National Aeronautics and
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April 28, 2025

Reply to Attn of: RE-25-058

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Subject: 600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 12

Enclosed is the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report for Project Year 12*, submitted in accordance with the 600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 5, approved by NMED August April 17, 2018. Requirements of the NMED-approved *600 Area Perched Groundwater Extraction Pilot Test Work Plan* (November 13, 2012) and subsequent correspondence are included in the report. A statistical analysis has been included in the Year 12 report in order to support groundwater and soil vapor data evaluations. A recommendation is also made to transition NASA 600 Area PGEPT annual reporting into Projected Targeted Mobile Remediation Process (TMRP) annual reporting. The *Proposal to Transition NASA White Sands Test Facility (WSTF) 600 Area Perched Groundwater Extraction Pilot Test (PGEPT) Annual Reporting into Projected Targeted Mobile Remediation Process (TMRP) Annual Reporting Following Submittal of the PGEPT – Project Year 12 Report* is currently under review by NMED. This submittal includes an Executive Summary as Enclosure 1, a paper copy of the report (up to Appendix A) as Enclosure 2, and a CD-ROM with the report as a PDF and Excel Statistical Trend Input Files and analytical data as Enclosure 3.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments concerning this submittal, please contact Antonette Doherty of my staff at 575-202-5406.

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3 Enclosures

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Executive Summary

The Interim Status Report for 600 Area Perched Groundwater Extraction Pilot Test (PGEPT) Project Year 12 summarizes the results of perched groundwater (PGW) extraction at the White Sands Test Facility (WSTF) 600 Area Closure (Closure). National Aeronautics and Space Administration (NASA) has extracted PGW for 12 years, originally in accordance with the 600 Area Perched Groundwater Extraction Pilot Test Work Plan, submitted by NASA on November 13, 2012. Subsequent directives by New Mexico Environment Department (NMED) have required continued monitoring and extraction of the PGW. The objective of the pilot test is to extract PGW on the top of bedrock at the bedrock-alluvium interface using groundwater monitoring well 600-G-138 and determine the impact of groundwater extraction on the concentrations of hazardous constituents in the groundwater and soil vapor beneath the Closure. Quarterly PGW and soil vapor sampling was continued throughout Project Year 12 to monitor the impact of extraction.

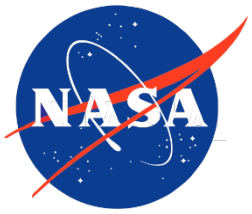
Between April 2013 (when extraction was initiated) and March 2025, NASA has extracted 23,136 gallons of contaminated PGW from monitoring well 600-G-138. For Project Year 12, 2,227 gallons of extracted PGW were transported to and treated by the Mid-plume Interception and Treatment System. Field data and chemical analytical results obtained indicate that contaminated PGW prevails on top of the andesite bedrock at well 600-G-138 and the source of soil vapor contaminants remains. Analytical data from PGW well 600-G-138 indicate that the concentrations of volatile organic compounds (VOCs) continue to decline at a similar rate to concentrations in contaminated groundwater from upgradient locations in the 200 Area. Groundwater extraction over the 12-year duration of the PGEPT has not significantly reduced the 3-foot (ft) thickness of PGW over an extended period. Analytical data from soil vapor monitoring at adjacent multiport soil vapor monitoring well (MSVM) 600-SGW-5 indicate that concentrations of VOCs in the soil vapor have continued to decline slightly throughout the 12-year duration of the pilot test.

Chemical analytical data show that the concentrations of nitrate/nitrite and chloride in PGW exhibit slightly declining trends over the PGEPT. The gradual declining trend in chloride and nitrate/nitrite concentrations may indicate a lessening in the impact of infiltration following the removal of standing water from the adjacent 600 Area Wastewater Lagoons by July 2017. Concentrations of trichloroethene (TCE) in PGW have declined from 110 micrograms per liter (µg/L) in November 2013 to 49 µg/L in January 2025 or approximately 55 percent over the 12-year duration of the PGEPT. Chloroform concentrations in PGW measured during the PGEPT contrast the other VOCs and exhibit a statistically inconsistent trend.

The declining concentrations of several of the PGW VOCs is inferred to have had a delayed effect on reducing the associated concentrations in soil vapor measured within four available ports at depths of 7.5 ft, 52.5 ft, 102.5 ft, and 137.5 ft at well 600-SGW-5. There is also a strong relationship of increasing soil vapor concentrations with depth and proximity to the local groundwater source. Concentrations of chloroform trend downward in the upper three monitoring zones and are relatively stable in the lowest soil vapor monitoring zone. Soil vapor chemical analytical data from samples collected at 600-SGW-5 has statistically significantly declined over time for TCE in monitoring zones at all depths.

Although groundwater extraction at well 600-G-138 has not significantly reduced the 3 ft thickness of PGW, it contributes to the removal of groundwater contaminant mass. Declining concentrations of contaminants in PGW corresponds to declining concentrations in soil vapor within the overlying vadose zone at adjacent well 600-SGW-5. On February 19, 2025, NASA submitted a proposal to NMED to the transition of PGEPT annual reporting into Targeted Mobile Remediation Process (TMRP) annual reporting. The majority of elements for TMRP data collection and reporting correspond to PGEPT interim status reporting requirements. While this proposal is under review by NMED, NASA will continue the extraction of contaminated PGW from monitoring well 600-G-138 for Project Year 13 in accordance with the 600 Area PGEPTWP (NASA, 2012b). Groundwater and soil vapor samples will continue to be collected quarterly from PGW monitoring well 600-G-138 and MSVM well 600-SGW-5, respectively.

National Aeronautics and Space Administration



Interim Status Report for 600 Area Perched Groundwater Extraction Pilot Test

Project Year 12

April 2025

NM8800019434

NASA Johnson Space Center White Sands Test Facility

Interim Status Report for 600 Area Perched Groundwater Extraction Pilot Test

Project Year 12

April 2025

NM8800019434

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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Executive Summary

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Between April 2013 (when extraction was initiated) and March 2025, NASA has extracted 23,136 gallons of contaminated PGW from monitoring well 600-G-138. For Project Year 12, 2,227 gallons of extracted PGW were transported to and treated by the Mid-plume Interception and Treatment System. Field data and chemical analytical results obtained indicate that contaminated PGW prevails on top of the andesite bedrock at well 600-G-138 and the source of soil vapor contaminants remains. Analytical data from PGW well 600-G-138 indicate that the concentrations of volatile organic compounds (VOCs) continue to decline at a similar rate to concentrations in contaminated groundwater from upgradient locations in the 200 Area. Groundwater extraction over the 12-year duration of the PGEPT has not significantly reduced the 3-foot (ft) thickness of PGW over an extended period. Analytical data from soil vapor monitoring at adjacent multiport soil vapor monitoring well (MSVM) 600-SGW-5 indicate that concentrations of VOCs in the soil vapor have continued to decline slightly throughout the 12-year duration of the pilot test.

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The declining concentrations of several of the PGW VOCs is inferred to have had a delayed effect on reducing the associated concentrations in soil vapor measured within four available ports at depths of 7.5 ft, 52.5 ft, 102.5 ft, and 137.5 ft at well 600-SGW-5. There is also a strong relationship of increasing soil vapor concentrations with depth and proximity to the local groundwater source. Concentrations of chloroform trend downward in the upper three monitoring zones and are relatively stable in the lowest soil vapor monitoring zone. Soil vapor chemical analytical data from samples collected at 600-SGW-5 has statistically significantly declined over time for TCE in monitoring zones at all depths.

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the 600 Area PGEPTWP (NASA, 2012b). Groundwater and soil vapor samples will continue to be collected quarterly from PGW monitoring well 600-G-138 and MSVM well 600-SGW-5, respectively.

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List of Acronyms

µg/L	Micrograms per liter
µg/m^3	Microgram per cubic meter
bgs	Below ground surface
btoc	Below top of casing
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DL	Detection limit
DP	Discharge Plan
dtw	Depth to water
EPA	Environmental Protection Agency
ft	Feet/foot
GMP	Groundwater Monitoring Plan
GSA	Gardner Spring Arroyo
HHF	Hardscrabble Hill Fault
HWMU	Hazardous Waste Management Unit
ITRC	Interstate Technology and Regulatory Council
M-K	Mann-Kendall
MPITS	Mid-plume Interception and Treatment System
MSVM	Multiport Soil Vapor Monitoring Well
NASA	National Aeronautics and Space Administration
ND	Non-detect
NDMA	N-Nitrosodimethylamine
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OLS	Ordinary Least Squares
PCE	Tetrachloroethene
PGEPT	Perched Groundwater Extraction Pilot Test
PGEPTWP	Perched Groundwater Extraction Pilot Test Work Plan
PGW	Perched groundwater
ROS	Regression on Order Statistics
SGW	Soil Gas Well
SRT	Seismic refraction tomography
SVE	Soil Vapor Extraction
TCE	Trichloroethene
TMRP	Targeted Mobile Remediation Process
VOC	Volatile organic compound(s)
WSTF	White Sands Test Facility

1.0 Introduction

The National Aeronautics and Space Administration (NASA) Johnson Space Center White Sands Test Facility (WSTF) is located in Doña Ana County, 18 miles northeast of Las Cruces, New Mexico and 65 miles north of El Paso, Texas. Figure 1.1 provides a WSTF location map.

WSTF's primary activities in support of the space program are:

1. Development, qualification, refurbishment, and testing of spacecraft propulsion systems, subsystems, and ground support equipment.

2. Investigation of flight hardware anomalies.

3. Testing of materials and components.

4. Performance of hazard and failure analyses.

Hazardous wastes are generated during the testing and evaluation processes at WSTF. Following the completion of construction of WSTF in 1964, many wastes were historically managed in surface impoundments within the WSTF industrial area which contributed to groundwater contamination. There are five closed hazardous waste management units (HWMUs) at WSTF, including the 600 Area impoundments. The 600 Area HWMU was closed by NASA in August 1989 and was managed under the WSTF Post-closure Care Permit between the time of closure and November 2009, when management of the HWMUs was incorporated into WSTF's Hazardous Waste Permit (Permit; NMED, 2009). Figure 1.2 provides an aerial photograph of the Closure (600 Area Closure) with pertinent features identified including the local well network.

1.1 Background

1.1.1 600 Area Closure Investigations and Perched Groundwater Identification (2009 – 2013)

NASA performed a comprehensive investigation to the depth of the vadose zone at the 600 Area Closure in late 2009 and early 2010. During the investigation, perched groundwater (PGW) was unexpectedly identified on the top of the poorly fractured to non-fractured (competent) andesite bedrock surface near the north and east corners of the Closure (Figure 1.2) in two of eight soil borings installed. Grab samples of the PGW indicated trichloroethene (TCE) concentrations in excess of groundwater cleanup levels. Nitrate/nitrite and chloride were also detected in the grab samples, indicating that the nearby 600 Area Wastewater Lagoons could potentially be contributing to the PGW at this location. Specific information was provided in the *NASA White Sands Test Facility (WSTF) 600 Area Closure Investigation Report Provided in Response to a NMED Notice of Disapproval* submitted to the New Mexico Environment Department (NMED) on March 30, 2011 (NASA, 2011a). NMED approved the report on June 9, 2011 (NMED, 2011a).

In accordance with NMED's approval of the 600 Area Closure Investigation Report, NASA submitted the *600 Area Closure Soil Vapor Extraction (SVE) Pilot Test Work Plan* on September 1, 2011. NMED approved the *600 Area Closure Soil Vapor Extraction Pilot Test Work Plan* with a modification on October 28, 2011 (NMED, 2011b). NASA performed a soil vapor extraction (SVE) pilot test at the Closure in March 2012. In the final NMED-approved report on the SVE pilot test (NASA, 2012a), NASA proposed the development of an abbreviated work plan for extraction of contaminated PGW beneath the Closure. NASA submitted the *600 Area Perched Groundwater Extraction Pilot Test Work Plan* (PGEPTWP) on November 13, 2012 (NASA, 2012b). NMED approved the work plan on January 16,

2013 (NMED, 2013a) and directed NASA to begin extraction by February 22, 2013. NASA was unable to obtain approval from the New Mexico Office of the State Engineer to utilize groundwater monitoring well 600-G-138 as a pollution recovery well in time to meet the NMED deadline. This required NASA to request an extension of time for implementation of the pilot test (NASA, 2013), in which NASA proposed to initiate extraction of PGW by April 19, 2013. NMED approved this extension request on March 1, 2013 (NMED, 2013b).

1.1.2 Perched Groundwater Extraction Pilot Testing and Reporting (2013 – Present)

NASA initiated extraction of PGW in accordance with the approved work plan on April 19, 2013, and provided the results of groundwater extraction and associated groundwater and soil vapor monitoring in the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report* (NASA, 2014). In that report, NASA concluded that the presence of contaminated PGW beneath the Closure continued to contribute to volatile organic compounds (VOCs) in the soil vapor above the PGW and potentially throughout the 600 Area. NASA recommended continued extraction and monitoring of 600 Area PGW and soil vapor monitoring. NMED approved the report on August 14, 2014 (NMED, 2014) and directed NASA to continue PGW extraction and submit another project report within 30 days of the end of the second project year.

NASA continued the extraction of PGW from monitoring well 600-G-138 between April 2014 and March 2015 and presented the results of the second project year in the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 2* on April 16, 2015 (NASA, 2015a). NASA again concluded that the extraction of PGW had not reduced the thickness of the PGW unit beneath the closure and that the presence of contaminated PGW continued to contribute to the presence of VOCs in the soil vapor of the vadose zone. NMED approved NASA's report on July 15, 2015, with modifications (NMED, 2015). NMED directed NASA to provide nitrate/nitrite analytical data in subsequent status reports and to develop and submit a potentiometric map of the area. The required information was included in all subsequent interim status reports beginning with the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 3*, submitted to NMED on April 14, 2016 (NASA, 2016a) and approved on November 17, 2016 (NMED, 2016a).

On April 26, 2017, NASA submitted the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 4* (NASA, 2017a), in which NASA recommended discontinuing the extraction of PGW from monitoring well 600-G-138. NMED issued the *Approval with Modification Interim Status Report for 600 Area Perched Groundwater Extraction Pilot Test* on September 15, 2017 (NMED, 2017b). NMED disagreed with NASA's recommendation and directed NASA to revise the investigation report to continue PGW extraction at monitoring well 600-G-138. NASA submitted *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 5* on May 3, 2018 (NASA, 2018a), which was approved by NMED on August 17, 2018 (NMED, 2018). The 600 Area Wastewater Lagoons standing water was removed by July 2017, and all sludge was removed by December 2018 (NASA, 2019c). NASA submitted the *600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 6* on April 30, 2019 (NASA, 2019a), which was approved by NMED on September 3, 2019 (NMED, 2019b). The Year 7 report was submitted on May 26, 2020 (NASA, 2020a) and approved by NMED on May 6, 2021 (NMED, 2021a). On April 29, 2021, NASA submitted the Year 8 report (NASA, 2021), which was approved on December 8, 2021 (NMED, 2021b). The Year 9 report was submitted on April 26, 2022 (NASA, 2022a) and was approved by NMED on January 6, 2023 (NMED, 2023a). The Year 10 report was submitted on April 19, 2023 (NASA, 2023b) and was approved by NMED on March 7, 2024 (NMED, 2024a). Most recently, the Year 11 report was submitted on April 29, 2024 (NASA, 2024a) and was approved by NMED on November 5, 2024 (NMED, 2024c).

1.1.3 Perched Groundwater Investigation (2019 – Present)

Following initial identification of PGW unit in the vicinity of the 600 Area Closure, NMED indicated that additional investigation was warranted and required NASA to develop and submit a work plan by December 31, 2015 (NMED, 2015). NASA submitted the *Additional Work Plan Requirements to Evaluate Potential Source of 600 Area Contamination* on November 25, 2015 (NASA, 2015b) and the required *Abbreviated Investigation Work Plan (AIWP) for the 600 Area Perched Groundwater* to NMED on July 7, 2016 (NASA, 2016b). NMED disapproved the Work Plan on November 30, 2016 (NMED, 2016b). NASA submitted the *Response to Disapproval of Abbreviated Investigation Work Plan for 600 Area Perched Groundwater* on December 22, 2016 (NASA, 2016c). NMED approved the revised version of the work plan on March 31, 2017 (NMED, 2017a). The revised work plan included a geophysical refraction/reflection survey to image the bedrock surface below the Closure and the installation of PGW wells based on the results of the survey.

On August 7, 2019, NASA submitted the *Request to Remove Electrical Resistivity Component of the 600 Area Perched Groundwater Geophysical Survey based on Geophysical Subcontractor Input Received during the Procurement Process* (NASA, 2019b). NMED approved the work scope modification request on August 23, 2019 (NMED, 2019a). NASA submitted the *Synopsis of the Findings of the 600 Area Closure Geophysical Seismic Refraction Tomography and Reflection Surveys with Revised Soil Boring Locations* on December 19, 2019 (NASA, 2019d). NMED approved the submittal with modifications on December 22, 2020 (NMED, 2020). The objective of the seismic survey was to image the bedrock surface to assist in refining optimal soil boring locations to target any depressions in the bedrock surface that preferentially channelize the PGW. Attempts to define the elevation of the bedrock-alluvial interface using seismic refraction tomography (SRT) and reflection methods to the level of accuracy required to meet the objective were not successful. The inability of the seismic survey to predict the elevation of bedrock in an area with a considerable amount of available soil boring and well borehole bedrock tags indicated that extending the existing geophysical seismic survey would not be beneficial. On June 29, 2022, NASA submitted the 600 Area Perched Groundwater Investigation Report (IR; NASA, 2022b). NMED approved the IR with modifications on June 28, 2023 (NMED, 2023c).

The 600 Area PGW field investigation was conducted between October 2019 and May 2022. In addition to the preliminary geophysical seismic survey of the bedrock surface, the investigation included: the installation of six soil borings, one of which was subsequently converted into a PGW unit monitoring well screened across the alluvial-andesite bedrock interface; a colloidal borescope flow vector evaluation; and the groundwater sampling of existing PGW wells. The six exploratory PGW soil borings (600-PGW-1 through 600-PGW-6) were initially installed at locations either where PGW had been previously identified or was inferred based on the results of the geophysical seismic survey. The bedrock elevations encountered at the soil boring locations did not correlate well with the predicted bedrock elevations from the seismic survey (SRT and reflection) with discrepancies up to 50 feet (ft). The single location with acceptable correlation between the actual and predicted elevations of bedrock to the required level of resolution for the survey (ability to detect ≤ 5 ft channels) was soil boring 600-PGW-2 at the north corner of the 600 Area Closure. This was located adjacent to previously identified multiport soil vapor monitoring well (MSVM) well 600-SGW-8 where a ground truth bedrock elevation was available. Monitoring well 600A-001-GW was subsequently completed at this location (Figure 1.2).

A colloidal borescope flow vector evaluation was performed to evaluate the two available PGW wells (600-G-138 and 600A-001-GW) along with 12 other conventional monitoring wells screened within the adjacent fractured bedrock aquifer. Flow vectors generally conformed to the local pattern of groundwater bedrock aquifer and overlying PGW unit flow hypothesized for the 600 Area Closure. The flow directions suggested potential groundwater movement from the 200 Area along the strike of bedding plane solution channels in limestone southwest toward the 600 Area in the vicinity of Gardner Spring Arroyo (GSA).

West of the Hardscrabble Hill Fault (HHF), flow onto the poorly fractured andesite bedrock is inferred to be predominantly toward the west under the influence of the strong hydraulic gradient on the bedrock pediment. A tangential south-southwest flow component on the bedrock interface is reflected by the vector in PGW well 600-G-138, which is consistent with a 200 Area/GSA source (NASA, 2022b).

Groundwater sampling was performed at the two available PGW locations (wells 600-G-138 and 600A-001-GW). Preliminary groundwater analytical results for PGW well 600A-001-GW were not compatible to the suite of contaminants and higher concentrations identified within previously installed PGW well 600-G-138. Although an insight to PGW geochemistry was improved through the installation of well 600A-001-GW, data acquired did not improve conceptualization of the upgradient PGW source and downgradient PGW migration pathways. Direct flow between the two existing PGW wells is unlikely based on available data due to: the shallow bedrock high identified between the two at well 600-SGW-3 (Figure 1.2); the preliminary colloidal borescope flow direction at well 600-G-138 toward the southwest; and differences in the groundwater analytical results (NASA, 2022b).

Following NMED's approval of the 600 Area PGW IR (NMED, 2023c), NASA submitted the *600 Area Perched Groundwater Phase II Abbreviated Investigation Work Plan* (AIWP) on November 27, 2023 (NASA, 2023d). The AIWP was approved by NMED on November 11, 2024 (NMED, 2024b). The purpose of the Phase II AIWP is to continue characterizing the nature, source, and migration pathways of the PGW unit in the vicinity of the 600 Area Closure, which is hypothesized to be a channelized system based on information collected to date (NASA, 2022a). Phase II is divided into two separate components. Phase IIa comprises a comprehensive hydrogeological investigation of the existing PGW network based on the investigation of four conventional monitoring wells installed in the 600 Area that have encountered PGW. Phase IIb comprises the potential installation of additional soil borings and/or wells at locations deemed to have the best opportunity for PGW interception based on Phase IIa and conform to the requests of NMED (2023b).

1.2 Objective and Scope

The objective of the perched groundwater extraction pilot test (PGEPT) is to extract contaminated PGW using existing monitoring well 600-G-138 and to evaluate the impact of groundwater extraction on concentrations of VOCs in the vadose zone near that groundwater monitoring well. To achieve this objective, NASA has collected and managed groundwater and soil vapor samples from 600-G-138 and adjacent MSVM well 600-SGW-5 (Figure 1.2), respectively. The scope of the pilot test is limited to extracting PGW from existing monitoring well 600-G-138, treating the extracted PGW at the Mid-plume Interception and Treatment System (MPITS) as indicated in the MPITS Interim Measure Work Plan (NASA, 2008) and Discharge Permit (DP)-1255 (NMED, 2023b), and evaluating PGW samples from well 600-G-138 and soil vapor samples from well 600-SGW-5.

1.3 Contaminants of Concern

The potential groundwater contaminants of concern (COCs) for this investigation were identified in the PGEPTWP and consist of TCE, tetrachloroethene (PCE), chloroform, N-Nitrosodimethylamine (NDMA), nitrate/nitrite, and chloride. TCE, PCE, chloroform, and NDMA were identified as COCs for this investigation because treatment standards for these constituents are stipulated in DP-1255 (NMED, 2023b), which provides the requirements for discharging groundwater treated by the MPITS, including groundwater extracted from 600-G-138. Nitrate/nitrite and chloride were identified as COCs because of their presence in grab samples collected from 600-G-138 during the initial 600 Area Investigation. The primary COC for soil vapor has been identified as TCE because concentrations of TCE in groundwater beneath the Closure exceed NMED regulatory cleanup levels (NASA, 2012b).

2.0 Scope of Activities

2.1 Perched Groundwater Extraction and Management

PGW is pumped from well 600-G-138 twice each WSTF working day. The pump is activated and operated until it breaks suction when the water level draws down to the pump intake depth, generally located at approximately 148 ft below top of casing (btoc), which is coincidental with the depth of the bedrock surface. On average, 12 to 15 gallons of PGW are removed each pumping day through the two purging events, one in the morning and one in the afternoon. PGW recovery is not monitored on a regular basis, although well 600-G-138 is observed to recover fully between the morning purge event and the afternoon purge event, which are separated by approximately four to six hours. A field evaluation performed at well 600-G-138 in August 2022 indicated that PGW recovers at approximately 0.23 gallons per minute (gpm) over a period of 30 minutes.

NASA manages extracted groundwater in accordance with 40 Code of Federal Regulations (CFR) 262.17 and 20.4.1.300 New Mexico Administrative Code (NMAC) prior to transfer to the MPITS, where it is treated in accordance with the MPITS Interim Measure Work Plan (NASA, 2008) and discharged in accordance with DP-1255 (NMED, 2023b).

2.2 Groundwater Monitoring

Throughout the pilot test, groundwater samples have been collected quarterly from PGW monitoring well 600-G-138 (Figure 1.2) in accordance with the requirements of site-specific sampling procedures and the WSTF Groundwater Monitoring Plan (GMP) in effect at the time of each sampling (NASA, 2023e; NMED, 2023d). Prior to every PGW sample collection event for Project Year 12 (4/22/2024, 7/19/2024, 10/22/2024, and 1/27/2025), the standing water in the well casing was evacuated and the non-dedicated purge pump was removed. The water level was allowed to recover before groundwater samples were collected with a decontaminated Teflon®[1] bailer. Groundwater indicator parameters (pH, temperature, conductivity, and turbidity) were measured and recorded in the appropriate field logbook. The PGW was then dispensed into laboratory-provided sample containers, which were appropriately labeled and placed in cold storage. Samples were shipped to NASA's contracted off-site analytical laboratories for analysis. Samples were analyzed quarterly for VOCs (by Environmental Protection Agency [EPA] Method 8260), chloride (by EPA Method 300.0), and nitrate/nitrite (by EPA Method 353.2) and annually for NDMA (by EPA Method 607; sampled 4/22/2024).

2.3 Soil Vapor Monitoring

For Project Year 12, soil vapor well 600-SGW-5 was sampled quarterly (4/22/2024, 7/19/2024, 10/22/2024, and 1/27/2025) at the same time as groundwater sampling performed at PGW monitoring well 600-G-138 as part of the PGEPT evaluation. The monitoring zones of soil vapor well 600-SGW-5 were sampled in accordance with WSTF-specific procedures for soil vapor sampling. The monitoring zones, sampling ports, and stainless-steel tubing were purged of entrained soil vapor with a non-dedicated surface vacuum pump to evacuate stagnant air from the soil vapor sampling implant and stainless-steel tubing connecting the implant to the surface sample collection fitting. Each MSVM well monitoring zone was purged for a minimum of five minutes per zone to evacuate at least three volumes of the ¼ inch tubing and soil vapor implant. Carbon dioxide, oxygen, and methane indicator parameters were monitored during the purging operation as these parameters are required to stabilize prior to sampling and recorded in the appropriate field logbook. Soil vapor samples were collected in 1-liter stainless-steel SUMMA

[1] Teflon® is a registered trademark of The Chemours Company FC, LLC.

canisters provided by the analytical laboratory. Samples were labeled and placed in controlled storage prior to shipment to the contracted off-site analytical laboratory. Samples were analyzed for VOCs by EPA Method TO-15.

2.4 WSTF Precipitation Monitoring

NASA currently monitors precipitation at WSTF via a rain gauge installed at the 700 Area closed landfill. As part of this PGW study, rain levels are evaluated with depth to PGW in well 600-G-138 to assess precipitation recharge effects on the PGW aquifer. Table 2.1 includes rain gauge results from 2013 through present (Project Year 1 through Project Year 12). The total annual rainfall for Project Year 12 between April 2024 and March 2025 was 6.60 inches. This is below the average annual rainfall of 10.04 inches over the 12-year duration of PGEPT pumping activities.

2.5 Statistical Evaluation

Both the well 600-G-138 groundwater and well 600-SGW-5 soil vapor COC data sets were used to perform ordinary least squares (OLS) regression or Mann-Kendall (M-K) trend tests using the most recent version of ProUCL software (Version 5.2) to determine if there was a statistically significant trend in COC concentrations from Project Year 1 to the present (Project Year 12). OLS is a parametric test and used to determine if a linear temporal trend in the data exists. A best-fit straight line is determined from the data with a positive slope indicating an increasing trend, and a negative slope indicating a decreasing trend. The correlation coefficient, titled Pearson's *r*, describes the relation between the observed and calculated concentrations. The sign of *r* equates to the type of trend (positive for increasing and negative for decreasing), with the magnitude of *r* indicating the strength of the trend. The closer the absolute value of *r* is to 1, the stronger the trend (ITRC, 2013; EPA, 2009).

M-K trend tests are non-parametric, meaning that there are no assumptions regarding data distribution. Each sample is ordered by earliest to latest date, and then compared to every other sample in pairs for concentration change. The change is listed as a score, either -1, 0, or +1. The individual pair scores are summed to establish the M-K value (*S*), which will be negative, positive, or close to 0. The null hypothesis for the M-K trend test is no trend, meaning the concentrations randomly fluctuate around a constant population mean. In general, a positive *S* shows a potential increasing or upward trend, and a negative *S* shows a potential decreasing or downward trend (EPA, 2009; 2015; 2022). The level of confidence (expressed as a confidence coefficient) desired for the test is set prior to testing. The default confidence coefficient in ProUCL and accepted by NMED and EPA is 95 percent, or 0.95 with a significance level of 5 percent or 0.05. This means that there is an error rate of no more than 5 percent. The *p*-value represents the probability that the M-K test results are false when they are true (i.e., when the M-K shows a statistically significant trend when, there is no trend, but random fluctuations). If the *p*-value is less than or equal to 0.05 (the level of significance chosen), then the null hypothesis is rejected, meaning there is a statistically significant trend. The M-K *S*-value shows which trend (increasing for a positive *S* and decreasing for a negative *S*). If the *p*-value is greater than 0.05, then the null hypothesis is accepted, meaning there is not enough evidence of a trend at the significance level chosen (EPA, 2009). ProUCL, Version 5.2 software generates the graph, the statistical output, and the interpretation of the M-K test results.

3.0 Pilot Testing Results

3.1 Field Results

3.1.1 Perched Groundwater Extraction

The initial depth to groundwater (dtw) over the duration of pumping (Table 3.1) has ranged between a high of 144.80 ft btoc on January 19, 2022 (3.18 ft thickness of PGW) and a low of 146.95 ft btoc on April 27, 2018 (1.03 ft thickness of PGW). Between April 2013 and March 2025, NASA has extracted an average of 160.7 gallons of contaminated PGW per month from 600-G-138 using a non-dedicated purge pump. Table 3.2 provides the PGW volume extracted each month between April 2013 and March 2024, listed by Project Year. During Project Year 12 between April 2024 and March 2025 a total of 2,227 gallons of PGW were extracted. PGW extraction was reduced to 95 gallons for December 2024 and 89 gallons for January 2025 (both well below the average) due to alternate equipment tasks, Bennett pump repairs, Dewar refill issues, and reduced technician availability during reassignment to other ongoing field projects. The total amount of PGW extracted since April 2013 is 23,136 gallons.

3.1.2 Groundwater Monitoring

Indicator parameters monitored during groundwater sampling events are provided in Table 3.1. For the three Project Year 12 groundwater monitoring events in April 2024, October 2024, and January 2025, NASA observed that initial depth to groundwater in the 600-G-138 well casing was consistent at between 145.10 and 145.13 ft btoc, which is compatible with the depths reported during previous PGEPT monitoring years. The initial depth to groundwater was not recorded for July 2024. With the depth to andesite below the closure identified as approximately148 ft btoc, a consistent thickness of approximately 2.9 ft of PGW was present on top of bedrock for Project year 12.

Figure 3.1 shows total rainfall in inches for each project year as well as depth to PGW for each sampling event at 600-G-138 for comparison. Local precipitation at WSTF for Project Year 8 (4.88 inches),Project Year 11 (6.13 inches), and Project Year 12 (6.60 inches) was low (when compared to Project Years 10 (13.47 inches) and 9 (14.11 inches; Table 2.1; Figure 3.1). However, as shown by depth to PGW in well 600-G-138, the observed variability in annual precipitation does not appear to significantly affect the measured thickness of the PGW. For 2022, the largest amount of rainfall was recorded in the month of August (4.77 inches) accounting for approximately 36 percent of the total annual rainfall based on WSTF rain gauge data at the 700 Area Landfill (Table 2.1). The elevated rainfall did not result in any significant change in the initial PGW elevation for the October 2022 (145.27 ft btoc), or January 2023 (145.00 ft btoc) measurements.

3.1.3 Soil Vapor Monitoring

NASA performed PGEPTWP-required quarterly soil vapor monitoring at MSVM well 600-SGW-5 (Figure 1.2) in conjunction with groundwater sampling. During each sampling event, soil vapor was purged from each monitoring port (7.5, 52.5, 102.5, and 137.5 ft below ground surface [bgs]) using a landfill gas monitoring instrument. Purged vapor for the Project Year 12 sampling events ranged from 0.4 to 1.8 percent carbon dioxide, from 17.7 to 20.5 percent oxygen and was 0.0 percent for methane throughout.

3.2 Project Year 12 Chemical Analytical Results

3.2.1 Groundwater Monitoring Chemical Analytical Data

Chemical analytical results for the groundwater COCs from samples collected during the groundwater sampling events at monitoring well 600-G-138 for all project years including Project Year 12 are summarized in Table 3.3. All chemical analytical data for groundwater samples through Project Year 12 are provided in Enclosure 3.

3.2.2 Soil Vapor Monitoring Chemical Analytical Data

Chemical analytical results from soil vapor samples collected during the quarterly vapor sampling events at MSVM well 600-SGW-5 for all project years including Project Year 12 are summarized in Table 3.4. The chemical analytical data from all 600-SGW-5 soil vapor samples associated with the PGEPT though Project Year 12 are provided in Enclosure 3.

3.2.3 Surface Water Chemical Analytical Data

In the July 15, 2015, *Approval with Modifications 600 Area Perched Groundwater Extraction Pilot Test Interim Status Report – Project Year 2*, NMED directed NASA to "…include the nitrate/nitrite water sample data from the lagoon" in future reports (NMED, 2015). NASA ceased wastewater discharge to the lagoons in July 2015 and collected the final set of water samples for waste characterization purposes in September 2015. No further chemical analytical data are available for the wastewater lagoons and NASA no longer reports surface water chemical analytical data from the lagoons.

3.3 Statistical Trends

Appendix A contains statistical data output files and the OLS and M-K graphs performed as part of this evaluation. Enclosure 3 of this submittal includes the data input files in Excel spreadsheets.

3.3.1 Groundwater Trends

Due to normally distributed data and constant variance, OLS regression was performed for groundwater concentrations in well 600-G-138 for COCs chloroform and chloride. TCE and nitrate/nitrite were not distributed normally, so M-K trend tests were completed. PCE and NDMA were not detected frequently enough in groundwater at well 600-G-138 during the PGW pilot study to perform statistics, and therefore neither OLS regression nor M-K were performed for those COCs. Table 3.3 provides a summary of statistics for both groundwater and soil vapor.

All four COCs (TCE, chloride, nitrate/nitrite, and chloroform) tested displayed statistically significant decreasing or downward trends in COC concentrations. Chloride showed a strongly decreasing trend with a large negative *r*-value (-0.6891 and a *p*-value of 0.0000), while chloroform showed a smaller magnitude decreasing trend (*r*-value of -0.4061 and a *p*-value of 0.0038). M-K trend results for nitrate/nitrite showed a statistically significant downward trend, with TCE showing a strongly decreasing trend (S-values of -260 and -835, respectively). M-K trend tests were also completed for chloride and chloroform for comparison purposes. The M-K trends agreed with OLS regression results (*S*-values of -516, and -340). This indicates that COC concentrations within the PGW are decreasing over time (Appendix A).

