Tennessee Valley Authority (TVA)

Colbert Fossil Plant (COF) – Ash Disposal Area 4 CCR Unit

40 CFR § 257.95(g) End of Year Statistics Memo

REVISION LOG

Revision	Description	Date
0	Issued for Operating Record posting	January 6, 2023
1	End of Year Statistics Memo revised to separate statistical analysis of groundwater monitoring data in the alluvium and residuum from statistical analysis of groundwater monitoring data in the bedrock.	January 13, 2023

Memo

To:	Tennessee Valley Authority Chattanooga, TN	From:	Matthew Dagon Indianapolis, IN
File:	Updated GWPS and SSLs Colbert Fossil Plant Ash Disposal Area 4 CCR Unit – Revision 1	Date:	January 13, 2023

Reference: **End of Year Update on Statistically Significant Levels (SSLs) (40 CFR § 257.95(g)) - CCR Rule Groundwater Monitoring - Colbert Fossil Plant Ash Disposal Area 4 CCR Unit**

In accordance with the federal regulations for management of coal combustion residuals (CCR Rule; 40 Code of Federal Regulations [CFR] Part 257, Subpart D)[1], the Tennessee Valley Authority (TVA) is currently conducting Assessment Monitoring at the Ash Disposal Area 4 CCR Unit at its Colbert Fossil Plant (COF) in Tuscumbia, Alabama. The Ash Disposal Area 4 consists of one CCR surface impoundment subject to the CCR Rule with a single-unit groundwater monitoring system with monitoring wells screened in alluvium, residuum, and bedrock.

In 2022, TVA evaluated potential changes to the certified groundwater monitoring system and added additional monitoring wells in the alluvium, residuum, and bedrock to be consistent with the Alabama Department of Environmental Management (ADEM) CCR Facility Permit 17-11. In compliance with 40 CFR § 257.91, one background well (CA5) was established and seven monitoring wells (COF-102, COF-104, COF-105, COF-108, COF-111, MC4, and MC5A) were established downgradient and upgradient of the CCR Unit in the alluvium and residuum. Monitoring well COF-106 was removed from the certified monitoring system. In addition, two background wells (CA6 and COF-116BR) were established and eight monitoring wells (COF-111BR, COF-112BR, COF-113BR, COF-114BR, CA17B, CA30B, MC1, and MC5C) were established downgradient, upgradient, or cross-gradient of the CCR Unit in the bedrock. The certified monitoring system was updated in December 2022.

As required by the CCR Rule, 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 and documented in a notice dated October 15, 2018 as required by 40 CFR § 257.95(d)(2) and are provided on Table 1.

As part of ongoing Assessment Monitoring, the second semiannual assessment monitoring event for 2022 occurred July 12-13, 2022, with the additional "resample" event occurring August 23-30, 2022. This technical memorandum presents GWPS and lower confidence bands (LCBs) that have been updated with the data collected during the second semiannual assessment monitoring event and resample event for 2022, as well as any identified SSLs after incorporating the additional data collected in 2022[2]. The identification of SSLs was performed as a two-step process:

1. Historical sampling results (December 2016[3] or October 2018[4] through August 2022) for Appendix IV parameters from each downgradient, cross-gradient, or upgradient well were compared directly to the

[1] The ADEM has adopted a state CCR rule. As the state rule has not been approved by United States Environmental Protection Agency to operate in lieu of the federal CCR Rule, TVA must comply with both the state and federal CCR regulations. This notification also complies with ADEM Admin. Code r. 335-13-15-.06 (6)(g).
[2] Previously, TVA has provided notifications of SSLs for the second semiannual assessment monitoring event in the Annual Groundwater Monitoring and Corrective Action Reports.
[3] Applies to monitoring wells: CA5, COF-102, COF-104, COF-105, and COF-106.
[4] Applies to monitoring wells: COF-108, COF-111, MC4, MC5A, CA6, COF-116BR, COF-111BR, COF-112BR, COF-113BR, COF-114BR, CA17B, CA30B, MC1, and MC5C.

updated GWPS. If Appendix IV parameter concentrations were below the GWPS, no SSLs over the GWPS were identified.

2. Where the direct comparison of an Appendix IV parameter indicated a concentration greater than the GWPS, further statistical analysis was performed to identify levels statistically greater than the GWPS using procedures recommended in the United States Environmental Protection Agency's Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 530/R-09-007, March 2009). Further statistical analysis comparisons were made against a fixed GWPS via LCBs. For each situation where an Appendix IV parameter concentration was greater than the GWPS, the 99% LCB of the fitted line in that monitoring well was calculated using CCR Rule monitoring data collected from December 2016 or October 2018 through August 2022. As recommended in the Unified Guidance where the 99% LCB exceeds the GWPS at the last sampling event, an SSL was identified for the Appendix IV parameter /monitoring well pair.

Based on the statistical analysis performed in 2022, there continues to be an SSL above the GWPS for arsenic at monitoring well COF-105 and a new recorded SSL for arsenic at monitoring well COF-108 in the alluvium/residuum as summarized in Table 1. In the bedrock, SSLs above the GWPS were recorded for antimony in monitoring well MC5C, arsenic in monitoring well COF-114BR, lithium in monitoring well MC5C, and molybdenum in monitoring wells COF-111BR and COF-114BR as summarized in Table 2. TVA will continue to conduct groundwater monitoring and reporting pursuant to 40 CFR § 257.95.

