



HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

14 January 2019
File No. 130116

TO: AES Ohio Generation, LLC
745 US Route 52
Manchester, Ohio 45144
Attn: Troy Williams

FROM: Haley & Aldrich, Inc.
[Steven F. Putrich, P.E., Project Principal
Mark Miesfeldt, P.G., Lead Hydrogeologist]

SUBJECT: Notification of Statistically Significant Levels of Appendix IV Constituents
Pursuant to 40 CFR § 257.95(g) and 40 CFR § 257.105(h)(8)
J.M. Stuart Station – Landfill 11, Manchester, Ohio

AES Ohio Generation, LLC (AES) is implementing the 17 April 2015 U.S. Environmental Protection Agency (U.S. EPA) Federal Coal Combustion Residuals (CCR) Rule (40 CFR § 257 and 261) for the J.M. Stuart Station, in Adams County near Manchester, Ohio. AES provided Haley & Aldrich, Inc. with assessment monitoring data collected from a groundwater monitoring system constructed at Landfill 11 that meets the requirements of 40 CFR §257.91 and 40 CFR §257.93. This memorandum documents the results of statistical tests conducted to determine if Appendix IV groundwater monitoring constituents detected in samples collected from wells located downgradient of Landfill 11 are present at a statistically significant levels (SSL) above groundwater protection standards (GWPS) consistent with the requirements in 40 CFR § 257.95.

As required by 40 CFR § 257.95(b) and 40 CFR § 257.95(d)(1), two rounds of groundwater sampling and analysis were completed by October 15, 2018. GWPSs, pursuant to 40 CFR § 257.95(d)(2) and in accordance with Phase I, Part 1 CCR Rule Revisions dated 17 July 2018, effective 16 August 2018, were generated for each Appendix IV constituent detected during assessment monitoring. The GWPSs were set at the maximum contaminant level (MCL) or regional screening level (RSL) for those constituents that did not have a promulgated MCL since the background values for the detected Appendix IV constituents did not exceed those values.

For Landfill 11, which was in assessment monitoring in 2018, analytical results from downgradient wells were compared to each respective GWPS. If the detected constituent was greater than the GWPS for that Unit, pursuant to 40 CFR § 257.93 (f)(5), the confidence interval method was used to evaluate if that Appendix IV constituent was present at a statistically significant level (SSL). The statistical

procedures chosen to evaluate the assessment monitoring results differ from the procedures certified to evaluate the detection monitoring results. As a result, and as required by 40 CFR § 257.93 (f)(5), the certification of the statistical method for the Landfill 11 has been updated and is provided with this notification as Attachment A.

Based on the comparisons outlined above, the results of the statistical analyses conducted for those detected Appendix IV constituents indicate that lithium, molybdenum and selenium are present at statistically significant levels above GWPSs in one or more wells downgradient of Landfill 11. A summary of the assessment monitoring sampling results and the statistical analysis is provided with this notification as Attachment B.

Enclosures:

Attachment A – Selection of Statistical Procedures Certification for Landfill 11

Attachment B – Summary of Assessment Monitoring Sampling Results and Statistical Analysis

ATTACHMENT A

Selection of Statistical Procedures Certification for Landfill 11



HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

14 January 2019
File No. 130116

SUBJECT: Selection of Statistical Procedures Certification for the Landfill 11
AES Ohio Generation, LLC (AES)
J.M. Stuart Station, Manchester, Ohio

Pursuant to CFR Title 40 Chapter I Subchapter I Part 257 Subpart D §257.93 (f)(6)¹, I certify that the selected statistical method described herein will be appropriate for evaluating the groundwater monitoring data collected for detection and assessment monitoring for the CCR management area for J.M. Stuart Landfill 11. This certification and the underlying evaluation to select a statistical procedure were conducted under my direction or supervision according to a system designed to assure that qualified personnel selected the statistical procedure pursuant to 40 CFR §257.93. The certification submitted is, to the best of my knowledge, accurate and complete.


It is anticipated that a tolerance interval is a concentration range, with a specified confidence level, designed to contain a pre-specified proportion (e.g., 95 percent) of the underlying population from which the statistical sample is drawn (background). The upper endpoint of a tolerance interval is called the upper tolerance limit or UTL. Depending on the data distribution, parametric or non-parametric tolerance limits procedures are used to evaluate groundwater monitoring data using this method. Parametric tolerance limits utilize normally distributed data or normalized data via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the tolerance limit. If all the background data are non-detect, a reporting limit (RL) may serve as an approximate upper tolerance limit.

