

Supplement to the Expert Report of John Seymour, P.E.

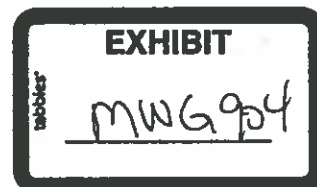
I have prepared this Supplement to the Expert Report on behalf of Midwest Generation, LLC (MWG) to address a mathematical issue in § 5.5.2 of my Expert Report. This supplemental § 5.5.2 replaces the original §5.5.2 in its entirety, including Tables 5-4 and 5-5. This supplemental does not change my opinions presented in my Expert Report in the Matter of:

SIERRA CLUB, ENVIRONMENTAL LAW AND POLICY CENTER, PRAIRIE RIVERS NETWORK,
and CITIZENS AGAINST RUINING THE ENVIRONMENT
Complainants,
v
MIDWEST GENERATION, LLC,
Respondent
PCB 2013-0015

Revised Section 5.5.2: Recent Groundwater Concentrations do Not Match Constituent Indicators for Leachate from Ash Stored in Ponds

I compared the occurrence of constituents during groundwater monitoring events in the most recent year, 2014, to the minimum and maximum sets of constituent indicators of leachate from ash currently stored in ponds. Conceptually, if all the constituents detected in groundwater samples from a monitoring well match the constituents detected in leachate from ash currently stored in ponds, and if constituents *not* detected in groundwater samples match the constituents *not* detected in leachate from ash currently stored in ponds, then it would be probable that leachate from ash currently stored in ponds is impacting groundwater (i.e. as of sample dates). To evaluate whether or not groundwater concentrations match leachate constituent indicators, I calculated the percentage of constituents detected at each groundwater monitoring well that match constituent indicators of leachate from ash currently stored in the ponds ("matching percentages"). I restricted my analysis to the most recent full year of groundwater monitoring, 2014, to account for seasonal variations in constituent concentrations and to reflect groundwater concentrations after MWG's pond relining and pond decommissioning had been completed.

For the maximum set of constituent indicators, indicators included constituents that were detected by EPRI (2006) and were detected in groundwater monitoring wells. The percentage of observed constituents that are not consistent with indicators of leachate from ash that was stored in impoundments based on EPRI 2006 is based on the following formula based on a maximum set of



indicator parameters. A division is performed with a numerator of the number of indicator constituents that are not consistent and with a denominator of the total number of indicators and constituents detected in groundwater monitoring wells. The formula result is expressed as a percentage by multiplying by 100 percent. (See Table 5-4.)

For the minimum set of constituent indicators, detection limits for MWG site specific data meet current IEPA Class I groundwater goals with the exception of arsenic, which met the former Class I groundwater goal that was applicable at the time of analysis. The percentage of observed constituents that are not consistent with indicators of leachate from ash currently stored in impoundments is based on the following corrected formula based on a minimum set of indicator parameters. A division is performed with a numerator of the minimum number of indicator constituents and with a denominator of the total number of constituents observed at that monitoring well. The denominator includes constituents that are both consistent and not consistent with the indicator parameters. The formula result is expressed as a percentage by multiplying by 100 percent. (See Table 5-5.)

In summary, if the constituents match then it is likely that the leachate from the ash is impacting the groundwater. Moreover, if the constituents *do not* match then it is likely that the leachate from ash currently in ponds *is not* impacting the groundwater.

My results are tabulated in Tables 5-4 and 5-5 and are summarized as follows:

- At Joliet #29, the percentage of constituents at groundwater monitoring wells that do not match constituent indicators of leachate from ash currently stored in the ponds ranges from
 - 40 percent to 70 percent based on the minimum set of indicators (MWG specific data), and
 - 44 percent to 63 percent based on the maximum set of indicators (EPRI data).
- At Powerton, the percentage of constituents at groundwater monitoring wells that do not match constituent indicators of leachate from ash currently stored in the ponds ranges from
 - 25 percent to 70 percent based on the minimum set of indicators (MWG specific data), and
 - 38 percent to 69 percent based on the maximum set of indicators (EPRI data).
- At Waukegan, the percentage of constituents at groundwater monitoring wells that do not match constituent indicators of leachate from ash currently stored in the ponds ranges from

- 50 percent to 63 percent based on the minimum set of indicators (MWG specific data), and
- 50 percent to 69 percent based on the maximum set of indicators (EPRI data).
- At Will County, the percentage of constituents at groundwater monitoring wells that do not match constituent indicators of leachate from ash currently stored in the ponds ranges from
 - 57 percent to 70 percent based on the minimum set of indicators (MWG specific data), and
 - 44 percent to 63 percent based on the maximum set of indicators (EPRI data).

