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Submitted to
Southern Indiana
Gas & Electric Company
(SIGECO)
One Vectren Square
Evansville, IN 47708

Submitted by
AECOM
525 Vine Street, Suite 1800
Cincinnati, Ohio 45202

November 5, 2020

Request for Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment

Development of Alternative Capacity is Technically Infeasible Demonstration (40 CFR § 257.103(f)(1)) for the Ash Pond at the A.B. Brown Generating Station

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Acronyms

A.B. Brown	A.B. Brown Generating Station
Acre-ft	Acre-feet
ARO	After receipt of order
CCGT	Combined Cycle Gas Turbine
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CPCN	Certificate of Public Convenience and Necessity
CT	Combustion Turbine
EPA	United States Environmental Protection Agency
FGD	Flue Gas Desulfurization
GAs	General Arrangements
gpm	Gallons per minute
GWPS	Groundwater Protection Standards
H:V	Horizontal: Vertical
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IFC	Issue for Construction
IRP	Integrated Resource Plan
IURC	Indiana Utility Regulatory Commission
MCC	Motor control centers
MGD	Million gallons per day
MM	Million
MSL	Mean Sea Level
MW	Megawatt
NPDES	National Pollution Discharge Elimination System
PD	Pressure discharge
PDC	Power distribution centers
P&IDs	Piping and Instrument Diagrams
PLCs	Programmable Logic Controllers
POTW	Publicly Owned Treatment Works
RFP	Request for Proposal
SCC	Submerged scrapper conveyor

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SIGECO	Southern Indiana Gas and Electrical Company
SSLs	Statistically Significant Levels
TSS	Total Suspended Solids
USWAG	Utilities Solid Waste Activities Group
Westside WWTP	Westside Wastewater Treatment Plant
WWTF	Wastewater Treatment Facility
ZLD	Zero-Liquid discharge

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1 Executive Summary

Southern Indiana Gas and Electric Company (SIGECO) owns and operates the A.B. Brown Generating Station (A.B. Brown) surface impoundment (Ash Pond). The Ash Pond is a currently operating surface impoundment that is planning for closure in accordance with the requirements of the United States Environmental Protection Agency's (EPA) Final Coal Combustion Residuals (CCR) Rule (40 Code of Federal Regulations (CFR) 257, Subpart D or Federal CCR Rule). The Ash Pond will be closed by removal, with the majority of CCR materials being recycled for beneficial use within the cement kiln industry[1] (a portion of material will not conform to cement kiln specifications and will be subject to disposal in an onsite landfill). The CCR Rule (following the Part A updates) requires SIGECO to cease placing CCR and non-CCR wastestreams into the Ash Pond as soon as technically feasible, but no later than April 11, 2021 or seek appropriate extensions under 40 CFR § 257.103 to continue operating. As described in this document, SIGECO is requesting an extension of the April 11, 2021 "cease flow" deadline for operation of the Ash Pond until October 15, 2023.

SIGECO is subject to a regulatory process required under rules promulgated by the Indiana Utility Regulatory Commission (IURC), called Integrated Resource Planning, which requires periodic evaluation and definition of its future generation portfolio, including continued operations of A.B. Brown. This process involved significant planning and evaluation, including a series of public stakeholder meetings held in 2019 and 2020 culminating in the June 2020 update of SIGECO's Integrated Resource Plan (IRP). The most recent IRP concluded with a preferred portfolio that retires coal-generation assets (Unit 1 and 2) at A.B. Brown, and replaces the A.B. Brown units with a mix of renewable energy sources and two new simple-cycle gas turbines that are anticipated to be constructed and located at A.B. Brown. Throughout this regulatory planning process, SIGECO has been actively working on identifying alternative capacity for management of its CCR and non-CCR wastestreams. However, the recent decision to retire coal-generation assets at A.B. Brown has affected this strategy. Nevertheless, plans have been adjusted to match the current scenario and a preferred alternative for future flow management has been selected.

For continued operation of the Ash Pond beyond April 11, 2021, two extension mechanisms are available under the final Part A: (1) *Development of Alternative Capacity is Technically Infeasible* (40 CFR § 257.103(f)(1)) or (2) *Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain* (40 CFR § 257.103(f)(2)). SIGECO has prepared this document to demonstrate that obtaining alternative capacity for the CCR and non-CCR flows at the A.B. Brown Ash Pond is infeasible before the April 11, 2021 deadline. This extension mechanism has been selected in lieu of the "*boiler cessation*" alternative due to the regulatory criteria within the "*boiler cessation*" alternative that requires that closure also be completed by October 17, 2028 (for units greater than 40 acres). This closure completion date is not attainable due to the closure method selected (closure by removal for beneficial use[2]) and production limitations by the end user. For this reason, the "*Development of Alternative Capacity is Technically Infeasible*" extension mechanism has been selected.

As discussed in this document, six flow management alternatives were identified and evaluated based on feasibility and schedule. Following evaluation of these alternatives in consideration of the decision to retire the coal-fired boilers at A.B. Brown, SIGECO has decided to construct a new lined pond for alternative capacity to allow the cessation of non-CCR flows to the Ash Pond (CCR flows to the Ash Pond will cease on or before October 15, 2023). Conceptual engineering and design of the new pond (and associated flow redirection) has been initiated, and the project schedule is expected to be 40 months from start to finish (beginning June 2020 after issuance of IRP report). Based on the considerations provided within this report, SIGECO is requesting approval of extension of Ash Pond

[1] It should be noted that the majority of fly ash generated by SIGECO's coal-fired generating facilities is currently recycled for beneficial reuse within the cement kiln industry.

[2] Capital investments necessary to complete the beneficial reuse and closure project were approved by the IURC on May 13, 2020. Moreover, as necessitated by the beneficial reuse pond closure project, current loading of dry fly generated at the Brown units will be handled by a new loading silo being constructed by SIGECO in an adjacent county.

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operations until October 15, 2023 to allow for use of the Ash Pond during the remaining life of the coal-fired boilers and until alternative capacity for non-CCR flows can be operational.

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2 Demonstration Purpose and Objectives

This document has been prepared in accordance with the requirements 40 CFR § 257.103(f)(1) to demonstrate that obtaining alternative capacity for the CCR and non-CCR flows at the SIGECO A.B. Brown Ash Pond is infeasible before the April 11, 2021 "cease receipt" deadline provided in 40 CFR § 257.101(a)(1). Accordingly, SIGECO is respectfully requesting an extension to the deadline for Ash Pond operations pursuant to the *Development of Alternative Capacity is Technically Infeasible* criteria under 40 CFR § 257.103(f)(1). This document provides the requested information to support this demonstration.

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3 Organization of the Demonstration

For ease of review and verification of completeness, this demonstration has been structured consistent with the specific requirements and criteria under 40 CFR § 257.103(f)(1)(iv). The document structure and contents of each section are as follows:

Section 1 – Executive Summary – The section provides an overview of the document.

Section 2 - Demonstration Purpose and Objectives – The section provides a brief discussion of the document purpose.

Section 3 – Organization of the Demonstration – This section provides a discussion of the document outline and organization, indicating where the various regulatory criteria are addressed.

Section 4 – Facility and CCR Unit Background and Description – This section provides background information associated with the generation station, its current operating scenario, and the CCR unit.

Section 5 – Work Plan for Alternative Capacity – This section addresses the requirements for a work plan described in 40 CFR § 257.103(f)(1)(iv)(A), and includes the following key subsections:

- **Section 5.1 – Evaluation of On-site and Off-site Options for Alternative Capacity –** This section provides a detailed Work Plan for obtaining Alternative Capacity consisting of a narrative discussion of options considered, technical infeasibility demonstrations, and a justification of the option selected (40 CFR § 257.103(f)(1)(iv)(A)(1)).

- **Section 5.2 – Detailed Schedule and Narrative Discussion** – This section provides a detailed schedule of the fastest technically feasible time to complete the measures necessary and a narrative discussion describing the schedule and timeline considerations (40 CFR § 257.103(f)(1)(iv)(A)(2 and 3)).

- **Section 5.3 – Progress Toward Alternative Capacity** - This provides a narrative discussion of the progress made to obtain alternative capacity thus far (40 CFR § 257.103(f)(1)(iv)(A)(4)).

Section 6 – Compliance Certification and Additional Information – This section provides a signed certification that the facility is operating in compliance with this subpart and a narrative summary of the requested hydrogeologic and other information (40 CFR § 257.103(f)(1)(iv)(B)).

The recent "A Holistic Approach to Closure Part A: Deadline to Initiate Closure" (Part A) revision to the Federal CCR Rule requires that demonstrations be submitted to EPA for approval no later than November 30, 2020. Following the submission of this demonstration, SIGECO will place a Notice of Intent to apply for a site-specific alternative to initiation of closure due to development of alternative capacity infeasible into its operating record and onto the company's CCR Compliance website (https://www.vectren.com/reporting/ccr) as required by 40 CFR 257.105(i)(14) and 40 CFR 257.106(i)(14), respectively.

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4 Facility and CCR Unit Background and Description

A discussion of the facility, operational scenario, and CCR unit background is provided in the following sections.

4.1 Facility Description and Future Operations

SIGECO owns and operates the A.B. Brown located at 8511 Welborn Road near Evansville, Indiana (see attached **Figure 1**). The coal-fired power plant is located approximately 10 miles east of Mount Vernon in Posey County, Indiana. SIGECO currently operates two coal burning units (245 megawatt (MW) each) at A.B. Brown. The units were placed in service in 1979 (Unit 1) and 1986 (Unit 2). Over the past several years, significant consideration and evaluation has been given to the future of coal-fired generation at A.B. Brown and SIGECO's forward-looking generation portfolio. This process was initiated after an application for a Certificate of Public Convenience and Necessity (CPCN) was denied by the Indiana Utility Regulatory Commission (IURC) based on feedback received from the IURC. A copy of order (Cause No. 45052) is provided in **Appendix A**. To this end, SIGECO has been involved in a regulatory process involving an update of the IRP, which was recently finalized in June 2020 after an effort of significant modelling and a series of public stakeholder meetings. With evaluation of options and input from stakeholder groups culminating in the June 2020 update of the IRP, it is SIGECO's intention to pursue retirement of the coal-fired generation assets at A.B. Brown in October 2023. As discussed in the June 2020 IRP report, this generating capacity is expected to be replaced with a mix of generation sources including two new simple-cycle Combustion Turbine (CT) gas units, new solar generation, and wind generation.

The process to reach this critical decision (as documented in the IRP and discussed in this demonstration) has taken considerable effort over the last several years, making this demonstration somewhat unique as compared to the considerations for other facilities as many of the future plant water management decisions have been tied to outcomes and resolutions regarding future generation at A.B. Brown. As such, this process and the corresponding technical considerations and schedule interactions have been referenced and discussed throughout this demonstration, as appropriate.

4.2 CCR Unit Description

A.B. Brown operates an unlined CCR surface impoundment which is referred to as the Ash Pond (see attached **Figure 2**). The Ash Pond was commissioned in 1978 and currently receives and manages bottom ash and fly ash transport water flows, scrubber and truck bay wash waters, as well as non-CCR flows including the Capital Pond discharge, treated sanitary wastewater, plant floor drains, coal pile runoff and stormwater. Under normal operations, solids are settled within the unit and treated water is returned to the plant for use in the process. A portion of the discharge, when discharge is necessary for purposes of maintaining the pond operating level, is also treated through a second-stage wastewater mercury treatment system, then through a lined settling pond, and ultimately discharged through Outfall 001. Under high rainfall scenarios occurring on an infrequent basis, treated emergency overflow water is discharged through Outfall 004 under the provisions of the facility's National Pollutant Discharge Elimination System (NPDES) permit. It is worth noting that as a result of active water management and weather forecast monitoring, discharge through Outfall 004 has not occurred since February 2018.

The Ash Pond comprises a surface area of approximately 164 acres and is considered a "valley fill" unit as an earthen dam was originally constructed to form the unit. In 2003, a second dam was constructed east of the original dam and further up the valley to increase storage capacity. This temporarily created an upper pond and lower pond. The upper and lower ponds were operated separately until 2016 when the upper dam was decommissioned. An approximately 10-foot wide breach was installed in the upper embankment and the normal pool elevation was

lowered. Currently, the upper pool and the lower pool hydraulically act as one unit. The Ash Pond is estimated to contain approximately 5.9 million cubic yards of CCR materials.

Following promulgation of the Federal CCR Rule, SIGECO began working with consultants (AECOM and Haley & Aldrich) to evaluate the Ash Pond's compliance with the new Federal CCR Rule requirements. Following construction of an earthen buttress in 2016, the Ash Pond was certified to be compliant with Federal CCR Rule stability and safety factor criteria. The Ash Pond is also compliant with the wetlands, fault area, seismic impact zone, and unstable area location restrictions. However, the Ash Pond did not achieve the uppermost aquifer separation criteria. In addition, groundwater monitoring results associated with the Ash Pond indicate statistically significant levels (SSLs) of molybdenum and lithium above Groundwater Protection Standards (GWPS). Given that the unit is unlined, the Ash Pond is required to cease CCR and non-CCR flows by April 11, 2021 (under the provisions of the recently effective Part A) and either initiate closure or seek appropriate extensions for continued short-term operation.

Following extensive planning, analysis of alternatives and efforts to determine and finalize arrangements for beneficial use of the ponded CCR material, the decision has been made to close the Ash Pond by removal and recycle the majority of the CCR in a cement kiln (a portion of material will not achieve cement kiln specification and will require disposal in an onsite landfill). It should be noted that the majority of fly ash generated by SIGECO's coal-fired generating facilities is currently recycled for beneficial reuse within the cement kiln industry. This closure process will involve excavation and beneficial reuse of the majority of CCR materials from the Ash Pond and has been met with agency and public support due to its environmental benefit. Planning and engineering are currently underway to facilitate this project, with excavation activities planning to commence in the upper portions of the Ash Pond in 2021. Capital investments necessary to complete the beneficial reuse and closure project were approved by the IURC on May 13, 2020 (Cause No. 45280, provided in **Appendix B**). Moreover, as necessitated by the beneficial reuse pond closure project, current loading of dry fly generated at the Brown units will be handled by a new loading silo being constructed by SIGECO in an adjacent county. However, in order to continue to manage CCR and non-CCR flows until coal-fired boiler retirement, the lower portions of the Ash Pond will need to continue to operate until October 2023 because no alternative capacity exists, either on-site or off-site, and it is infeasible to obtain alternative capacity prior to the April 11, 2021 "cease flow" deadline and the expected October 2023 plant retirement (as discussed in this demonstration). At this time of coal-fired boiler retirement, the pond will cease flows and formally initiate the closure process under the Federal CCR Rule.

4.3 Extension Mechanism Selection

As indicated above, the Ash Pond will operate until October 2023 (until coal-fired boiler retirement) for continued management of CCR and non-CCR flows because no alternative capacity currently exists (either on or off-site) and it is infeasible to obtain alternative capacity prior to the April 11, 2021 "cease flow" deadline and the expected October 2023 plant retirement. For continued operation of the Ash Pond beyond April 11, 2021, two extension mechanisms are available under the final Part A: (1) *Development of Alternative Capacity is Technically Infeasible* (40 CFR § 257.103(f)(1)) or (2) *Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain* (40 CFR § 257.103(f)(2)). Key considerations for each of these provisions and the basis for extension selection are outlined below.

1) *Development of Alternative Capacity is Technically Infeasible*: Under this provision, Owner/Operators are required to demonstrate to EPA that no alternative capacity currently exists (either on or off-site) and that obtaining alternative capacity prior to April 11, 2021 is infeasible. Therefore, additional time is needed to secure this alternative capacity. In summary, the demonstration must provide information and technical justification that no alternative capacity exists on-site or off-site, must provide a detailed workplan and schedule that includes technical and narrative discussions of how A.B. Brown will obtain alternative capacity as soon as technically feasible. Following public comment and EPA approval, this provision may allow for an operational extension up to October 15th, 2023 (for non-eligible unlined CCR surface impoundments) or October 15th, 2024 (for eligible unlined CCR surface impoundments). Under the provisions of Part A, the A.B. Brown Ash Pond is a non-eligible unlined CCR surface impoundment.

2) *Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain*: Under this provision, a CCR unit may continue to receive flows in the event it also commits to coal-fired boiler retirement. As discussed in Part A, the facility must commit to coal-fired boiler retirement and cease flows/complete CCR unit closure by October 17th, 2028 (for units over 40 acres). While in typical cases this would be the default demonstration mechanism for the scenario at the A.B. Brown Generation Station, this extension mechanism is not a viable option in this scenario due to the timetables required to complete closure. As mentioned previously, closure of the Ash Pond will be performed by excavation of the contents and recycling of the majority of the CCR material within a cement kiln. This process is limited by the production needs and feedstock consumption rates of the end-user. Based on these production constraints, it is estimated to take approximately 12 years to complete closure of the Ash Pond. While SIGECO intends to cease boiler operations, this option is not available to us because we will not be able to complete full closure of the ash pond by December 2028 due to the nature of the beneficial reuse and closure plan. SIGECO will commence activities and capital investment necessary to beneficially reuse the ponded material starting in 2021. However, because the Ash Pond recycling and closure activities cannot be completed by October 17, 2028, the unit is not eligible for the *Permanent Cessation of a Coal-Fired Boiler by a Date Certain* extension under 40 CFR § 257.103(f)(2) even though it is SIGECO's intention to cease burning coal at its generating units.

Based on the considerations above, SIGECO has prepared this extension based on the requirements for the *Development of Alternative Capacity is Technically Infeasible* extension provision of Part A. As discussed throughout this demonstration, this selection meets the following criteria for *Development of Alternative Capacity is Technical Infeasible* as referenced in 40 CFR § 257.103(f)(1):

- No alternative disposal capacity is available on or off-site (40 CFR § 257.103(f)(1)(i))
- CCR and non-CCR waste streams must continue to be managed in the CCR surface impoundment because it is technically infeasible to complete the measures necessary to obtain alternative disposal capacity either on or off-site of the facility by April 11, 2020 (40 CFR § 257.103(f)(1)(ii)).

The basis and technical justification for this demonstration is provided in the following sections.

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5 Work Plan for Alternative Capacity (40 CFR § 257.103(f)(1)(iv)(A)(1))

The Part A demonstration criteria presented in 40 CFR § 257.103(f)(1)(iv)(A)(1) requires a written narrative discussing the options considered both on and off-site to obtain alternative capacity for each CCR and/or non-CCR waste stream, the technical infeasibility of obtaining alternative capacity prior to April 11, 2021, and the option selection and justification for the alternative capacity selected. While A.B. Brown has been actively and aggressively pursuing alternative capacity since the Utility Solid Waste Activities Group (USWAG) decision in August 2018, much of this effort has been associated with the evaluation of future energy generation mix associated with the two most recent IRP cycles leading to the recent study result to retire coal-fired boilers at the site. As this decision has a direct impact on the nature, characteristics, and magnitude of the flows to be managed, detailed evaluation and final engineering was not possible to be commenced prior to completion of the IRP process required by the State of Indiana. Thus, the requirement to complete the IRP process prior to expending further capital investment at the Brown facility did not provide sufficient time for SIGECO to obtain alternate capacity for CCR and non-CCR waste streams. Ultimately, the IRP planning process resulted in a recommendation to retire the Brown coal-fired units, which is currently being evaluated by IURC. This process and the options considered are further discussed in the following sections.

5.1 Evaluation of On-site and Off-site Options for Alternative Capacity

As currently operating, the Ash Pond receives an average of approximately 8.8 million gallons per day (MGD) of influent from various plant sources. The flows to the Ash Pond are generally comingled, and the flowrates of the primary streams are listed in **Table 1**.

Table 1. Ash Pond Inflows

CCR Flows			
Source	**MGD**	**Current management**	**Future management**
Bottom Ash Transport Water	0.316	Ash Pond	No production
Fly Ash Transport Water	6.02	Ash Pond	No production
Treated Flue Gas Desulfurization (FGD) Wastewater [4]	0.622	Ash Pond	No production
Non-CCR Flows			
Source	**MGD**	**Current management**	**Future management**
Stormwater Runoff[1]	0.675	Ash Pond	New Lined Pond
Landfill Runoff and Leachate[2]	0.048	Wastewater treatment	New Lined Pond
Coal Pile Runoff Pond[2]	1.137	Ash Pond	New Lined Pond
Total[3]	**8.818**		

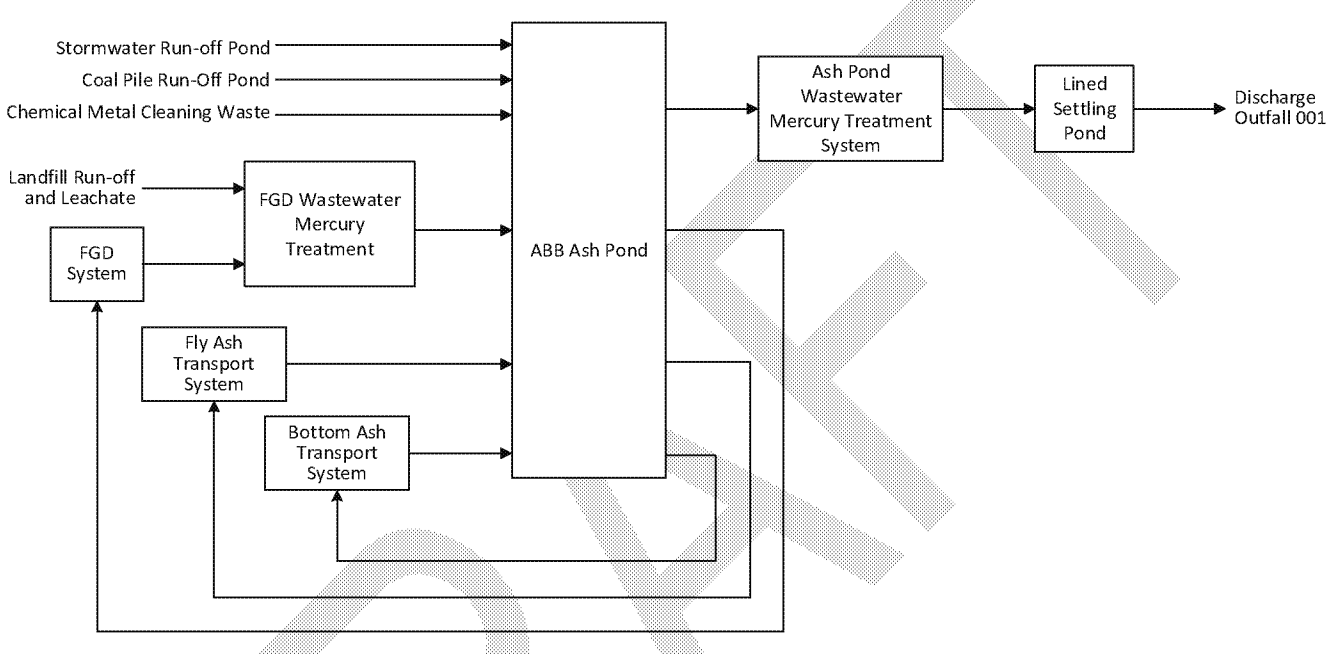
Notes:
1. Plant Wastewater and treated sanitary wastewater included in Coal Pile Run-Off Pond. A portion of this will be discontinued, but the remainder will need to be routed to the new lined pond
2. Landfill Runoff and Leachate will continue to be processed in the Wastewater Mercury Treatment System prior to discharging to the new lined pond.
3. Chemical Metal Cleaning Waste not accounted for, occurs for 2 days every 6 to 7 years for average flow rate of 0.045 MGD

4. FGD Wastewater (CCR flow) is currently treated in the Wastewater Mercury Treatment System with the Landfill Runoff and Leachate (non-CCR flow) prior to discharging to the East Ash Pond.

Most of the flow into the Ash Pond is recycled back to the plant for use by either the fly ash handling, bottom ash handling system or FGD system. However, a portion of the flow is treated by the Ash Pond Wastewater Mercury Treatment System, conveyed to a smaller lined settling pond, and discharged through Outfall 001 in accordance with the facilities NPDES permit system.

A block flow diagram of the current flows to and from the Ash Pond is shown in **Figure 3**.

Figure 3. Flow Diagram of Current Flows to/from Ash Pond



As mentioned previously, the Ash Pond is unlined and thus will require closure. As discussed in this demonstration, closure of the Ash Pond will begin with the planned retirement of coal-fired Units 1 and 2 and their concurrent replacement by wind and solar sources. The proposed plan as discussed in the recently issued IRP also includes construction of two (2) simple-cycle gas turbines with a currently proposed in-service date in 2024.

Both closure-by-removal and closure-in-place methodologies were considered to close the Ash Pond. However, Indiana Department of Environmental Management (IDEM) interpretations regarding the Federal CCR Rule render closure-in-place challenging and likely infeasible given the groundwater levels in the vicinity of the Ash Pond. Due in part to this consideration, a decision was made to excavate and beneficially reuse a majority of the CCR materials within the Ash Pond. In support of this excavation, a conveyor is currently being constructed to transport CCR material from a proposed hopper, located adjacent to the Ash Pond, to a barge loading point on the Ohio River. Infrastructure design work and the excavation/closure plan for the Ash Pond are currently in development, with material excavation and beneficial reuse planned to be initiated in 2021. Due to receiving facility throughput limitations, closure by removal activities will be performed over approximately 12 years at which time closure will be complete.

As mentioned previously, no current alternatives exist for management of the current CCR and non-CCR flows managed by the Ash Pond. As part of the overall planning effort, various on-site and off-site alternatives were evaluated to assess the feasibility of alternative capacity for management and treatment of CCR and non-CCR flows at A.B. Brown. As this effort has been ongoing since 2019, it should be noted that these alternatives generally presumed that coal-fired boiler operations would continue past 2023. This was the overriding assumption and was also considered a "worse-case scenario" for planning purposes. If another scenario would be selected, the plan

would be adjusted to address this more-manageable scenario. However, with the recent decision to retire coal-burning assets in October 2023, these alternatives are not fully applicable to the current scenario. Nevertheless, and in the interest of demonstration completeness, this discussion has been provided to illustrate the efforts and options considered. These options (and the associated costs and schedules) were one of many considerations in the decision to retire coal-fired boiler operations.

The following sections detail this evaluation of the options considered, the feasibility of each option, and justification for the alternative capacity ultimately selected.

5.1.1 Alternative Capacity – On-Site Alternatives

As alternative capacity does not currently exist at A.B. Brown, the cessation of CCR and non-CCR flows to the Ash Pond requires alternative capacity to replace the operational functions of the Ash Pond, or the plant must be modified to operate without the Ash Pond. Primary functions of the Ash Pond include removal of solids by settlement and hydraulic storage. Due to the large flowrate with multiple commingled individual discharge streams, this increases the size and complexity of alternative capacity options. The following 4 on-site alternatives were evaluated to manage CCR and non-CCR flows:

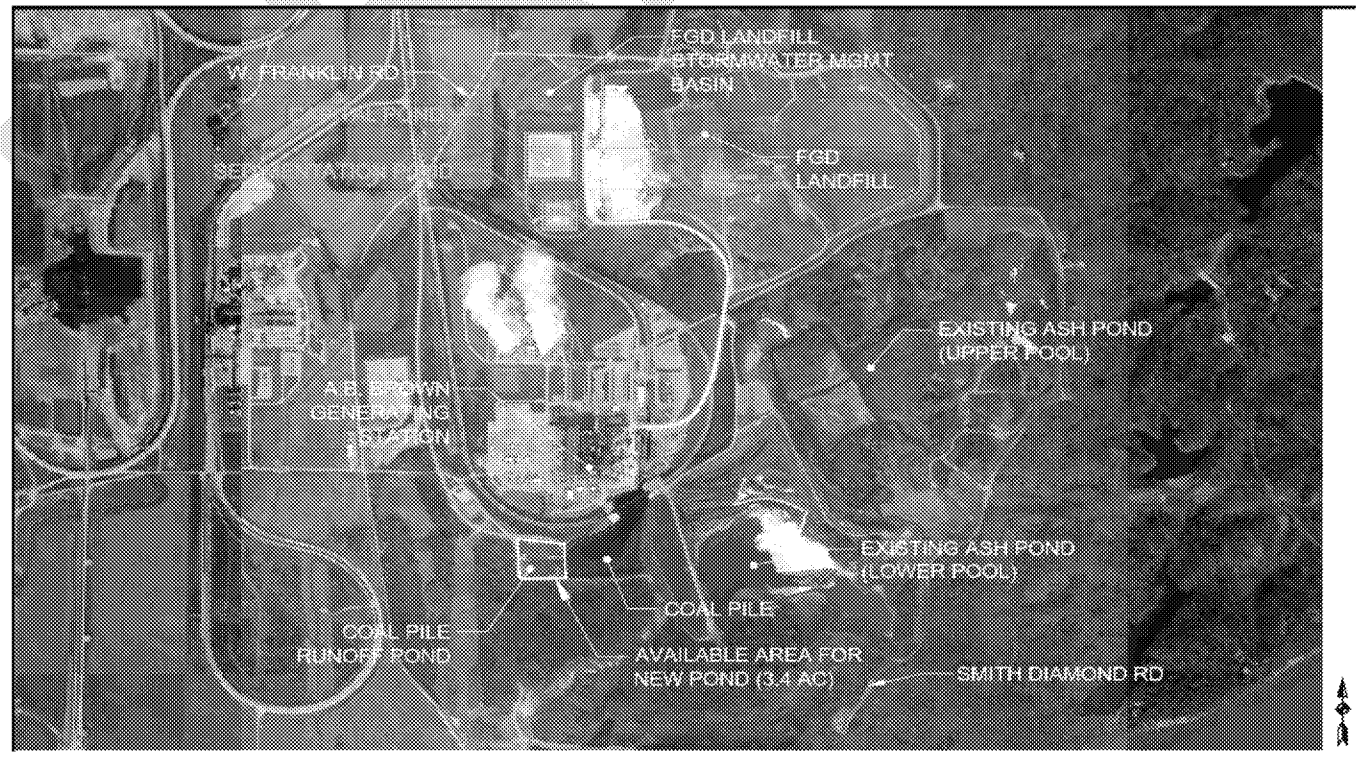
- Alternative 1 - Repurposing Existing Lined Facilities
- Alternative 2 - Construction of a New Settling Pond in the Vicinity of the Coal Pile Area
- Alternative 3 - Constructing a New Wastewater Treatment Facility
- Alternative 4 - Converting the Bottom Ash, Fly Ash and FGD System to Dry Handling

The following is a summary of the technical evaluation for each of these alternatives:

Alternative 1 – Repurposing Existing Lined Facilities

The existing facilities evaluated for repurposing include the Capital Pond and the Sedimentation Pond. A layout of the plant site with the location of these facilities is shown in **Figure 4**.

Figure 4. Existing Facility Layout and Potential Site for New Pond



The Sedimentation Pond is an H-shaped, lined CCR-regulated pond that receives leachate and runoff from the FGD Landfill located to the east. From the Sedimentation Pond, supernatant is conveyed to the Capital Pond located to the immediate north.

As a basis for comparison of alternatives, settling capacity of the lower pool of the existing Ash Pond was first evaluated. The lower pool of the Ash Pond was dredged in January of 2020 to expand its settling capacity. Material removed from the lower pool was moved to the upper pool. A bathymetry survey performed February 26, 2020, provides a volume of approximately 48 million gallons of storage capacity within the lower pool, from the bottom to a water surface elevation of 442.08 feet above mean sea level (MSL). Given the inflows previously described, the approximate retention and settling time provided by the lower pool of the pond is 5.4 days. This is the pond volume and settling time that will need to be replaced by alternative capacity.

After determining the existing volume and settling time provided by the lower pool of the Ash Pond, the existing facilities, previously mentioned, were examined to evaluate feasibility of repurposing for managing CCR and non-CCR flows. Of the existing facilities other than the Ash Pond, the Capital Pond, which is also lined with a bentonite-based liner system, has the largest capacity with a volume of approximately 6.96 million gallons. The Sedimentation Pond located just to the south is a Federal CCR Rule-regulated surface impoundment lined with a composite liner system (meeting the requirements of the Federal CCR Rule). The Sedimentation Pond has a capacity of 1.01 million gallons. The combined settling capacity of the Capital Pond and Sedimentation Pond is less than 17% of the 48 million gallon capacity provided by the lower pool of the Ash Pond. A significant expansion of these ponds would therefore be required to provide an additional 40 million gallons of settling capacity. Any expansion would be constrained by the landfill's stormwater basin to the north the FGD Landfill to the east, and the plant railway to the south. Expansion to the west may be possible but would require realignment of the stormwater features and other infrastructure. Such an expansion would also likely not be able to provide enough capacity due to space constraints between the Capital Pond and West Franklin Road and/or would result in a pond depth that is not feasible.

The significant distance of the Capital Pond and Sedimentation Pond from the Ash Pond also poses technical challenges. Re-routing the wastestreams that currently discharge to the Ash Pond to the Capital Pond area would require significant modifications and additions to the existing plant infrastructure. New pumping systems to transfer the wastestreams to the Capital Pond and then return of wastewater to the plant for re-use would be required. Due to these considerations, converting existing facilities to manage CCR and non-CCR flows is considered infeasible.

Alternative 2 – Construction of a New Settling Pond in the Vicinity of the Coal Pile Area

Construction of a new settling pond on plant property was also considered for this analysis. There are few on-site locations with potentially sufficient area and acceptable topography for a new settling pond. Two candidate locations were identified for evaluation.

Settling Pond Area 1 - The largest area on-site that is not currently utilized for plant operations is the wooded area southwest of the existing Ash Pond to West Franklin Road and Smith Diamond Road. Prior to the 2019 - 2020 IRP, a conceptual pond design with equivalent settling capacity to the lower pool of the existing Ash Pond was considered for this area. The new pond would manage CCR and non-CCR flows discharged to the existing Ash Pond for the period between the CCR cease flow deadline and the retirement of coal-fired boilers in late 2023. The evaluation established that this wooded area with steep hill slopes and no existing access roads would be difficult to develop. It would likely require a significant permitting effort (i.e., Section 401/404 for stream impacts with stream mitigation, etc.) to site a new settling pond in this location. Furthermore, the conveyor transporting material for beneficial reuse will bisect this area. Based on these considerations, this area was determined to be not suitable for a new settling pond.