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Reference: **End of Year Update on Statistically Significant Levels (SSLs) at the Colbert Fossil Plant - Ash Disposal Area 4 CCR Unit**

TABLE 1: Statistically Significant Levels Above GWPS - COF Ash Disposal Area 4 CCR Unit - Alluvium/Residuum

Appendix IV Parameter	GWPS (a)	Updated GWPS (b)	Downgradient wells with analytical results above GWPS (c)	Updated LCBs (d)	SSL LCB > GWPS (e)
Antimony (μg/L)	6	6	None	NA	NA
Arsenic (μg/L)	10	10	COF-105	33.8	**Yes**
			COF-106(f)	0.0	**No**
			COF-108	10.9	**Yes**
Barium (μg/L)	2,000	2,000	None	NA	NA
Beryllium (μg/L)	4	4	None	NA	NA
Cadmium (μg/L)	5	5	None	NA	NA
Chromium (μg/L)	100	100	None	NA	NA
Cobalt (μg/L)	6	6	COF-102(f)	0.0	**No**
			COF-104	0.221	**No**
			COF-105(f)	0.0	**No**
Fluoride (mg/L)	4	4	None	NA	NA
Lead (μg/L)	15	15	None	NA	NA
Lithium (μg/L)	40	40	None	NA	NA
Mercury (μg/L)	2	2	None	NA	NA
Molybdenum (μg/L)	100	100	None	NA	NA
Radium-226+228 (pCi/L)	5	5	None	NA	NA
Selenium (μg/L)	50	50	None	NA	NA
Thallium (μg/L)	2	2	None	NA	NA

Applies to monitoring wells: CA5, COF-102, COF-104, COF-105, COF-106, COF-108, COF-111, MC4, and MC5A

NA – Not applicable

(a) GWPS documented in notice dated October 15, 2018 [reported in micrograms per liter (μg/L) except fluoride (mg/L) and radium 226+228 (pCi/L)]

(b) GWPS updated as of January 6, 2023, with results from two additional sampling events collected on July 12-13, 2022, and August 23-30, 2022 [reported in μg/L except fluoride (mg/L) and radium 226+228 (pCi/L)]

(c) Downgradient wells with analytical results above updated GWPS December 2016 or October 2018 through August 2022 (per 40 CFR § 257.95(b) and (d))

(d) Most recent value of 99% lower confidence band (LCB) on the mean of Appendix IV groundwater sampling events between December 2016 or October 2018 and August 2022. Upper confidence band (UCB) not shown as it is greater than LCB [reported in μg/L]

(e) SSL: “statistically significant level” over GWPS occurs when the updated LCB value at the last sampling event exceeds the updated GWPS

(f) Negative lower confidence bands were reported as 0.0 μg/L

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Reference: End of Year Update on Statistically Significant Levels (SSLs) at the Colbert Fossil Plant - Ash Disposal Area 4 CCR Unit

TABLE 2: Statistically Significant Levels Above GWPS - COF Ash Disposal Area 4 CCR Unit - Bedrock

Appendix IV Parameter	GWPS (g)	Downgradient, cross-gradient, or upgradient wells with analytical results above GWPS (h)	Updated LCBs (i)	SSL LCB > GWPS (j)
Antimony (µg/L)	6	MC5C	7.42	**Yes**
Arsenic (µg/L)	10	COF-114BR	11.9	**Yes**
Barium (µg/L)	2,000	None	NA	NA
Beryllium (µg/L)	4	None	NA	NA
Cadmium (µg/L)	5	None	NA	NA
Chromium (µg/L)	100	None	NA	NA
Cobalt (µg/L)	6	None	NA	NA
Fluoride (mg/L)	4	None	NA	NA
Lead (µg/L)	15	None	NA	NA
Lithium (µg/L)	69.6	MC5C	214	**Yes**
Mercury (µg/L)	2	None	NA	NA
Molybdenum (µg/L)	100	COF-111BR	171	**Yes**
		COF-114BR	114	**Yes**
Radium-226+228 (pCi/L)	5	None	NA	NA
Selenium (µg/L)	50	None	NA	NA
Thallium (µg/L)	2	None	NA	NA

Applies to monitoring wells: CA6, COF-116BR, COF-111BR, COF-112BR, COF-113BR, COF-114BR, CA17B, CA30B, MC1, and MC5C

NA – Not applicable

(g) GWPS established in Statistical Analysis Report dated January 6, 2023. Results from August 23-30, 2022 sampling event used for comparison to GWPS [reported in µg/L except fluoride (mg/L) and radium 226+228 (pCi/L)]

(h) Downgradient, cross-gradient, or upgradient wells with analytical results above updated GWPS October 2018 through August 2022 (per 40 CFR § 257.95(b) and (d))

(i) Most recent value of 99% lower confidence band (LCB) on the mean of Appendix IV groundwater sampling events between October 2018 and August 2022. Upper confidence band (UCB) not shown as it is greater than LCB [reported in µg/L]

(j) SSL: “statistically significant level” over GWPS occurs when the updated LCB value at the last sampling event exceeds the updated GWPS