.91e+006	140000	67	43
3.072e+006	2.91e+006	162000	68	43
3.91e+006	2.91e+006	1e+006	69	43
4.24e+006	2.91e+006	1.33e+006	70	43
4.53e+006	2.91e+006	1.62e+006	71	43
4.38e+006	2.91e+006	1.47e+006	72	43
4.13e+006	2.91e+006	1.22e+006	73	43
4.26e+006	2.91e+006	1.35e+006	74	43
3.05e+006	3.05e+006	0	74	43
3.072e+006	3.05e+006	22000	75	43
3.91e+006	3.05e+006	860000	76	43
4.24e+006	3.05e+006	1.19e+006	77	43
4.53e+006	3.05e+006	1.48e+006	78	43
4.38e+006	3.05e+006	1.33e+006	79	43
4.13e+006	3.05e+006	1.08e+006	80	43
4.26e+006	3.05e+006	1.21e+006	81	43
3.072e+006	3.05e+006	22000	82	43
3.91e+006	3.05e+006	860000	83	43
4.24e+006	3.05e+006	1.19e+006	84	43
4.53e+006	3.05e+006	1.48e+006	85	43
4.38e+006	3.05e+006	1.33e+006	86	43
4.13e+006	3.05e+006	1.08e+006	87	43
4.26e+006	3.05e+006	1.21e+006	88	43
3.91e+006	3.072e+006	838000	89	43
4.24e+006	3.072e+006	1.168e+006	90	43
4.53e+006	3.072e+006	1.458e+006	91	43
4.38e+006	3.072e+006	1.308e+006	92	43
4.13e+006	3.072e+006	1.058e+006	93	43
4.26e+006	3.072e+006	1.188e+006	94	43
4.24e+006	3.91e+006	330000	95	43
4.53e+006	3.91e+006	620000	96	43
4.38e+006	3.91e+006	470000	97	43
4.13e+006	3.91e+006	220000	98	43
4.26e+006	3.91e+006	350000	99	43
4.53e+006	4.24e+006	290000	100	43
4.38e+006	4.24e+006	140000	101	43
4.13e+006	4.24e+006	-110000	101	44
4.26e+006	4.24e+006	20000	102	44

4.38e+006	4.53e+006	-150000	102	45
4.13e+006	4.53e+006	-400000	102	46
4.26e+006	4.53e+006	-270000	102	47
4.13e+006	4.38e+006	-250000	102	48
4.26e+006	4.38e+006	-120000	102	49
4.26e+006	4.13e+006	130000	103	49

S Statistic = 103 - 49 = 54

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Tied Group	Value	Members
1	3.05e+006	2

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Time Period	Observations
10/21/2016	1
12/28/2016	1
1/18/2017	1
2/14/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/8/2017	1
8/21/2017	1
11/29/2017	1
5/31/2018	1
12/4/2018	1
6/28/2019	1
11/4/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 12546

b = 44064

c = 612

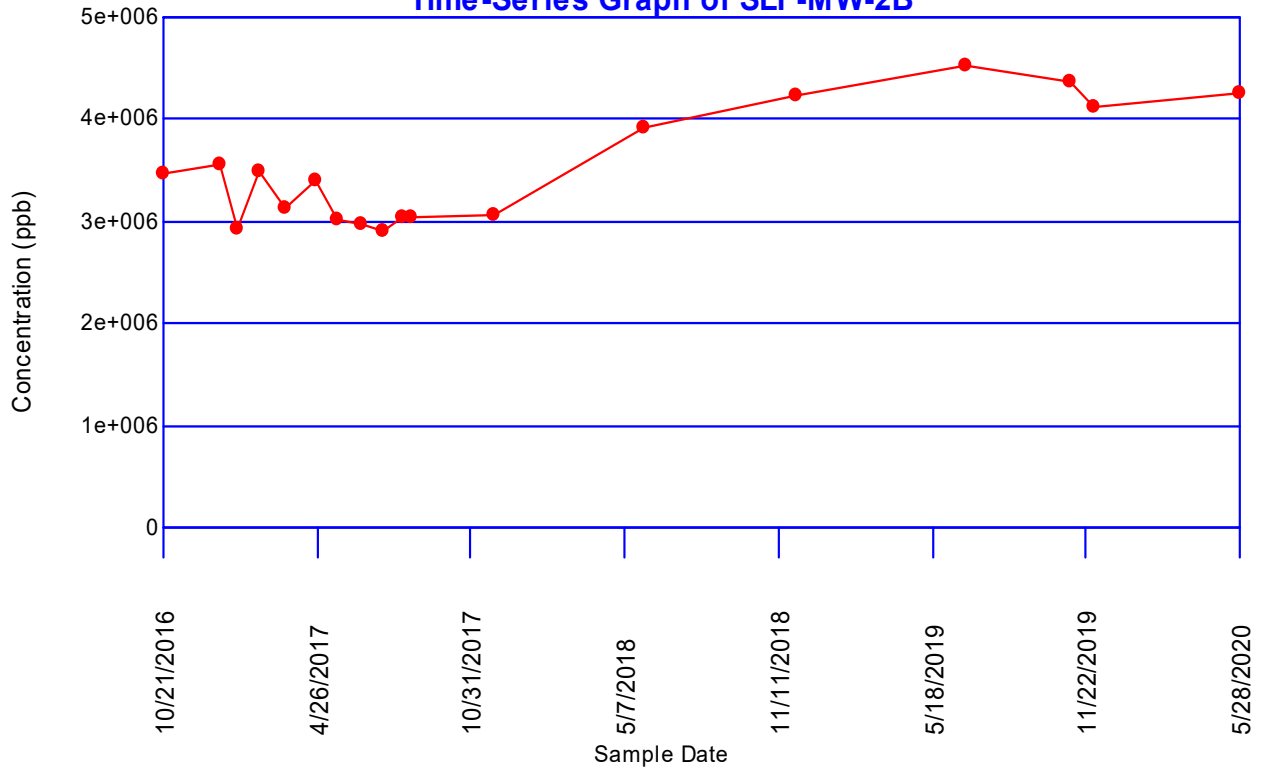
Group Variance = 696

Z-Score = 2.00896

Comparison Level at 1.0 - (0.05 / 2) = 97.5% confidence level = 1.97737 (two-tailed)

**|2.00896| > 1.97737 indicating a trend**

### Total Dissolved Solids (TDS) Time-Series Graph of SLF-MW-2B



## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-3B

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 17 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.186567	0.161538	0.49	None

Loc.	Date	Conc.	Outlier
SLF-MW-3B	10/21/2016	1.341e+006	FALSE
	11/30/2016	1.38e+006	FALSE
	12/28/2016	1.41e+006	FALSE
	1/18/2017	1.12e+006	FALSE
	2/15/2017	1.179e+006	FALSE
	3/20/2017	1.255e+006	FALSE
	4/25/2017	1.227e+006	FALSE
	5/22/2017	1.142e+006	FALSE
	6/20/2017	1.156e+006	FALSE
	7/17/2017	1.232e+006	FALSE
	8/7/2017	1.273e+006	FALSE
	8/21/2017	1.235e+006	FALSE
	11/29/2017	1.208e+006	FALSE
	12/4/2018	1.28e+006	FALSE
	6/27/2019	1.36e+006	FALSE
	12/2/2019	1.1e+006	FALSE
	5/28/2020	1.15e+006	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-3B

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 8 for 17 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	1.1e+006	1.41e+006	310000	0.4968	154008
2	1.12e+006	1.38e+006	260000	0.3273	85098
3	1.142e+006	1.36e+006	218000	0.254	55372
4	1.15e+006	1.341e+006	191000	0.1988	37970.8
5	1.156e+006	1.28e+006	124000	0.1524	18897.6
6	1.179e+006	1.273e+006	94000	0.1109	10424.6
7	1.208e+006	1.255e+006	47000	0.0725	3407.5
8	1.227e+006	1.235e+006	8000	0.0359	287.2
9	1.232e+006	1.232e+006	0		
10	1.235e+006	1.227e+006	-8000		
11	1.255e+006	1.208e+006	-47000		
12	1.273e+006	1.179e+006	-94000		
13	1.28e+006	1.156e+006	-124000		
14	1.341e+006	1.15e+006	-191000		
15	1.36e+006	1.142e+006	-218000		
16	1.38e+006	1.12e+006	-260000		
17	1.41e+006	1.1e+006	-310000		

---

Sum of b values = 365466

Sample Standard Deviation = 93447.1

W Statistic = 0.955964

5% Critical value of 0.892 is less than 0.955964  
Data is normally distributed at 95% level of significance

1% Critical value of 0.851 is less than 0.955964  
Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-3B**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
1.38e+006	1.341e+006	39000	1	0
1.41e+006	1.341e+006	69000	2	0
1.12e+006	1.341e+006	-221000	2	1
1.179e+006	1.341e+006	-162000	2	2
1.255e+006	1.341e+006	-86000	2	3
1.227e+006	1.341e+006	-114000	2	4
1.142e+006	1.341e+006	-199000	2	5
1.156e+006	1.341e+006	-185000	2	6
1.232e+006	1.341e+006	-109000	2	7
1.273e+006	1.341e+006	-68000	2	8
1.235e+006	1.341e+006	-106000	2	9
1.208e+006	1.341e+006	-133000	2	10
1.28e+006	1.341e+006	-61000	2	11
1.36e+006	1.341e+006	19000	3	11
1.1e+006	1.341e+006	-241000	3	12
1.15e+006	1.341e+006	-191000	3	13
1.41e+006	1.38e+006	30000	4	13
1.12e+006	1.38e+006	-260000	4	14
1.179e+006	1.38e+006	-201000	4	15
1.255e+006	1.38e+006	-125000	4	16
1.227e+006	1.38e+006	-153000	4	17
1.142e+006	1.38e+006	-238000	4	18
1.156e+006	1.38e+006	-224000	4	19
1.232e+006	1.38e+006	-148000	4	20
1.273e+006	1.38e+006	-107000	4	21
1.235e+006	1.38e+006	-145000	4	22
1.208e+006	1.38e+006	-172000	4	23
1.28e+006	1.38e+006	-100000	4	24
1.36e+006	1.38e+006	-20000	4	25
1.1e+006	1.38e+006	-280000	4	26
1.15e+006	1.38e+006	-230000	4	27
1.12e+006	1.41e+006	-290000	4	28
1.179e+006	1.41e+006	-231000	4	29
1.255e+006	1.41e+006	-155000	4	30
1.227e+006	1.41e+006	-183000	4	31
1.142e+006	1.41e+006	-268000	4	32
1.156e+006	1.41e+006	-254000	4	33
1.232e+006	1.41e+006	-178000	4	34
1.273e+006	1.41e+006	-137000	4	35
1.235e+006	1.41e+006	-175000	4	36
1.208e+006	1.41e+006	-202000	4	37
1.28e+006	1.41e+006	-130000	4	38
1.36e+006	1.41e+006	-50000	4	39
1.1e+006	1.41e+006	-310000	4	40
1.15e+006	1.41e+006	-260000	4	41



1.179e+006	1.12e+006	59000	5	41
1.255e+006	1.12e+006	135000	6	41
1.227e+006	1.12e+006	107000	7	41
1.142e+006	1.12e+006	22000	8	41
1.156e+006	1.12e+006	36000	9	41
1.232e+006	1.12e+006	112000	10	41
1.273e+006	1.12e+006	153000	11	41
1.235e+006	1.12e+006	115000	12	41
1.208e+006	1.12e+006	88000	13	41
1.28e+006	1.12e+006	160000	14	41
1.36e+006	1.12e+006	240000	15	41
1.1e+006	1.12e+006	-20000	15	42
1.15e+006	1.12e+006	30000	16	42
1.255e+006	1.179e+006	76000	17	42
1.227e+006	1.179e+006	48000	18	42
1.142e+006	1.179e+006	-37000	18	43
1.156e+006	1.179e+006	-23000	18	44
1.232e+006	1.179e+006	53000	19	44
1.273e+006	1.179e+006	94000	20	44
1.235e+006	1.179e+006	56000	21	44
1.208e+006	1.179e+006	29000	22	44
1.28e+006	1.179e+006	101000	23	44
1.36e+006	1.179e+006	181000	24	44
1.1e+006	1.179e+006	-79000	24	45
1.15e+006	1.179e+006	-29000	24	46
1.227e+006	1.255e+006	-28000	24	47
1.142e+006	1.255e+006	-113000	24	48
1.156e+006	1.255e+006	-99000	24	49
1.232e+006	1.255e+006	-23000	24	50
1.273e+006	1.255e+006	18000	25	50
1.235e+006	1.255e+006	-20000	25	51
1.208e+006	1.255e+006	-47000	25	52
1.28e+006	1.255e+006	25000	26	52
1.36e+006	1.255e+006	105000	27	52
1.1e+006	1.255e+006	-155000	27	53
1.15e+006	1.255e+006	-105000	27	54
1.142e+006	1.227e+006	-85000	27	55
1.156e+006	1.227e+006	-71000	27	56
1.232e+006	1.227e+006	5000	28	56
1.273e+006	1.227e+006	46000	29	56
1.235e+006	1.227e+006	8000	30	56
1.208e+006	1.227e+006	-19000	30	57
1.28e+006	1.227e+006	53000	31	57
1.36e+006	1.227e+006	133000	32	57
1.1e+006	1.227e+006	-127000	32	58
1.15e+006	1.227e+006	-77000	32	59
1.156e+006	1.142e+006	14000	33	59
1.232e+006	1.142e+006	90000	34	59
1.273e+006	1.142e+006	131000	35	59
1.235e+006	1.142e+006	93000	36	59
1.208e+006	1.142e+006	66000	37	59
1.28e+006	1.142e+006	138000	38	59

1.36e+006	1.142e+006	218000	39	59
1.1e+006	1.142e+006	-42000	39	60
1.15e+006	1.142e+006	8000	40	60
1.232e+006	1.156e+006	76000	41	60
1.273e+006	1.156e+006	117000	42	60
1.235e+006	1.156e+006	79000	43	60
1.208e+006	1.156e+006	52000	44	60
1.28e+006	1.156e+006	124000	45	60
1.36e+006	1.156e+006	204000	46	60
1.1e+006	1.156e+006	-56000	46	61
1.15e+006	1.156e+006	-6000	46	62
1.273e+006	1.232e+006	41000	47	62
1.235e+006	1.232e+006	3000	48	62
1.208e+006	1.232e+006	-24000	48	63
1.28e+006	1.232e+006	48000	49	63
1.36e+006	1.232e+006	128000	50	63
1.1e+006	1.232e+006	-132000	50	64
1.15e+006	1.232e+006	-82000	50	65
1.235e+006	1.273e+006	-38000	50	66
1.208e+006	1.273e+006	-65000	50	67
1.28e+006	1.273e+006	7000	51	67
1.36e+006	1.273e+006	87000	52	67
1.1e+006	1.273e+006	-173000	52	68
1.15e+006	1.273e+006	-123000	52	69
1.208e+006	1.235e+006	-27000	52	70
1.28e+006	1.235e+006	45000	53	70
1.36e+006	1.235e+006	125000	54	70
1.1e+006	1.235e+006	-135000	54	71
1.15e+006	1.235e+006	-85000	54	72
1.28e+006	1.208e+006	72000	55	72
1.36e+006	1.208e+006	152000	56	72
1.1e+006	1.208e+006	-108000	56	73
1.15e+006	1.208e+006	-58000	56	74
1.36e+006	1.28e+006	80000	57	74
1.1e+006	1.28e+006	-180000	57	75
1.15e+006	1.28e+006	-130000	57	76
1.1e+006	1.36e+006	-260000	57	77
1.15e+006	1.36e+006	-210000	57	78
1.15e+006	1.1e+006	50000	58	78

S Statistic = 58 - 78 = -20

---

Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
10/21/2016		1
11/30/2016		1
12/28/2016		1

1/18/2017	1
2/15/2017	1
3/20/2017	1
4/25/2017	1
5/22/2017	1
6/20/2017	1
7/17/2017	1
8/7/2017	1
8/21/2017	1
11/29/2017	1
12/4/2018	1
6/27/2019	1
12/2/2019	1
5/28/2020	1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 10608

b = 36720

c = 544

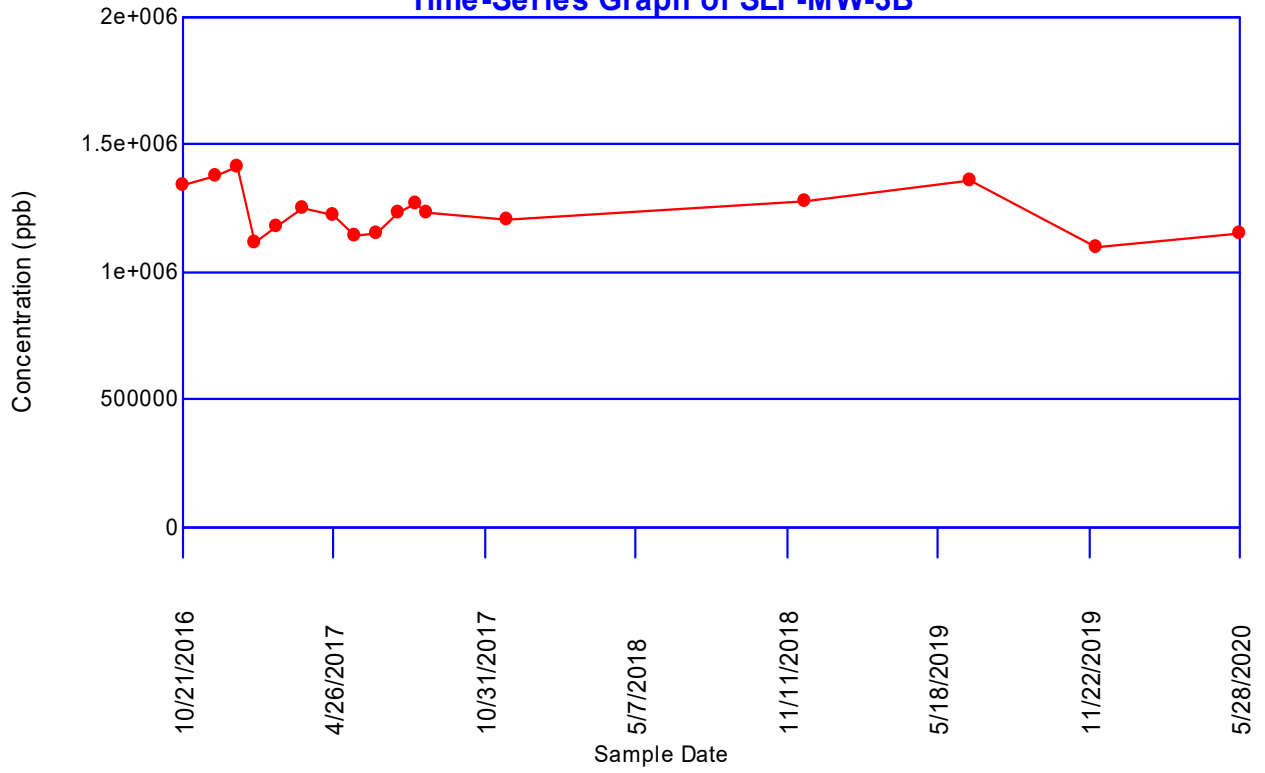
Group Variance = 589.333

Z-Score = -0.78266

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

$|-0.78266| \leq 1.97737$  indicating no evidence of a trend

### Total Dissolved Solids (TDS) Time-Series Graph of SLF-MW-3B



## Dixon's Test for Outliers

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-5R

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

For 14 Measurements...

