BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	**)**	
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	)	
STANDARDS FOR THE DISPOSAL OF	**)**	**R20-19**
COAL COMBUSTION RESIDUALS	**)**	**(Rulemaking – Land)**
IN SURFACE IMPOUNDMENTS:	**)**	
PROPOSED NEW 35 ILL. ADM. CODE 845	**)**	

NOTICE OF FILING

To: ALL PARTIES ON THE ATTACHED SERVICE LIST

PLEASE TAKE NOTICE that I have today electronically filed with the Office of the Clerk of the Illinois Pollution Control Board the attached **Prefiled Responses of Andrew Bittner**, copies of which are herewith served upon you.

/s/ Ryan C. Granholm
Ryan C. Granholm

Dated: September 24, 2020

SCHIFF HARDIN LLP
Joshua R. More
Stephen J. Bonebrake
Ryan C. Granholm
233 South Wacker Drive, Suite 7100
Chicago, Illinois 60606
(312) 258-5500

GIBSON, DUNN & CRUTCHER LLP
Michael L. Raiff
2001 Ross Avenue, Suite 2100
Dallas, TX 75201-6912
(214) 698-3350
mraiff@gibsondunn.com

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NOW COME Dynegy Midwest Generation, LLC, Electric Energy, Inc., Illinois Power Generating Company, Illinois Power Resources Generating, LLC, and Kincaid Generation, LLC, (collectively, "Dynegy"), by their attorneys, Schiff Hardin LLP, pursuant to the Hearing Officer's July 14, 2020 Order and submit the below responses.

Prefiled Responses of Andrew Bittner

Illinois Pollution Control Board:

24. On pages 9-10, regarding closure of CCR surface impoundments, you state that the proposed performance criteria under Section 845.710 are adequate for evaluating closures, including closure of CCR impoundments intersecting groundwater or those failing to meet the location standards. Among the requirements, you note that Section 845.710(b)(1)(E) allows the determination of whether CCRs at a site act as a significant continuing source of constituents to groundwater.

a. Please comment on whether the rules should require closure by removal if groundwater contaminant transport (GCT) modeling shows that a CCR surface impoundment intersecting groundwater or failing to meet location standards will not comply with the groundwater protection standards within the 30-year postclosure care period, i.e., the surface impoundment is a significant continuing source of constituents to groundwater.

RESPONSE: The proposed post-closure period is the later of either (1) 30 years, or (2) the date when the groundwater protection standards are met. See Section 845.780(c)

(IEPA, 2020a).[1] IEPA's proposal correctly recognizes that it can take decades for closure and corrective action to achieve the groundwater protection standards, and as such, does not set a specific maximum time period by which the standards must be met. This is consistent with federal regulations, as discussed in Section 7 of my testimony (Bittner, 2020).[2]

It is not appropriate to mandate removal as the sole remedial option in any specific circumstance. The criteria in Section 845.710 are adequate for evaluating closure alternatives (see Section 3 in my testimony [Bittner, 2020]), and if a proposed closure option would not meet the groundwater protection standards "within a reasonable period of time" (IEPA, 2020a, Part 845.670(f)), that closure option would not meet the Section 845.710 criteria and could not be selected.

b. In the alternative, comment on whether the rules should require longer postclosure care period, as determined by the GCT modeling results.

<u>RESPONSE:</u> My interpretation of the proposed Section 845.780(c), as currently drafted, is that the post-closure care period is the longer of either (1) 30 years, or (2) the date when the groundwater protection standards are met. As discussed on page 35 of the Statement of Reasons, "CCR surface impoundments that close with the CCR left in place have a 30-year minimum post-closure care period, which may be longer if the groundwater protection standards that are protective of human health and the environment have not been achieved" (IEPA, 2020b, p. 35).[3]

[1] Illinois Environmental Protection Agency (IEPA). 2020a. "Title 35: Environmental Protection, Subtitle G: Waste Disposal, Chapter I: Pollution Control Board, Subchapter J: Coal Combustion Waste Surface Impoundments, Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Draft)." 133p., March.
[2] Bittner, AB. [Gradient]. 2020. "Pre-filed Testimony of Andrew Bittner, P.E. Regarding Proposed Illinois Administrative Code Title 35, Subtitle G, Chapter I, Subchapter j, Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments." Report to Schiff Hardin LLP. 52p., August 27.
[3] Illinois Environmental Protection Agency (IEPA). 2020b. "Statement of reasons [In the Matter of: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Proposed New 35 Ill. Adm. Code 845]." Submitted to Illinois Pollution Control Board. R 2020-019 (Rulemaking - Water). 320p., March 30.

25. On page 24, you state, "[i]n order to accurately assess whether releases from an SI have occurred or are occurring, background concentrations should be specific to each SI, even if the upgradient groundwater has been affected by another source."

a. Please clarify whether you are recommending that background concentrations must be used as the groundwater protection standards for inactive and existing CCR surface impoundments instead of the proposed numeric standards.

RESPONSE: I am not recommending any changes to the proposed numeric standards listed in Section 845.600 (IEPA, 2020a). As described in Section 845.600(a)(2), background concentrations may become the groundwater protection standards at some SIs. My testimony on page 24 is intended to address how background concentrations are established for a particular SI in practice (*i.e.*, sites with multiple SIs may require additional analysis to determine whether each SI is leaking) and to respond to preliminary comments on the proposed rule regarding background concentrations (Earthjustice *et al*., 2020, p. 25).[4]

b. If so, propose any revisions to the rules that implements the application of background concentrations as illustrated in your conceptual model of "SI-specific Background Concentration Determinations".

RESPONSE: I am not recommending any changes to the language regarding background concentrations in the proposed rule. The groundwater sampling and analysis requirements in Part 845.640 provide sufficient avenues for determining whether an SI is contributing to groundwater impacts even if elevated upgradient constituent concentrations are present. In addition, the contaminant transport modeling and calculations required as part of closure (IEPA, 2020a, Part 845.220(d)(3) and 845.710(d)(2)) are capable of evaluating contributions from multiple sources to determine whether observed downgradient impacts are a result of a release from a particular SI or are due to an upgrzdient contribution.z

[4] Earthjustice; Environmental Law and Policy Center, Prairie Rivers Network; Prairie Rivers Network; Sierra Club. 2020. "Public Comments on Rulemaking to Implement the Coal Ash Pollution Prevention Act, Public Act 101-171." Submitted to Illinois Environmental Protection Agency (IEPA). 45p., January 13.

<u>Illinois Environmental Protection Agency:</u>

1. Referring to page 7 of your testimony, why should evaluation of constructing an onsite landfill not be a requirement of the closure alternatives analysis, where such evaluation would include viability?

<u>RESPONSE:</u> As described in my testimony, the closure alternatives evaluated against the rigorous Part 845.710 criteria should be practical, viable alternatives. Such an approach is consistent with the approach outlined in existing federal regulations for remedy selection under CERCLA: "A detailed analysis shall be conducted on the limited number of alternatives that represent viable approaches to remedial action after evaluation in the screening stage" (US EPA, 2003, 40 CFR 300.430(e)(9)(i)).[5] Screening evaluations streamline the alternatives analysis process by reducing the large number of possible alternatives to a reasonable number of viable alternatives. Specifying the evaluation of alternatives that are theoretical, but may not be viable, as in Part 845.710(c) (requiring the evaluation of "whether constructing an onsite landfill is possible" [IEPA, 2020a]) should not be a requirement of the closure alternatives analysis. Construction of an on-site landfill is not a viable option at all sites. Some sites, for example, may not have sufficient land available where a new landfill could be constructed. At sites where the construction of an on-site landfill is known to not be viable *a priori*, it should not be necessary to include an on-site landfill as an option in the closure alternatives analysis.

2. On page 30 of your testimony, you state that post closure leachate concentrations "are not affected" by the presence of consolidated CCRs.

   a. Do you believe that would be the case if the CCR being consolidated was of a different nature? For example: consolidating FGD materials into a bottom ash CCR

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[5] US EPA. 2003. "National Oil and Hazardous Substances Pollution Contingency Plan." 40 CFR 300, July 1.

surface impoundment or consolidating fly ash from Illinois Basin Coal with fly ash from Powder River Basin coal.

RESPONSE: **If the consolidated CCRs were generated by the combustion of coal sourced from a different location or were a different type of CCR (*i.e.*, bottom ash, fly ash, or flue-gas desulfurization waste) compared to the original impounded CCRs, there may be differences in the associated leachate concentrations due to chemical differences between different types of ash. However, as long as consolidated CCR is placed above the groundwater table and an appropriately designed cap is maintained overlying the consolidated CCR, I would not expect that the addition of consolidated ash would have a measurable effect on groundwater impacts due to the significantly reduced rate of leachate leaving the SI. Once a cap has been constructed over a CCR SI, the hydraulic flux, and the resulting CCR constituent mass flux to the aquifer, is controlled by the impermeable cap and, in the case of an SI constructed with intersecting groundwater conditions, the depth of groundwater intersection and hydrogeology. Increasing the vertical height of CCRs stored in the SI above the groundwater table will not increase the amount of water infiltrating from the SI to the underlying groundwater. Consequently, consolidating CCRs into a single SI will not affect the post-closure hydraulic flux that migrates through an SI into the underlying groundwater. Consolidating CCRs from SIs at the same site above the water table does not affect the ability of a cap to be constructed that meets the requirements of Part 845.750 and can be protective of human health and the environment, consistent with the requirements of Part 845.710 (IEPA, 2020a).**

b. Do you believe that consolidating CCR with different characteristics would require modelling to demonstrate compliance with the GWPS?