The non-matching percentages demonstrate that there are substantial and widespread mismatches between the characteristics of recent groundwater analyzed near the ash ponds and the characteristics of leachate from ash currently stored in the ash basins. Thus, it is my opinion that the recent groundwater impacts are not a result of the ash currently stored in ponds at the sites, but instead are more likely than not a result of historical uses at the sites and the surrounding industrial companies and conditions.¹


¹ IEPA, 2015 and MWG13-15_29775-29776.

Reservation

I am reserving the ability to supplement my opinions in response to any documents or bases for Dr. Kunkel's reports that are presented by the Complainants. In addition, my opinions may be supplemented based on future changes in the construction or operation of the generating stations and in response to any future changes in groundwater conditions observed at the sites.

Signature

This supplement contains 15 pages, including tables.



John Seymour, P.E.

29 February 2016

DATE

Table 5-4
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Actual Leachate Sample Results for Bituminous Ash Stored in Impoundments (EPRI, 2006)

Constituent	Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾										
		Joliet No. 29 Generating Station										
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
Antimony	Yes (Table 5-2)											
Arsenic	Yes (Table 5-2)		x	x	x	x	x	x				x
Barium	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Boron	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Cadmium	Yes (Table 5-2)					x			x			
Chromium	Yes (Table 5-2)											
Cobalt	Yes (Table 5-2)				x	x	x	x	x	x		
Copper	Yes (Table 5-2)					x	x	x	x			
Iron					x				x	x		
Lead	Yes (Table 5-2)								x			
Manganese	Yes (Table 5-2)	x				x		x	x	x		
Mercury	Yes (Table 5-2)											
Nickel	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Selenium	Yes (Table 5-2)		x	x		x	x	x			x	x
Sulfate	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Zinc	Yes (Table 5-2)								x			
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments⁽³⁾		10	10	9	10	7	7	7	7	10	10	9
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments⁽⁴⁾		63%	63%	56%	63%	44%	44%	44%	44%	63%	63%	56%

Table 5-4
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Actual Leachate Sample Results for Bituminous Ash Stored in Impoundments (EPRI, 2006)

Constituent	Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾															
		Powerton Generating Station															
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16
Antimony	Yes (Table 5-2)																
Arsenic	Yes (Table 5-2)																
Barium	Yes (Table 5-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Boron	Yes (Table 5-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium	Yes (Table 5-2)																
Chromium	Yes (Table 5-2)																
Cobalt	Yes (Table 5-2)																
Copper	Yes (Table 5-2)			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Iron																	
Lead	Yes (Table 5-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manganese	Yes (Table 5-2)																
Mercury	Yes (Table 5-2)																
Nickel	Yes (Table 5-2)			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Selenium	Yes (Table 5-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	Yes (Table 5-2)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zinc	Yes (Table 5-2)			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽³⁾		11	11	8	9	9	8	8	11	6	7	10	10	9	9	11	11
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾		69%	69%	50%	56%	56%	50%	69%	38%	44%	63%	63%	56%	56%	69%	69%	

Table 5-4
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Actual Leachate Sample Results for Bituminous Ash Stored in Impoundments (EPRI, 2006)

Constituent	Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾										
		Waukegan Generating Station										
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7				
Antimony	Yes (Table 5-2)											
Arsenic	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Barium	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Boron	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Cadmium	Yes (Table 5-2)											
Chromium	Yes (Table 5-2)											
Cobalt	Yes (Table 5-2)											
Copper	Yes (Table 5-2)	x								x		
Iron			x					x	x			x
Lead	Yes (Table 5-2)											
Manganese	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Mercury	Yes (Table 5-2)											
Nickel	Yes (Table 5-2)								x			
Selenium	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Sulfate	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x
Zinc	Yes (Table 5-2)											
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽³⁾		8	10	8	9	10	9	11				
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾		50%	63%	50%	56%	63%	56%	69%				

