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August 22, 2024

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Iowa Department of Natural Resources
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RE: Statistical Evaluation Report
Shelby County Sanitary Landfill
Permit No. 83-SDP-01-74C

Dear Michael W. Smith, P.E.:

On behalf of the Shelby County Area Solid Waste Agency, Foth Infrastructure & Environment, LLC (Foth) is submitting this statistical evaluation of groundwater data at the Shelby County Sanitary Landfill. The Iowa Department of Natural Resources (IDNR) requested the statistical evaluation in its letter dated January 12, 2024 (IDNR, 2024) to demonstrate the site is not a threat to human health or the environment for potentially proceeding with termination of post-closure care.

# 1. Organization

The statistical methods and results are summarized, with the organization given as follows:

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# 2. Background

The Shelby County Sanitary Landfill received residential, commercial, and industrial waste within Shelby County between 1975 and 1994. The Closure Permit was issued by the IDNR on April 29, 1994. The property consists of approximately 80 acres with approximately 18 acres utilized for waste disposal (Barker Lemar, 2009).

The current groundwater monitoring network at the Shelby County Sanitary Landfill consists of downgradient monitoring wells MW-12, MW-13, MW-15, MW-16, and MW-19, and upgradient monitoring well MW-4 (Barker Lemar, 2009 and V&K, 2023). In accordance with Permit Amendment No. 13, these locations are monitored annually for the Appendix I list and total suspended solids (TSS). Since 2018, no purge sampling has been conducted for the Appendix I metals and TSS. The Appendix I volatiles were monitored using high-volume sampling with WaTerra pumps (V&K, 2018).

# 3. Statistical Methodology

This report presents a statistical evaluation of groundwater data following the requirements of 567 Iowa Administrative Code (IAC) 113.10(4)g and h. Additional discussion regarding the locations and parameters evaluated along with the statistical methodology utilized is presented in the subsections below.

## 3.1 Background

Monitoring well MW-4 is an upgradient or background monitoring well located approximately 300 feet west of the waste boundary of the closed Shelby County Sanitary Landfill (Barker Lemar, 2009). The Appendix I detections identified at MW-4 are provided in Attachment 1. As shown in Attachment 1, none of the volatile Appendix I constituents were detected at MW-4. Detections were limited to arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, vanadium, and zinc, which are naturally occurring elements that can be found in Iowa groundwater.

Time-series graphs depicting the detected Appendix I metals in MW-4 compared to total suspended solids (TSS) are provided in Attachment 2. Two date ranges were developed. One set depicts only the no purge sampling events between 2018-2023. Another set includes the 2016 and 2017 high-volume events with the 2018-2023 no purge results. A significant reduction in the TSS concentration is evident with the change from high-volume to no purge sampling. However, the graphs do not indicate correlation between TSS and detected metals concentrations, both with the high-volume and no purge sampling events. The graphs indicate that TSS concentrations were not likely impacting the detected metals results in MW-4; therefore, no background dataset adjustments are recommended based on the review of turbidity.

## 3.2 Locations and Parameters Evaluated

Statistical comparisons to the groundwater protection standards (GWPS) and trend tests will be evaluated for downgradient monitoring wells MW-12, MW-13, MW-15, MW-16, and MW-19. Note that comparisons to the GWPS and trend tests will not be conducted for MW-4 since this location is an upgradient/background monitoring well.

In its letter dated January 12, 2024 (IDNR, 2024), the IDNR did not specify the analytes to evaluate for statistically significant levels (SSLs) over the GWPS and trends. This evaluation seeks to avoid a single snapshot in time and, instead, will consider the data over the recent five years for determining compliance with the GWPS and the protection of human health and the environment. As a result, comparisons to the GWPS and trends will be evaluated for the analyte/well pairs that were detected at least once from 2018-2023. The Appendix I detections for MW-12, MW-13, MW-15, MW-16, and MW-19 are provided in Attachment 1. The following analyte/well pairs were detected at least once from 2018-2023 and will be evaluated for SSLs over the GWPS and trends:

- MW-12 (downgradient): 1,4-dichlorobenzene; arsenic; barium; benzene; cadmium; chlorobenzene; chloroethane; chromium; cis-1,2-dichloroethene; cobalt; copper; lead; nickel; vanadium; vinyl chloride; and zinc.
- MW-13 (downgradient): acetone; arsenic; barium; chlorobenzene; chloroethane; chromium; cis-1,2-dichloroethene; cobalt; copper; lead; nickel; vanadium; and zinc.
- MW-15 (downgradient): 1,1-dichloroethane; 1,4-dichlorobenzene; arsenic; barium; benzene; cadmium; chlorobenzene; chloroethane; cobalt; copper; lead; nickel; and zinc.
- MW-16 (downgradient): arsenic; barium; cadmium; cobalt; nickel; and zinc.
- MW-19 (downgradient): 1,4-dichlorobenzene; arsenic; barium; cadmium; chlorobenzene; chromium; cobalt; copper; lead; nickel; toluene; vanadium; and zinc.

## 3.3 Comparisons to the GWPS

Under 567 IAC 113.10(6)h, the GWPS is the Maximum Contaminant Level (MCL) promulgated under Section 1412 of the Safe Drinking Water Act in 40 Code of Federal Regulations (CFR) Part 141. If no MCL exists, or if background concentrations are higher than the MCL, the GWPS is defined as background. Also, per 567 IAC 113.10(6)i, an alternative GWPS may be established by the IDNR for constituents for which there is no MCL such as the "health-based concentrations that comply with the statewide standards for groundwater established pursuant to 567-Chapter 137."

When the GWPS is the MCL or an alternative health-based concentration, per the Unified Guidance (USEPA, 2009), "confidence intervals are the recommended general statistical strategy in compliance/assessment or corrective action monitoring." In the case of normally distributed data, a normal-based parametric confidence interval is used. If the data are not normally distributed a non-parametric confidence interval on the median is used.

As detailed in Section 7.2 of the Unified Guidance (USEPA, 2009), the hypothesis testing structure under assessment monitoring is to presume compliance point concentrations do not exceed the fixed standard unless sampling data indicates otherwise. As a formal statistical hypothesis, this is written as:

$$H_0: \Theta \leq G \quad \text{vs.} \quad H_A: \Theta > G$$

For testing under assessment monitoring, a lower confidence limit is compared to the compliance standard (i.e., GWPS). A lower confidence limit falling above the GWPS implies that concentrations are detected at statistically significant levels above the GWPS. The Sanitas default alpha level of 0.01 was utilized, which is also the minimum Resource Conservation and Recovery Act (RCRA) regulatory limit from §264.97(i)(2) for an individual test false positive error rate.

For constituents with 50% to 85% detects, Kaplan-Meier estimation will be applied to manage statistical bias introduced by non-detects. For interwell constituents with over 85% detects in the background dataset, half the reporting limit will be used for non-detect data. These estimation methods follow Unified Guidance recommendations and are given in detail in Unified Guidance Chapter 15 (USEPA, 2009).

For calculation of confidence intervals, Sanitas® v10.0 software is used to check distributional assumptions, perform Kaplan-Meier estimation in the case of 50% to 85% detects, and calculate either parametric or nonparametric confidence limits.

### 3.3.1 GWPS as Background

Pursuant to 567 IAC 113.10(6)h, when background concentrations of an analyte exceed the applicable MCL or 567 IAC Statewide Standard for a Protected Groundwater Source, the GWPS is the background concentration. In this case, the GWPS is not a fixed standard but is based on a distribution of background sample results.

Section 7.5 of the Unified Guidance (USEPA, 2009) details statistical hypothesis testing when the GWPS is background. The Unified Guidance offers two alternative statistical approaches to hypothesis testing in this case. The first represents a *two-sample* test of two distinct populations, namely the compliance well to background populations, with the recommended statistical test approach being a prediction limit." The second involves the computation of a fixed statistic from the background data as the GWPS, based on a background upper tolerance limit with 95% confidence and 95% coverage. Either can be used under compliance/assessment or corrective action testing, with the difference being that the null and alternative hypothesis structure is reversed under corrective action.

The upper tolerance limit with 95% confidence and 95% coverage is designed to be a "reasonable maximum on the likely range of background concentrations." This upper tolerance limit based on background data is then used as a fixed standard in statistical comparisons with 90% or 95% confidence limits from compliance wells. When under compliance/assessment monitoring, the hypothesis structure dictates that a lower confidence limit based on compliance well data is compared to the background upper tolerance limit. The Unified Guidance (USEPA, 2009) refers to this approach as a *single-sample* testing method, since the compliance well population is tested against a defined fixed standard

The Unified Guidance discusses tradeoffs between the two approaches and does not necessarily prescribe either approach over the other. However, since in this case compliance data accumulated over time will be compared to the background GWPS, the second approach utilizing background upper tolerance limits for comparison to compliance well lower confidence limits will be taken.

### 3.4 Trend Tests

Mann-Kendall trends were evaluated using Sanitas® v10.0 software. This is a non-parametric test that evaluates data trends by comparing all measurement pairs in the dataset. The Mann-Kendall trend tests were performed as a two-tailed test with a Type I error level of 0.1 (or $\alpha/2 = 0.05$). By default, Sanitas software utilizes half the reporting limit for non-detected values. The Mann-Kendall test is described further in *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987) and the Unified Guidance (USEPA, 2009).

## 4. Results of Analysis

### 4.1 Comparisons to the Groundwater Protection Standard

The analyte/well pairs listed in Section 4.1 were evaluated for SSLs over the GWPS per 567 IAC 113.10(6)f and g. Comparisons to the GWPS were evaluated through statistical confidence intervals under the assessment monitoring hypothesis. SSLs were declared to exist with statistical certainty when the lower confidence limit exceeded the GWPS.

#### 4.1.1 Background as the Arsenic and Cobalt GWPS

The concentrations in the background dataset exceeded the 40 Code of Federal Regulations (CFR) Part 141 Safe Drinking Water Act Maximum Contaminant Level (MCL) of 0.01 mg/L for arsenic and the 567 IAC Chapter 137 Statewide Standard for a Protected Groundwater Source of 0.0021 mg/L for cobalt. Therefore, pursuant to 567 IAC 113.10(6)h, the GWPS for arsenic and cobalt is taken as background and evaluated with the statistical methods described in Section 3.3.1 and as recommended in the Unified Guidance (USEPA, 2009). In these instances, the confidence interval (i.e., *single-sample*) method was evaluated. With background as the GWPS, the upper confidence limit is compared to the background upper tolerance limit with 95% confidence and 95% coverage (discussed in detail in Section 3.3.1). Statistical output for the arsenic and cobalt upper tolerance limits are included in Attachment 3.

#### 4.1.2 SSL Summary

Statistical outputs for confidence intervals in assessment mode are included in Attachment 3, with the results summarized in Table 1.

**Table 1**
**SSL Summary**
**May 2007 – Oct. 2023 Appendix I Data (1)**

| Chemical Name | Wells with SSL | Wells without SSL | Groundwater Protection Standard (2) |
|---|---|---|---|
| 1,1-Dichloroethane (ug/L) | | MW-15 | 140 |
| 1,4-Dichlorobenzene (mg/L) | | MW-12, MW-15, MW-19 | 75 |
| Acetone (ug/L) | | MW-13 | 6300 |
| Arsenic (mg/L) | MW-12, MW-15 | MW-13, MW-16, MW-19 | 0.01 |
| | | MW-12, MW-13, MW-15, MW-16, MW-19 | 0.07267 (3) |
| Barium (mg/L) | | MW-12, MW-13, MW-15, MW-16, MW-19 | 2 |
| Benzene (ug/L) | | MW-12, MW-15 | 5 |

**Table 1 Continued**
**SSL Summary**
**May 2007 – Oct. 2023 Appendix I Data [1]**

| Chemical Name | Wells with SSL | Wells without SSL | Groundwater Protection Standard [2] |
|---|---|---|---|
| 1,1-Dichloroethane (ug/L) | | MW-15 | 140 |
| 1,4-Dichlorobenzene (mg/L) | | MW-12, MW-15, MW-19 | 75 |
| Acetone (ug/L) | | MW-13 | 6300 |
| Arsenic (mg/L) | MW-12, MW-15 | MW-13, MW-16, MW-19 | 0.01 |
| | | MW-12, MW-13, MW-15, MW-16, MW-19 | 0.07267 [3] |
| Barium (mg/L) | | MW-12, MW-13, MW-15, MW-16, MW-19 | 2 |
| Benzene (ug/L) | | MW-12, MW-15 | 5 |
| Cadmium (mg/L) | | MW-12, MW-15, MW-16, MW-19 | 0.005 |
| Chlorobenzene (ug/L) | | MW-12, MW-13, MW-15, MW-19 | 100 |
| Chloroethane (ug/L) | | MW-12, MW-13, MW-15 | 2800 |
| Chromium (mg/L) | | MW-12, MW-13, MW-19 | 0.1 |
| cis-1,2-Dichloroethene (ug/L) | | MW-12, MW-13 | 70 |
| Cobalt (mg/L) | MW-12, MW-13, MW-15 | MW-16, MW-19 | 0.0021 |
| | | MW-12, MW-13, MW-15, MW-16, MW-19 | 0.08416 [3] |
| Copper (mg/L) | | MW-12, MW-13, MW-15, MW-19 | 1.3 |
| Lead (mg/L) | | MW-12, MW-13, MW-15, MW-19 | 0.015 |
| Nickel (mg/L) | | MW-12, MW-13, MW-15, MW-16, MW-19 | 0.1 |
| Toluene (ug/L) | | MW-19 | 1000 |
| Vanadium (mg/L) | | MW-12, MW-13, MW-19 | 0.035 |
| Vinyl Chloride (ug/L) | | MW-12 | 2 |
| Zinc (mg/L) | | MW-12, MW-13, MW-15, MW-16, MW-19 | 2 |

[1] For the Appendix I metals, the Jul. 2018 through Oct. 2023 results associated with no purge sampling events were utilized for statistical comparisons. For the Appendix I volatile organic compounds, all available data was utilized.
[2] Values are the 40 CFR Part 141 Safe Drinking Water Act MCL or the 567 IAC Chapter 137 Statewide Standard for a Protected Groundwater Source.
[3] GWPS for arsenic and cobalt as background. The hypothesis was evaluated through the *single-sample* confidence limit method where the fixed GWPS was based on the background upper tolerance limit with 95% confidence and 95% coverage (GWPS = 0.07267 for arsenic and 0.08416 for cobalt).

As shown in Table 1, SSLs were not identified for the analyte/well pairs evaluated except for arsenic in MW-12 and MW-15 and cobalt in MW-12, MW-13, and MW-15, when compared to the health-based GWPS. As detailed in Sections 3.3.1 and 4.1.1, the GWPS for arsenic and cobalt can be taken as background pursuant to 567 IAC 113.10(6)h since concentrations in background exceeded the health-based standards (i.e., 40 CFR Part 141 Safe Drinking Water Act MCL for arsenic and 567 IAC Chapter 137 Statewide Standard for a Protected Groundwater Source for cobalt). When statistical comparisons to the GWPS were conducted with background as the GWPS for arsenic and cobalt, no SSLs were identified.

For arsenic in MW-15, the LCL is close to the background GWPS with an alpha level of 0.01. At higher alpha levels, an SSL over the GWPS would be identified for arsenic in MW-15. No trend was

identified in the 2018-2023 arsenic concentrations in MW-15, as noted in Section 4.2. The arsenic spatial variation is not fully captured at the Shelby County Sanitary Landfill as evidenced by MW-4 having higher concentrations than MW-12, MW-13, MW-16, and MW-19 and the limited dataset for metals (i.e., 2018-2023 data). While an SSL over the GWPS could be identified at higher alpha levels, the absence of a trend, the current limitations in characterizing metals spatial variation, and the lack of other SSLs suggest the arsenic concentrations in MW-15 are not due to a release from the landfill.

### 4.2 Trend Test Results

Trend tests were also conducted for the analyte/well pairs listed in Section 4.1. Statistical outputs for trend tests are included in Attachment 4. Trends were not significant at the 98% confidence level except for chloroethane in MW-12 and MW-15, cis-1,2-dichloroethene in MW-12 and MW-13, and vinyl chloride in MW-12, where statistically significant decreasing trends were identified.

## 5. Conclusions

This report presents a statistical evaluation of groundwater data at the Shelby County Sanitary Landfill. The IDNR requested the statistical evaluation in its letter dated January 12, 2024 (IDNR, 2024) to demonstrate the site is not a threat to human health or the environment for potentially proceeding with termination of post-closure care.

The current groundwater monitoring network at the Shelby County Sanitary Landfill consists of downgradient monitoring wells MW-12, MW-13, MW-15, MW-16, and MW-19, and upgradient monitoring well MW-4 (Barker Lemar, 2009 and V&K, 2023). Statistical comparisons to the GWPS and trend tests were evaluated for downgradient monitoring wells MW-12, MW-13, MW-15, MW-16, and MW-19. Note that comparisons to the GWPS and trend tests were not conducted for MW-4 since this location is an upgradient/background monitoring well.

As shown in Table 1, SSLs were not identified for the analyte/well pairs evaluated except for arsenic in MW-12 and MW-15 and cobalt in MW-12, MW-13, and MW-15, when compared to the health-based GWPS. As detailed in Sections 3.3.1 and 4.1.1, the GWPS for arsenic and cobalt can be taken as background pursuant to 567 IAC 113.10(6)h since concentrations in background exceeded the health-based standards (i.e., 40 CFR Part 141 Safe Drinking Water Act MCL for arsenic and 567 IAC Chapter 137 Statewide Standard for a Protected Groundwater Source for cobalt). When statistical comparisons to the GWPS were conducted with background as the GWPS for arsenic and cobalt, no SSLs were identified.

Trends were not significant at the 98% confidence level except for chloroethane in MW-12 and MW-15, cis-1,2-dichloroethene in MW-12 and MW-13, and vinyl chloride in MW-12, where statistically significant decreasing trends were identified.

No SSLs over the GWPS or statistically significant increasing trends were identified in the groundwater data at the Shelby County Sanitary Landfill. Therefore, the results indicate groundwater concentrations are not a threat to human health or the environment. Based on the results of this statistical evaluation, Foth recommends proceeding with the termination of post-closure care for the Shelby County Sanitary Landfill.

# 6. References

Barker Lemar Engineering Consultants (Barker Lemar), 2009. *Groundwater Quality Assessment Work Plan, Shelby County Area Solid Waste Agency, Shelby County Landfill, Permit No. 83-SDP-01-74C, Project No. SHLBY 09000.* May 12. [Doc. ID 43628].

Gilbert, Richard O., 1987. *Statistical Methods for Environmental Pollution Monitoring.* Van Nostrand Reinhold, New York.

Iowa Department of Natural Resources (IDNR) (Michael W. Smith, P.E.), Letter to Brandon Burmeister. 12 Jan 2024. "Shelby County Sanitary Landfill, Permit #83-SDP-01-74, 2023 Annual Water Quality Report (Doc. 108583)." [Doc. ID 108774).

United States Environmental Protection Agency (USEPA), 1997. *The Lognormal Distribution in Environmental Applications.* EPA/600/R97/006. Office of Solid Waste and Emergency Response, Washington, D.C.

USEPA, 2006. *On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Datasets with Below Detection Limit Observations.* EPA/600/R-06/022. Office of Research and Development, Washington, D.C.

USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance.* EPA 530-R-09-007. Office of Resource Conservation and Recovery, Program Implementation and Information Division, Washington, D.C.

Veenstra & Kimm, Inc. (V&K), 2023. Email to Iowa Department of Natural Resources (Matthew Graesch), 15 November. [Doc. ID 93755].

V&K, 2023. *Shelby County Sanitary Landfill, Permit Number 83-SDP-01-74C, 2023 Annual Hydrologic Monitoring System Sampling*. December 29. [Doc. ID 108583].

Thank you for your attention to this matter, and please contact us if you have any questions or need additional information.

Sincerely,

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# Attachment 1

# Summary of Detected Analytical Results

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethane | 2016-10 | EPA 8260B | ug/L | 1.4 | | 1.4 | | | |
| 1,1-Dichloroethane | 2017-10 | EPA 8260B | ug/L | 1.1 | | 1.7 | | | |
| 1,1-Dichloroethane | 2018-07 | EPA 8260B | ug/L | | | 1.1 | | | |
| 1,4-Dichlorobenzene | 2007-05 | EPA 8260B | ug/L | | | 2.6 | | | |
| 1,4-Dichlorobenzene | 2011-05 | EPA 8260B | ug/L | | | 3.9 | | | |
| 1,4-Dichlorobenzene | 2011-10 | EPA 8260B | ug/L | | | 4.3 | | | |
| 1,4-Dichlorobenzene | 2012-06 | EPA 8260B | ug/L | | | 5.1 | | | |
| 1,4-Dichlorobenzene | 2012-10 | EPA 8260B | ug/L | | | 2.6 | | | |
| 1,4-Dichlorobenzene | 2013-06 | EPA 8260B | ug/L | | | 6.2 | | | |
| 1,4-Dichlorobenzene | 2013-10 | EPA 8260B | ug/L | | | 4.4 | | | |
| 1,4-Dichlorobenzene | 2014-05 | EPA 8260B | ug/L | | | 4.4 | | | |
| 1,4-Dichlorobenzene | 2014-10 | EPA 8260B | ug/L | | | 5.5 | | | |
| 1,4-Dichlorobenzene | 2015-05 | EPA 8260B | ug/L | | | 4.0 | | | |
| 1,4-Dichlorobenzene | 2015-10 | EPA 8260B | ug/L | | | 3.6 | | | |
| 1,4-Dichlorobenzene | 2016-10 | EPA 8260B | ug/L | | | 5.8 | | | |
| 1,4-Dichlorobenzene | 2017-10 | EPA 8260B | ug/L | 1.1 | | 6.4 | | 1.2 | |
| 1,4-Dichlorobenzene | 2018-07 | EPA 8260B | ug/L | | | 5.6 | | | |
| 1,4-Dichlorobenzene | 2019-10 | EPA 8260B | ug/L | | | 6.6 | | | |
| 1,4-Dichlorobenzene | 2020-09 | EPA 8260B | ug/L | | | 2.9 | | 1.2 | |
| 1,4-Dichlorobenzene | 2021-10 | EPA 8260B | ug/L | | | 5.6 | | 1.6 | |
| 1,4-Dichlorobenzene | 2022-10 | EPA 8260B | ug/L | | | 3.6 | | | |
| 1,4-Dichlorobenzene | 2023-10 | EPA 8260B | ug/L | 1.6 | | 5.5 | | 1.8 | |
| Acetone | 2016-10 | EPA 8260B | ug/L | | 16.6 | | | | |
| Acetone | 2020-09 | EPA 8260B | ug/L | | 21.7 | | | | |
| Arsenic | 2007-05 | EPA 7060A | mg/L | | | 0.048 | | | |
| Arsenic | 2008-10 | EPA 6020A | mg/L | | | 0.0302 | | | 0.0071 |
| Arsenic | 2009-05 | EPA 6020A | mg/L | | | 0.0317 | | | |
| Arsenic | 2009-10 | EPA 6020A | mg/L | | | 0.0351 | | | 0.0332 |
| Arsenic | 2010-05 | EPA 6020A | mg/L | | | 0.0395 | | | |
| Arsenic | 2010-10 | EPA 6020A | mg/L | | | 0.0333 | | | 0.129 |
| Arsenic | 2011-05 | EPA 6020A | mg/L | | | 0.134 | | | 0.0467 |
| Arsenic | 2011-10 | EPA 6020A | mg/L | | | 0.0583 | | | 0.0347 |
| Arsenic | 2012-06 | EPA 6020A | mg/L | | | 0.0811 | | | 0.166 |
| Arsenic | 2012-10 | EPA 6020A | mg/L | | | 0.0466 | | 0.0047 | 0.0123 |
| Arsenic | 2013-06 | EPA 6020A | mg/L | | | 0.0602 | | | 0.0047 |
| Arsenic | 2013-10 | EPA 6020A | mg/L | 0.0063 | | 0.0608 | | | |
| Arsenic | 2014-05 | EPA 6020A | mg/L | 0.0045 | | 0.0617 | | 0.008 | 0.0415 |
| Arsenic | 2014-10 | EPA 6020A | mg/L | 0.0065 | | 0.0743 | | 0.0151 | 0.0551 |
| Arsenic | 2015-05 | EPA 6020A | mg/L | 0.0148 | | 0.0814 | | 0.0272 | 0.0186 |
| Arsenic | 2015-10 | EPA 6020A | mg/L | 0.0069 | | 0.065 | | 0.0062 | 0.0107 |
| Arsenic | 2016-10 | EPA 6020A | mg/L | | | 0.0329 | | | |
| Arsenic | 2017-10 | EPA 6020A | mg/L | 0.0194 | 0.0084 | 0.0395 | 0.005 | 0.0054 | 0.0081 |
| Arsenic | 2018-07 | EPA 6020A | mg/L | 0.0218 | | 0.373 | | | |
| Arsenic | 2019-10 | EPA 6020A | mg/L | 0.0183 | 0.0137 | 0.0889 | 0.0054 | 0.0085 | 0.0193 |
| Arsenic | 2020-09 | EPA 6020A | mg/L | 0.0237 | 0.0101 | 0.0833 | | | 0.0172 |
| Arsenic | 2021-10 | EPA 6020A | mg/L | 0.0165 | 0.0099 | 0.0478 | | | 0.0239 |

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 2022-10 | EPA 6020A | mg/L | 0.0187 | 0.0115 | 0.0817 | | | 0.0452 |
| Arsenic | 2023-10 | EPA 6020A | mg/L | 0.0176 | 0.0142 | 0.0862 | 0.0062 | | 0.0347 |
| Barium | 2007-05 | EPA 6010B | mg/L | | | 1.15 | | | |
| Barium | 2008-10 | EPA 6020A | mg/L | | | 1.44 | | | 0.644 |
| Barium | 2009-05 | EPA 6020A | mg/L | | | 1.58 | | | 2.48 |
| Barium | 2009-10 | EPA 6020A | mg/L | | | 1.53 | | | 0.89 |
| Barium | 2010-05 | EPA 6020A | mg/L | | | 1.54 | | | 0.379 |
| Barium | 2010-10 | EPA 6020A | mg/L | | | 4.38 | | | 1.7 |
| Barium | 2011-05 | EPA 6020A | mg/L | | | 1.78 | | | 1.01 |
| Barium | 2011-10 | EPA 6020A | mg/L | | | 1.65 | | | 0.954 |
| Barium | 2012-06 | EPA 6020A | mg/L | 1.05 | | 1.52 | | 0.827 | 4.98 |
| Barium | 2012-10 | EPA 6020A | mg/L | 1.16 | | 1.57 | | 1.93 | 1.72 |
| Barium | 2013-06 | EPA 6020A | mg/L | 1.26 | | 1.4 | | 0.867 | 0.399 |
| Barium | 2013-10 | EPA 6020A | mg/L | 1.48 | | 1.65 | | 0.794 | 0.381 |
| Barium | 2014-05 | EPA 6020A | mg/L | 1.16 | | 1.32 | | 1.17 | 1.11 |
| Barium | 2014-10 | EPA 6020A | mg/L | 1.27 | | 1.59 | | 1.35 | 2.9 |
| Barium | 2015-05 | EPA 6020A | mg/L | 1.67 | | 1.99 | | 1.69 | 0.759 |
| Barium | 2015-10 | EPA 6020A | mg/L | 1.18 | | 1.59 | | 0.988 | 0.907 |
| Barium | 2016-10 | EPA 6020A | mg/L | 0.908 | 0.139 | 1.47 | 0.0177 | 0.776 | 0.352 |
| Barium | 2017-10 | EPA 6020A | mg/L | 1.7 | 0.0478 | 1.54 | 0.0498 | 1.08 | 0.545 |
| Barium | 2018-07 | EPA 6020A | mg/L | 1.19 | 0.152 | 2 | 0.0166 | 0.736 | 0.331 |
| Barium | 2019-10 | EPA 6020A | mg/L | 1.14 | 0.522 | 1.69 | 0.0294 | 1.21 | 0.975 |
| Barium | 2020-09 | EPA 6020A | mg/L | 1.21 | 0.368 | 1.57 | 0.0172 | 0.944 | 0.773 |
| Barium | 2021-10 | EPA 6020A | mg/L | 1.08 | 0.348 | 1.45 | 0.017 | 1.09 | 1.76 |
| Barium | 2022-10 | EPA 6020A | mg/L | 1.02 | 0.469 | 1.38 | 0.0191 | 0.975 | 1.92 |
| Barium | 2023-10 | EPA 6020A | mg/L | 1.21 | 0.401 | 1.57 | 0.0528 | 0.985 | 1.38 |
| Benzene | 2007-05 | EPA 8260B | ug/L | | | 1.5 | | | |
| Benzene | 2011-05 | EPA 8260B | ug/L | | | 1.7 | | | |
| Benzene | 2011-10 | EPA 8260B | ug/L | | | 2.3 | | | |
| Benzene | 2012-06 | EPA 8260B | ug/L | 1.4 | | 2.5 | | | |
| Benzene | 2012-10 | EPA 8260B | ug/L | 1.2 | | 2 | | | |
| Benzene | 2013-06 | EPA 8260B | ug/L | 1.5 | | 2.3 | | | |
| Benzene | 2013-10 | EPA 8260B | ug/L | 1.4 | | 2.6 | | | |
| Benzene | 2014-05 | EPA 8260B | ug/L | 1.1 | | 2.4 | | | |
| Benzene | 2014-10 | EPA 8260B | ug/L | 1.3 | | 2 | | | |
| Benzene | 2015-05 | EPA 8260B | ug/L | 1.4 | | 2.2 | | | |
| Benzene | 2015-10 | EPA 8260B | ug/L | 1.2 | | 2.1 | | | |
| Benzene | 2016-10 | EPA 8260B | ug/L | 1.5 | | 2.5 | | | |
| Benzene | 2017-10 | EPA 8260B | ug/L | 1.4 | | 2.3 | | | |
| Benzene | 2019-10 | EPA 8260B | ug/L | | | 1.8 | | | |
| Benzene | 2020-09 | EPA 8260B | ug/L | | | 2.2 | | | |
| Benzene | 2021-10 | EPA 8260B | ug/L | | | 1.7 | | | |
| Benzene | 2022-10 | EPA 8260B | ug/L | 1.1 | | 1.8 | | | |
| Benzene | 2023-10 | EPA 8260B | ug/L | 1.6 | | 2.2 | | | |
| Beryllium | 2021-10 | EPA 6020A | mg/L | | | | | | 0.0056 |
| Beryllium | 2022-10 | EPA 6020A | mg/L | | | | | | 0.0071 |

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| Beryllium | 2023-10 | EPA 6020A | mg/L | | | | | | 0.005 |
| Cadmium | 2017-10 | EPA 6020A | mg/L | 0.0018 | | 0.0018 | 0.0009 | 0.0011 | |
| Cadmium | 2018-07 | EPA 6020A | mg/L | | | 0.0008 | 0.0042 | | |
| Cadmium | 2019-10 | EPA 6020A | mg/L | | | 0.0095 | | 0.0012 | 0.0008 |
| Cadmium | 2020-09 | EPA 6020A | mg/L | 0.0013 | | 0.0015 | | 0.001 | |
| Cadmium | 2021-10 | EPA 6020A | mg/L | | | 0.0017 | | 0.0015 | 0.0019 |
| Cadmium | 2022-10 | EPA 6020A | mg/L | | | 0.0039 | | 0.0011 | 0.0018 |
| Cadmium | 2023-10 | EPA 6020A | mg/L | | | 0.0128 | | 0.0016 | 0.0014 |
| Chlorobenzene | 2007-05 | EPA 8260B | ug/L | | | 11.6 | | | |
| Chlorobenzene | 2011-05 | EPA 8260B | ug/L | | | 21.8 | | | |
| Chlorobenzene | 2011-10 | EPA 8260B | ug/L | | | 23.6 | | | |
| Chlorobenzene | 2012-06 | EPA 8260B | ug/L | 2.3 | | 24.3 | | 5 | |
| Chlorobenzene | 2012-10 | EPA 8260B | ug/L | 1.8 | | 14.1 | | 3.9 | |
| Chlorobenzene | 2013-06 | EPA 8260B | ug/L | 2.2 | | 19.6 | | 4 | |
| Chlorobenzene | 2013-10 | EPA 8260B | ug/L | 1.5 | | 16.5 | | 5 | |
| Chlorobenzene | 2014-05 | EPA 8260B | ug/L | 1.7 | | 15 | | 4.4 | |
| Chlorobenzene | 2014-10 | EPA 8260B | ug/L | 2.2 | | 14.9 | | 3.6 | |
| Chlorobenzene | 2015-05 | EPA 8260B | ug/L | 2.3 | | 14.9 | | 3.3 | |
| Chlorobenzene | 2015-10 | EPA 8260B | ug/L | 2 | | 13.8 | | 4.2 | |
| Chlorobenzene | 2016-10 | EPA 8260B | ug/L | 2.2 | 1 | 19 | | 3.8 | |
| Chlorobenzene | 2017-10 | EPA 8260B | ug/L | 2.2 | 1.3 | 18.1 | | 4.7 | |
| Chlorobenzene | 2018-07 | EPA 8260B | ug/L | 1.9 | 1.1 | 15.6 | | 5.1 | |
| Chlorobenzene | 2019-10 | EPA 8260B | ug/L | 1.7 | | 18.6 | | 4.8 | |
| Chlorobenzene | 2020-09 | EPA 8260B | ug/L | 1.4 | | 11.7 | | 4.6 | |
| Chlorobenzene | 2021-10 | EPA 8260B | ug/L | 1.9 | | 16.3 | | 5.7 | |
| Chlorobenzene | 2022-10 | EPA 8260B | ug/L | 1.6 | | 11.5 | | 4.3 | |
| Chlorobenzene | 2023-10 | EPA 8260B | ug/L | 2.6 | 1.1 | 15.2 | | 5.3 | |
| Chloroethane | 2007-05 | EPA 8260B | ug/L | | | 1.2 | | | |
| Chloroethane | 2008-10 | EPA 8260B | ug/L | | | 2.2 | | | |
| Chloroethane | 2009-05 | EPA 8260B | ug/L | | | 2.2 | | | |
| Chloroethane | 2009-10 | EPA 8260B | ug/L | | | 2.7 | | | |
| Chloroethane | 2010-05 | EPA 8260B | ug/L | | | 1.7 | | | |
| Chloroethane | 2011-05 | EPA 8260B | ug/L | | | 1.9 | | | |
| Chloroethane | 2011-10 | EPA 8260B | ug/L | | | 2.3 | | | |
| Chloroethane | 2012-06 | EPA 8260B | ug/L | 6.3 | | 1.9 | | 1.1 | |
| Chloroethane | 2012-10 | EPA 8260B | ug/L | 5.7 | | 1.7 | | | |
| Chloroethane | 2013-06 | EPA 8260B | ug/L | 6.6 | | 2.1 | | | |
| Chloroethane | 2013-10 | EPA 8260B | ug/L | 6.8 | | 1.6 | | | |
| Chloroethane | 2014-05 | EPA 8260B | ug/L | 5.4 | | 1.7 | | | |
| Chloroethane | 2014-10 | EPA 8260B | ug/L | 5.1 | | 1.3 | | | |
| Chloroethane | 2015-05 | EPA 8260B | ug/L | 5.6 | | 1.6 | | | |
| Chloroethane | 2015-10 | EPA 8260B | ug/L | 4.3 | | 1 | | | |
| Chloroethane | 2016-10 | EPA 8260B | ug/L | 4.9 | 2.7 | 1.7 | | | |
| Chloroethane | 2017-10 | EPA 8260B | ug/L | 4.3 | 2.7 | 2.2 | | | |
| Chloroethane | 2018-07 | EPA 8260B | ug/L | 2.9 | 1.8 | 1.4 | | | |
| Chloroethane | 2019-10 | EPA 8260B | ug/L | 3.9 | 2.2 | 2.2 | | | |

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| Chloroethane | 2020-09 | EPA 8260B | ug/L | 2 | 1.5 | | | | |
| Chloroethane | 2021-10 | EPA 8260B | ug/L | 3 | 1.2 | 1.3 | | | |
| Chloroethane | 2022-10 | EPA 8260B | ug/L | 2 | 1.2 | | | | |
| Chloroethane | 2023-10 | EPA 8260B | ug/L | 2 | 1.3 | | | | |
| Chromium | 2017-10 | EPA 6020A | mg/L | | | | | 0.0086 | 0.0088 |
| Chromium | 2019-10 | EPA 6020A | mg/L | | 0.0124 | | | 0.0121 | 0.0345 |
| Chromium | 2020-09 | EPA 6020A | mg/L | 0.0118 | | | | | 0.0273 |
| Chromium | 2021-10 | EPA 6020A | mg/L | | | | | | 0.0345 |
| Chromium | 2022-10 | EPA 6020A | mg/L | | | | | | 0.0594 |
| Chromium | 2023-10 | EPA 6020A | mg/L | | | | | | 0.0398 |
| cis-1,2-Dichloroethene | 2007-05 | EPA 8260B | ug/L | | | 13.6 | | | |
| cis-1,2-Dichloroethene | 2008-10 | EPA 8260B | ug/L | | | 7.1 | | | |
| cis-1,2-Dichloroethene | 2009-05 | EPA 8260B | ug/L | | | 6.8 | | | |
| cis-1,2-Dichloroethene | 2009-10 | EPA 8260B | ug/L | | | 5.5 | | | |
| cis-1,2-Dichloroethene | 2010-05 | EPA 8260B | ug/L | | | 5.1 | | | |
| cis-1,2-Dichloroethene | 2010-10 | EPA 8260B | ug/L | | | 4.1 | | | |
| cis-1,2-Dichloroethene | 2011-05 | EPA 8260B | ug/L | | | 2.7 | | | |
| cis-1,2-Dichloroethene | 2011-10 | EPA 8260B | ug/L | | | 2.7 | | | |
| cis-1,2-Dichloroethene | 2012-06 | EPA 8260B | ug/L | 7.7 | | 1.5 | | 2.7 | |
| cis-1,2-Dichloroethene | 2012-10 | EPA 8260B | ug/L | 9.8 | | | | 2.8 | |
| cis-1,2-Dichloroethene | 2013-06 | EPA 8260B | ug/L | 9.7 | | 1.9 | | 2.4 | |
| cis-1,2-Dichloroethene | 2013-10 | EPA 8260B | ug/L | 7.6 | | | | 1.6 | |
| cis-1,2-Dichloroethene | 2014-05 | EPA 8260B | ug/L | 7.8 | | | | 1.8 | |
| cis-1,2-Dichloroethene | 2014-10 | EPA 8260B | ug/L | 8.2 | | 1.3 | | 1.4 | |
| cis-1,2-Dichloroethene | 2015-05 | EPA 8260B | ug/L | 7.6 | | 1 | | 1.2 | |
| cis-1,2-Dichloroethene | 2015-10 | EPA 8260B | ug/L | 7.3 | | | | 1.1 | |
| cis-1,2-Dichloroethene | 2016-10 | EPA 8260B | ug/L | 7.9 | 4.1 | | | 1.3 | |
| cis-1,2-Dichloroethene | 2017-10 | EPA 8260B | ug/L | 7 | 4.2 | | | 1.1 | |
| cis-1,2-Dichloroethene | 2018-07 | EPA 8260B | ug/L | 5.3 | 3.4 | | | | |
| cis-1,2-Dichloroethene | 2019-10 | EPA 8260B | ug/L | 4.6 | 2.9 | | | | |
| cis-1,2-Dichloroethene | 2020-09 | EPA 8260B | ug/L | 4.6 | 3.3 | | | | |
| cis-1,2-Dichloroethene | 2021-10 | EPA 8260B | ug/L | 3 | 1.4 | | | | |
| cis-1,2-Dichloroethene | 2022-10 | EPA 8260B | ug/L | 2.5 | 1.6 | | | | |
| cis-1,2-Dichloroethene | 2023-10 | EPA 8260B | ug/L | 2 | 1.4 | | | | |
| Cobalt | 2007-05 | EPA 6010B | mg/L | | | 0.019 | | | |
| Cobalt | 2008-10 | EPA 6020A | mg/L | | | 0.0238 | | | 0.0061 |
| Cobalt | 2009-05 | EPA 6020A | mg/L | | | 0.0266 | | | |
| Cobalt | 2009-10 | EPA 6020A | mg/L | | | 0.0289 | | | 0.0236 |
| Cobalt | 2010-05 | EPA 6020A | mg/L | | | 0.0269 | | | |
| Cobalt | 2010-10 | EPA 6020A | mg/L | | | 0.0325 | | | 0.0781 |
| Cobalt | 2011-05 | EPA 6020A | mg/L | | | 0.0295 | | | 0.0255 |
| Cobalt | 2011-10 | EPA 6020A | mg/L | | | 0.0269 | | | 0.0168 |
| Cobalt | 2012-06 | EPA 6020A | mg/L | 0.0055 | | 0.0292 | | | 0.0827 |
| Cobalt | 2012-10 | EPA 6020A | mg/L | 0.0054 | | 0.0282 | | 0.0232 | 0.0293 |
| Cobalt | 2013-06 | EPA 6020A | mg/L | 0.0061 | | 0.0259 | | 0.0074 | |
| Cobalt | 2013-10 | EPA 6020A | mg/L | 0.0113 | | 0.0347 | | | |

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| Cobalt | 2014-05 | EPA 6020A | mg/L | 0.0069 | | 0.0288 | | 0.0063 | 0.0261 |
| Cobalt | 2014-10 | EPA 6020A | mg/L | 0.0093 | | 0.0316 | | 0.0118 | 0.0754 |
| Cobalt | 2015-05 | EPA 6020A | mg/L | 0.0219 | | 0.0458 | | 0.0177 | 0.0111 |
| Cobalt | 2015-10 | EPA 6020A | mg/L | 0.0097 | | 0.0318 | | 0.0046 | 0.0175 |
| Cobalt | 2016-10 | EPA 6020A | mg/L | 0.0029 | 0.0017 | 0.0285 | 0.0023 | 0.0012 | |
| Cobalt | 2017-10 | EPA 6020A | mg/L | 0.018 | 0.0071 | 0.0299 | 0.0072 | 0.0049 | 0.0053 |
| Cobalt | 2018-07 | EPA 6020A | mg/L | 0.0103 | 0.0039 | 0.0304 | | | |
| Cobalt | 2019-10 | EPA 6020A | mg/L | 0.0121 | 0.012 | 0.0354 | 0.0029 | 0.0038 | 0.0189 |
| Cobalt | 2020-09 | EPA 6020A | mg/L | 0.0157 | 0.01 | 0.0353 | 0.0023 | 0.0008 | 0.0138 |
| Cobalt | 2021-10 | EPA 6020A | mg/L | 0.011 | 0.0101 | 0.0318 | 0.0021 | 0.0018 | 0.0411 |
| Cobalt | 2022-10 | EPA 6020A | mg/L | 0.0118 | 0.0119 | 0.0317 | 0.0039 | 0.0036 | 0.0473 |
| Cobalt | 2023-10 | EPA 6020A | mg/L | 0.012 | 0.0103 | 0.0334 | 0.0034 | 0.0016 | 0.029 |
| Copper | 2017-10 | EPA 6020A | mg/L | | | | 0.0044 | 0.0165 | 0.0133 |
| Copper | 2019-10 | EPA 6020A | mg/L | | 0.0119 | 0.0081 | | 0.0157 | 0.054 |
| Copper | 2020-09 | EPA 6020A | mg/L | 0.0185 | 0.0054 | | | | 0.0373 |
| Copper | 2021-10 | EPA 6020A | mg/L | | 0.006 | | | 0.0055 | 0.101 |
| Copper | 2022-10 | EPA 6020A | mg/L | | 0.0059 | 0.004 | | 0.0064 | 0.117 |
| Copper | 2023-10 | EPA 6020A | mg/L | | 0.0083 | 0.0228 | | 0.0082 | 0.0713 |
| Lead | 2017-10 | EPA 6020A | mg/L | | | | | 0.0134 | 0.0126 |
| Lead | 2019-10 | EPA 6020A | mg/L | | 0.0051 | | | 0.0099 | 0.0324 |
| Lead | 2020-09 | EPA 6020A | mg/L | 0.0077 | | | | | 0.0249 |
| Lead | 2021-10 | EPA 6020A | mg/L | | | | | | 0.0595 |
| Lead | 2022-10 | EPA 6020A | mg/L | | | | | | 0.0791 |
| Lead | 2023-10 | EPA 6020A | mg/L | | | 0.0046 | | | 0.0589 |
| Nickel | 2007-05 | EPA 6010B | mg/L | | | 0.065 | | | |
| Nickel | 2008-10 | EPA 6020A | mg/L | | | 0.0658 | | | 0.0189 |
| Nickel | 2009-05 | EPA 6020A | mg/L | | | 0.0666 | | | 0.2 |
| Nickel | 2009-10 | EPA 6020A | mg/L | | | 0.0756 | | | 0.068 |
| Nickel | 2010-05 | EPA 6020A | mg/L | | | 0.0713 | | | 0.0068 |
| Nickel | 2010-10 | EPA 6020A | mg/L | | | 0.0945 | | | 0.197 |
| Nickel | 2011-05 | EPA 6020A | mg/L | | | 0.0907 | | | 0.0774 |
| Nickel | 2011-10 | EPA 6020A | mg/L | | | 0.0777 | | | 0.0509 |
| Nickel | 2012-06 | EPA 6020A | mg/L | 0.0329 | | 0.0754 | | 0.0244 | 0.229 |
| Nickel | 2012-10 | EPA 6020A | mg/L | 0.0327 | | 0.07 | | 0.0617 | 0.0741 |
| Nickel | 2013-06 | EPA 6020A | mg/L | 0.0261 | | 0.0821 | | 0.0256 | 0.007 |
| Nickel | 2013-10 | EPA 6020A | mg/L | 0.0357 | | 0.0892 | | 0.0185 | |
| Nickel | 2014-05 | EPA 6020A | mg/L | 0.0254 | | 0.0586 | | 0.032 | 0.0719 |
| Nickel | 2014-10 | EPA 6020A | mg/L | 0.027 | | 0.0831 | | 0.0438 | 0.151 |
| Nickel | 2015-05 | EPA 6020A | mg/L | 0.0602 | | 0.101 | | 0.0662 | 0.0302 |
| Nickel | 2015-10 | EPA 6020A | mg/L | 0.0242 | | 0.076 | | 0.0275 | 0.0421 |
| Nickel | 2016-10 | EPA 6020A | mg/L | 0.0285 | 0.009 | 0.0798 | 0.0051 | 0.0198 | |
| Nickel | 2017-10 | EPA 6020A | mg/L | 0.0378 | 0.0223 | 0.0991 | 0.0183 | 0.034 | 0.0139 |
| Nickel | 2018-07 | EPA 6020A | mg/L | 0.0241 | 0.0166 | 0.0999 | 0.0067 | 0.0172 | |
| Nickel | 2019-10 | EPA 6020A | mg/L | 0.0277 | 0.0339 | 0.0979 | 0.0081 | 0.0525 | 0.0496 |
| Nickel | 2020-09 | EPA 6020A | mg/L | 0.0376 | 0.026 | 0.0837 | 0.0059 | 0.0453 | 0.0368 |
| Nickel | 2021-10 | EPA 6020A | mg/L | 0.0278 | 0.0257 | 0.0778 | 0.0057 | 0.0614 | 0.107 |

**Summary of Detected Analytical Results**
**May 2007 - Oct. 2023 Appendix I Data**

| Chemical Name | Sample Date | Method | Unit | MW-12 (downgradient) | MW-13 (downgradient) | MW-15 (downgradient) | MW-16 (downgradient) | MW-19 (downgradient) | MW-4 (upgradient) |
|---|---|---|---|---|---|---|---|---|---|
| Nickel | 2022-10 | EPA 6020A | mg/L | 0.0255 | 0.0254 | 0.0712 | 0.0063 | 0.0558 | 0.117 |
| Nickel | 2023-10 | EPA 6020A | mg/L | 0.0315 | 0.0296 | 0.0726 | 0.0099 | 0.0628 | 0.07 |
| Selenium | 2019-10 | EPA 6020A | mg/L | | | | | | 0.0051 |
| Selenium | 2020-09 | EPA 6020A | mg/L | | | | | | 0.005 |
| Selenium | 2021-10 | EPA 6020A | mg/L | | | | | | 0.0051 |
| Selenium | 2022-10 | EPA 6020A | mg/L | | | | | | 0.01 |
| Selenium | 2023-10 | EPA 6020A | mg/L | | | | | | 0.0074 |
| Toluene | 2021-10 | EPA 8260B | ug/L | | | | | 1.1 | |
| Vanadium | 2017-10 | EPA 6020A | mg/L | | | | | 0.0219 | |
| Vanadium | 2019-10 | EPA 6020A | mg/L | | 0.0276 | | | 0.0323 | 0.0725 |
| Vanadium | 2020-09 | EPA 6020A | mg/L | 0.0274 | | | | | 0.0468 |
| Vanadium | 2021-10 | EPA 6020A | mg/L | | | | | | 0.0652 |
| Vanadium | 2022-10 | EPA 6020A | mg/L | | | | | | 0.12 |
| Vanadium | 2023-10 | EPA 6020A | mg/L | | | | | | 0.0899 |
| Vinyl Chloride | 2007-05 | EPA 8260B | ug/L | | | 8.3 | | | |
| Vinyl Chloride | 2008-10 | EPA 8260B | ug/L | | | 7.4 | | | |
| Vinyl Chloride | 2009-05 | EPA 8260B | ug/L | | | 6.3 | | | |
| Vinyl Chloride | 2009-10 | EPA 8260B | ug/L | | | 6 | | | |
| Vinyl Chloride | 2010-05 | EPA 8260B | ug/L | | | 5 | | | |
| Vinyl Chloride | 2010-10 | EPA 8260B | ug/L | | | 4.4 | | | |
| Vinyl Chloride | 2011-05 | EPA 8260B | ug/L | | | 3.6 | | | |
| Vinyl Chloride | 2011-10 | EPA 8260B | ug/L | | | 4.3 | | | |
| Vinyl Chloride | 2012-06 | EPA 8260B | ug/L | 4.8 | | 4.6 | | 2.3 | |
| Vinyl Chloride | 2012-10 | EPA 8260B | ug/L | 3.5 | | 3.8 | | 2.2 | |
| Vinyl Chloride | 2013-06 | EPA 8260B | ug/L | 4.5 | | 5.8 | | 1.8 | |
| Vinyl Chloride | 2013-10 | EPA 8260B | ug/L | 3.1 | | 2.7 | | 1.6 | |
| Vinyl Chloride | 2014-05 | EPA 8260B | ug/L | 2.8 | | 2 | | | |
| Vinyl Chloride | 2014-10 | EPA 8260B | ug/L | 3.2 | | 2.4 | | | |
| Vinyl Chloride | 2015-05 | EPA 8260B | ug/L | 2.5 | | 1.8 | | | |
| Vinyl Chloride | 2015-10 | EPA 8260B | ug/L | 2.3 | | | | | |
| Vinyl Chloride | 2016-10 | EPA 8260B | ug/L | 2.8 | 1.5 | | | 1 | |
| Vinyl Chloride | 2017-10 | EPA 8260B | ug/L | 1.9 | 1.1 | | | | |
| Vinyl Chloride | 2018-07 | EPA 8260B | ug/L | 1.4 | | | | | |
| Vinyl Chloride | 2019-10 | EPA 8260B | ug/L | 2.3 | | | | | |
| Zinc | 2016-10 | EPA 6020A | mg/L | | 0.0092 | | 0.0118 | 0.0101 | 0.0082 |
| Zinc | 2017-10 | EPA 6020A | mg/L | | | | 0.0577 | 0.0401 | 0.0444 |
| Zinc | 2018-07 | EPA 6020A | mg/L | | | 0.0117 | 0.123 | | |
| Zinc | 2019-10 | EPA 6020A | mg/L | | 0.0311 | | | 0.0425 | 0.154 |
| Zinc | 2020-09 | EPA 6020A | mg/L | 0.0322 | | | | | 0.109 |
| Zinc | 2021-10 | EPA 6020A | mg/L | | | | | | 0.295 |
| Zinc | 2022-10 | EPA 6020A | mg/L | | | | | | 0.339 |
| Zinc | 2023-10 | EPA 6020A | mg/L | | | | | | 0.235 |

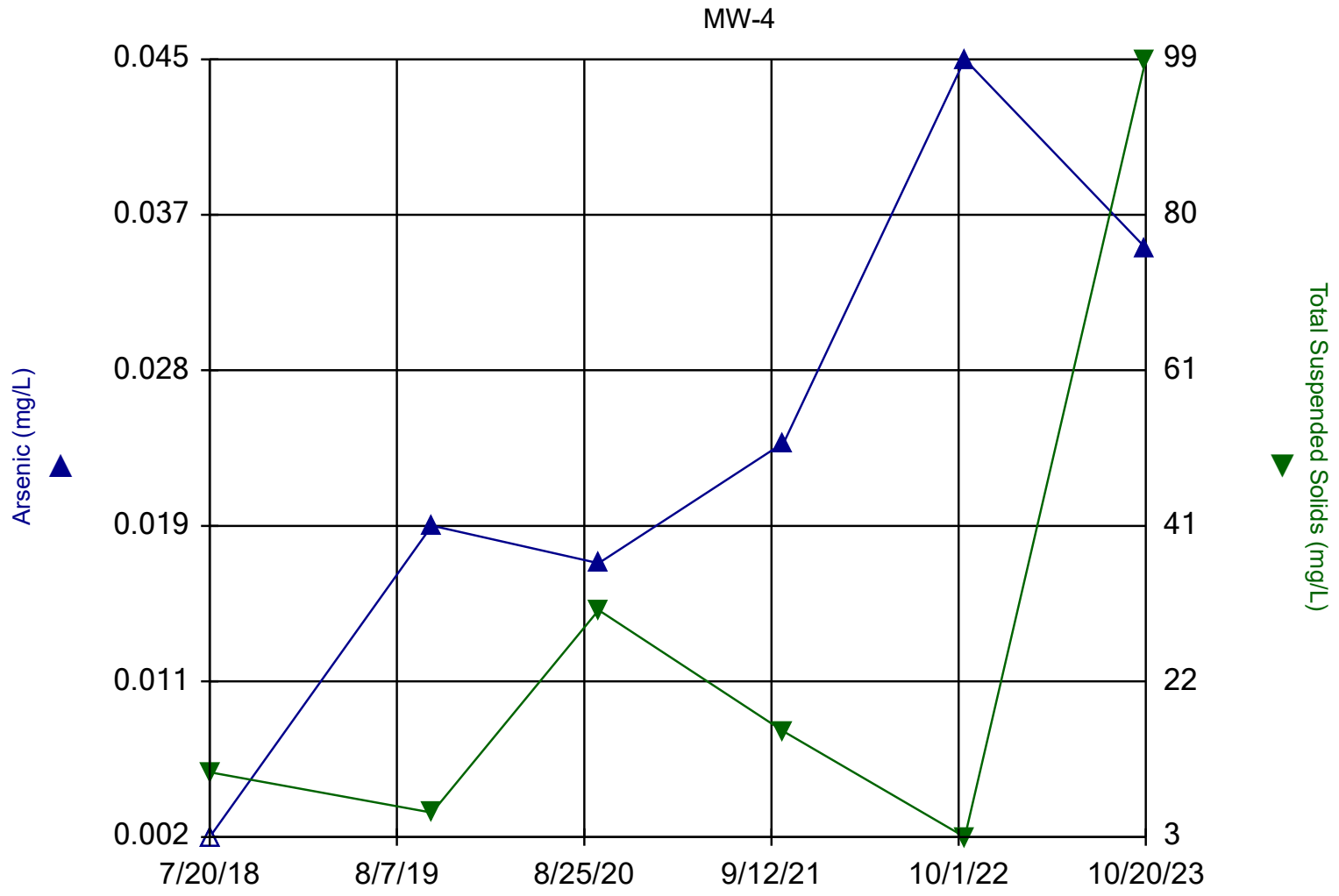
# Attachment 2

# Background Metals and TSS Time-Series Graphs

# Jul. 2018 – Oct. 2023 Graphs

Hollow symbols indicate censored values.