3.3.2 Soil Vapor Trends

OLS regression (for normally distributed data) or M-K trend tests (for non-normally distributed data) were performed for chloroform and TCE soil vapor concentrations within well 600-SGW-05. Since the regression line in OLS regression represents the population mean and M-K hypothesizes no trend (that concentrations will fluctuate around a constant population mean) it is important that the mean (or median) be determined by detections and not influenced by NDs (EPA, 2009). To ensure this, NASA did not perform OLS regression or M-K trend tests on data sets with greater than 50 percent non-detect (NDs). Therefore, no OLS regression or M-K trend tests were completed for PCE at all depths (with percent NDs of 55, 57, 55, and 78). For use in OLS regression and M-K trend tests, NDs cannot be replaced using Kaplan-Meier or regression on order statistics (ROS) censoring methods. This is because both Kaplan-Meier and ROS assume a stable population, and a trend test may not have a stable population. Therefore, a form of simple substitution or not using NDs are the only options for use in trend tests with NDs (EPA, 2009; ITRC, 2013). ProUCL guidance recommends replacing all NDs for use in trend tests with a single value lower than the lowest detection limit (DL). Multiple DLs cannot be input, or the trend test is invalid (it would be seeing trends in DLs instead of detected values; EPA, 2015; 2022). However, this method only works for NDs with low DLs. NDs with elevated DLs may be outliers from errors or dilution effects. It is recommended that high concentration outliers be deleted from the data set for use in M-K tests (Cameron, 2017). The OLS regression method is similar and is sensitive to outliers. Since it is important to have a regression that is representative of the data (and not NDs), outliers should be removed (EPA, 2009). For chloroform at 7.5 ft, two NDs with high DLs (16 and 32) were removed as well as a high detection outlier (89 micrograms per cubic meter (µg/m$^{3)}$ from April 2024, believed to be a result of a potential transposition of results between the 7.5 ft and 137.5 ft ports for that sampling event). Two outliers were present for chloroform at 102.5 ft depth (a low detection at 15 µg/m^3 and a low ND 0.31 µg/m^3) as listed as an outlier in Rosner's outlier test (Appendix A). These points were removed for trend testing. For the 137.5 ft depth for chloroform, there was one large, detected outlier (20,000 µg/m^3) which was removed and 17 high NDs (where the DL was larger than the adjacent detections at concentrations between 110 and 600 µg/m^3). For TCE at 7.5 ft depth, a large outlier concentration was removed from April 2024 (7,300 µg/m^3) believed to be a potential transposition of results between the 7.5 ft and the 137.5 ft ports. All NDs for trend testing were replaced with DLs less than any detections. Chloroform NDs at 7.5 ft and 137.5 ft were replaced with 0.31 µg/m^3. For TCE there was only one ND in all the data (at 137.5 ft bgs). This value was replaced with 0.3 µg/m^3, a value lower than the lowest detection (Enclosure 3, Excel input file).

A goodness-of-fit test was performed for soil vapor COCs chloroform and TCE (Appendix A). Chloroform was normally distributed at 52.5 ft and 102.5 ft, and at 102.5 ft, TCE was also normally distributed. OLS regression was performed for those COCs/depths. M-K trend tests were completed for chloroform and TCE at all depths. For chloroform in soil vapor at 137.5 ft bgs, there was insufficient statistical evidence of a significant trend in the M-K graph (S-value of -49 and *p*-value greater than 0.05 (0.2171); Appendix A). The null hypothesis was accepted, meaning that there was no trend. However, chloroform at 7.5 ft, 52.5 ft, and 102.5 ft bgs resulted in statistically significant decreasing trends. For chloroform at 7.5 ft, the S-value was -235, a moderate decreasing trend. At 52.5 ft, the *r*-value was -0.5997, showing a moderate decreasing trend. M-K results for that depth indicate a strong decreasing trend with a strongly negative *S*-value (-659) and a *p*-value of zero. For chloroform at 102.5 ft bgs, the OLS regression shows a decreasing trend as well (*r*-value of -0.4725, *S*-value of -459 and a *p*-value of zero [less than 0.05 shows a trend]; Appendix A).

As shown on the TCE soil vapor M-K plots (Appendix A), a statistically significant decreasing or downward trend was present at all depths (7.5 ft bgs with negative M-K test values [-422], and *p*-values less than 0.05 [0.0002] at 52.5 ft with *S*-value of -776 and *p*-value of 0.0000, and at 137.5 ft with an *S*-

value of -348 and *p*-value of 0.0013). OLS regression and M-K results for TCE at 102.5 ft bgs showed strongly decreasing trends (*r*-value of, -0.7579, *S*-value of -764, and a *p*-value of 0.0000; Appendix A).

4.0 Conclusions and Recommendations

4.1 Recent Developments

The 600 Area PGW field investigation conducted between October 2019 and May 2022 included the installation of PGW monitoring well 600A-001-GW screened across the alluvial-andesite bedrock interface (NASA, 2022b). Recent fieldwork for the sewage lagoons soil boring investigation performed in early February through March 22, 2023, subsequently improved the potential to conceptualize the 600 Area PGW unit. During the installation of two deep soil borings to bedrock, both locations positively identified PGW on top of the andesite bedrock surface and were converted to PGW monitoring wells. Well 600A-003-GW was installed on the west side of the 600 Area Overflow Lagoons and well 600A-004-GW within the north cell of the 100 Area Lagoons (Figure 1.2). As a result, the 600 Area PGW unit is available for study in four monitoring wells (600-G-136, 600A-001-GW, 600A-003-GW, and 600A-004-GW). The channelized PGW unit and dispersed nature of PGW wells in the 600 Area is hypothesized to reflect preferential flow along depressions carved by erosion. NASA proposed additional strategies that may be utilized to further evaluate and conceptualize the 600 Area PGW unit in the *600 Area Perched Groundwater Phase II AIWP* on November 27, 2023 (NASA, 2023d). The AIWP was approved by NMED on November 5, 2024 (NMED, 2024d), and the Phase IIa component of fieldwork is scheduled to commence in April 2025.

4.2 Conclusions

The cumulative total volume of PGW extracted and treated from WSTF well 600-G-138 over the 12 project years of the pilot study is 23,136 gallons (Table 3.2), with 2,227 gallons specifically extracted for Project Year 12. Field measurements of the PGW depth in monitoring well 600-G-138 (Table 3.1) over the 12-year project duration of the PGEPT show that groundwater extraction has not significantly reduced the average thickness of PGW on top of andesite bedrock at approximately 3 ft over the evaluation period. The adjacent 600 Area Wastewater Lagoons were drained by July 2017 (NASA, 2019c), and no longer contribute potential infiltration to the area. The annual rainfall at WSTF for Year 12 was below average at 6.60 inches but did not significantly affect the thickness of the PGW even during the period of highest precipitation in July (3.17 inches) that accounted for approximately 48 percent of the total annual rainfall.

Chemical analytical data presented in Section 3.2 and the M-K trends and OLS regressions show that the concentrations of TCE, chloride, nitrate/nitrite and chloroform in groundwater have been declining over the 12 project years of the PGEPT. Concentrations of nitrate/nitrite in PGW samples from 600-G-138 (Table 3.3) for Project Year 12 currently approximate the New Mexico maximum concentration limit of 10 mg/L (for the more conservative nitrite). The nearby former 600 Area Wastewater Lagoons may have contributed to the existence and composition of PGW in the area. The declining trend in both chloride concentrations by approximately 38 percent and nitrate/nitrite concentrations by approximately 19 percent (Table 3.3) over the 12 PGEPT project years and the statistically significant decreasing trends shown by the OLS regression and M-K graphs indicate a lessening in the impact of infiltration from the 600 Area Wastewater Lagoons following their removal.

The TCE concentrations in PGW have shown declines of between 50 to 60 percent over the 12-year duration of the PGEPT (from approximately 100 to 110 micrograms per liter (µg/L) in Project Year 1 to 47 to 49 µg/L in Project Year 12), and a statistically significant decreasing OLS regression and M-K trend. The lower the *p*-value, the more confidence in the result, and the TCE OLS regressions (and M-K trend test) had *p*-values at 0. Concentrations of TCE in the upgradient aquifer of the 200 Area theorized to

be a source of the 600 Area PGW have also declined significantly in recent years. As calculated from concentrations listed in the 4th quarter 2024 PMR, significant reduction of TCE of approximately 86 percent between 1990 through 2024 has been observed within well 200-D-240, and approximately 76 percent between 2007 through 2024 at adjacent well 200-SG-1 (NASA, 2025a). Chloroform, chloride, and nitrate/nitrite concentrations in PGW measured during the PGEPT also show a decreasing trend over the 12 years of the PGEPT. PCE and NDMA have remained undetected in groundwater at well 600-G-138 throughout the project.

Continued PGW extraction at well 600-G-138 has not significantly affected the volume of groundwater migrating through the well. The reduction in the COC concentrations in groundwater samples is inferred to be the result of reduced infiltration of nitrates/nitrites following removal of the 600 Area Wastewater Lagoons, in conjunction with declining VOC concentrations associated with the migrating contaminated groundwater from upgradient locations in the 200 Area (NASA, 2023a). The extraction of PGW from well 600-G-138 is contributing to the removal of contaminant mass from the 600 Area local aquifer. Although the contaminant mass removed over the duration of the pilot test is relatively low compared to other wells in the network, data obtained during this pilot test supported the development of NASA's November 1, 2018, *Targeted Mobile Remediation Process Pilot Test Work Plan* (NASA, 2018b).

Declining concentrations of the PGW COCs appear to have influenced a reduction of the concentrations of COC in soil vapor measured in four ports at depths of 7.5 ft, 52.5 ft, 102.5 ft, and 137.5 ft bgs at adjacent MSVM well 600-SGW-5 (Table 3.4, Figure 4.1). The declining concentration trends are shown in the Appendix A soil vapor M-K graphs, which provide graphical summaries of the detected concentrations of TCE and chloroform in soil vapor at well 600-SGW-5 over the duration of PGW extraction at well 600-G-138. For these two contaminants, well 600-SGW-5 also shows a relationship for increasing soil vapor contaminant concentrations with depth during single sampling events as evidenced by the plots for individual sampling ports. This trend would be anticipated due to the confirmed presence of contaminated shallow PGW at this location. Over the 12 project years of the PGEPT, concentrations of TCE, the primary VOC in soil vapor, trend downward in the monitoring zones at 7.5, 52.5, 102.5, and 137.5 ft bgs (Table 3.4, Figure 4.1). Concentrations of chloroform trend downward in the upper three monitoring zones of MSVM well 600-SGW-05 and are relatively stable in the lowest soil vapor monitoring zone. Soil vapor chemical analytical data from samples collected at 600-SGW-5 has statistically significantly declined over time for TCE in monitoring zones at all depths (Enclosure 3; Appendix A). PCE has been detected less than 55 percent of the time and is below the most conservative cleanup level (residential VISL 1,390 µg/m^3) in all four monitoring zones in soil vapor at well 600-SGW-5.

NASA concludes that the presence of contaminated PGW with declining concentrations of the COCs beneath the Closure continues to contribute to overlying soil vapor in the vadose zone. The reduction in groundwater concentrations within the upgradient 200 Area that is hypothesized to source the 600 Area PGW appears to have had an impact on declining COC concentrations in groundwater at well 600-G-138 and the soil vapor at well 600-SGW-5. Declining concentrations of COCs in the soil vapor appear to have a slight lag relative to the declining concentrations in the PGW.

4.3 Recommendations

On February 19, 2025, NASA submitted the *Proposal to Transition NASA White Sands Test Facility (WSTF) 600 Area Perched Groundwater Extraction Pilot Test (PGEPT) Annual Reporting into Projected Targeted Mobile Remediation Process (TMRP) Annual Reporting Following Submittal of the PGEPT – Project Year 12 Report* (proposal) to NMED (NASA, 2025b). The timing of the proposal coincides with NASA's ongoing implementation and development of the TMRP program at WSTF. The TMRP is

designed to extract additional contaminated groundwater from specific target concentrations/locations within the contaminant plume.

The TMRP Phase 2 Pilot Test Work Plan, submitted to NMED on April 25, 2023 (NASA, 2023c), was approved by NMED on May 15, 2024 (NMED, 2024b). PGEPT monitoring well 600-G-138 represented one of the additional wells proposed for inclusion in the TMRP Phase 2 Work Plan. The NASA WSTF Correction Action Projects; Proposal to Restructure Priorities and Schedule, Table 1.2 submitted to NMED on December 13, 2024 (NASA, 2024c) proposed that the start of TMRP Phase 2 activities be deferred to fiscal year 26 (September 28, 2025, through September 26, 2026). The proposed deferral date may change based on additional evaluation of the restructuring of priorities, and a formal updated extension request is currently in progress.

Most elements of the TMRP data collection and reporting process identified in the TMRP Phase 2 Work Plan for well 600-G-138 correspond to ongoing PGEPT interim status reporting requirements. These elements include 1) records of monthly groundwater elevations and well performance data, 2) monthly volume of groundwater extracted, 3) systematic collection of groundwater indicator parameters, 4) collection of quarterly groundwater chemical analytical samples and evaluation of data, and 5) a summary of investigation-derived waste management and processing at the Mid-plume Interception and Treatment System in accordance with established WSTF procedures and regulatory requirements.

In order to streamline NASA's reporting process to NMED, NASA proposed that 1) the PGEPT interim status reporting requirement at well 600-G-138 be discontinued if NMED approves the transition of PGEPT annual reporting to TMRP annual reporting, 2) groundwater data components previously presented in the annual PGEPT report be incorporated into TMRP interim status reporting upon implementation as presented in the NMED-approved TMRP Phase 2 Pilot Test Work Plan, and 3) annual TMRP reporting including well 600-G-138 be performed within two months of the completion of each project year as defined in the approved TMRP Work Plan.

Data to support justification of the proposal to transition Well 600-G-138 reporting from PGEPT to TMRP was provided in Attachment 1 of the proposal (NASA, 2025b). The data collected over the 12-year duration of the PGEPT supported the primary conclusion presented in the original Year 1 Report that the presence of contaminated PGW beneath the 600 Area Closure likely sourced the volatile organic compounds in the overlying vadose zone soil vapor.

In the interim while the proposal to transition PGEPT to TMRP annual reporting is under review by NMED, NASA will continue the extraction of contaminated PGW from monitoring well 600-G-138 for Project Year 13 in accordance with the 600 Area PGEPTWP (NASA, 2012b). Groundwater and soil vapor samples will continue to be collected quarterly from PGW monitoring well 600-G-138 and MSVM well 600-SGW-5, respectively.

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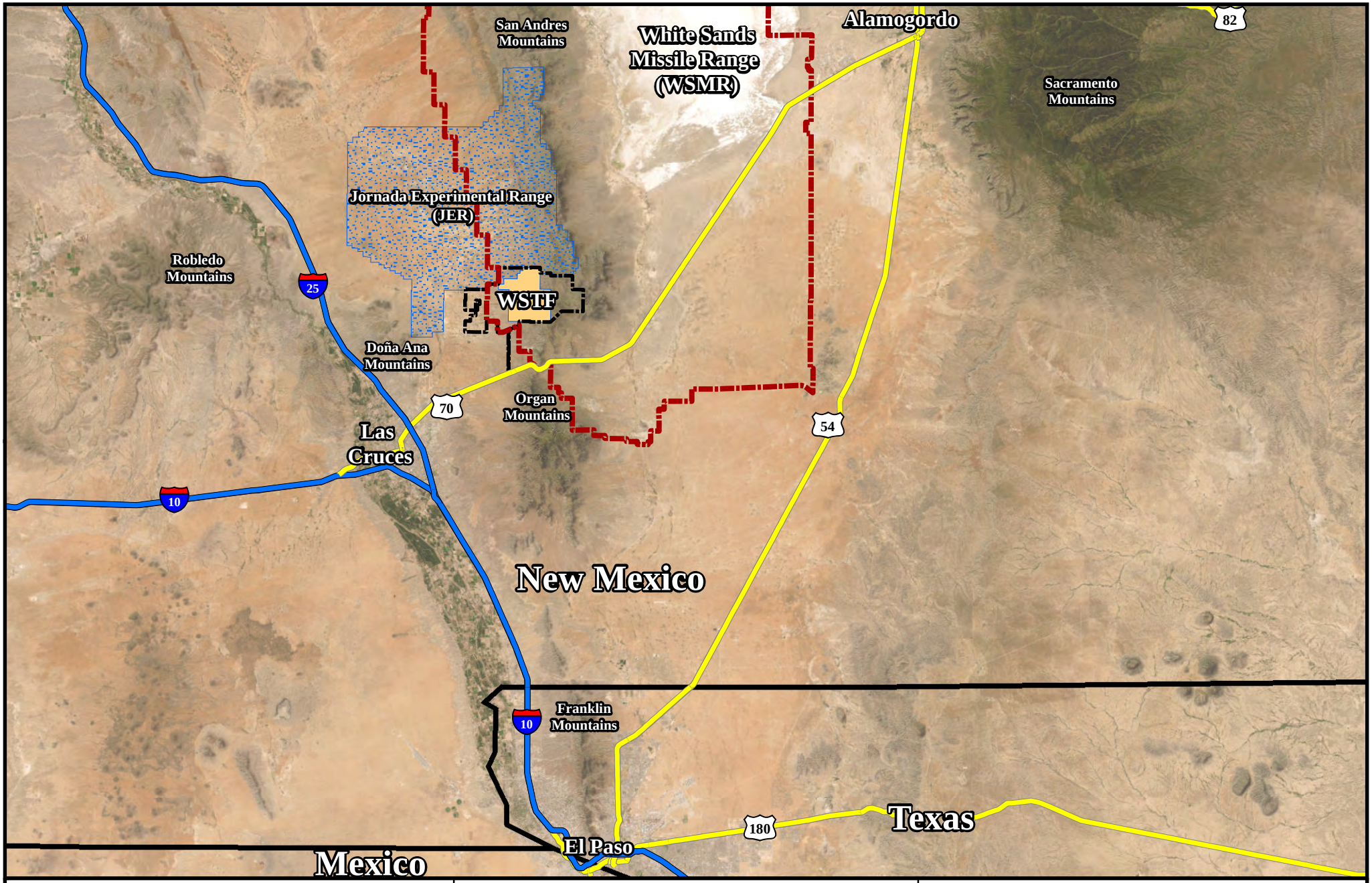
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Figures

Figure 1.1 **WSTF Location Map**

SEE NEXT PAGE



WSTF Location Map

NASA Johnson Space Center
White Sands Test Facility
Las Cruces, New Mexico

Coordinate System:
NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet

G:\Projects\environmental\PMR\2023\1stQuarter

- WSMR Boundary
- WSTF Boundary
- WSTF Industrial Area
- Jornada Experimental Range (JER)

1 in = 12 miles

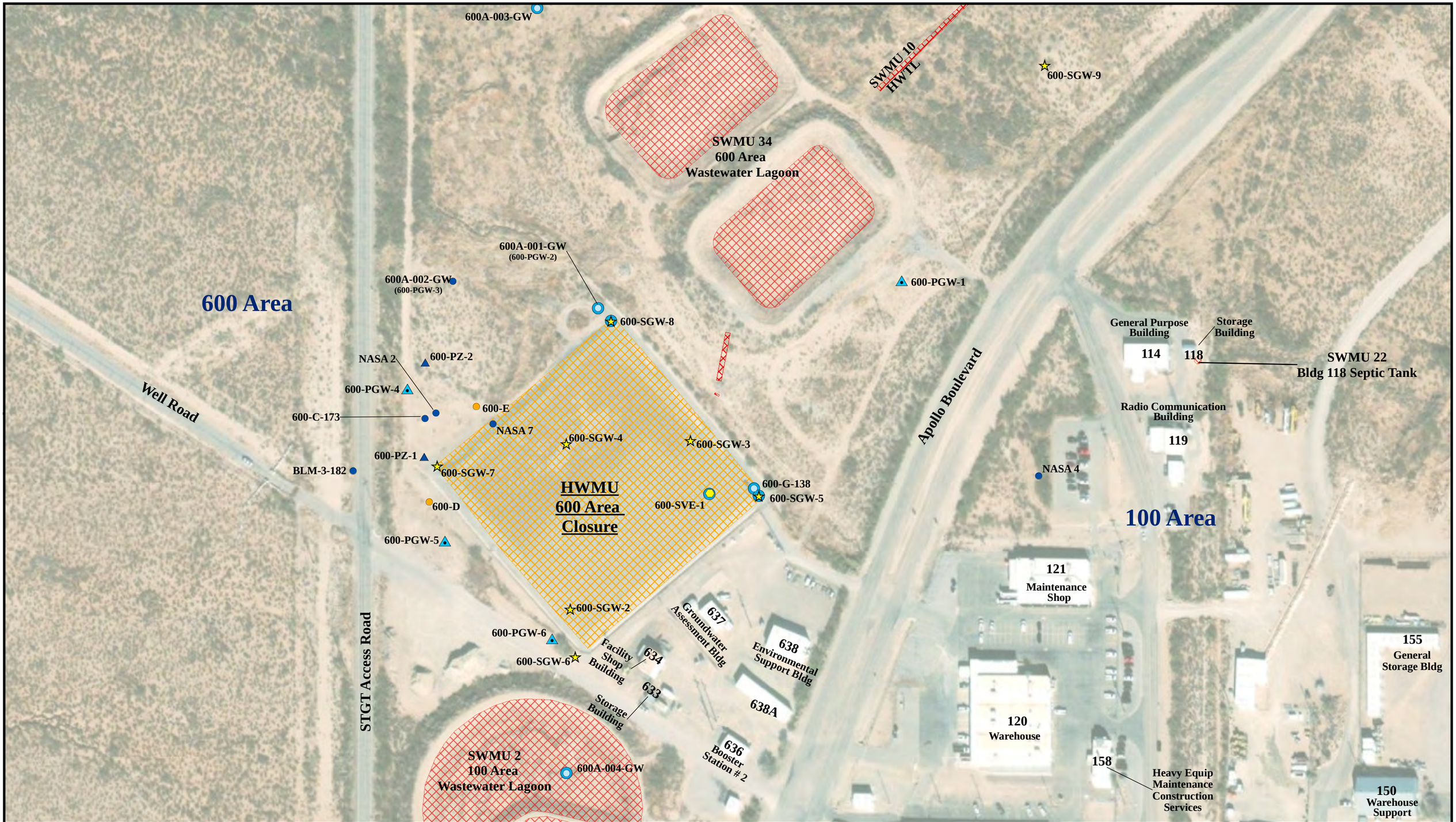
Miles
0 6 12 24

N
W E
S

April 2024

Figure 1.2 **Map of 600 Area Closure**

SEE NEXT PAGE



600 Area Closure Perched Groundwater Boring Locations

NASA Johnson Space Center
White Sands Test Facility Las Cruces, New Mexico

Coordinate System:
NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet

G:\Projects\environmental\600AreaProjects\600_PerchedGW\600PGW_AquiferTest_WP

- Perched Groundwater Monitoring Well
- Conventional Monitoring Well
- Soil Vapor Test Well
- Westbay Multiport Well
- Piezometer
- Multiport Soil Vapor Monitoring Well
- Abandoned Perched Groundwater Exploratory Boring
- Perched Groundwater Identified
- Post Closure Care
- RCRA Area

1 inch = 150 feet

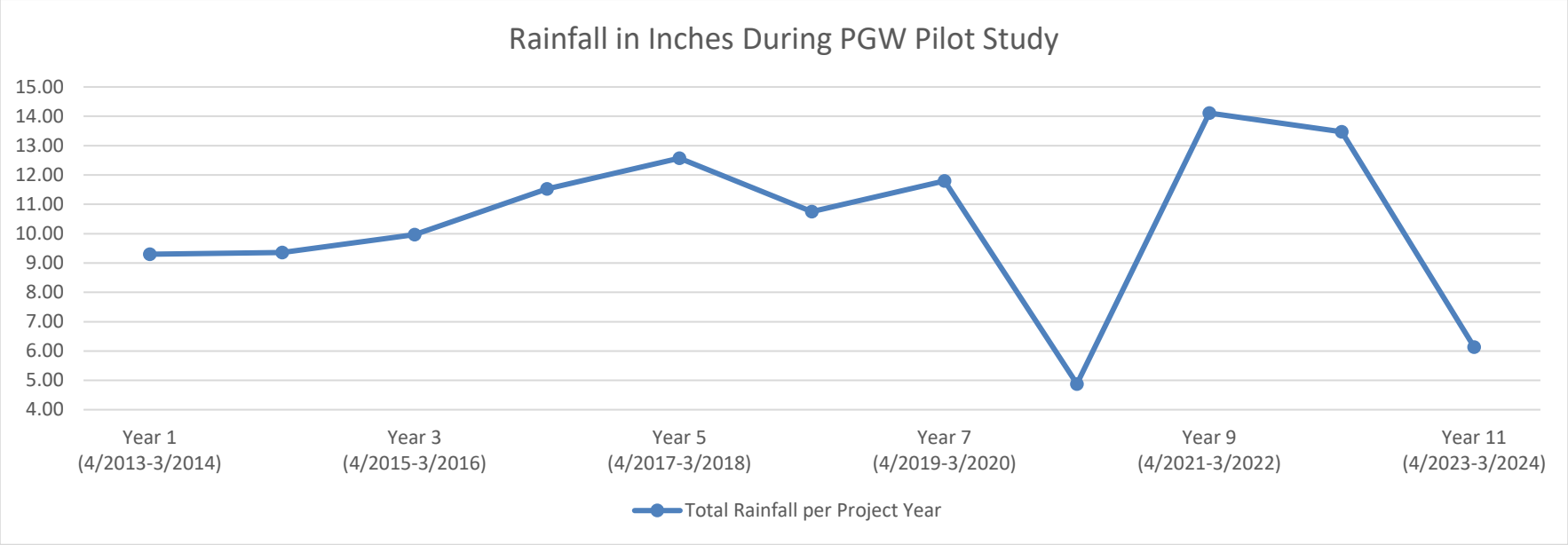
0 150 300 Feet

N W E S

April 2024

Figure 3.1 Rainfall in Inches During PGW Pilot Study

SEE NEXT PAGE


Rainfall in Inches During PGW Pilot Study
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
Year 1 (4/2013-3/2014)
Year 3 (4/2015-3/2016)
Year 5 (4/2017-3/2018)
Year 7 (4/2019-3/2020)
Year 9 (4/2021-3/2022)
Year 11 (4/2023-3/2024)
Total Rainfall per Project Year

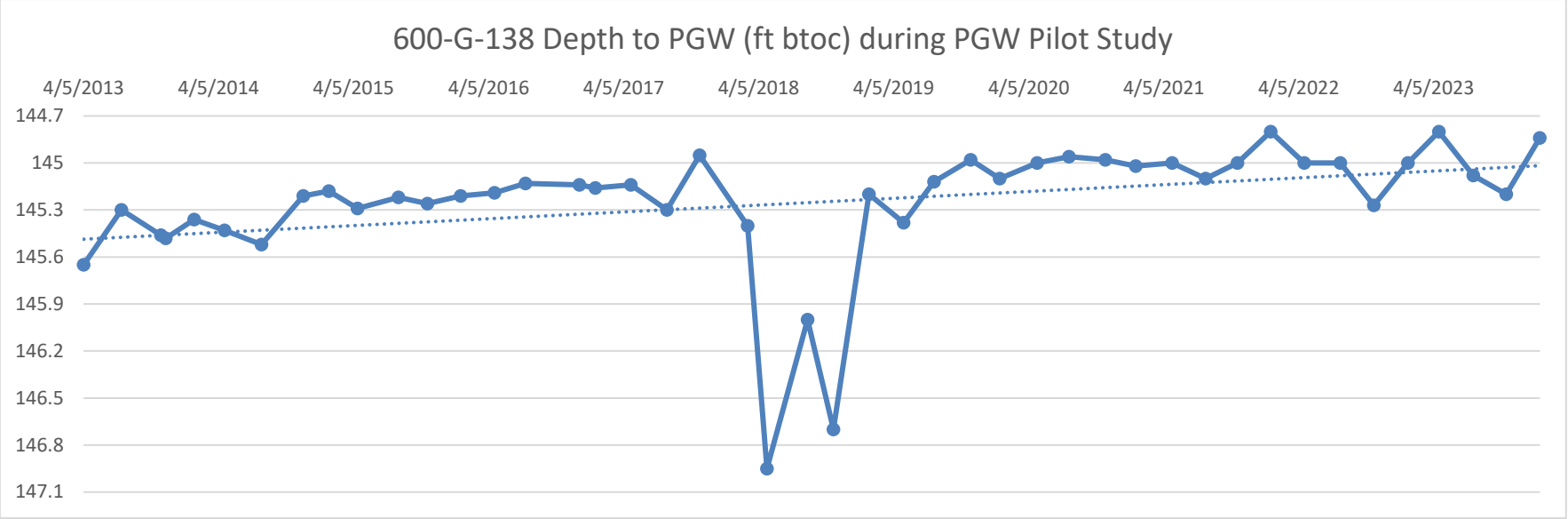
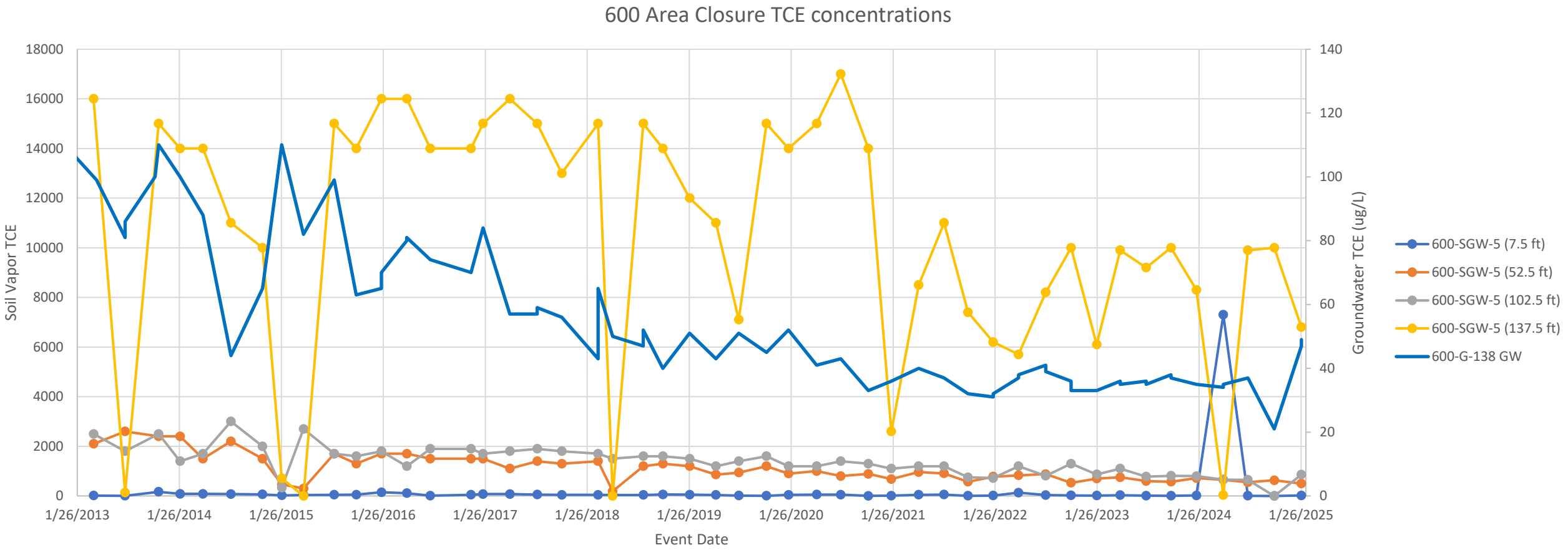
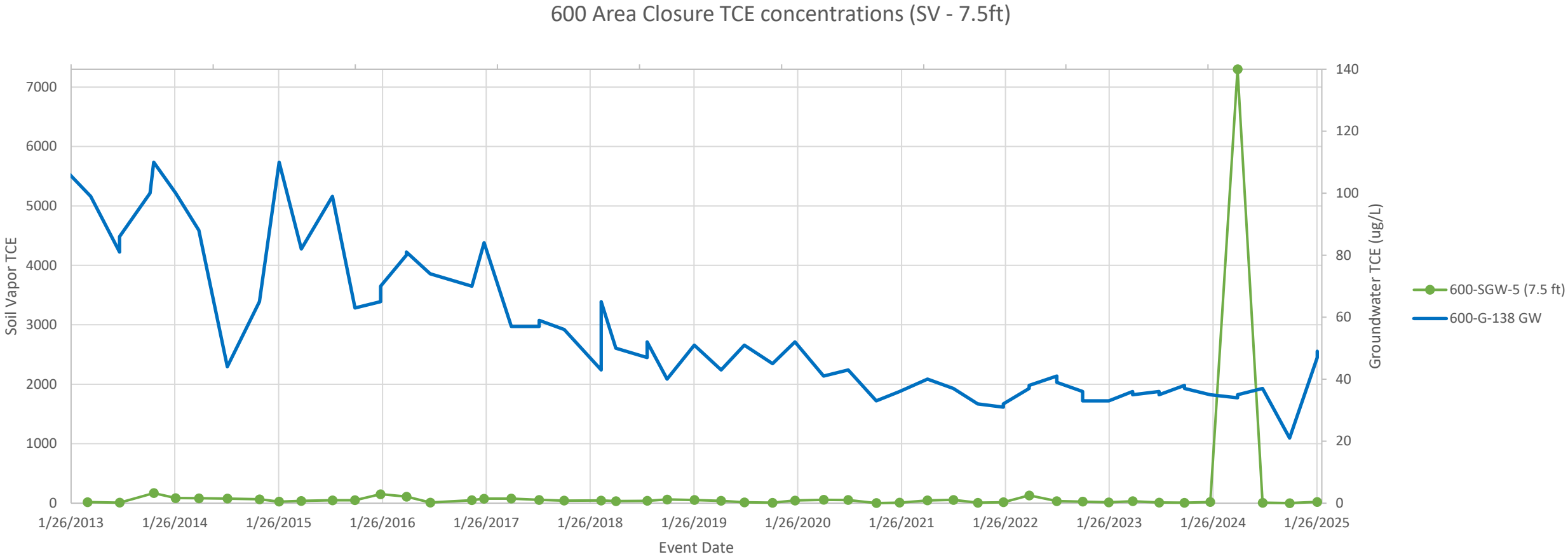
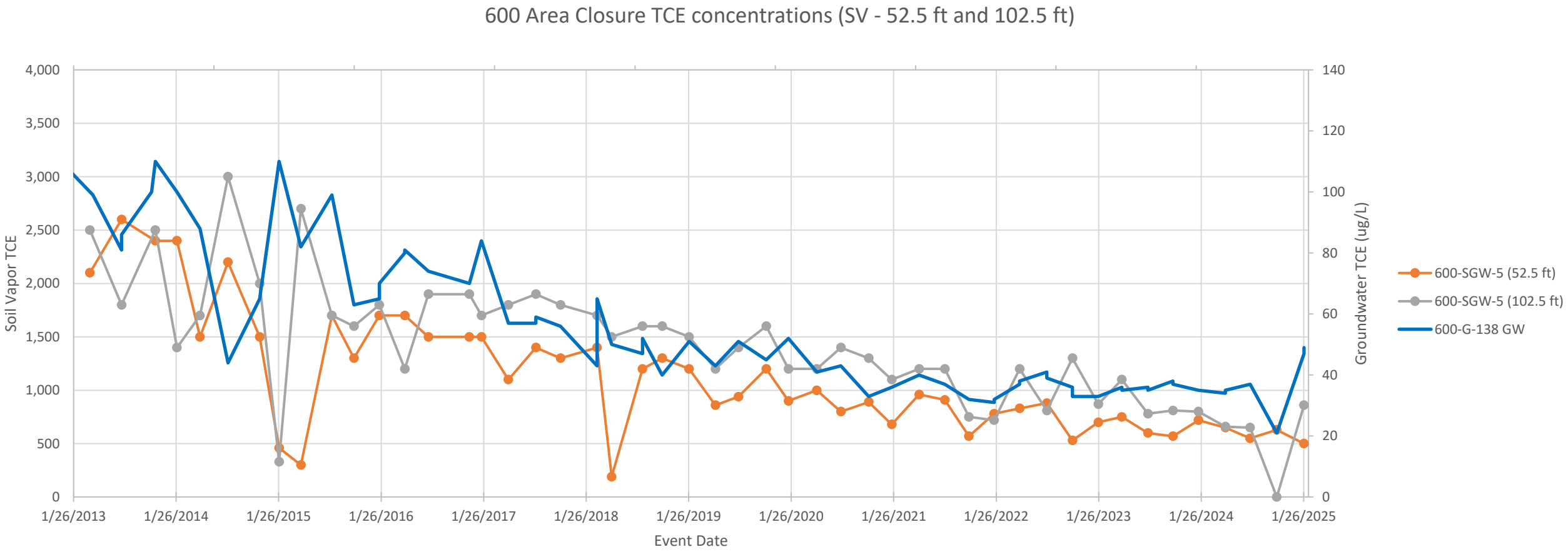