Table 5-4
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Actual Leachate Sample Results for Bituminous Ash Stored in Impoundments (EPRI, 2006)

Constituent	Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾																			
		Will County Generating Station																			
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10										
Antimony	Yes (Table 5-2)																				
Arsenic	Yes (Table 5-2)																				
Barium	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Boron	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Cadmium	Yes (Table 5-2)																				
Chromium	Yes (Table 5-2)																				
Cobalt	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Copper	Yes (Table 5-2)																				
Iron	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Lead	Yes (Table 5-2)																				
Manganese	Yes (Table 5-2)																				
Mercury	Yes (Table 5-2)																				
Nickel	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Selenium	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Sulfate	Yes (Table 5-2)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Zinc	Yes (Table 5-2)																				
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽³⁾		9	10	8	7	8	9	9	9	9	9	9	9	8	10						
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾		56%	63%	50%	44%	50%	56%	56%	56%	56%	56%	56%	56%	50%	63%						

Abbreviations:

⁽¹⁾ x = constituent was detected above analytical detection limits during at least one quarterly groundwater monitoring event in 2014

Table 5-4
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Actual Leachate Sample Results for Bituminous Ash Stored in Impoundments (EPR1, 2006)

Notes:

1. Indicators of leachate from ash stored in impoundments are based on leachate sample results for bituminous ash stored in impoundments (Table 5-2) as denoted in this table as "Yes (Table 5-2)". Indicator include constituents that were detected by EPR1 (2006) and were detected in groundwater monitoring wells. (Thallium, which was detected only at Powerton MW-14, was not included as an indicator.)
2. Shading of cells is described below.
 - Green shading indicates that a constituent that is an indicator of leachate from ash stored in the impoundments was not detected during quarterly groundwater monitoring in 2014.
 - Blue shading indicates that a constituent that is not an indicator of leachate from ash stored in the impoundments was detected during at least one quarterly groundwater monitoring event in 2014.
3. No shading indicates that either (1) a constituent that is an indicator of leachate from ash stored in the impoundments was detected during at least one quarterly groundwater monitoring event in 2014, or (2) a constituent that is not an indicator of leachate from ash stored in the impoundments was not detected during quarterly groundwater monitoring in 2014.
4. Green and blue shading (see Note 2) demonstrate observed constituents that are not consistent with indicators of leachate from ash stored in impoundments. The percentage of observed constituents that are not consistent with indicators of leachate from ash stored in impoundments is based on the following formula based on a maximum set of indicator parameters. A division is performed with a numerator of the number of indicator constituents that are not consistent and corrected a denominator of the total number of constituents detected at that groundwater monitoring well. The denominator includes observed constituents that are both consistent and not consistent with the indicator parameters. The formula result is expressed as a percentage by multiplying by 100 percent.

Table 5-5
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Site-Specific NLET Results for Bottom Ash (Midwest Generation Site-Specific Analyses)

Constituent	Constituent is an Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾												
		Joliet No. 29 Generating Station												
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11		
Arsenic		X	X	X	X	X	X	X	X	X	X	X	X	X
Barium	Yes (Table 5-1)	X	X	X	X	X	X	X	X	X	X	X	X	X
Boron	Yes (Table 5-1)	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium														
Cobalt														
Copper														
Iron														
Lead														
Manganese														
Nickel		X	X	X	X	X	X	X	X	X	X	X	X	X
Selenium		X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	Yes (Table 5-1)	X	X	X	X	X	X	X	X	X	X	X	X	X
Zinc														
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽³⁾		2	2	3	4	5	5	5	5	5	7	4	2	3
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾		40%	40%	50%	57%	63%	63%	63%	63%	70%	57%	40%	50%	

Table 5-5
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Site-Specific NLET Results for Bottom Ash (Midwest Generation Site-Specific Analyses)

Constituent	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽¹⁾																
	Powerton Generating Station																
Constituent	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	
Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾																	
Yes (Table 5-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Yes (Table 5-1)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium																	
Cobalt																	
Copper																	
Iron																	
Lead																	
Manganese																	
Nickel																	
Selenium																	
Sulfate																	
Zinc																	
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽²⁾	1	1	4	3	4	5	6	3	6	7	5	4	4	7	5	1	
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾	25%	25%	57%	50%	57%	63%	67%	50%	67%	70%	63%	57%	57%	70%	63%	25%	