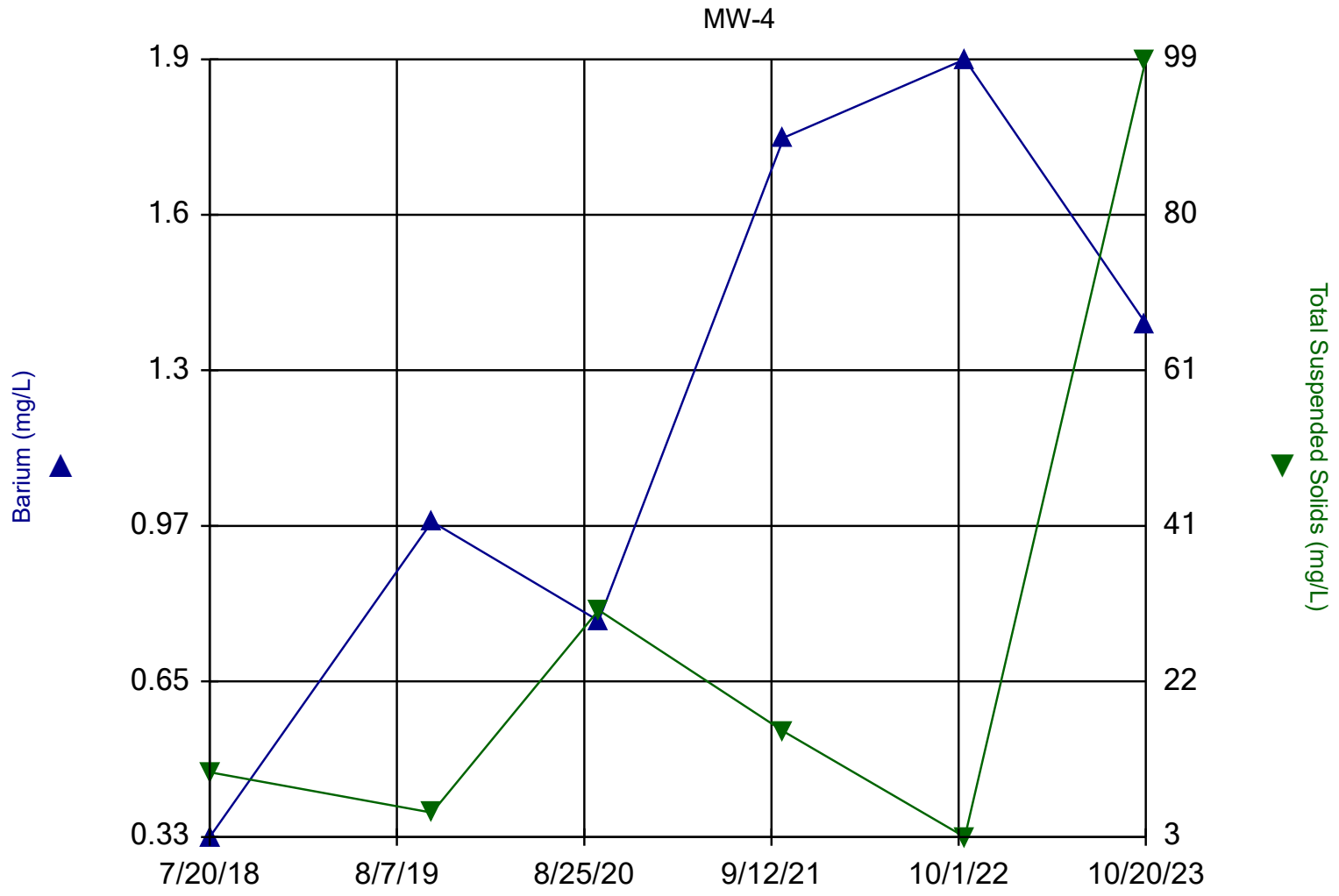
# Time Series




Analysis Run 7/11/2024 2:06 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Time Series

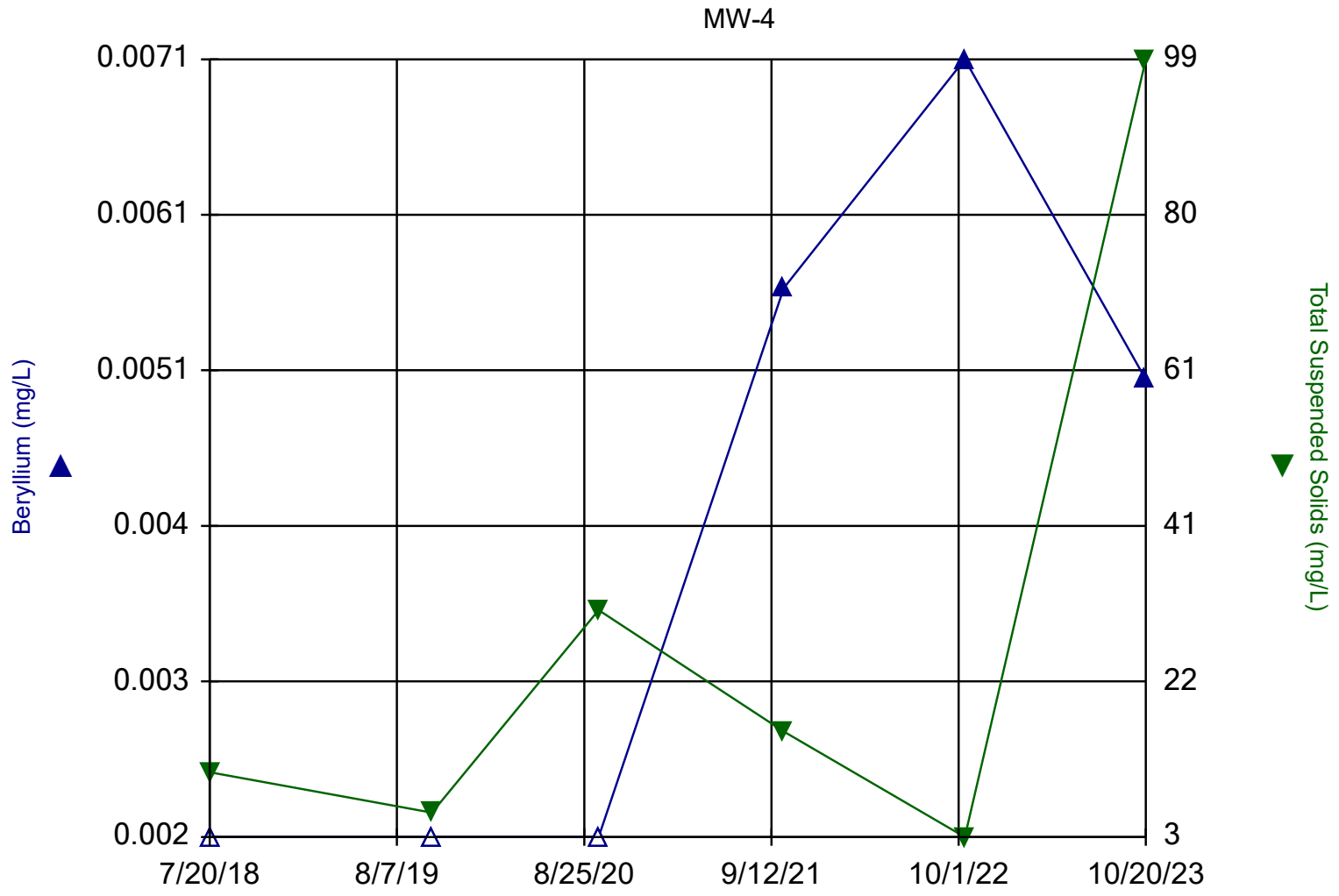



Analysis Run 7/11/2024 2:11 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

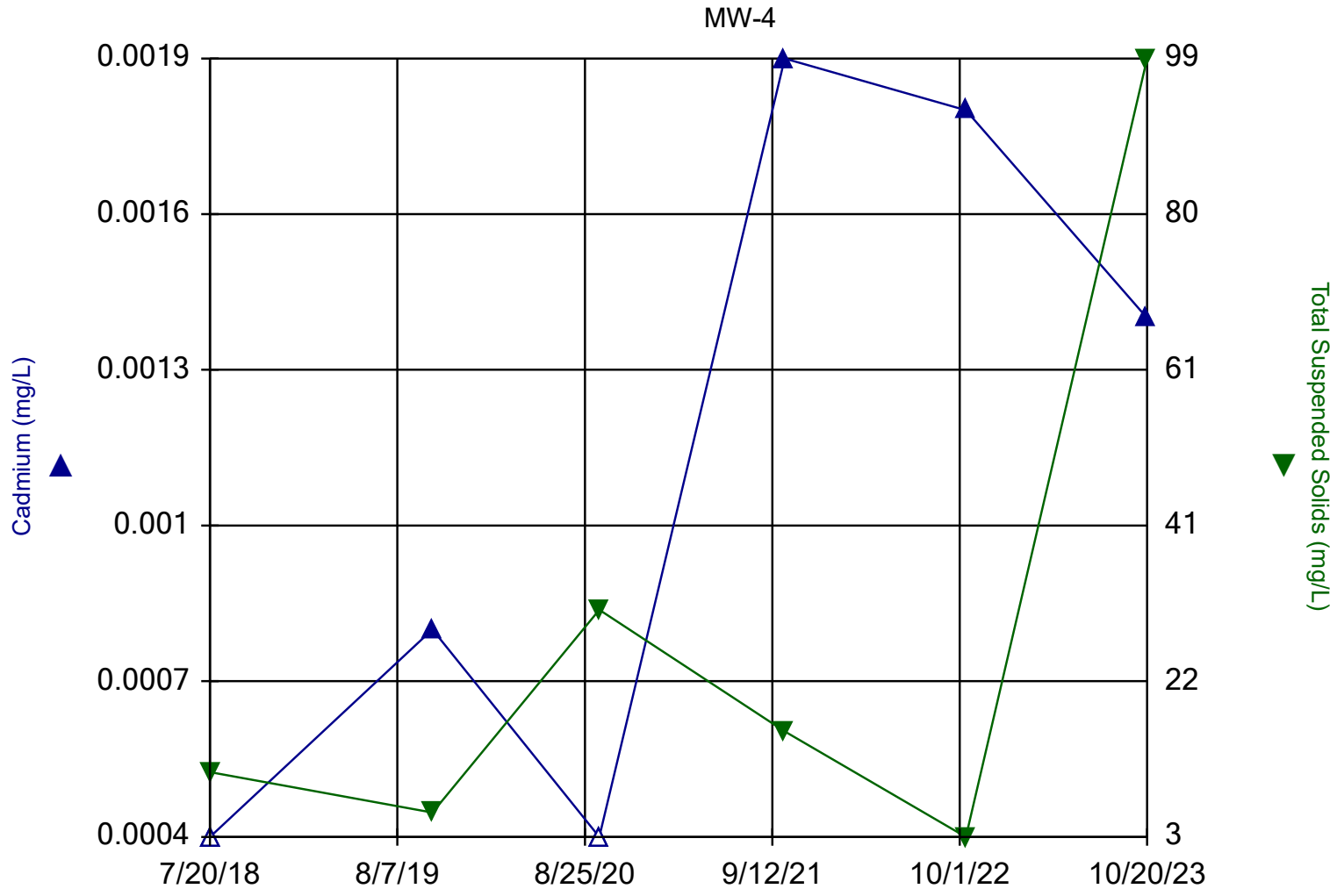



Analysis Run 7/11/2024 2:19 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

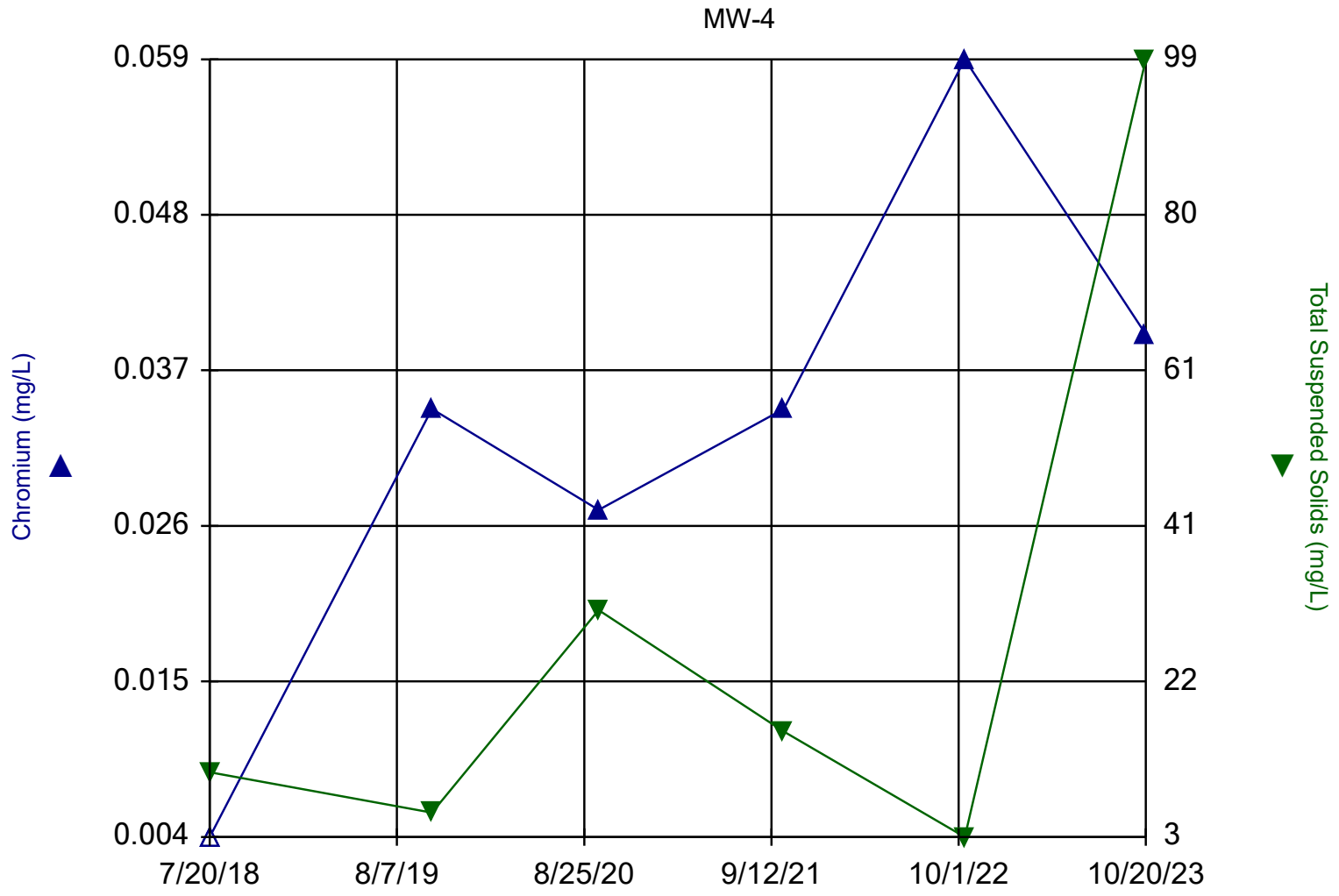



Analysis Run 7/11/2024 2:25 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

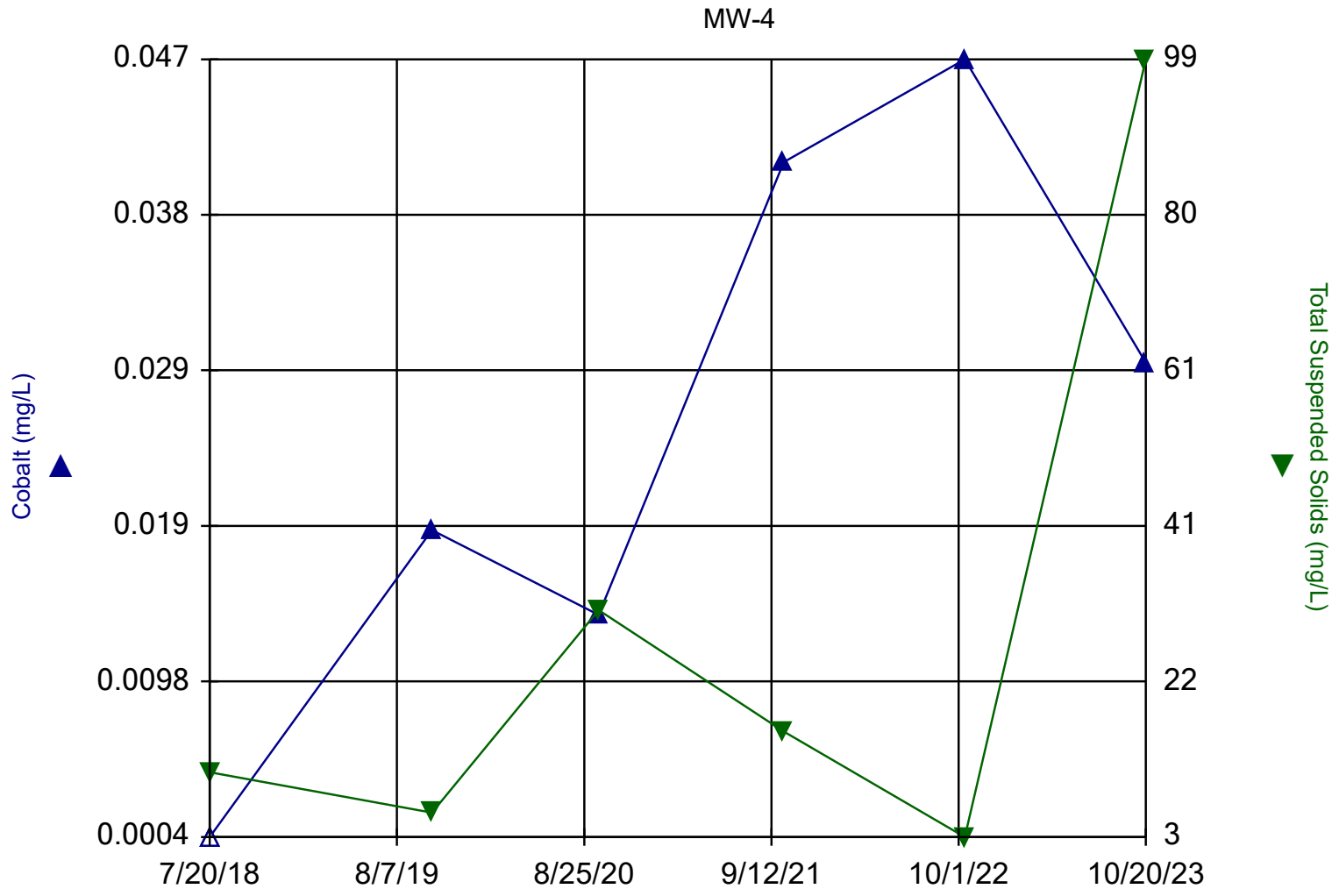



Analysis Run 7/11/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

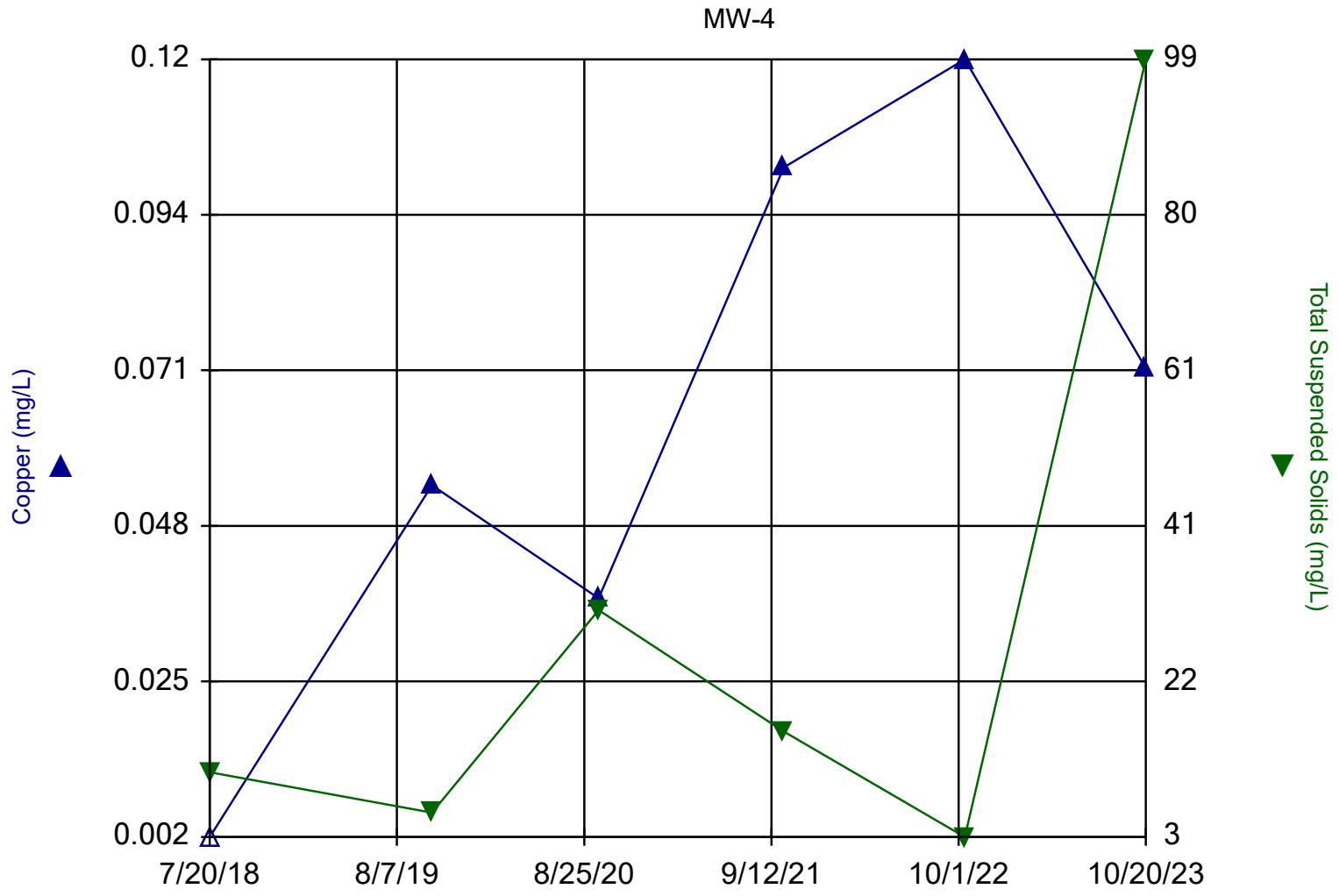



Analysis Run 7/11/2024 2:29 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

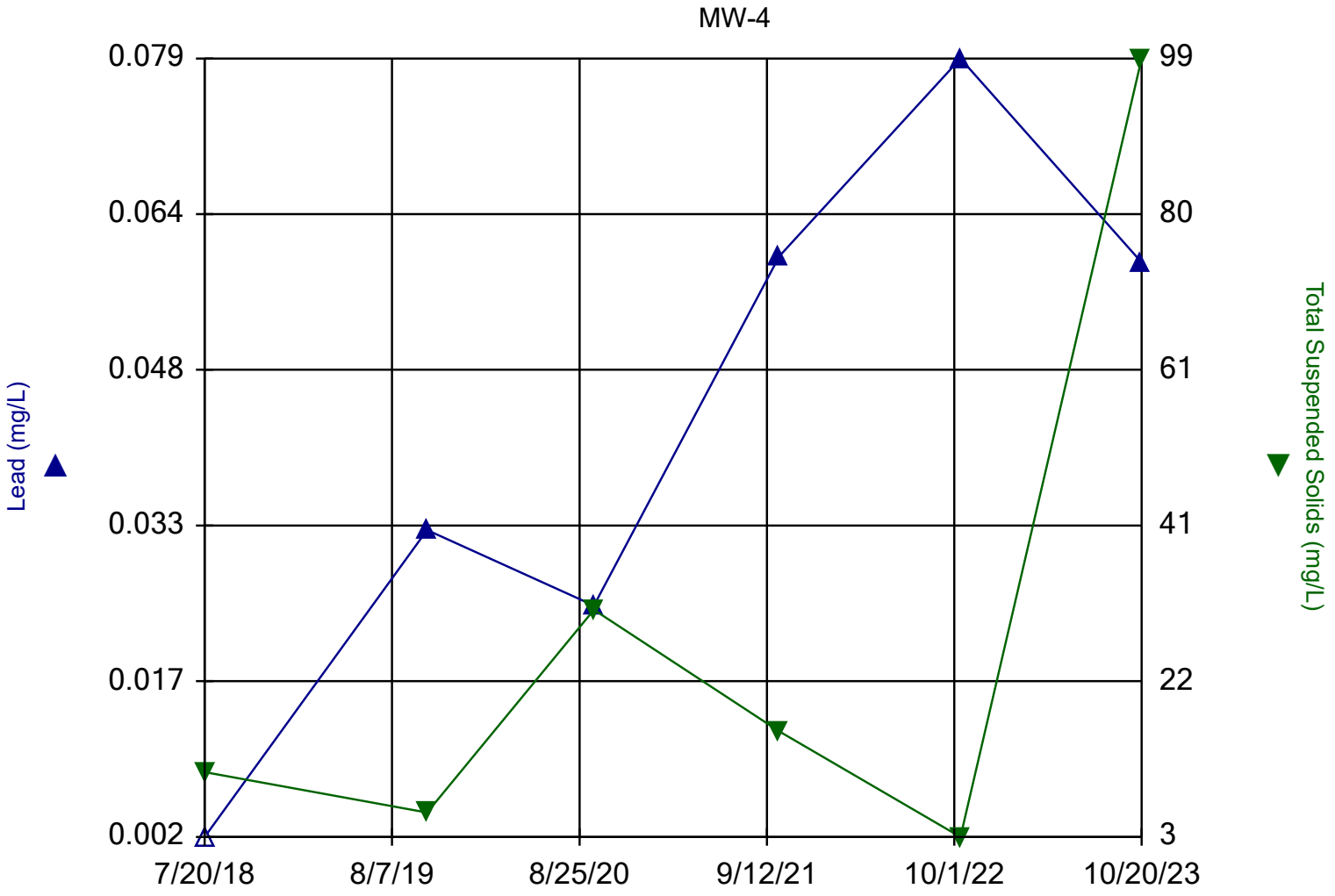



Analysis Run 7/11/2024 2:33 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

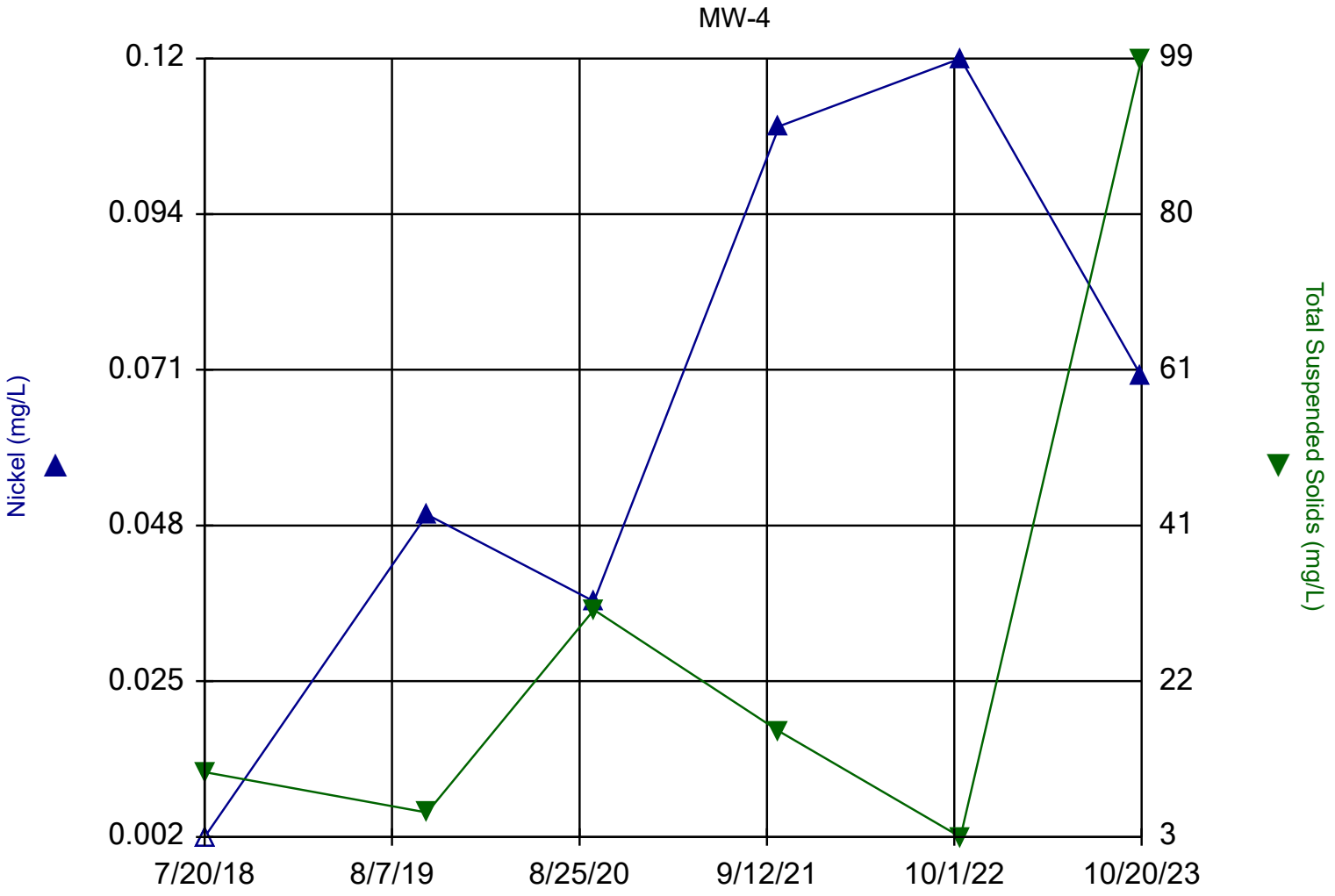



Analysis Run 7/11/2024 2:48 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

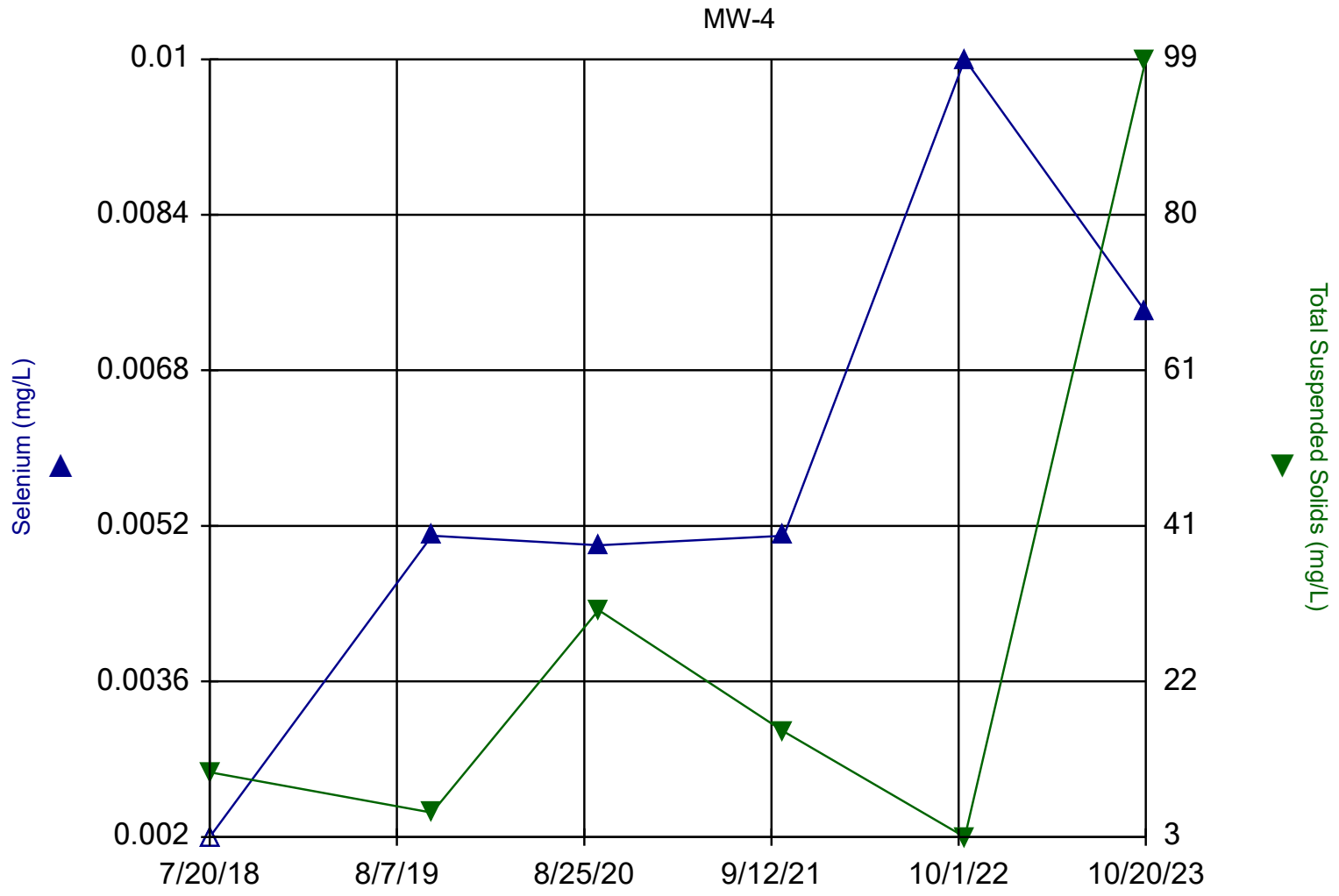



Analysis Run 7/11/2024 2:54 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

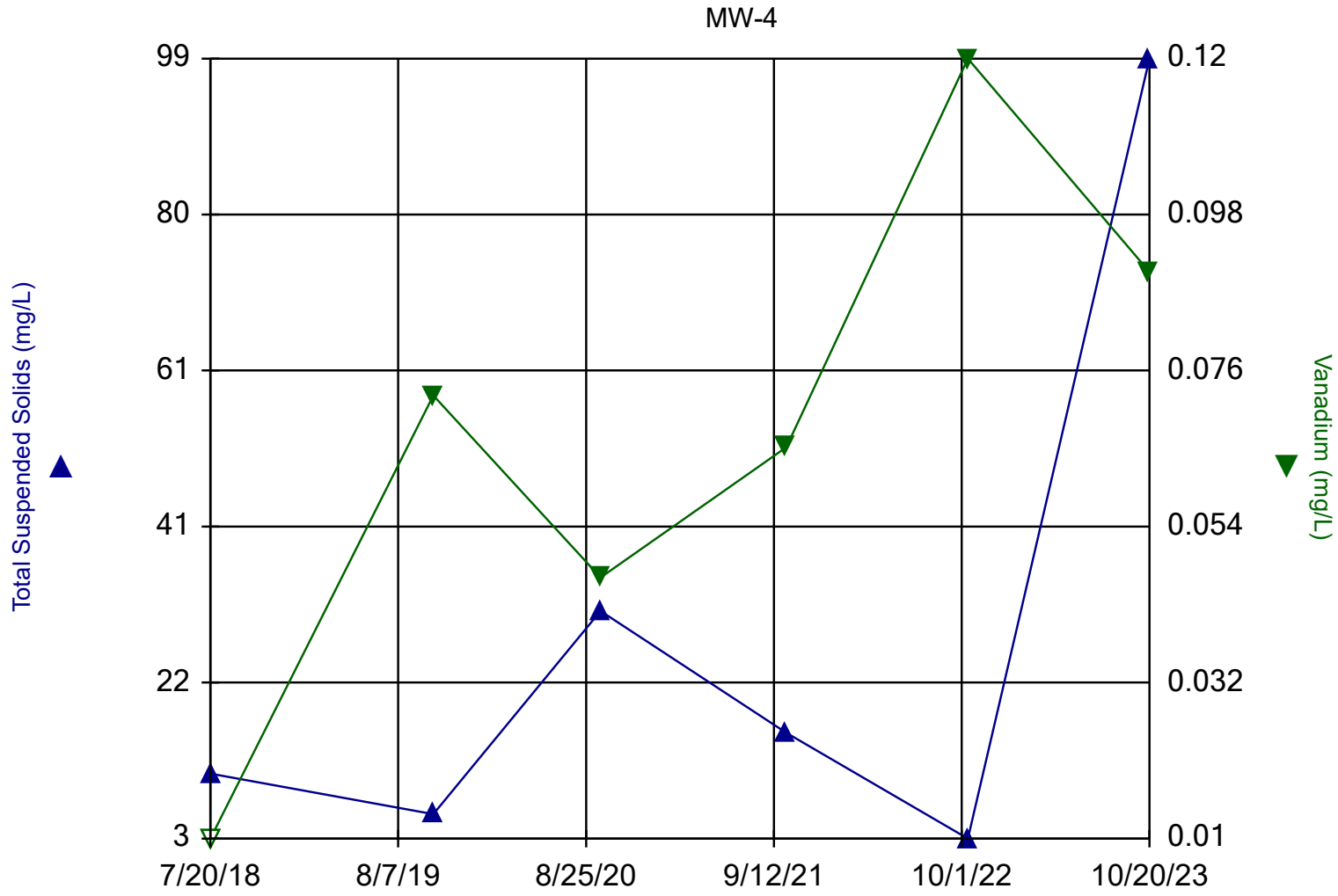



Analysis Run 7/11/2024 2:55 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

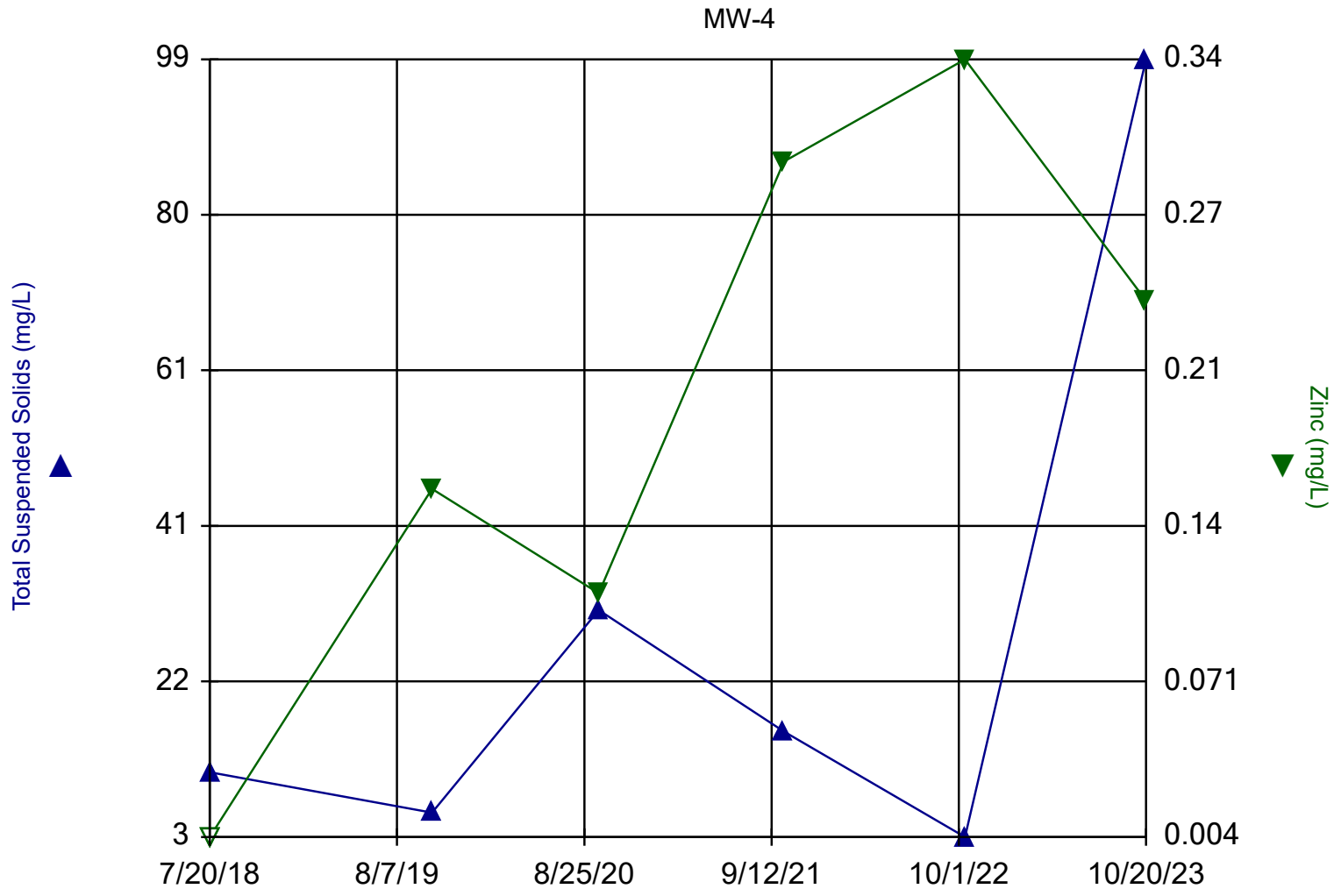



Analysis Run 7/11/2024 3:05 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series



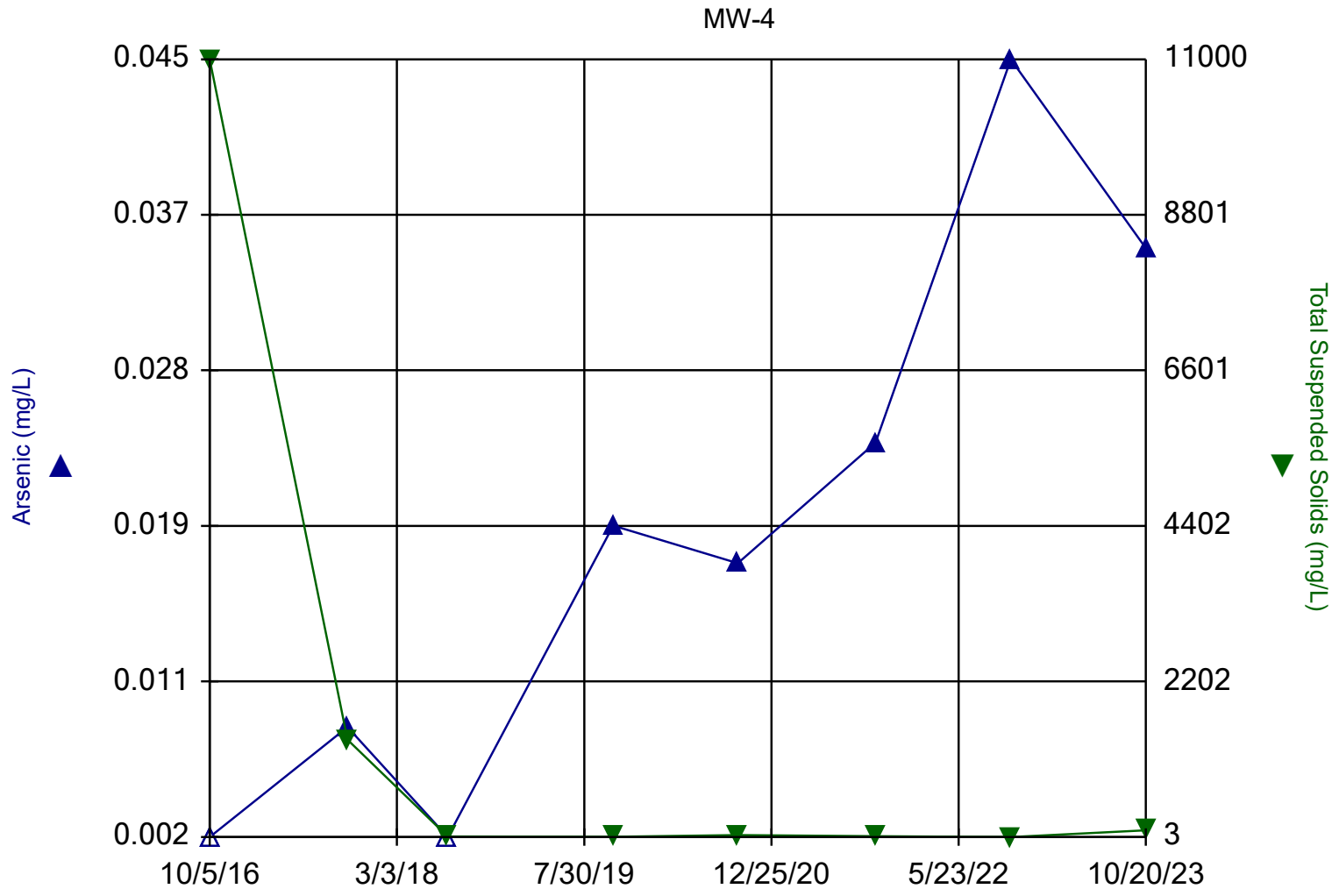

Analysis Run 7/11/2024 3:06 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Oct. 2016 – Oct. 2023 Graphs

Hollow symbols indicate censored values.

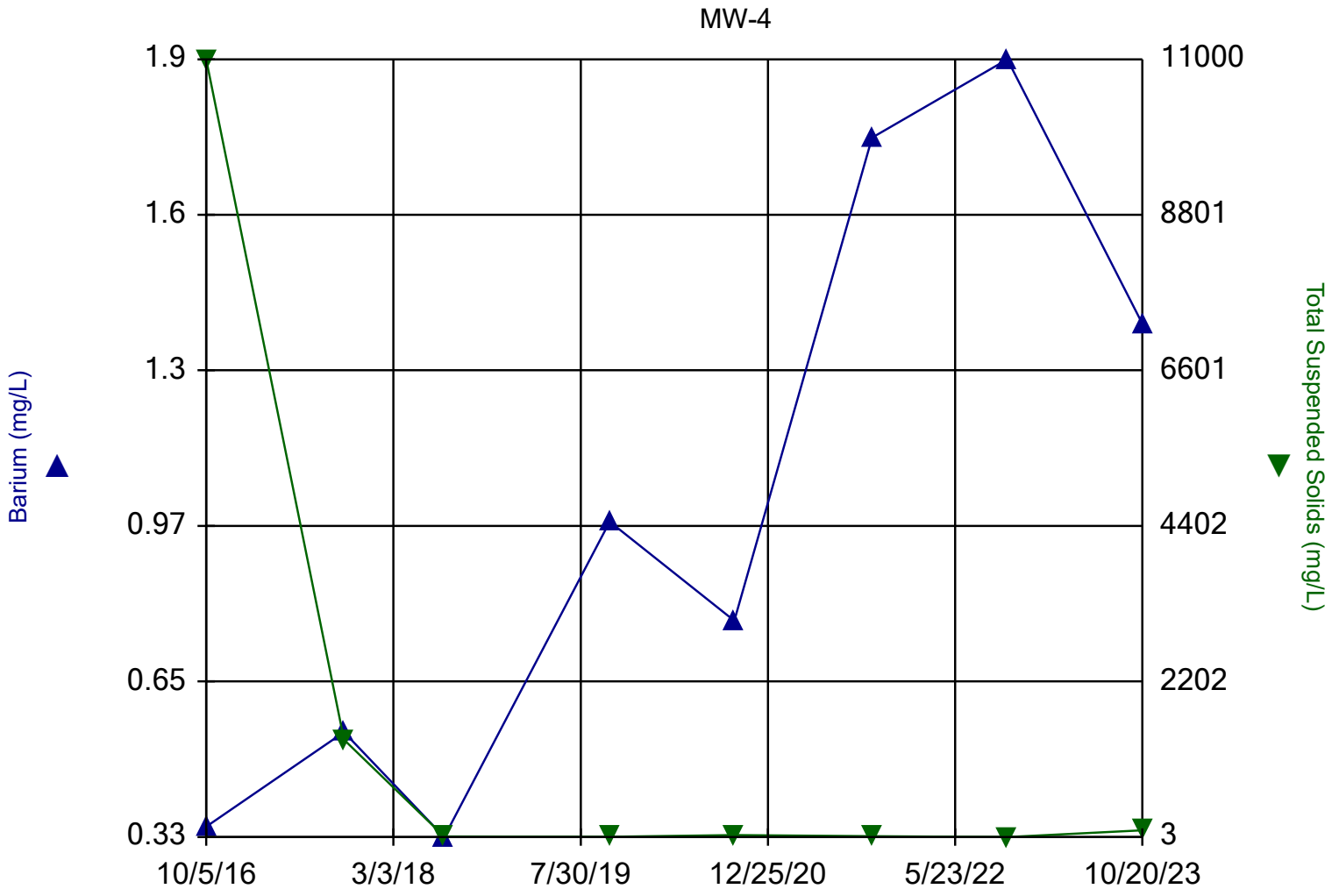
# Time Series




Analysis Run 7/11/2024 2:07 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Time Series

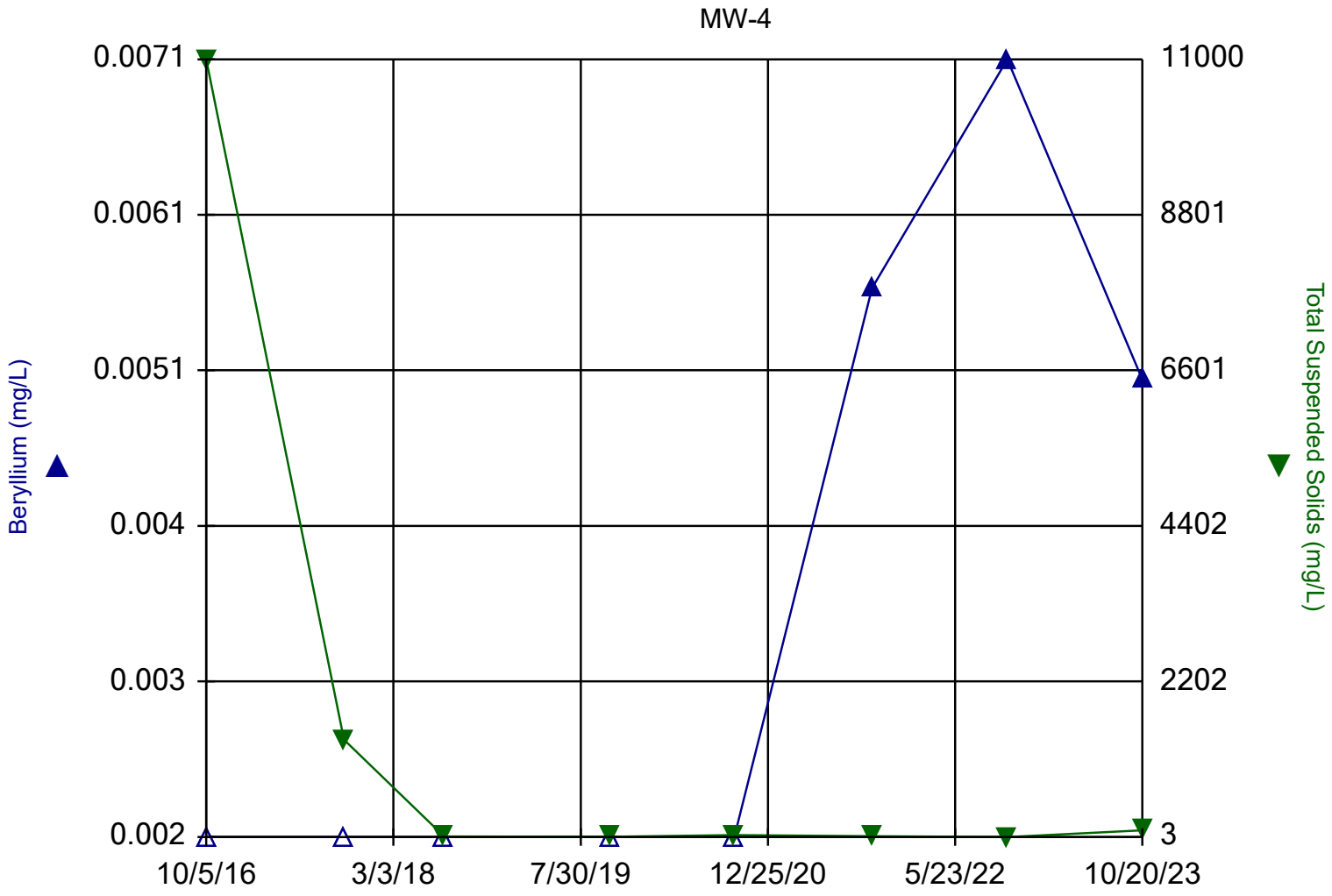



Analysis Run 7/11/2024 2:13 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

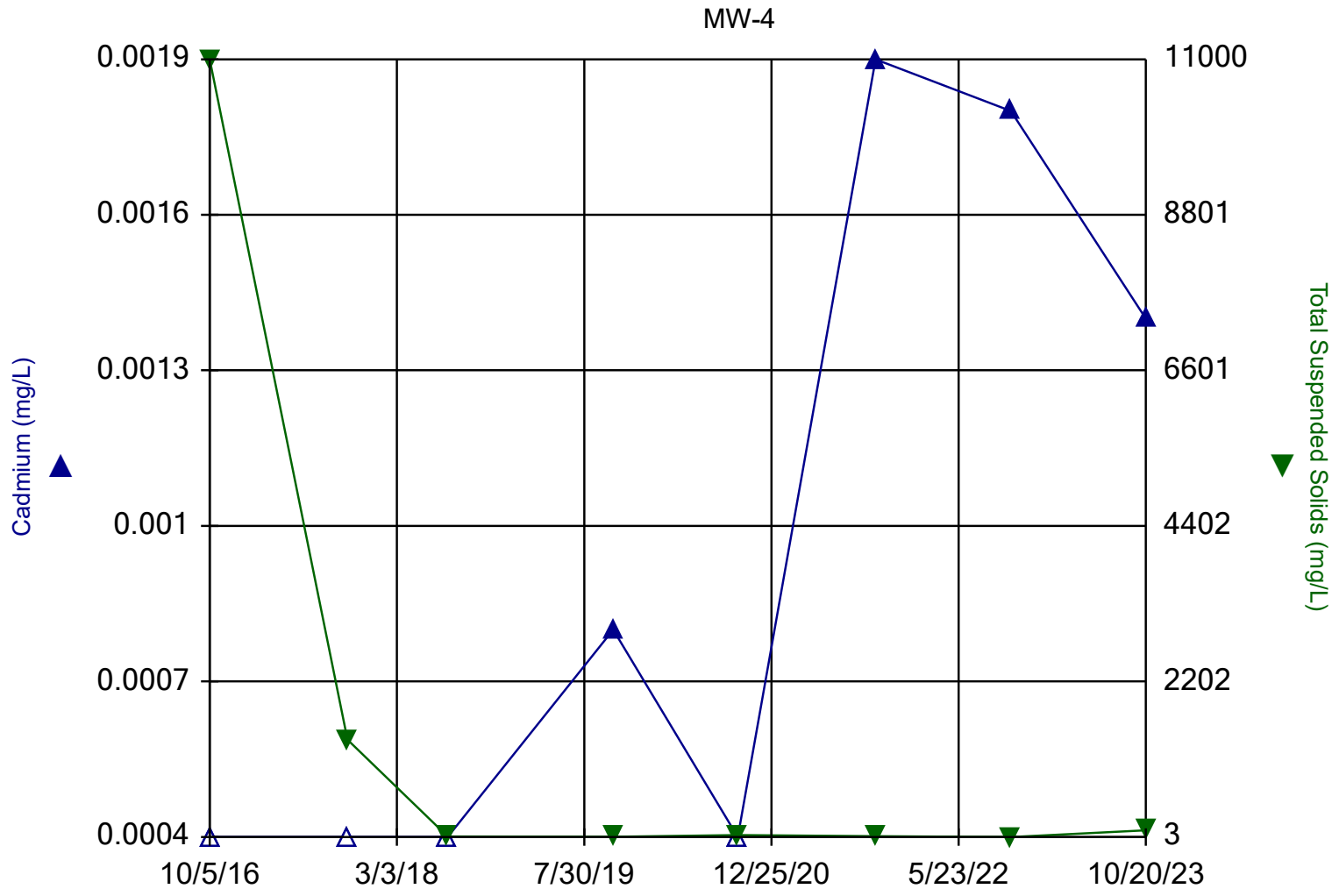



Analysis Run 7/11/2024 2:17 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

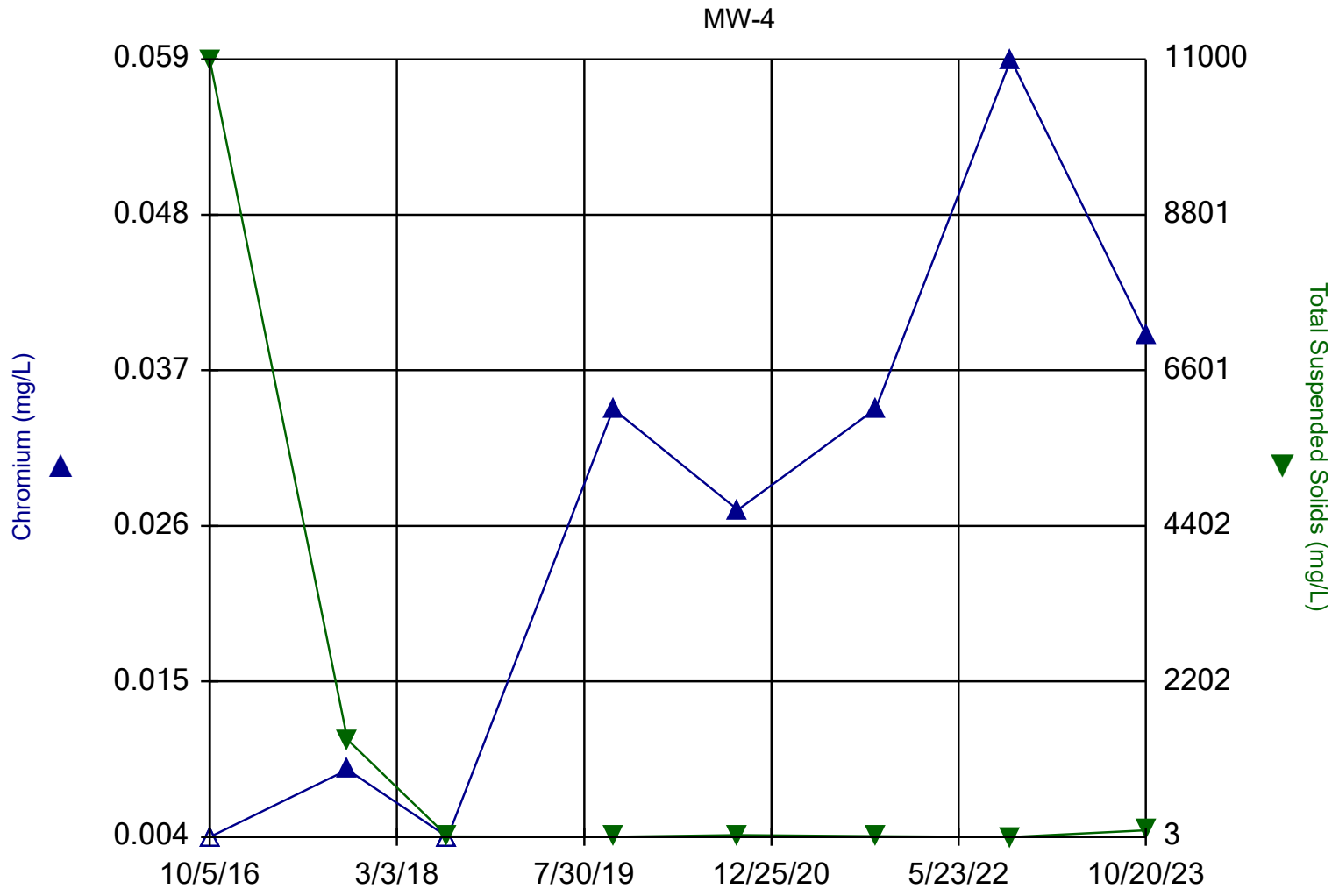



Analysis Run 7/11/2024 2:26 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

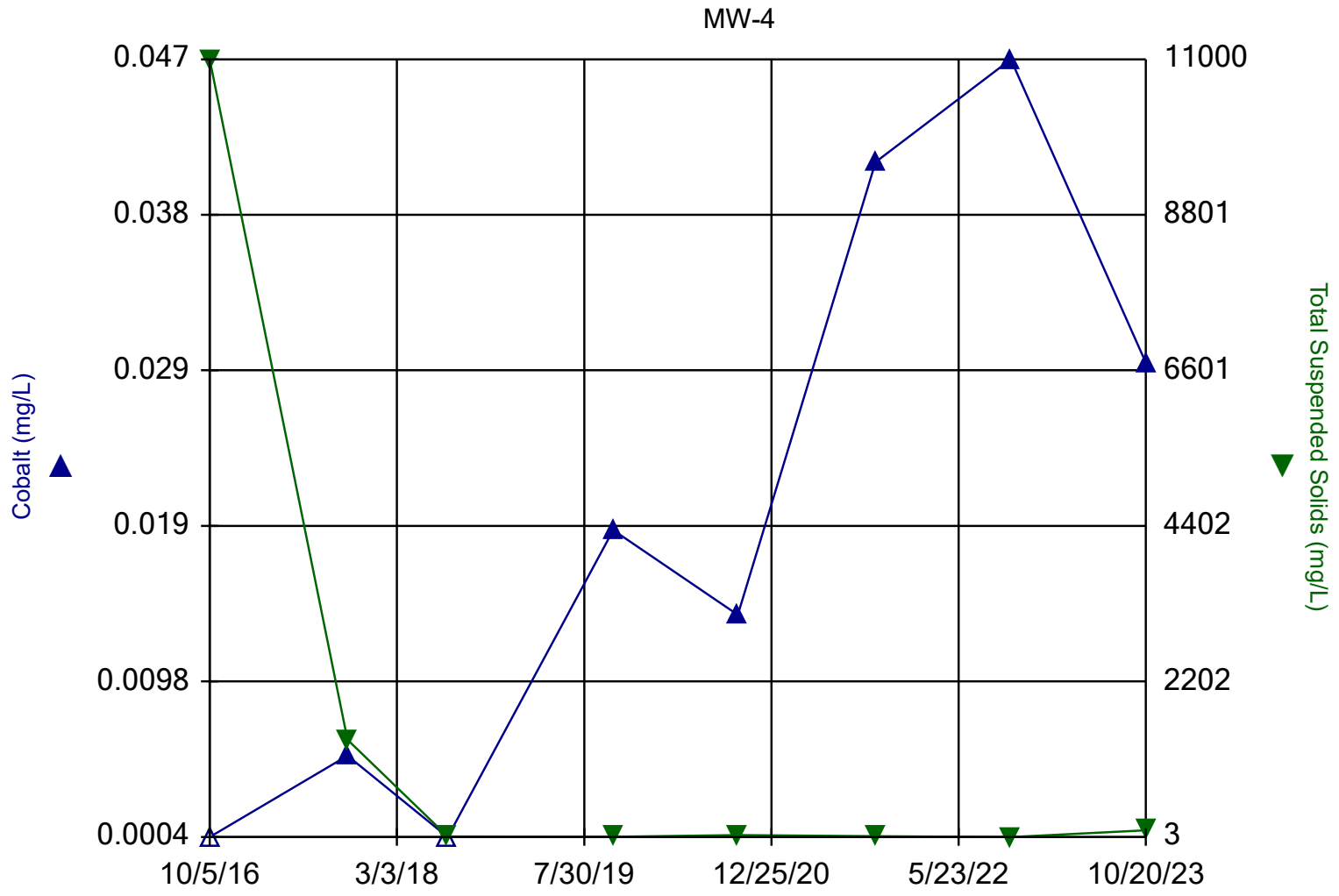



Analysis Run 7/11/2024 2:27 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