600-G-138 Depth to PGW (ft btoc) during PGW Pilot Study
4/5/2013
4/5/2014
4/5/2015
4/5/2016
4/5/2017
4/5/2018
4/5/2019
4/5/2020
4/5/2021
4/5/2022
4/5/2023
144.7
145
145.3
145.6
145.9
146.2
146.5
146.8
147.1

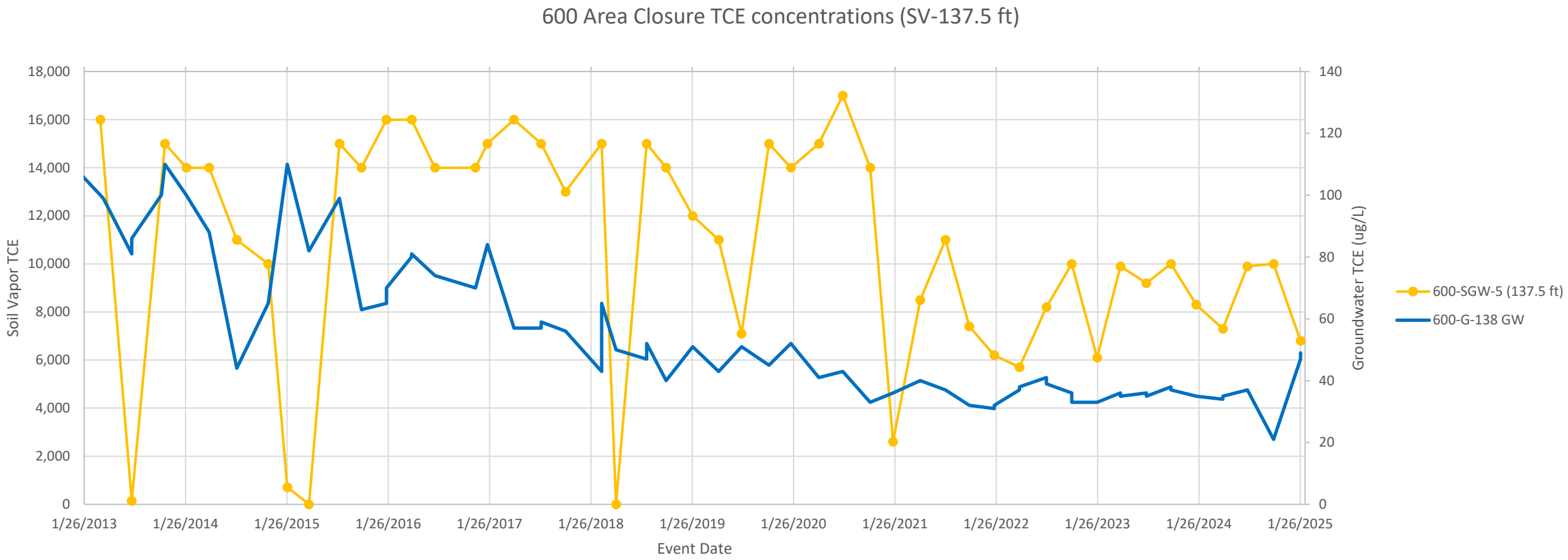
Figure 4.1 **600 Area Closure TCE Concentrations**

SEE NEXT PAGE


600 Area Closure TCE concentrations
Soil Vapor TCE
Groundwater TCE (ug/L)
Event Date
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
140
120
100
80
60
40
20
0
1/26/2013
1/26/2014
1/26/2015
1/26/2016
1/26/2017
1/26/2018
1/26/2019
1/26/2020
1/26/2021
1/26/2022
1/26/2023
1/26/2024
1/26/2025
600-SGW-5 (7.5 ft)
600-SGW-5 (52.5 ft)
600-SGW-5 (102.5 ft)
600-SGW-5 (137.5 ft)
600-G-138 GW


600 Area Closure TCE concentrations (SV - 7.5ft)
Soil Vapor TCE
7000
6000
5000
4000
3000
2000
1000
0
Groundwater TCE (ug/L)
140
120
100
80
60
40
20
0
1/26/2013
1/26/2014
1/26/2015
1/26/2016
1/26/2017
1/26/2018
1/26/2019
1/26/2020
1/26/2021
1/26/2022
1/26/2023
1/26/2024
1/26/2025
Event Date
600-SGW-5 (7.5 ft)
600-G-138 GW


600 Area Closure TCE concentrations (SV - 52.5 ft and 102.5 ft)
Soil Vapor TCE
Groundwater TCE (ug/L)
Event Date
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
140
120
100
80
60
40
20
0
1/26/2013
1/26/2014
1/26/2015
1/26/2016
1/26/2017
1/26/2018
1/26/2019
1/26/2020
1/26/2021
1/26/2022
1/26/2023
1/26/2024
1/26/2025
600-SGW-5 (52.5 ft)
600-SGW-5 (102.5 ft)
600-G-138 GW


600 Area Closure TCE concentrations (SV-137.5 ft)
Soil Vapor TCE
Groundwater TCE (ug/L)
Event Date
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
140
120
100
80
60
40
20
0
1/26/2013
1/26/2014
1/26/2015
1/26/2016
1/26/2017
1/26/2018
1/26/2019
1/26/2020
1/26/2021
1/26/2022
1/26/2023
1/26/2024
1/26/2025
600-SGW-5 (137.5 ft)
600-G-138 GW

Tables

Table 2.1 WSTF Rainfall (inches)

	Project Year 1 (4/2013-3/2014)	Project Year 2 (4/2014-3/2015)	Project Year 3 (4/2015-3/2016)	Project Year 4 (4/2016-3/2017)	Project Year 5 (4/2017-3/2018)	Project Year 6 (4/2018-3/2019)	Project Year 7 (4/2019-3/2020)	Project Year 8 (4/2020-3/2021)	Project Year 9 (4/2021-3/2022)	Project Year 10 (4/2022-3/2023)	Project Year 11 (4/2023-3/2024)	Project Year 12 (4/2024-3/2025)
April	0.00	0.00	0.68	0.50	0.00	0.00	0.34	0.00	0.11	0.00	0.00	0.12
May	0.00	0.00	1.31	0.35	0.59	0.00	0.17	0.00	0.00	0.00	0.59	0.00
June	0.00	0.00	0.15	0.97	0.52	0.63	1.28	0.64	1.36	1.63	0.02	0.17
July	4.37	1.33	2.60	0.20	3.44	2.27	0.13	2.14	5.48	1.47	0.95	3.17
August	1.94	2.74	0.96	2.99	5.35	0.52	1.71	0.36	4.49	4.77	1.36	1.24
September	2.45	2.71	0.75	1.50	0.36	1.51	0.84	0.86	0.85	1.40	0.55	0.00
October	0.00	0.00	1.44	0.09	0.24	3.68	1.29	0.32	0.21	2.50	0.40	0.45
November	0.02	0.51	1.36	0.66	0.37	0.05	1.82	0.04	0.38	0.03	0.21	1.38
December	0.12	0.08	0.28	0.05	0.14	1.12	0.48	0.21	0.00	0.40	0.75	0.00
January	0.00	0.83	0.44	2.92	0.09	0.12	0.16	0.14	0.60	0.99	0.58	0.07
February	0.00	0.71	0.00	1.17	1.43	0.04	1.20	0.12	0.10	0.22	0.68	0.00
March	0.40	0.45	0.00	0.13	0.04	0.81	2.38	0.05	0.53	0.06	0.04	0.00
Total Rainfall per Project Year	**9.30**	**9.36**	**9.97**	**11.53**	**12.57**	**10.75**	**11.80**	**4.88**	**14.11**	**13.47**	**6.13**	**6.60**

Table 3.1 Groundwater Indicator Parameters Measured at 600-G-138

	Date	DTW (ft btoc)		pH		Conductivity (µS/cm)		Temperature (°C)		Turbidity (NTU)	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Project Year 1	4/5/2013	145.65	NA	7.63	7.71	2,120	2,110	21.3	22.8	5.73	4.53
	7/16/2013	145.3	NA	6.96	6.94	2,180	2,210	20.8	20.7	0.89	0.96
	10/31/2013	145.46	NA	7.70	7.76	1,959	1,975	20.8	20.2	1.62	13.3
	11/13/2013	145.48	NA	7.68	7.81	2,270	2,320	19.3	19.8	1.59	1.30
	1/29/2014	145.36	NA	7.18	7.26	1,849	1,837	19.5	19.6	18	17.2
Project Year 2	4/21/2014	145.43	148.12	7.54	7.37	897	913	21.2	21.5	0.98	0.67
	7/30/2014	145.52	147.50	6.71	6.76	2,200	2,220	28.4	28.1	5.81	4.65
	11/20/2014	145.21	147.87	8.49	8.31	2,200	2,240	18.3	18.1	2.51	1.71
	1/28/2015	145.18	147.93	8.29	8.16	1,936	1,922	21.0	21.3	0.68	1.00
Project Year 3	4/16/2015	145.29	147.81	7.58	7.67	1,941	1,959	23.3	23.6	7.45	6.13
	8/4/2015	145.22	147.89	8.19	8.07	1,915	1,928	28.1	27.9	1.96	1.10
	10/22/2015	145.26	147.85	7.66	7.58	1,896	1,909	19.0	19.4	1.10	1.18
	1/20/2016	145.21	148.00	8.25	8.36	1,856	1,844	18.7	18.6	1.75	0.93
Project Year 4	4/20/2016	145.19	147.48	7.61	7.57	1,867	1,873	18.9	17.1	1.54	1.49
	7/13/2016	145.13	147.68	7.23	7.38	1,922	1,908	26.2	26.5	0.93	0.74
	12/6/2016	145.14	146.85	8.41	8.3	2,080	2,140	17.4	18.0	6.67	4.80
	1/18/2017	145.16	147.63	7.74	7.64	2,000	2,020	16.2	16.5	0.98	0.80

	Date	DTW (ft btoc)		pH		Conductivity (µS/cm)		Temperature (°C)		Turbidity (NTU)	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Project Year 5	4/24/2017	145.14	147.22	7.50	7.38	1,861	1,890	27.4	26.8	5.78	2.90
	7/31/2017	145.30	147.64	7.52	7.70	1,843	1,851	26.7	27.3	2.46	2.35
	10/27/2017	144.95	147.33	7.10	6.86	1,774	1,791	17.6	17.9	2.35	1.94
	3/6/2018	145.40	146.57	7.84	7.70	1,840	1,852	21.6	21.9	3.23	2.89
Project Year 6	4/27/2018	146.95	NR	8.27	8.11	1,850	1,868	19.6	19.4	2.42	2.02
	8/15/2018	146.00	147.67	7.02	6.97	1,873	1,876	26.4	26.3	3.45	3.62
	10/24/2018	146.70	NR	7.65	7.78	1,920	1,911	19.9	20.4	28.6	26.4
	1/28/2019	145.20	147.48	7.28	7.35	1,647	1,652	21.7	21.7	8.56	9.02
Project Year 7	5/2/2019	145.38	147.96	7.74	7.62	1728	1750	23.2	23.8	14.7	8.6
	7/23/2019	145.12	147.13	7.58	7.51	1769	1780	20.1	19.8	2.67	1.94
	10/30/2019	144.98	145.16	7.5	7.43	1704	1692	19.6	19.4	3.74	2.75
	1/17/2020	145.10	145.47	7.87	7.68	1698	1709	14.4	14.9	1.98	1.4
Project Year 8	4/27/2020	145.00	146.12	7.70	7.63	1805	1815	23.0	23.2	2.51	1.94
	7/22/2020	144.96	145.38	7.65	7.49	1744	1765	22.4	22.7	1.79	1.48
	10/29/2020	144.98	145.50	7.59	7.41	1780	1750	20.8	21.0	1.17	1.13
	1/19/2021	145.02	145.36	8.00	7.91	1865	1876	18.3	18.0	13.20	11.80
Project Year 9	4/27/2021	145.00	145.61	7.76	7.68	2420	2440	20.1	19.8	17.6	8.75
	7/27/2021	145.10	147.10	7.81	7.90	1976	1964	23.5	23.4	13.10	10.20
	10/21/2021	145.00	145.60	7.85	7.95	1699	1714	18.6	18.8	1.71	1.64
	1/19/2022	144.80	145.27	7.82	7.94	1651	1658	20.9	21.2	4.23	3.13

	Date	DTW (ft btoc)		pH		Conductivity (µS/cm)		Temperature (°C)		Turbidity (NTU)	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Project Year 10	4/20/2022	145.00	145.00	7.73	7.58	2260	2260	18.2	18.8	0.59	1.49
	7/26/2022	145.00	145.19	7.75	7.70	2130	2130	22.5	23.1	0.70	0.74
	10/25/2022	145.27	145.35	7.85	7.92	1972	1979	20.4	20.6	1.57	1.34
	1/25/2023	145.00	144.90	8.12	8.33	1653	1633	17.0	16.8	1.35	5.86
Project Year 11	4/19/2023	144.80	146.40	7.94	7.87	1683	1702	20.3	20.1	1.88	2.12
	7/21/2023	145.08	145.33	7.94	8.01	1963	1960	25.2	25.4	3.77	2.94
	10/18/2023	145.20	145.38	7.92	7.99	1813	1819	19.5	19.7	1.37	1.23
	1/17/2024	144.84	145.08	8.38	8.46	2430	2440	17.7	17.9	4.14	3.76
Project Year 12	4/22/2024	145.13	145.89	8.27	8.15	1792	1852	21.1	21.9	2.68	2.56
	7/19/2024	NR	NR	8.30	8.39	1857	1846	25.2	24.9	1.08	1.16
	10/22/2024	145.12	145.46	8.18	8.23	1895	1884	24.5	24.8	2.10	1.78
	1/27/2025	145.10	NR	8.87	NR	1840	NR	11.8	NR	NR	NR

Notes:
Well 600-G-138 top of casing stickup = 1.98 ft above ground surface.
NR = Not Recorded.

Table 3.2 Volume of Perched Groundwater Extracted from 600-G-138 (gallons)

	Project Year 1 (4/2013-3/2014)	Project Year 2 (4/2014-3/2015)	Project Year 3 (4/2015-3/2016)	Project Year 4 (4/2016-3/2017)	Project Year 5 (4/2017-3/2018)	Project Year 6 (4/2018-3/2019)	Project Year 7 (4/2019-3/2020)	Project Year 8 (4/2020-3/2021)	Project Year 9 (4/2021-3/2022)	Project Year 10 (4/2022-3/2023)	Project Year 11 (4/2023-3/2024)	Project Year 12 (4/2024-3/2025)
April	85	191	132	208	125	188	217	201	210	100	98	197
May	319	197	161	249	207	48	172	195	191	175	156	244
June	255	283	201	219	194	0	86	246	238	167	130	164
July	146	285	271	167	166	0	0	227	182	135	78	212
August	142	275	210	230	158	42	0	267	222	205	194	238
September	65	199	226	149	205	161	0	235	135	154	196	165
October	29	236	179	171	250	229	0	180	223	168	72	241
November	74	197	155	144	0	120	69	186	230	117	120	169
December	76	203	120	91	0	151	140	172	283	133	195	95
January	215	164	141	130	0	115	158	101	27	72	148	89
February	170	164	143	182	0	174	104	183	110	83	210	196
March	294	216	205	140	203	198	218	180	229	163	185	217
Total Extracted per Year	**1,870**	**2,610**	**2,144**	**2,080**	**1,508**	**1,426**	**1,164**	**2,373**	**2,280**	**1,672**	**1,782**	**2,227**
Cumulative Total	**1,870**	**4,480**	**6,624**	**8,704**	**10,212**	**11,638**	**12,802**	**15,175**	**17,455**	**19,127**	**20,909**	**23,136**

Table 3.3 Summary of Groundwater Chemical Analytical Results at 600-G-138

	Date	TCE (µg/L)	PCE (µg/L)	Chloroform (µg/L)	NDMA (µg/L)	NO2/NO3 (mg/L)	Chloride (mg/L)
Project Year 1	4/5/2013	**99**	<0.3	0.63 J	**<0.0044**	**12.3**	266
	7/16/2013	**81/86**	<0.3/<0.3	0.5/0.54 J	**<0.0044**	**13.5**	281
	10/31/2013	**100**	<0.3	0.73 J	**<0.019**	**12.9**	292
	11/13/2013	**110**	<0.3	0.68 J	+	+	+
	1/29/2014	**100/100**	<0.3/<0.3	0.61/0.65 J	**<0.019**	**12**	238
Project Year 2	4/21/2014	**88**	<0.3	0.61 J	**<0.0047**	**12**	242
	7/30/2014	**44**	<0.3	0.51 J	NA	**12.8**	265
	11/20/2014	**65**	<0.3	0.56 J	NA	**12.6**	282
	1/28/2015	**110**	<0.3	0.83 J	NA	**11.3**	221
Project Year 3	4/16/2015	**82**	<0.3	0.54 J	**<0.019**	**11.8**	226
	8/4/2015	**99**	<0.3	0.77 J	NA	**11.2**	238
	10/22/2015	**63/63**	<0.3/<0.3	0.7/0.64 J	NA	**11.1**	233
	1/20/2016	**65/70**	<0.3/<0.3	0.7/0.73 J	NA	**10.1**	232
Project Year 4	4/20/2016	**80/81**	<0.3/<0.3	0.67/0.76 J	**<0.0048**	**11.2**	214
	7/13/2016	**74**	<0.3	0.72 J	NA	**11.4**	238
	12/6/2016	**70**	<0.3	0.6 J	NA	**11.3**	253
	1/18/2017	**84**	<0.3	0.68 J	NA	9.98	251/249
Project Year 5	4/24/2017	**57**	<0.3	0.65 J	**<0.0097**	**12**	241
	7/31/2017	**57/59**	<0.3/<0.3	0.81/0.74 J	NA	**12.5**	141
	10/27/2017	**56**	<0.3	0.65 J	NA	6.81	169
	3/6/2018	**63/65**	<0.3/<0.3	0.77/0.65 J	NA	**11**	205

	Date	TCE (µg/L)	PCE (µg/L)	Chloroform (µg/L)	NDMA (µg/L)	NO2/NO3 (mg/L)	Chloride (mg/L)
Project Year 6	4/27/2018	**50**	<0.3	0.83 J	**<0.048**	**11.1**	207
	8/15/2018	**47/52**	<0.28/<0.28	1.2/1.2	NA	**10.2**	236
	10/24/2018	**40**	<0.28	0.57 J	NA	**10.6**	212
	1/28/2019	**51**	<0.28	0.71 J	NA	**10.8**	164
Project Year 7	5/2/2019	**43**	<0.21	0.58 J	**<0.019**	**10.7**	171
	7/23/2019	**51**	<0.21	0.63 J	NA	**11.9**	177
	10/30/2019	**45**	<0.21	0.47 J	NA	9.09	214
	1/17/2020	**52**	<0.21	0.68 J	NA	**10.2**	185/182
Project Year 8	4/27/2020	**41**	<0.21	0.64 J	**<0.048**	9.43	182
	7/22/2020	**43**	<0.21	0.45 J	NA	**12.3**	179
	10/29/2020	**33**	<0.21	0.27 J	NA	**11.1**	168
	1/19/2021	**36**	<0.21	0.50 J	NA	**11.0**	173
Project Year 9	4/27/2021	**40**	<0.21	0.51 J	**<0.1**	**11.5**	205
	7/27/2021	**37**	<0.21	0.26 J	NA	**12.4**	221
	10/21/2021	**32**	<0.21	0.52 J	NA	9.43	161
	1/19/2022	**31/32**	<0.21/<0.21	0.27/0.28 J	NA	**11.2**	166
Project Year 10	4/20/2022	**37/38**	<0.21/<0.21	<0.24/<0.24	**<0.0047**	**11.2**	177
	7/26/2022	**41/39**	<0.21/<0.21	<0.48 J/<0.48 J	NA	**11.8**	188
	10/25/2022	**36/33**	<0.21/<0.21	0.60 J/0.52 J	NA	**10.9**	159
	1/25/2023	**33**	<0.21	<0.51	NA	5.32	137
	4/19/2023	**36/35**	<0.21/<0.21	0.57/<0.51	**<0.0048**	**10.4**	171

	Date	TCE (µg/L)	PCE (µg/L)	Chloroform (µg/L)	NDMA (µg/L)	NO2/NO3 (mg/L)	Chloride (mg/L)
Project Year 11	7/21/2023	**36/35**	<0.21/<0.21	0.52/0.57	NA	**12.3**	170
	10/18/2023	**38/37**	<0.21/<0.21	<0.51/<0.51	NA	**11.0**	191
	1/17/2024	**35**	<0.21	<0.51	NA	**11.9**	204
Project Year 12	4/22/2024	**34/35**	<0.21/<0.21	0.53/0.58	NA	**11.9**	200
	7/19/2024	**37/37**	<0.21/<0.21	0.63/0.63	NA	**10.8**	245
	10/22/2024	**21**	<0.21	<0.51	NA	**11.4**	196
	1/27/2025	**47/49**	<0.21/<0.21	0.59/0.64	NA	**10.9**	181

Note: Two values in the results column indicates that a field duplicate sample was collected, analyzed, and presented as the second result.

J – Indicates the result is an estimated value less than the quantitation limit, but greater than or equal to the detection limit.

NA – Indicates that the analyte was not monitored for the event. NDMA samples are collected annually in accordance with the approved GMP (NASA, 2023e; NMED, 2023d).

< – Indicates that the analyte was not detected above the detection limit.

+ – Indicates that samples were not collected for the specified analysis during this event. The 11/13/13 sampling event was performed in order to obtain results for VOCs that could be used in conjunction with soil vapor analytical results from sampling performed the same day. Additional results for NDMA, NO2/NO3, and chloride were not required for this comparison, so additional samples were not collected.

Groundwater cleanup levels: TCE 4.9 µg/L; PCE 5 µg/L; Chloroform 2.2 µg/L; NDMA 0.0011 µg/L; and Nitrite/Nitrate 10 mg/L (from the GMP; NASA, 2023e; NMED, 2023d); and chloride 250 mg/L (WQCC MCL).

Bold indicates exceedance of groundwater regulatory limit.

Table 3.4 Summary of Soil Vapor Chemical Analytical Results at 600-SGW-5 (results in µg/m³)

WSTF RBC		**380**	**10,000**	**210**	**3,400**	**93,000**	**1,800**	**6,800**	**180,000**	**3,600**	**6,800**	**180,000**	**6,800**
Residential VISL_sg[1] NC/C		**69.5 / 147**	**1,390 / 3,600**		**3,410 / 40.7**	**---**	**---**		**---**	**---**	**---**	**---**	**---**
		600-SGW-5-7.5			**600-SGW-5-52.5**			**600-SGW-5-102.5**			**600-SGW-5-137.5**		
	Date	**TCE**	**PCE**	**Chloro-form**	**TCE**	**PCE**	**Chloro-form**	**TCE**	**PCE**	**Chloro-form**	**TCE**	**PCE**	**Chloro-form**
Project Year 1	3/25/13	17	<0.46	0.63 J	2,100	<14	88	2,500	<26	100 J	**16,000**	<460	<540
	7/16/13	8.7 FB	<0.54	<0.65	2,600 D	1.8 J	94 A	650/ 1,800 D	2.8/2.8	110/ 110 A	140	1.3 J FB	5.8 A
	11/13/13	170	<2.7	5.4 J	2,400	<14	100	2,500	<27	100	**15,000**	<380	<460
	1/29/14	85	<0.49	2.2	2,400	<7.1	90	1,400	<4.9	58	**14,000**	<64	110 J
Project Year 2	4/21/14	82	<1.6	3 J	1,500	<3.3	67	1,700 D	2.5 J	82	**14,000**	<410	<490
	7/30/14	77	6.1 FB	3.3	2,200	<9.4	99	3,000	<15	120	**11,000**	<210	<260
	11/20/14	65	<6.3	2.2 J	1,500	<12	72	2,000	<13	86	**10,000**	<350	<430
	1/28/15	25	<1.1	<1.4	460	<1.2	22	330	<2.3	15	710	<12	<14
Project Year 3	4/16/15	37	<2	<2.4	300[1]	<0.56[1]	13[1]	2,700[1]	<15[1]	110[1]	<1.9	<1.9	<2.3
	8/4/15	48	0.77 J FB	1.7 J	1,700 D	<4.4	85	1,700 D	<4.6	100	**13,000/ 15,000**	<45/ <92	120/ 140 J
	10/22/15	50	<0.71	1.5 J	1,300	<9	54	1,600	<3.8	68	**14,000**	<170	<210
	1/20/16	150	<0.57	5.4	1,600/ 1,700	<11/ <9	77/84	1,800	<15	81	**16,000**	<240	<290
Project Year 4	4/20/16	110/ 100	<1.2/ <1.1	4.2/3.9	1,700	<2.3	78	1,200	<2.1	54	**16,000 D**	<15	130
	7/13/16	11 FB	<0.57	<0.69	1,500	<2.4	82	1,900	<16	91	**14,000**	<490	<600
	12/6/16	49	<0.54	1.7 J	1,500	<4.4	73	1,900	<7.3	82	**12,000/ 14,000**	<380/ <340	<460/ <410
	1/18/17	75	10 FB	3.7 J	1,500	<9	76	1,700	<12	79	**15,000**	<370	<450

WSTF RBC		380	10,000	210	3,400	93,000	1,800	6,800	180,000	3,600	6,800	180,000	6,800
Residential VISL_sg[1] NC/C		69.5 / 147	1,390 / 3,600		3,410 / 40.7	---	---		---	---	---	---	---
		600-SGW-5-7.5			600-SGW-5-52.5			600-SGW-5-102.5			600-SGW-5-137.5		
	Date	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form
Project Year 5	4/24/17	77	<0.59	3.0	1,100 D	16	84	1,800 D	2.6 J	86	**16,000/ 16,000**	<24/ <25	110/ 110
	7/31/17	54	<13	<16	1,200/ 1,400	<11/ <11	66/80	1,900	<12	98	**15,000**	<33	110 J
	10/27/17	43	2.5 FB	1.4 J	1,300	3.1 J	73	1,800	<15	87	**13,000**	<280	<340
	3/6/18	44	2.0 FB	1.3 J	1,400/ 1,400	<7/ <4.2	70/69	1,700	<14	87	**15,000**	<150	<180
Project Year 6	4/27/18	34	1.2 J FB	1.7 J	190	2.3	11	1,500	3.2 J	83	1.3 J FB	<0.55	0.67
	8/15/18	39	1.2 J FB	1.4 J	1,200	<2.3	59	1,600	<4	77	**15,000**	230 J	<150
	10/24/18	61	0.47 J FB	2.1	1,300	<2.4	65	1,600/ 1,600	<5.3/ <4.6	80/ 78	**14,000**	<120	<120
	1/28/19	53	<0.29	2.1	1,200	1.3 J	68	1,500	<3.7	79	**12,000**	<44	81 J
Project Year 7	5/2/19	40	0.95 J FB	1.6 J	860 D	2.9	57	1,200 D	2.1	69	**11,000**	<59	67 J
	7/23/19	14 FB	0.68 J FB	0.67 J	940 D	1.8 J	62	1,400 D	2.4	78	**7,100 D**	<6.1	74
	10/30/19	7 FB	3.4	0.36 J	1,200	<2.4	70	1,600	<4.4	86	**15,000**	<140	200 J
	1/17/20	45	<0.28	1.5 J	900 D	1.8 J	58	1,200 D	2.5	76	**14,000**	<49	87 J
Project Year 8	4/27/20	57	0.43 J	2.5	1,000	<2.8	54	1,200	<3	64	**15,000**	<36	91 J
	7/22/20	53	0.93 J	2.3	800 D	1.5 J	49	1,400 D	3.1 J	80	**17,000**	810 J	120 J
	10/29/20	2.3 FB	<0.3	<0.31	890	2.3 J	61	1,300	2.6 J	82	**14,000**	200 J	<130
	1/19/21	9.2	<0.27	0.52 J	680 D	1.5 J	56	1,100 D	2.0 J	78	2,600 D	0.95 J	24

WSTF RBC		380	10,000	210	3,400	93,000	1,800	6,800	180,000	3,600	6,800	180,000	6,800
Residential VISL_sg[1] NC/C		69.5 / 147	1,390 / 3,600		3,410 / 40.7	---	---		---	---	---	---	---
		600-SGW-5-7.5			600-SGW-5-52.5			600-SGW-5-102.5			600-SGW-5-137.5		
	Date	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form
Project Year 9	4/27/21	47	2.7	2.4	960	<1.9*	56	1,200	<2.3*	67	**8,500**	19 J	67
	7/27/21	55	0.49 J	2.5	910 D	1.5 J	61	1,200 D	2.0 J	78	**11,000 D**	<7.5*	100
	10/21/21	7.4	1.2 J	0.36 J	570 D	1.1 J	35	750	1.5 J	54	**7,400**	<24*	59 J
	1/19/22	16	0.64 J	0.74 J	780	0.86 J	38	720	0.98 J	46	6,200	84 J	44 J
Project Year 10	4/20/22	130	<0.37	4.2 FB	830	<1.6	50 FB	1,200	<7.6	61 FB	5,700	<62	<64
	7/26/22	34	0.4 J	1.7 J	880	<2.4	56	810	2.7 J	51	**8,200**	<25	67
	10/25/22	25	0.71 J	1.0 J	530 D	2.5	28	1,300 D	3.0	62	**10,000**	<11	70 J
	1/25/23	14	<0.28	0.54 J	700 D	1.4 J	36	870 D	1.6 J	44	6,100	<7.7	92
Project Year 11	4/19/23	33	<0.30	<0.31	750	<1.3	47	1,100	<3.1	68	**9,900**	<12	<13
	7/21/23	11	<0.31	0.74 J	600 D	0.92 J	41	780 D	1.1 J	53	**9,200**	1,100	94 J
	10/18/23	6.3	<0.29	2.0 J RB	570	<1.4	40 J RB	810	2.2 J	94 J RB	**10,000**	670	20,000 J RB
	1/17/24	19	<0.27	1.0 J	720	<2.2	52	800	2.3 J	57	**8,300**	1,300	<110

WSTF RBC		380	10,000	210	3,400	93,000	1,800	6,800	180,000	3,600	6,800	180,000	6,800
Residential VISL_sg[1] NC/C		69.5 / 147	1,390 / 3,600		3,410 / 40.7	---	---		---	---	---	---	---
		600-SGW-5-7.5			600-SGW-5-52.5			600-SGW-5-102.5			600-SGW-5-137.5		
	Date	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form	TCE	PCE	Chloro-form
Project Year 12	4/22/24[2]	**7,300**	3.7	89	650	1.6	53	660	3.7	130	30	0.4	1.7
	7/19/24	6.4	0.54	0.48	550	1.5	44	650	1.6	55	**9,900**	<8.2	82
	10/22/24	<0.3	<0.28	<0.29	630	2.7	46	0.4	<0.3	<0.31	**10,000**	<7.8	73
	1/27/25	21	<0.28	<0.29	500	1.2	41	860	1.6	59	**6,800**	<59	<61

Notes:
Two values in the results column indicates that a field duplicate sample was collected, analyzed, and presented as the second result.
A – Indicates that the result of an analyte for a laboratory control sample (LCS), initial calibration verification (ICV) or continuing calibration verification (CCV) was outside standard limits.
D – Indicates that the reported result is from a dilution.
FB – Indicates that the analyte was detected in the field blank.
J – Indicates that the result is an estimated value less than the quantitation limit, but greater than or equal to the detection limit.
RB – The analyte was detected in the method blank.
[1] – The result provided is from replacement samples collected on May 20, 2015.
* – Indicates that the analyte was reported as non-detect with an elevated detection limit and dilution factor.
< – Indicates result is non-detect at reported detection limit.
[1] Residential VISL for soil vapor used. The values are listed as noncancer / cancer.
[2] The data for the 4/22/24 soil vapor sampling event for 600-SGW-5 represents an unconfirmed exceedance of the RBC for the 7.5-ft port. NASA suspects the 7.5-ft and 137.5-ft ports were transposed for the April 2024 event; however, QA reviews of the available records cannot confirm this. The dataset represents a single event outlier for the two ports relative to the 12-year duration of the PGEPT. If transposed, the results are representative of the historical values for all TO-15 analytes.
Bold indicates exceedance of current residential RBC in Table 3b (NASA, 2024b).

