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By Terri.Drake at 6:37 am, May 29, 2025

Department of Energy

Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
(859) 219-4000

May 28, 2025

Ms. Lauren Linehan
Division of Waste Management
Kentucky Department for Environmental Protection
625 Hospital Drive
Madisonville, Kentucky 42431

PPPO-02-10033008-25

Ms. April Webb
Hazardous Waste Branch Manager
Division of Waste Management
Kentucky Department for Environmental Protection
300 Sower Boulevard, 2nd Floor
Frankfort, Kentucky 40601

Dear Ms. Linehan and Ms. Webb:

C-404 HAZARDOUS WASTE LANDFILL MAY 2025 SEMIANNUAL GROUNDWATER REPORT (OCTOBER 2024–MARCH 2025), PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, FRNP-RPT-0382/V1, HAZARDOUS WASTE MANAGEMENT FACILITY PERMIT NO. KY8-890-008-982, AGENCY INTEREST ID NO. 3059

Enclosed is the subject report for the first reporting period, fiscal year 2025. This report is required in accordance with Part II, Specific Condition II.K.6.d, of Hazardous Waste Management Facility Permit No. KY8-890-008-982 (Permit).

Results of the statistical analyses indicate that compliance well concentrations of permit-required parameters are not statistically different from those in background wells, with the exception of trichloroethene (TCE) in compliance well MW84A and technetium-99 (Tc-99) in compliance wells MW84A and MW90A.

TCE in compliance well MW84A and Tc-99 concentrations in compliance well MW90A showed statistically significant concentrations compared to concentrations observed in the background wells. Mann-Kendall analysis of TCE in MW84A and Tc-99 in MW90A did not show increasing trends, confirming no exceedances of these parameters are attributable to the C-404 landfill.

Mann-Kendall analysis of Tc-99 in MW84A showed an increasing trend, indicating a confirmed statistical exceedance. Resampling of all C-404 monitoring wells for radionuclide constituents is planned per Part E, Section 6(2) of the Permit.

Notification of the statistically significant exceedance for Tc-99 in MW84A was submitted, pursuant to Part II, Specific Condition II.K.6.a, to the Kentucky Department for Environmental Protection under separate correspondence.

If you have any questions or require additional information, please contact Angus MacKelvey at (270) 349-7526.

Sincerely,

APRIL LADD Digitally signed by APRIL LADD
Date: 2025.05.28 16:23:19 -05'00'

April Ladd
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:
1. Certification Page
2. *C-404 Hazardous Waste Landfill May 2025 Semiannual Groundwater Report (October 2024–March 2025), Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0382/V1

cc w/enclosures:
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CERTIFICATION

Document Identification: ***C-404 Hazardous Waste Landfill May 2025 Semiannual Groundwater Report (October 2024–March 2025), Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0382/V1, Permit No. KY8-890-008-982, Agency Interest ID No. 3059**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to 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.

Four Rivers Nuclear Partnership, LLC

MYRNA REDFIELD (Affiliate)
Digitally signed by MYRNA REDFIELD (Affiliate)
Date: 2025.05.27 12:16:06 -05'00'

Myrna E. Redfield, Program Manager/Date Signed
Four Rivers Nuclear Partnership, LLC

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to 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.

U.S. Department of Energy

APRIL LADD
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Date: 2025.05.28 16:23:49 -05'00'

April Ladd, Paducah Site Lead/Date Signed
Portsmouth/Paducah Project Office
U.S. Department of Energy

FRNP-RPT-0382/V1

C-404 Hazardous Waste Landfill May 2025 Semiannual Groundwater Report (October 2024–March 2025), Paducah Gaseous Diffusion Plant, Paducah, Kentucky

FOUR RIVERS NUCLEAR PARTNERSHIP, LLC

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C-404 Hazardous Waste Landfill May 2025 Semiannual Groundwater Report (October 2024–March 2025), Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—May 2025

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
FOUR RIVERS NUCLEAR PARTNERSHIP, LLC,
managing the
Deactivation and Remediation Project at the
Paducah Gaseous Diffusion Plant
under Contract DE-EM0004895

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CONTENTS

TABLES

FIGURE

ACRONYMS

AKGWA	Assembled Kentucky Groundwater
M-K	Mann-Kendall
MW	monitoring well
RCRA	Resource Conservation and Recovery Act
RGA	Regional Gravel Aquifer
UCRS	upper continental recharge system
URGA	Upper Regional Gravel Aquifer

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EXECUTIVE SUMMARY

This report, *C-404 Hazardous Waste Landfill May 2025 Semiannual Groundwater Report (October 2024–March 2025), Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* FRNP-RPT-0382/V1, is being submitted by the U.S. Department of Energy in accordance with requirements in Kentucky Division of Waste Management Hazardous Waste Management Facility Permit, KY8-890-008-982 (Permit). The period covered by this report is October 2024 through March 2025; and the report includes analytical data from the January 2025 semiannual sampling for all parameters of monitoring wells (MWs) located in the vicinity of the closed C-404 Hazardous Waste Landfill (C-404 Landfill).

The groundwater monitoring analytical data were subjected to statistical analyses. The statistical analyses were conducted in accordance with the Hazardous Waste Management Facility Permit. With the exception of trichloroethene (TCE) in compliance well MW84A and technetium-99 (Tc-99) observed in compliance wells MW84A and MW90A, the statistical tests on all other parameters showed no statistically significant differences above concentrations observed in background wells. Concentrations of TCE in compliance well MW84A and Tc-99 in compliance well MW90A showed statistically significant concentrations compared to concentrations observed in the background wells; however, the concentrations did not show increasing trends, so there are no confirmed exceedances for TCE from MW84A or Tc-99 from MW90A attributable to C-404; however, Tc-99 concentrations in MW84A showed an increasing Mann-Kendall (M-K) trend, indicating a confirmed statistical exceedance.

The leachate in the C-404 Landfill leachate collection system is monitored at least monthly and, at a minimum, is removed and sampled when the level exceeds 3 ft in depth. During this reporting period of October 2024 through March 2025, the depth of the leachate did not exceed 36 inches. The maximum leachate depth in this reporting period was 34 inches, which was recorded on January 14, 2025. On February 5, 2025, 1,125 gal of leachate were removed from the sump and subsequently sampled.

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1. INTRODUCTION

This report contains the statistical evaluation of data from groundwater sampling and analysis for the closed C-404 Hazardous Waste Landfill (C-404 Landfill) at the U.S. Department of Energy Paducah Site (Paducah Site), Paducah, Kentucky. This semiannual report is required by the Kentucky Division of Waste Management Hazardous Waste Management Facility Permit, KY8-890-008-982 (Permit), Specific Condition II.K.6.d—Recordkeeping, Reporting, and Response (KDWM 2020). The period covered by this report is October 2024 through March 2025.

Groundwater analytical results are provided in Appendix A. The statistical analyses and qualification statement are provided in Appendix B. Leachate sump sampling results are provided in Appendix C.

1.1 BACKGROUND

The closed C-404 Landfill is located in the west-central portion of the Paducah Site secured area. The 1.2-acre facility operated as a surface impoundment from approximately 1952 until early 1957. During this time, influents to the impoundment originated from the C-400 Cleaning Building. In 1957, the impoundment was converted to a solid waste disposal facility for uranium-contaminated solid waste. When the impoundment was converted into a disposal facility, a sump was installed at the former weir to collect the leachate from the facility. Leachate is pumped from the sump, as needed, into a mobile tank. The leachate then is transferred to a permitted hazardous waste storage facility on-site prior to characterization; once characterized, the leachate is transferred off-site for treatment.

In 1986, the disposal of waste at the C-404 Landfill was halted, and a portion of the disposed-of waste was found to be Resource Conservation and Recovery Act (RCRA)-hazardous. The landfill was covered with a RCRA multilayered cap and certified closed in 1987. It currently is regulated under RCRA as a land disposal unit and compliance is monitored under the current Hazardous Waste Management Facility Permit (KDWM 2020).

Previous groundwater monitoring documented that concentrations of trichloroethene (TCE) found in compliance wells were statistically different from those found in background wells. The *C-404 Landfill Source Demonstration, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS-ENM-0031/R2, demonstrated that the source of TCE in compliance wells is not from the C-404 Landfill, but rather, the source is located upgradient/crossgradient of the C-404 Landfill (PRS 2007a).

Regional Gravel Aquifer (RGA) compliance monitoring well (MW) MW90 was abandoned and replaced by MW90A in 2001. RGA compliance well MW420 was installed in 2007 to better assess groundwater quality at the C-404 Landfill (PRS 2007b).

Previous groundwater monitoring of RGA compliance well MW87 documented that concentrations in the compliance well were statistically different from background wells for lead and uranium (FRNP 2018). The *C-404 Hazardous Waste Landfill Alternate Source Demonstration—Source of Lead and Uranium in MW87 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, concluded that the statistical differences were a result of infiltration of upper continental recharge system (UCRS) groundwater into the RGA well due to compromised integrity of the well (FRNP 2019). The integrity of the well had deteriorated to a point that it no longer was suitable for its intended purpose. RGA compliance wells MW84, MW87, and background well MW93 were abandoned and replaced with MW84A, MW87A, and MW93A in 2019. RGA wells MW84 and MW93 were abandoned and replaced because they were the same age (installed in 1988) as MW87. MW84A and MW87A were placed 10 ft north of MW84 and MW87, respectively, and screened at the same depth intervals. MW93A was placed 6 ft west of MW93 and screened at the same depth interval.

In the first semiannual reporting period for 2021 (October 2020–March 2021), statistical analysis of technetium-99 (Tc-99) detections in downgradient compliance well MW84A indicated a statistically significant exceedance over background concentrations. Notification of the statistically significant difference for Tc-99 in MW84A was submitted, pursuant to Part II, Specific Condition II.K.6.a, to the Kentucky Department of Waste Management.

An alternate source demonstration investigation for Tc-99 in MW84A was performed in June 2021. The *C-404 Hazardous Waste Landfill Alternate Source Demonstration—Source of Technetium-99 in MW84A at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0206, consisted of redevelopment and over pumping of MW84A, and review of the lines of evidence relating redevelopment of MW84A and the associated Tc-99 levels (FRNP 2021). The lines of evidence concluded that the observed trend of increasing Tc-99 in MW84A is not a result of contamination introduced into the well boring during drilling and well installation, but it is indicative of dissolved Tc-99 contamination in the RGA. Quarterly compliance monitoring for Tc-99 and other radionuclides was conducted at the C-404 Landfill through November 2022. The radionuclide statistics of the current semiannual report contain results from additional quarterly compliance sampling for radiological constituents conducted in November 2022, in addition to the routine semiannual groundwater sampling.

In accordance with Permit Specific Condition II.K.6.j, development and submittal of an engineering feasibility plan for a corrective action program is not required when a statistically significant exceedance has been confirmed for radionuclides (i.e., Tc-99).

1.2 MONITORING PERIOD ACTIVITIES

1.2.1 Groundwater Monitoring

There are nine MWs sampled under the Permit for the C-404 Landfill: four UCRS wells and five Upper Regional Gravel Aquifer (URGA) wells. A map of the MW locations is provided in Figure 1.

Table 1 presents the well number for URGA wells located upgradient and downgradient of the C-404 Landfill. Table 1 also presents the well numbers for the UCRS wells located in proximity to the URGA wells. This table refers to the UCRS wells as being adjacent to an upgradient or downgradient URGA well location and are identified relative to URGA groundwater flow direction. The conceptual model for the C-404 Landfill indicates that groundwater in the UCRS wells flows primarily vertically downward until it reaches the URGA; therefore, UCRS wells are not considered "upgradient" or "downgradient" of other UCRS wells in the area.

Table 1. Monitoring Well Locations

UCRS	
Located south of C-404 Landfill, adjacent to upgradient URGA background well MW93A	MW94
Located north of C-404 Landfill, adjacent to downgradient URGA compliance wells	MW85, MW88, MW91A*
URGA	
Upgradient background wells	MW93A*, MW420
Downgradient compliance wells	MW84A*, MW87A*, MW90A*

*MW90 was abandoned in 2001 and replaced with MW90A. MW91 was abandoned in 2017 and replaced with MW91A. MW84, MW87, and MW93 were abandoned in 2019 and replaced with MW84A, MW87A, and MW93A.

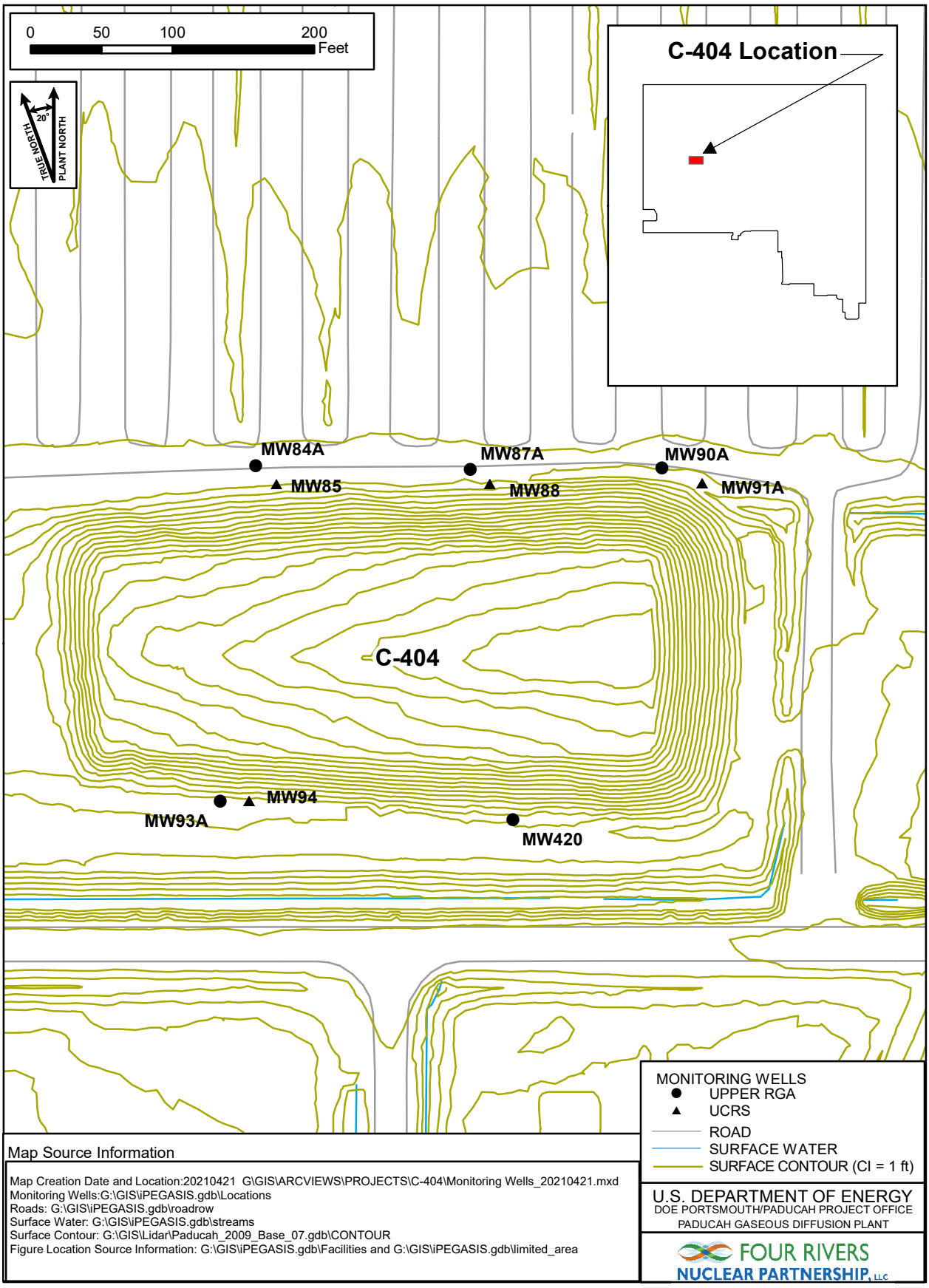


Figure 1. Monitoring Wells

Table 2 presents the Assembled Kentucky Groundwater (AKGWA) numbers for each MW.

Table 2. AKGWA Numbers

Paducah Site Well Number	AKGWA Number
MW84A	8007-4849
MW85	8000-5234
MW87A	8007-4850
MW88	8000-5237
MW90A	8004-0357
MW91A	8007-2917
MW93A	8007-4851
MW94	8000-5103
MW420	8005-3263

All nine MWs were sampled in January 2025 during this reporting period. Samples collected in January 2025 were analyzed for the parameters that are required by Part VIII.E of the Permit. Groundwater sampling was conducted using procedure CP4-ES-2101, *Groundwater Sampling*. The appropriate sample containers and preservatives were used. The laboratory that performed the analyses used U.S. Environmental Protection Agency-approved methods, as applicable. Appendix A of this report contains the analytical results. Appendix B of this report contains the statistical analyses.

1.2.2 Landfill Leachate

In accordance with Appendix I2, C-404 Landfill Closure Plan (Section 1.2 of the Permit), the quantity of liquid in the leachate collection system is monitored (at least monthly) and, at a minimum, will be "removed when the quantity exceeds 36 inches in depth." Once the leachate depth reaches 36 inches, the leachate is pumped into a mobile tank. The leachate then is transferred to a permitted hazardous waste storage facility on-site prior to characterization; once characterized, the leachate is transferred off-site for treatment. During this reporting period (October 2024 through March 2025), the maximum depth of the leachate was 34 inches, measured on January 14, 2025. Subsequently, 1,125 gal of leachate from the C-404 Landfill sump were pumped and sampled on February 5, 2025. Leachate sample results are presented in Appendix C.

2. STATISTICAL SYNOPSIS

The statistical analyses conducted on the data collected from the C-404 Landfill were performed in accordance with procedures in the Permit, Part VIII.E, reissued in February 2020. Appendix B of this report contains the statistical analyses performed for this reporting period. Statistical analyses utilized data from the URGA background wells, MW93A and MW420, and URGA compliance wells, MW84A, MW87A, and MW90A. For this reporting period, the data set includes data from January 2023, July 2023, January 2024, July 2024, and January 2025.