5% Level of Significance

Iteration	Highest	Lowest	Critical	Outlier
1	0.307263	0.27907	0.546	None

Loc.	Date	Conc.	Outlier
SLF-MW-5R	2/14/2017	470000	FALSE
	3/20/2017	445000	FALSE
	4/25/2017	435000	FALSE
	5/22/2017	400000	FALSE
	6/20/2017	451000	FALSE
	7/17/2017	556000	FALSE
	8/7/2017	477000	FALSE
	8/22/2017	529000	FALSE
	11/29/2017	549000	FALSE
	5/30/2018	591000	FALSE
	12/4/2018	480000	FALSE
	6/28/2019	611000	FALSE
	12/2/2019	432000	FALSE
	5/28/2020	384000	FALSE

## Shapiro-Wilks Test of Normality

Parameter: Total Dissolved Solids (TDS)

Location: SLF-MW-5R

Normality Test of Parameter Concentrations

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

K = 7 for 14 measurements

<b>i</b>	<b>x(i)</b>	<b>x(n-i+1)</b>	<b>x(n-1+1)-x(i)</b>	<b>a(n-i+1)</b>	<b>b(i)</b>
1	384000	611000	227000	0.5251	119198
2	400000	591000	191000	0.3318	63373.8
3	432000	556000	124000	0.246	30504
4	435000	549000	114000	0.1802	20542.8
5	445000	529000	84000	0.124	10416
6	451000	480000	29000	0.0727	2108.3
7	470000	477000	7000	0.024	168
8	477000	470000	-7000		
9	480000	451000	-29000		
10	529000	445000	-84000		
11	549000	435000	-114000		
12	556000	432000	-124000		
13	591000	400000	-191000		
14	611000	384000	-227000		

---

Sum of b values = 246311

Sample Standard Deviation = 70143.5

W Statistic = 0.948523

5% Critical value of 0.874 is less than 0.948523  
Data is normally distributed at 95% level of significance

1% Critical value of 0.825 is less than 0.948523  
Data is normally distributed at 99% level of significance

**Mann-Kendall Trend Analysis**  
**Parameter: Total Dissolved Solids (TDS)**  
**Location: SLF-MW-5R**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

95% Confidence Level

---

<b>Xj</b>	<b>Xk</b>	<b>Xj - Xk</b>	<b>Positives</b>	<b>Negatives</b>
445000	470000	-25000	0	1
435000	470000	-35000	0	2
400000	470000	-70000	0	3
451000	470000	-19000	0	4
556000	470000	86000	1	4
477000	470000	7000	2	4
529000	470000	59000	3	4
549000	470000	79000	4	4
591000	470000	121000	5	4
480000	470000	10000	6	4
611000	470000	141000	7	4
432000	470000	-38000	7	5
384000	470000	-86000	7	6
435000	445000	-10000	7	7
400000	445000	-45000	7	8
451000	445000	6000	8	8
556000	445000	111000	9	8
477000	445000	32000	10	8
529000	445000	84000	11	8
549000	445000	104000	12	8
591000	445000	146000	13	8
480000	445000	35000	14	8
611000	445000	166000	15	8
432000	445000	-13000	15	9
384000	445000	-61000	15	10
400000	435000	-35000	15	11
451000	435000	16000	16	11
556000	435000	121000	17	11
477000	435000	42000	18	11
529000	435000	94000	19	11
549000	435000	114000	20	11
591000	435000	156000	21	11
480000	435000	45000	22	11
611000	435000	176000	23	11
432000	435000	-3000	23	12
384000	435000	-51000	23	13
451000	400000	51000	24	13
556000	400000	156000	25	13
477000	400000	77000	26	13
529000	400000	129000	27	13
549000	400000	149000	28	13
591000	400000	191000	29	13
480000	400000	80000	30	13
611000	400000	211000	31	13

432000	400000	32000	32	13
384000	400000	-16000	32	14
556000	451000	105000	33	14
477000	451000	26000	34	14
529000	451000	78000	35	14
549000	451000	98000	36	14
591000	451000	140000	37	14
480000	451000	29000	38	14
611000	451000	160000	39	14
432000	451000	-19000	39	15
384000	451000	-67000	39	16
477000	556000	-79000	39	17
529000	556000	-27000	39	18
549000	556000	-7000	39	19
591000	556000	35000	40	19
480000	556000	-76000	40	20
611000	556000	55000	41	20
432000	556000	-124000	41	21
384000	556000	-172000	41	22
529000	477000	52000	42	22
549000	477000	72000	43	22
591000	477000	114000	44	22
480000	477000	3000	45	22
611000	477000	134000	46	22
432000	477000	-45000	46	23
384000	477000	-93000	46	24
549000	529000	20000	47	24
591000	529000	62000	48	24
480000	529000	-49000	48	25
611000	529000	82000	49	25
432000	529000	-97000	49	26
384000	529000	-145000	49	27
591000	549000	42000	50	27
480000	549000	-69000	50	28
611000	549000	62000	51	28
432000	549000	-117000	51	29
384000	549000	-165000	51	30
480000	591000	-111000	51	31
611000	591000	20000	52	31
432000	591000	-159000	52	32
384000	591000	-207000	52	33
611000	480000	131000	53	33
432000	480000	-48000	53	34
384000	480000	-96000	53	35
432000	611000	-179000	53	36
384000	611000	-227000	53	37
384000	432000	-48000	53	38



S Statistic = 53 - 38 = 15

---

Tied Group	Value	Members
<b>Time Period</b>		<b>Observations</b>
2/14/2017		1
3/20/2017		1
4/25/2017		1
5/22/2017		1
6/20/2017		1
7/17/2017		1
8/7/2017		1
8/22/2017		1
11/29/2017		1
5/30/2018		1
12/4/2018		1
6/28/2019		1
12/2/2019		1
5/28/2020		1

There are 0 time periods with multiple data

---

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 6006

b = 19656

c = 364

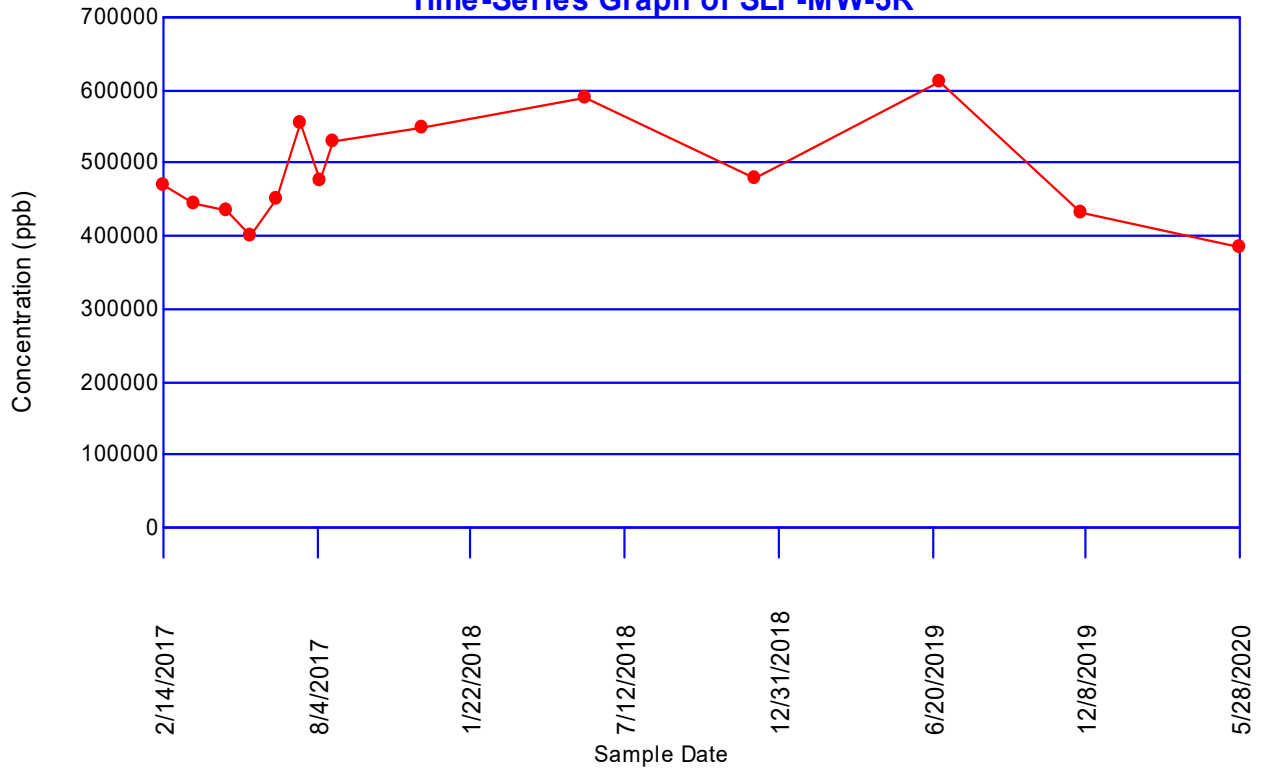
Group Variance = 333.667

Z-Score = 0.766428

Comparison Level at  $1.0 - (0.05 / 2) = 97.5\%$  confidence level = 1.97737 (two-tailed)

|0.766428| <= 1.97737 indicating no evidence of a trend

### Total Dissolved Solids (TDS) Time-Series Graph of SLF-MW-5R



## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	2683.12
	11/30/2016	4817.2
	12/28/2016	3895.84
	1/18/2017	3956.91
	2/14/2017	3573.57
	3/20/2017	3806.16
	4/25/2017	3914.41
	5/22/2017	3891.56
	6/20/2017	3773.44
	7/17/2017	4668
	8/8/2017	4027
	8/21/2017	3197
	11/29/2017	4576
	5/31/2018	4370
	12/4/2018	4940
	6/28/2019	4410
	12/2/2019	4280
	5/28/2020	3390

From 18 baseline samples  
 Baseline mean = 4009.46  
 Baseline std Dev = 582.366

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 18 (background observations) - 1  
 $t(0.9975, 17) = 3.36544$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	2900	[0, 6023.08]	FALSE
11/30/2020	1	3560	[0, 6023.08]	FALSE
5/28/2020	1	3390	[0, 6023.08]	FALSE
12/2/2019	1	4280	[0, 6023.08]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	4238.42
	11/30/2016	6242.46
	12/28/2016	5154.49
	1/18/2017	4910.63
	2/15/2017	3595.68
	3/20/2017	3637.76
	4/25/2017	3392.27
	5/22/2017	3135.58
	6/20/2017	3335.63
	7/17/2017	4381
	8/7/2017	3684
	8/21/2017	3922
	11/29/2017	3860
	5/30/2018	2650
	12/4/2018	3490
	6/27/2019	2170
	12/2/2019	2220
	5/28/2020	1590

From 18 baseline samples  
 Baseline mean = 3645  
 Baseline std Dev = 1124.86

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 18 (background observations) - 1  
 $t(0.9975, 17) = 3.36544$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1410	[0, 7534.39]	FALSE
12/1/2020	1	1920	[0, 7534.39]	FALSE
5/28/2020	1	1590	[0, 7534.39]	FALSE
12/2/2019	1	2220	[0, 7534.39]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Boron

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	493.993
	3/20/2017	345.223
	4/25/2017	314.115
	5/22/2017	270.744
	6/20/2017	438.039
	7/17/2017	550
	8/7/2017	363
	8/22/2017	461
	11/29/2017	524
	5/30/2018	517
	12/4/2018	395
	6/28/2019	631
	12/2/2019	653
	5/28/2020	220

From 14 baseline samples  
Baseline mean = 441.151  
Baseline std Dev = 130.121

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 14 (background observations) - 1  
 $t(0.9975, 13) = 3.53713$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	431	[0, 917.559]	FALSE
11/30/2020	1	290	[0, 917.559]	FALSE
5/28/2020	1	220	[0, 917.559]	FALSE
12/2/2019	1	653	[0, 917.559]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	37032.2
	11/30/2016	61315.7
	12/28/2016	44056.6
	1/18/2017	35837.4
	2/14/2017	37524.8
	3/20/2017	38622.7
	4/25/2017	39897.3
	5/22/2017	43737.6
	6/20/2017	34857
	7/17/2017	33220
	8/8/2017	30756
	8/21/2017	31548
	11/29/2017	37641
	3/8/2018	47865
	5/31/2018	44100
	12/4/2018	48600
	6/28/2019	43600
	12/2/2019	49100
	5/28/2020	47400

From 19 baseline samples  
 Baseline mean = 41405.9  
 Baseline std Dev = 7525.63

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	41200	[0, 67163.3]	FALSE
11/30/2020	1	44100	[0, 67163.3]	FALSE
5/28/2020	1	47400	[0, 67163.3]	FALSE
12/2/2019	1	49100	[0, 67163.3]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	184501
	11/30/2016	249120
	12/28/2016	254980
	1/18/2017	228148
	2/15/2017	188140
	3/20/2017	191435
	4/25/2017	188976
	5/22/2017	229431
	6/20/2017	213067
	7/17/2017	220459
	8/7/2017	208907
	8/21/2017	235062
	11/29/2017	204990
	3/8/2018	173000
	5/30/2018	171000
	12/4/2018	200000
	6/27/2019	172000
	12/2/2019	179000
	5/28/2020	138000

From 19 baseline samples  
 Baseline mean = 201590  
 Baseline std Dev = 29984.9

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	143000	[0, 304217]	FALSE
12/1/2020	1	167000	[0, 304217]	FALSE
5/28/2020	1	138000	[0, 304217]	FALSE
12/2/2019	1	179000	[0, 304217]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Calcium

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	107763
	3/20/2017	104972
	4/25/2017	101443
	5/22/2017	118938
	6/20/2017	120726
	7/17/2017	123508
	8/7/2017	115159
	8/22/2017	123970
	11/29/2017	136418
	3/8/2018	105000
	5/30/2018	118000
	12/4/2018	114000
	6/28/2019	126000
	12/2/2019	130000
	5/28/2020	99100

From 15 baseline samples

Baseline mean = 116333

Baseline std Dev = 10950.5

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$

t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$

Degrees of Freedom = 15 (background observations) - 1

$t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	115000	[0, 155730]	FALSE
11/30/2020	1	85100	[0, 155730]	FALSE
5/28/2020	1	99100	[0, 155730]	FALSE
12/2/2019	1	130000	[0, 155730]	FALSE



## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	1.54749e+006
	11/30/2016	1.61454e+006
	12/28/2016	1.768e+006
	1/18/2017	1.33503e+006
	2/14/2017	1.5337e+006
	3/20/2017	1.36241e+006
	4/25/2017	1.35437e+006
	5/22/2017	1.37044e+006
	6/20/2017	1.31495e+006
	7/17/2017	2.425e+006
	8/8/2017	616000
	8/21/2017	1.136e+006
	11/29/2017	1.421e+006
	3/8/2018	1.712e+006
	5/31/2018	1.87e+006
	12/4/2018	2.08e+006
	6/28/2019	2.53e+006
	12/2/2019	2.44e+006
	5/28/2020	2.2e+006

From 19 baseline samples  
 Baseline mean = 1.66479e+006  
 Baseline std Dev = 495499

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1.48e+006	[0, 3.36069e+006]	FALSE
11/30/2020	1	1.54e+006	[0, 3.36069e+006]	FALSE
5/28/2020	1	2.2e+006	[0, 3.36069e+006]	FALSE
12/2/2019	1	2.44e+006	[0, 3.36069e+006]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	152574
	11/30/2016	169582
	12/28/2016	160177
	1/18/2017	146634
	2/15/2017	143113
	3/20/2017	171319
	4/25/2017	167869
	5/22/2017	126662
	6/20/2017	121058
	7/17/2017	98000
	8/7/2017	103000
	8/21/2017	98000
	11/29/2017	152000
	3/8/2018	224000
	5/30/2018	179000
	12/4/2018	225000
	6/27/2019	239000
	12/2/2019	245000
	5/28/2020	262000

From 19 baseline samples  
Baseline mean = 167578  
Baseline std Dev = 50492.3

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	250000	[0, 340395]	FALSE
12/1/2020	1	269000	[0, 340395]	FALSE
5/28/2020	1	262000	[0, 340395]	FALSE
12/2/2019	1	245000	[0, 340395]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Chloride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	33649.2
	3/20/2017	25801.9
	4/25/2017	22580.8
	5/22/2017	16154
	6/20/2017	25945.6
	7/17/2017	26000
	8/7/2017	19100
	8/22/2017	25500
	11/29/2017	24500
	3/8/2018	15000
	5/30/2018	25500
	12/4/2018	20500
	6/28/2019	24300
	12/2/2019	29200
	5/28/2020	12400

From 15 baseline samples  
Baseline mean = 23075.4  
Baseline std Dev = 5597.13

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 15 (background observations) - 1  
 $t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	25700	[0, 43212.3]	FALSE
11/30/2020	1	14200	[0, 43212.3]	FALSE
5/28/2020	1	12400	[0, 43212.3]	FALSE
12/2/2019	1	29200	[0, 43212.3]	FALSE

**Non-Parametric Prediction Interval**  
**Intra-Well Comparison for SLF-MW-2B**  
**Parameter: Fluoride**  
**Original Data (Not Transformed)**  
**Non-Detects Replaced with Detection Limit**

Total Percent Non-Detects = 11.1111%  
 Future Samples (k) = 4  
 Recent Dates = 4  
 Baseline Measurements (n) = 18  
**Maximum Baseline Concentration = 2647.4**  
 Confidence Level = 81.8%  
 False Positive Rate = 18.2%

---

<b>Baseline Measurements</b>	<b>Date</b>	<b>Value</b>
	10/21/2016	ND<500
	11/30/2016	2647.4
	12/28/2016	1500
	1/18/2017	1875.9
	2/14/2017	ND<500
	3/20/2017	1794.9
	4/25/2017	1972.9
	5/22/2017	1673.4
	6/20/2017	2104.9
	7/17/2017	2000
	8/8/2017	2000
	8/21/2017	1900
	11/29/2017	2000
	5/31/2018	2200
	12/4/2018	1620
	6/28/2019	2190
	12/2/2019	2280
	5/28/2020	2330

---

<b>Date</b>	<b>Count</b>	<b>Mean</b>	<b>Significant</b>
4/28/2021	1	1980	FALSE
11/30/2020	1	2220	FALSE
5/28/2020	1	2330	FALSE
12/2/2019	1	2280	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-3B

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 18

Maximum Baseline Concentration = 500

Confidence Level = 81.8%

False Positive Rate = 18.2%

---

Baseline Measurements	Date	Value
	10/21/2016	ND<500
	11/30/2016	ND<500
	12/28/2016	ND<500
	1/18/2017	ND<500
	2/15/2017	ND<500
	3/20/2017	ND<500
	4/25/2017	ND<500
	5/22/2017	ND<500
	6/20/2017	ND<500
	7/17/2017	ND<500
	8/7/2017	ND<500
	8/21/2017	ND<500
	11/29/2017	ND<500
	5/30/2018	ND<500
	12/4/2018	ND<500
	6/27/2019	ND<500
	12/2/2019	ND<500
	5/28/2020	ND<500

---

Date	Count	Mean	Significant
4/28/2021	1	500	FALSE
12/1/2020	1	500	FALSE
5/28/2020	1	500	FALSE
12/2/2019	1	500	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-5R

Parameter: Fluoride

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 100%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 14

Maximum Baseline Concentration = 500

Confidence Level = 77.8%

False Positive Rate = 22.2%

---

Baseline Measurements	Date	Value
	2/14/2017	ND<500
	3/20/2017	ND<500
	4/25/2017	ND<500
	5/22/2017	ND<500
	6/20/2017	ND<500
	7/17/2017	ND<500
	8/7/2017	ND<500
	8/22/2017	ND<500
	11/29/2017	ND<500
	5/30/2018	ND<500
	12/4/2018	ND<500
	6/28/2019	ND<500
	12/2/2019	ND<500
	5/28/2020	ND<500

---

Date	Count	Mean	Significant
4/28/2021	1	500	FALSE
11/30/2020	1	500	FALSE
5/28/2020	1	500	FALSE
12/2/2019	1	500	FALSE

## Non-Parametric Prediction Interval

### Intra-Well Comparison for SLF-MW-2B

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Total Percent Non-Detects = 0%

Future Samples (k) = 4

Recent Dates = 4

Baseline Measurements (n) = 20

Maximum Baseline Concentration = 9

Confidence Level = 83.3%

False Positive Rate = 16.7%

---

Baseline Measurements	Date	Value
	10/21/2016	7.51
	11/30/2016	7.67
	12/28/2016	7.73
	1/18/2017	7.59
	2/14/2017	7.79
	3/20/2017	7.61
	4/25/2017	7.48
	5/22/2017	7.93
	6/20/2017	8.06
	7/17/2017	8.34
	8/8/2017	9
	8/21/2017	8.93
	11/29/2017	7.66
	3/8/2018	7.88
	5/31/2018	7.56
	12/4/2018	7.62
	6/28/2019	7.54
	11/4/2019	7.6
	12/2/2019	7.5
	5/28/2020	7.28

---

Date	Count	Mean	Significant
4/28/2021	1	7.73	FALSE
11/30/2020	1	7.87	FALSE
5/28/2020	1	7.28	FALSE
12/2/2019	1	7.5	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% Two-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	7.02
	11/30/2016	7.11
	12/28/2016	7.19
	1/18/2017	6.97
	2/15/2017	7.24
	3/20/2017	7.06
	4/25/2017	7.02
	5/22/2017	7.22
	6/20/2017	6.99
	7/17/2017	7.33
	8/7/2017	7.61
	8/21/2017	7.53
	11/29/2017	7.12
	3/8/2018	7.46
	5/30/2018	7.09
	12/4/2018	7.11
	6/27/2019	7.22
	12/2/2019	7.11
	5/28/2020	6.97

From 19 baseline samples

Baseline mean = 7.17737

Baseline std Dev = 0.187286

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.05/4)/2 = 99.875\%$

t is Percentile of Student's T-Test  $(0.99/4/2) = 0.99875$

Degrees of Freedom = 19 (background observations) - 1

$t(0.99875, 19) = 3.56472$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	7.14	[6.49, 7.86]	FALSE
12/1/2020	1	7.23	[6.49, 7.86]	FALSE
5/28/2020	1	6.97	[6.49, 7.86]	FALSE
12/2/2019	1	7.11	[6.49, 7.86]	FALSE



## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: pH, Field

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% Two-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	7.16
	3/20/2017	7.14
	4/25/2017	7.06
	5/22/2017	7.14
	6/20/2017	7.09
	7/17/2017	7.2
	8/7/2017	7.32
	8/22/2017	7.34
	11/29/2017	7.1
	3/8/2018	7.35
	5/30/2018	6.94
	12/4/2018	7.14
	6/28/2019	7.1
	12/2/2019	7.08
	5/28/2020	7.1

From 15 baseline samples

Baseline mean = 7.15067

Baseline std Dev = 0.112152

For 4 recent sampling event(s)

Actual confidence level is  $1.0 - (0.05/4)/2 = 99.875\%$

t is Percentile of Student's T-Test  $(0.99/4/2) = 0.99875$

Degrees of Freedom = 15 (background observations) - 1

$t(0.99875, 15) = 3.73677$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	7.16	[6.72, 7.58]	FALSE
11/30/2020	1	7.2	[6.72, 7.58]	FALSE
5/28/2020	1	7.1	[6.72, 7.58]	FALSE
12/2/2019	1	7.08	[6.72, 7.58]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	347901
	11/30/2016	244670
	12/28/2016	359044
	1/18/2017	229595
	2/14/2017	224624
	3/20/2017	221785
	4/25/2017	205884
	5/22/2017	204497
	6/20/2017	195436
	7/17/2017	203000
	8/8/2017	198500
	8/21/2017	196500
	11/29/2017	191600
	3/8/2018	233000
	5/31/2018	200000
	12/4/2018	163000
	6/28/2019	122000
	12/2/2019	120000
	5/28/2020	104000