Groundwater protection standards (GWPS), generated pursuant to 40 CFR § 257.95(d)(2) and in accordance with Phase I, Part 1 CCR Rule Revisions dated 17 July 2018, effective 16 August 2018, were generated for each Appendix IV constituent detected during assessment monitoring at J.M. Stuart Landfill 11. Analytical results from downgradient wells will be compared to each respective GWPS. If a constituent is greater than the GWPS for that Unit, pursuant to 40 CFR § 257.93 (f)(5), the confidence interval method will be used to evaluate if that Appendix IV constituent is present at a statistically significant level (SSL).

¹ "The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating the selected statistical method is appropriate for evaluating the groundwater for the CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data."

Specifically, the lower confidence limit (LCL) from each downgradient well will be compared to the GWPS. A confidence interval is an estimated concentration range intended to contain true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence or conversely, with a low probability of error. The LCL is the lower end of the confidence interval range. A LCL greater than the GWPS would indicate a SSL for that constituent. By requiring that a LCL be used as the basis of comparison, the statistical test will account for data variability and ensure that the potential statistical exceedance is unlikely to have occurred by chance. A parametric confidence interval on the mean is used if the data is normal with or without transformation. If no transformation is appropriate, the non-parametric confidence interval on the median is used. Pursuant to 40 CFR § 257.93 (g)(2), if an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons will be maintained.

Any change in the statistical methods will be documented in a subsequent certification, if necessary and appropriate.

Signed: 

Certifying Engineer

Print Name: Steven F. Putrich, P.E.
Ohio License No.: 67329
Title: Vice President
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal



ATTACHMENT B
Summary of Assessment Monitoring Sampling Results
And Statistical Analysis