Appendix B provides a summary of the statistical analyses performed. The statistical test results on all wells and parameters showed no statistically significant exceedances above concentrations observed in the background wells with the exception of TCE in MW84A and Tc-99 in MW84A and MW90A. Concentrations of TCE in compliance well MW84A and Tc-99 in compliance well MW90A showed statistically significant concentrations compared to concentrations observed in the background wells; however, the concentrations did not show increasing trends. As a result, there are no confirmed exceedances for TCE from MW84A or Tc-99 from MW90A attributable to C-404; however, Tc-99 concentrations in MW84A showed an increasing Mann-Kendall (M-K) trend indicating a confirmed statistical exceedance. An evaluation of the confirmed exceedance for Tc-99 in MW84A was performed in regard to the previously referenced 2007 alternate source demonstration and was determined not to be relevant.

3. DATA VALIDATION AND QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

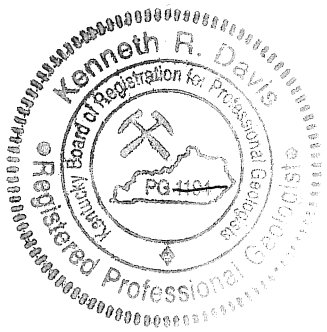
The data and the data validation codes for the January 2025 data sets are provided in Appendix A. All data for these data sets were considered useable as reported. Data validation was performed on the analytical data by an independent, third-party validator.

Field quality control samples are collected during each semiannual sampling event. Equipment rinseate blanks, field blanks, field duplicates, and trip blanks are obtained to ensure quality control and are reported in the analytical results in Appendix A. Laboratory quality control samples, such as matrix spikes, matrix spike duplicates, and method blanks, are performed by the laboratory and reported in the laboratory report. Both field and laboratory quality control sample results are reviewed as part of the data validation process.

4. PROFESSIONAL GEOLOGIST AUTHORIZATION

DOCUMENT IDENTIFICATION: *C-404 Hazardous Waste Landfill*
May 2025 Semiannual Groundwater Report
(October 2024–March 2025),
Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(FRNP-RPT-0382/V1)

Stamped and signed pursuant to my authority as a duly registered geologist under the provisions of *KRS* Chapter 322A.



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KD 5-19-2025

Kenneth R. Davis — PG113927 — 05-19-2025

Kenneth R. Davis | PG113927 | Date

5. REFERENCES

FRNP (Four Rivers Nuclear Partnership, LLC) 2018. *C-404 Hazardous Waste Landfill November 2018 Semiannual Groundwater Report (April 2018—September 2018), Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0026/V2, U.S. Department of Energy, Paducah, KY, November.

FRNP 2019. *C-404 Hazardous Waste Landfill Alternate Source Demonstration—Source of Lead and Uranium in MW87 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0078, Four Rivers Nuclear Partnership, LLC, Paducah, KY, February.

FRNP 2021. *C-404 Hazardous Waste Landfill Alternate Source Demonstration—Source of Technetium-99 in MW84A at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0206, Four Rivers Nuclear Partnership, LLC, Paducah, KY, August.

KDWM (Kentucky Division of Waste Management) 2020. Hazardous Waste Management Facility Permit for the U.S. Department of Energy, Paducah Gaseous Diffusion Plant, KY8-890-008-982, effective February 21.

PRS (Paducah Remediation Services, LLC) 2007a. *C-404 Landfill Source Demonstration Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS-ENM-0031/R2, Paducah Remediation Services, LLC, Kevil, KY, August.

PRS 2007b. *Well Plan for Addition of Wells for C-404 Monitoring Well Network, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS/PROJ/0028, Paducah Remediation Services, LLC, Kevil, KY, July.

APPENDIX A

C-404 HAZARDOUS WASTE LANDFILL GROUNDWATER ANALYTICAL RESULTS

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Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW84A REG Downgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8007-4849

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.0432	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved		0.0358	mg/L	0.005	1/7/2025			SW846-6020B	J
Barometric Pressure Reading		30.46	Inches/Hg		1/7/2025				X
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Conductivity		458	µmhos/cm		1/7/2025				X
Depth to Water		52.61	ft		1/7/2025				X
Dissolved Oxygen		4.25	mg/L		1/7/2025				X
Eh (approx)		440	mV		1/7/2025				X
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
pH		5.72	Std Unit		1/7/2025				X
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		7.9	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99		104	pCi/L	19.5	1/7/2025	16	20.4	HASL 300, Tc-02-RC M	=
Temperature		55.8	deg F		1/7/2025				X
Trichloroethene	Y1	5270	ug/L	100	1/7/2025			SW846-8260D	=
Turbidity		5.3	NTU		1/7/2025				X
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.354	pCi/L	1.29	1/7/2025	0.73	0.733	HASL 300, U-02-RC M	=
Uranium-235	U	-0.0335	pCi/L	1.17	1/7/2025	0.502	0.503	HASL 300, U-02-RC M	=
Uranium-238	U	0.476	pCi/L	0.749	1/7/2025	0.603	0.606	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW84A FR Downgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8007-4849

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.0421	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved		0.0348	mg/L	0.005	1/7/2025			SW846-6020B	J
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		7.98	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99		98.9	pCi/L	20.1	1/7/2025	16.1	20.1	HASL 300, Tc-02-RC M	=
Trichloroethene	Y1	5340	ug/L	100	1/7/2025			SW846-8260D	=
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.132	pCi/L	2.11	1/7/2025	1.02	1.02	HASL 300, U-02-RC M	=
Uranium-235	U	-0.113	pCi/L	1.59	1/7/2025	0.627	0.629	HASL 300, U-02-RC M	=
Uranium-238	U	-0.213	pCi/L	1.56	1/7/2025	0.521	0.523	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW85 REG Downgradient UCRS **Period:** Semiannual Report

AKGWA Well Tag #: 8000-5234

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.00509	mg/L	0.005	1/6/2025			SW846-6020B	=
Arsenic, Dissolved	J	0.00441	mg/L	0.005	1/6/2025			SW846-6020B	J
Barometric Pressure Reading		30.05	Inches/Hg		1/6/2025				X
Cadmium	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	UJ
Chromium	J	0.00467	mg/L	0.01	1/6/2025			SW846-6020B	=
Chromium, Dissolved	J	0.00351	mg/L	0.01	1/6/2025			SW846-6020B	J
Conductivity		350	µmhos/cm		1/6/2025				X
Depth to Water		8.18	ft		1/6/2025				X
Dissolved Oxygen		3	mg/L		1/6/2025				X
Eh (approx)		471	mV		1/6/2025				X
Lead	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	UJ
pH		6.13	Std Unit		1/6/2025				X
Selenium	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	UJ
Sulfate		12.3	mg/L	0.4	1/6/2025			SW846-9056A	=
Technetium-99		79.5	pCi/L	20.5	1/6/2025	15.2	18	HASL 300, Tc-02-RC M	=
Temperature		51.6	deg F		1/6/2025				X
Trichloroethene	J	0.47	ug/L	1	1/6/2025			SW846-8260D	=
Turbidity		5.3	NTU		1/6/2025				X
Uranium		0.000497	mg/L	0.0002	1/6/2025			SW846-6020B	=
Uranium-234	U	0.0356	pCi/L	1.51	1/6/2025	0.696	0.696	HASL 300, U-02-RC M	=
Uranium-235	U	0	pCi/L	0.726	1/6/2025	0.488	0.489	HASL 300, U-02-RC M	=
Uranium-238	U	0.102	pCi/L	1.08	1/6/2025	0.565	0.566	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW87A REG Downgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8007-4850

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.00799	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved		0.00624	mg/L	0.005	1/7/2025			SW846-6020B	J
Barometric Pressure Reading		30.48	Inches/Hg		1/7/2025				X
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium	J	0.00531	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Conductivity		336	µmhos/cm		1/7/2025				X
Depth to Water		52.7	ft		1/7/2025				X
Dissolved Oxygen		3.78	mg/L		1/7/2025				X
Eh (approx)		350	mV		1/7/2025				X
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
pH		5.86	Std Unit		1/7/2025				X
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		6.7	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99		25.7	pCi/L	20.4	1/7/2025	13	13.3	HASL 300, Tc-02-RC M	=
Temperature		56.1	deg F		1/7/2025				X
Trichloroethene	Y1	172	ug/L	4	1/7/2025			SW846-8260D	J
Turbidity		1.93	NTU		1/7/2025				X
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.591	pCi/L	1.11	1/7/2025	0.741	0.747	HASL 300, U-02-RC M	=
Uranium-235	U	0.408	pCi/L	0.896	1/7/2025	0.648	0.65	HASL 300, U-02-RC M	=
Uranium-238	U	0.262	pCi/L	0.393	1/7/2025	0.449	0.45	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW88 REG Downgradient UCRS **Period:** Semiannual Report

AKGWA Well Tag #: 8000-5237

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.00815	mg/L	0.005	1/6/2025			SW846-6020B	=
Arsenic, Dissolved		0.0058	mg/L	0.005	1/6/2025			SW846-6020B	J
Barometric Pressure Reading		30.09	Inches/Hg		1/6/2025				X
Cadmium	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	UJ
Chromium	J	0.00409	mg/L	0.01	1/6/2025			SW846-6020B	=
Chromium, Dissolved	J	0.00444	mg/L	0.01	1/6/2025			SW846-6020B	J
Conductivity		614	µmhos/cm		1/6/2025				X
Depth to Water		7.9	ft		1/6/2025				X
Dissolved Oxygen		2.72	mg/L		1/6/2025				X
Eh (approx)		470	mV		1/6/2025				X
Lead		0.0048	mg/L	0.002	1/6/2025			SW846-6020B	=
Lead, Dissolved	J	0.00181	mg/L	0.002	1/6/2025			SW846-6020B	J
Mercury		0.00187	mg/L	0.0002	1/6/2025			SW846-7470A	=
Mercury, Dissolved		0.000584	mg/L	0.0002	1/6/2025			SW846-7470A	J
pH		5.94	Std Unit		1/6/2025				X
Selenium	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	UJ
Sulfate		94	mg/L	4	1/6/2025			SW846-9056A	=
Technetium-99	U	9.18	pCi/L	17.4	1/6/2025	10.3	10.4	HASL 300, Tc-02-RC M	=
Temperature		52.2	deg F		1/6/2025				X
Trichloroethene		5.87	ug/L	1	1/6/2025			SW846-8260D	=
Turbidity		127	NTU		1/6/2025				X
Uranium		0.000848	mg/L	0.0002	1/6/2025			SW846-6020B	=
Uranium-234	U	0.224	pCi/L	1.67	1/6/2025	0.862	0.864	HASL 300, U-02-RC M	=
Uranium-235	U	0.231	pCi/L	0.694	1/6/2025	0.651	0.652	HASL 300, U-02-RC M	=
Uranium-238	U	0.569	pCi/L	1.23	1/6/2025	0.844	0.848	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW90A REG Downgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8004-0357

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic	J	0.00334	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved	J	0.00281	mg/L	0.005	1/7/2025			SW846-6020B	J
Barometric Pressure Reading		30.48	Inches/Hg		1/7/2025				X
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Conductivity		224	µmhos/cm		1/7/2025				X
Depth to Water		51.93	ft		1/7/2025				X
Dissolved Oxygen		5	mg/L		1/7/2025				X
Eh (approx)		492	mV		1/7/2025				X
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
pH		5.83	Std Unit		1/7/2025				X
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		4.13	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99		55.8	pCi/L	19.6	1/7/2025	13.9	15.5	HASL 300, Tc-02-RC M	=
Temperature		56.2	deg F		1/7/2025				X
Trichloroethene	Y1	121	ug/L	5	1/7/2025			SW846-8260D	=
Turbidity		1.27	NTU		1/7/2025				X
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	-0.523	pCi/L	1.89	1/7/2025	0.709	0.709	HASL 300, U-02-RC M	=
Uranium-235	U	-0.186	pCi/L	1.28	1/7/2025	0.431	0.432	HASL 300, U-02-RC M	=
Uranium-238	U	0.0188	pCi/L	1.44	1/7/2025	0.669	0.669	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW91A REG Downgradient UCRS **Period:** Semiannual Report

AKGWA Well Tag #: 8007-2917

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.00718	mg/L	0.005	1/6/2025			SW846-6020B	=
Arsenic, Dissolved		0.00661	mg/L	0.005	1/6/2025			SW846-6020B	J
Barometric Pressure Reading		30.09	Inches/Hg		1/6/2025				X
Cadmium	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	UJ
Chromium	U	0.01	mg/L	0.01	1/6/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/6/2025			SW846-6020B	UJ
Conductivity		782	µmhos/cm		1/6/2025				X
Depth to Water		12.15	ft		1/6/2025				X
Dissolved Oxygen		1.15	mg/L		1/6/2025				X
Eh (approx)		267	mV		1/6/2025				X
Lead	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	UJ
pH		6.09	Std Unit		1/6/2025				X
Selenium	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	UJ
Sulfate		85.9	mg/L	2	1/6/2025			SW846-9056A	=
Technetium-99		147	pCi/L	19.6	1/6/2025	17.1	24.9	HASL 300, Tc-02-RC M	=
Temperature		59.7	deg F		1/6/2025				X
Trichloroethene		17.2	ug/L	1	1/6/2025			SW846-8260D	=
Turbidity		0	NTU		1/6/2025				X
Uranium	U	0.0002	mg/L	0.0002	1/6/2025			SW846-6020B	=
Uranium-234	U	-0.756	pCi/L	2.38	1/6/2025	0.761	0.761	HASL 300, U-02-RC M	=
Uranium-235	U	0.0786	pCi/L	1.71	1/6/2025	0.821	0.823	HASL 300, U-02-RC M	=
Uranium-238	U	-0.318	pCi/L	1.97	1/6/2025	0.722	0.723	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW93A REG Upgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8007-4851

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.00902	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved		0.00701	mg/L	0.005	1/7/2025			SW846-6020B	J
Barometric Pressure Reading		30.5	Inches/Hg		1/7/2025				X
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium		0.0159	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Conductivity		349	µmhos/cm		1/7/2025				X
Depth to Water		55.74	ft		1/7/2025				X
Dissolved Oxygen		2.94	mg/L		1/7/2025				X
Eh (approx)		496	mV		1/7/2025				X
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
pH		5.88	Std Unit		1/7/2025				X
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		7.54	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99	U	3.06	pCi/L	23.4	1/7/2025	13.7	13.7	HASL 300, Tc-02-RC M	=
Temperature		56.6	deg F		1/7/2025				X
Trichloroethene	Y1	658	ug/L	50	1/7/2025			SW846-8260D	=
Turbidity		9.3	NTU		1/7/2025				X
Uranium	J	0.000068	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.692	pCi/L	2.14	1/7/2025	1.27	1.28	HASL 300, U-02-RC M	=
Uranium-235	U	-0.0388	pCi/L	1.35	1/7/2025	0.638	0.64	HASL 300, U-02-RC M	=
Uranium-238	U	0.111	pCi/L	1.91	1/7/2025	0.911	0.912	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW94 REG Upgradient UCRS **Period:** Semiannual Report

AKGWA Well Tag #: 8000-5103

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	=
Arsenic, Dissolved	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	UJ
Barometric Pressure Reading		30.13	Inches/Hg		1/6/2025				X
Cadmium	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/6/2025			SW846-6020B	UJ
Chromium	J	0.00333	mg/L	0.01	1/6/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/6/2025			SW846-6020B	UJ
Conductivity		709	µmhos/cm		1/6/2025				X
Depth to Water		13.29	ft		1/6/2025				X
Dissolved Oxygen		1.75	mg/L		1/6/2025				X
Eh (approx)		316	mV		1/6/2025				X
Lead	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/6/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/6/2025			SW846-7470A	UJ
pH		6.4	Std Unit		1/6/2025				X
Selenium	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/6/2025			SW846-6020B	UJ
Sulfate		56.1	mg/L	2	1/6/2025			SW846-9056A	=
Technetium-99		2850	pCi/L	18.9	1/6/2025	56.8	355	HASL 300, Tc-02-RC M	=
Temperature		59.4	deg F		1/6/2025				X
Trichloroethene	J	0.6	ug/L	1	1/6/2025			SW846-8260D	=
Turbidity		69.56	NTU		1/6/2025				X
Uranium		0.00132	mg/L	0.0002	1/6/2025			SW846-6020B	=
Uranium-234	U	-0.323	pCi/L	2	1/6/2025	0.809	0.81	HASL 300, U-02-RC M	=
Uranium-235	U	-0.384	pCi/L	1.77	1/6/2025	0.542	0.543	HASL 300, U-02-RC M	=
Uranium-238	U	0.296	pCi/L	1.61	1/6/2025	0.861	0.862	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Sampling Point: MW420 REG Upgradient URGA **Period:** Semiannual Report

AKGWA Well Tag #: 8005-3263

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic		0.0173	mg/L	0.005	1/7/2025			SW846-6020B	=
Arsenic, Dissolved		0.0136	mg/L	0.005	1/7/2025			SW846-6020B	J
Barometric Pressure Reading		30.51	Inches/Hg		1/7/2025				X
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Cadmium, Dissolved	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	UJ
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Chromium, Dissolved	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	UJ
Conductivity		386	µmhos/cm		1/7/2025				X
Depth to Water		54.7	ft		1/7/2025				X
Dissolved Oxygen		0.9	mg/L		1/7/2025				X
Eh (approx)		519	mV		1/7/2025				X
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Lead, Dissolved	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	UJ
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Mercury, Dissolved	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	UJ
pH		5.75	Std Unit		1/7/2025				X
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Selenium, Dissolved	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	UJ
Sulfate		6.08	mg/L	0.4	1/7/2025			SW846-9056A	=
Technetium-99	U	14.3	pCi/L	21.9	1/7/2025	13.2	13.3	HASL 300, Tc-02-RC M	=
Temperature		59.3	deg F		1/7/2025				X
Trichloroethene	Y1	2670	ug/L	50	1/7/2025			SW846-8260D	=
Turbidity		1.51	NTU		1/7/2025				X
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.475	pCi/L	1.18	1/7/2025	0.723	0.727	HASL 300, U-02-RC M	=
Uranium-235	U	0.394	pCi/L	0.865	1/7/2025	0.626	0.627	HASL 300, U-02-RC M	=
Uranium-238	U	0.101	pCi/L	0.886	1/7/2025	0.453	0.453	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Type of Sample: FB **Period:** Semiannual Report QC Samples