From 19 baseline samples  
 Baseline mean = 208686  
 Baseline std Dev = 64124.9

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	555000	[0, 428162]	TRUE
11/30/2020	1	607000	[0, 428162]	TRUE
5/28/2020	1	104000	[0, 428162]	FALSE
12/2/2019	1	120000	[0, 428162]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	603053
	11/30/2016	589957
	12/28/2016	614466
	1/18/2017	582135
	2/15/2017	486076
	3/20/2017	472830
	4/25/2017	465682
	5/22/2017	495843
	6/20/2017	480297
	7/17/2017	519000
	8/7/2017	532000
	8/21/2017	549000
	11/29/2017	483000
	3/8/2018	476000
	5/30/2018	454000
	12/4/2018	476000
	6/27/2019	417000
	12/2/2019	384000
	5/28/2020	336000

From 19 baseline samples  
 Baseline mean = 495597  
 Baseline std Dev = 72759.8

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 $t$  is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 19 (background observations) - 1  
 $t(0.9975, 18) = 3.33596$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	355000	[0, 744626]	FALSE
12/1/2020	1	389000	[0, 744626]	FALSE
5/28/2020	1	336000	[0, 744626]	FALSE
12/2/2019	1	384000	[0, 744626]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-5R

Parameter: Sulfate

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	2/14/2017	126012
	3/20/2017	107411
	4/25/2017	95475.3
	5/22/2017	90985.1
	6/20/2017	130226
	7/17/2017	132600
	8/7/2017	112400
	8/22/2017	143100
	11/29/2017	157800
	3/8/2018	89800
	5/30/2018	158000
	12/4/2018	122000
	6/28/2019	173000
	12/2/2019	162000
	5/28/2020	83400

From 15 baseline samples  
Baseline mean = 125614  
Baseline std Dev = 28935.1

For 4 recent sampling event(s)  
Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
Degrees of Freedom = 15 (background observations) - 1  
 $t(0.9975, 14) = 3.48346$

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	144000	[0, 229714]	FALSE
11/30/2020	1	84400	[0, 229714]	FALSE
5/28/2020	1	83400	[0, 229714]	FALSE
12/2/2019	1	162000	[0, 229714]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-2B

#### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	3.468e+006
	12/28/2016	3.5667e+006
	1/18/2017	2.93e+006
	2/14/2017	3.5e+006
	3/20/2017	3.13e+006
	4/25/2017	3.4e+006
	5/22/2017	3.014e+006
	6/20/2017	2.97e+006
	7/17/2017	2.91e+006
	8/8/2017	3.05e+006
	8/21/2017	3.05e+006
	11/29/2017	3.072e+006
	5/31/2018	3.91e+006
	12/4/2018	4.24e+006
	6/28/2019	4.53e+006
	11/4/2019	4.38e+006
	12/2/2019	4.13e+006
	5/28/2020	4.26e+006

From 18 baseline samples  
 Baseline mean = 3.52837e+006  
 Baseline std Dev = 565772

For 4 recent sampling event(s)  
 Actual confidence level is 1.0 - (0.01/4) = 99.75 %  
 t is Percentile of Student's T-Test (0.9975) = 0.9975  
 Degrees of Freedom = 18 (background observations) - 1  
 t(0.9975, 17) = 3.36544

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	3.67e+006	[0, 5.48462e+006]	FALSE
11/30/2020	1	3.55e+006	[0, 5.48462e+006]	FALSE
5/28/2020	1	4.26e+006	[0, 5.48462e+006]	FALSE
12/2/2019	1	4.13e+006	[0, 5.48462e+006]	FALSE

## Parametric Prediction Interval Analysis

### Intra-Well Comparison for SLF-MW-3B

#### Parameter: Total Dissolved Solids (TDS)

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

#### Intra-Well Unified Guid. Formula 99% One-Sided Comparison

Baseline Samples	Date	Result
	10/21/2016	1.341e+006
	11/30/2016	1.38e+006
	12/28/2016	1.41e+006
	1/18/2017	1.12e+006
	2/15/2017	1.179e+006
	3/20/2017	1.255e+006
	4/25/2017	1.227e+006
	5/22/2017	1.142e+006
	6/20/2017	1.156e+006
	7/17/2017	1.232e+006
	8/7/2017	1.273e+006
	8/21/2017	1.235e+006
	11/29/2017	1.208e+006
	12/4/2018	1.28e+006
	6/27/2019	1.36e+006
	12/2/2019	1.1e+006
	5/28/2020	1.15e+006

From 17 baseline samples  
 Baseline mean = 1.23812e+006  
 Baseline std Dev = 93447.1

For 4 recent sampling event(s)  
 Actual confidence level is 1.0 - (0.01/4) = 99.75 %  
 t is Percentile of Student's T-Test (0.9975) = 0.9975  
 Degrees of Freedom = 17 (background observations) - 1  
 t(0.9975, 16) = 3.39914

---

Date	Samples	Mean	Interval	Significant
4/28/2021	1	1.22e+006	[0, 1.56497e+006]	FALSE
12/1/2020	1	1.21e+006	[0, 1.56497e+006]	FALSE
5/28/2020	1	1.15e+006	[0, 1.56497e+006]	FALSE
12/2/2019	1	1.1e+006	[0, 1.56497e+006]	FALSE

**Parametric Prediction Interval Analysis**

**Intra-Well Comparison for SLF-MW-5R**

**Parameter: Total Dissolved Solids (TDS)**

Original Data (Not Transformed)

Non-Detects Replaced with Detection Limit

**Intra-Well Unified Guid. Formula 99% One-Sided Comparison**

<b>Baseline Samples</b>	<b>Date</b>	<b>Result</b>
	2/14/2017	470000
	3/20/2017	445000
	4/25/2017	435000
	5/22/2017	400000
	6/20/2017	451000
	7/17/2017	556000
	8/7/2017	477000
	8/22/2017	529000
	11/29/2017	549000
	5/30/2018	591000
	12/4/2018	480000
	6/28/2019	611000
	12/2/2019	432000
	5/28/2020	384000

From 14 baseline samples  
 Baseline mean = 486429  
 Baseline std Dev = 70143.5

For 4 recent sampling event(s)  
 Actual confidence level is  $1.0 - (0.01/4) = 99.75\%$   
 t is Percentile of Student's T-Test  $(0.99/4) = 0.9975$   
 Degrees of Freedom = 14 (background observations) - 1  
 $t(0.9975, 13) = 3.53713$

---

<b>Date</b>	<b>Samples</b>	<b>Mean</b>	<b>Interval</b>	<b>Significant</b>
4/28/2021	1	498000	[0, 743243]	FALSE
11/30/2020	1	336000	[0, 743243]	FALSE
5/28/2020	1	384000	[0, 743243]	FALSE
12/2/2019	1	432000	[0, 743243]	FALSE

## **APPENDIX F – Alternate Source Demonstration(s)**





*Prepared for*

**East Kentucky Power Cooperative**

P.O. Box 707

Winchester, Kentucky 40392-0707

# **ALTERNATE SOURCE DEMONSTRATION**

## **SPURLOCK STATION LANDFILL**

### **MAYSVILLE, KENTUCKY**

*Prepared by*

**Geosyntec**   
consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200  
Kennesaw, Georgia 30144

Project Number GR8809

April 2022



## ALTERNATE SOURCE DEMONSTRATION

H.L. Spurlock Generating Station  
Spurlock Landfill  
Maysville, Kentucky

April 19, 2022

A handwritten signature in black ink that reads "Herwig Goldemund".

---

Herwig Goldemund, Ph.D.  
*Principal*

A handwritten signature in black ink that reads "Robert M. Glazier".

---

Robert Glazier  
*Project Director*

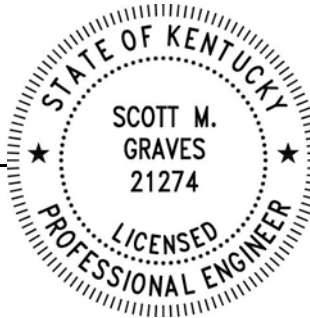
**Certification Statement**

**Alternate Source Demonstration  
H.L. Spurlock Generating Station  
Spurlock Landfill  
Maysville, Kentucky  
April 19, 2022**

I, Scott Graves, a qualified professional engineer registered in the Commonwealth of Kentucky, certify that the above document was completed consistent with the requirements stipulated in 40 CFR 257.94(e)(2) and that the information contained herein is, to the best of my knowledge, accurate.



\_\_\_\_\_  
Seal and Signature



04/19/2022

\_\_\_\_\_  
Date

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## LIST OF ACRONYMS

ASD	alternate source demonstration
B	boron
bgs	below ground surface
Ca	calcium
CCR	coal combustion residual
CFR	Code of Federal Regulations
cm/sec	centimeter per second
Cl	chloride
DO	dissolved oxygen
EKPC	East Kentucky Power Cooperative
FGD	flue gas desulfurization
ft. bgs	feet below ground surface
ft./ft.	feet per foot
ft./yr.	feet per year
HCO <sub>3</sub>	bicarbonate
K	potassium
KPDES	Kentucky Pollution Discharge Elimination System
Li	lithium
LPL	lower prediction limit
mg/L	milligram per liter
Na	sodium
SSI	statistically significant increase
SO <sub>4</sub>	sulfate
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UPL	upper prediction limit
UTL	upper tolerance limit

## 1. INTRODUCTION

### 1.1 Introduction and Purpose

The Federal Coal Combustion Residuals (CCR) Rule provides a process under 40 Code of Federal Regulations (CFR) Section 257.94(e)(2) for the owner/operator of a regulated CCR unit to demonstrate that a statistically significant increase (SSI) above background concentrations of Appendix III constituents during the detection monitoring program is not due to a release of CCR constituents from the CCR unit. An SSI for one or more Appendix III constituents might be a potential indication of a release of CCR constituents from the CCR unit to groundwater. However, the CCR unit may remain in the detection monitoring program if it can be demonstrated that an SSI is due to an error (i.e., sampling error, laboratory error, or statistical analysis error), due to natural variation in groundwater quality, or due to an alternate source (other than the regulated CCR unit). The Federal CCR Rule does not contain requirements nor reference agency guidance for a successful alternate source demonstration other than certification of its accuracy by a Professional Engineer.

Geosyntec Consultants, Inc. (Geosyntec) previously prepared a total of six successful Alternate Source Demonstrations (ASDs) for East Kentucky Power Cooperative's (EKPC's) Coal Combustion Residuals (CCR) Landfill Unit at the Spurlock Generating Station in Maysville, Kentucky, referred to herein as the Site, the Landfill, and the CCR Unit (Geosyntec, 2018a and b, 2019b, 2020, and 2021b and c). One of the major findings of the previous ASD reports was the fact that the upgradient groundwater monitoring wells MW-6 and MW-7 are not representative of background groundwater conditions that could be compared to downgradient conditions at the compliance wells (MW-2B, MW-3B, and MW-5B/R) to detect a potential release from the regulated unit (Geosyntec, 2018a and b). Together with previous demonstrations that certify that the SSI(s) were not due to a release from the unit, there was enough evidence that a new statistical approach was needed for the detection monitoring program at this CCR unit. Therefore, Haley & Aldrich certified new statistical methods on 8 April 2019 that shifted the statistical approach from inter-well to intra-well statistics (Haley & Aldrich, 2019a).

On 19 November 2021, EKPC collected the second semi-annual 2021 detection monitoring event. Groundwater sampling results were statistically analyzed by Haley & Aldrich, and an SSI for SO<sub>4</sub> was identified in monitoring well MW-2B. EKPC was notified by teleconference on 19 January 2022 of the SSI and commissioned Geosyntec

to evaluate if the SSI detected during the detection monitoring event was caused by a release from the CCR unit. This report constitutes an ASD to evaluate whether the SSI for SO<sub>4</sub> in well MW-2B is not due to a release from the regulated unit.

## **1.2 Site Description**

The Spurlock Landfill occupies a disposal area of approximately 177 acres and is located along South Ripley Road in Mason County, Kentucky. The Site is located approximately five miles northwest of Maysville, Kentucky. Immediately adjacent to the Spurlock Landfill lies the site of the recently permitted Peg's Hill CCR Landfill (**Figure 1**). Construction activities for the Peg's Hill Landfill are anticipated to start in 2023.

The Spurlock Landfill consists of three sections, designated as Areas A, B, and C (see **Figure 2**) and is permitted to accept approximately 1.8M tons of CCR waste annually, including fly ash, bottom ash, and flue gas desulfurization (FGD) process wastes.

## **1.3 Description of the CCR Unit**

The areal extent of the Spurlock Landfill was developed in three major sections, designated as Area A, Area B, and Area C. Area A was the earliest section developed, with landfilling operations commencing in 1982, followed by development of Area B. Area C was the most recent section developed, with initial construction taking place in approximately 2010, and final phase cell construction for Area C, Phase 5 ending in October 2021. As indicated above, the adjacent Peg's Hill Landfill is currently permitted, with construction to be completed and receipt of waste to commence in 2023.

The CCR unit that is the subject of this ASD includes all three areas of the Spurlock Landfill (A, B, and C), which are underlain by different liner systems as further described in Subsection 2.2 below. Peg's Hill Landfill is a new, and separate, CCR Unit under 40 CFR Part 257 that has not received any waste.

## **1.4 Groundwater Monitoring System**

**Figure 2** depicts the layout of the Landfill together with the certified CCR groundwater monitoring well network. A *Groundwater Monitoring System and Hydrogeologic Investigation Report* was prepared in support of certifying the monitoring well network at the Landfill (Tetra Tech, 2017). Groundwater monitoring activities were implemented to comply with the requirements of 40 CFR 257.90 through 257.98.



The Landfill is underlain by three bedrock formations, including (from top to bottom) the Grant Lake Formation (both Upper and Lower members), the Fairview Formation, and the Kope Formation, all of which were deposited and formed during the Upper Ordovician geologic period. All three formations are comprised of interbedded limestone and shale, but their percentages vary in each of the formations. The Grant Formation contains about 70-90% limestone, the Fairview Formation contains about 50-60% limestone, while the Kope Formation consists of 20-30% limestone. The uppermost aquifer in the downgradient hydrogeologic position was determined to be in the weathered and fractured (upper) portion of the Kope Formation. (Tetra Tech, 2017).

The certified groundwater monitoring well network consists of two upgradient monitoring wells (MW-6 and MW-7) and three downgradient monitoring wells (MW-2B, MW-3B, and MW-5B/R), as depicted on **Figure 2**. The upgradient monitoring wells (i.e., MW-6 and MW-7) were installed as 2-inch diameter wells to a total depth of 160 ft. feet below ground surface (ft. bgs) with a 10-foot screened interval between 150 ft. and 160 ft. bgs. As such, they were installed within the same geologic formation (i.e., the Kope Formation) as the downgradient wells, but much deeper within the bedrock compared to the downgradient wells. Since fractures in bedrock generally decrease with depth (and therefore, recharge and transmission of groundwater within these fractures generally decreases with depth), the water chemistry within these deeper wells may be affected by this different hydrogeologic position. Three downgradient monitoring wells were installed as 2-inch diameter wells to total depths of 60 ft. bgs (MW-2B), 30 ft. bgs (MW-3B), and 40 ft. bgs (MW-5). They were completed with a 10-foot screen at the bottom of the boring. MW-5 did not produce sufficient volumes of water for sampling, and it was subsequently replaced in January 2017 with a 4-inch well at the same location and designated as groundwater monitoring well MW-5B, which is screened from 14 ft. to 24 ft. bgs. Note that well MW-5B is also referred to as MW-5R in some reports and therefore, it is designated as MW-5B/R in this ASD report. All well screens have an opening size of 0.01 inches (i.e., 10-slot).

## **1.5 Detection Monitoring Program**

Groundwater monitoring under the CCR Rule at the Landfill began in October 2016 following the installation and development of each monitoring well. At least eight baseline groundwater samples were collected from each upgradient and downgradient well prior to October 17, 2017. Baseline sampling events were conducted between October 2016 and August 2017 for wells MW-2B, MW-3B, MW-5B/R, MW-6, and MW-

7. Detection Monitoring for the Landfill began in October 2017, and the initial detection monitoring sampling event was conducted in November 2017.

Statistical estimates of the upper end of the range of background concentrations were initially calculated by Haley and Aldrich (2018a and b) using the baseline monitoring data and inter-well statistical methods. The initial background concentrations were calculated using the Upper Tolerance Limit (UTL) method as described in the U.S. Environmental Protection Agency's (USEPA) 2009 Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance (Unified Guidance) and 40 CFR Section 257.93(f)(3).

Following the first two ASDs finding no release from the CCR unit and based on the sampling data obtained from the groundwater monitoring network, Haley and Aldrich reevaluated the statistical approach and determined that intra-well statistical testing is an appropriate and more sensitive method for detecting potential releases from the CCR unit. An intra-well approach was certified and has been used for statistical evaluation for groundwater detection monitoring at the Landfill since the second half of 2018, pursuant to 40 CFR 257.94 (Haley and Aldrich, 2019a). Haley and Aldrich established intra-well background by calculating the intra-well Upper Prediction Limit (UPL) for each Appendix III constituent (as well as the Lower Prediction Limit [LPL] for pH) separately for each downgradient monitoring location.

Prior to conducting the statistical analysis for the November/December 2020 compliance event, the groundwater analytical results for samples collected from October 2016 through May 2020 were used by Haley and Aldrich to calculate updated intra-well UPLs and LPL (for pH) for each downgradient well. These current intra-well background UPLs (and LPL for pH) are provided in **Table 1** and are used to evaluate potential SSIs at each downgradient well during each semiannual groundwater monitoring event.

In addition, leachate data from previous ASD demonstrations are also included in **Table 1** for comparison purposes.

## **1.6 Basis of the Statistically Significant Increase**

The concentrations of each Appendix III constituent from the second 2021 semi-annual detection monitoring sampling event were compared to their respective UPLs/LPL at the three downgradient compliance wells. A sample concentration greater than the UPL is

considered to represent an SSI. An SSI for SO<sub>4</sub> was detected at MW-2B (**Table 1**). No other SSIs were identified at the Landfill.

## 2. CONCEPTUAL SITE MODEL

### 2.1 Waste Description

The Spurlock Landfill currently occupies a disposal area of 176.67 acres and is permitted to accept approximately 1.8M tons of CCR materials annually. These materials include fly ash, bottom ash, and FGD process wastes.

### 2.2 Engineered Barrier Systems

The original extent of Areas A and B is underlain by in-situ clay material that was not engineered to meet certain thickness and/or hydraulic performance criteria (EKPC, personal communication). However, in-situ clay materials tested for the expansion design had measured hydraulic conductivities of approximately  $10^{-8}$  cm/sec (Kenvirons, 2002).

Subsequently, a horizontal and vertical expansion was designed for the Spurlock Landfill, which included horizontal “expansion areas” outside of the original footprint of Areas A and B to allow for a vertical expansion on top of these areas while still maintaining the appropriate side slopes. Based on design drawings presented in the March 2002 Permit Modification Application (Kenvirons, 2002), the Area A and B expansion areas of the Landfill are underlain by an engineered 24-inch clay liner with a maximum hydraulic conductivity of  $10^{-7}$  cm/sec.

Similar to the Area A and B expansion areas, Phase 1 of Area C is underlain by an engineered 24-inch clay liner with a maximum hydraulic conductivity of  $10^{-7}$  cm/sec. Areas underlain by this engineered clay liner also contain a leachate collection layer composed of materials with a hydraulic conductivity of  $10^{-2}$  cm/sec on top of the clay liner.

The liner system for Phases 2, 3 and 4 of Area C consists of two components to meet the requirements of 40 CFR 257.70: an upper component consisting of a 60-mil HDPE geomembrane and a lower component consisting of at least a two-foot compacted soil layer with a maximum hydraulic conductivity of  $10^{-7}$  cm/sec over subgrade construction. Areas underlain by this CCR Rule engineered liner system also contain a leachate collection and removal system that meets the requirements of 40 CFR 257.70 (Kenvirons, 2018). It is also noted that Phase 5 of Area C is currently under construction, using a

liner system and leachate collection/removal system design consistent with that of Phases 2 through 4 and meeting the requirements of 40 CFR 257.70.

### **2.3 Potential Release Mechanisms**

The potential release mechanism for CCR constituents from the Spurlock Landfill to groundwater would be via infiltration of precipitation into the CCR, dissolution of the soluble components of the CCR materials into leachate, and (potential) migration of leachate to groundwater through defects and cracks in the engineered barrier system. It is noted, however, that the expansion areas outside of Areas A and B (as well as Area C) are constructed with an engineered liner system and are equipped with a leachate collection system composed of a drainage layer containing materials with a hydraulic conductivity of  $10^{-2}$  cm/sec on top of the 24-inch clay liner and/or the geomembrane liner (for Phases 2 and 3 of Area C). This drainage layer conveys leachate towards lined sedimentation Pond 1, where it mixes with stormwater and is treated by aeration/gravity settling before discharge via Outfall 008 permitted through the Kentucky Pollutant Discharge Elimination System (KPDES) Permit No. KY0022250.

While the removal of leachate from large portions of the Landfill reduces the downward driving force, seepage into the subsurface cannot be excluded, especially from the original areas that may not contain a fully engineered liner system with a drainage layer on top. However, seepage (if it occurs at all) is expected to be minor due to low leachate generation rate as a result of the dry-handling of the CCR waste, the low permeability of the CCR waste (which limits percolation of rainwater through the waste), the storm water run-on/runoff controls, and the aforementioned engineered liner systems.

