

## MEMORANDUM

**DATE** July 15, 2022  
**TO** Tennessee Valley Authority, Chattanooga, Tennessee  
**CC** Paradise Fossil Plant Operating Record  
**FROM** Jeffrey Frazier, WSP Golder

**REFERENCE: UPDATE ON STATISTICALLY SIGNIFICANT LEVELS (SSLs) / (40 CFR § 257.95(g))  
PARADISE FOSSIL PLANT – GYPSUM DISPOSAL AREA CCR UNITS**

In accordance with the federal regulations for management of coal combustion residuals (CCR Rule; 40 CFR Part 257, Subpart D), the Tennessee Valley Authority (TVA) is currently conducting Assessment Monitoring for the Gypsum Disposal Area CCR Units at its Paradise Fossil Plant (PAF) in Drakesboro, Kentucky.

In accordance with 40 CFR § 257.95(d)(2), the owner or operator of a CCR unit shall establish groundwater protection standards (GWPS) for Appendix IV parameters detected during Assessment Monitoring and determine if one or more Appendix IV parameters are detected at statistically significant levels (SSLs) above their GWPS. GWPS for all Appendix IV parameters were originally established per 40 CFR § 257.95(h) and documented in a notice dated October 15, 2018. Table 1 presents the GWPS, along with the updated GWPS, and results of a comparison of the lower confidence band (LCB) concentrations to the GWPS, as explained below.

As part of ongoing Assessment Monitoring, the first semiannual assessment monitoring event for 2022 occurred February 16, 2022, with the additional “resample” event occurring March 29, 2022. This technical memorandum presents GWPS that have been updated with the samples collected as part of the first semiannual assessment monitoring events of 2022. The updated GWPS has been calculated using data collected at background wells (95-48A, PAF-101 and PAF-104) from November 2016 through March 2022. To statistically evaluate the Appendix IV constituents, concentration data are compared to the GWPS through the use of confidence bands. In assessment monitoring, a well is determined to be out of compliance and has an SSL when the lower confidence band (LCB), and thus the entire confidence interval, exceeds the GWPS, as discussed in *Unified Guidance*. If the compliance data at a given well-constituent pair show evidence of a significant trend, a linear regression line will be fit to the data and a confidence band (one-sided) with a 99% confidence level will be constructed around the trend line.

To evaluate compliance with regulatory standards, the lower edge of the confidence band at the most recent sampling event will be compared to the GWPS. If the lower edge exceeds the GWPS at that point in time (thus guaranteeing the entire vertical cross-section of the band also exceeds the GWPS at that point), an SSL will be recorded. If the lower edge of the band does not exceed the GWPS, no SSL has occurred. As new sampling events are collected, the trend estimate will be updated along with the confidence band.

Based on the mid-year statistical analysis performed in 2022, an SSL for arsenic at PAF-116 above the GWPS was identified following the first semi-annual monitoring events in 2022. TVA will continue to conduct groundwater monitoring and reporting pursuant to 40 CFR § 257.95.

**TABLE 1: Statistically Significant Levels Above GWPS at the CCR Units**

Appendix IV Parameter	Original GWPS (Notice Dated 10-15-18)	Updated GWPS <sup>(a)</sup>	Downgradient well(s) with Analytical Results above GWPS <sup>(b)</sup>	Updated LCBs <sup>(c)</sup>	SSL LCB > GWPS <sup>(d)</sup>
Antimony (ug/L)	6	6	None	NA	NA
Arsenic (ug/L)	13.6	10	PAF-116	12.3	Yes
Barium (ug/L)	2,000	2,000	None	NA	NA
Beryllium (ug/L)	50	4	None	NA	NA
Cadmium (ug/L)	5	5	None	NA	NA
Chromium (ug/L)	100	100	None	NA	NA
Cobalt (ug/L)	88.9	99.5	None	NA	NA
Fluoride (ug/L)	4,000	4,000	None	NA	NA
Lead (ug/L)	15	15	None	NA	NA
Lithium (ug/L)	165	182	None	NA	NA
Mercury (ug/L)	2	2	None	NA	NA
Molybdenum (ug/L)	100	100	None	NA	NA
Radium-226+228 (pCi/L)	5	5	None	NA	NA
Selenium (ug/L)	50	50	None	NA	NA
Thallium (ug/L)	2	2	None	NA	NA

## Notes:

- (a) GWPS updated as of 6/15/2022 with two additional samples results collected on 2/16/2022 through 3/29/2022 [reported in ug/L or pCi/L]
- (b) Downgradient well(s) with analytical result above GWPS (per 40 CFR § 257.95(b) and (d))
- (c) Most recent value of 99% lower confidence band (LCB) of the mean of Appendix IV groundwater sampling events between November 2016 and March 2022. Data is presented for wells with analytical result above GWPS. The upper confidence band (UCB) is not shown, as it is greater than LCB.
- (d) SSL: "statistically significant level" over GWPS occurs when the updated LCB value at the evaluated sampling event exceeds the updated GWPS