AKGWA Well Tag #: 0000-0000

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Technetium-99	U	16.4	pCi/L	22.7	1/7/2025	13.7	13.9	HASL 300, Tc-02-RC M	=
Trichloroethene	UY1	1	ug/L	1	1/7/2025			SW846-8260D	=
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.307	pCi/L	2.08	1/7/2025	1.09	1.09	HASL 300, U-02-RC M	=
Uranium-235	U	0.0681	pCi/L	1.49	1/7/2025	0.712	0.713	HASL 300, U-02-RC M	=
Uranium-238	U	-0.134	pCi/L	1.53	1/7/2025	0.605	0.606	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Type of Sample: RI **Period:** Semiannual Report QC Samples

AKGWA Well Tag #: 0000-0000

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Arsenic	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Cadmium	U	0.001	mg/L	0.001	1/7/2025			SW846-6020B	=
Chromium	U	0.01	mg/L	0.01	1/7/2025			SW846-6020B	=
Lead	U	0.002	mg/L	0.002	1/7/2025			SW846-6020B	=
Mercury	U	0.0002	mg/L	0.0002	1/7/2025			SW846-7470A	=
Selenium	U	0.005	mg/L	0.005	1/7/2025			SW846-6020B	=
Technetium-99	U	1.75	pCi/L	20.9	1/7/2025	11.9	11.9	HASL 300, Tc-02-RC M	UJ
Trichloroethene	UY1	1	ug/L	1	1/7/2025			SW846-8260D	=
Uranium	U	0.0002	mg/L	0.0002	1/7/2025			SW846-6020B	=
Uranium-234	U	0.565	pCi/L	1.12	1/7/2025	0.805	0.812	HASL 300, U-02-RC M	=
Uranium-235	U	-0.0542	pCi/L	1.08	1/7/2025	0.467	0.468	HASL 300, U-02-RC M	=
Uranium-238	U	0.095	pCi/L	1.01	1/7/2025	0.528	0.528	HASL 300, U-02-RC M	=

Paducah OREIS
GROUNDWATER MONITORING REPORT

Facility: C-404 Landfill **County:** McCracken **Permit #:** KY8-890-008-982

Type of Sample: TB **Period:** Semiannual Report QC Samples

AKGWA Well Tag #: 0000-0000

Parameter	Qualifier	Result	Units	Reporting Limit	Date Collected	Counting Error (+/-)	TPU	Method	Validation
Trichloroethene	U	1	ug/L	1	1/6/2025			SW846-8260D	=
	UY1	1	ug/L	1	1/7/2025			SW846-8260D	=

QUALIFIER Codes

U Not detected.
J Estimated quantitation.
Y1 MS/MSD recovery outside acceptance criteria.

SAMPLING POINT Codes

UCRS Upper Continental Recharge System
URGA Upper Regional Gravel Aquifer

SAMPLE TYPE Codes

FB Field Blank
FR Field Duplicate as defined in sampling procedure.
REG Regular
RI QC Equipment Rinseate/Decon
TB Trip Blank

VALIDATION Codes

= Validated result, no qualifier is necessary.
J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ Analyte, compound or nuclide not detected above the reported detection limit, and the reported detection limit is approximated due to quality deficiency.
X Not validated.

APPENDIX B

C-404 HAZARDOUS WASTE LANDFILL STATISTICAL ANALYSES

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GROUNDWATER STATISTICAL SUMMARY

INTRODUCTION

The statistical analyses conducted on the data collected from the C-404 Hazardous Waste Landfill (C-404 Landfill) were performed in accordance with procedures provided in Appendix E of the Hazardous Waste Management Facility Permit, reissued by the Kentucky Division of Waste Management in February 2020. The percent of censored (nondetected) data points for individual parameters was calculated for the combined analytical data from the most recent five sampling events. The percent of censored data was used to select the types of statistical analyses to determine whether compliance well concentrations differed from background well concentrations. Data points were used in the statistical analysis for analyte results close to the sample quantitation limit that were judged to be below that limit by the data validator.

For the first reporting period of 2025 semiannual report, the data set includes data from January 2023, July 2023, January 2024, July 2024, and January 2025.

STATISTICAL ANALYSIS PROCESS

Utilizing the current data set and four previous data sets, the type of statistical test conducted for each chemical data set is a function of the number of samples and proportion of censored data (nondetects) to uncensored data (detects) in each group. The percent of censored (nondetected) data points for individual parameters was calculated for the combined analytical data. The statistical procedures applied to the data are summarized below.

- Determine the percentage of the censored data using the reporting period data set.
- Group by percentage of censored data where the following apply:
  - — If censored data are greater than or equal to 90%, determine the limit of detection (LOD) and half of the LOD (½ LOD). This is Statistical Test 1.
  - — If censored data are between 50% and 90%, perform a Test of Proportions. If the analysis indicates a significant proportional difference in compliance wells, further analyze through nonparametric Analysis of Variance (ANOVA) Test. This is Statistical Test 2.
  - — If censored data are between 15% and 50%, perform nonparametric ANOVA Test. If results exceed the critical value, compute the critical difference used to identify individual well concentrations, which are significantly elevated compared with background. This is Statistical Test 3.
  - — If censored data are less than 15%, actual data values are analyzed using parametric ANOVA procedures. If the wells exhibit equal variances, then the data are used as presented. If the wells do not exhibit equal variances, then the log of the data is taken and then used in the calculations. Where statistical testing indicates elevated compliance well concentrations, Bonferroni's Test of Contrasts

is performed. This is Statistical Test 4. Statistical Test 4 is found in Section 5.2.1 of EPA guidance document, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance* (April 1989).

If the statistical method above indicates no statistical difference between concentrations in downgradient wells and concentrations in background wells, then there are no indications of statistically significant impacts on the groundwater from the C-404 Landfill. If the tiered statistical method above identifies a statistically significant difference between concentrations in downgradient wells and concentrations in background wells, then the data will be evaluated further to determine if the concentrations in downgradient wells are within the statistically developed upper tolerance limit (UTL) for background concentrations or are consistent with the findings of the 2007 alternate source demonstration (ASD), as follows:

(1) Compare the most recent downgradient sample results to a 95% UTL using the five most recent sets of data for each upgradient well as described below. If downgradient concentrations are lower than the UTL for the paired upgradient concentrations, then there is no confirmed exceedance.

(2) Evaluate results using paired ANOVA of wells in the same direction relative to the landfill (e.g., compare upgradient westernmost well results to downgradient westernmost well results). If ANOVA does not identify a statistically significant difference between upgradient and downgradient wells, then the results are consistent with the historical ASD.

(3) If results show downgradient wells have statistically significant higher concentrations than upgradient wells, even when evaluated with respect to the ASD, additional intra-well evaluation of trend will be performed using the Mann-Kendall test for trend. If concentrations do not show an increasing trend, then there is no confirmed exceedance attributable to C-404.

(4) Review other Regional Gravel Aquifer (RGA) well results in vicinity to determine if they are consistent with the ASD.

If the statistical analysis identifies downgradient well concentrations that are increasing, are higher than UTL, are higher than the upgradient well concentrations even when the ASD results are taken into account, this evaluation will identify a confirmed, statistically significant exceedance (in a compliance well) over background.

DATA ANALYSIS

Data from the upgradient background wells in the Upper Regional Gravel Aquifer (URGA) are included for comparison with three downgradient URGA wells. Figure 1 of this C-404 Landfill Groundwater Report provides a map of the well locations associated with the C-404 Landfill. Upper continental recharge system (UCRS) wells in Figure 1 are provided for reference only. Data from wells that are in the UCRS are not included in the statistical analyses.

Table B.1 presents the C-404 Landfill upgradient or background wells and downgradient or compliance wells from the URGA. Data from the URGA compliance wells were compared with data from the URGA background wells.

Table B.1. Monitoring Well Locations

URGA	
Upgradient background wells	MW93A*, MW420
Downgradient compliance wells	MW84A*, MW87A*, MW90A*

*MW90 was abandoned in 2001 and replaced with MW90A. MW84, MW87, and MW93 were abandoned in 2019 and replaced with MW84A, MW87A, and MW93A, respectively.

For this reporting period, the data set includes data from January 2023, July 2023, January 2024, July 2024, and January 2025 consisting of five semiannual sets of data.

Table B.2 lists the number of analyses (observations), nondetects (censored observations), detects (uncensored observations), and missing observations by parameter. When field duplicate data are available from a well, the higher of the two readings was retained for further evaluation.

Table B.2. Summary of Missing, Censored, and Uncensored Data Collected

Parameters	Observations	Missing Observations	Censored Observations (Nondetects)	Uncensored Observations (Detects)
URGA				
Arsenic	25	0	0	25
Cadmium	25	0	25	0
Chromium	25	0	21	4
Lead	25	0	25	0
Mercury	25	0	25	0
Selenium	25	0	25	0
Technetium-99	25	0	12	13
Trichloroethene	25	0	0	25
Uranium (Metals)	25	0	24	1
Uranium-234	25	0	25	0
Uranium-235	25	0	25	0
Uranium-238	25	0	25	0

CENSORING PERCENTAGE AND STATISTICAL ANALYSIS

The type of statistical test set applied to the data is a function of the number of nondetects (censored) versus detects (uncensored) in each of the parameter groups and among the wells. Table B.3 presents the percentage of censored data and type of statistical test chosen for each of the parameters required by Part VIII.E of the Hazardous Waste Management Facility Permit.

Table B.3. Percent Censored Report and Statistical Test Set Selected

Parameter	Total Samples (Nonmissing)	Uncensored (Detects)	Censored (Nondetects)	Percent Censored	Statistical Test Set*
URGA					
Arsenic	25	25	0	0	4
Cadmium	25	0	25	100	1
Chromium	25	4	21	84	2
Lead	25	0	25	100	1
Mercury	25	0	25	100	1
Selenium	25	0	25	100	1
Technetium-99	25	13	12	48	3
Trichloroethene	25	25	0	0	4
Uranium (Metals)	25	1	24	96	1
Uranium-234	25	0	25	100	1
Uranium-235	25	0	25	100	1
Uranium-238	25	0	25	100	1

*A list of the constituents with ≥ 90% censored data is included in Table B.4, which summarizes the results of Statistical Test 1.

SUMMARY OF CONCLUSIONS

The results for Statistical Test 1, LOD, are summarized in Table B.4. Table B.5 provides the summary of conclusions for the C-404 Landfill statistical analyses for the first reporting period 2025, including the statistical tests performed, the attachment number, well type, parameter, and results of each statistical test. Results of Statistical Test 2, Statistical Test 3, and Statistical Test 4 are presented in Attachments B1 through B5. The statistician qualification statement is presented in Attachment B6.

Table B.4. Statistical Test 1: Limit of Detection

Parameter	LOD Values	½ LOD Values
URGA		
Cadmium (mg/L)	0.001	0.0005
Lead (mg/L)	0.002	0.001
Mercury (mg/L)	0.0002	0.0001
Selenium (mg/L)	0.005	0.0025
Uranium (mg/L)	0.0002	0.0001
Uranium-234 (pCi/L)	2.14	1.07
Uranium-235 (pCi/L)	1.35	0.675
Uranium-238 (pCi/L)	1.91	0.955

Table B.5. Summary of Conclusions from the C-404 Hazardous Waste Landfill Statistical Analyses for the First Reporting Period 2025

Attachment	RGA Well Type	Parameter	Applied Statistical Test	Results
B1	URGA	Arsenic	Statistical Test 4, parametric ANOVA (abandoned) and Statistical Test 3, nonparametric ANOVA.	Because equality of variance could not be confirmed, Statistical Test 4 was abandoned and Statistical Test 3, nonparametric ANOVA, was performed. Nonparametric ANOVA did not indicate a statistically significant difference between concentrations in downgradient wells and concentrations in background wells.
B2	URGA	Chromium	Statistical Test 2, Test of Proportions	No statistically significant difference was detected between concentrations in downgradient wells and concentrations in background wells.
B3	URGA	Technetium-99	Statistical Test 3, nonparametric ANOVA, 95% UTL, paired (parametric) ANOVA, paired (nonparametric) ANOVA, and Mann-Kendall.	Statistical Test 3 Nonparametric ANOVA indicated a statistically significant difference between concentrations in downgradient wells and the concentrations in background wells for compliance wells MW84A and MW90A. Comparisons to the 95% UTL identified statistically significant differences between compliance wells (MW84A and MW90A) and the background wells. Paired (parametric) ANOVA (MW84A vs. MW93A and MW90A vs. MW93A) were performed and determined the equality of variances were not confirmed for either MW84A or MW90A. Paired (nonparametric) ANOVA was then performed. Paired (nonparametric) ANOVA identified a significant difference between upgradient (MW93A) and downgradient (MW84A and MW90A) wells. The Mann-Kendall trend analysis identified a statistically significant increasing trend for technetium-99 in MW84A. Mann-Kendall trend analysis did not identify a statistically significant trend for technetium-99 in MW90A.
B4	URGA	Trichloroethene (TCE)	Statistical Test 4, parametric ANOVA (abandoned) and Statistical Test 3, nonparametric ANOVA, with 95% UTL, paired (parametric) ANOVA, and Mann-Kendall trend analysis.	Because equality of variance could not be confirmed, Statistical Test 4 was abandoned and Statistical Test 3, nonparametric ANOVA, was performed. Nonparametric ANOVA indicated a statistically significant difference between concentrations in background wells and compliance well MW84A, a comparison to the 95% UTL was performed. The 95% UTL indicated a statistically significant difference between concentrations in compliance well MW84A and concentrations in background wells; therefore, a paired (parametric) ANOVA (MW84A vs. MW93A) was performed that indicated a statistically significant difference between the wells. The Mann-Kendall trend analysis did not identify a statistically significant trend for TCE in MW84A.

In summary, Statistical Test 2, Test of Proportions, for chromium in the URGA indicated no statistically significant difference between concentrations in downgradient wells and concentrations in background wells.

Statistical Test 3, Nonparametric ANOVA, for technetium-99 identified statistically significant exceedances in downgradient wells MW84A and MW90A as compared to background wells. The MW84A and MW90A technetium-99 concentrations also exceeded the 95% UTL. Because equality of variance could not be confirmed for either MW84A or MW90A, paired (parametric) ANOVA was abandoned and a paired (nonparametric) was performed. Paired (nonparametric) ANOVA identified a significant difference between upgradient (MW93A) and downgradient (MW84A and MW90A) wells. Mann-Kendall trend analysis was performed and did not indicate a statistically significant trend for MW90A; however, Mann-Kendall trend analysis did indicate a statistically significant increasing trend for technetium-99 in MW84A.

Statistical Test 4, because equality of variance by parametric ANOVA for arsenic could not be confirmed, the test was abandoned. Statistical Test 3, nonparametric ANOVA, did not identify a statistically significant difference between concentrations in downgradient wells and concentrations in background wells.

Statistical Test 4, because equality of variance by parametric ANOVA for TCE could not be confirmed, the test was abandoned. Statistical Test 3, nonparametric ANOVA, indicated a statistically significant difference between concentrations in downgradient well MW84A and concentrations in background wells; therefore, the data were evaluated further by comparing results to the UTL. The 95% UTL indicated a statistically significant difference between concentrations in downgradient well MW84A and concentrations in background wells; therefore, paired (parametric) ANOVA was performed on upgradient well MW93A and downgradient well MW84A. Paired (parametric) ANOVA identified a statistically significant difference between the upgradient and downgradient wells. Mann-Kendall trend analysis was performed and did not indicate a statistically significant trend.

ATTACHMENT B1

ARSENIC
STATISTICAL TEST 4

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Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Arsenic (As, mg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.11E-02**	**1.10E-02**	**3.43E-02**	**8.57E-03**	**2.78E-03**
Jul-23	**8.63E-03**	**1.14E-02**	**3.51E-02**	**8.63E-03**	**2.60E-03**
Jan-24	**8.19E-03**	**1.28E-02**	**3.76E-02**	**8.20E-03**	**2.72E-03**
Jul-24	**7.39E-03**	**1.35E-02**	**3.79E-02**	**7.80E-03**	**3.27E-03**
Jan-25	**9.02E-03**	**1.73E-02**	**4.32E-02**	**7.99E-03**	**3.34E-03**
n_i	10		5	5	5
Sum	1.10E-01		1.88E-01	4.12E-02	1.47E-02
(x_i)avg	1.10E-02		3.76E-02	8.24E-03	2.94E-03

mg/L = milligrams per liter
Bolded values indicate a detected result.

Overall mean x.. =	1.42E-02	
N =	25	N = the total number of samples
p =	4	p = the number of n_i groups
x.. =	3.54E-01	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test

Table of Residuals

Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	6.70E-05	-3.30E-05	-3.32E-03	3.32E-04	-1.62E-04
Jul-23	-2.40E-03	3.67E-04	-2.52E-03	3.92E-04	-3.42E-04
Jan-24	-2.84E-03	1.77E-03	-2.00E-05	-3.80E-05	-2.22E-04
Jul-24	-3.64E-03	2.47E-03	2.80E-04	-4.38E-04	3.28E-04
Jan-25	-2.01E-03	6.27E-03	5.58E-03	-2.48E-04	3.98E-04

X: Mean Value =	1.73E-19	
S: Standard Deviation =	2.32E-03	
CV = S/X =	1.34E+16	≥1, data are not normally distributed

Data are not normally distributed (i.e., ≥1)

If the coefficient of variation is < 1, the data are normally distributed.
If the coefficient of variation is ≥ 1, data are not normally distributed.