Settling Pond Area 2 - The Coal Pile Runoff Pond is planned to be expanded and lined to manage dewatering and stormwater flows generated from closure of the Ash Pond. These changes to the Coal Pile Runoff Pond are in the planning stages and the detailed design has not yet been completed. The existing Coal Pile Runoff Pond and the area available for expansion to the north are shown in **Figure 4**. Approximately 3.4 acres would currently be

available for a pond in this area but would require coal pile run-off to be rerouted during construction if a pond this area were to be reused for a new larger lined pond. To create approximately the same settling capacity (approximately 48 million gallons) as the lower pool of the Ash Pond, the volume of a square pond was calculated and compared to the available area in the Coal Pile Runoff Pond and its vicinity. This pond was assumed to have the shape of an upside-down square truncated pyramid, with 3:1 H:V (horizontal : vertical) interior side slopes, and a depth of 8 feet. The outer boundary of the pond would be 920 feet by 920 feet, sloping down to a flat square bottom 872 feet on each side. These dimensions would provide a total settling volume of approximately 48 million gallons. However, the concept is infeasible for several reasons:

- The proposed pond would occupy an area of 19 acres, not including access roads or other necessary features. Approximately 3.4 acres are currently available in the footprint of the Coal Pile Runoff Pond and the area to the north. This is insufficient compared to the 19 acres required.

- The proposed pond will likely not be able to be incised into the topography as it must meet aquifer separation requirements of the CCR Rule. The proposed pond will then likely require dam permitting with the Indiana Department of Natural Resources (IDNR) based on storage volume since 48 million gallons is equal to 147 acre-feet (acre-ft), exceeding the 100 acre-ft threshold for regulation (IC 14-27-7.5-1). Design, permitting, and construction of a new impoundment meeting the requirements of the CCR Rule is not feasible in the remaining time before April 11, 2021.

- The coal pile will remain in use by the plant until the coal-fired units retire in October 2023. No feasible alternative location exists for the coal pile. Construction of a small new pond may be able to begin (and is currently planned for) as the coal stockpile is used and becomes smaller. Coal is delivered to the plant by way of rail cars and unloaded via a coal trestle just to the North of the existing coal pile. Changing the location of the coal pile would also involve significant modifications to the railway and relocation of the coal unloading trestle. Due to the complexity involved it is not be feasible to change the location of the plant's coal pile to allow a larger pond to be constructed earlier.

Based upon the constraints associated with repurposing existing facilities as well as constructing a new settling pond, it is reasonable to conclude that no options for alternative on-site capacity exists on site for management of the CCR and non-CCR flows described previously. In addition, it is not feasible for alternative capacity to be constructed prior to April 11, 2021.

Alternative 3 – Constructing a New Wastewater Treatment Facility

A wastewater treatment facility (WWTF) capable of managing and treating the 8.8 MGD of CCR and non-CCR flows would require a large amount of storage capacity and the capability to remove and dewater the suspended solids in these flow streams. Several agitated storage tanks with an overall capacity of 8 to 10 million gallons would be required for storage and equalization of the flow. Key WWTF unit operations include primary and secondary dewatering to produce solids that can be placed in a landfill and a discharge stream that is low in total suspended solids (TSS) and suitable for reuse by the plant or discharge through the site's NPDES permit. Thickener/clarifiers would be used for primary dewatering of the feed stream and filter press or belt press for secondary dewatering. The system would have multiple units both for redundancy and to manage fluctuations in the flow. Treated water would be held in several storage tanks with capacity of 4 to 6 million gallons. Dewatered solids would be loaded in trucks for transport to the landfill.

The project scope would include field-erected tanks, engineered equipment, structural steel, buildings, piping, electrical, and controls. The duration for project of this scope is estimated at 42 months from conceptual design to initial operation. Due to the long duration required to implement, a WWTF is not technically a feasible alternative.

The use of temporary tanks in lieu of the Ash Pond was evaluated. In order to replace the capacity of the Ash Pond, 48 million gallons of storage capacity is required. Temporary tanks range in size from 21,000-gallon frac tanks to 1 million (MM) gallon modular tanks. Modular tanks are typically field erected with a bolted steel frame and a geosynthetic membrane liner. To replace the capacity of the Ash Pond, 2,400 frac tanks or 48 of the largest modular

tanks would be required. These temporary tanks would require approximately 30 acres of flat graded area with secondary containment to address spills and a potential tank failure. There is no area of this size available near the lower pool of Ash Pond. Locating the temporary tanks further away would require redesign and replacement of multiple systems that transfer the wastestreams to and from the Ash Pond. Due to the large storage capacity required, lack of available area to locate the tanks, and extensive modifications to the existing plant systems, temporary tanks are not a technically feasible option in lieu of the Ash Pond.

Alternative 4 - Converting the Bottom Ash, Fly Ash and FGD System to Dry Handling

Conversion of the bottom ash, fly ash handling and FGD systems to dry handling was evaluated. These dry conversions require significant plant modifications involving retrofit of the boilers, air quality control system and balance of plant components. The following options were evaluated for the dry conversion of the plant CCR wastestreams that discharge to the Ash Pond:

Bottom Ash Wet to Dry Conversion

For the conversion of the boiler bottom ash from wet to dry handling, the following three options were evaluated:

1. Dewatering Bunker and Settling Tank
2. Remote Submerged Chain Conveyor
3. Modified submerged scrapper conveyor (SCC).

The first two options are a high recycle rate system with the dewatering equipment located remotely and the bottom ash is sluiced to the equipment. The third option is retrofit the boiler with a submerged scrapper conveyor and dewater. Of the three options, a modified SCC retrofit has the shortest installation duration. based on similar installations that have been recently completed, the schedule duration required to design, fabricate and install a retrofit SCC is 34 – 38 months. Based on input from the equipment vendor, the duration required to install a remote SCC system is 6 – 18 months longer due to the additional scope associated with this system. The duration to install a Dewatering Bunker and Settling tank is also estimated to be longer.

Fly Ash Wet to Dry Conversion

The option to convert the existing wet fly ash handling system to a dry was evaluated. Converting to a dry pressure pneumatic system requires the addition of mechanical exhausters, pneumatic ash conveying lines and a new fly ash storage silo. Dry fly ash will be stored in the new fly ash silo until it is unloaded into pressure discharge (PD) trucks for transport to a location for beneficial re-use or disposal. The estimated duration for this wet to dry conversion is 28 months.

FGD System Wet to Dry Conversion

The FGD system can be retrofit with a zero-liquid discharge (ZLD) system and eliminate the wet wastestream. The following ZLD technologies were considered for wet to dry conversion of the FGD wastestream:

1. Brine concentrator and encapsulation of the waste solids
2. Membrane separation
3. Wastewater spray dryer

The brine concentrator and wastewater spray dryer are the only two FGD ZLD technologies that have been implemented on a commercial system in the U.S. Membrane separation is an emerging technology for this application and was therefore removed from consideration. Brine concentrators and wastewater spray dryers have similar schedule durations of 36 – 42 months for design, manufacture and installation.

The shortest schedule for wet to dry conversion of the bottom ash, fly ash and FGD wastestreams is 36 to 42 months. The longest duration is the conversion of the FGD system followed by the bottom ash and fly ash. These conversions do not address the other plant streams that discharge to the Ash Pond nor streams associated with Ash Pond closure activities. Additional modifications or alternative capacity, such as a new pond would also be required to manage these flows. Due to the long duration required to implement this alternative, conversion of the FGD, bottom ash and fly ash handing systems to dry handling is not technically a feasible alternative within the available timeframes.

5.1.2 Alternative Capacity – Off-Site Alternatives

As required by Part A, alternatives for off-site treatment of the flows discharged to the Ash Pond were also evaluated. These alternatives included:

- Alternative 5 - Transporting Waste Streams to Area Treatment Facilities
- Alternative 6 - Pumping Waste Streams to Area Treatment Facilities

In addition to identifying an off-site facility that could receive the waste streams currently discharged to the Ash Pond, additional plant modifications would be required for continued plant operation and to transport the waste streams to the off-site facility. These considerations also affect the viability of these options. The following are two substantial design issues that would have to be addressed for an off-site alternative:

- Most of the Ash Pond water is re-circulated for continued operations. Based on the current plant water balance diagram, rainfall and runoff supplies approximately 8% of the inflow to the Ash Pond. Converting to a once through system with an off-site alternative would require redesign and/or expansion of the plant water intake systems. This would require a significant amount of additional water that is not currently brought in from the Ohio River and groundwater. This could result in applicability of Section 316(b) of the Clean Water Act and associated studies, reports, permitting, and potentially system design modifications, which could further delay the ability to cease use of the Ash Pond.

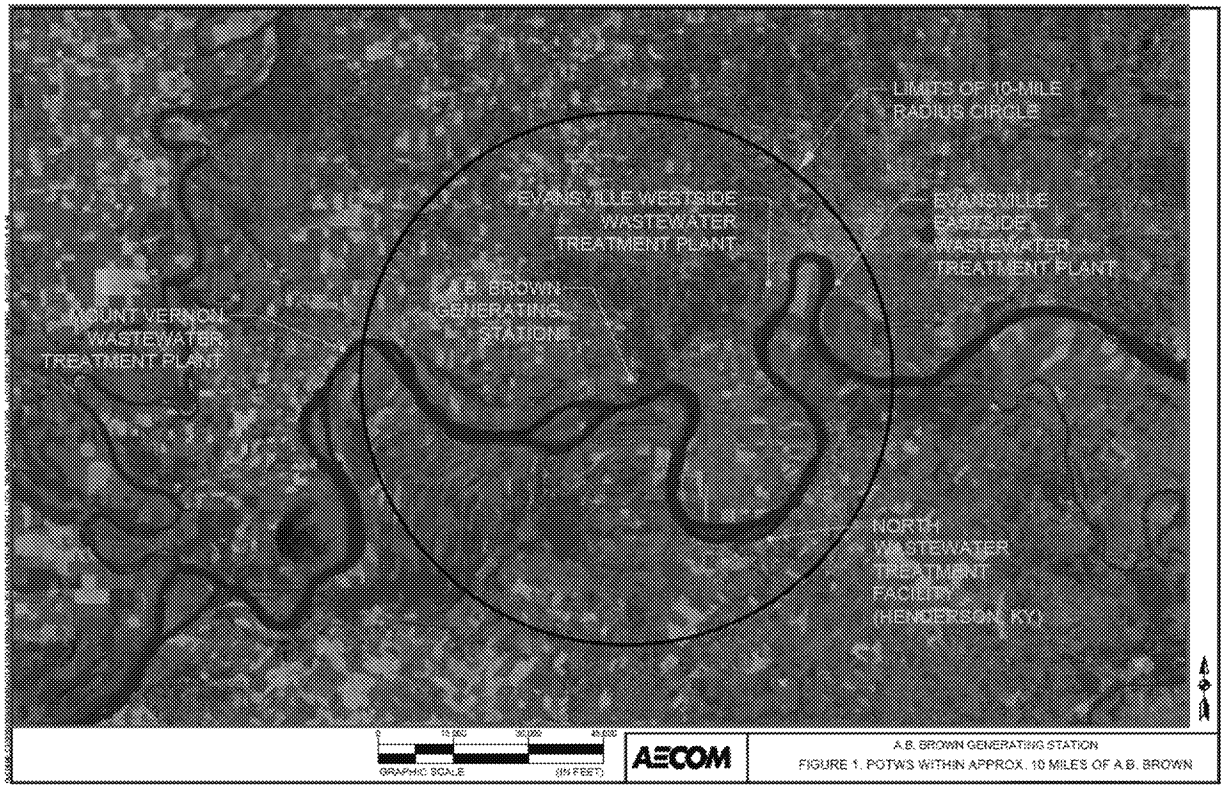
- Conventional tanker trucks are not designed to transport slurries with settleable solids. An on-site facility would be required to store, pre-treat and load the wastewater in trucks. Pretreatment of the flows to remove the heavier solids would likely be necessary. Additional treatment may also be needed to remove dissolved metals (e.g., arsenic, mercury and selenium) to below applicable Categorical and Local standards. This would require a WWTF similar to one summarized in Alternative 3.

Addressing these modifications of the plant alone would require 42 months with the critical path being installation of a new WWTF as detailed in Alternative 3, which the project scope at a minimum would consist of engineering buildings, thickener/clarifiers, dewatering filter presses, tanks and pumps. Notwithstanding these constraints for all off-site alternatives, an evaluation was performed to identify facilities in the area that could potentially treat the Ash Pond flows.

Alternative 5 - Transporting Waste Streams to Area Treatment Facilities

For this alternative the CCR and non-CCR flows would be transported via truck to either a publicly owned treatment works (POTW) or a private facility capable of managing the waste. A 20-mile radius from A.B. Brown was surveyed for POTWs or private facilities that may be capable of treating the waste streams flows. No private commercial treatment facilities were identified during this search. The POTWs of Evansville and Mt. Vernon, Indiana, and Henderson, Kentucky are located approximately within this radius, as shown in **Figure 5**.

Figure 5. POTWs Within 10 Miles of A. B. Brown Station



It should be noted that since these facilities treat municipal wastewater, it is likely that many or all their processes are incompatible with treatment of the CCR and non-CCR flows from A.B. Brown. For example, the primary clarification tank at Evansville's Westside Wastewater Treatment Plant (Westside WWTP) has a volume of 280,000 gallons. The residence time of wastewater at this tank is approximately 10 minutes at the maximum treatment rate of 39 MGD. This is not sufficient time to settle out the remaining fine particles (e.g. fly ash) present in the CCR waste stream. Furthermore, addition of CCR materials into the sludge products of wastewater treatment would require analysis of regulatory considerations and potential waste characterization prior to the mixed waste's acceptance in a municipal solid waste landfill or land application. As a simplification in analyzing this alternative, it is assumed that this facility could treat the wastewater. Several further significant assumptions are also necessary for consideration of this scenario:

- It is assumed that the non-CCR and CCR flows would be able to be held in a tank or storage area at A.B. Brown with multiple filling stations that would permit truck traffic to enter and leave the site with minimal delays.

- It is assumed that tanker trucks used to transport CCR and non-CCR liquids are 5,000-gallon capacity, with a filling and dumping rate of 400 gallons per minute (gpm). Large capacity (10,000 gallon) trucks would not meet the local road weight limits of 80,000 pounds or less, per Indiana Code Title 9, Article 20. Trucks are assumed to be in operation 10 hours per day.

- Westside WWTP is the closest POTW to the site. It takes approximately 28 minutes to travel to this plant from A.B. Brown and back.

The following table presents the calculated trucks required based on these assumptions:

Table 2. Estimated Trucking Calculations

Quantity	Units/Description
8,818,000	Gallons that must be treated per day
5,000	Capacity, gallons per truck
1,764	Truck loads required per day
14	Minutes from site to Westside Treatment Plant
28	Total round trip time (minutes)
13	Truck filling time at 400 gpm (minutes)
13	Truck unloading time (minutes)
53	Total time to deliver one load and return (minutes)
600	Length of shift (minutes)
11	Trips per shift per truck
156	Number of trucks required to transport CCR/non-CCR flows

Given the assumptions and calculations presented above, 156 trucks would be required to make approximately 11 trips each per day to transport the waste to the closest POTW, Westside WWTP. As it is not likely that this POTW is capable of accepting and treating these waste streams, this estimate serves as a minimum estimated number of trucks that are required, as more trucks would be required to transport waste to a facility farther away that is capable of treating the waste.

If trucking of the waste were to be implemented, it is likely that 1,764 total truckloads per day would strain traffic patterns at the site, at the POTW, and in the local community. It would also mount a significant logistics challenge for A.B. Brown, as three trucks would have to leave A.B. Brown every minute for 10 hours per day. With three trucks leaving every minute, approximately 39 filling stations would be required to keep trucks coming and going with a 13-minute loading time. Based on experience of SIGECO staff and managing truck traffic within the site, the approximate maximum truckloads per day that can be effectively accommodated are estimated to be approximately 100. Based on these considerations, transporting waste via truck to the nearest POTW is considered infeasible.

Alternative 6 - Pumping Waste Streams to Area Treatment Facilities

Alternative 6 would involve the pumping of CCR and non-CCR flows directly to a POTW or private treatment facility from the site. The straight-line distance for such a pipeline to the nearest POTW would be approximately 6.9 miles. As with trucking waste to a POTW, this alternative also assumes that the POTW would be able to treat the waste. Furthermore, this alternative would require several key items to be completed rapidly to be successful:

- Selection of pipeline route. Completion of any environmental studies required and environmental permitting from regulatory agencies.
- Application for any federal and/or state permitting required, and timely receipt of approval.
- Acquisition of easements for pipeline right of-way.
- Design of pipeline and any necessary pumping stations.
- Construction of pipeline and pumping stations.
- Final testing.

Given the length of pipeline required, the volume of flows required to be conveyed, and the significant regulatory and design obstacles, construction of a pipeline to a POTW before the April 11, 2021 deadline, especially for such a short lifespan given the planned switch to renewable sources and natural gas-fired generation, is not feasible. Further, this effort would require multiple lift stations (given the distance) with significant required time for acquisition of property rights and design. The timeframe to complete these efforts would be on the order of 60 months.

5.1.3 Alternative Selected and Analysis of the Site and any Site-Specific Conditions that Led to the Alternative Selected (40 CFR § 257.103(f)(1)(iv)(A)(1)(i))

As discussed throughout this document, SIGECO is subject to a required regulatory process to evaluate, model, and decide on its future mix of generation assets as part of its IRP. During the evaluation of CCR and non-CCR flow management alternatives, it was announced, at a June 15, 2020 public stakeholder meeting, that it is SIGECO's intention to pursue retirement of the coal-fired generation assets at A.B. Brown and replace this generation capacity with a mix of renewables (solar and wind) and two simple-cycle gas turbines. This strategy is further addressed in SIGECO's IRP and changed the scope and trajectory of flow-management alternatives at the facility.

In summary, none of the six alternative capacity options evaluated for continued operation of the plant can be implemented and completed prior to October 2023 when coal-fired operations at A.B. Brown are scheduled to cease. The Ash Pond must continue to serve the CCR flows during the planning and construction of alternative energy sources, and it would not be reasonable to design and construct alternative capacity for flows that have a short life of approximately 2.5 years (April 11, 2021 to October 15, 2023). Based on this current scenario of retirement of coal-fired boilers, the selected alternative is to expand the concept of construction of a new lined pond to receive the much smaller flowrate (combination of remaining non-CCR and future flows generated by Ash Pond closure). The future flow management efforts have been redirected and work associated with accommodating the proposed scenario is currently underway.

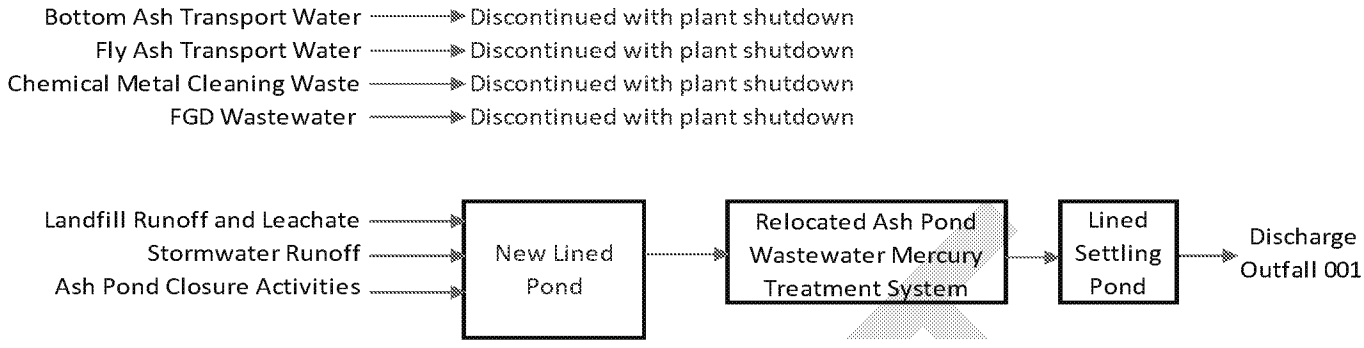
The currently estimated non-CCR and closure-related flows for post-coal-fired operation are summarized in **Table 3**. These flows are each being individually evaluated, and the final identified mix of flows may vary following completion of this evaluation process. Overall, this is approximately 10% of the current flow to the Ash Pond.

Table 3. CCR and Non-CCR Flows Following Shutdown of ABB Units 1 & 2

CCR Flows	
Source	**MGD**
Ash Pond Closure Activities	Currently Under Development
Non-CCR Flows	
Source	**MGD**
Stormwater Runoff	0.675
Landfill Runoff and Leachate	0.07
South Side Runoff Pond (Coal Pile Runoff Pond)[1]	0.066
Total:	**0.811**

A block flow diagram of the discontinued flows, remaining plant flows and new flows to and from the new lined pond are shown in **Figure 6**.

Figure 6. Preliminary Flow Diagram of Flows to/from New Pond



Due to the much lower flows, the new pond would be significantly smaller than the current Ash Pond. Preliminary estimates are that the new pond will be approximately 10% of the size of the current Ash Pond. A likely location for the new pond is the area where the coal pile currently resides. This location is a central operating area and the majority of stormwater already flows to this location. Further, this is downgradient from the Ash Pond and closure-related flows (dewatering and contact stormwater) could be conveyed to this pond via gravity flow. Therefore, the location of the new pond in the vicinity of the current coal pile would be the preferred location.

While this will reduce the scope associated with new infrastructure to redirect flows to the new pond, there are still multiple individual flows that will require construction of pump stations and piping systems to accommodate. This option will likely also involve relocation of the mercury treatment system that currently serves the landfill runoff and leachate stream as well as modifications and/or relocation of the Ash Pond wastewater mercury treatment system.

Construction of the new pond will also require close coordination with plant operations as the coal pile is necessary for plant operation and cannot be moved. The Coal Pile Run-Off Pond will continue to operate until the units are shutdown in October 2023. This alternative can be implemented within approximately 40 months, allowing the cessation of CCR and non-CCR flows to the Ash Pond by October 15, 2023. This option was selected from the 6 alternatives evaluated as the fastest technically feasible time to complete development of the alternative capacity.

5.1.4 Adverse Impact on Plant Operation if the Ash Pond Were No Longer Available (40 CFR § 257.103(f)(1)(iv)(A)(1)(ii))

Given the lack of current alternative capacity, continued operation of A.B. Brown Units 1 and 2 is wholly dependent on the continued operation of the Ash Pond until plant shutdown in October 2023. If the CCR and non-CCR flows to the Ash Pond were to cease on April 11, 2021 without alternative capacity available, Units 1 and 2 will not be able to continue operation. As mentioned previously, some non-CCR flows to the Ash Pond will continue independent of the operating status of the units. These streams would need to be directed to alternative capacity under implementation of the preferred alternative.

A.B. Brown Units 1 and 2 haves a combined capacity of 490 MW and currently comprise a significant portion of SIGECO's generating units. A.B. Brown Units 1 and 2 are an essential part of the generation capacity within the fleet and the region, particularly during peak demand periods.

5.1.5 Explanation and Justification for the Amount of Time being Requested and How it is the Fastest Technically Feasible Time to Complete the Development of Alternative Capacity

As stated above, continued operation of the Ash Pond is needed until the intended retirement of A.B. Brown Units 1 and 2 on or before October 15, 2023. As demonstrated in Section 4.1.1 and 4.1.2, there are no current feasible options for obtaining alternative capacity for CCR and non-CCR flows prior to October 15, 2023. Therefore, the Ash Pond must remain operational throughout the remaining life of coal-burning generation at the facility. For this reason, extension of Ash Pond operation until October 15, 2023 is requested in this demonstration.

The selected alternative for management of non-CCR and future closure-related flows represents the fastest technically feasible time to obtain alternative capacity for these flows. Given the complexities of flow identification and reroute (described in the next section) and the complications associated with constructing this unit in the vicinity of the current coal pile (as the pile is being reduced in the final months of operation), it is anticipated that the entire time until October 15, 2023 will be required for this effort (given the recent decision of future generation mix). In the event ways are identified to accelerate this process, the Ash Pond would still be needed for the management of CCR flows (approximately 2/3 of the flow managed by the Ash Pond) until October 15, 2023. Therefore, the benefits of early redirection, even if realized, would be relatively minor.

5.2 Detailed Schedule and Narrative Discussion (40 CFR § 257.103(f)(1)(iv)(A)(2) and (3))

The provisions of 40 CFR § 257.103(f)(1)(iv)(A)(2) and (3) requires that a detailed schedule be provided illustrating the fastest technically feasible time to complete the measures necessary for alternative capacity to be available including a visual timeline representation. The visual timeline must clearly show the following:

- How each phase and the steps within that phase interact with or are dependent on each other and the other phases (40 CFR §257.103(f)(1)(iv)(A)(2)(i)),
- All of the steps and phases that can be completed concurrently (40 CFR §257.103(f)(1)(iv)(A)(2)(ii)),
- The total time needed to obtain the alternative capacity and how long each phase and step within each phase will take (40 CFR §257.103(f)(1)(iv)(A)(2)(iii)), and
- At a minimum, the following phases: engineering and design, contractor selection, equipment fabrication and delivery, construction and start-up and implementation (40 CFR §257.103(f)(1)(iv)(A)(2)(iv)).

In addition, 40 CFR §257.103(f)(1)(iv)(A)(3) requires a narrative discussion of the schedule and visual timeline representation which must discuss all of the following:

- Why the length of time for each phase and step is needed and a discussion of the tasks that occur during the specific step (40 CFR §257.103(f)(1)(iv)(A)(3)(i)),
- Why each phase and step shown on the chart must happen in the order it is occurring (40 CFR §257.103(f)(1)(iv)(A)(3)(ii)),
- The task that occur during each of the steps within the phase (40 CFR §257.103(f)(1)(iv)(A)(3)(iii)), and
- Anticipated worker schedules ((40 CFR §257.103(f)(1)(iv)(A)(3)(iv)).

These items are provided and discussed in the following sections.

5.2.1 Regulatory and Other Considerations Associated with Overall Project Schedule

The scenario at A.B. Brown is complex and involves a series of interrelated regulatory and technical milestones. In order to address the requirements of this section, two detailed schedule representations have been provided. The first, provided in **Appendix C**, provides a representation of the overall schedule for A.B. Brown which includes sections for the regulatory process to select future generation technology, CCR-related activities, and alternative pond capacity development activities. This schedule is intended to represent the overall scenario at A.B. Brown and illustrates the interrelationships of the various activities.

In order to understand the schedule for alternative capacity development, the overall context of activities at A.B. Brown also must be understood.

SIGECO has been involved in a process regulated by the IURC to determine future generation sources and seek approval of these sources. On February 20, 2018, SIGECO filed an application with the IURC for a CPCN to

construct a proposed 850 MW Combined Cycle Gas Turbine (CCGT) facility at A.B. Brown replacing the current coal-fired generation units. Following a required process involving review of the application and a series of hearings, IURC issued an order of denial of the CPCN on April 24, 2019 (see Cause No. 45052 in **Appendix A**). The IURC provided feedback on this denial and recommendations for proceeding which involved a robust process of evaluating and modelling potential generation scenarios, implementing an all-source Request for Proposal (RFP) process, evaluating all potential future generation scenarios, and holding a series of stakeholder meetings. These activities and milestones are depicted on the overall schedule provided in **Appendix C**.

The All-Source RFP bid process was conducted between June and August 2019, and a series of four stakeholder meetings held in 2019 and 2020. This evaluation process culminated in a final stakeholder meeting and filing of an updated IRP in June 2020. This process resulted in significant changes to the scope of water management as well as the overall schedule of activities at A.B. Brown.

In summary, the current preferred IRP portfolio involves replacement of 730 MWs of coal-fired generation (490 MW at A.B. Brown) with renewables by the end of 2023, but the steps along the way are subject to some variation. In addition, the preferred IRP portfolio also involves development and construction of two (2) simple-cycle gas turbines at A.B. Brown. The IRP also proposes retirement of coal-fired generation assets at A.B. Brown in 2023. While the issuance of the IRP provides a framework for planning and engineering activities, the process is still very much dynamic and subject to adjustment. SIGECO will continue to monitor developments with the State of Indiana's Energy Policy Task Force and the wholesale energy market for potential changes that could alter the plan.

Once attractive renewable projects from the All-Source RFP are selected, SIGECO will seek approval from IURC by issuing a CPCN. Around this time, SIGECO will also issue another RFP for combustion turbines. The results of that RFP are expected within the first quarter of 2021, and following this RFP process the CPCN for the combustion turbines will also be submitted to IURC (anticipated sometime in 2021). Engineering, design work, and development of cost estimates will occur as soon as possible after the RFPs are completed and will take place during mid-2021.

Related to and in parallel with the above activities, SIGECO has been evaluating the plans for closure of the A.B. Brown Ash Pond. This process has been ongoing since 2016 and culminated in the decision to close the Ash Pond by removal with the majority of the Ash Pond contents being beneficially used within the cement market. This concept was addressed by SIGECO in a press release dated August 14, 2019. Since 2016, significant Ash Pond closure planning and engineering efforts have been ongoing, and construction of a pipe conveyor system to convey the excavated ash to a barge loading system is currently underway. It is currently anticipated that excavation of the Ash Pond for beneficial use will commence in June 2021. Schedule activities and milestones related to closure of the Ash Pond is provided on the overall schedule in **Appendix C**.

In addition to and in parallel with the above activities, SIGECO has also been involved with planning and evaluation of CCR and non-CCR flow management options and alternative capacity. In 2019 (following the IURC denial of the CCGT CPCN application) and the first half of 2020, these planning activities were focused on continued operation of the coal-fired assets (as discussed in Section 4.1 of this report). However, following selection of the preferred generation mix in June 2020, efforts have been made to revise the concepts to accommodate the scenario of retirement of coal-fired generation assets in 2023. This process has resulted in the alternative selected for alternative capacity (new lined pond) discussed in Section 5.1.3 of this report.

As discussed above, the scenario at A.B. Brown has been dynamic with a significant number of activities being performed in parallel. With the June 2020 announced intention to retire coal-fired generation assets at A.B. Brown in 2023, clarity has been provided as to the future of A.B. Brown and alternative capacity efforts are focused on redirection of remaining non-CCR flows and management of these flows (as well as flows associated with closure of the Ash Pond) in a new lined pond. The sections below focus on the development schedule for this alternative capacity.

5.2.2 Schedule for Development of Alternative Capacity (New Lined Pond)

The construction of a new lined pond is the selected option for alternative capacity to allow the cessation of CCR and non-CCR flows to the Ash Pond. The new pond will receive the plant flows that remain following the retirement of coal-fired boilers and new and/or redirected flows from Ash Pond closure activities. Because the coal-fired units will continue operation until October 2023, much of the existing infrastructure must remain functional throughout the execution of this project.

A detailed schedule for development of alternative capacity is provided in **Appendix D**.

As shown in **Appendix D**, the overall project duration is estimated to be 40 months from conceptual design to the cessation of CCR and non-CCR flows to the Ash Pond. The project schedule can be broken down into the following segments: conceptual design, preliminary design, contractor bid, selection and award, detailed design, procurement and construction and start-up. A discussion of the considerations related to each phase is provided below.

5.2.2.1 Conceptual Design

Work on the conceptual design for alternative capacity was initiated in 2019 with a review of environmental compliance and flow management alternatives for continued coal-fired operation. As previously discussed, development of the conceptual design was temporarily placed on hold pending completion of the regulatory process regarding the future of generation at A.B. Brown. The difference in the project size, complexity and time required to implement for alternatives that continue coal-fired operations is significant compared to alternatives that do not. Following the IRP study completion and report issuance, work has re-started based on the concepts of the preferred alternative (new lined pond).

In the conceptual design phase, the various streams that currently discharge to the Ash Pond will be verified including the flowrate and composition, as well as the location. The new flows following the cessation of coal-fired operation will be identified and quantified (based on best available estimates) as well. These include water produced from dewatering the Ash Pond and redirection of stormwater run-off flows into and within the Ash Pond. Activities may include flow measurements, sampling and analysis, review of plant operating data and the collection of design information. Once all the streams have been defined and characterized, a conceptual design will be developed to redirect the flows to the new lined pond. This may include the modification of existing plant facilities, re-grading to redirect stormwater and new facilities to transport the flows to the new pond. The pond will be sized based on the expected flows. A candidate pond location in the coal pile area has been identified, but required further evaluation including the pond size and the management of construction activities with on-going plant operation. Eight months are planned for the conceptual design phase. Key deliverables from this phase include:

a) Plant Water Balances
b) Process Flow Diagrams
c) Potential Permit Modifications (i.e. NPDES Outfalls)
d) Conceptual Pond Sizing
e) Overall Site Plan
f) Summary Description of Concept

The scope for the preliminary design phase will be refined based on the results of the conceptual design. Potential design issues and the information needed will be established. Development the preliminary design will follow the conceptual design.

5.2.2.2 Preliminary Design and Specification Development

The key objective of the preliminary design phase is to develop a design package and specifications for the procurement and construction package. Work from the conceptual design will be used to develop the drawings, documents, and specifications. Key deliverables from this phase includes:

a) Piping and Instrument Diagrams (P&IDs)
b) Pond Site Plan, Preliminary Sections and Details
c) General Arrangements (GA's), Preliminary Pipe Routing
d) Electrical One Lines, Control System Architecture
e) Surveys and Investigations – Geotechnical, Topographic, Electrical
f) Detailed Project Schedule
g) Preliminary Technical Specification Package

The preliminary design must address both continued plant coal-fired operation up to the time the new system is placed in operation and the plans for the coal-fired units after they are shut down. This may require identifying alternate sources of electrical power, service water, potable water and instrument air when the coal-fired units are decommissioned. A period of 6 months is planned for development of the preliminary design and draft technical specification package.

5.2.2.3 Contractor Bid, Selection and Award

The preliminary design and draft technical specification package will be finalized and incorporated in the RFP package. In this phase potential contractors will be issued the RFP construction. The bid, selection and award phase is 6 months in duration from issue of the RFP. This includes 2 months for the bidders to prepare proposals and 2 months for evaluation. Evaluation of the proposals includes a review of the means and methods of construction proposed by the bidders and any alternates that may improve the design or reduce the project schedule or cost. The duration of the evaluation period is dependent on the quantity and quality of the proposals received, responsiveness of the bidders to questions and complexity of the alternates considered.