RESPONSE: **Part 845 requires assessing the potential impacts of each closure alternative on groundwater and surface water (IEPA, 2020a, Part 845.710(d)), including the requirement that the closure alternatives analysis contain the results of groundwater**

contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standards (IEPA, 2020a, Part 845.710(d)(2)). This requirement applies regardless of whether consolidating CCR is part of a closure alternative. Determining the appropriate leachate concentrations representative of ash in the SI would be part of the modeling process.

City Water, Light & Power:

1. Explain why you conclude that size of an impoundment or impoundments can impact what type of closure method is more environmentally protective of groundwater quality?

RESPONSE: Closures that are completed relatively quickly often result in more rapid improvements in groundwater quality because the hydraulic head is removed and the coal ash is isolated more quickly from infiltration due to precipitation (see Section 4.2 of my testimony [Bittner, 2020]). Impoundment size affects how quickly a closure can be implemented. Specifically, larger impoundments take longer to close than smaller impoundments. Furthermore, as impoundment size increases, the difference in the time required to install a cap and the time required to perform a full excavation also increases. Thus, for large impoundments, closure-in-place may be more protective of groundwater quality than closure-by-removal because it can be implemented much more rapidly.

ELPC, Prairie Rivers Network, and Sierra Club:

Municipal Solid Waste Landfills

1. Have you reviewed whether the statutory provision authorizing the development of standards for municipal solid waste landfills is different from the provision that authorized the federal CCR rule? If so, please explain your findings.

<u>RESPONSE:</u> I did not undertake a review of the statutory provision(s) as part of the scope of my testimony.

2. Are the constituents found in CCR surface impoundments the same as those found in municipal solid waste landfills?

a. If there are differences in the constituents in CCR surface impoundments versus municipal solid waste landfills, what are those differences?

<u>RESPONSE:</u> Although this is outside the scope of my testimony, there are differences in the types of constituents that may be found in CCR SIs and municipal solid waste landfills. While CCR SIs are largely associated with inorganic constituents, municipal solid waste landfills may contain both organic and inorganic constituents (US EPA, 1988a).[6]

b. Are there differences in how long the contaminants from municipal solid waste landfills can persist in the environment, as compared to contaminants that leach from CCR? If so, please note those differences.

<u>RESPONSE:</u> Although this is outside the scope of my testimony, some of the organic constituents present in municipal solid waste landfills will degrade over time in the environment. These organic constituents may, however, still result in increased potential risks to human and ecological receptors compared to inorganic constituents. Further, municipal solid waste landfills also contain a broader suite of inorganic constituents relative to those found in CCR SIs, which can interact in complex ways in the environment.

3. Have you evaluated whether municipal solid waste landfills are typically located in a same type of location, i.e., adjacent to a surface water body, as CCR surface impoundments?

a. If so, what have you found?

<u>RESPONSE:</u> This is outside the scope of my testimony.

4. Do municipal solid waste landfills impound water?

[6] US EPA. 1988a. "Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics: Criteria for Municipal Solid Waste Landfills, 40 CFR Part 258, Subtitle D of Resource Conservation and Recovery Act (RCRA) (Draft)." Report by NUS Corp. to US EPA, Office of Solid Waste. NTIS PB88-242441; EPA/530-SW-88-038. 114p., July.

<u>RESPONSE:</u> This is outside the scope of my testimony, but I am aware that water does accumulate in landfills due to precipitation.

<u>Viable Alternatives</u>

5. What is a "viable" closure alternative?

<u>RESPONSE:</u> As described in my testimony, the closure alternatives evaluated against the rigorous Part 845.710 criteria should be practical, viable alternatives. Such an approach is consistent with the approach outlined in existing federal regulations for remedy selection under CERCLA: "A detailed analysis shall be conducted on the limited number of alternatives that represent viable approaches to remedial action after evaluation in the screening stage" (US EPA, 2003, 40 CFR 300.430(e)(9)(i)). Screening evaluations streamline the alternatives analysis process by reducing the large number of possible alternatives to a reasonable number of viable alternatives.

6. Does the phrase "to the maximum extent feasible" require comparing feasible alternatives?

<u>RESPONSE:</u> The phrase "to the maximum extent feasible" is used in several contexts in Part 845 (IEPA, 2020a); I am not sure in what context this question is being asked.

7. Would moving CCR to an onsite landfill reduce the need for transportation of coal ash as compared to moving CCR offsite?

<u>RESPONSE:</u> Moving CCR to an on-site landfill would not reduce the need to transport CCR compared to moving CCR off-site; only the distance the CCR would be transported would potentially be reduced.

8. What is the difference between evaluating whether constructing an onsite landfill is possible and evaluating whether constructing an onsite landfill is viable?

<u>RESPONSE:</u> Viability implies a degree of reasonability, whereas possibility does not necessarily imply reasonability.

<u>Intersecting Groundwater</u>

9. On page 9 of your testimony, you state that surface impoundments with intersecting groundwater are "often of particular concern due to the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed."

a. In what circumstances can CCR constituent mass continue leaching into groundwater after closure is completed?

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed, including, but not limited to, the degree of CCR intersection with groundwater, the hydraulic environment at the site, and the components of the closure plan. CCR constituent mass that is in contact with groundwater after closure is completed may continue to leach. However, the ongoing leaching may or may not result in elevated downgradient groundwater concentrations. Similarly, the ongoing leaching may or may not cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods, including for sites with potentially intersecting groundwater.

b. Does the rise and fall of the groundwater table affect the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed? If so, please describe how.

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed, including, but not limited to, the degree of CCR intersection with groundwater, the hydraulic environment at the site, and the components of the closure plan. Groundwater fluctuations may affect CCR constituent mass leaching if groundwater is intermittently in contact with the stored CCR. However, this ongoing leaching may or may not result in elevated downgradient groundwater concentrations. Similarly, the ongoing leaching may or may not

cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods, including at sites with potential groundwater fluctuations that cause groundwater to intersect with stored CCR.

c. Does the rise and fall of adjacent surface water affect the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed? If so, please describe how.

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed, including, but not limited to, the degree of CCR intersection with groundwater, the hydraulic environment at the site, and the components of the closure plan. Surface water fluctuations may cause groundwater levels to fluctuate, which may affect CCR constituent mass leaching if groundwater is intermittently in contact with the stored CCR. However, this ongoing leaching may or may not result in elevated downgradient groundwater concentrations. Similarly, the ongoing leaching may or may not cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods, including at sites with potential surface water fluctuations that cause groundwater to intersect with stored CCR.

d. Does settling or shifting of the subsurface affect the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed? If so, please describe how.

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed. The potential for subsurface settlement can be considered in a site-specific closure alternatives evaluation. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate

closure methods, including at sites with potential settling or shifting of the subsurface that may cause groundwater to come into contact with stored CCR.

e. Can actions at nearby offsite locations affect the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed? If so, please describe how.

RESPONSE: It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed. The potential for off-site groundwater influences to affect CCR constituent leaching can be considered in a site-specific closure alternatives evaluation. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods.

f. Can deterioration of the cap in a cap-in-place closure affect the potential for CCR constituent mass to continue leaching into groundwater even after closure is completed? If so, please describe how.

RESPONSE: It depends. There are many site-specific variables that affect whether CCR constituent mass may leach into groundwater after the closure of an SI is completed. The potential for cap deterioration to affect CCR constituent leaching would be a factor for every landfill and SI in the country, regardless of whether the final CCR storage location is in a landfill or in an existing SI. Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected.

Floodplains

10. On page 10 of your testimony, you state that surface impoundments "constructed in floodplains are another scenario of concern due to the potential contact of surface water and CCR in some circumstances."

a. In what circumstances can contact of surface water and CCR occur when a surface impoundment is located in a floodplain?

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether surface water may come into contact with CCR, including, but not limited to, the location and characteristics of the surface water body, the engineering configuration of the SI, and the regional topography at the site. Surface water may potentially come into contact with CCR in a closed impoundment located in a floodplain. However, this type of event may not result in elevated concentrations in downgradient groundwater and surface water. Similarly, this type of event may not cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods for SIs, including at CCR disposal sites located in floodplain environments.

b. Can floods affect the elevation of adjacent groundwater?

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether surface water may affect the elevation of groundwater adjacent to an SI, including, but not limited to, the location and characteristics of the surface water body, the location and characteristics of the groundwater system at the site, and the characteristics of the flood event.

c. Can floods affect the direction of flow of groundwater adjacent to the flooded surface water body?

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether surface water may affect the elevation, and thus the direction of flow, of groundwater adjacent to an SI, including, but not limited to, the location and characteristics of the surface water body, the location and characteristics of the groundwater system at the site, and the characteristics of the flood event.

d. Do floods pose a risk of release of CCR or CCR contaminants into ground or surface waters? Please explain.

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether floods may impact the risk of release of CCR or CCR contaminants into groundwater or surface water, including, but not limited to, the location and characteristics of the surface water body, the engineering configuration of the SI, and the regional topography. Site-specific risks of flooding and potential subsequent releases of CCR can be evaluated as part of a closure alternatives analysis, consistent with the standards in Part 845.710 (IEPA, 2020a).

e. Do you know if rising or receding floodwaters can affect the stability of berms of surface impoundments located in the floodplain? If so, how? Please explain.

<u>RESPONSE:</u> It depends. There are many site-specific variables that affect whether floodwaters may impact the stability of an SI's berms, including, but not limited to, the location and characteristics of the flooding surface water body, the engineering configuration of the SI, and the characteristics of the flood event. The effect of rising or receding floodwaters can be evaluated and considered in a site-specific closure alternatives analysis, consistent with the standards in Part 845.710 (IEPA, 2020a).

f. What other structural damage may a closed impoundment located in the floodplain be susceptible to in the event of a flood?