**TABLE 1
SUMMARY OF ANALYTICAL RESULTS
J.M. STUART STATION - LANDFILL 11
AES OHIO GENERATION LLC, MANCHESTER, OHIO**

Chemical Group			Assessment Monitoring - EPA Appendix IV Constituents													Radiological		
Chemical Name			Antimony, Total	Arsenic, Total	Barium, Total	Beryllium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Fluoride	Lead, Total	Lithium, Total	Mercury, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Radium-226 & 228	
Groundwater Protection Standard			0.006	0.01	2	0.004	0.005	0.1	0.006	4	0.015	0.04	0.002	0.1	0.05	0.002	5	
US EPA MCL			0.006	0.01	2	0.004	0.005	0.1		4		0.002		0.05	0.002	5		
US EPA RSL									0.006	0.015	0.04		0.1					
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	
Well Location	Sample Date	Sample Name																
Downgradient	MW11-1	05/22/2018	MW11-1-052218-1100	< 0.002	< 0.005	0.044	< 0.001	< 0.001	< 0.002	< 0.001	0.28	< 0.001	0.019	< 0.0002	0.67	0.029	< 0.001	0.302 UJ ± 0.266
	MW11-1	08/22/2018	MW11-1-082218-0945	-	-	0.046	-	-	< 0.0022	< 0.001	0.34	< 0.001	0.019	-	0.89	0.024	-	0.648 R ± 0.252
	MW11-2	05/22/2018	MW11-2-052218-1250	< 0.002	< 0.005	0.076	< 0.001	< 0.001	0.0028	0.0024	0.2	0.0016	0.013	< 0.0002	< 0.01	< 0.005	< 0.001	0.5 J ± 0.275
	MW11-2	08/21/2018	MW11-2-082118-1720	-	-	0.047	-	-	< 0.0024	< 0.001	0.21	< 0.001	0.01	-	0.046	0.0088	-	0.535 R ± 0.236
	MW11-3	05/18/2018	MW11-3-051818-1025	< 0.002	< 0.005	0.07	< 0.001	< 0.001	< 0.002	< 0.001	0.18	< 0.001	0.024	< 0.0002	< 0.005	0.054	< 0.001	0.527 ± 0.304
	MW11-3	08/21/2018	MW11-3-082118-1520	-	-	0.037	-	-	< 0.0021	< 0.001	0.24	< 0.001	0.012	-	< 0.005	0.025	-	0.436 R ± 0.235
	MW11-4	05/18/2018	MW11-4-051818-1235	< 0.002	< 0.005	0.044	< 0.001	< 0.001	< 0.002	< 0.001	0.22	< 0.001	0.034	< 0.0002	< 0.005	0.094	< 0.001	0.421 U ± 0.331
	MW11-4	08/21/2018	MW11-4-082118-1405	-	-	0.051	-	-	< 0.0027	0.0012	0.25	< 0.001	0.037	-	< 0.005	0.063	-	0.55 R ± 0.227
	MW11-5	05/18/2018	MW11-5-051818-1238	< 0.002	< 0.005	0.069	< 0.001	< 0.001	< 0.002	< 0.001	0.19	< 0.001	0.04	< 0.0002	< 0.005	0.011	< 0.001	1.41 J ± 0.407
	MW11-5	08/21/2018	MW11-5-082118-1215	-	-	0.072	-	-	< 0.0026	< 0.001	0.19	0.001	0.044	-	< 0.005	0.021	-	0.904 R ± 0.267
	MW11-6	05/18/2018	MW11-6-051818-1056	< 0.002	< 0.005	0.044	< 0.001	< 0.001	< 0.002	< 0.001	0.16	< 0.001	0.017	< 0.0002	< 0.005	< 0.005	< 0.001	0.249 U ± 0.312
	MW11-6	08/22/2018	MW11-6-082218-0955	-	-	0.051	-	-	< 0.0035	0.0015	0.18	< 0.001	0.023	-	< 0.005	< 0.005	-	0.455 R ± 0.22
	MW11-7	05/22/2018	MW11-7-052218-1316	< 0.002	< 0.005	0.038	< 0.001	< 0.001	< 0.002	< 0.001	0.2	< 0.001	< 0.008	< 0.0002	< 0.01	< 0.005	< 0.001	0.122 UJ ± 0.221
	MW11-7	08/21/2018	MW11-7-082118-1645	-	-	0.039	-	-	< 0.0032	0.0011	0.21	< 0.001	< 0.008	-	< 0.005	< 0.005	-	0.519 R ± 0.215
Upgradient	MW11-8	05/21/2018	MW11-8-052118-1240	< 0.002	< 0.005	0.051	< 0.001	< 0.001	< 0.002	< 0.001	0.23	< 0.001	< 0.008	< 0.0002	< 0.01	< 0.005	< 0.001	0.315 UJ ± 0.228
	MW11-8	08/21/2018	MW11-8-082118-1520	-	-	0.06	-	-	< 0.0039	< 0.001	0.23	< 0.001	< 0.008	-	< 0.005	< 0.005	-	0.595 R ± 0.227
	MW11-9	05/21/2018	MW11-9-052118-1300	< 0.002	< 0.005	0.068	< 0.001	< 0.001	< 0.002	< 0.001	0.12	< 0.001	< 0.008	< 0.0002	< 0.01	< 0.005	< 0.001	0.525 ± 0.261
	MW11-9	08/21/2018	MW11-9-082118-1345	-	-	0.064	-	-	< 0.0026	< 0.001	0.13	< 0.001	< 0.008	-	< 0.005	< 0.005	-	0.468 R ± 0.244
	MW11-10	05/22/2018	MW11-10-052218-1036	< 0.002	< 0.005	0.06	< 0.001	< 0.001	< 0.002	< 0.001	0.16	< 0.001	< 0.008	< 0.0002	< 0.01	< 0.005	< 0.001	0.268 U ± 0.247
	MW11-10	08/21/2018	MW11-10-082118-1215	-	-	0.071	-	-	< 0.0028	< 0.001	0.17	< 0.001	< 0.008	-	< 0.005	< 0.005	-	0.808 R ± 0.25

NOTES:

Bold indicates concentration detected above laboratory reporting limit
 mg/L: milligram per liter
 MCL: Maximum Contaminant Level
 pCi/L: picoCurie per liter
 RSL: Regional Screening Level
 US EPA: United States Environmental Protection Agency

TABLE 2
SUMMARY OF ASSESSMENT MONITORING STATISTICAL ANALYSIS
J.M. STUART STATION - LANDFILL 11
AES OHIO GENERATION, LLC - MANCHESTER, OHIO