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA,
First Reporting Period 2025

Determine Equality of Variance of Dataset

p = number of well groups
n_i = number of data points per well
N = total sample size
S^2 = the square of the standard deviation
$\ln(S_i^2)$ = natural logarithm of each variance
f = total sample size minus the number of wells (groups)
$f_i = n_i - 1$
x.. = the sum of the total number of samples
$(x_{avg})_{..}$ = the mean of the total number of samples

$x_{..} =$ 3.54E-01
$(x_{avg})_{..} =$ 1.42E-02

p = 4
N = 25

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	n_i	$f_iS_i^2$	$f_i\ln(S_i^2)$
2.98E-03	8.87E-06	-1.16E+01	10	7.98E-05	-1.05E+02
3.49E-03	1.21E-05	-1.13E+01	5	4.86E-05	-4.53E+01
3.60E-04	1.30E-07	-1.59E+01	5	5.19E-07	-6.34E+01
3.39E-04	1.15E-07	-1.60E+01	5	4.58E-07	-6.39E+01

$\sum(S_i^2) =$ 2.13E-05 $\sum f_i\ln(S_i^2) =$ -2.77E+02

Equality of Variance: Bartlett's Test

f = 21
$Sp^2 =$ 6.16E-06
$\ln Sp^2 =$ -1.20E+01
$c^2 =$ 2.54E+01 (If $c^2 \le c^2_{crit}$, then variances are equal at the given significance level).
c^2_{crit} * = 7.81E+00 at a 5% significance level with 3 degrees of freedom

NOTE: The variances are NOT equal. **(i.e., $c^2 > c^2_{crit}$)**

Variances are not equal, transform the original data to lognormal (i.e., since $c^2 > c^2_{crit}$).

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Lognormal Data for Arsenic

ln[As (mg/L)]					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	-4.50E+00	-4.51E+00	-3.37E+00	-4.76E+00	-5.89E+00
Jul-23	-4.75E+00	-4.47E+00	-3.35E+00	-4.75E+00	-5.95E+00
Jan-24	-4.80E+00	-4.36E+00	-3.28E+00	-4.80E+00	-5.91E+00
Jul-24	-4.91E+00	-4.31E+00	-3.27E+00	-4.85E+00	-5.72E+00
Jan-25	-4.71E+00	-4.06E+00	-3.14E+00	-4.83E+00	-5.70E+00
Mean x_i	-4.73E+00	-4.34E+00	-3.28E+00	-4.80E+00	-5.83E+00
Background Mean	-4.54E+00		NA	NA	NA
Grand Mean	-4.60E+00				
x_i^2	2.03E+01	2.03E+01	1.14E+01	2.27E+01	3.46E+01
	2.26E+01	2.00E+01	1.12E+01	2.26E+01	3.54E+01
These values needed for ANOVA	2.31E+01	1.90E+01	1.08E+01	2.31E+01	3.49E+01
	2.41E+01	1.85E+01	1.07E+01	2.36E+01	3.28E+01
	2.22E+01	1.65E+01	9.87E+00	2.33E+01	3.25E+01
Sum x_i^2	5.46E+02				

mg/L = milligrams per liter

Determine Normality of Dataset

Coefficient of Variability Test

Table of ln[As (mg/L)] Data

Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	-4.50E+00	-4.51E+00	-3.37E+00	-4.76E+00	-5.89E+00
Jul-23	-4.75E+00	-4.47E+00	-3.35E+00	-4.75E+00	-5.95E+00
Jan-24	-4.80E+00	-4.36E+00	-3.28E+00	-4.80E+00	-5.91E+00
Jul-24	-4.91E+00	-4.31E+00	-3.27E+00	-4.85E+00	-5.72E+00
Jan-25	-4.71E+00	-4.06E+00	-3.14E+00	-4.83E+00	-5.70E+00

X: Mean Value = -4.60E+00
S: Standard Deviation = 8.47E-01
CV = S/X = -1.84E-01 <1, data are normally distributed

Data are normally distributed (i.e., <1)

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Determine Equality of Variance of Dataset for Lognormal Data

p = number of wells (background wells considered as one group)
n_i = number of data points per well
N = total sample size
S^2 = the square of the standard deviation
$\ln(S_i^2)$ = natural logarithm of each variance
f = total sample size minus the number of wells (groups)
$f_i = n_i - 1$
x.. = the sum of the total lognormal dataset
$(x_{avg})_{..}$ = the mean of the lognormal dataset

$x_{..} =$ -1.15E+02
$(x_{avg})_{..} =$ -4.60E+00
$n_i =$ 5
p = 4
N = 25

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	ni	$f_iS_i^2$	$f_i\ln(S_i^2)$
2.60E-01	6.74E-02	-2.70E+00	10	6.07E-01	-2.43E+01
9.01E-02	8.12E-03	-4.81E+00	5	3.25E-02	-1.93E+01
4.38E-02	1.91E-03	-6.26E+00	5	7.66E-03	-2.50E+01
1.14E-01	1.29E-02	-4.35E+00	5	5.18E-02	-1.74E+01

$\sum(S_i^2) =$ 9.04E-02 $\sum f_i\ln(S_i^2) =$ -8.59E+01

Equality of Variance: Bartlett's Test

f = 2.10E+01
$Sp^2 =$ 3.33E-02
$\ln Sp^2 =$ -3.40E+00
$c^2 =$ 1.45E+01 (If $c^2 \le c^2_{crit}$, then variances are equal at the given significance level).
c^2_{crit} * = 7.81E+00 at a 5% significance level with 3 degrees of freedom

NOTE: The variances are NOT equal. (i.e., $c^2 \ge c^2_{crit}$)

Because variances are not equal, Statistical Test 3, Nonparametric ANOVA is performed.**

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

**Section 5.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA,
First Reporting Period 2025

Nonparametric ANOVA

Arsenic (mg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.11E-02**	**1.10E-02**	**3.43E-02**	**8.57E-03**	**2.78E-03**
Jul-23	**8.63E-03**	**1.14E-02**	**3.51E-02**	**8.63E-03**	**2.60E-03**
Jan-24	**8.19E-03**	**1.28E-02**	**3.76E-02**	**8.20E-03**	**2.72E-03**
Jul-24	**7.39E-03**	**1.35E-02**	**3.79E-02**	**7.80E-03**	**3.27E-03**
Jan-25	**9.02E-03**	**1.73E-02**	**4.32E-02**	**7.99E-03**	**3.34E-03**
Sum	1.10E-01		1.88E-01	4.12E-02	1.47E-02
n_i	10		5	5	5
$(x_i)_{avg}$	1.10E-02		3.76E-02	8.24E-03	2.94E-03

mg/L = milligrams per liter
DL = detection limit
All data sets represent 1/2 DL values for nondetects.
Bolded values indicate a detected result.

Overall mean x.. = 1.42E-02

N =	25	N = the total number of samples
p =	4	p = the number of n_i groups
x.. =	3.54E-01	x.. = the sum of the total number of samples

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA,
First Reporting Period 2025

Nonparametric ANOVA

Ranking of Observations

Sequence	Arsenic (mg/L)	Adjusted Rank	Tie Number
1	**2.60E-03**	1	
2	**2.72E-03**	2	
3	**2.78E-03**	3	
4	**3.27E-03**	4	
5	**3.34E-03**	5	
6	**7.39E-03**	6	
7	**7.80E-03**	7	
8	**7.99E-03**	8	
9	**8.19E-03**	9	
10	**8.20E-03**	10	
11	**8.57E-03**	11	
12	**8.63E-03**	12.5	Tie 1
13	**8.63E-03**	12.5	
14	**9.02E-03**	14	
15	**1.10E-02**	15	
16	**1.11E-02**	16	
17	**1.14E-02**	17	
18	**1.28E-02**	18	
19	**1.35E-02**	19	
20	**1.73E-02**	20	
21	**3.43E-02**	21	
22	**3.51E-02**	22	
23	**3.76E-02**	23	
24	**3.79E-02**	24	
25	**4.32E-02**	25	

mg/L = milligrams per liter
DL = detection limit
Bolded values indicate a detected result.
NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

n_{tie}
2 Tie 1 = 6

$\sum T_i$ = 6

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Sums of Ranks and Averages

Arsenic (mg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.11E-02**	**1.10E-02**	**3.43E-02**	**8.57E-03**	**2.78E-03**
Jul-23	**8.63E-03**	**1.14E-02**	**3.51E-02**	**8.63E-03**	**2.60E-03**
Jan-24	**8.19E-03**	**1.28E-02**	**3.76E-02**	**8.20E-03**	**2.72E-03**
Jul-24	**7.39E-03**	**1.35E-02**	**3.79E-02**	**7.80E-03**	**3.27E-03**
Jan-25	**9.02E-03**	**1.73E-02**	**4.32E-02**	**7.99E-03**	**3.34E-03**

Observation Ranks for Arsenic					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	16	15	21	11	3
Jul-23	12.5	17	22	12.5	1
Jan-24	9	18	23	10	2
Jul-24	6	19	24	7	4
Jan-25	14	20	25	8	5
R_i	146.5		115	48.5	15
$(R_i)_{avg}$	14.7		23.0	9.7	3.0
R_i^2/n_i	2146.2		2645.0	470.5	45.0

$\Sigma R_i^2/n_i$ = 5.31E+03

mg/L = milligrams per liter
DL = detection limit

K = the number of n_i groups
N = the total number of samples

Bolded values indicate a detected result.

K = 4
N = 25

NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

Calculation of Kruskal-Wallis Statistic

H =	2.00E+01	Kruskal-Wallis Statistic	$H = [12/N(N+1)*\Sigma R_i^2/n_i] - 3(N+1)$
H' =	2.00E+01	Corrected Kruskal-Wallis	$H' = H/[1-(\sum T_i/N^3-N)]$
χ^2_{crit}* =	7.81E+00	3	degrees of freedom at the 5% significance level

NOTE: $H' > \chi^2_{crit}$

If $H' \leq \chi^2_{crit}$, the data from each well come from the same continuous distribution and hence have the same median concentrations of a specific constituent.

If $H' > \chi^2_{crit}$, reject the null hypothesis and calculate the critical difference for well comparisons to the background.

K-1 =	3	α/(K-1) =	1.67E-02	Z(α/(K-1))** =	2.13E+00
α =	0.05	1-(α/K-1) =	9.83E-01		

NOTE: *Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).
**Table 4, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B1: Arsenic URGA, Statistical Test 4, Parametric ANOVA,
First Reporting Period 2025

Calculate Critical Values

Average Background Ranking = 14.7

	Well No.	C_i	$(R_i)_{avg} - (R_b)_{avg}$	Conclusion
BG Well	MW93A			
BG Well	MW420			
	MW84A	8.58E+00	8.35E+00	not contaminated
	MW87A	8.58E+00	-4.95E+00	not contaminated
	MW90A	8.58E+00	-1.17E+01	not contaminated

CONCLUSION: If $(R_i)_{avg} - (R_b)_{avg} > C_i$, then there is evidence that the compliance well is contaminated.

If $(R_i)_{avg} - (R_b)_{avg} < C_i$ for wells, there is no evidence of a statistically significant difference between concentrations in downgradient compliance test wells and background wells.

Since $(R_i)_{avg} - (R_b)_{avg} < C_i$ for MW84A, MW87A, and MW90A, there is no statistically significant difference between background wells and these downgradient compliance test wells; however, the negative value indicates that background wells have elevated concentrations.

Section 5.2.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

ATTACHMENT B2

CHROMIUM
STATISTICAL TEST 2

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Attachment B2: Chromium URGA, Statistical Test 2, Test of Proportions, First Reporting Period 2025

Chromium (mg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
Jul-23	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
Jan-24	**3.82E-03**	5.00E-03	5.00E-03	**4.16E-03**	5.00E-03
Jul-24	5.00E-03	5.00E-03	5.00E-03	5.00E-03	5.00E-03
Jan-25	**1.59E-02**	5.00E-03	5.00E-03	**5.31E-03**	5.00E-03

mg/L = milligrams per liter
DL = detection limit
All data sets represent 1/2 DL values for nondetects.
Bolded values indicate a detected result.

[!] **Test of Proportions**

Calculate the number of detections in background wells vs. compliance wells.

X =	2	X = number of samples above DL in background wells
Y =	2	Y = number of samples above DL in compliance wells
n_b =	10	n_b = count of background well results/samples analyzed
n_c =	15	n_c = count of compliance well results/samples analyzed
n =	25	n = total number of samples

P =	0.16	P = (x+y)/n
nP =	4	$n = n_b+n_c$
n(1-P) =	21	

NOTE: If nP and n(1-P) are both >= 5, then the normal approximation may be used; however, because nP < 5 and/or n(1-P) < 5, the test was continued to determine if the conclusion, along with a simple evaluation of the data would be similar.

P_b =	0.20	P_b = proportion of detects in background wells
P_c =	0.13	P_c = proportion of detects in compliance wells
S_D =	0.15	S_D = standard error of difference in proportions
Z =	0.45	$Z = (P_b-P_c)/S_D$
absolute value of Z =	0.45	

If the absolute value of Z exceeds the 97.5th percentile value of 1.96 from the standard normal distribution, this provides statistically significant evidence at the 5% significance level that the proportion of detects in one group of data exceeds the proportion of detects in the other group.

CONCLUSION: **Because the absolute value of Z is less than or equal to 1.96, there is no statistical evidence that the proportion of samples with detected results differs between the background wells and compliance well samples.**

[!] Section 8.1.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance* (EPA 1989).

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ATTACHMENT B3

TECHNETIUM-99
STATISTICAL TEST 3

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Nonparametric ANOVA

Technetium-99 (pCi/L)					
Date	**Background**	**Background**	**Compliance**	**Compliance**	**Compliance**
	MW93A	**MW420**	**MW84A**	**MW87A**	**MW90A**
Jan-23	9.15E+00	8.85E+00	**2.02E+02**	**2.44E+01**	1.19E+01
Jul-23	9.35E+00	9.75E+00	**6.42E+01**	**3.33E+01**	**2.47E+01**
Jan-24	8.30E+00	8.15E+00	**8.60E+01**	**1.92E+01**	**4.35E+01**
Jul-24	9.95E+00	9.80E+00	**9.35E+01**	9.80E+00	**4.53E+01**
Jan-25	1.17E+01	1.10E+01	**1.04E+02**	**2.57E+01**	**5.58E+01**
Sum	9.60E+01		5.50E+02	1.12E+02	1.81E+02
n_i	10		5	5	5
$(x_i)_{avg}$	9.60E+00		1.10E+02	2.25E+01	3.62E+01

pCi/L = picocuries per liter
All data sets represent 1/2 detection limit values for nondetects.
Bolded values indicate a detected result.

Overall mean x.. = 3.76E+01

N =	25	N = the total number of samples
p =	4	p = the number of n_i groups
x.. =	9.39E+02	x.. = the sum of the total number of samples

Nonparametric ANOVA

Ranking of Observations

Sequence	Technetium-99 (pCi/L)	Adjusted Rank	Tie Number
1	0	6.5	Tie
2	0	6.5	
3	0	6.5	
4	0	6.5	
5	0	6.5	
6	0	6.5	
7	0	6.5	
8	0	6.5	
9	0	6.5	
10	0	6.5	
11	0	6.5	
12	0	6.5	
13	**1.92E+01**	13	
14	**2.44E+01**	14	
15	**2.47E+01**	15	
16	**2.57E+01**	16	
17	**3.33E+01**	17	
18	**4.35E+01**	18	
19	**4.53E+01**	19	
20	**5.58E+01**	20	
21	**6.42E+01**	21	
22	**8.60E+01**	22	
23	**9.35E+01**	23	
24	**1.04E+02**	24	
25	**2.02E+02**	25	

pCi/L = picocuries per liter

Bolded values indicate a detected result.

NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

n_{tie}		
12	Tie 1 =	1716
	$\sum T_i$ =	1716

Nonparametric ANOVA

Sums of Ranks and Averages

Technetium-99 (pCi/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	0	0	**2.02E+02**	**2.44E+01**	0
Jul-23	0	0	**6.42E+01**	**3.33E+01**	**2.47E+01**
Jan-24	0	0	**8.60E+01**	**1.92E+01**	**4.35E+01**
Jul-24	0	0	**9.35E+01**	0	**4.53E+01**
Jan-25	0	0	**1.04E+02**	**2.57E+01**	**5.58E+01**

Observation Ranks for Technetium-99					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	6.5	6.5	25	14	6.5
Jul-23	6.5	6.5	21	17	15
Jan-24	6.5	6.5	22	13	18
Jul-24	6.5	6.5	23	6.5	19
Jan-25	6.5	6.5	24	16	20
R_i	65.00		115.00	66.50	78.50
$(R_i)_{avg}$	6.50		23.00	13.30	15.70
R_i^2/n_i	422.50		2645.00	884.45	1232.45

$\Sigma R_i^2/n_i$ = 5.18E+03

K = 4

N = 25

pCi/L = picocuries per liter

K = the number of n_i groups

N = the total number of samples

Bolded values indicate a detected result.

NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

Calculation of Kruskal-Wallis Statistic

H =	1.77E+01	Kruskal-Wallis Statistic	$H = [12/N(N+1)*\Sigma R_i^2/n_i] - 3(N+1)$
H' =	1.99E+01	Corrected Kruskal-Wallis	$H' = H/[1-(\sum T_i/N^3-N)]$
χ^2_{crit}* =	7.81E+00	3	degrees of freedom at the 5% significance level

NOTE: $H' > \chi^2_{crit}$

If $H' \leq \chi^2_{crit}$, the data from each well come from the same continuous distribution and hence have the same median concentrations of a specific constituent.

If $H' > \chi^2_{crit}$, reject the null hypothesis and calculate the critical difference for well comparisons to the background.