<u>RESPONSE:</u> This is outside the scope of my testimony, but can be evaluated and considered in a site-specific closure alternatives analysis, consistent with the standards in Part 845.710 (IEPA, 2020a).

<u>Assessments</u>

11. Does an assessment stop an eroding riverbank or an earthquake?

<u>RESPONSE:</u> An assessment provides an opportunity to identify issues and undertake corrective measures, reducing the likelihood of adverse impacts by catching potential problems early.

12. Does an assessment stop a sudden collapse of an impoundment or the subsurface underlying it?

<u>RESPONSE:</u> An assessment provides an opportunity to identify issues and undertake corrective measures, reducing the likelihood of adverse impacts by catching potential problems early.

<u>Costs</u>

13. Please explain the basis for the statement on page 12 of your testimony that "cost is a key component of the 'ease or difficulty of implementing a potential closure method.'"

<u>RESPONSE:</u> US EPA has included cost as a key component of the implementability of remediation options since at least 1988, stating that "[t]he practicable capabilities of the facility, including the capability to finance and manage a corrective action program may be considered by the State in determining the duration of the clean-up. Therefore, the cost of the remedy may affect the remedy selected and the timing of the cleanup..." (US EPA, 1988b, p. 33376).[7]

14. Can the word "difficulty" encompass physical or technical challenges, rather than cost considerations?

[7] US EPA. 1988b. "Solid waste disposal facility criteria (Proposed rule)." *Fed. Reg.* 53(168):33314-33422. 40 CFR 257; 40 CFR 258, August 30.

<u>RESPONSE:</u> The statement "ease or difficulty of implementing a potential closure method" refers to physical and technical challenges, as well as cost considerations (IEPA, 2020a).

15. Can the word "ease" address physical or technical limitations, or lack thereof, of an endeavor, rather than cost considerations?

<u>RESPONSE:</u> The statement "ease or difficulty of implementing a potential closure method" refers physical and technical challenges, as well as cost considerations (IEPA, 2020a).

16. What types of options or methods would not be considered for closure if costs were listed as criteria in Section 845.710(b)?

<u>RESPONSE:</u> I did not identify cost as a threshold or screening criteria, but rather stated that cost is one additional factor that should be explicitly required to be considered in site-specific closure alternatives analyses. Thus, any viable option or method can be considered for closure as part of the alternatives analysis. Requiring the consideration of costs is consistent with other existing Federal and State guidance and regulations, as described in Section 3.3.2 of my written testimony (Bittner, 2020). I did not testify that certain closure alternatives should not be considered in a closure alternatives analysis due to cost.

17. Are you aware that the Coal Ash Pollution Prevention Act requires that the Part 845 rules be at least as protective as federal regulations of coal combustion residuals promulgated by the United States Environmental Protection Agency under the Resource Conservation and Recovery Act?

a. Did the United States Court of Appeals for the District of Columbia Circuit hold in *Utility Solid Waste Activities Group v. United States Environmental Protection Agency*, 901 F.3d 414, 448-49 (D.C. Cir. 2018), that cost cannot be considered in establishing regulatory standards under Section 4005(a) of the Resource Conservation and Recovery Act, 42 U.S.C. § 6945(a)? If not, please explain in detail the basis for your answer.

<u>RESPONSE:</u> I am not offering an opinion regarding the interpretation or application of the *Utility Solid Waste Activities Group v. United States Environmental Protection Agency*,

901 F.3d 414, 448-49 (D.C. Cir. 2018) decision on my recommendation that the Board include costs as a factor when performing a closure alternatives analysis under Part 845.710. My understanding is consistent with IEPA's understanding that the Federal CCR Rule allows the owner/operator of a site to consider costs when selecting an SI closure method (R20-19, Transcript at 237:16-238:10 [Dunaway and More, 2020]).[8]

b. Does the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which you cite on pages 12-13 of your prefiled testimony, incorporate different standards concerning consideration of cost than 42 U.S.C. § 6945(a) of the Resource Conservation and Recovery Act? If not, please explain in detail the basis for your answer.

<u>RESPONSE:</u> This calls for a legal conclusion.

18. Please provide the basis for your statement on page 13 of your testimony that "Regulations that pertain to municipal solid waste landfills and certain non-municipal non-hazardous waste disposal facilities…are the regulations upon which the Federal CCR Rule is based…."

<u>RESPONSE:</u> In the Federal CCR Rule and other US EPA legislation, there are numerous references to the fact that the Rule was modeled on existing regulations that pertain to municipal solid waste landfills. Several examples are provided below:

- **"Since the proposed and final RCRA subtitle D standards for CCR landfills are modeled after the standards for MSWLFs found at 40 CFR part 258, EPA has concluded that disposal of CCR in MSWLFs is as protective as disposal in a CCR landfill…" (US EPA, 2015, p. 21341);[9]**
- **"For CCR landfills, the proposed closure and post-closure care requirements were modeled on current regulations that apply to municipal solid waste landfills, which are codified in part 258" (US EPA, 2015, p. 21409); and**
- **"During the rulemaking process for the 2015 CCR rule, EPA received numerous comments requesting that EPA authorize state permit programs and adopt alternative performance standards that would allow state regulators or facilities to 'tailor' the requirements to particular site-specific**

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[8] Dunaway, L; More, J. 2020. "Testimony transcript [In the Matter of: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Proposed New 35 Ill. Adm. Code 845] (Excerpt re: Closure options performance standards under 40 CFR 257.102)." Submitted to Illinois Pollution Control Board. R 20-19 (Rulemaking - Water). 3p., August 13.
[9] US EPA. 2015. "Hazardous and solid waste management system; Disposal of coal combustion residuals from electric utilities (Final rule)." Fed. Reg. 80(74):21302-21501. 40 CFR 257; 40 CFR 261, April 17.

> **conditions. Many requested EPA adopt particular alternative performance standards found in EPA's municipal solid waste landfill (MSWLF) regulations in 40 CFR part 258. 4 Although the CCR rule was largely modeled on the MSWLF regulations, as explained in both the 2010 proposed and 2015 final rules…" (US EPA, 2018, p. 36438).[10]**

Closure Methods

19. In what circumstances is closure of an impoundment by removal more protective of health and the environment than closure by cap in place? Please describe.

RESPONSE: **Neither CBR nor CIP is universally more protective of human health and the environment than the other; there are numerous site-specific and environmental factors that might make one closure alternative preferable to the other, including, but not limited to, hydrogeological conditions, SI construction details, the size and volume of the SI, leachate quality, the size and flowrate of nearby surface waters, and the presence or absence of human or ecological receptors (*e.g.*, residents using groundwater as a source of drinking water and recreators or anglers using nearby surface waters). As such, performance standards, such as those defined in Part 845.710 (IEPA, 2020a), are the appropriate regulatory mechanism to ensure the proper evaluation and selection of CCR SI closure alternatives. Setting arbitrary criteria or triggers that require the selection of a specific closure alternative would neglect the fact that no one closure approach is always more protective than another. Site-specific evaluations, based on the criteria in Part 845.710, are necessary to determine which closure alternatives are appropriate for a given site. Note that US EPA considers that both CIP and CBR can be equally protective if implemented properly (see Section 4.1 of my written testimony [Bittner, 2020]).**

20. On page 15 of your testimony, you note that "a combination of [Closure in Place] and a vertical barrier wall may be necessary to be protective of human health and the environment." Please describe a vertical barrier wall and explain what it does.

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[10] US EPA. 2018. "Hazardous and solid waste management system: Disposal of coal combustion residuals from electric utilities; Amendments to the national minimum criteria (Phase One) (Final rule)." *Fed. Reg.* 83(146):36435-36456. 40 CFR 257, July 30.

<u>RESPONSE:</u> Barrier walls are generally designed to prevent the flow of groundwater or the flow of chemical constituents in groundwater.

21. Why would a vertical barrier wall, in combination with closure in place, be necessary to protect human health and the environment?

<u>RESPONSE:</u> The combination of a barrier wall with CIP may be more protective of groundwater and surface water quality than just CIP or CBR with no associated barrier wall.

22. Do vertical barrier walls need to be operated or maintained to continue functioning as intended? If so, please describe.

<u>RESPONSE:</u> This is outside the scope of my testimony, but barrier walls may require maintenance and inspection to ensure proper operation.

23. Do such vertical barrier walls need to be inspected?

<u>RESPONSE:</u> This is outside the scope of my testimony, but barrier walls may require maintenance and inspection to ensure proper operation.

24. If a vertical barrier wall is not properly operated, maintained, or inspected, how may such failure to properly operate, maintain, or inspect the vertical barrier wall affect its performance?

<u>RESPONSE:</u> This is outside the scope of my testimony; however, post-closure care must be conducted until groundwater monitoring data show that constituent concentrations have met the requirements in Part 845.780(c)(2) (IEPA, 2020a). If a closure option is not performing as designed, post-closure care will continue until the performance criteria are met. Financial assurance through the completion of post-closure care is also required as part of Subpart I.

25. Do such vertical barrier walls involve components that at times need to be replaced?

<u>RESPONSE:</u> This is outside the scope of my testimony.

26. If vertical barrier walls involve components that at times need to be replaced, how may the performance of the wall be affected if such components are not timely replaced, or not replaced at all?

RESPONSE: **This is outside the scope of my testimony.**

27. Would it be prudent to put in place a vertical barrier wall without anticipating the need for operation, maintenance, inspection, and/or replacement of certain components of that wall?