### **2.4 Migration Pathways and Site-Specific Hydrogeologic Setting**

To illustrate potential groundwater migration pathways within, below, and around the Spurlock Landfill, several cross sections were developed and presented in the July 2018 ASD report (Geosyntec, 2018a). These cross-sections illustrated that there was likely not a continuous aquifer between upgradient (i.e., MW-6 and MW-7) and downgradient (i.e., MW-2B, MW-3B, and MW-5B/R) monitoring wells. Geosyntec conducted a hydrogeologic investigation within the adjacent proposed and permitted Peg's Hill CCR Landfill area in support of certifying a CCR monitoring well network at that location (Geosyntec, 2019a and 2021a). The Peg's Hill CCR Landfill site is located in the adjacent watershed from the existing Spurlock CCR Landfill, which is the subject of this ASD

report, and therefore, the geology and hydrogeology at that location are very similar to the Spurlock Landfill.

During the hydrogeologic investigation at the Peg's Hill Landfill, longer-term (i.e., 11 days) aquifer recovery tests were performed in each of the five installed wells because the wells did not recover within a few hours after initial drawdown. This was done in lieu of traditional slug testing and provided a better and more reliable estimate of hydraulic conductivity within the monitored formation (i.e., the upper portions of the Kope Formation, which constitutes the uppermost aquifer at both the existing Spurlock Landfill as well as the permitted Peg's Hill Landfill). The horizontal hydraulic conductivity values estimated for the Kope Formation from these aquifer recovery tests ranged from  $5.6 \times 10^{-7}$  cm/sec to  $1.9 \times 10^{-6}$  cm/sec. These results are lower than the short-term slug test results reported by Tetra Tech (2017) for Spurlock Landfill, which ranged from  $2.9 \times 10^{-5}$  cm/sec to  $1.4 \times 10^{-4}$  cm/sec, but they are consistent with the horizontal hydraulic conductivity values for secondary permeability associated with "tight" fractured rock in bedrock wells (Heath, 1983). The hydraulic conductivity values obtained through longer-term aquifer testing are also within the ranges expected for shale and limestone (Dominico and Schwartz, 1990). Using an average hydraulic conductivity of  $1.12 \times 10^{-6}$  cm/sec, an effective porosity of 6% for shale, and a gradient of 0.066 ft./ft., a groundwater flow velocity of 1.27 ft./year was calculated (Geosyntec, 2019a).

The slow well recovery, the low hydraulic conductivity and the low groundwater flow velocity indicate that the formation does not yield much water and that the water entering a well likely has had long residence times, which is also consistent with the salinity levels detected in samples from certain wells that have low yields and slow recoveries, such as upgradient wells MW-6 and MW-7 as well as downgradient well MW-2B at Spurlock Landfill.

A representative cross-section (A-A') between upgradient well MW-7 and downgradient well MW-3B is presented on **Figure 3**. The figure also includes water level measurements taken in November 2021. Previous hydrogeologic investigations summarized in Geosyntec (2019a) indicated that many exploratory borings along hillsides and ridges in this area did not contain groundwater, and only wells located near valley bottoms and drainage features contained sufficient water for sampling purposes. The presence of landfill liners, leachate collection systems, and landfilled dry CCR materials over large areas of potential groundwater recharge further reduces recharge within the footprint of the Landfill. The cross-section illustrates that, consistent with

previous hydrogeologic investigation reports describing the geologic and hydrogeologic site setting, the area below the Landfill likely does not contain a continuous aquifer between the upgradient and downgradient locations.

### **3. ALTERNATE SOURCE DEMONSTRATION**

#### **3.1 Evaluation of Error**

##### **3.1.1 Potential Sampling Error**

Geosyntec was not present during groundwater sampling events. However, EKPC's field sampler is knowledgeable of the Site and has been briefed on the Site's *Sampling and Analysis Plan*, which details sampling protocols to be followed for each groundwater monitoring event. In addition, based on historical evaluations of field sampling records and communications with EKPC, there is little potential for false positive laboratory results due to suspended solids in the samples or inconsistent purging/sampling technique.

##### **3.1.2 Potential Laboratory Analysis Error**

EKPC conducts quality assurance/quality control (QA/QC) for data collected during groundwater monitoring activities as prescribed in Spurlock Landfill's *Sampling and Analysis Plan*. The QA/QC controls consist of data quality objectives, field and laboratory QA/QC requirements, and data validation (Stage I-III) components. Geosyntec did not conduct independent data validation of the laboratory results to evaluate whether laboratory analysis errors might have occurred during this event. However, previous (i.e., 2018) and recent charge balance calculations conducted for major cations and anions in the leachate and groundwater samples were/are indicative of good data quality. In addition, resampling activities conducted in April 2021 and July 2021 as part of the two previous ASDs yielded SO<sub>4</sub> results consistent with the initial detections as well as the November 2021 sample. Therefore, there is a low potential for laboratory error.

##### **3.1.3 Potential Statistical Analysis Error**

Geosyntec performed high-level reviews of the *Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation* reports prepared by Haley and Aldrich (2019b, 2019c, 2020, 2021, and 2022) and did not identify concerns in the approach presented. The potential for statistical analysis error is low.



## 3.2 Natural Variation

Based on the hydrogeologic setting of the Site, which is discussed in Subsection 2.4, it is possible that the full extent of natural variation at the Spurlock Landfill has not been captured by the intra-well prediction limits calculated to date due to low recharge and slow groundwater flow velocities. Very little of the precipitation recharges into the upper portions of the Kope Formation, and most of the surface water runs off quickly through the various drainage channels and valleys towards larger streams and rivers. Only wells located close to these drainage valleys receive somewhat higher recharge. This hydrogeologic setting results in increased natural variation depending on climatic conditions (i.e., drought versus wet conditions) and seasonal groundwater recharge. It is therefore possible, and most likely, that the SSI for SO<sub>4</sub> in monitoring well MW-2B is due to natural variation.

### 3.2.1 Geochemical Characterization of Leachate and Groundwater

The initial ASD (Geosyntec 2018a) as well as the ASD conducted to update the CSM under the modified statistical intra-well approach (Geosyntec, 2019b) indicated that the leachate chemistry was substantially different from the chemistry of downgradient wells, including well MW-2B. Indicators of salinity, including conductivity, chloride (Cl), and sodium (Na) were substantially higher in monitoring well MW-2B compared to CCR leachate. This indicated that leachate releases were not likely to be the source of the observed groundwater composition in well MW-2B. Furthermore, TDS in well MW-2B was dominated by Na, Cl and bicarbonate (HCO<sub>3</sub>), while TDS in leachate was dominated by SO<sub>4</sub>, calcium (Ca) and potassium (K) (Geosyntec, 2019b).

At the time of the first semi-annual 2021 groundwater detection monitoring sampling event in April 2021, a leachate sample was also collected (although not required by the detection monitoring program) to supplement the March 2018 leachate sample and thereby update the chemical characterization of site-specific leachate for use in comparing the chemistry of the detection monitoring sampling results to the chemistry of the site-specific leachate. **Table 2** summarizes the leachate results from April 2021 and the groundwater sampling results from November 2021. The analytical results from upgradient wells MW-6 and MW-7 are also included in this table to provide context concerning low recharge and high salinity, though the results from these upgradient wells are no longer used for statistical comparisons since the transition from inter-well to intra-well statistics.

Analytical results for the current detection monitoring sample from MW-2B are consistent with sampling events prior to November 2020, except for the increased SO<sub>4</sub> concentration, which was first detected during the November/December 2020 sampling event. However, SO<sub>4</sub> concentrations have started to decrease again after the initial elevated detection in November 2020. **Figure 4** depicts a time series for select constituents, including SO<sub>4</sub>, in well MW-2B. As discussed in the previous ASD (Geosyntec 2021c), the ionic composition of the site-specific leachate (as measured in 2018 and April 2021) is dominated by Ca, K, and SO<sub>4</sub>, while the chemical composition of groundwater in well MW-2B is dominated by Na, Cl and, to a larger extent than previously, by SO<sub>4</sub>.

As discussed in the previous two ASDs for SO<sub>4</sub> in MW-2B (Geosyntec, 2021b and c), the difference in the geochemical composition between the downgradient wells is likely due to slow recharge as a result of fewer and smaller water-bearing fractures deeper within the bedrock. Shallower wells with more prolific water-producing fractures, like MW-5B/R, are more oxygenated and appear to receive younger (and “fresher”) groundwater recharge, while water collected from lower-producing deeper wells is generally more reducing and has had a longer time to interact with the rock matrix, leading to increased weathering and dissolution of solutes (including naturally occurring, or geogenic, constituents/contaminants) into the water, increasing salinity and TDS concentrations in groundwater (e.g., Degnan et al., 2020; USGS, 2019). This phenomenon is illustrated by the geochemical fingerprints of the upgradient wells MW-6 and MW-7, which are not impacted by leachate, but indicate a very saline geochemical makeup with TDS and Cl concentrations consistent with seawater (see **Table 2**). As previously discussed, these wells were installed deep into bedrock and yield very little water. The resulting long residence times of groundwater in these small fractures increase not only the level of salinity, but also a number of other “CCR indicator parameters” such as boron (B) or Ca, as well as some more mobile Appendix IV parameters such as lithium (Li). Similarly, the geochemical composition of samples collected from downgradient wells installed deeper into the bedrock, especially MW-2B, is likely the result of these weathering processes and longer groundwater residence times.

The June 2021 ASD also presented an updated Piper diagram to evaluate geochemical similarities or dissimilarities between downgradient groundwater samples and site-specific leachate. It was shown that all three downgradient wells at the Spurlock Landfill exhibited very different geochemical characteristics from each other, indicating that they represent distinct localized conditions. Furthermore, the geochemical composition of

groundwater from well MW-2B is distinctly different from the geochemical composition of the site-specific leachate and does not indicate a release from the CCR unit.

In addition, ion ratios of mobile CCR indicator parameters (i.e., B, SO<sub>4</sub>, and Cl) were calculated during previous ASDs, and have been updated using the most recent leachate (April 2021) and groundwater (November 2021) sampling results. The updated ion ratios are summarized in **Table 2** within this ASD, including for the upgradient wells MW-6 and MW-7 to provide additional context. Ion ratios for highly mobile constituents are useful indicators (i.e., “leachate tracers”) for geochemical characterization purposes since dilution of “source leachate” (with much higher solute mass per liter) by background groundwater (with much lower solute mass per liter) generally does not change these ratios. Note that Li was again included as a constituent to calculate ion ratios since Li is usually weakly sorbed/attenuated and also acts as a “leachate tracer” and is contained in site-specific leachate and groundwater at detectable concentrations. As can be seen in **Table 2**, these ion ratios are very different between each compliance well and the CCR leachate. The differences are especially pronounced between well MW-2B and CCR leachate, which further supports that the geochemical signature in this well is unrelated to potential leachate releases from the CCR Unit.

### **3.3 Alternate Source**

As described in Section 3.2 above, the SSI for SO<sub>4</sub> in well MW-2B is potentially the result of natural variation in groundwater quality. However, while unlikely, an alternate source can also not be excluded to explain the fairly sudden increase in SO<sub>4</sub> concentrations in this well first observed during the November/December 2020 detection monitoring event. As discussed further below, a potential alternate source could explain the increase in SO<sub>4</sub> without associated increases in B and Li that are characteristic for the site-specific CCR leachate. The leachate chemistry and ion ratios, which are distinctly different from the groundwater chemistry in well MW-2B, and the lack of leachate indicator parameters (i.e., other than SO<sub>4</sub>) in groundwater samples collected from well MW-2B indicate that a source other than the regulated CCR unit is likely responsible for the SO<sub>4</sub> SSI.

**Figure 4** depicts the time trends for the constituents B, SO<sub>4</sub>, Cl, and Li in well MW-2B; as mentioned above, these constituents could be viewed as “conservative leachate tracers.” As can be seen on this figure, B, Cl, and Li show similar trends that are generally decreasing during the time frame when SO<sub>4</sub> shows an unexpected and sudden increase in

concentrations. This clearly points to a source other than a release of CCR leachate from the CCR unit since none of the other potential conservative “indicator parameters” follow a pattern similar to  $\text{SO}_4$ . If a release from the CCR unit was the source of the SSI for  $\text{SO}_4$  in well MW-2B, one would expect (a) concurrent SSI(s) of other Appendix III and/or conservative Appendix IV constituents. This pattern in groundwater characteristics is inconsistent with a release of leachate from the regulated CCR unit, and it is most consistent with natural variation.

#### 4. CONCLUSIONS

This ASD for the Spurlock Landfill was prepared in accordance with 40 CFR 257.94(e)(2). The following lines of evidence demonstrate that the SSI for SO<sub>4</sub> in monitoring well MW-2B is not due to a leachate release from the regulated CCR unit.

1. The updated 2021 CSM reaffirmed that there is no continuous aquifer between upgradient and downgradient locations at the CCR unit; conditions below the Spurlock Landfill are likely dry (i.e., little to no groundwater or evidence of aquifer continuity was encountered during previous hydrogeologic investigations even prior to landfill construction) with limited to no recharge to areas covered by the Spurlock Landfill and an unlikely migration pathway for CCR leachate towards groundwater.
2. The chemical characteristics of CCR leachate and groundwater samples downgradient of the CCR unit are distinctly different; ion ratios of mobile and less reactive constituents indicate that the groundwater chemistry is not affected by a release of CCR leachate from the unit. These constituents will not be attenuated by mineral precipitation or adsorption reactions.
3. The site-specific hydrogeologic conditions, including very low hydraulic conductivities, result in substantial variability and natural fluctuations in groundwater quality depending on seasonality and climate that may not have been fully captured within the data set used to calculate intra-well prediction limits to date; the saline nature of groundwater from well MW-2B is consistent with long groundwater residence times that may affect the chemistry of groundwater in this area; therefore, this natural variation could result in detections of SSIs that are likely false positives.
4. While unlikely, an alternate source for the SO<sub>4</sub> SSI in well MW-2B (other than natural variation) cannot be excluded; an alternate source could explain the sudden and unexpected increase in SO<sub>4</sub> concentrations in this well without a concurrent increase in concentrations of other conservative leachate indicator parameters, as was found to be the case for well MW-2B.

Based on these multiple lines of evidence, the SSI for SO<sub>4</sub> detected in well MW-2B during the second semi-annual 2021 detection monitoring sampling event is not due to a leachate

release from the regulated CCR unit but is likely the result of natural variation. Based on these findings, Geosyntec has determined that the CCR unit may remain in the Detection Monitoring Program pursuant to 40 CFR 257.94(e)(2) and does not need to establish an Assessment Monitoring Program.

## 5. REFERENCES

- Degnan J.R., B.D. Lindsey, J.P. Levitt, and Z. Szabo (2020). The relation of geogenic contaminants to groundwater age, aquifer hydrologic position, water type, and redox conditions in Atlantic and Gulf Coastal Plain aquifers, eastern and south-central USA. *Science of the Total Environment* 723 (2020) 137835.
- Domenico, P.A. and F.W. Schwartz (1990). Physical and Chemical Hydrogeology, John Wiley & Sons, New York, 824 p.
- Geosyntec Consultants (2018a). Alternate Source Demonstration; Spurlock Station Landfill, Maysville, Kentucky; July 2018.
- Geosyntec Consultants (2018b). Supplemental Alternate Source Demonstration; Spurlock Station Landfill, Maysville, Kentucky; December 2018.
- Geosyntec Consultants (2019a). Groundwater Monitoring System and Hydrogeologic Investigation Report; Peg's Hill CCR Landfill, Maysville, Kentucky; February 2019.
- Geosyntec Consultants (2019b). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. December 2019.
- Geosyntec Consultants (2020). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. November 2020.
- Geosyntec Consultants (2021a). Groundwater Monitoring System and Hydrogeologic Investigation Report, Addendum No. 1; Peg's Hill CCR Landfill, Maysville, Kentucky; May 2021.
- Geosyntec Consultants (2021b). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. June 2021.
- Geosyntec Consultants (2021c). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. October 2021.

- Haley & Aldrich (2018a). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. April 2018.
- Haley & Aldrich (2018b). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. October 2018.
- Haley & Aldrich (2019a). East Kentucky Power Cooperative, Inc.; Spurlock Landfill; Selection of Statistical Procedures; April 8, 2019.
- Haley & Aldrich (2019b). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. May 2019.
- Haley & Aldrich (2019c). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation; East Kentucky Power Cooperative; H.L. Spurlock Generating Station Landfill, Maysville, Kentucky; October 2019.
- Haley & Aldrich (2020). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. June 2020.
- Haley & Aldrich (2021). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. July 2021.
- Haley & Aldrich (2022). DRAFT Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. February 2022.
- Heath R.C. (1983). Basic Ground-Water Hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p.
- Kenvirons, Inc. (2002). Spurlock Station Landfill, Mason County, Kentucky, East Kentucky Power Cooperative, Inc.; Modification to Permit No. 081-00005; Special Waste Landfill Expansion; March 2002.



- Kenviron, Inc. (2018). Spurlock Station Landfill, Phase 3-A Cell Construction; CCR Rule Post-Construction Design Certification East Kentucky Power Cooperative; Coal Combustion Residual Rule Compliance; Rev. 0 (01/19/2018).
- Tetra Tech, Inc. (2017). Groundwater Monitoring System and Hydrogeologic Investigation Report, Spurlock Landfill, H.L. Spurlock Generating Station, Maysville, Kentucky; October 10, 2017.
- U.S. EPA (2009). Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance; March 2009.
- USGS, Water Resources, 2019. *Chloride, Salinity, and Dissolved Solids*. Available at [https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids?qt-science\\_center\\_objects=3#qt-science\\_center\\_objects](https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids?qt-science_center_objects=3#qt-science_center_objects). Accessed on April 7, 2022.

# TABLES

**Table 1 - Summary of Intra-Well Statistics of Detection Monitoring Program Data in Comparison to Leachate Data**  
Alternative Source Demonstration for Sulfate under the Federal CCR Rule  
Spurlock Station Landfill, Maysville, Kentucky

Constituent <sup>1</sup>	MW-2B		MW-3B		MW-5B/R		Leachate		
	2nd Half 2021 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	2nd Half 2021 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	2nd Half 2021 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	March 2018	September 2020	April 2021
Boron	4.14	6.02	1.90	7.53	0.621	0.92	31.1	NA <sup>4</sup>	31.5
Calcium	42.5	67	176	304	135	156	507	NA	505
Chloride	1,680	3,361	246	340	26.9	43	325	NA	807
Fluoride	1.96	2.65	<0.5 <sup>5</sup>	0.50	<0.5	0.50	<0.5	NA	0.73
pH	7.82	7.28 / 9.00	7.25	6.49 / 7.86	7.08	6.72 / 7.58	8.26	7.98 (lab) 7.97 (field)	7.87
Sulfate	<b>469<sup>6</sup></b>	428	396	745	178	230	2,160	NA	2,260
Total Dissolved Solids	3,900	5,485	1,210	1,565	526	743	4,084	NA	5,090

Notes:

<sup>1</sup>All concentrations are in milligrams per liter (mg/L), except pH, which is expressed in standard units (s.u.).

<sup>2</sup>Second half 2021 detection monitoring event conducted on 19 November 2021.

<sup>3</sup>Intra-well UPL - 95% Upper Prediction Limit developed by Haley & Aldrich using data collected between October 2016 and May 2020; the reporting limit (RL) is used for values below the RL (e.g., for fluoride).

<sup>4</sup>NA - Not analyzed

<sup>5</sup>Value is less than the reporting limit.

<sup>6</sup>Bold number and yellow highlight indicate statistically significant increase above background for the November 2021 detection monitoring program samples.

Sample results provided by East Kentucky Power Cooperative.