Location Id	Frequency of Detection	Percent Non-Detects	Range of Non-Detect	Mean	50th Percentile (Median)	95th Percentile	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	CCR MCL/RSL	Report Result Unit	Compliance Samples			Outlier Presence	Outlier Removed	Trend	Distribution Group	Distribution Well*	Inter-well Analysis			SSL			
													Detection Exceedances (Y/N)	Number of Detection Exceedances	Number of Non-Detection Exceedances						Lower Confidence Limit	Upper Tolerance Limit	Background Limit (Higher of MCL/RSL or Upper Tolerance Limit)		Exceedance above Background at Individual Well		
MW11-7	8/11	27%	1000-1000	413	210	1000	210	142600	377.6	0.9149	4000	µg/L	N	0	0	NA	NA	Stable		174.444			N	FALSE			
CCR Appendix-IV: Lead, Total (µg/L)																											
MW11-8	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA									
MW11-9	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA	Non-parametric		1.0	15.0					
MW11-10	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA									
MW11-1	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA					N	FALSE			
MW11-2	2/11	82%	1-1	1.19	1	2.05	2.5	0.2209	0.47	0.3947	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
MW11-3	1/11	91%	1-1	1.01	1	1.05	1.1	0.0009091	0.03015	0.02988	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
MW11-4	2/11	82%	1-1	1.07	1	1.4	1.4	0.02618	0.1618	0.1508	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
MW11-5	2/11	82%	1-1	1.03	1	1.15	1.3	0.008182	0.09045	0.08805	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
MW11-6	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
MW11-7	0/11	100%	1-1	1	1	1	0	0	0	0	15	µg/L	N	0	0	NA	NA	NA			1.000			N	FALSE		
CCR Appendix-IV: Lithium, Total (µg/L)																											
MW11-8	0/11	100%	8-8	8	8	8	0	0	0	0	40	µg/L	N	0	0	NA	NA	NA									
MW11-9	0/11	100%	8-8	8	8	8	0	0	0	0	40	µg/L	N	0	0	NA	NA	NA	Non-parametric		8.0	40.0					
MW11-10	0/11	100%	8-8	8	8	8	0	0	0	0	40	µg/L	N	0	0	NA	NA	NA									
MW11-1	11/11	0%	-	20	19	24	25	6.8	2.608	0.1304	40	µg/L	N	0	0	NA	NA	Stable			18.636			N	FALSE		
MW11-2	11/11	0%	-	13.3	13	15.5	16	3.418	1.849	0.1393	40	µg/L	N	0	0	NA	NA	Stable			12.182			N	FALSE		
MW11-3	11/11	0%	-	22.4	21	38	49	99.65	9.983	0.4464	40	µg/L	Y	1	0	NA	NA	Stable			18.455			N	FALSE		
MW11-4	11/11	0%	-	38.5	36	54.5	58	72.47	8.513	0.2209	40	µg/L	Y	2	0	NA	NA	Stable			34.818			N	FALSE		
MW11-5	11/11	0%	-	45	44	55.5	56	40.4	6.356	0.1412	40	µg/L	Y	9	0	NA	NA	Stable			41.545			Y	TRUE		
MW11-6	11/11	0%	-	20.6	21	26	28	12.45	3.529	0.171	40	µg/L	N	0	0	NA	NA	Stable			18.727			N	FALSE		
MW11-7	0/11	100%	8-8	8	8	8	0	0	0	0	40	µg/L	N	0	0	NA	NA	NA			8.000			N	FALSE		
CCR Appendix-IV: Mercury, Total (µg/L)																											
MW11-8	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA										
MW11-9	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA	Non-parametric			0.2	2.0					
MW11-10	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA										