5.2.2.4 Detailed Design

The detailed design phase is expected to commence following preliminary design. This activity will be executed concurrently with the contractor bid, selection and award. The preliminary design will be developed to produce sealed Issue for Construction (IFC) drawings and documents. Input received from the contractor will be considered to improve construction efficiency and reduce the schedule. Some planned detail design tasks include pipe stress analysis and supports, electrical and control cable routing and termination drawings, control narratives, foundation details, structural and access steel, and electrical load studies. In addition, this package will include detailed drawings and details (as well as relevant calculations) for the new lined pond. It may be necessary to accelerate some engineered equipment procurement activities to obtain certified vendor information required for the detailed design. This information may electrical and controls circuits, interface connections, structural support details and access.

A total of 9 months is planned for detailed design with completion at award the contract for construction. This provides contractor with the information required for planning, procurement and construction.

5.2.2.5 Procurement

Mechanical Engineered procurements are expected to include pumps and agitators. Shop fabricated procurements may also include components such as chemical feed skids and piping spools. A duration of 1 month is expected to receive vendor bids with 2 months to evaluate and award each package. The long lead procurement item for mechanical procurements have been identified as agitators. Based on previously solicited vendor bids for similar equipment these are expected to have a 6-month lead time after receipt of order (ARO) for manufacturing and delivery, resulting in a total duration of 9 months for mechanical procurements.

Electrical procurements are expected to include transformers, panel boards, motor control centers (MCC), power distribution centers (PDC) and programmable logic controllers (PLCs). As with the mechanical procurements, a duration of 1 month is expected to receive vendor bids and a two-month period for evaluation and vendor award. The long lead items associated with electrical procurements have been identified as PDCs with an expected lead

time of 9 months ARO for manufacturing and delivery, resulting in a total duration of 12 months for mechanical procurements.

Mechanical and Electrical procurements occur in parallel for a total procurement cycle of 12 months. These activities follow completion of the mechanical detailed design and runs in parallel with completion of the electrical detailed design and contractor selection. Vendor award is expected the month following contractor selection. The manufacturing and delivery of these components will occur in parallel with construction of the new impoundment.

Other procurements identified are structural steel, pond liner, valves and instrumentation. These items have been identified to have a short lead time and not to impact the overall project schedule and will occur in parallel with the mechanical and electrical procurements.

5.2.2.6 Construction

The overall duration planned for construction is 16 months including start-up and commissioning. Civil construction of the new pond is expected to require 8 – 10 months after the site is available. The candidate site is in the location where a portion of the coal pile is currently located. If this area is selected, a plan for removal of the coal must be developed with plant operations. Construction of the new pond is not on the critical path and can be pushed to later date without affecting overall duration or date for initial operation.

The project scope will include modifications to reroute various flows to the new pond. Some of these streams can be rerouted to drain to the new pond, others will require pumped transfer systems. This work is to begin approximately 6 months following contractor award to provide time for the manufacturing and fabrication of the equipment and components. Engineered equipment may include pumps, agitators, automated valves, instruments and electrical equipment. Fabricated items may include support steel, tanks, and chemical feed skids. Tie-ins for the electrical supply and other utilities must be planned and coordinated with plant operations and it may be necessary to perform this work during an outage.

Following completion of construction, the system will undergo start-up and commissioning. This project phase will require 2 months and involves instrument loop checks, motor meagering, electrical system settings, overall system hydrostatic testing, mechanical operation of all rotating equipment and various other tasks to prepare the system for operation. Issues discovered during this period may require support from the equipment vendor to repair or replace damaged components. At the conclusion of this phase, a package with all checkout records produced and the system will be ready to begin initial operation.

A period of 1 month is allocated for initial operation, during which the process controls loops will be tuned and setpoints adjusted. A key objective of the run-in period is to verify the reliability of the system over a range of operating conditions. Issues that are identified during this phase may require support from the equipment vendor or modification of the system. At the completion of initial operation period, all remaining plant flows to the Ash Pond will cease and be redirected to the new pond.

5.2.2.7 Schedule Summary

Based on the schedule provided in **Appendix D**, conceptual design activities for the new lined pond and redirection of flows are currently underway. The path to alternative capacity will involve conceptual design, preliminary design, contractor selection, detailed design, procurement and construction. It is currently projected that operation of the new lined pond will begin on October 15, 2023. Throughout the design process, efforts will be made to identify schedule improvements. However, given the specific scenario at A.B. Brown, the advantages of early completion are limited as the Ash Pond will still require operation for management of CCR flows until anticipated retirement of the coal-fired generation in October 2023.

5.2.3 Anticipated Worker Schedules (40 CFR 257.103(f)(1)((iv)(A)(3)(iv)

During construction of the new lined pond and infrastructure to redirect flows, the anticipated worker schedules will consist of 50-hour weeks. This will involve work 5 days per week, working approximately 10 hours per day. If weather or other delays are encountered, the worker schedule may be adjusted (increased) to address this lost time as it is critical systems are complete and operational by October 15, 2023 in order to comply with regulatory timelines.

5.3 Progress Toward Alternate Capacity (40 CFR 257.103(f)(1)(iv)(A)(4))

Part A (40 CFR 257.103(f)(1)(iv)(A)(4) requires a narrative discussion of the progress the Owner/Operator has made to obtain alternative capacity for the CCR and/or non-CCR wastestreams. The narrative must discuss all the steps taken, starting from when the Owner/Operator initiated the design phase up to the steps occurring when the demonstration is being compiled. It must discuss where the facility currently is on the timeline and the efforts that are currently being undertaken to development alternative capacity.

As discussed throughout this document, decisions regarding the future generation at A.B. Brown were absolutely critical to the process of obtaining alternative capacity. Over the past several years, significant efforts have been expended toward this goal. During this process, options for alternative capacity were developed and evaluated, and the preferred alternative is currently within the conceptual design phase.

Below is a summary of the progress made toward the goal of alternative capacity:

- Evaluation and Decision on Future Energy Generation Mix
  - Following an involved process, SIGECO announced in June 2020 the result of the IRP study, which is to replace the coal-fired generation at A.B. Brown with a mix of solar generation, wind generation, and simple-cycle Combustion Turbine gas units
- Evaluation of On-Site and Off-Site Options for Alternative Capacity
  - During the future generation evaluation process, six alternative options were evaluated for schedule and feasibility and included the following options:
    - Repurposing Existing Lined Facilities
    - Construction of New Settling Pond in the Coal Pile area
    - Construction of New Wastewater Treatment Facility
    - Converting Bottom Ash, Fly Ash and FGD System to Dry Handling
    - Transporting Wastestreams to Area Treatment Facilities
    - Pumping Wastestreams to Area Treatment Facilities
  - Following the decision on future generation, options were again reevaluated based on the scenario of retirement of coal-fired boilers
- Selection of Alternative Capacity Option
  - The selected option is the construction of a new lined pond to accommodate non-CCR flows (currently entering the Ash Pond) and closure-related flows
- Conceptual Design (current phase)
  - Initiated identification and evaluation of individual flows to be accommodated in the new lined pond
  - Initiated work on design basis for the new lined pond
  - Candidate pond location has been identified and is being further evaluated for any fatal flaws

Work toward alternative capacity will continue in general accordance with the schedule provided in **Appendix D**.

6 Compliance Certification and Additional Information (40 CFR § 257.103(f)(1)(iv)(B))

In accordance with *40 CFR § 257.103 (f)(1)(iv)(B),* the following information and attachments have been assembled to demonstrate that the A.B. Brown Ash Pond is in compliance with the Federal CCR Rule.

As required by the Federal CCR Rule, groundwater monitoring wells were installed to evaluate the groundwater quality in the vicinity of the A.B. Brown Ash Pond. The analytical results from this monitoring have identified two constituents, lithium and molybdenum, that were found to have concentrations at SSLs that exceeded GWPS. In response, Haley & Aldrich prepared a Corrective Measures Assessment for the A.B. Brown Ash Pond on behalf of SIGECO. The Corrective Measures Assessment evaluated the risk related to the lithium and molybdenum exceedances and determined there are "no adverse effects on human health or the environment currently or under reasonably anticipated future uses" from groundwater at the Ash Pond.

Haley & Aldrich continues to evaluate the nature and extent of groundwater impact. Additional piezometers and wells have been installed and semiannual groundwater sampling will be implemented to continue to monitor and evaluate groundwater through the closure process. This information will be used for the future groundwater remedy selection.

6.1 Certification of Compliance (40 CFR § 257.103 (f)(1)(iv)(B)(1))

Part A requires a certification (signed by the Owner or Operator) be provided to state that the facility is in compliance with all the requirements of the Federal CCR Rule. **Appendix E** provides the certification of compliance.

6.2 Visual Representation of Hydrogeologic Information (40 CFR § 257.103 (f)(1)(iv)(B)(2))

Part A requires a representation of hydrogeologic information at and around the CCR unit(s) be provided that supports the design, construction and installation of the groundwater monitoring system. This includes all of the following:

6.2.1 Groundwater Monitoring Well Locations (40 CFR § 257.103 (f)(1)(iv)(B)(2)(i))

A figure (prepared by Haley & Aldrich) detailing the location of the groundwater monitoring wells in relation to the Ash Pond at A.B. Brown is provided in **Appendix F**.

6.2.2 Well Construction Diagrams and Drilling Logs (*40 CFR § 257.103 (f)(1)(iv)(B)(2)(ii)*

Well construction diagrams and drilling logs (prepared by Haley & Aldrich) are provided in **Appendix G**.

6.2.3 Groundwater Flow Direction Maps (*40 CFR § 257.103 (f)(1)(iv)(B)(2)(iii)*)

Figures (prepared by Haley & Aldrich) detailing the groundwater elevation contours representing seasonal variations (November 2016 and June 2017) are provided in **Appendix H**.

6.3 Groundwater Monitoring Analytical Results (*40 CFR § 257.103 (f)(1)(iv)(B)(3)*)

Tables (prepared by Haley & Aldrich) summarizing the constituent concentrations of each groundwater monitoring well sampled between 2016 and 2020 are attached (**Appendix I**).

6.4 Description of Site Hydrogeology (*40 CFR § 257.103 (f)(1)(iv)(B)(4)*)

A description of the site hydrogeology including stratigraphic cross-sections (prepared by Haley & Aldrich) is attached (**Appendix J**).

6.5 Corrective Measures Assessment (*40 CFR § 257.103 (f)(1)(iv)(B)(5)*)

The Corrective Measures Assessment report (prepared by Haley & Aldrich) is located on A.B. Brown's CCR Compliance website. (https://www.vectren.com/assets/downloads/planning/ccr/Brown-Ash-Pond-Corrective-Measures-Assessment-Report.pdf)

Groundwater sampling at A.B. Brown identified two Appendix IV constituents, lithium and molybdenum, in exceedance of Groundwater Protection Standards, and the Corrective Measures Assessment was prepared in response to those results. The Corrective Measures Assessment evaluated the potential risk these constituents posed and potential corrective measures to prevent further releases. Groundwater flow was evaluated and found in the vicinity of the Ash Pond to flow predominantly to the west with a component of flow to the northwest from the northern portion of the Ash Pond. There are no groundwater supply wells within one-half mile to the north or northwest of the Ash Pond. The nearby Ohio River is to the south of the Ash Pond and groundwater does not flow in that direction. The risk assessment demonstrated no adverse effects on human or ecological health from groundwater. Potential corrective measures to prevent further releases were identified and evaluated. These measures are based on Closure by Removal with Beneficial Use and include Monitored Natural Attenuation, Hydraulic Containment with No Treatment, and Hydraulic Containment with Treatment. These evaluations are further discussed and compared in the Corrective Measures Assessment.

6.6 Progress Reports (*40 CFR § 257.103 (f)(1)(iv)(B)(6)*)

The progress reports (prepared by Haley & Aldrich) on corrective action remedy selection dated March 2020 and September 2020 are located on A.B. Brown's CCR Compliance website.

March 2020 Progress Report (https://www.vectren.com/assets/downloads/planning/ccr/Brown-Ash-Pond-Semi-Annual-Selection-of-Remedy-Progress-Report_2020March.pdf)

September 2020 Progress Report (https://www.vectren.com/assets/downloads/planning/ccr/Brown-Ash-Pond-Semi-Annual-Selection-of-Remedy-Progress-Report_2020September.pdf)

6.7 Structural Stability Assessment (*40 CFR § 257.103 (f)(1)(iv)(B)(7)*)

The structural stability assessment report (prepared by AECOM) is located on A.B. Brown's CCR Compliance website. (https://www.vectren.com/assets/downloads/planning/ccr/Brown-Pond-Structural-Stability-Assessment.pdf)

6.8 Safety Factor Assessment (*40 CFR § 257.103 (f)(1)(iv)(B)(8)*)

The factor of safety assessment report (prepared by AECOM) is located on A.B. Brown's CCR Compliance website. (https://www.vectren.com/assets/downloads/planning/ccr/Brown-Pond-Safety-Factor-Assessment.pdf

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Figures

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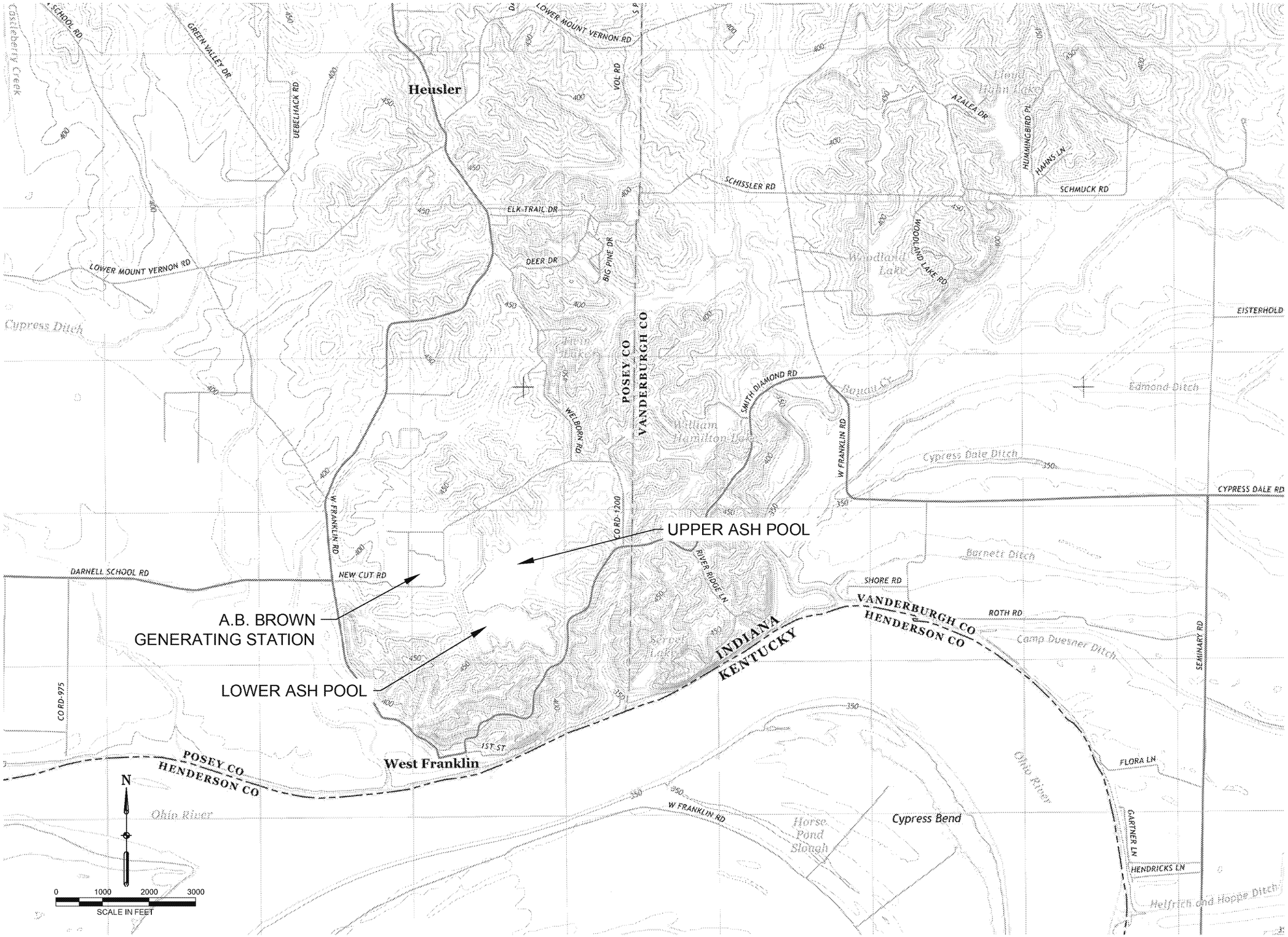

AECOM
9400 Amberglen Boulevard
Austin, TX 78729-1100
512-454-4797 (phone)
512-454-8807 (fax)

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
dba VECTREN POWER SUPPLY, INC.

One Vectren Square
Evansville, IN 47708
1-800-227-1376 (phone)

A.B. BROWN GENERATING STATION
MT. VERNON, IN

DEVELOPMENT OF ALTERNATIVE CAPACITY INFEASIBLE DEMOSTRATION

ISSUED FOR CERTIFICATION

	DATE	BY
ISSUED FOR BIDDING		
ISSUED FOR CONSTRUCTION		

REVISIONS

NO.	DESCRIPTION	DATE
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AECOM PROJECT NO:	60442676
DRAWN BY:	MJC
DESIGNED BY:	MJC
CHECKED BY:	TLE
DATE CREATED:	
PLOT DATE:	4/22/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

LOCATION MAP

FIGURE 1

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AECOM
525 VINE ST, SUITE 1800
CINCINNATI, OH 45202
513-651-3440 (phone)
877-660-7727 (fax)

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
dba VECTREN POWER SUPPLY, INC.

P.O.BOX 209
EVANSVILLE, IN 47702
1-800-227-1376

A.B. BROWN GENERATING STATION
MT. VERNON, IN

DEVELOPMENT OF ALTERNATIVE CAPACITY INFEASIBLE DEMONSTRATION

ISSUED FOR BIDDING - - (DATE BY)

ISSUED FOR CONSTRUCTION (DATE BY)

REVISIONS

NO.	DESCRIPTION	DATE
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AECOM PROJECT NO:	60442676
DRAWN BY:	MSR/MAW
DESIGNED BY:	MSR
CHECKED BY:	RJB
DATE CREATED:	5/1/2017
PLOT DATE:	5/1/2017
SCALE:	AS SHOWN
ACAD VER:	CIVIL 3D 2016

SHEET TITLE

SITE MAP

FIGURE 2

SHEET 4 OF 22

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Appendices

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Appendix A
IURC Cause No. 45052

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ORIGINAL

TAO
SNK

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF A COMBINED CYCLE GAS TURBINE GENERATION FACILITY ("CCGT"); (2) APPROVAL OF ASSOCIATED RATEMAKING AND ACCOUNTING TREATMENT; (3) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR COMPLIANCE PROJECTS TO MEET FEDERALLY MANDATED REQUIREMENTS ("CULLEY 3 COMPLIANCE PROJECT"); (4) AUTHORITY TO TIMELY RECOVER 80% OF THE COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE CULLEY 3 COMPLIANCE PROJECTS THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (5) AUTHORITY TO CREATE REGULATORY ASSETS TO RECORD (A) 20% OF THE REVENUE REQUIREMENT FOR COSTS, INCLUDING CAPITAL, OPERATING, MAINTENANCE, DEPRECIATION, TAX AND FINANCING COSTS ON THE CULLEY 3 COMPLIANCE PROJECT WITH CARRYING COSTS AND (B) POST-IN-SERVICE ALLOWANCE FOR FUNDS USED DURING CONSTRUCTION, BOTH DEBT AND EQUITY, AND DEFERRED DEPRECIATION ASSOCIATED WITH THE CCGT AND CULLEY 3 COMPLIANCE PROJECT UNTIL SUCH COSTS ARE REFLECTED IN RETAIL ELECTRIC RATES; (6) ONGOING REVIEW OF THE CCGT; (7) AUTHORITY TO IMPLEMENT A PERIODIC RATE ADJUSTMENT MECHANISM FOR RECOVERY OF COSTS DEFERRED IN ACCORDANCE WITH THE ORDER IN CAUSE NO. 44446; AND (8) AUTHORITY TO ESTABLISH DEPRECIATION RATES FOR THE CCGT AND CULLEY 3 COMPLIANCE PROJECT ALL UNDER IND. CODE §§ 8-1-2-6.7, 8-1-2-23, 8-1-8.4-1 *ET SEQ*, 8-1-8.5-1 *ET SEQ.*, AND 8-1-8.8 - 1 *ET SEQ.*	)	CAUSE NO. 45052 APPROVED: APR 24 2019

ORDER OF THE COMMISSION

Presiding Officers:
David E. Ziegner, Commissioner
David E. Veleta, Senior Administrative Law Judge

On February 20, 2018, Southern Indiana Gas & Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South") filed its verified petition in this Cause seeking, among other relief, certificates of public convenience and necessity for a new duct-fired F-class 2x1 combined cycle gas turbine ("CCGT") providing 700 MW of baseload and 150 MW of peaking capacity pursuant to Ind. Code ch. 8-1-8.5 and for certain environmental projects at its Culley Unit 3 generating station pursuant to Ind. Code ch. 8-1-8.4. Petitions to intervene were filed by the Vectren Industrial Group; Valley Watch, Inc., the Citizens Action Coalition of Indiana, Inc., and the Sierra Club ("Joint Intervenors"); the Indiana Coal Council, Inc. ("ICC"), Sunrise Coal, and Alliance Coal, LLC (the "Coal Parties"); SABIC Innovative Plastics Mt. Vernon, LLC; St. Joseph Energy Center, LLP; St. Joseph Phase II LLC; and Evansville Western Railway. All of these petitions to intervene were subsequently granted. A public field hearing was held in Evansville on July 11, 2018, at which time members of the public presented testimony. The Indiana Utility Regulatory Commission ("Commission") held an evidentiary hearing at 9:30 a.m. on October 9, 2018, in Room 222, PNC Center, 101 West Washington Street, Indianapolis, Indiana.

Based upon the applicable law and the evidence presented, the Commission finds:

1. **Notice and Jurisdiction.** Notice of the hearings in this Cause was given and published as required by law. Vectren South is a "public utility" as defined in Ind. Code § 8-1-2-1(a) and Ind. Code § 8-1-8.5-1, an "energy utility" as defined in Ind. Code § 8-1-8.4-3, and an "eligible business" as defined in Ind. Code § 8-1-8.8-6. Vectren South is subject to the jurisdiction of this Commission in the manner and to the extent provided by Indiana law. Pursuant to Ind. Code chs. 8-1-8.5 and 8-1-8.4, Vectren South may seek Commission approval of Certificates of Public Convenience and Necessity. Accordingly, the Commission has jurisdiction over Vectren South and the subject matter of this proceeding.

2. **Vectren South's Characteristics.** Vectren South is an operating public utility incorporated under the laws of the State of Indiana, with its principal office and place of business in the City of Evansville. Vectren South provides electric and gas utility service to the public in Indiana and is subject to the regulation by this Commission in the manner and to the extent provided by the laws of the State of Indiana. This proceeding pertains to Vectren South's electric utility business. Vectren South renders retail electric utility service to approximately 145,000 customers in seven counties in southwestern Indiana, and owns, operates, manages and controls electric generating, transmission and distribution plant, property and equipment and related facilities which are used and useful for the convenience of the public in the production, transmission, delivery and furnishing of electric energy, heat, light and power for residential, commercial, industrial and municipal uses. Vectren South furnishes such electric utility service to retail customers located in Vanderburgh, Posey, Gibson, Pike, Warrick, Dubois and Spencer Counties, with a major portion of such customers residing in and around the City of Evansville, Indiana. Vectren South owns and operates 1,248 megawatts ("MW") of total net generating capacity. This generation capacity is primarily derived from the following five coal-fired baseload units providing a total of approximately 1,000 MW: A.B. Brown 1 (245 MW), A.B. Brown 2 (245 MW), F.B. Culley 2 (90 MW), F.B. Culley 3 (270 MW) and Warrick Unit 4 (150 MW[1]). Vectren South procures 100% of its coal supply from mines located in Indiana.

[1] Represents Vectren South's ½ interest in Warrick Unit 4, a 300 MW unit.

Vectren South's operations are subject to federal, state and local rules promulgated and/or implemented by, among others, the federal Environmental Protection Agency ("EPA"), the Indiana Department of Environmental Management ("IDEM") and by the Environmental Rules Board of the State of Indiana. Such rules establish environmental compliance standards that govern emissions and discharges from Vectren South's electric generating units.

3. Overview of the Evidence.

A. Condition of Current Fleet.

i. Vectren South. The main drivers behind Vectren South's proposal are the age and operating characteristics of Vectren South's existing baseload capacity and the upcoming deadlines for significant capital investments to address environmental regulations. Mr. Wayne D. Games, Vice President of Power Supply at Vectren South, testified regarding the condition of Vectren South's current generation fleet and the challenges facing the fleet. He testified Vectren South's fleet consists of five coal-fired baseload units totaling 1,000 MW. Mr. Games further testified that growth of renewable energy sources and low natural gas prices have negatively affected MISO's dispatch of Vectren South's coal-fired units. Instead of running continuously, Vectren South's units are now cycled up and down throughout the day, or are shut down altogether, decreasing unit efficiency and increasing wear and tear on the units. Mr. Games testified that because the units were not designed to cycle in this manner, the units cannot effectively compete with gas units in particular, which have far better operating flexibility. Continued market reforms are exacerbating this issue and jeopardizing unit availability and reliability.

Mr. Games also explained that the individual units face additional operating challenges. In particular, the A.B. Brown Units rely on scrubbers that utilize a technology that has been abandoned by the industry because of its high variable costs and the vapor it emits which causes corrosion of the unit structure. The scrubbers are already past their expected 30 year design life and present a significant risk to reliability and maintenance costs. He explained that Culley Unit 2 is Vectren South's oldest and smallest unit and that it has the worst heat rate of any coal unit in the state. Finally, he explained the unique circumstances related to the joint operation of the Warrick Unit which creates uncertainty as to the duration of its operation.

Ms. Angila Retherford, Vice President of Environmental Affairs and Corporate Sustainability, testified regarding two new major federal regulatory initiatives – Effluent Limitations Guidelines ("ELG") and Coal Combustion Residuals ("CCR") - impacting Vectren South's coal-generating units. Absent substantial investment at all of Vectren South's coal plants, they must cease operations by December 31, 2023. Ms. Retherford described Vectren South's environmental compliance strategy for the A.B. Brown and Culley units and testified future compliance costs were modeled in Vectren South's 2016 Integrated Resource Plan ("IRP") under the business as usual scenario. Ms. Retherford testified these rules and other existing federal regulatory requirements will require Vectren South to make significant further investment at the A.B. Brown and Culley generating facilities to continue their operation.

ii. Non-Utility Parties.

(1) OUCC. OUCC witnesses Lauren M. Aguilar – Utility Analyst, Anthony A. Alvarez – Utility Analyst and Peter M. Boerger – Senior Utility Analyst testified regarding Vectren South's request for a CPCN to construct the CCGT. These OUCC witnesses testified Vectren South's decision to construct the CCGT is premature because Vectren South has not explored all practical alternatives to extend the life of the A.B. Brown units. OUCC Witness Aguilar ultimately recommended that the decision to build the CCGT be delayed until the end of the 2019 IRP process, in order to allow Vectren South the opportunity to evaluate additional alternatives. The OUCC offered no alternative resource proposal, but argued for a "blended approach" with the possible continued use of existing assets, and suggested that the necessary expenditures to continue use of these assets could be viewed as buying an "option on the future." The OUCC witnesses asserted that deferring any decision until the conclusion of the 2019 IRP process would still allow sufficient time to take action without affecting reliability.

(2) Coal Parties. The Coal Parties' witnesses generally testified that Vectren South should wait to transition its baseload generation from coal to natural gas because the environmental regulations driving the transition, the ELG and CCR rules, are in flux and not yet final. Specifically, the Coal Parties' witnesses testified that recent and anticipated EPA reconsiderations of the ELG and CCR regulations, as well as the potential stay or replacement of the Clean Power Plan ("CPP"), create the potential scenario where Vectren South could operate the A.B. Brown and Culley units beyond 2023 without the need to make material investments in compliance measures. Coal Parties witness Michael J. Nasi – Partner with the law firm of Jackson Walker L.L.P. – further testified that Vectren South's decision to retire its coal plants is premature. He recommended that the decision be delayed until the environmental regulations driving the decision are better understood. With respect to the A.B. Brown units, the Coal Parties suggested that Vectren should investigate an alternative scrubber technology marketed by a Chinese firm to replace the existing dual alkali scrubbers. This technology which uses ammonia creates material that can be sold as fertilizer with revenues used to offset variable operating costs of the scrubber.

iii. Vectren South Rebuttal. Ms. Retherford, who is also a licensed attorney, testified regarding the risks associated with continuing to operate Vectren South's coal-fired fleet and delaying the decision to construct the proposed CCGT. Ms. Retherford testified that recent legal developments related to the CCR rule have made it impossible for Vectren South to continue operating its coal-fired fleet beyond 2023 without significant capital investment. She testified that the current water discharge permits require, and the groundwater monitoring results at the A.B. Brown and Culley ash ponds confirm, that Vectren South must cease discharging coal ash by December 31, 2023, pursuant to the ELG and CCR rules. She also testified that *Utility Solid Waste Activities Group v. Environmental Protection Agency*, 901 F.3d 414 (D.C. Cir. 2018), 2018 U.S. App. LEXIS 23547, confirms that the CCR Rule is final, including the final compliance deadlines at issue in this proceeding. Ms. Retherford testified that pond retirement delay is not an option, and therefore Vectren South must either make investments to comply with the CCR rule or retire the plants before 2024.

In response to the Coal Parties' position that the current administration could alleviate environmental carbon regulations applicable to the coal units, Ms. Retherford testified that the Administration's proposed replacement for CPP does not alleviate the problems. On August 31, 2018, the EPA published its proposed Affordable Clean Energy ("ACE") rule in lieu of CPP. She explained

that ACE would increase uncertainty and could actually increase the cost of compliance. For units with high heat rates – such as A.B. Brown – ACE would cause significant future compliance costs.

Vectren South also presented the testimony of Richard McMahon from Edison Electric Institute ("EEI") regarding the growing importance of Environmental, Sustainability and Governance ("ESG") reporting and metrics to the financial community, and the focus of all public electric utilities on being responsive to these topics and establishing explicit carbon reduction targets as part of their public disclosures. Mr. McMahon described the coordinated electric industry response to the demands for ESG reporting, and provided specific examples of lenders and large institutional investors who are putting pressure on companies to transition from dependence on coal units. He explained that Vectren South's 60% carbon emission reduction was in line with similar targets publicly disclosed by its electric utility peers. He also presented information regarding the industry transition from reliance on coal to use of gas as part of the ability to reduce carbon emissions.

As to the potential for alternative scrubbers, Vectren South witness Paul Farber – Principal of P. Farber & Associates, LLC – testified regarding the shortcomings of the technologies presented by Sunrise Coal witness Dombrowski and OUCC witness Aguilar and explained why, from an operational and financial perspective, it would not be prudent for Vectren South to adopt those technologies. With respect to the ammonia based scrubber technology presented by witness Dombrowski, Mr. Farber testified the technology has very limited deployment in the United States and would present a number of operational challenges if installed at baseload coal-fired units like A.B. Brown. These uncertainties and risks posed by adoption of this technology include its cost, its impact on operation of the units (including that it might cause Vectren South to be out of compliance with regulations for other constituents such as mercury and particulate matter absent further types of investments), the unknown ability to sell fertilizer output, and the complications associated with dealing with vendors with no domestic history. He discussed in depth the substantial operational burden and health and Homeland Security risk associated with handling the large amount of ammonia required by such a scrubber. Mr. Farber concluded that the Coal Parties had failed to provide any evidence that the capital costs of this scrubber technology would be any less than the scrubber modeled in Vectren South's 2017 IRP Update. In rebuttal testimony, Jon K. Luttrell, Senior Vice President, Utility Operations and President of Vectren Utility Holdings, Inc., also discussed the cyber security complications and risks posed by adoption of Chinese scrubber technology.

Mr. Farber also responded to OUCC witness Aguilar's criticism that Vectren South "only" evaluated wet limestone and her presentation of potential costs for other technologies. Mr. Farber testified that dry scrubbing is not an applicable technology at A.B. Brown for technical and economic reasons, and therefore it was logical for Vectren South to evaluate wet limestone technology at A.B. Brown. He also testified the cost estimates presented by Ms. Aguilar are not comparable cost estimates to replace the existing scrubbers at A.B. Brown Units 1 and 2.

Mr. Games testified on rebuttal that there simply is no time to delay a decision and await the outcome of another IRP. The Vectren South coal units must be retired or retrofitted by December 31, 2023. Given that there has been nothing to suggest more delay would change the overall economics that the F-class 2x1 CCGT is part of the lowest cost solution under every scenario, there is no reason to believe that modeling in the next IRP would change that result. Mr. Games provided an exhibit setting forth a timeline showing that a delay to allow the next IRP to proceed would leave Vectren South with essentially no baseload capacity for almost three years. During that entire period, Vectren

South customers would be completely exposed to the market for capacity and energy. Per the redirect examination of Justin M. Joiner, Director of Regulatory Policy and MISO Affairs for Vectren Utility Holdsings, Inc. ("VUHI"), this would be during the period when MISO is projecting its largest capacity shortfall for Zone 6 (Indiana). The Commission's Director's Report states "[a]n appropriate planning aspiration is to maintain flexibility while also waiting as long as reasonably possible to commit to a resource." Mr. Games testified on cross-examination that Vectren South has waited as long as reasonably possible.