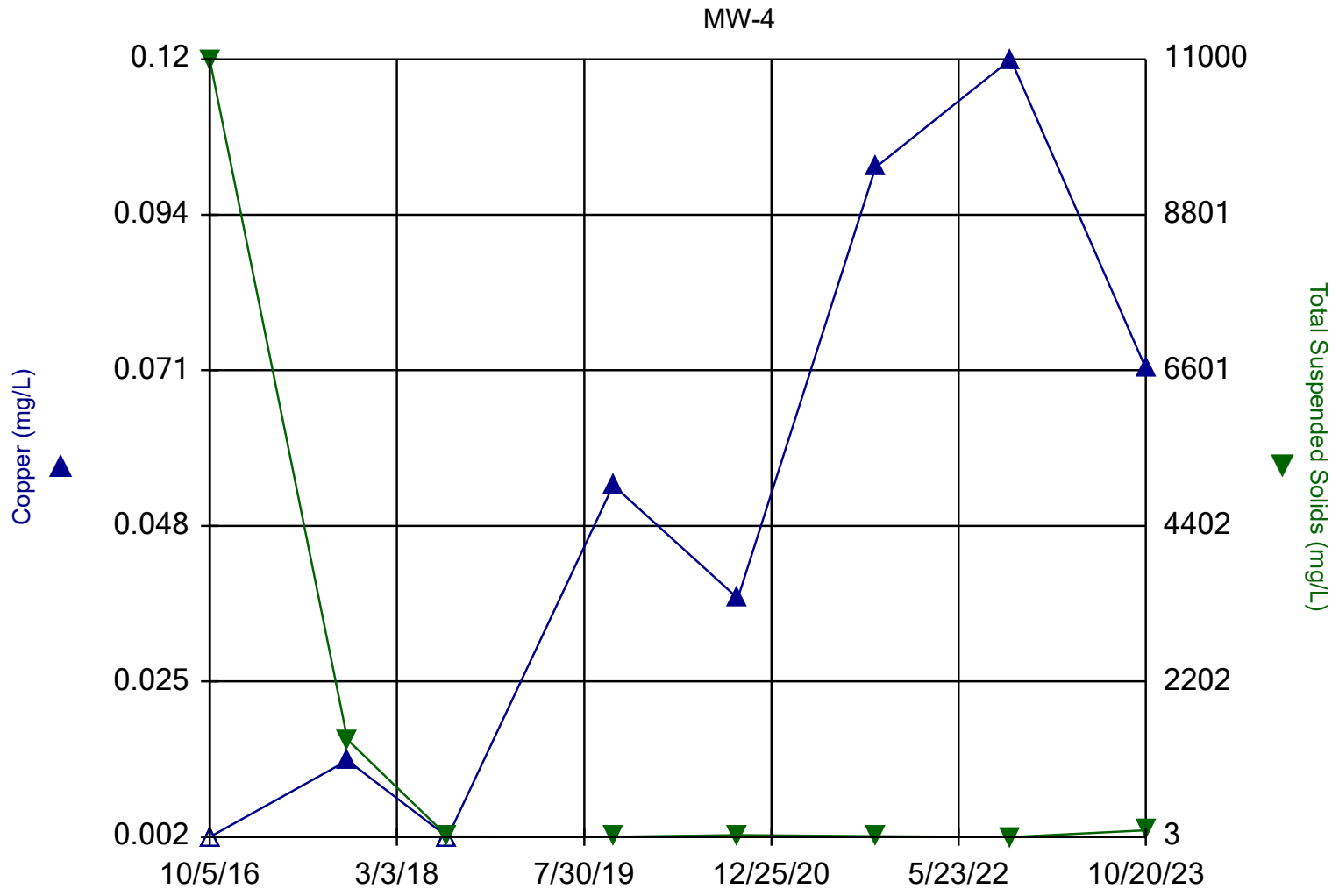



Analysis Run 7/11/2024 2:30 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

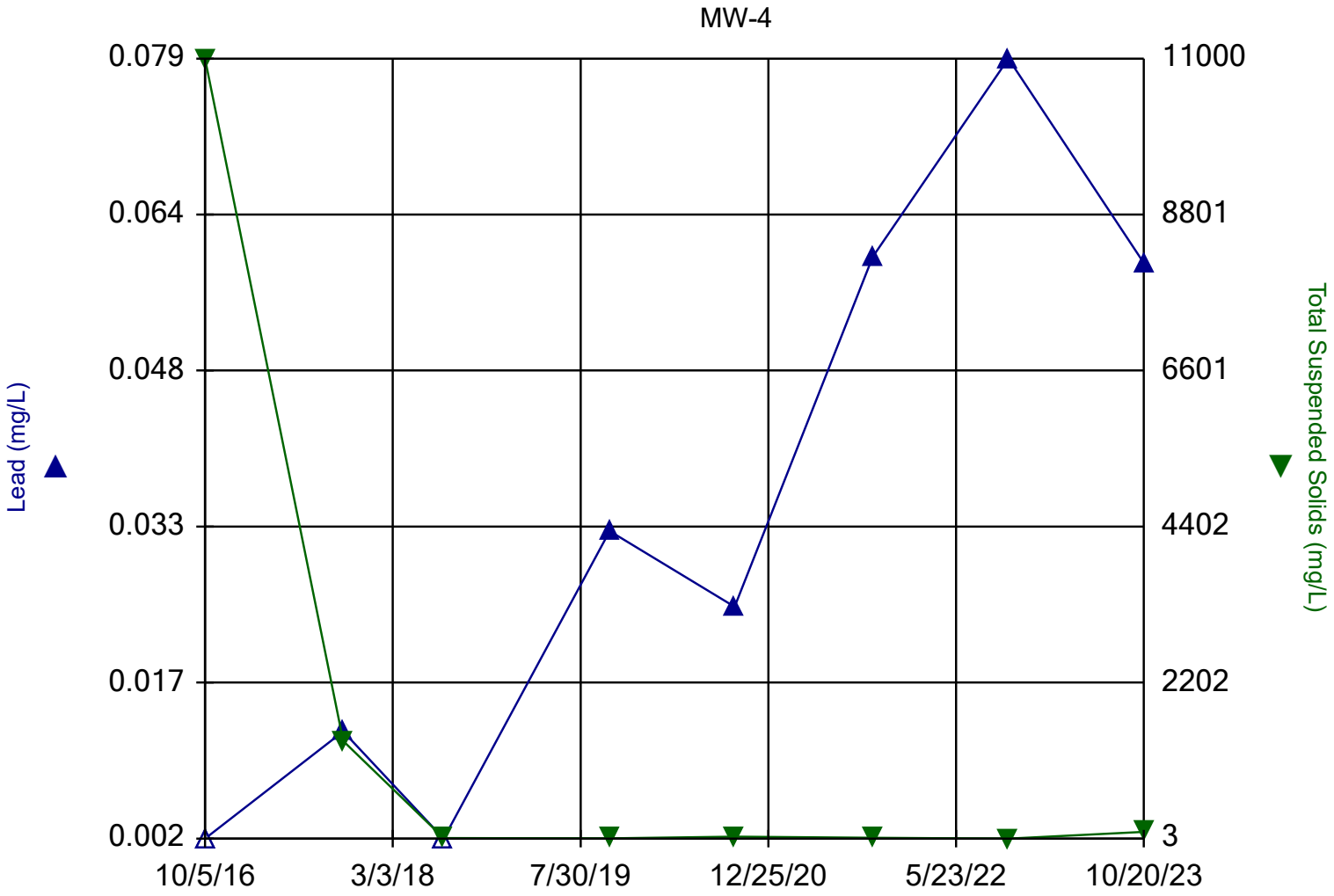



Analysis Run 7/11/2024 2:32 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

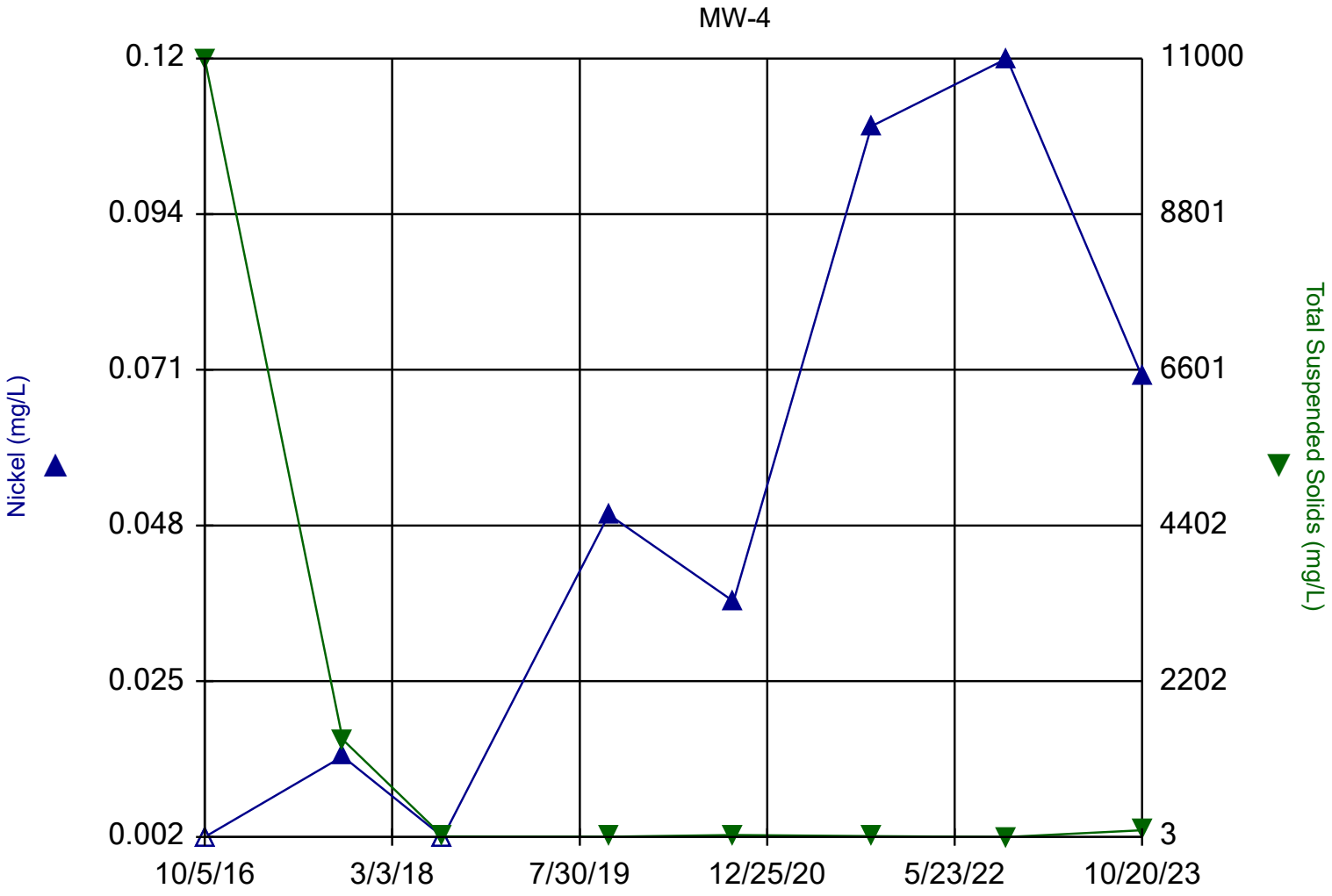



Analysis Run 7/11/2024 2:49 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

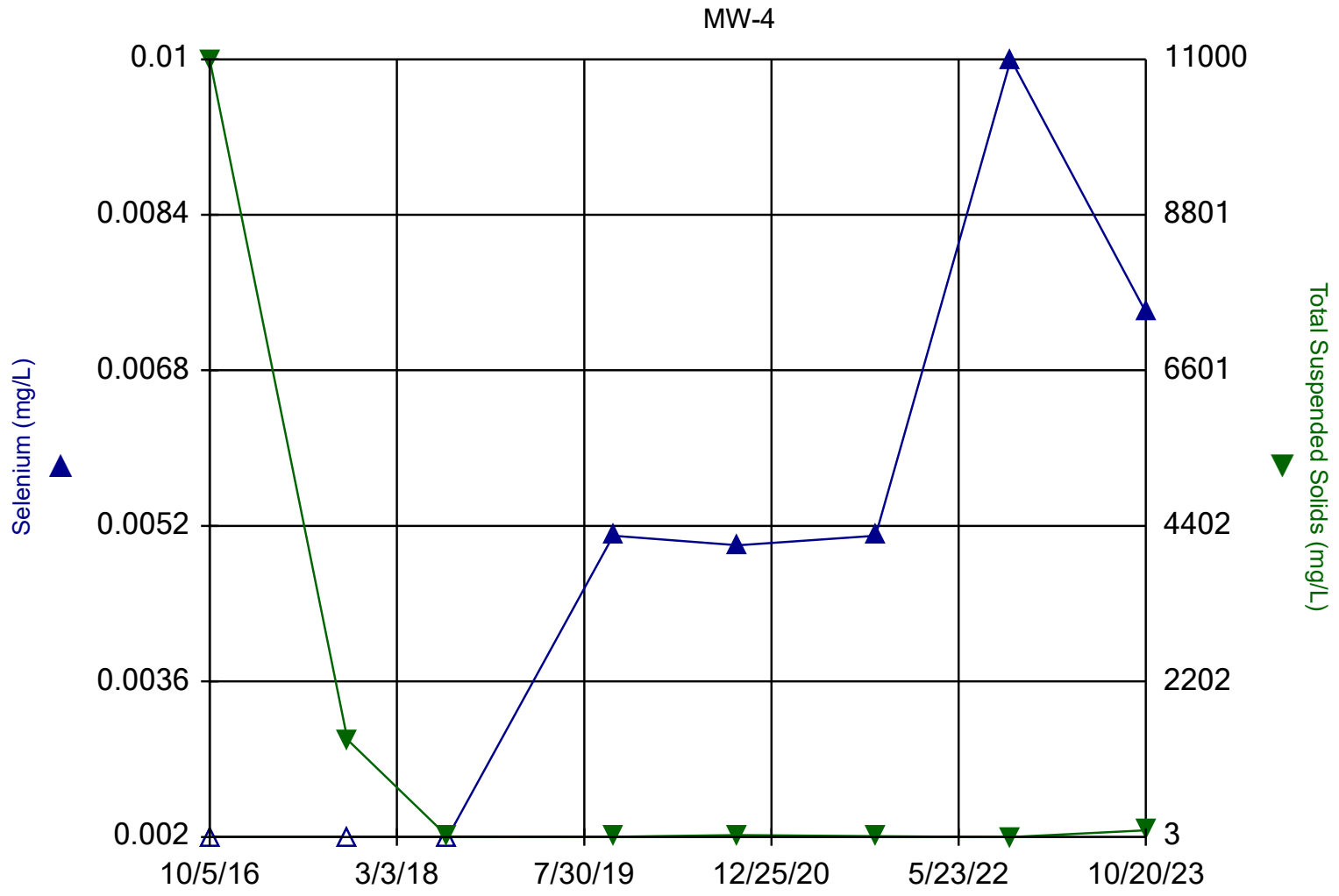



Analysis Run 7/11/2024 2:50 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

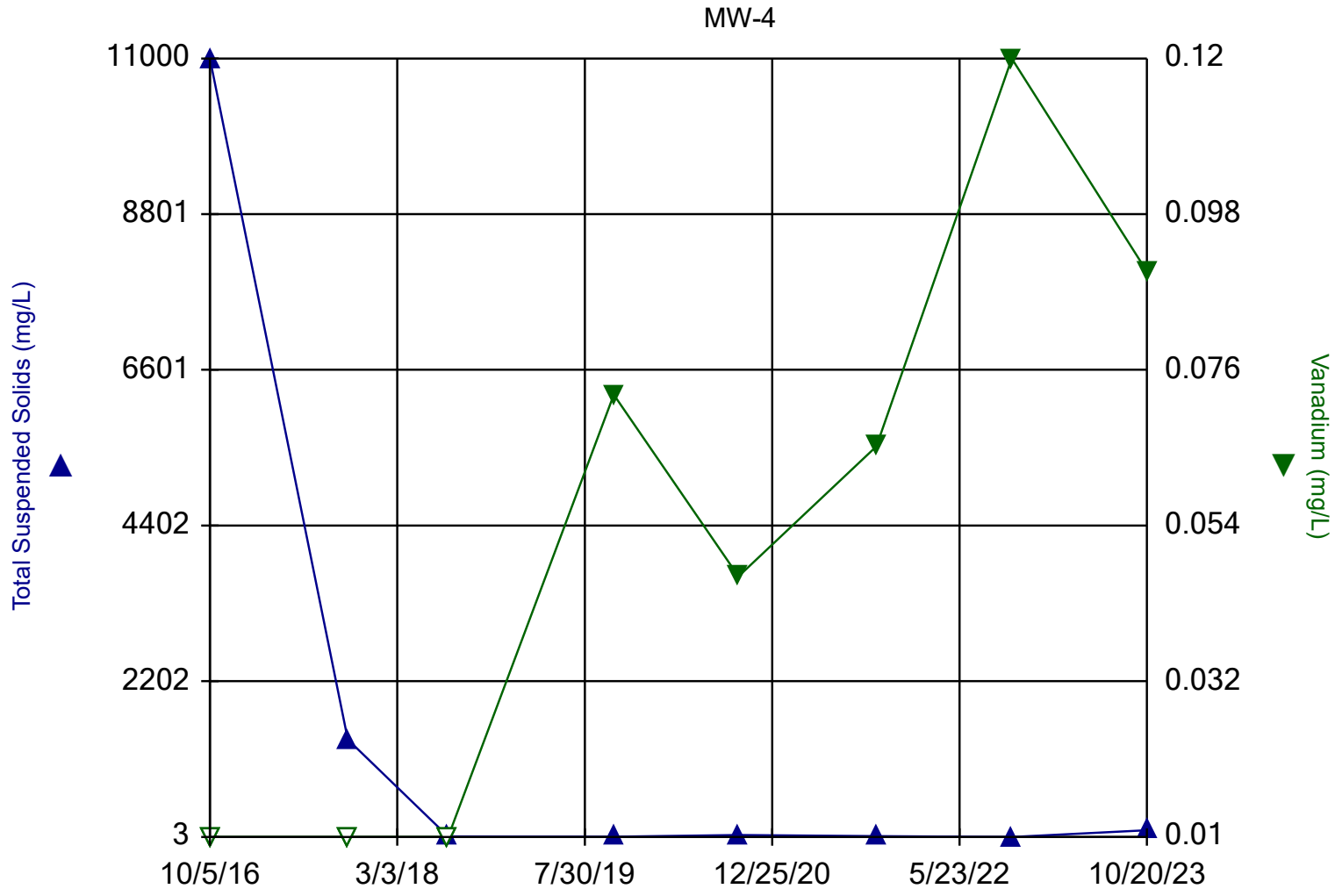



Analysis Run 7/11/2024 2:56 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series

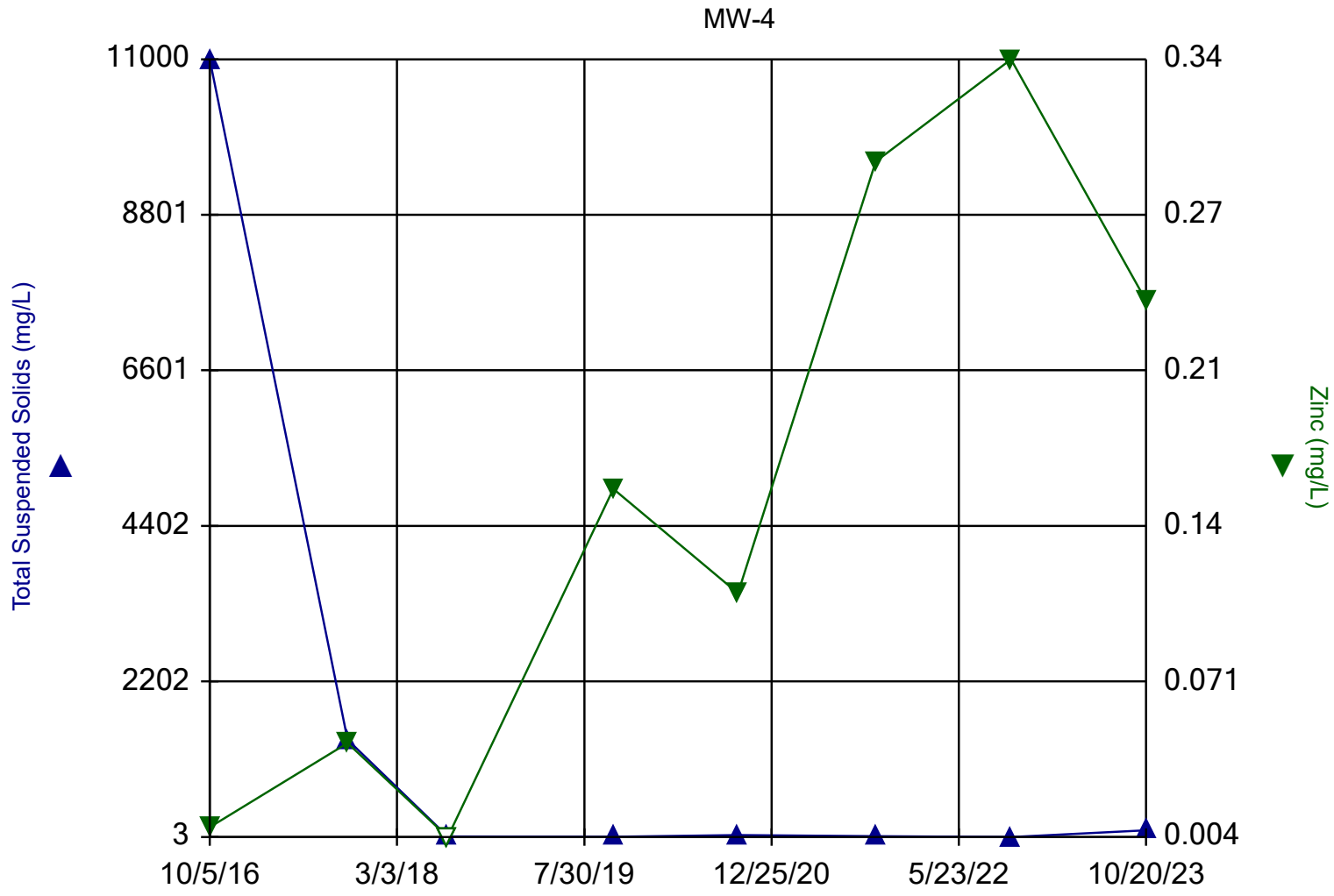



Analysis Run 7/11/2024 2:58 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Time Series




Analysis Run 7/11/2024 3:07 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Attachment 3

# Sanitas Report Output for Confidence Interval Calculations

# Assessment Mode

## Confidence Interval

| Constituent Name | Well | Upper Limit | Lower Limit | Compliance Limit [1] | Exceed [2] | N | Mean | Standard Deviation | % Non-detects | Non-detect Adjustment | Transformation | Alpha | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Downgradient Monitoring Locations** | | | | | | | | | | | | | |
| 1,1-Dichloroethane (ug/L) | MW-15 | 1.7 | 0.5 | 140 | No | 9 | 0.8 | 0.5 | 67 | None | No | 0.00 | NP (normality) |
| 1,4-Dichlorobenzene (ug/L) | MW-12 | 1.1 | 0.5 | 75 | No | 16 | 0.6 | 0.3 | 88 | None | No | 0.01 | NP (NDs) |
| 1,4-Dichlorobenzene (ug/L) | MW-15 | 5.4 | 3.9 | 75 | No | 19 | 4.7 | 1.3 | 0 | None | No | 0.01 | Param. |
| 1,4-Dichlorobenzene (ug/L) | MW-19 | 1.2 | 0.5 | 75 | No | 16 | 0.8 | 0.4 | 75 | None | No | 0.01 | NP (normality) |
| Acetone (ug/L) | MW-13 | 21.7 | 5.0 | 6300 | No | 8 | 8.5 | 6.7 | 75 | None | No | 0.00 | NP (normality) |
| Arsenic (mg/L) | MW-12 | 0.0232 | 0.0157 | 0.01 | Yes | 6 | 0.0194 | 0.0027 | 0 | None | No | 0.01 | Param. |
| Arsenic (mg/L) | MW-13 | 0.0152 | 0.0060 | 0.01 | No | 6 | 0.0102 | 0.0044 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Arsenic (mg/L) | MW-15 | 0.3730 | 0.0478 | 0.01 | Yes | 6 | 0.1268 | 0.1215 | 0 | None | No | 0.02 | NP (normality) |
| Arsenic (mg/L) | MW-16 | 0.0062 | 0.0020 | 0.01 | No | 6 | 0.0033 | 0.0020 | 67 | None | No | 0.02 | NP (normality) |
| Arsenic (mg/L) | MW-19 | 0.0085 | 0.0020 | 0.01 | No | 6 | 0.0031 | 0.0027 | 83 | None | No | 0.02 | NP (normality) |
| Barium (mg/L) | MW-12 | 1.25 | 1.04 | 2 | No | 6 | 1.14 | 0.08 | 0 | None | No | 0.01 | Param. |
| Barium (mg/L) | MW-13 | 0.55 | 0.20 | 2 | No | 6 | 0.38 | 0.13 | 0 | None | No | 0.01 | Param. |
| Barium (mg/L) | MW-15 | 1.91 | 1.31 | 2 | No | 6 | 1.61 | 0.22 | 0 | None | No | 0.01 | Param. |
| Barium (mg/L) | MW-16 | 0.05 | 0.02 | 2 | No | 6 | 0.03 | 0.01 | 0 | None | No | 0.02 | NP (normality) |
| Barium (mg/L) | MW-19 | 1.21 | 0.77 | 2 | No | 6 | 0.99 | 0.16 | 0 | None | No | 0.01 | Param. |
| Benzene (ug/L) | MW-12 | 1.50 | 0.50 | 5 | No | 16 | 1.13 | 0.40 | 25 | None | No | 0.01 | NP (normality) |
| Benzene (ug/L) | MW-15 | 2.40 | 1.70 | 5 | No | 19 | 2.03 | 0.48 | 5 | None | No | 0.01 | NP (normality) |
| Cadmium (mg/L) | MW-12 | 0.00130 | 0.00040 | 0.005 | No | 6 | 0.00055 | 0.00037 | 83 | None | No | 0.02 | NP (normality) |
| Cadmium (mg/L) | MW-15 | 0.01185 | 0.00000 | 0.005 | No | 6 | 0.00503 | 0.00496 | 0 | None | No | 0.01 | Param. |
| Cadmium (mg/L) | MW-16 | 0.00420 | 0.00040 | 0.005 | No | 6 | 0.00103 | 0.00155 | 83 | None | No | 0.02 | NP (normality) |
| Cadmium (mg/L) | MW-19 | 0.00158 | 0.00082 | 0.005 | No | 6 | 0.00113 | 0.00043 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Chlorobenzene (ug/L) | MW-12 | 2.2 | 1.8 | 100 | No | 16 | 2.0 | 0.3 | 0 | None | No | 0.01 | Param. |
| Chlorobenzene (ug/L) | MW-13 | 1.3 | 0.5 | 100 | No | 8 | 0.8 | 0.3 | 50 | None | No | 0.00 | NP (normality) |
| Chlorobenzene (ug/L) | MW-15 | 18.9 | 14.4 | 100 | No | 19 | 16.6 | 3.8 | 0 | None | No | 0.01 | Param. |
| Chlorobenzene (ug/L) | MW-19 | 4.9 | 4.1 | 100 | No | 16 | 4.5 | 0.7 | 0 | None | No | 0.01 | Param. |
| Chloroethane (ug/L) | MW-12 | 5.5 | 3.4 | 2800 | No | 16 | 4.4 | 1.7 | 0 | None | No | 0.01 | Param. |
| Chloroethane (ug/L) | MW-13 | 2.5 | 1.2 | 2800 | No | 8 | 1.8 | 0.6 | 0 | None | No | 0.01 | Param. |
| Chloroethane (ug/L) | MW-15 | 1.7 | 1.2 | 2800 | No | 24 | 1.6 | 0.6 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Chromium (mg/L) | MW-12 | 0.012 | 0.004 | 0.1 | No | 6 | 0.005 | 0.003 | 83 | None | No | 0.02 | NP (normality) |
| Chromium (mg/L) | MW-13 | 0.012 | 0.004 | 0.1 | No | 6 | 0.005 | 0.003 | 83 | None | No | 0.02 | NP (normality) |
| Chromium (mg/L) | MW-19 | 0.012 | 0.004 | 0.1 | No | 6 | 0.005 | 0.003 | 83 | None | No | 0.02 | NP (normality) |
| cis-1,2-Dichloroethene (ug/L) | MW-12 | 8.0 | 4.8 | 70 | No | 16 | 6.4 | 2.4 | 0 | None | No | 0.01 | Param. |
| cis-1,2-Dichloroethene (ug/L) | MW-13 | 4.0 | 1.5 | 70 | No | 8 | 2.8 | 1.2 | 0 | None | No | 0.01 | Param. |
| Cobalt (mg/L) | MW-12 | 0.01570 | 0.01030 | 0.0021 | Yes | 6 | 0.01215 | 0.00187 | 0 | None | No | 0.02 | NP (normality) |
| Cobalt (mg/L) | MW-13 | 0.01200 | 0.00390 | 0.0021 | Yes | 6 | 0.00970 | 0.00298 | 0 | None | No | 0.02 | NP (normality) |
| Cobalt (mg/L) | MW-15 | 0.03582 | 0.03018 | 0.0021 | Yes | 6 | 0.03300 | 0.00205 | 0 | None | No | 0.01 | Param. |
| Cobalt (mg/L) | MW-16 | 0.00394 | 0.00119 | 0.0021 | No | 6 | 0.00250 | 0.00123 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Cobalt (mg/L) | MW-19 | 0.00374 | 0.00040 | 0.0021 | No | 6 | 0.00200 | 0.00141 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Copper (mg/L) | MW-12 | 0.02 | 0.00 | 1.3 | No | 6 | 0.00 | 0.01 | 83 | None | No | 0.02 | NP (normality) |
| Copper (mg/L) | MW-13 | 0.01 | 0.00 | 1.3 | No | 6 | 0.01 | 0.00 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Copper (mg/L) | MW-15 | 0.02 | 0.00 | 1.3 | No | 6 | 0.01 | 0.01 | 50 | None | No | 0.02 | NP (normality) |
| Copper (mg/L) | MW-19 | 0.01 | 0.00 | 1.3 | No | 6 | 0.01 | 0.01 | 33 | Kaplan-Meier | No | 0.01 | Param. |
| Lead (mg/L) | MW-12 | 0.0077 | 0.0020 | 0.015 | No | 6 | 0.0030 | 0.0023 | 83 | None | No | 0.02 | NP (normality) |
| Lead (mg/L) | MW-13 | 0.0051 | 0.0020 | 0.015 | No | 6 | 0.0025 | 0.0013 | 83 | None | No | 0.02 | NP (normality) |
| Lead (mg/L) | MW-15 | 0.0046 | 0.0020 | 0.015 | No | 6 | 0.0024 | 0.0011 | 83 | None | No | 0.02 | NP (normality) |
| Lead (mg/L) | MW-19 | 0.0099 | 0.0020 | 0.015 | No | 6 | 0.0033 | 0.0032 | 83 | None | No | 0.02 | NP (normality) |
| Nickel (mg/L) | MW-12 | 0.036 | 0.022 | 0.1 | No | 6 | 0.029 | 0.005 | 0 | None | No | 0.01 | Param. |

## Confidence Interval

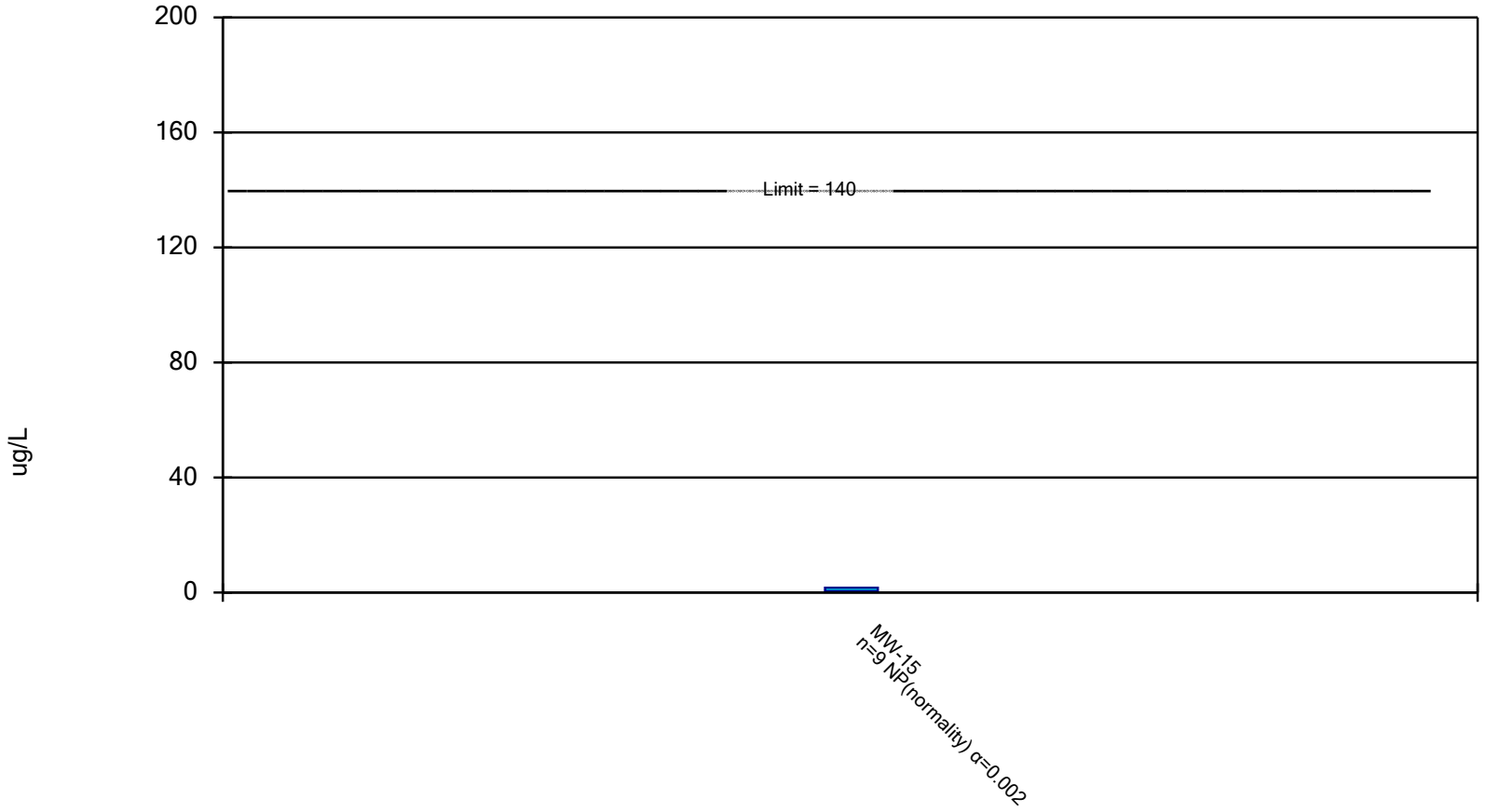
| Constituent Name | Well | Upper Limit | Lower Limit | Compliance Limit [1] | Exceed [2] | N | Mean | Standard Deviation | % Non-detects | Non-detect Adjustment | Transformation | Alpha | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Downgradient Monitoring Locations (Continued)** | | | | | | | | | | | | | |
| Nickel (mg/L) | MW-13 | 0.034 | 0.018 | 0.1 | No | 6 | 0.026 | 0.006 | 0 | None | No | 0.01 | Param. |
| Nickel (mg/L) | MW-15 | 0.101 | 0.067 | 0.1 | No | 6 | 0.084 | 0.012 | 0 | None | No | 0.01 | Param. |
| Nickel (mg/L) | MW-16 | 0.009 | 0.005 | 0.1 | No | 6 | 0.007 | 0.002 | 0 | None | No | 0.01 | Param. |
| Nickel (mg/L) | MW-19 | 0.063 | 0.017 | 0.1 | No | 6 | 0.049 | 0.017 | 0 | None | No | 0.02 | NP (normality) |
| Toluene (ug/L) | MW-19 | 1.1 | 0.5 | 1000 | No | 8 | 0.6 | 0.2 | 88 | None | No | 0.00 | NP (NDs) |
| Vanadium (mg/L) | MW-12 | 0.0274 | 0.0100 | 0.035 | No | 6 | 0.0129 | 0.0071 | 83 | None | No | 0.02 | NP (normality) |
| Vanadium (mg/L) | MW-13 | 0.0276 | 0.0100 | 0.035 | No | 6 | 0.0129 | 0.0072 | 83 | None | No | 0.02 | NP (normality) |
| Vanadium (mg/L) | MW-19 | 0.0323 | 0.0100 | 0.035 | No | 6 | 0.0137 | 0.0091 | 83 | None | No | 0.02 | NP (normality) |
| Vinyl Chloride (ug/L) | MW-12 | 3.10 | 1.49 | 2 | No | 16 | 2.32 | 1.38 | 25 | Kaplan-Meier | No | 0.01 | Param. |
| Zinc (mg/L) | MW-12 | 0.03 | 0.00 | 2 | No | 6 | 0.01 | 0.01 | 83 | None | No | 0.02 | NP (normality) |
| Zinc (mg/L) | MW-13 | 0.03 | 0.00 | 2 | No | 6 | 0.01 | 0.01 | 83 | None | No | 0.02 | NP (normality) |
| Zinc (mg/L) | MW-15 | 0.01 | 0.01 | 2 | No | 6 | 0.01 | 0.00 | 83 | None | No | 0.02 | NP (normality) |
| Zinc (mg/L) | MW-16 | 0.12 | 0.01 | 2 | No | 6 | 0.03 | 0.05 | 83 | None | No | 0.02 | NP (normality) |
| Zinc (mg/L) | MW-19 | 0.04 | 0.00 | 2 | No | 6 | 0.01 | 0.01 | 83 | None | No | 0.02 | NP (normality) |

[1] Value is the 40 CFR Part 141 Safe Drinking Water Act MCL or the IAC 567 Chapter 137 Statewide Standard for a Protected Groundwater Source.

[2] Under assessment mode, an SSL is indicated when the lower confidence limit exceeds the groundwater protection standard (compliance limit).

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

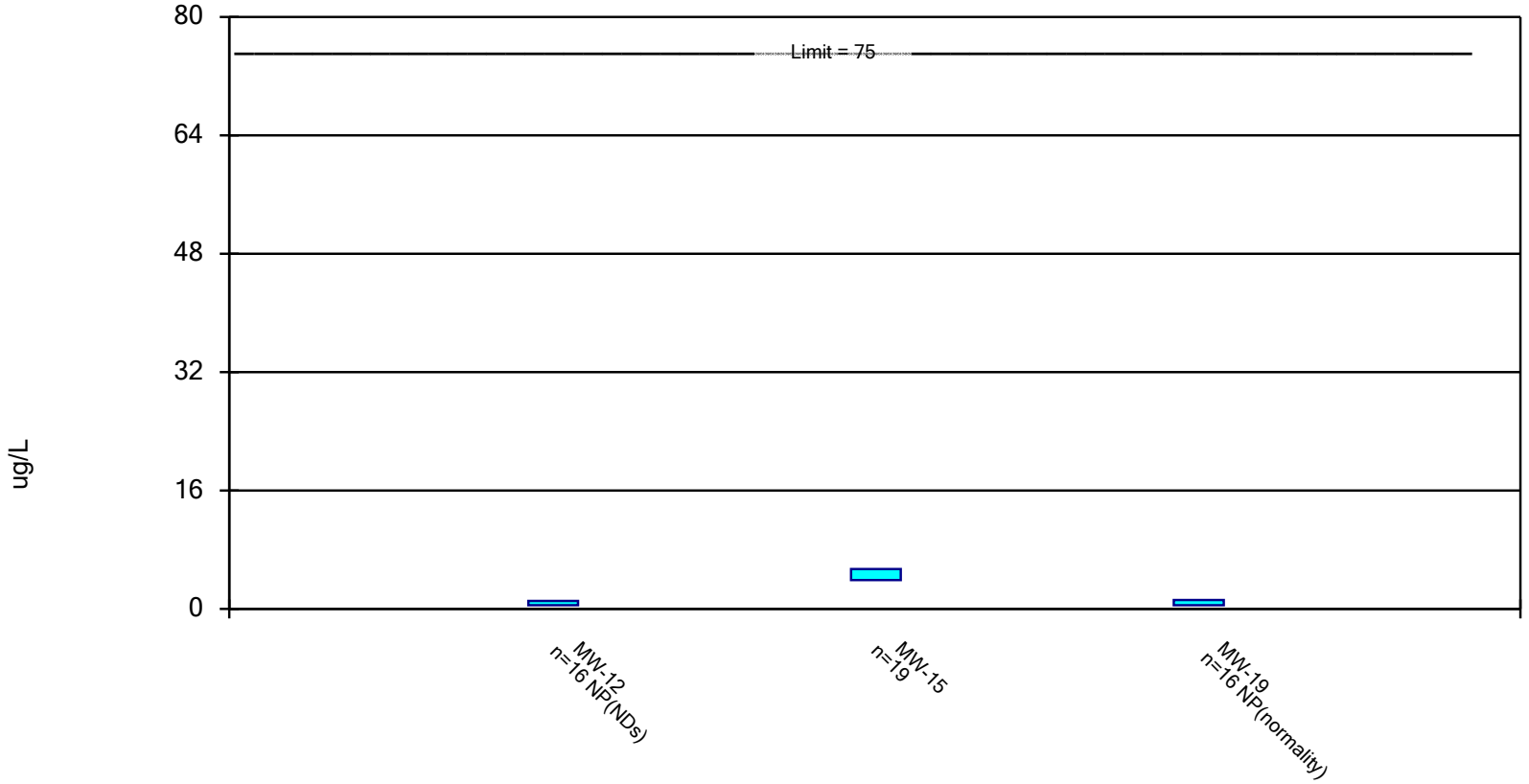



Constituent: 1,1-Dichloroethane  Analysis Run 7/19/2024 11:22 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

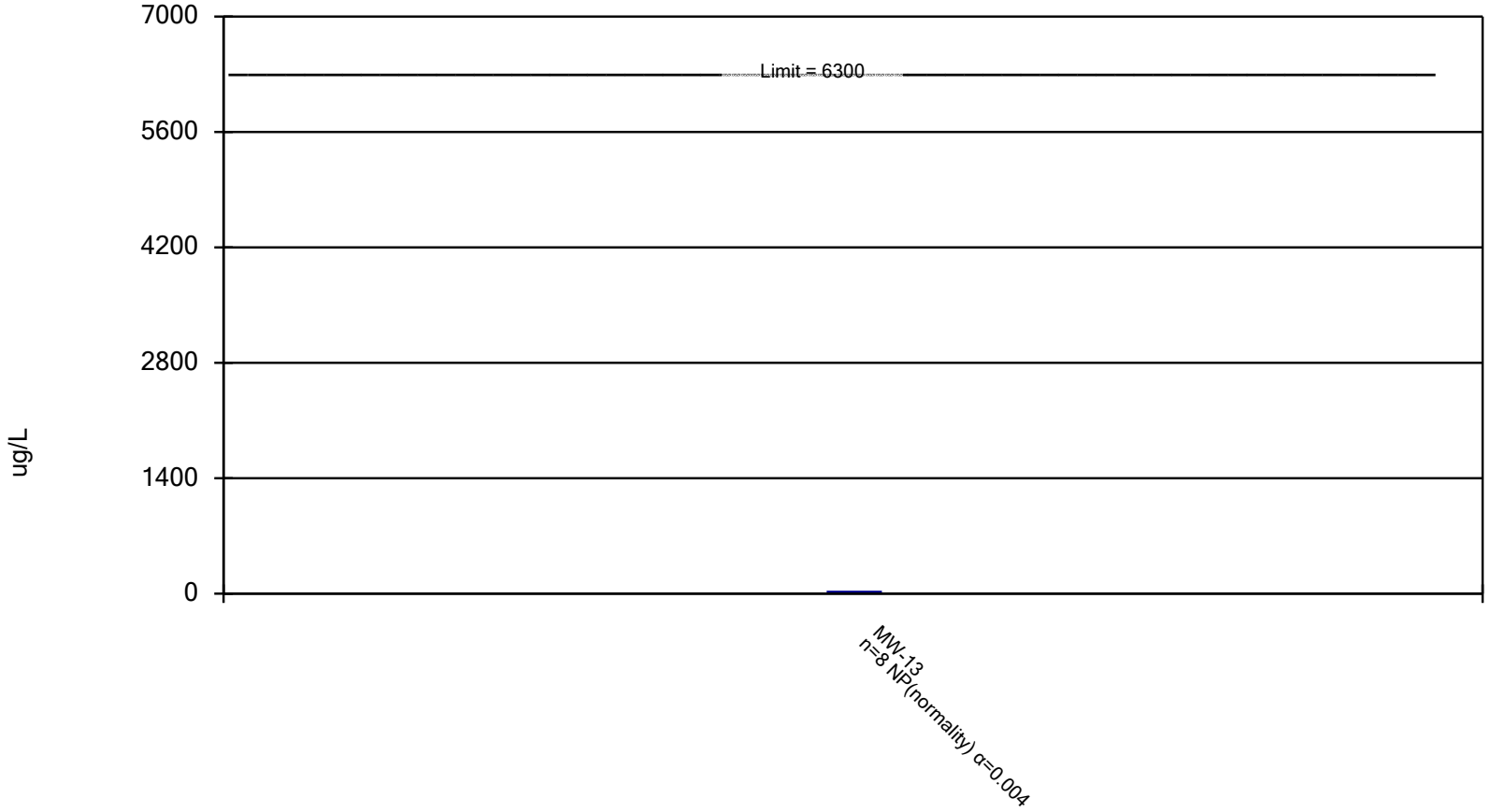



Constituent: 1,4-Dichlorobenzene Analysis Run 7/19/2024 11:22 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

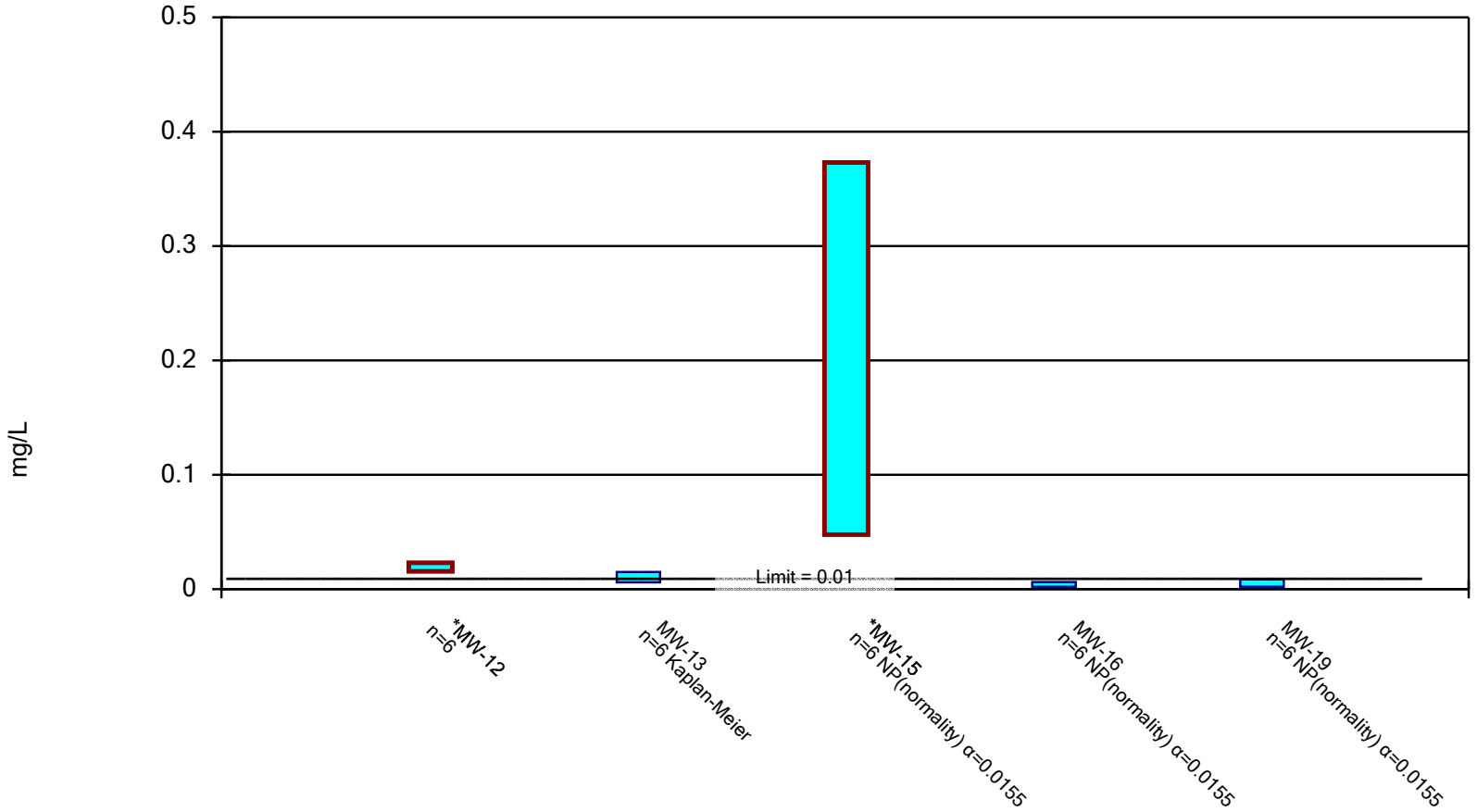



Constituent: Acetone  Analysis Run 7/19/2024 11:22 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

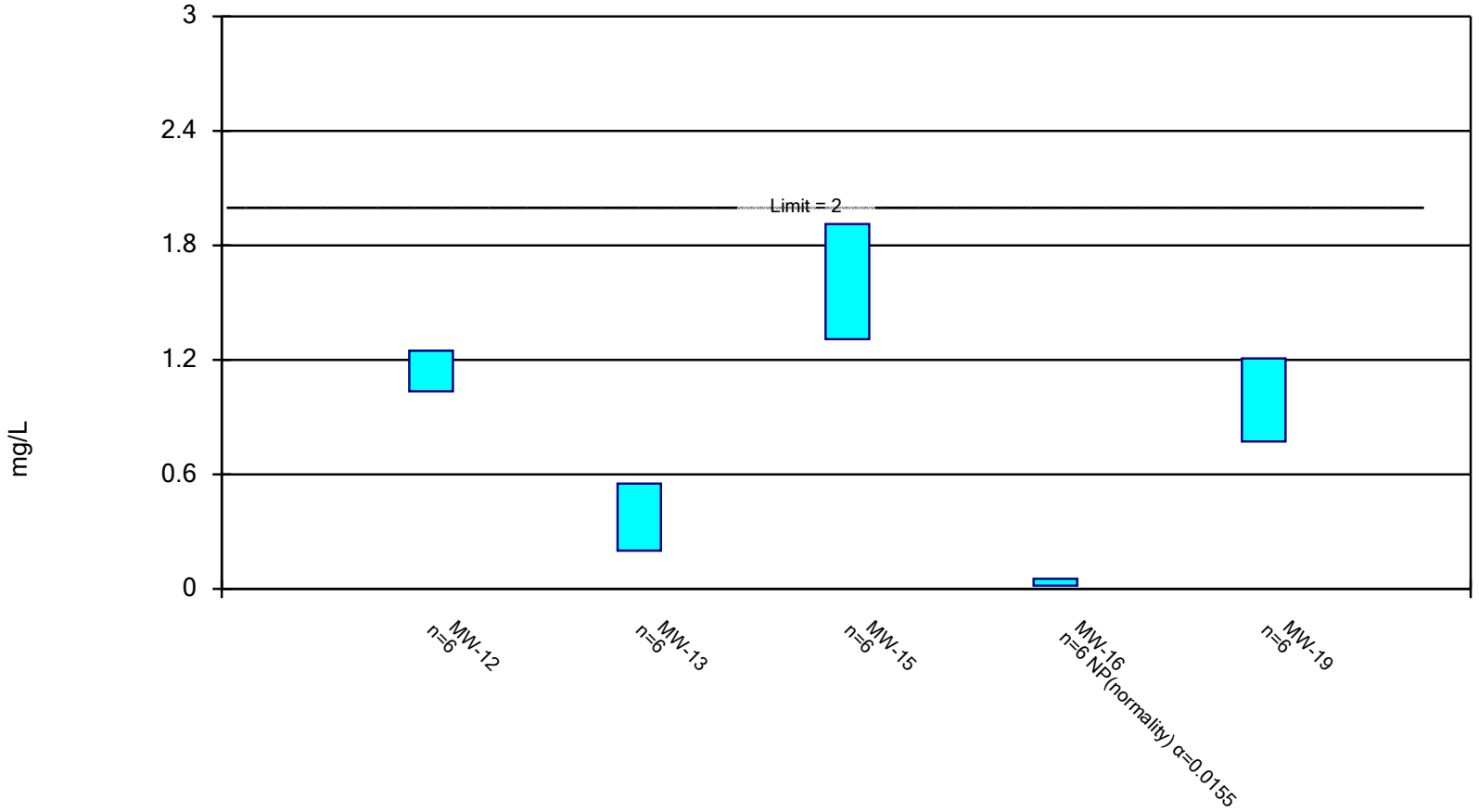



Constituent: Arsenic Analysis Run 7/19/2024 10:15 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

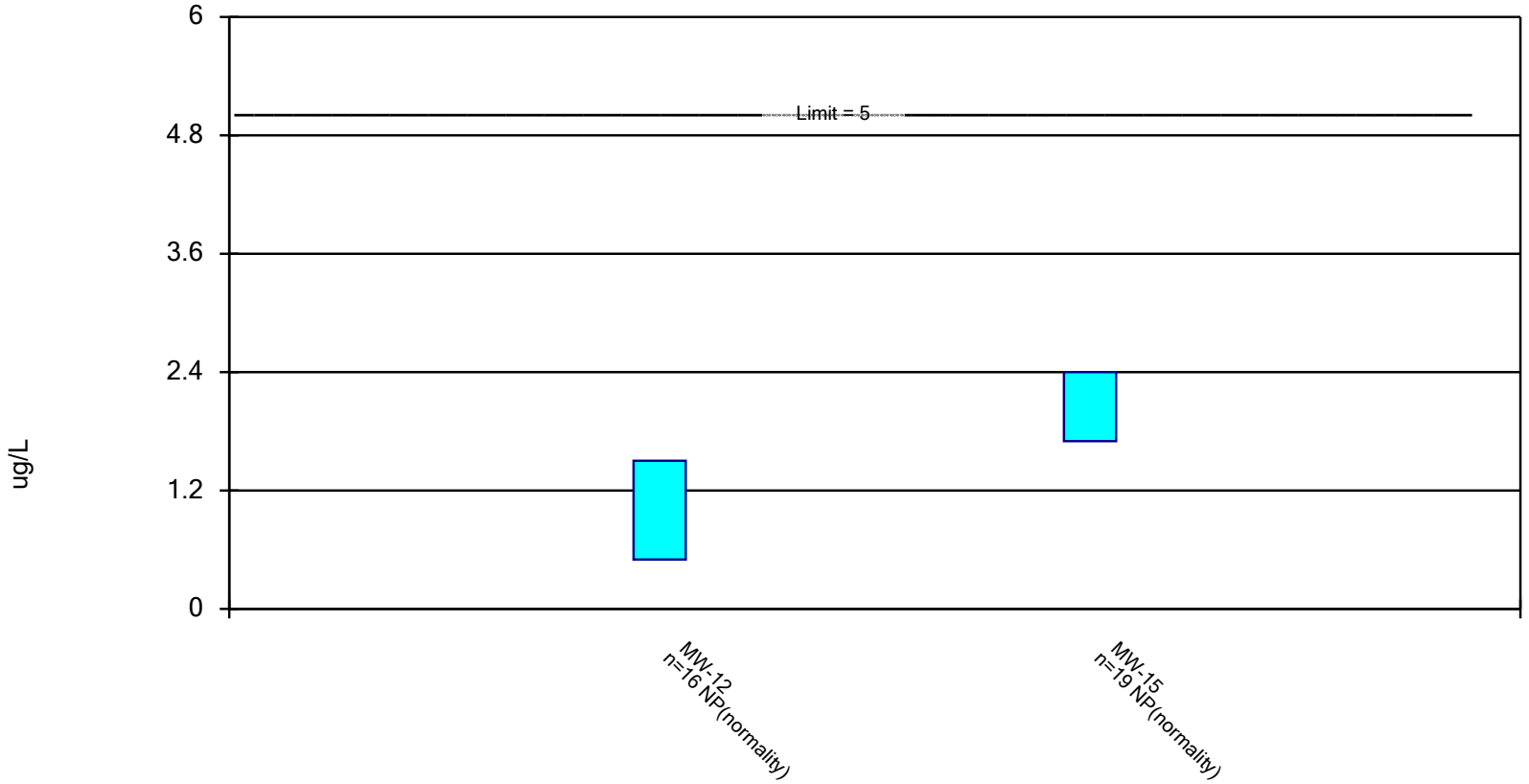



Constituent: Barium Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.