RESPONSE: **This is outside the scope of my testimony, but barrier walls may require maintenance and inspection to ensure proper operation.**

US EPA Risk Assessment

28. On page 16 of your testimony, you cite to statements in US EPA's 2014 Risk Assessment stating that "releases from surface impoundments [to groundwater] drop dramatically after closure, even with waste in place" and that closure by removal "has a negligible effect on modeled risks." (US EPA, 2014, pp. 5-28 – 5-29). Do you know what model US EPA relied on in coming to those findings? Was it the EPACMTP model?

RESPONSE: **This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Based on my own experience, I agree with the conclusions I quoted from US EPA's CCR risk assessment (US EPA, 2014).[11] Critiques of the model used by US EPA are not relevant to my testimony and do not impact my conclusions.**

29. Did the model used by US EPA in coming to those findings simulate scenarios where CCR is disposed within an underlying aquifer? Please provide the basis for your answer.

RESPONSE: **This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.**

30. Did the model used by US EPA in coming to those findings simulate groundwater flow through fractured rock? Please provide the basis for your answer.

[11] US EPA. 2014. "Human and Ecological Risk Assessment of Coal Combustion Residuals (Final)." Office of Solid Waste and Emergency Response (OSWER), Office of Resource Conservation and Recovery. 1237p., December.

<u>RESPONSE:</u> This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

31. Does CCR mineralogy and leachate chemistry evolve over time, as leaching continues? If your answer is no, please explain.

<u>RESPONSE:</u> It depends. CCR mineralogy and leachate chemistry are dependent on a variety of site-specific factors, including, but not limited to, the hydrogeologic environment at the site and the operating and engineering characteristics of the SI.

32. Did the model used by US EPA in coming to those findings simulate more than a single leachate composition from an operating or closed impoundment? Please provide the basis for your answer.

<u>RESPONSE:</u> This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

33. Did the model used by US EPA in coming to those findings assume that there is no net addition of ash into the impoundment over its operating life? Please provide the basis for your answer.

<u>RESPONSE:</u> This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

34. Did the model used by US EPA take into account climate data that is more recent than 1990? Please provide the basis for your answer.

<u>RESPONSE:</u> This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or

model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

35. Did the model used by US EPA take into account the potential effects of climate change, such as changes in rainfall, temperature, or episodic rainfall events? Please provide the basis for your answer.

RESPONSE: This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

36. Can CCR be highly alkaline and create pH plumes downgradient of the CCR impoundment?

RESPONSE: It depends. CCR alkalinity and downgradient pH are dependent on a variety of site-specific factors, including, but not limited to, the composition of the CCR stored in the SI, the hydrogeologic environment at the site, and the operating and engineering characteristics of the SI.

37. Did the model used by US EPA in coming to those findings simulate scenarios where CCR leachate changes the chemistry of the aquifer receiving the leachate? Please provide the basis for your answer.

RESPONSE: This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

38. Did the model used by US EPA in coming to those findings simulate variable oxidation/reduction potential (Eh) conditions in either leachate or leachate-impacted groundwater? Please provide the basis for your answer.

RESPONSE: This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or

model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.

39. Did the model used by US EPA in coming to those findings evaluate the effect of contaminant-plume mobilization of non-waste related metals from the aquifer due to altered aquifer water quality? Please provide the basis for your answer.

RESPONSE: **This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.**

40. Did the model used by US EPA in coming to those findings consider either the preexisting occupation of adsorption sites in the aquifer by naturally occurring metals or competition for remaining sites by multiple contaminants migrating from the waste disposal area? Please provide the basis for your answer.

RESPONSE: **This is beyond the scope of my testimony. The development of my opinion did not require me to review US EPA's model in detail. Critiques of the model and/or model inputs used by US EPA are not relevant to my testimony and do not impact my conclusions.**

41. Do you agree with US EPA's statement that "an operating time of 75 years for impoundments is not enough to deplete the entire constituent mass present in CCR waste" (EPA 2014 Risk Assessment at 5-28)? Please explain your answer.

RESPONSE: **This is beyond the scope of my testimony.**

42. What is the "incomplete[] elimination of the flux of constituents to groundwater," which, on page 16 of your testimony, you state sometimes occurs with closure in place?

RESPONSE: **In some scenarios after a cap has been installed, there may be some ongoing flux of CCR constituents to groundwater due to intersecting groundwater or downward infiltration of precipitation through the cap. This flux may not result in elevated concentrations in groundwater and surface water. Similarly, this flux may not cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-**

specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods.

Closure in Place

43. Please explain the basis for your statement on page 16 of your testimony that closure in place "tends to be more protective in lower-conductivity aquifers."

RESPONSE: **Page 16 of my testimony includes a table with examples of site-specific factors that can influence when CIP is as or more protective of groundwater quality than CBR (Bittner, 2020). Whether or not CIP will be more protective at a particular SI depends on many site-specific conditions, including the example factors I listed in the table.**

44. Over what time horizon is closure in place "more protective" in lower-conductivity aquifers? Please provide the basis for your statement.

RESPONSE: **There are many site-specific factors that affect over what time horizon CIP is more protective of groundwater, including, but not limited to, aquifer hydraulic conductivity, the hydrogeologic environment at the site, the constituents of interest, and the SI size.**

45. Have you evaluated when the peak contaminant concentrations in CCR leachate occur in low-conductivity aquifers? If so, please describe the results of that evaluation.

RESPONSE: **This is outside the scope of my testimony.**

46. Are you aware of studies evaluating when the peak contaminant concentration in CCR leachate occurs in low-conductivity aquifers? If so, what do they find?

RESPONSE: **This is outside the scope of my testimony.**

47. Have you evaluated the impacts of climate change on leaching from closed-in-place CCR surface impoundments in lower-conductivity aquifers? If so, please describe the results of that evaluation.

RESPONSE: **This is outside the scope of my testimony.**

48. Please explain the basis for the statement on page 16 of your testimony that closure in place "tends to be more protective for compounds that sorb more strongly to soil and are transported more slowly."

<u>RESPONSE:</u> Page 16 of my testimony includes a table with examples of site-specific factors that can influence when CIP is as or more protective of groundwater quality than CBR (Bittner, 2020). Whether or not CIP will be more protective of groundwater at a particular SI depends on many site-specific conditions, including the example factors I listed in the table.

49. Over what time horizon is closure in place “more protective” for CCR compounds that sorb more strongly to soil and are transported more slowly? Please provide the basis for your statement.

<u>RESPONSE:</u> There are many site-specific factors that affect over what time horizon CIP is more protective, including, but not limited to, aquifer hydraulic conductivity, the hydrogeologic environment at the site, the constituents of interest, and the SI size.

50. Have you evaluated when the peak contaminant concentrations in CCR leachate occur for compounds that sorb more strongly to soil and are transported more slowly? If so, please describe the results of that evaluation.

<u>RESPONSE:</u> This is outside the scope of my testimony.

51. Are you aware of studies evaluating when the peak contaminant concentration in CCR leachate occur for compounds that sorb more strongly to soil and are transported more slowly? If so, what do they find?

<u>RESPONSE:</u> This is outside the scope of my testimony.

52. Have you evaluated the impacts of climate change on leaching from closed-in-place CCR surface impoundments in lower-conductivity aquifers? If so, please describe the results of that evaluation.

<u>RESPONSE:</u> This is outside the scope of my testimony.

53. Please explain the basis for your statement on page 16 of your testimony that closure in place “tends to be more protective for larger impoundments….”

<u>RESPONSE:</u> Page 16 of my testimony includes a table with examples of site-specific factors that can influence when CIP is as or more protective of groundwater quality than CBR (Bittner, 2020). Whether or not CIP will be more protective of groundwater at a

particular SI depends on many site-specific conditions, including the example factors I listed in the table.

54. Over what time horizon is closure in place "more protective" for larger CCR impoundments?

<u>**RESPONSE:**</u> **There are many site-specific factors that affect over what time horizon CIP is more protective, including, but not limited to, aquifer hydraulic conductivity, the hydrogeologic environment at the site, the constituents of interest, and the SI size.**

55. What size is a "larger" CCR impoundment?

<u>**RESPONSE:**</u> **There is no threshold size for what constitutes a "larger" CCR impoundment. "Larger" is a comparative term, *i.e.*, a 200-acre impoundment is larger than a 25-acre impoundment. Data support that SIs with larger surface areas are more commonly closed in place than smaller SIs (Rokoff, 2020, pp. 13-16).[12] The size of the impoundment is one of many site-specific conditions that will impact an alternatives analysis under Part 845.710 (IEPA, 2020a).**

<u>Groundwater Model</u>

56. On page 17 of your testimony you state that the hypothetical impoundments you assumed for these models were "square SIs," but were of much different area: the large hypothetical impoundment is 200 acres, while the smaller impoundment is 25 acres. On Figures 4.1 and 4.2, the impoundments appear to occupy the same width and depth.

a. Are figures 4.1 and 4.2 an accurate depiction of what you modeled – including that both modeled impoundments have the same width and depth?

<u>**RESPONSE:**</u> **Representative cross-sections of intersecting and non-intersecting groundwater model setups are shown in Figures 4.1 and 4.2, respectively, for an SI that is 100 acres in size (Bittner, 2020). The size of the SIs evaluated in my testimony were 200 acres**

[12] Rokoff, MD. [AECOM]. 2020. "Pre-filed Testimony of Mark D. Rokoff, PE [re: Proposed Illinois Administrative Code Title 35, Subtitle G, Chapter I, Subchapter j, Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments]." Report to Schiff Hardin LLP, Chicago, IL. 39p., August 27.

and 25 acres, so would be larger and smaller, respectively, than the area depicted as occupied by the SIs in Figures 4.1 and 4.2.

b. If so, given the differences in area covered by the impoundments, must one impoundment be far longer than the other to encompass 400 acres while the other covers only 25 acres?