K-1 =	3	α/(K-1) =	1.67E-02	Z(α/(K-1))** =	2.13E+00
α =	0.05	1-(α/K-1) =	9.83E-01		

NOTE: *Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

**Table 4, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Nonparametric ANOVA

Calculate Critical Values

Average Background Ranking = 6.5

	Well No.	C_i	$(R_i)_{avg} - (R_b)_{avg}$	Conclusion
BG Well	MW93A			
BG Well	MW420			
	MW84A	8.58E+00	1.65E+01	**evidence of contamination**
	MW87A	8.58E+00	6.80E+00	not contaminated
	MW90A	8.58E+00	9.20E+00	**evidence of contamination**

pCi/L = picocuries per liter
BG = background

CONCLUSION: If $(R_i)_{avg} - (R_b)_{avg} > C_i$, then there is evidence that the compliance well is contaminated.

If $(R_i)_{avg} - (R_b)_{avg} < C_i$ for wells, there is no evidence of a statistically significant difference between concentrations in downgradient compliance test wells and background wells.

Since $(R_i)_{avg} - (R_b)_{avg} > C_i$ for MW84A and MW90A, there is a statistically significant difference between background wells and downgradient compliance test wells in MW84A and MW90A from the C-404 Landfill.

Since $(R_i)_{avg} - (R_b)_{avg} < C_i$ for MW87A, there is no statistically significant difference between background wells and downgradient compliance test well MW87A.

Because nonparametric ANOVA indicated a statistically significant difference between compliance test wells and background wells at the C-404 Landfill in compliance well MW84A and MW90A, the 95% UTL was performed.

Section 5.2.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

95% Upper Tolerance Limit (UTL)

Compare the most recent downgradient sample results to a calculated 95% UTL using the five most recent sets of data for each upgradient well, as described below. If downgradient concentration is less than the UTL for the paired upgradient concentrations, then there is no confirmed exceedance.

January 2025 Data, First Reporting Period
Technetium-99 Observations (pCi/L)

Well No.						
MW93A	**9.15E+00**	**9.35E+00**	**8.30E+00**	**9.95E+00**	**1.17E+01**	**Upgradient Well[!]**
MW420	**8.85E+00**	**9.75E+00**	**8.15E+00**	**9.80E+00**	**1.10E+01**	**Upgradient Well[!]**
						Current Data
MW84A						**1.04E+02**
MW90A						**5.58E+01**
	X: Mean Value =		9.60E+00			
	S: Standard Deviation =		1.11E+00			
	K* factor =		2.911	(for n = 10)		
	CV = S/X		1.15E-01	<1, assume normal distribution		
	Upper Tolerance Interval: TL = X +(KxS) =			**1.28E+01**	(pCi/L)	

! = Data from previous 5 sampling events.
Nondetect values are 1/2 DL.
CV = coefficient of variation
* = Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Result: **MW84A and MW90A exceeded the UTL, which is statistically significant evidence that these compliance wells have elevated concentration with respect to background data.**

Conclusion: **Because the 95% UTL indicated a statistically significant difference between compliance test wells and background wells at the C-404 Landfill in compliance wells MW84A and MW90A, the paired (parametric) ANOVA was performed for each downgradient well.**

Paired (Parametric) ANOVA - MW93A and MW84A

Evaluate results using paired ANOVA of wells in the same direction relative to the landfill [e.g., compare upgradient westernmost well results to downgradient westernmost well results]. If ANOVA does not identify a statistically significant difference between upgradient and downgradient wells, then the results are consistent with the historical ASD.

Technetium-99 (pCi/L)				
Date	Background	Compliance		
	MW93A	MW84A	n_i^2	
Jan-23	9.15E+00	**2.02E+02**	8.37E+01	4.08E+04
Jul-23	9.35E+00	**6.42E+01**	8.74E+01	4.12E+03
Jan-24	8.30E+00	**8.60E+01**	6.89E+01	7.40E+03
Jul-24	9.95E+00	**9.35E+01**	9.90E+01	8.74E+03
Jan-25	1.17E+01	**1.04E+02**	1.37E+02	1.08E+04
Sum (x_i)	4.85E+01	5.50E+02	5.98E+02	Total Sum (x..)
n_i	5	5		
$(x_i)_{avg}$	9.69E+00	1.10E+02		
$(x_i)^2$	2.35E+03	3.02E+05		

pCi/L = picocuries per liter
Nondetect values are 1/2 DL.
Bolded values indicate a detected result.

Overall mean x.. =	5.98E+01	
N =	10	N = the total number of samples
p =	2	p = the number of n_i groups
$x_{..}$ =	5.98E+02	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test

Table of Residuals ($x_i - x_{iavg}$)

Date	Background	Compliance
	MW93A	MW84A
Jan-23	-5.40E-01	9.21E+01
Jul-23	-3.40E-01	-4.57E+01
Jan-24	-1.39E+00	-2.39E+01
Jul-24	2.60E-01	-1.64E+01
Jan-25	2.01E+00	-5.94E+00

X: Mean Value =	-7.11E-15	
S: Standard Deviation =	3.57E+01	
K* Factor =	2.911	(for n = 10)
CV = S/X =	–5.02E+15	<1, data are normally distributed

Data are normally distributed (i.e., < 1)

*Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

If the coefficient of variation is < 1, the data are normally distributed.
If the coefficient of variation is > or = 1, data are not normally distributed.

Determine Equality of Variance of Dataset

p = number of wells	$x_{..} =$ 5.98E+02
n_i = number of data points per well	$(x_{avg})_{..} =$ 5.98E+01
N = total sample size	$n_{i} =$ 5
S^2 = the square of the standard deviation	p = 2
$\ln(S_i^2)$ = natural logarithm of each variance	N = 10
f = total sample size minus the number of wells (groups)	f_i = 4
$f_i = n_i - 1$	

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$†	n_i	$f_iS_i^2$	$f_i\ln(S_i^2)$†
1.27E+00	1.61E+00	4.77E-01	5	6.45E+00	1.91E+00
5.35E+01	2.86E+03	7.96E+00	5	1.14E+04	3.18E+01

$\sum(S_i^2) =$ 2.86E+03 $\sum f_i\ln(S_i^2) =$ 3.37E+01

Equality of Variance: Bartlett's Test

f =	8	
Sp^2 =	1.43E+03	
ln Sp^2 =	7.27E+00	
χ^2 =	2.44E+01	(If calculated $\chi^2 \leq$ tabulated χ^2_{crit}, then variances are equal at the given significance level).
χ^2_{crit} * =	3.84E+00	at a 5% significance level witl 1 degrees of freedom (p-1)

NOTE: The variances are NOT equal. (i.e., calculated $\chi^2 > \chi^2_{crit}$)

Variances are not equal, transform the original data to lognormal (i.e., since calculated $\chi^2 > \chi^2_{crit}$).

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Paired (Parametric) ANOVA—Lognormal Data

ln[Technetium-99 (pCi/L)]				
Date	Background	Compliance		
	MW93A	MW84A	n_i^2	
Jan-23	2.21E+00	**5.31E+00**	4.90E+00	2.82E+01
Jul-23	2.24E+00	**4.16E+00**	5.00E+00	1.73E+01
Jan-24	2.12E+00	**4.45E+00**	4.48E+00	1.98E+01
Jul-24	2.30E+00	**4.54E+00**	5.28E+00	2.06E+01
Jan-25	2.46E+00	**4.64E+00**	6.05E+00	2.16E+01
Sum (x_i)	1.13E+01	2.31E+01	3.44E+01	Total Sum (x..)
n_i	5	5		
$(x_i)_{avg}$	2.26E+00	4.62E+00		
$(x_i)^2$	1.28E+02	5.34E+02		

pCi/L = picocuries per liter **Bolded values indicate a detected result.**

Overall mean x.. =	3.44E+00	
N =	10	N = the total number of samples
p =	2	p = the number of n_i groups
$x_{..}$ =	3.44E+01	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test—Lognormal Data

Table of Residuals (x_i-$x_i$avg) for Lognormal Data

Date	Background	Compliance
	MW93A	MW84A
Jan-23	-5.08E-02	6.87E-01
Jul-23	-2.91E-02	-4.59E-01
Jan-24	-1.48E-01	-1.67E-01
Jul-24	3.31E-02	-8.34E-02
Jan-25	1.95E-01	2.30E-02

X: Mean Value =	-1.33E-16	
S: Standard Deviation =	2.95E-01	
K* Factor =	2.911	(for n = 10)
CV = S/X =	–2.21E+15	<1, data are normally distributed

Data are normally distributed (i.e., < 1)

*Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

If the coefficient of variation is < 1, the residuals are normally distributed.
If the coefficient of variation is > or = 1, the residuals are not normally distributed.

Determine Equality of Variance—Lognormal Data

p = number of wells	$x_{..} =$ 3.44E+01
n_i = number of data points per well	$(x_{avg})_{..} =$ 3.44E+00
N = total sample size	$n_i =$ 5
S^2 = the square of the standard deviation	p = 2
$\ln(S_i^2)$ = natural logarithm of each variance	N = 10
f = total sample size minus the number of wells (groups)	$f_i =$ 4
$f_i = n_i - 1$	

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	n_i	$f_i S_i^2$	$f_i \ln(S_i^2)$
1.27E-01	1.61E-02	-4.13E+00	5	6.46E-02	-1.65E+01
4.24E-01	1.80E-01	-1.72E+00	5	7.18E-01	-6.87E+00

$\sum(S_i^2) =$ 1.96E-01 $\sum f_i \ln(S_i^2) =$ -2.34E+01

Equality of Variance: Bartlett's Test

f =	8	
$Sp^2 =$	9.78E-02	
$\ln Sp^2 =$	-2.32E+00	
$\chi^2 =$	4.78E+00	(If calculated $\chi^2 \leq$ tabulated χ^2_{crit}, then variances are equal at the given significance level).
χ^2_{crit} * =	3.84E+00	at a 5% significance level with 1 degrees of freedom (p-1)

NOTE: The variances are NOT equal. (i.e., calculated $\chi^2 \leq \chi^2_{crit}$)

Since the variances are not equal, paired (nonparametric) ANOVA is performed.

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

**Section 5.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

Paired (Parametric) ANOVA - MW93A and MW90A

Evaluate results using paired ANOVA of wells in the same direction relative to the landfill [e.g., compare upgradient westernmost well results to downgradient westernmost well results]. If ANOVA does not identify a statistically significant difference between upgradient and downgradient wells, then the results are consistent with the historical ASD.

Technetium-99 (pCi/L)				
Date	Background	Compliance		
	MW93A	MW90A	n_i^2	
Jan-23	9.15E+00	1.19E+01	8.37E+01	1.40E+02
Jul-23	9.35E+00	**2.47E+01**	8.74E+01	6.10E+02
Jan-24	8.30E+00	**4.35E+01**	6.89E+01	1.89E+03
Jul-24	9.95E+00	**4.53E+01**	9.90E+01	2.05E+03
Jan-25	1.17E+01	**5.58E+01**	1.37E+02	3.11E+03
Sum (x_i)	4.85E+01	1.81E+02	2.30E+02	Total Sum (x..)
n_i	5	5		
$(x_i)_{avg}$	9.69E+00	3.62E+01		
$(x_i)^2$	2.35E+03	3.28E+04		

pCi/L = picocuries per liter
Nondetect values are 1/2 DL.
Bolded values indicate a detected result.

Overall mean x.. =	2.30E+01	
N =	10	N = the total number of samples
p =	2	p = the number of n_i groups
$x_{..}$ =	2.30E+02	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test

Table of Residuals ($x_i - x_{iavg}$)

Date	Background	Compliance
	MW93A	MW90A
Jan-23	-5.40E-01	-2.44E+01
Jul-23	-3.40E-01	-1.15E+01
Jan-24	-1.39E+00	7.27E+00
Jul-24	2.60E-01	9.07E+00
Jan-25	2.01E+00	1.96E+01

X: Mean Value =	0.00E+00	
S: Standard Deviation =	1.18E+01	
K* Factor =	2.911	(for n = 10)
CV = S/X =	#ΔIç/0!	#DIV/0!

The Coefficient of Variability Test was not performed due to mean = 0 (i.e., division by 0 is not possible).

*Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

If the coefficient of variation is < 1, the data are normally distributed.
If the coefficient of variation is > or = 1, data are not normally distributed.

Determine Equality of Variance of Dataset

p = number of wells	$x_{..} =$ 2.30E+02
n_i = number of data points per well	$(x_{avg})_{..} =$ 2.30E+01
N = total sample size	$n_{i} =$ 5
S^2 = the square of the standard deviation	p = 2
$\ln(S_i^2)$ = natural logarithm of each variance	N = 10
f = total sample size minus the number of wells (groups)	f_i = 4
$f_i = n_i - 1$	

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$†	n_i	$f_iS_i^2$	$f_i\ln(S_i^2)$†
1.27E+00	1.61E+00	4.77E-01	5	6.45E+00	1.91E+00
1.76E+01	3.11E+02	5.74E+00	5	1.25E+03	2.30E+01

$\sum(S_i^2) =$ 3.13E+02 $\sum f_i\ln(S_i^2) =$ 2.49E+01

Equality of Variance: Bartlett's Test

f =	8	
Sp^2 =	1.56E+02	
ln Sp^2 =	5.05E+00	
χ^2 =	1.56E+01	(If calculated $\chi^2 \leq$ tabulated χ^2_{crit}, then variances are equal at the given significance level).
χ^2_{crit} * =	3.84E+00	at a 5% significance level witl 1 degrees of freedom (p-1)

NOTE: The variances are NOT equal. (i.e., calculated $\chi^2 > \chi^2_{crit}$)

Variances are not equal, transform the original data to lognormal (i.e., since calculated $\chi^2 > \chi^2_{crit}$).

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Paired (Parametric) ANOVA—Lognormal Data

ln[Technetium-99 (pCi/L)]				
Date	Background	Compliance		
	MW93A	MW90A	n_i^2	
Jan-23	2.21E+00	2.47E+00	4.90E+00	6.11E+00
Jul-23	2.24E+00	**3.21E+00**	5.00E+00	1.03E+01
Jan-24	2.12E+00	**3.77E+00**	4.48E+00	1.42E+01
Jul-24	2.30E+00	**3.81E+00**	5.28E+00	1.45E+01
Jan-25	2.46E+00	**4.02E+00**	6.05E+00	1.62E+01
Sum (x_i)	1.13E+01	1.73E+01	2.86E+01	Total Sum (x..)
n_i	5	5		
$(x_i)_{avg}$	2.26E+00	3.46E+00		
$(x_i)^2$	1.28E+02	2.99E+02		

pCi/L = picocuries per liter **Bolded values indicate a detected result.**

Overall mean x.. =	2.86E+00	
N =	10	N = the total number of samples
p =	2	p = the number of n_i groups
$x_{..}$ =	2.86E+01	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test—Lognormal Data

Table of Residuals (x_i-$x_i$avg) for Lognormal Data

Date	Background	Compliance
	MW93A	MW90A
Jan-23	-5.08E-02	-9.85E-01
Jul-23	-2.91E-02	-2.51E-01
Jan-24	-1.48E-01	3.15E-01
Jul-24	3.31E-02	3.56E-01
Jan-25	1.95E-01	5.64E-01

X: Mean Value =	3.11E-16	
S: Standard Deviation =	4.27E-01	
K* Factor =	2.911	(for n = 10)
CV = S/X =	1.37E+15	≥1, data are NOT normally distributed

Data are not normally distributed (i.e., < 1)

*Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

If the coefficient of variation is < 1, the residuals are normally distributed.
If the coefficient of variation is > or = 1, the residuals are not normally distributed.

Determine Equality of Variance—Lognormal Data

p = number of wells	$x_{..} =$ 2.86E+01
n_i = number of data points per well	$(x_{avg})_{..} =$ 2.86E+00
N = total sample size	$n_i =$ 5
S^2 = the square of the standard deviation	p = 2
$\ln(S_i^2)$ = natural logarithm of each variance	N = 10
f = total sample size minus the number of wells (groups)	f_i = 4
$f_i = n_i - 1$	

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	n_i	$f_i S_i^2$	$f_i \ln(S_i^2)$
1.27E-01	1.61E-02	-4.13E+00	5	6.46E-02	-1.65E+01
6.28E-01	3.94E-01	-9.30E-01	5	1.58E+00	-3.72E+00

$\sum(S_i^2) =$ 4.11E-01 $\sum f_i \ln(S_i^2) =$ -2.02E+01

Equality of Variance: Bartlett's Test

f =	8	
$Sp^2 =$	2.05E-01	
ln $Sp^2 =$	-1.58E+00	
$\chi^2 =$	7.56E+00	(If calculated $\chi^2 \leq$ tabulated χ^2_{crit}, then variances are equal at the given significance level).
χ^2_{crit} * =	3.84E+00	at a 5% significance level with 1 degrees of freedom (p-1)

NOTE: The variances are NOT equal. (i.e., calculated $\chi^2 \leq \chi^2_{crit}$)

Since the variances are not equal, paired (nonparametric) ANOVA is performed.

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

**Section 5.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

Paired Nonparametric ANOVA - MW93A vs MW84A

Technetium-99 (pCi/L)		
Date	Background	Compliance
	MW93A	MW84A
Jan-23	9.15E+00	**2.02E+02**
Jul-23	9.35E+00	**6.42E+01**
Jan-24	8.30E+00	**8.60E+01**
Jul-24	9.95E+00	**9.35E+01**
Jan-25	1.17E+01	**1.04E+02**
Sum	4.85E+01	5.50E+02
n_i	5	5
$(x_i)_{avg}$	9.69E+00	1.10E+02

pCi/L = picocuries per liter
DL = detection limit
All data sets represent 1/2 DL values for nondetects.
Bolded values indicate a detected result.