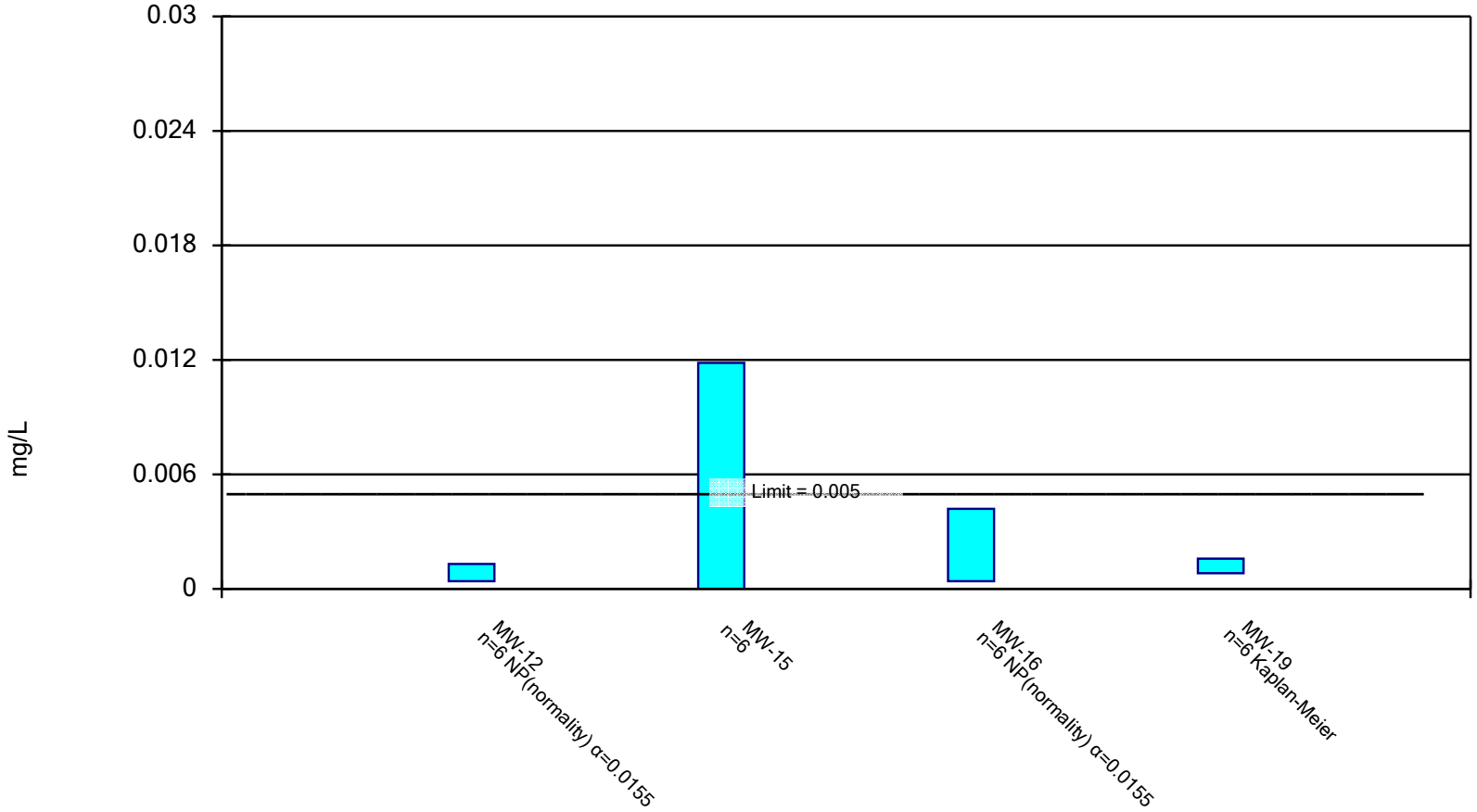



Constituent: Benzene Analysis Run 7/19/2024 11:22 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

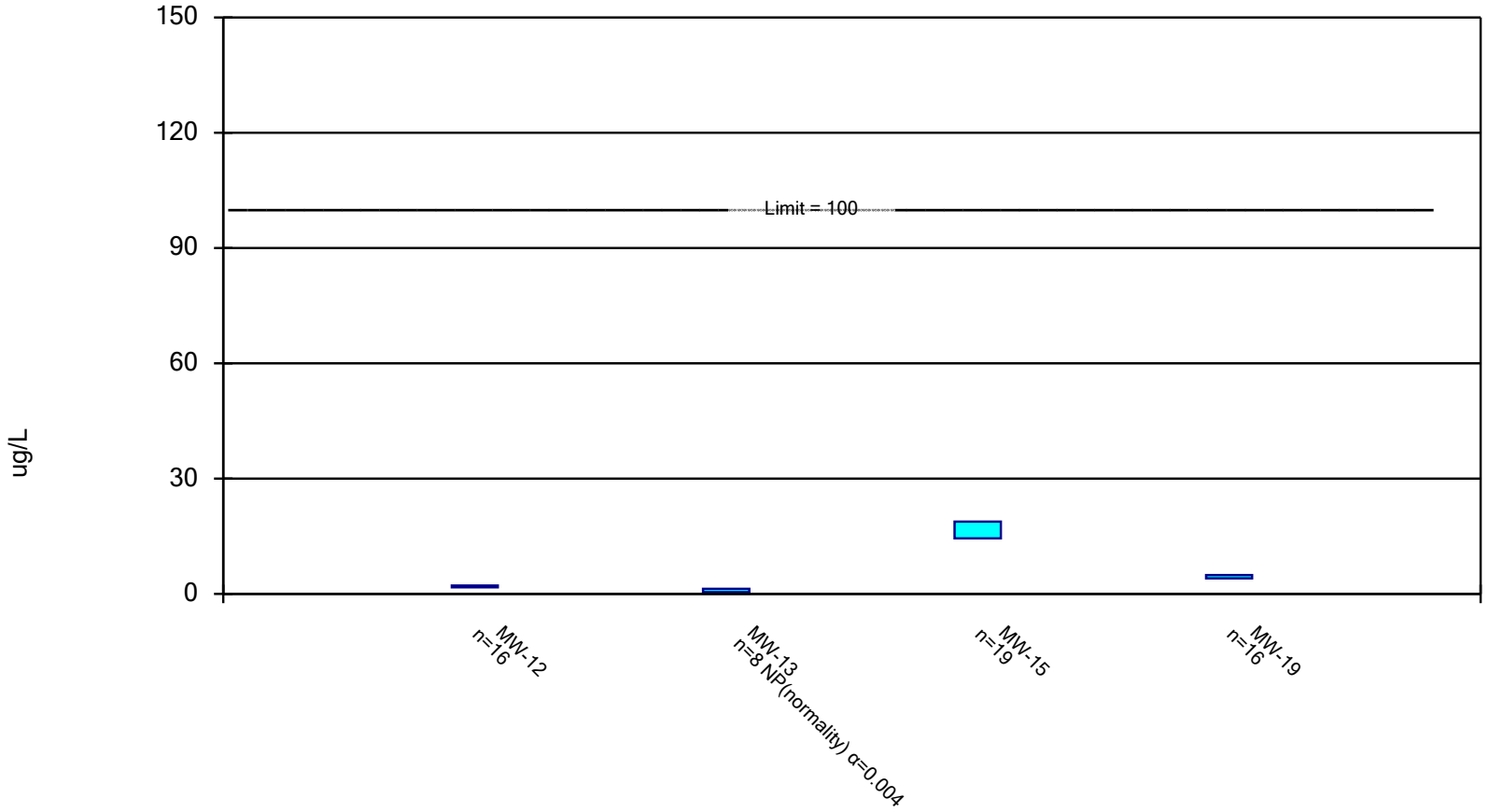



Constituent: Cadmium Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.




Constituent: Chlorobenzene Analysis Run 7/19/2024 11:22 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric Confidence Interval

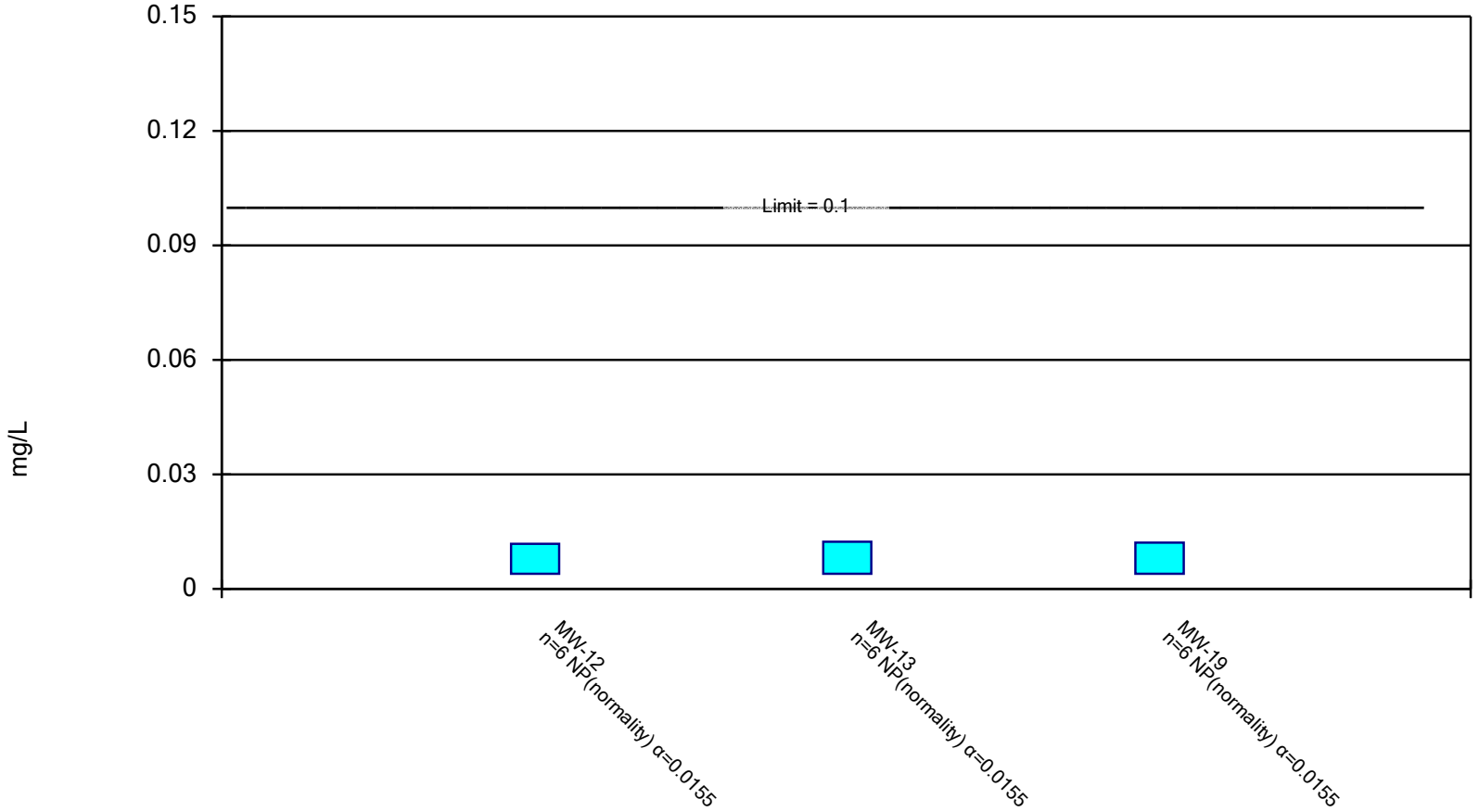
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.


Constituent: Chloroethane Analysis Run 7/19/2024 11:23 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

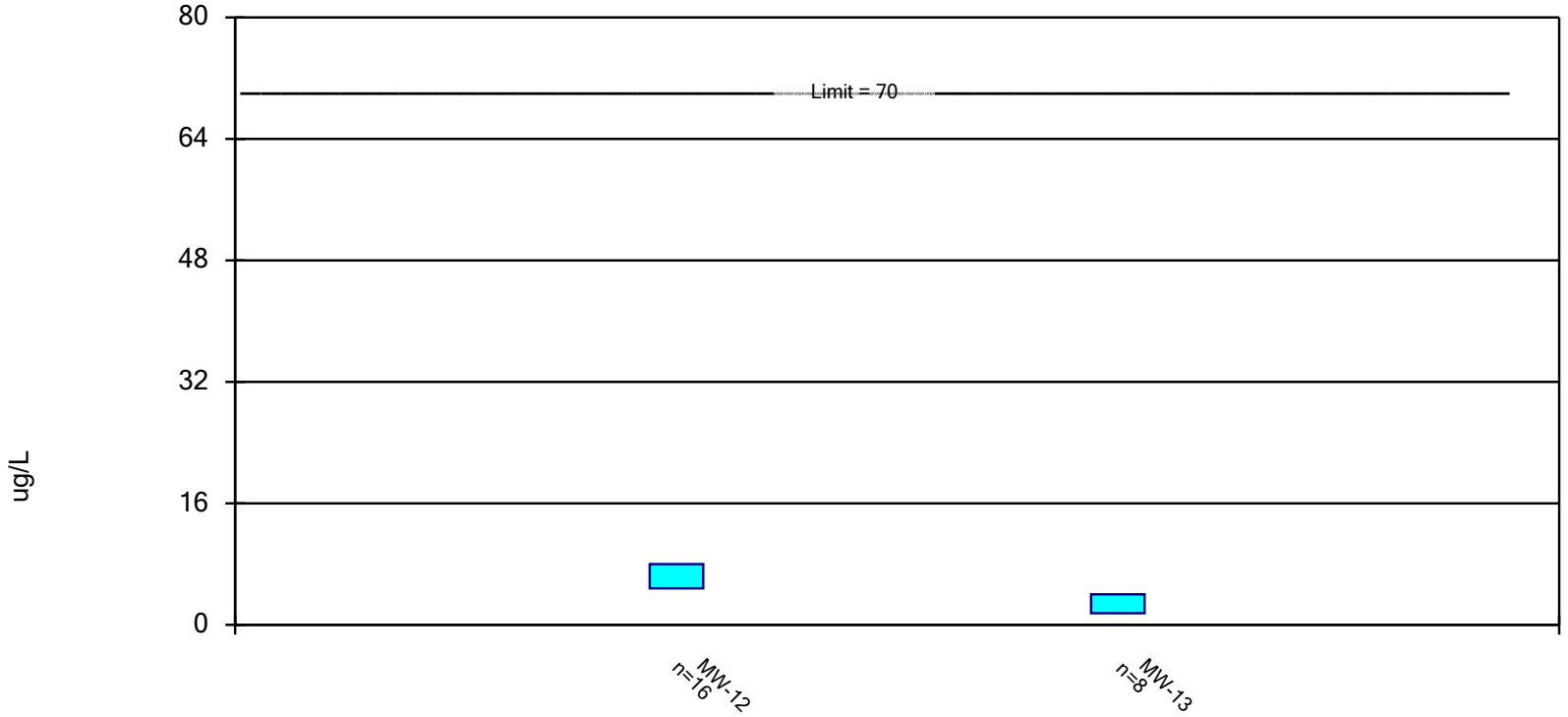



Constituent: Chromium  Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

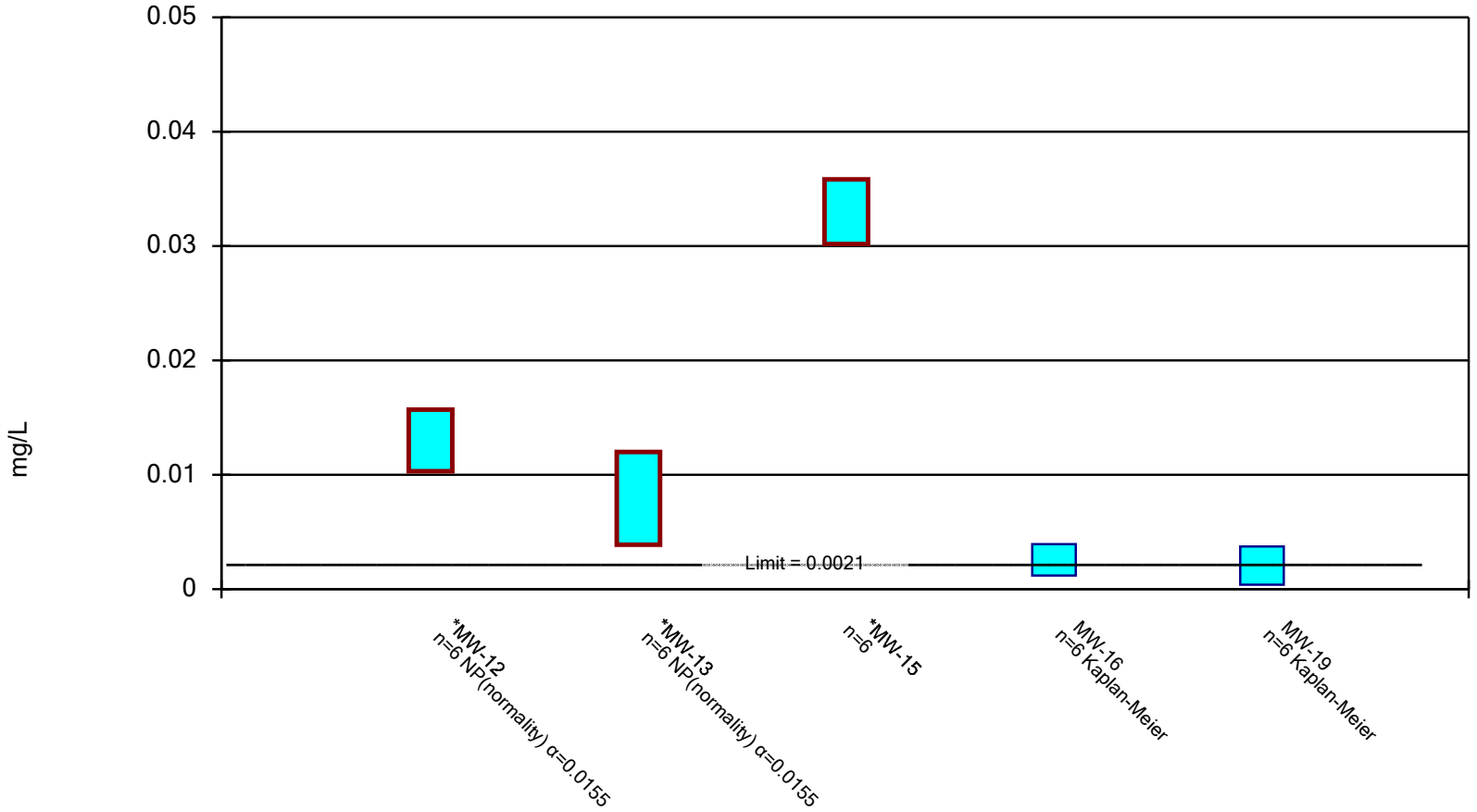



Constituent: cis-1,2-Dichloroethene Analysis Run 7/19/2024 11:23 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance limit is exceeded.* Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

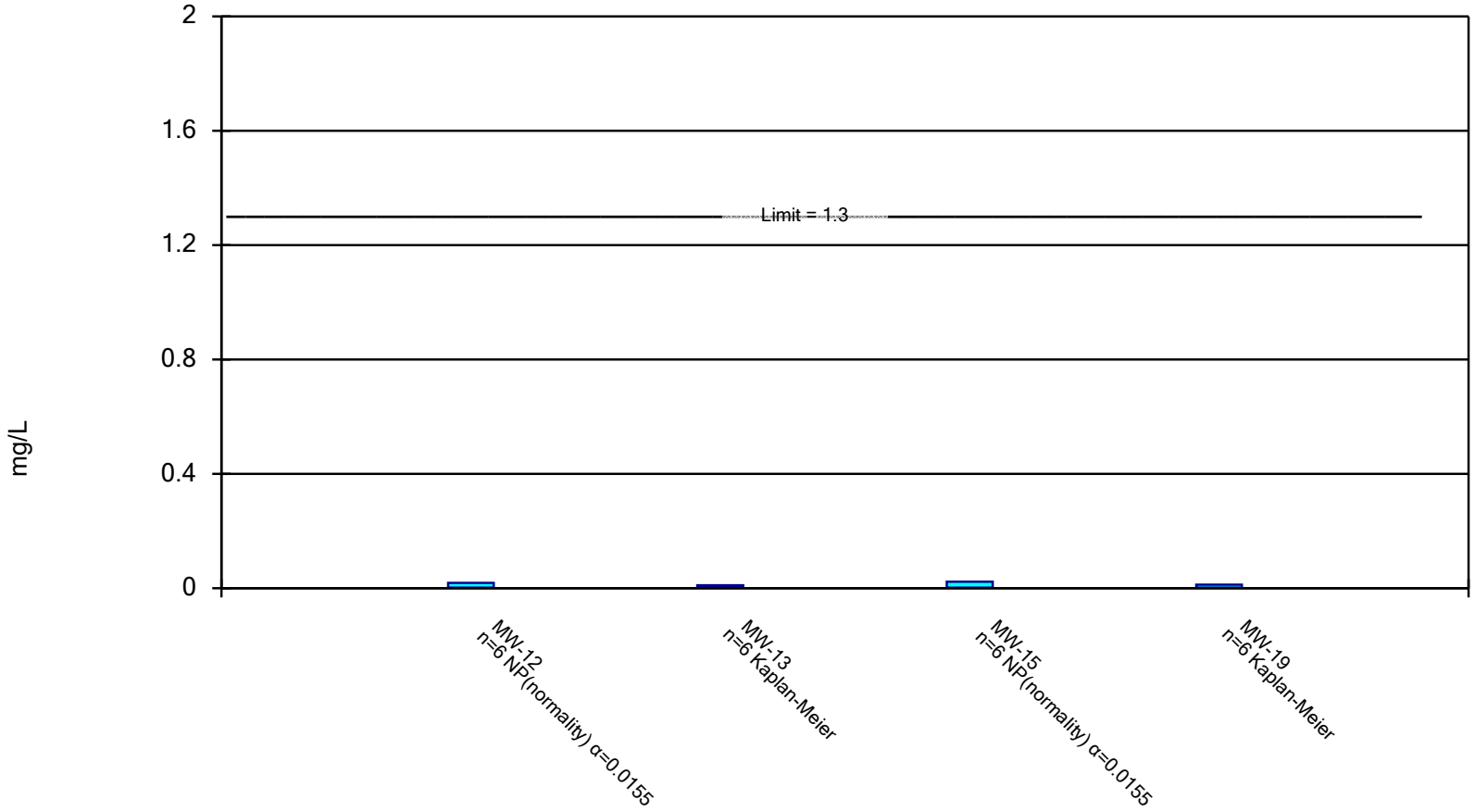



Constituent: Cobalt Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

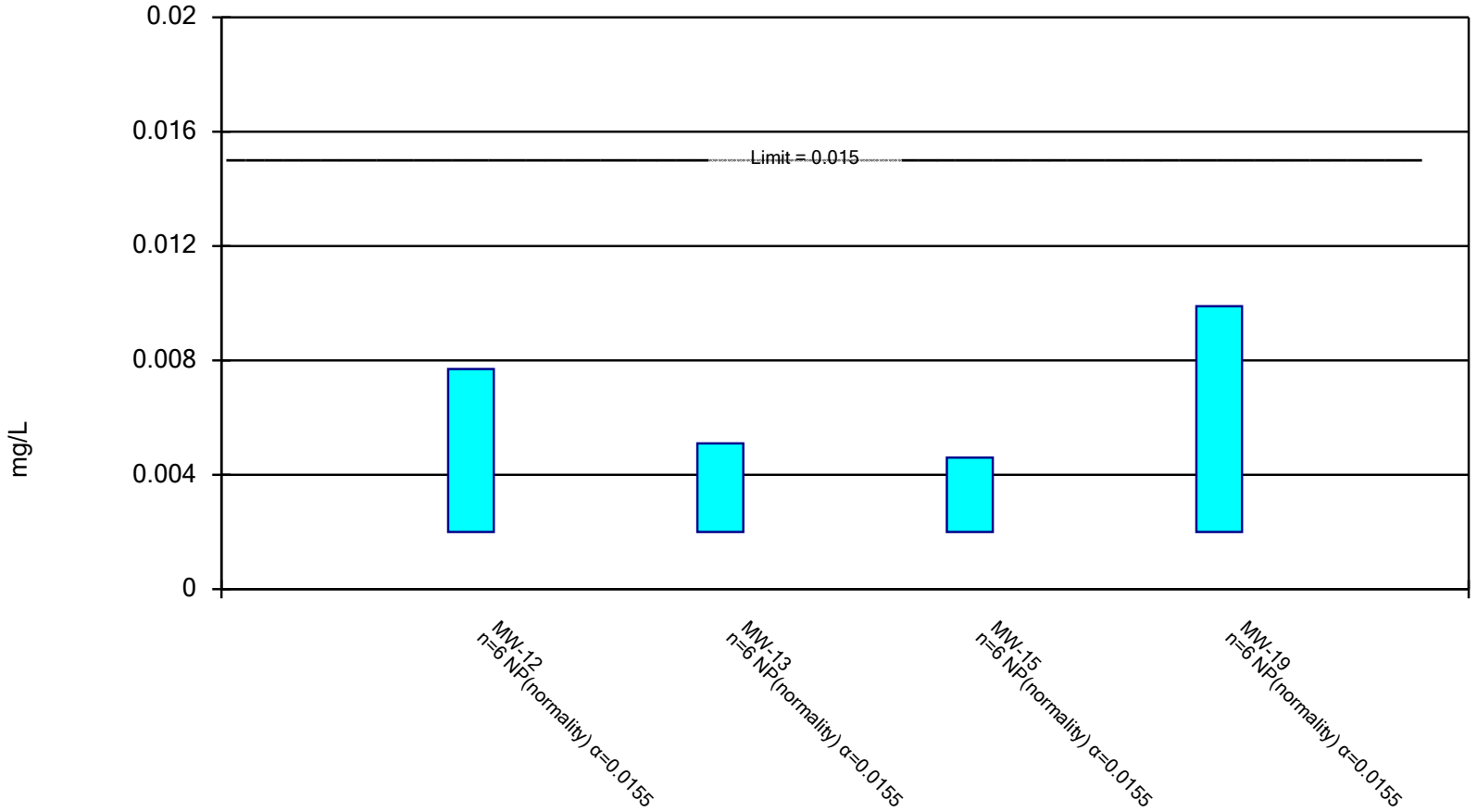



Constituent: Copper Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

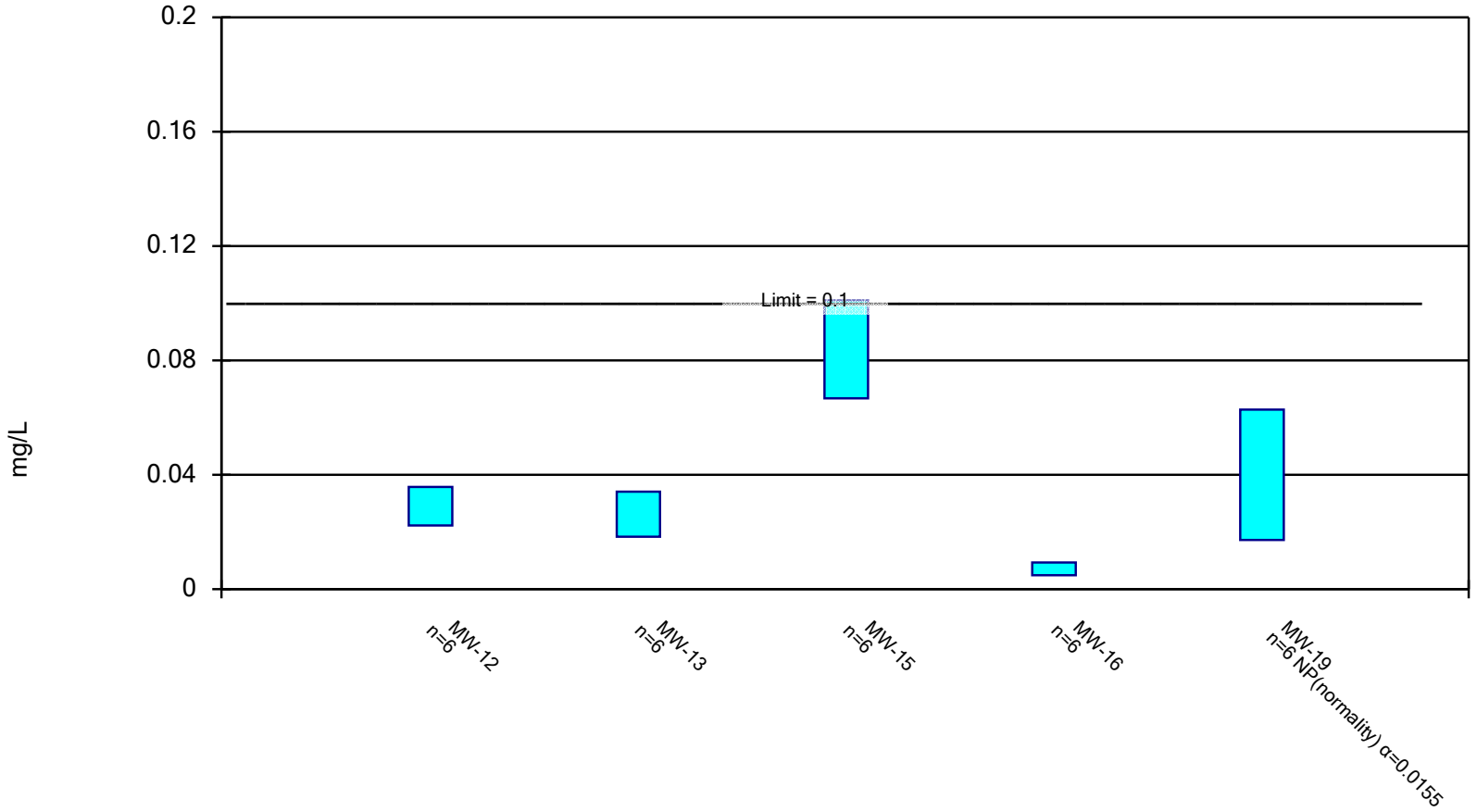



Constituent: Lead  Analysis Run 7/19/2024 10:16 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

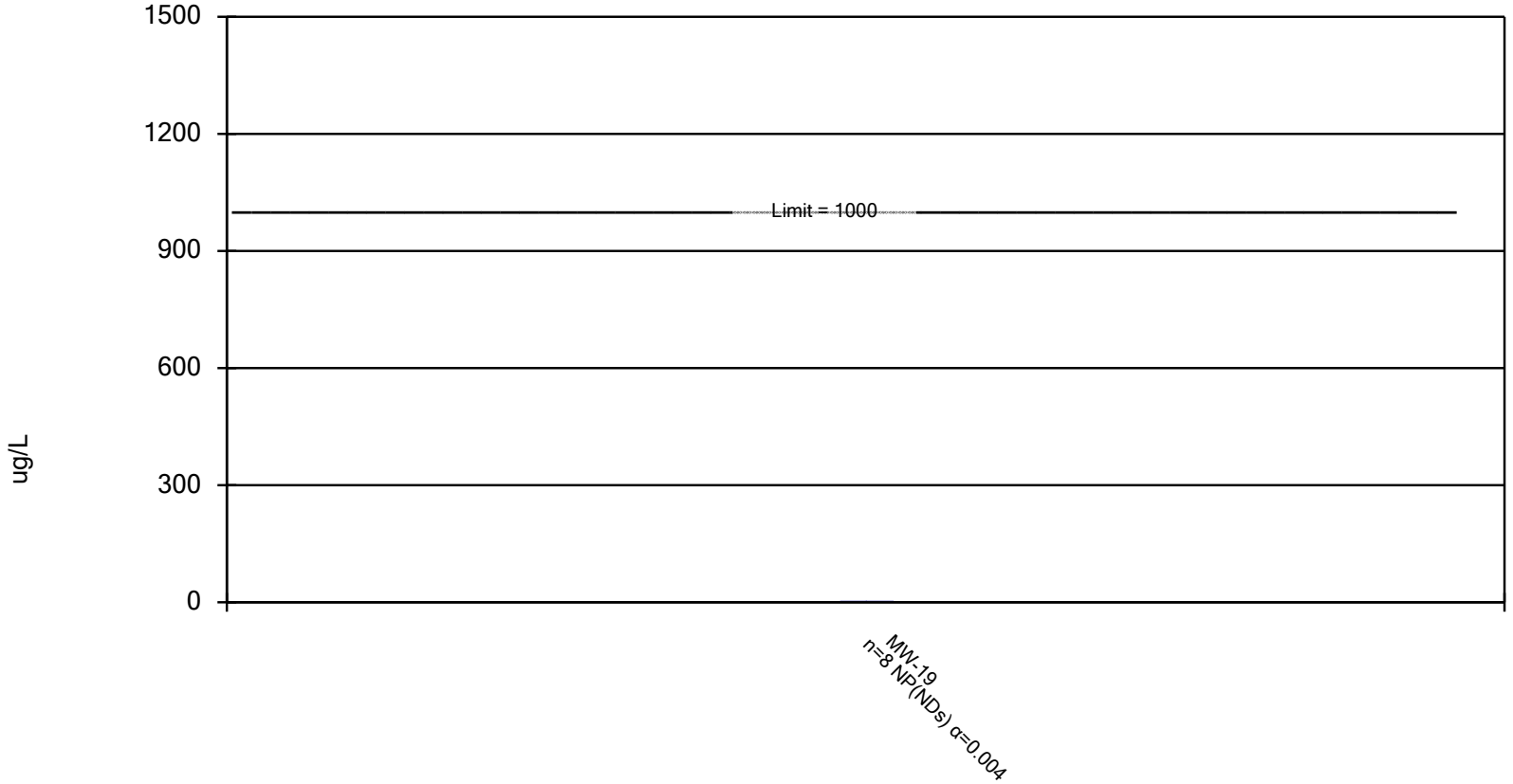



Constituent: Nickel Analysis Run 7/19/2024 10:17 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

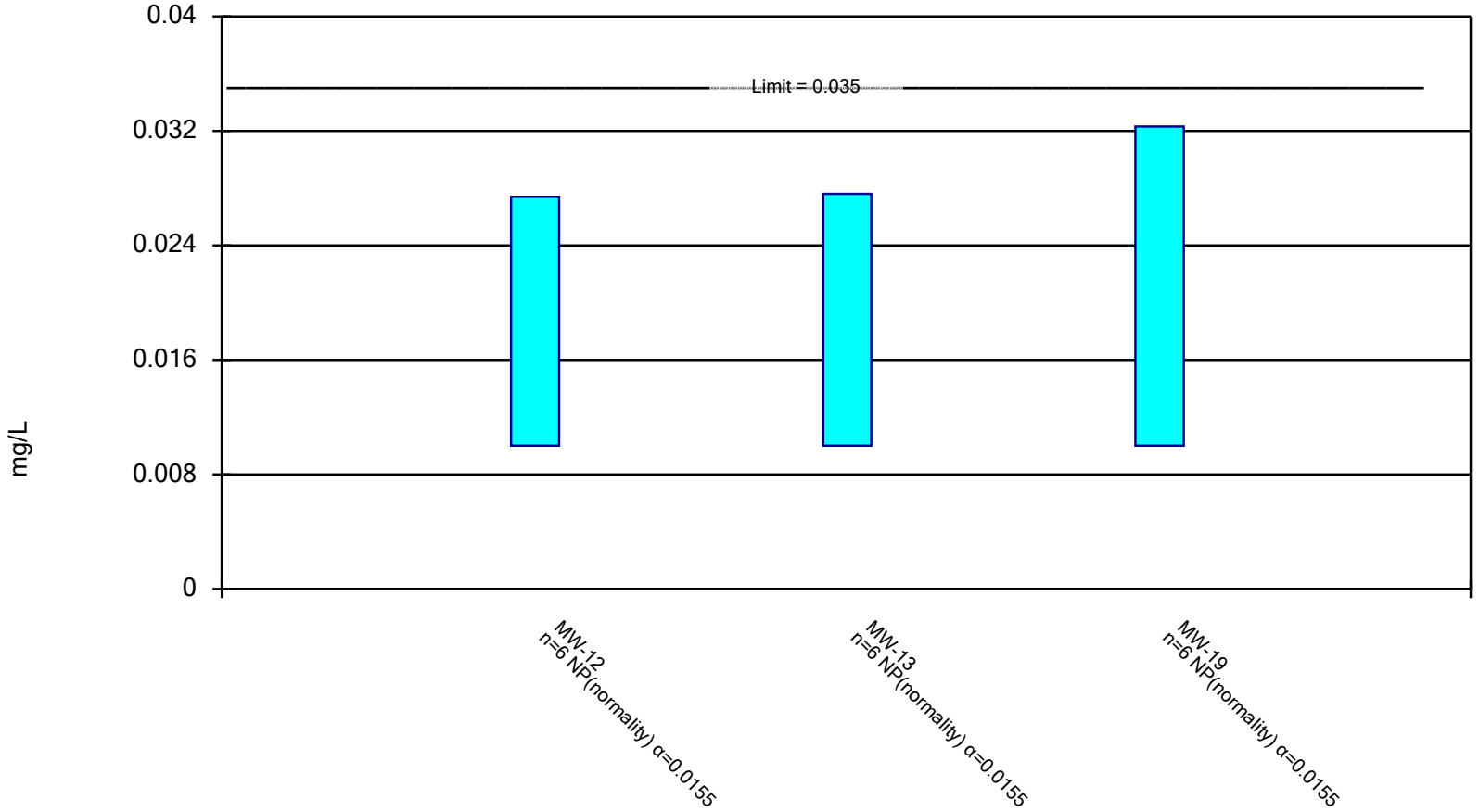



Constituent: Toluene  Analysis Run 7/19/2024 11:23 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.

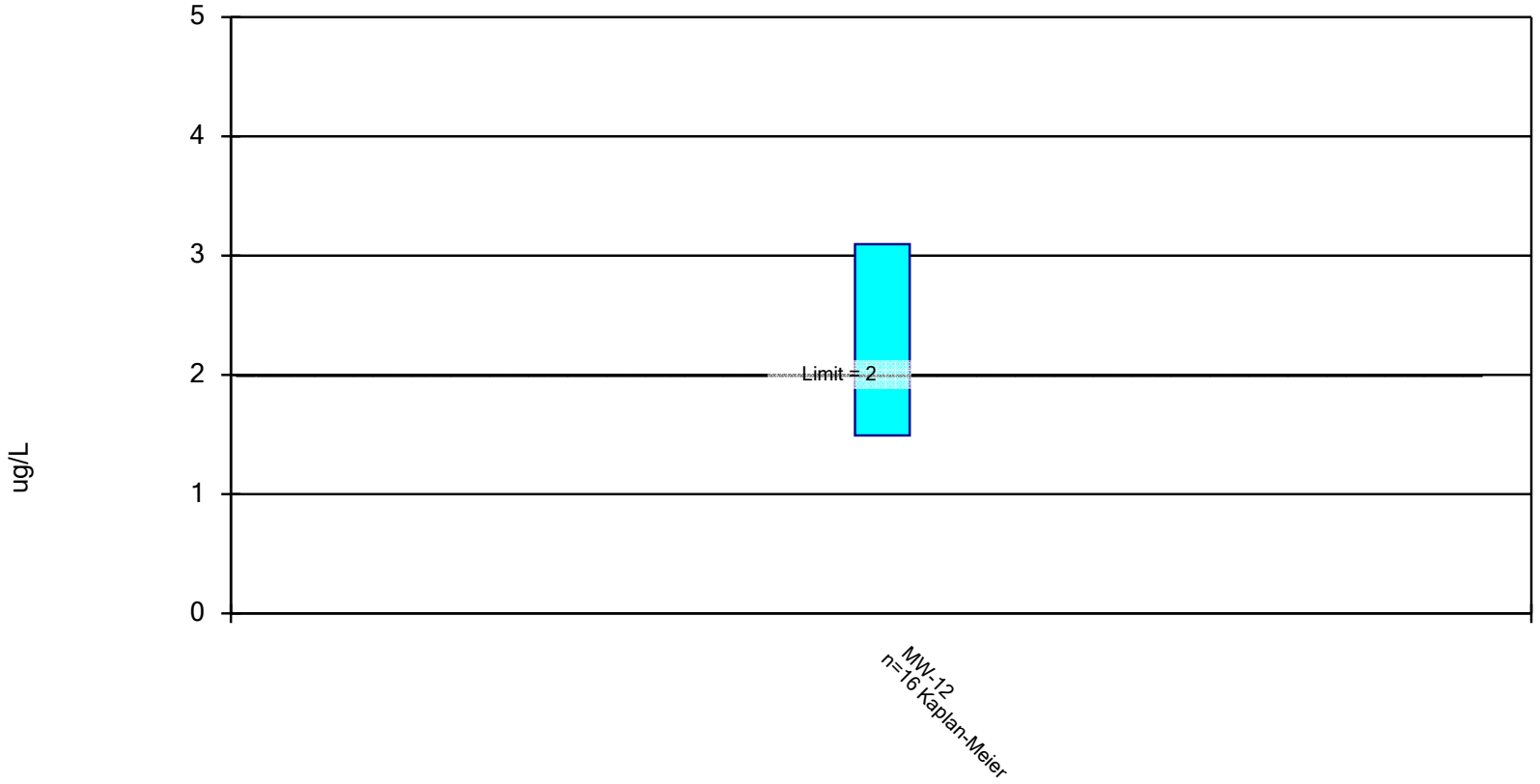



Constituent: Vanadium  Analysis Run 7/19/2024 10:17 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.

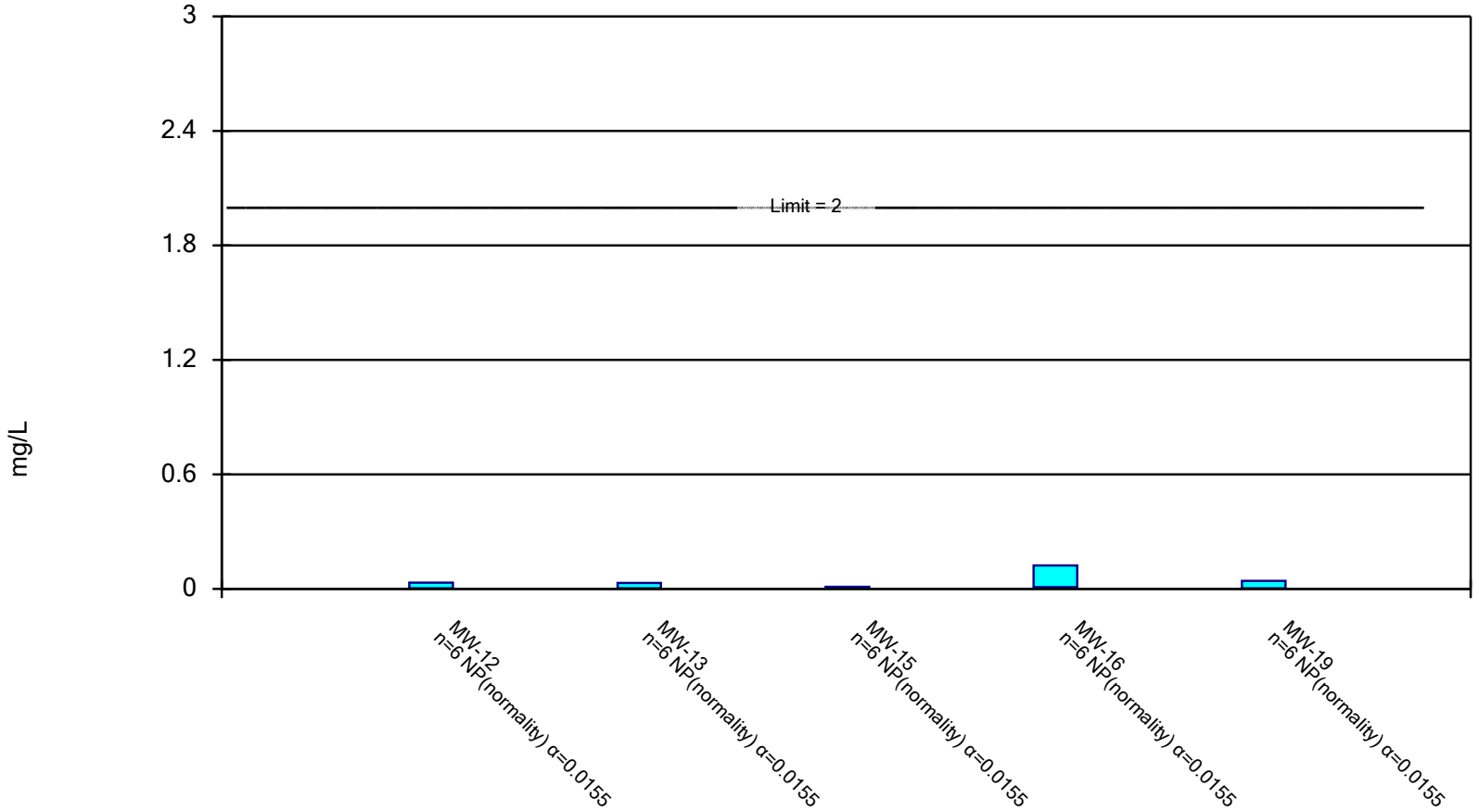



Constituent: Vinyl Chloride Analysis Run 7/19/2024 11:23 AM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Non-Parametric Confidence Interval

Compliance Limit is not exceeded.




Constituent: Zinc  Analysis Run 7/19/2024 10:17 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

## Calculation of Arsenic and Cobalt Upper Tolerance Limits with 95% Coverage and 95% Confidence

| Constituent Name | Upper Limit | Background N | Background Well | Background Mean | Standard Deviation | % Non-detects | Non-detect Adjustment | Transformation | Alpha | Method | Minimum Achieved Coverage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic (mg/L) | 0.07267 | 6 | MW-4 | 0.02405 | 0.01312 | 17 | Kaplan-Meier | No | 0.01021 | Interwell Parametric | 95% |
| Cobalt (mg/L) | 0.08416 | 6 | MW-4 | 0.02515 | 0.01592 | 17 | Kaplan-Meier | No | 0.01021 | Interwell Parametric | 95% |

## Confidence Interval

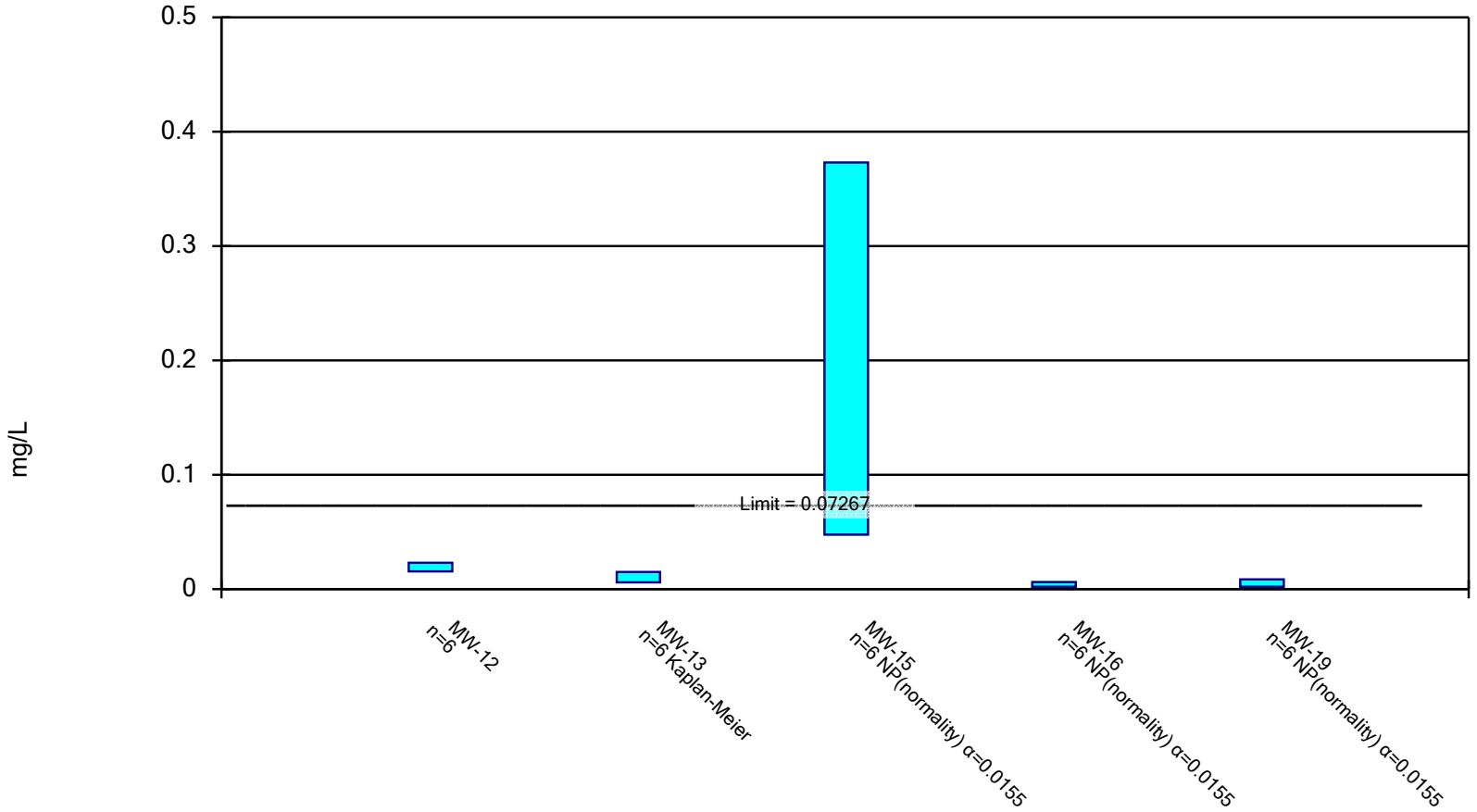
| Constituent Name | Well | Upper Limit | Lower Limit | Compliance Limit [1] | Exceed [2] | N | Mean | Standard Deviation | % Non-detects | Non-detect Adjustment | Transformation | Alpha | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Downgradient Monitoring Locations** | | | | | | | | | | | | | |
| Arsenic (mg/L) | MW-12 | 0.02320 | 0.01567 | 0.07267 | No | 6 | 0.01943 | 0.00274 | 0 | None | No | 0.01 | Param. |
| Arsenic (mg/L) | MW-13 | 0.01518 | 0.00595 | 0.07267 | No | 6 | 0.01023 | 0.00441 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Arsenic (mg/L) | MW-15 | 0.37300 | 0.04780 | 0.07267 | No | 6 | 0.12680 | 0.12150 | 0 | None | No | 0.02 | NP (normality) |
| Arsenic (mg/L) | MW-16 | 0.00620 | 0.00200 | 0.07267 | No | 6 | 0.00327 | 0.00198 | 67 | None | No | 0.02 | NP (normality) |
| Arsenic (mg/L) | MW-19 | 0.00850 | 0.00200 | 0.07267 | No | 6 | 0.00308 | 0.00265 | 83 | None | No | 0.02 | NP (normality) |
| Cobalt (mg/L) | MW-12 | 0.01570 | 0.01030 | 0.08416 | No | 6 | 0.01215 | 0.00187 | 0 | None | No | 0.02 | NP (normality) |
| Cobalt (mg/L) | MW-13 | 0.01200 | 0.00390 | 0.08416 | No | 6 | 0.00970 | 0.00298 | 0 | None | No | 0.02 | NP (normality) |
| Cobalt (mg/L) | MW-15 | 0.03582 | 0.03018 | 0.08416 | No | 6 | 0.03300 | 0.00205 | 0 | None | No | 0.01 | Param. |
| Cobalt (mg/L) | MW-16 | 0.00394 | 0.00119 | 0.08416 | No | 6 | 0.00250 | 0.00123 | 17 | Kaplan-Meier | No | 0.01 | Param. |
| Cobalt (mg/L) | MW-19 | 0.00374 | 0.00040 | 0.08416 | No | 6 | 0.00200 | 0.00141 | 17 | Kaplan-Meier | No | 0.01 | Param. |

[1] Value is Background. The background GWPS for arsenic and cobalt are the background upper tolerance limit with 95% confidence and 95% coverage.

[2] Under assessment mode, an SSL is indicated when the lower confidence limit exceeds the groundwater protection standard (compliance limit).

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.

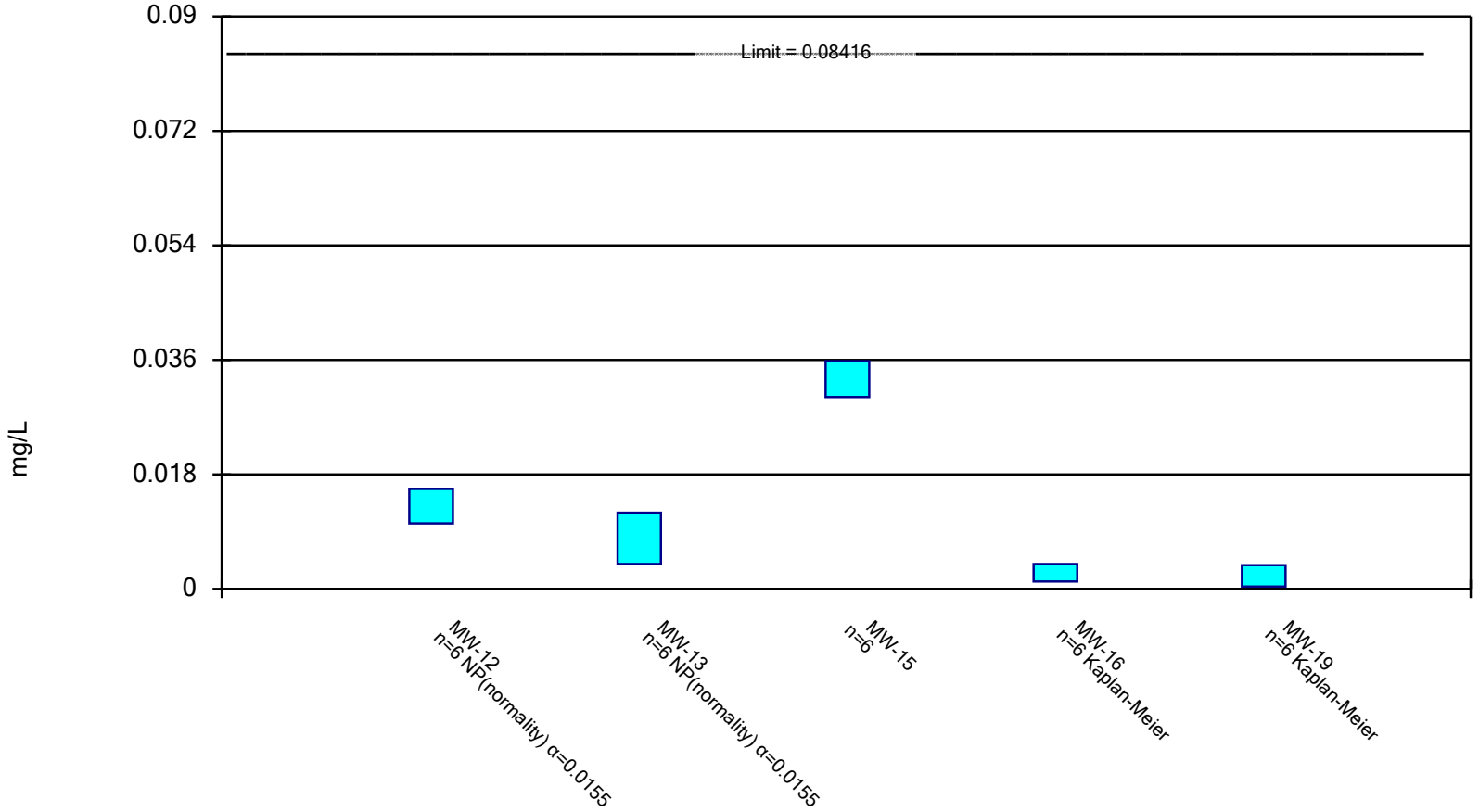



Constituent: Arsenic Analysis Run 8/13/2024 4:42 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Parametric and Non-Parametric (NP) Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.