Table 5-5
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Currently Stored in Impoundments
Based on Site-Specific NLET Results for Bottom Ash (Midwest Generation Site-Specific Analyses)

Constituent	Indicator of Leachate from Ash Currently Stored in Impoundments ⁽¹⁾	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽²⁾						
		Waukegan Generating Station						
		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
Arsenic		X	X	X	X	X	X	X
Barium	Yes (Table 5-1)	X	X	X	X	X	X	X
Boron	Yes (Table 5-1)	X	X	X	X	X	X	X
Copper		X					X	
Iron			X			X	X	X
Lead				X				
Manganese		X	X	X	X	X	X	X
Nickel						X		
Selenium		X	X	X	X		X	
Sulfate	Yes (Table 5-1)	X	X	X	X	X	X	X
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽³⁾		4	4	4	3	4	5	3
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Currently Stored in Impoundments ⁽⁴⁾		57%	57%	57%	50%	57%	63%	50%

Table 5-5
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Stored in Impoundments
Based on Site-Specific NLET Results for Bottom Ash (Midwest Generation Site-Specific Analyses)

Constituent	Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring ⁽¹⁾										
	Will County Generating Station										
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10
Arsenic	X	X	X	X	X	X	X	X	X	X	X
Barium	X	X	X	X	X	X	X	X	X	X	X
Boron	X	X	X	X	X	X	X	X	X	X	X
Cobalt	X	X	X	X	X	X	X	X	X	X	X
Iron	X	X	X	X	X	X	X	X	X	X	X
Manganese	X	X	X	X	X	X	X	X	X	X	X
Mercury	X	X	X	X	X	X	X	X	X	X	X
Nickel	X	X	X	X	X	X	X	X	X	X	X
Selenium	X	X	X	X	X	X	X	X	X	X	X
Sulfate	X	X	X	X	X	X	X	X	X	X	X
Number of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Stored in Impoundments ⁽¹⁾	5	4	6	7	4	5	5	5	5	4	4
Percentage of Observed Constituents that are not Consistent with Indicators of Leachate from Ash Stored in Impoundments ⁽¹⁾	63%	57%	67%	70%	57%	63%	63%	63%	63%	57%	57%

Abbreviations:

"NLET" = neutral leaching extraction test (ASTM D3987-85)

"X" = constituent was detected above analytical detection limits during at least one quarterly groundwater monitoring event in 2014

Table 5-5
Summary of Constituents Detected during Most Recent Year (2014) of Quarterly Groundwater Monitoring Compared to
Indicators of Leachate from Ash Stored in Impoundments
Based on Site-Specific NILET Results for Bottom Ash (Midwest Generation Site-Specific Analyses)

Notes:

1. Indicators of leachate from ash stored in impoundments is based on site-specific NILET results for bottom ash (Table 5-1). Detection limits presented in Table 5-1 meet current IEPA Class I groundwater goals with the exception of arsenic, which met the former Class I groundwater goal that was applicable at the time of analysis.
2. Shading of cells is described below.
 - Green shading, which is not applicable to this Table 5-5, would indicate that a constituent that is an indicator of leachate from ash stored in the impoundments was not detected during quarterly groundwater monitoring in 2014.
 - Blue shading indicates that a constituent that is not an indicator of leachate from ash stored in the impoundments was detected during at least one quarterly groundwater monitoring event in 2014.
 - No shading indicates that either (1) a constituent that is an indicator of leachate from ash stored in the impoundments was detected during at least one quarterly groundwater monitoring event in 2014, or (2) a constituent that is not an indicator of leachate from ash stored in the impoundments was not detected during quarterly groundwater monitoring in 2014.
3. Green and blue shading (see Note 2) demonstrate observed constituents that are not consistent with indicators of leachate from ash stored in impoundments.
4. The percentage of observed constituents that are not consistent with indicators of leachate from ash stored in impoundments is based on the following corrected formula based on a minimum set of indicator parameters. A division is performed with a numerator of the minimum number of observed constituents that are not consistent and with a denominator of the total number of indicators and constituents observed at that monitoring well. The denominator includes observed constituents that are both consistent and not consistent with the indicator parameters. The formula result is expressed as a percentage by multiplying by 100 percent.