Overall mean x.. = 5.98E+01
N = 10
p = 2
x.. = 5.98E+02

Ranking of Observations

Sequence	Technetium-99	Adjusted	Tie Number
1	0	3	
2	0	3	
3	0	3	Tie 1
4	0	3	
5	0	3	
6	**6.42E+01**	6	
7	**8.60E+01**	7	
8	**9.35E+01**	8	
9	**1.04E+02**	9	
10	**2.02E+02**	10	

pCi/L = picocuries per liter
Bolded values indicate a detected result.

n_{tie}	Adjustment for Ties: $(n_{tie}^3 - n_{tie})$	
5	Tie 1 =	120
	$\sum T_i$ =	120

Note: for this method, observations below the detection that are considered non-detects (i.e., U qualified data) are reported as a concentration 0.

Sums of Ranks and Averages

Observation Ranks for Tc-99		
Date	Background	Compliance
	MW93A	MW84A
Jan-23	3	10
Jul-23	3	6
Jan-24	3	7
Jul-24	3	8
Jan-25	3	9
R_i	15	40
$(R_i)_{avg}$	3.0	8
R_i^2/n_i	45.0	320.0

$\Sigma R_i^2/n_i$ = 365
K = 2
N = 10

K = the number of n_i groups
N = the total number of samples

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Calculation of Kruskal-Wallis Statistic

H =	6.82E+00	Kruskal-Wallis Statistic	$H = [12/N(N+1)*\Sigma R_i^2/n_i] - 3(N+1)$
H' =	7.76E+00	Corrected Kruskal-Wallis	$H' = H/[1-(\sum T_i/N^3-N)]$
χ^2_{crit} * =	3.84E+00	1	degrees of freedom at the 5% significance level

NOTE: $H' > \chi^2_{crit}$

If $H' \leq \chi^2_{crit}$, the data from each well comes from the same continuous distribution and hence have the same median concentrations of a specific constituent.

If $H' > \chi^2_{crit}$, reject the null hypothesis and calculate the critical difference for well comparisons to the background.

K-1 =	1	α/(K-1) =	5.00E-02	Z(α/(K-1))** =	1.64E+00
α =	0.05	1-(α/K-1) =	9.50E-01		

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).
**Table 4, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Calculate Critical Values

Average Background Ranking = 3.0

	Well No.	C_i	$(R_i)_{avg} - (R_b)_{avg}$	Conclusion
BG Well	MW93A			
	MW84A	3.15E+00	5.00E+00	**evidence of contamination**

CONCLUSION: If $(R_i)_{avg} - (R_b)_{avg} > C_i$, then there is evidence that the compliance well is contaminated.

If $(R_i)_{avg} - (R_b)_{avg} < C_i$ for wells, there is no evidence of a statistically significant difference between concentrations in downgradient compliance test wells and background wells.

Since (Ri)avg - (Rb)avg > Ci for MW84A, there is a statistically significant difference in this downgradient compliance test well.

Because the nonparametric ANOVA for the two wells indicated a statistically significant difference between compliance test wells and background wells at the C-404 Landfill in compliance well MW84A, a Mann-Kendall statistical analysis was performed.

Section 5.2.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Paired Nonparametric ANOVA - MW93A vs. MW90A

Technetium-99 (pCi/L)		
Date	Background	Compliance
	MW93A	MW90A
Jan-23	9.15E+00	1.19E+01
Jul-23	9.35E+00	**2.47E+01**
Jan-24	8.30E+00	**4.35E+01**
Jul-24	9.95E+00	**4.53E+01**
Jan-25	1.17E+01	**5.58E+01**
Sum	4.85E+01	1.81E+02
n_i	5	5
$(x_i)_{avg}$	9.69E+00	3.62E+01

pCi/L = picocuries per liter
DL = detection limit
All data sets represent 1/2 DL values for nondetects.
Bolded values indicate a detected result.

Overall mean x.. = 2.30E+01
N = 10
p = 2
x.. = 2.30E+02

Ranking of Observations

Sequence	Technetium-99	Adjusted	Tie Number
1	0	3.5	Tie 1
2	0	3.5	
3	0	3.5	
4	0	3.5	
5	0	3.5	
6	0	3.5	
7	**2.47E+01**	7	
8	**4.35E+01**	8	
9	**4.53E+01**	9	
10	**5.58E+01**	10	

pCi/L = picocuries per liter
Bolded values indicate a detected result.

n_{tie}	Adjustment for Ties: $(n_{tie}^3 - n_{tie})$	
6	Tie 1 =	210
	$\sum T_i$ =	210

Note: for this method, observations below the detection that are considered non-detects (i.e., U qualified data) are reported as a concentration 0.

Sums of Ranks and Averages

Observation Ranks for Tc-99		
Date	Background	Compliance
	MW93A	MW84A
Jan-23	3.5	3.5
Jul-23	3.5	7
Jan-24	3.5	8
Jul-24	3.5	9
Jan-25	3.5	10
R_i	17.5	37.5
$(R_i)_{avg}$	3.5	7.5
R_i^2/n_i	61.3	281.3

$\Sigma R_i^2/n_i$ = 342.5
K = 2
N = 10

K = the number of n_i groups
N = the total number of samples

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Calculation of Kruskal-Wallis Statistic

H =	4.36E+00	Kruskal-Wallis Statistic	$H = [12/N(N+1)*\Sigma R_i^2/n_i] - 3(N+1)$
H' =	5.54E+00	Corrected Kruskal-Wallis	$H' = H/[1-(\sum T_i/N^3-N)]$
χ^2_{crit} * =	3.84E+00	1	degrees of freedom at the 5% significance level

NOTE: $H' > \chi^2_{crit}$

If $H' \leq \chi^2_{crit}$, the data from each well comes from the same continuous distribution and hence have the same median concentrations of a specific constituent.
If $H' > \chi^2_{crit}$, reject the null hypothesis and calculate the critical difference for well comparisons to the background.

K-1 =	1	α/(K-1) =	5.00E-02	Z(α/(K-1))** =	1.64E+00
α =	0.05	1-(α/K-1) =	9.50E-01		

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).
**Table 4, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Calculate Critical Values

Average Background Ranking = 3.5

	Well No.	C_i	$(R_i)_{avg} - (R_b)_{avg}$	Conclusion
BG Well	MW93A			
	MW90A	3.15E+00	4.00E+00	**evidence of contamination**

CONCLUSION: If $(R_i)_{avg} - (R_b)_{avg} > C_i$, then there is evidence that the compliance well is contaminated.

If $(R_i)_{avg} - (R_b)_{avg} < C_i$ for wells, there is no evidence of a statistically significant difference between concentrations in downgradient compliance test wells and background wells.

Since (Ri)avg - (Rb)avg > Ci for MW90A, there is a statistically significant difference in this downgradient compliance test well.

Because the nonparametric ANOVA for the two wells indicated a statistically significant difference between compliance test wells and background wells at the C-404 Landfill in compliance well MW90A, a Mann-Kendall statistical analysis was performed.

Section 5.2.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Test Analysis

Input Data

Date Collected	Result (pCi/L)
May-22	**4.79E+01**
Jul-22	**4.72E+01**
Nov-22	**6.40E+01**
Jan-23	**2.02E+02**
Jul-23	**6.42E+01**
Jan-24	**8.60E+01**
Jul-24	**9.35E+01**
Jan-25	**1.04E+02**

Bolded values indicate a detected result.

User Selected Options	
Date/Time of Computation	ProUCL 5.2 3/19/2025 10:50:14 AM
From File	WorkSheet_a.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

MW84A_Tc-99_2025-1

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	47.2
Maximum	202
Mean	88.6
Geometric Mean	79.33
Median	75.1
Standard Deviation	50.28
Coefficient of Variation	0.568

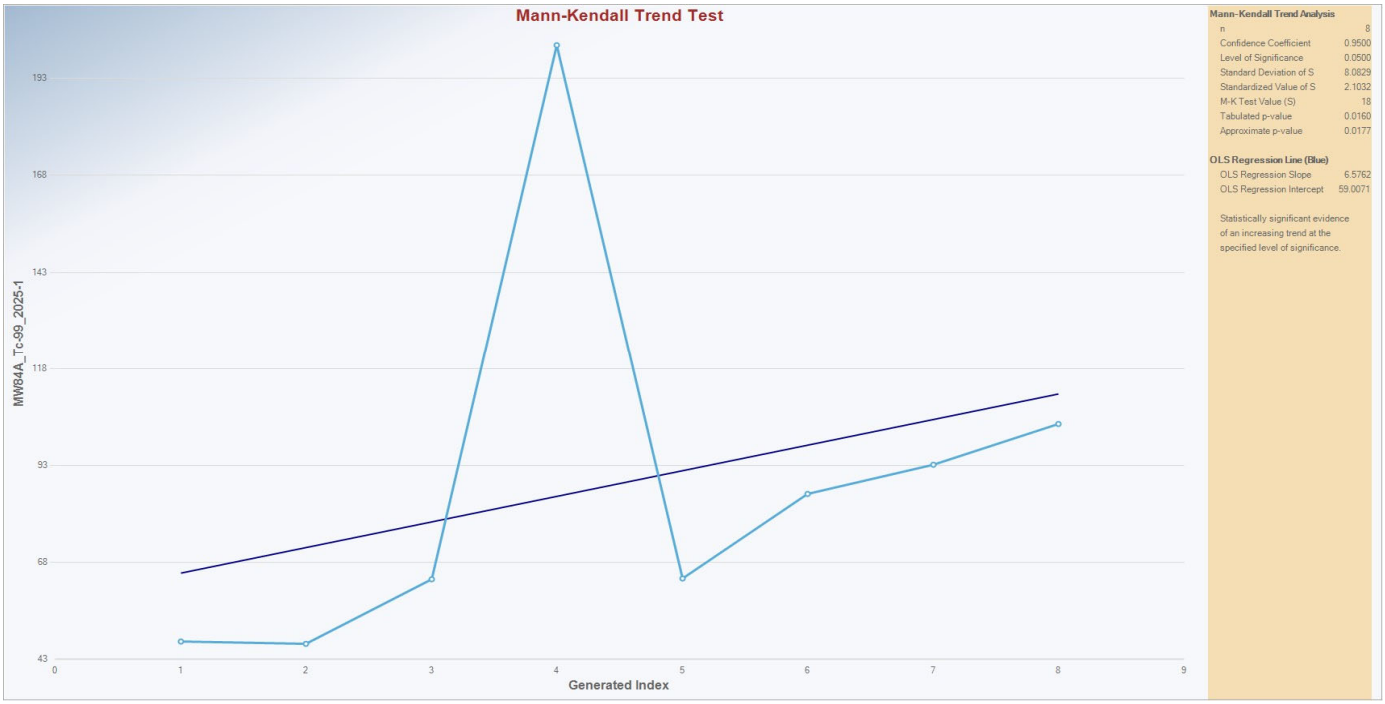
Mann-Kendall Test

M-K Test Value (S)	18
Tabulated p-value	0.016
Standard Deviation of S	8.083
Standardized Value of S	2.103
Approximate p-value	0.0177

Statistically significant evidence of an increasing trend at the specified level of significance.

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Analysis for Technetium-99 in MW84A



Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Test Analysis

Input Data

Date Collected	Result (pCi/L)
May-22	**3.44E+01**
Aug-22	**2.57E+01**
Nov-22	**2.23E+01**
Jan-23	2.16E+01
Jul-23	**2.47E+01**
Jan-24	**4.35E+01**
Jul-24	**4.53E+01**
Jan-25	**5.58E+01**

Bolded values indicate a detected result.

User Selected Options	
Date/Time of Computation	ProUCL 5.2 3/19/2025 10:56:54 AM
From File	WorkSheet_b.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

MW90A_Tc-99_2025-1

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	21.6
Maximum	55.8
Mean	34.16
Geometric Mean	32.2
Median	30.05
Standard Deviation	12.76
Coefficient of Variation	0.373

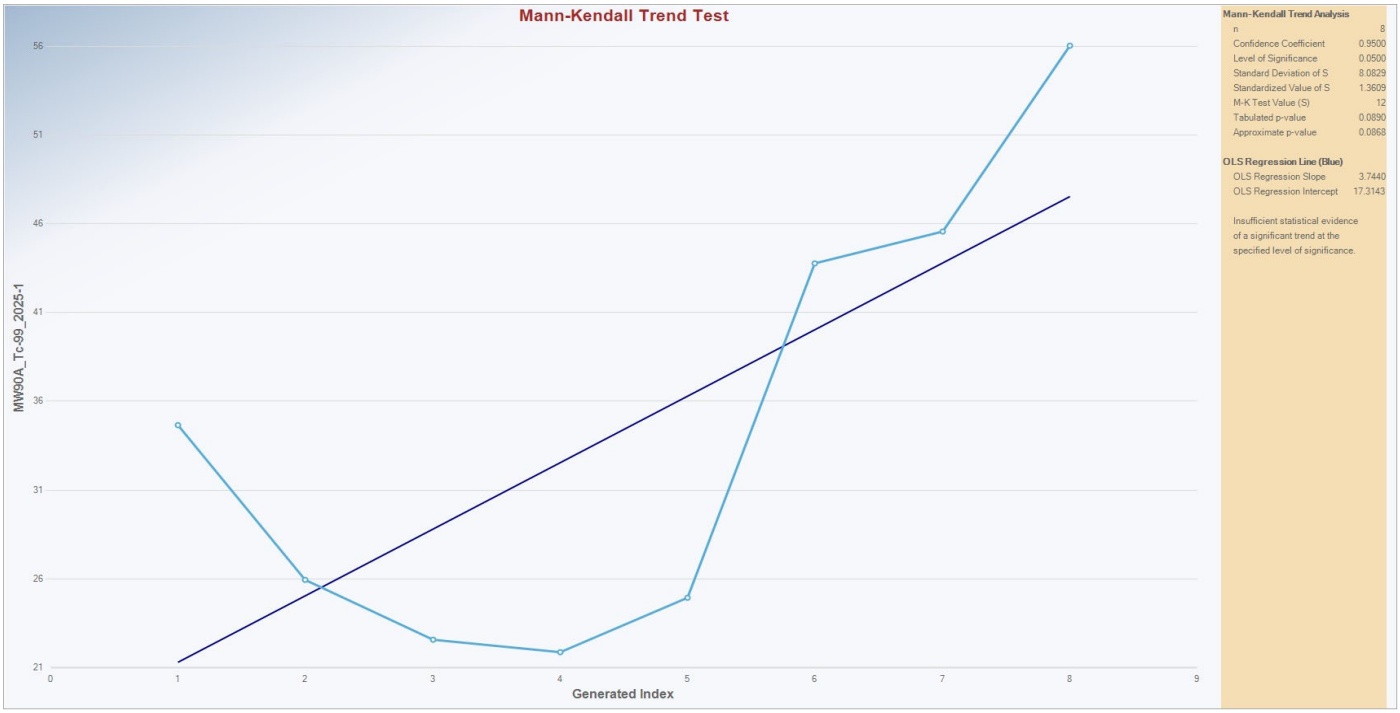
Mann-Kendall Test

M-K Test Value (S)	12
Tabulated p-value	0.089
Standard Deviation of S	8.083
Standardized Value of S	1.361
Approximate p-value	0.0868

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

Attachment B3: Technetium-99 URGA, Statistical Test 3, Nonparametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Analysis for Technetium-99 in MW90A



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ATTACHMENT B4

TRICHLOROETHENE
STATISTICAL TEST 4

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Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Trichloroethene (TCE, µg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.96E+03**	**2.11E+03**	**7.00E+03**	**2.14E+03**	**2.96E+02**
Jul-23	**1.88E+03**	**2.09E+03**	**5.87E+03**	**2.16E+03**	**2.67E+02**
Jan-24	**1.32E+03**	**2.60E+03**	**6.09E+03**	**1.69E+03**	**3.13E+02**
Jul-24	**5.54E+02**	**1.79E+03**	**5.11E+03**	**1.00E+03**	**1.77E+02**
Jan-25	**6.58E+02**	**2.67E+03**	**5.34E+03**	**1.72E+02**	**1.21E+02**
n_i	10		5	5	5
Sum	1.76E+04		2.94E+04	7.16E+03	1.17E+03
(x_i)avg	1.76E+03		5.88E+03	1.43E+03	2.35E+02

µg/L = micrograms per liter
Bolded values indicate a detected result.

Overall mean x.. =	2.22E+03	
N =	25	N = the total number of samples
p =	4	p = the number of n_i groups
x.. =	5.54E+04	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test

Table of Residuals

Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	1.97E+02	3.47E+02	1.12E+03	7.08E+02	6.12E+01
Jul-23	1.17E+02	3.27E+02	-1.20E+01	7.28E+02	3.22E+01
Jan-24	-4.43E+02	8.37E+02	2.08E+02	2.58E+02	7.82E+01
Jul-24	-1.21E+03	2.68E+01	-7.72E+02	-4.32E+02	-5.78E+01
Jan-25	-1.11E+03	9.07E+02	-5.42E+02	-1.26E+03	-1.14E+02

X: Mean Value =	-1.14E-14	
S: Standard Deviation =	6.38E+02	
K* Factor =	2.292	(for n = 25)
CV = S/X =	-5.61E+16	

Conclusion: Since the coefficient of variability is less than 1, the data are normally distributed.

*K factor [from Table 5, Appendix B of *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

If the coefficient of variation is < 1, the data are normally distributed.
If the coefficient of variation is > or = 1, data are not normally distributed.

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Determine Equality of Variance of Dataset

p = number of well groups
n_i = number of data points per well
N = total sample size
S^2 = the square of the standard deviation
$\ln(S_i^2)$ = natural logarithm of each variance
f = total sample size minus the number of wells (groups)
$f_i = n_i - 1$
x.. = the sum of the total number of samples
$(x_{avg})_{..}$ = the mean of the total number of samples

$x_{..}$ = 5.54E+04
$(x_{avg})_{..}$ = 2.22E+03
p = 4
N = 25

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	n_i	$f_i S_i^2$	$f_i \ln(S_i^2)$
7.21E+02	5.20E+05	1.32E+01	10	4.68E+06	1.18E+02
7.39E+02	5.46E+05	1.32E+01	5	2.18E+06	5.28E+01
8.47E+02	7.18E+05	1.35E+01	5	2.87E+06	5.39E+01
8.24E+01	6.80E+03	8.82E+00	5	2.72E+04	3.53E+01

$\sum(S_i^2)$ = 1.79E+06 $\sum f_i \ln(S_i^2)$ = 2.61E+02

Equality of Variance: Bartlett's Test

f = 21
Sp^2 = 4.65E+05
ln Sp^2 = 1.30E+01
c^2 = 1.35E+01 (If $c^2 \leq c^2_{crit}$, then variances are equal at the given significance level).
c^2_{crit} * = 7.81E+00 at a 5% significance level with 3 degrees of freedom

NOTE: The variances are NOT equal. **(i.e., $c^2 > c^2_{crit}$)**

Variances are not equal, transform the original data to lognormal (i.e., since $c^2 > c^2_{crit}$).