Constituent: Cobalt Analysis Run 8/13/2024 4:45 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

# Attachment 4

# Sanitas Report Output for Trend Tests

## Trend Tests
## May 2007 Through Oct. 2023 Data [1]

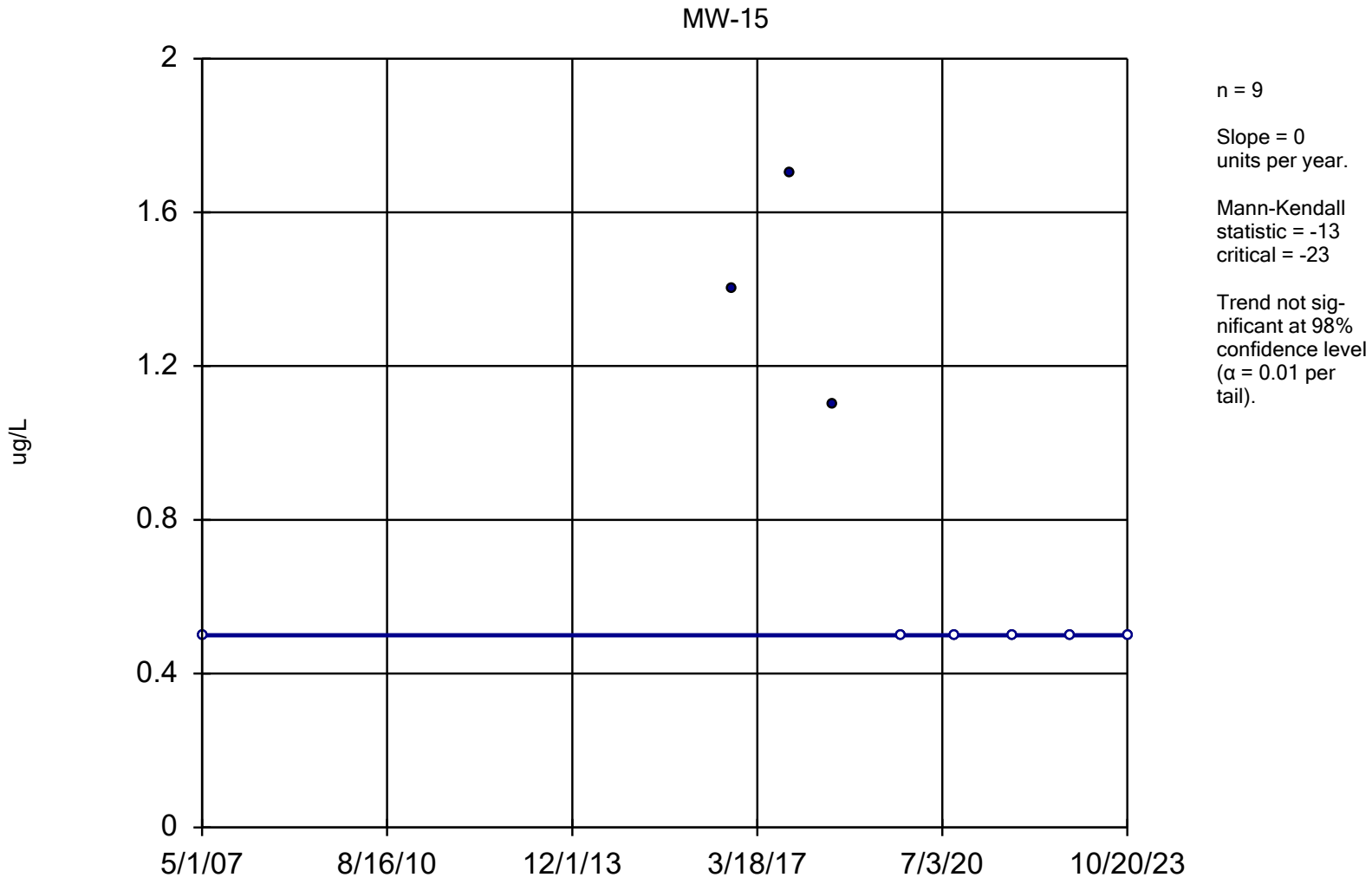
| Constituent Name | Well | Slope | Mann-Kendall | Critical Value | Trend | N | % Non-detects | Normality | Transformation | Alpha | Method |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethane (ug/L) | MW-15 | 0 | -13 | -23 | No | 9 | 66.67 | n/a | n/a | 0.02 | NP |
| 1,4-Dichlorobenzene (ug/L) | MW-12 | 0 | 19 | 53 | No | 16 | 87.5 | n/a | n/a | 0.02 | NP |
| 1,4-Dichlorobenzene (ug/L) | MW-15 | 0.1182 | 42 | 68 | No | 19 | 0 | n/a | n/a | 0.02 | NP |
| 1,4-Dichlorobenzene (ug/L) | MW-19 | 0 | 38 | 53 | No | 16 | 75 | n/a | n/a | 0.02 | NP |
| Acetone (ug/L) | MW-13 | 0 | -5 | -20 | No | 8 | 75 | n/a | n/a | 0.02 | NP |
| Arsenic (mg/L) | MW-12 | -0.0007993 | -5 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Arsenic (mg/L) | MW-13 | 0.001574 | 7 | 13 | No | 6 | 16.67 | n/a | n/a | 0.02 | NP |
| Arsenic (mg/L) | MW-15 | -0.005977 | -7 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Arsenic (mg/L) | MW-16 | 0 | 3 | 13 | No | 6 | 66.67 | n/a | n/a | 0.02 | NP |
| Arsenic (mg/L) | MW-19 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Barium (mg/L) | MW-12 | -0.03037 | -2 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Barium (mg/L) | MW-13 | 0.02607 | 3 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Barium (mg/L) | MW-15 | -0.1036 | -10 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Barium (mg/L) | MW-16 | 0.0009247 | 7 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Barium (mg/L) | MW-19 | 0.01335 | 3 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Benzene (ug/L) | MW-12 | -0.03695 | -27 | -53 | No | 16 | 25 | n/a | n/a | 0.02 | NP |
| Benzene (ug/L) | MW-15 | -0.01375 | -17 | -68 | No | 19 | 5.263 | n/a | n/a | 0.02 | NP |
| Cadmium (mg/L) | MW-12 | 0 | -1 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Cadmium (mg/L) | MW-15 | 0.0008233 | 9 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Cadmium (mg/L) | MW-16 | 0 | -5 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Cadmium (mg/L) | MW-19 | 0.0001652 | 9 | 13 | No | 6 | 16.67 | n/a | n/a | 0.02 | NP |
| Chlorobenzene (ug/L) | MW-12 | -0.01769 | -17 | -53 | No | 16 | 0 | n/a | n/a | 0.02 | NP |
| Chlorobenzene (ug/L) | MW-13 | -0.01664 | -7 | -20 | No | 8 | 50 | n/a | n/a | 0.02 | NP |
| Chlorobenzene (ug/L) | MW-15 | -0.4254 | -42 | -68 | No | 19 | 0 | n/a | n/a | 0.02 | NP |
| Chlorobenzene (ug/L) | MW-19 | 0.08696 | 33 | 53 | No | 16 | 0 | n/a | n/a | 0.02 | NP |
| Chloroethane (ug/L) | MW-12 | -0.4302 | -94 | -53 | Yes | 16 | 0 | n/a | n/a | 0.02 | NP |
| Chloroethane (ug/L) | MW-13 | -0.2288 | -20 | -20 | No | 8 | 0 | n/a | n/a | 0.02 | NP |
| Chloroethane (ug/L) | MW-15 | -0.08196 | -99 | -95 | Yes | 24 | 16.67 | n/a | n/a | 0.02 | NP |
| Chromium (mg/L) | MW-12 | 0 | -1 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Chromium (mg/L) | MW-13 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Chromium (mg/L) | MW-19 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| cis-1,2-Dichloroethene (ug/L) | MW-12 | -0.6537 | -94 | -53 | Yes | 16 | 0 | n/a | n/a | 0.02 | NP |
| cis-1,2-Dichloroethene (ug/L) | MW-13 | -0.4079 | -21 | -20 | Yes | 8 | 0 | n/a | n/a | 0.02 | NP |
| Cobalt (mg/L) | MW-12 | 0.0002173 | 3 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Cobalt (mg/L) | MW-13 | 0.00009838 | 5 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Cobalt (mg/L) | MW-15 | -0.00009838 | -1 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Cobalt (mg/L) | MW-16 | 0.0005276 | 7 | 13 | No | 6 | 16.67 | n/a | n/a | 0.02 | NP |
| Cobalt (mg/L) | MW-19 | 0.0002284 | 3 | 13 | No | 6 | 16.67 | n/a | n/a | 0.02 | NP |
| Copper (mg/L) | MW-12 | 0 | -1 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Copper (mg/L) | MW-13 | 0.0009202 | 5 | 13 | No | 6 | 16.67 | n/a | n/a | 0.02 | NP |
| Copper (mg/L) | MW-15 | 0.0009733 | 6 | 13 | No | 6 | 50 | n/a | n/a | 0.02 | NP |
| Copper (mg/L) | MW-19 | 0.001086 | 6 | 13 | No | 6 | 33.33 | n/a | n/a | 0.02 | NP |
| Lead (mg/L) | MW-12 | 0 | -1 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Lead (mg/L) | MW-13 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Lead (mg/L) | MW-15 | 0 | 5 | 13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Lead (mg/L) | MW-19 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Nickel (mg/L) | MW-12 | 0.0009481 | 5 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Nickel (mg/L) | MW-13 | 0.001172 | 1 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Nickel (mg/L) | MW-15 | -0.006312 | -13 | -13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Nickel (mg/L) | MW-16 | 0.0001947 | 1 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Nickel (mg/L) | MW-19 | 0.005698 | 11 | 13 | No | 6 | 0 | n/a | n/a | 0.02 | NP |
| Toluene (ug/L) | MW-19 | 0 | 3 | 20 | No | 8 | 87.5 | n/a | n/a | 0.02 | NP |
| Vanadium (mg/L) | MW-12 | 0 | -1 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Vanadium (mg/L) | MW-13 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Vanadium (mg/L) | MW-19 | 0 | -3 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Vinyl Chloride (ug/L) | MW-12 | -0.3497 | -98 | -53 | Yes | 16 | 25 | n/a | n/a | 0.02 | NP |
| Zinc (mg/L) | MW-12 | 0 | 3 | 13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Zinc (mg/L) | MW-13 | 0 | 1 | 13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Zinc (mg/L) | MW-15 | 0 | -5 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Zinc (mg/L) | MW-16 | 0 | -5 | -13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |
| Zinc (mg/L) | MW-19 | 0 | 1 | 13 | No | 6 | 83.33 | n/a | n/a | 0.02 | NP |

[1] For the Appendix I metals, the Jul. 2018 through Oct. 2023 results associated with no purge sampling events were utilized for statistical comparisons. For the Appendix I volatile organic compounds, all available data was utilized.

[2] By default, Sanitas software utilizes half the reporting limit for non-detected values. In the case of changing reporting limits, this may artificially introduce variation into the trend test.

Hollow symbols indicate censored values.

# Sen's Slope Estimator

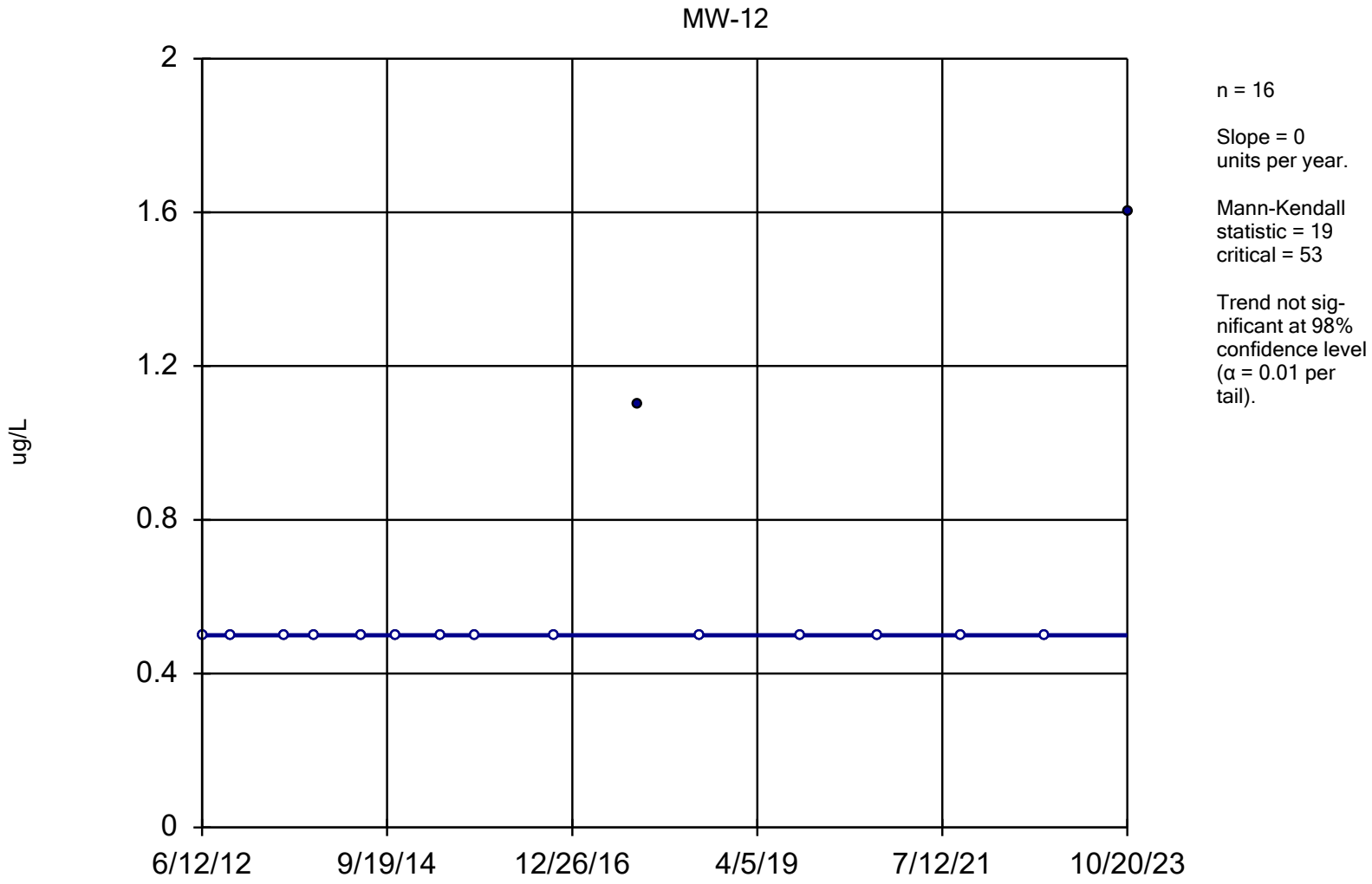



Constituent: 1,1-Dichloroethane  Analysis Run 7/16/2024 8:29 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

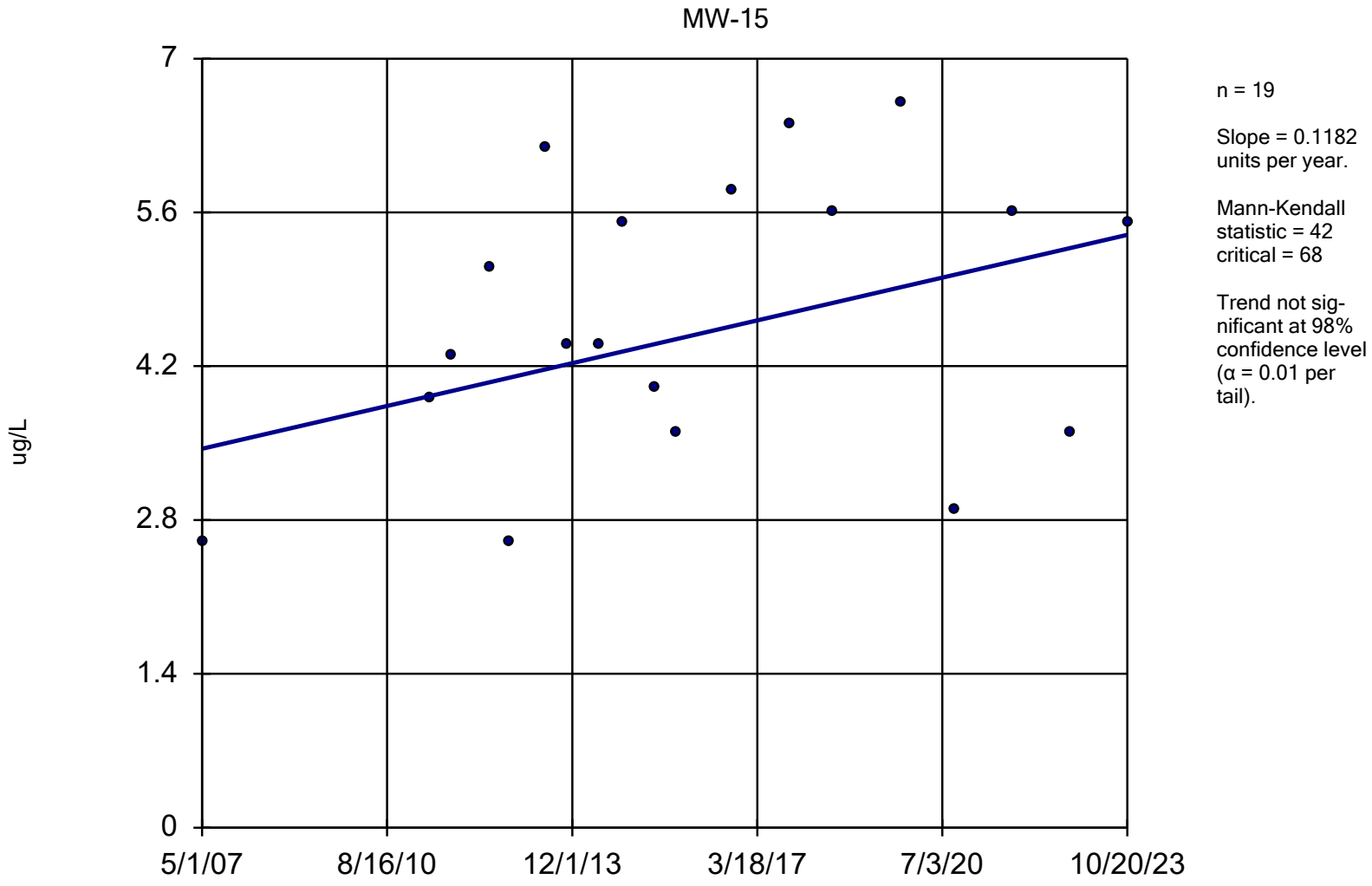
# Sen's Slope Estimator




Constituent: 1,4-Dichlorobenzene  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator



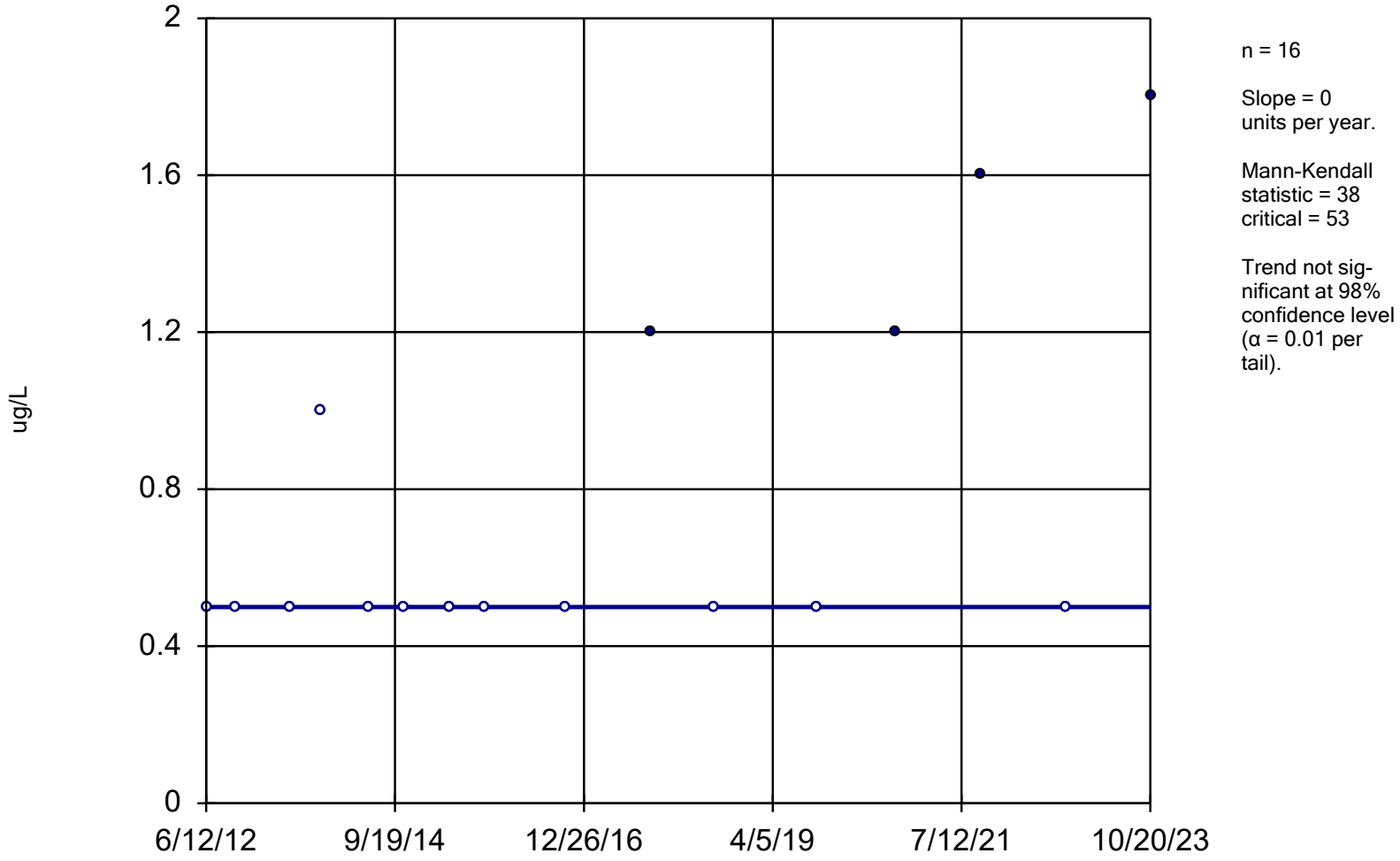

Constituent: 1,4-Dichlorobenzene Analysis Run 7/16/2024 8:29 PM

Shelby County Sanitary Landfill Client: Foth Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-19

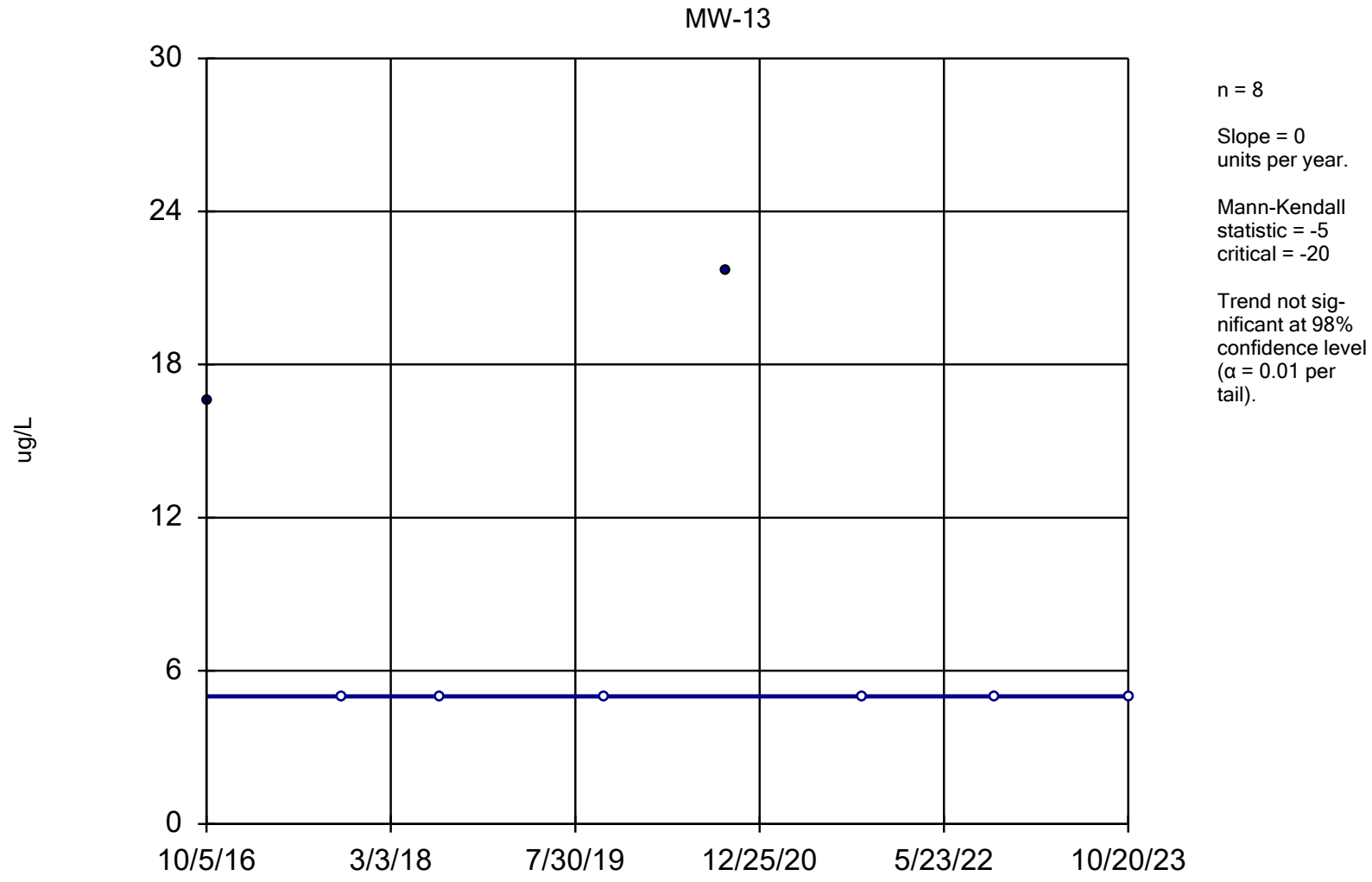



Constituent: 1,4-Dichlorobenzene  Analysis Run 7/16/2024 9:13 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

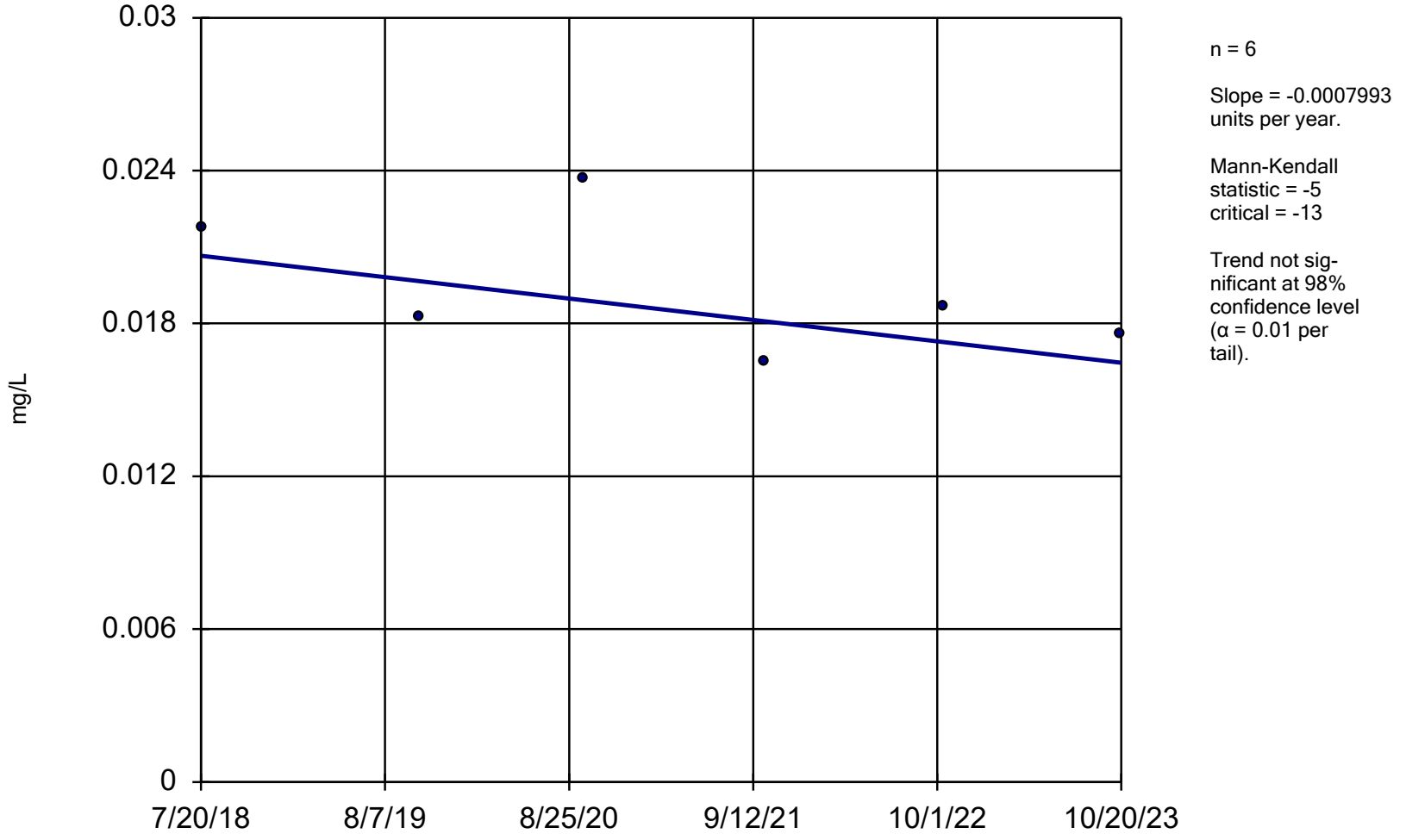



Constituent: Acetone  Analysis Run 7/16/2024 8:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-12




n = 6

Slope = -0.0007993 units per year.

Mann-Kendall statistic = -5
critical = -13

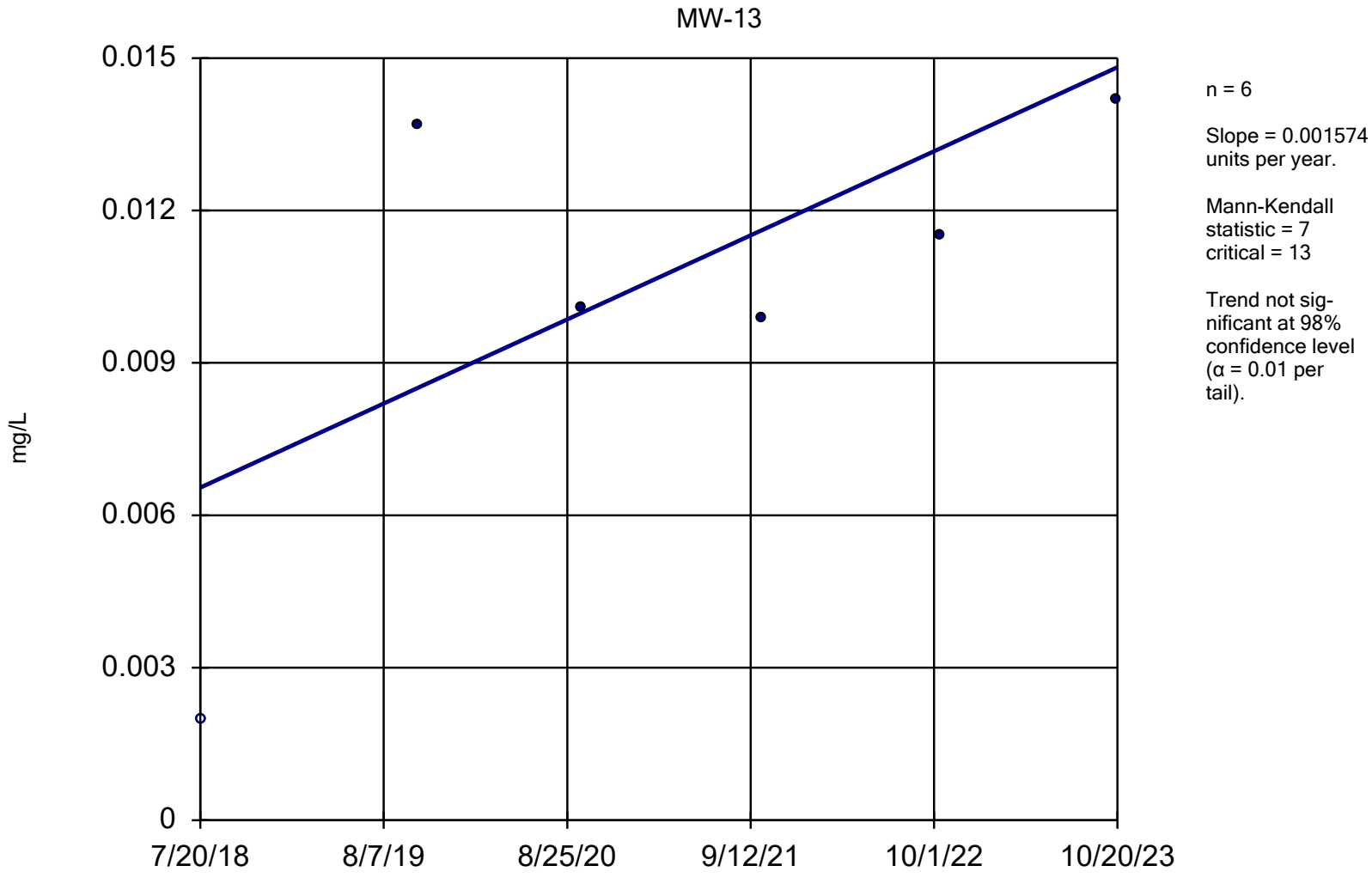
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Arsenic  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

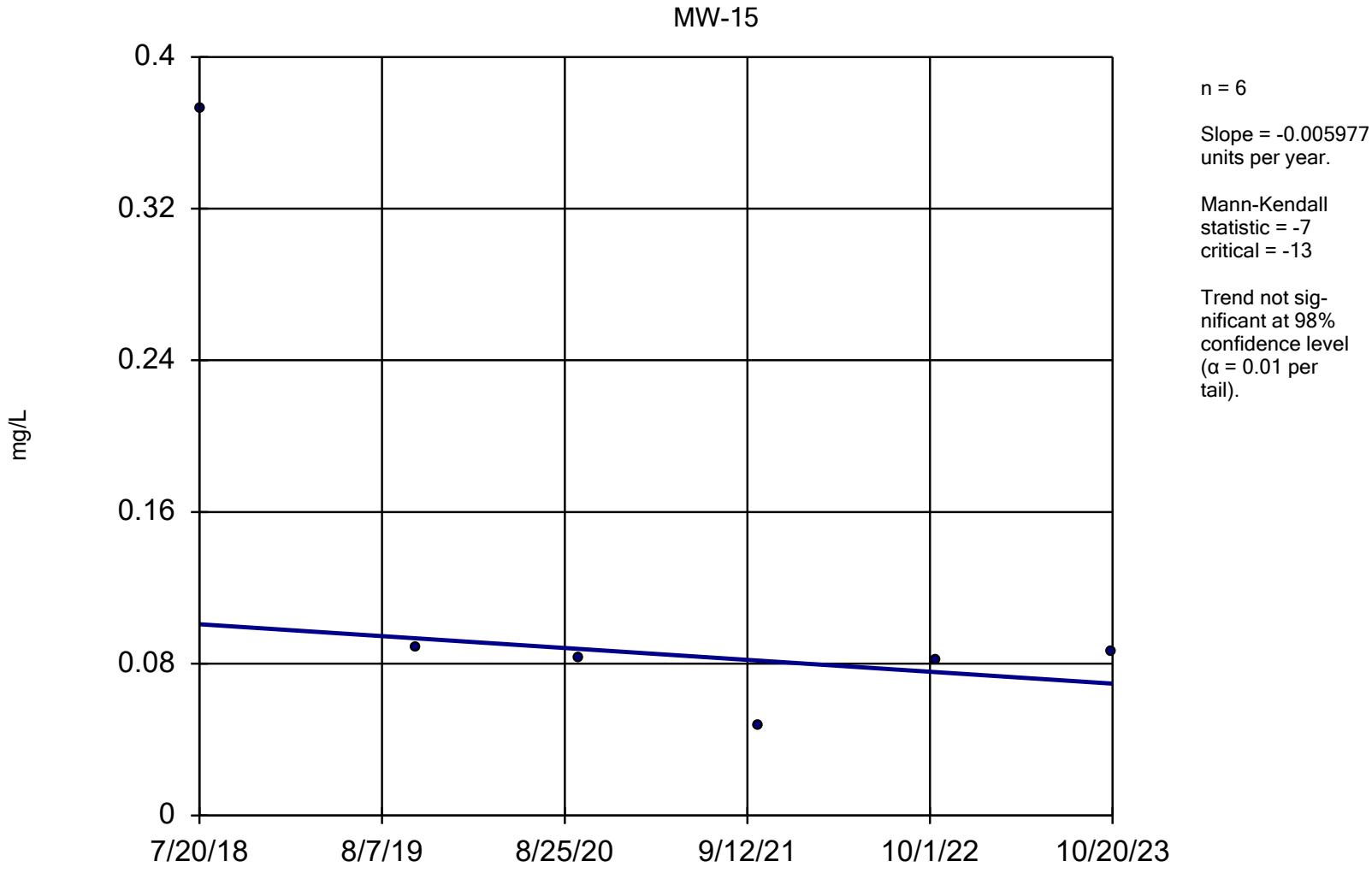
# Sen's Slope Estimator




Constituent: Arsenic  Analysis Run 7/17/2024 2:27 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

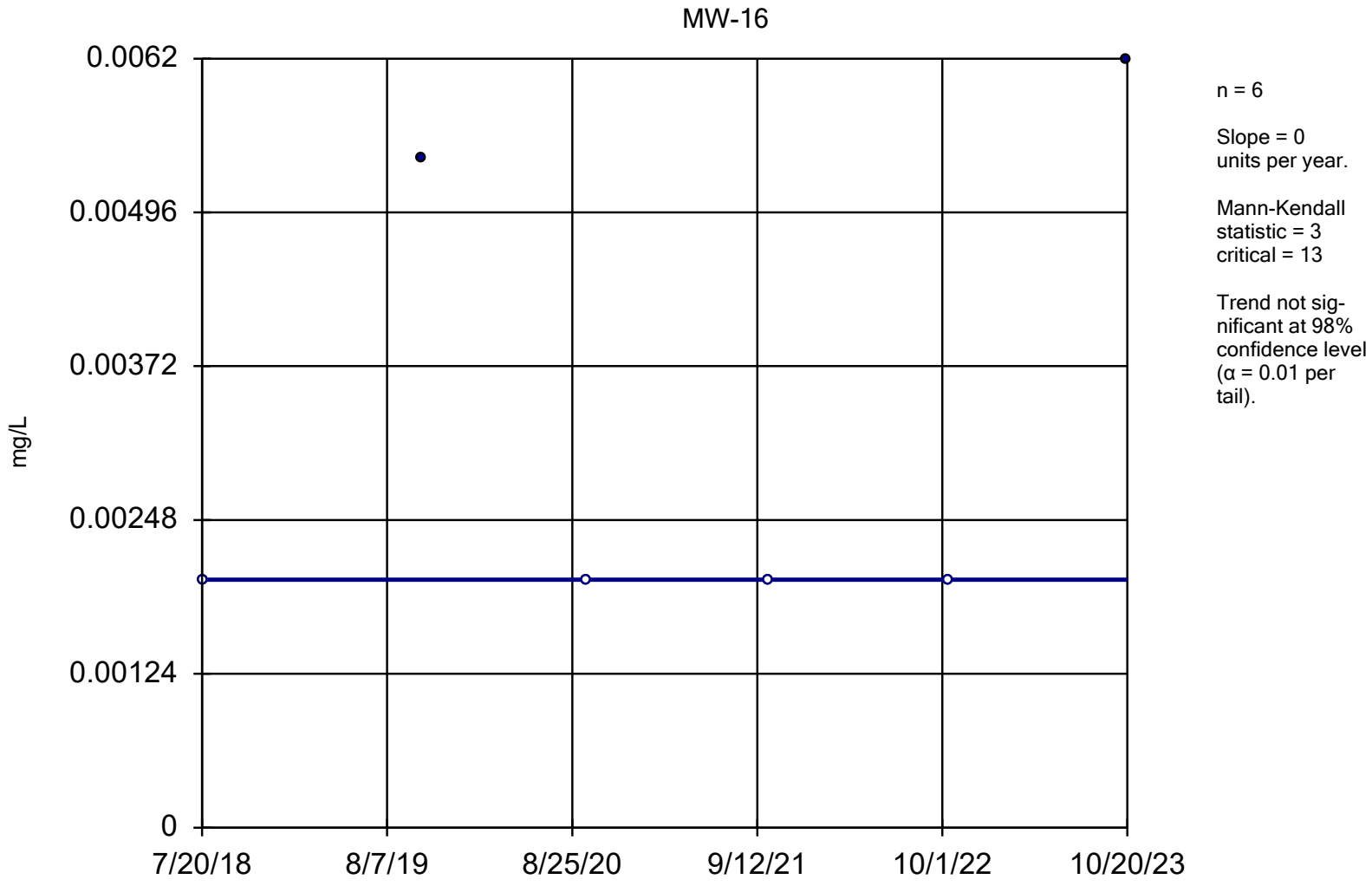



Constituent: Arsenic  Analysis Run 7/15/2024 8:18 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

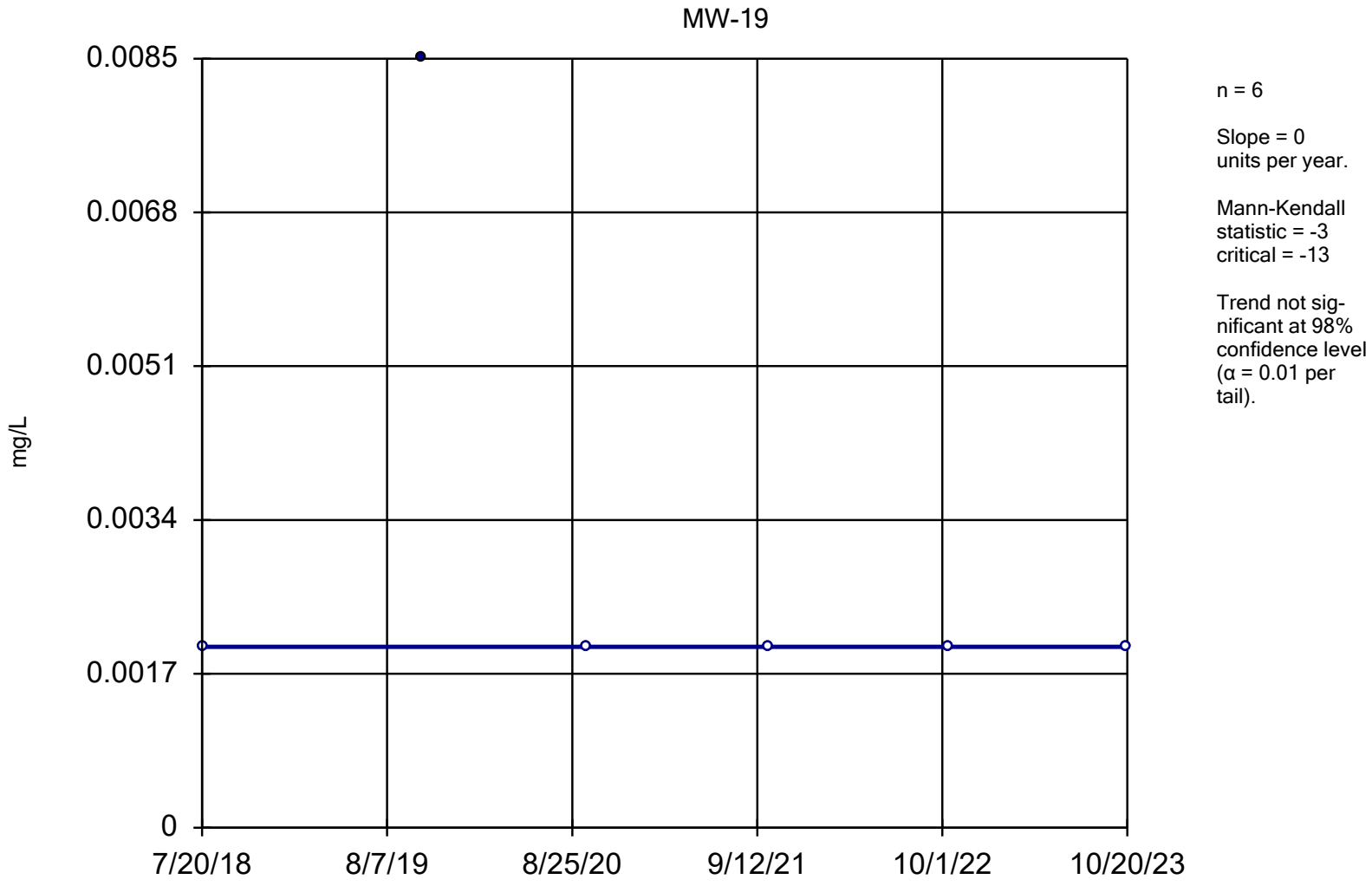



Constituent: Arsenic  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

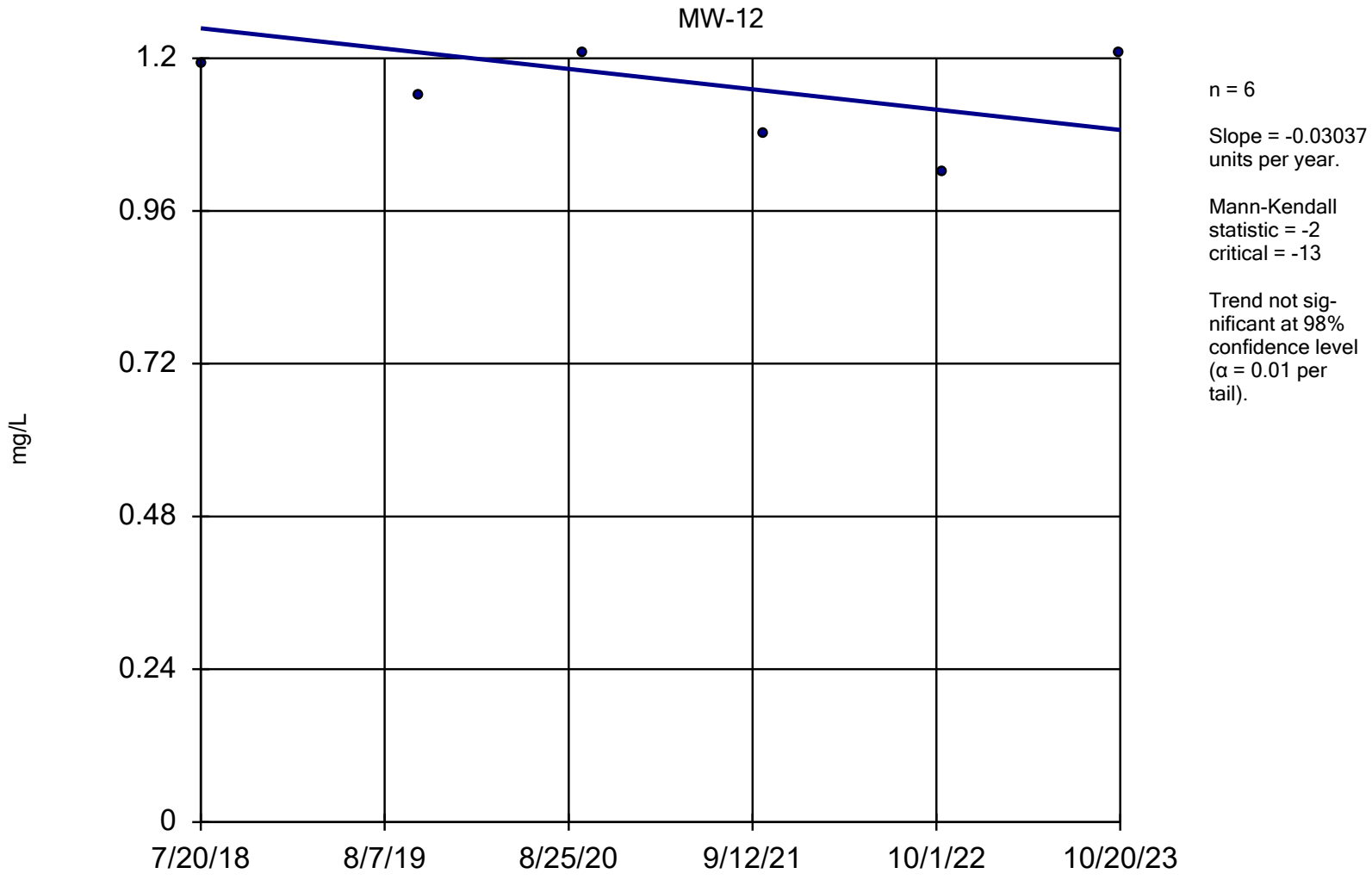
# Sen's Slope Estimator




Constituent: Arsenic  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

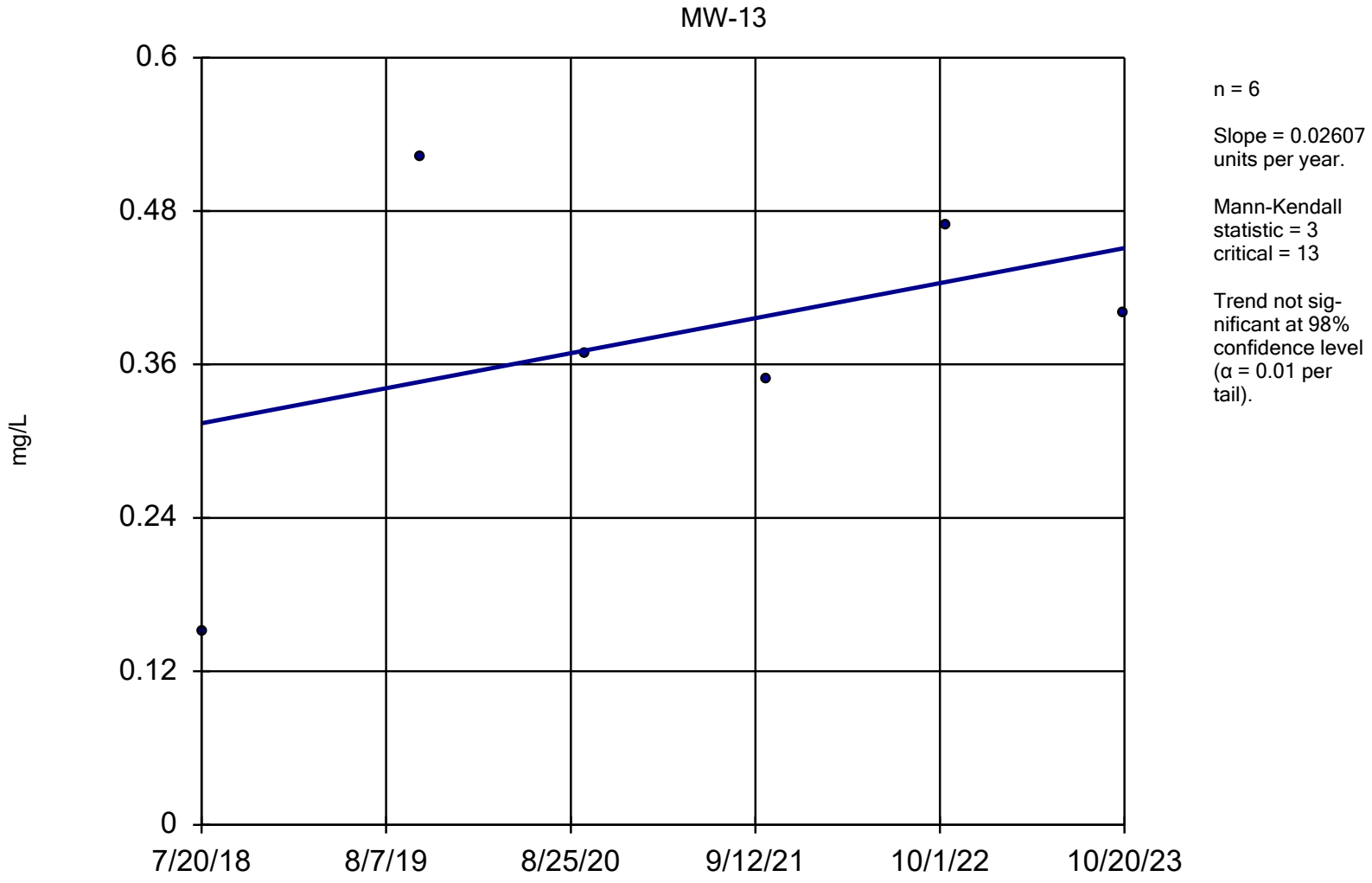
# Sen's Slope Estimator




Constituent: Barium  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

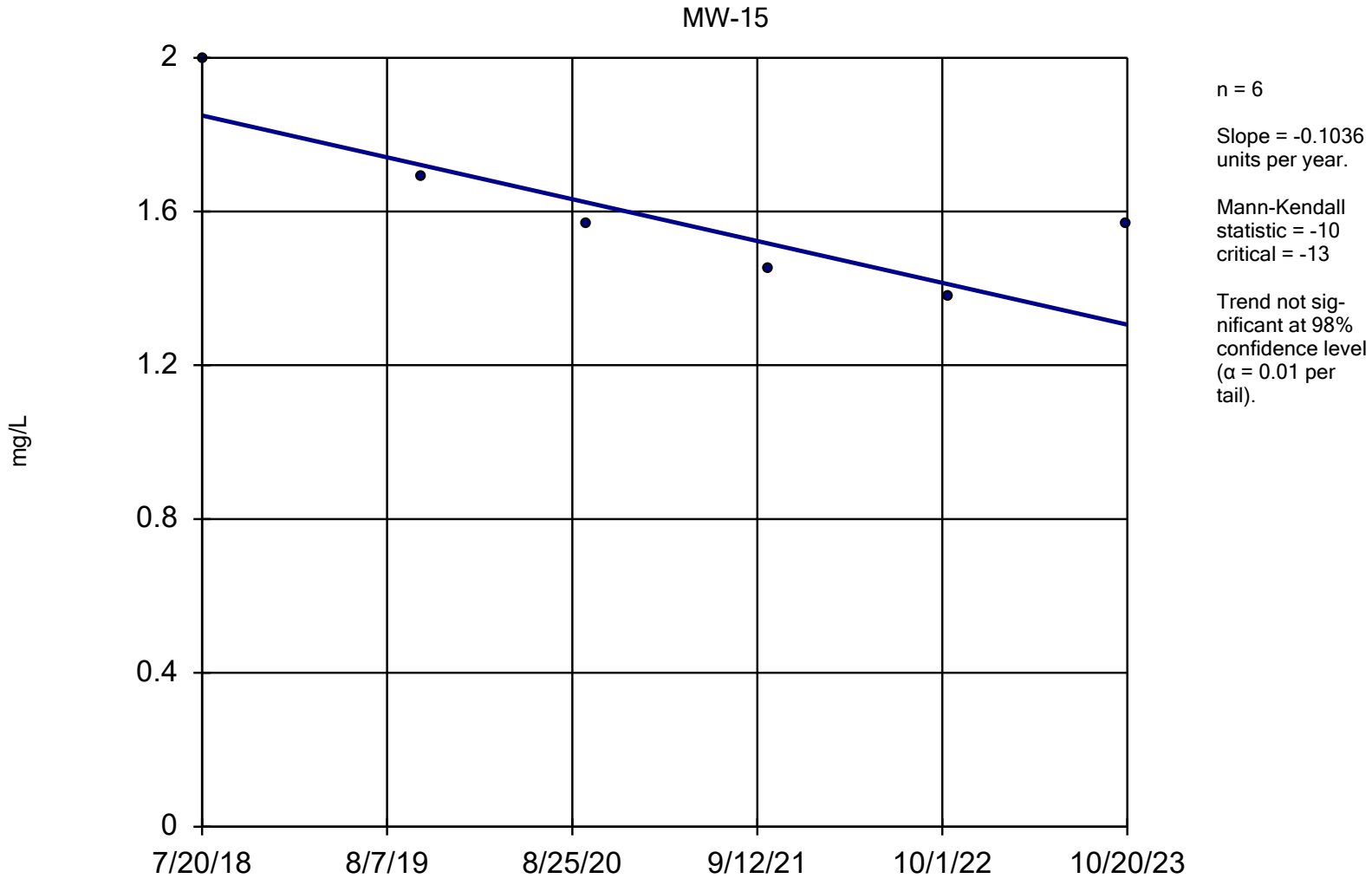
# Sen's Slope Estimator




Constituent: Barium  Analysis Run 7/17/2024 2:27 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

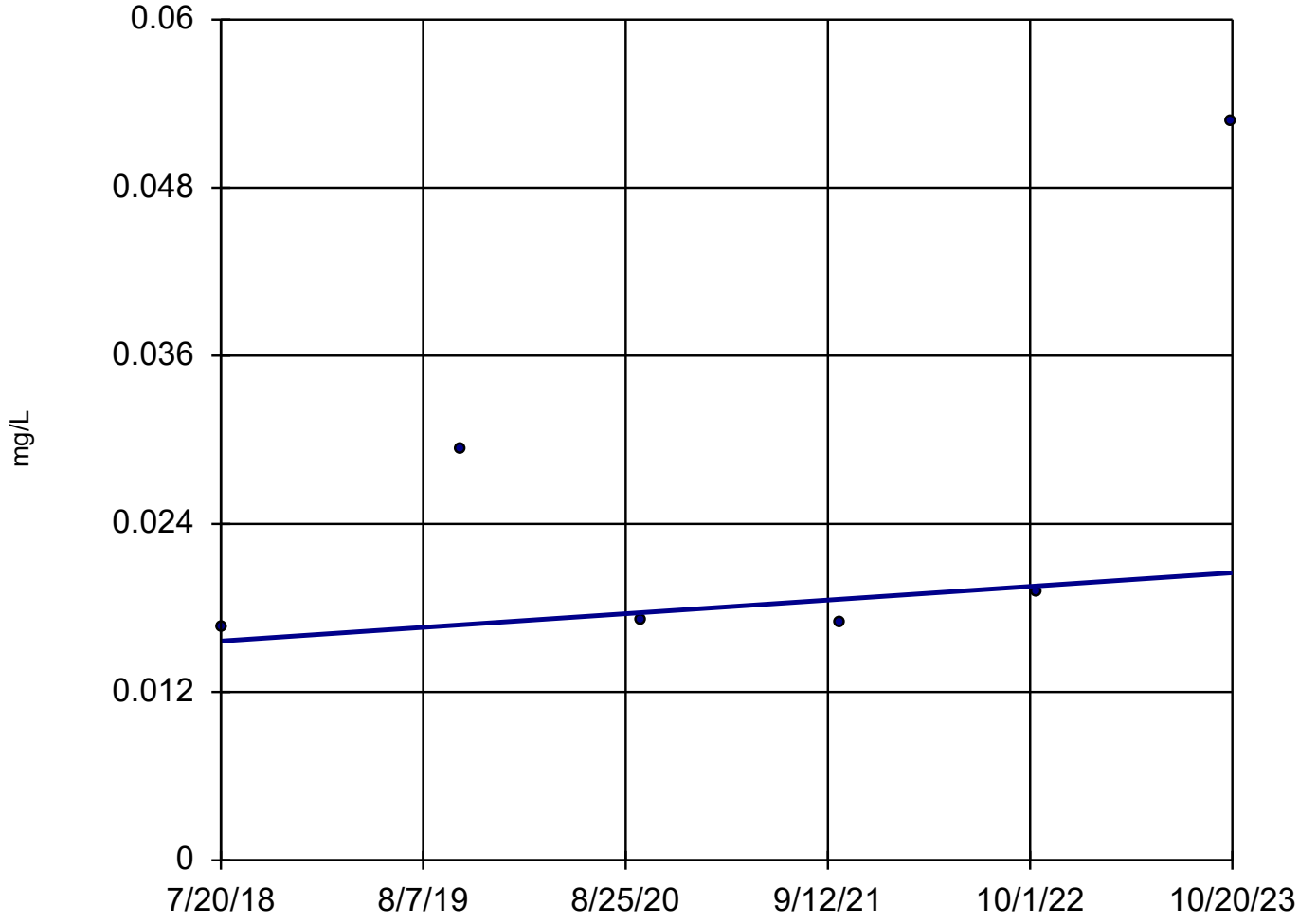



Constituent: Barium  Analysis Run 7/15/2024 8:19 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-16




n = 6

Slope = 0.0009247 units per year.

Mann-Kendall statistic = 7
critical = 13

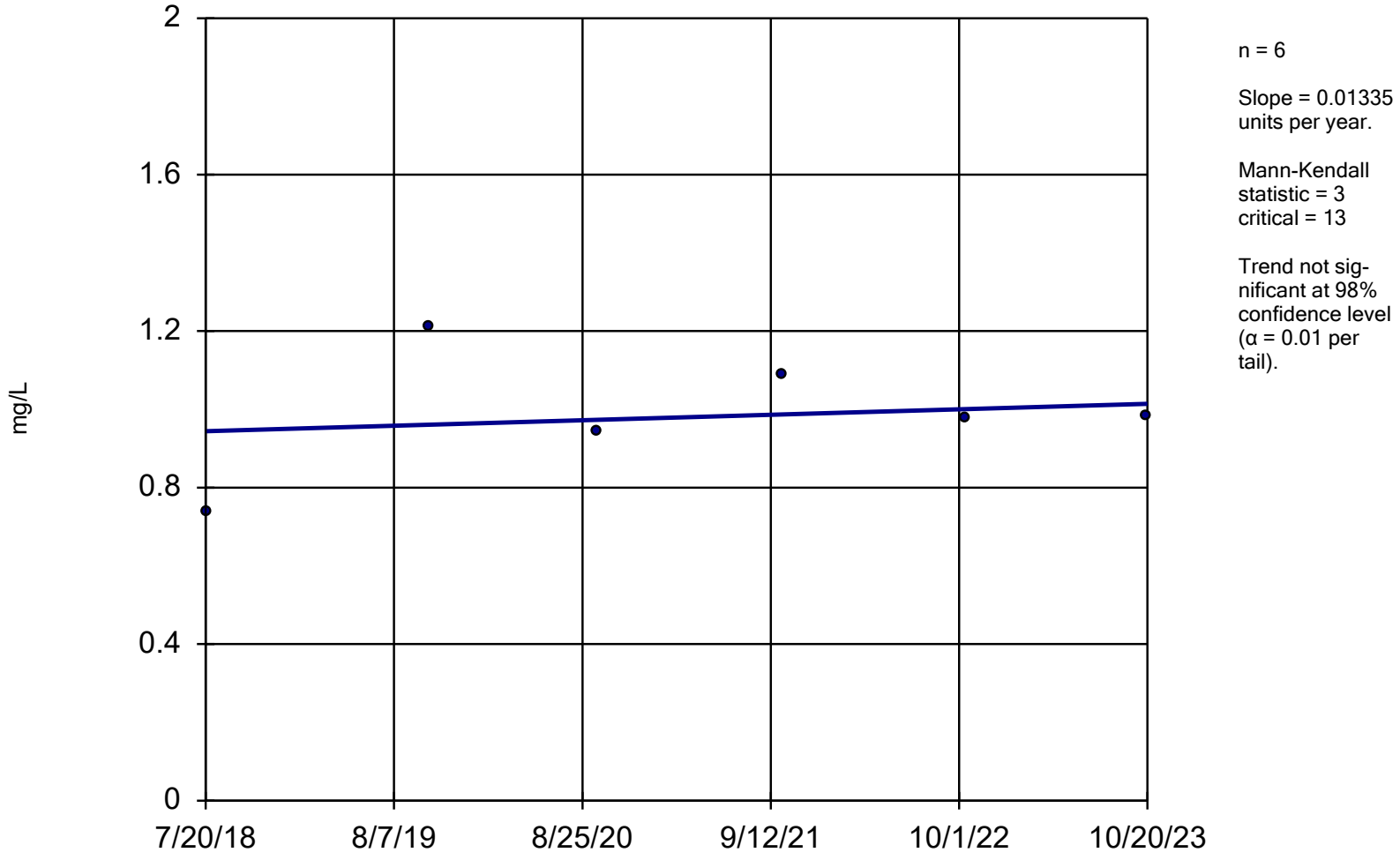
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Barium  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-19




n = 6

Slope = 0.01335 units per year.