B. Modeling and Results. Only two parties presented modeling evidence and results. Vectren South presented the modeling from the 2017 IRP Update and the 2016 IRP. Sunrise Coal Witness Philip Hayet presented alternative modeling whereby Vectren South's Preferred Portfolio was delayed by seven years in order to allow existing coal units to continue to operate beyond 2023. Other parties offered criticism of Vectren South's modeling but presented no alternative modeling.

i. 2016 IRP. Vectren South's case was filed in the context of a proposed new rule to govern the IRP process. While our new rule was not effective during the 2016 IRPs, all participating electric utilities complied. This new process is significantly more transparent. It includes the participation of stakeholders, the convening of public meetings, and the submission of and response to comments. Mr. Matt Rice, Director – Research and Energy Technologies, testified regarding Vectren South's IRP process and the results of that process. Mr. Rice described Vectren's approach to its 2016 IRP process and testified Vectren South engaged several industry experts, including Burns & McDonnell and Pace Global, to conduct technical modeling. Mr. Rice testified Vectren South worked with these experts and IRP stakeholders to conduct scenario analysis to evaluate 15 portfolios, each representing a different mix of supply and demand side resources to meet customer load over a 20-year time horizon. He further testified Vectren South worked with Pace Global to conduct a risk analysis and evaluate the 15 portfolios using a balanced scorecard approach. From this analysis, Vectren South identified the "preferred portfolio" which consisted of replacing all existing coal fired generation other than Culley Unit 3 as well as gas peaking units Northeast 1 and 2 and Broadway 1 by 2024 with an F-class .05 Fired CCGT. Mr. Rice testified Vectren South incorporated stakeholder input throughout the process and described the steps Vectren South took to engage stakeholders both before and during the process. This engagement included having stakeholders develop two portfolios which were then modeled and included in the risk analysis.

Mr. Matthew Lind – Associate Project Manager, Burns & McDonnell – described the modeling Burns & McDonnell conducted in the 2016 IRP on behalf of Vectren South to evaluate its resource needs over the next 20 years. He testified the results of Burns & McDonnell's modeling identified a low-cost portfolio that ceased coal operations at Vectren South's coal fired facilities (A.B. Brown Units 1 and 2, F.B. Culley Units 2 and 3, and Warrick Unit 4) and replaced this capacity and energy with the combined cycle facility proposed here along with a simple cycle facility. Mr. Gary Vicinus – Managing Director for Utilities at Pace Global – described Pace Global's role in identifying and defining the objectives, metrics and risks in order to select the preferred portfolio among the many options. He testified Pace Global used a balanced scorecard approach to apply a risk analysis to a selection of portfolios ultimately to recommend a preferred portfolio. Mr. Vicinus further testified regarding revisions Pace Global made to its risk analysis and explained that, even with these revisions, the risk analysis indicated the preferred portfolio was the best approach.

Mr. Rice described the preferred portfolio and explained why it ranked the best on the balanced scorecard. He testified it performed the best because the portfolio is diversified as it contemplates keeping FB Culley 3 (a coal unit) and existing wind contracts, building a CCGT and introducing solar and continuing to offer energy efficiency. He further testified it is among the lower cost portfolios (within 4% of the predominantly gas lowest cost portfolio) and ultimately performed best overall when viewed across multiple measures on the balanced scorecard. Because the all-gas portfolio represented the lowest cost portfolio, it is the retention of Culley Unit 3 and the accelerated addition of the 50 MW solar project that increases the costs of the Preferred Portfolio over the lowest cost all-gas portfolio. Retention of coal and the addition of solar are essential to diversity.

ii. 2017 IRP Update. Mr. Lind testified Vectren South requested Burns & McDonnell to update the 2016 IRP modeling and the re-evaluated low-cost portfolio was consistent with the low-cost portfolio identified in the 2016 IRP. He explained that several modeling inputs were updated, including the capital cost for solar resources, variable production costs and revenue requirements for existing units, an assumed operation of Warrick Unit 4 through 2023, and updated cost assumptions for capacity, energy, natural gas, coal, and energy efficiency.

OUCC witness Peter Boerger testified regarding Vectren South's 2017 IRP Update economic modeling. Mr. Boerger testified that Vectren South's 2017 IRP Update did not adequately consider viable options for serving its customers—including making use of existing resources and adequately considering the addition of a smaller CCGT unit rather than the 2x1 unit being proposed. Mr. Boerger also testified Vectren South's modeling of the proposed CCGT understated its capital cost by $200 million, an error which disadvantaged other options in Vectren South's modeling. Mr. Boerger ultimately recommended Vectren South reevaluate its future needs and model additional alternatives.

CAC witness Tyler Comings – Senior Researcher at Applied Economics Clinic – testified on behalf of the Joint Intervenors. Mr. Comings criticized Vectren South's modeling, testifying it was too convoluted to yield a sufficiently transparent or credible result. He testified Vectren South used too many models in the selection of the preferred portfolio and that the use of many models created ample opportunity for flawed and/or inconsistent input assumptions and other settings that could create bias in favor of the preferred plan. Mr. Comings ultimately recommended Vectren South's petition be denied because, in his view, Vectren South did not provide sufficient justification for its choice to build the CCGT and continue the operation of Culley 3.

Indiana Coal Council witness Emily Medine – Principal in the consulting firm of Energy Venture Analysis, Inc. – also testified regarding Vectren South's modeling. Witness Medine testified Vectren South should have fully updated its 2016 IRP analysis, including its scenario analysis, in order to confirm its preferred resource portfolio. She further testified that such an update should include a broader analysis (including sensitivity analyses) of the relevant assumptions and factors as of a time as close to Vectren South filing its Petition as possible. Ms. Medine attributed the decision to build a CCGT to financial motivations and also opined that approval of the CCGT might be a condition to closing the Vectren South merger transaction.[2] Ms. Medine recommended that Vectren South's Petition be rejected because Vectren South has failed to show that proceeding with building the CCGT at this time is prudent, less risky, and a better decision for both customers and the environment.

[2] While this case was pending, it was announced publicly that Vectren South's holding company was the subject of an acquisition at the holding company level, which was the subject of Cause No. 45109.

Mr. Lind responded to Mr. Boerger's testimony about an alleged $200 million "error." He explained that approximately $67 million of the alleged error identified by Mr. Boerger was due to Mr. Boerger's mistaken assumption about whether modeled option costs are stated in 2017 dollars or nominal dollars in the year of incurrence. The remainder is due to Mr. Boerger's efforts to compare apples and oranges. As Mr. Lind explained, the modeling was done prior to the more refined cost estimates for the CCGT that were developed for this case. Rather than based on a design level accuracy of plus/minus 50%, the CCGT design has been refined to a plus/minus 10%. All of the other portfolios were still at plus/minus 50%. As Mr. Lind explained, to compare the other less refined portfolios to the more refined CCGT would require some additional risk factor for the other portfolios. But even if one includes the updated cost estimate, Mr. Lind testified that it doesn't change that the lowest cost portfolios still include the CCGT. Mr. Lind prepared additional modeling involving coal-to-gas conversion (which we will describe later) and which did include the more refined CCGT cost estimate. While this additional modeling used the more precise CCGT cost and therefore impacted every portfolio that included the CCGT by increasing the overall net present value ("NPV") by $54 million, the portfolios that included the CCGT were still the lowest cost portfolios compared to portfolios that did not include the CCGT. Regarding the use of the models, witnesses Lind and Vicinus confirmed that the process and modeling for Vectren South's IRP and risk analysis were consistent with the resource planning approach Pace and Burns & McDonnell have used for numerous other utilities.

(iii) Size of the Proposed CCGT. Joint Intervenors' witness Tyler Comings testified regarding the size of the proposed CCGT. Witness Comings testified that Vectren South has not provided a sufficient justification to build a CCGT of the size included in its proposal. Witness Comings also criticized Vectren South's Request for Proposals ("RFP") (which we will describe in greater detail later) which sought resources between 600 and 800 MW, because he believed Vectren South could have considered combinations of small resources that added up to 600 MW. He further testified that considering smaller options would limit the market risk exposure for ratepayers, as well as permit a combination of bids to make up a least cost alternative. Mr. Comings testified that in order to reduce ratepayers' risk, Vectren South should explore cost effective alternatives that do not require intensive capitalization, but still provide benefits to ratepayers.

OUCC witness Anthony Alvarez also testified regarding the size Vectren South is proposing for the CCGT. Mr. Alvarez testified that Vectren South currently has excess supply, and there is no resource shortfall or inadequacy that supports Vectren's proposed 850 MW CCGT. He also questioned the load forecast used in the IRP and testified Vectren South has excess supply after serving its peak load and therefore has excess capacity to offer into the market and serve new customers.

Industrial Group witness Michael Gorman also testified regarding the size of Vectren South's proposed CCGT. Mr. Gorman testified Vectren South's proposal to build an 850 MW CCGT will result in excess capacity and have a compound impact on Vectren South's cost of service because the plan increases the costs of new generation resources and results in unrecovered stranded costs from the retired resources. Mr. Gorman recommended the Commission implement mitigation measures to reduce the cost burden on customers related to stranded costs and the cost of the new CCGT. He also recommended the Commission modify the off-system sales margin treatment so that 100% of future wholesale revenues be provided to customers to offset the cost of the proposed resource plan.

Vectren South witness Carl Chapman testified on rebuttal regarding Vectren South's decision to construct an 850 MW CCGT. Mr. Chapman explained the CCGT is essentially two units -- a 700 MW baseload unit to replace 730 MWs of retiring coal unit capacity and 150 MWs of duct fired peaking capacity to replace older peaking units and provide available low cost capacity for growth and wholesale sales opportunity. The additional peaking capacity is provided by the decision to duct-fire the CCGT. The incremental cost of duct-firing the CCGT is $15 million, and that decision must be made at the time the CCGT is constructed (i.e., it cannot be added at a later time.) Mr. Chapman testified that if only the unfired 700 MW baseload CCGT is built, then by 2025, Vectren South has a projected surplus above MISO's Planning Reserve Margin ("PRM") (which fluctuates) of only 51 MW. He further testified that by 2030, the surplus is only 5 MWs and by 2031 Vectren South will fail to meet its PRM. He testified that by 2036, Vectren South will be short 39 MWs, and all of this assumes Vectren South will not add significant new load. Mr. Chapman testified that with its low capital cost, firing makes sense from a customer perspective. For an incremental cost of 2%, the firing provides a 21% increase in capacity. Nevertheless, if the Commission approves the baseload 700 MW CCGT without firing, Vectren South will proceed to construct the unfired CCGT to replace its baseload coal units. He stated that Vectren South would also consider investing the incremental $15 million to duct-fire the unit and be at risk to recoup its investment via retention of the wholesale revenue produced by that peaking capacity.

Mr. Chapman also testified regarding Industrial Group witness Gorman's recommendation that Vectren South pass off-system sales margins on to retail customers. Mr. Chapman testified that Vectren South has decided to commit to provide 100% of wholesale sales revenue from the CCGT (baseload and peaking) to customers. Mr. Chapman explained that once the CCGT is placed in rate base, the benefits from the wholesale revenue produced by the unit will go to reduce customer costs. Mr. Chapman testified that providing 100% of wholesale revenue to customers further improves the NPV of the CCGT, will provide a larger offset to customer costs in general, and adds even more support to the $15 million incremental investment to duct fire the unit.

C. <u>Coal Parties' Modeling</u>. Indiana Coal Council, Inc. witness Philip Hayet – Vice President of J. Kennedy and Associates, Inc. – testified regarding Vectren South's 2016 IRP modeling and the 2017 IRP Update. Mr. Hayet testified that Vectren South's modeling analyses were flawed due to errors, inconsistencies, and a lack of consideration of important factors. Mr. Hayet performed his own analysis and testified that using the same model with certain corrections, including a deferral of a decision to add a CCGT, produced a slightly lower cost result on a NPV basis. He predicated his modeling on the assumption that the A.B. Brown 2 scrubber will continue to operate reliably through 2030. He ultimately recommended that Vectren South defer its decision to construct the CCGT.

On rebuttal, Vectren South witness Matthew Lind testified regarding Indiana Coal Council witness Hayet's alternative modeling. Mr. Lind testified that when Mr. Hayet's modeling is corrected for obvious errors, it reaches the same preferred portfolio conclusion as Vectren South's modeling. Mr. Lind provided corrections to Mr. Hayet's modeling in the form of an updated Strategist model and spreadsheets documenting the corrections. Mr. Lind outlined each of the errors he identified in Mr. Hayet's modeling and the impact of the individual errors on his analysis. The first of several errors he identified was that Mr. Hayet failed to include cost escalation during the seven years of delay that he was urging and that correcting this error alone would change Mr. Hayet's overall conclusion that delay would be less costly. Mr. Lind also testified regarding the cumulative effect of

addressing all of the errors. As part of this analysis, Mr. Lind testified that he included the increased cost of the CCGT to reflect the more recent cost estimates based on a plus or minus 10% confidence level. He testified that when correcting Mr. Hayet's modeling for all of these errors and inconsistencies, the NPV favors Vectren South's preferred portfolio, even under Mr. Hayet's no carbon regulation scenario. Witness Hayet corrected his testimony after Mr. Lind filed his rebuttal to add the escalation during the period of delay he was urging, and this correction changed his original conclusion that delay was less expensive. Mr. Hayet did not address the other modeling issues raised by Mr. Lind.

Mr. Games' rebuttal testimony also addressed witness Hayet's assumption that the A.B. Brown 2 unit and scrubber could be operated without added cost and reliability risk through 2030. Apart from the reliability issues created by the frequent cycling of the unit, he explained the structural damage resulting from the corrosive environment created by the unique characteristics of these scrubbers, and based on his direct experience with this equipment, Mr. Games concluded that he could not agree that it would be prudent to continue to operate the A.B. Brown 2 scrubber for another 12 years beyond 2018.

D. <u>Renewables and All-Source RFP</u>. Joint Intervenor witness Tyler Comings criticized the costs assumed in Vectren South's modeling for most renewable energy sources. Mr. Comings testified that Vectren South's forecast of the capital costs of future wind resources is higher than he would have recommended for the type of planning analysis and its forecast of the fixed O&M costs are lower. Mr. Comings recommended the use of the National Renewable Energy Laboratory's Annual Technology Baseline ("ATB") to develop the forecasts. With respect to future solar resources, Mr. Comings testified Vectren South's forecasts are too high for both the capital and fixed O&M costs. Mr. Comings recommended the reliance on the ATB to develop wind and solar price forecasts. For utility-scale PV, he testified that the ATB midpoint projection would be appropriate. As part of his discussion of renewable costs, he noted that Northern Indiana Public Service Company ("NIPSCO") had recently conducted an RFP and obtained solar and wind bids. Mr. Comings testified that Vectren South's overestimation of renewable costs compared to the ATB data biased the modeling results against renewable resources in favor of non-renewable resources, such as natural gas.

On rebuttal, Mr. Lind responded to Mr. Comings' testimony related to the cost of renewables included in Vectren South's modeling. With respect to wind resources, Mr. Lind noted that prior to revising his testimony, Mr. Comings' originally filed testimony included an inaccurate and inappropriate comparison of assumed capital cost for wind resources between Vectren South and ATB because Mr. Comings failed to account for the declining cost curve over time utilized by Vectren South. Mr. Lind testified that when Mr. Comings updated his testimony to reflect this decline, he recognized that Vectren South's wind costs are only "slightly higher" than what Mr. Comings recommends. Mr. Lind further testified that even with this correction, Mr. Comings' comparison to the ATB figures is incorrect because the ATB figure excludes a 2.1% construction finance factor and is thus understated. Mr. Lind testified that when the 2.1% construction finance factor is included, the ATB capital cost will exceed Vectren South's modeled capital cost for wind over more than half of the planning period. Mr. Lind pointed out that Vectren South assumed a higher capacity factor than the ATB survey and also assumed lower O&M costs compared to the ATB survey, and as a result, it is likely that the wind prices recommended by Mr. Comings are actually higher than those modeled by Vectren South.

With respect to Mr. Comings' criticisms of Vectren South's solar costs, Mr. Lind testified Mr. Comings again failed to account for the declining cost curve over time in the original version of his testimony. Mr. Lind further testified that while Mr. Comings did update his comparison to reflect the decline, he did not update it to include the 2.1% construction finance factor in the ATB comparison. Moreover, Mr. Lind explained that the national survey costs relied upon by Mr. Comings were presented on a direct current (DC) basis, whereas the 2017 IRP Update stated cost in terms of alternating current (AC), thus requiring that Comings' costs be converted to AC to allow for a valid comparison to be made. When correcting for these additional errors, Mr. Lind testified the solar costs used by Mr. Comings and Vectren South are nearly consistent over the last half of the study period and fairly similar from 2024 onward, which is the point at which capacity is needed.

Mr. Lind also testified regarding the impact of network upgrades and congestion costs on a portfolio that would rely more heavily on renewables. Mr. Lind testified that a portfolio which would rely heavily on renewables to supply power to Vectren South's customers is more likely to source some or all of these resources remote to Vectren South's service territory given the acreage required for such projects, the grid issues that can be encountered, and the enhanced production that can be obtained in certain locations (e.g., northern Indiana). Mr. Lind explained that when significant amounts of power are sourced from off-system resources, congestion costs to Vectren South's customers increase substantially. Because such costs were not part of the 2017 IRP Update assumptions, Mr. Lind concluded that any small differences between the solar costs presented by Mr. Comings and those modeled by Vectren South would be more than offset by the congestion costs associated with greater reliance on such resources. Finally, Mr. Lind noted that even assuming lower renewable costs could be achieved, such resources would likely displace Culley Unit 3's 270 MWs of capacity because that could be done incrementally to reduce the effects of network upgrades and congestion, whereas the CCGT would remain the optimal low cost choice to replace the remaining 730 MWs of retiring coal capacity in 2023. Further, wind and solar are intermittent sources of power; given that Culley Unit 3 would be Vectren South's only baseload capacity under its preferred portfolio, dispatchable baseload generation from a CCGT provides greater flexibility to respond to intermittent resources.

E. <u>Capacity Price Forecasts</u>. Mr. Comings testified regarding Vectren South's ability to purchase future needed capacity from the MISO market. Mr. Comings testified that Vectren South overestimated future capacity prices in MISO in its modeling, and in reality, the MISO market has had an oversupply of resources and tempered demand, leading to low capacity prices. He testified Vectren South's assumption of higher capacity prices is critical, because it makes the economics of building a new resource more attractive. He concluded that Vectren South was placing risk on its customers if the price of capacity is lower. To reach his conclusion, he relied on the MISO auction clearing results for Zone 6 (Indiana) for the past five years. Indiana Coal Council witness Hayet had a similar criticism of Vectren South's modeled capacity prices. He agreed that the cost of new entry ("CONE") served as the upper end of future capacity prices but that, also based on MISO historic auction clearing prices, it was inappropriate for future assumed capacity prices to approximate CONE. Instead, witness Hayet proposed to use 75% of CONE.

On rebuttal, Vectren South witness Joiner responded to Mr. Comings' testimony related to Vectren South's alleged overestimation of MISO capacity prices. Mr. Joiner testified he disagreed with Mr. Comings' contention that Vectren South should assume it will be able to purchase capacity and energy from the MISO market at low prices based upon recent market conditions. Mr. Joiner explained that the MISO market has been volatile in recent years and is experiencing shrinking

capacity, and such factors have prompted MISO to evaluate changes to its market structure. Mr. Joiner testified that MISO's recent and pending market reform initiatives, including MISO's Resource Availability and Need ("RAN"), are aimed at increasing capacity and energy prices to incentivize new generation development and are thus leading to higher prices as capacity tightens. As such, Mr. Joiner testified that while MISO's historical capacity and energy prices are indicators of recent trends, contrary to Mr. Comings' MISO auction clearing price testimony, they are not good indicators of expected, long-term future pricing. Moreover, the reported potential for a capacity shortfall by 2024 shows the risk of increased market prices.

F. Refueling Options. OUCC witness Boerger recommended that Vectren model a smaller 440 MW CCGT option in conjunction with gas refueling of one or both A.B. Brown units in order to consider a lower capital cost alternative. This option, which replaces retired coal units with a smaller gas baseload unit, was consistent with his stated concern that implementation of large quantities of intermittent renewables could create grid difficulties and that the extension of the life of small coal units is not common in the industry.

Mr. Lind's rebuttal presented the results of additional modeling in response to the OUCC's interest in further analysis related to resource plan options including coal-to-gas conversion that would make use of the A.B. Brown unit boilers. Burns & McDonnell performed that modeling and analyzed four additional portfolios, each where the conversion of one or more units to natural gas was considered. Mr. Lind testified that this updated rebuttal modeling used the more refined cost estimates (at the plus/minus 10% confidence level) for the CCGT for comparison with the coal-to-gas conversion portfolios (which were stated at plus/minus 50% accuracy.) Mr. Lind described the results of the updated analysis and testified that when compared with the coal-to-gas conversion portfolios, the preferred portfolio still produces a lower NPV and projected customer cost. Witness Games explained that this is due in part to the high heat rates of refueled units which result in very poor dispatch rates and resulting reliance on the market for energy needs. He explained that such a portfolio would result in customers significantly depending on market purchases for energy. Witness Games testified the fuel cost per MWhr from a converted gas plant is roughly $20 more expensive than the cost from the proposed CCGT when gas price is $4.000/dkt. He showed the much higher heat rates and lower capacity factors at converted plants that were completed between 2013 through the first quarter of 2018. Mr. Games testified during the hearing that the problem of high heat rates means that the refueled units continue to cycle and ramp up and down when dispatched, leading to wear and tear and the risk of additional maintenance costs.

G. Docket Entry Question & Response. As a follow-up to the additional modeling performed by Vectren South on rebuttal of gas conversion options, we issued a Docket Entry requesting further iterations of gas conversion portfolios. These included refurbishment of Broadway Unit 2 coupled with delays of removal of Warrick Unit 4 and installation of either a simple cycle or combined cycle gas turbine. Vectren South's response included the more refined cost estimate of the CCGT at plus/minus 10%, excluded additional environmental compliance costs at Warrick Unit 4 that would allow for the delay, and were presented with and without the commitment by Vectren South on rebuttal to pass 100% of wholesale revenues to customers if the CCGT is approved. All of the additional modeling requested by our docket entry produced a higher NPV than the lowest cost refueling portfolio presented on rebuttal (to convert A.B. Brown and instill a simple cycle gas turbine). With the sharing of 100% of wholesale revenues, all of the additional modeling produced a higher NPV when compared to the preferred portfolio ranging from 3.5% to 7.0%. Given that the preferred portfolio was within 4% of the lowest cost 2016 IRP portfolio (CCGT, an additional

simple cycle turbine, and delayed renewables), that means the gas conversion portfolios ranged anywhere from 8-12% higher than the lowest cost portfolio.

H. Estimated Cost of CCGT and RFP Process.

i. Vectren South. Mr. Games testified that, consistent with the 2016 IRP results, the 2017 IRP Update, and the Pace risk analysis, Vectren South is proposing to build a CCGT with 700 MW of baseload capacity and 150 MW of peaking capacity to replace retiring coal-fired capacity. Mr. Games testified Vectren South is proposing to build a unit with an output of approximately 850 MWs in order to hold some additional capacity to meet its obligations as a public utility, as well as to serve potential new customers and foster economic development. The 850 MW replaces 865 MW of retiring capacity (730 MW of baseload and 135 MW of peaking capacity, including Broadway Unit 2 in 2025). Mr. Games further testified the estimated cost of the CCGT is $781 million (+/-10%). The estimate includes owner's costs and allowance for funds used during construction ("AFUDC"). This figure was based on cost estimates developed by witness Diane M. Fischer, Central Regional Area Director and Associate Vice President with Black & Veatch. Those estimates were derived from a request for proposals for all equipment comprising the CCGT as well as construction. Mr. Games testified Vectren South is proposing to construct the new CCGT on its existing A.B. Brown generating site which will provide a conservative cost savings of $50 million resulting from reusing the existing site, facilities and equipment. He explained the critical timing of the in-service date of the CCGT which will be operational for the 2023/2024 MISO capacity year in order to retire the Culley 2 and A.B. Brown units and thereby avoid material capital investments otherwise required to operate those units beyond 2023. Similarly, the Warrick Unit 4 joint operating agreement will terminate at the end of 2023. To continue to operate Warrick would also require further investment to comply with environmental regulations.

Mr. Luttrell testified regarding the other replacement generation options Vectren South considered. He described the solicitation of competitive bids for either purchased power or ownership of all or a portion of a new CCGT unit. Mr. Luttrell explained Vectren South engaged Burns & McDonnell to manage the entire power supply RFP process, and testified this process allowed Vectren South to compare the best competitive offers for dispatchable baseload capacity to several self-build alternatives, including a partnership alternative. Mr. Luttrell testified that based on this economic and qualitative comparison, Vectren South made the decision to pursue building the duct-fired version of the proposed CCGT at the existing A.B. Brown site.

Mr. Lind testified in greater depth regarding Burns & McDonnell's role in developing and managing the RFP process to address Vectren South's power supply needs. He testified Vectren South received 11 unique proposals from six different developers. He further testified each of the conforming proposals was ranked and the top two proposals were compared with Vectren South's self-build proposals. Mr. Lind testified that based on NPV cost and qualitative risk factors, including a congestion analysis related to an off-system generation project developed by a third party, Vectren South determined that the self-build option was the best resource for reliable, long term service.

ii. OUCC. Witness Alvarez testified that, while Vectren South conducted an RFP, Vectren South did not competitively bid the actual CCGT it seeks to build in this case. OUCC witness Aguilar testified that Vectren South has not yet identified a manufacturer, chosen an exact type of CCGT, or issued any bids for the project.

iii. Coal Parties. ICC witness Medine criticized Vectren South's RFP process for a number of reasons, including the contention that Vectren South was involved in the process and the self-build project did not submit a bid as part of the RFP process. ICC witness Hayet stated a similar concern. Ms. Medine also disagreed with the position that self-build projects represent less risk than merchant projects. Ms. Medine further testified regarding the risks associated with self-builds, including cost over-runs. She testified that most if not all new Indiana plants have experienced cost over-runs that utilities look to customers to recover, and unless Vectren South is willing to guarantee costs, this is a risk that should be considered.

iv. Joint Intervenors. Witness Comings testified Vectren South did not facilitate a competitive bidding process, which limited resources and discouraged bidders from offering purchased power agreements ("PPAs"). He further testified the RFP should not have been limited to MISO Zone 6 and should have been similar to other investor-owned utility solicitations.

v. Vectren South Rebuttal. Mr. Luttrell responded to the Intervenors' criticisms of Vectren South's RFP process. With respect to Mr. Comings' criticisms that Vectren South did not facilitate a competitive bidding process, including limiting resources and discouraging bidders from offering PPAs, Mr. Luttrell testified Vectren South is retiring over 70% of its baseload capacity and the RFP was specifically designed to fill that deficiency with reliable cost-effective supply identified by the IRP. Mr. Luttrell further testified PPAs were not discouraged and all four of the responsive bidders offered a PPA. Mr. Luttrell also responded to Ms. Medine's criticisms that Vectren South was involved in many aspects of the solicitation and that Vectren South did not submit a bid as part of the RFP Process. Mr. Luttrell testified Vectren South used two separate teams—one focused on the RFP and evaluation and one focused on developing the cost estimate for the Vectren South-build CCGT—and each of these teams were separate and walled off from the other. He testified Vectren South's involvement in the RFP process was critical to help ensure the RFP would meet the needs its modeling indicated was necessary. He further testified he did not believe the RFP process was negatively impacted as a result of the self-build alternative being developed parallel to the evaluation of the RFP bids, and Ms. Medine acknowledges "there is no evidence that there was inappropriate information transfer." Mr. Luttrell explained that ultimately, an evaluation of congestion costs associated with the off-system resource proposal was the driver of selecting the CCGT project at A.B. Brown as the best option.

Mr. Luttrell also responded to Ms. Medine's position that a PPA does not pose a greater risk than having a regulated utility own the generation facility. Mr. Luttrell testified that Vectren South believes that an on-system project at an existing utility site subject to regulatory oversight and financed by a public utility, is less risky than relying on a developer. He further testified that when 70% of baseload capacity is at stake, a utility should consider all risks to project completion and to ongoing service in the long term. Mr. Luttrell provided a real-life, recent example of the risks associated with relying on a developer to construct a project. Further, Mr. Luttrell testified that a PPA does represent greater risk compared to a self-build option because the financing, construction, operation, and future financial stability of the seller is not in control of either the regulated public utility or the Commission. Mr. Lind also explained that while the cost estimate for the CCGT is stated at plus/minus 10%, the risk is actually higher (plus/minus 50%) for all portfolios that do not include the CCGT.

I. Construction of Gas Lateral to Serve CCGT.

i. Vectren South. Mr. Perry Pergola – Director, Gas Supply – testified regarding Vectren South's decision to secure the interstate pipeline services of Texas Gas Transmission ("TGT") to provide natural gas service to the proposed CCGT. He testified Vectren South selected TGT because it was the least cost pipeline option to serve the CCGT at the A.B. Brown location. Mr. Pergola further testified Vectren South will build and operate a new gas lateral to interconnect with TGT and serve the CCGT.

Mr. Steve Hoover – Director of Engineering – testified regarding the 23 mile gas lateral Vectren South will construct to connect the CCGT with TGT. He testified Vectren South will construct the pipeline itself because, by virtue of its experience building, operating and maintaining new or existing gas facilities in the Vectren South service area, Vectren South is uniquely qualified and positioned to construct the new pipeline. Mr. Hoover further testified the estimated cost to construct the gas pipeline is approximately $87 million. This is not included in the estimated cost of the CCGT as presented by witnesses Fischer and Games, as it is expected the costs of the gas pipeline will be reflected in the delivered cost of the gas.

ii. OUCC. OUCC witness Alvarez testified regarding Vectren South's proposal to build the gas lateral to serve the CCGT. He testified Vectren South did not include the costs necessary to build the gas lateral in the $781 million CCGT cost estimate and should have.

iii. Industrial Group. Industrial Group witness Gorman also testified regarding Vectren South's proposal to construct a gas lateral to serve the proposed CCGT. Mr. Gorman testified Vectren South's proposal to self-build the gas lateral is not consistent with protecting the public interest and is anti-competitive. He testified that Vectren South should have considered a third party or TGT to develop the gas lateral. Mr. Gorman testified that to the extent TGT can construct a gas lateral at a lower cost than the Vectren South self-build option, then this option should be adopted. Mr. Gorman further testified that Vectren South's proposal to recover the pipeline costs as part of the fuel costs for the CCGT is not reasonable because the fixed cost to build the gas lateral will not vary with energy generation or volume of gas delivered to the CCGT. He testified instead it would be appropriate to allocate the gas lateral cost as part of the CCGT fixed capital cost of the facility and allocate it on a capacity basis.

iv. Coal Parties. ICC witness Medine testified regarding Vectren South's proposal to construct the gas lateral. Ms. Medine characterized Vectren South's proposal as a proposal to build the lateral using an affiliate without competitive bidding. She also criticized Vectren South's decision to self-build the gas lateral instead of soliciting bids from third parties. Ms. Medine testified that Vectren South did not solicit bids for the lateral from third parties, and, therefore, it cannot represent that it was the lowest cost option for the construction of the lateral.

v. Vectren South Rebuttal. Vectren South witness Steve Hoover responded to criticisms raised by the Intervenors related to Vectren South's proposal to construct the gas lateral. Mr. Hoover testified that Ms. Medine's characterization of the proposal as an "affiliate transaction" has no bearing on the overall substance of the proposed transaction because there are many reasons why it is advantageous for Vectren South to construct the gas lateral. He reiterated that the Vectren South engineering, land services, and construction management teams have already

successfully completed two similar projects to deliver gas to Duke Edwardsport and IPL Eagle Valley generating units. He testified it is therefore in the best interest of Vectren South's customers for it to enlist the experience and expertise of its gas utility in the pipeline construction and operations. Mr. Hoover also responded to criticisms raised by witnesses Gorman and Medine that the lateral project is anti-competitive and being conducted without competitive bidding. Mr. Hoover testified that Vectren South requested TGT to provide a cost estimate to construct the lateral early in the process, and TGT's cost estimate was 10-15% higher than Vectren South's estimate. He further testified that Vectren South will complete a competitive procurement process to select a contractor to construct the lateral. Mr. Hoover testified that during the course of bidding and the evaluation process, Vectren South will also incorporate cost protections and performance incentives to ensure both competitive and fair pricing.

Mr. Hoover also responded to Mr. Gorman's preference that the lateral be placed in Vectren South's rate base as opposed to the costs being recovered via the Fuel Adjustment Clause ("FAC"). Mr. Hoover testified that like IPL and Duke, Vectren South has chosen to have a qualified local distribution company ("LDC") own and operate its gas delivery pipeline. Therefore, the pipeline will not be an electric utility asset and the costs associated with it will be recovered through gas rates.

As to the allegation that Vectren South's owning the gas pipeline as a gas utility asset is anti-competitive, witness Pergola testified on cross-examination that nearly all of the pipeline (more than 22 of the 23 miles of length) is located in Kentucky and therefore presents no opportunity for bypass, because Vectren South does not possess the right to serve customers in Kentucky.

J. Warrick Unit 4.

i. Vectren South. Mr. Wayne Games testified regarding the uncertain future of Warrick Unit 4. Mr. Games explained that Vectren South and Alcoa co-own the unit pursuant to a Joint Operating Agreement ("JOA") whereby each has 50% ownership in the unit. Mr. Games testified that while Warrick Unit 4 will continue to operate in the near term, the long term outlook for the unit is uncertain. He testified the future of the unit is tied to the Alcoa industrial site, and at any time Alcoa could decide to close the smelter unit, which utilizes significant quantities of electricity produced by Warrick Unit 4, based on price volatility in the aluminum market. He testified that the decision to shut down the smelter unit would jeopardize the future of Warrick Unit 4 and this uncertainty makes it difficult to justify investment in the unit or to depend upon it in the long run.

Vectren South witness Carl Chapman also testified regarding the future of Warrick Unit 4. Mr. Chapman testified that Vectren South has agreed to retain its involvement in the unit through 2023 to support the re-opening of the Alcoa smelter. However, he testified beyond 2023 it does not makes sense to continue to invest in a unit that could be subject to shut down if Alcoa decides it has no continuing need for the capacity.

ii. OUCC. OUCC witness Aguilar testified regarding Warrick Unit 4. Ms. Aguilar testified she does not agree with Vectren South's assessments of the risk of continuing to operate Warrick Unit 4 under the JOA and she disagrees with Vectren South's "presentation of the agreement." She further testified that Vectren South could continue to operate Warrick Unit 4 beyond 2023 with environmental compliance updates.

iii. Vectren South Rebuttal. Mr. Games responded to OUCC witness Aguilar's contention that Vectren South could continue to operate Warrick Unit 4 beyond 2023. He testified that due to compliance requirements coming in Alcoa's next National Pollutant Discharge Elimination System ("NPDES") permit, it is anticipated that the unit will require significant capital investment to meet environmental standards in the future. He testified that these investments coupled with the uncertainty related to whether Alcoa will continue to operate Warrick Unit 4[3] under the JOA and performance issues at the unit, warn against continued reliance on Warrick Unit 4.