Appendix A
Mann-Kendall Calculations

	A	B	C	D	E	F	G	H	I	J	K
1	**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**										
2	**User Selected Options**										
3	Date/Time of Computation			ProUCL 5.2 4/21/2025 7:53:35 AM							
4	From File			600-G-138_GW_2025_Input.xls							
5	Full Precision			OFF							
6	Confidence Coefficient			0.95							
7											
8											
9	**Chloride**										
10											
11	**Raw Statistics**										
12	Number of Valid Observations					48					
13	Number of Distinct Observations					41					
14	Minimum					137					
15	Maximum					292					
16	Mean of Raw Data					207.7					
17	Standard Deviation of Raw Data					38.42					
18	Khat					29.97					
19	Theta hat					6.929					
20	Kstar					28.11					
21	Theta star					7.387					
22	Mean of Log Transformed Data					5.319					
23	Standard Deviation of Log Transformed Data					0.186					
24											
25	**Normal GOF Test Results**										
26											
27	Correlation Coefficient R					0.987					
28	Shapiro Wilk Test Statistic					0.961					
29	Shapiro Wilk Critical (0.05) Value					0.947					
30	Approximate Shapiro Wilk P Value					0.187					
31	Lilliefors Test Statistic					0.102					
32	Lilliefors Critical (0.05) Value					0.127					
33	**Data appear Normal at (0.05) Significance Level**										
34											
35	**Gamma GOF Test Results**										
36											
37	Correlation Coefficient R					0.99					
38	A-D Test Statistic					0.446					
39	A-D Critical (0.05) Value					0.748					
40	K-S Test Statistic					0.0947					
41	K-S Critical(0.05) Value					0.128					
42	**Data appear Gamma Distributed at (0.05) Significance Level**										
43											

	A	B	C	D	E	F	G	H	I	J	K
44	**Lognormal GOF Test Results**										
45											
46					Correlation Coefficient R	0.991					
47					Shapiro Wilk Test Statistic	0.968					
48					Shapiro Wilk Critical (0.05) Value	0.947					
49					Approximate Shapiro Wilk P Value	0.34					
50					Lilliefors Test Statistic	0.0875					
51					Lilliefors Critical (0.05) Value	0.127					
52	**Data appear Lognormal at (0.05) Significance Level**										
53											
54	**Chloroform**										
55											
56				**Raw Statistics**							
57					Number of Valid Observations	49					
58					Number of Distinct Observations	35					
59					Minimum	0.24					
60					Maximum	1.2					
61					Mean of Raw Data	0.603					
62					Standard Deviation of Raw Data	0.164					
63					Khat	12.6					
64					Theta hat	0.0479					
65					Kstar	11.84					
66					Theta star	0.051					
67					Mean of Log Transformed Data	-0.545					
68					Standard Deviation of Log Transformed Data	0.301					
69											
70				**Normal GOF Test Results**							
71											
72					Correlation Coefficient R	0.956					
73					Shapiro Wilk Test Statistic	0.936					
74					Shapiro Wilk Critical (0.05) Value	0.947					
75					Approximate Shapiro Wilk P Value	0.0136					
76					Lilliefors Test Statistic	0.121					
77					Lilliefors Critical (0.05) Value	0.126					
78	**Data appear Approximate Normal at (0.05) Significance Level**										
79											
80				**Gamma GOF Test Results**							
81											
82					Correlation Coefficient R	0.958					
83					A-D Test Statistic	1.407					
84					A-D Critical (0.05) Value	0.749					
85					K-S Test Statistic	0.15					
86					K-S Critical(0.05) Value	0.126					
87	**Data not Gamma Distributed at (0.05) Significance Level**										
88											

	A	B	C	D	E	F	G	H	I	J	K
89	**Lognormal GOF Test Results**										
90											
91					Correlation Coefficient R	0.933					
92					Shapiro Wilk Test Statistic	0.885					
93					Shapiro Wilk Critical (0.05) Value	0.947					
94					Approximate Shapiro Wilk P Value	6.1667E-5					
95					Lilliefors Test Statistic	0.172					
96					Lilliefors Critical (0.05) Value	0.126					
97	**Data not Lognormal at (0.05) Significance Level**										
98											
99	**NO2NO3**										
100											
101				**Raw Statistics**							
102					Number of Valid Observations	48					
103					Number of Distinct Observations	35					
104					Minimum	5.32					
105					Maximum	13.5					
106					Mean of Raw Data	11.1					
107					Standard Deviation of Raw Data	1.417					
108					Khat	49.52					
109					Theta hat	0.224					
110					Kstar	46.44					
111					Theta star	0.239					
112					Mean of Log Transformed Data	2.396					
113					Standard Deviation of Log Transformed Data	0.154					
114											
115				**Normal GOF Test Results**							
116											
117					Correlation Coefficient R	0.912					
118					Shapiro Wilk Test Statistic	0.853					
119					Shapiro Wilk Critical (0.05) Value	0.947					
120					Approximate Shapiro Wilk P Value	3.5461E-6					
121					Lilliefors Test Statistic	0.168					
122					Lilliefors Critical (0.05) Value	0.127					
123	**Data not Normal at (0.05) Significance Level**										
124											
125				**Gamma GOF Test Results**							
126											
127					Correlation Coefficient R	0.894					
128					A-D Test Statistic	2.652					
129					A-D Critical (0.05) Value	0.748					
130					K-S Test Statistic	0.194					
131					K-S Critical(0.05) Value	0.127					
132	**Data not Gamma Distributed at (0.05) Significance Level**										
133											

	A	B	C	D	E	F	G	H	I	J	K
134	**Lognormal GOF Test Results**										
135											
136					Correlation Coefficient R	0.843					
137					Shapiro Wilk Test Statistic	0.74					
138					Shapiro Wilk Critical (0.05) Value	0.947					
139					Approximate Shapiro Wilk P Value	1.557E-10					
140					Lilliefors Test Statistic	0.206					
141					Lilliefors Critical (0.05) Value	0.127					
142	**Data not Lognormal at (0.05) Significance Level**										
143											
144	**Non-parametric GOF Test Results**										
145											
146	**Data do not follow a discernible distribution at (0.05) Level of Significanc**										
147											
148	**TCE**										
149											
150					**Raw Statistics**						
151					Number of Valid Observations	49					
152					Number of Distinct Observations	31					
153					Minimum	21					
154					Maximum	110					
155					Mean of Raw Data	56.63					
156					Standard Deviation of Raw Data	23.87					
157					Khat	6.303					
158					Theta hat	8.985					
159					Kstar	5.931					
160					Theta star	9.549					
161					Mean of Log Transformed Data	3.955					
162					Standard Deviation of Log Transformed Data	0.403					
163											
164					**Normal GOF Test Results**						
165											
166					Correlation Coefficient R	0.947					
167					Shapiro Wilk Test Statistic	0.88					
168					Shapiro Wilk Critical (0.05) Value	0.947					
169					Approximate Shapiro Wilk P Value	4.1450E-5					
170					Lilliefors Test Statistic	0.169					
171					Lilliefors Critical (0.05) Value	0.126					
172	**Data not Normal at (0.05) Significance Level**										
173											
174					**Gamma GOF Test Results**						
175											
176					Correlation Coefficient R	0.973					
177					A-D Test Statistic	1.289					
178					A-D Critical (0.05) Value	0.752					
179					K-S Test Statistic	0.132					
180					K-S Critical(0.05) Value	0.127					
181	**Data not Gamma Distributed at (0.05) Significance Level**										

	A	B	C	D	E	F	G	H	I	J	K
182											
183	**Lognormal GOF Test Results**										
184											
185					Correlation Coefficient R	0.975					
186					Shapiro Wilk Test Statistic	0.939					
187					Shapiro Wilk Critical (0.05) Value	0.947					
188					Approximate Shapiro Wilk P Value	0.021					
189					Lilliefors Test Statistic	0.113					
190					Lilliefors Critical (0.05) Value	0.126					
191	**Data appear Approximate_Lognormal at (0.05) Significance Level**										
192											
193	**Y12Chloride**										
194											
195					**Raw Statistics**						
196					Number of Valid Observations	4					
197					Number of Distinct Observations	4					
198					Minimum	181					
199					Maximum	245					
200					Mean of Raw Data	205.5					
201					Standard Deviation of Raw Data	27.57					
202					Khat	78.3					
203					Theta hat	2.624					
204					Kstar	19.74					
205					Theta star	10.41					
206					Mean of Log Transformed Data	5.319					
207					Standard Deviation of Log Transformed Data	0.129					
208											
209					**Normal GOF Test Results**						
210											
211					Correlation Coefficient R	0.927					
212					Shapiro Wilk Test Statistic	0.874					
213					Shapiro Wilk Critical (0.05) Value	0.748					
214					Approximate Shapiro Wilk P Value	N/A					
215					Lilliefors Test Statistic	0.329					
216					Lilliefors Critical (0.05) Value	0.375					
217	**Data appear Normal at (0.05) Significance Level**										
218											
219					**Gamma GOF Test Results**						
220											
221					Correlation Coefficient R	0.945					
222					A-D Test Statistic	0.411					
223					A-D Critical (0.05) Value	0.656					
224					K-S Test Statistic	0.33					
225					K-S Critical(0.05) Value	0.394					
226	**Data appear Gamma Distributed at (0.05) Significance Level**										
227											

	A	B	C	D	E	F	G	H	I	J	K
228	**Lognormal GOF Test Results**										
229											
230					Correlation Coefficient R	0.94					
231					Shapiro Wilk Test Statistic	0.897					
232					Shapiro Wilk Critical (0.05) Value	0.748					
233					Approximate Shapiro Wilk P Value	N/A					
234					Lilliefors Test Statistic	0.314					
235					Lilliefors Critical (0.05) Value	0.375					
236	**Data appear Lognormal at (0.05) Significance Level**										
237											
238	**Y12Chloroform**										
239											
240				**Raw Statistics**							
241					Number of Valid Observations	4					
242					Number of Distinct Observations	4					
243					Minimum	0.51					
244					Maximum	0.64					
245					Mean of Raw Data	0.59					
246					Standard Deviation of Raw Data	0.0594					
247					Khat	126.2					
248					Theta hat	0.00467					
249					Kstar	31.73					
250					Theta star	0.0186					
251					Mean of Log Transformed Data	-0.532					
252					Standard Deviation of Log Transformed Data	0.104					
253											
254				**Normal GOF Test Results**							
255											
256					Correlation Coefficient R	0.953					
257					Shapiro Wilk Test Statistic	0.901					
258					Shapiro Wilk Critical (0.05) Value	0.748					
259					Approximate Shapiro Wilk P Value	N/A					
260					Lilliefors Test Statistic	0.25					
261					Lilliefors Critical (0.05) Value	0.375					
262	**Data appear Normal at (0.05) Significance Level**										
263											
264				**Gamma GOF Test Results**							
265											
266					Correlation Coefficient R	0.939					
267					A-D Test Statistic	0.37					
268					A-D Critical (0.05) Value	0.657					
269					K-S Test Statistic	0.281					
270					K-S Critical(0.05) Value	0.394					
271	**Data appear Gamma Distributed at (0.05) Significance Level**										
272											

	A	B	C	D	E	F	G	H	I	J	K
273	**Lognormal GOF Test Results**										
274											
275					Correlation Coefficient R	0.947					
276					Shapiro Wilk Test Statistic	0.891					
277					Shapiro Wilk Critical (0.05) Value	0.748					
278					Approximate Shapiro Wilk P Value	N/A					
279					Lilliefors Test Statistic	0.248					
280					Lilliefors Critical (0.05) Value	0.375					
281	**Data appear Lognormal at (0.05) Significance Level**										
282											
283	**Y12NO2NO3**										
284											
285				**Raw Statistics**							
286					Number of Valid Observations	4					
287					Number of Distinct Observations	4					
288					Minimum	10.8					
289					Maximum	11.9					
290					Mean of Raw Data	11.25					
291					Standard Deviation of Raw Data	0.507					
292					Khat	664.2					
293					Theta hat	0.0169					
294					Kstar	166.2					
295					Theta star	0.0677					
296					Mean of Log Transformed Data	2.42					
297					Standard Deviation of Log Transformed Data	0.0447					
298											
299				**Normal GOF Test Results**							
300											
301					Correlation Coefficient R	0.963					
302					Shapiro Wilk Test Statistic	0.916					
303					Shapiro Wilk Critical (0.05) Value	0.748					
304					Approximate Shapiro Wilk P Value	N/A					
305					Lilliefors Test Statistic	0.255					
306					Lilliefors Critical (0.05) Value	0.375					
307	**Data appear Normal at (0.05) Significance Level**										
308											
309				**Gamma GOF Test Results**							
310											
311					Correlation Coefficient R	0.966					
312					A-D Test Statistic	0.334					
313					A-D Critical (0.05) Value	0.657					
314					K-S Test Statistic	0.287					
315					K-S Critical(0.05) Value	0.394					
316	**Data appear Gamma Distributed at (0.05) Significance Level**										
317											

	A	B	C	D	E	F	G	H	I	J	K
318	**Lognormal GOF Test Results**										
319											
320					Correlation Coefficient R	0.964					
321					Shapiro Wilk Test Statistic	0.918					
322					Shapiro Wilk Critical (0.05) Value	0.748					
323					Approximate Shapiro Wilk P Value	N/A					
324					Lilliefors Test Statistic	0.255					
325					Lilliefors Critical (0.05) Value	0.375					
326	**Data appear Lognormal at (0.05) Significance Level**										
327											
328	**Y12TCE**										
329											
330				**Raw Statistics**							
331					Number of Valid Observations	4					
332					Number of Distinct Observations	4					
333					Minimum	21					
334					Maximum	49					
335					Mean of Raw Data	35.5					
336					Standard Deviation of Raw Data	11.47					
337					Khat	11.56					
338					Theta hat	3.071					
339					Kstar	3.056					
340					Theta star	11.62					
341					Mean of Log Transformed Data	3.526					
342					Standard Deviation of Log Transformed Data	0.353					
343											
344				**Normal GOF Test Results**							
345											
346					Correlation Coefficient R	0.977					
347					Shapiro Wilk Test Statistic	0.97					
348					Shapiro Wilk Critical (0.05) Value	0.748					
349					Approximate Shapiro Wilk P Value	N/A					
350					Lilliefors Test Statistic	0.233					
351					Lilliefors Critical (0.05) Value	0.375					
352	**Data appear Normal at (0.05) Significance Level**										
353											
354				**Gamma GOF Test Results**							
355											
356					Correlation Coefficient R	0.963					
357					A-D Test Statistic	0.3					
358					A-D Critical (0.05) Value	0.657					
359					K-S Test Statistic	0.27					
360					K-S Critical(0.05) Value	0.395					
361	**Data appear Gamma Distributed at (0.05) Significance Level**										
362											

	A	B	C	D	E	F	G	H	I	J	K
363	**Lognormal GOF Test Results**										
364											
365						Correlation Coefficient R	0.96				
366						Shapiro Wilk Test Statistic	0.936				
367						Shapiro Wilk Critical (0.05) Value	0.748				
368						Approximate Shapiro Wilk P Value	N/A				
369						Lilliefors Test Statistic	0.284				
370						Lilliefors Critical (0.05) Value	0.375				
371	**Data appear Lognormal at (0.05) Significance Level**										

	A	B	C	D	E	F	G	H	I	J	K
1					**Outlier Tests for Selected Uncensored Variables**						
2				**User Selected Options**							
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 7:55:23 AM							
4				From File	600-G-138_GW_2025_Input.xls						
5				Full Precision	OFF						
6											
7											
8				**Rosner's Outlier Test for Chloride**							
9											
10											
11				**Mean**	**207.7**						
12				**Standard Deviation**	**38.42**						
13				**Number of data**	**48**						
14				**Number of suspected outliers**	**1**						
15											
16				Potential	Obs.	Test	Critical	Critical			
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)			
18	1	207.7	38.02	292	3	2.218	3.11	3.46			
19											
20	For 5% Significance Level, there is no Potential Outlier										
21											
22	For 1% Significance Level, there is no Potential Outlier										
23											
24											
25				**Rosner's Outlier Test for Chloroform**							
26											
27											
28				**Mean**	**0.603**						
29				**Standard Deviation**	**0.164**						
30				**Number of data**	**49**						
31				**Number of suspected outliers**	**1**						
32											
33				Potential	Obs.	Test	Critical	Critical			
34	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)			
35	1	0.603	0.162	1.2	23	3.686	3.12	3.47			
36											
37	For 5% Significance Level, there is 1 Potential Outlier										
38	Potential outliers is: 1.2										
39											
40	For 1% Significance Level, there is 1 Potential Outlier										
41	Potential outliers is: 1.2										
42											
43											

	A	B	C	D	E	F	G	H	I	J	K
44	**Rosner's Outlier Test for NO2NO3**										
45											
46											
47				**Mean**	**11.1**						
48				**Standard Deviation**	**1.417**						
49				**Number of data**	**48**						
50				**Number of suspected outliers**	**1**						
51											
52				Potential	Obs.	Test	Critical	Critical			
53	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)			
54	1	11.1	1.402	5.32	40	4.118	3.11	3.46			
55											
56	For 5% Significance Level, there is 1 Potential Outlier										
57	Potential outliers is: 5.32										
58											
59	For 1% Significance Level, there is 1 Potential Outlier										
60	Potential outliers is: 5.32										
61											
62											
63	**Rosner's Outlier Test for TCE**										
64											
65											
66				**Mean**	**56.63**						
67				**Standard Deviation**	**23.87**						
68				**Number of data**	**49**						
69				**Number of suspected outliers**	**1**						
70											
71				Potential	Obs.	Test	Critical	Critical			
72	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)			
73	1	56.63	23.62	110	4	2.259	3.12	3.47			
74											
75	For 5% Significance Level, there is no Potential Outlier										
76											
77	For 1% Significance Level, there is no Potential Outlier										
78											
79											
80	**Dixon's Outlier Test for Y12Chloride**										
81											
82	Number of Observations = 4										
83	10% critical value: 0.679										
84	5% critical value: 0.765										
85	1% critical value: 0.889										
86											

	A	B	C	D	E	F	G	H	I	J	K
87	**1. Observation Value 245 is a Potential Outlier (Upper Tail)?**										
88											
89	Test Statistic: 0.703										
90											
91	For 10% significance level, 245 is an outlier.										
92	For 5% significance level, 245 is not an outlier.										
93	For 1% significance level, 245 is not an outlier.										
94											
95	**2. Observation Value 181 is a Potential Outlier (Lower Tail)?**										
96											
97	Test Statistic: 0.234										
98											
99	For 10% significance level, 181 is not an outlier.										
100	For 5% significance level, 181 is not an outlier.										
101	For 1% significance level, 181 is not an outlier.										
102											
103											
104	**Dixon's Outlier Test for Y12Chloroform**										
105											
106	Number of Observations = 4										
107	10% critical value: 0.679										
108	5% critical value: 0.765										
109	1% critical value: 0.889										
110											
111	**1. Observation Value 0.64 is a Potential Outlier (Upper Tail)**										
112											
113	Test Statistic: 0.077										
114											
115	For 10% significance level, 0.64 is not an outlier.										
116	For 5% significance level, 0.64 is not an outlier.										
117	For 1% significance level, 0.64 is not an outlier.										
118											
119	**2. Observation Value 0.51 is a Potential Outlier (Lower Tail)?**										
120											
121	Test Statistic: 0.538										
122											
123	For 10% significance level, 0.51 is not an outlier.										
124	For 5% significance level, 0.51 is not an outlier.										
125	For 1% significance level, 0.51 is not an outlier.										
126											
127											
128	**Dixon's Outlier Test for Y12NO2NO3**										
129											
130	Number of Observations = 4										
131	10% critical value: 0.679										
132	5% critical value: 0.765										
133	1% critical value: 0.889										

	A	B	C	D	E	F	G	H	I	J	K
134											
135	**1. Observation Value 11.9 is a Potential Outlier (Upper Tail)**										
136											
137	Test Statistic: 0.455										
138											
139	For 10% significance level, 11.9 is not an outlier.										
140	For 5% significance level, 11.9 is not an outlier.										
141	For 1% significance level, 11.9 is not an outlier.										
142											
143	**2. Observation Value 10.8 is a Potential Outlier (Lower Tail)?**										
144											
145	Test Statistic: 0.091										
146											
147	For 10% significance level, 10.8 is not an outlier.										
148	For 5% significance level, 10.8 is not an outlier.										
149	For 1% significance level, 10.8 is not an outlier.										
150											
151											
152	**Dixon's Outlier Test for Y12TCE**										
153											
154	Number of Observations = 4										
155	10% critical value: 0.679										
156	5% critical value: 0.765										
157	1% critical value: 0.889										
158											
159	**1. Observation Value 49 is a Potential Outlier (Upper Tail)?**										
160											
161	Test Statistic: 0.429										
162											
163	For 10% significance level, 49 is not an outlier.										
164	For 5% significance level, 49 is not an outlier.										
165	For 1% significance level, 49 is not an outlier.										
166											
167	**2. Observation Value 21 is a Potential Outlier (Lower Tail)?**										
168											
169	Test Statistic: 0.500										
170											
171	For 10% significance level, 21 is not an outlier.										
172	For 5% significance level, 21 is not an outlier.										
173	For 1% significance level, 21 is not an outlier.										
174											

	A	B	C	D	E	F	G	H	I	J	K
1	**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**										
2			**User Selected Options**								
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 9:50:35 AM							
4			From File	600-SGW-05_Vapor_2025_Input.xls							
5			Full Precision	OFF							
6			Confidence Coefficient	0.95							
7											
8											
9	**Chloroform_7.5_M-K**										
10											
11			**Raw Statistics**								
12			Number of Valid Observations	49							
13			Number of Distinct Observations	29							
14			Minimum	0.31							
15			Maximum	89							
16			Mean of Raw Data	3.439							
17			Standard Deviation of Raw Data	12.55							
18			Khat	0.616							
19			Theta hat	5.586							
20			Kstar	0.592							
21			Theta star	5.814							
22			Mean of Log Transformed Data	0.236							
23			Standard Deviation of Log Transformed Data	1.093							
24											
25			**Normal GOF Test Results**								
26											
27			Correlation Coefficient R	0.422							
28			Shapiro Wilk Test Statistic	0.218							
29			Shapiro Wilk Critical (0.05) Value	0.947							
30			Approximate Shapiro Wilk P Value	0							
31			Lilliefors Test Statistic	0.418							
32			Lilliefors Critical (0.05) Value	0.126							
33	**Data not Normal at (0.05) Significance Level**										
34											
35			**Gamma GOF Test Results**								
36											
37			Correlation Coefficient R	0.669							
38			A-D Test Statistic	4.563							
39			A-D Critical (0.05) Value	0.804							
40			K-S Test Statistic	0.237							
41			K-S Critical(0.05) Value	0.133							
42	**Data not Gamma Distributed at (0.05) Significance Level**										
43											

	A	B	C	D	E	F	G	H	I	J	K
44	**Lognormal GOF Test Results**										
45											
46					Correlation Coefficient R	0.939					
47					Shapiro Wilk Test Statistic	0.891					
48					Shapiro Wilk Critical (0.05) Value	0.947					
49					Approximate Shapiro Wilk P Value	1.2661E-4					
50					Lilliefors Test Statistic	0.108					
51					Lilliefors Critical (0.05) Value	0.126					
52	**Data appear Approximate_Lognormal at (0.05) Significance Level**										
53											
54	**Chloroform_7.5_OLS_No_Outliers**										
55											
56	**Raw Statistics**										
57					Number of Valid Observations	46					
58					Number of Distinct Observations	28					
59					Minimum	0.31					
60					Maximum	5.4					
61					Mean of Raw Data	1.715					
62					Standard Deviation of Raw Data	1.33					
63					Khat	1.638					
64					Theta hat	1.048					
65					Kstar	1.545					
66					Theta star	1.11					
67					Mean of Log Transformed Data	0.204					
68					Standard Deviation of Log Transformed Data	0.885					
69											
70	**Normal GOF Test Results**										
71											
72					Correlation Coefficient R	0.942					
73					Shapiro Wilk Test Statistic	0.876					
74					Shapiro Wilk Critical (0.05) Value	0.945					
75					Approximate Shapiro Wilk P Value	5.2777E-5					
76					Lilliefors Test Statistic	0.145					
77					Lilliefors Critical (0.05) Value	0.129					
78	**Data not Normal at (0.05) Significance Level**										
79											
80	**Gamma GOF Test Results**										
81											
82					Correlation Coefficient R	0.988					
83					A-D Test Statistic	0.75					
84					A-D Critical (0.05) Value	0.766					
85					K-S Test Statistic	0.0998					
86					K-S Critical(0.05) Value	0.133					
87	**Data appear Gamma Distributed at (0.05) Significance Level**										
88											

	A	B	C	D	E	F	G	H	I	J	K
89	**Lognormal GOF Test Results**										
90											
91					Correlation Coefficient R	0.968					
92					Shapiro Wilk Test Statistic	0.911					
93					Shapiro Wilk Critical (0.05) Value	0.945					
94					Approximate Shapiro Wilk P Value	0.00166					
95					Lilliefors Test Statistic	0.146					
96					Lilliefors Critical (0.05) Value	0.129					
97	**Data not Lognormal at (0.05) Significance Level**										
98											
99	**Chloro_52.5**										
100											
101				**Raw Statistics**							
102					Number of Valid Observations	49					
103					Number of Distinct Observations	41					
104					Minimum	11					
105					Maximum	100					
106					Mean of Raw Data	60.67					
107					Standard Deviation of Raw Data	21.51					
108					Khat	6.122					
109					Theta hat	9.911					
110					Kstar	5.761					
111					Theta star	10.53					
112					Mean of Log Transformed Data	4.022					
113					Standard Deviation of Log Transformed Data	0.461					
114											
115				**Normal GOF Test Results**							
116											
117					Correlation Coefficient R	0.994					
118					Shapiro Wilk Test Statistic	0.976					
119					Shapiro Wilk Critical (0.05) Value	0.947					
120					Approximate Shapiro Wilk P Value	0.58					
121					Lilliefors Test Statistic	0.0468					
122					Lilliefors Critical (0.05) Value	0.126					
123	**Data appear Normal at (0.05) Significance Level**										
124											
125				**Gamma GOF Test Results**							
126											
127					Correlation Coefficient R	0.968					
128					A-D Test Statistic	0.781					
129					A-D Critical (0.05) Value	0.753					
130					K-S Test Statistic	0.101					
131					K-S Critical(0.05) Value	0.127					
132	**Data appear Gamma Distributed at (0.05) Significance Level**										
133											

	A	B	C	D	E	F	G	H	I	J	K
134	**Lognormal GOF Test Results**										
135											
136					Correlation Coefficient R	0.927					
137					Shapiro Wilk Test Statistic	0.864					
138					Shapiro Wilk Critical (0.05) Value	0.947					
139					Approximate Shapiro Wilk P Value	7.9414E-6					
140					Lilliefors Test Statistic	0.133					
141					Lilliefors Critical (0.05) Value	0.126					
142	**Data not Lognormal at (0.05) Significance Level**										
143											
144	**Chloro_102.5**										
145											
146				**Raw Statistics**							
147					Number of Valid Observations	49					
148					Number of Distinct Observations	35					
149					Minimum	0.31					
150					Maximum	130					
151					Mean of Raw Data	75.01					
152					Standard Deviation of Raw Data	23.47					
153					Khat	3.797					
154					Theta hat	19.75					
155					Kstar	3.578					
156					Theta star	20.96					
157					Mean of Log Transformed Data	4.18					
158					Standard Deviation of Log Transformed Data	0.849					
159											
160				**Normal GOF Test Results**							
161											
162					Correlation Coefficient R	0.974					
163					Shapiro Wilk Test Statistic	0.963					
164					Shapiro Wilk Critical (0.05) Value	0.947					
165					Approximate Shapiro Wilk P Value	0.202					
166					Lilliefors Test Statistic	0.109					
167					Lilliefors Critical (0.05) Value	0.126					
168	**Data appear Normal at (0.05) Significance Level**										
169											
170				**Gamma GOF Test Results**							
171											
172					Correlation Coefficient R	0.933					
173					A-D Test Statistic	4.282					
174					A-D Critical (0.05) Value	0.754					
175					K-S Test Statistic	0.22					
176					K-S Critical(0.05) Value	0.127					
177	**Data not Gamma Distributed at (0.05) Significance Level**										
178											

	A	B	C	D	E	F	G	H	I	J	K
179	**Lognormal GOF Test Results**										
180											
181					Correlation Coefficient R	0.636					
182					Shapiro Wilk Test Statistic	0.452					
183					Shapiro Wilk Critical (0.05) Value	0.947					
184					Approximate Shapiro Wilk P Value	0					
185					Lilliefors Test Statistic	0.303					
186					Lilliefors Critical (0.05) Value	0.126					
187	**Data not Lognormal at (0.05) Significance Level**										
188											
189	**Chloroform_102.5_No_Outliers**										
190											
191				**Raw Statistics**							
192					Number of Valid Observations	47					
193					Number of Distinct Observations	33					
194					Minimum	44					
195					Maximum	130					
196					Mean of Raw Data	77.87					
197					Standard Deviation of Raw Data	19.15					
198					Khat	16.98					
199					Theta hat	4.585					
200					Kstar	15.91					
201					Theta star	4.894					
202					Mean of Log Transformed Data	4.325					
203					Standard Deviation of Log Transformed Data	0.248					
204											
205				**Normal GOF Test Results**							
206											
207					Correlation Coefficient R	0.986					
208					Shapiro Wilk Test Statistic	0.967					
209					Shapiro Wilk Critical (0.05) Value	0.946					
210					Approximate Shapiro Wilk P Value	0.304					
211					Lilliefors Test Statistic	0.104					
212					Lilliefors Critical (0.05) Value	0.128					
213	**Data appear Normal at (0.05) Significance Level**										
214											
215				**Gamma GOF Test Results**							
216											
217					Correlation Coefficient R	0.993					
218					A-D Test Statistic	0.372					
219					A-D Critical (0.05) Value	0.748					
220					K-S Test Statistic	0.11					
221					K-S Critical(0.05) Value	0.129					
222	**Data appear Gamma Distributed at (0.05) Significance Level**										
223											

	A	B	C	D	E	F	G	H	I	J	K
224	**Lognormal GOF Test Results**										
225											
226					Correlation Coefficient R	0.992					
227					Shapiro Wilk Test Statistic	0.976					
228					Shapiro Wilk Critical (0.05) Value	0.946					
229					Approximate Shapiro Wilk P Value	0.581					
230					Lilliefors Test Statistic	0.126					
231					Lilliefors Critical (0.05) Value	0.128					
232	**Data appear Lognormal at (0.05) Significance Level**										
233											
234	**Chloro_137.5**										
235											
236				**Raw Statistics**							
237					Number of Valid Observations	49					
238					Number of Distinct Observations	24					
239					Minimum	0.31					
240					Maximum	20000					
241					Mean of Raw Data	451.2					
242					Standard Deviation of Raw Data	2851					
243					Khat	0.174					
244					Theta hat	2591					
245					Kstar	0.177					
246					Theta star	2548					
247					Mean of Log Transformed Data	1.795					
248					Standard Deviation of Log Transformed Data	2.992					
249											
250				**Normal GOF Test Results**							
251											
252					Correlation Coefficient R	0.347					
253					Shapiro Wilk Test Statistic	0.156					
254					Shapiro Wilk Critical (0.05) Value	0.947					
255					Approximate Shapiro Wilk P Value	0					
256					Lilliefors Test Statistic	0.515					
257					Lilliefors Critical (0.05) Value	0.126					
258	**Data not Normal at (0.05) Significance Level**										
259											
260				**Gamma GOF Test Results**							
261											
262					Correlation Coefficient R	0.74					
263					A-D Test Statistic	6.822					
264					A-D Critical (0.05) Value	0.937					
265					K-S Test Statistic	0.314					
266					K-S Critical(0.05) Value	0.142					
267	**Data not Gamma Distributed at (0.05) Significance Level**										
268											

	A	B	C	D	E	F	G	H	I	J	K
269	**Lognormal GOF Test Results**										
270											
271					Correlation Coefficient R	0.879					
272					Shapiro Wilk Test Statistic	0.763					
273					Shapiro Wilk Critical (0.05) Value	0.947					
274					Approximate Shapiro Wilk P Value	6.185E-10					
275					Lilliefors Test Statistic	0.288					
276					Lilliefors Critical (0.05) Value	0.126					
277	**Data not Lognormal at (0.05) Significance Level**										
278											
279	**Non-parametric GOF Test Results**										
280											
281	**Data do not follow a discernible distribution at (0.05) Level of Significanc**										
282											
283	**Chloro_137.5_no_outliers**										
284											
285	**Raw Statistics**										
286					Number of Valid Observations	32					
287					Number of Missing Observations	16					
288					Number of Distinct Observations	23					
289					Minimum	0.31					
290					Maximum	200					
291					Mean of Raw Data	65.69					
292					Standard Deviation of Raw Data	51.04					
293					Khat	0.541					
294					Theta hat	121.4					
295					Kstar	0.511					
296					Theta star	128.5					
297					Mean of Log Transformed Data	3.025					
298					Standard Deviation of Log Transformed Data	2.374					
299											
300	**Normal GOF Test Results**										
301											
302					Correlation Coefficient R	0.959					
303					Shapiro Wilk Test Statistic	0.912					
304					Shapiro Wilk Critical (0.05) Value	0.93					
305					Approximate Shapiro Wilk P Value	0.0144					
306					Lilliefors Test Statistic	0.161					
307					Lilliefors Critical (0.05) Value	0.154					
308	**Data not Normal at (0.05) Significance Level**										
309											
310	**Gamma GOF Test Results**										
311											
312					Correlation Coefficient R	0.87					
313					A-D Test Statistic	3.435					
314					A-D Critical (0.05) Value	0.807					
315					K-S Test Statistic	0.306					
316					K-S Critical(0.05) Value	0.164					
317	**Data not Gamma Distributed at (0.05) Significance Level**										