Mann-Kendall statistic = 3
critical = 13

Trend not significant at 98% confidence level (α = 0.01 per tail).

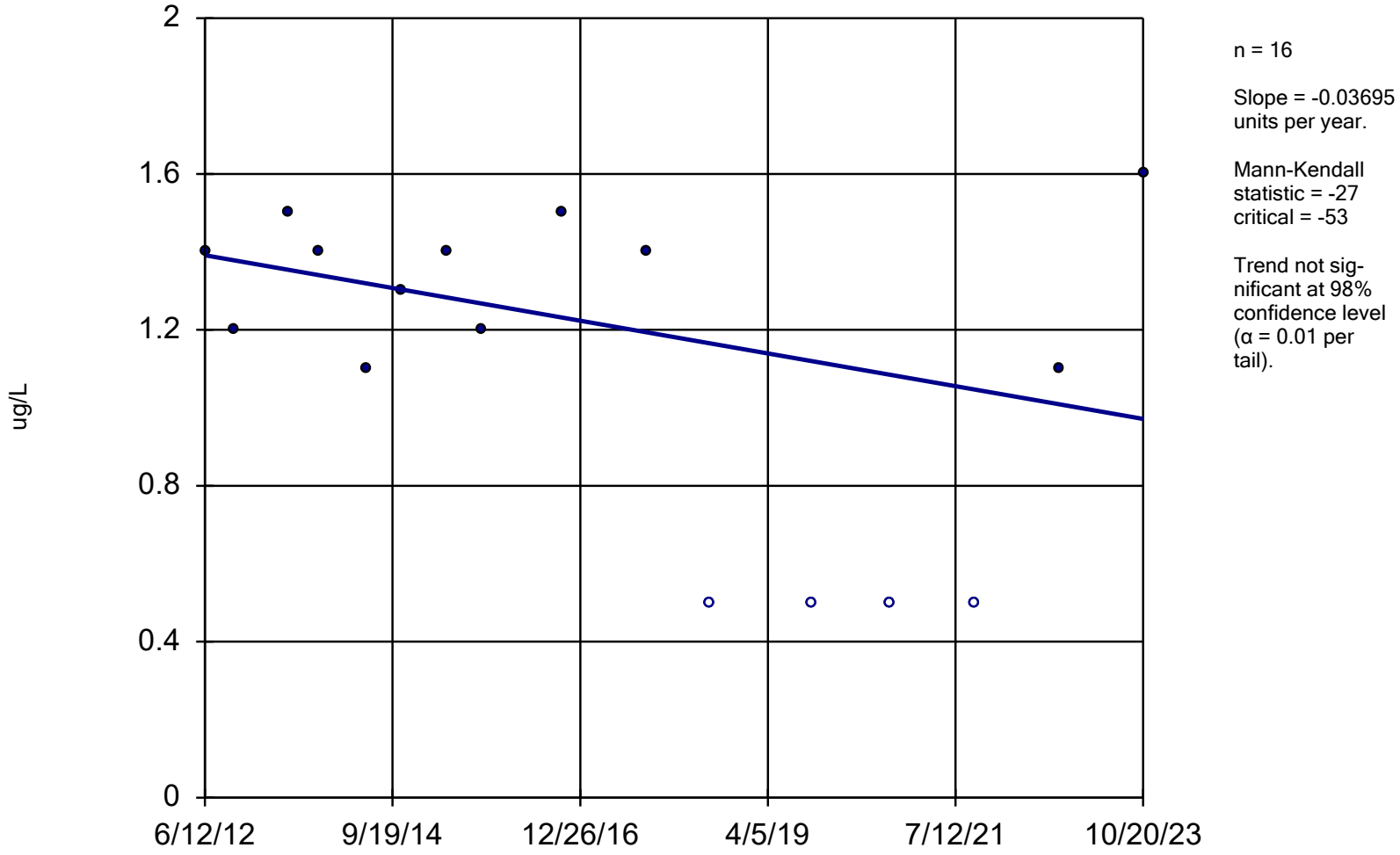
Constituent: Barium  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-12




n = 16

Slope = -0.03695 units per year.

Mann-Kendall statistic = -27
critical = -53

Trend not significant at 98% confidence level (α = 0.01 per tail).

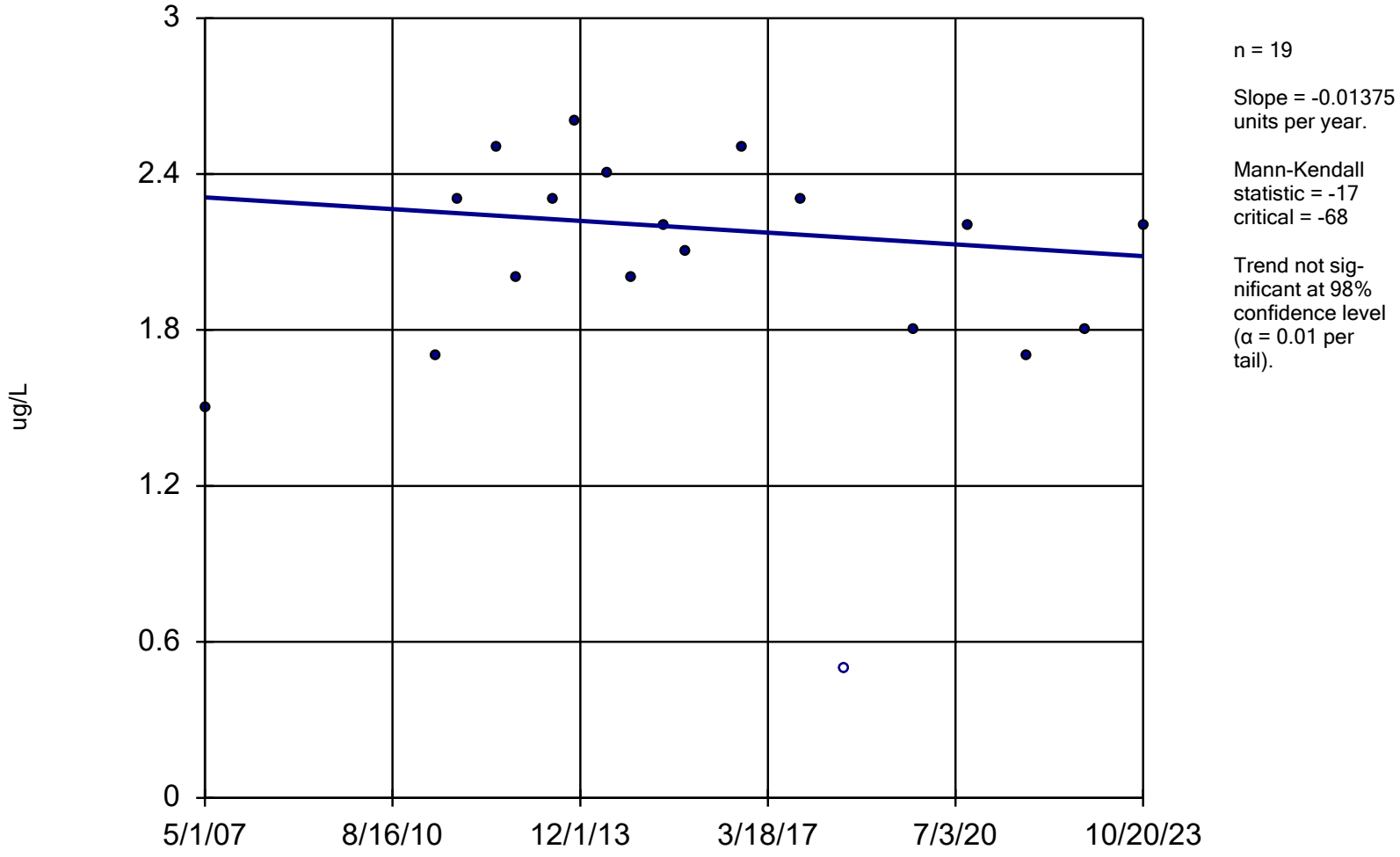
Constituent: Benzene  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-15




n = 19

Slope = -0.01375 units per year.

Mann-Kendall statistic = -17
critical = -68

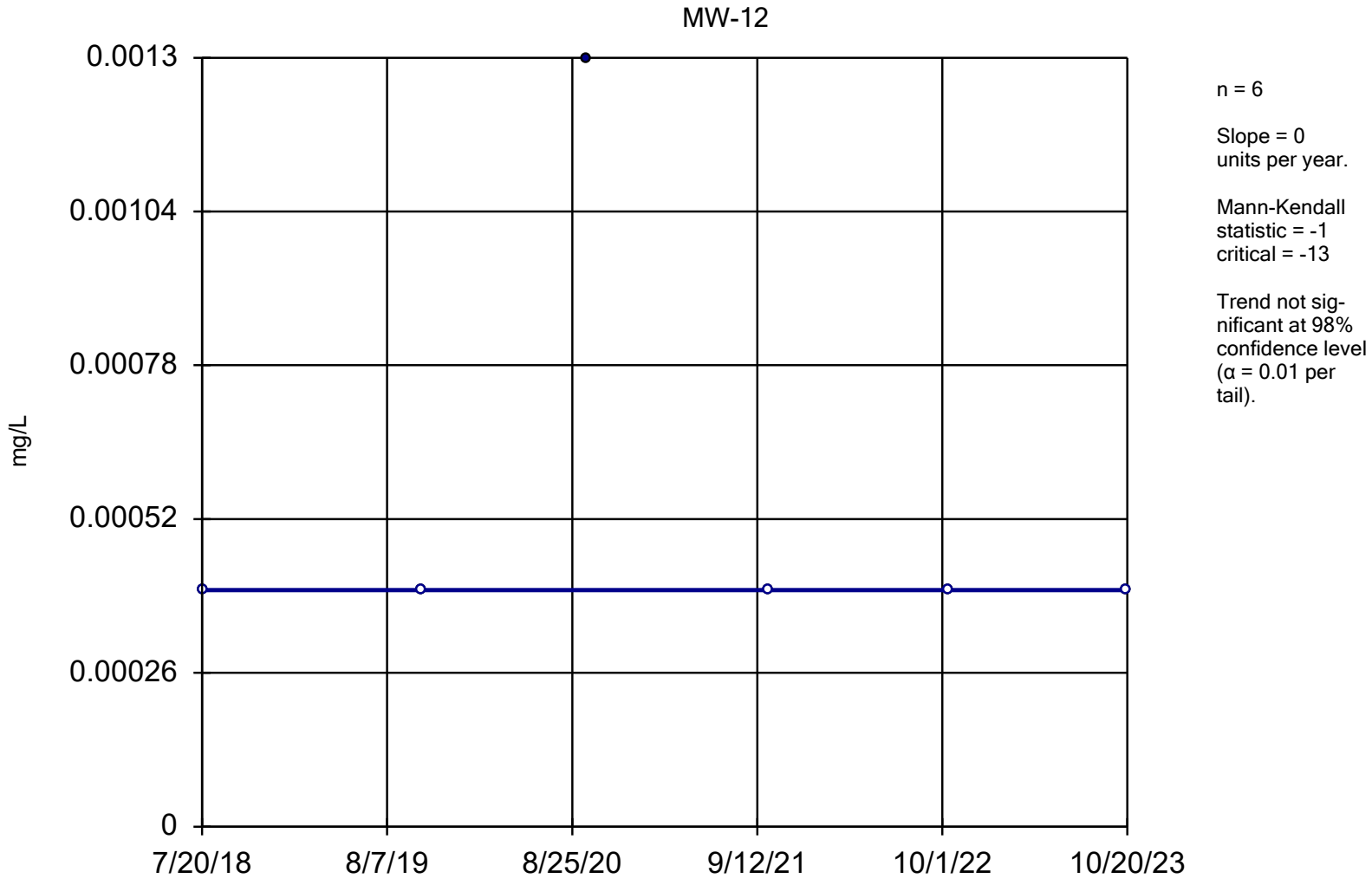
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Benzene  Analysis Run 7/16/2024 8:29 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

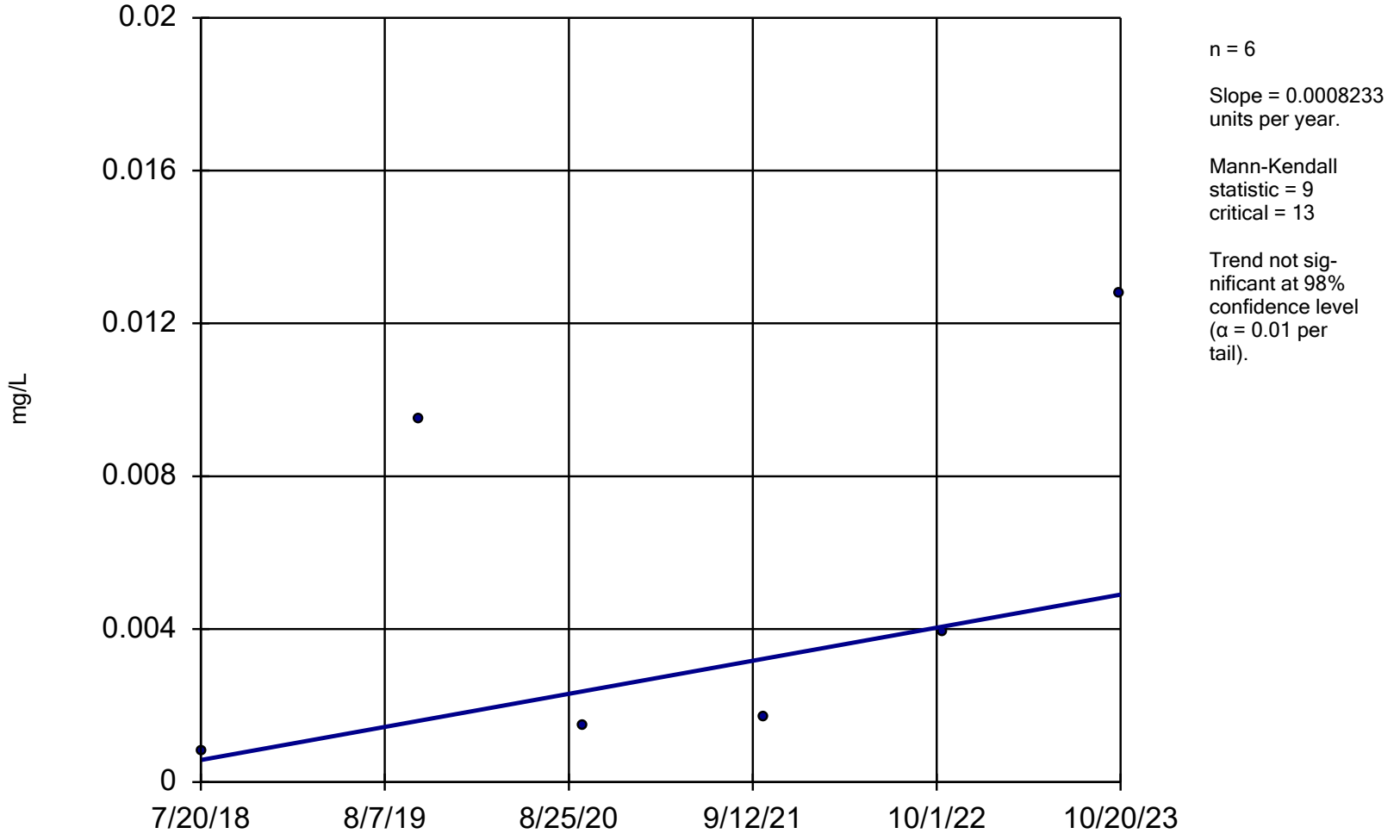



Constituent: Cadmium  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-15




n = 6

Slope = 0.0008233 units per year.

Mann-Kendall statistic = 9
critical = 13

Trend not significant at 98% confidence level (α = 0.01 per tail).

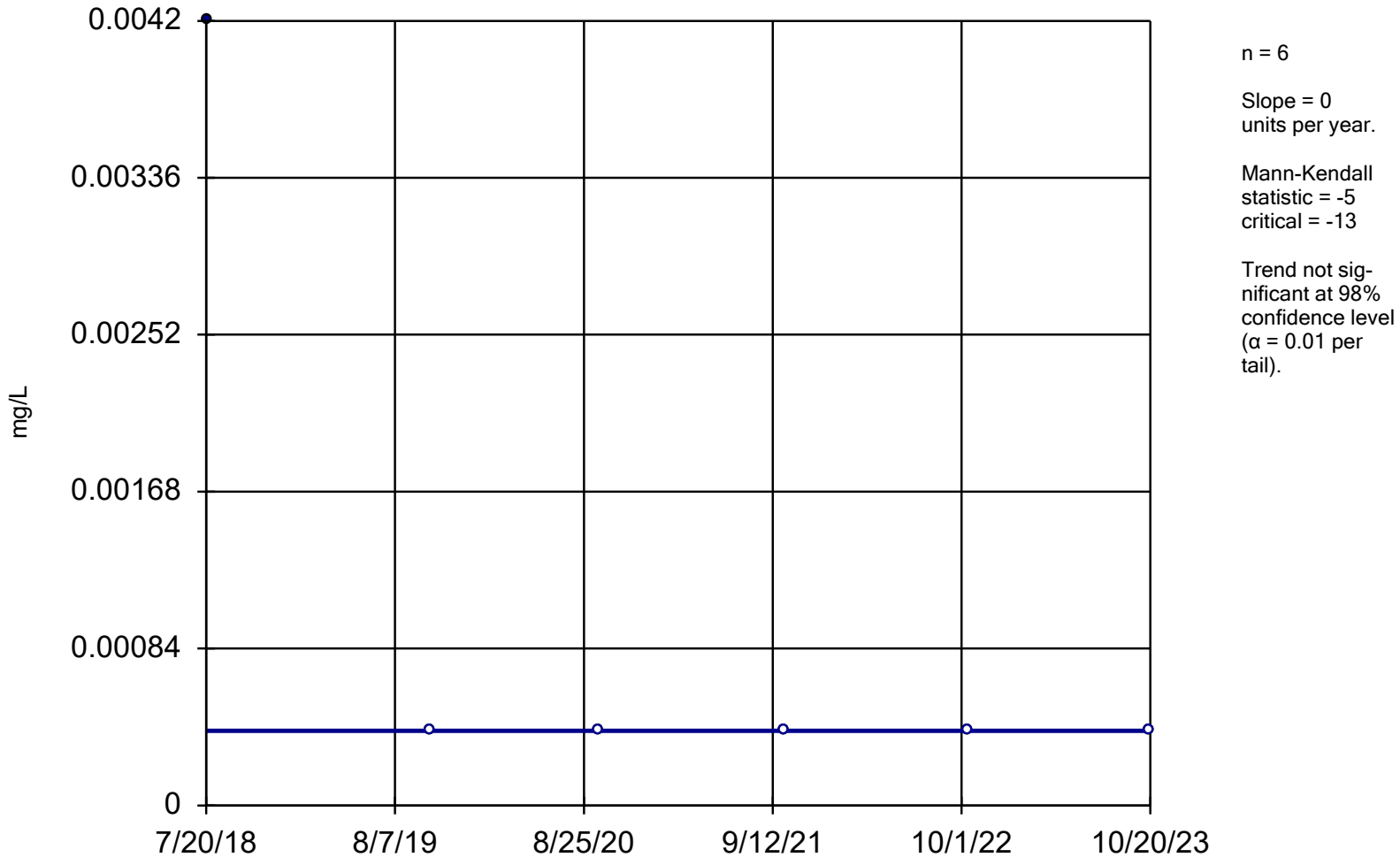
Constituent: Cadmium  Analysis Run 7/15/2024 8:23 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-16




n = 6

Slope = 0
units per year.

Mann-Kendall
statistic = -5
critical = -13

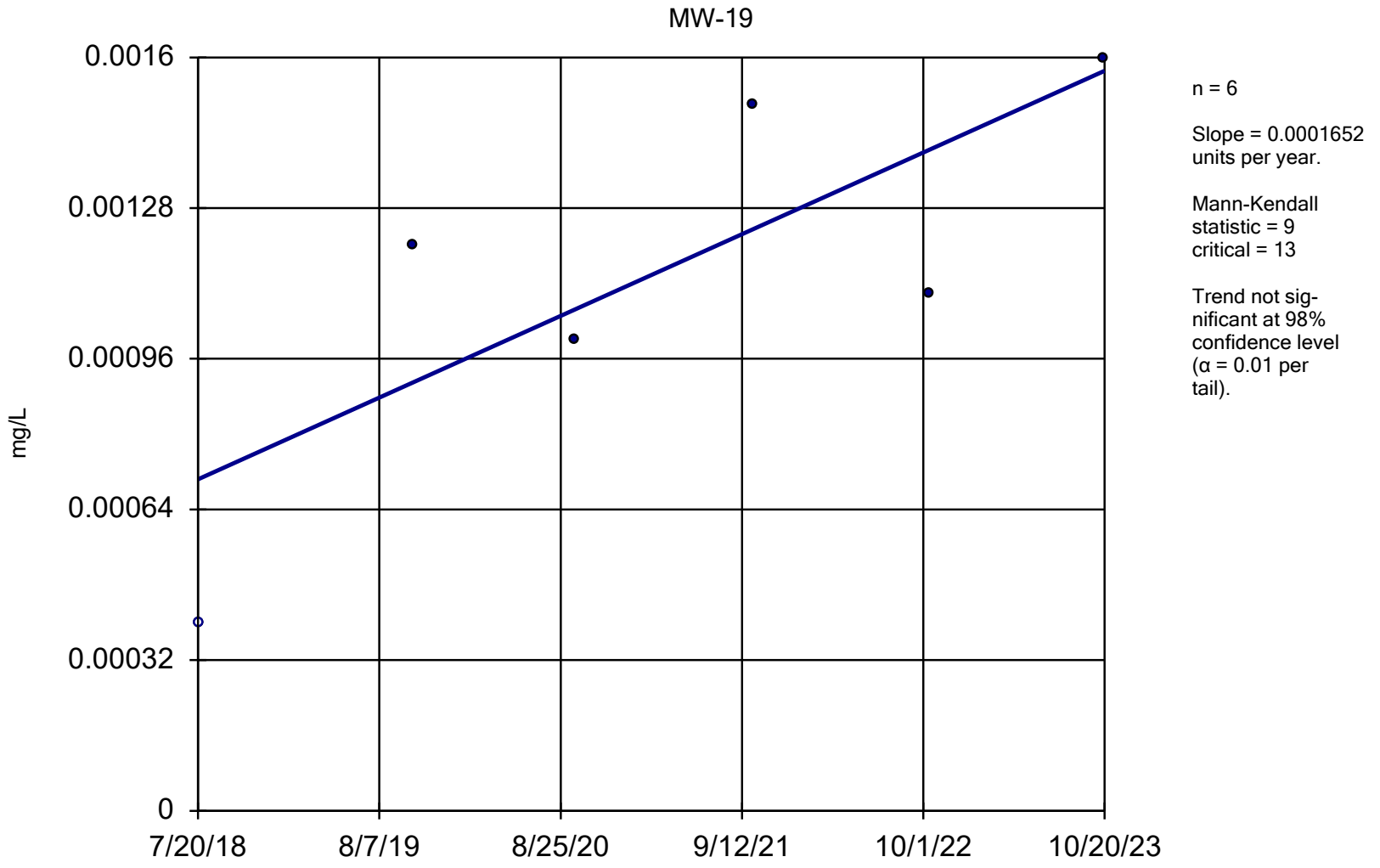
Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Cadmium  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

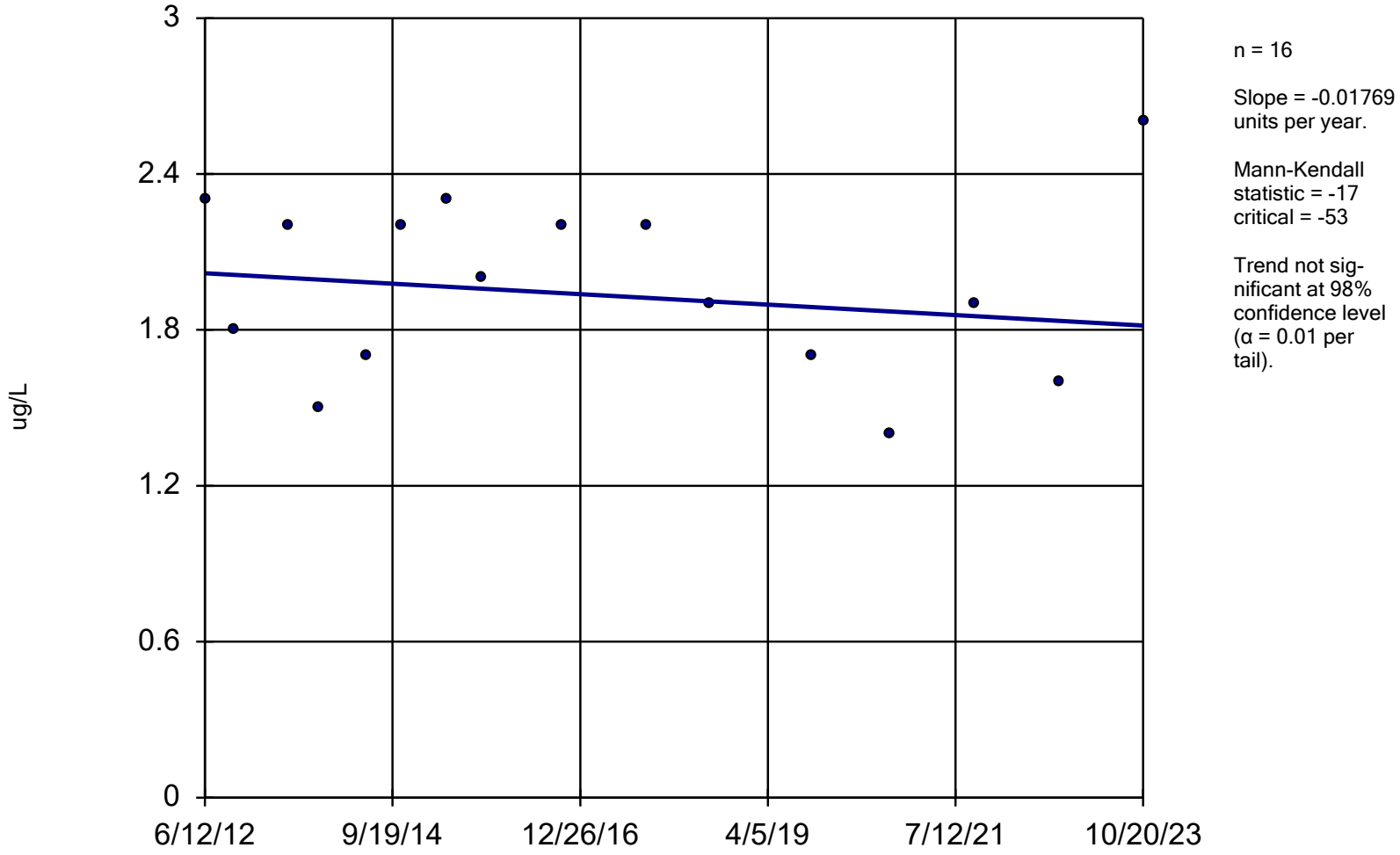



Constituent: Cadmium  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-12




n = 16

Slope = -0.01769 units per year.

Mann-Kendall statistic = -17
critical = -53

Trend not significant at 98% confidence level (α = 0.01 per tail).

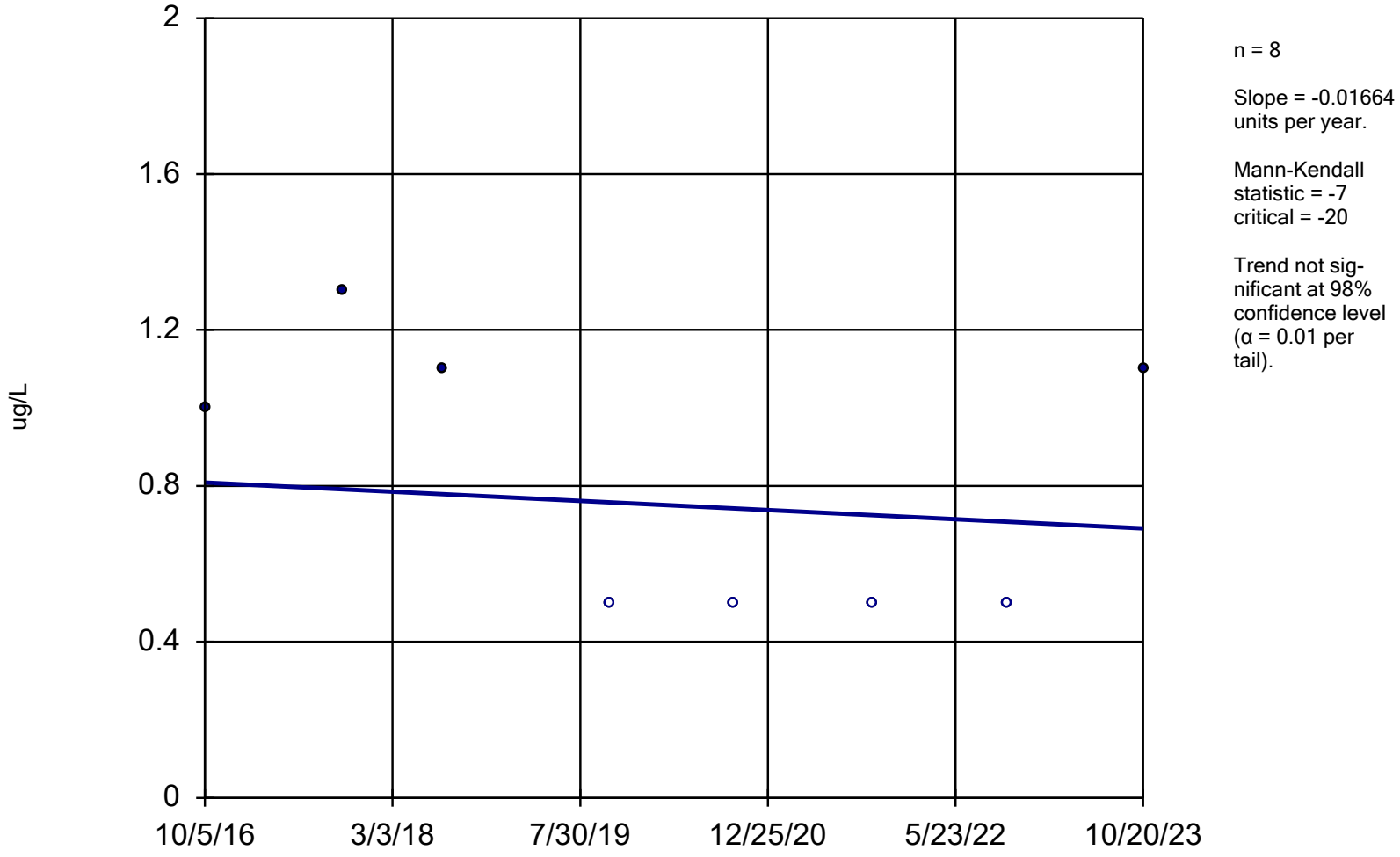
Constituent: Chlorobenzene  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-13




n = 8

Slope = -0.01664 units per year.

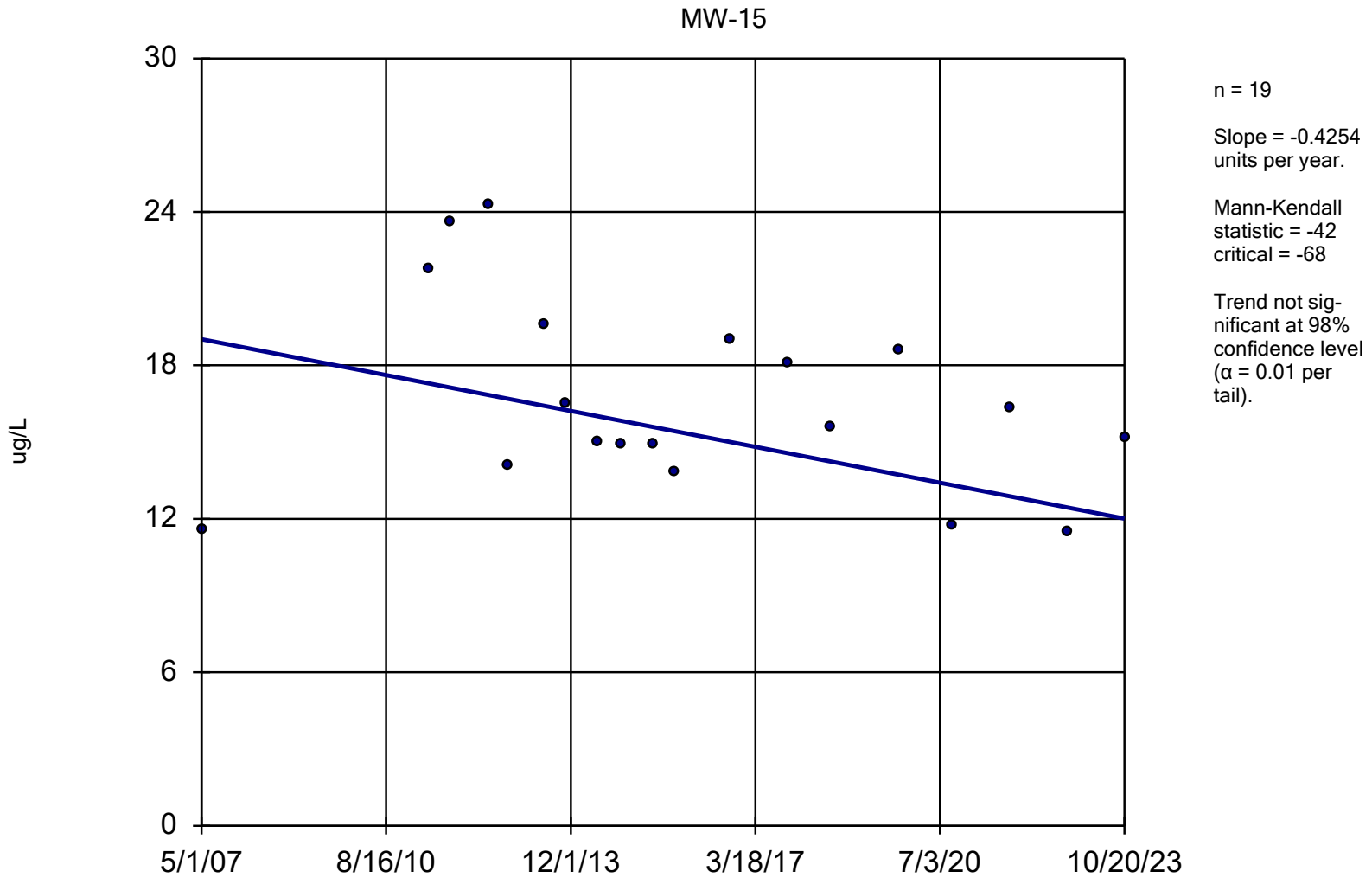
Mann-Kendall statistic = -7
critical = -20

Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Chlorobenzene  Analysis Run 7/16/2024 8:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

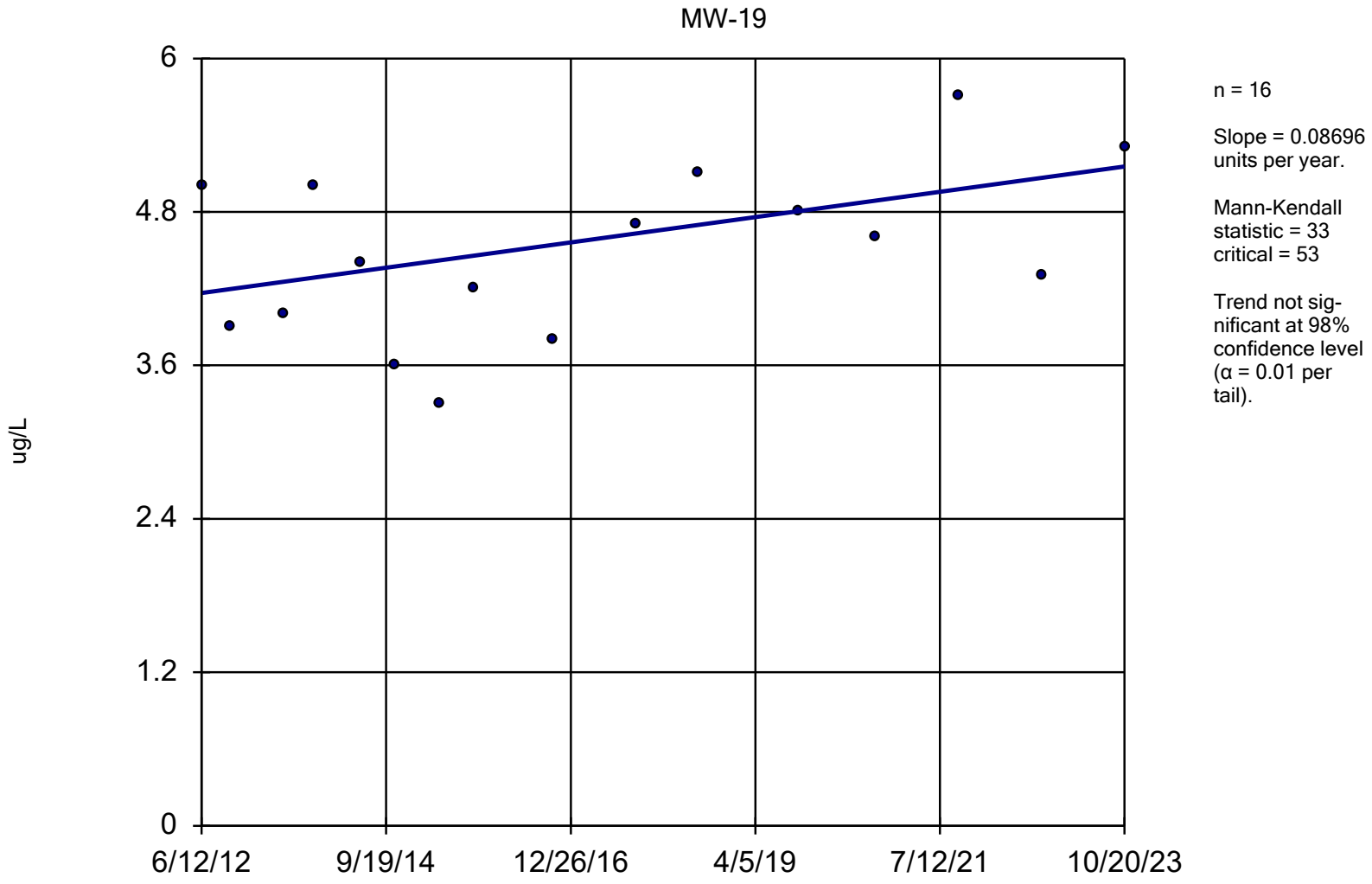
# Sen's Slope Estimator




Constituent: Chlorobenzene  Analysis Run 7/16/2024 8:29 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

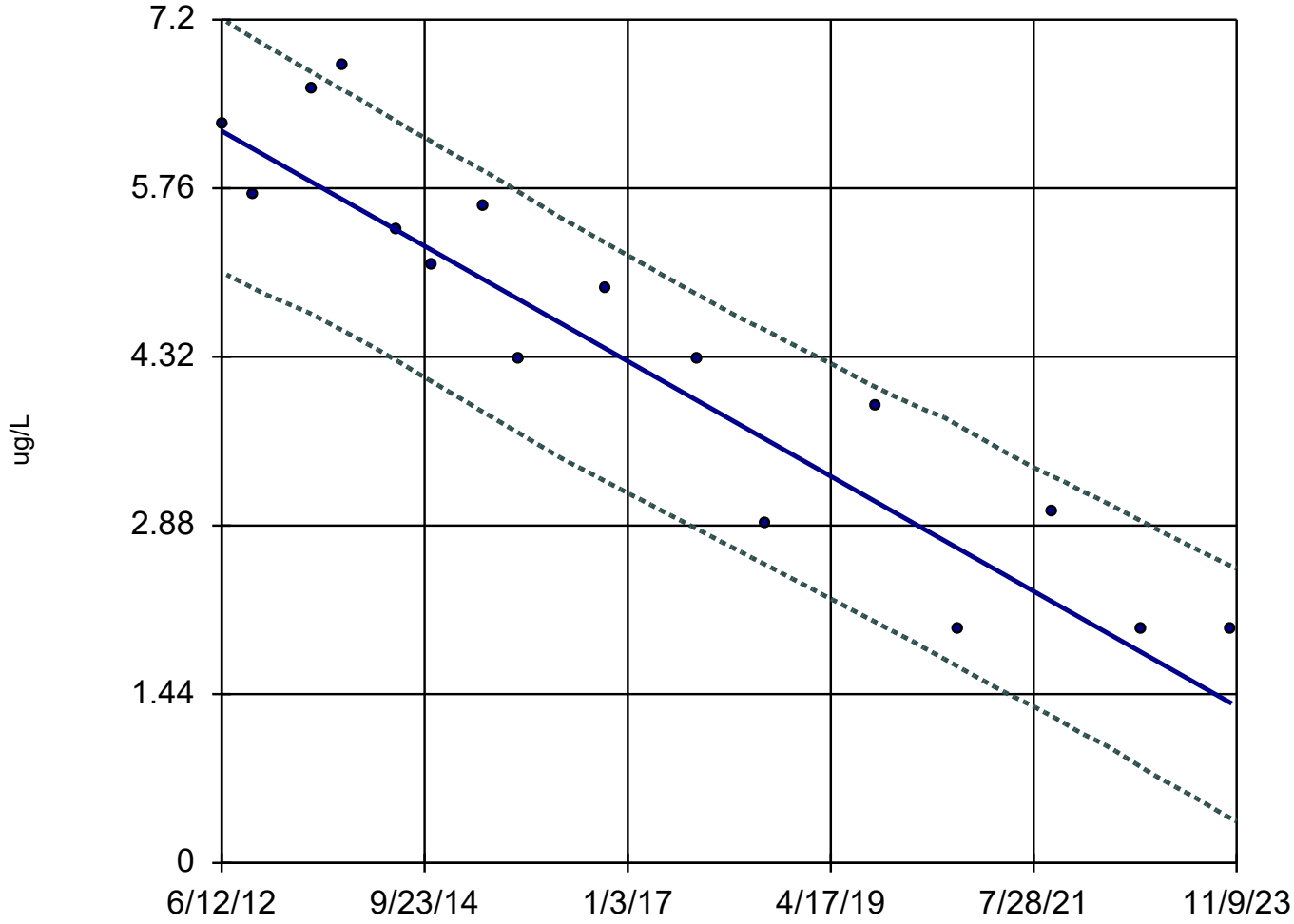



Constituent: Chlorobenzene  Analysis Run 7/16/2024 9:13 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope and 90% Confidence Band

MW-12




n = 16

Slope = -0.4302 units per year.

Mann-Kendall statistic = -94
critical = -53

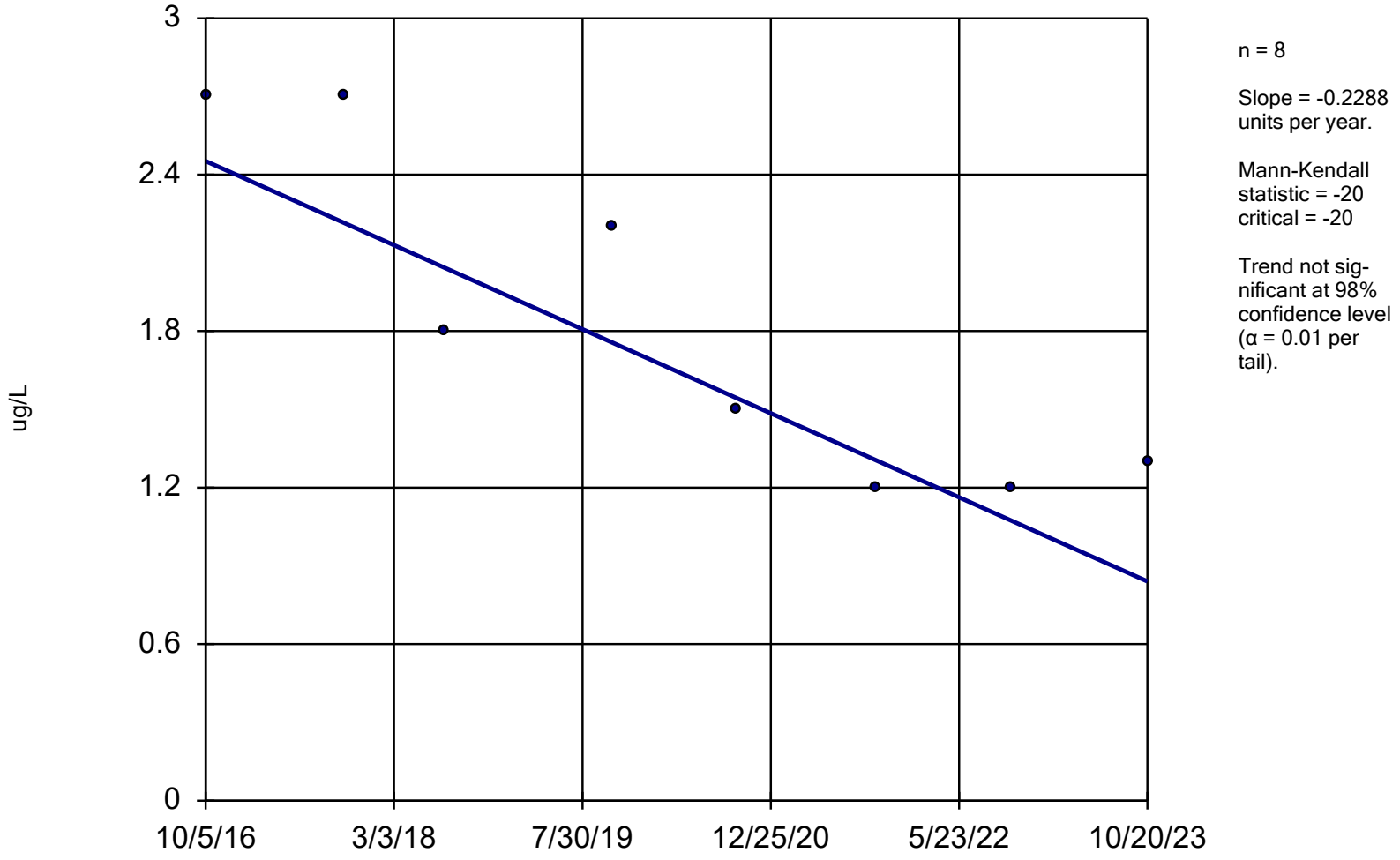
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Chloroethane  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

MW-13




n = 8

Slope = -0.2288 units per year.

Mann-Kendall statistic = -20
critical = -20

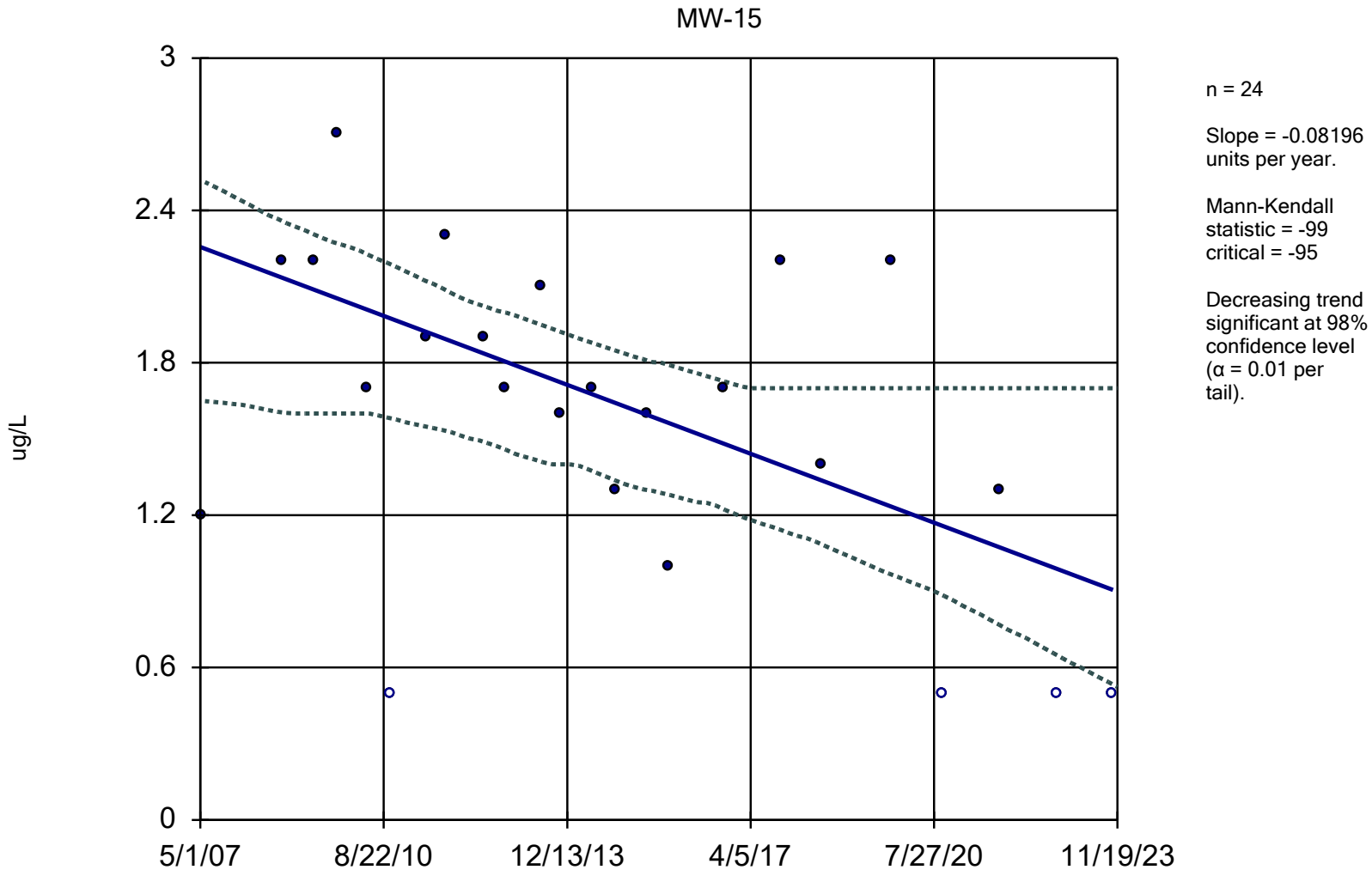
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Chloroethane  Analysis Run 7/16/2024 8:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope and 90% Confidence Band

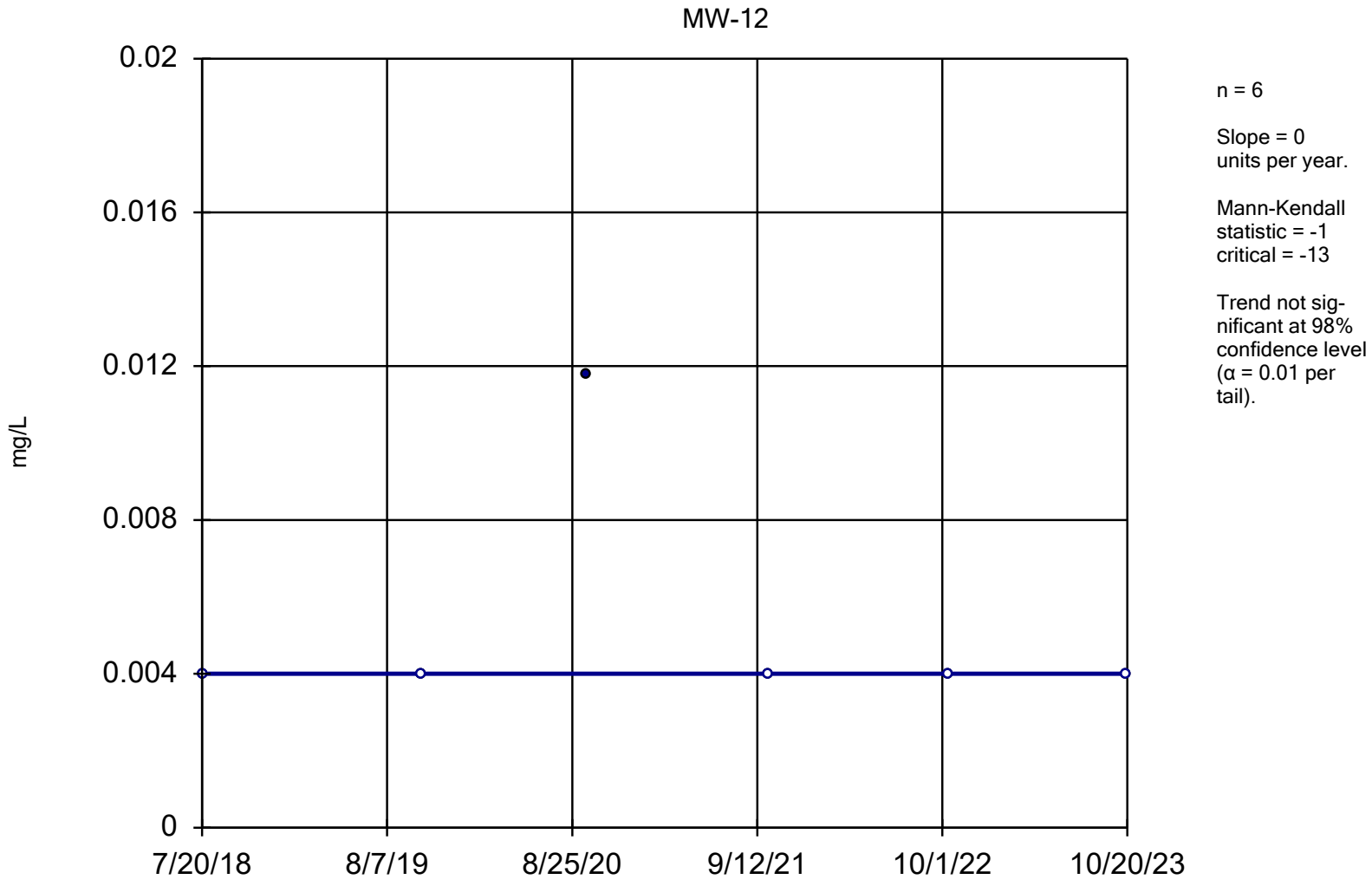



Constituent: Chloroethane  Analysis Run 7/16/2024 8:29 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

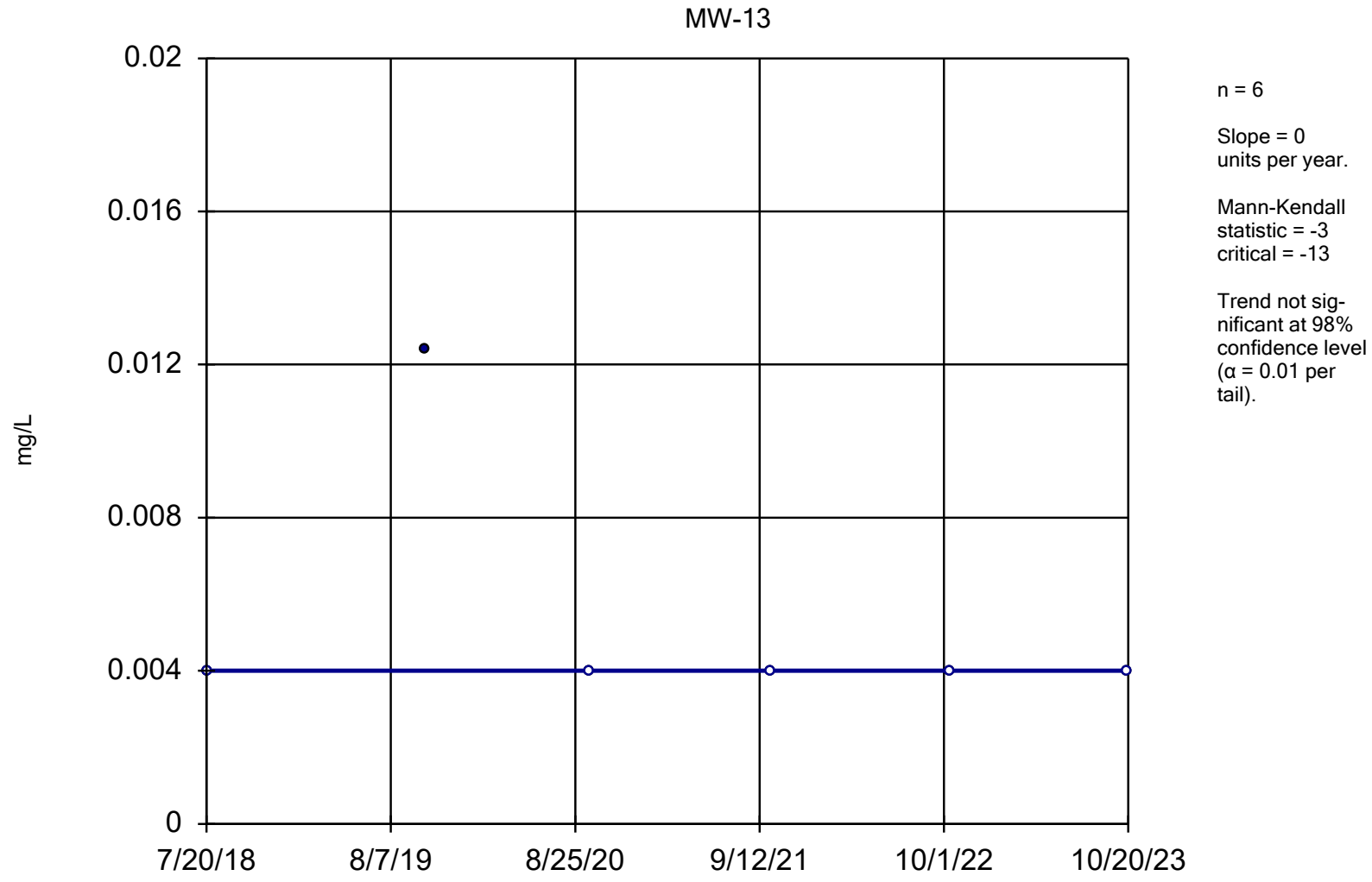



Constituent: Chromium  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

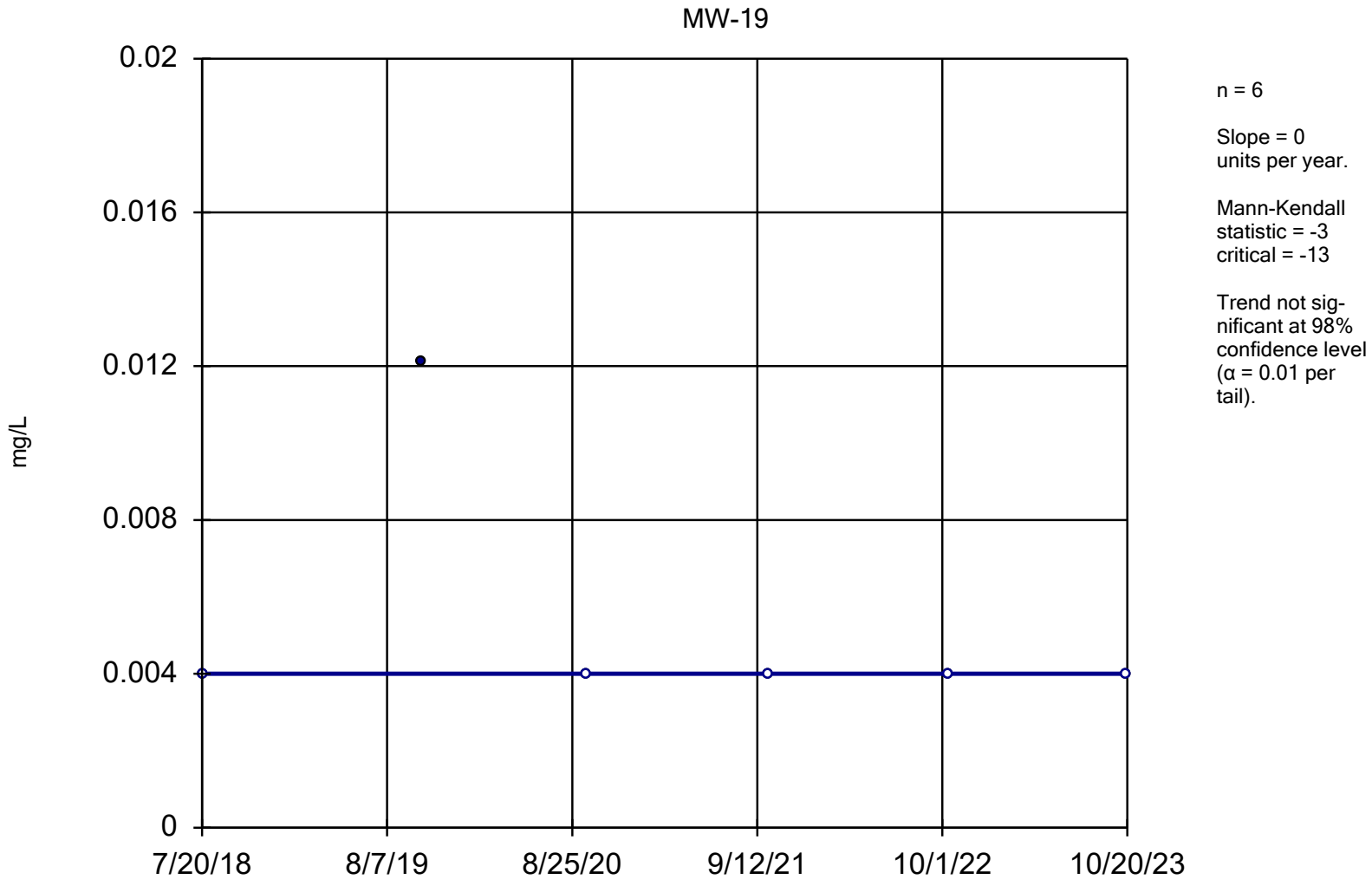



Constituent: Chromium  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

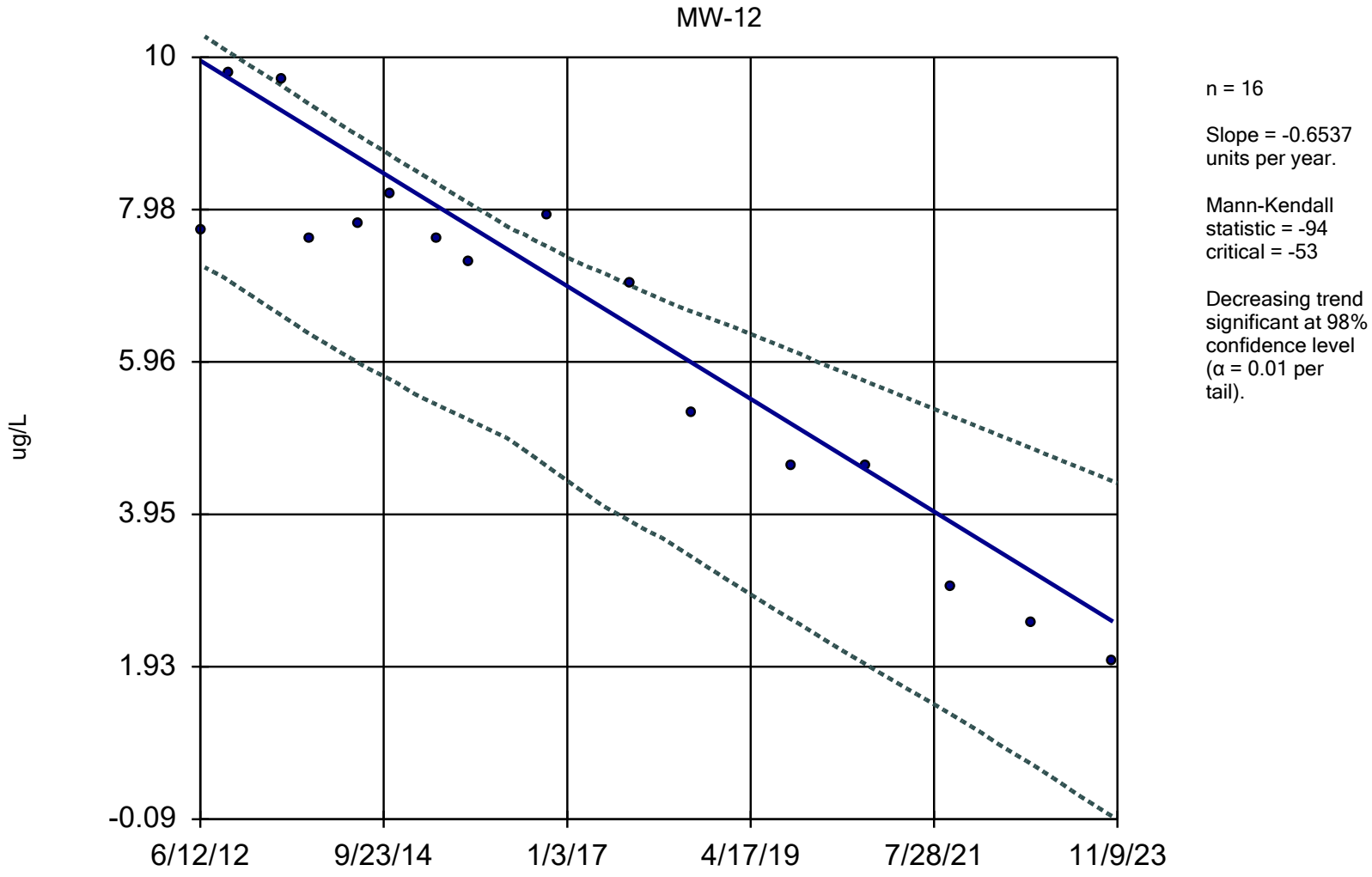
# Sen's Slope Estimator




Constituent: Chromium  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope and 90% Confidence Band




n = 16

Slope = -0.6537 units per year.