Mr. Chapman also testified regarding the continued operation of Warrick Unit 4. He testified that the partnership with Alcoa jointly to operate Warrick Unit 4 has become highly uncertain in terms of duration and no longer represents a viable long-term resource option. Mr. Chapman further testified that while Vectren South's IRP recommended retirement of Warrick Unit 4 well before 2023, Vectren South examined each of the coal units to determine whether such units should be retained. He testified that while Culley 3 and Warrick Unit 4 had better profiles in terms of environmental equipment as compared to Vectren South's other units, Culley 3 ultimately had a better operating history based on cost, availability and heat rate. Mr. Chapman reiterated that a strike against continued operation of Warrick Unit 4 is the uncertainty surrounding the longevity of the Alcoa partnership. He reiterated the continued operation of Warrick Unit 4 is dependent on the aluminum market, and if Alcoa's industrial operations cease at the site, the environmental requirements facing Warrick Unit 4 will become significantly more stringent. Mr. Chapman ultimately testified the bottom line is assuming Warrick Unit 4 can continue on post-2023 presents great risk.

As noted previously, in response to our Docket Entry question seeking additional modeling of a portfolio with delayed retirement of Warrick Unit 4, Vectren South indicated that an additional capital investment cost of as much as $50 million may be required to retain the unit if IDEM determines not to renew a variance in the unit's current NPDES permit that allows water discharge at a higher temperature. The new draft renewal NPDES permit allows IDEM to terminate this variance at any time, which will likely require the construction of a cooling tower. Coupled with both Alcoa's and Vectren South's ability to terminate the joint operating agreement, this even further increases the risk of reliance on Warrick Unit 4 beyond 2023.

K. Culley Unit 3. While making investments to preserve some coal-fired generation is not part of the lowest NPV under the 2016 IRP modeling, Vectren South proposes to make investments at Culley Unit 3, its most efficient plant, in order that it may continue to operate beyond 2023. This decision became part of the preferred portfolio as a result of the risk assessment in the 2016 IRP. Preserving Culley Unit 3 promotes greater diversity in fuel sources and it also lessens the impact on the local coal industry. Witness Retherford described the environmental controls that are needed as a result of CCR and ELG. The Culley 3 Compliance Projects consist of (1) conversion of the current wet bottom ash collection system to a dry handling bottom ash system; (2) installation of a spray dryer evaporator system; and (3) the closure of the Culley West ash pond and construction of a new lined process water and storm water retention pond in its place. This new retention pond will be constructed on the location of the existing ash pond due to space limitations. Witness Fischer developed the cost estimates for the former two and Ms. Retherford provided the cost estimate for the latter. Recovery of the associated costs through a rate adjustment mechanism under Ind. Code ch. 8-1-8.4 was opposed by OUCC witness Aguilar and Industrial Group witness Gorman.

[3] With proper notice, Alcoa can also terminate the JOA.

4. Pending Summary Judgment Motion and Motion to Dismiss under T.R. 41(B). On July 19, 2018, the Coal Parties, Joint Intervenors, Evansville Western Railway, the OUCC, and the Industrial Group filed a Motion for Summary Judgment asking the Commission to vacate the schedule, arguing that we cannot grant Vectren South's request for authority to construct facilities until we have completed a "final" statewide analysis pursuant to Ind. Code § 8-1-8.5-3(a). Alternatively, the Movants asked us to grant them an extension of time to file their pre-filed testimony until at least 45 days after we post a "final" statewide analysis. We took the matter under advisement. At the conclusion of Vectren South's case-in-chief, Alliance Coal made an oral motion to dismiss under T.R. 41(B) on the same grounds. The T.R. 41(B) motion was joined by the OUCC and all of the other Movants except the Industrial Group and Evansville Railway.

In construing a statute, we start with its plain language and "attempt[] to give words their plain and ordinary meanings." *Indiana Wholesale Wine & Liquor Co., Inc. v. State ex rel. Indiana Alcoholic Beverage Com'n*, 695 N.E.2d 99, 103 (Ind., 1998) (citations omitted). "[I]n seeking to give effect to the legislature's intent, [the court] read[s] an act's sections as a whole and strive[s] to give effect to all of the provisions so that no part is held meaningless if it can be reconciled with the rest of the statute." *Fort Wayne Patrolmen's Benev. Ass'n, Inc. v. City of Fort Wayne*, 903 N.E.2d 493, 497 (Ind. Ct. App., 2009) (citation omitted).

The Motion is based primarily on Section 3(a) of Ind. Code § 8-1-8.5, which provides that "[t]he Commission shall develop, publicize, and keep current an analysis of the long range needs for expansion of facilities for generation of electricity," and Section 3(c), which provides that "[t]he commission shall consider the analysis in acting upon any petition by any utility for consideration." The Movants interpret these provisions to mean that we cannot consider a certificate of public convenience and necessity ("CPCN") request absent a "final" statewide analysis. We disagree.

Neither provision requires or implies there must be a "final" or conclusive statewide analysis. Nor does any other provision in Chapter 8.5. Section 3 directs us to undertake an "analysis" that is subject to ongoing review and revision. An analysis that must remain "current" cannot possibly remain static or culminate in a finished product. We find that the analysis detailed in the draft and final versions of the Statewide Analysis meets the requirements of the statute.

To the extent the Movants argue that we cannot grant Vectren South's Petition until we complete our annual report on the analysis, their Motion also fails.

Section 3(h) requires us "[e]ach year" to "submit to the governor and to the appropriate committees of the general assembly a report of its analysis regarding the future requirements of electricity for Indiana or this region." Ind. Code § 8-1-8.5-3(h). Section 5(b)(2) provides that a certificate may be granted if the Commission finds the project (A) "will be consistent with the Commission's analysis (or such part of the analysis as may then be developed, if any)"; or (B) is "consistent with a utility's specific proposal submitted under Section 3(e)(1) of this chapter and approved under subsection (d)." Ind. Code § 8-1-8.5-5(b)(2)(A) and (B).

This unambiguous language reflects the Legislature's understanding that new generation needs may arise at a time while the analysis or even the annual report is being developed or under revision. The Legislature granted the Commission authority to issue a CPCN rather than hold the request in abeyance until the annual report is issued.

It must be presumed that "'the legislature intended the language used in the statute be applied logically and not to bring about an unjust or absurd result.'" *D.B. v. Review Bd. of Indiana Dept. of Workforce Development*, 2 N.E.3d 705, 710 (Ind. Ct. App., 2013) (quoting *Penny v. Review Bd. of Ind. Dep't of Workforce Dev.*, 852 N.E.2d 954, 960 (Ind. Ct. App., 2006), trans. denied). Reviewing bodies also avoid "interpreting a statute in such a manner as to render its provisions mere surplusage." *Id.* (citing *In re Adoption of D.C.*, 887 N.E.2d 950, 959 (Ind. Ct. App., 2008). The Legislature cannot have meant for the Commission to hold off assessing petitions until its analysis becomes "final" (which will never occur), or even until its annual report is submitted. Thus, the statute is clear that in considering a CPCN request, pursuant to Section 5(b)(2) we can rely on whatever current statewide analysis exists or simply determine whether the proposal is consistent with the utility's own plan and reports.

In sum, the Commission retains authority to review a project at any time. Ind. Code § 8-1-8.5-5.5 expressly allows us to "commence a review of any certificate granted under this chapter" when, "in the opinion of the commission, changes in the estimate of the probable future growth of the use of electricity" call for such review. Further, "[i]f the commission finds that completion of the facility under construction is no longer in the public interest, the commission may modify or revoke the certificate." Id.

For all of the foregoing reasons, and each of them, the Motions for Summary Judgment and for Dismissal under T.R. 41(B) are denied.

5. <u>Commission Discussion and Findings</u>.

A. <u>Vectren South's Request for a CPCN for a CCGT</u>. Vectren South requests a CPCN for a proposed CCGT (approximately 850 MW) to be constructed at the current site of the A.B. Brown power plant in Posey County. Under Chapter 8.5, a public utility may not begin the construction, purchase or lease of any steam, water, or other facility for the generation of electricity to be directly or indirectly used for the furnishing of public utility service without first obtaining from the Commission a certificate that public convenience and necessity requires, or will require, such construction, purchase or lease.

In considering a CPCN request, Chapter 8.5 requires the Commission to consider options other than the construction, purchase, or lease of an electric generating facility. *See* Ind. Code § 8-1-8.5-4.

Further, Ind. Code § 8-1-8.5-5 sets forth specific findings the Commission must make in order to approve and grant the requested CPCN. First, the Commission must make a finding, based on the evidence of the record, as to the best estimate of construction costs. Second, the Commission must find that either (a) construction will be consistent with the Commission's Statewide Analysis, if any, for the expansion of electric generation facilities, or (b) the proposed construction is consistent with a utility-specific proposal as to the future needs of consumers in the State of Indiana or in the petitioning public utility's service area [i.e., the utility's IRP]. Third, the Commission must find that public convenience and necessity require the facilities for which the CPCN is requested.[4]

[4] A fourth finding relating to coal-consuming facilities, pursuant to Ind. Code § 8-1-8.5-5(b)(4), does not apply to the proposed natural gas facilities.

"We have indicated in previous CPCN cases that 'least-cost planning' is an essential component of our [CPCN] law." *Joint Petition of PSI Energy, Inc. and CINCAP VII, LLC*, Cause No. 42145, at 4 (IURC Dec. 29, 2002), *quoting Southern Indiana Gas & Electric Co.*, Cause No. 38738, at 5 (IURC Oct. 25, 1989). "We have defined 'least-cost planning' as a 'planning approach' which will find the set of options most likely to provide utility services at the lowest cost once appropriate service and reliability levels are determined." *Id.* "However, we have emphasized that the [CPCN] statute does not require the utility to automatically select the least cost alternative. Nor does the statute require the utility to ignore its obligation to provide reliable service or to disregard its exercise of reasonable judgment as to how best to meet its obligation to serve." *Id.* As this Commission has previously ruled: "[i]f an Indiana utility reasonably considers and evaluates the statutorily required options for providing reliable, efficient, and economic service, then the utility should, in recognition that it bears the service obligations of IC 8-1-2-4, be given some discretion to exercise its reasonable judgment in selecting the option or options to implement which minimize the cost of providing such service." *PSI Energy, Inc.*, Cause No. 39175, at 14 (IURC May 13, 1992); *see also Joint Petition of PSI Energy, Inc. and CINCAP VII, LLC*, Cause No. 42145, at 4.

The pre-approval of long-lived power plant investment and the concurrent regulatory assurance of that investment's recovery is, at its base, the creation of fixed costs that customers will be required to pay several years into the future, perhaps as long as 30 years or more into the future. Accordingly, our consideration in this and other pre-approval requests, especially in periods of seemingly quickening technological change, must not ignore the risk that any such investment may become uneconomic over the long-term. We must acknowledge that the economic forces at work may come from other supply side options or even demand side opportunities. The supply side and demand side certificating statutes implicate this by recognizing that an optimal balance of energy resources should consider both aspects in meeting customer needs.[5] A complication in the optimizing effort is the often disparate time horizons of the supply and demand sides of the balance. The inability to adjust the long-lasting nature of the supply side of the equation in the event market conditions or demand side expectations change in a lesser time horizon introduces a risk that some measure of the supply side investment may become uneconomic within its lifetime.[6] Demand side efforts by customers as a result of the uncontroverted improving economics of customer-scale generation resources may further compound the challenge of the optimal balancing act. Reducing demand in the near term does not necessarily correspond with reduced assured supply side investment cost recovery.[7] Because unwinding assured cost recovery should an asset become uneconomic is not a commonly employed regulatory option, it is prudent to ensure during the pre-approval process that we understand and consider the risk that customers could sometime in the future be saddled with an uneconomic investment. Outcomes that reasonably minimize such potential risk and serve to foster utility and customer flexibility in an environment of rapid technological innovation on both the utility and customer side of the meter are, therefore, a lens through which we will review Vectren South's request.

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[5] Indiana Code §§ 8-1-8.5-4 and -10(c)(3).

[6] This effect can be see through the recovery of lost revenues a statutory component of utility DSM programs, which is in part a function of investment, of fixed cost, that is not being consumed at the expected rate.

[7] This timing inconsistency can reduce the value of demand side efforts because they are not avoiding long-lived fixed costs previously approved and included in rates. The full incremental impacts of demand side actions which occur after the approval of long-lived fixed costs are only affected over longer periods of time when future resources must be acquired and the timing and type of resource might change as a result of cumulative demand side activities.

i. Ind. Code §§ 8-1-8.5-4.

(1) Ind. Code § 8-1-8.5-4(1). In evaluating a utility application for approval to construct new generation, the Legislature has directed us to take into account the utility's "current and potential arrangements with other electric utilities for (A) the interchange of power; (B) the pooling of facilities; (C) the purchase of power; and (D) joint ownership of facilities."

As a member of MISO, Vectren South interchanges power on a daily basis, and Vectren South's modeling considered and factored this arrangement into its decision to seek a CPCN. In addition, early in its resource selection process Vectren South identified a potential partner for a joint generation project. Witness Luttrell explained that this partner was interested in owning a minority share of a larger CCGT, and agreed to study locating such a unit on Vectren South's system. As studies ensued, the partnership appeared to be a viable resource option. As a result, the parties studied this joint ownership opportunity throughout 2017, but ultimately in January 2018 the potential partner provided notice that it would not proceed with such a project. Both Vectren South and the Commission have considered the interchange of power and pooling of facilities.

When assessing a CPCN petition, the Commission also considers the potential purchase of power by Vectren South. On June 20, 2017, Vectren South issued a RFP for dispatchable resources located in MISO Zone 6. Vectren South explained that its RFP specified this location requirement in order to satisfy MISO's requirement that a load serving entity have at least 67% of its resources located within its zone. The RFP sought dispatchable resources based upon the 2016 IRP analysis, which recommended that Vectren South retire nearly all of its baseload coal-fired capacity by the end of 2023. As a result, the RFP was designed to solicit baseload capacity to replace the 730 MWs provided by the retiring coal units. In response, Vectren South received nine qualified bids offering both PPAs and offers to build a CCGT and sell that unit or a partial interest in that unit to Vectren South. Using the expertise of Burns & McDonnell ("BMC"), Vectren South evaluated both quantitative and qualitative aspects of the competing bids. Based on BMC's analysis of the levelized cost of energy ("LCOE") of the bids, Vectren South selected the bid with the most favorable LCOE to compare to a self-build option. BMC's analysis was that Vectren South's self-build option had a better net present value than this best bid, and also exposed Vectren South to less risk versus long-term reliance on a merchant developer. Vectren South's rebuttal testimony noted that the merchant developer in question had in fact, even prior to its bid submission, withdrawn its project from the MISO queue without informing Vectren South.

The Commission acknowledges Vectren South's issuance of an RFP but believes the RFP was unduly restrictive given the rapid changes in technology and costs being seen in the market, especially regarding renewable energy. The narrow RFP with its focus on a large baseload dispatchable resource limited the options Vectren South evaluated to those larger than 600 MW. As a result, Vectren South foreclosed consideration of combinations of smaller resources that might have offered greater resource diversity, flexibility and cost efficiencies than reliance on the acquisition of a single large natural-gas facility. As discussed further below, expansion of the RFP to consider a broader spectrum of resource options would have also gone a long way to improve the metrics to limit risks from exposure to changes in market conditions and technologies.

Based on Vectren South's unduly restrictive RFP the Commission cannot conclude that Vectren South thoroughly evaluated the purchase of power in connection with Vectren South's request.

(2). Ind. Code § 8-1-8.5-4(2).

(a) The Refurbishment of Existing Facilities. In acting upon a petition for the construction of an electric generation facility, we must consider other methods for providing reliable, efficient, and economical electric service, including the refurbishment of existing facilities. Ind. Code § 8-1-8.5-4(2). Ms. Aguilar summarized the following alternatives that Vectren South failed to fully analyze: (1) Retain Coal at Vectren South's existing plants and invest in refurbishments; (2) Retain the agreement with Alcoa for Warrick Unit 4; (3) Refuel the A.B. Brown unit(s) with gas; (4) A blended option, such as refueling one or more A.B. Brown units to gas and building a smaller CCGT; (5) Enter into a PPA with one of the bidders who responded to Vectren South's RFP; and (6) Retain its Broadway Avenue Unit 2. Pub. Ex 1, p. 8. Ms. Aguilar argued that Vectren South unfairly screened out these alternatives during the IRP process.

We agree with Ms. Aguilar and Dr. Boerger that Vectren South did not fully consider options to extend the life, or refurbish, existing units as required by Ind. Code § 8-1-8.5-4(1). *Id.* and Pub. Ex. 3, p. 6. This failure began during Vectren South's IRP process, when Vectren South screened out, without further study, viable refurbishment options. Pub. Ex. 1, p. 11. Vectren South's stated reason for shutting down the A.B. Brown units is premised on the need to replace the flue-gas desulfurization ("FGD") units at a cost of approximately $350 million. Pub. Ex. 3, p. 7. Dr. Boerger stated that with the exception of the current FGDs, the units operate quite well and are sized appropriately for a small utility like Vectren South. But as noted by Ms. Aguilar and Dr. Boerger, Vectren South's chosen FGD replacement technology was the most expensive and only technology reviewed. *Id.,* Pub. Ex. 3. Dr. Boerger pointed out that Vectren South did not consider lower-cost FGD replacement options, even though such options were available. He said that this decision made the continued use of the A.B. Brown units look less attractive in modeling than if those options had been included. A reasonable alternative would have been the refurbishment of these units through refueling. Pub. Ex. 3, p. 7. Refueling is viable, proven technology that could be accomplished at a fraction of the price of the CCGT – approximately $45 million for both A.B. Brown units.

Vectren South considered a smaller 440 MW CCGT option in its last IRP, but Vectren South did not include it as part of any refueling options. Pub. Ex. 3, p. 9. Further, when Vectren South issued its RFP, it did so for 600-800 MW of dispatchable power, precluding smaller units that might have combined with refurbishment of other Vectren South units. Tr. B-25 - B-26. Vectren South did not fully model the conversion of one of the A.B. Brown units in its rebuttal testimony. Tr. E-45 – E-46.

On cross-examination, Vectren South witness Mr. Swiz estimated that the value of the stranded assets at the A.B. Brown unit alone will equal $220 million and that the system-wide total will be $270 million. While Vectren South argues that the CCGT option is the lowest cost, we find for the many reasons stated throughout this Order, including Vectren South's failure to sufficiently consider the refurbishment and continued operation of its existing facilities, we are not able to verify this claim. Through the lens of minimizing risk and providing future flexibility the refurbishment option would seem to provide a potential bridge to the future, providing system capacity value that was not sufficiently evaluated. This conservative solution and risk avoidance strategy stands in stark contrast to proposed CCGT. Vectren South plans to submit a new IRP in 2019. We instruct Vectren South to closely consider our analysis in this Order and the Director's Report on the 2016 IRP of the flaws in their modeling for the 2016 IRP and the 2017 IRP Update and to present a more thorough

analysis that fully evaluates all possible options for continuing to provide reliable, efficient, and economical electric service.

(b) Conservation and Load Management. The evidence demonstrates that Vectren South has evaluated the CCGT against other reasonable generation alternatives, and included demand side management and energy efficiency ("DSM/EE") levels consistent with the targets approved in Cause No. 44927. Vectren South's modeling concludes that, even when the cost of energy efficiency has been significantly lowered, the CCGT is still the least cost reliable resource alternative to meet Vectren South's customers' future energy resource needs.

The Joint Intervenors criticize the assumptions used by Vectren South to model the cost of DSM/EE, arguing that the assumptions used by Vectren South were too high resulting in a higher cost of DSM/EE. Ms. Harris stated in her rebuttal that for purposes of this proceeding, Vectren South opted only to update its growth factors in its revised cost analysis in order to show the impact lower DSM/EE costs would have on the energy resources selected in its IRP. Ms. Harris explained that limiting the updates to the growth factors preserved the integrity of Vectren South's 2016 IRP. Petitioner's Exhibit No. 8-R, p. 3. We find that while some of the cost assumptions used by Vectren South could have been updated, on the whole it does not render Vectren South's analysis of DSM/EE unreasonable.

(c) Cogeneration and Renewable Energy Sources. Vectren South's IRP modeling process considered the potential for cogeneration facilities to serve its customers and adjusted its load forecast to reflect the potential for cogeneration facilities. Petitioner's Exhibit No. 5, Attachment MAR-1, pp. 99-103. Consequently, the potential for customer-owned generation resources, including renewable generation, to reduce Vectren South's load was evaluated as part of the IRP process that concluded the CCGT was necessary as part of least-cost planning. Nonetheless, while Vectren South may have considered renewable energy in the IRP, there is a lack of evidence that Vectren South made a serious effort to determine the price and availability of renewables. In addition, the economics of customer-scale renewable and cogeneration facilities appears likely to continue to improve and we anticipate that additional well-developed efforts to understand their customers' interest would serve to provide clarity to the lens of risk avoidance by minimizing the potential for unexpected demand side efforts. Therefore, we would expect Vectren South to ensure an enhanced consideration of renewable energy and customer-generator opportunities in future IRPs.

(3) Ind. Code § 8-1-8.5-5. A certificate may be granted only if the Commission makes the followings findings:

(a) Best estimate of construction, purchase, or lease costs based on the evidence of record. The cost estimates for Vectren South's proposed CCGT were developed and presented by witness Diane Fischer. Black & Veatch developed a design basis and conceptual design and thereafter developed a cost estimate. Several conceptual designs were first developed. From that, ten plant alternatives for purposes of estimating costs were identified. This was later narrowed to seven alternatives for which detailed costs were developed. Competitive bids were obtained for the equipment and materials. Based upon Black & Veatch's experience as an engineering, procurement and construction ("EPC") contractor, Black & Veatch was able to estimate indirect costs, contingency, overhead, and profit for the EPC contractor. Bids were also received for construction. Ultimately, Ms. Fischer testified that the cost estimate for the proposed CCGT had been refined to +/- 10%. The total estimated project cost (excluding owner's costs) was $582,000,000. The owner's

costs were then provided by witness Games, including insurance, contingency, study, and AFUDC. The total cost estimate was $781,000,000.

(b) Consistency of the CCGT with Vectren South's Utility-Specific IRP and the Statewide Analysis. Ind. Code § 8-1-8.5-5(b)(2)(A) directs the Commission to determine whether Vectren South's proposed construction of a new CCGT will be consistent with the Commission's 2018 Statewide Analysis. The final version of that report was issued after the parties' pre-filing deadline, but before the evidentiary hearing and was admitted into evidence as Pet. Admin. Not. Ex. 2. Included in that report is a synopsis of information taken from the most recent IRP projects of Indiana utilities, including Vectren South.

In Appendix 12 of the Statewide Analysis, the concept of Resource Diversity is explained:

> In an electric system, resource diversity may be characterized as utilizing multiple resource types to meet demand. A more diversified system is intuitively expected to have increased flexibility and adaptability to: 1) mitigate risk associated with equipment design issues or common modes of failure in similar resource types, 2) address fuel price volatility, and 3) reliably mitigate instabilities caused by weather and other unforeseen system shocks. In this way, resource diversity can be considered a system-wide tool to ensure a stable and reliable supply of electricity. Resource diversity itself, however, is not a measure of reliability. Relying too heavily on any one fuel type may create a fuel security or resilience issue because the level of resource mix diversity does not correlate directly with a resource portfolio's ability to provide sufficient generator reliability attributes.

Vectren South's proposal to concentrate its base load capacity from five different generating units located at three different sites down to just three generating units (one of them constituting 70% of Vectren South's baseload capacity) located at two sites appears to be contrary to the concept of resource diversity.

On page 5 of the 2018 Statewide Analysis it says:

> A key consideration in long-term resource planning is the need to retain maximum flexibility in utility resource decisions to minimize risks. An IRP developed by a utility should be regarded as illustrative and not a commitment for the utility to undertake.

In explaining the importance of sound long-range planning on page 56 of the 2018 Statewide Analysis, it says, "[t]he credibility of the analysis is critical to the efforts of Indiana utilities to maintain as many options as possible, which includes off ramps, to react quickly to changing circumstances and make appropriate changes in the resources." However, we find nothing in Vectren South's evidence convinces us that its proposal provides any off ramps that would allow Vectren South to react to changing circumstances and make appropriate changes in resources. To the contrary, Vectren South's proposal seems to close most off ramps for the foreseeable future.

The parties offered diametrically opposed views on the modeling offered to support the CPCN, with Vectren South pointing to its CCGT conclusion as consistent with its IRP. But that conclusion is but one part of the analysis. We have criticized utilities in the past for modeling infirmities and even penalized a utility for analysis we found lacking. In IPL's MATS case, we ordered a $10 million credit to customers to "send[] an appropriate message" to the utility. *Indianapolis Pwr. & Light Co.*, Cause No. 44242, 2013 WL 4479081 *38, 307 P.U.R.4th 311, Order p. 36 (IURC Aug. 14, 2013). We found IPL's cost/benefit study "disappointing" and noted our own "responsibility to insure that the regulatory process involves the presentation of the best evidence possible, given the facts and circumstances of a particular case." *Id.* at 35.

At the outset, Mr. Games testified that Vectren South sent a request for information ("RFI") to original equipment manufacturers ("OEM") for CCGT pricing information before Vectren South's 2016 IRP. Tr. E-89 – E-91. Mr. Chapman stated that under any of the IRP models, the CCGT is the least expensive. Tr. A-27 - A-28.

Dr. Boerger testified that Vectren South did not consider other viable options such as refueling and smaller combinations of generation assets to meet its needs, Pub. Ex. 3, p. 1 – p. 2, which would be more prudent for a small utility like Vectren South. Pub. Ex. 3, p. 5. Vectren South excluded possible options such as maintaining Culley 2, Pub. Ex. 3, pp. 11-12, and did not allow the refueling of the A.B. Brown units to be included in any of its model runs. *Id.* Vectren South kept a smaller, 440 MW CCGT from being combined with a refueled A.B. Brown unit. Pub. Ex. 3, p. 13. Mr. Games admitted that Vectren "never [ran] a risk analysis of portfolios including a 1 X 1 CCGT instead of a 2 X 1[.]" Tr. E-50. Vectren South also did not allow for proposals of joint projects to be built at it's A.B. Brown site, which would eliminate the potential for congestion problems Vectren South identified as a problem in its RFP responses. Vectren South's Strategist model limited the amount of capacity purchases that a given portfolio could make. Tr. D-73. This had the effect of automatically screening out PPAs that could have been combined with other resources to meet Vectren South's capacity needs. The Director's Report on Vectren South's 2016 IRP noted that Vectren South failed to model a wide range of gas prices, making the "range of fuel price projections… unduly limited[,]" Tr. D-85, and Vectren South's re-run of gas costs did not model higher prices in a wide enough range. Tr. D-86. As noted by Mr. Alvarez, Vectren South's model retired the BAGS 2 unit in 2024 without evidence of any engineering reason to do so. Pub. Ex. 2, pp. 13-14.

Dr. Boerger also found that Vectren South modeled the cost of its proposed CCGT to be $200 million less than the cost of the project presented in the testimony of Vectren South witness Games. Pub. Ex. 3, p. 2. The consequence of excluding $200 million in Vectren South's NPV calculation had the effect of making the CCGT option look more favorable. Pub. Ex. 3, p. 14. Without adding the $200 million back into the model runs, Vectren South's analysis is skewed. Pub. Ex. 3, p. 18 – p. 19. Mr. Games admitted that his testimony about the estimates was confusing, stating "[w]e started off with 2017 dollars, and those were -- then overheads were added, anticipated profit with the EPC, contingency for EPC, and escalation was added to get to the 582 million." Tr. E-15 – E-16. Mr. Lind took issue with Dr. Boerger's analysis, but admitted that Vectren South did not include $130 million in owner's costs when it compared its self-built CCGT to other options offered in the RFP and otherwise. Tr. A-36 – A-38; Tr. D-7 – D-8. When questioned why BMC did not use the $781 million figure, Mr. Lind stated that the $630 million estimate used for modeling was a +/- 50% estimate; the $781 million had a more certain +/- 10% range of accuracy. Tr. A-35; Tr. C-61 - C-62, C-74. BMC's projected cost of $580 - $650 million was used to weigh the economics of potential projects. Tr. A-

36 – A-38. And Vectren South witness Mr. Vicinus ran his "low regulatory" model using the $630 million estimate. Tr. D-98.

In response to the OUCC's criticism of its modeling, Vectren South's rebuttal included a new model run that refueled one of the A.B. Brown units, and added 200 MW of solar. Tr. D-12 – D-13. Vectren South used this rebuttal modeling to try to reinforce its original request for a 850 MW CCGT. Both Mr. Lind and Mr. Games acknowledged, however, that the addition of 200 MW of solar was not the best choice to meet MISO's PRM, because MISO would only give Vectren 100 MW of credit for the 200 MW of solar. Tr. E-15. The revised model also did not take into account the fact that solar costs between $1,200 - $1,800 per MW, Tr. D-16 – D-17, and Vectren South did not model any storage to counter the inherent intermittency of solar resources. Tr. D-14.

While we find Vectren South's request is "consistent" with its 2016 IRP, the subsequent modeling for this case effectively screened out multiple less-expensive alternatives. Vectren South did not allow its models to choose refueling or smaller units in combination. While Vectren South's rebuttal modeling runs included refueling of the A.B. Brown units in various configurations, the rebuttal modeling was not used to make Vectren South's decision of what generation form to choose. Tr. D-14. We view the rebuttal modeling as an after-thought used to buttress Vectren South's initial request.

Vectren South had sufficient time to conduct its analysis in a way more open to smaller-scale options that would correct the modeling deficiencies that have been identified. It seems straight-forward to suggest that smaller-scale options, especially for a relatively small electric utility, serve to minimize the risk should a challenge arise at any one option. As noted above, minimizing supply side long-term investment risk in an environment of rapid technological innovation is an attractive characteristic in a utility resource proposal. Vectren South should use its scheduled 2019 IRP process to address problems in its modeling, incorporate more options for partnering with other entities and competitive inquiries into smaller-scale options that can be acted upon swiftly to meet the end-of-2023 date upon which additional capacity may be needed.

(c) Public Convenience and Necessity. Ind. Code § 8-1-8.5-5(b)(2) requires that we find that public convenience and necessity requires or will require the proposed CCGT. Such consideration of the public interest is not only a statutory requirement at the outset but would become a continuing obligation should the Commission grant a CPCN. Ind. Code § 8-1-8.5-5.5 provides that if, after granting a CPCN for construction of a new generator, "the commission finds that completion of the facility under construction is no longer in the public interest, the commission may modify or revoke the certificate."

"[P]ublic interest may be taken to encompass a wide range of considerations, from environmental, health, and safety concerns, to the financial concerns of employers, employees, and ratepayers." *General Motors Corp. v. Indianapolis Power & Light Co.*, 654 N.E.2d 752, 762 (Ind. Ct. App., 1995). In *General Motors*, the court approved the Commission's consideration of the impact on employment in the coal industry in its public interest determination. *Id.*

The parties dispute whether Vectren South accurately and adequately evaluated risk in its analysis of alternative portfolios and selection of the proposed CCGT. As noted earlier, under Ind. Code § 8-1-8.5-4, we are required to take into account other methods for providing reliable, efficient,

and economical service, and we find utility risk analyses play an important role in comparing alternative portfolios.

Joint Intervenors argued that Vectren South's risk analysis is inadequate for multiple reasons. Joint Intervenors note that the risk analysis has not been updated since the 2016 IRP, despite Vectren South having updated inputs available for several inputs, including the estimated cost of its preferred build, and adequate time to re-run the model. Joint Intervenors complain that Vectren South ignored known material risks in a manner that biased results in favor of its preferred portfolio, including taking a one-sided view of capacity purchase and market purchase risks and failing to consider the potential for future methane regulations. Joint Intervenors further argue that Vectren South arbitrarily scored several metrics and designed others to conceal rather than measure obvious risks of the preferred portfolio.

We find merit in several of Joint Intervenor's critiques and are further concerned that Vectren South has not fully responded to critiques in the Final Director's Report on the 2016 IRPs. We agree that Vectren South had adequate time and opportunity to update its risk analysis modeling prior to this filing, and that it has sufficient time to do so now before moving forward. Vectren South updated inputs in its possession for multiple factors, including: solar capital costs; variable production costs and revenue requirement assumptions for existing units; forecasted cost for wholesale market capacity and energy; delivered fuel prices for gas and coal; and costs associated with new energy efficiency programs. Pet. Ex. 6 at 9-10. Vectren South also had a higher capital cost estimate for its preferred build. We know Vectren South had time to use these inputs to re-run the model because (a) it did just that with some of its Strategist modeling and (b) Mr. Vicinus testified that it would have taken just three months to re-run the risk analysis modeling. Tr. p. D-66. Mr. Vicinus opined that updated risk modeling would not change the result, but we are skeptical given the number and import of the updated inputs and the significance of the proposed portfolio changes. *See Indianapolis Pwr. & Light,* Cause No. 44339, 2014 WL 2091348, Order p. 27 (IURC May 14, 2014) ("[W]e believe that IPL could have reasonably updated the [model] given the extent of changes in data inputs and assumptions and provided a more robust analysis."). Before proposing a portfolio change of this magnitude, Vectren South should have taken the three months necessary to update its risk analysis modeling. Updated risk modeling may not be necessary in all cases, but it is warranted here given the size and cost of the proposed CCGT.