	A	B	C	D	E	F	G	H	I	J	K
318											
319	**Lognormal GOF Test Results**										
320											
321					Correlation Coefficient R	0.85					
322					Shapiro Wilk Test Statistic	0.705					
323					Shapiro Wilk Critical (0.05) Value	0.93					
324					Approximate Shapiro Wilk P Value	1.2480E-7					
325					Lilliefors Test Statistic	0.327					
326					Lilliefors Critical (0.05) Value	0.154					
327	**Data not Lognormal at (0.05) Significance Level**										
328											
329	**Non-parametric GOF Test Results**										
330											
331	**Data do not follow a discernible distribution at (0.05) Level of Significanc**										
332											
333	**TCE_7.5**										
334											
335				**Raw Statistics**							
336					Number of Valid Observations	51					
337					Number of Distinct Observations	44					
338					Minimum	0.3					
339					Maximum	7300					
340					Mean of Raw Data	186.5					
341					Standard Deviation of Raw Data	1017					
342					Khat	0.376					
343					Theta hat	496.4					
344					Kstar	0.367					
345					Theta star	508.6					
346					Mean of Log Transformed Data	3.459					
347					Standard Deviation of Log Transformed Data	1.377					
348											
349				**Normal GOF Test Results**							
350											
351					Correlation Coefficient R	0.358					
352					Approximate Shapiro Wilk Test Statistic	0.166					
353					Approximate Shapiro Wilk P Value	0					
354					Lilliefors Test Statistic	0.487					
355					Lilliefors Critical (0.05) Value	0.123					
356	**Data not Normal at (0.05) Significance Level**										
357											
358				**Gamma GOF Test Results**							
359											
360					Correlation Coefficient R	0.662					
361					A-D Test Statistic	8.211					
362					A-D Critical (0.05) Value	0.844					
363					K-S Test Statistic	0.348					
364					K-S Critical(0.05) Value	0.134					
365	**Data not Gamma Distributed at (0.05) Significance Level**										
366											

	A	B	C	D	E	F	G	H	I	J	K
367	**Lognormal GOF Test Results**										
368											
369					Correlation Coefficient R	0.924					
370					Approximate Shapiro Wilk Test Statistic	0.9					
371					Approximate Shapiro Wilk P Value	2.1362E-4					
372					Lilliefors Test Statistic	0.139					
373					Lilliefors Critical (0.05) Value	0.123					
374	**Data not Lognormal at (0.05) Significance Level**										
375											
376	**Non-parametric GOF Test Results**										
377											
378	**Data do not follow a discernible distribution at (0.05) Level of Significanc**										
379											
380	**TCE_7.5_No_outlier**										
381											
382					**Raw Statistics**						
383					Number of Valid Observations	50					
384					Number of Distinct Observations	43					
385					Minimum	0.3					
386					Maximum	170					
387					Mean of Raw Data	44.22					
388					Standard Deviation of Raw Data	37.05					
389					Khat	1.281					
390					Theta hat	34.53					
391					Kstar	1.217					
392					Theta star	36.33					
393					Mean of Log Transformed Data	3.35					
394					Standard Deviation of Log Transformed Data	1.148					
395											
396					**Normal GOF Test Results**						
397											
398					Correlation Coefficient R	0.929					
399					Shapiro Wilk Test Statistic	0.863					
400					Shapiro Wilk Critical (0.05) Value	0.947					
401					Approximate Shapiro Wilk P Value	5.3705E-6					
402					Lilliefors Test Statistic	0.146					
403					Lilliefors Critical (0.05) Value	0.125					
404	**Data not Normal at (0.05) Significance Level**										
405											
406					**Gamma GOF Test Results**						
407											
408					Correlation Coefficient R	0.99					
409					A-D Test Statistic	0.5					
410					A-D Critical (0.05) Value	0.773					
411					K-S Test Statistic	0.115					
412					K-S Critical(0.05) Value	0.128					
413	**Data appear Gamma Distributed at (0.05) Significance Level**										
414											

	A	B	C	D	E	F	G	H	I	J	K
415	**Lognormal GOF Test Results**										
416											
417					Correlation Coefficient R	0.94					
418					Shapiro Wilk Test Statistic	0.899					
419					Shapiro Wilk Critical (0.05) Value	0.947					
420					Approximate Shapiro Wilk P Value	2.4198E-4					
421					Lilliefors Test Statistic	0.171					
422					Lilliefors Critical (0.05) Value	0.125					
423	**Data not Lognormal at (0.05) Significance Level**										
424											
425	**TCE_52.5**										
426											
427				**Raw Statistics**							
428					Number of Valid Observations	49					
429					Number of Distinct Observations	36					
430					Minimum	190					
431					Maximum	2600					
432					Mean of Raw Data	1140					
433					Standard Deviation of Raw Data	577.9					
434					Khat	3.888					
435					Theta hat	293.1					
436					Kstar	3.664					
437					Theta star	311.1					
438					Mean of Log Transformed Data	6.905					
439					Standard Deviation of Log Transformed Data	0.547					
440											
441				**Normal GOF Test Results**							
442											
443					Correlation Coefficient R	0.972					
444					Shapiro Wilk Test Statistic	0.934					
445					Shapiro Wilk Critical (0.05) Value	0.947					
446					Approximate Shapiro Wilk P Value	0.0113					
447					Lilliefors Test Statistic	0.132					
448					Lilliefors Critical (0.05) Value	0.126					
449	**Data not Normal at (0.05) Significance Level**										
450											
451				**Gamma GOF Test Results**							
452											
453					Correlation Coefficient R	0.991					
454					A-D Test Statistic	0.262					
455					A-D Critical (0.05) Value	0.754					
456					K-S Test Statistic	0.0725					
457					K-S Critical(0.05) Value	0.127					
458	**Data appear Gamma Distributed at (0.05) Significance Level**										
459											

	A	B	C	D	E	F	G	H	I	J	K
460	**Lognormal GOF Test Results**										
461											
462					Correlation Coefficient R	0.985					
463					Shapiro Wilk Test Statistic	0.97					
464					Shapiro Wilk Critical (0.05) Value	0.947					
465					Approximate Shapiro Wilk P Value	0.384					
466					Lilliefors Test Statistic	0.0818					
467					Lilliefors Critical (0.05) Value	0.126					
468	**Data appear Lognormal at (0.05) Significance Level**										
469											
470	**TCE_102.5**										
471											
472				**Raw Statistics**							
473					Number of Valid Observations	49					
474					Number of Distinct Observations	24					
475					Minimum	0.4					
476					Maximum	3000					
477					Mean of Raw Data	1407					
478					Standard Deviation of Raw Data	588.8					
479					Khat	2.367					
480					Theta hat	594.5					
481					Kstar	2.235					
482					Theta star	629.4					
483					Mean of Log Transformed Data	7.023					
484					Standard Deviation of Log Transformed Data	1.232					
485											
486				**Normal GOF Test Results**							
487											
488					Correlation Coefficient R	0.984					
489					Shapiro Wilk Test Statistic	0.974					
490					Shapiro Wilk Critical (0.05) Value	0.947					
491					Approximate Shapiro Wilk P Value	0.5					
492					Lilliefors Test Statistic	0.0991					
493					Lilliefors Critical (0.05) Value	0.126					
494	**Data appear Normal at (0.05) Significance Level**										
495											
496				**Gamma GOF Test Results**							
497											
498					Correlation Coefficient R	0.964					
499					A-D Test Statistic	3.13					
500					A-D Critical (0.05) Value	0.76					
501					K-S Test Statistic	0.207					
502					K-S Critical(0.05) Value	0.128					
503	**Data not Gamma Distributed at (0.05) Significance Level**										
504											

	A	B	C	D	E	F	G	H	I	J	K
505	**Lognormal GOF Test Results**										
506											
507					Correlation Coefficient R	0.623					
508					Shapiro Wilk Test Statistic	0.437					
509					Shapiro Wilk Critical (0.05) Value	0.947					
510					Approximate Shapiro Wilk P Value	0					
511					Lilliefors Test Statistic	0.288					
512					Lilliefors Critical (0.05) Value	0.126					
513	**Data not Lognormal at (0.05) Significance Level**										
514											
515	**TCE_137.5**										
516											
517				**Raw Statistics**							
518					Number of Valid Observations	49					
519					Number of Distinct Observations	25					
520					Minimum	0.3					
521					Maximum	17000					
522					Mean of Raw Data	10669					
523					Standard Deviation of Raw Data	4917					
524					Khat	0.939					
525					Theta hat	11359					
526					Kstar	0.895					
527					Theta star	11916					
528					Mean of Log Transformed Data	8.656					
529					Standard Deviation of Log Transformed Data	2.232					
530											
531				**Normal GOF Test Results**							
532											
533					Correlation Coefficient R	0.943					
534					Shapiro Wilk Test Statistic	0.869					
535					Shapiro Wilk Critical (0.05) Value	0.947					
536					Approximate Shapiro Wilk P Value	1.3149E-5					
537					Lilliefors Test Statistic	0.2					
538					Lilliefors Critical (0.05) Value	0.126					
539	**Data not Normal at (0.05) Significance Level**										
540											
541				**Gamma GOF Test Results**							
542											
543					Correlation Coefficient R	0.738					
544					A-D Test Statistic	7.88					
545					A-D Critical (0.05) Value	0.783					
546					K-S Test Statistic	0.303					
547					K-S Critical(0.05) Value	0.131					
548	**Data not Gamma Distributed at (0.05) Significance Level**										
549											

	A	B	C	D	E	F	G	H	I	J	K
550	**Lognormal GOF Test Results**										
551											
552						Correlation Coefficient R	0.679				
553						Shapiro Wilk Test Statistic	0.481				
554						Shapiro Wilk Critical (0.05) Value	0.947				
555						Approximate Shapiro Wilk P Value	0				
556						Lilliefors Test Statistic	0.376				
557						Lilliefors Critical (0.05) Value	0.126				
558	**Data not Lognormal at (0.05) Significance Level**										
559											
560	**Non-parametric GOF Test Results**										
561											
562	**Data do not follow a discernible distribution at (0.05) Level of Significanc**										

1				**Goodness-of-Fit Test Statistics for Data Sets with Non-Detects**							
2			**User Selected Options**								
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 8:25:52 AM							
4			From File	600-SGW-05_Vapor_2025_Input.xls							
5			Full Precision	OFF							
6			Confidence Coefficient	0.95							
7											
8											
9	**Chloroform_7.5_M-K**										
10											
11					Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
12				Raw Statistics	49	0	49	40	9	18.37%	
13											
14					Number	Minimum	Maximum	Mean	Median	SD	
15				Statistics (Non-Detects Only)	9	0.31	0.31	0.31	0.31	0	
16				Statistics (Detects Only)	40	0.36	89	4.143	1.7	13.82	
17				Statistics (All: NDs treated as DL value)	49	0.31	89	3.439	1.5	12.55	
18				Statistics (All: NDs treated as DL/2 value)	49	0.155	89	3.411	1.5	12.55	
19				Statistics (Normal ROS Imputed Data)	49	-16.96	89	1.374	1.5	13.85	
20				Statistics (Gamma ROS Imputed Data)	49	0.01	89	3.384	1.5	12.56	
21				Statistics (Lognormal ROS Imputed Data)	49	0.0977	89	3.427	1.5	12.55	
22											
23					K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
24				Statistics (Detects Only)	0.696	0.66	5.956	0.552	0.954	1.729	
25				Statistics (NDs = DL)	0.616	0.592	5.586	0.236	1.093	4.64	
26				Statistics (NDs = DL/2)	0.558	0.538	6.11	0.108	1.278	11.81	
27				Statistics (Gamma ROS Estimates)	0.407	0.395	8.324	-0.395	2.193	-5.551	
28				Statistics (Lognormal ROS Estimates)	--	--	--	0.174	1.192	6.834	
29											
30				**Normal GOF Test Results**							
31											
32					No NDs	NDs = DL	NDs = DL/2	Normal ROS			
33				Correlation Coefficient R	0.437	0.422	0.425	0.618			
34											
35					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
36				Shapiro-Wilk (Detects Only)	0.229	0.94	Data Not Normal				
37				Shapiro-Wilk (NDs = DL)	0.218	0.947	Data Not Normal				
38				Shapiro-Wilk (NDs = DL/2)	0.221	0.947	Data Not Normal				
39				Shapiro-Wilk (Normal ROS Estimates)	0.436	0.947	Data Not Normal				
40				Lilliefors (Detects Only)	0.439	0.139	Data Not Normal				
41				Lilliefors (NDs = DL)	0.418	0.126	Data Not Normal				
42				Lilliefors (NDs = DL/2)	0.417	0.126	Data Not Normal				
43				Lilliefors (Normal ROS Estimates)	0.365	0.126	Data Not Normal				
44											

	A	B	C	D	E	F	G	H	I	J	K
45	**Gamma GOF Test Results**										
46											
47					No NDs	NDs = DL	NDs = DL/2	Gamma ROS			
48				Correlation Coefficient R	0.676	0.669	0.679	0.709			
49											
50					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
51				Anderson-Darling (Detects Only)	4.868	0.794					
52				Kolmogorov-Smirnov (Detects Only)	0.264	0.146	Data Not Gamma Distributed				
53				Anderson-Darling (NDs = DL)	4.563	0.804					
54				Kolmogorov-Smirnov (NDs = DL)	0.237	0.133	Data Not Gamma Distributed				
55				Anderson-Darling (NDs = DL/2)	3.743	0.809					
56				Kolmogorov-Smirnov (NDs = DL/2)	0.222	0.133	Data Not Gamma Distributed				
57				Anderson-Darling (Gamma ROS Estimates)	3.086	0.837					
58				Kolmogorov-Smirnov (Gamma ROS Est.)	0.193	0.136	Data Not Gamma Distributed				
59											
60	**Lognormal GOF Test Results**										
61											
62					No NDs	NDs = DL	NDs = DL/2	Log ROS			
63				Correlation Coefficient R	0.925	0.939	0.949	0.963			
64											
65					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
66				Shapiro-Wilk (Detects Only)	0.88	0.94	Data Not Lognormal				
67				Shapiro-Wilk (NDs = DL)	0.891	0.947	Data Not Lognormal				
68				Shapiro-Wilk (NDs = DL/2)	0.906	0.947	Data Not Lognormal				
69				Shapiro-Wilk (Lognormal ROS Estimates)	0.945	0.947	Data Not Lognormal				
70				Lilliefors (Detects Only)	0.126	0.139	Data Appear Lognormal				
71				Lilliefors (NDs = DL)	0.108	0.126	Data Appear Lognormal				
72				Lilliefors (NDs = DL/2)	0.142	0.126	Data Not Lognormal				
73				Lilliefors (Lognormal ROS Estimates)	0.126	0.126	Data Appear Lognormal				
74											
75	**Note: Substitution methods such as DL or DL/2 are not recommended.**										
76											
77	**Chloro_102.5**										
78											
79					Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
80				Raw Statistics	49	0	49	48	1	2.04%	
81											
82					Number	Minimum	Maximum	Mean	Median	SD	
83				Statistics (Non-Detects Only)	1	0.31	0.31	0.31	0.31	N/A	
84				Statistics (Detects Only)	48	15	130	76.56	78.5	21.01	
85				Statistics (All: NDs treated as DL value)	49	0.31	130	75.01	78	23.47	
86				Statistics (All: NDs treated as DL/2 value)	49	0.155	130	75	78	23.48	
87				Statistics (Normal ROS Imputed Data)	49	15	130	75.46	78	22.17	
88				Statistics (Gamma ROS Imputed Data)	49	15	130	75.7	78	21.65	
89				Statistics (Lognormal ROS Imputed Data)	49	15	130	75.68	78	21.69	
90											

	A	B	C	D	E	F	G	H	I	J	K
91					K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
92				Statistics (Detects Only)	10.93	10.26	7.007	4.292	0.339	0.0789	
93				Statistics (NDs = DL)	3.797	3.578	19.75	4.18	0.849	0.203	
94				Statistics (NDs = DL/2)	3.458	3.26	21.69	4.166	0.941	0.226	
95				Statistics (Gamma ROS Estimates)	10.04	9.435	7.542	4.276	0.353	0.0824	
96				Statistics (Lognormal ROS Estimates)	--	--	--	4.276	0.354	0.0827	
97											
98				**Normal GOF Test Results**							
99											
100					No NDs	NDs = DL	NDs = DL/2	Normal ROS			
101				Correlation Coefficient R	0.985	0.974	0.974	0.986			
102											
103					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
104				Shapiro-Wilk (Detects Only)	0.983	0.947	Data Appear Normal				
105				Shapiro-Wilk (NDs = DL)	0.963	0.947	Data Appear Normal				
106				Shapiro-Wilk (NDs = DL/2)	0.962	0.947	Data Appear Normal				
107				Shapiro-Wilk (Normal ROS Estimates)	0.98	0.947	Data Appear Normal				
108				Lilliefors (Detects Only)	0.101	0.127	Data Appear Normal				
109				Lilliefors (NDs = DL)	0.109	0.126	Data Appear Normal				
110				Lilliefors (NDs = DL/2)	0.109	0.126	Data Appear Normal				
111				Lilliefors (Normal ROS Estimates)	0.102	0.126	Data Appear Normal				
112											
113				**Gamma GOF Test Results**							
114											
115					No NDs	NDs = DL	NDs = DL/2	Gamma ROS			
116				Correlation Coefficient R	0.979	0.933	0.93	0.979			
117											
118					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
119				Anderson-Darling (Detects Only)	0.773	0.749					
120				Kolmogorov-Smirnov (Detects Only)	0.135	0.128	Data Not Gamma Distributed				
121				Anderson-Darling (NDs = DL)	4.282	0.754					
122				Kolmogorov-Smirnov (NDs = DL)	0.22	0.127	Data Not Gamma Distributed				
123				Anderson-Darling (NDs = DL/2)	4.704	0.755					
124				Kolmogorov-Smirnov (NDs = DL/2)	0.233	0.127	Data Not Gamma Distributed				
125				Anderson-Darling (Gamma ROS Estimates)	0.801	0.749					
126				Kolmogorov-Smirnov (Gamma ROS Est.)	0.139	0.127	Data Not Gamma Distributed				
127											

	A	B	C	D	E	F	G	H	I	J	K
128	**Lognormal GOF Test Results**										
129											
130					No NDs	NDs = DL	NDs = DL/2	Log ROS			
131				Correlation Coefficient R	0.907	0.636	0.609	0.919			
132											
133					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
134				Shapiro-Wilk (Detects Only)	0.854	0.947	Data Not Lognormal				
135				Shapiro-Wilk (NDs = DL)	0.452	0.947	Data Not Lognormal				
136				Shapiro-Wilk (NDs = DL/2)	0.418	0.947	Data Not Lognormal				
137				Shapiro-Wilk (Lognormal ROS Estimates)	0.871	0.947	Data Not Lognormal				
138				Lilliefors (Detects Only)	0.15	0.127	Data Not Lognormal				
139				Lilliefors (NDs = DL)	0.303	0.126	Data Not Lognormal				
140				Lilliefors (NDs = DL/2)	0.32	0.126	Data Not Lognormal				
141				Lilliefors (Lognormal ROS Estimates)	0.154	0.126	Data Not Lognormal				
142											
143	**Note: Substitution methods such as DL or DL/2 are not recommended.**										
144											
145	**Chloro_137.5**										
146											
147					Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
148				Raw Statistics	49	0	49	27	22	44.90%	
149											
150					Number	Minimum	Maximum	Mean	Median	SD	
151				Statistics (Non-Detects Only)	22	0.31	0.31	0.31	0.31	1.705E-16	
152				Statistics (Detects Only)	27	0.67	20000	818.5	82	3834	
153				Statistics (All: NDs treated as DL value)	49	0.31	20000	451.2	5.8	2851	
154				Statistics (All: NDs treated as DL/2 value)	49	0.155	20000	451.1	5.8	2851	
155				Statistics (Normal ROS Imputed Data)	49	-8097	20000	-1433	5.8	3944	
156				Statistics (Gamma ROS Imputed Data)	49	0.01	20000	451	5.8	2851	
157				Statistics (Lognormal ROS Imputed Data)	49	0.112	20000	452.4	8.898	2851	
158											
159					K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
160				Statistics (Detects Only)	0.28	0.273	2928	4.212	1.735	0.412	
161				Statistics (NDs = DL)	0.174	0.177	2591	1.795	2.992	1.667	
162				Statistics (NDs = DL/2)	0.164	0.167	2752	1.484	3.31	2.23	
163				Statistics (Gamma ROS Estimates)	0.133	0.139	3381	0.253	4.612	18.19	
164				Statistics (Lognormal ROS Estimates)	--	--	--	2.596	2.354	0.907	
165											

	A	B	C	D	E	F	G	H	I	J	K
166	**Normal GOF Test Results**										
167											
168					No NDs	NDs = DL	NDs = DL/2	Normal ROS			
169				Correlation Coefficient R	0.421	0.347	0.347	0.788			
170											
171					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
172				Shapiro-Wilk (Detects Only)	0.207	0.923	Data Not Normal				
173				Shapiro-Wilk (NDs = DL)	0.156	0.947	Data Not Normal				
174				Shapiro-Wilk (NDs = DL/2)	0.156	0.947	Data Not Normal				
175				Shapiro-Wilk (Normal ROS Estimates)	0.668	0.947	Data Not Normal				
176				Lilliefors (Detects Only)	0.527	0.167	Data Not Normal				
177				Lilliefors (NDs = DL)	0.515	0.126	Data Not Normal				
178				Lilliefors (NDs = DL/2)	0.515	0.126	Data Not Normal				
179				Lilliefors (Normal ROS Estimates)	0.319	0.126	Data Not Normal				
180											
181	**Gamma GOF Test Results**										
182											
183					No NDs	NDs = DL	NDs = DL/2	Gamma ROS			
184				Correlation Coefficient R	0.77	0.74	0.747	0.77			
185											
186					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
187				Anderson-Darling (Detects Only)	6.331	0.863					
188				Kolmogorov-Smirnov (Detects Only)	0.456	0.184	Data Not Gamma Distributed				
189				Anderson-Darling (NDs = DL)	6.822	0.937					
190				Kolmogorov-Smirnov (NDs = DL)	0.314	0.142	Data Not Gamma Distributed				
191				Anderson-Darling (NDs = DL/2)	6.383	0.946					
192				Kolmogorov-Smirnov (NDs = DL/2)	0.303	0.142	Data Not Gamma Distributed				
193				Anderson-Darling (Gamma ROS Estimates)	5.318	0.976					
194				Kolmogorov-Smirnov (Gamma ROS Est.)	0.266	0.144	Data Not Gamma Distributed				
195											
196	**Lognormal GOF Test Results**										
197											
198					No NDs	NDs = DL	NDs = DL/2	Log ROS			
199				Correlation Coefficient R	0.834	0.879	0.879	0.959			
200											
201					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
202				Shapiro-Wilk (Detects Only)	0.736	0.923	Data Not Lognormal				
203				Shapiro-Wilk (NDs = DL)	0.763	0.947	Data Not Lognormal				
204				Shapiro-Wilk (NDs = DL/2)	0.761	0.947	Data Not Lognormal				
205				Shapiro-Wilk (Lognormal ROS Estimates)	0.927	0.947	Data Not Lognormal				
206				Lilliefors (Detects Only)	0.284	0.167	Data Not Lognormal				
207				Lilliefors (NDs = DL)	0.288	0.126	Data Not Lognormal				
208				Lilliefors (NDs = DL/2)	0.293	0.126	Data Not Lognormal				
209				Lilliefors (Lognormal ROS Estimates)	0.184	0.126	Data Not Lognormal				
210											
211	**Note: Substitution methods such as DL or DL/2 are not recommended.**										
212											

	A	B	C	D	E	F	G	H	I	J	K
213	**TCE_7.5**										
214											
215					Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
216				Raw Statistics	51	0	51	50	1	1.96%	
217											
218					Number	Minimum	Maximum	Mean	Median	SD	
219				Statistics (Non-Detects Only)	1	0.3	0.3	0.3	0.3	N/A	
220				Statistics (Detects Only)	50	2.3	7300	190.2	42.5	1027	
221				Statistics (All: NDs treated as DL value)	51	0.3	7300	186.5	42	1017	
222				Statistics (All: NDs treated as DL/2 value)	51	0.15	7300	186.5	42	1017	
223				Statistics (Normal ROS Imputed Data)	51	-766.1	7300	171.5	42	1025	
224				Statistics (Gamma ROS Imputed Data)	51	0.01	7300	186.5	42	1017	
225				Statistics (Lognormal ROS Imputed Data)	51	1.846	7300	186.5	42	1017	
226											
227					K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
228				Statistics (Detects Only)	0.39	0.38	488.1	3.552	1.217	0.343	
229				Statistics (NDs = DL)	0.376	0.367	496.4	3.459	1.377	0.398	
230				Statistics (NDs = DL/2)	0.373	0.364	499.6	3.446	1.426	0.414	
231				Statistics (Gamma ROS Estimates)	0.364	0.356	512.4	3.392	1.66	0.489	
232				Statistics (Lognormal ROS Estimates)	--	--	--	3.495	1.273	0.364	
233											
234						**Normal GOF Test Results**					
235											
236					No NDs	NDs = DL	NDs = DL/2	Normal ROS			
237				Correlation Coefficient R	0.36	0.358	0.358	0.39			
238											
239					Apr. Test	P Value	Conclusion with Alpha(0.05)				
240				Shapiro-Wilk (NDs = DL)	0.166	0	Data Not Normal				
241				Shapiro-Wilk (NDs = DL/2)	0.166	0	Data Not Normal				
242				Shapiro-Wilk (Normal ROS Estimates)	0.196	0	Data Not Normal				
243					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
244				Shapiro-Wilk (Detects Only)	0.167	0.947	Data Not Normal				
245				Lilliefors (Detects Only)	0.488	0.125	Data Not Normal				
246				Lilliefors (NDs = DL)	0.487	0.123	Data Not Normal				
247				Lilliefors (NDs = DL/2)	0.487	0.123	Data Not Normal				
248				Lilliefors (Normal ROS Estimates)	0.481	0.123	Data Not Normal				
249											

	A	B	C	D	E	F	G	H	I	J	K
250	**Gamma GOF Test Results**										
251											
252					No NDs	NDs = DL	NDs = DL/2	Gamma ROS			
253				Correlation Coefficient R	0.66	0.662	0.662	0.665			
254											
255					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
256				Anderson-Darling (Detects Only)	8.651	0.841					
257				Kolmogorov-Smirnov (Detects Only)	0.357	0.134	Data Not Gamma Distributed				
258				Anderson-Darling (NDs = DL)	8.211	0.844					
259				Kolmogorov-Smirnov (NDs = DL)	0.348	0.134	Data Not Gamma Distributed				
260				Anderson-Darling (NDs = DL/2)	8.149	0.845					
261				Kolmogorov-Smirnov (NDs = DL/2)	0.347	0.134	Data Not Gamma Distributed				
262				Anderson-Darling (Gamma ROS Estimates)	7.974	0.847					
263				Kolmogorov-Smirnov (Gamma ROS Est.)	0.342	0.134	Data Not Gamma Distributed				
264											
265	**Lognormal GOF Test Results**										
266											
267					No NDs	NDs = DL	NDs = DL/2	Log ROS			
268				Correlation Coefficient R	0.926	0.924	0.914	0.933			
269											
270					Apr. Test	P Value	Conclusion with Alpha(0.05)				
271				Shapiro-Wilk (NDs = DL)	0.9	2.1362E-4	Data Not Lognormal				
272				Shapiro-Wilk (NDs = DL/2)	0.886	4.7478E-5	Data Not Lognormal				
273				Shapiro-Wilk (Lognormal ROS Estimates)	0.903	3.0867E-4	Data Not Lognormal				
274					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
275				Shapiro-Wilk (Detects Only)	0.892	0.947	Data Not Lognormal				
276				Lilliefors (Detects Only)	0.132	0.125	Data Not Lognormal				
277				Lilliefors (NDs = DL)	0.139	0.123	Data Not Lognormal				
278				Lilliefors (NDs = DL/2)	0.144	0.123	Data Not Lognormal				
279				Lilliefors (Lognormal ROS Estimates)	0.13	0.123	Data Not Lognormal				
280											
281	**Note: Substitution methods such as DL or DL/2 are not recommended.**										
282											
283	**TCE_137.5**										
284											
285					Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs	
286				Raw Statistics	49	0	49	48	1	2.04%	
287											
288					Number	Minimum	Maximum	Mean	Median	SD	
289				Statistics (Non-Detects Only)	1	0.3	0.3	0.3	0.3	N/A	
290				Statistics (Detects Only)	48	1.3	17000	10891	11500	4713	
291				Statistics (All: NDs treated as DL value)	49	0.3	17000	10669	11000	4917	
292				Statistics (All: NDs treated as DL/2 value)	49	0.15	17000	10669	11000	4917	
293				Statistics (Normal ROS Imputed Data)	49	-705.6	17000	10655	11000	4949	
294				Statistics (Gamma ROS Imputed Data)	49	1.3	17000	10797	11000	4710	
295				Statistics (Lognormal ROS Imputed Data)	49	1.3	17000	10677	11000	4899	
296											

	A	B	C	D	E	F	G	H	I	J	K
297					K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV	
298				Statistics (Detects Only)	1.292	1.226	8427	8.861	1.725	0.195	
299				Statistics (NDs = DL)	0.939	0.895	11359	8.656	2.232	0.258	
300				Statistics (NDs = DL/2)	0.921	0.878	11590	8.642	2.297	0.266	
301				Statistics (Gamma ROS Estimates)	1.31	1.243	8244	8.859	1.707	0.193	
302				Statistics (Lognormal ROS Estimates)	--	--	--	8.802	1.757	0.2	
303											
304				**Normal GOF Test Results**							
305											
306					No NDs	NDs = DL	NDs = DL/2	Normal ROS			
307				Correlation Coefficient R	0.945	0.943	0.943	0.943			
308											
309					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
310				Shapiro-Wilk (Detects Only)	0.875	0.947	Data Not Normal				
311				Shapiro-Wilk (NDs = DL)	0.869	0.947	Data Not Normal				
312				Shapiro-Wilk (NDs = DL/2)	0.869	0.947	Data Not Normal				
313				Shapiro-Wilk (Normal ROS Estimates)	0.872	0.947	Data Not Normal				
314				Lilliefors (Detects Only)	0.204	0.127	Data Not Normal				
315				Lilliefors (NDs = DL)	0.2	0.126	Data Not Normal				
316				Lilliefors (NDs = DL/2)	0.2	0.126	Data Not Normal				
317				Lilliefors (Normal ROS Estimates)	0.199	0.126	Data Not Normal				
318											
319				**Gamma GOF Test Results**							
320											
321					No NDs	NDs = DL	NDs = DL/2	Gamma ROS			
322				Correlation Coefficient R	0.775	0.738	0.735	0.784			
323											
324					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
325				Anderson-Darling (Detects Only)	6.685	0.772					
326				Kolmogorov-Smirnov (Detects Only)	0.269	0.131	Data Not Gamma Distributed				
327				Anderson-Darling (NDs = DL)	7.88	0.783					
328				Kolmogorov-Smirnov (NDs = DL)	0.303	0.131	Data Not Gamma Distributed				
329				Anderson-Darling (NDs = DL/2)	7.961	0.784					
330				Kolmogorov-Smirnov (NDs = DL/2)	0.307	0.131	Data Not Gamma Distributed				
331				Anderson-Darling (Gamma ROS Estimates)	6.543	0.772					
332				Kolmogorov-Smirnov (Gamma ROS Est.)	0.263	0.129	Data Not Gamma Distributed				
333											

	A	B	C	D	E	F	G	H	I	J	K
334	**Lognormal GOF Test Results**										
335											
336					No NDs	NDs = DL	NDs = DL/2	Log ROS			
337				Correlation Coefficient R	0.679	0.679	0.674	0.706			
338											
339					Test value	Crit. (0.05)	Conclusion with Alpha(0.05)				
340				Shapiro-Wilk (Detects Only)	0.489	0.947	Data Not Lognormal				
341				Shapiro-Wilk (NDs = DL)	0.481	0.947	Data Not Lognormal				
342				Shapiro-Wilk (NDs = DL/2)	0.477	0.947	Data Not Lognormal				
343				Shapiro-Wilk (Lognormal ROS Estimates)	0.523	0.947	Data Not Lognormal				
344				Lilliefors (Detects Only)	0.347	0.127	Data Not Lognormal				
345				Lilliefors (NDs = DL)	0.376	0.126	Data Not Lognormal				
346				Lilliefors (NDs = DL/2)	0.379	0.126	Data Not Lognormal				
347				Lilliefors (Lognormal ROS Estimates)	0.343	0.126	Data Not Lognormal				
348											
349	**Note: Substitution methods such as DL or DL/2 are not recommended.**										

	A	B	C	D	E	F	G	H	I	J
1	**Outlier Tests for Selected Uncensored Variables**									
2				**User Selected Options**						
3				Date/Time of Computation	ProUCL 5.2 4/21/2025 10:09:18 AM					
4					From File	600-SGW-05_Vapor_2025_Input.xls				
5					Full Precision	OFF				
6										
7										
8	**Rosner's Outlier Test for Chloroform_7.5_M-K**									
9										
10										
11				**Mean**	**3.439**					
12				**Standard Deviation**	**12.55**					
13				**Number of data**	**49**					
14				**Number of suspected outliers**	**1**					
15										
16				Potential	Obs.	Test	Critical	Critical		
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
18	1	3.439	12.42	89	46	6.89	3.12	3.47		
19										
20	For 5% Significance Level, there is 1 Potential Outlier									
21	Potential outliers is: 89									
22										
23	For 1% Significance Level, there is 1 Potential Outlier									
24	Potential outliers is: 89									
25										
26										
27	**Rosner's Outlier Test for Chloroform_7.5_OLS_No_Outliers**									
28										
29										
30				**Mean**	**1.715**					
31				**Standard Deviation**	**1.33**					
32				**Number of data**	**46**					
33				**Number of suspected outliers**	**1**					
34										
35				Potential	Obs.	Test	Critical	Critical		
36	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
37	1	1.715	1.316	5.4	3	2.8	3.09	3.45		
38										
39	For 5% Significance Level, there is no Potential Outlier									
40										
41	For 1% Significance Level, there is no Potential Outlier									
42										
43										

Rosner's Outlier Test for Chloro_52.5

Mean	60.67
Standard Deviation	21.51
Number of data	49
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	60.67	21.29	11	22	2.333	3.12	3.47

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for Chloro_102.5

Mean	75.01
Standard Deviation	23.47
Number of data	49
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	75.01	23.23	0.31	48	3.216	3.12	3.47

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.31

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for Chloroform_102.5_No_Outliers

Mean	77.87
Standard Deviation	19.15
Number of data	47
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	77.87	18.94	130	45	2.752	3.1	3.46