Mann-Kendall statistic = -94
critical = -53

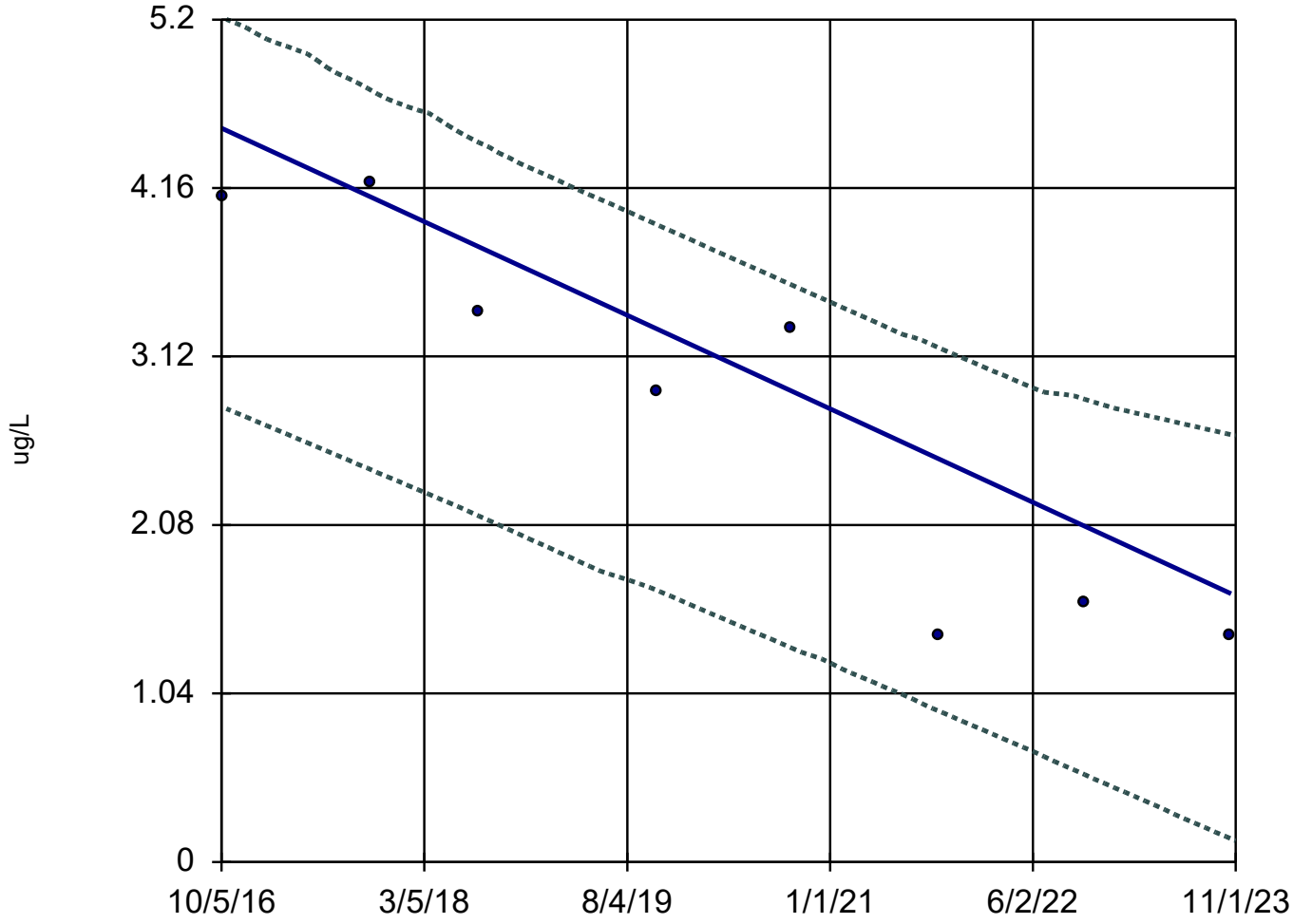
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: cis-1,2-Dichloroethene  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope and 90% Confidence Band

MW-13




n = 8

Slope = -0.4079 units per year.

Mann-Kendall statistic = -21
critical = -20

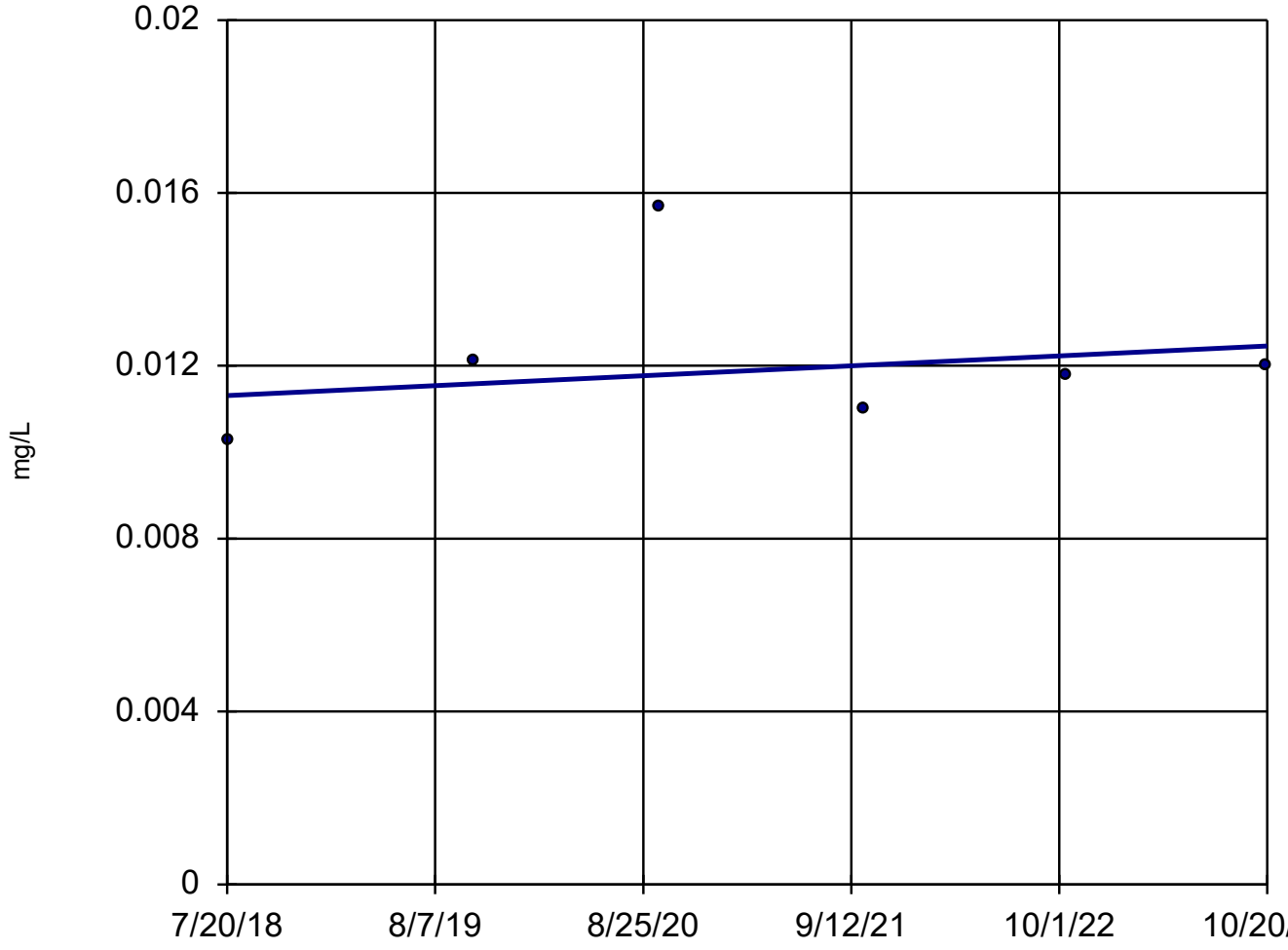
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: cis-1,2-Dichloroethene  Analysis Run 7/16/2024 8:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-12




n = 6

Slope = 0.0002173 units per year.

Mann-Kendall statistic = 3
critical = 13

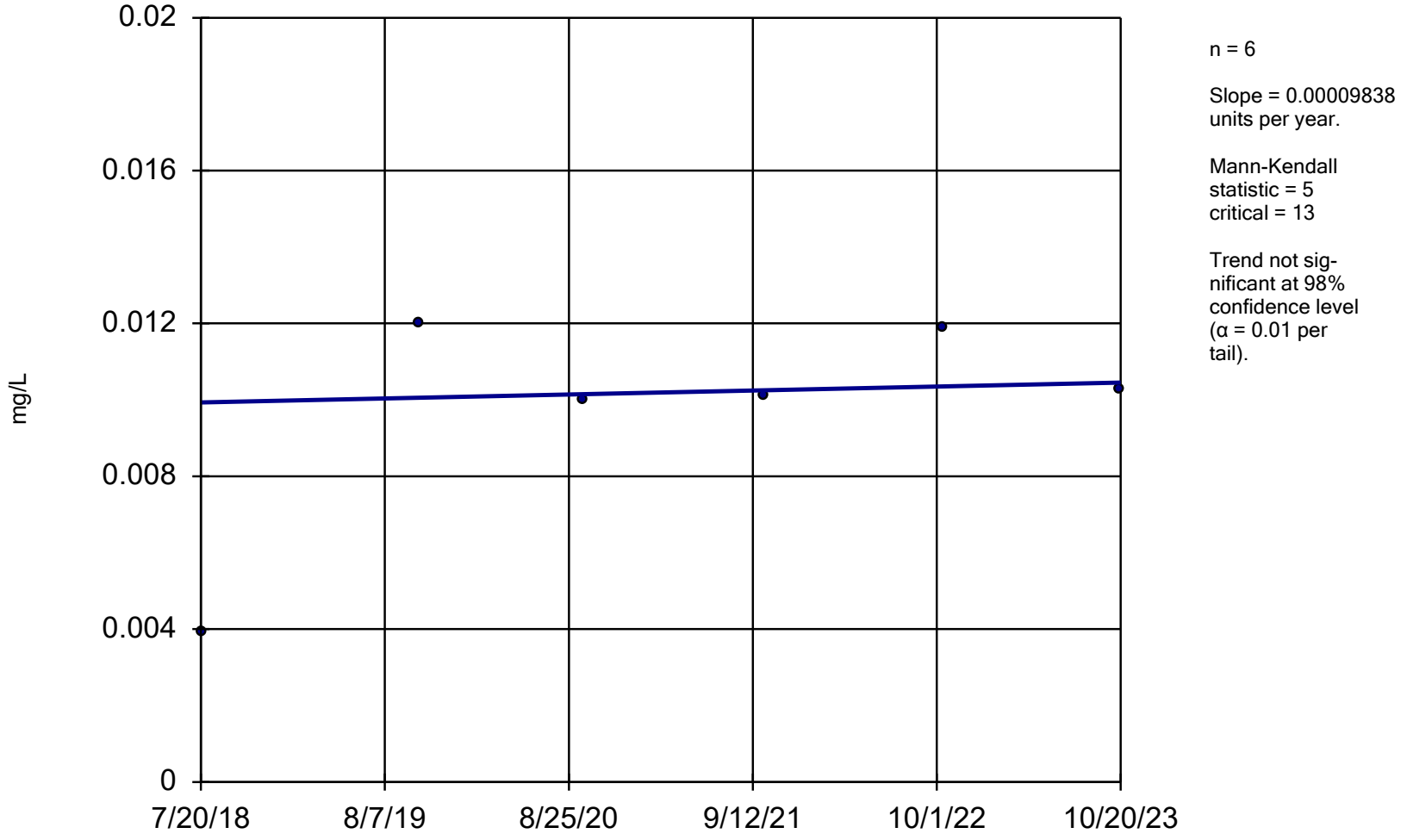
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Cobalt  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-13




n = 6

Slope = 0.00009838 units per year.

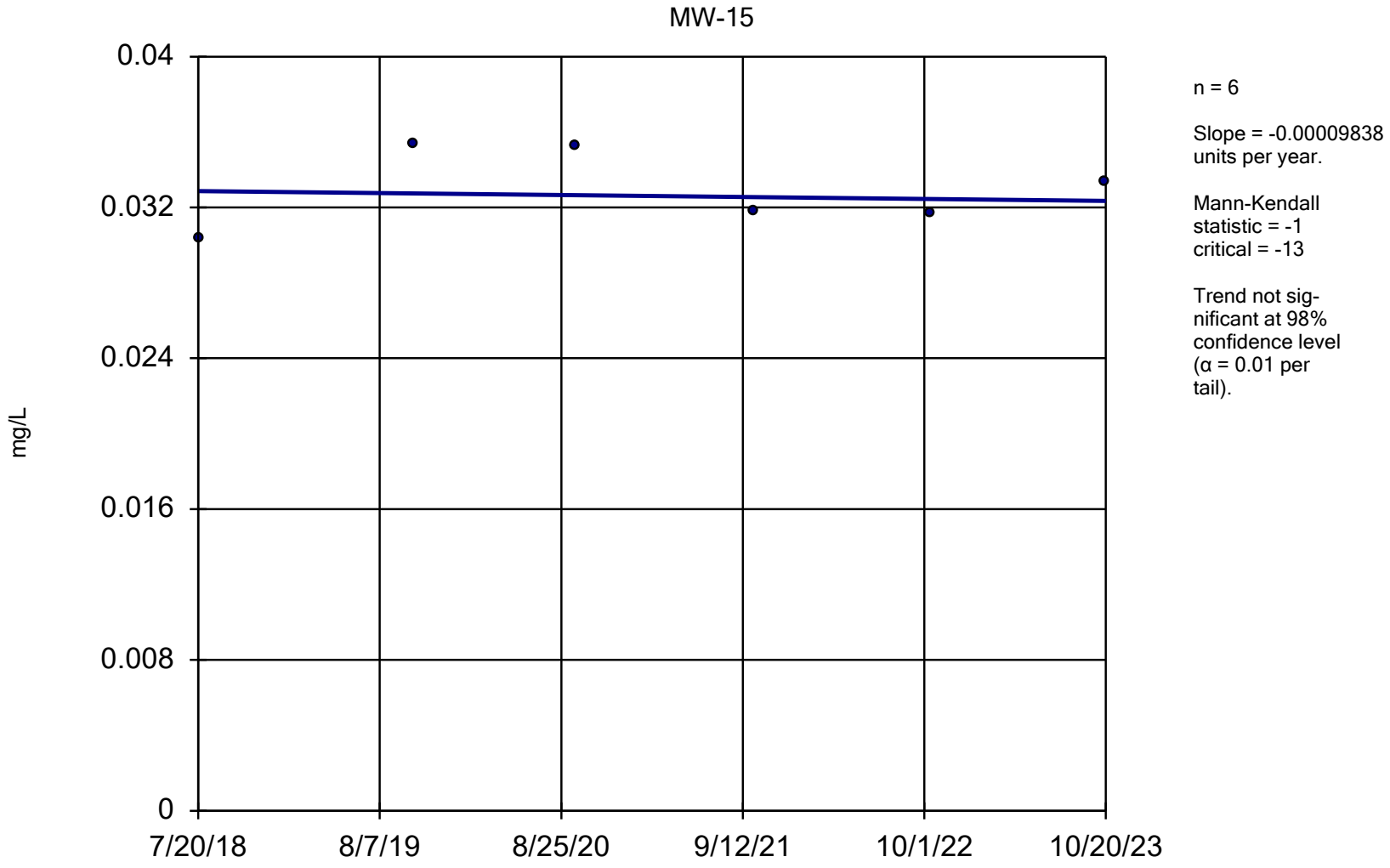
Mann-Kendall statistic = 5
critical = 13

Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Cobalt  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

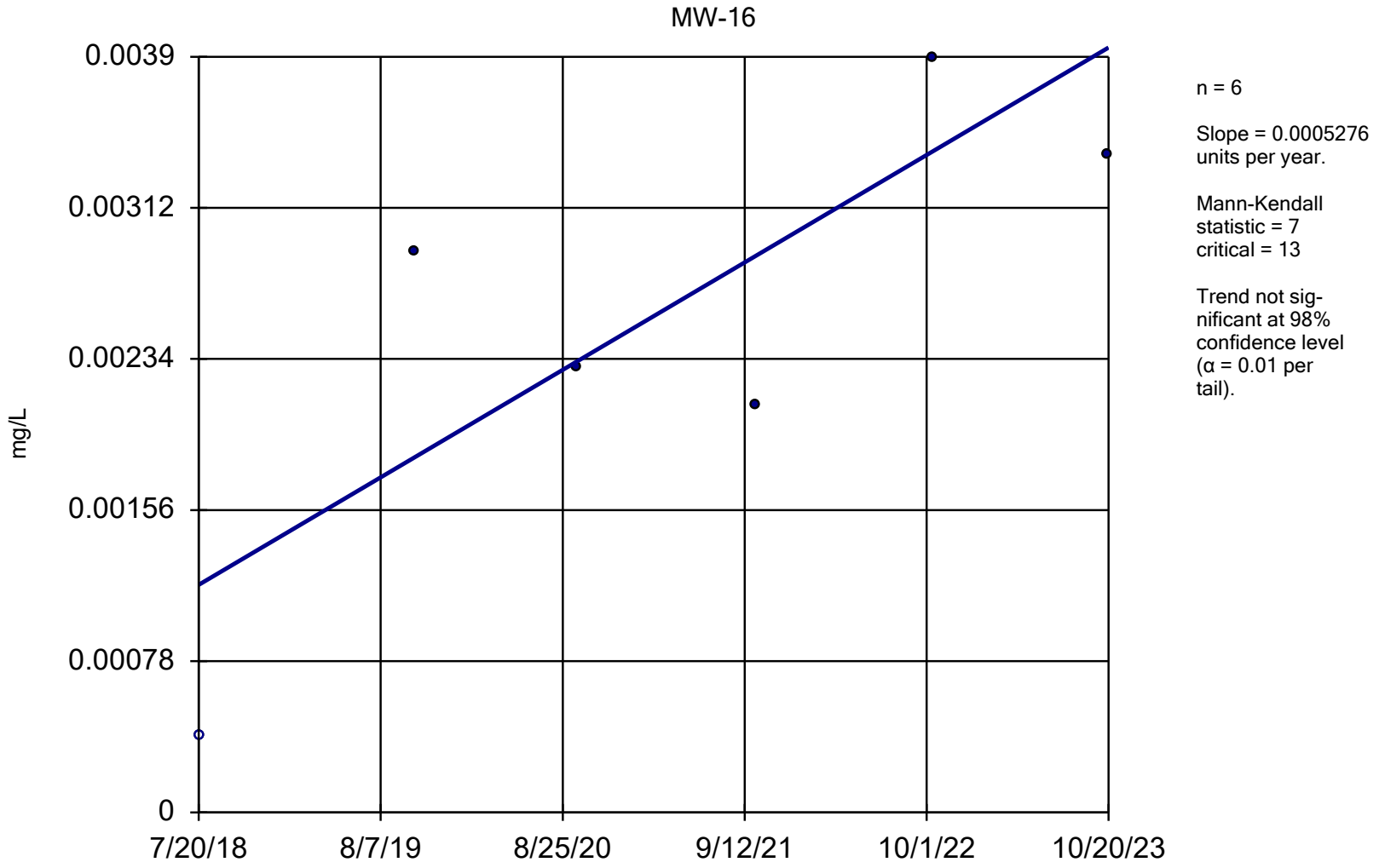



Constituent: Cobalt  Analysis Run 7/15/2024 8:24 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

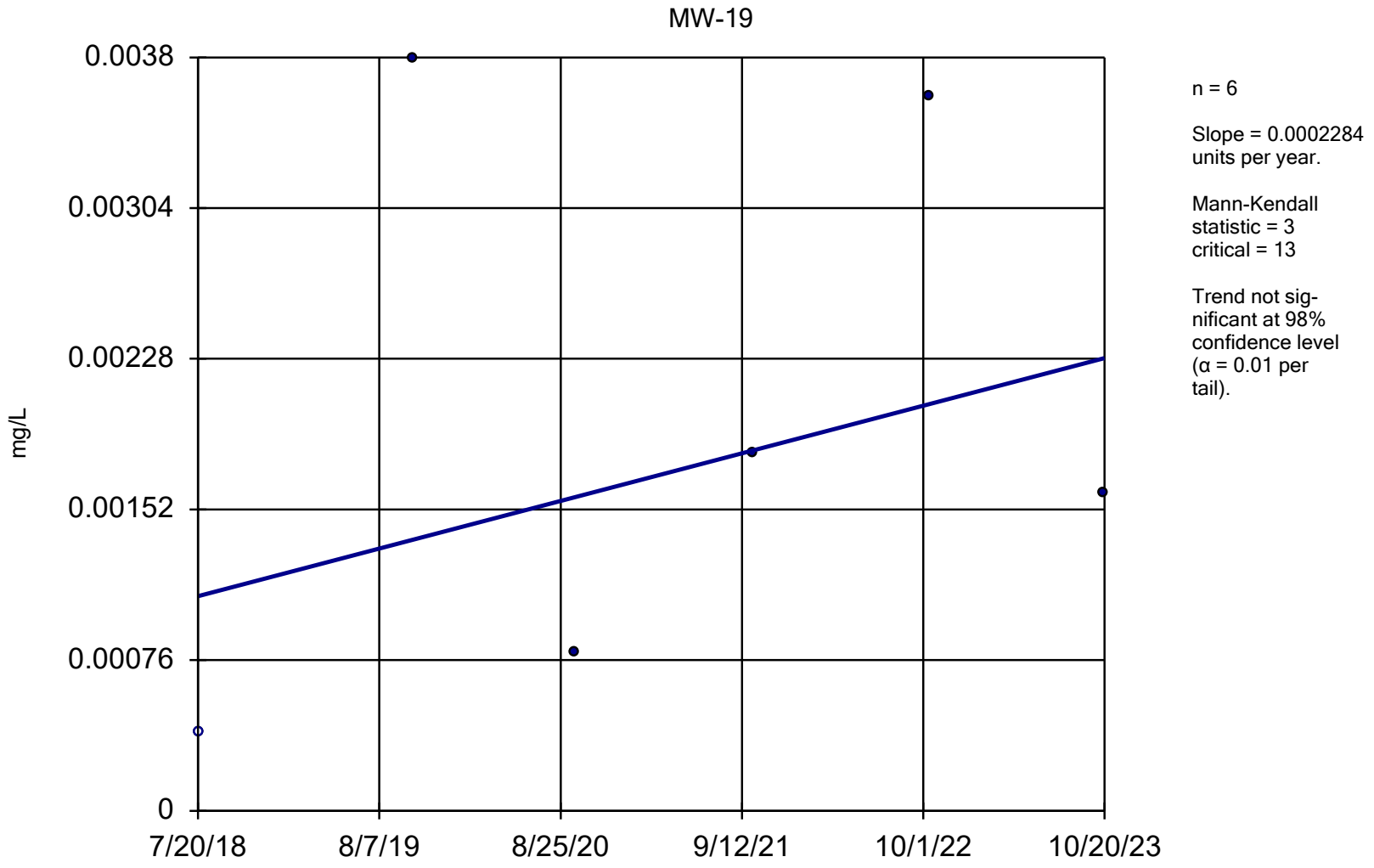



Constituent: Cobalt  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

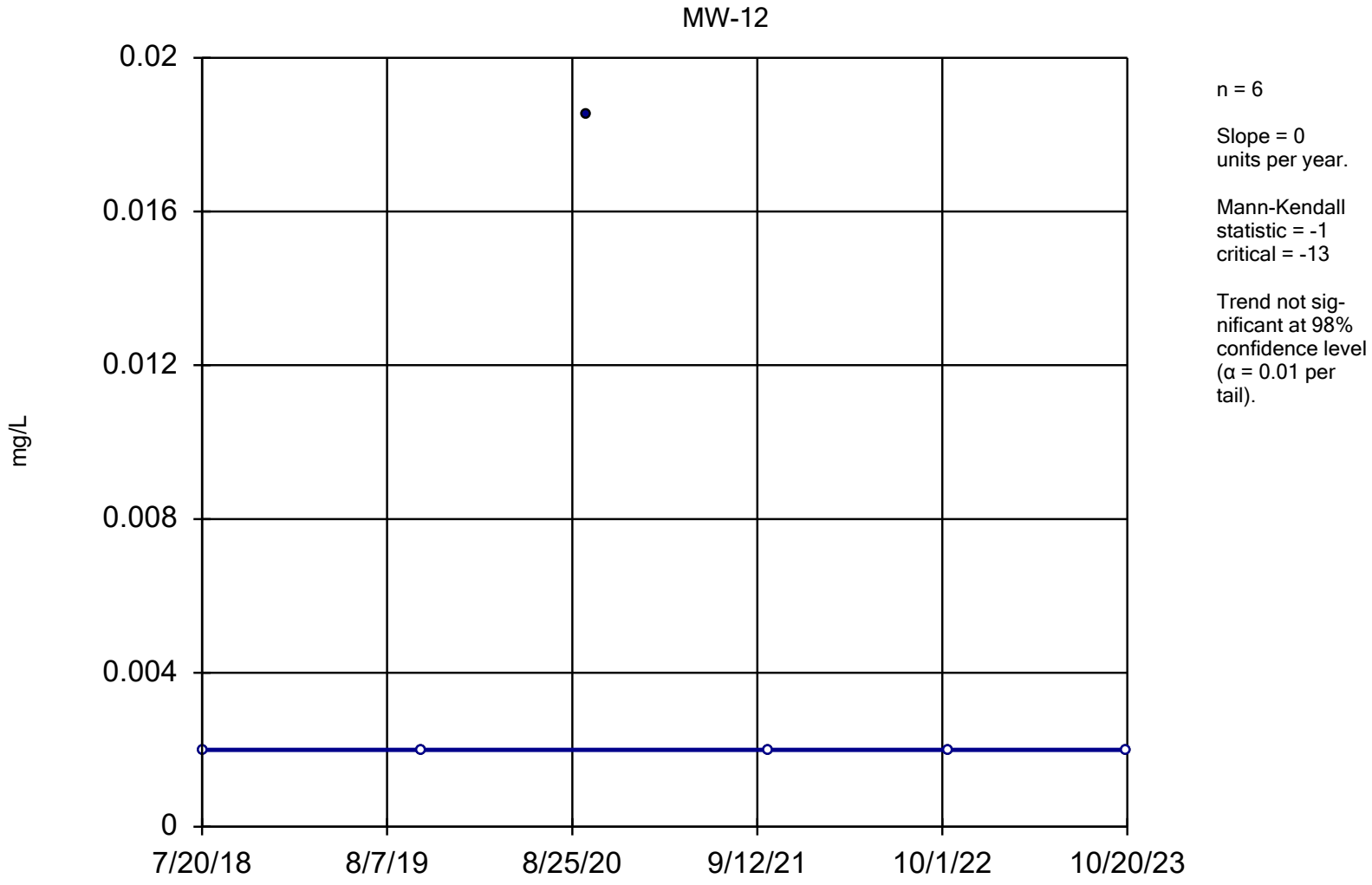



Constituent: Cobalt  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

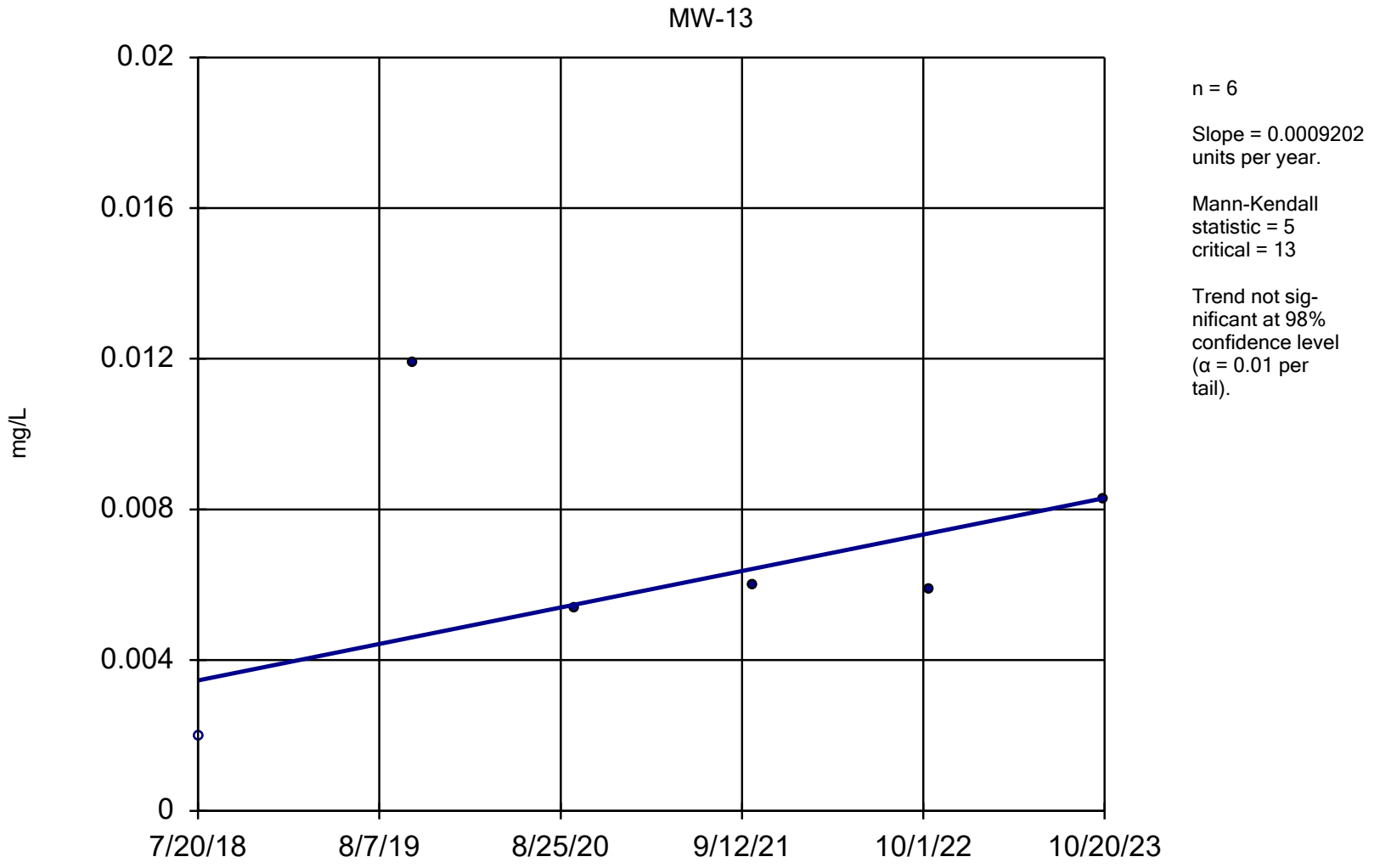



Constituent: Copper  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

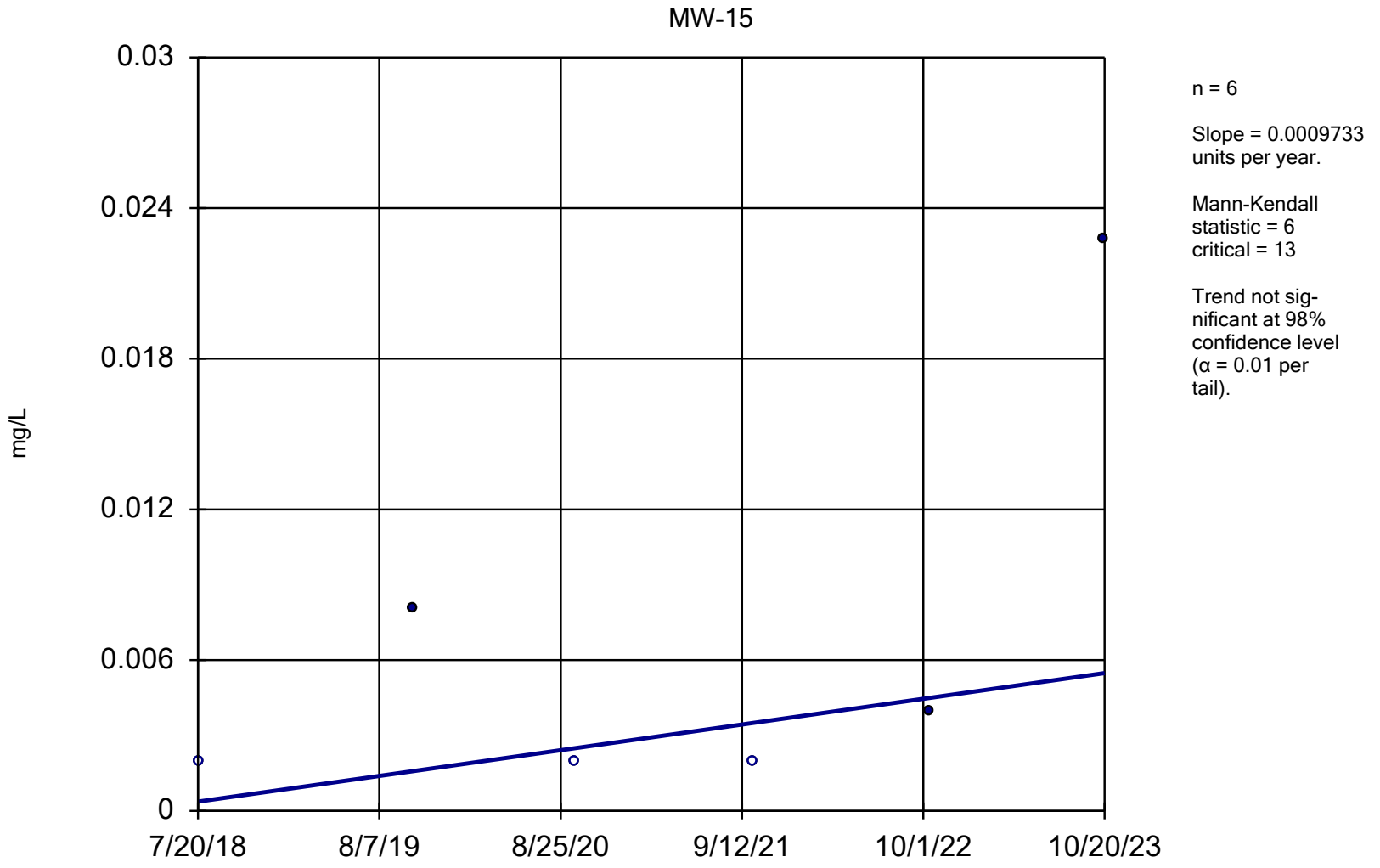



Constituent: Copper  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator



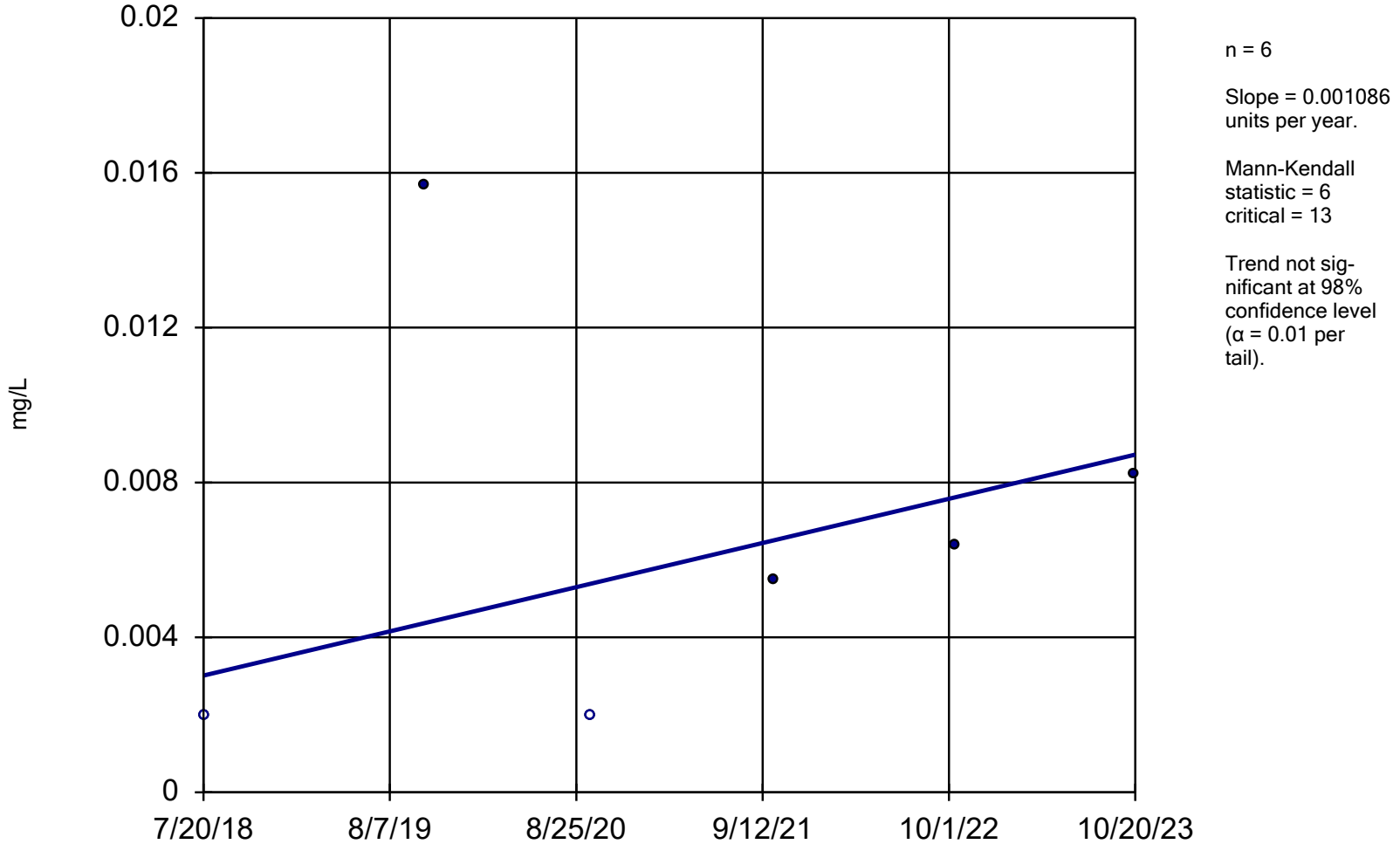

Constituent: Copper  Analysis Run 7/15/2024 8:25 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-19




n = 6

Slope = 0.001086 units per year.

Mann-Kendall statistic = 6
critical = 13

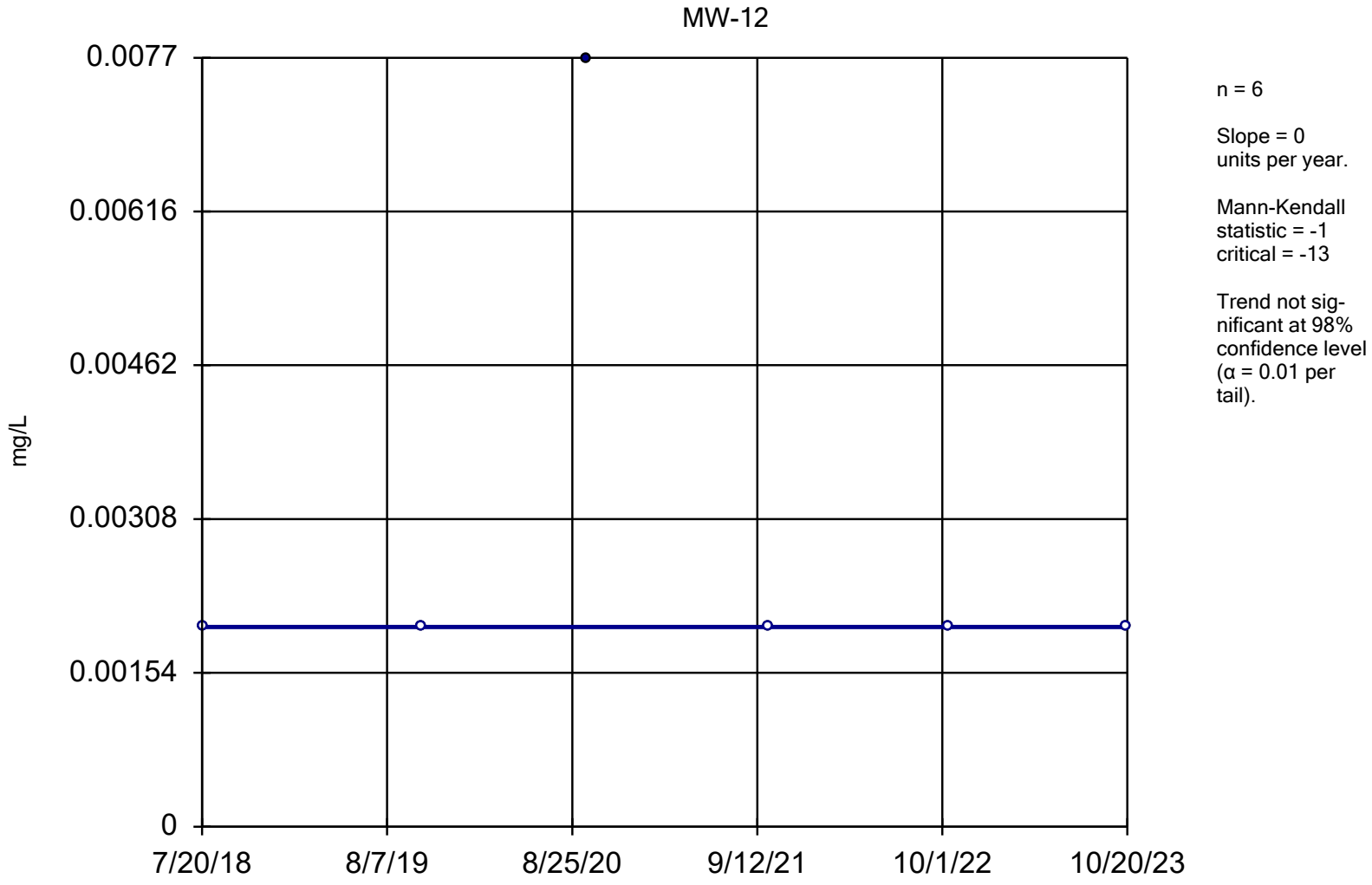
Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Copper  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

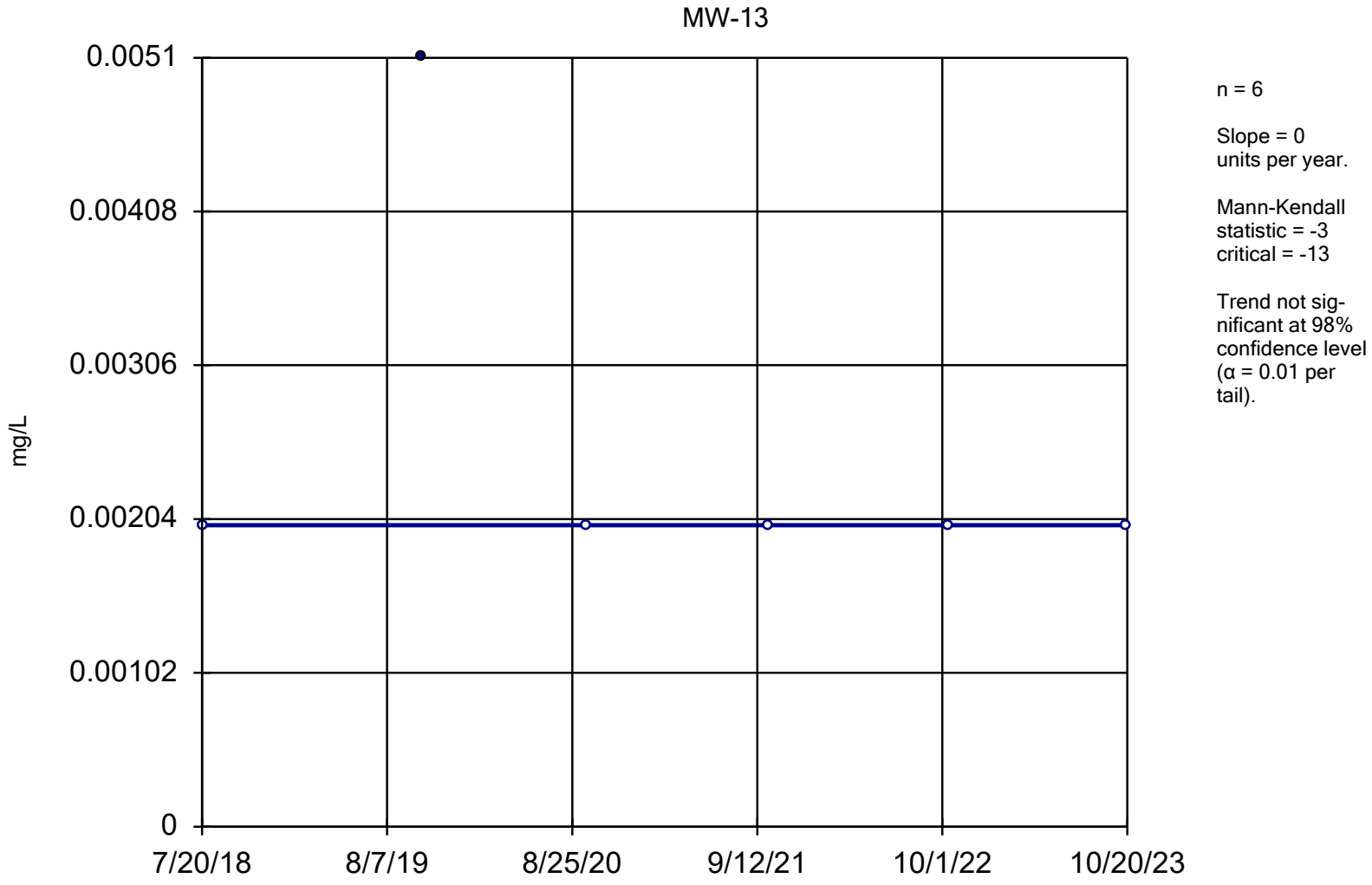



Constituent: Lead  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

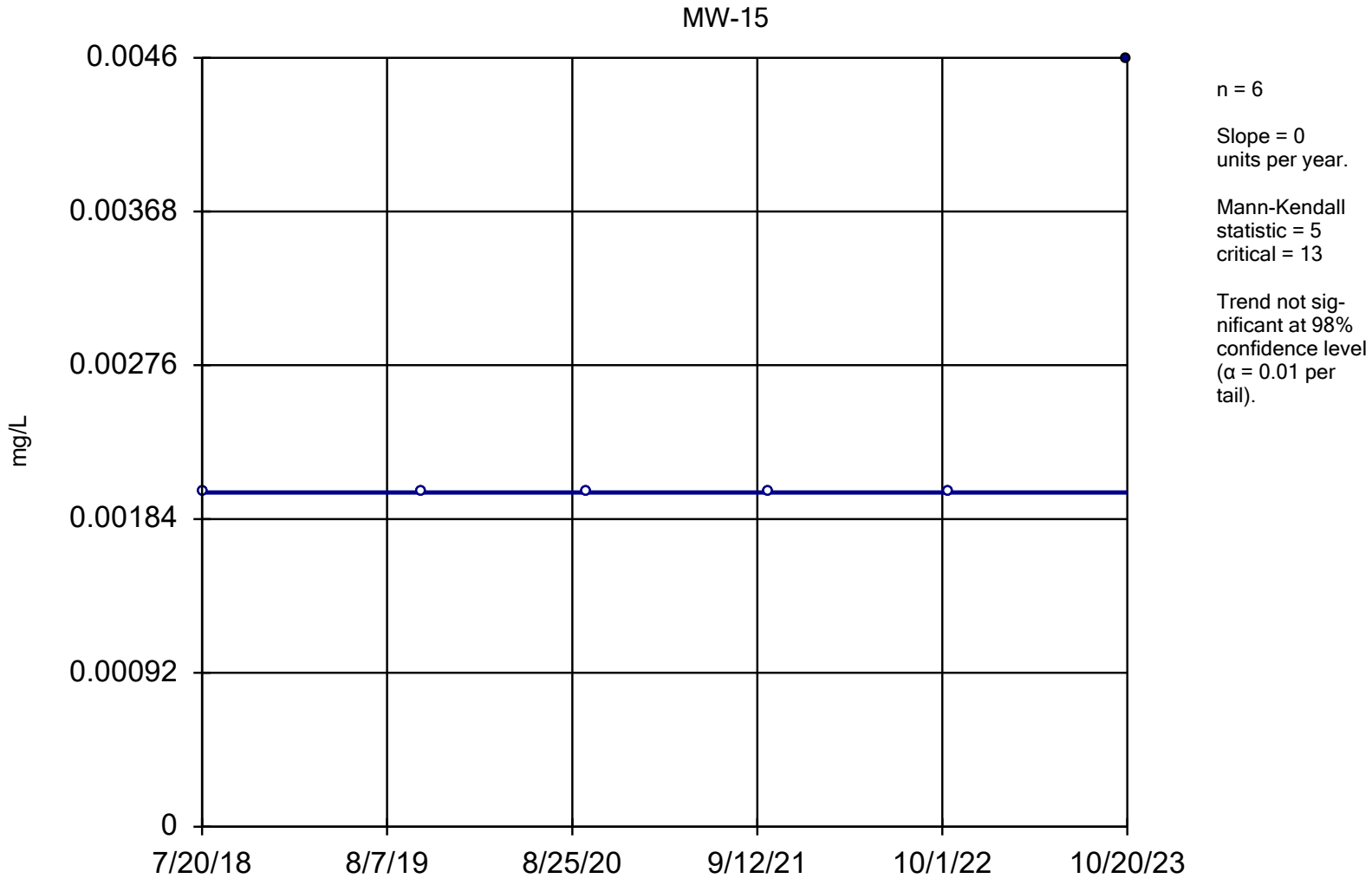



Constituent: Lead  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

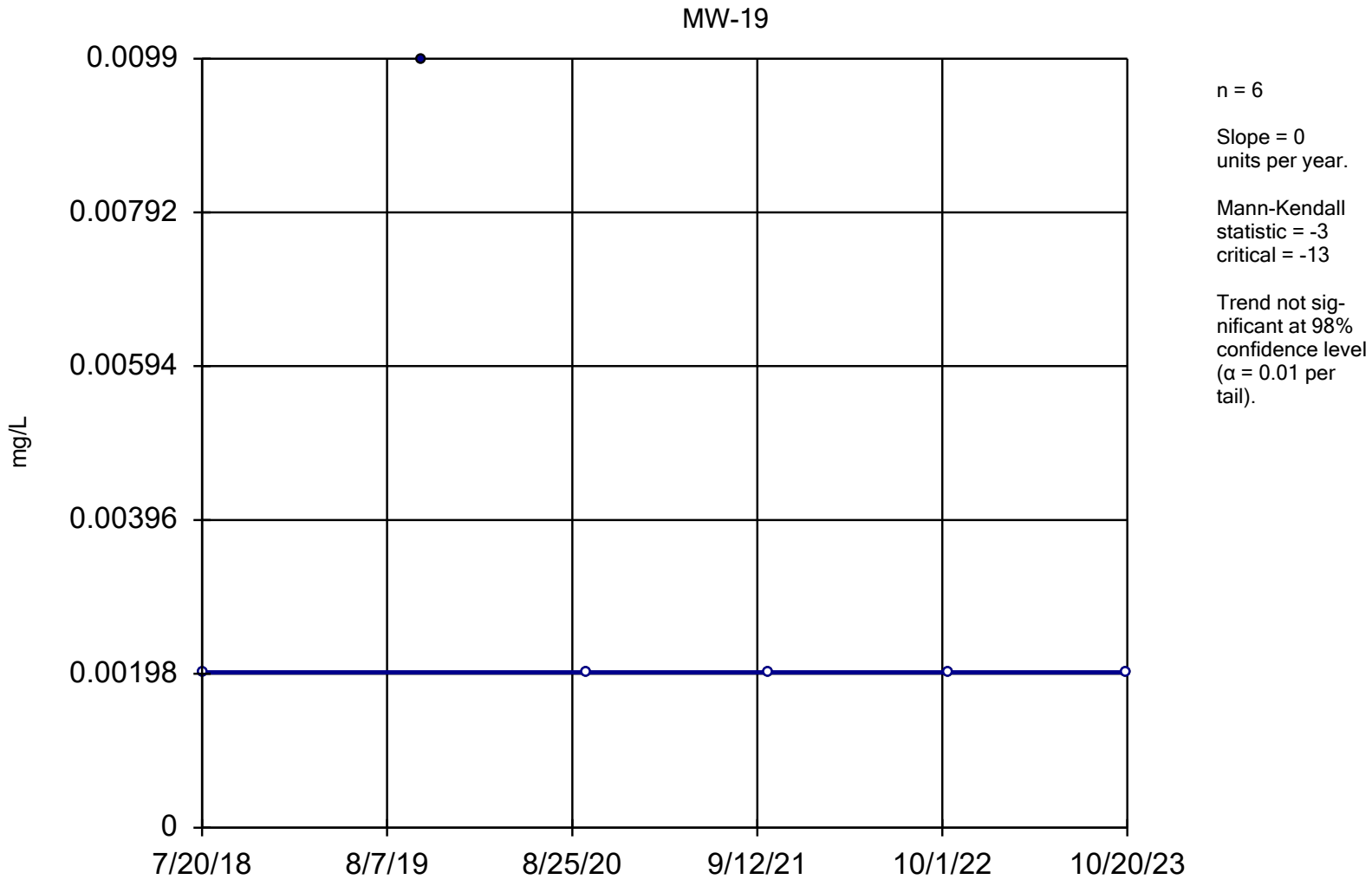



Constituent: Lead  Analysis Run 7/15/2024 8:26 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