**Table 2. CCR Leachate and Groundwater Characteristics at the Spurlock Landfill**

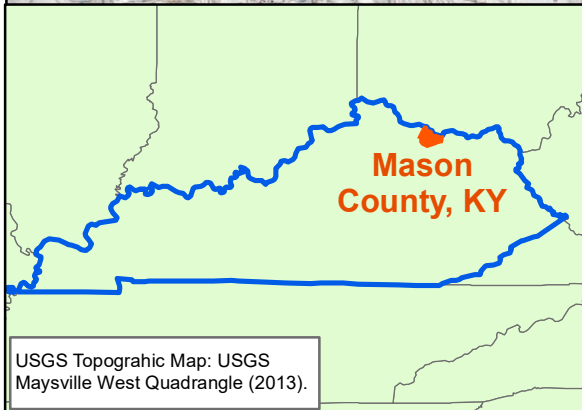
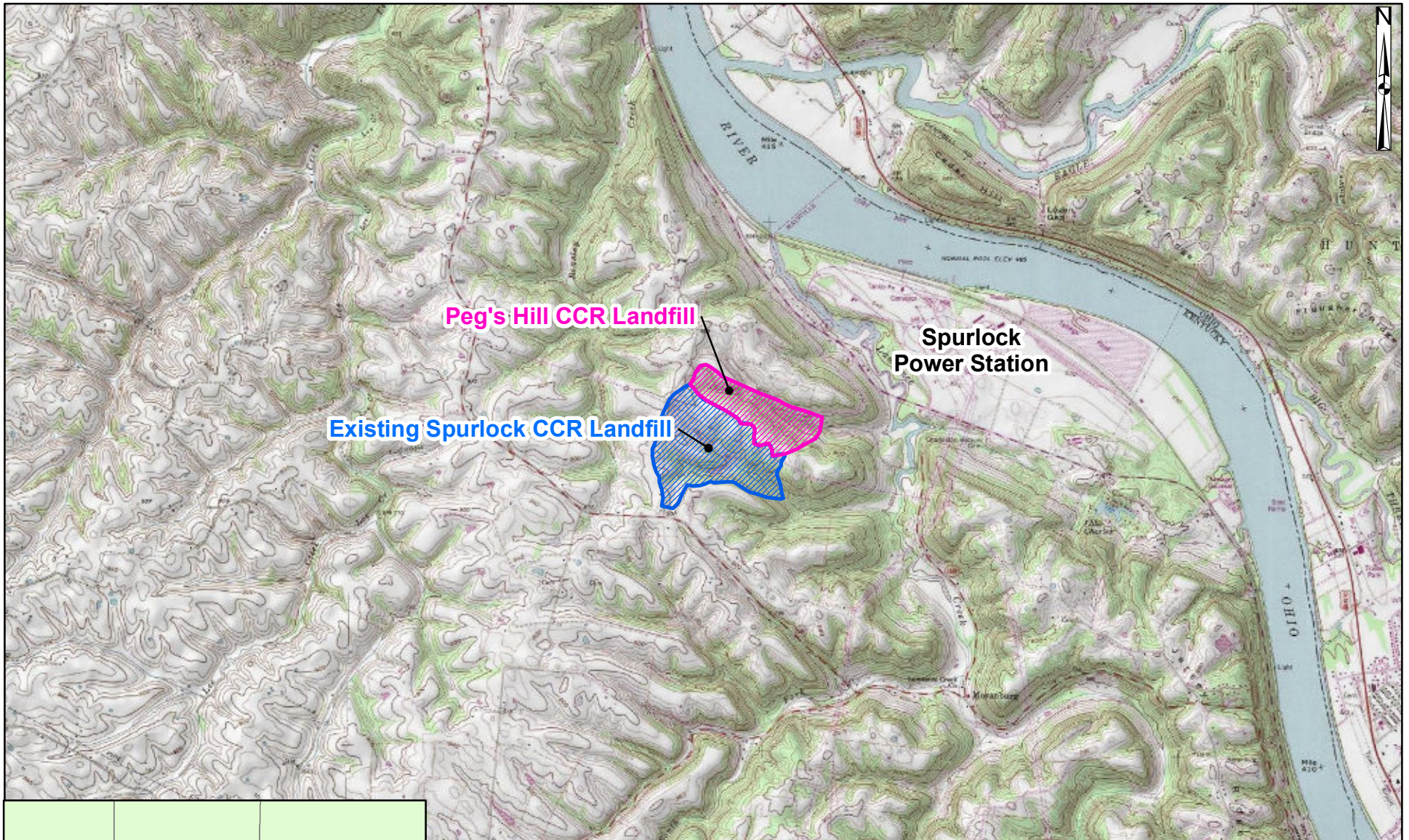
	Leachate <sup>1</sup>	Upgradient Wells <sup>2, 3</sup>		Downgradient Wells <sup>3</sup>		
		MW-6	MW-7	MW-2B	MW-3B	MW-5B/R
<b>Field Parameters</b>						
pH (s.u.)	7.87	7.11	7.01	7.82	7.25	7.08
Conductivity (µS/cm)	5,964	56,130	37,680	6,780	1,996	904
DO (mg/L)	3.25	<1.0	<1.0	<1.0	<1.0	3.00
ORP (mV)	61.3	-118.1	-82.3	-131.6	-79.2	39.7
Turbidity (NTU)	<1.0	<1.0	<1.0	<1.0	<1.0	1.58
<b>Appendix III</b>						
Boron (mg/L)	31.5	1.61	4.46	4.14	1.90	0.621
Calcium (mg/L)	505	1,290	514	42.5	176	135
Chloride (mg/L)	807	20,700	14,700	1,680	246	26.9
Fluoride (mg/L)	0.73	<0.5	0.71	1.96	<0.5	<0.5
pH (s.u.)	7.87	7.11	7.01	7.82	7.25	7.08
Sulfate (mg/L)	2,260	408	63.9	469	396	178
TDS (mg/L)	5,090	35,000	22,600	3,900	1,210	526
<b>Select Appendix IV</b>						
Lithium (µg/L)	6,930	1,460	1,600	302	386	97.3
<b>Ion Ratios (mol/mol)</b>						
B/SO <sub>4</sub> (x10 <sup>-3</sup> )	124	35.1	621	80	31.7	21.5
B/Cl (x10 <sup>-3</sup> )	128	0.256	0.997	8.26	18.8	52.7
SO <sub>4</sub> /Cl	1.03	0.007	0.002	0.103	0.595	2.44
Li/B (x10 <sup>-3</sup> )	342	1,411	558	111	426	351
Li/Cl (x10 <sup>-3</sup> )	43.9	0.361	0.557	0.920	8.03	18.5
Li/SO <sub>4</sub> (x10 <sup>-3</sup> )	42.5	49.6	347	8.92	13.5	7.57

<sup>1</sup>Sampled on 4/28/2021

<sup>2</sup>Upgradient wells are no longer used for statistical analyses, but are still sampled and results are provided for context



<sup>3</sup>Upgradient and downgradient wells were sampled on 11/19/2021

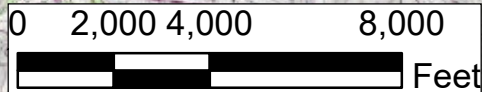
# FIGURES



USGS Topographic Map: USGS  
Maysville West Quadrangle (2013).

**Legend**

-  Peg's Hill CCR Landfill (Approximate Extent)
-  Existing Spurlock CCR Landfill



**SITE LOCATION MAP**

East Kentucky Power Cooperative  
Peg's Hill Landfill  
Mason County, Kentucky

PREPARED FOR



**EAST KENTUCKY  
POWER COOPERATIVE**  
A Touchstone Energy Cooperative

PREPARED BY



**Geosyntec**  
consultants  
**KENNESAW, GA**

Figure  
1

PROJECT NO. GR8809




DOCUMENT NO. GA220159

APRIL 2022

N:\E\East Kentucky Power\Spurlock Landfill\Area D MW Network\GIS\IMX\Ds\2021\ASD\Monitoring Well Location Map June 2021.mxd\DY 7/8/2021



### Legend

-  CCR Rule Monitoring Well
-  Abandoned Boreholes/Wells
-  Approximate Permitted Waste Boundary

Note: Groundwater elevation calculated based on 28 April 2021 measurements.

### MONITORING WELL LOCATION MAP

East Kentucky Power Cooperative  
Spurlock Landfill

PREPARED FOR



PREPARED BY

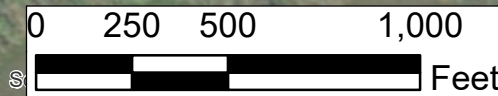


Figure  
2

PROJECT NO. GR8809

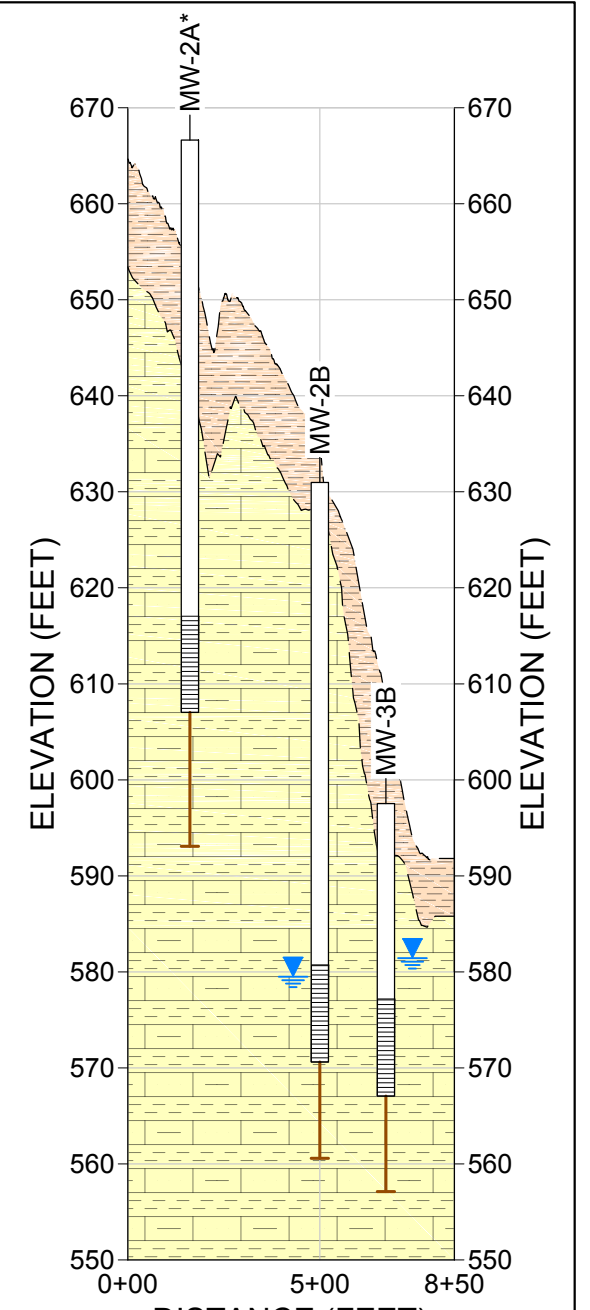
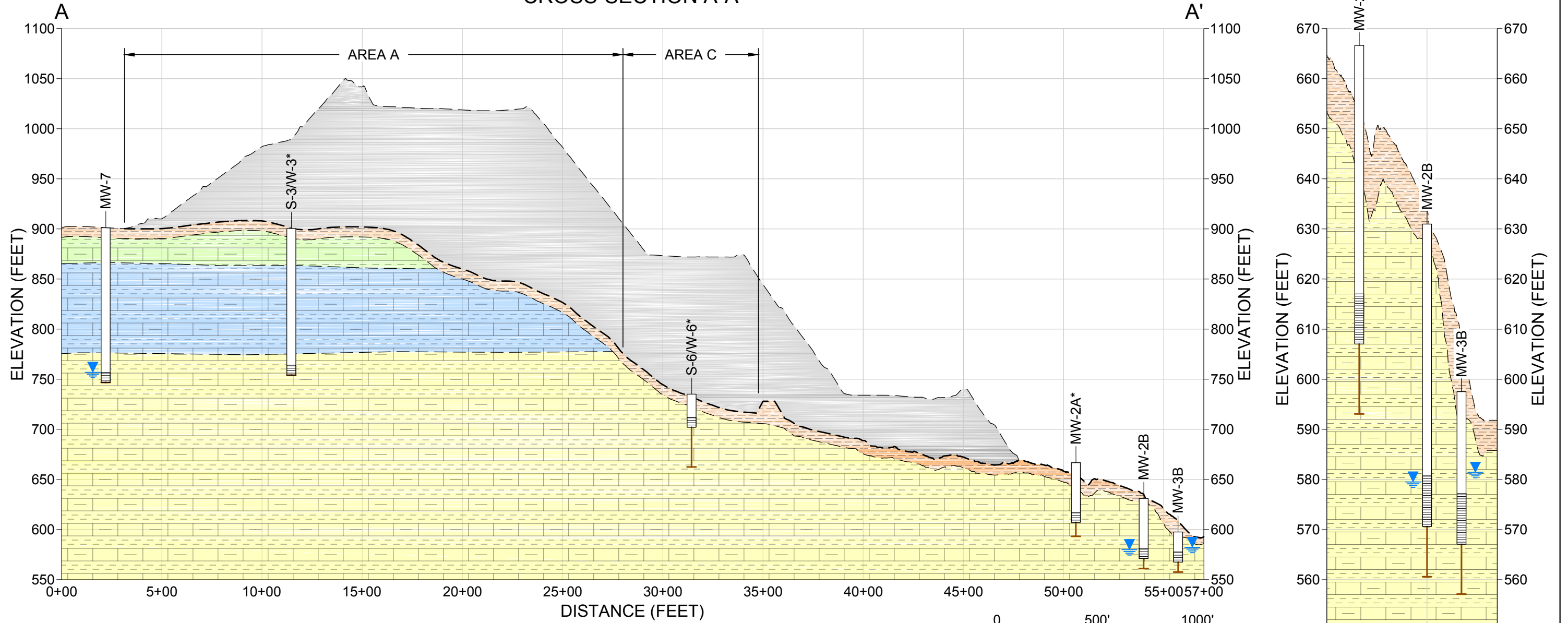
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APRIL 2022



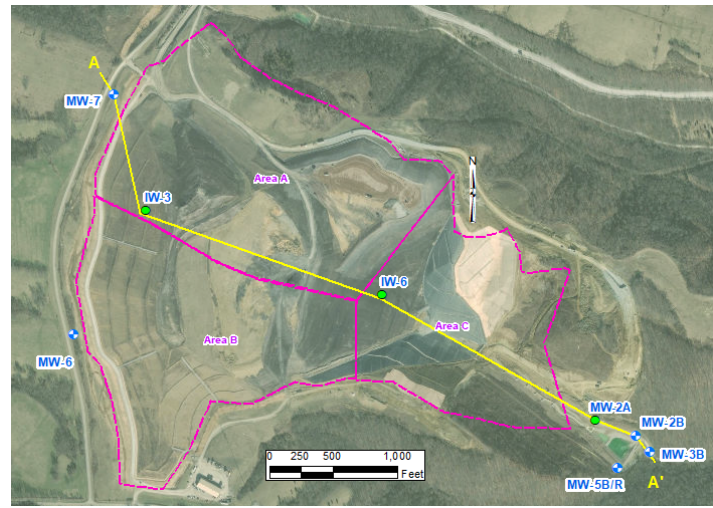
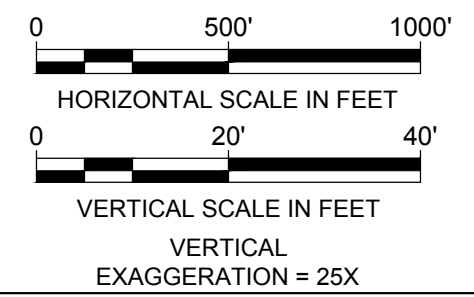
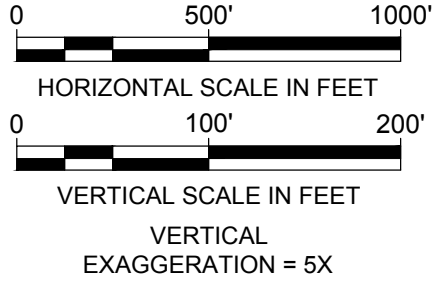
L:\CADD\EAST KENTUCKY POWER\DRAWINGS\GR7134.00 - SPURLOCK LANDFILL\GR7134-001

### CROSS-SECTION A-A'



#### LEGEND

- LITHOLOGIC DESCRIPTIONS**
- ASH
  - LIGHT BROWN OR RED BROWN OR BROWN SILTY CLAY, LEAN CLAY OR FAT CLAY WITH LIMESTONE PIECES
  - LOWER GRANT LAKE FORMATION (INTERBEDDED LIMESTONE (70-75%) WITH SHALE (25-30%))
  - FAIRVIEW FORMATION (INTERBEDDED LIMESTONE (55-60%) WITH SHALE (35-45%))
  - KOPE FORMATION (INTERBEDDED SHALE (70-80%) WITH LIMESTONE (20-30%))
- SYMBOLS**
- PIEZOMETER / WELL
  - SCREEN INTERVAL
  - SOIL BORING
  - GROUNDWATER ELEVATION (19 NOVEMBER 2021)
  - 24" SOIL LINER ( $1 \times 10^{-7}$  CM/SEC)
  - CLAY / POZOTEC LAYER
  - ABANDONED BORING / WELL
- NOTE:**
- TOP OF ASH ELEVATION FROM 2019 WAS OBTAINED FROM SURVEY CONDUCTED ON 25 NOVEMBER 2020 BY MIKON.

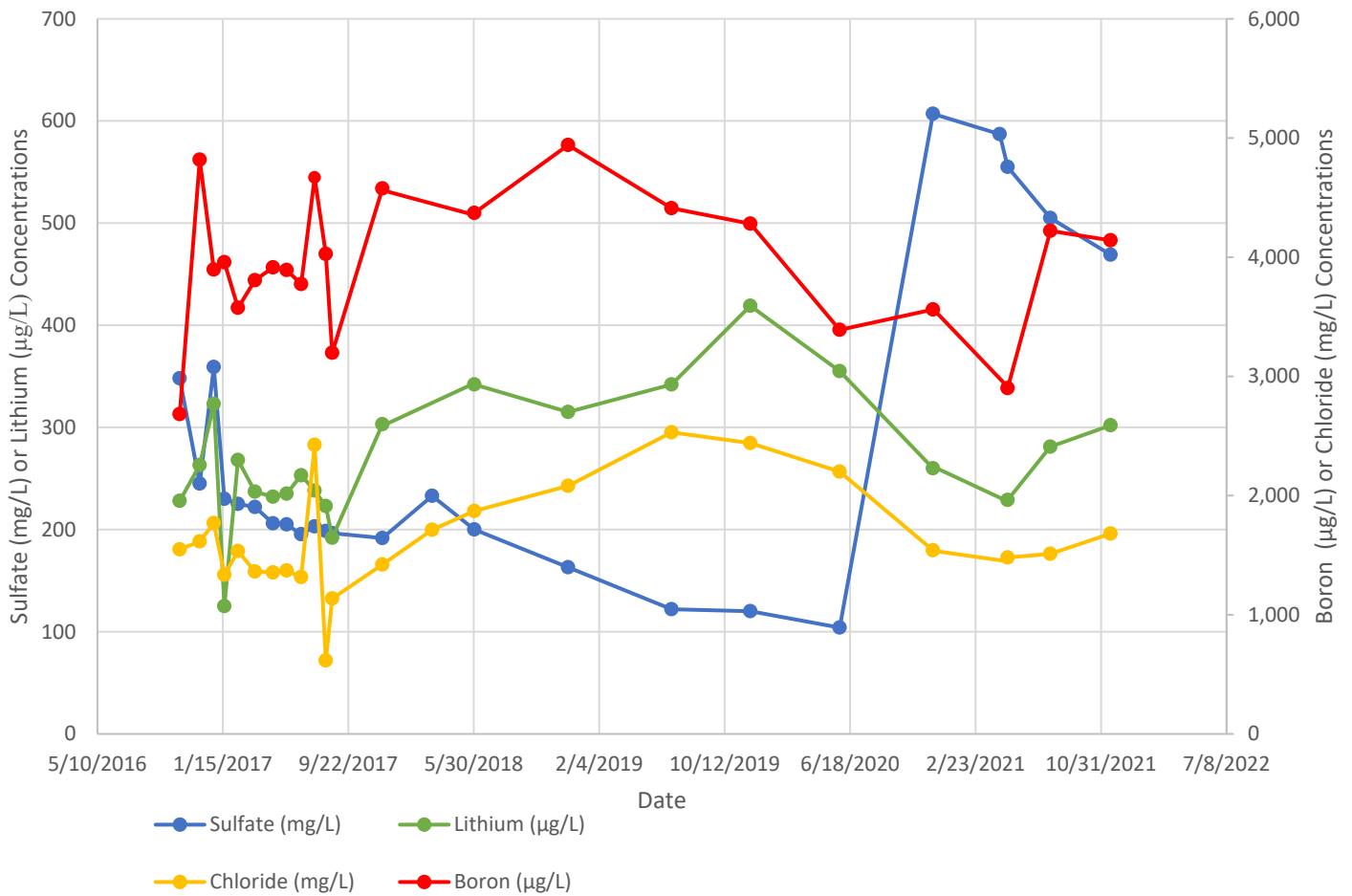


KEY MAP SECTION A-A'

CROSS-SECTION A-A' East Kentucky Power Cooperative Spurlock Landfill Mason County, Kentucky			
PREPARED BY: 	PREPARED FOR: 	FIGURE <b>3</b>	
KENNESAW, GA	PROJECT #: GR8809	GA220154	APRIL 2022



### Sulfate, Chloride, Boron and Lithium Time Series



Notes: Concentration trends of select constituents in well MW-2B covering the monitoring history of this well between October 2016 and November 2021.

#### Time Series of Select Constituents in MW-2B

Spurlock Station Landfill  
Maysville, Kentucky

PREPARED FOR



PREPARED BY



PROJECT NO. GR8809

DOCUMENT NO. GA220159

**Figure**

**4**



*Prepared for*

**East Kentucky Power Cooperative**  
P.O. Box 707  
Winchester, Kentucky 40392-0707

# **ALTERNATE SOURCE DEMONSTRATION**

## **SPURLOCK STATION LANDFILL**

### **MAYSVILLE, KENTUCKY**

*Prepared by*

**Geosyntec**   
consultants

engineers | scientists | innovators

1255 Roberts Boulevard, Suite 200  
Kennesaw, Georgia 30144

Project Number GR9232

October 2022



## ALTERNATE SOURCE DEMONSTRATION

H.L. Spurlock Generating Station  
Spurlock Landfill  
Maysville, Kentucky

October 18, 2022

A handwritten signature in black ink that reads "Herwig Goldemund".

---

Herwig Goldemund, Ph.D.  
*Principal*

A handwritten signature in black ink that reads "Robert M. Glazier".

---

Robert Glazier  
*Project Director*

**Certification Statement**

**Alternate Source Demonstration  
H.L. Spurlock Generating Station  
Spurlock Landfill  
Maysville, Kentucky  
October 18, 2022**

I, Scott Graves, a qualified professional engineer registered in the Commonwealth of Kentucky, certify that the above document was completed consistent with the requirements stipulated in 40 CFR 257.94(e)(2) and that the information contained herein is, to the best of my knowledge, accurate.