RESPONSE: The size of the SIs evaluated in my testimony were 200 acres and 25 acres, and both SIs were modeled as square footprints (Bittner, 2020).

c. Did you model the larger impoundment as a long rectangle and the other, smaller impoundment as a square?

RESPONSE: Both SIs evaluated in my testimony were modeled as square footprints (Bittner, 2020).

57. Does the model you used model coal ash in contact with groundwater as a continued source of groundwater contamination?

RESPONSE: For the modeling I presented in Section 4.2 of my testimony (Bittner, 2020), constant-strength source boundary conditions were applied to model cells within the SI to simulate the presence of CCR constituents in the saturated ash. For CIP, constant-strength source concentrations remained in the hypothetical SI's CCR layer to simulate the effect of CCRs left in place below the constructed cap. Under the modeled intersecting groundwater conditions, residual saturated ash will contribute to the ongoing flux of CCR constituents to downgradient groundwater.

58. Is it appropriate to model coal ash in contact with groundwater as a continued source of groundwater contamination? Please explain your answer.

RESPONSE: Whether it is appropriate to model coal ash in contact with groundwater as a continued source of groundwater contamination will depend on site-specific conditions, including, but not limited to, the characteristics of the coal ash stored in the SI, the hydrogeological conditions at the site, and the purpose of the model. While I

modeled coal ash in contact with groundwater as described in the preceding answer, there may be other ways that are also appropriate to model coal ash in contact with groundwater.

59. Does your groundwater model show that either alternative modeled achieves the groundwater protection standards?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. Source concentrations for both species of arsenic were fixed at a unitless concentration of 1. Downgradient groundwater concentrations are reported as a unitless concentration ratio, C/C_o; C is the model-predicted downgradient concentration and C_o is the simulated source leachate concentration in the SI. I did not run the model to evaluate when either alternative would achieve the groundwater protection standards.

60. Why did you limit your model to a 30 year timeframe?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. I used 30 years because it is a common, default high-end exposure duration assumption in risk assessments (see, *e.g.*, US EPA, 2002, pp. 1-5, 3-8).[13]

61. If the model had extended out further than 30 years, would that have changed the concentrations achieved by the different closure methods in your hypothetical scenarios?

<u>RESPONSE:</u> I did not evaluate constituent concentrations beyond 30 years as part of my testimony.

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[13] US EPA. 2002. "Supplemental guidance for developing soil screening levels for Superfund sites." Office of Solid Waste and Emergency Response (OSWER). OSWER 9355.4-24. 187p., December.

62. Why did you choose not to model additional scenarios, including where the smaller impoundment is in contact with groundwater and the larger impoundment is not?

RESPONSE: The development of my testimony did not require me to model additional scenarios.

63. Why did you model hypothetical impoundments rather than modeling real life site conditions?

RESPONSE: The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. I selected and modeled hypothetical sites that have general applicability.

64. Do contaminants in addition to – or other than – arsenic often leach from a CCR impoundment?

RESPONSE: Arsenic is a common risk-driving constituent associated with CCR SIs. The constituents that may leach from a CCR SI are site-specific and could be considered as part of an evaluation under Part 845.710 (IEPA, 2020a).

65. Can arsenic react differently in groundwater than other common CCR constituents?

RESPONSE: Arsenic is a common risk-driving constituent associated with CCR SIs. The constituents that may leach from a CCR SI and their reaction in groundwater are site-specific and could be considered as part of an evaluation under Part 845.710 (IEPA, 2020a).

66. Does arsenic travel through groundwater at the same speed as other common CCR constituents?

RESPONSE: Arsenic is a common risk-driving constituent associated with CCR SIs. The constituents that may leach from a CCR SI and the speed at which they travel through groundwater are site-specific and could be considered as part of an evaluation under Part 845.710 (IEPA, 2020a).

67. Would including multiple common CCR constituents in your modeling provide a more realistic view of the impacts of different closure methods on groundwater contamination?

<u>RESPONSE:</u> Arsenic is a common risk-driving constituent associated with CCR SIs and thus appropriate to use for the modeling evaluation presented in my testimony. I did not evaluate other constituents as part of my testimony.

68. On page 17 of your testimony, you state that the hydraulic conductivity in the aquifer underlying the hypothetical surface impoundment "was set to 5 x 10^{-3}" (cm/s). Is the hydraulic conductivity in the subsurface below actual impoundments variable?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. The hydraulic conductivity below an SI is a site-specific factor that should be considered as part of the alternatives analysis specified in Part 845.710 (IEPA, 2020a).

69. Did you evaluate whether the hydraulic conductivity you set for the hypothetical aquifers below the hypothetical impoundments is found in aquifers underlying impoundments in Illinois?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. The hydraulic conductivity below an SI is a site-specific factor that should be considered as part of the alternatives analysis specified in Part 845.710 (IEPA, 2020a).

70. Does your model of the removal scenario assume that the CCR liquid slurry source stops being added to the impoundment one year before removal of ash begins, but no other dewatering occurs prior to or during removal? If not, please explain your answer.

RESPONSE: **In the dewatering period (1 year), the constant head boundary conditions within the footprint of the SI were removed from the model, but all the other model parameters and boundary conditions remained consistent. Although active dewatering (*e.g.*, pumping wells) was not simulated in this period, at the end of the modeled 1-year dewatering period, groundwater elevations were set to what they had been pre-development to represent completed dewatering.**

71. At actual impoundments, does active dewatering of the impoundment – not just ceasing to sluice new slurry into the impoundment – take place before removal of ash begins? Please explain your answer.

RESPONSE: **The time between ceasing sluicing new slurry into an impoundment, the start of active dewatering, and the removal of ash will vary by site and by closure plan.**

72. Does active dewatering (i.e., pumping out water from the impoundment) result in a different hydraulic head in the impoundment, as opposed to just ceasing to sluice new slurry into the impoundment?

RESPONSE: **The purpose of active dewatering is to reduce the hydraulic head in the impoundment and to remove fluids from pore space in the CCR.**

73. Does active dewatering result in a different flux of contaminants into the groundwater as compared to just ceasing to sluice new slurry into the impoundment?

RESPONSE: **The hydraulic head in the impoundment is a key control on the flux of constituents from the ash basin into the environment (US EPA, 2014, p. 4-6). The flux of leachate into the subsurface is "driven by the hydraulic head of the ponded water" (US EPA, 2014, p. ES-5). US EPA found in its nationwide CCR risk assessment, conducted as part of the development of the Federal CCR Rule, "that releases from surface impoundments [to groundwater] drop dramatically after closure, even with waste in place" (US EPA, 2014, pp. 5-28 to 5-29) and concluded that the use of CBR as an SI closure alternative "has a negligible effect on modeled risks" compared to CIP (US EPA, 2014, p. 5-29).**

74. Did the model you used in the removal scenario account for changes in hydraulic head in the impoundment during the removal process?

<u>RESPONSE:</u> Transient hydraulic and transport conditions were simulated in all of the model periods I described in my testimony (Bittner, 2020). During the CCR excavation period under CBR, precipitation falling onto the exposed ash will either infiltrate or evaporate. I assumed that recharge within the aerial footprint of the SI was equal to the ambient recharge rate throughout the rest of the model domain (8 inches/year). Similarly, after the ash excavation has been completed under CBR, I used the same ambient recharge rate throughout the aerial footprint of the former SI, because soil backfill would be expected to produce a similar recharge rate as the surrounding native soils. All CCR sources are removed in this period, however, so recharge does not add leachate mass to groundwater.

75. Did the model you used in the removal scenarios account for increase and decrease in flux of contaminants to groundwater over time?

<u>RESPONSE:</u> Transient hydraulic and transport conditions were simulated in all of the model periods I described in my testimony (Bittner, 2020). During the CCR excavation period under CBR, precipitation falling onto the exposed ash will either infiltrate or evaporate. I assumed that recharge within the aerial footprint of the SI was equal to the ambient recharge rate throughout the rest of the model domain (8 inches/year). Similarly, after the ash excavation has been completed under CBR, I used the same ambient recharge rate throughout the aerial footprint of the former SI, because soil backfill would be expected to produce a similar recharge rate as the surrounding native soils. All CCR sources are removed in this period, however, so recharge does not add leachate mass to groundwater.

76. Did the modeling you used in both hypothetical scenarios account for changes in leachate concentration over time?

<u>RESPONSE:</u> Source concentrations for both species of arsenic were fixed at a unitless concentration of 1. Downgradient groundwater concentrations are reported as a unitless concentration ratio, C/C_o; C is the model-predicted downgradient concentration and C_o is the simulated source leachate concentration in the SI.

77. Did the modeling you used in both hypothetical scenarios account for reversals in direction of groundwater flow?

<u>RESPONSE:</u> Transient hydraulic and transport conditions were simulated in all of the model periods I described in my testimony (Bittner, 2020).

78. Did the modeling you used in both hypothetical scenarios account for variation in groundwater elevation, groundwater flow rates, elevation of adjacent surface waters, or precipitation?

<u>RESPONSE:</u> Transient hydraulic and transport conditions were simulated in all of the model periods I described in my testimony. The boundary conditions I used are described in Section 4.2 of my written testimony (Bittner, 2020).

79. Did the modeling you used in both hypothetical scenarios account for future changes in severity or frequency of storms and floods associated with climate change?

<u>RESPONSE:</u> This is outside the scope of modeling performed in support of my testimony.

80. Why did you assume 10-cubic-yard trucks for removal of CCR?

<u>RESPONSE:</u> The groundwater contaminant transport models in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. For the modeling I presented in my testimony, I assumed a reasonable truck size of 10 cubic yards.