	A	B	C	D	E	F	G	H	I	J
91	For 5% Significance Level, there is no Potential Outlier									
92										
93	For 1% Significance Level, there is no Potential Outlier									
94										
95										
96	**Rosner's Outlier Test for Chloro_137.5**									
97										
98										
99				**Mean**	**451.2**					
100				**Standard Deviation**	**2851**					
101				**Number of data**	**49**					
102				**Number of suspected outliers**	**1**					
103										
104				Potential	Obs.	Test	Critical	Critical		
105	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
106	1	451.2	2822	20000	44	6.927	3.12	3.47		
107										
108	For 5% Significance Level, there is 1 Potential Outlier									
109	Potential outliers is: 20000									
110										
111	For 1% Significance Level, there is 1 Potential Outlier									
112	Potential outliers is: 20000									
113										
114										
115	**Rosner's Outlier Test for Chloro_137.5_no_outliers**									
116										
117										
118				**Mean**	**65.69**					
119				**Standard Deviation**	**51.04**					
120				**Number of data**	**32**					
121				**Number of suspected outliers**	**1**					
122										
123				Potential	Obs.	Test	Critical	Critical		
124	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
125	1	65.69	50.24	200	14	2.674	2.94	3.27		
126										
127	For 5% Significance Level, there is no Potential Outlier									
128										
129	For 1% Significance Level, there is no Potential Outlier									
130										
131										

	A	B	C	D	E	F	G	H	I	J
132	**Rosner's Outlier Test for TCE_7.5**									
133										
134										
135				**Mean**	**186.5**					
136				**Standard Deviation**	**1017**					
137				**Number of data**	**51**					
138				**Number of suspected outliers**	**1**					
139										
140				Potential	Obs.	Test	Critical	Critical		
141	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
142	1	186.5	1007	7300	48	7.066	3.137	3.488		
143										
144	For 5% Significance Level, there is 1 Potential Outlier									
145	Potential outliers is: 7300									
146										
147	For 1% Significance Level, there is 1 Potential Outlier									
148	Potential outliers is: 7300									
149										
150										
151	**Rosner's Outlier Test for TCE_7.5_No_outlier1**									
152										
153										
154				**Mean**	**44.22**					
155				**Standard Deviation**	**37.05**					
156				**Number of data**	**50**					
157				**Number of suspected outliers**	**1**					
158										
159				Potential	Obs.	Test	Critical	Critical		
160	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
161	1	44.22	36.68	170	3	3.429	3.13	3.48		
162										
163	For 5% Significance Level, there is 1 Potential Outlier									
164	Potential outliers is: 170									
165										
166	For 1% Significance Level, there is no Potential Outlier									
167										
168										

	A	B	C	D	E	F	G	H	I	J
169	**Rosner's Outlier Test for TCE_7.5_No_outlier2**									
170										
171										
172				**Mean**	**41.66**					
173				**Standard Deviation**	**32.63**					
174				**Number of data**	**49**					
175				**Number of suspected outliers**	**1**					
176										
177				Potential	Obs.	Test	Critical	Critical		
178	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
179	1	41.66	32.3	150	12	3.354	3.12	3.47		
180										
181	For 5% Significance Level, there is 1 Potential Outlier									
182	Potential outliers is: 150									
183										
184	For 1% Significance Level, there is no Potential Outlier									
185										
186										
187	**Rosner's Outlier Test for TCE_7.5_No_outlier3**									
188										
189										
190				**Mean**	**39.4**					
191				**Standard Deviation**	**28.86**					
192				**Number of data**	**48**					
193				**Number of suspected outliers**	**1**					
194										
195				Potential	Obs.	Test	Critical	Critical		
196	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)		
197	1	39.4	28.55	130	38	3.173	3.11	3.46		
198										
199	For 5% Significance Level, there is 1 Potential Outlier									
200	Potential outliers is: 130									
201										
202	For 1% Significance Level, there is no Potential Outlier									
203										
204										

Rosner's Outlier Test for TCE_52.5

Mean	**1140**
Standard Deviation	**577.9**
Number of data	**49**
Number of suspected outliers	**1**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	1140	572	2600	2	2.553	3.12	3.47

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for TCE_102.5

Mean	**1407**
Standard Deviation	**588.8**
Number of data	**49**
Number of suspected outliers	**1**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	1407	582.7	3000	6	2.734	3.12	3.47

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

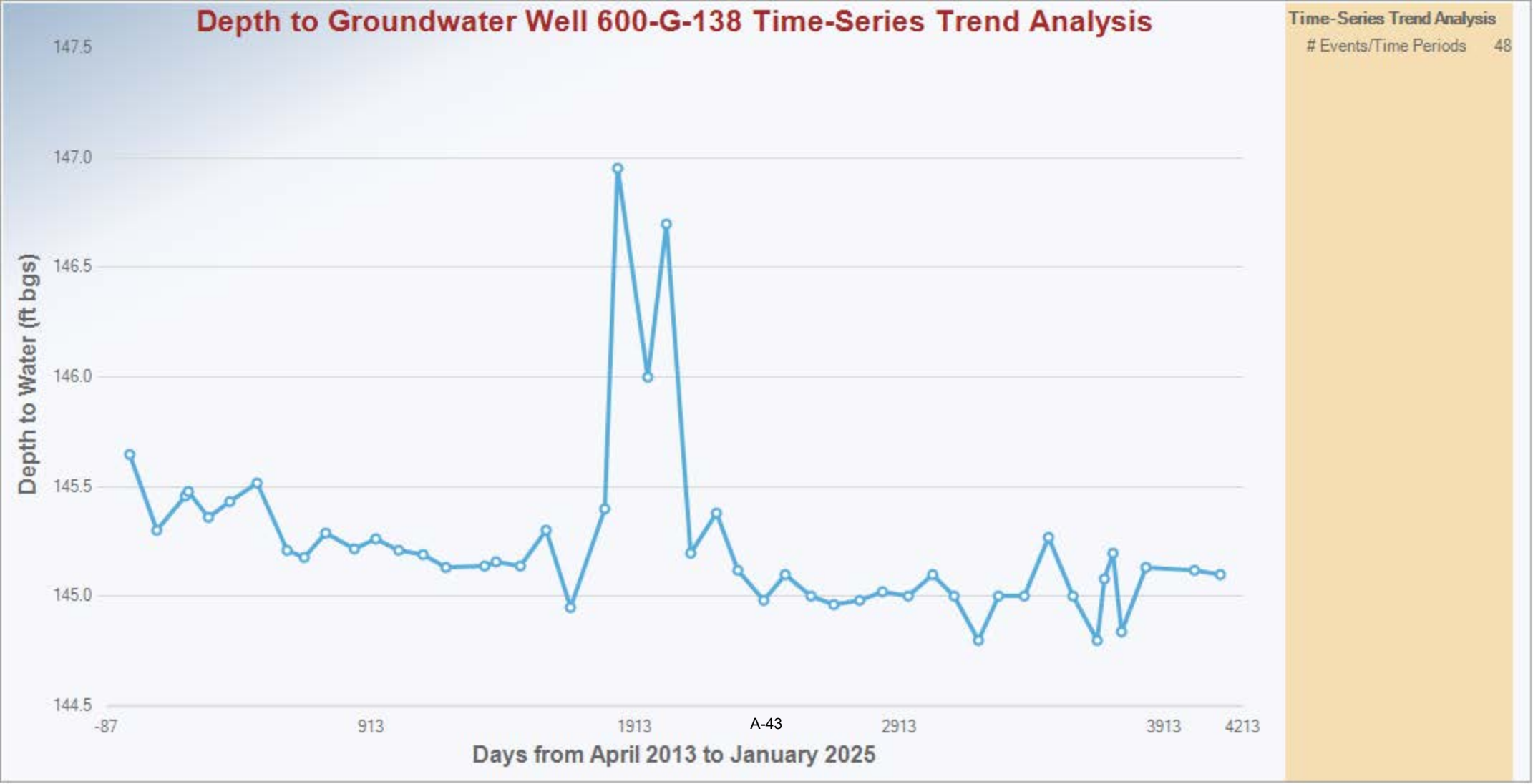
Rosner's Outlier Test for TCE_137.5

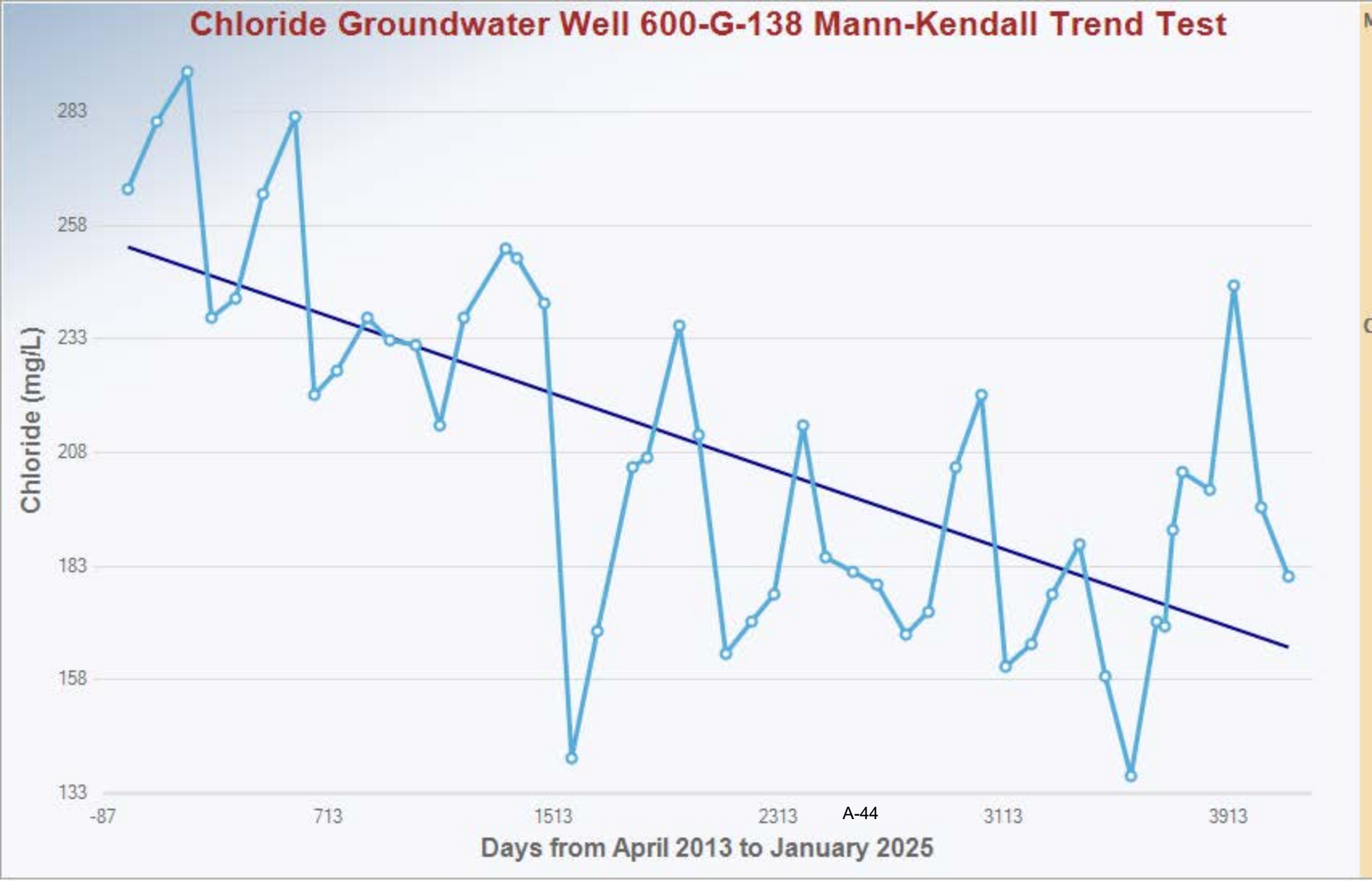
Mean	**10669**
Standard Deviation	**4917**
Number of data	**49**
Number of suspected outliers	**1**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	10669	4866	0.3	10	2.192	3.12	3.47

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier


Depth to Groundwater Well 600-G-138 Time-Series Trend Analysis
Time-Series Trend Analysis
Events/Time Periods 48
147.5
147.0
146.5
146.0
145.5
145.0
144.5
Depth to Water (ft bgs)
-87
913
1913
2913
3913
4213
Days from April 2013 to January 2025



Mann-Kendall Trend Analysis

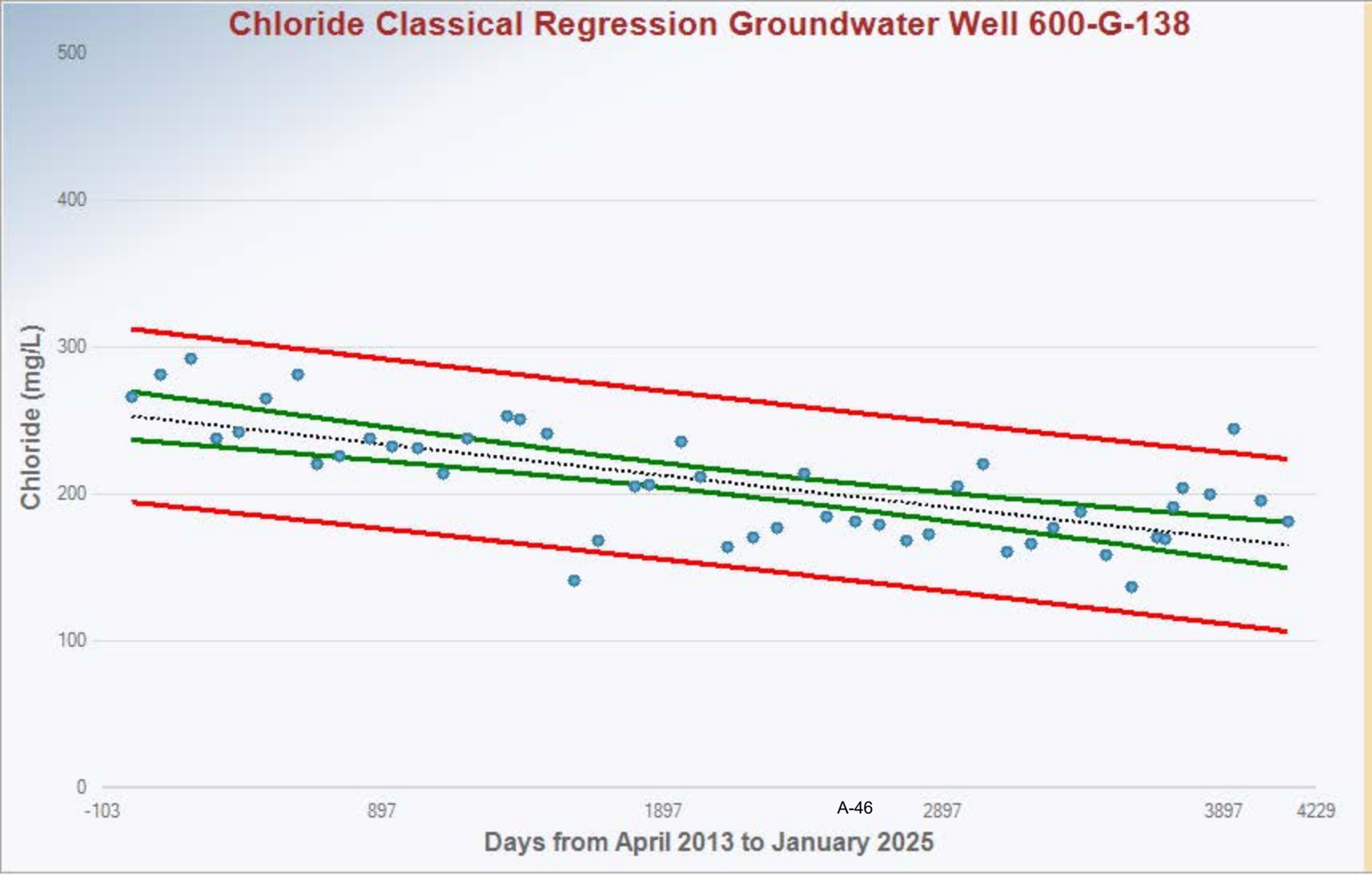
n	48
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	112.4722
Standardized Value of S	-4.5789
M-K Test Value (S)	-516
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.0214
OLS Regression Intercept	253.4102

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 7:10:55 AM					
4			From File	600-G-138_GW_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**Chloride**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		48				
13			Number of Missing Events		0				
14			Number or Reported Events Used		48				
15			Number Values Reported (n)		48				
16			Minimum		137				
17			Maximum		292				
18			Mean		207.7				
19			Geometric Mean		204.2				
20			Median		205				
21			Standard Deviation		38.42				
22			Coefficient of Variation		0.185				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-516				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		112.5				
28			Standardized Value of S		-4.579				
29			Approximate p-value		2.3370E-6				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



OLS	
n	48
Slope	-0.0214
Intercept	253.4102
R-sq	0.4749
R	-0.6891
Scale Estimate	28.1448
P-value (Reg)	0.0000
P-value (Slope)	0.0000

Mann-Kendall	
S	-516.0000
SD of S	112.4722
Standardized S	-4.5789
Approximate p-value	0.0000

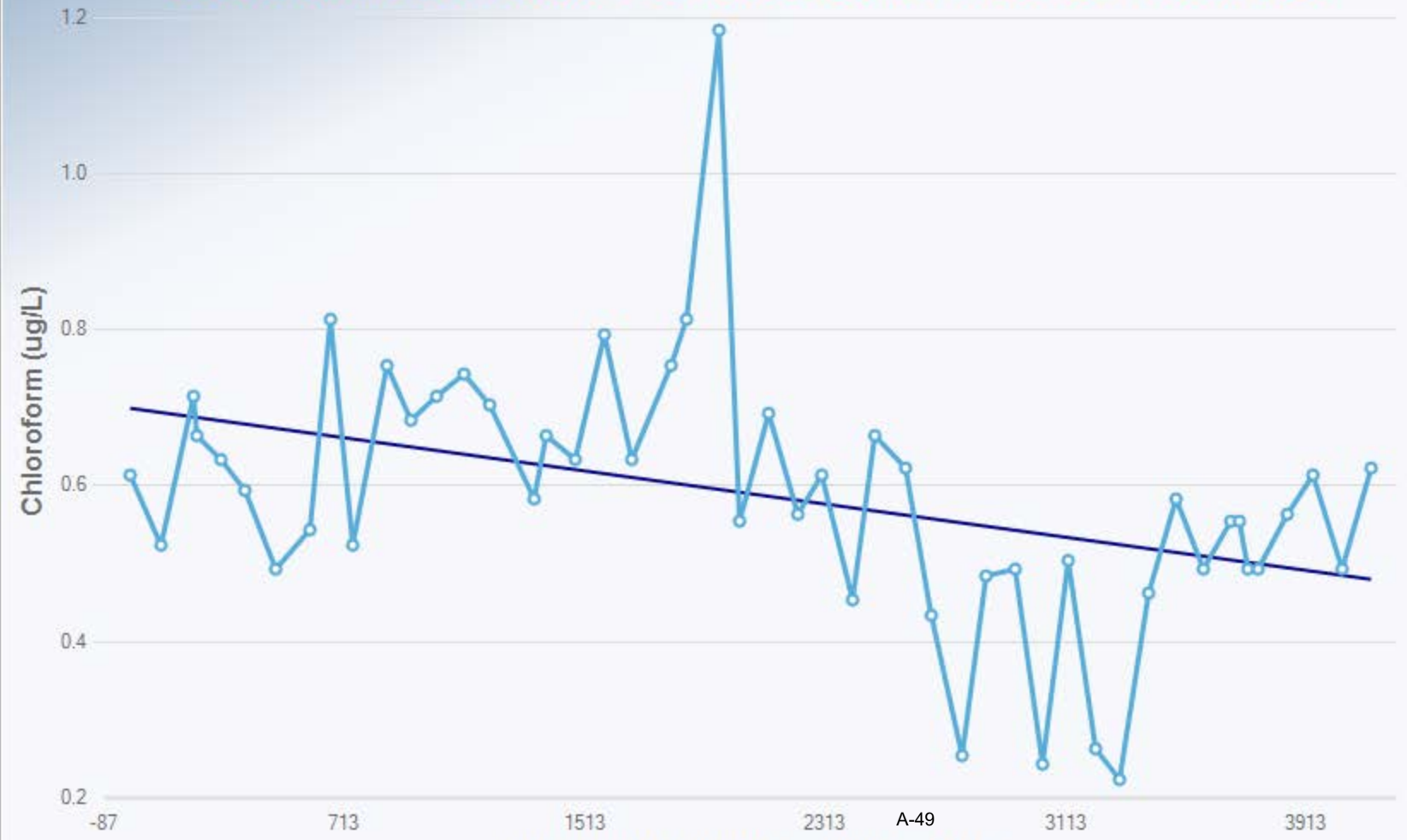
Confidence Coefficient	0.9500

Red = Prediction Interval
Green = Confidence Interval

	A	B	C	D	E	F	G	H	I	J
1				**Ordinary Least Squares Linear Regression Output Sheet**						
2			User Selected Options							
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 8:09:53 AM						
4			From File	600-G-138_GW_2025_Input.xls						
5			Full Precision	OFF						
6										
7			Display Limits	False						
8			Display Regresion Diagnostics	False						
9			Display Regresion Tables	True						
10			Title For Y vs X Plots	Classical Regression						
11			onfidence Level for Regression Line	0.95						
12			Display Confidence Band	True						
13			Display Prediction Band	True						
14										
15										
16			Dependendant Variable (Y-Data)	Chloride						
17			Number Reported (Y values)	48						
18			Independent Variable (x-data)	Date_Chloride						
19			Number Reported (x-values)	48						
20										
21										
22			**Regression Estimates and Inference Table**							
23	Parameter	Estimates	Std. Error	T-values	p-values					
24	intercept	253.4	8.173	31	1.775E-32					
25	Date_Chlorid	-0.0214	0.00331	-6.45	6.1162E-8					
26										
27			**OLS ANOVA Table**							
28			**Source of Variation**	**SS**	**DOF**	**MS**	**F-Value**	**P-Value**		
29			**Regression**	32951	1	32951	41.6	0.0000		
30			**Error**	36438	46	792.1				
31			**Total**	69389	47					
32										
33					R Square	0.475				
34					Adjusted R Square	0.463				
35					Sqrt(MSE) = Scale	28.14				
36										
37			**Regression Table**							
38	Obs	Y Vector	Yhat	Residuals	Res/Scale					
39	1	266	253.4	12.59	0.447					
40	2	281	251.2	29.77	1.058					
41	3	292	248.9	43.05	1.53					
42	4	238	247	-9.024	-0.321					
43	5	242	245.3	-3.273	-0.116					
44	6	265	243.1	21.86	0.777					
45	7	282	240.7	41.28	1.467					
46	8	221	239.3	-18.25	-0.648					
47	9	226	237.6	-11.58	-0.412					

	A	B	C	D	E	F	G	H	I	J
48	10	238	235.2	2.765	0.0982					
49	11	233	233.5	-0.548	-0.0195					
50	12	232	231.6	0.374	0.0133					
51	13	214	229.7	-15.68	-0.557					
52	14	238	227.9	10.11	0.359					
53	15	253	224.8	28.23	1.003					
54	16	251	223.9	27.15	0.965					
55	17	241	221.8	19.2	0.682					
56	18	141	219.7	-78.71	-2.797					
57	19	169	217.8	-48.83	-1.735					
58	20	205	215.1	-10.05	-0.357					
59	21	207	213.9	-6.942	-0.247					
60	22	236	211.6	24.41	0.867					
61	23	212	210.1	1.903	0.0676					
62	24	164	208	-44.05	-1.565					
63	25	171	206	-35.04	-1.245					
64	26	177	204.3	-27.29	-0.97					
65	27	214	202.2	11.83	0.42					
66	28	185	200.5	-15.49	-0.55					
67	29	182	198.3	-16.33	-0.58					
68	30	179	196.5	-17.49	-0.622					
69	31	168	194.4	-26.38	-0.937					
70	32	173	192.6	-19.63	-0.697					
71	33	205	190.5	14.47	0.514					
72	34	221	188.6	32.41	1.152					
73	35	161	186.8	-25.75	-0.915					
74	36	166	184.8	-18.83	-0.669					
75	37	177	183.2	-6.187	-0.22					
76	38	188	181.1	6.885	0.245					
77	39	159	179.2	-20.17	-0.717					
78	40	137	177.2	-40.21	-1.429					
79	41	171	175.2	-4.242	-0.151					
80	42	170	174.7	-4.666	-0.166					
81	43	191	174	17	0.604					
82	44	204	173.3	30.68	1.09					
83	45	200	171.3	28.73	1.021					
84	46	245	169.4	75.61	2.686					
85	47	196	167.4	28.64	1.018					
86	48	181	165.3	15.71	0.558					
87										

Chloroform Groundwater Well 600-G-138 Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

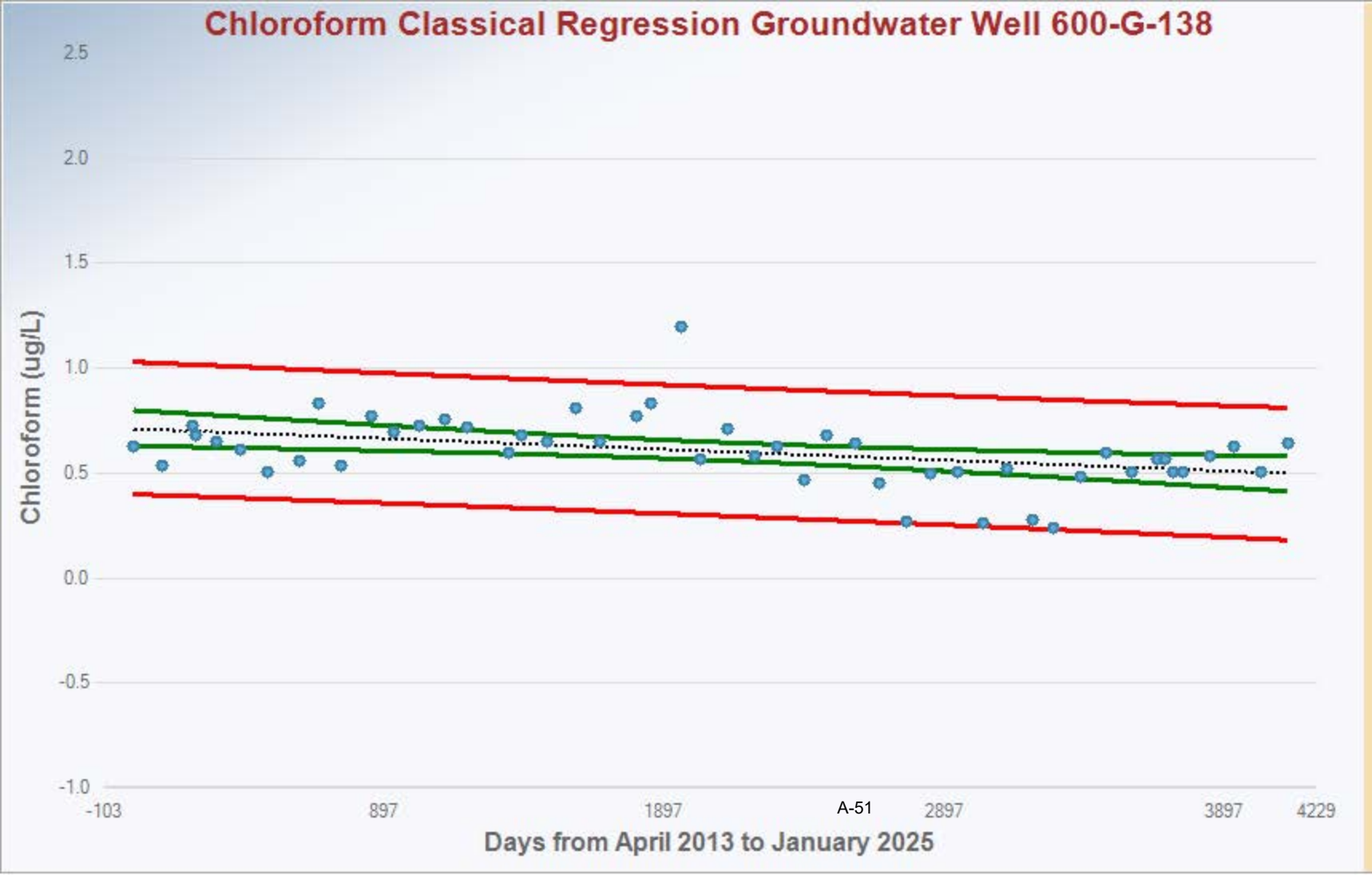
n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.8821
Standardized Value of S	-2.9254
M-K Test Value (S)	-340
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0017

OLS Regression Line (Blue)

OLS Regression Slope	-0.0001
OLS Regression Intercept	0.7145

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 7:19:51 AM					
4			From File	600-G-138_GW_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**Chloroform**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		0.24				
17			Maximum		1.2				
18			Mean		0.603				
19			Geometric Mean		0.58				
20			Median		0.6				
21			Standard Deviation		0.164				
22			Coefficient of Variation		0.271				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-340				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		115.9				
28			Standardized Value of S		-2.925				
29			Approximate p-value		0.00172				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



OLS	
n	49
Slope	-0.0001
Intercept	0.7145
R-sq	0.1649
R	-0.4061
Scale Estimate	0.1510
P-value (Reg)	0.0038
P-value (Slope)	0.0038

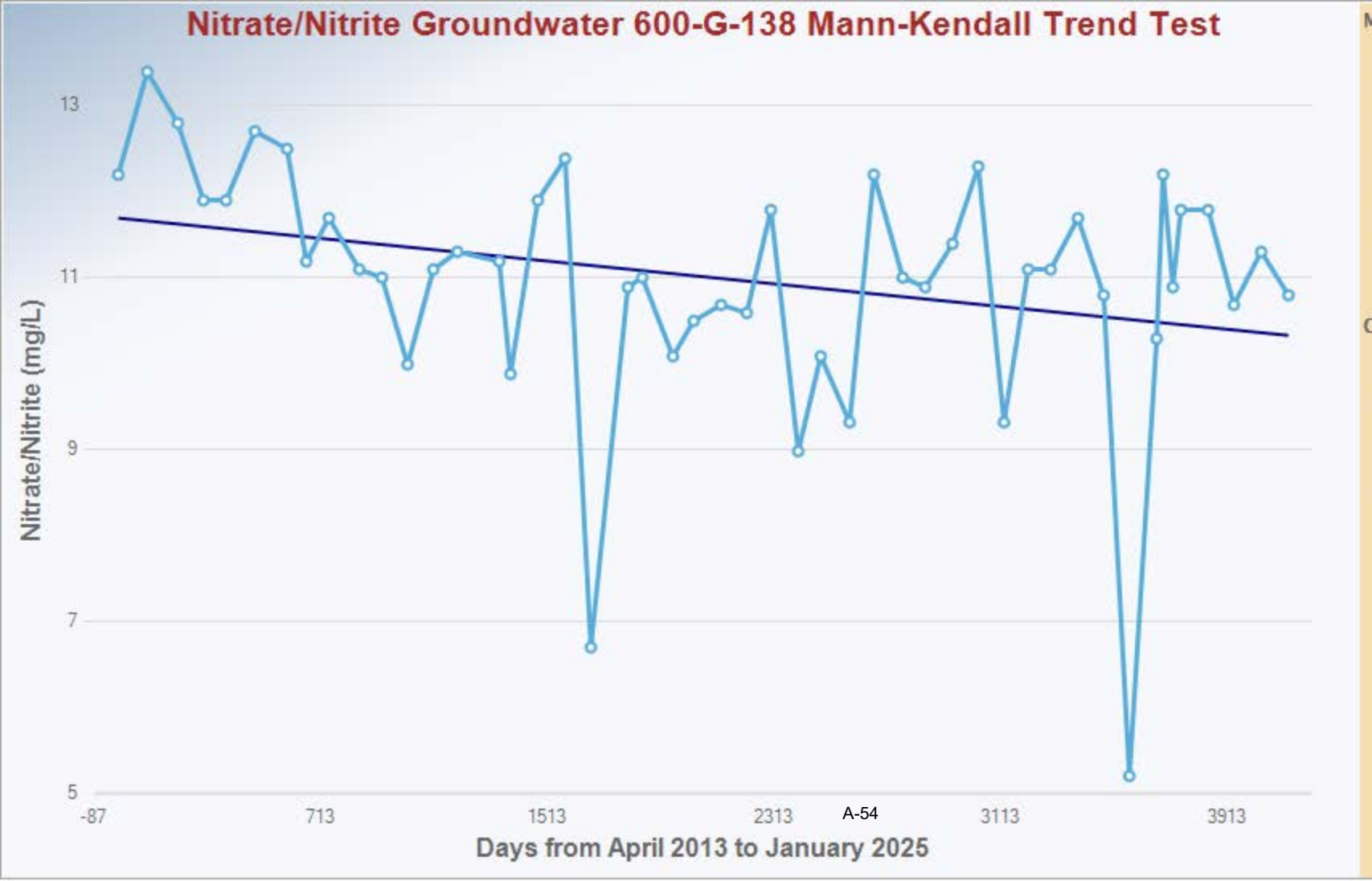
Mann-Kendall	
S	-340.0000
SD of S	115.8821
Standardized S	-2.9254
Approximate p-value	0.0017

Confidence Coefficient	0.9500

Red = Prediction Interval
Green = Confidence Interval

	A	B	C	D	E	F	G	H	I	J
1				**Ordinary Least Squares Linear Regression Output Sheet**						
2			User Selected Options							
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 8:15:45 AM						
4			From File	600-G-138_GW_2025_Input.xls						
5			Full Precision	OFF						
6										
7			Display Limits	False						
8			Display Regresion Diagnostics	False						
9			Display Regresion Tables	True						
10			Title For Y vs X Plots	Classical Regression						
11			onfidence Level for Regression Line	0.95						
12			Display Confidence Band	True						
13			Display Prediction Band	True						
14										
15										
16			Dependendant Variable (Y-Data)	Chloroform						
17			Number Reported (Y values)	49						
18			Independent Variable (x-data)	Date_Chloroform						
19			Number Reported (x-values)	49						
20										
21										
22			**Regression Estimates and Inference Table**							
23	Parameter	Estimates	Std. Error	T-values	p-values					
24	intercept	0.715	0.0424	16.87	1.437E-21					
25	ate_Chlorofo	-5.282E-5	1.7338E-5	-3.047	0.00379					
26										
27			**OLS ANOVA Table**							
28			**Source of Variation**	**SS**	**DOF**	**MS**	**F-Value**	**P-Value**		
29			**Regression**	0.212	1	0.212	9.281	0.0038		
30			**Error**	1.072	47	0.0228				
31			**Total**	1.283	48					
32										
33					R Square	0.165				
34					Adjusted R Square	0.147				
35					Sqrt(MSE) = Scale	0.151				
36										
37			**Regression Table**							
38	Obs	Y Vector	Yhat	Residuals	Res/Scale					
39	1	0.63	0.715	-0.0845	-0.56					
40	2	0.54	0.709	-0.169	-1.12					
41	3	0.73	0.703	0.0265	0.176					
42	4	0.68	0.703	-0.0228	-0.151					
43	5	0.65	0.699	-0.0487	-0.323					
44	6	0.61	0.694	-0.0844	-0.559					
45	7	0.51	0.689	-0.179	-1.186					
46	8	0.56	0.683	-0.123	-0.816					
47	9	0.83	0.68	0.15	0.997					