  
Seal and Signature



10/18/2022  
Date

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## LIST OF ACRONYMS

ASD	alternate source demonstration
B	boron
bgs	below ground surface
Ca	calcium
CCR	coal combustion residual
CFR	Code of Federal Regulations
cm/sec	centimeter per second
Cl	chloride
DO	dissolved oxygen
EKPC	East Kentucky Power Cooperative
FGD	flue gas desulfurization
ft. bgs	feet below ground surface
ft./ft.	feet per foot
ft./yr.	feet per year
HCO <sub>3</sub>	bicarbonate
K	potassium
KPDES	Kentucky Pollution Discharge Elimination System
Li	lithium
LPL	lower prediction limit
mg/L	milligram per liter
Na	sodium
SSI	statistically significant increase
SO <sub>4</sub>	sulfate
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UPL	upper prediction limit
UTL	upper tolerance limit

## 1. INTRODUCTION

### 1.1 Introduction and Purpose

The Federal Coal Combustion Residuals (CCR) Rule provides a process under 40 Code of Federal Regulations (CFR) Section 257.94(e)(2) for the owner/operator of a regulated CCR unit to demonstrate that a statistically significant increase (SSI) above background concentrations of Appendix III constituents during the detection monitoring program is not due to a release of CCR constituents from the CCR unit. An SSI for one or more Appendix III constituents might be a potential indication of a release of CCR constituents from the CCR unit to groundwater. However, the CCR unit may remain in the detection monitoring program if it can be demonstrated that an SSI is due to an error (i.e., sampling error, laboratory error, or statistical analysis error), due to natural variation in groundwater quality, or due to an alternate source (other than the regulated CCR unit). The Federal CCR Rule does not contain requirements nor reference agency guidance for a successful alternate source demonstration other than certification of its accuracy by a Professional Engineer.

Geosyntec Consultants, Inc. (Geosyntec) previously prepared a total of seven successful Alternate Source Demonstrations (ASDs) for East Kentucky Power Cooperative's (EKPC's) Coal Combustion Residuals (CCR) Landfill Unit at the Spurlock Generating Station in Maysville, Kentucky, referred to herein as the Site, the Landfill, and the CCR Unit (Geosyntec, 2018a and b, 2019b, 2020, 2021b and c, and 2022). One of the major findings of the previous ASD reports was the fact that the upgradient groundwater monitoring wells MW-6 and MW-7 are not representative of background groundwater conditions that could be compared to downgradient conditions at the compliance wells (MW-2B, MW-3B, and MW-5B/R) to detect a potential release from the regulated unit (Geosyntec, 2018a and b). Together with previous demonstrations that certify that the SSI(s) were not due to a release from the unit, there was enough evidence that a new statistical approach was needed for the detection monitoring program at this CCR Unit. Therefore, Haley & Aldrich certified new statistical methods on 8 April 2019 that shifted the statistical approach from inter-well to intra-well statistics (Haley & Aldrich, 2019a).

On 31 May 2022, EKPC collected samples for the first semi-annual 2022 detection monitoring event. Groundwater sampling results were statistically analyzed by Haley & Aldrich, and SSIs for calcium (Ca) and sulfate (SO<sub>4</sub>) were identified in monitoring well MW-2B. EKPC was verbally notified on 20 July 2022 of the SSIs and commissioned



Geosyntec to evaluate if the SSIs detected during the detection monitoring event were caused by a release from the CCR Unit. This report constitutes an ASD to evaluate whether the SSIs for Ca and SO<sub>4</sub> in well MW-2B are not due to a release from the regulated unit.

## **1.2 Site Description**

The Spurlock Landfill occupies a disposal area of approximately 177 acres and is located along South Ripley Road in Mason County, Kentucky. The Site is located approximately five miles northwest of Maysville, Kentucky. Immediately adjacent to the Spurlock Landfill lies the site of the recently permitted Peg's Hill CCR Landfill (**Figure 1**). Construction activities for the Peg's Hill Landfill are anticipated to start in 2023.

The Spurlock Landfill consists of three sections, designated as Areas A, B, and C (see **Figure 2**) and is permitted to accept approximately 1.8 million tons of CCR waste annually, including fly ash, bottom ash, and flue gas desulfurization (FGD) process wastes.

## **1.3 Description of the CCR Unit**

The areal extent of the Spurlock Landfill was developed in three major sections, designated as Area A, Area B, and Area C. Area A was the earliest section developed, with landfilling operations commencing in 1982, followed by development of Area B. Area C was the most recent section developed, with initial construction taking place in approximately 2010, and final phase cell construction for Area C, Phase 5 ending in October 2021. As indicated above, the adjacent Peg's Hill Landfill has been permitted, with the initial phase of construction to be completed and receipt of waste to commence in 2023.

The CCR Unit that is the subject of this ASD includes all three areas of the Spurlock Landfill (A, B, and C), which are underlain by different liner systems as further described in Subsection 2.2 below. Peg's Hill Landfill will be a new, and separate, CCR Unit under 40 CFR Part 257 that has not yet received any waste.

## **1.4 Groundwater Monitoring System**

**Figure 2** depicts the layout of the Landfill together with the certified CCR groundwater monitoring well network. A *Groundwater Monitoring System and Hydrogeologic*

*Investigation Report* was prepared in support of certifying the monitoring well network at the Landfill (Tetra Tech, 2017). Groundwater monitoring activities were implemented to comply with the requirements of 40 CFR 257.90 through 257.98.

The Landfill is underlain by three bedrock formations, including (from top to bottom) the Grant Lake Formation (both Upper and Lower members), the Fairview Formation, and the Kope Formation, all of which were deposited and formed during the Upper Ordovician geologic period. All three formations are comprised of interbedded limestone and shale, but their percentages vary in each of the formations. The Grant Formation contains about 70-90% limestone, the Fairview Formation contains about 50-60% limestone, while the Kope Formation consists of 20-30% limestone. The uppermost aquifer in the downgradient hydrogeologic position was determined to be in the weathered and fractured (upper) portion of the Kope Formation. (Tetra Tech, 2017).

The certified groundwater monitoring well network consists of two upgradient monitoring wells (MW-6 and MW-7) and three downgradient monitoring wells (MW-2B, MW-3B, and MW-5B/R), as depicted on **Figure 2**. The upgradient monitoring wells (i.e., MW-6 and MW-7) were installed as 2-inch diameter wells to a total depth of 160 ft. feet below ground surface (ft. bgs) with a 10-foot screened interval between 150 ft. and 160 ft. bgs. As such, they were installed within the same geologic formation (i.e., the Kope Formation) as the downgradient wells, but much deeper within the bedrock compared to the downgradient wells. Since fractures in bedrock generally decrease with depth (and therefore, recharge and transmission of groundwater within these fractures generally decreases with depth), the water chemistry within these deeper wells may be affected by the longer residence time in this different hydrogeologic position that increases the dissolved solids relative to more shallow wells. Three shallower downgradient monitoring wells were installed as 2-inch diameter wells to total depths of 60 ft. bgs (MW-2B), 30 ft. bgs (MW-3B), and 40 ft. bgs (MW-5) in the same geologic unit as the upgradient wells. They were completed with a 10-foot screen at the bottom of the boring. MW-5 did not produce sufficient volumes of water for sampling, and it was subsequently replaced in January 2017 with a 4-inch well at the same location and designated as groundwater monitoring well MW-5B, which is screened from 14 ft. to 24 ft. bgs. Note that well MW-5B is also referred to as MW-5R in some reports and therefore, it is designated as MW-5B/R in this ASD report. All well screens have an opening size of 0.01 inches (i.e., 10-slot).

## **1.5 Detection Monitoring Program**

Groundwater monitoring under the CCR Rule at the Landfill began in October 2016 following the installation and development of each monitoring well. At least eight baseline groundwater samples were collected from each upgradient and downgradient well prior to October 17, 2017. Baseline sampling events were conducted between October 2016 and August 2017 for wells MW-2B, MW-3B, MW-5B/R, MW-6, and MW-7. Detection Monitoring for the Landfill began in October 2017, and the initial detection monitoring sampling event was conducted in November 2017.

Statistical estimates of the upper end of the range of background concentrations were initially calculated by Haley and Aldrich (2018a and b) using the baseline monitoring data and inter-well statistical methods. The initial background concentrations were calculated using the Upper Tolerance Limit (UTL) method as described in the U.S. Environmental Protection Agency's (USEPA) 2009 Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance (Unified Guidance) and 40 CFR Section 257.93(f)(3).

Following the first two ASDs finding no release from the CCR Unit and based on the sampling data obtained from the groundwater monitoring network, Haley and Aldrich reevaluated the statistical approach and determined that intra-well statistical testing is an appropriate and more sensitive method for detecting potential releases from the CCR Unit. An intra-well approach was certified and has been used for statistical evaluation for groundwater detection monitoring at the Landfill since the second half of 2018, pursuant to 40 CFR 257.94 (Haley and Aldrich, 2019a). Haley and Aldrich established intra-well background by calculating the intra-well Upper Prediction Limit (UPL) for each Appendix III constituent (as well as the Lower Prediction Limit [LPL] for pH) separately for each downgradient monitoring location.

Prior to conducting the statistical analysis for the November/December 2020 compliance event, the groundwater analytical results for samples collected from October 2016 through May 2020 were used by Haley and Aldrich to calculate updated intra-well UPLs and LPL (for pH) for each downgradient well. These current intra-well background UPLs (and LPL for pH) are provided in **Table 1** and are used to evaluate potential SSIs at each downgradient well during each semi-annual groundwater monitoring event. The next time background will be reevaluated is prior to the statistical evaluation of the second semi-annual compliance event of 2022 (Haley and Aldrich, 2022a).

In addition, leachate data from previous ASD demonstrations as well as the current leachate sampling results are included in **Table 1** for comparison purposes.

### **1.6 Basis of the Statistically Significant Increase**

The concentrations of each Appendix III constituent from the first 2022 semi-annual detection monitoring sampling event were compared to their respective UPLs/LPL at the three downgradient compliance wells. A sample concentration greater than the UPL is considered to represent an SSI. Statistically significant increases for Ca and SO<sub>4</sub> were detected at MW-2B (Haley and Aldrich, 2022b). No other SSIs were identified at the Landfill. The results are summarized in **Table 1**.

## 2. CONCEPTUAL SITE MODEL

### 2.1 Waste Description

The Spurlock Landfill currently occupies a disposal area of 176.67 acres and is permitted to accept approximately 1.8 million tons of CCR materials annually. These materials include fly ash, bottom ash, and FGD process wastes.

### 2.2 Engineered Barrier Systems

The original extent of Areas A and B is underlain by in-situ clay material that was not engineered to meet certain thickness and/or hydraulic performance criteria (EKPC, personal communication). However, in-situ clay materials tested for the expansion design had measured vertical hydraulic conductivities of approximately  $10^{-8}$  centimeters per second (cm/sec) (Kenvirons, 2002).

Subsequently, a horizontal and vertical expansion was designed for the Spurlock Landfill, which included horizontal “expansion areas” outside of the original footprint of Areas A and B to allow for a vertical expansion on top of these areas while still maintaining the appropriate side slopes. Based on design drawings presented in the March 2002 Permit Modification Application (Kenvirons, 2002), the Area A and B expansion areas of the Landfill are underlain by an engineered 24-inch clay liner with a maximum vertical hydraulic conductivity of  $10^{-7}$  cm/sec.

Similar to the Area A and B expansion areas, Phase 1 of Area C is underlain by an engineered 24-inch clay liner with a maximum vertical hydraulic conductivity of  $10^{-7}$  cm/sec. Areas underlain by this engineered clay liner also contain a leachate collection layer composed of materials with a vertical hydraulic conductivity of  $10^{-2}$  cm/sec on top of the clay liner.

The liner system for Phases 2, 3 and 4 of Area C consists of two components to meet the requirements of 40 CFR 257.70: an upper component consisting of a 60-mil HDPE geomembrane and a lower component consisting of at least a two-foot compacted soil layer with a maximum vertical hydraulic conductivity of  $10^{-7}$  cm/sec over subgrade construction. Areas underlain by this CCR Rule engineered liner system also contain a leachate collection and removal system that meets the requirements of 40 CFR 257.70 (Kenvirons, 2018). It is also noted that the recently completed Phase 5 of Area C was designed and constructed with a liner system and leachate collection/removal system

consistent with that of Phases 2 through 4 and meeting the requirements of 40 CFR 257.70.

### **2.3 Potential Release Mechanisms**

The potential release mechanism for CCR constituents from the Spurlock Landfill to groundwater would be via infiltration of precipitation into the CCR, dissolution of the soluble components of the CCR materials into leachate, and (potential) migration of leachate to groundwater through defects and cracks in the engineered barrier system. It is noted, however, that the expansion areas outside of Areas A and B (as well as Area C) are constructed with an engineered liner system and are equipped with a leachate collection system composed of a drainage layer containing materials with a hydraulic conductivity of  $10^{-2}$  cm/sec on top of the 24-inch clay liner and/or the geomembrane liner (for Phases 2 and 3 of Area C). This drainage layer conveys leachate towards lined sedimentation Pond 1, where it mixes with stormwater and is treated by aeration/gravity settling before discharge via Outfall 008 permitted through the Kentucky Pollutant Discharge Elimination System (KPDES) Permit No. KY0022250.

While the removal of leachate from large portions of the Landfill reduces the potential for a downward hydraulic gradient driving force, seepage into the subsurface cannot be excluded, especially from the original areas that may not contain a fully engineered liner system with a drainage layer on top. However, seepage (if it occurs at all) is expected to be minor due to low leachate generation rate as a result of the dry-handling of the CCR waste, the low permeability of the CCR waste (which limits percolation of rainwater through the waste), the storm water run-on/runoff controls, and the aforementioned engineered liner systems.

### **2.4 Migration Pathways and Site-Specific Hydrogeologic Setting**

To illustrate potential groundwater migration pathways within, below, and around the Spurlock Landfill, several cross sections were developed and presented in the July 2018 ASD report (Geosyntec, 2018a). These cross-sections illustrated that there was likely not a continuous aquifer between upgradient (i.e., MW-6 and MW-7) and downgradient (i.e., MW-2B, MW-3B, and MW-5B/R) monitoring wells since many dry borings were encountered below the footprint of the Landfill during previous hydrogeologic investigations conducted in support of designing and permitting the initial areas and phases of the Landfill.

Geosyntec conducted a hydrogeologic investigation within the adjacent permitted Peg's Hill CCR Landfill area in support of certifying a CCR monitoring well network at that location (Geosyntec, 2019a and 2021a). The Peg's Hill CCR Landfill site is located in the adjacent watershed from the existing Spurlock CCR Landfill, which is the subject of this ASD report, and therefore, the geology and hydrogeology at that location are very similar to the Spurlock Landfill.

During the hydrogeologic investigation at the Peg's Hill Landfill, longer-term (i.e., 11 days) aquifer recovery tests were performed in each of the five installed wells because the wells did not recover within a few hours after initial drawdown. This was done in lieu of traditional slug testing and provided a better and more reliable estimate of hydraulic conductivity within the monitored formation (i.e., the upper portions of the Kope Formation, which constitutes the uppermost aquifer at both the existing Spurlock Landfill as well as the permitted Peg's Hill Landfill). The horizontal hydraulic conductivity values estimated for the Kope Formation from these aquifer recovery tests ranged from  $5.6 \times 10^{-7}$  cm/sec to  $1.9 \times 10^{-6}$  cm/sec. These results are lower than the short-term slug test results reported by Tetra Tech (2017) for Spurlock Landfill, which ranged from  $2.9 \times 10^{-5}$  cm/sec to  $1.4 \times 10^{-4}$  cm/sec, but they are consistent with the horizontal hydraulic conductivity values for secondary permeability associated with "tight" fractured rock in bedrock wells (Heath, 1983). The hydraulic conductivity values obtained through longer-term aquifer testing are also within the ranges expected for shale and limestone (Dominico and Schwartz, 1990). Using an average horizontal hydraulic conductivity of  $1.12 \times 10^{-6}$  cm/sec, an effective porosity of 6% for shale, and a gradient of 0.066 ft./ft., a groundwater flow velocity of 1.27 ft./year was calculated (Geosyntec, 2019a).

The slow well recovery, the low hydraulic conductivity and the low groundwater flow velocity indicate that the formation does not yield much water and that the water entering a well likely has had long residence times, which is also consistent with the salinity levels detected in samples from certain wells that have low yields and slow recoveries, such as upgradient wells MW-6 and MW-7 as well as downgradient well MW-2B at Spurlock Landfill.

A representative cross-section (A-A') between upgradient well MW-7 and downgradient well MW-3B is presented on **Figure 3**. The figure also includes water level measurements taken in November 2021. Previous hydrogeologic investigations summarized in Geosyntec (2019a) indicated that many exploratory borings along

hillsides and ridges in this area did not contain groundwater, and only wells located near valley bottoms and drainage features contained sufficient water for sampling purposes. The presence of landfill liners, leachate collection systems, and landfilled dry CCR materials over large areas of potential groundwater recharge further reduces recharge within the footprint of the Landfill. The cross-section illustrates that, consistent with previous hydrogeologic investigation reports describing the geologic and hydrogeologic site setting, the area below the Landfill likely does not contain a continuous aquifer between the upgradient and downgradient locations.



### **3. ALTERNATE SOURCE DEMONSTRATION**

#### **3.1 Evaluation of Error**

##### **3.1.1 Potential Sampling Error**

Geosyntec was not present during groundwater sampling events. However, EKPC's field technicians are knowledgeable of the Site and have been briefed on the Site's *Sampling and Analysis Plan*, which details sampling protocols to be followed for each groundwater monitoring event. In addition, based on historical evaluations of field sampling records and communications with EKPC, there is little potential for false positive laboratory results due to suspended solids in the samples or inconsistent purging/sampling technique.

##### **3.1.2 Potential Laboratory Analysis Error**

EKPC conducts quality assurance/quality control (QA/QC) for data collected during groundwater monitoring activities as prescribed in Spurlock Landfill's *Sampling and Analysis Plan*. The QA/QC controls consist of data quality objectives, field and laboratory QA/QC requirements, and data validation (Stage I-III) components. Geosyntec did not conduct independent data validation of the laboratory results to evaluate whether laboratory analysis errors might have occurred during this event. However, previous and current charge balance calculations conducted for major cations and anions in the leachate and groundwater samples were/are indicative of good data quality. Therefore, there is a low potential for laboratory error.

##### **3.1.3 Potential Statistical Analysis Error**

Geosyntec performed high-level reviews of the *Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation* reports prepared by Haley and Aldrich (2019b and c, 2020, 2021, and 2022a and b) and did not identify concerns in the approach presented. The potential for statistical error is low.

#### **3.2 Natural Variation**

Based on the hydrogeologic setting of the Site, which is discussed in Subsection 2.4, it is possible that the full extent of natural variation at the Spurlock Landfill has not been captured by the intra-well prediction limits calculated to date due to low recharge and

slow groundwater flow velocities. Very little of the precipitation recharges into the upper portions of the Kope Formation, and most of the surface water runs off quickly through the various drainage channels and valleys towards larger streams and rivers. Only wells located close to these drainage valleys receive somewhat higher recharge. This hydrogeologic setting results in increased natural variation depending on climatic conditions (i.e., drought versus wet conditions) and seasonal groundwater recharge. It is therefore possible, and most likely, that the SSIs for Ca and SO<sub>4</sub> in monitoring well MW-2B are due to natural variation.

### 3.2.1 Groundwater and Leachate Sampling Results

The initial ASD (Geosyntec 2018a) as well as the ASD conducted to update the CSM under the modified statistical intra-well approach (Geosyntec, 2019b) indicated that the leachate chemistry was substantially different from the chemistry of downgradient wells, including well MW-2B. Indicators of salinity, including conductivity, chloride (Cl), and sodium (Na) were substantially higher in monitoring well MW-2B compared to CCR leachate. This indicated that leachate releases were not likely to be the source of the observed groundwater composition in well MW-2B. Furthermore, TDS in well MW-2B was dominated by Na, Cl and bicarbonate (HCO<sub>3</sub>), while TDS in leachate was dominated by SO<sub>4</sub>, calcium (Ca) and potassium (K) (Geosyntec, 2019b).

To confirm and further evaluate the groundwater results from May 2022, an additional round of groundwater sampling as well as the collection of a leachate sample were implemented on 6 September 2022. The September 2022 leachate results were used to update and compare leachate characteristics previously established during April 2021 and March 2018 leachate sampling events under prior ASD evaluations for the Site. **Table 1** includes a summary of Appendix III parameters for the three comprehensive leachate sampling events, and **Table 2** summarizes the groundwater and leachate results from the supplemental September 2022 sampling event. The analytical results from upgradient wells MW-6 and MW-7 are also included in **Table 2** to provide context regarding low recharge and high salinity, even though the results from these upgradient wells are no longer used for statistical comparisons since the transition from inter-well to intra-well statistics.

As can be seen in **Table 1**, the results of Appendix III parameters in leachate have generally been consistent across the three comprehensive leachate sampling events conducted between March 2018 and September 2022. This is especially true for the SSI

constituents Ca and SO<sub>4</sub>, but also for boron (B), which is frequently used as a “tracer” for CCR leachate. A fourth leachate sampling event in September 2020 was limited to the measurement of pH.

Similar to earlier leachate characterization events, the September 2022 results indicate that groundwater conditions in well MW-2B are more saline compared to site-specific leachate. Conductivity as well as concentrations of Na and Cl are higher in MW-2B compared to leachate, while TDS concentrations are comparable. TDS in well MW-2B is dominated by Na on the cationic side, and Cl on the anionic side, while TDS in leachate is dominated by K and Ca on the cationic side and SO<sub>4</sub> on the anionic side (**Table 2**).

As discussed in the previous three ASDs for SO<sub>4</sub> in MW-2B (Geosyntec, 2021b and c, and 2022), the difference in the geochemical composition between the downgradient wells is likely due to slow recharge as a result of fewer and smaller water-bearing fractures deeper within the bedrock. Shallower wells with more prolific water-producing fractures, like MW-5B/R, are more oxygenated and appear to receive younger (and “fresher”) groundwater recharge, while water collected from lower-producing deeper wells is generally more reducing and has had a longer time to interact with the rock matrix, leading to increased weathering and dissolution of solutes (including naturally occurring, or geogenic, constituents/contaminants) into the water, increasing salinity and TDS concentrations in groundwater (e.g., Degnan et al., 2020; USGS, 2019). This phenomenon is illustrated by the chemical characteristics of the upgradient wells MW-6 and MW-7, which are not impacted by leachate, but indicate a very saline geochemical makeup with TDS and Cl concentrations consistent with seawater (see **Table 2**). As discussed in Section 1.4, these wells were installed deep into bedrock and yield very little water. The resulting long residence times of groundwater in these small fractures increase not only the level of salinity, but also a number of other “CCR indicator parameters” such as B or Ca, as well as some more mobile Appendix IV parameters such as lithium (Li). Similarly, the geochemical composition of samples collected from downgradient wells installed deeper into the bedrock, especially MW-2B, is likely the result of these weathering processes and longer groundwater residence times.