We are further concerned that Vectren South appears not to have accounted for material risks associated with its preferred portfolio. As we have previously stated, "it is appropriate that modeling take into consideration reasonable risks and unknowns." *Indianapolis Pwr. & Light Co.*, Cause No. 44794, 2017 WL 1632316, Order p. 28 (IURC Apr. 26, 2017). Joint Intervenors point out that Vectren South's risk analysis took a one-sided view of capacity purchase and market purchase risks. *See* JI Ex. 2 at 43; Vicinus Rebuttal. Vectren South offered no rebuttal explaining its one-sided view of market risk, which assumed surplus capacity and generation offers only benefits to ratepayers. JI Ex. 2 at 20-21. That view of market purchases is only true when market prices and/or load are high. JI Ex. 2 at 21. Further, Vectren South's Docket Entry response of October 5, 2018, presents portfolio results that suggest the material weight at which opportunity sales influences the analysis.[8] Heavy dependence on market revenues to support a regulated investment choice is a speculative influence that we find must be materially discounted to limit the risk of customers being saddled with

[8] The submitted table indicates that the advantage of the Preferred Portfolio in comparison to (1) BAU to Gas Conversion escalates from 1.3% to 3.5% when the opportunity sales sharing moves from 50% to 100%.

uneconomic options should such speculation unfold differently than forecasted. A metric biased in favor of portfolios with surplus generation is speculation we decline to embrace.

Vectren South's own witnesses and others acknowledged risks related to relying on gas generation, but Vectren South only considered carbon dioxide emission reductions when it evaluated environmental risk. We agree that was too narrow an approach to environmental risk and one that biased the analysis in favor of gas-fired generation.

The Commission appreciates the metrics developed and used by Vectren South in the 2016 IRP, but we agree with the Joint Intervenors that the use of these particular metrics also obscured critical characteristics of the preferred portfolio. One of Vectren South's IRP objectives was to develop a plan with flexibility to adapt to market conditions and technological change to minimize risks to shareholders and customers. Specific metrics to measure resource portfolio balance and flexibility included concentration on one technology, the number of technologies and having resources remote from Vectren South's load. A critical piece of information these metrics overlook is that the acquisition of an 850 MW resource must be evaluated relative to the load to be served. Vectren South's 2016 IRP Base peak load forecast is for the summer peak to increase from 1,109 MW in 2019 to 1,198 MW in 2036. The acquisition of an 850 MW generation facility represents approximately 77 percent of the 2019 peak load and just under 71 percent of the summer peak load for 2036. We are hard pressed to see how reliance on one facility for so much of the Vectren South system requirements is consistent with maintaining flexibility to respond to changing market conditions and technological change.

Therefore, we conclude that Vectren South's risk analysis does not adequately consider the relative risk of other methods for providing reliable, efficient, and economical electric service. The proposed large scale single resource investment for a utility of Vectren South's size does not present an outcome which reasonably minimizes the potential risk that customers could sometime in the future be saddled with an uneconomic investment or serve to foster utility and customer flexibility in an environment of rapid technological innovation. As a result, we find that Vectren South has not demonstrated through the evidence of record that the public convenience and necessity require the building of an 850 MW CCGT. Therefore, Vectren South's request for a CPCN to construct a 850 MW CCGT is denied.

B. <u>Vectren South's Request for a CPCN for Culley compliance projects and related relief</u>. Vectren South's preferred portfolio also includes the construction of various environmental projects that Vectren South contends are needed so that Culley Unit 3 can continue to operate beyond 2023. Vectren South's petition seeks relief for these projects under Ind. Code ch. 8-1-8.4 as "federally mandated" projects.

i. <u>Ind. Code ch. § 8-1-8.4 ("Chapter 8.4")</u>.

(1) <u>Federally Mandated Requirements (Ind. Code §§ 8-1-8.4-5 and 8-1-8.4-6(b)(1)(A) and 8-1-8.4-7(b)(3))</u>. Ind. Code § 8-1-8.4-5 defines a federally mandated requirement to include "a requirement that the commission determines is imposed on an energy utility by the federal government in connection with any of the following: (2) The federal Water Pollution Control Act (33 U.S.C. 1251 *et seq.*)" and also includes "(7) Any other law, order, or regulation administered or issued by the United States Environmental Protection Agency, the United States

Department of Transportation, the Federal Energy Regulatory Commission, or the United States Department of Energy."

The description of the Culley 3 Compliance Projects was set forth in the direct testimonies of Ms. Fischer and Ms. Retherford. The Culley 3 Compliance Projects consist of (1) conversion of the current wet bottom ash collection system to a dry handling bottom ash system; (2) installation of a spray dryer evaporator system; and (3) the closure of the Culley West ash pond and construction of a new lined process water and storm water retention pond in its place. This new retention pond will be constructed on the location of the existing ash pond due to space limitations. No party disputed that the dry handling bottom ash conversion or spray dryer evaporator system qualify as compliance projects to meet federally mandated requirements. The OUCC challenged whether the closure of the existing pond qualified for relief but did not contend that it was not federally mandated. For the reasons described below, we find that these projects all constitute compliance projects to meet federally mandated requirements as those terms are defined in Ind. Code §§ 8-1-8.4-2 and -5.

Vectren South witness Retherford testified that the dry handling bottom ash system is required to comply with the ELG Rule, which was promulgated under the federal Water Pollution Control Act. Petitioner's Exhibit No. 9, p. 11. The ELG rule prohibits further wet handling of fly and bottom ash. This system will enable ash from Culley Unit 3 to be disposed of in a landfill, hauled back to a surface mine in accordance with applicable surface mining regulation or recycled rather than being washed into the ash pond as part of a water discharge.

Ms. Retherford further explained that the spray dryer evaporator system was necessary to ensure compliance with ELG-imposed limits on FGD wastewater discharge. She noted that this system functions effectively as a ZLD system and enables Vectren South to utilize the alternative ELG-imposed compliance date of December 31, 2023, and to meet future more stringent ELG wastewater discharge limits.

Ms. Retherford testified that construction of a new, lined process and storm water retention pond is required to comply with the ELG Rule. As we have already noted, projects necessary to comply with the ELG Rule, promulgated pursuant to the federal Water Pollution Control Act (33 U.S.C. 1251 *et seq.*), constitute a federally mandated requirement. The only dispute, raised by OUCC witness Aguilar, pertains to Vectren South's plans to close the existing Culley West pond so that the new lined pond can be built at the site. Witness Retherford testified that there are two reasons the Culley West pond is closing: (1) the pond was taken out of service prior to the 2015 deadline and the CCR rule requires that it be closed by 2020; and (2) the current space limitations require that the new stormwater retention and process water pond be constructed on the current location. Thus, there is no dispute that costs associated with the construction of the new lined pond are incurred pursuant to a federally mandated requirement. The dispute is whether the costs to close the Culley West pond so that the new pond can be built on top of that location, also qualify as federally mandated costs.

The OUCC identifies three reasons closure costs for the Culley West pond should not be considered federally mandated costs. First, OUCC witness Aguilar contends that Vectren South has been collecting depreciation and asset retirement costs in base rates, which include the closure of ash ponds. Public's Exhibit No. 1, p. 28. However, Vectren South witness Retherford responded that finalization of the CCR rule on April 17, 2015 imposed more stringent requirements to close the ash pond. The CCR rule imposed an obligation to dewater, cap and/or remove ponded ash. Petitioner's Exhibit No. 9-R, pp. 24-25.

On rebuttal, Mr. Swiz stated Vectren South's existing depreciation rates include an estimated level of cost of removal that was designed well before the implementation of requirements to close the ponds in accordance with the environmental regulations described by Ms. Retherford. The assumed removal costs in the demolition study provided in Cause No. 43839 (Vectren South's most recent general rate case), estimated $1.1 million to close both of the Culley Ash Ponds based on cost of backfill, grading and seeding. By comparison, the estimate for closure of one ash pond in this proceeding is $19.969 million. Petitioner's Exhibit No. 13-R, pp. 6-7; Petitioner's Administrative Notice 1.

Consequently, we find that costs associated with CCR closure have not been included in Vectren South's depreciation rates, which were last updated prior to finalization of the CCR Rule.

Second, the OUCC contends that other utilities are not tracking pond closure costs as Federally-Mandated CCR Projects. Public's Exhibit No. 1, p. 28. Vectren South witness Swiz noted that no utility had proposed such recovery yet but that one utility specifically indicated that it would present closure related activities as recoverable under the Federal Mandate Statute. Petitioner's Exhibit No. 13-R, pp. 6-7. Mr. Swiz explained that Duke, IPL and NIPSCO did not ask for recovery of their pond closure costs in the proceedings Ms. Aguilar cited, and in fact the order in Cause No. 44765 specifically notes that Duke anticipates presenting closure related activities of existing surface impoundments and their associated costs in a future proceeding. Petitioner's Exhibit No. 13-R, p. 6, citing *Duke Energy Indiana*, Cause No. 44765, at *7 (IURC May 24, 2017). Each of the cases Ms. Aguilar cited were settled cases containing non-precedential language. Nevertheless, Mr. Swiz pointed out that the NIPSCO Order in Cause No. 44872, suggests that the OUCC agreed that closure costs can be recovered as federally mandated costs. Petitioner's Exhibit No. 13-R, p. 7.

Third, the OUCC contends that Vectren South should have presented alternative suitable locations to the West Pond for consideration. However, Ms. Retherford testified that the location was chosen because there was limited space at the Culley generating station. In other words, there was not an alternate location to explore. The statutory requirement to consider options does not require a utility to present alternatives that are not practical or feasible. Accordingly, we find the Culley 3 Compliance Projects are all federally mandated requirements and that Vectren South described them in its application.

(2) Energy utilities seeking recovery of Federally Mandated Costs must establish that the costs are incurred in connection with a compliance project, including capital, operating, maintenance, depreciation, tax or financing costs and describe the costs to be recovered. Ind. Code §§ 8-1-8.4-4 and -6(b)(1)(B). We have already found that the Culley 3 Compliance Projects constitute projects required by federally mandated requirements. Consequently, the costs associated with these projects constitute Federally Mandated Costs. These costs will consist of capital, operating, maintenance, depreciation, tax and financing costs. Vectren South identified the estimated costs to be recovered as Federally Mandated Costs. Costs associated with the dry handling bottom ash handling system and spray dryer evaporator system were identified by Vectren South witness Fischer. Petitioner's Exhibit No. 6, pp. 16-18, 26-28. Costs associated with the construction of a new lined process water and storm water retention pond were identified in Ms. Retherford's testimony. Petitioner's Exhibit No. 9, Attachment AMR-1. No party disputed the cost estimates for the Culley 3 Compliance Projects. Based on the evidence presented, we find that Vectren South has identified

federally mandated costs and reasonably described those costs. Those total costs are $95 million, and they are hereby approved. Petitioner's Exhibit No. 4, p. 26.

(3) Compliance with Federally Mandated Requirements (Ind. Code §§ 8-1-8.4-6(b)(1)(C)) and 8-1-8.4-7(b)(3)). No party disputed that the Culley 3 Compliance Projects will allow Vectren South to comply with ELG and CCR or that ELG and CCR are federally mandated. We previously addressed the OUCC's objections related to appropriateness of recovery. We have already found that the ELGs and CCR Rule are federally mandated requirements within the meaning of Ind. Code §§ 8-1-8.4-5 and 8-1-8.4-6(b)(1)(A) and 8-1-8.4-7(b)(3). Based on the evidence presented, we find that Vectren South's Culley 3 Compliance Projects, will allow the utility to comply with the ELGs and the CCR Rule. Therefore, we find that Vectren South has satisfied the requirements of Ind. Code § 8-1-8.4-6(b)(1)(C).

(4) Alternative Plans for Compliance (Ind. Code §§ 8-1-8.4-6(b)(1)(D) and 8-1-8.4-7(b)(3)). Ind. Code § 8-1-8.4-6(b)(1)(D) requires the Commission to examine "[a]lternative plan that demonstrate that the proposed compliance project is reasonable and necessary." Vectren South witness Diane Fischer testified about Black & Veatch's evaluation of the ELG Compliance Program for Culley to identify potential FGD discharge water treatment alternatives and ash transport water alternatives that could be implemented to comply with the ELGs. She sponsored two written reports setting forth Black & Veatch's analyses of the alternatives. Ms. Fischer testified that each of the potential discharge treatment technology alternatives assessed by Black & Veatch were screened for design concept feasibility, capital expense and operating expense.

With respect to FGD discharge water treatment, two main treatment alternatives were considered: (1) FGD treatment and discharge; and (2) zero liquid discharge ("ZLD"). Three technology types were evaluated within these two treatment alternatives: (1) for FGD treatment and discharge, physical/chemical pretreatment with biological treatment technology, (2) for ZLD, spray dryer evaporator technology, and (3) also for ZLD, brine concentrator/crystallizer technology. Ms. Fischer testified that multiple vendors providing such technologies were evaluated. A sensitivity analysis was then performed for each technology and vendor. Ms. Fischer's Discharge Treatment Report also included a cost assessment of all alternatives considered. Petitioner's Exhibit No. 10, p. 7. Ms. Fischer testified that Black & Veatch provided Vectren South with a final overall assessment of each technology and vendor offering based on Black & Veatch's analysis and the following attributes: (1) start-up/ramp up reliability; (2) technology readiness risk; (3) adaptability to sensitivity analysis scenarios; (4) operation and control risk; (5) heat rate impact risk; (6) number of operators; (7) capital and annual O&M costs; (8) susceptibility to future environmental regulations; (9) overall financial stability and credit rating. Black & Veatch ultimately recommended that Vectren move forward to a detailed engineering phase with Stochastic Differential Equation ("SDE") type technology if the maximum FGD wastewater flow rate of between 50 and 80 gpm is achieved through future testing and operations. Ms. Fischer explained the SDE solution ranks the highest among all technologies based on the attributes discussed above and the solution is economically viable and provides a zero discharge solution if the minimum FGD wastewater flow rate of between 50 and 80 gpm is achieved. The conceptual design evaluation indicated the SDE can be feasibly located and tied into the existing equipment at Culley. In addition, Ms. Fischer stated the ZLD solution provides certainty that any future change in EPA regulations would not apply at Culley since there would be no discharge of FGD wastewater.

With respect to ash transport, Ms. Fischer described Black & Veatch's analysis to identify alternative ash transport solutions that could be implemented at Culley to comply with ELG requirements, focused specifically on identifying options for removal and dewatering of bottom ash from the Culley Unit 3 boiler with truck transport and disposal of the dry material at an off-site location. Black & Veatch evaluated two categories of technologies: (1) dry conversion of the bottom ash system and (2) closed loop wet sluicing system. For dry conversion system, Black & Veatch evaluated a submerged chain conveyor under the existing bottom ash hopper. For the closed loop wet sluicing system, Black & Veatch evaluated both a dewatering bunker and a remote submerged chain conveyor. In comparing all technologies, Black & Veatch used the following quality attributes to select the preferred treatment: technical feasibility; total installed cost, O&M cost, estimated additional manpower ("FTE"), estimated footprint, major equipment, advantage, disadvantages and reliability. Ms. Fischer's testimony discussed in detail the advantages and disadvantage of each alternative. Black & Veatch prepared cost estimates for all technologies considered for addressing ash transport water. Black & Veatch ultimately recommended the submerged chain conveyor for Culley 3 compliance with ELG requirements, due to the complexity of design and comparatively higher installed cost of the other alternatives.

The only evidence offered in opposition as being an alternative plan was the OUCC's conclusory statement about possible alternative locations for the new lined pond. As we have previously found, the chosen site was selected because there are no alternative locations.

While the Commission gives significant weight to cost-effective planning and decision making when considering alternatives, the Federal Mandate Statute does not require that a utility demonstrate that the chosen compliance plan is the least cost option. Consistent with the Commission's finding in Indianapolis Power and Light's recent proceeding, Cause No. 44794 (IURC 4/26/2017), p. 30, 2017 Ind. PUC LEXIS 114, *92, (finding "it is important that the Petersburg Station is able to continue to operate on coal and protect customers from potential price volatility in the gas markets"), a reasonable alternative can be, and often is, a solution that includes risk balancing through a diversified portfolio.

Based on the evidence presented, we find that Vectren South considered alternative plans for compliance with the ELGs and the CCR Rule. The evidence shows that the Culley 3 Compliance Projects are reasonable and necessary.

(5) Useful Life of the Facility (Ind. Code §§ 8-1-8.4-6(b)(1)(E) and 8-1-8.4-7(b)(3)). Mr. Games testified that the investments in the Culley 3 Compliance Projects will allow for the continued operation of Vectren South's most efficient coal fired unit. Ms. Retherford described the environmental regulations requiring the Culley 3 Compliance Projects in order for Culley Unit 3 to continue operating. Ms. Retherford explained how closure of the Culley West pond will extend the useful life of Culley 3, because closure of the Culley West pond is necessary to provide a suitable location to construct a new pond that can continue to take non-CCR process water discharged from Culley Unit 3 and plant stormwater (i.e. surface water) which flows into the West Pond. Without this new lined process and stormwater pond, continued operation consistent with applicable regulations would be impossible after the Culley East pond commences closure.

No party disputes that issuance of a CPCN for the Culley 3 Compliance Projects will extend the useful life of Vectren South's Culley 3 unit or that Culley 3 would be required to retire in the near future if the Culley 3 Compliance Projects are not completed.

Based on the evidence presented, we find that Vectren South has satisfied the requirements of Ind. Code § 8-1-8.4-6(b)(1)(E).

(6) Conclusion. We find that the Culley 3 Compliance Projects will allow Vectren South to comply directly or indirectly with one or more federally mandated requirements and that public convenience and necessity will be served by the Culley 3 Compliance Projects.

ii. Accounting and Ratemaking Issues Associated with Culley Compliance Projects. Ind. Code § 8-1-8.4-7(c) states:

> If the commission approves under subsection (b) a proposed compliance project and the projected federally mandated costs associated with the proposed compliance project, the following apply:
> (1) Eighty percent (80%) of the approved federally mandated costs shall be recovered by the energy utility through a periodic retail rate adjustment mechanism that allows the timely recovery of the approved federally mandated costs. The Commission shall adjust the energy utility's authorized net operating income to reflect any approved earnings for purposes of IC 8-1-2-42(d)(3)and IC 8-1-2-42(g)(3).
> (2) Twenty percent (20%) of the approved federally mandated costs, including depreciation, allowance for funds used during construction, and post in service carrying costs, based on the overall cost of capital most recently approved by the commission, shall be deferred and recovered by the energy utility as part of the next general rate case filed by the energy utility with the commission.
> (3) Actual costs that exceed the projected federally mandated costs of the approved compliance project by more than twenty-five percent (25%) shall require specific justification by the energy utility and specific approval by the commission before being authorized in the next general rate case filed by the energy utility with the commission.

(1) Accounting and Ratemaking Treatment for ECA. Vectren South requests authority to implement a new annual rate adjustment mechanism ("ECA") pursuant to Ind. Code § 8-1-8.4-7 for the timely and periodic recovery of 80% of the federally mandated costs. Vectren South also requests approval of proposed changes to its electric service tariff relating to the proposed ECA mechanism, including the proposed Appendix E. Ind. Code §8-1-8.4-8 provides that an energy utility may, in a timely manner, recover 80% of all federally mandated costs through a periodic rate adjustment mechanism. Ind. Code §§ 8-1-8.4-4 and 8-1-8.4-7 provide that such costs include capital, AFUDC, O&M, depreciation, tax, and financing costs.

Vectren South witness Swiz described how the eligible costs associated with the Culley 3 Compliance Projects will be incorporated into the proposed ECA mechanism. He testified Vectren South will prepare in each annual filing a revenue requirement calculation accumulating all eligible costs incurred through December 31 of the previous calendar year. To provide for timely recovery, Mr. Swiz testified the proposed ECA will project an annualized level of expense related to the approved projects for the 12-month effective period. Mr. Swiz stated the annual revenue requirements

will capture eligible new capital investments (both in service and Construction Work in Progress) related to the Culley 3 Compliance Projects, multiplied by the applicable rate of return, with depreciation, O&M and property tax expenses associated with the projects, and recovery of the regulatory assets recorded through interim deferral of depreciation expense, plan development expense, and PISCC, added to the resulting total. The revenue requirement for those projects will be the basis for the recovery of 80% of the eligible revenue requirement amounts in each annual ECA filing.

Mr. Swiz also described Vectren South's proposal to defer and subsequently recover depreciation expense as well as costs associated with development of the Culley 3 Compliance Projects through the ECA. The cumulative deferred balances of the regulatory assets recorded through interim deferral of such depreciation expenses would be amortized over the remaining life of the assets (20 years) and the amortization amount would be included in the ECA revenue requirements. Mr. Swiz stated the costs of development of the projects would be included for recovery within the ECA, with the balance amortized over a period of three years.

Vectren South proposes the pre-tax return on the new capital investment will be calculated by multiplying the pre-tax rate of return, based on the weighted average cost of capital ("WACC"), by total new capital investment related to the approved projects. Mr. Swiz testified Vectren South proposes to use a WACC in the ECA based upon the most recent approved WACC within Vectren South's TDSIC mechanism under Cause No. 44910, which is based on a return on equity ("ROE") of 10.4% as approved in Cause Nos. 43111 and 43839, Vectren South's two most recent base rate cases. Mr. Swiz stated the equity component of the rate used in the ECA revenue requirement calculation will be grossed up for recovery of income taxes, both state and federal, at then current rates.

Mr. Swiz testified that approved recoveries within each ECA filing will be calculated by taking the billing determinants by month multiplied by the applicable rates and charges for the ECA period. Any under recoveries resulting from instances in which ECA rates and charges are not in place for a full month will be recovered as an under-recovery variance in a subsequent ECA proceeding. Vectren South proposes to allocate ECA costs pursuant to the four-coincident peak allocation percentages for Vectren South utilized in its Cause No. 43406 RCRA15 and 43405 DSMA15 rate mechanisms.

With respect to the treatment of operating income, Mr. Swiz testified Vectren South will adjust its statutory earnings test under Ind. Code § 8-1-2-42(d)(3) to include the incremental earnings from approved ECA filings.

Mr. Swiz testified Vectren South proposes to file its ECA petitions and cases in chief annually, on May 1 of each year, with new ECA rates and charges becoming effective August 1 of each year. Each filing will be based on capital investments and expenses through the twelve months ended December of the prior calendar year. Variances will be reconciled in each ECA filing and recovered over the subsequent 12 month rate effective period. Vectren South seeks approval of its proposed Sheet No. 69, Appendix E, Environmental Cost Adjustment. Additional changes to Vectren South's rate schedules in its tariff are needed to reflect that the ECA will be applied monthly.

Industrial Group witness Gorman recommended that the ELG costs associated with the Culley 3 Compliance Projects be recovered within a base rate proceeding and not through the proposed ECA. He cited Vectren South's overall rate of return and stated Vectren South's costs have declined since

the last base rate case. He also suggested that Vectren South should be permitted to recover a return on investment of no more than 9.8%.

Mr. Swiz explained on rebuttal that under the statutory test under Ind. Code § 8-1-2-42(d) and -42.3, performed in Vectren South's most recent FAC proceedings as of the time his rebuttal testimony was filed (Cause No. 38708 FAC 120), Vectren South's comprehensive earnings compared to authorized levels, including both changes in expenses and revenues, show that Vectren South is currently under-earning by approximately $6.5 million of net operating income and has been under-earning since February 2017. Mr. Swiz explained that depreciation and operating expense are driving much of these results, and Mr. Gorman does not capture those expenses in his calculation.

Eligibility for recovery through Ind. Code ch. 8-1-8.4 is not contingent on whether other costs have declined to offset the new federally mandated costs. Once we have made the required findings, 80% of the federally mandated costs "shall be recovered by the energy utility through a periodic retail rate adjustment mechanism." Ind. Code § 8-1-8.4-7(c)(1). In any event, we find that Mr. Swiz has adequately explained why Mr. Gorman's position is incorrect.

Mr. Swiz testified that pursuant to Ind. Code § 8-1-8.4-7, Vectren South seeks ratemaking treatment for 80% of the costs associated with the Culley 3 Compliance Projects through its proposed ECA mechanism. Specifically, Vectren South seeks timely recovery of all federally mandated costs associated with the Culley 3 Compliance Projects, including capital costs, AFUDC, post-in-service carrying cost charges ("PISCC"), O&M, depreciation expense, property tax expense, and other taxes, with 80% recovered through the ECA and the balance deferred for recovery in Vectren South's next rate case.

Vectren South proposes to implement construction work in progress ("CWIP") ratemaking treatment related to the recovery of financing costs incurred during construction of the Culley 3 Compliance Projects. In connection with CWIP ratemaking treatment, Vectren South will remove from the AFUDC-eligible balance the amount of investment included for recovery in the ECA, so that only the amount of the Culley 3 Compliance Projects investment not currently being recovered in the ECA would be eligible for AFUDC.

Mr. Swiz testified that Vectren South proposes to accrue post-in-service carrying charges on all eligible new capital investment from the date it is placed in service until the date it is included in rates. He explained the PISCC balances will be multiplied by the pre-tax rate of return within the ECA revenue requirement, at the WACC rate described herein. Unlike other utilities who have been granted such authority, Vectren South is not seeking to accrue and subsequently recover in the next base rate case PISCC on the 20% deferred balance discussed below.

OUCC witness Aguilar opposed Vectren South's request to recover pond closure costs for the Culley 3 Compliance Projects as part of the ECA because the OUCC's position is that Vectren South is already collecting pond closure costs within its depreciation rates. Ms. Aguilar also testified that neither Duke, IPL, nor NIPSCO are tracking pond closure costs. We have already addressed these positions and rejected them.

Based on the evidence presented, we find that the proposed ECA mechanism should allow for the timely and periodic recovery of 80% of Vectren South's approved federally mandated costs. We further find that Vectren South's request for approval to adjust its authorized net operating income to

reflect an approved earnings associated with the Culley 3 Compliance Project for purposes of Ind. Code §§ 8-1-2-42(d)(3) and 8-1-2-42(g)(3) is consistent with Ind. Code § 8-1-8.4-7(c)(1).

Vectren South is authorized to defer (until captured within the ECA mechanism) and recover 80% of the approved federally mandated costs incurred in connection with the Culley 3 Compliance Projects through the approved ECA Mechanism pursuant to Ind. Code § 8-1-8.4-7, including capital, O&M, depreciation, taxes, financing, and carrying costs based on the current overall WACC and AFUDC. Vectren South is authorized to utilize CWIP ratemaking treatment for the Culley 3 Compliance Projects through the proposed ECA mechanism. Vectren South is authorized to defer post-in service costs of the Culley 3 Compliance Projects, including carrying costs based on the current overall WACC, depreciation, taxes and operating and maintenance expenses on an interim basis until such costs are recognized for ratemaking purposes through Vectren South's ECA mechanism or otherwise included for recovery in Vectren South's base rates in its next general rate case. Vectren South is authorized to defer and recover through the ECA mechanism 80% of its federally mandated costs, including but not limited to federally mandated costs incurred prior to and after approval of a final order in this proceeding to the extent that such costs are reasonable and consistent with the scope of the Culley 3 Compliance Projects described in Vectren South's evidence. Vectren South's proposed cost allocation factors are also approved.

(2) Accounting and Ratemaking Treatment for Deferred Costs. Indiana Code § 8-1-8.4-8 provides that 20% of the approved federally mandated costs, including depreciation, AFUDC, and PISCC, based on the overall cost of capital most recently approved by the Commission, shall be deferred and recovered by the energy utility as part of the next general rate case filed by the energy utility with the Commission. Vectren South proposes to defer as a regulatory asset 20% of all federally mandated costs incurred in connection with these projects.

Based on the evidence presented, the Commission finds Vectren South is authorized to defer 20% of the federally mandated costs incurred in connection with the Culley 3 Compliance Projects, and Vectren South may recover the deferred costs in its next general rate case as allowed by Ind. Code § 8-1-8.4-7(c)(2).

(3) Depreciation Treatment. Vectren South proposes to utilize a depreciation rate of 5%, representing a 20-year life on these investments. Mr. Swiz testified the proposed depreciation rate for the investments aligns with the estimated remaining life of Culley Unit 3.

No party opposed Vectren South's proposed depreciation rate for the investments required for the Culley 3 Compliance Projects.

Based on the evidence presented, we find that Vectren South's proposal to depreciate the individual projects included in the Culley 3 Compliance Projects based on a 5% depreciation rate is reasonable and is approved.

C. Recovery of Prior Pollution Control Investments. Our January 28, 2015 and June 22, 2016 Orders in Cause No. 44446 (the "44446 Orders") (1) granted Vectren South a CPCN for A.B. Brown Unit 1 and 2, Culley Unit 3 and Warrick Unit 3 clean coal technology projects and (2) authorized Vectren South to recover federally mandated costs associated with federally mandated requirements at A.B. Brown Units 1 and 2 (collectively the "MATS Projects"). Rather than recovering

the costs of the MATS Projects through a tracking mechanism as authorized by Ind. Code § 8-1-8.4-7, Vectren South sought, and we granted, authority to defer these costs for recovery in a future proceeding. Vectren South now seeks to commence recovery of the MATS Projects' costs through the ECA pursuant to Ind. Code § 8-1-8.4-7.

Vectren South witness Swiz described the proposed recovery through the ECA in more detail. He indicated that Vectren South proposes recovery of the MATS Projects to begin on January 1, 2019 with the approval of ECA rates and charges recovering the specified revenue requirement. In accordance with applicable statutory requirements, Vectren South proposes to recover the 80% of eligible revenue requirements amounts for post-in-service carrying costs, incremental depreciation and property taxes and financing costs that Vectren South incurred to construct the MATS Projects and deferral of the remaining 20% of these costs for subsequent recovery in a base rate case. Vectren South will prepare an annual revenue requirement as part of the ECA to capture eligible capital investments in plant related to the MATS Projects, multiplied by the applicable rate of return, with depreciation, O&M, and property tax expenses associated with the MATS Projects added to the resulting total. To provide for timely recovery, Vectren South's proposed ECA will project an annualized level of expense related to these approved projects for the 12-month effective period.

Depreciation associated with the MATS Projects will be based on the currently approved depreciation rates applicable to the assets, as approved in Vectren South's last electric base rate case (Cause No. 43839). The pre-tax return on the new capital investment will be calculated by multiplying the pre-tax rate of return, based on the WACC, by total new capital investment related to the approved projects. Vectren South proposes to use a WACC in the ECA based upon the most recent approved WACC within Vectren South's TDSIC mechanism, Cause No. 44910. This WACC, approved by the Commission, represents an updated actual capital structure as of the cut-off date of each TDSIC filing, and includes the typical items captured in Vectren South's base rate case capital structure. This rate will be used in the ECA revenue requirement calculation, and the equity component will be grossed up for recovery of income taxes, both state and federal, at then current rates. O&M expense included for recovery in the ECA will reflect an annualized level of expense related to the MATS Projects. This O&M expense represents incremental chemical costs and other expenses associated only with the MATS Projects.

No party objected to Vectren South's proposal to commence recovery of the MATS Projects' costs, currently being deferred, through the ECA. We previously found the MATS Projects costs qualify as federally mandated costs in the 44446 Orders. While Vectren South proposed, and we approved of, deferral of these costs in lieu of the recovery through a periodic retail rate adjustment mechanism, Vectren South now seeks to recover the costs in accordance with Ind. Code § 8-1-8.4-7(c). We find that Vectren South shall be authorized to commence recovery of these MATS Projects' costs pursuant to Ind. Code § 8-1-8.4-7 through the ECA in accordance with the procedures outlined in Mr. Swiz's testimony.

6. <u>Confidentiality</u>. Vectren South filed motions for protection and nondisclosure of confidential and proprietary information on March 20, 2018, August 21, 2018, and September 10, 2018, respectively. In its motions, Vectren South states certain information redacted in the evidence is confidential, proprietary, competitively sensitive, and/or trade secrets. Docket entries were issued on March 29, August 27, and October 4, 2018 finding such information to be preliminarily confidential and protected from disclosure under Ind. Code §§ 8-1-2-29 and 5-14-3-4. The confidential information was subsequently submitted under seal. The Commission finds the

information for which Vectren South seeks confidential treatment is confidential trade secret information pursuant to Ind. Code § 8-1-2-29 and Ind. Code ch. 5-14-3, is exempt from public access and disclosure by Indiana law, and shall continue to be held by the Commission as confidential and protected from public access and disclosure.

IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:

1. Vectren South's request for a certificate of public convenience and necessity under Ind. Code ch. 8-1- 8.5 to construct an 850 MW CCGT and all associated relief requested is denied.

2. Vectren South's request for a certificate of public convenience and necessity for the Culley 3 Compliance Projects pursuant to Ind. Code ch. 8-1-8.4 and all associated relief requested is approved.

3. Vectren South's proposed recovery of federally mandated costs approved in connection with Cause No. 44446 through the ECA is approved as described in this Order.

4. Vectren South's proposed ECA, and Vectren South's proposed Sheet No. 69, Appendix E of its tariff to implement such ECA is approved.

5. The Confidential Information submitted under seal in this Cause pursuant to Vectren South's requests for confidential treatment is determined to be confidential trade secret information as defined in Ind. Code § 24-2-3-2 and shall continue to be held as confidential and exempt from public access and disclosure under Ind. Code §§ 8-1-2-29 and 5-14-3-4.

6. This Order shall be effective on and after the date of its approval.

HUSTON, KREVDA, OBER, AND ZIEGNER CONCUR; FREEMAN ABSENT:

APPROVED: APR 24 2019

I hereby certify that the above is a true and correct copy of the Order as approved.

Mary M. Becerra

Mary M. Becerra
Secretary of the Commission

Appendix B
IURC Cause No. 45280

DRAFT

ORIGINAL

Commissioner	Yes	No	Not Participating
Huston	✓		
Freeman	✓		
Krevda	✓		
Ober	✓		
Ziegner	✓		

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR: (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC') AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	)	**CAUSE NO. 45280** **APPROVED:** MAY 13 2020

ORDER OF THE COMMISSION

Presiding Officers:
Stefanie N. Krevda, Commissioner
Brad J. Pope, Administrative Law Judge

On August 14, 2019, Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc., a CenterPoint Energy Company ("Petitioner" or "Vectren South") filed its Verified Petition with the Indiana Utility Regulatory Commission ("Commission") seeking: (1) a Certificate of Public Convenience and Necessity ("CPCN") pursuant to Ind. Code ch. 8-1-8.4 for the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Pond Compliance Project" or "Project"); (2) authority to timely recover 80% of the approved federally mandated costs incurred during construction and operation of the Project, including post-in-service carrying costs ("PISCC"), both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's environmental cost adjustment ("ECA") mechanism; and (3)

authority to defer for recovery in Petitioner's ensuing general rate case 20% of such approved federally mandated costs.