	A	B	C	D	E	F	G	H	I	J
48	10	0.54	0.675	-0.135	-0.897					
49	11	0.77	0.67	0.1	0.665					
50	12	0.7	0.665	0.0346	0.229					
51	13	0.73	0.661	0.0693	0.459					
52	14	0.76	0.656	0.104	0.69					
53	15	0.72	0.651	0.0686	0.454					
54	16	0.6	0.644	-0.0437	-0.289					
55	17	0.68	0.641	0.0386	0.255					
56	18	0.65	0.636	0.0136	0.0903					
57	19	0.81	0.631	0.179	1.184					
58	20	0.65	0.627	0.0235	0.155					
59	21	0.77	0.62	0.15	0.996					
60	22	0.83	0.617	0.213	1.411					
61	23	1.2	0.611	0.589	3.9					
62	24	0.57	0.607	-0.0374	-0.248					
63	25	0.71	0.602	0.108	0.713					
64	26	0.58	0.597	-0.0174	-0.115					
65	27	0.63	0.593	0.037	0.245					
66	28	0.47	0.588	-0.118	-0.78					
67	29	0.68	0.584	0.0964	0.638					
68	30	0.64	0.578	0.0617	0.409					
69	31	0.45	0.574	-0.124	-0.82					
70	32	0.27	0.569	-0.299	-1.977					
71	33	0.5	0.564	-0.0642	-0.425					
72	34	0.51	0.559	-0.049	-0.325					
73	35	0.26	0.554	-0.294	-1.948					
74	36	0.52	0.55	-0.0297	-0.197					
75	37	0.28	0.545	-0.265	-1.754					
76	38	0.24	0.541	-0.301	-1.992					
77	39	0.48	0.536	-0.0557	-0.369					
78	40	0.6	0.531	0.0691	0.457					
79	41	0.51	0.526	-0.0161	-0.106					
80	42	0.57	0.521	0.0488	0.323					
81	43	0.57	0.52	0.0502	0.333					
82	44	0.51	0.518	-0.00814	-0.0539					
83	45	0.51	0.516	-0.00645	-0.0427					
84	46	0.58	0.511	0.0686	0.454					
85	47	0.63	0.507	0.123	0.816					
86	48	0.51	0.502	0.00828	0.0549					
87	49	0.64	0.497	0.143	0.95					
88										



Mann-Kendall Trend Analysis

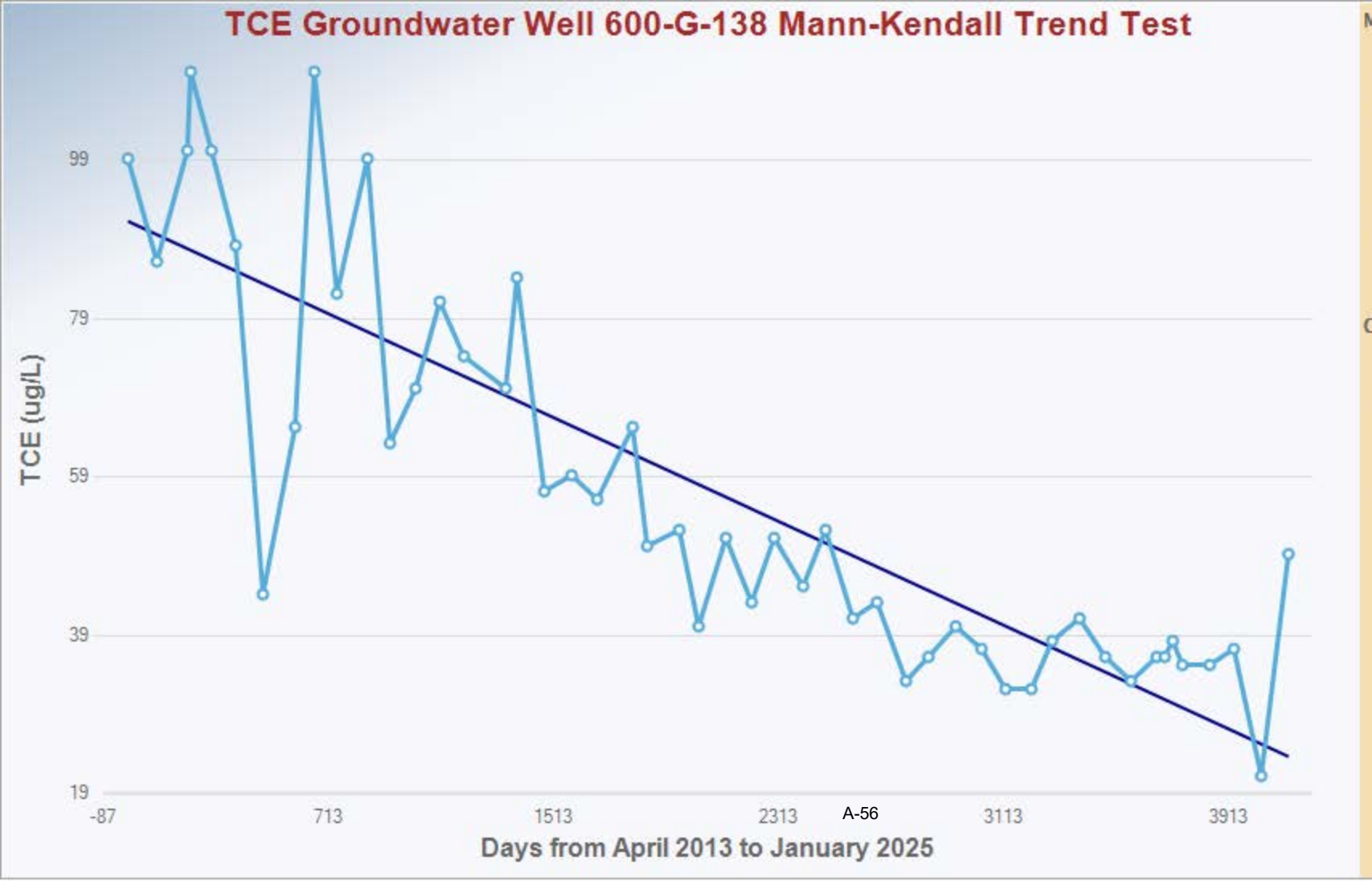
n	48
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	112.4307
Standardized Value of S	-2.3036
M-K Test Value (S)	-260
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0106

OLS Regression Line (Blue)

OLS Regression Slope	-0.0003
OLS Regression Intercept	11.8051

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 7:23:11 AM					
4			From File	600-G-138_GW_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**NO2NO3**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		48				
13			Number of Missing Events		0				
14			Number or Reported Events Used		48				
15			Number Values Reported (n)		48				
16			Minimum		5.32				
17			Maximum		13.5				
18			Mean		11.1				
19			Geometric Mean		10.98				
20			Median		11.2				
21			Standard Deviation		1.417				
22			Coefficient of Variation		0.128				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-260				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		112.4				
28			Standardized Value of S		-2.304				
29			Approximate p-value		0.0106				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



Mann-Kendall Trend Analysis

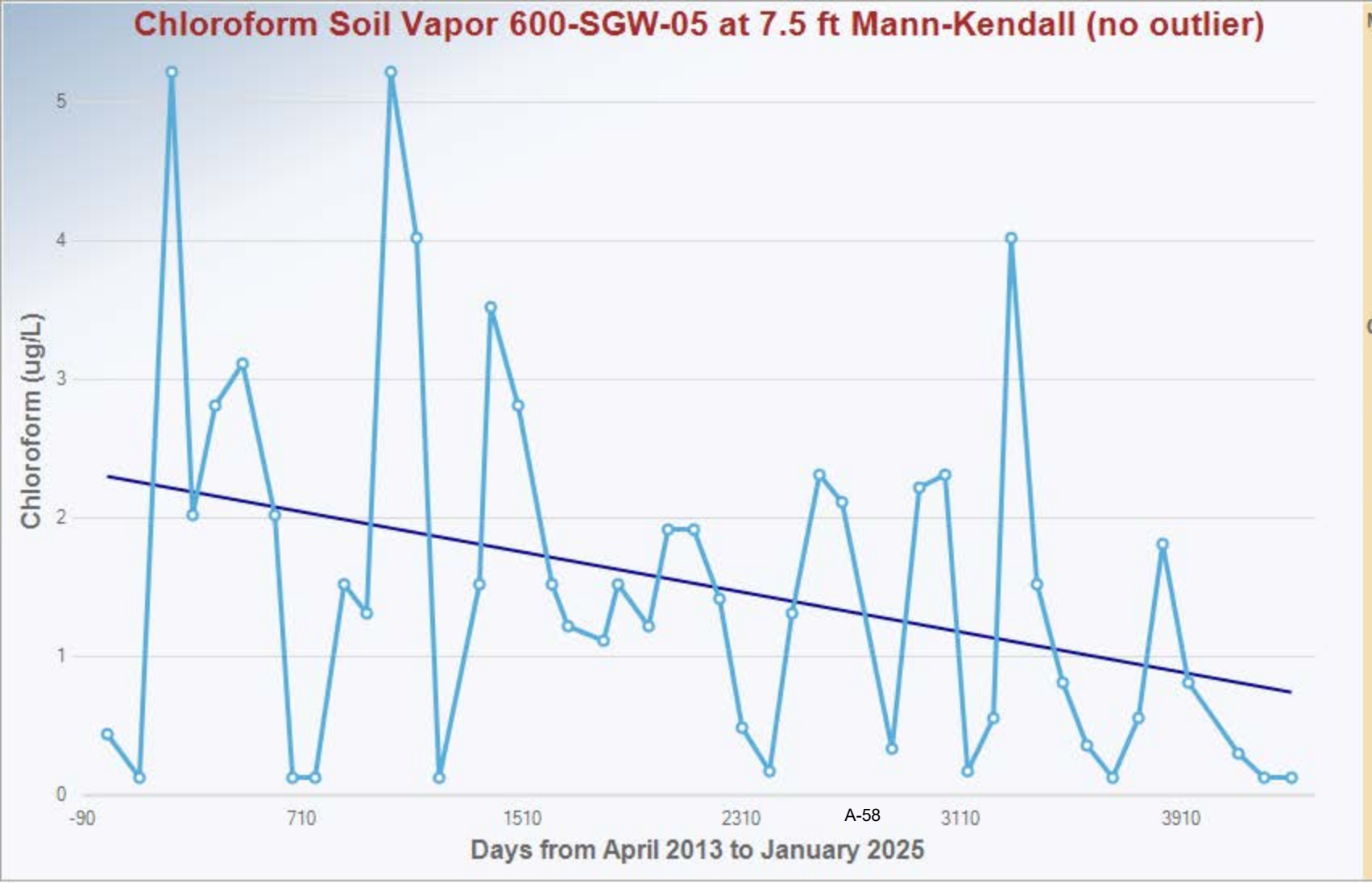
n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.9094
Standardized Value of S	-7.1953
M-K Test Value (S)	-835
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.0164
OLS Regression Intercept	91.0935

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 7:29:22 AM					
4			From File	600-G-138_GW_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**TCE**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		21				
17			Maximum		110				
18			Mean		56.63				
19			Geometric Mean		52.2				
20			Median		50				
21			Standard Deviation		23.87				
22			Coefficient of Variation		0.421				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-835				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		115.9				
28			Standardized Value of S		-7.195				
29			Approximate p-value		3.117E-13				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



Mann-Kendall Trend Analysis

n	46
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	105.3233
Standardized Value of S	-2.2217
M-K Test Value (S)	-235
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0132

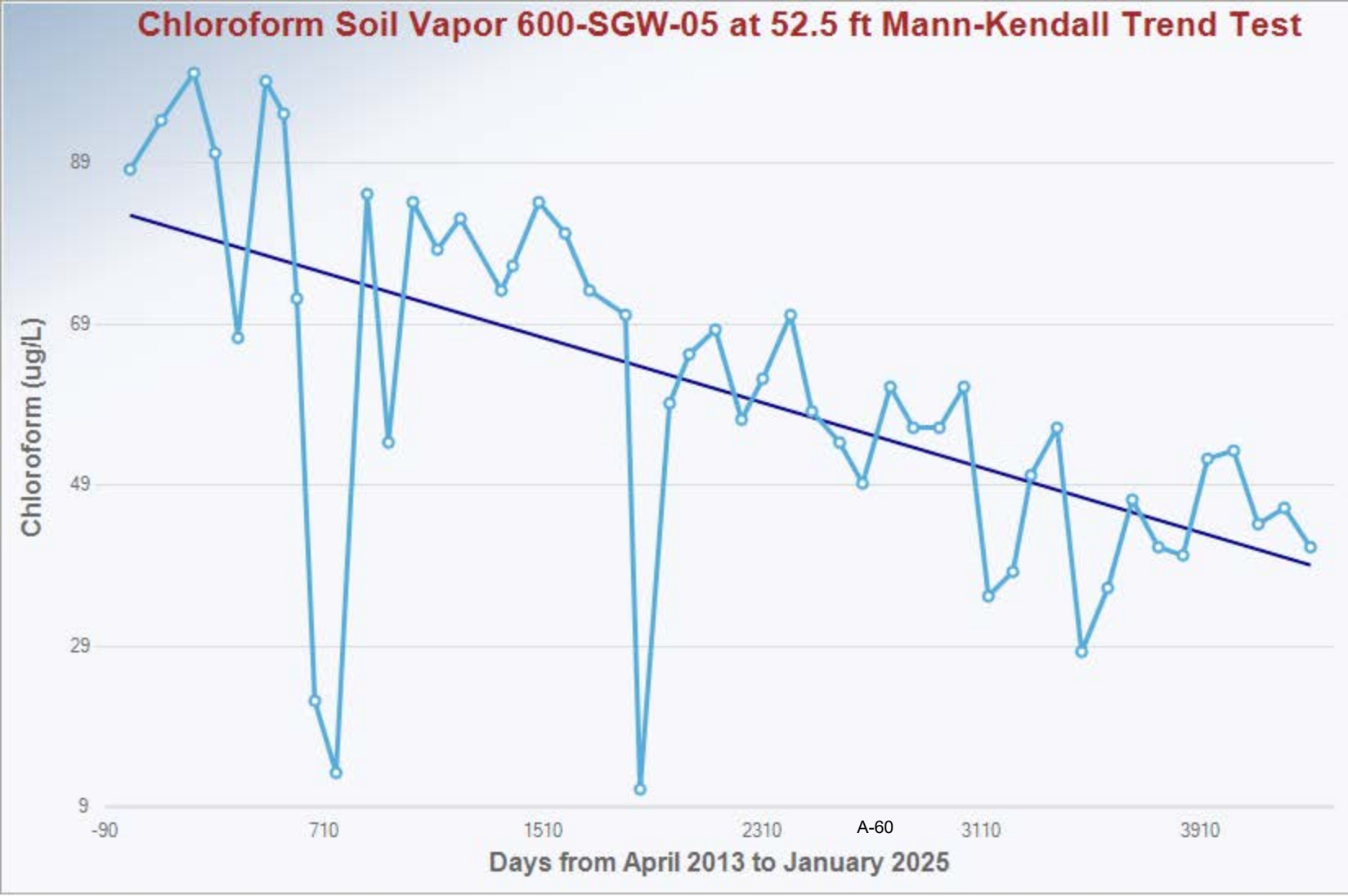
OLS Regression Line (Blue)

OLS Regression Slope	-0.0004
OLS Regression Intercept	2.4827

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:31:17 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9	**Chloroform_7.5_OLS_No_Outliers**								
10									
11	**General Statistics**								
12			Number of Events Reported (m)		46				
13			Number of Missing Events		0				
14			Number or Reported Events Used		46				
15			Number Values Reported (n)		46				
16			Minimum		0.31				
17			Maximum		5.4				
18			Mean		1.715				
19			Geometric Mean		1.227				
20			Median		1.55				
21			Standard Deviation		1.33				
22			Coefficient of Variation		0.776				
23									
24	**Mann-Kendall Test**								
25			M-K Test Value (S)		-235				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		105.3				
28			Standardized Value of S		-2.222				
29			Approximate p-value		0.0132				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								

Chloroform Soil Vapor 600-SGW-05 at 52.5 ft Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

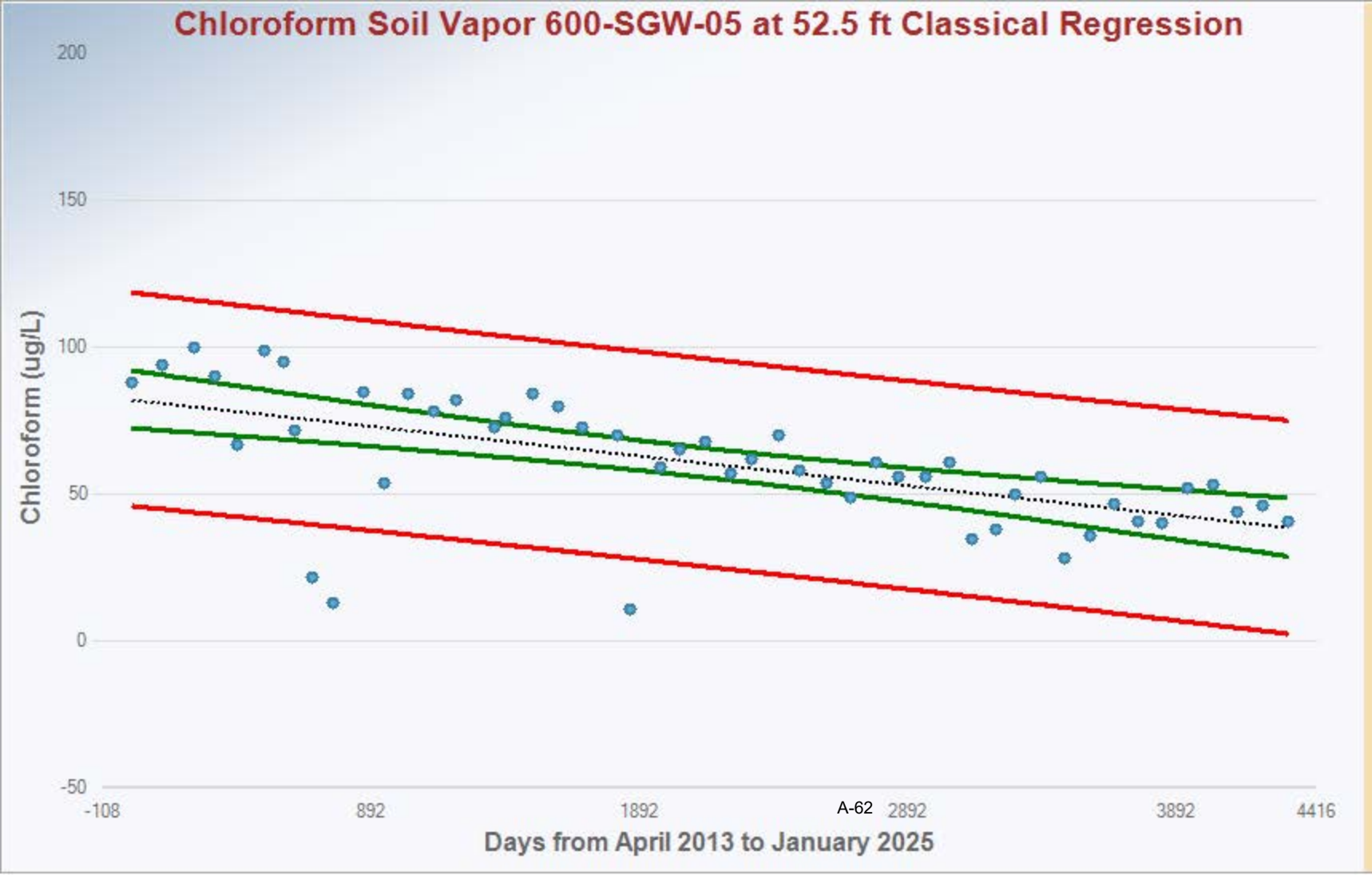
n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.9698
Standardized Value of S	-5.6739
M-K Test Value (S)	-659
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.0101
OLS Regression Intercept	82.2800

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:27:15 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**Chloro_52.5**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		11				
17			Maximum		100				
18			Mean		60.67				
19			Geometric Mean		55.79				
20			Median		59				
21			Standard Deviation		21.51				
22			Coefficient of Variation		0.354				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-659				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		116				
28			Standardized Value of S		-5.674				
29			Approximate p-value		6.9795E-9				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



OLS	
n	49
Slope	-0.0101
Intercept	82.2800
R-sq	0.3597
R	-0.5997
Scale Estimate	17.3927
P-value (Reg)	0.0000
P-value (Slope)	0.0000

Mann-Kendall	
S	-659.0000
SD of S	115.9698
Standardized S	-5.6739
Approximate p-value	0.0000

Confidence Coefficient	0.9500

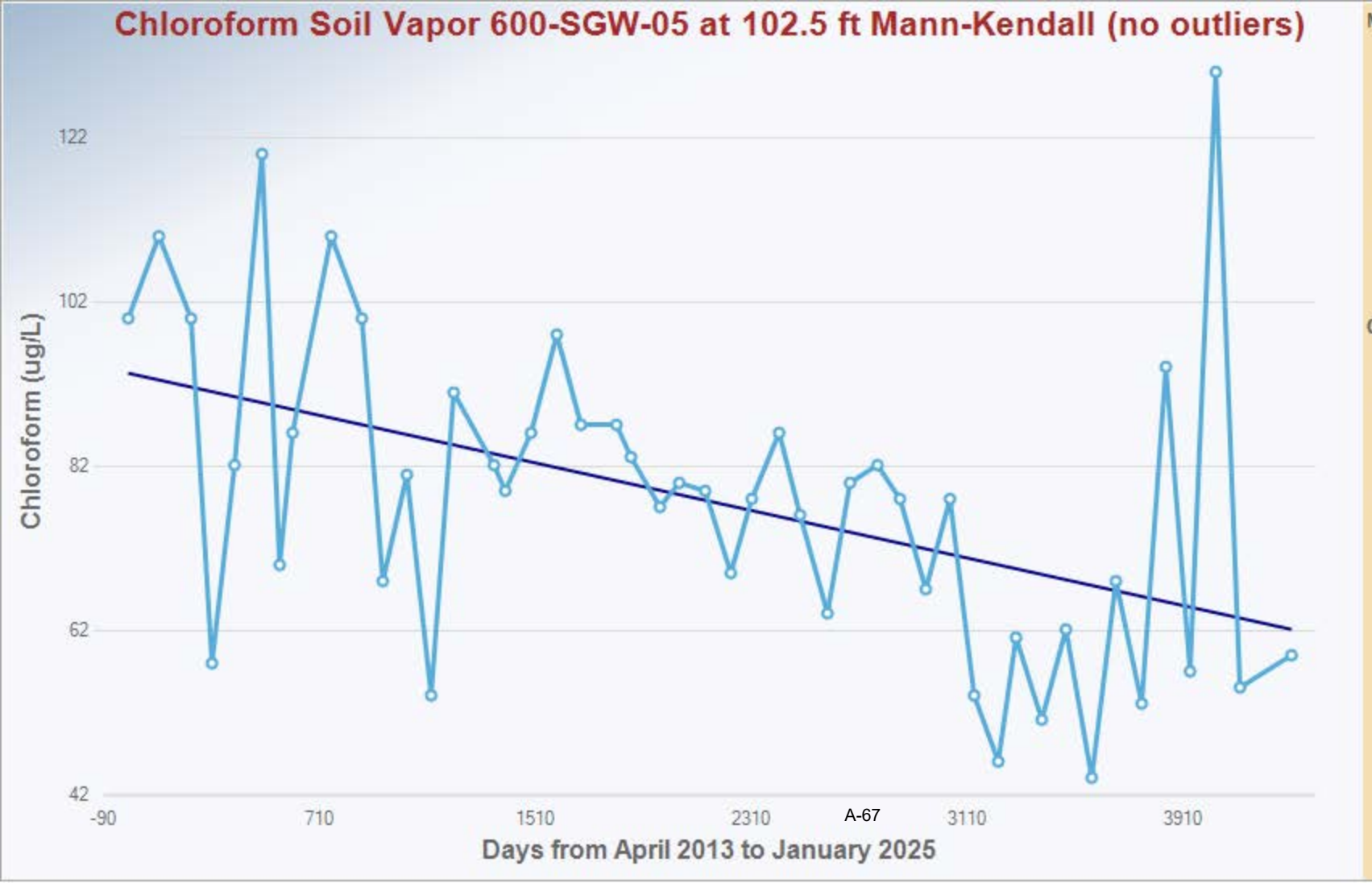
Red = Prediction Interval
Green = Confidence Interval

	A	B	C	D	E	F	G	H	I	J	K
1				**Ordinary Least Squares Linear Regression Output Sheet**							
2			User Selected Options								
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:11:22 AM							
4			From File	600-SGW-05_Vapor_2025_Input.xls							
5			Full Precision	OFF							
6											
7			Display Limits	False							
8			Display Regresion Diagnostics	False							
9			Display Regresion Tables	True							
10			Title For Y vs X Plots	Classical Regression							
11			nfidence Level for Regression Line	0.95							
12			Display Confidence Band	True							
13			Display Prediction Band	True							
14											
15											
16			Dependendant Variable (Y-Data)	Chloro_52.5							
17			Number Reported (Y values)	49							
18			Independent Variable (x-data)	Date_Chloro_52.5							
19			Number Reported (x-values)	49							
20											
21											
22			**Regression Estimates and Inference Table**								
23	Parameter	Estimates	Std. Error	T-values	p-values						
24	intercept	82.28	4.884	16.85	1.514E-21						
25	te_Chloro_5	-0.0101	0.00196	-5.138	5.2613E-6						
26											
27			**OLS ANOVA Table**								
28			**Source of Variation**	**SS**	**DOF**	**MS**	**F-Value**	**P-Value**			
29			**Regression**	7987	1	7987	26.4	0.0000			
30			**Error**	14218	47	302.5					
31			**Total**	22205	48						
32											
33					R Square	0.36					
34					Adjusted R Square	0.346					
35					Sqrt(MSE) = Scale	17.39					
36											
37			**Regression Table**								
38	Obs	Y Vector	Yhat	Residuals	Res/Scale						
39	1	88	82.28	5.72	0.329						
40	2	94	81.14	12.86	0.739						
41	3	100	79.93	20.07	1.154						
42	4	90	79.15	10.85	0.624						
43	5	67	78.32	-11.32	-0.651						
44	6	99	77.31	21.69	1.247						
45	7	95	76.6	18.4	1.058						
46	8	72	76.17	-4.172	-0.24						
47	9	22	75.48	-53.48	-3.075						

	A	B	C	D	E	F	G	H	I	J	K
48	10	13	74.69	-61.69	-3.547						
49	11	85	73.58	11.42	0.657						
50	12	54	72.78	-18.78	-1.08						
51	13	84	71.87	12.13	0.697						
52	14	78	70.95	7.048	0.405						
53	15	82	70.1	11.9	0.684						
54	16	73	68.63	4.37	0.251						
55	17	76	68.2	7.804	0.449						
56	18	84	67.23	16.77	0.964						
57	19	80	66.24	13.76	0.791						
58	20	73	65.35	7.651	0.44						
59	21	70	64.04	5.964	0.343						
60	22	11	63.51	-52.51	-3.019						
61	23	59	62.4	-3.401	-0.196						
62	24	65	61.69	3.306	0.19						
63	25	68	60.72	7.275	0.418						
64	26	57	59.78	-2.776	-0.16						
65	27	62	58.95	3.052	0.175						
66	28	70	57.95	12.05	0.693						
67	29	58	57.15	0.849	0.0488						
68	30	54	56.13	-2.131	-0.123						
69	31	49	55.26	-6.263	-0.36						
70	32	61	54.26	6.736	0.387						
71	33	56	53.44	2.564	0.147						
72	34	56	52.45	3.554	0.204						
73	35	61	51.53	9.472	0.545						
74	36	35	50.66	-15.66	-0.9						
75	37	38	49.75	-11.75	-0.676						
76	38	50	49.08	0.916	0.0526						
77	39	56	48.1	7.895	0.454						
78	40	28	47.19	-19.19	-1.103						
79	41	36	46.26	-10.26	-0.59						
80	42	47	45.34	1.661	0.0955						
81	43	41	44.4	-3.4	-0.195						
82	44	40	43.5	-3.501	-0.201						
83	45	52	42.58	9.418	0.541						
84	46	53	41.61	11.39	0.655						
85	47	44	40.72	3.275	0.188						
86	48	46	39.77	6.234	0.358						
87	49	41	38.79	2.214	0.127						
88											

1				**Ordinary Least Squares Linear Regression Output Sheet**							
2			User Selected Options								
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:15:21 AM							
4			From File	600-SGW-05_Vapor_2025_Input.xls							
5			Full Precision	OFF							
6											
7			Display Limits	False							
8			Display Regresion Diagnostics	False							
9			Display Regresion Tables	True							
10			Title For Y vs X Plots	Classical Regression							
11			nfidence Level for Regression Line	0.95							
12			Display Confidence Band	True							
13			Display Prediction Band	True							
14											
15											
16			Dependendant Variable (Y-Data)	Chloroform_102.5_No_Outliers							
17			Number Reported (Y values)	47							
18			Independent Variable (x-data)	Date_Chloro_102.5_No_outlier							
19			Number Reported (x-values)	47							
20											
21											
22			**Regression Estimates and Inference Table**								
23	Parameter	Estimates	Std. Error	T-values	p-values						
24	intercept	93.27	4.951	18.84	5.660E-23						
25	oro_102.5_N	-0.00724	0.00201	-3.596	7.9775E-4						
26											
27			**OLS ANOVA Table**								
28			**Source of Variation**	**SS**	**DOF**	**MS**	**F-Value**	**P-Value**			
29			**Regression**	3766	1	3766	12.93	0.0008			
30			**Error**	13101	45	291.1					
31			**Total**	16867	46						
32											
33					R Square	0.223					
34					Adjusted R Square	0.206					
35					Sqrt(MSE) = Scale	17.06					
36											
37			**Regression Table**								
38	Obs	Y Vector	Yhat	Residuals	Res/Scale						
39	1	100	93.27	6.734	0.395						
40	2	110	92.45	17.55	1.029						
41	3	100	91.58	8.42	0.493						
42	4	58	91.02	-33.02	-1.935						
43	5	82	90.43	-8.429	-0.494						
44	6	120	89.71	30.29	1.775						
45	7	70	89.19	-19.19	-1.125						
46	8	86	88.89	-2.888	-0.169						
47	9	110	87.82	22.18	1.3						

	A	B	C	D	E	F	G	H	I	J	K
48	10	100	87.03	12.97	0.76						
49	11	68	86.46	-18.46	-1.082						
50	12	81	85.81	-4.805	-0.282						
51	13	54	85.15	-31.15	-1.825						
52	14	91	84.54	6.461	0.379						
53	15	82	83.48	-1.482	-0.0869						
54	16	79	83.17	-4.171	-0.244						
55	17	86	82.48	3.524	0.207						
56	18	98	81.77	16.23	0.951						
57	19	87	81.13	5.87	0.344						
58	20	87	80.19	6.81	0.399						
59	21	83	79.81	3.187	0.187						
60	22	77	79.02	-2.017	-0.118						
61	23	80	78.51	1.489	0.0873						
62	24	79	77.82	1.184	0.0694						
63	25	69	77.14	-8.136	-0.477						
64	26	78	76.54	1.457	0.0854						
65	27	86	75.83	10.17	0.596						
66	28	76	75.25	0.746	0.0437						
67	29	64	74.52	-10.52	-0.617						
68	30	80	73.9	6.099	0.357						
69	31	82	73.18	8.815	0.517						
70	32	78	72.59	5.409	0.317						
71	33	67	71.88	-4.882	-0.286						
72	34	78	71.22	6.776	0.397						
73	35	54	70.6	-16.6	-0.973						
74	36	46	69.95	-23.95	-1.404						
75	37	61	69.47	-8.472	-0.497						
76	38	51	68.77	-17.77	-1.041						
77	39	62	68.11	-6.112	-0.358						
78	40	44	67.45	-23.45	-1.374						
79	41	68	66.79	1.212	0.071						
80	42	53	66.11	-13.11	-0.769						
81	43	94	65.47	28.53	1.672						
82	44	57	64.81	-7.812	-0.458						
83	45	130	64.12	65.88	3.861						
84	46	55	63.48	-8.481	-0.497						
85	47	59	62.09	-3.091	-0.181						
86											