### 3.2.2 Piper and Stiff Diagrams

To further evaluate geochemical similarities or dissimilarities between groundwater samples and site-specific leachate, updated Piper and Stiff diagrams were constructed using the results from the supplemental September 2022 sampling event.

Piper diagrams are trilinear diagrams that plot the relative contributions of major ions to the overall geochemical makeup of a liquid sample. The diagram has three components. The large diamond-shaped component displays the combined cation and anion composition of major solutes. The two smaller triangular components display the cation components and the anion components, separately and in greater detail. The sample data are plotted as a percentage of the total milliequivalents on the diagram with each component reaching 100 percent at its respective corner of the diagram. If the results from discrete samples plot relatively close to each other, their respective chemical compositions are similar, and they might have a similar (or the same) source of solutes.

**Figure 4** depicts the updated Piper diagram. As can be seen, the leachate sample and groundwater from MW-2B plot in very different areas of the diagram, indicating that they are geochemically dissimilar and that groundwater from MW-2B does not exhibit an impact from site-specific leachate. Furthermore, the geochemical makeup of groundwater from MW-2B is very similar to groundwater samples from upgradient wells MW-6 and MW-7 as these samples plot very close to each other. This is consistent with the discussion above and indicates that the geochemical makeup of the deeper groundwater wells (including MW-2B) is affected by low recharge and long groundwater residence times, leading to increased salinity and dissolution of naturally occurring constituents into groundwater. In addition, the geochemical makeup of groundwater samples from downgradient wells MW-2B, MW-3B and MW-5B/R is different for all three wells, indicating that they represent distinct localized conditions affected by varying degrees of recharge.

Stiff diagrams plot the chemical compositions of each sample as polygons. Similar-shaped polygons for different samples indicate similar geochemical compositions, and they might have a similar (or the same) source of solutes. The relative size of each polygon is an indication of the ionic strength (or “concentration”) of the respective sample. **Figures 5A** and **5B** depict the updated Stiff diagrams, organized by ionic strength as indicated by the different scales of these two figures. **Figure 5A** depicts the high-salinity samples of upgradient wells MW-6 and MW-7 as well as MW-2B. While groundwater from MW-2B has a lower ionic strength compared to the upgradient wells, it does show a very similar geochemical makeup that is dominated by Na and Cl. **Figure 5B** depicts the geochemical makeup of leachate and groundwater samples from MW-3B and MW-5B/R. As can be seen, these samples look dissimilar from each other as well as dissimilar from the other groundwater samples consistent with the interpretation of the

Piper diagram. Again, the geochemistry of groundwater from well MW-2B does not indicate an impact from site-specific leachate.

### 3.2.3 Ion Ratios

Ion ratios of mobile CCR indicator parameters (i.e., B, SO<sub>4</sub>, and Cl) were calculated during previous ASDs, and have been updated using the most recent supplemental leachate and groundwater sampling results from September 2022. The updated ion ratios are summarized in **Table 2**, including for the upgradient wells MW-6 and MW-7 to provide additional context. Ion ratios for highly mobile constituents are useful indicators (i.e., “leachate tracers”) for geochemical characterization purposes since dilution of “source leachate” (usually with much higher solute mass per liter) by groundwater (usually with much lower solute mass per liter) generally does not change these ratios. Note that Li was again included as a constituent to calculate ion ratios since Li is usually weakly sorbed/attenuated and also acts as a “leachate tracer” and is contained in site-specific leachate and groundwater at detectable concentrations. As can be seen in **Table 2**, these ion ratios are very different between each compliance well and the CCR leachate. The differences are especially pronounced between well MW-2B and CCR leachate, which further supports that the geochemical signature in this well is unrelated to potential leachate releases from the CCR Unit.

### 3.3 Alternate Source

As described in Section 3.2 above, the SSIs for Ca and SO<sub>4</sub> in well MW-2B are not due to a release from the CCR Unit, thus are likely the result of natural variation in groundwater quality due to differences in groundwater recharge and the resulting varying dissolution of solutes into groundwater. While this is not an “alternate source” in a more conventional sense (such as an industrial release of chemicals), it is a natural/geogenic source all around the CCR Unit and not a release of leachate from the regulated CCR Unit. This natural variation may not have been fully captured within the data set used to calculate intra-well prediction limits to date.

#### 4. CONCLUSIONS

This ASD for the Spurlock Landfill was prepared in accordance with 40 CFR 257.94(e)(2). The following lines of evidence demonstrate that the SSIs for Ca and SO<sub>4</sub> in monitoring well MW-2B are not due to a leachate release from the regulated CCR Unit.

1. The updated CSM reaffirmed that there is no continuous aquifer between upgradient and downgradient locations at the CCR Unit; conditions below the Spurlock Landfill are likely dry (i.e., little to no groundwater or evidence of aquifer continuity was encountered during previous hydrogeologic investigations even prior to landfill construction) with limited to no recharge to areas covered by the Spurlock Landfill and an unlikely migration pathway for CCR leachate towards groundwater.
2. The chemical characteristics of CCR leachate and groundwater samples downgradient of the CCR Unit are distinctly different; ion ratios of mobile and less reactive constituents indicate that the groundwater chemistry is not affected by a release of CCR leachate from the unit. These constituents will not be attenuated by mineral precipitation or adsorption reactions.
3. Updated Piper and Stiff diagrams indicate that the geochemistry of downgradient well MW-2B is similar to the deep, low-recharge and saline upgradient wells MW-6 and MW-7 and dissimilar from site-specific leachate, which is inconsistent with a leachate release from the regulated CCR Unit.
4. The site-specific hydrogeologic conditions, including very low hydraulic conductivities, result in substantial variability and natural fluctuations in groundwater quality depending on seasonality and climate that may not have been fully captured within the data set used to calculate intra-well prediction limits to date; the saline nature of groundwater from well MW-2B is consistent with long groundwater residence times that may affect the chemistry of groundwater in this area; therefore, this natural variation could result in detections of SSIs that are likely false positives.

Based on these multiple lines of evidence, the SSIs for Ca and SO<sub>4</sub> detected in well MW-2B during the first semi-annual 2022 detection monitoring event are not due to a leachate

release from the regulated CCR Unit but are likely the result of natural variation. Based on these findings, Geosyntec has determined that the CCR Unit may remain in the Detection Monitoring Program pursuant to 40 CFR 257.94(e)(2) and does not need to establish an Assessment Monitoring Program.

## 5. REFERENCES

- Degnan J.R., B.D. Lindsey, J.P. Levitt, and Z. Szabo (2020). The relation of geogenic contaminants to groundwater age, aquifer hydrologic position, water type, and redox conditions in Atlantic and Gulf Coastal Plain aquifers, eastern and south-central USA. *Science of the Total Environment* 723 (2020) 137835.
- Domenico, P.A. and F.W. Schwartz (1990). Physical and Chemical Hydrogeology, John Wiley & Sons, New York, 824 p.
- Geosyntec Consultants (2018a). Alternate Source Demonstration; Spurlock Station Landfill, Maysville, Kentucky; July 2018.
- Geosyntec Consultants (2018b). Supplemental Alternate Source Demonstration; Spurlock Station Landfill, Maysville, Kentucky; December 2018.
- Geosyntec Consultants (2019a). Groundwater Monitoring System and Hydrogeologic Investigation Report; Peg's Hill CCR Landfill, Maysville, Kentucky; February 2019.
- Geosyntec Consultants (2019b). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. December 2019.
- Geosyntec Consultants (2020). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. November 2020.
- Geosyntec Consultants (2021a). Groundwater Monitoring System and Hydrogeologic Investigation Report, Addendum No. 1; Peg's Hill CCR Landfill, Maysville, Kentucky; May 2021.
- Geosyntec Consultants (2021b). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. June 2021.
- Geosyntec Consultants (2021c). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. October 2021.
- Geosyntec Consultants (2022). Alternate Source Demonstration, Spurlock Station Landfill, Maysville, Kentucky. April 2022.



- Haley & Aldrich (2018a). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. April 2018.
- Haley & Aldrich (2018b). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. October 2018.
- Haley & Aldrich (2019a). East Kentucky Power Cooperative, Inc.; Spurlock Landfill; Selection of Statistical Procedures; April 8, 2019.
- Haley & Aldrich (2019b). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. May 2019.
- Haley & Aldrich (2019c). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation; East Kentucky Power Cooperative; H.L. Spurlock Generating Station Landfill, Maysville, Kentucky; October 2019.
- Haley & Aldrich (2020). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. June 2020.
- Haley & Aldrich (2021). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. July 2021.
- Haley & Aldrich (2022a). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. April 2022.
- Haley & Aldrich (2022b). Summary of Appendix III Semi-Annual Groundwater Detection Monitoring Statistical Evaluation, East Kentucky Power Cooperative, H.L. Spurlock Generating Station Landfill, Maysville, Kentucky. October 2022.
- Heath R.C. (1983). Basic Ground-Water Hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p.

- Kenvirons, Inc. (2002). Spurlock Station Landfill, Mason County, Kentucky, East Kentucky Power Cooperative, Inc.; Modification to Permit No. 081-00005; Special Waste Landfill Expansion; March 2002.
- Kenvirons, Inc. (2018). Spurlock Station Landfill, Phase 3-A Cell Construction; CCR Rule Post-Construction Design Certification East Kentucky Power Cooperative; Coal Combustion Residual Rule Compliance; Rev. 0 (01/19/2018).
- Tetra Tech, Inc. (2017). Groundwater Monitoring System and Hydrogeologic Investigation Report, Spurlock Landfill, H.L. Spurlock Generating Station, Maysville, Kentucky; October 10, 2017.
- U.S. EPA (2009). Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance; March 2009.
- USGS, Water Resources, 2019. *Chloride, Salinity, and Dissolved Solids*. Available at [https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids?qt-science\\_center\\_objects=3#qt-science\\_center\\_objects](https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids?qt-science_center_objects=3#qt-science_center_objects). Accessed on October 13, 2022.

# TABLES

**Table 1 - Summary of Intra-Well Statistics of Detection Monitoring Program Data in Comparison to Leachate Data**  
 Alternative Source Demonstration for Sulfate under the Federal CCR Rule  
 Spurlock Station Landfill, Maysville, Kentucky

Constituent <sup>1</sup>	MW-2B		MW-3B		MW-5B/R		Leachate			
	1st Half 2022 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	1st Half 2022 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	1st Half 2022 Detection Monitoring Event <sup>2</sup>	Background Limit <sup>3</sup> (Upper Prediction Limit)	March 2018	September 2020	April 2021	September 2022
Boron	4.01	6.02	1.80	7.53	0.469	0.92	31.1	NA	31.5	31.4
Calcium	<b>76.4<sup>4</sup></b>	67	200	304	123	156	507	NA	505	582
Chloride	1,820	3,361	228	340	26.2	43	325	NA	807	642
Fluoride	1.10	2.65	0.20	0.50	0.10	0.50	<0.50 <sup>5</sup>	NA	0.73	0.17
pH	7.70	7.28 / 9.00	7.28	6.49 / 7.86	7.20	6.72 / 7.58	8.26	7.98 (lab) 7.97 (field)	7.87	7.93
Sulfate	<b>500<sup>4</sup></b>	428	381	745	159	230	2,160	NA	2,260	2,020
Total Dissolved Solids	4,160	5,485	1,220	1,565	586	743	4,084	NA	5,090	4,950

NA = Not analyzed

Notes:

<sup>1</sup>All concentrations are in milligrams per liter (mg/L), except pH, which is expressed in standard units (s.u.).

<sup>2</sup>First half 2022 detection monitoring event conducted on 31 May 2022.

<sup>3</sup>Intra-well UPL - 95% Upper Prediction Limit developed by Haley & Aldrich using data collected between October 2016 and May 2020; the reporting limit (RL) is used for values below the RL (e.g., for fluoride); pH has both a UPL and a Lower Prediction Limit (LPL).

<sup>4</sup>Bold numbers and yellow highlights indicate statistically significant increase(s) above background for the May 2022 detection monitoring program samples.

<sup>5</sup>Value is less than the reporting limit.

Sample results provided by East Kentucky Power Cooperative.

**Table 2. CCR Leachate and Groundwater Characteristics at the Spurlock Landfill**

	Leachate <sup>1</sup>	Upgradient Wells <sup>2,3</sup>		Downgradient Wells <sup>3</sup>		
		MW-6	MW-7	MW-2B	MW-3B	MW-5B/R
<b>Field Parameters</b>						
pH (s.u.)	7.93	7.20	7.05	7.63	7.25	7.12
Conductivity (µS/cm)	5,871	54,630	37,750	7,385	1,762	1,018
DO (mg/L)	5.38	<1.0	<1.0	<1.0	<1.0	3.40
ORP (mV)	132.7	-119	-72.0	-97.4	-54.7	123.4
Turbidity (NTU)	2.2	1.22	<1.0	<1.0	<1.0	3.15
<b>Appendix III</b>						
Boron (mg/L)	31.4	1.58	4.87	3.70	1.76	0.855
Calcium (mg/L)	582	1,540	497	110	182	157
Chloride (mg/L)	642	20,600	14,800	1,940	191	44.1
Fluoride (mg/L)	0.17	<1.0	1.11	0.97	0.16	0.15
pH (s.u.)	7.93	7.20	7.05	7.63	7.25	7.12
Sulfate (mg/L)	2,020	405	48.1	448	364	209
TDS (mg/L)	4,950	41,600	26,300	4,410	1,180	732
<b>Major Ions</b>						
Magnesium (mg/L)	32	310	221	35.6	39.6	31.8
Potassium (mg/L)	697	131	94.9	27.4	8.04	<2.50
Sodium (mg/L)	353	11,100	8,340	1,370	127	26
Bicarb. Alkalinity (mg/L)	140	100	210	250	220	270
<b>Select Appendix IV</b>						
Lithium (µg/L)	6,730	1,530	1,620	345	358	122
<b>Ion Ratios (mol/mol)</b>						
B/SO <sub>4</sub> (x10 <sup>-3</sup> )	138	34.7	901	73.5	43.0	36.4
B/Cl (x10 <sup>-3</sup> )	161	0.252	1.08	6.27	30.3	63.7
SO <sub>4</sub> /Cl	1.16	0.007	0.001	0.085	0.704	1.75
Li/B (x10 <sup>-3</sup> )	334	1,507	518	145	317	222
Li/Cl (x10 <sup>-3</sup> )	53.6	0.380	0.560	0.910	9.59	14.2
Li/SO <sub>4</sub> (x10 <sup>-3</sup> )	46.1	52.3	466	10.7	13.6	8.08

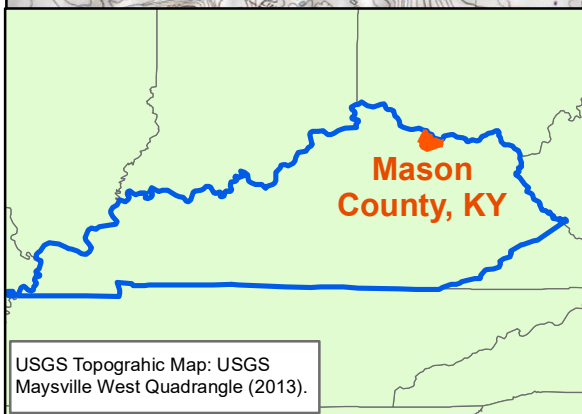
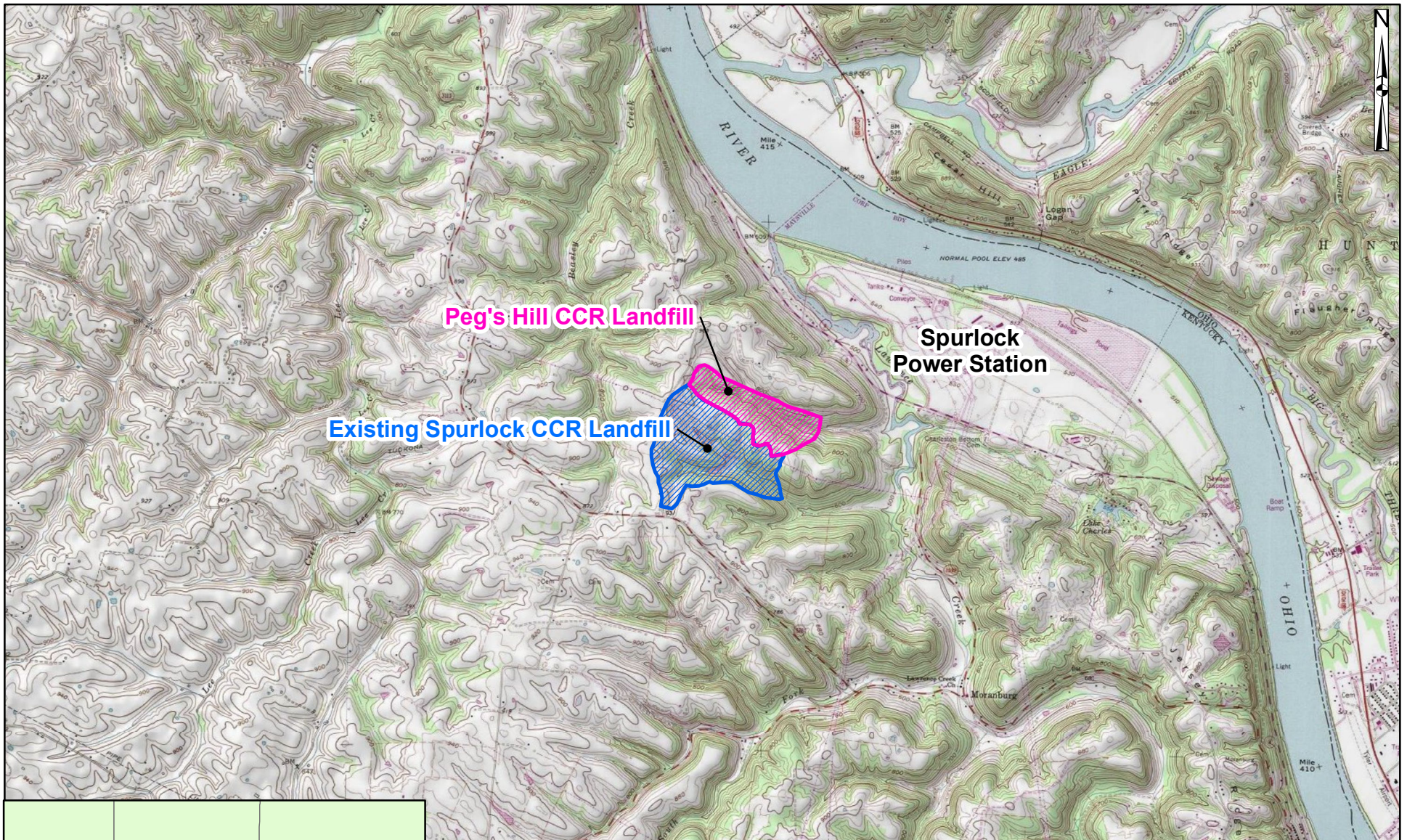
<sup>1</sup>Sampled on 9/6/2022

<sup>2</sup>Upgradient wells are no longer used for statistical analyses but are still sampled and results are provided for context.

<sup>3</sup>Sampling results are from the ASD sampling event conducted on 9/6/2022 concurrent with the leachate sampling.



# FIGURES

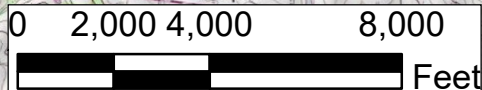
N:\East Kentucky Power\Spurlock Landfill\Area D MW Network\GIS\MXDs\2021\ASD\Figure 1 Site Location Map with Topo.mxd



USGS Topographic Map: USGS Maysville West Quadrangle (2013).

### Legend

-  Peg's Hill CCR Landfill (Approximate Extent)
-  Existing Spurlock CCR Landfill



### SITE LOCATION MAP

East Kentucky Power Cooperative  
 Peg's Hill Landfill  
 Mason County, Kentucky

PREPARED FOR



EAST KENTUCKY  
POWER COOPERATIVE  
A Touchstone Energy Cooperative

PREPARED BY



Geosyntec  
consultants  
KENNESAW, GA




Figure  
1

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N:\E\East Kentucky Power\Spurlock Landfill\Area D MW Network\GIS\IMX\Ds\2021\ASD\Monitoring Well Location Map June 2021.mxd\DY 7/8/2021



### Legend

-  CCR Rule Monitoring Well
-  Abandoned Boreholes/Wells
-  Approximate Permitted Waste Boundary

Note: Groundwater elevation calculated based on 28 April 2021 measurements.