On August 15, 2019, Petitioner filed the direct testimony and attachments of the following witnesses in support of its Verified Petition:

- Wayne D. Games, Vice President Power Generation Operations, for Petitioner;
- Angila M. Retherford, Vice President, Environmental and Corporate Responsibility, for Petitioner;
- Jay D. Mokotoff, Senior Engineer Group Manager, Civil and Environmental Engineering, AECOM Technical Services, Inc. ("AECOM");
- Claire Schmit, Principal Process Engineer, AECOM;
- David M. Bowler, Director, Accounting, for Petitioner; and
- J. Cas Swiz, Director, Rates and Regulatory Portfolio Management, for Petitioner.

On October 4, 2019, Petitioner filed a Notice of Substitution of Witness indicating that Mr. Keith Benton, Senior Project Engineer, AECOM is being substituted for and is adopting the direct testimony previously filed by Vectren South witness Claire Schmit.

Also on August 15, 2019, Petitioner filed a Motion for Protection of Confidential and Proprietary Information ("Motion"). In the Motion, Petitioner indicated certain information ("Confidential Information") that it intended to submit in this matter contains trade secrets as that term is defined under Ind. Code § 24-2-3-2. The Presiding Officers granted the Motion by docket entry dated September 10, 2019, and Petitioner submitted the Confidential Information on September 11, 2019.

On September 19, 2019, Citizens Action Coalition of Indiana, Inc. ("CAC") filed a Petition to Intervene, which was granted by docket entry dated September 30, 2019.

On December 19, 2019, Petitioner and the Indiana Office of Utility Consumer Counselor ("OUCC") jointly submitted a Stipulation and Settlement Agreement resolving all matters raised in this proceeding as among Petitioner and OUCC (the "December Settlement Agreement"). Petitioner also filed the supplemental testimony of David M. Bowler, Director, Accounting, for Petitioner, in support of the December Settlement Agreement. In addition, the OUCC filed the Settlement Testimony of Cynthia M. Armstrong, Senior Utility Analyst, Electric Division, for the OUCC, in support of the December Settlement Agreement.

On January 10, 2020, Petitioner, the OUCC, and CAC (collectively, the "Settling Parties") jointly submitted a Stipulation and Settlement Agreement pursuant to which CAC joined in the December Settlement Agreement and the Settling Parties agreed to additional terms pertaining to the Brown Ash Pond Compliance Project (the "Joint Settlement Agreement"), thereby resolving all matters raised in this proceeding as among the Settling Parties. Petitioner also filed supplemental testimony of Angila M. Retherford in support of the Joint Settlement Agreement.

On February 11, 2020, the Presiding Officers issued a docket entry requesting updates of certain information related to the settlements. On February 13, 2020, Petitioner filed its Second Motion for Protection of Confidential and Proprietary Information ("Second Motion"), seeking

confidential treatment for certain information related to Petitioner's response to the February 11, 2020 Docket Entry (also referred to as "Confidential Information"). The Second Motion was granted that same day, and Petitioner filed its Response on February 14, 2020.

The Commission held an Evidentiary Hearing in this Cause on February 18, 2020, at 9:30 a.m. in Room 222 of the PNC Center, 101 West Washington Street, Indianapolis, Indiana. Petitioner, the OUCC, and CAC appeared at and participated in the hearing, and their respective evidence was admitted into the record without objection.

Based on the applicable law and the evidence presented, the Commission now finds:

1. **Notice and Commission Jurisdiction.** Notice of the Evidentiary Hearing in this Cause was given and published by the Commission as required by law. Petitioner is a "public utility" as defined in Ind. Code § 8-1-2-1(a) and an "energy utility" as defined in Ind. Code § 8-1-8.4-3. Petitioner is subject to the jurisdiction of this Commission in the manner and to the extent provided by Indiana law. Pursuant to Ind. Code ch. 8-1-8.4, Petitioner may apply to the Commission for CPCNs and recovery of federally mandated costs. Accordingly, the Commission has jurisdiction over Petitioner and the subject matter of this proceeding.

2. **Petitioner's Characteristics.** Vectren South is a public utility incorporated under the laws of the State of Indiana with its principal office at One Vectren Square, Evansville, Indiana. Petitioner is engaged in rendering electric utility service to the public and owns, operates, manages, and controls, among other things, plants, property, equipment, and facilities that are used and useful for the production, storage, transmission, distribution, delivery, and furnishing of electric utility service to approximately 145,000 customers in southwestern Indiana.

3. **Relief Requested.** Petitioner requests: (1) a finding that public convenience and necessity will be served by the proposed Project; (2) granting Petitioner a CPCN for the Project pursuant to Ind. Code ch. 8-1-8.4; (3) a finding that the Project constitutes a compliance project that will allow Petitioner to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and a finding that the associated costs are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7; (4) making the required findings under each of the factors set forth in Ind. Code § 8-1-8.4-6(b); (5) authorizing Petitioner to timely recover 80% of the stipulated federally mandated costs incurred during construction and operation of the Project, including PISCC, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism; (6) authorizing Petitioner to defer for recovery in Petitioner's ensuing general rate case 20% of such approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2); (7) authorizing Petitioner to accrue PISCC, both debt and equity, related to the Project after its in-service date using the overall cost of capital approved in Petitioner's TDSIC cases; (8) authorizing Petitioner to defer depreciation and operation and maintenance ("O&M) expenses relating to the Project until such expenses are recovered through either a rate adjustment mechanism or in base rates; and (9) approving depreciation rates for the Project.

4. **Petitioner's Case-in-Chief.** Wayne Games, Petitioner's Vice President Power Generation Operations, described the Brown Ash Pond, the evaluation that led to the selection of Closure by Removal ("CBR") for the Project, the overall benefits of the Project and its estimated cost, and how that compliance cost compares to other pond closure options. Mr. Games also provided support for the request that the Commission issue Petitioner a CPCN for the Project.

Mr. Games testified the Brown Ash Pond was placed in service in 1979 and remains in use. He explained that while all bottom ash produced by the Brown plant is deposited in the Brown Ash Pond, since 2009, most of the dry ash produced by the plant has been provided to a manufacturer for beneficial reuse. He explained that Petitioner's consistent supply of local Indiana coal coupled with its operating practices and procedures has allowed Petitioner to ship over 1.4 million tons of fly ash for reuse, all of which has met acceptable specifications and never been rejected. Mr. Games testified the manufacturer has not paid Petitioner for the fly ash and that providing it for beneficial reuse has benefited both Petitioner and its customers by providing a more environmentally friendly solution, avoiding costs for disposal, extending the life of the Brown and F.B. Culley ash ponds, and eliminating the expense of excavating ash and transporting it to other locations for disposal.

Mr. Games testified the CCR Rule requires that the Brown Ash Pond be closed, explaining Petitioner must cease ash disposal by October 2020 and commence closure of the Brown Ash Pond within six months of cessation of disposal as discussed in greater detail in the testimony of Petitioner's witness Angila Retherford. Mr. Games explained challenges associated with closing the Brown Ash Pond include the ravine's irregular shape and varying depth of up to 70 feet deep; the very fine and saturated nature of the ash material causing it to be unstable, absent dewatering; and the fact the Ash Pond continues to accept water from higher groundwater around the edges. Mr. Games then described the selection process for identifying AECOM as the engineering firm to assist Petitioner in evaluating its compliance options as well as the work performed by AECOM related to CCR compliance, such as its assessing the structural stability of the ponds to continue to accept CCR material and development of alternative plans for closing the Brown Ash Pond. Mr. Games explained while internally evaluating Petitioner's compliance options for the Brown Ash Pond under the CCR Rule, an entity approached Petitioner expressing interest in the reuse of the ash, yielding another opportunity for Petitioner to explore.

Next, Mr. Games described the compliance options presented by AECOM. First, he described the Cap (or Close) in Place ("CIP") option, explaining it requires dewatering the pond, leaving the CCR material in place, constructing a synthetic membrane cap, installing a system to drain all surface water away from the cap, adding topsoil, and establishing a vegetative cover. Mr. Games testified the CIP option requires long-term groundwater monitoring and cap maintenance. Next, he described two CBR options, which involve dewatering the pond and removing the CCR material for disposal or beneficial reuse. Mr. Games testified while the CIP approach, at first, would appear to be less expensive than the CBR approaches, there are multiple reasons to select CBR over CIP. First, as further explained by Ms. Retherford, he testified that the Indiana Department of Environmental Management ("IDEM") has been unwilling to approve a CIP approach where significant amounts of ash remain in contact with groundwater and other states are moving to require CBR. He added if required to remove the ash from the groundwater under a CIP approach, Petitioner's upfront costs for CIP would no longer be lower. Mr. Games

continued by explaining the CIP (even if a viable option), poses risk for future groundwater contamination and associated remediation due to CCR material being left in the closed pond. Mr. Games stated that the CBR options, on the other hand, remove the requirement for 30 years of groundwater monitoring, mitigate groundwater issues, and eliminate the potential future requirement for CCR material to be excavated and placed in a lined landfill because of future regulations, more stringent groundwater standards, and/or changes in interpretations of existing regulations or standards.

With respect to the CBR options, Mr. Games explained the advantages for selecting beneficial reuse of CCR material over disposal in a landfill include eliminating the requirement to design and permit a new landfill since the one at Brown is nearly out of space and cannot accommodate the ash from the Project, as well as eliminate the ongoing expense of monitoring and maintaining a landfill in future years. He added that an off-site landfill would dramatically increase compliance costs further. Mr. Games explained if the majority or all of CCR material can be beneficially reused, the liability associated with the CCR material would be removed from the site, greatly increasing certainty and reducing risk to Petitioner and customers over time.

Mr. Games testified that in order to comply with the CCR Regulations and complete a closure of the Brown Ash Pond, the Project contains three major components: (1) building infrastructure to transport and load ash material to the barges on the Ohio River; (2) excavation and blending of the ash to acceptable specifications for reuse; and (3) encapsulating non-conforming CCR material with an impermeable cap that meets EPA and IDEM requirements.

Mr. Games explained that Petitioner entered into a confidential agreement (the "CBR Project Agreement") with an Ash Reuser to excavate CCR material from the Brown Ash Pond and deliver acceptable material (ponded ash) to the Ash Reuser by loading it on a barge at the Brown loading facility on the Ohio River. Mr. Games confirmed the Ash Reuser will pay Petitioner for the Brown fly ash it accepts and that the Ash Reuser agreed to accept a specified minimum required amount of ash each year, which will ensure timely removal of the ash material from the Brown Ash Pond. Mr. Games confirmed the CBR Project Agreement also contains security provisions to protect Petitioner financially in the case of default by the Ash Reuser. He continued by explaining the Ash Reuser accepts ownership once the material is on the barge and transports it to its manufacturing site. Mr. Games described acceptable material is defined as material that meets or exceeds the CBR Project Agreement quality specifications, or non-conforming material that is off-spec but accepted by the Ash Reuser prior to its loading on a barge for shipment. Mr. Games testified Petitioner will test the ash quality in an on-site laboratory and will oversee blending of the ash as necessary to meet the specifications.

To effectuate the Project, Mr. Games explained Petitioner entered in to a confidential agreement with AECOM as the Engineering, Procurement, and Construction Management ("EPCM") entity. He testified that Petitioner selected AECOM based on its impressive expertise and the initial compliance work AECOM completed on Petitioner's behalf. Per Mr. Games, the scope of work for AECOM services includes: (1) engineering and design; (2) procurement; (3) project management and controls; (4) construction and construction management; (5) technical support during construction and start-up; (6) operator training; and (7) proper disposal of non-conforming material.

Regarding infrastructure investments, Mr. Games explained the Ash Reuser, and not Petitioner, is responsible for any infrastructure investments required at the Ash Reuser's manufacturing facility. He testified that Petitioner will need to make several infrastructure investments to move the ash from the Brown Ash Pond to the barges on the Ohio River, such as dewatering the ash to a moisture content level specified in the CBR Project Agreement; constructing an above-ground conveyor system to move the ponded ash one mile to the existing tube conveyor; and modifying the current dry handling barge loading system to allow for handling of ponded ash. Mr. Games explained the EPCM Agreement provides that AECOM will design, procure, and install the infrastructure required to convey and then handle or load the ponded ash on the barge, and then turn over the infrastructure equipment to Petitioner to own, operate, and maintain while AECOM excavates the ash pond by removing the ponded material from the Brown Ash Pond and loading conforming material into the new conveying system. Mr. Games testified the estimated cost for the infrastructure construction and dry ash handling modifications is $47 million in 2018 dollars. He explained that AECOM provided the estimate and will execute the construction project, as the EPCM entity, for that target price. Mr. Games added, however, that the cost of obtaining permits, clearing trees, and providing electrical feed, along with Petitioner's overhead and allowance for funds used during construction ("AFUDC"), must be added to the estimate to arrive at the total cost.

While the terms of the agreement are confidential, Mr. Games explained the EPCM Agreement offers Petitioner cost risk protections. He explained the agreement allows AECOM to pass actual project costs on to Petitioner with a predetermined profit margin. Mr. Games testified a fixed price alternative was not viable given uncertainties related to volume, quantity, and quality of ash as well as project duration due to the unpredictable amount to be accepted annually by the Ash Reuser. Mr. Games added, however, that AECOM agreed to a Performance Cost Model with a Target Price that includes sharing in cost-savings and protections for cost overruns to mitigate Petitioner's cost risk and incentivize AECOM to minimize costs. Specifically, Mr. Games explained the performance components of the project related to infrastructure, excavation, and blending build up to a target price that includes a cost of work estimate, contractor's fees and contingency. Per Mr. Games, specific benefits to the Performance Cost Model include the avoidance of contingencies associated with a fixed price; the incentive for AECOM to blend and ship as much as possible to the Ash Reuser thereby maximizing revenue received by Petitioner and minimizing the amount of non-conforming ash to be encapsulated; and the incentive for AECOM to identify cost reduction opportunities and control costs thereby avoiding loss of profit margin and forfeit fees. Mr. Games confirmed Petitioner has used a Performance Cost Model with a Target Price in the past, citing both large power plant projects where scope is difficult to define and the Brown dam stabilizing project, the latter of which came in below the target price resulting in shared savings.

Mr. Games then testified regarding the capital and O&M costs for the Project. He indicated Table 1 to his testimony (Petitioner's Exhibit No. 1) provided the estimated total capital and O&M costs, which represents the federally mandated costs, totaling $164,539,000, adjusted for inflation. Mr. Games explained the ash will be supplied over several years and will generate revenue from the Ash Reuser that will be used to offset Project costs. Mr. Games presented a comparison of those total costs to total project costs adjusted for inflation of the CIP option ($137,509,000) and the CBR and Landfill option ($225,526,351). He explained that because the CIP option assumes

that ash would be left in contact with groundwater, it is not a viable option because IDEM has been unwilling to permit such an approach. He also noted that the CIP option has the risks of future groundwater contamination and associated remediation obligations due to CCR material being left in the closed pond. He noted the costs of CIP compare very differently to the total federally mandated costs of the Project when consideration is given to the fact that a portion of the cost will be offset by payments from the Ash Reuser.

Regarding the estimated 1.25 million tons of ponded material that may not be able to be blended to meet Ash Reuser contract specifications or be accepted by the Ash Reuser, Mr. Games explained that as Ms. Retherford testified, Petitioner is in discussions with IDEM to allow placement of CCR material in the current Brown landfill, which if approved and provided space is available, will be Petitioner's first option. If not approved or space is not available, the excavated CCR material will be placed in an area within the footprint of the Brown Ash Pond that is a minimum of five feet above the uppermost aquifer, encapsulated, and covered with an impermeable cap that prevents water infiltration.

Angila Retherford, Petitioner's Vice President of Environmental and Corporate Sustainability, testified regarding the CCR Rule, how the CCR Rule applies to the Brown Ash Pond, and Petitioner's planned closure and remediation of the Brown Ash Pond to achieve compliance with the CCR Rule. In addition, Ms. Retherford's testimony provided support for the request for the Commission to issue Petitioner a CPCN for the Compliance Project. Ms. Retherford described the requirements under the CCR Rule to continue to use an existing ash pond beyond October 2020. She described Petitioner's Ash Ponds and current ash handling practices. She then explained that the closure of the Brown Ash Pond was triggered under the CCR Rule for not only violating the location restrictions enumerated in the CCR Rule but also due to detection of lithium and molybdenum in groundwater above acceptable levels. She explained that removing ash from the pond means Vectren South will be removing all ash out of the groundwater and capping any remaining non-spec ash (i.e., ash that cannot be recycled) under an impermeable cap. In addition to describing IDEM's authority under the CCR Rule, Ms. Retherford explained how the costs associated with the closure of the Brown Ash Pond qualify as federally mandated costs. Specifically, Ms. Retherford testified the CCR Rule requiring closure satisfies the requirements of a federally mandated requirement in Ind. Code § 8-1-8.4-5 because it is a requirement imposed on Petitioner by the federal government in connection with the Resource Conservation and Recovery Act ("RCRA") by virtue of being an energy utility that generates electricity. She added the Project is directly related to Petitioner's compliance with applicable federally mandated requirements. As such, the costs associated with closure of the Brown Ash Pond qualify as federally mandated costs.

Ms. Retherford also testified as to whether the Project would extend the life of an existing utility facility. She explained while the compliance project will not extend the overall life of the nearby Brown Generating Station, the CCR Rule applies regardless of when coal generation ceases at that site. Ms. Retherford explained that remediation of the Brown Ash Pond to achieve compliance with the CCR Rule allows Petitioner to retain a compliant brownfield generation site that can continue to be used in the future.

David M. Bowler, Petitioner's Director of Accounting, testified regarding the accounting and ratemaking treatment for the Project pursuant to the Federal Mandate Statute. Mr. Bowler

noted that the Brown plant depreciation rates never contemplated a cost of removal associated with the ash pond since the rates were set prior to adoption of CCR regulations, and thus no funds have been collected for pond closure activities. He described the capital and O&M costs of the Project, as well as the cash proceeds from potential insurance recoveries and the Ash Reuser that would be used to offset O&M costs. Relying on the Federal Mandate Statute, he discussed the manner in which eligible Project costs would be recovered over time, including the treatment of construction work in progress and AFUDC. He noted that once capital investments were placed in-service, the accumulated depreciation would be included as a reduction to gross plant. He also explained that until such time as investments are included for recovery in rates, they would be eligible for PISCC.

Mr. Bowler described the method for calculation of depreciation expense as well as the cost of capital that would be used for this investment. He presented Vectren South's proposal to use a depreciation rate of 7.69%, representing a 13-year life, coincident with the life of the Project. He stated a smaller ash impoundment to be constructed toward the end of the Project would obtain a 3.33% depreciation rate, representing a 30-year life, which coincides with the length of time the impoundment must be operated and managed pursuant to regulatory guidelines discussed by Ms. Retherford. Regarding the cost of capital, Mr. Bowler testified that, as was approved in Cause No. 45052, the weighted average cost of capital ("WACC") proposed to be utilized in the ECA is the most recent approved WACC from Petitioner's TDSIC mechanism (Cause No. 44910). Based on the terms of the Federal Mandate Statute, Mr. Bowler described how 20% of the Project investment would be deferred until Petitioner's next base rate proceeding. He also covered the recovery of O&M costs related to the Project. Finally, Mr. Bowler reviewed how the revenue requirement for the Project would be calculated for purposes of recovery in the ECA mechanism. He attached illustrative ECA schedules to his testimony to demonstrate how the ECA filings would be prepared to reflect inclusion of the Project. He also discussed the proposed adjustment to Vectren South's authorized return amount used in its Fuel Adjustment Clause net operating income earnings tests under Ind. Code §§ 8-1-2-42(d) and -42.3 because of the proposed ECA, consistent with the Federal Mandate Statute.

J. Cas Swiz, Petitioner's Director, Rates and Regulatory Portfolio Management, testified regarding use of the ECA to recover Project costs pursuant to the Federal Mandate Statute. He explained that consistent with the Federal Mandate Statute, 80% of the Project costs will be recovered via the ECA mechanism, with the remaining 20% deferred and recovered in a future base rate case. Mr. Swiz described how the revenue requirement related to the Project will be calculated for purposes of ECA filings, and he discussed the illustrative ECA schedules that will be submitted to the Commission once costs have been incurred. He provided the cost allocation percentages that will be applied in the ECA and discussed the timing of annual ECA filings. Mr. Swiz presented a revised ECA tariff to be used once the Project is approved and proposed that the tariff be approved. He concluded by providing a schedule of projected bill impacts resulting from recovery of Project costs.

Jay D. Mokotoff, Senior Engineer Group Manager, Civil and Environmental Engineering at AECOM, and Mr. Keith Benton, Senior Project Engineer in the Process Development and Consulting Department of the Process Technologies Organization of AECOM, testified about the process of option development and the evaluation and engineering work completed by AECOM related to closure of the Brown Ash Pond consistent with applicable federal and state regulations.

Mr. Mokotoff described AECOM's qualification and experience related to CCR projects. He defined AECOM's role in evaluating closure options for the Brown Ash Pond. He described the ABB Evaluation of Options for Pond Closure Report (the "Report") with a description of the various options and how those options were compared and evaluated. He then described the work performed by AECOM in order to prepare the Report including the development of option concepts and the application of design and regulatory criteria to each option. He then explained how the two main options, CIP and CBR, were further analyzed by evaluating alternatives related to the six main components of the closure process: Pond Closure, Excavation, Dewatering, Handling, Processing, and Storage. He then described how each of these options were analyzed including the formulation of conceptual engineering designs.

Mr. Mokotoff testified as to how the Report documents the analysis process and that CBR with Beneficial Reuse was ultimately selected. He described the CBR with Beneficial Reuse process including stormwater control and how the ash material will be loaded onto barges on the Ohio River. Lastly, he testified as to how the public convenience and necessity will be served by the chosen approach. Specifically, he testified that CBR with Beneficial Reuse represents the preferred alternative in terms of compliance, risk, and cost and how it provides the best approach for this site in terms of balancing upfront project cost, cost certainty, and long-term risk.

Mr. Keith Benton adopted the prefiled testimony of Claire Schmit, Principal Process Engineer at AECOM, and described the preparation of the Report, specifically the elements related to the infrastructure to support CBR with Beneficial Reuse, including loading, storage, handling, and transport of CCR materials. He then provided an overview of the Report including the description of a separate study to determine the market value of the reclaimed ponded ash and an evaluation of the infrastructure required for a CBR option in which the CCR material is transported off-site for beneficial reuse. He described the process used for evaluating CCR pond closure and infrastructure options including, but not limited to, the development and comparison of estimates of the capital cost of the infrastructure equipment, anticipated operating cost, anticipated revenue from ash reclaimed for beneficial use, and total project duration for each option.

Mr. Benton's testimony described Section 4 of the Report, which defines the phases of the closure process including how the CCR material will be processed and then transported to the upgraded barge loading system. The processed ponded ash will then transfer onto river barges for transport to the third party for beneficial reuse. He explained what other options were considered and how AECOM evaluated the cost of each alternative as part of its analysis. He described how AECOM prepared the capital cost estimates for the selected pond closure and infrastructure options with a specific discussion of the bidding process. He also explained how AECOM developed lifecycle cost estimates for the pond closure and ash handling systems. He stated that lifecycle costs are a combination of utility costs, O&M costs, replacement parts, and for the CIP option, post-closure maintenance.

Mr. Benton then testified regarding the design basis for the cost estimates for the pond closure and ash handling systems including the costs (services, equipment, construction, lifecycle, fee, and contingency) included in the cost estimates. He stated that the estimate set forth in the Report was accurate within a range of -20% to +30%, and the final project costs (as provided in

Mr. Games' testimony) should have an accuracy range of -10% to +20%. Mr. Benton concluded by stating that AECOM supports Petitioner's conclusions with respect to the selection of CBR with Beneficial Reuse.

5. **Settlement Agreements.** After the filing of Petitioner's case-in-chief and before the submissions of any responsive testimony, two Settlement Agreements were submitted to the Commission supporting the proposed Project and resolving all issues in the proceeding. Initially, the OUCC and Petitioner entered into the December Settlement Agreement, and subsequently CAC, the OUCC, and Petitioner entered into the Joint Settlement Agreement wherein CAC also joined in the December Settlement Agreement. The two Settlement Agreements provide for approval of the relief requested in this proceeding by Petitioner and add additional customer safeguards that the Settlement Parties agreed upon after good faith negotiations. The terms of the two Settlement Agreements comprise the complete agreement of the Settling Parties and will be considered together and referred to hereafter as the Settlement Agreements. The key provisions are set forth below.

A. **Agreement that a CPCN Should Be Granted for the Project.** The Settling Parties have entered into the Settlement Agreements in which they agreed that the Commission should grant Petitioner a CPCN pursuant to Ind. Code ch. 8-1-8.4 for the Project in order to close the Brown Ash Pond in compliance with CCR regulations, as described in Petitioner's case-in-chief.

B. **Recovery of Federally Mandated Costs.** The Settling Parties agree that the Commission should find that the Project constitutes a compliance project that will allow Petitioner to comply with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7. The Settling Parties agree that the total estimated federally mandated costs of $156,200,000 are reasonable and should be approved. This agreed-upon amount reflects the Settling Parties' agreement that, in light of Ind. Code § 8-1-8.4-7(c)(3) and without waiver of the rights provided to the parties thereunder, Petitioner shall remove the contingency of $8.33 million from the federally mandated costs.

C. **Agreement on a Project Cost Credit Based upon Cash Proceeds Received by Petitioner.** The Settling Parties agree that the total federally mandated costs will be offset by total cash proceeds to be received from the Ash Reuser ("Ash Payments" in Table 1 of Petitioner's Exhibit No. 1-C, p. 20) and insurance proceeds (Petitioner's Exhibit No. 5, p. 6, lines 1-5) and that these proceeds will be at least $25 million. These cash proceeds will be used to offset incurred O&M costs to excavate and convey the ash to the loading facility.

D. **Agreement for Timely Cost Recovery through ECA Mechanism.** The Settling Parties agree that the Commission should grant Petitioner's request to timely recover 80% of the approved federally mandated costs incurred during construction and after placement in service and operation of the Project, including PISCC, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism, as described in Petitioner's Exhibit No. 5, p. 6.

E. **Agreement Regarding Treatment of Cost of Removal.** The Settling Parties agree that the costs of removal associated with retirements of existing or future capital assets in connection with the Project are not reflected in the total projected federally mandated costs and they will not be reflected in the ECA mechanism in future proceedings. The Settling Parties agree that such costs of removal, if incurred, will be addressed in future general base rate cases to the extent of their effect on net original cost rate base. In the event the Project results in a retirement of existing assets, Petitioner will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets, as stated in Petitioner's Exhibit No. 5, p. 8.

F. **Agreement to Deferral Authority.** The Settling Parties agree the Commission should grant Petitioner's request to defer 20% of the approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2), as presented in Petitioner's Exhibit No. 5, p. 6.

G. **Agreement on Other Accounting and Ratemaking Treatment.** The Settling Parties agree that the Commission should grant Petitioner's requested accounting and ratemaking treatment.

H. **Agreement on Preservation of Rights Regarding Effect of Environmental Liability on Rates.** The Settling Parties agree in the event Petitioner is held liable for damages or made subject to enforcement action with respect to the handling of the ash from the Brown Ash Pond, the Settling Parties reserve their respective positions with respect to any request for rate recovery related thereto and preserve their rights to defend such positions in future proceedings.

I. **Agreement to Submit Plans and Notice Regarding Dewatering.** The Settling Parties agree that, prior to commencing dewatering of the Brown Ash Pond, for purposes of closing the Brown Ash Pond, Petitioner shall submit the dewatering plans to IDEM for approval. Petitioner shall provide a copy of the dewatering plans and the notice to IDEM of the commencement of dewatering to the Settling Parties.

J. **Agreement on Closure Activities.** The Settling Parties agree that, prior to commencing any closure-in-place of CCR at the Brown Ash Pond, Petitioner shall submit and receive IDEM approval of a closure plan for the Brown Ash Pond pursuant to applicable IDEM regulations. Petitioner shall include a revised Fugitive Dust Plan for the Brown Ash Pond as part of the closure plan application. The full closure plan for the Brown Ash Pond shall be made publicly available.

K. **Agreement to Worker Protections.** The Settling Parties agree that Petitioner shall work with its contractors to include worker protection provisions in the revised Fugitive Dust Plan submitted as part of Petitioner's closure plan for the Ash Pond. Those worker protection provisions should include protections for workers engaged in the removal of CCR from the Brown Ash Pond, onsite processing of the CCR, and conveying of the CCR from the Brown Ash Pond to any barge that will transport it to off-site locations.

L. **Additional Terms.** The Settling Parties agree that the Settlement Agreements are a complete, interrelated package and should be accepted or rejected in their entirety without modifications or conditions that may be unacceptable to any Settling Party. If not approved in their entirety, the Settlement Agreements shall be null and void to the extent a Settling Party issues notice within 15 business days of the date of the Final Order in this proceeding that the modifications made by the Commission are unacceptable.

6. **Evidence Supporting the Settlement Agreement.**

A. **Petitioner's Testimony in Support of the Settlement Agreement.** Mr. Bowler testified in support of the December Settlement Agreement with the OUCC, which was later joined by the CAC. He explained that the Settlement Agreement supports the relief requested regarding the Project, including agreement that a CPCN pursuant to the Federal Mandate Statute should be granted, and that the Settlement Agreement adds certain customer safeguards that further support a finding that the Project is in the public interest. Mr. Bowler described the following customer protections set forth in the Settlement Agreement: (1) removal of a contingency of over $8 million from the Project costs, thereby reducing the approved federally mandated costs to $156,200,000; (2) setting a $25 million minimum offset of Project O&M costs based on projected cash proceeds to be received from both the Ash Reuser and insurance policies; and (3) to the extent Petitioner is found liable for damages or faces an enforcement action related to handling of fly ash, the parties reserve their rights as to any request for recovery of such costs. Mr. Bowler noted that the Settlement Agreement also clarifies how costs of removal will be handled once existing assets are retired. He stated that the Settlement Agreement represents a negotiated compromise that produces a fair and balanced outcome and asked the Commission to issue an order approving the terms of the Settlement Agreement in its entirety.

Ms. Retherford testified in support of the Joint Settlement Agreement and explained the conditions related to Petitioner's dewatering plans, closure plans, fugitive dust plan, and worker protections with respect to fugitive dust. She testified that Petitioner's commitment to provide copies to the OUCC and CAC of the dewatering plans and the notice to IDEM regarding commencement of dewatering activities does not change Vectren South's obligations under applicable regulations or its communications with IDEM. However, it does allow the other parties to remain aware of Petitioner's interactions with IDEM related to dewatering at the Project.

Ms. Retherford further testified as to conditions imposed with respect to Petitioner's closure plan under the Joint Settlement Agreement. She explained that Vectren South will submit and receive IDEM approval of its closure plan for the Brown Ash Pond, pursuant to applicable IDEM regulations, prior to commencing any CIP for materials that do not meet the specifications for reuse by the Ash Reuser. Additionally, she explained that Petitioner commits to provide the revised Fugitive Dust Plan (as required under the CCR Rule) as part of its closure plan application to IDEM and to make the full closure plan publicly available.

She also testified that the worker protections Vectren South has committed to include in the closure plan to be submitted to IDEM are already contemplated in the anticipated contractor and subcontractor agreements to be utilized to complete the Project. She concluded by stating that the Joint Settlement Agreement is in the public interest due in part to the fact that it provides a

reasonable resolution without the time and expense that would be incurred in connection with litigation.

B. <u>The OUCC's Testimony in Support of the Settlement Agreement.</u> Cynthia M. Armstrong, Senior Utility Analyst, Electric Division testified in support of the December Settlement Agreement. Ms. Armstrong summarized the primary components of the December Settlement Agreement, explaining that it is in the public interest for many reasons. First, she stated that the Settlement Agreement mitigates the impact on consumers of potential cost overruns by removing the contingency Vectren South originally proposed in its application for a Federally Mandated CPCN. She explained that under Ind. Code § 8-1-8.4-7(c)(3), actual costs that exceed the projected federally mandated costs of the approved compliance project by more than 25% require specific justification by the energy utility and specific approval by the Commission before being authorized in the next general rate case filed by the energy utility with the Commission. She concluded that a utility does not have to receive specific Commission approval for cost overruns until the project costs exceed 25% of the approved amount, so the Federally Mandated Requirements statute naturally allows a utility a reasonable level of contingency for a federally mandated project.

Second, she testified that the Settlement Agreement further mitigates the rate impact of the project on ratepayers by offsetting O&M costs with the cash proceeds received from the ash re-user and insurance proceeds. She also noted that if the Brown Ash Pond Compliance Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation for the ECA with the impact of the retired assets.

Third, Ms. Armstrong stated the Settlement Agreement allows for the closure of the Brown Ash Pond in a manner that is more protective of public health and the environment (i.e., CBR) than the complete closure in-place of the pond. She explained that by removing the ash and allowing it to be beneficially re-used in a manner that will encapsulate it, Vectren South is minimizing the likelihood that dangerous constituents within the ash will leak into local groundwater supplies. She testified that beneficially re-using the ash also mitigates Vectren South's future liability associated with remediation and decreases costs that could potentially be passed onto ratepayers. She noted that the OUCC does not necessarily agree that such remediation costs are appropriate to pass onto ratepayers, but stated that the project minimized the risk of a future conflict between Vectren South and the OUCC on additional remediation costs.

Finally, she stated that public policy supports the Settlement Agreement. She explained that by collaborating to resolve the issues in this proceeding, the Settlement Agreement also serves the public interest by avoiding contentious and costly litigation. She affirmed that the Settlement Agreement provides ratepayer benefits and a reasonable compromise among the Settling Parties and recommended its approval.