MW11-1	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
MW11-2	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
MW11-3	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
MW11-4	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
MW11-5	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
MW11-6	1/10	90%	0.2-0.2	0.203	0.2	0.2165	0.23	0.00009	0.009487	0.04673	2	µg/L	N	0	0	NA	NA	NA			0.200			N	FALSE		
MW11-7	0/10	100%	0.2-0.2	0.2	0.2	0.2	2.467E-17	4.967E-09	2.484E-08	2	µg/L	N	0	0	NA	NA	NA				0.200			N	FALSE		
CCR Appendix-IV: Molybdenum, Total (µg/L)																											
MW11-8	0/11	100%	5-10	9.55	10	10	2.273	1.508	0.1579	100	µg/L	N	0	0	NA	NA	NA										
MW11-9	0/11	100%	5-10	9.55	10	10	2.273	1.508	0.1579	100	µg/L	N	0	0	NA	NA	NA	Non-parametric			10.0	100.0					
MW11-10	0/11	100%	5-10	9.55	10	10	2.273	1.508	0.1579	100	µg/L	N	0	0	NA	NA	NA										
MW11-1	11/11	0%	-	804	810	910	920	9945	99.73	0.1241	100	µg/L	Y	2	0	NA	NA	Stable			747.257			Y	TRUE		
MW11-2	5/11	55%	10-10	18.9	10	47.5	49	231.3	15.21	0.8043	100	µg/L	N	0	0	NA	NA	NA			12.273			N	FALSE		
MW11-3	0/11	100%	5-10	9.09	10	10	4.091	2.023	0.2225	100	µg/L	N	0	0	NA	NA	NA				7.727			N	FALSE		
MW11-4	0/11	100%	5-10	9.09	10	10	4.091	2.023	0.2225	100	µg/L	N	0	0	NA	NA	NA				7.727			N	FALSE		
MW11-5	0/11	100%	5-10	9.09	10	10	4.091	2.023	0.2225	100	µg/L	N	0	0	NA	NA	NA				7.727			N	FALSE		
MW11-6	0/11	100%	5-10	9.09	10	10	4.091	2.023	0.2225	100	µg/L	N	0	0	NA	NA	NA				7.727			N	FALSE		
MW11-7	0/11	100%	5-10	9.55	10	10	2.273	1.508	0.1579	100	µg/L	N	0	0	NA	NA	NA				7.727			N	FALSE		
CCR Appendix-IV: Radium-226 & 228 (pCi/L)																											
MW11-8	1/8	88%	5-5	4.43	5	5	0.447	2.591	1.61	0.3633	5	pCi/L	N	0	0	NA	NA	NA									
MW11-9	2/10	80%	5-5	4.13	5	5	0.774	3.368	1.835	0.4444	5	pCi/L	N	0	0	NA	NA	NA	Non-parametric			5.0	5.0				
MW11-10	2/9	78%	5-5	4	5	5	0.573	3.95	1.987	0.497	5	pCi/L	N	0	0	NA	NA	NA									
MW11-1	2/8	75%	5-5	3.85	5	5	0.401	4.546	2.132	0.554	5	pCi/L	N	0	0	NA	NA	NA			1.694			N	FALSE		
MW11-2	4/10	60%	5-5	3.22	5	5	0.755	5.261	2.294	0.7114	5	pCi/L	N	0	0	NA	NA	NA			1.728			N	FALSE		
MW11-3	2/8	75%	5-5	3.89	5	5	0.583	4.234	2.058	0.5291	5	pCi/L	N	0	0	NA	NA	NA			1.749			N	FALSE		
MW11-4	1/9	89%	5-5	4.57	5	5	1.16	1.638	1.28	0.2799	5	pCi/L	N	0	0	NA	NA	NA			2.448			N	FALSE		
MW11-5	3/8	62%	5-5	3.41	5	5	1.41	4.915	2.217	0.6503	5	pCi/L	N	0	0	NA	NA	Stable			0.452			N	FALSE		
MW11-6	2/8	75%	5-5	3.87	5	5	0.507	4.348	2.085	0.5383	5	pCi/L	N	0	0	NA	NA	NA			1.709			N	FALSE		
MW11-7	2/9	78%	5-5	4.08	5	5	1.16	3.32	1.822	0.4461	5	pCi/L	N	0	0	NA	NA	NA			1.928			N	FALSE		
CCR Appendix-IV: Selenium, Total (µg/L)																											
MW11-8	0/11	100%	5-5	5	5	5	0	0	0	0	50	µg/L	N	0	0	NA	NA	NA									
MW11-9	0/11	100%	5-5	5	5	5	0	0	0	0	50	µg/L	N	0	0	NA	NA	NA	Non-parametric			5.0	50.0				
MW11-10	0/11	100%	5-5	5	5	5	0	0	0	0	50	µg/L	N	0	0	NA	NA	NA									
MW11-1	11/11	0%	-	30.5	28	45	46	82.27	9.07	0.2978	50	µg/L	N	0	0	NA	NA	Stable			26.000			N	FALSE		
M																											