### MONITORING WELL LOCATION MAP

East Kentucky Power Cooperative  
Spurlock Landfill

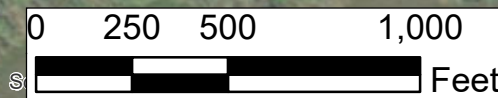
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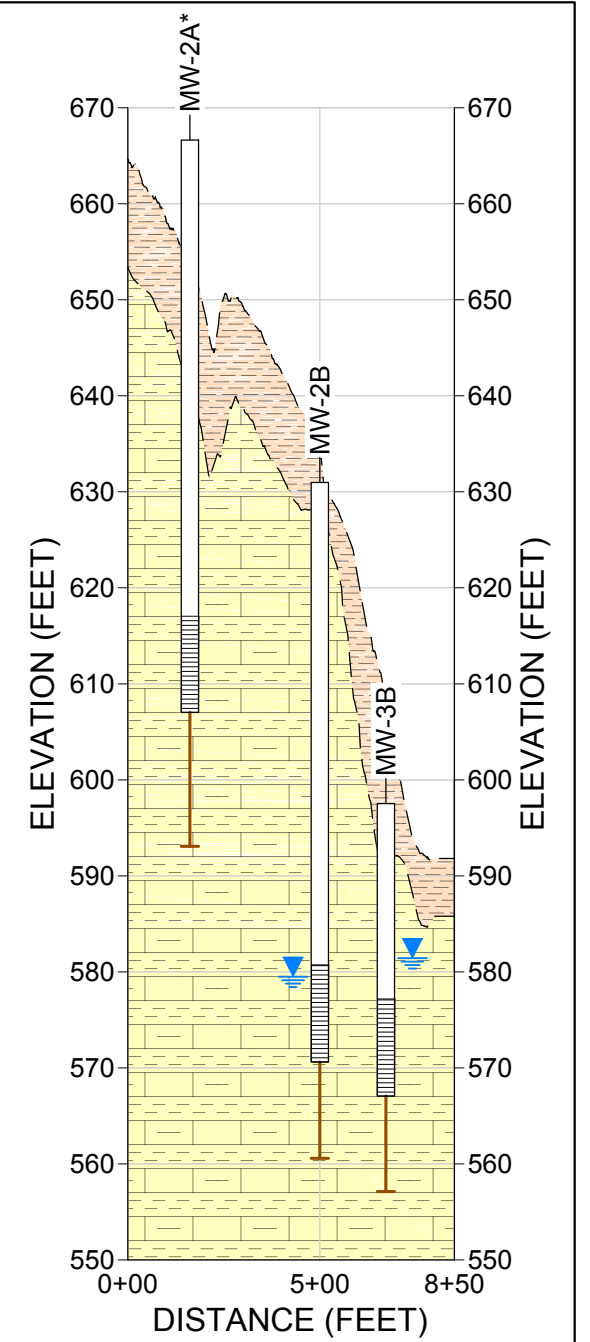
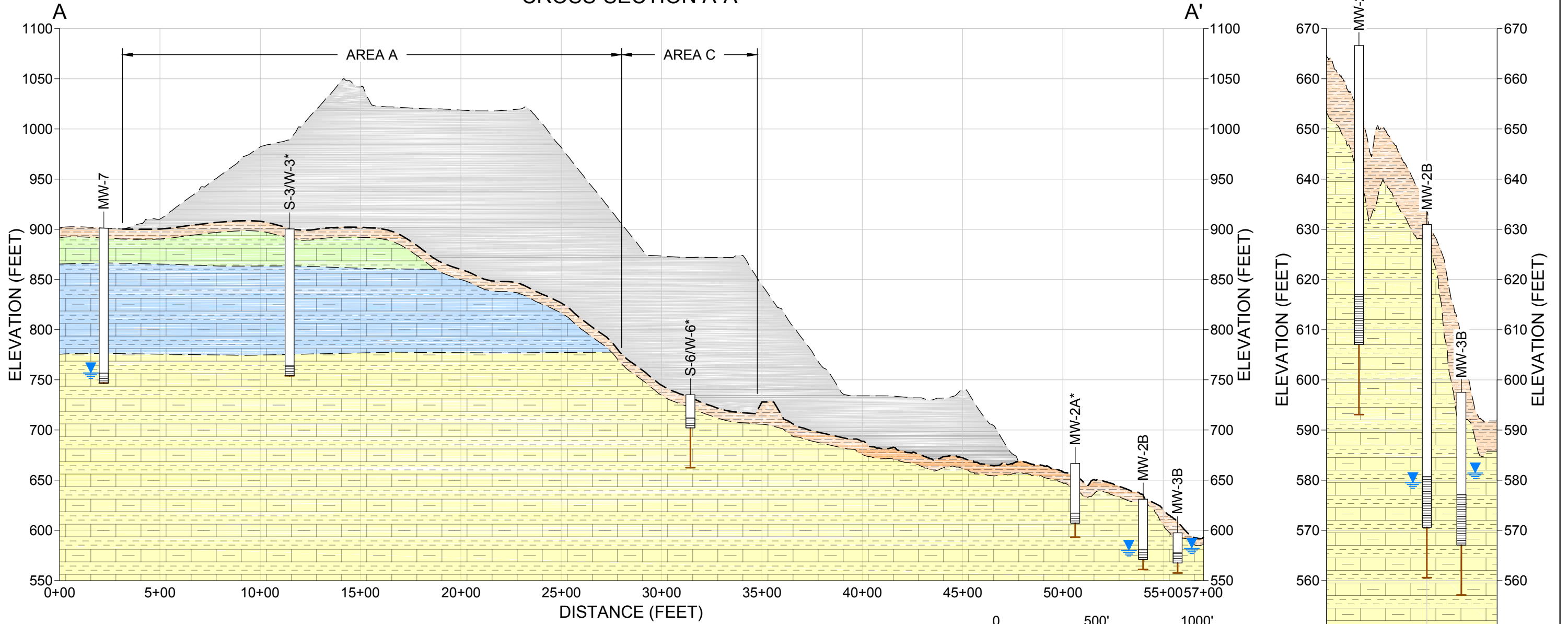
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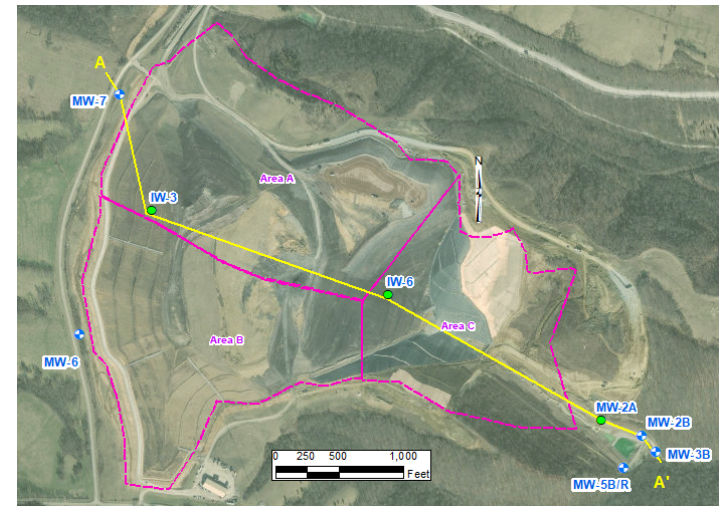
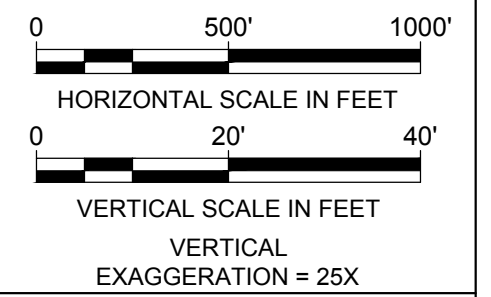
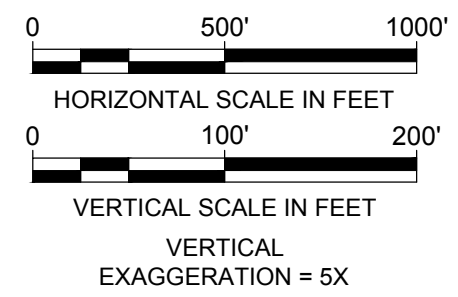
### CROSS-SECTION A-A'



#### LEGEND

- LITHOLOGIC DESCRIPTIONS**
- ASH
  - LIGHT BROWN OR RED BROWN OR BROWN SILTY CLAY, LEAN CLAY OR FAT CLAY WITH LIMESTONE PIECES
  - LOWER GRANT LAKE FORMATION (INTERBEDDED LIMESTONE (70-75%) WITH SHALE (25-30%))
  - FAIRVIEW FORMATION (INTERBEDDED LIMESTONE (55-60%) WITH SHALE (35-45%))
  - KOPE FORMATION (INTERBEDDED SHALE (70-80%) WITH LIMESTONE (20-30%))
- SYMBOLS**
- PIEZOMETER / WELL
  - SCREEN INTERVAL
  - SOIL BORING
  - GROUNDWATER ELEVATION (31 MAY 2022)
  - 24" SOIL LINER ( $1 \times 10^{-7}$  CM/SEC)
  - CLAY / POZOTEC LAYER
  - \* ABANDONED BORING / WELL

**NOTE:**  
 1. TOP OF ASH ELEVATION FROM 2019 WAS OBTAINED FROM SURVEY CONDUCTED ON 25 NOVEMBER 2020 BY MIKON.

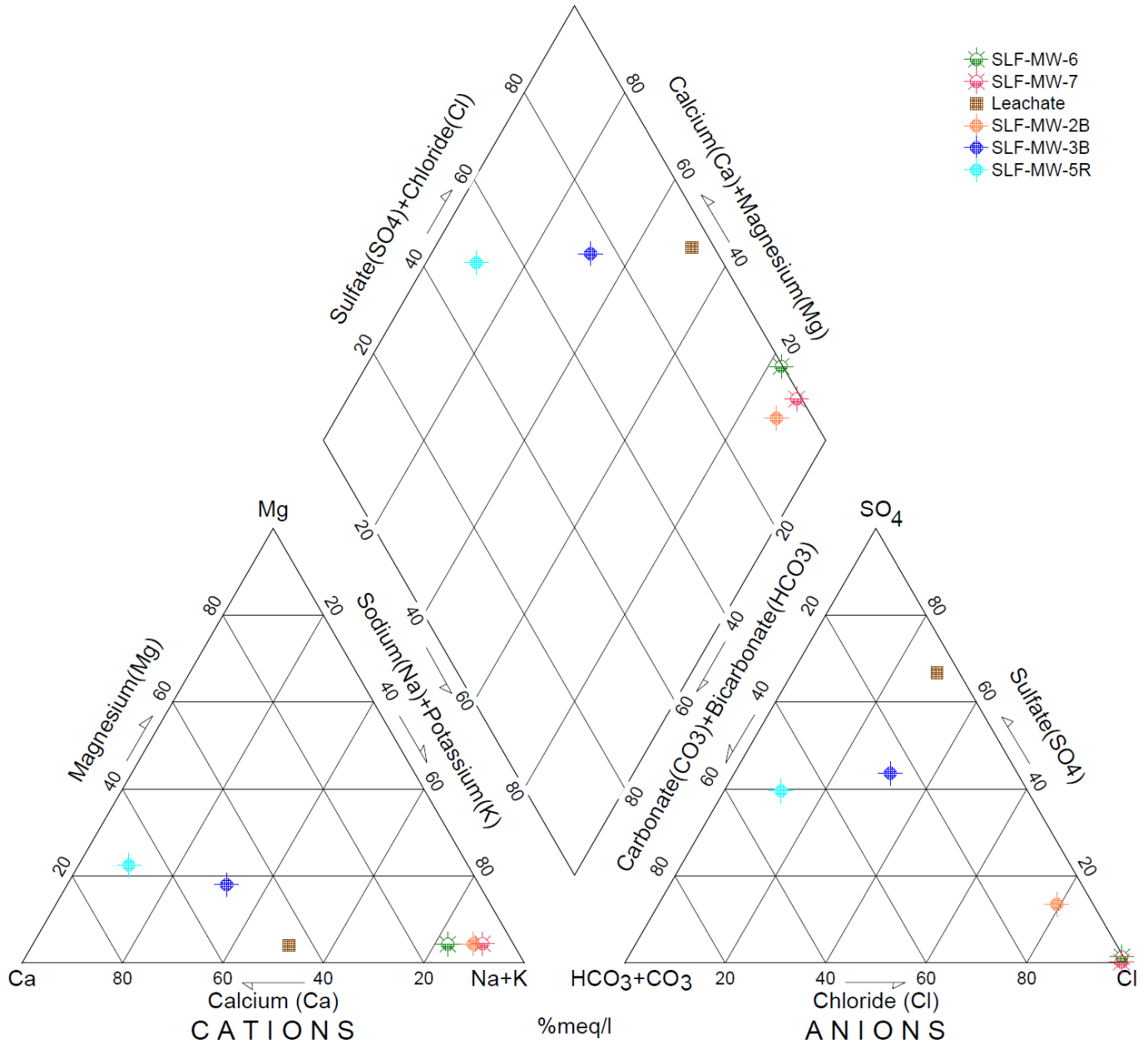


KEY MAP SECTION A-A'

CROSS-SECTION A-A' East Kentucky Power Cooperative Spurlock Landfill Mason County, Kentucky		
PREPARED BY: 	PREPARED FOR: 	<b>FIGURE</b> <b>3</b>
KENNESAW, GA	PROJECT #: GR9232	GA220389
		October 2022

# Piper Diagram

Spurlock Landfill (September 2022)



Notes: Data depicted on this diagram are from the supplemental groundwater and leachate sampling event conducted on 6 September 2022.

## Trilinear (Piper) Diagram

Spurlock Station Landfill  
Maysville, Kentucky

PREPARED FOR



PREPARED BY

**Geosyntec**  
consultants  
KENNESAW, GA

PROJECT NO. GR9232

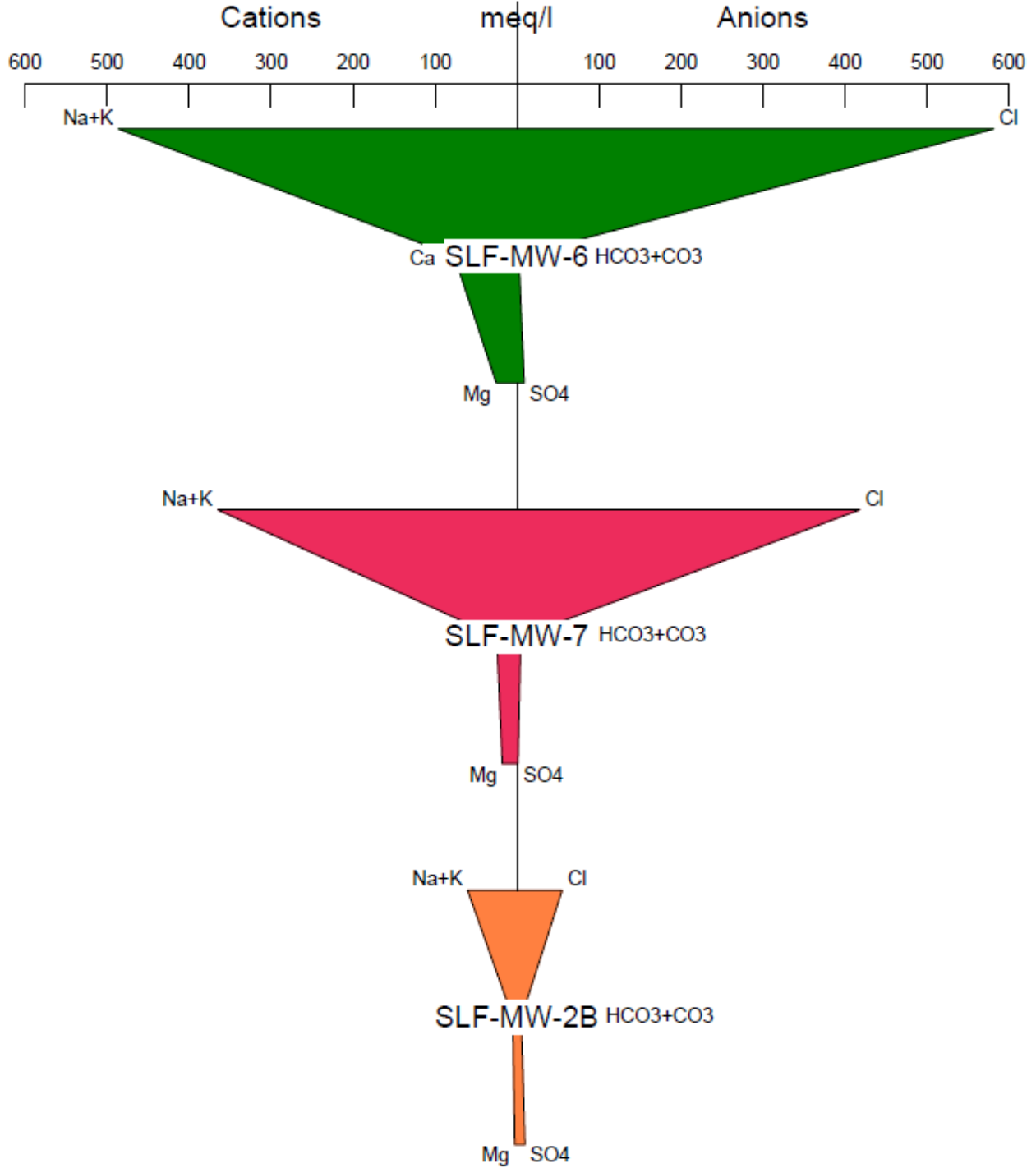
DOCUMENT NO. GA220389

**Figure**

**4**

# Stiff Diagram

## Spurlock Landfill (September 2022)



Notes: Data depicted on this diagram are from the supplemental groundwater and leachate sampling event conducted on 6 September 2022.

### Stiff Diagram A

Spurlock Station Landfill  
Maysville, Kentucky

PREPARED FOR



PREPARED BY

**Geosyntec**  
consultants  
KENNESAW, GA

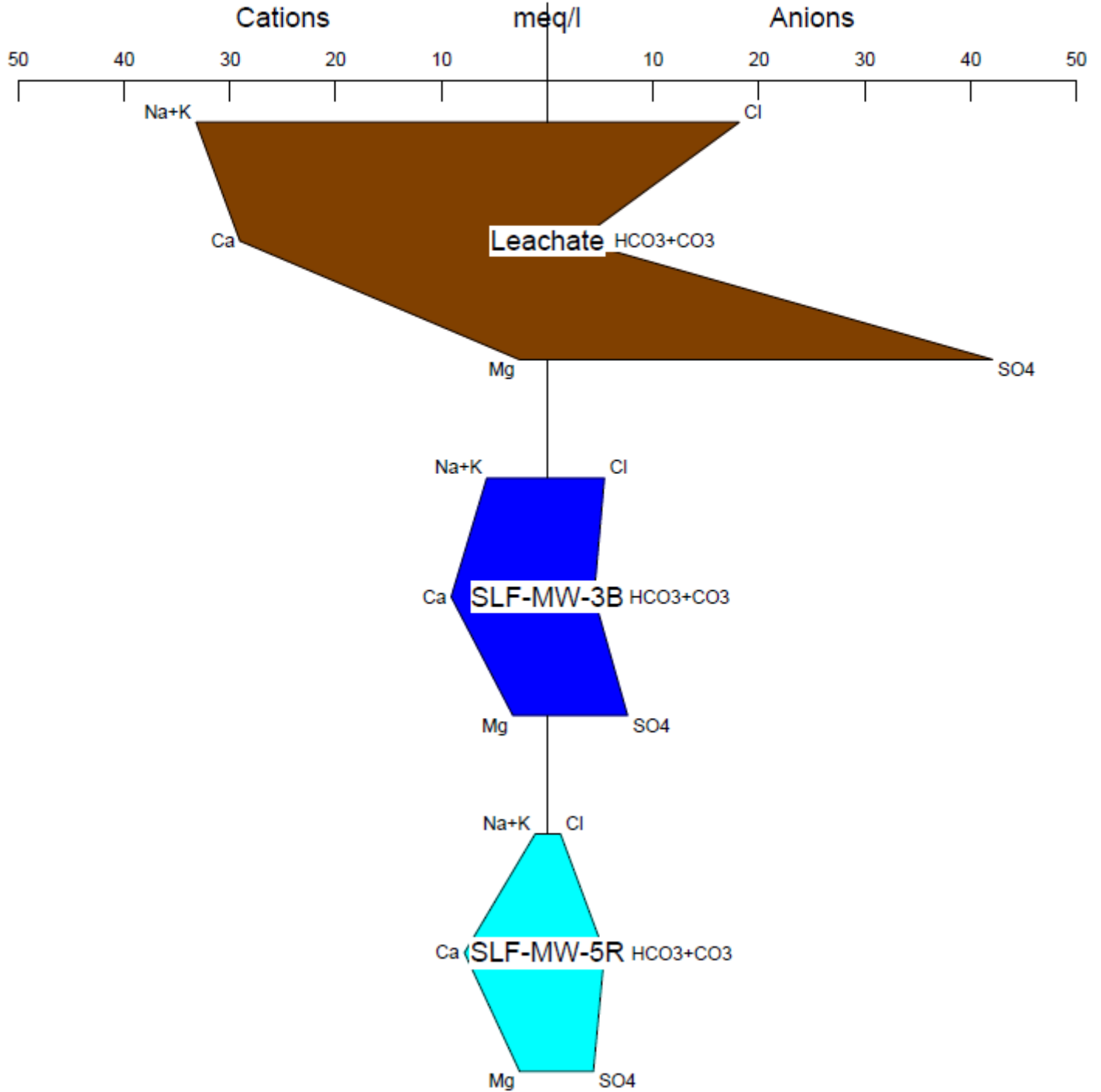
PROJECT NO. GR9232

DOCUMENT NO. GA220389

**Figure**  
**5A**

# Stiff Diagram

## Spurlock Landfill (September 2022)



Notes: Data depicted on this diagram are from the supplemental groundwater and leachate sampling event conducted on 6 September 2022.

### Stiff Diagram B

Spurlock Station Landfill  
Maysville, Kentucky

PREPARED FOR



PREPARED BY

**Geosyntec**  
consultants  
KENNESAW, GA

PROJECT NO. GR9232

DOCUMENT NO. GA220389

**Figure**  
**5B**