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Lognormal Data for TCE

ln[TCE (µg/L)]					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	7.58E+00	7.65E+00	8.85E+00	7.67E+00	5.69E+00
Jul-23	7.54E+00	7.64E+00	8.68E+00	7.68E+00	5.59E+00
Jan-24	7.19E+00	7.86E+00	8.71E+00	7.43E+00	5.75E+00
Jul-24	6.32E+00	7.49E+00	8.54E+00	6.91E+00	5.18E+00
Jan-25	6.49E+00	7.89E+00	8.58E+00	5.15E+00	4.80E+00
Mean x_i	7.02E+00	7.71E+00	8.67E+00	6.97E+00	5.40E+00
Background Mean	7.37E+00		NA	NA	NA
Grand Mean	7.15E+00				
x_i^2	5.75E+01	5.86E+01	7.84E+01	5.88E+01	3.24E+01
	5.68E+01	5.84E+01	7.53E+01	5.89E+01	3.12E+01
These values needed for ANOVA	5.16E+01	6.18E+01	7.59E+01	5.52E+01	3.30E+01
	3.99E+01	5.61E+01	7.29E+01	4.77E+01	2.68E+01
	4.21E+01	6.22E+01	7.37E+01	2.65E+01	2.30E+01
Sum x_i^2	1.31E+03				

µg/L = micrograms per liter

Determine Normality of Dataset

Coefficient of Variability Test

Table of ln[TCE (µg/L)] Data

Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	7.58E+00	7.65E+00	8.85E+00	7.67E+00	5.69E+00
Jul-23	7.54E+00	7.64E+00	8.68E+00	7.68E+00	5.59E+00
Jan-24	7.19E+00	7.86E+00	8.71E+00	7.43E+00	5.75E+00
Jul-24	6.32E+00	7.49E+00	8.54E+00	6.91E+00	5.18E+00
Jan-25	6.49E+00	7.89E+00	8.58E+00	5.15E+00	4.80E+00

X: Mean Value = 7.15E+00
S: Standard Deviation = 1.22E+00
K* Factor = 2.292 (for n = 25)
CV = S/X = 1.70E-01 <1, data are normally distributed

Data are normally distributed (i.e.,<1)

*K factor [from Table 5, Appendix B of *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Determine Equality of Variance of Dataset for Lognormal Data

p = number of wells (background wells considered as one group)
n_i = number of data points per well
N = total sample size
S^2 = the square of the standard deviation
$\ln(S_i^2)$ = natural logarithm of each variance
f = total sample size minus the number of wells (groups)
$f_i = n_i - 1$
x.. = the sum of the total lognormal dataset
$(x_{avg})_{..} =$ the mean of the lognormal dataset

$x_{..} =$ 1.79E+02
$(x_{avg})_{..} =$ 7.15E+00
$n_i =$ 5
p = 4
N = 25

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$	ni	$f_iS_i^2$	$f_i\ln(S_i^2)$
5.45E-01	2.97E-01	-1.21E+00	10	2.68E+00	-1.09E+01
1.23E-01	1.51E-02	-4.19E+00	5	6.04E-02	-1.68E+01
1.06E+00	1.13E+00	1.24E-01	5	4.53E+00	4.96E-01
4.04E-01	1.64E-01	-1.81E+00	5	6.54E-01	-7.24E+00

$\sum(S_i^2) =$ 1.61E+00 $\sum f_i\ln(S_i^2) =$ -3.44E+01

Equality of Variance: Bartlett's Test

f = 21
$Sp^2 =$ 3.77E-01
$\ln Sp^2 =$ -9.75E-01
$c^2 =$ 1.40E+01 (If $c^2 \leq c^2_{crit}$, then variances are equal at the given significance level).
c^2_{crit} * = 7.81E+00 at a 5% significance level with 3 degrees of freedom

NOTE: The variances are NOT equal. (i.e., $c^2 > c^2_{crit}$)

Because variances are not equal, Nonparametric ANOVA will be performed.

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

**Section 5.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989)].

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Nonparametric ANOVA

Trichloroethene (µg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.96E+03**	**2.11E+03**	**7.00E+03**	**2.14E+03**	**2.96E+02**
Jul-23	**1.88E+03**	**2.09E+03**	**5.87E+03**	**2.16E+03**	**2.67E+02**
Jan-24	**1.32E+03**	**2.60E+03**	**6.09E+03**	**1.69E+03**	**3.13E+02**
Jul-24	**5.54E+02**	**1.79E+03**	**5.11E+03**	**1.00E+03**	**1.77E+02**
Jan-25	**6.58E+02**	**2.67E+03**	**5.34E+03**	**1.72E+02**	**1.21E+02**
Sum	1.76E+04		2.94E+04	7.16E+03	1.17E+03
n_i	10		5	5	5
$(x_i)_{avg}$	1.76E+03		5.88E+03	1.43E+03	2.35E+02

µ/L = micrograms per liter
DL = detection limit
All data sets represent 1/2 DL values for nondetects.
Bolded values indicate a detected result.

Overall mean x.. = 2.22E+03

N =	25	N = the total number of samples
p =	4	p = the number of n_i groups
x.. =	5.54E+04	x.. = the sum of the total number of samples

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Nonparametric ANOVA

Ranking of Observations

Sequence	Trichloroethene (µg/L)	Adjusted Rank	Tie Number
1	**121**	1	
2	**172**	2	
3	**177**	3	
4	**267**	4	
5	**296**	5	
6	**313**	6	
7	**554**	7	
8	**658**	8	
9	**1000**	9	
10	**1320**	10	
11	**1690**	11	
12	**1790**	12	
13	**1880**	13	
14	**1960**	14	
15	**2090**	15	
16	**2110**	16	
17	**2140**	17	
18	**2160**	18	
19	**2600**	19	
20	**2670**	20	
21	**5110**	21	
22	**5340**	22	
23	**5870**	23	
24	**6090**	24	
25	**7000**	25	

µ/L = micrograms per liter
DL = detection limit
Bolded values indicate a detected result.
NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

n_{tie}
0 Tie = 0

$\sum T_i$ = 0

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Sums of Ranks and Averages

Trichloroethene (µg/L)					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	**1.96E+03**	**2.11E+03**	**7.00E+03**	**2.14E+03**	**2.96E+02**
Jul-23	**1.88E+03**	**2.09E+03**	**5.87E+03**	**2.16E+03**	**2.67E+02**
Jan-24	**1.32E+03**	**2.60E+03**	**6.09E+03**	**1.69E+03**	**3.13E+02**
Jul-24	**5.54E+02**	**1.79E+03**	**5.11E+03**	**1.00E+03**	**1.77E+02**
Jan-25	**6.58E+02**	**2.67E+03**	**5.34E+03**	**1.72E+02**	**1.21E+02**

Observation Ranks for Trichloroethene					
Date	Background	Background	Compliance	Compliance	Compliance
	MW93A	MW420	MW84A	MW87A	MW90A
Jan-23	14	16	25	17	5
Jul-23	13	15	23	18	4
Jan-24	10	19	24	11	6
Jul-24	7	12	21	9	3
Jan-25	8	20	22	2	1
R_i	134		115	57	19
$(R_i)_{avg}$	13.4		23.0	11.4	3.8
R_i^2/n_i	1795.6		2645.0	649.8	72.2

$\Sigma R_i^2/n_i$ = 5.16E+03

µ/L = micrograms per liter
DL = detection limit
K = the number of n_i groups
N = the total number of samples

Bolded values indicate a detected result.

K = 4
N = 25

NOTE: For this method, observations below the detection limit that are considered nondetects (i.e., U qualified data) are reported as a concentration of 0.

Calculation of Kruskal-Wallis Statistic

H =	1.73E+01	Kruskal-Wallis Statistic	$H = [12/N(N+1)*\Sigma R_i^2/n_i] - 3(N+1)$
H' =	1.73E+01	Corrected Kruskal-Wallis	$H' = H/[1-(\sum T_i/N^3-N)]$
χ^2_{crit}* =	7.81E+00	3	degrees of freedom at the 5% significance level

NOTE: $H' > \chi^2_{crit}$

If $H' \leq \chi^2_{crit}$, the data from each well come from the same continuous distribution and hence have the same median concentrations of a specific constituent.

If $H' > \chi^2_{crit}$, reject the null hypothesis and calculate the critical difference for well comparisons to the background.

K-1 =	3	α/(K-1) =	1.67E-02	Z(α/(K-1))** =	2.13E+00
α =	0.05	1-(α/K-1) =	9.83E-01		

NOTE: *Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).
**Table 4, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Calculate Critical Values

Average Background Ranking = 13.4

	Well No.	C_i	$(R_i)_{avg} - (R_b)_{avg}$	Conclusion
BG Well	MW93A			
BG Well	MW420			
	MW84A	8.58E+00	9.60E+00	evidence of contamination
	MW87A	8.58E+00	-2.00E+00	not contaminated
	MW90A	8.58E+00	-9.60E+00	not contaminated

CONCLUSION: If $(R_i)_{avg} - (R_b)_{avg} > C_i$, then there is evidence that the compliance well is contaminated.

If $(R_i)_{avg} - (R_b)_{avg} < C_i$ for wells, there is no evidence of a statistically significant difference between concentrations in downgradient compliance test wells and background wells.

Since $(R_i)_{avg} - (R_b)_{avg} > C_i$ for MW84A, there is a statistically significant difference between background wells and downgradient compliance test well MW84A.

Since $(R_i)_{avg} - (R_b)_{avg} < C_i$ for MW87A and MW90A, there is no statistically significant difference between background wells and these downgradient compliance test wells; however, the negative value indicates that background wells have elevated concentrations.

Because nonparametric ANOVA indicated a statistically significant difference between compliance test well MW84A and background wells at the C-404 Landfill in compliance well MW84A, the 95% UTL was performed.

Section 5.2.2, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

95% Upper Tolerance Limit (UTL)

Compare the most recent downgradient sample results to a calculated 95% UTL using the five most recent sets of data for each upgradient well, as described below. If downgradient concentration is less than the UTL for the paired upgradient concentrations, then there is no confirmed exceedance.

January 2025 Data, First Reporting Period
TCE Observations (µg/L)

Well No.						
MW93A	**1.96E+03**	**1.88E+03**	**1.32E+03**	**5.54E+02**	**6.58E+02**	**Upgradient Well!**
MW420	**2.11E+03**	**2.09E+03**	**2.60E+03**	**1.79E+03**	**2.67E+03**	**Upgradient Well!**
						Current Data
MW84A						**5.34E+03**
	X: Mean Value =		1.76E+03			
	S: Standard Deviation =		7.21E+02			
	K* factor =		2.911	(for n = 10)		
	CV = S/X		4.09E-01	<1, assume normal distribution		
	Upper Tolerance Interval: TL = X +(KxS) =		**3.86E+03**	(µg/L)		

! = Data from previous 5 sampling events.
CV = coefficient of variation
* = Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Result: **MW84A exceeded the 95% UTL, which is statistically significant evidence that this compliance well has elevated TCE concentrations with respect to background data.**

Conclusion: **Because the 95% UTL indicated a statistically significant difference between compliance test wells and background wells at the C-404 Landfill in compliance well MW84A, the paired ANOVA was performed.**

Paired (Parametric) ANOVA - MW93A and MW84A

Evaluate results using paired ANOVA of wells in the same direction relative to the landfill [e.g., compare upgradient westernmost well results to downgradient westernmost well results]. If ANOVA does not identify a statistically significant difference between upgradient and downgradient wells, then the results are consistent with the historical ASD.

TCE (µg/L)				
Date	Background	Compliance		
	MW93A	MW84A	n_i^2	
Jan-23	**1.96E+03**	**7.00E+03**	3.84E+06	4.90E+07
Jul-23	**1.88E+03**	**5.87E+03**	3.53E+06	3.45E+07
Jan-24	**1.32E+03**	**6.09E+03**	1.74E+06	3.71E+07
Jul-24	**5.54E+02**	**5.11E+03**	3.07E+05	2.61E+07
Jan-25	**6.58E+02**	**5.34E+03**	4.33E+05	2.85E+07
Sum (x_i)	6.37E+03	2.94E+04	3.58E+04	Total Sum (x..)
n_i	5	5		
$(x_i)_{avg}$	1.27E+03	5.88E+03		
$(x_i)^2$	4.06E+07	8.65E+08		

µg/L = micrograms per liter
Bolded values indicate a detected result.

Overall mean x.. =	3.58E+03	
N =	10	N = the total number of samples
p =	2	p = the number of n_i groups
$x_{..}$ =	3.58E+04	x.. = the sum of the total number of samples

Determine Normality of Dataset

Coefficient of Variability Test

Table of Residuals (x_i-x_{iavg})

Date	Background	Compliance
	MW93A	MW84A
Jan-23	6.86E+02	1.12E+03
Jul-23	6.06E+02	-1.20E+01
Jan-24	4.56E+01	2.08E+02
Jul-24	-7.20E+02	-7.72E+02
Jan-25	-6.16E+02	-5.42E+02

X: Mean Value =	0.00E+00	
S: Standard Deviation =	6.60E+02	
K* Factor =	2.911	(for n = 10)
CV = S/X =	#DIV/0!	#DIV/0!

The Coefficient of Variability Test was not performed due to mean = 0 (i.e., division by 0 is not possible).

*Table 5, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

If the coefficient of variation is < 1, the data are normally distributed.
If the coefficient of variation is > or = 1, data are not normally distributed.

Determine Equality of Variance of Dataset

p = number of wells	$x_{..} =$ 3.58E+04
n_i = number of data points per well	$(x_{avg})_{..} =$ 3.58E+03
N = total sample size	$n_{i} =$ 5
S^2 = the square of the standard deviation	p = 2
$\ln(S_i^2)$ = natural logarithm of each variance	N = 10
f = total sample size minus the number of wells (groups)	f_i = 4
$f_i = n_i - 1$	

Calculations for Equality of Variance: Bartlett's Test

S_i	S_i^2	$\ln(S_i^2)$†	n_i	$f_iS_i^2$	$f_i\ln(S_i^2)$†
6.59E+02	4.34E+05	1.30E+01	5	1.74E+06	5.19E+01
7.39E+02	5.46E+05	1.32E+01	5	2.18E+06	5.28E+01

$\sum(S_i^2) =$ 9.80E+05 $\sum f_i\ln(S_i^2) =$ 1.05E+02

Equality of Variance: Bartlett's Test

f =	8	
Sp^2 =	4.90E+05	
ln Sp^2 =	1.31E+01	
c^2 =	5.19E-02	(If calculated $c^2 \leq$ tabulated c^2_{crit}, then variances are equal at the given significance level).
c^2_{crit} * =	3.84E+00	at a 5% significance level with 1 degrees of freedom (p-1)

NOTE: The variances are equal. (i.e., calculated $c^2 \leq c^2_{crit}$)

Since calculated $c^2 \leq c^2_{crit}$, then the analysis can proceed as normal.

*Table 1, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989).

Between Well Sum of Squares

Source of Variation	Sums of Squares		Degrees of Freedom	Mean Squares	Calculated F	F Statistic**
Between Wells	SS_{wells} =	5.31E+07	1	5.31E+07	1.08E+02	5.32E+00
Error	SS_{Error} =	3.92E+06	8	4.90E+05		
Total	SS_{Total} =	5.70E+07	9			

If calculated F > F statistic, then reject the hypothesis of equal well means. If calculated F is less than or equal to F statistic, it can be concluded that there is no significant difference between concentrations; therefore, there is no evidence of well contamination.

CONCLUSION: **Calculated F > F statistic; therefore, ANOVA has identified a significant difference between upgradient and downgradient wells.**

Mann-Kendall trend analysis was performed.

**Table 2, Appendix B, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Guidance* (EPA 1989). F statistic taken at the 5% significance level.

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.2 3/19/2025 2:21:31 PM
From File	WorkSheet_c.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

MW84A_TCE_2025-1

Input Data	
Date Collected	**Result (µg/L)**
Jul-21	**5.29E+03**
Jan-22	**6.56E+03**
Jul-22	**6.57E+03**
Jan-23	**7.00E+03**
Jul-23	**5.87E+03**
Jan-24	**6.09E+03**
Jul-24	**5.11E+03**
Jan-25	**5.34E+03**

Bolded values indicate a detected result.