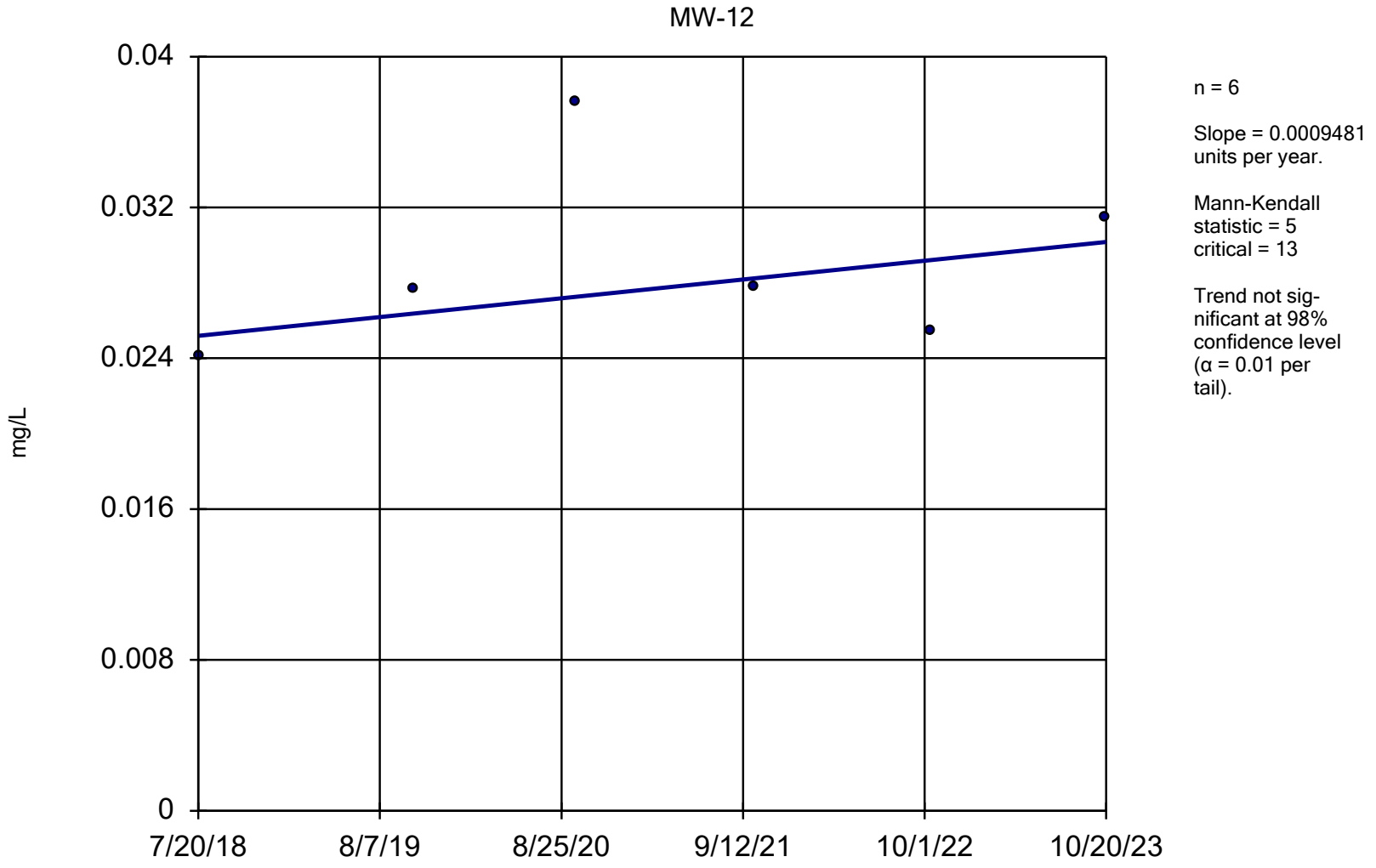
# Sen's Slope Estimator




Constituent: Lead  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

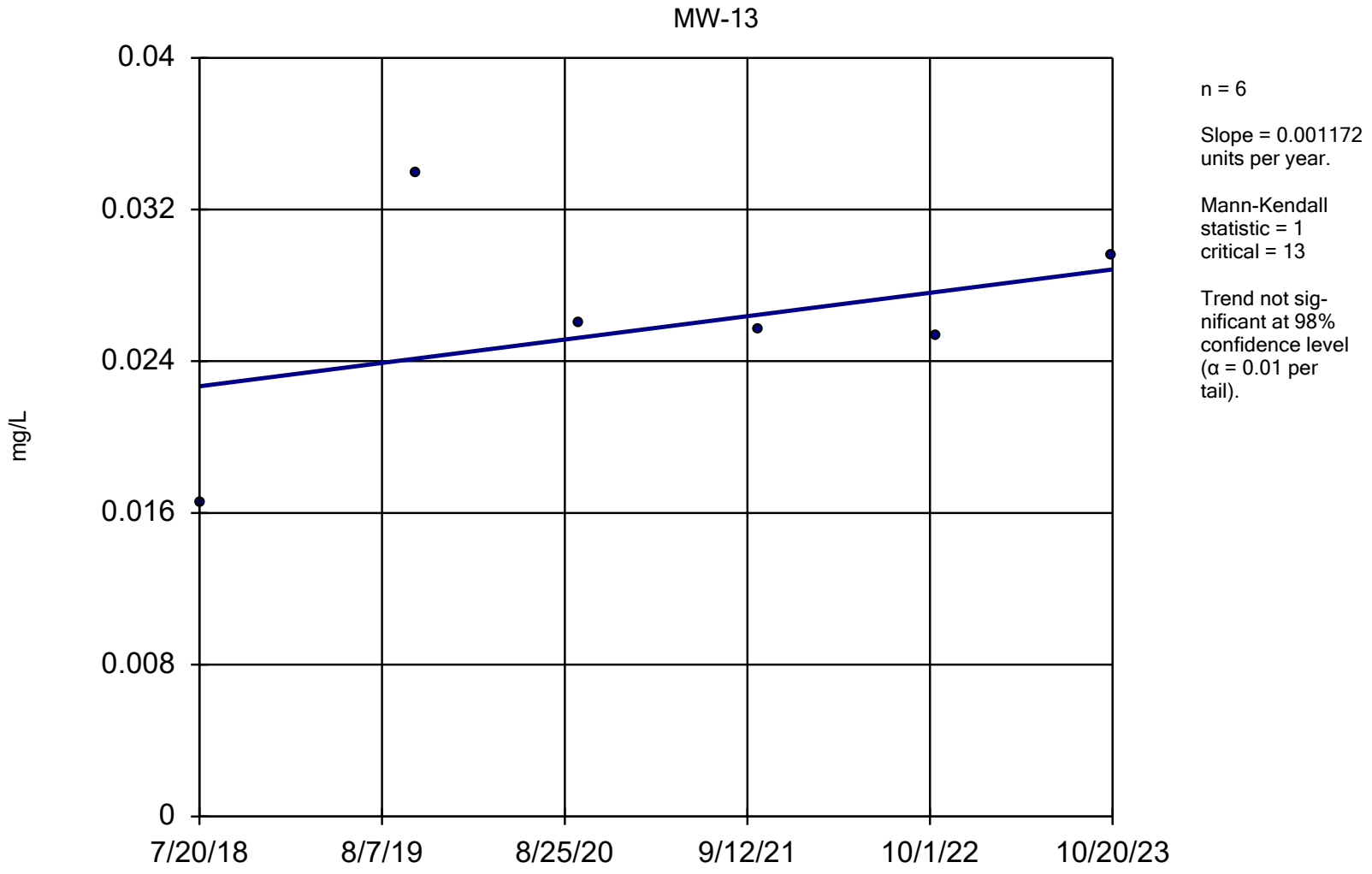
# Sen's Slope Estimator




Constituent: Nickel  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

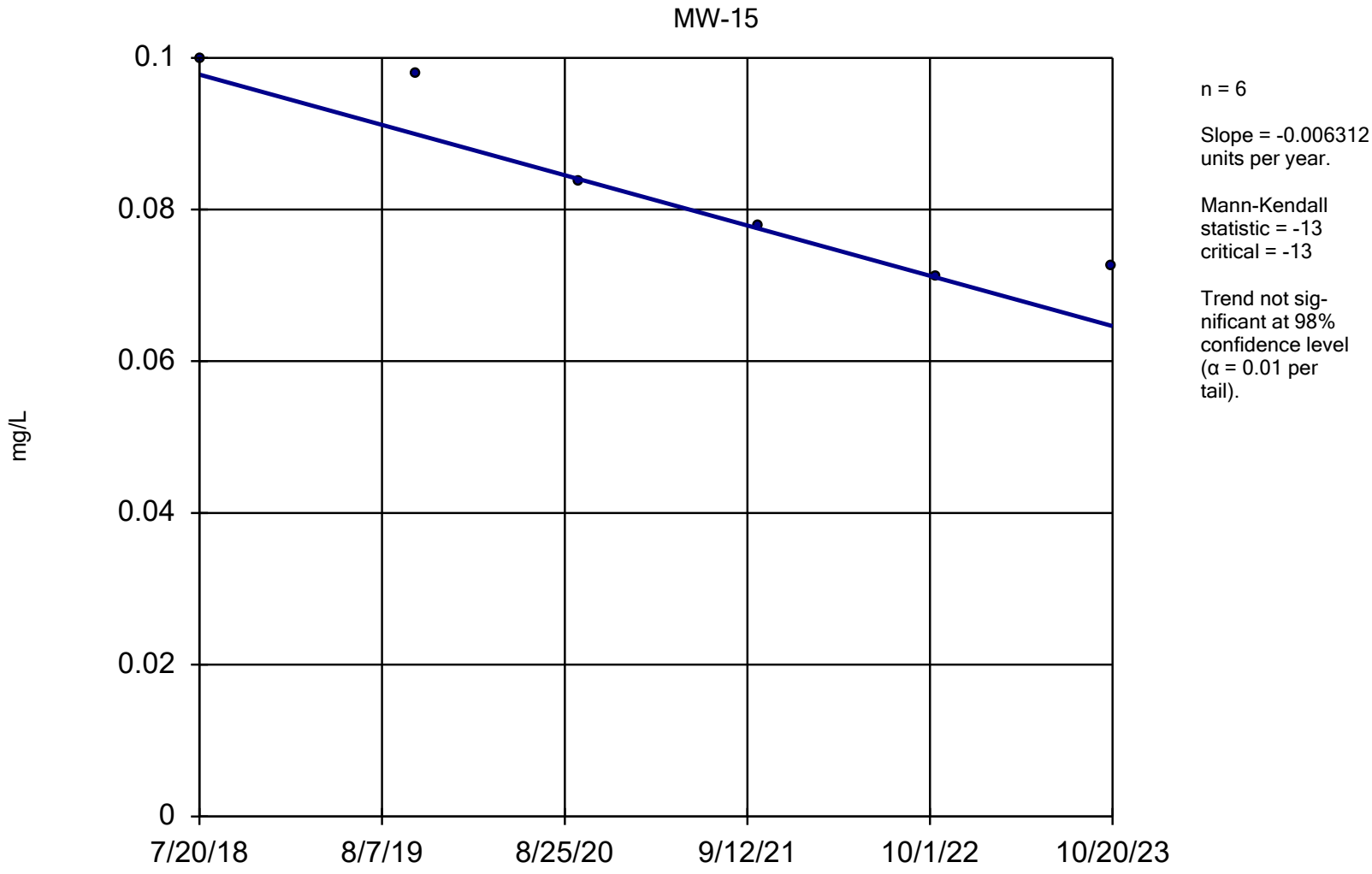
# Sen's Slope Estimator




Constituent: Nickel  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

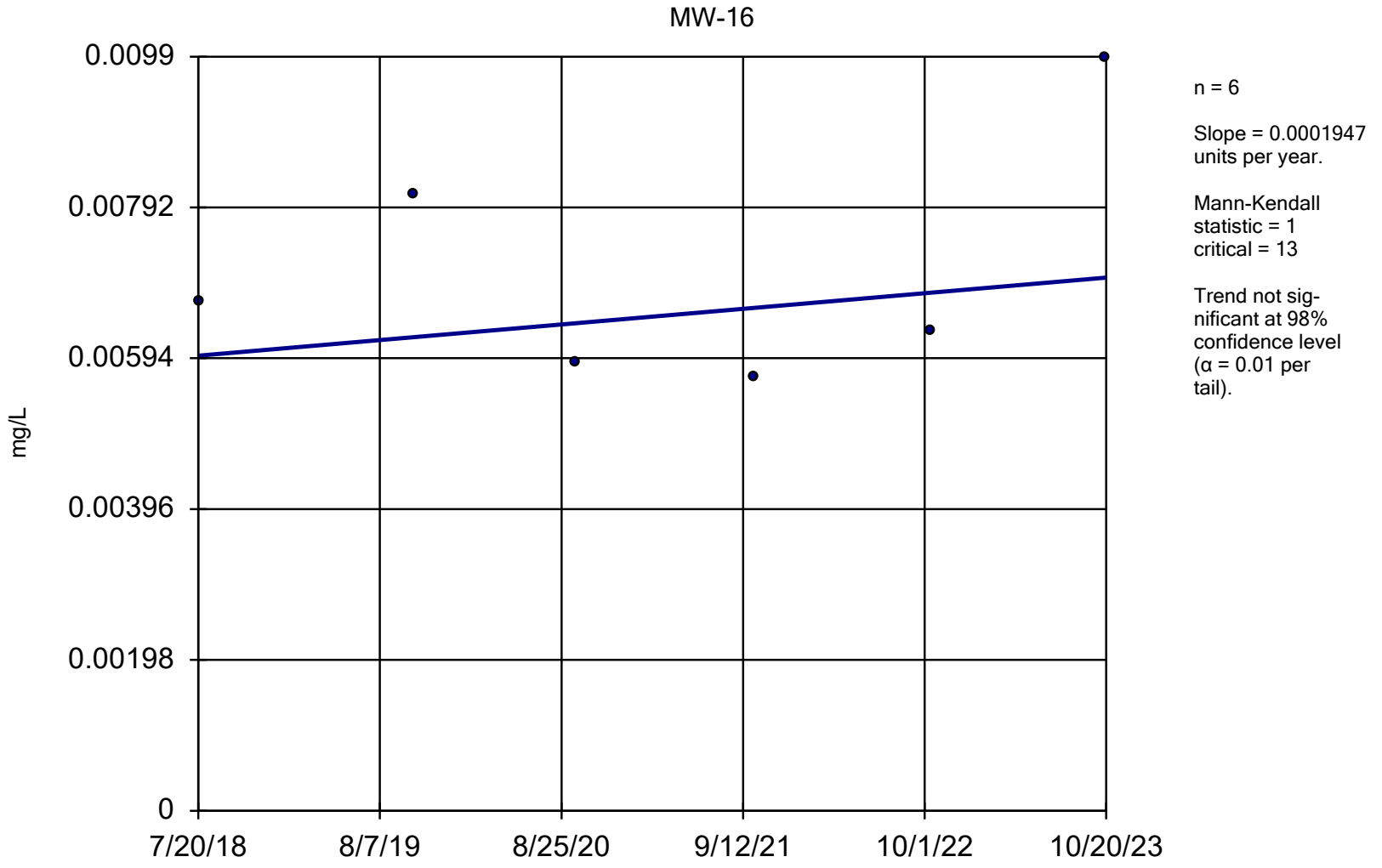
# Sen's Slope Estimator




Constituent: Nickel  Analysis Run 7/15/2024 8:27 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

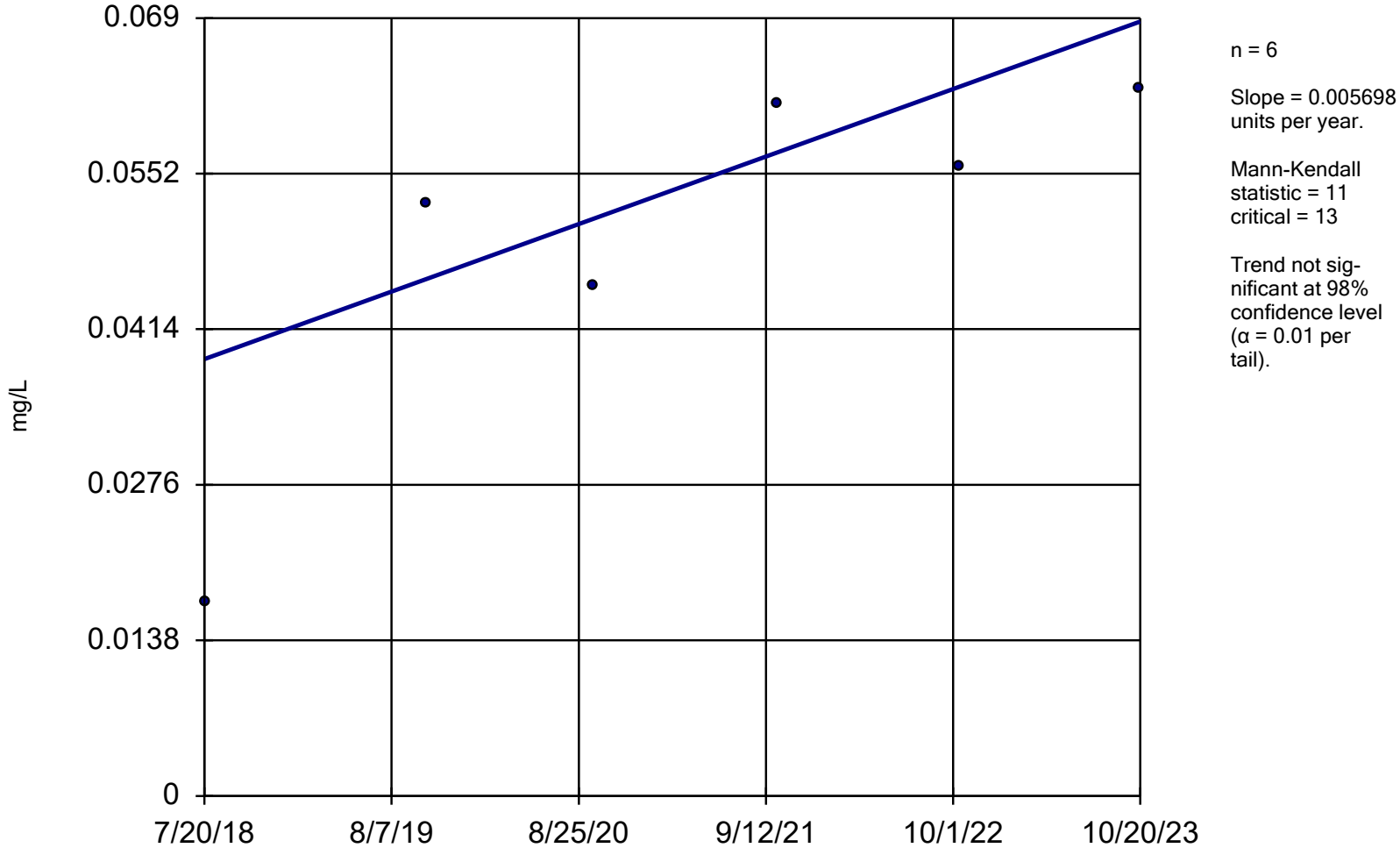



Constituent: Nickel  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

# Sen's Slope Estimator

## MW-19




n = 6

Slope = 0.005698 units per year.

Mann-Kendall statistic = 11
critical = 13

Trend not significant at 98% confidence level (α = 0.01 per tail).

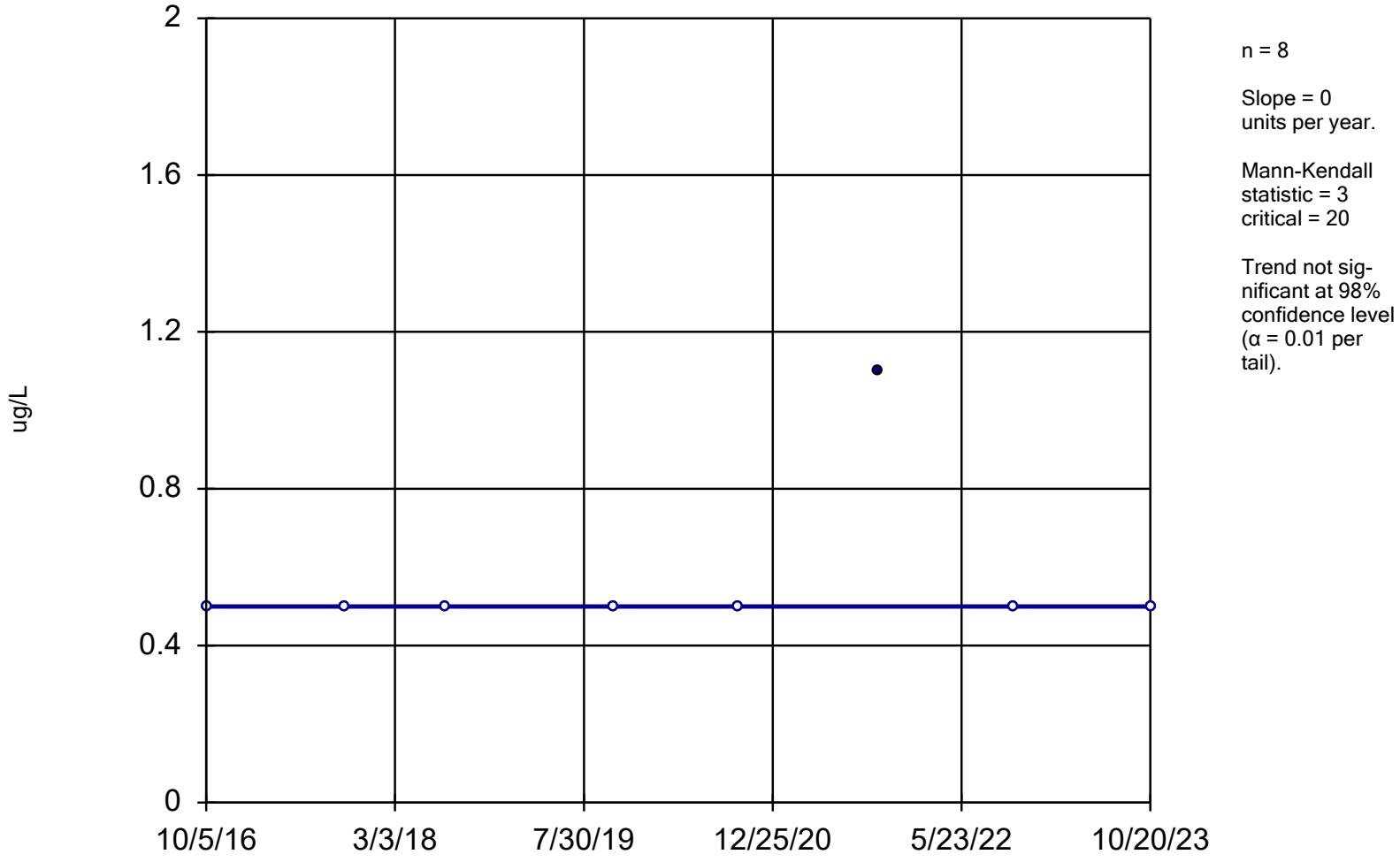
Constituent: Nickel  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-19

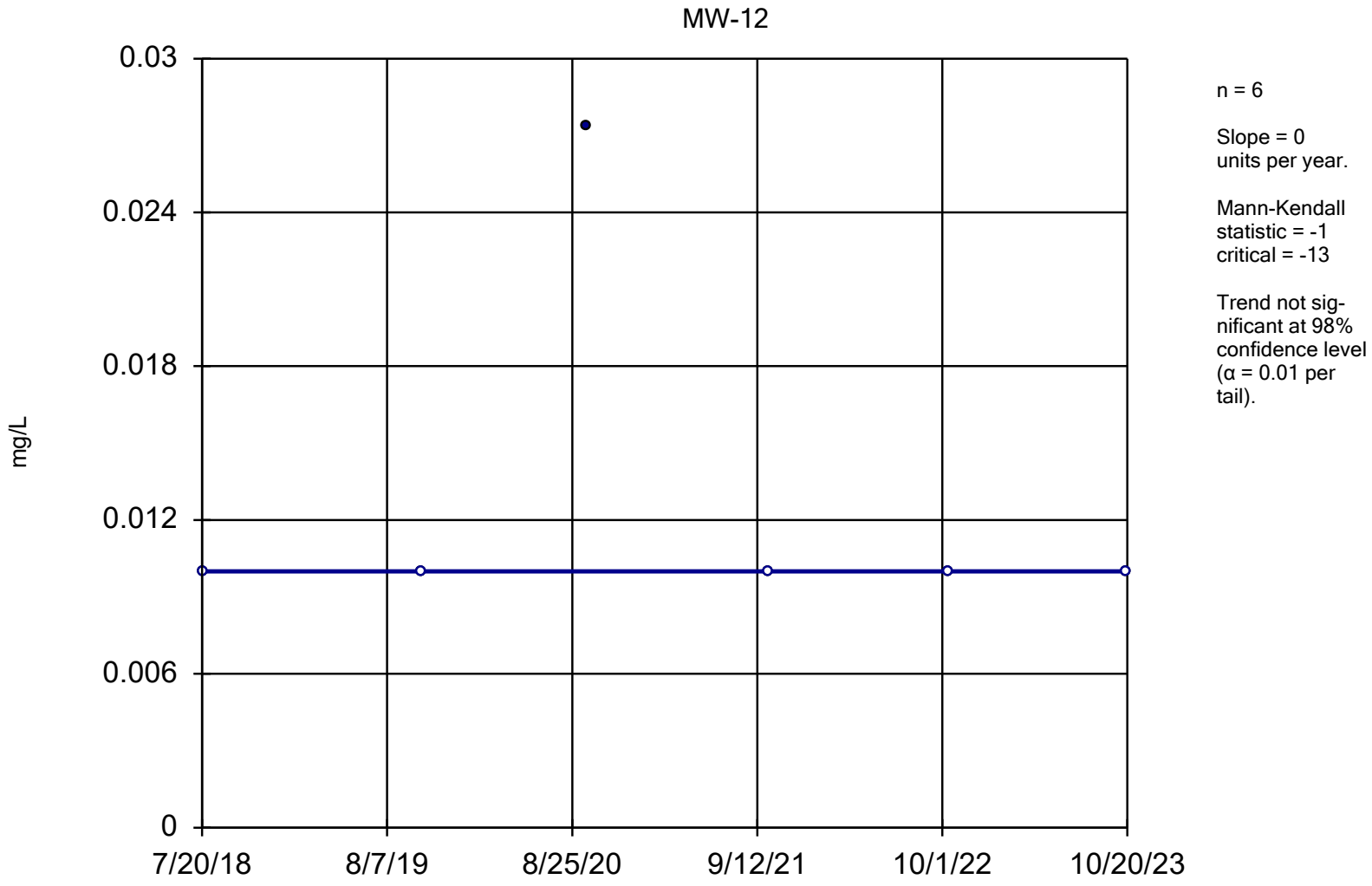



Constituent: Toluene  Analysis Run 7/16/2024 9:13 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

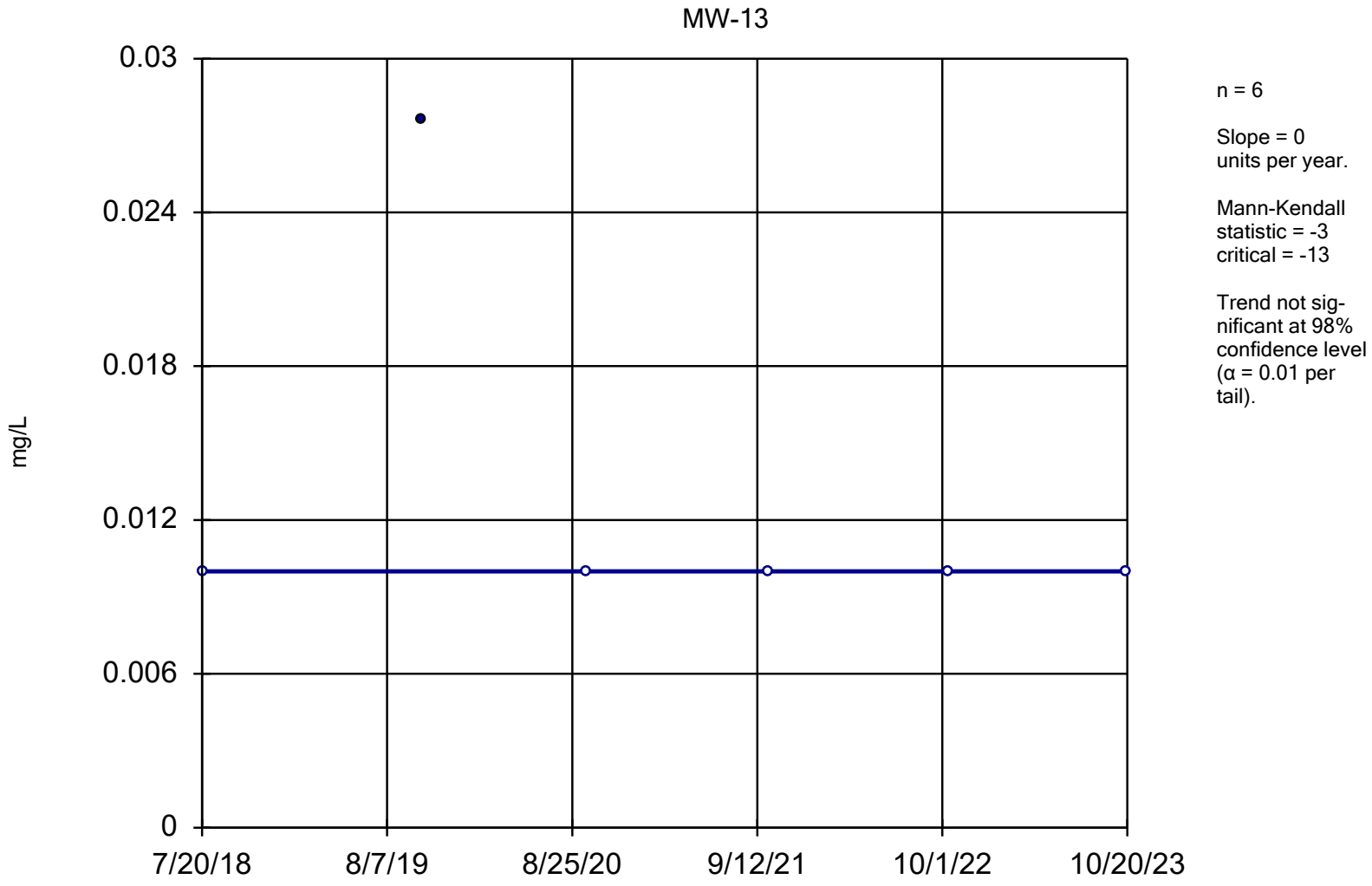



Constituent: Vanadium  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

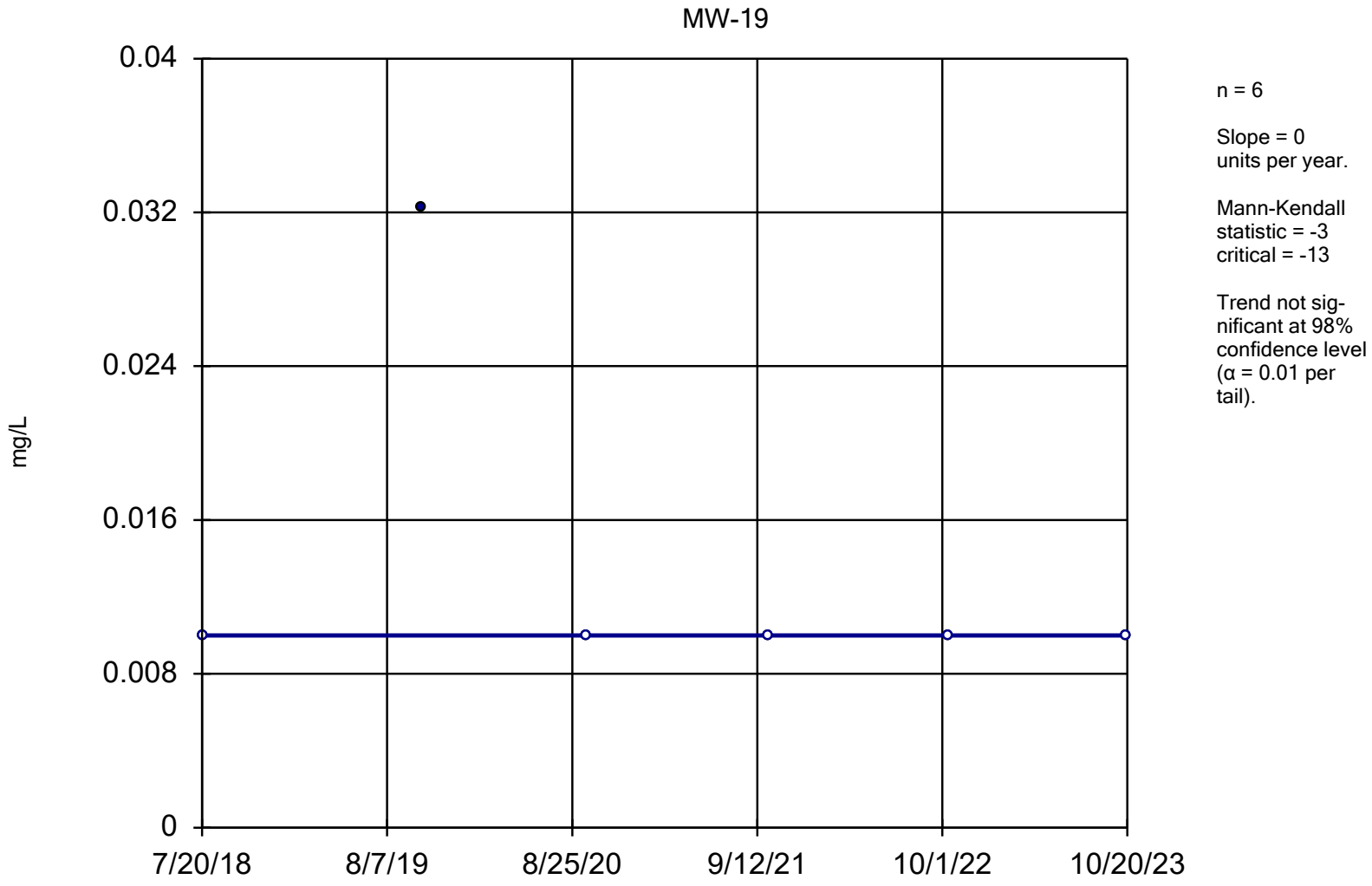



Constituent: Vanadium  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator



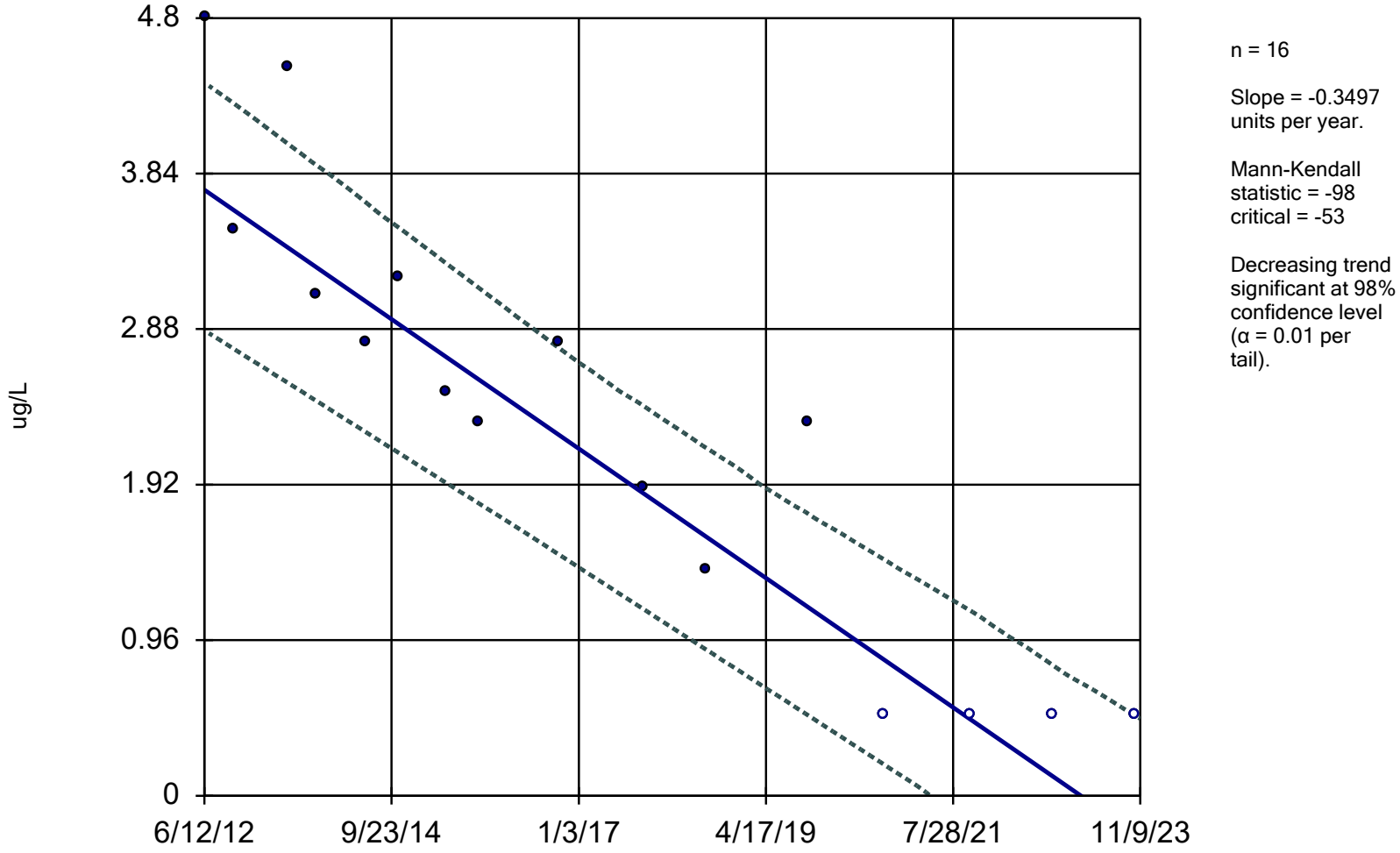

Constituent: Vanadium  Analysis Run 7/17/2024 2:01 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope and 90% Confidence Band

MW-12




n = 16

Slope = -0.3497 units per year.

Mann-Kendall statistic = -98
critical = -53

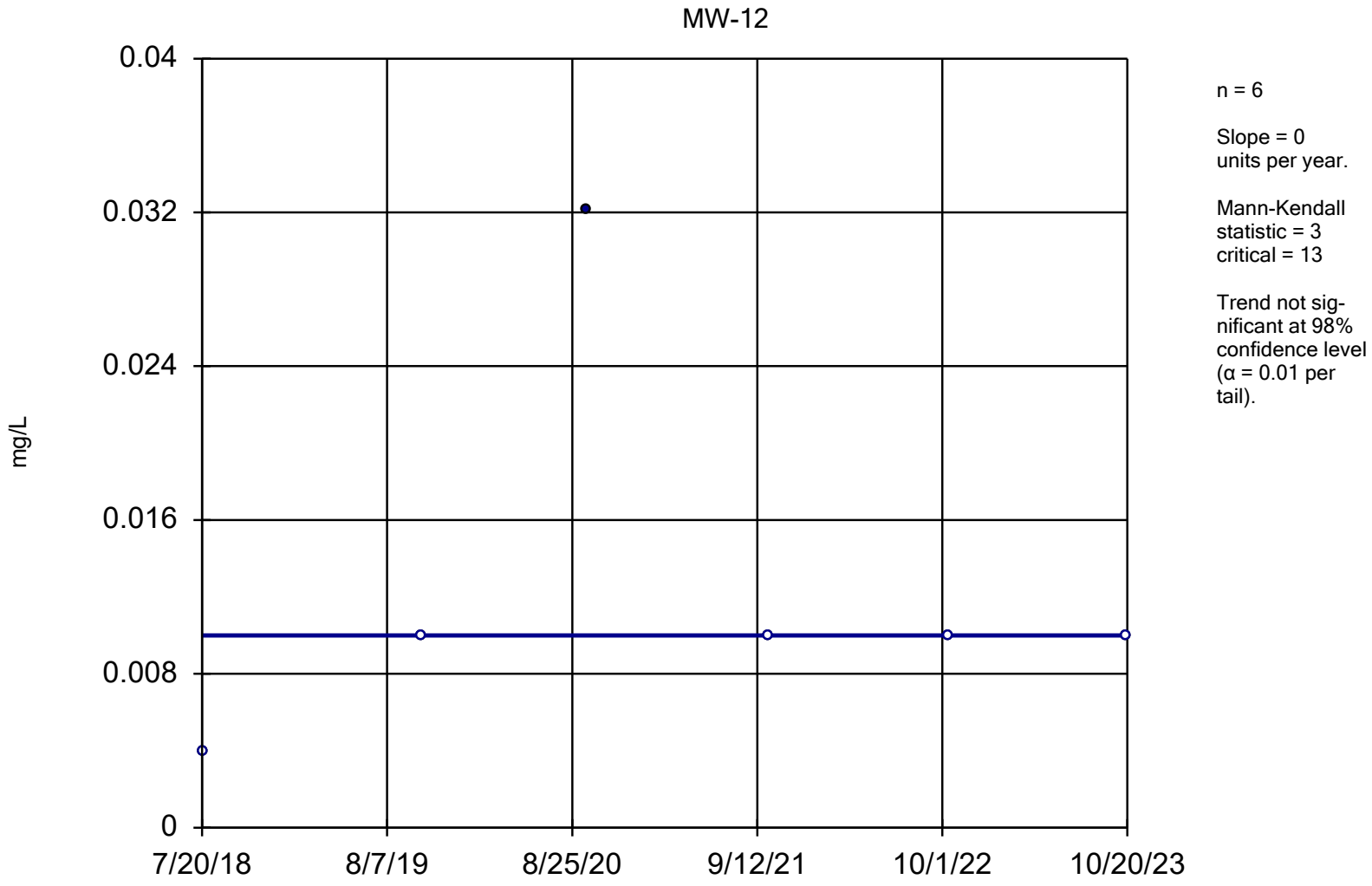
Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

Constituent: Vinyl Chloride  Analysis Run 7/16/2024 8:38 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

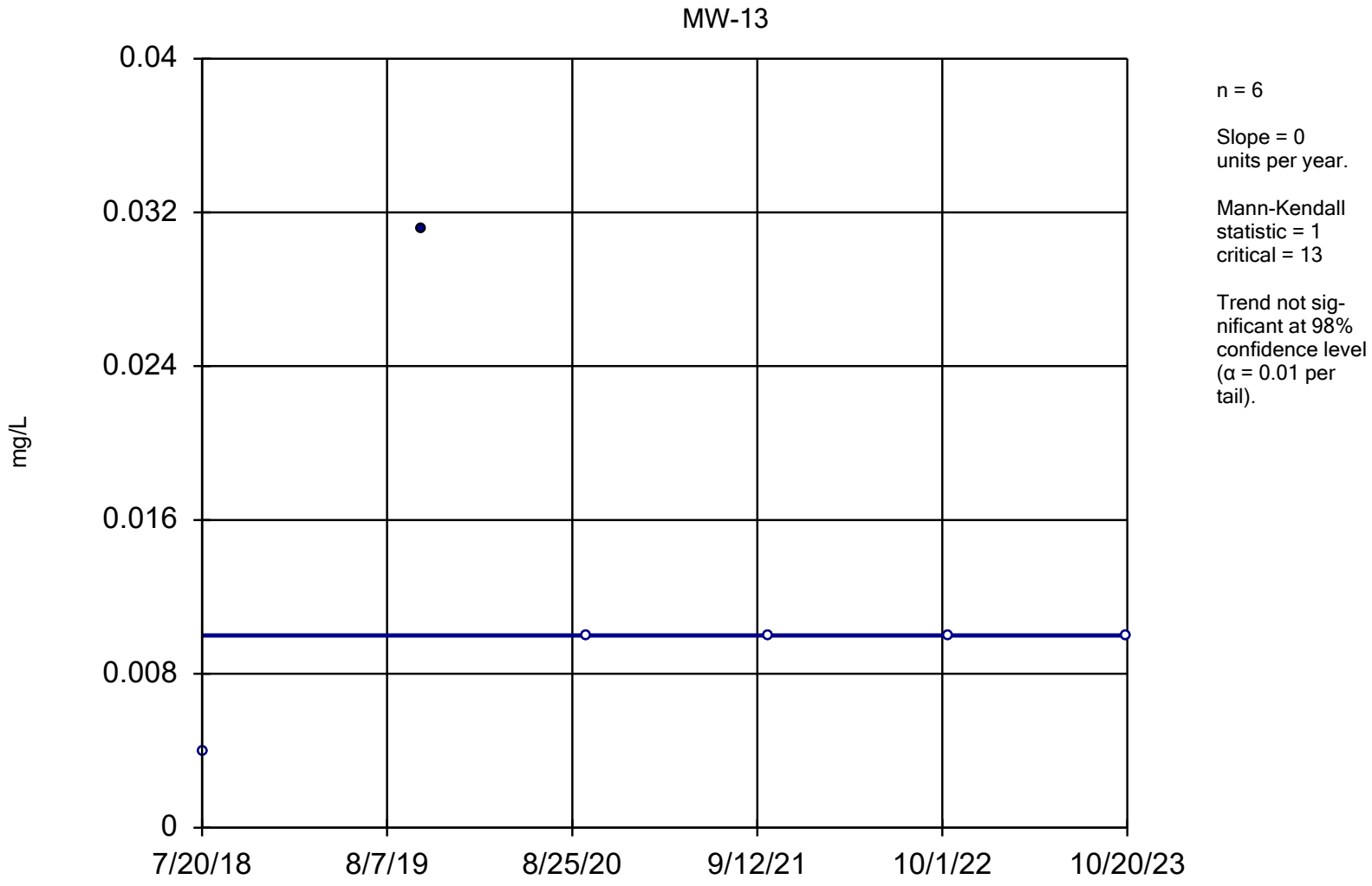



Constituent: Zinc  Analysis Run 7/16/2024 9:20 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

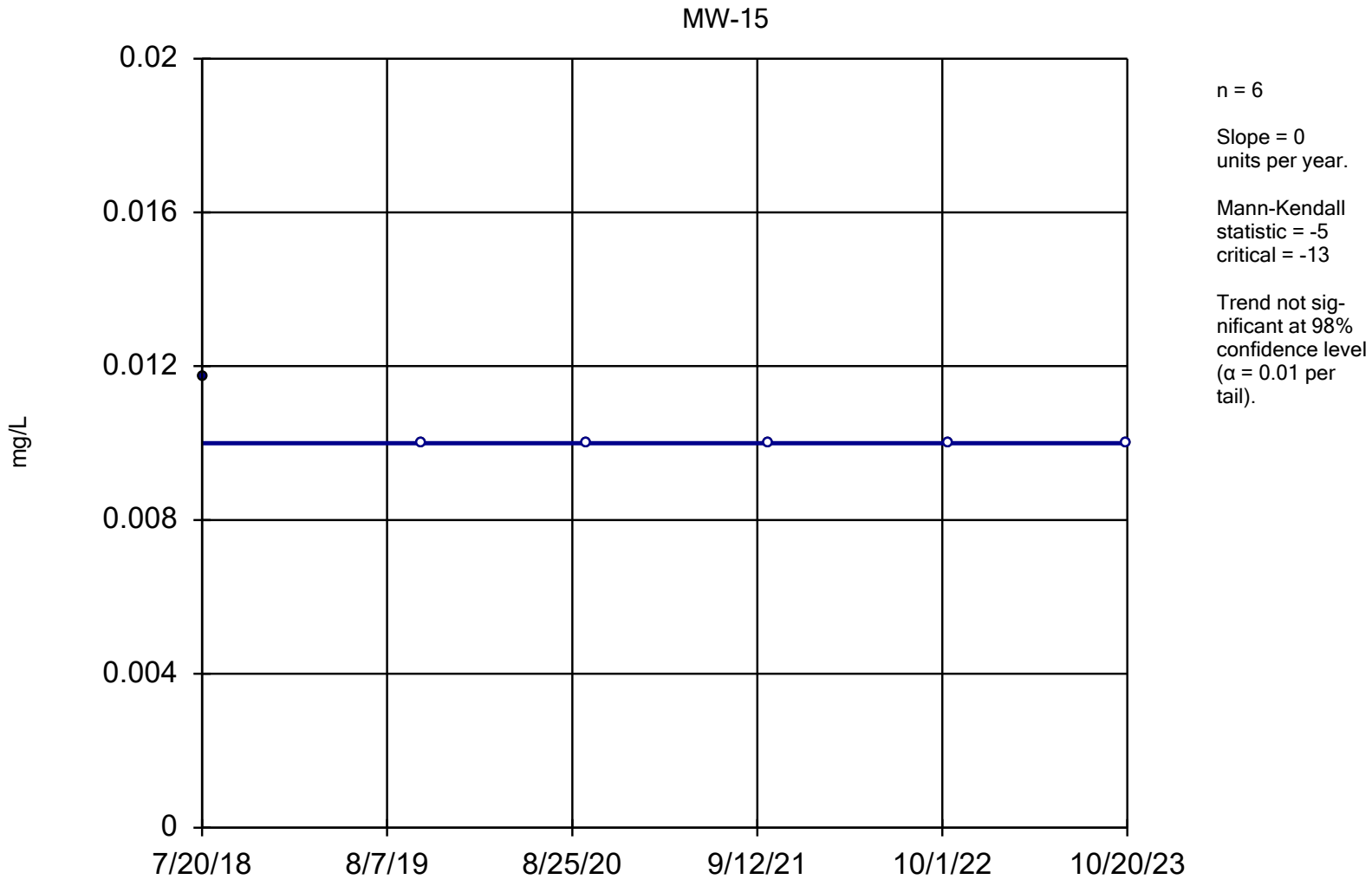



Constituent: Zinc  Analysis Run 7/17/2024 2:28 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

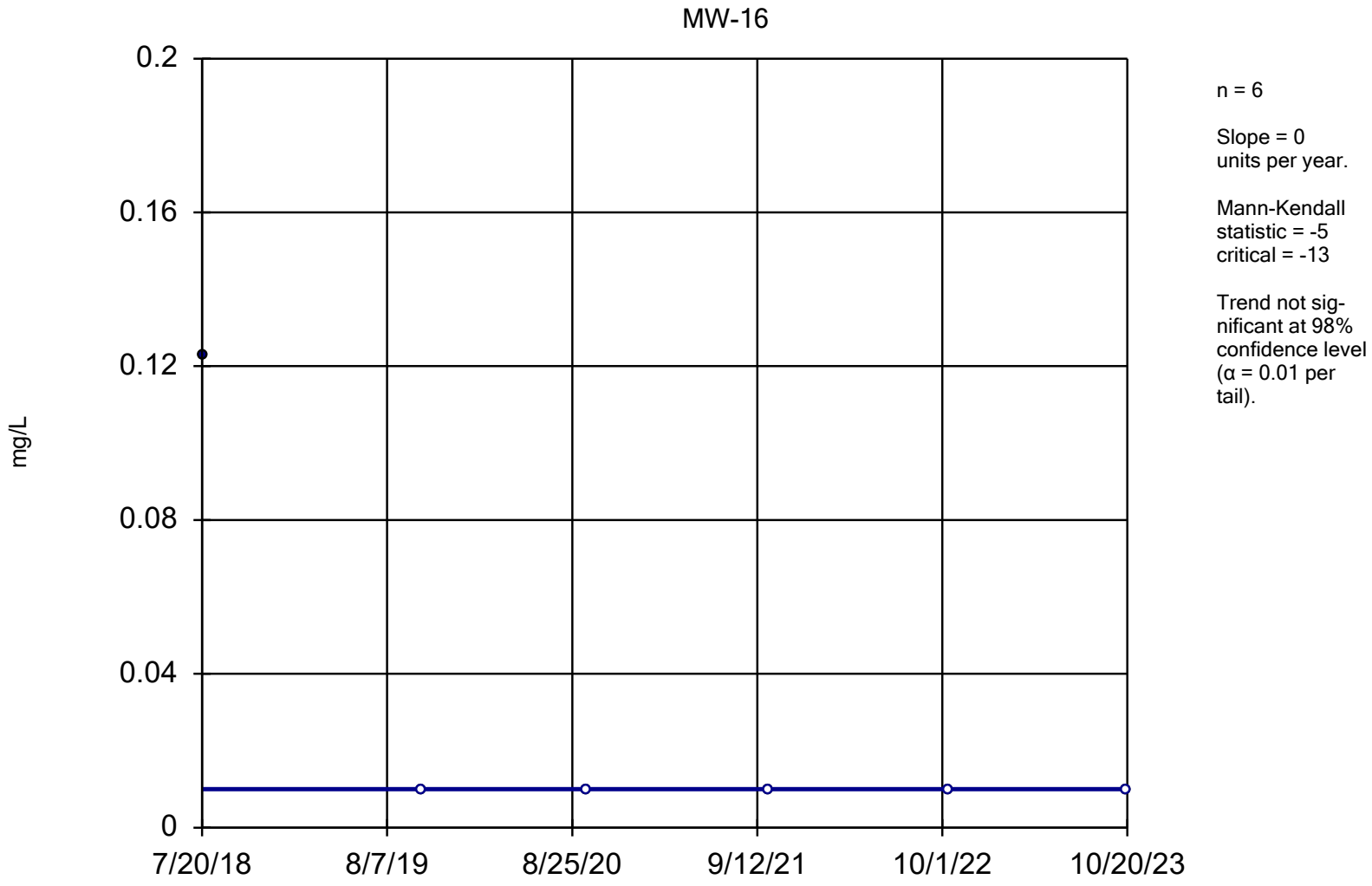



Constituent: Zinc  Analysis Run 7/15/2024 8:31 AM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator



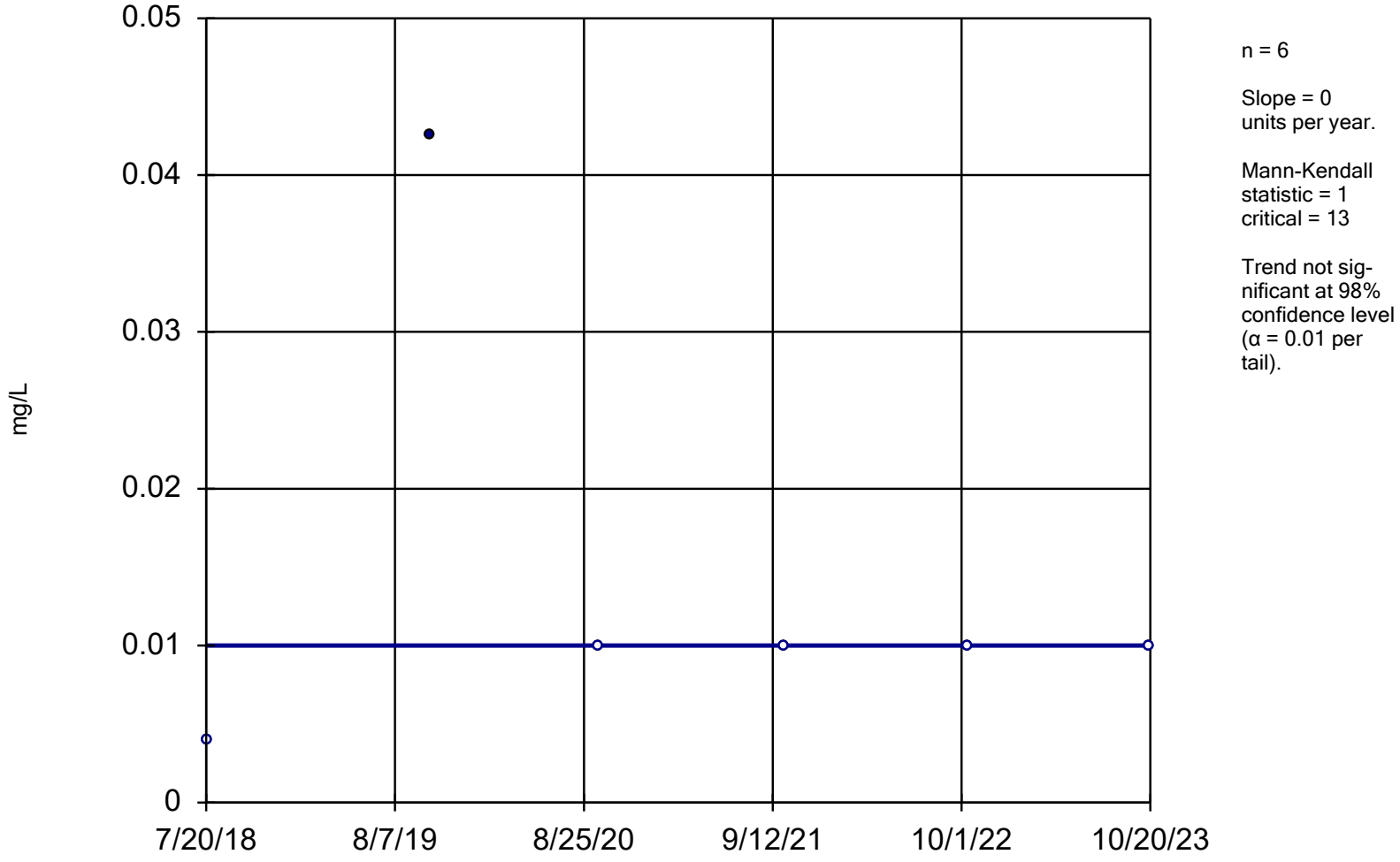

Constituent: Zinc  Analysis Run 7/17/2024 1:45 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics

Hollow symbols indicate censored values.

# Sen's Slope Estimator

## MW-19




n = 6

Slope = 0
units per year.

Mann-Kendall
statistic = 1
critical = 13

Trend not sig-
nificant at 98%
confidence level
(α = 0.01 per
tail).

Constituent: Zinc  Analysis Run 7/17/2024 2:02 PM

Shelby County Sanitary Landfill  Client: Foth  Data: 2024 Shelby Statistics