81. There are trucks that hold more than 10 cubic yards, correct?

<u>RESPONSE:</u> Yes, there are trucks that hold more than 10 cubic yards. Another possible truck capacity is 15 cubic yards.

82. Are you aware of whether trucks that hold more than 10 cubic yards have been used in removal of CCR?

<u>RESPONSE:</u> Yes, there are trucks that hold more than 10 cubic yards. Another possible truck capacity is 15 cubic yards.

83. Are you aware of any technical reason why a truck that holds more than 10 cubic yards could not be used in removal of CCR?

<u>RESPONSE:</u> I am not aware of any technical reason why a truck that holds more than 10 cubic yards could not be used for the removal of CCR. I note that the use of any specific truck will depend on site-specific conditions, such as available turning radius and road conditions/limitations.

84. What is the basis for the assumption in your model, noted on page 18 of your testimony, that the trucks make 100 roundtrips per day?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. For the modeling I presented in my testimony, I assumed a reasonable number of 100 roundtrip truck trips per day.

85. Why did you choose to model only transport by trucks, and not by rail or barge or a combination of truck, rail, and/or barge?

<u>RESPONSE:</u> The groundwater contaminant transport models presented in Section 4.2 of my testimony (Bittner, 2020) are meant to show how site-specific factors affect concentrations of constituents in groundwater associated with an SI closed by CIP *vs*. CBR, and that CIP may be as protective, and in some instances more protective, of groundwater than CBR at some sites. I designed and modeled sites that have general applicability. I am not aware of any SIs or landfills that cannot be accessed by truck, but I am aware of landfills and SIs that cannot be accessed by existing rail systems or barges.

86. Have you reviewed the duration from commencement to completion of removal of CCR from impoundments where removal has already been completed? If so, please comment on that duration.

<u>RESPONSE:</u> This is beyond the scope of my testimony, although I am aware of sites where CCR removal has been ongoing for multiple years.

87. Have you reviewed the methods by which CCR was transported at locations where removal has been completed or is underway? If so, please comment on those methods.

<u>RESPONSE:</u> This is beyond the scope of my testimony, although I am aware of multiple sites where CCR removal has been performed by trucks.

<u>Worker Protections and Climate Change</u>

88. Fugitive dust can be reduced by implementing dust controls, correct?

<u>RESPONSE:</u> The ability of dust controls to reduce fugitive dust depends on several factors. An analysis of these mitigation measures was outside the scope of my testimony.

89. Do robust dust controls help reduce exposure to fugitive dust?

<u>RESPONSE:</u> The ability of dust controls to reduce fugitive dust depends on several factors. I am not sure what the nature of the "robust" dust controls being referred to in the question are specifically. An analysis of fugitive dust mitigation measures was outside the scope of my testimony.

90. Does monitoring of fugitive dust help identify when control measures are not adequately controlling such dust?

<u>RESPONSE:</u> Monitoring and assessment provides an opportunity to identify issues and undertake corrective measures, reducing the likelihood of adverse impacts by catching potential problems early. An analysis of fugitive dust mitigation measures was outside the scope of my testimony.

91. Have you evaluated what protections for workers proposed Part 845 requires?

<u>RESPONSE:</u> I have reviewed the proposed Part 845 (IEPA, 2020a). While Part 845.710 effectively accounts for many of the important elements associated with the closure

of an SI, there are additional factors, such as worker safety and cost, that should be explicitly identified as performance metrics for closure alternatives analyses. Both worker safety and cost are currently implicitly referenced in Part 845.710; however, to improve clarity, both of these important factors should be explicitly identified.

92. Are you familiar with low-sulfur diesel or diesel particulate filters?

<u>RESPONSE:</u> An analysis of low-sulfur diesel or diesel particulate filters was outside the scope of my testimony.

93. Do you know whether low-sulfur diesel or diesel particulate filters can be used in construction equipment, such as excavators? If so, can they? If your answer is no, please explain.

<u>RESPONSE:</u> An analysis of low-sulfur diesel or diesel particulate filters was outside the scope of my testimony.

94. Are you familiar with low-NOx engines?

a. If so, could low-NOx engines be used to reduce NOx emissions from construction equipment used for CCR removal? If your answer is no, please explain.

<u>RESPONSE:</u> The availability and/or use of equipment with low-NO_x engines was outside the scope of my testimony.

b. If so, could low-NOx engines be used to reduce NOx emissions from trucks transporting CCR onsite or offsite? If your answer is no, please explain.

<u>RESPONSE:</u>

The availability and/or use of equipment with low-NO_x engines was outside the scope of my testimony.

95. Have you evaluated whether electric equipment – including electric construction equipment or electric trucks – can be used in CCR removal?

<u>RESPONSE:</u> The use of electric equipment was outside the scope of my testimony.

96. Have you evaluated whether CCR can be transported by rail or barge, rather than truck?

<u>RESPONSE:</u> The use of different CCR transportation methods was outside the scope of my testimony. However, CCR transportation methods are site-specific considerations. I

am not aware of any SIs or landfills that cannot be accessed by truck, but I am aware of landfills and SIs that cannot be accessed by existing rail systems or barges.

97. Would evaluation of different coal ash transportation options, including but not limited to rail, barge, truck size, truck trips, number of days and hours truck trips are taking place, together with their climate impacts, assist Illinois EPA and the public in accounting for risks in evaluating closure and corrective action alternatives? Please provide the basis for your answer.

RESPONSE: **The use of different CCR transportation methods and the duration of their expected operation during an SI's closure are site-specific considerations. I am not aware of any SIs or landfills that cannot be accessed by truck, but I am aware of landfills and SIs that cannot be accessed by existing rail systems or barges.**

Vermilion

98. What is the basis for your assumption that 10 cubic yard trucks and 15 cubic yard trucks would be used in CCR removal at the Vermilion site? (p. 23)

RESPONSE: **I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to worker safety, the community, and the environment are typically much greater for CBR than for CIP. For the calculations I presented in my testimony, I assumed reasonable truck sizes of 10 and 15 cubic yards (Bittner, 2020).**

99. What is the basis for your assumption of 60 trucks making one round trip per day to transport ash from the site?

RESPONSE: **I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to worker safety, the community, and the environment are typically much greater for CBR than for CIP. For the calculations I presented in my testimony, I assumed a reasonable number of 60 roundtrip truck trips per day (Bittner, 2020).**

100. What is the basis for your assumption that removal would only occur during a 5-day work week?

<u>RESPONSE:</u> I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to worker safety, the community, and the environment are typically much greater for CBR than for CIP. For the calculations I presented in my testimony, I assumed a reasonable number of 5 work days per week (Bittner, 2020).

101. In your experience, does construction work at CCR impoundments sometimes take place on weekends?

<u>RESPONSE:</u> This is beyond the scope of my testimony. I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to worker safety, the community, and the environment are typically much greater for CBR than for CIP. For the calculations I presented in my testimony, I assumed a reasonable number of 5 work days per week (Bittner, 2020).

102. Have you evaluated other disposal options other than Republic Services Brickyard Disposal landfill in Batestown, Illinois, and Republic Services Illinois Landfill in Rossville, Illinois, for disposal of the CCR from the Vermilion site?

a. If so, what are they?

<u>RESPONSE:</u> I did not evaluate any disposal options for CCR from the Vermilion site; however, I did identify two nearby options. I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to worker safety, the community, and the environment are typically much greater for CBR than for CIP.

b. If not, why not?

<u>RESPONSE:</u> I did not evaluate any disposal options for CCR from the Vermilion site; however, I did identify two nearby options. I provided example calculations of requirements for CCR removal at the Vermilion site to illustrate how short-term risks to

worker safety, the community, and the environment are typically much greater for CBR than for CIP.

103. Have you reviewed the mandates for transporting CCR, including manifests and the transportation plan, under Part 845.740?

<u>RESPONSE:</u> I have reviewed the proposed Part 845 (IEPA, 2020a).

104. In addition to the mandates for transportation in proposed Part 845.740(c), do you have an opinion about additional protections that should be included to limit potential safety risks for communities?

<u>RESPONSE:</u> This is outside the scope of my testimony.

105. If there are multiple sources of CCR at a site, is it possible to determine from which source a given molecule of a CCR contaminant originated? If yes, please explain your answer.

<u>RESPONSE:</u> The contaminant transport modeling and calculations required as part of closure (IEPA, 2020a, Part 845.220(d)(3) and 845.710(d)(2)) are capable of evaluating contributions from multiple sources to determine whether observed downgradient impacts are a result of a release from a particular SI or are due to an upgradient contribution.

106. Do you agree that determining whether groundwater has been impacted by any source of pollution requires knowing the background concentrations of constituents in groundwater at the site that has not been affected by any source of contamination?

<u>RESPONSE:</u> The groundwater sampling and analysis requirements in Part 845.640 provide sufficient avenues for determining whether an SI is contributing to groundwater impacts even if elevated upgradient constituent concentrations are used as the background concentrations. As an example, Part 845.640(g)(6) states that any statistical method "must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data" (IEPA, 2020a), which could be used to control for increasing or decreasing background concentration trends attributable to a migrating upgradient plume.