Mann-Kendall Trend Analysis

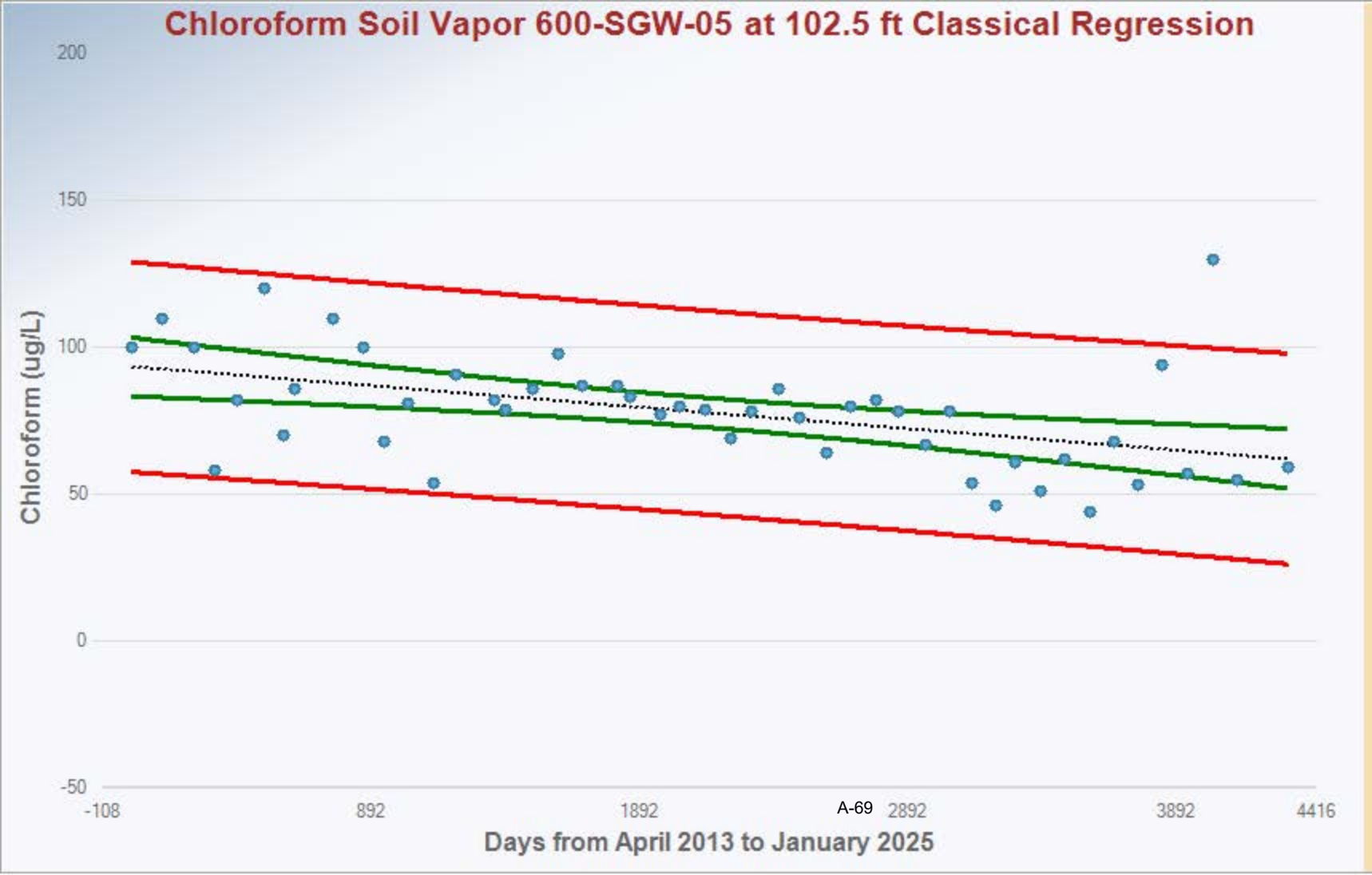
n	47
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	108.9511
Standardized Value of S	-4.2037
M-K Test Value (S)	-459
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.0072
OLS Regression Intercept	93.2661

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:36:12 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**Chloroform_102.5_No_Outliers**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		47				
13			Number of Missing Events		0				
14			Number or Reported Events Used		47				
15			Number Values Reported (n)		47				
16			Minimum		44				
17			Maximum		130				
18			Mean		77.87				
19			Geometric Mean		75.59				
20			Median		79				
21			Standard Deviation		19.15				
22			Coefficient of Variation		0.246				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-459				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		109				
28			Standardized Value of S		-4.204				
29			Approximate p-value		1.3128E-5				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



OLS	
n	47
Slope	-0.0072
Intercept	93.2661
R-sq	0.2233
R	-0.4725
Scale Estimate	17.0629
P-value (Reg)	0.0008
P-value (Slope)	0.0008

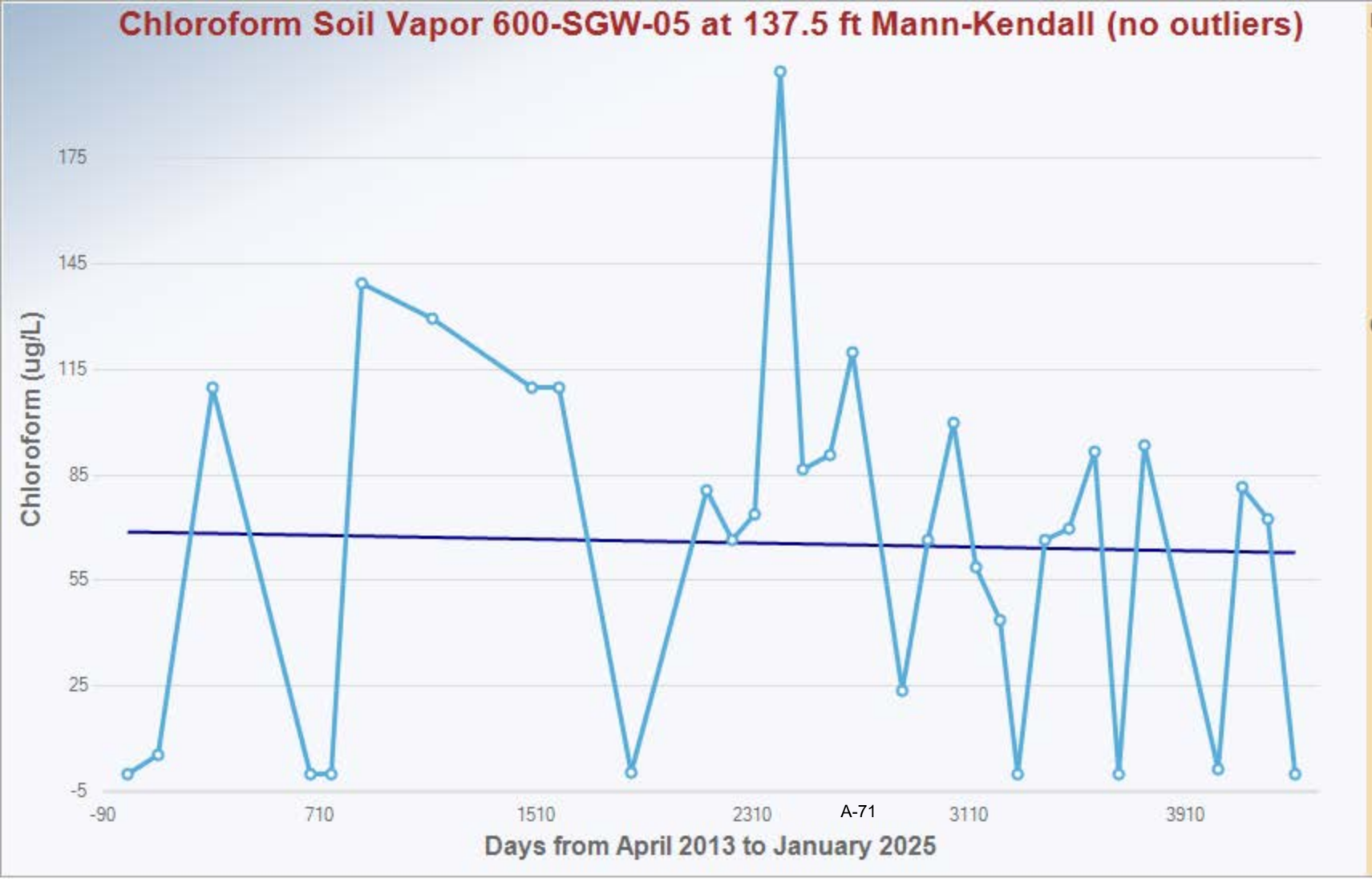
Mann-Kendall	
S	-459.0000
SD of S	108.9511
Standardized S	-4.2037
Approximate p-value	0.0000

Confidence Coefficient	0.9500

Red = Prediction Interval

Green = Confidence Interval

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:38:53 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**Chloro_137.5_no_outliers**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		48				
13			Number of Missing Events		16				
14			Number or Reported Events Used		32				
15			Number Values Reported (n)		48				
16			Number Values Missing		16				
17			Number Values Used		32				
18			Minimum		0.31				
19			Maximum		200				
20			Mean		65.69				
21			Geometric Mean		20.6				
22			Median		71.5				
23			Standard Deviation		51.04				
24			Coefficient of Variation		0.777				
25									
26			**Mann-Kendall Test**						
27			M-K Test Value (S)		-49				
28			Critical Value (0.05)		-1.645				
29			Standard Deviation of S		61.38				
30			Standardized Value of S		-0.782				
31			Approximate p-value		0.217				
32									
33	**Insufficient evidence to identify a significant**								
34	**trend at the specified level of significance.**								



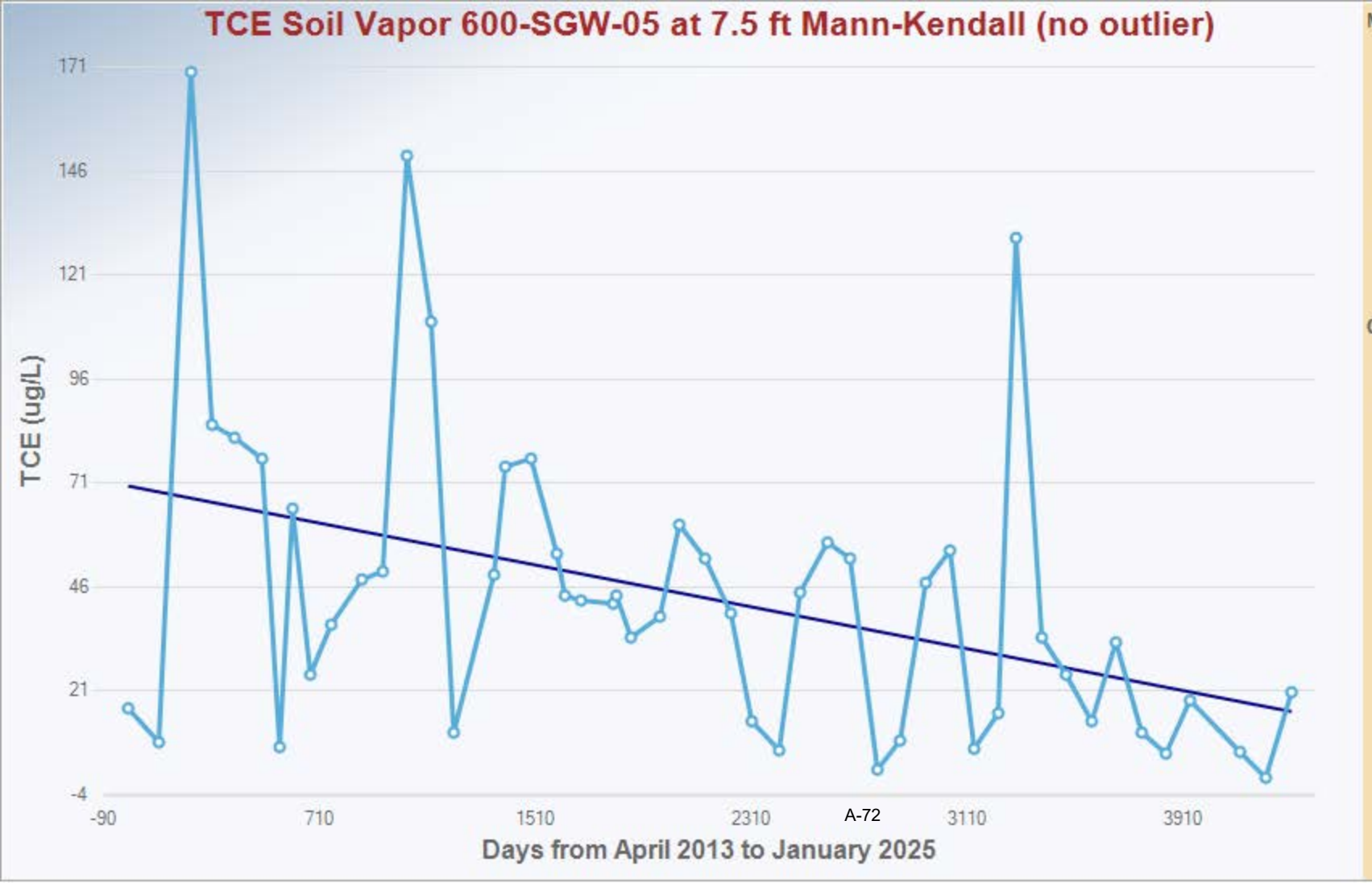
Mann-Kendall Trend Analysis

n	32
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	61.3759
Standardized Value of S	-0.7821
M-K Test Value (S)	-49
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.2171

OLS Regression Line (Blue)

OLS Regression Slope	-0.0014
OLS Regression Intercept	69.1586

Insufficient statistical evidence of a significant trend at the specified level of significance.



Mann-Kendall Trend Analysis

n	50
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	119.5185
Standardized Value of S	-3.5225
M-K Test Value (S)	-422
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0002

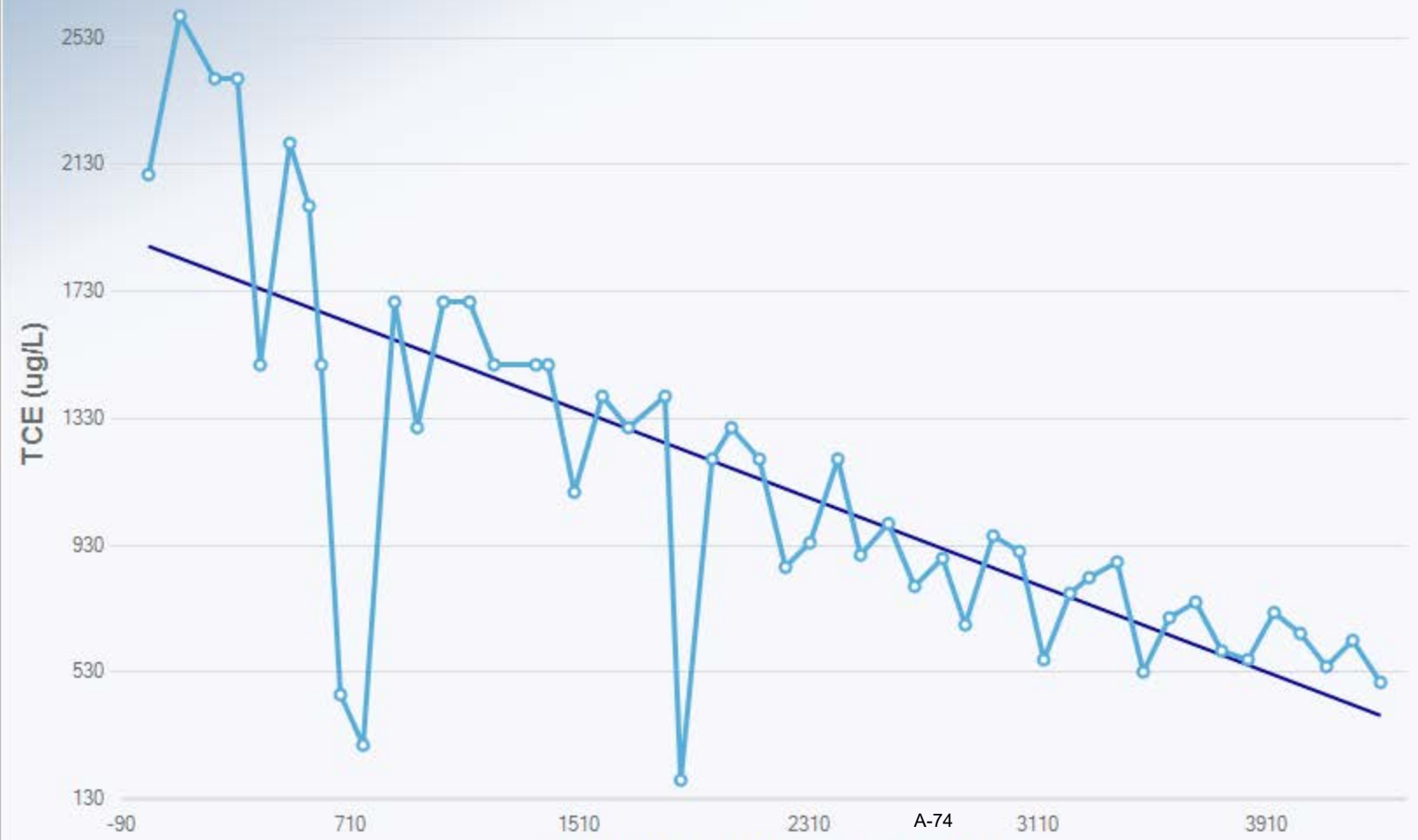
OLS Regression Line (Blue)

OLS Regression Slope	-0.0126
OLS Regression Intercept	70.5064

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:53:36 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**TCE_7.5_No_outlier1**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		50				
13			Number of Missing Events		0				
14			Number or Reported Events Used		50				
15			Number Values Reported (n)		50				
16			Minimum		0.3				
17			Maximum		170				
18			Mean		44.22				
19			Geometric Mean		28.52				
20			Median		41				
21			Standard Deviation		37.05				
22			Coefficient of Variation		0.838				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-422				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		119.5				
28			Standardized Value of S		-3.522				
29			Approximate p-value		2.1377E-4				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								

TCE Soil Vapor 600-SGW-05 at 52.5 ft Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

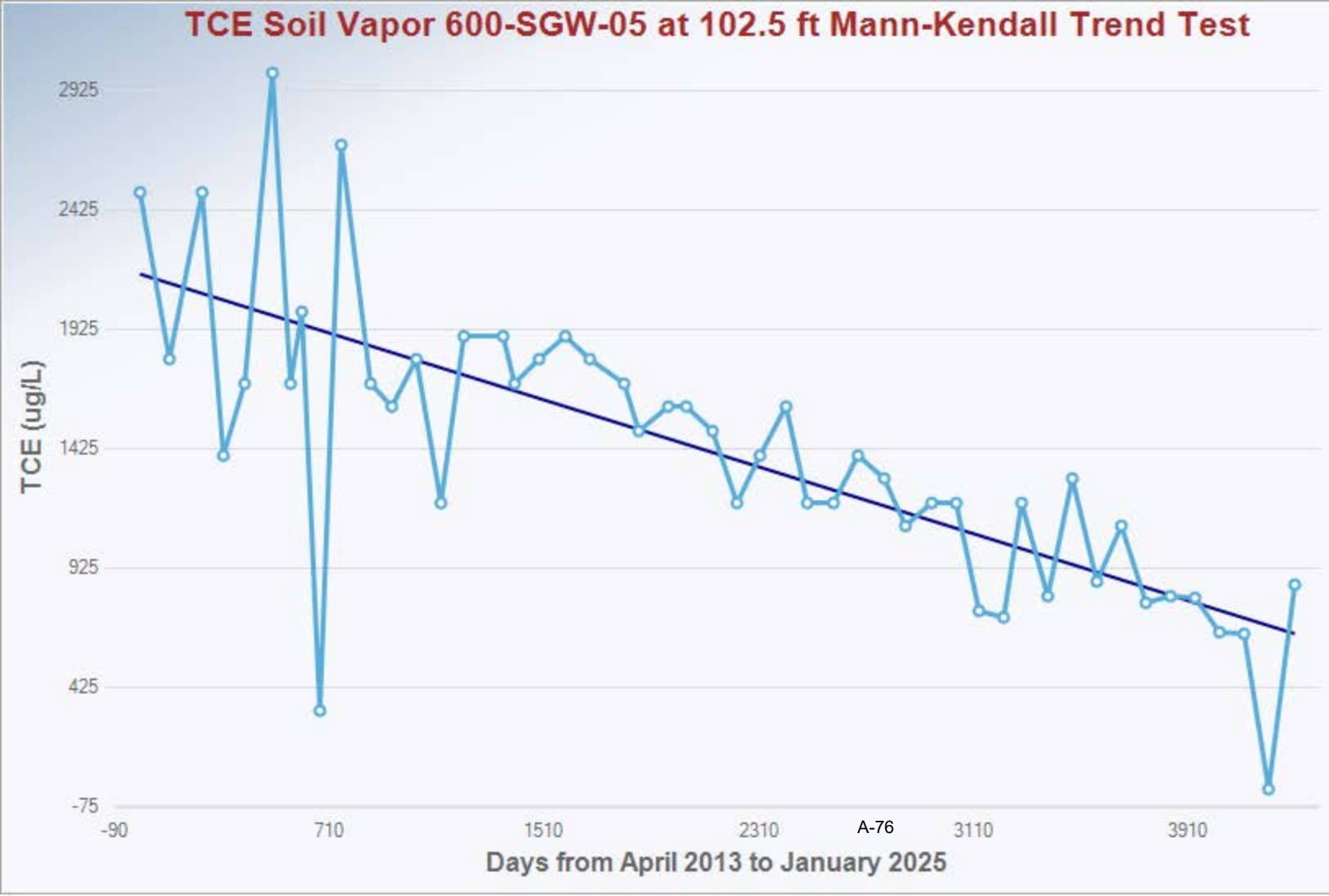
n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.8792
Standardized Value of S	-6.6880
M-K Test Value (S)	-776
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.3431
OLS Regression Intercept	1,874.0026

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:56:11 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**TCE_52.5**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		190				
17			Maximum		2600				
18			Mean		1140				
19			Geometric Mean		996.8				
20			Median		960				
21			Standard Deviation		577.9				
22			Coefficient of Variation		0.507				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-776				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		115.9				
28			Standardized Value of S		-6.688				
29			Approximate p-value		1.131E-11				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



Mann-Kendall Trend Analysis

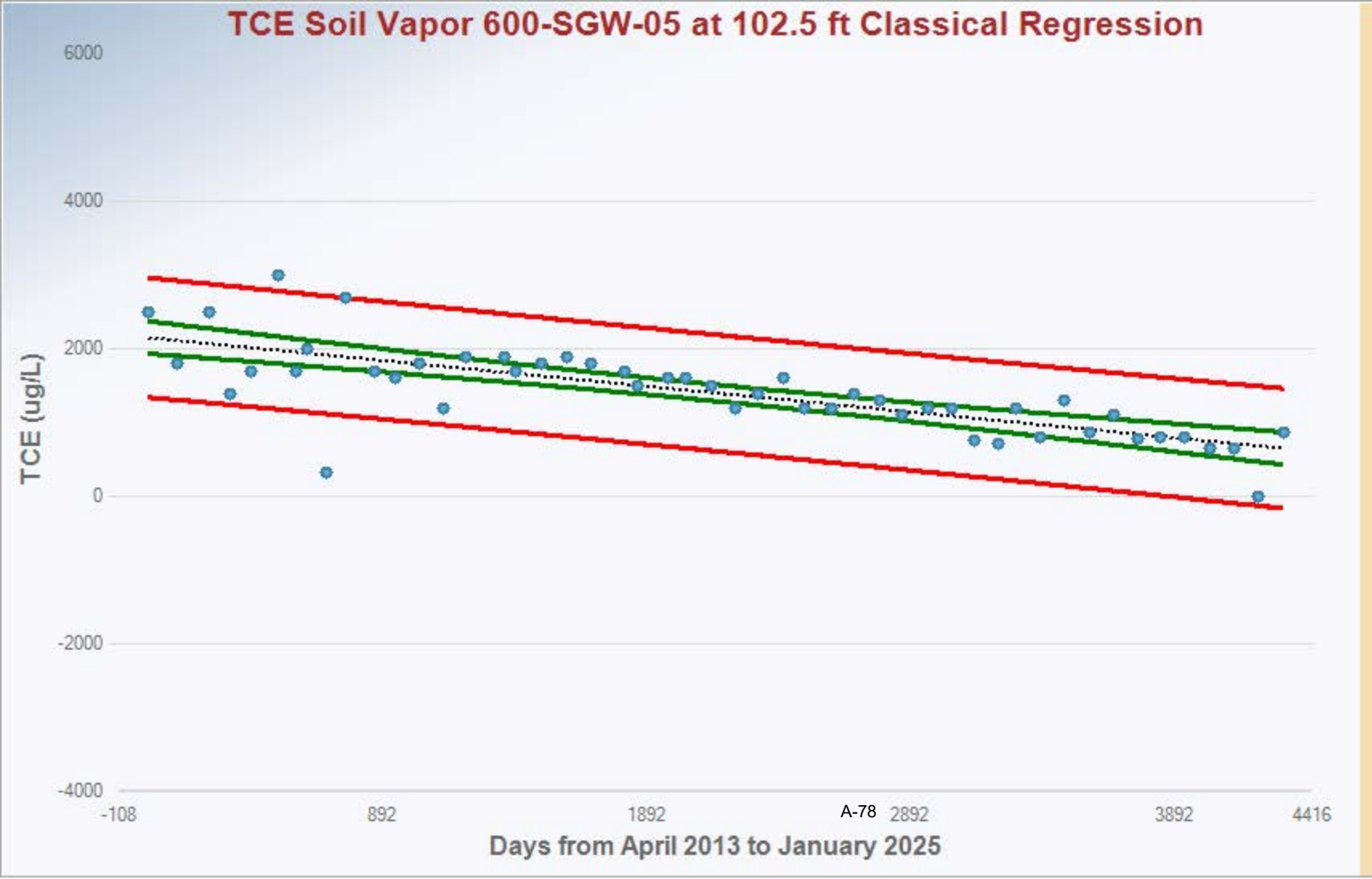
n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.6201
Standardized Value of S	-6.5992
M-K Test Value (S)	-764
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0000

OLS Regression Line (Blue)

OLS Regression Slope	-0.3493
OLS Regression Intercept	2,154.4304

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:58:27 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**TCE_102.5**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		0.4				
17			Maximum		3000				
18			Mean		1407				
19			Geometric Mean		1122				
20			Median		1400				
21			Standard Deviation		588.8				
22			Coefficient of Variation		0.418				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-764				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		115.6				
28			Standardized Value of S		-6.599				
29			Approximate p-value		2.067E-11				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								



OLS	
n	49
Slope	-0.3493
Intercept	2,154.4304
R-sq	0.5745
R	-0.7579
Scale Estimate	388.1331
P-value (Reg)	0.0000
P-value (Slope)	0.0000

Mann-Kendall	
S	-764.0000
SD of S	115.6201
Standardized S	-6.5992
Approximate p-value	0.0000

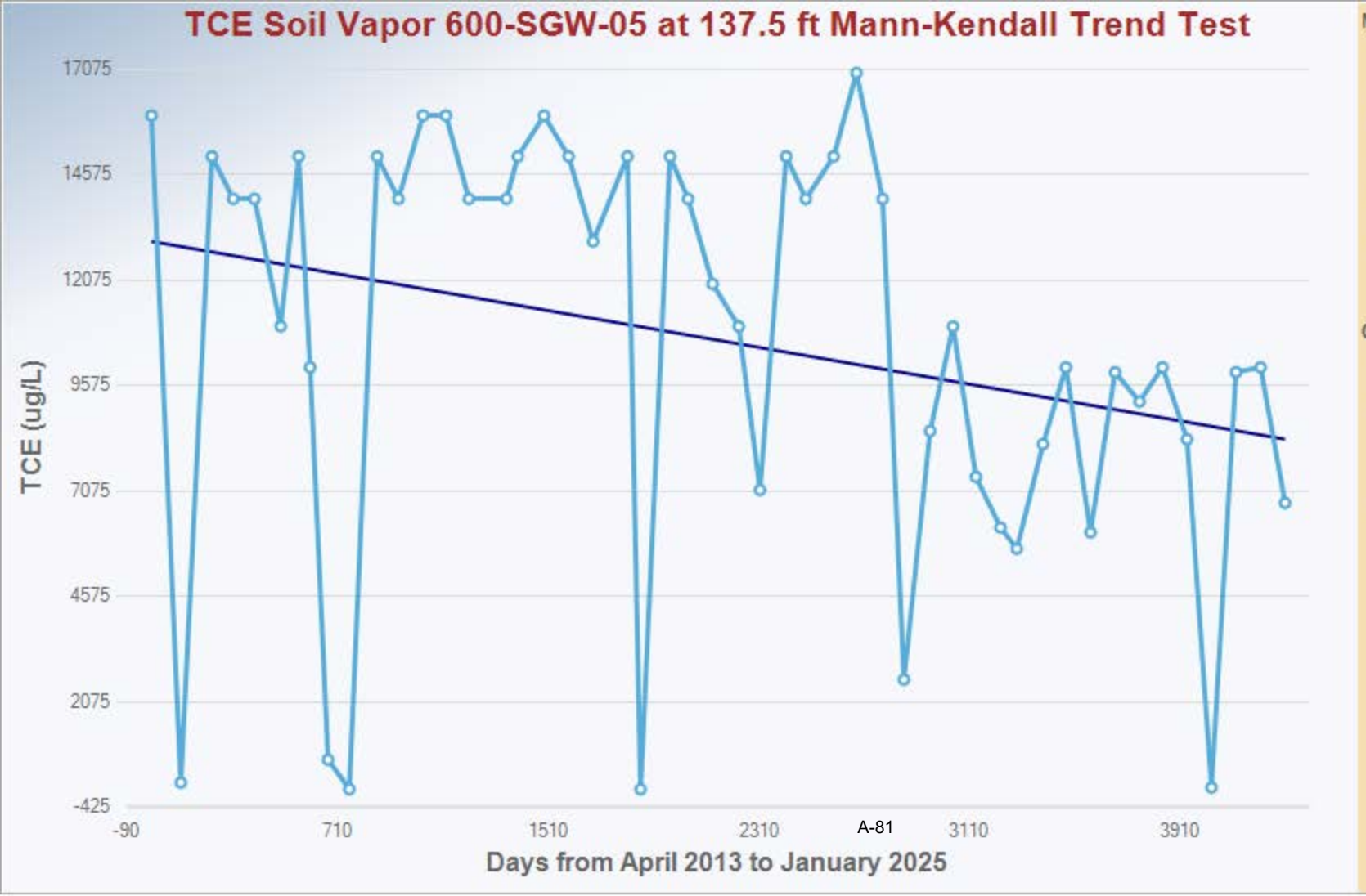
Confidence Coefficient	0.9500

Red = Prediction Interval

Green = Confidence Interval

	A	B	C	D	E	F	G	H	I	J
1				**Ordinary Least Squares Linear Regression Output Sheet**						
2			User Selected Options							
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 10:18:21 AM						
4			From File	600-SGW-05_Vapor_2025_Input.xls						
5			Full Precision	OFF						
6										
7			Display Limits	False						
8			Display Regresion Diagnostics	False						
9			Display Regresion Tables	True						
10			Title For Y vs X Plots	Classical Regression						
11			nfidence Level for Regression Line	0.95						
12			Display Confidence Band	True						
13			Display Prediction Band	True						
14										
15										
16			Dependendant Variable (Y-Data)	TCE_102.5						
17			Number Reported (Y values)	49						
18			Independent Variable (x-data)	Date_TCE_102.5						
19			Number Reported (x-values)	49						
20										
21										
22			**Regression Estimates and Inference Table**							
23	Parameter	Estimates	Std. Error	T-values	p-values					
24	intercept	2154	109	19.77	2.059E-24					
25	te_TCE_102	-0.349	0.0438	-7.966	2.865E-10					
26										
27			**OLS ANOVA Table**							
28			**Source of Variation**	**SS**	**DOF**	**MS**	**F-Value**	**P-Value**		
29			**Regression**	9559092	1	9559092	63.45	0.0000		
30			**Error**	7080424	47	150647				
31			**Total**	16639515	48					
32										
33					R Square	0.574				
34					Adjusted R Square	0.565				
35					Sqrt(MSE) = Scale	388.1				
36										
37			**Regression Table**							
38	Obs	Y Vector	Yhat	Residuals	Res/Scale					
39	1	2500	2154	345.6	0.89					
40	2	1800	2115	-315	-0.811					
41	3	2500	2073	427	1.1					
42	4	1400	2046	-646.2	-1.665					
43	5	1700	2018	-317.5	-0.818					
44	6	3000	1983	1017	2.621					
45	7	1700	1958	-257.8	-0.664					
46	8	2000	1943	56.88	0.147					
47	9	330	1919	-1589	-4.094					

	A	B	C	D	E	F	G	H	I	J
48	10	2700	1892	808.2	2.082					
49	11	1700	1853	-153.4	-0.395					
50	12	1600	1826	-225.8	-0.582					
51	13	1800	1794	5.672	0.0146					
52	14	1200	1763	-562.5	-1.449					
53	15	1900	1733	166.8	0.43					
54	16	1900	1682	217.8	0.561					
55	17	1700	1667	32.81	0.0845					
56	18	1800	1634	166.3	0.429					
57	19	1900	1599	300.6	0.774					
58	20	1800	1569	231.3	0.596					
59	21	1700	1523	176.7	0.455					
60	22	1500	1505	-5.129	-0.0132					
61	23	1600	1467	133.3	0.343					
62	24	1600	1442	157.7	0.406					
63	25	1500	1409	91.27	0.235					
64	26	1200	1376	-175.9	-0.453					
65	27	1400	1347	52.74	0.136					
66	28	1600	1313	287.3	0.74					
67	29	1200	1285	-85.09	-0.219					
68	30	1200	1250	-49.81	-0.128					
69	31	1400	1220	180.2	0.464					
70	32	1300	1185	114.8	0.296					
71	33	1100	1157	-56.55	-0.146					
72	34	1200	1122	77.68	0.2					
73	35	1200	1091	109.5	0.282					
74	36	750	1061	-310.5	-0.8					
75	37	720	1029	-309.1	-0.796					
76	38	1200	1006	194	0.5					
77	39	810	972.1	-162.1	-0.418					
78	40	1300	940.4	359.6	0.927					
79	41	870	908.2	-38.22	-0.0985					
80	42	1100	876.4	223.6	0.576					
81	43	780	844	-63.95	-0.165					
82	44	810	812.9	-2.866	-0.00738					
83	45	800	781.1	18.92	0.0487					
84	46	660	747.6	-87.55	-0.226					
85	47	650	716.8	-66.82	-0.172					
86	48	0.4	683.6	-683.2	-1.76					
87	49	860	649.8	210.2	0.542					
88										



Mann-Kendall Trend Analysis

n	49
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	115.2360
Standardized Value of S	-3.0112
M-K Test Value (S)	-348
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.0013

OLS Regression Line (Blue)

OLS Regression Slope	-1.0986
OLS Regression Intercept	13,020.2080

Statistically significant evidence of a decreasing trend at the specified level of significance.

	A	B	C	D	E	F	G	H	I
1				**Mann-Kendall Trend Test Analysis**					
2			User Selected Options						
3			Date/Time of Computation	ProUCL 5.2 4/21/2025 11:00:55 AM					
4			From File	600-SGW-05_Vapor_2025_Input.xls					
5			Full Precision	OFF					
6			Confidence Coefficient	0.95					
7			Level of Significance	0.05					
8									
9			**TCE_137.5**						
10									
11			**General Statistics**						
12			Number of Events Reported (m)		49				
13			Number of Missing Events		0				
14			Number or Reported Events Used		49				
15			Number Values Reported (n)		49				
16			Minimum		0.3				
17			Maximum		17000				
18			Mean		10669				
19			Geometric Mean		5744				
20			Median		11000				
21			Standard Deviation		4917				
22			Coefficient of Variation		0.461				
23									
24			**Mann-Kendall Test**						
25			M-K Test Value (S)		-348				
26			Critical Value (0.05)		-1.645				
27			Standard Deviation of S		115.2				
28			Standardized Value of S		-3.011				
29			Approximate p-value		0.0013				
30									
31	**Statistically significant evidence of a decreasing**								
32	**trend at the specified level of significance.**								