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	8
Number Values Reported (n)	8
Minimum	5110
Maximum	7000
Mean	5979
Geometric Mean	5943
Median	5980
Standard Deviation	696.1
Coefficient of Variation	0.116

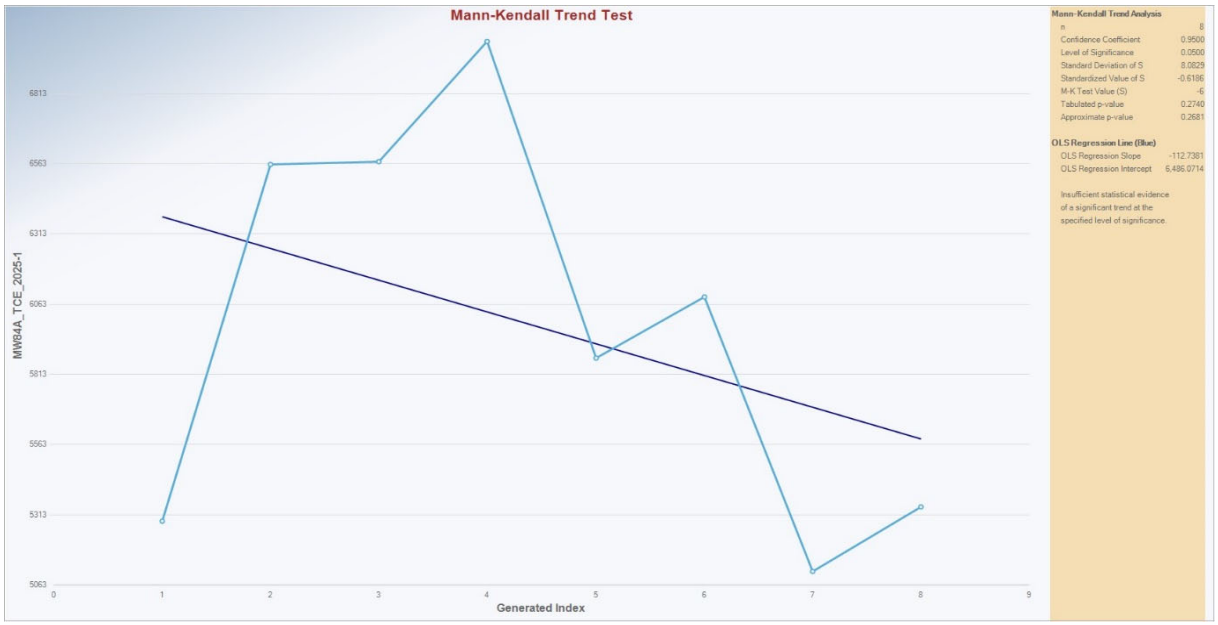
Mann-Kendall Test

M-K Test Value (S)	-6
Tabulated p-value	0.274
Standard Deviation of S	8.083
Standardized Value of S	-0.619
Approximate p-value	0.268

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

Attachment B4: Trichloroethene URGA, Statistical Test 4, Parametric ANOVA, First Reporting Period 2025

Mann-Kendall Trend Test Analysis



ATTACHMENT B5

STATISTICIAN STATEMENT

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FOUR RIVERS
NUCLEAR PARTNERSHIP, LLC

Four Rivers Nuclear Partnership, LLC
5511 Hobbs Road
Kevil, KY 42053
www.fourriversnuclearpartnership.com

April 1, 2025

Mr. Dennis Greene
Four Rivers Nuclear Partnership, LLC
5511 Hobbs Road
Kevil, KY 42053

Dear Mr. Greene:

I am submitting this statement as a supplementary document to the completed statistical analysis I performed on the groundwater data for the C-404 Hazardous Waste Landfill at the Paducah Site.

As an Environmental Scientist, with a bachelor's degree in Earth Sciences/Geology, I have over 30 years of experience in reviewing and assessing laboratory analytical results associated with environmental sampling and investigation activities.

For this project, the statistical analyses on groundwater data from January 2023 through January 2025 were performed in accordance with the *Hazardous Waste Management Facility Permit*, Appendix E using Microsoft Excel 2016 and the U.S. Environmental Protection Agency's (EPA's) ProUCL Version 5.2 software. The spreadsheets include the results for the following statistical tests:

- Test of Proportions
- Parametric Analysis of Variance (ANOVA)
- Nonparametric ANOVA
- 95% Upper Tolerance Limit
- Paired (parametric) ANOVA
- Paired (nonparametric) ANOVA
- Mann-Kendall

The statistical analyses procedures were based on EPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance* (1989).

Sincerely,

Bryan Smith

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APPENDIX C

C-404 LEACHATE SUMP SAMPLING ANALYSIS RESULTS

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Paducah OREIS Report for 404L25-01

Sample ID: **404L25-01-01** Station: C404L Date Collected: 2/5/2025 MedType: WW SmpMethod: GR

Comments: Depth to water 4.71' from ground surface. MH 2-5-25

Analysis	Results	Units	Result Qual	Foot Note	Reporting Limit	Counting Error	TPU**	Method	LabCode	V/V/A*
ANION										
Fluoride	9.02	mg/L			4			SW846-9056A	GEL	I / X /
FS										
Conductivity	548	µmhos/cm						FS	FS	/ /
Dissolved Oxygen	9.95	mg/L						FS	FS	/ /
Eh (approx)	413	mV						FS	FS	/ /
pH	7.97	Std Unit						FS	FS	/ /
Temperature	58.4	deg F						FS	FS	/ /
METAL										
Arsenic	0.00207	mg/L		J	0.005			SW846-6020B	GEL	/ X /
Barium	0.111	mg/L			0.004			SW846-6020B	GEL	/ X /
Cadmium	0.001	mg/L		U	0.001			SW846-6020B	GEL	/ X /
Chromium	0.00647	mg/L		J	0.01			SW846-6020B	GEL	S / X /
Copper	0.0429	mg/L			0.002			SW846-6020B	GEL	/ X /
Iron	2.05	mg/L			0.1			SW846-6020B	GEL	/ X /
Lead	0.00253	mg/L			0.002			SW846-6020B	GEL	/ X /
Mercury	0.0002	mg/L		U	0.0002			SW846-7470A	GEL	/ X /
Nickel	0.0197	mg/L			0.002			SW846-6020B	GEL	/ X /
Selenium	0.005	mg/L		U	0.005			SW846-6020B	GEL	/ X /
Silver	0.000302	mg/L		J	0.001			SW846-6020B	GEL	S / X /
Uranium	102	mg/L			0.02			SW846-6020B	GEL	I / X /
Zinc	0.0218	mg/L			0.02			SW846-6020B	GEL	/ X /
PPCB										
PCB-1016	0.102	ug/L		U	0.102			SW846-8082A	GEL	/ X /
PCB-1221	0.102	ug/L		U	0.102			SW846-8082A	GEL	/ X /
PCB-1232	0.102	ug/L		U	0.102			SW846-8082A	GEL	/ X /
PCB-1242	0.102	ug/L		U	0.102			SW846-8082A	GEL	/ X /
PCB-1248	1.1	ug/L			0.102			SW846-8082A	GEL	/ X /
PCB-1254	0.599	ug/L			0.102			SW846-8082A	GEL	/ X / FDUP-OUT
PCB-1260	0.324	ug/L			0.102			SW846-8082A	GEL	/ X / FDUP-OUT
Polychlorinated biphenyl	2.02	ug/L			0.102			SW846-8082A	GEL	I / X / FDUP-OUT
RADS										
Cesium-137	1.95	pCi/L		U	10.7	5.77	5.84	EPA-901.1	GEL	/ X /
Neptunium-237	4.1	pCi/L			1.35	1.89	1.95	ASTM-1475-00M	GEL	/ X /
Plutonium-239/240	3.93	pCi/L			0.792	1.62	1.7	HASL 300, Pu-11-RC M	GEL	S / X /
Technetium-99	281	pCi/L			22.5	19.7	37.4	HASL 300, Tc-02-RC M	GEL	/ X /
Thorium-230	5.05	pCi/L			1.95	2.21	2.34	HASL 300, Th-01-RC M	GEL	/ X / FDUP-OUT
Uranium-234	3220	pCi/L			131	388	598	HASL 300, U-02-RC M	GEL	/ X /
Uranium-235	573	pCi/L			151	194	210	HASL 300, U-02-RC M	GEL	/ X /
Uranium-238	33700	pCi/L			142	1240	4890	HASL 300, U-02-RC M	GEL	/ X /
VOA										
Trichloroethene	1	ug/L		U	1			SW846-8260D	GEL	/ X /
WETCHEM										
Ammonia as Nitrogen	0.05	mg/L		UW	0.05			EPA-350.1	GEL	/ X /

*Verification/Validation/Assessment ** TPU reported at 1.96 sigma Report Generated on 3/20/2025

Paducah OREIS Report for 404L25-01

Sample ID: **404L25-01-01D** Station: C404L Date Collected: 2/5/2025 MedType: WW SmpMethod: GR

Comments: Field Duplicate; Depth to water 4.71' from ground surface. MH 2-5-25

Analysis	Results	Units	Result Qual	Foot Note	Reporting Limit	Counting Error	TPU**	Method	LabCode	V/V/A*
ANION										
Fluoride	9.11	mg/L			4			SW846-9056A	GEL	I / X /
METAL										
Arsenic	0.0024	mg/L	J		0.005			SW846-6020B	GEL	/ X /
Barium	0.109	mg/L			0.004			SW846-6020B	GEL	/ X /
Cadmium	0.001	mg/L	U		0.001			SW846-6020B	GEL	/ X /
Chromium	0.00595	mg/L	J		0.01			SW846-6020B	GEL	S / X /
Copper	0.0397	mg/L			0.002			SW846-6020B	GEL	/ X /
Iron	1.9	mg/L			0.1			SW846-6020B	GEL	/ X /
Lead	0.00239	mg/L			0.002			SW846-6020B	GEL	/ X /
Mercury	0.0002	mg/L	U		0.0002			SW846-7470A	GEL	/ X /
Nickel	0.0184	mg/L			0.002			SW846-6020B	GEL	/ X /
Selenium	0.005	mg/L	U		0.005			SW846-6020B	GEL	/ X /
Silver	0.001	mg/L	U		0.001			SW846-6020B	GEL	/ X /
Uranium	96.1	mg/L			0.02			SW846-6020B	GEL	I / X /
Zinc	0.0203	mg/L			0.02			SW846-6020B	GEL	/ X /
PPCB										
PCB-1016	0.0996	ug/L	U		0.0996			SW846-8082A	GEL	/ X /
PCB-1221	0.0996	ug/L	U		0.0996			SW846-8082A	GEL	/ X /
PCB-1232	0.0996	ug/L	U		0.0996			SW846-8082A	GEL	/ X /
PCB-1242	0.0996	ug/L	U		0.0996			SW846-8082A	GEL	/ X /
PCB-1248	1.37	ug/L			0.0996			SW846-8082A	GEL	/ X /
PCB-1254	0.844	ug/L			0.0996			SW846-8082A	GEL	/ X / FDUP-OUT
PCB-1260	0.509	ug/L			0.0996			SW846-8082A	GEL	/ X / FDUP-OUT
Polychlorinated biphenyl	2.72	ug/L			0.0996			SW846-8082A	GEL	I / X / FDUP-OUT
RADS										
Cesium-137	6.2	pCi/L	U		11.1	5.38	6.09	EPA-901.1	GEL	/ X /
Neptunium-237	18.5	pCi/L			1.65	4.16	4.69	ASTM-1475-00M	GEL	S / X /
Plutonium-239/240	11	pCi/L			0.689	2.32	2.64	HASL 300, Pu-11-RC M	GEL	S / X /
Technetium-99	370	pCi/L			23.5	22.1	47.4	HASL 300, Tc-02-RC M	GEL	/ X /
Thorium-230	25.8	pCi/L			1.51	4.28	5.47	HASL 300, Th-01-RC M	GEL	/ X / FDUP-OUT
Uranium-234	3190	pCi/L			84.7	315	491	HASL 300, U-02-RC M	GEL	/ X /
Uranium-235	555	pCi/L			65.7	148	162	HASL 300, U-02-RC M	GEL	/ X /
Uranium-238	35100	pCi/L			53.1	1040	4250	HASL 300, U-02-RC M	GEL	/ X /
VOA										
Trichloroethene	1	ug/L	U		1			SW846-8260D	GEL	/ X /
WETCHEM										
Ammonia as Nitrogen	0.05	mg/L	UW		0.05			EPA-350.1	GEL	/ X /

Paducah OREIS Report for 404L25-01

Sample ID: **FB404L25-01** Station: QC Date Collected: 2/5/2025 MedType: WQ SmpMethod:

Comments:

Analysis	Results	Units	Result Qual	Foot Note	Reporting Limit	Counting Error	TPU**	Method	LabCode	V/V/A*
ANION										
Fluoride	4	mg/L	U		4			SW846-9056A	GEL	/x/
METAL										
Arsenic	0.005	mg/L	U		0.005			SW846-6020B	GEL	/x/
Barium	0.004	mg/L	U		0.004			SW846-6020B	GEL	/x/
Cadmium	0.001	mg/L	U		0.001			SW846-6020B	GEL	/x/
Chromium	0.01	mg/L	U		0.01			SW846-6020B	GEL	/x/
Copper	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Iron	0.1	mg/L	U		0.1			SW846-6020B	GEL	/x/
Lead	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Mercury	0.0002	mg/L	U		0.0002			SW846-7470A	GEL	/x/
Nickel	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Selenium	0.005	mg/L	U		0.005			SW846-6020B	GEL	/x/
Silver	0.001	mg/L	U		0.001			SW846-6020B	GEL	/x/
Uranium	0.000546	mg/L			0.0002			SW846-6020B	GEL	/x/
Zinc	0.02	mg/L	U		0.02			SW846-6020B	GEL	/x/
PPCB										
PCB-1016	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1221	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1232	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1242	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1248	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1254	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
PCB-1260	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
Polychlorinated biphenyl	0.0991	ug/L	U		0.0991			SW846-8082A	GEL	/x/
RADS										
Cesium-137	2.45	pCi/L	U		8.03	3.9	4.06	EPA-901.1	GEL	/x/
Neptunium-237	0.243	pCi/L	U		5.88	2.76	2.77	ASTM-1475-00M	GEL	/x/
Plutonium-239/240	-0.147	pCi/L	U		1.01	0.34	0.341	HASL 300, Pu-11-RC M	GEL	/x/
Technetium-99	4.24	pCi/L	U		21.2	12.4	12.4	HASL 300, Tc-02-RC M	GEL	/x/
Thorium-230	1.14	pCi/L			0.975	0.819	0.834	HASL 300, Th-01-RC M	GEL	/x/
Uranium-234	0.156	pCi/L	U		0.62	0.37	0.371	HASL 300, U-02-RC M	GEL	/x/
Uranium-235	0.0556	pCi/L	U		0.812	0.415	0.415	HASL 300, U-02-RC M	GEL	/x/
Uranium-238	0.446	pCi/L	U		0.657	0.486	0.489	HASL 300, U-02-RC M	GEL	/x/
VOA										
Trichloroethene	1	ug/L	U		1			SW846-8260D	GEL	/x/
WETCHEM										
Ammonia as Nitrogen	0.05	mg/L	UW		0.05			EPA-350.1	GEL	/x/

*Verification/Validation/Assessment ** TPU reported at 1.96 sigma Report Generated on 3/20/2025

Paducah OREIS Report for 404L25-01

Sample ID: **RI404L25-01** Station: QC Date Collected: 2/5/2025 MedType: WQ SmpMethod:

Comments:

Analysis	Results	Units	Result Qual	Foot Note	Reporting Limit	Counting Error	TPU**	Method	LabCode	V/V/A*
ANION										
Fluoride	4	mg/L	U		4			SW846-9056A	GEL	/x/
METAL										
Arsenic	0.005	mg/L	U		0.005			SW846-6020B	GEL	/x/
Barium	0.004	mg/L	U		0.004			SW846-6020B	GEL	/x/
Cadmium	0.001	mg/L	U		0.001			SW846-6020B	GEL	/x/
Chromium	0.01	mg/L	U		0.01			SW846-6020B	GEL	/x/
Copper	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Iron	0.1	mg/L	U		0.1			SW846-6020B	GEL	/x/
Lead	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Mercury	0.0002	mg/L	U		0.0002			SW846-7470A	GEL	/x/
Nickel	0.002	mg/L	U		0.002			SW846-6020B	GEL	/x/
Selenium	0.005	mg/L	U		0.005			SW846-6020B	GEL	/x/
Silver	0.001	mg/L	U		0.001			SW846-6020B	GEL	/x/
Uranium	0.00012	mg/L	J		0.0002			SW846-6020B	GEL	/x/
Zinc	0.02	mg/L	U		0.02			SW846-6020B	GEL	/x/
PPCB										
PCB-1016	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1221	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1232	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1242	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1248	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1254	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
PCB-1260	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
Polychlorinated biphenyl	0.0983	ug/L	U		0.0983			SW846-8082A	GEL	/x/
RADS										
Cesium-137	3.8	pCi/L	U		7.7	4.6	4.61	EPA-901.1	GEL	/x/
Neptunium-237	1.32	pCi/L	U		4.82	3.04	3.04	ASTM-1475-00M	GEL	/x/
Plutonium-239/240	-0.0718	pCi/L	U		0.829	0.318	0.318	HASL 300, Pu-11-RC M	GEL	/x/
Technetium-99	2.15	pCi/L	U		20.5	12	12	HASL 300, Tc-02-RC M	GEL	/x/
Thorium-230	0.725	pCi/L	U		1.36	0.887	0.896	HASL 300, Th-01-RC M	GEL	/x/
Uranium-234	0.22	pCi/L	U		0.48	0.315	0.318	HASL 300, U-02-RC M	GEL	/x/
Uranium-235	0.0381	pCi/L	U		0.557	0.285	0.285	HASL 300, U-02-RC M	GEL	/x/
Uranium-238	0.212	pCi/L	U		0.515	0.325	0.326	HASL 300, U-02-RC M	GEL	/x/
VOA										
Trichloroethene	1	ug/L	U		1			SW846-8260D	GEL	/x/
WETCHEM										
Ammonia as Nitrogen	0.05	mg/L	UW		0.05			EPA-350.1	GEL	/x/

*Verification/Validation/Assessment ** TPU reported at 1.96 sigma Report Generated on 3/20/2025

Paducah OREIS Report for 404L25-01

Sample ID: **TB404L25-01** Station: QC Date Collected: 2/5/2025 MedType: WQ SmpMethod:

Comments:

Analysis	Results	Units	Result Qual	Foot Note	Reporting Limit	Counting Error	TPU**	Method	LabCode	V/V/A*
VOA										
Trichloroethene	1	ug/L	U		1			SW846-8260D	GEL	/X/

*Verification/Validation/Assessment ** TPU reported at 1.96 sigma Report Generated on 3/20/2025

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