107. Does manganese leach from CCR? If no, please provide the basis for your answer.

RESPONSE: **Leaching and transport behavior depend on site-specific conditions, including, but not limited to, CCR composition and hydrogeologic properties. The installation of a cap during CIP mitigates the amount of infiltration, significantly reducing the leaching volume. Manganese is typically not considered a risk-driving component of CCR, and its concentrations in fly ash and bottom ash are not typically elevated relative to background soil.**

108. Does iron leach from CCR? If no, please provide the basis for your answer.

RESPONSE: **Leaching and transport behavior depend on site-specific conditions, including, but not limited to, CCR composition and hydrogeologic properties. The installation of a cap during CIP mitigates the amount of infiltration, significantly reducing the leaching volume. Iron is typically not considered a risk-driving component of CCR, and its concentrations in fly ash and bottom ash are not typically elevated relative to background soil.**

109. Does vanadium leach from CCR? If no, please provide the basis for your answer.

RESPONSE: **Leaching and transport behavior depend on site-specific conditions, including, but not limited to, CCR composition and hydrogeologic properties. The installation of a cap during CIP mitigates the amount of infiltration, significantly reducing the leaching volume. Vanadium is typically not considered a risk-driving component of CCR, and its concentrations in fly ash and bottom ash are not typically elevated relative to background soil.**

110. Do caps over closed surface impoundments need to be maintained? Please explain your answer.

<u>RESPONSE:</u> Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-specific and can be evaluated as part of a closure alternatives analysis, consistent with Part 845.710.

111. If so, if that maintenance is not provided, how may that affect the functionality of the cap?

<u>RESPONSE:</u> Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-specific and can be evaluated as part of a closure alternatives analysis, consistent with Part 845.710.

112. Should caps over closed surface impoundments be inspected?

<u>RESPONSE:</u> An inspection or assessment provides an opportunity to identify issues and undertake corrective measures, reducing the likelihood of adverse impacts by catching potential problems early. Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-

specific and can be evaluated as part of a closure alternatives analysis, consistent with Part 845.710.

113. If so, if such inspections do not take place or take place too infrequently, how may that affect the functionality of the cap?

<u>RESPONSE:</u> An inspection or assessment provides an opportunity to identify issues and undertake corrective measures, reducing the likelihood of adverse impacts by catching potential problems early. Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-specific and can be evaluated as part of a closure alternatives analysis consistent with Part 845.710.

114. Can changes in environmental conditions – including but not limited to increased severity and frequency of storms or floods, or increased drought – affect the functionality of a cap? Please explain your answer.

<u>RESPONSE:</u> Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-specific and can be evaluated as part of a closure alternatives analysis, consistent with Part 845.710.

115. Would it be prudent to close an impoundment in place with a cap without anticipating the need for future maintenance and inspection of the cap to maintain its functionality?

<u>RESPONSE:</u> Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA,

2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected. The degree of cap maintenance required for an SI will be site-specific and can be evaluated as part of a closure alternatives analysis, consistent with Part 845.710.

116. Capped impoundments are expected to settle over time, correct?

RESPONSE: **It depends. There are many site-specific variables that affect whether capped impoundments are expected to settle over time. The potential for capped impoundments to settle over time can be considered in a site-specific closure alternatives analysis. Site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods, including at sites with the potential for settling. Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected.**

117. Are there circumstances in which CCR in an unlined impoundment can migrate below the original bottom elevation of the impoundment?

RESPONSE: **It depends. There are many site-specific variables that affect whether CCR in an unlined impoundment can migrate below the original bottom elevation of the impoundment. The potential for CCR in an unlined impoundment to migrate below the original bottom elevation of the impoundment can be considered in a site-specific closure alternatives analysis. Site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods.**

118. Does the elevation of the water table in Illinois vary seasonally?

__RESPONSE:__ **This is beyond the scope of my testimony; an evaluation of the seasonality of the water table in Illinois was not necessary for the development of my testimony.**

119. Have you studied changes in the water table underlying impoundments over time? If so, please explain your findings.

__RESPONSE:__ **This is beyond the scope of my testimony.**

120. Have you evaluated whether climate change has affected or is affecting the elevation of the groundwater table at CCR impoundments? If so, please explain your findings.

__RESPONSE:__ **This is beyond the scope of my testimony.**

121. In what circumstances could on-site consolidation of CCRs result in an increase of CCR constituent mass migrating to the underlying aquifer?

__RESPONSE:__ **On-site CCR consolidation in an existing SI that increases the height of the stored CCRs above the water table will not increase constituent migration to the underlying aquifer, because the downward hydraulic flux after consolidation would be controlled by the overlying impermeable cap. Consolidating CCRs into a single SI can result in a number of benefits if implemented properly and consistent with the requirements of Part 845.710 and 845.750 (IEPA, 2020a). In its recent proposed rule for Part B of the holistic approach to closure, US EPA provided an example of the benefits of consolidating CCRs at a site (US EPA, 2020).[14]**

122. If groundwater rises into consolidated ash, would the re-wetting of that ash raise the risk of CCR constituent leaching more than the wetting of clean fill?

__RESPONSE:__ **This depends on numerous site-specific characteristics. However, on-site CCR consolidation in an existing SI that increases the height of the stored CCRs above the water table will not increase constituent migration to the underlying aquifer, because the**

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[14] US EPA. 2020. "Hazardous and solid waste management system: Disposal of CCR; A holistic approach to closure Part B: Alternate demonstration for unlined surface impoundments; Implementation of closure (Proposed rule)." ***Fed. Reg.*** **85(42):12456-12478. 40 CFR 257, March 3.**

downward hydraulic flux after consolidation would be controlled by the overlying impermeable cap.

123. By using CCR instead of clean soil to fill the impoundment for purposes of covering it, would you expose a greater area and volume of CCR to precipitation than if soil were placed over drained CCR? If not, please explain your answer.

RESPONSE: **This depends on numerous site-specific characteristics. However, on-site CCR consolidation in an existing SI that increases the height of the stored CCRs above the water table will not increase constituent migration to the underlying aquifer, because the downward hydraulic flux after consolidation would be controlled by the overlying impermeable cap.**

124. Is uncovered, exposed CCR more likely to create fugitive CCR dust than CCR covered by clean soil? If not, please explain your answer.

RESPONSE: **The creation of fugitive dust depends on several factors. A detailed analysis of these factors was outside the scope of my testimony.**

125. Should any CCR impoundment be permitted, in your opinion, to receive additional CCR?

a. If not, in what circumstances should a CCR surface impoundment not be permitted to receive more CCR?

RESPONSE: **Consolidating CCRs into a single SI can result in a number of benefits if implemented properly and consistent with the requirements of Part 845.710 and 845.750 (IEPA, 2020a). The recent proposed rule for Part B of the holistic approach to closure (US EPA, 2020) cites the benefits of CCR consolidation, including a reduced footprint where CCRs are located at a site, the elimination of long-term threats to groundwater and surface water from CCR SIs serving as the source of the consolidated CCRs, and the ability to allow owners and operators to focus "long-term monitoring, care and cleanup obligations on a single unit rather than multiple units" (US EPA, 2020, p. 12463). US EPA provided an example of the benefits of consolidating CCRs at a site (US EPA, 2020):**

> **Consolidating multiple units into a single unit would result in an overall smaller CCR unit footprint. Closing two 10-acre impoundments by removal of CCR and using the removed CCR for the purpose of achieving subgrade elevations necessary to support the closure and final cover system of a third 35-acre CCR unit is an example of consolidation resulting in a smaller CCR disposal footprint. One environmental benefit of this closure scenario would be the elimination of any long-term threat of impact to groundwater and surface water from 20 acres of land (two 10-acre units) as well as concerns about the long-term performance of a final cover system had these units been closed alternatively with CCR in place. In addition, upon closure of the two 10-acre impoundments, a total of 20 acres of land would become available for other uses. Finally, there may be benefits to allowing an owner or operator to focus their long-term monitoring, care and cleanup obligations on a single unit rather than multiple units. (US EPA, 2020)**

In order to allow for the benefits of consolidating CCRs to be realized, Part 845.750 (IEPA, 2020a) should allow for the consolidation of CCRs from multiple SIs into a single SI, which can then be closed by CIP.

126. Would it be a lesser burden on an operator to move CCR to safe, lined landfill or other safe location once, than to run the risk of needing to move the CCR twice if it is determined that CCR must be removed from the impoundment into which it is placed?

<u>RESPONSE:</u> **In the Federal CCR Rule, US EPA notes, having specified CIP and CBR as the two methods by which CCR SIs may close (US EPA, 2015, p. 21305), that "both methods of closure… can be equally protective, provided they are conducted properly" (US EPA, 2015, p. 21412). If CIP were determined not to be protective of human health and the environment for a particular SI, it would not be eligible for selection as the closure alternative for the impoundment. Further, any selected closure alternative can be supplemented with additional source control and corrective action measures in order to be protective of human health and the environment. The performance standards in Part 845.710 (IEPA, 2020a) are sufficient for evaluating the ability of a closure alternative to meet protectiveness requirements at all SIs.**

127. On page 29 of your testimony, you state that "consolidation of CCRs will not increase the addition of CCR constituent mass to the aquifer." Does this statement assume a fully functioning cap that has not deteriorated? Please explain your answer.

RESPONSE: Because consolidating CCRs into a single SI does not affect either the hydraulic flux through the SI to the underlying groundwater or the constituent concentrations in the CCR leachate, the mass flux of CCR constituents to the aquifer is also not affected by the consolidation of CCRs.

128. On page 30, n. 8 of your testimony, you state that "[i]f the consolidated CCRs were generated by the combustion of coal sourced from a different location or is a different type of CCR (i.e., bottom ash, fly ash, or flue-gas desulfurization waste) compared to the original impoundment CCRs, there may be differences in the associated leachate concentrations." What factors may affect the difference in leachate concentrations from different types of CCRs or CCR from different coals?

RESPONSE: It depends. Leachate chemistry is dependent on a variety of site-specific factors, including, but not limited to, the source of the coal from which the stored CCRs were derived, the type of CCRs being stored, the geochemical environment at the site, and the operating and engineering characteristics of the SI.

129. Could the mingling of coal ash from one impoundment with coal ash of a different type, or with different properties, from a separate impoundment accelerate leaching through both the original and consolidated ash? Please provide the basis for your answer.

RESPONSE: I do not expect that the addition of consolidated ash would have a measurable effect on groundwater impacts due to the significantly reduced rate of leachate leaving the SI. Once a cap has been constructed over a CCR SI, the hydraulic flux, and the resulting CCR constituent mass flux to the aquifer, is controlled by the impermeable cap and, in the case of an SI constructed with intersecting groundwater conditions, the depth of groundwater intersection and hydrogeology. Increasing the vertical height of CCRs stored in the SI above the groundwater table will not increase the amount of water infiltrating from the SI to the underlying groundwater. Consequently, consolidating CCRs into a single SI will not affect the post-closure hydraulic flux that migrates through an SI into the underlying

groundwater. Consolidating CCRs from SIs at the same site above the water table does not affect the ability of a cap that meets the requirements of Part 845.750 to be constructed and can be protective of human health and the environment, consistent with the requirements of Part 845.710 (IEPA, 2020a).

130. On page 30, n. 8 of your testimony, you state that you "expect that in most cases, the chemical differences between the consolidated CCRs and the original impounded CCRs to be minimal, because… the CCRs must have been generated at the same facility and are, thus, likely reflective of the same coal sources and the same types of CCRs." Is CCR generated at the same facility always from the same coal sources? If so, please provide the basis for your answer.

a. Have you done any research into whether Illinois coal plants sourced their coal from different locations, with different types of coal, over the many years they have been operating? If so, please explain your findings.

RESPONSE: This is outside the scope of my testimony.

131. Does CCR disposed of in different impoundments at a site always contain the same type of CCR? If so, please provide the basis for your answer.

a. Have you done any research into whether Illinois coal plants disposed of, or dispose of, different types of CCR (fly ash versus bottom ash, for example) in different impoundments? If so, please describe that research and your findings.

RESPONSE: This is outside the scope of my testimony.

132. Could concentrations of CCR pollutants in groundwater underlying or adjacent to an impoundment meet groundwater protection standards while active remediation, such as pump and treat or maintenance of certain groundwater gradients, is ongoing, but then exceed those standards after active remediation has ceased? Please explain your answer.

RESPONSE: Under the proposed Part 845.780, "Upon the completion of the post-closure care period, the owner or operator of the CCR surface impoundment must submit a request to the Agency to terminate postclosure care" (IEPA, 2020a), and the Agency will be able to evaluate whether additional post-closure care is necessary.

133. Could concentrations of CCR pollutants in groundwater underlying or adjacent to an impoundment meet groundwater protection standards while a cap is maintained and in good condition, but exceed groundwater standards if the cap degrades and allows increased precipitation to filter down into the CCR? Please explain your answer.

<u>RESPONSE:</u> The potential for cap deterioration to affect CCR constituent leaching is a consideration at every landfill and SI in the country. Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected.

134. Could concentrations of CCR pollutants meet groundwater standards while a cap is intact but exceed groundwater standards if the cap is disturbed by an earthquake or flood? Please explain your answer.

<u>RESPONSE:</u> This is outside the scope of my testimony. However, Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected.

135. Could concentrations of CCR pollutants meet groundwater standards for a period and then exceed groundwater standards after a disturbance to the subsurface, such as nearby blasting or fracturing? Please explain your answer.

<u>RESPONSE:</u> This is outside the scope of my testimony. However, Part 845.780 ("Post-Closure Care Requirements") states that the integrity and effectiveness of the final cover system for a CCR SI must be maintained (IEPA, 2020a). This stipulation ensures that the cap will perform as intended, and that any potential degradation in cap performance as a result of settlement, subsidence, erosion, or other damage will be corrected.

136. Are there other circumstances in which concentrations of CCR pollutants could meet groundwater protection standards for a certain period but then exceed them? Please explain your answer.

<u>RESPONSE:</u> The potential for temporal variation in groundwater concentrations is dependent on a number of site-specific factors, including, but not limited to, hydrogeological conditions at the site, SI construction details, leachate quality, and the size and flowrate of

nearby surface waters. This variation may not cause unacceptable risks to downgradient human and ecological receptors. Because of this, site-specific evaluations should be conducted at all sites, consistent with the standards in Part 845.710 (IEPA, 2020a), to determine appropriate closure methods.

CERTIFICATE OF SERVICE

I, the undersigned, certify that on this 24th day of September, 2020, I have electronically served the attached **Prefiled Responses of Andrew Bittner**, upon all parties on the attached service list. I further certify that my email address is rgranholm@schiffhardin.com; the number of pages in the email transmission is 54; and the email transmission took place today before 5:00 p.m.

/s/ Ryan Granholm
Ryan Granholm

SCHIFF HARDIN LLP
Joshua R. More
Stephen J. Bonebrake
Ryan C. Granholm
233 South Wacker Drive
Suite 7100
Chicago, Illinois 60606
312-258-5500

GIBSON, DUNN & CRUTCHER LLP
Michael L. Raiff
2001 Ross Avenue, Suite 2100
Dallas, TX 75201-6912
(214) 698-3350
mraiff@gibsondunn.com

Attorneys for Dynegy

SERVICE LIST	
Vanessa Horton, Hearing Officer Vanessa.Horton@illinois.gov Don Brown, Clerk of the Board Don.brown@illinois.gov Illinois Pollution Control Board James R. Thompson Center Suite 11-500 100 West Randolph Chicago, Illinois 60601	Stephanie N. Diers Stefanie.Diers@illinois.gov Christine M. Zeivel Christine.Zeivel@illinois.gov Illinois Environmental Protection Agency 1021 N. Grand Ave., East, P.O. Box 19276 Springfield, Illinois 62794-9276
Virginia I. Yang - Deputy Counsel virginia.yang@illinois.gov Nick San Diego - Staff Attorney nick.sandiego@illinois.gov Robert G. Mool bob.mool@illinois.gov Paul Mauer - Senior Dam Safety Eng. Paul.Mauer@illinois.gov Renee Snow - General Counsel renee.snow@illinois.gov Illinois Department of Natural Resources One Natural Resources Way Springfield, IL 62702-1271	Matthew J. Dunn mdunn@atg.state.il.us Stephen Sylvester ssylvester@atg.state.il.us Andrew Armstrong aarmstrong@atg.state.il.us Kathryn A. Pamenter KPamenter@atg.state.il.us 69 West Washington Street, Suite 1800 Chicago, IL 60602
Deborah Williams Deborah.Williams@cwlp.com City of Springfield Office of Utilities 800 E. Monroe, 4th Floor Municipal Building East Springfield, IL 62757-0001	Kim Knowles Kknowles@prairierivers.org Andrew Rehn Arehn@prairierivers.org 1902 Fox Dr., Ste. 6 Champaign, IL 61820
Jennifer Cassel jcassel@earthjustice.org Thomas Cmar tcmar@earthjustice.org Mychal Ozaeta mozaeta@earthjustice.org Melissa Legge mlegge@earthjustice.org Earthjustice 311 South Wacker Drive, Suite 1400 Chicago, IL 60606	Jeffrey Hammons JHammons@elpc.org Kiana Courtney KCourtney@elpc.org Environmental Law & Policy Center 35 E. Wacker Dr., Suite 1600 Chicago, Illinois 60601

Faith Bugel fbugel@gmail.com 1004 Mohawk Wilmette, IL 60091	Michael Smallwood Msmallwood@ameren.com Ameren 1901 Choteau Ave. St. Louis, MO 63103
Mark A. Bilut Mbilut@mwe.com McDermott, Will & Emery 227 W. Monroe Street Chicago, IL 60606-5096	Abel Russ aruss@environmentalintegrity.org Environmental Integrity Project 1000 Vermont, Ave NW, Ste. 1100 Washington, DC 20005
Susan M. Franzetti Sf@nijmanfranzetti.com Kristen Laughridge Gale kg@nijmanfranzetti.com Vincent R. Angermeier va@nijmanfranzetti.com Nijman Franzetti LLP 10 S. Lasalle St., Ste. 3600 Chicago, IL 60603	Alec M Davis adavis@ierg.org Kelly Thompson kthompson@ierg.org Illinois Environmental Regulatory Group 215 E. Adams St. Springfield, IL 62701
Jennifer M. Martin Jennifer.martin@heplerbroom.com Melissa Brown Melissa.brown@heplerbroom.com Heplerbroom, LLC 4340 Acer Grove Drive Springfield, Illinois 62711	Cynthia Skrukrud Cynthia.Skrukrud@sierraclub.org Jack Darin Jack.Darin@sierraclub.org Christine Nannicelli christine.nannicelli@sierraclub.org Sierra Club 70 E. Lake Street, Ste. 1500 Chicago, IL 60601-7447
Alisha Anker aanker@ppi.coop Prairie Power Inc. 3130 Pleasant Runn Springfield, IL 62711	Walter Stone Water.stone@nrgenergy.com NRG Energy, Inc. 8301 Professional Place, Suite 230 Landover, MD 20785
Keith Harley kharley@kentlaw.iit.edu Daryl Grable dgrable@clclaw.org Chicago Legal Clinic, Inc. 211 W. Wacker Dr. Ste. 750 Chicago, IL 60606	Chris Newman newman.christopherm@epa.gov Jessica Schumacher Schumacher.Jessica@epa.gov U.S. EPA, Region 5 77 West Jackson Blvd. Chicago, IL 60604-3590

Claire Manning cmanning@bhslaw.com Anthony Shuering aschuering@bhslaw.com Brown, Hay & Stephens, LLP 205 S. Fifth Street, Suite 1000 P.O. Box 2459 Springfield, IL 62705-2459	