Ms. Armstrong also addressed the OUCC's opposition to recovery under the Federal Mandate Statute in other cases before the Commission and explained the OUCC's differing position in this case. She testified that after reviewing Vectren South's CCR Compliance Plan, the OUCC found Vectren South put forth an approvable plan that met the requirements of Ind. Code § 8-1-8.4-6(b). She stated that Vectren South developed an innovative plan for dealing with its

legacy ash waste and that it was clear to the OUCC that Vectren South investigated reasonable alternatives to closing the ash pond in a manner that mitigated the costs passed onto ratepayers. She noted that although that a CCR Compliance Plan similar to Vectren South's may not be possible for other utilities to implement, a utility should show that it reasonably considered and investigated the possibility of re-using its ash when submitting an application for rate recovery before the Commission. She further explained that Vectren South appears to be taking all actions possible to further reduce the costs of closure beyond selling the ash for re-use by actively pursuing compensation under its insurance policies and providing an offset to costs recovered in the ECA tracker to account for the retirement of the ash ponds.

7. **Commission Discussion and Findings.**

A. **Overview of the Brown Ash Pond and Vectren South's CCR Compliance Analysis.** In 1978, the Brown Ash Pond was commissioned in order to dispose of CCR material including fly ash, bottom ash, and scrubber byproduct from Vectren South's nearby A. B. Brown Generating Station in Posey County, Indiana. The unlined Brown Ash Pond was created by constructing an earthen dam across an existing valley and remains in operation today. In 2005, a second earthen dam was constructed across the middle of the pond on top of the existing ash to increase the storage capacity. This created upper and lower pools that together comprise the Brown Ash Pond. The lower pool, which is approximately 57 acres, holds process water for the A. B. Brown Generating Station, while the upper pool, which is approximately 107 acres, continues to collect fly ash and bottom ash. In total, both ponds can hold approximately 5.9 million cubic yards or 6.2 million tons of CCR material.

Pursuant to the CCR Rule, Vectren South commenced groundwater monitoring at the Brown site in June 2016. Vectren South published the results of that testing on its website as required by the CCR Rule. The groundwater monitoring results indicated statistically significant groundwater impacts above acceptable levels, which triggered closure under the CCR Rule. The CCR Rule requires that Vectren South cease disposal of ash in the Brown Ash Pond by October 2020 and commence closure activities within six months thereafter, or April 2021.

In order to achieve the CCR Rule compliance objectives, Vectren South selected AECOM as the engineering firm to assist in evaluating its CCR compliance options, assessing the structural stability of the ponds to continue accepting CCR material, and developing alternative plans for the potential closure of the Brown Ash Pond. During Vectren South's internal compliance evaluation for the Brown Ash Pond, an entity expressed interest in the reuse of the ash. After extensive consideration of its compliance options as documented in the AECOM Report, Vectren South ultimately selected CBR with Beneficial Reuse and executed a contract with the Ash Reuser.

B. **Consideration of Settlement Agreements.** In previous Orders, we have discussed our policy with respect to settlements:

> Indiana law strongly favors settlement as a means of resolving contested proceedings. *See, e.g., Manns v. State Department of Highways,* (1989), Ind., 541 N.E.2d 929, 932; *Klebes v. Forest Lake Corp.,* (1993), Ind. App. 607 N.E.2d 978, 982; *Harding v. State,* (1992), Ind. App., 603 N.E.2d 176, 179. A settlement

> agreement "may be adopted as a resolution on the merits if [the Commission] makes an independent finding, supported by substantial evidence on the record as a whole, that the proposal will establish 'just and reasonable' rates." *Mobil Oil Corp. v. FPC,* (1974), 417 U.S. 283, 314.

Indianapolis Power & Light Co., Cause No. 39936, p. 7 (IURC 9/24/95); *see also Commission Investigation of Northern Ind. Pub. Serv. Co.,* Cause No. 41746, p. 23 (IURC 9/23/02). This policy is consistent with expressions to the same effect by the Supreme Court of Indiana. *See, e.g., Mendenhall v. Skinner & Broadbent Co.,* 728 N.E.2d 140, 145 (Ind. 2000) ("The policy of the law generally is to discourage litigation and encourage negotiation and settlement of disputes"); *In re Assignment of Courtrooms, Judge's Offices and Other Facilities of St. Joseph Superior Court,* 715 N.E.2d 372, 376 (Ind. 1999) ("Without question, state judicial policy strongly favors settlement of disputes over litigation").

Nevertheless, pursuant to the Commission's procedural rules and prior determinations by this Commission, a settlement agreement will not be approved by the Commission unless it is supported by probative evidence. 170 Ind. Admin. Code 1-1.1-17. Settlements presented to the Commission are not ordinary contracts between private parties. *U.S. Gypsum, Inc. v. Indiana Gas Co.,* 73 5 N.E.2d 790, 803 (Ind. 2000). Any settlement agreement approved by the Commission "loses its status as a strictly private contract and takes on a public interest gloss." *Id.* (quoting *Citizens Action Coalition v. PSI Energy, Inc.,* 664 N.E.2d 401, 406 (Ind. Ct. App. 1996)). Thus, the Commission "may not accept a settlement merely because the private parties are satisfied; rather [the Commission] must consider whether the public interest will be served by accepting the settlement." *Citizens Action Coalition,* 664 N.E.2d at 406. Furthermore, a Commission decision, ruling or order must be supported by specific findings of fact and sufficient evidence. *U.S. Gypsum,* 735 N.E.2d at 795 (citing *Citizens Action Coalition v. Public Service Co.,* 582 N.E.2d 330, 331 (Ind. 1991)). Therefore, before the Commission can approve the Settlement Agreement, we must determine whether the evidence in this Cause sufficiently supports the conclusion that the Settlement Agreements are reasonable, just, and consistent with the purpose of the governing statutory provisions, and that such agreements serve the public interest.

In this case, the Commission has before it a considerable body of evidence with which to judge the reasonableness of the terms of the Settlement Agreements, including the Settling Parties' agreement that the Commission should grant Petitioner a CPCN pursuant to Ind. Code ch. 8-1-8.4 for the Project. We are also mindful that settlements represent the product of negotiations, and modifications to the terms can result in nullification of the entire settlement.

As we will discuss below, the record includes substantial evidence supporting each element of the Federal Mandate Statute. The evidence also supports the Settling Parties' agreement that the Project constitutes a compliance project that will allow Petitioner to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and, therefore, eligible for cost recovery as set forth in Ind. Code § 8-1-8.4-7.

C. **Certificate of Public Convenience and Necessity.** Before approving the Settlement Agreements, and thus granting Petitioner a CPCN under Ind. Code ch. 8-1-8.4, we

must: (1) find that public convenience and necessity will be served by the proposed Project; (2) approve the projected costs associated with the Compliance Project; and (3) make a finding on each of the factors in Ind. Code § 8-1-8.4-6(b). Those factors include:

> (A) A description of the federally mandated requirements that the energy utility seeks to comply with through the proposed compliance project.
>
> (B) A description of the projected federally mandated costs associated with the proposed compliance project.
>
> (C) A description of how the proposed compliance project allows the energy utility to comply with the federally mandated requirements described by the energy utility under clause (A).
>
> (D) Evaluation of alternative plans that demonstrate that the proposed compliance project is reasonable and necessary.
>
> (E) Information as to whether the proposed compliance project will extend the useful life of an existing energy utility facility and, if so, the value of that extension.

Ind. Code § 8-1-8.4-6(b)(1).

i. Federally Mandated Requirements and Petitioner's Compliance with the Mandate. Ind. Code § 8-1-8.4-5 defines a federally mandated requirement to include a "requirement that the commission determines is imposed on an energy utility by the federal government in connection with . . . [a]ny other law, order, or regulation administered or issued by the United States Environmental Protection Agency[.]" EPA promulgated the CCR Rule under RCRA, which is one of the federal mandates explicitly listed in Ind. Code § 8-1-8.4-5. As discussed by Ms. Retherford, the CCR Rule requires groundwater testing at the Brown Ash Pond. The testing results indicated statistically significant groundwater impacts above acceptable levels, which triggered the mandate that Vectren South commence closure of the Brown Ash Pond. As such, the Project is being undertaken to comply with these federally mandated requirements under Ind. Code § 8-1-8.4-5.

Mr. Games and Ms. Retherford both explained how the proposed Project allows Petitioner to comply with the CCR Rule. Additionally, the Settling Parties agree that the proposed Project is reasonable and necessary to meet a federally mandated requirement. Based on the evidence presented, we find that Petitioner's Project will allow it to comply with EPA's CCR Rule, which is a "federally mandated requirement" under Ind. Code § 8-1-8.4-5.

ii. Federally Mandated Project Costs. Ind. Code § 8-1-8.4-4 defines federally mandated costs, in part, as "costs that an energy utility incurs in connection with a compliance project, including capital, operating, maintenance, depreciation, tax, or financing costs." Based on Petitioner's direct testimony, the Project has a total cost of $164,539,000. Under the Settlement Agreements, Petitioner agreed to remove a contingency cost, thereby reducing the total federally mandated cost to $156,200,000. The Settling Parties agree that this cost estimate constitutes a reasonable estimate of the costs for the Project. Under the Settlement Agreements, Petitioner has agreed to a minimum amount of cash proceeds from the Ash Reuser and insurance

policy recoveries of $25 million to offset the O&M Project Costs to be recovered. Actual recoveries in excess of this minimum will also be applied to offset O&M costs.

Petitioner explained in detail the unique aspects of the Project whereby beneficial reuse of the excavated ash results in the ash being safely removed from the pond and transported off site to the Ash Reuser. Project costs are offset by the proceeds from the Ash Reuser and the insurance recoveries to the point that the Project costs are comparable to the estimated total inflated CIP project cost of $137.5 million. We recognize the economic and environmental advantages of the CBR approach to achieving CCR compliance. The record sets forth the many benefits of CBR with Beneficial Reuse in this particular circumstance compared to a CIP project, including long-term mitigation of risk to the extent a CIP approach would expose Petitioner to future additional remediation requirements at the pond.

The evidence sufficiently describes the projected federally mandated costs and expenses associated with the Project and demonstrates that Petitioner used sufficient rigor to develop its estimates, including the testimony of AECOM, an expert engineering firm that frequently engages in such remediation projects. The Commission agrees that the stipulated eligible project cost of $156,200,000 represents a reasonable estimate of the federally mandated costs for the Project. We further commend Vectren South for identifying a beneficial re-use of its CCR material and finalizing its agreement with the Ash Reuser in order to offset overall project costs. While each CCR project has its own unique challenges, we encourage all jurisdictional utilities facing similar CCR Rule compliance obligations to explore potential beneficial re-use and other cost mitigation options. Therefore, we approve the stipulated project cost as federally mandated costs and expenses associated with the Project.

iii. Alternative Plans. Through its partnership with AECOM, Vectren South presented detailed and comprehensive options for closing the Brown Ash Pond in compliance with the CCR Rule. The two general approaches that Vectren South evaluated are CIP and CBR. As detailed in the AECOM Report and Mr. Mokotoff's direct testimony, these two options were analyzed by evaluating engineering alternatives related to the six main components of the closure process: pond closure, excavation, dewatering, handling, processing, and storage. As such, the alternative evaluation included the following scenarios:

1. Pond Closure Options
    a. Closure-in-Place (CIP)
    b. Closure-by-Removal (CBR)
    c. Partial Removal Option 1: 50% CBR / 50% CIP
    d. Partial Removal Option 2: 75% CBR / 25% CIP
2. Excavation
    a. Hydraulic Dredging
    b. Drag Line
    c. Conventional
3. Dewatering Options
    a. Gravity Dewatering
    b. Positive Dewatering
    c. Combination of Gravity and Positive Dewatering

4. Handling Options
    a. Trucking
    b. Conveyor
5. Processing Options
    a. Screening
    b. Blending
    c. Drying
6. Storage Options
    a. Eurosilo
    b. Dome Structure

AECOM reviewed each scenario by using experience based on similar pond closure and infrastructure projects, by conducting research specific to the various possible technologies, and by discussing the potential options with construction contractors and equipment vendors. In addition, AECOM observed current CCR handling operations at the Brown Ash Pond and at ash ponds and CCR landfills owned by other electric utilities to gain further insight into what might be the most appropriate and effective CCR management methods for the Brown Ash Pond. AECOM then developed conceptual engineering designs to approximately a 60% of final level of detail for each of the pond closure options.

The CIP option involves dewatering the pond, leaving the CCR material in place, constructing a synthetic membrane cap, installing a system to drain all surface water away from the cap, adding topsoil, and establishing a vegetative cover. As such, the CIP option requires long-term groundwater monitoring and ongoing cap maintenance. Alternatively, the CBR option entails dewatering the pond and removing the CCR material for disposal or beneficial reuse.

Initially, the CIP approach appeared to be less expensive and resource intensive than the CBR approaches. In his direct testimony, Mr. Games presented the estimated total federally mandated costs for CBR with Beneficial Reuse at $164,539,000, adjusted for inflation. However, based on the Settling Parties' agreement, this projected cost estimate was offset by: 1.) removing the inflated contingency of $8.33 million; and 2.) applying cash proceeds from the Ash Reuser and insurance proceeds of at least $25 million. Applying the $25 million offset to the total federally mandated costs of $156,200,000 agreed to by the Settling Parties results in at most $131,200,000 for CBR with Beneficial Reuse compared to AECOM's estimates of $137,509,000 for the CIP option and $225,526,351 for the CBR and Landfill option.

Additionally, Vectren South identified multiple reasons to select CBR over CIP prior to negotiating these cost reductions. First, IDEM has been unwilling to approve a CIP approach where significant amounts of ash remain in contact with groundwater, and other states are starting to require CBR. Second, if required to remove ash from groundwater under a CIP approach, the upfront costs would no longer be lower. Third, the CIP poses risk for future groundwater contamination and associated remediation due to CCR material being left in the closed pond. The CBR options, on the other hand, remove the requirement for 30 years of groundwater monitoring and mitigate groundwater issues. The CBR options also avoid the potential scenario wherein CCR material is required to be excavated and placed in a lined landfill as a result of future regulations. Given these considerations as detailed in AECOM's comprehensive engineering analysis and the

evidence of record, we find that Petitioner properly considered alternative plans for compliance with the CCR Rule and that the Project as presented is reasonable and necessary.

iv. Useful Life of the Facilities. In her testimony, Ms. Retherford explained that the Project will extend the useful life of the existing A.B. Brown Generating Station, which is a brownfield site with infrastructure to be used for existing and possible future generation resources. We find that the Project will benefit the continued and future use of the Brown site as a location for generation resources.

v. Conclusion. The evidence presented demonstrates that the proposed Project will allow Petitioner to comply with the requirements of the CCR Rule. As discussed above, we have made a finding on each of the factors described in Ind. Code § 8-1-8.4-6(b), and we have approved the projected federally mandated costs associated with this Compliance Project. Therefore, we find that public convenience and necessity will be served by the Project, and we approve the proposed Project and issue Petitioner a CPCN for the Project under Ind. Code § 8-1-8.4-7(b), consistent with the Settlement Agreements negotiated by the Settling Parties.

D. Cost Recovery. Ind. Code § 8-1-8.4-7(c) states:

> If the commission approves under subsection (b) a proposed compliance project, including approval of the projected federally mandated costs associated with the compliance project, the following apply:
>
> (1) Eighty percent (80%) of the approved federally mandated costs shall be recovered by the energy utility through a periodic retail rate adjustment mechanism that allows the timely recovery of the approved federally mandated costs. The commission shall adjust the energy utility's authorized net operating income to reflect any approved earnings for purposes of IC 8-1-2-42(d)(3) and IC 8-1-2-42(g)(3).
>
> (2) Twenty percent (20%) of the approved federally mandated costs, including depreciation, allowance for funds used during construction, and post in service carrying costs, based on the overall cost of capital most recently approved by the commission, shall be deferred and recovered by the energy utility as part of the next general rate case filed by the energy utility with the commission.
>
> (3) Actual costs that exceed the projected federally mandated costs of the approved compliance project by more than twenty-five percent (25%) shall require specific justification by the energy utility and specific approval by the commission before being authorized in the next general rate case filed by the energy utility with the commission.

Pursuant to the Settlement Agreements, the Settling Parties have agreed that Petitioner should be authorized to: (1) recover 80% of the federally mandated costs for the Project, including PISCC, both debt and equity using the overall cost of capital approved in Petitioner's TDSIC cases, and deferred depreciation expense associated with the Project, through Petitioner's ECA Rider; (2) defer 20% of the federally mandated costs for the Project for subsequent recovery in a base rate case; and (3) defer depreciation and O&M expenses relating to the Project until such expenses

are recovered through either a rate adjustment mechanism or in base rates, all as described in Petitioner's Exhibit No. 5, p. 6. The Settling Parties further agreed that Vectren South's requested accounting and ratemaking treatment should be granted except as expressly modified in the Settlement Agreements (as we have described above). The Settling Parties' agreement on the total federally mandated costs is without waiver of the rights provided to the parties under Ind. Code § 8-1-8.4-7(c)(3). The Settling Parties further agree that in the event the Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets.

We find that the stipulated accounting and ratemaking treatment set forth in the Settlement Agreements as described above are reasonable and are hereby approved. Additionally, we find the proposed ECA tariff changes described by Mr. Cas Swiz are reasonable and are approved.

8. Conclusion. The evidence presented provides substantive support demonstrating that the Settlement Agreements are reasonable and in the public interest. We find the Settlement Agreements contain reasonable customer safeguards in terms of the project costs to be recovered and represent a reasonable resolution of the issues. Based on the evidence presented, we find that the Settlement Agreements should be approved in their entirety. Petitioner is authorized to proceed with the Project, which it has demonstrated is reasonable and necessary for compliance with the CCR Rule.

The Settling Parties agree that the Settlement Agreements should not be used as precedent in any other proceeding or for any other purpose, except to the extent necessary to implement or enforce their terms. Consequently, with regard to future citation of the Settlement Agreements, we find our approval herein should be construed in a manner consistent with our finding in *Richmond Power & Light*, Cause No. 40434, 1997 WL 34880849, at *7-8 (IURC March 19, 1997).

We commend Vectren South for developing an innovative plan for addressing its legacy ash waste at the Brown Ash Pond. We likewise agree with the OUCC and CAC that Vectren South investigated reasonable alternatives to closing the pond in a manner that mitigated the costs passed onto ratepayers and diminished the potential of future liability. While we recognize that each ash pond subject to the CCR Rule has unique geographic, structural, and environmental characteristics, jurisdictional utilities should show that they reasonably examined all realistic closure options and pursued all avenues to reduce costs to ratepayers when submitting an application for rate recovery before the Commission. We also recognize CAC's efforts in securing worker safety provisions for workers engaged in the removal, onsite processing, and conveying of CCR material from the Brown Ash Pond without attributing additional costs to ratepayers.

9. Confidential Information. Petitioner filed motions for protective order on August 15, 2019, and February 13, 2020, all of which were supported by affidavits showing documents to be submitted to the Commission were trade secret information within the scope of Ind. Code §§ 5-14-3-4(a)(4) and (9) and Ind. Code § 24-2-3-2. The Presiding Officers issued docket entries finding all of the information described in the motions to be preliminarily confidential, after which such information was submitted under seal. We find all such information is confidential pursuant to Ind. Code § 5-14-3-4 and Ind. Code § 24-2-3-2, is exempt from public access and disclosure by Indiana

law and shall be held confidential and protected from public access and disclosure by the Commission.

IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:

1. The Settlement Agreements attached hereto are approved in their entirety as set forth above.

2. Petitioner is issued a Certificate of Public Convenience and Necessity for the Project pursuant to Ind. Code §§ 8-1-8.4-6 and -7. This Order constitutes the Certificate.

3. Petitioner is authorized to timely recover 80% of the stipulated federally mandated costs incurred during construction and operation of the Project, including post-in-service carrying costs, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism. Petitioner's authorized return amount utilized in its Fuel Adjustment Clause net operating income earnings tests under Ind. Code § 8-1-2-42(d) and Ind. Code § 8-1-2-42.3 shall be adjusted accordingly.

4. Petitioner is authorized to defer for recovery 20% of such approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2).

5. Petitioner is authorized to accrue post-in-service carrying costs, both debt and equity, related to the Project after its in-service date using the overall cost of capital approved in Petitioner's TDSIC cases.

6. Petitioner is authorized to defer depreciation and operating and maintenance expenses relating to the Project until such expenses are recovered through either a rate adjustment mechanism or in base rates.

7. Petitioner is authorized to utilize the depreciation rates set forth in Petitioner's Exhibit No. 5, p. 8 with respect to the Project.

8. Petitioner is authorized to revise its ECA Rider tariffs as shown in Petitioner's Exhibit No. 6, Attachment JCS-2.

9. Petitioner shall file with the Commission as a compliance filing under this Cause its dewatering plans upon submission to IDEM.

10. The Commission's approval of Petitioner's request in this Cause is contingent on IDEM's final approval of the Project.

11. The Confidential Information is deemed confidential under Ind. Code §§ 8-1-2-29 and 5-14-3-4, is exempt from public access and disclosure by Indiana law, and shall be held confidential and protected from public access and disclosure by the Commission.

12. This Order shall be effective on and after the date of its approval.

HUSTON, FREEMAN, KREVDA, OBER, AND ZIEGNER CONCUR:

APPROVED: MAY 13 2020

I hereby certify that the above is a true and correct copy of the Order as approved.

Mary M Becerra

Mary M. Becerra
Secretary of the Commission

FILED
December 19, 2019
INDIANA UTILITY
REGULATORY COMMISSION

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC") AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	)	CAUSE NO. 45280

STIPULATION AND SETTLEMENT AGREEMENT

This Stipulation and Settlement Agreement (the "Settlement Agreement") is entered into by and among Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company") and the Indiana Office of Utility Consumer Counselor ("OUCC"). Vectren South and the OUCC are collectively referred to herein as the "Settling Parties." The Settling Parties, solely for

purposes of compromise and settlement, stipulate and agree that the terms and conditions set forth in this Settlement Agreement represent a fair, just and reasonable resolution of all matters raised in this proceeding, subject to their incorporation by the Indiana Utility Regulatory Commission ("Commission") into a final, non-appealable order without modification or further condition that is unacceptable to any Settling Party. The Settling Parties agree that this Settlement Agreement resolves all disputes, claims and issues arising from the Commission proceeding currently pending in Cause No. 45280 as between the Settling Parties. The Settling Parties agree that Vectren South's requested relief in this Cause should be granted in its entirety except as expressly modified herein.

1. Certificate of Public Convenience and Necessity. The Settling Parties agree the Commission should find that public convenience and necessity will be served by the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Ash Pond Compliance Project") and grant Vectren South a certificate of public convenience and necessity ("CPCN") pursuant to Ind. Code ch. 8-1-8.4 for the Brown Ash Pond Compliance Project.

2. Federally Mandated Costs. The Settling Parties agree that, in light of Ind. Code 8-1-8.4-7(c)(3) and without waiver of the rights provided to the parties thereunder, Vectren South shall remove the inflated contingency of $8.33 million ($7.49 million prior to inflation)[1] from the total federally mandated costs. As a result, the Settling Parties agree that the total projected (inflated) federally mandated costs of $156,200,000 are reasonable and should be approved. The Settling Parties agree that the Commission

[1] Petitioner's Exhibit No. 1, p. 22, lines 2-7.

should find that the Brown Ash Pond Compliance Project constitutes a compliance project that will allow Vectren South to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7.

3. Credit for Cash Proceeds and Insurance Proceeds. The Settling Parties agree that total federally mandated costs will be offset by total cash proceeds to be received from the ash reuser ("Ash Payments" in Table 1 of Petitioner's Exhibit No. 1, p. 20) plus total insurance proceeds to be received (Petitioner's Exhibit No. 5, p. 5, lines 1-5) of at least $25 million. These cash proceeds will be used to offset incurred operations and maintenance ("O&M") Costs to excavate and convey the ash to the loading facility, as described in Vectren South's direct testimony.

4. Timely Recovery Through ECA Mechanism. The Settling Parties agree that Vectren South should be authorized to timely recover 80% of the approved federally mandated costs incurred during construction and after placement in service and operation of the Brown Pond Compliance Project, including post-in-service carrying costs, both debt and equity, and deferred depreciation expense associated with the Brown Ash Pond Compliance Project through Vectren South's Environmental Cost Adjustment ("ECA") mechanism, as described in Petitioner's Exhibit No. 5, p. 6.

5. Cost of Removal. The Settling Parties agree that the costs of removal associated with retirements of existing or future capital assets in connection with the Brown Ash Pond Compliance Project are not reflected in the total projected federally mandated costs and they will not be reflected in the ECA mechanism in future

proceedings. Such costs of removal, if incurred, will be addressed in future general base rate cases to the extent of their effect on net original cost rate base. In the event the Brown Ash Pond Compliance Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets. (Petitioner's Exhibit No. 5, p. 8.)

6. Deferral Authority. The Settling Parties agree that Vectren South should be authorized to defer 20% of the approved federally mandated costs until such costs are reflected in Vectren South's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2), as presented in Petitioner's Exhibit No. 5, p. 6.

7. Other Accounting and Ratemaking Treatment. The Settling Parties agree that the Commission should grant Vectren South's requested accounting and ratemaking treatment except as expressly modified herein.

8. Preservation of Rights Regarding Effect of Environmental Liability on Rates. In the event Vectren South is held liable for damages or made subject to enforcement action with respect to the handling of the ash from the Brown Ash Pond, the Settling Parties reserve their respective positions with respect to rate recovery related thereto and preserve their rights to defend such positions in future proceedings.

9. Scope and Effect of Settlement.

a. Neither the making of this Settlement Agreement nor any of its provisions shall constitute in any respect an admission by any Settling Party in this or any other litigation or proceeding. Neither the making of this Settlement Agreement, nor the provisions thereof, nor the entry by the Commission of

a Final Order approving this Settlement Agreement, shall establish any principles or legal precedent applicable to Commission proceedings other than those resolved herein.

b. This Settlement Agreement shall not constitute nor be cited as precedent by any person or deemed an admission by any Settling Party in any other proceeding except as necessary to enforce its terms before the Commission, or any tribunal of competent jurisdiction. This Settlement Agreement is solely the result of compromise in the settlement process and, except as provided herein, is without prejudice to and shall not constitute a waiver of any position that any of the Settling Parties may take with respect to any or all of the issues resolved herein in any future regulatory or other proceedings.

c. The Settling Parties' entry into this Settlement Agreement shall not be construed as a limitation on any position they may take or relief they may seek in other pending or future Commission proceedings not specifically addressed in this Settlement Agreement.

10. Authority to Enter Settlement. The undersigned have represented and agreed that they are fully authorized to execute this Settlement Agreement on behalf of their designated clients, and their successors and assigns, who will be bound thereby, subject to the agreement of the Settling Parties on the provisions contained herein.

11. Privileged Settlement Communications. The communications and discussions during the negotiations and conferences have been conducted based on the explicit understanding that said communications and discussions are or relate to offers of

settlement and therefore are privileged. All prior drafts of this Settlement Agreement and any settlement proposals and counterproposals also are or relate to offers of settlement and are privileged.

12. Conditions of Settlement. This Settlement Agreement is conditioned upon and subject to Commission acceptance and approval of its terms in their entirety, without any change or condition that is unacceptable to any Settling Party.

13. Evidence in Support of Settlement. Vectren South and the OUCC shall offer supplemental testimony supporting the Commission's approval of this Settlement Agreement and will request that the Commission issue a Final Order incorporating the agreed proposed language of the Settling Parties and accepting and approving the same in accordance with its terms without any modification. Such supportive testimony will be agreed-upon by the Settling Parties and offered into evidence without objection by any Settling Party. The Settling Parties hereby waive cross-examination of each other's witnesses.

14. Commission Approval. The Settling Parties will support this Settlement Agreement before the Commission and request that the Commission accept and approve the Settlement Agreement. This Settlement Agreement is a complete, interrelated package and is not severable, and shall be accepted or rejected in its entirety without modification or further condition(s) that may be unacceptable to any Settling Party. If the Commission does not approve the Settlement Agreement in its entirety, the Settlement Agreement shall be null and void and deemed withdrawn, upon notice in writing by any Settling Party within fifteen (15) business days after the date of the Final Order that any modifications made by the Commission are unacceptable to it. In the event the Settlement

Agreement is withdrawn, the Settling Parties will request that an Attorneys' Conference be convened to establish a procedural schedule for the continued litigation of this proceeding.

15. Proposed Order. The Settling Parties will work together to prepare an agreed upon proposed order to be submitted in this Cause. The Settling Parties will request Commission acceptance and approval of this Settlement Agreement in its entirety, without any change or condition that is unacceptable to any party to this Settlement Agreement.

16. Publicity. The Settling Parties also will work cooperatively on news releases or other announcements to the public about this Settlement Agreement.

17. Waiver of Opposition. The Settling Parties shall not appeal or seek rehearing, reconsideration or a stay of any Final Order entered by the Commission approving the Settlement Agreement in its entirety without changes or condition(s) unacceptable to any Settling Party (or related orders to the extent such orders are specifically and exclusively implementing the provisions hereof) and shall not oppose this Settlement Agreement in the event of any appeal or a request for rehearing, reconsideration or a stay by any person not a party hereto.

Accepted and Agreed on this 19th day of December, 2019.

(signature page follows)

Southern Indiana Gas and Electric Company
d/b/a Vectren Energy Delivery of Indiana, Inc.

By: _____

Indiana Office of Utility Consumer Counselor

By: _____

DMS 15900098v1

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC") AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	)	CAUSE NO. 45280

FILED
January 10, 2020
INDIANA UTILITY
REGULATORY COMMISSION

STIPULATION AND SETTLEMENT AGREEMENT

This Stipulation and Settlement Agreement (the "Settlement Agreement") is entered into by and among Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company"), the Indiana Office of Utility Consumer Counselor ("OUCC") and the Citizens Action Coalition of Indiana, Inc. ("CAC"). Vectren South, the OUCC and the CAC are collectively referred to herein as the

"Settling Parties." The Settling Parties, solely for purposes of compromise and settlement, stipulate and agree that the terms and conditions set forth in this Settlement Agreement represent a fair, just and reasonable resolution of concerns raised by the CAC related to the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Ash Pond Compliance Project"), subject to their incorporation by the Indiana Utility Regulatory Commission ("Commission") into a final, non-appealable order without modification or further condition that is unacceptable to any Settling Party. The Settling Parties agree that this Settlement Agreement resolves all disputes, claims and issues arising from the Commission proceeding currently pending in Cause No. 45280 as between the Settling Parties. The Settling Parties agree that Vectren South's requested relief in this Cause should be granted in its entirety subject to the conditions stated herein.

1. Stipulation and Settlement Agreement between Vectren South and OUCC dated December 19, 2019. CAC agrees with and joins the Stipulation and Settlement Agreement between Vectren South and the OUCC dated December 19, 2019 (the "December 19 Settlement Agreement"), subject to the additional conditions stated in this Settlement Agreement.

2. Submission of Plans and Notice Regarding Dewatering. The Settling Parties agree that, prior to commencing dewatering of the Brown Ash Pond, for purposes of closing the Brown Ash Pond, Vectren South shall submit the dewatering plans to the Indiana Department of Environmental Management ("IDEM") for approval. Vectren shall provide a copy of the dewatering plans and shall also provide the notice to IDEM of the commencement of dewatering to the Settling Parties.

3. Closure Activities. The Settling Parties agree that, prior to commencing any closure-in-place of CCR at the Brown Ash Pond, Vectren South shall submit, and receive IDEM approval of, a closure plan for the Brown Ash Pond pursuant to applicable IDEM regulations. Vectren South shall include a revised Fugitive Dust Plan for the Brown Ash Pond as part of that closure plan application. The full closure plan for the Brown Ash Pond shall be made publicly available.

4. Worker Protections. The Settling Parties agree that Vectren South shall work with its contractors to include worker protection provisions in the revised Fugitive Dust Plan submitted as part of Vectren South's closure plan for the Ash Pond. Those worker protection provisions should include protections for workers engaged in the removal of CCR from the Brown Ash Pond, onsite processing of the CCR, and conveying of the CCR from the Brown Ash Pond to any barge that will transport it to off-site locations.

5. Scope and Effect of Settlement.

a. Neither the making of this Settlement Agreement nor any of its provisions shall constitute in any respect an admission by any Settling Party in this or any other litigation or proceeding. Neither the making of this Settlement Agreement, nor the provisions thereof, nor the entry by the Commission of a Final Order approving this Settlement Agreement, shall establish any principles or legal precedent applicable to Commission proceedings other than those resolved herein.

b. This Settlement Agreement shall not constitute nor be cited as precedent by any person or deemed an admission by any Settling Party in any other proceeding except as necessary to enforce its terms before the

Commission, or any tribunal of competent jurisdiction. This Settlement Agreement is solely the result of compromise in the settlement process and, except as provided herein, is without prejudice to and shall not constitute a waiver of any position that any of the Settling Parties may take with respect to any or all of the issues resolved herein in any future regulatory or other proceedings.

c. The Settling Parties' entry into this Settlement Agreement shall not be construed as a limitation on any position they may take or relief they may seek in other pending or future Commission proceedings not specifically addressed in this Settlement Agreement or the December 19 Settlement Agreement.

6. Authority to Enter Settlement. The undersigned have represented and agreed that they are fully authorized to execute this Settlement Agreement on behalf of their designated clients, and their successors and assigns, who will be bound thereby, subject to the agreement of the Settling Parties on the provisions contained herein.

7. Privileged Settlement Communications. The communications and discussions during the negotiations and conferences have been conducted based on the explicit understanding that said communications and discussions are or relate to offers of settlement and therefore are privileged. All prior drafts of this Settlement Agreement and any settlement proposals and counterproposals also are or relate to offers of settlement and are privileged.

8. Conditions of Settlement. This Settlement Agreement is conditioned upon and subject to Commission acceptance and approval of its terms in their entirety, without any change or condition that is unacceptable to any Settling Party.

9. Evidence in Support of Settlement. Vectren South shall offer supplemental testimony supporting the Commission's approval of this Settlement Agreement and will request that the Commission issue a Final Order incorporating the agreed proposed language of the Settling Parties and accepting and approving the same in accordance with its terms without any modification. Such supportive testimony will be agreed-upon by the Settling Parties and offered into evidence without objection by any Settling Party. The Settling Parties hereby waive cross-examination of each other's witnesses.

10. Commission Approval. The Settling Parties will support this Settlement Agreement before the Commission and request that the Commission accept and approve the Settlement Agreement. The terms of this Settlement Agreement constitute an interrelated package and are not severable, and shall be accepted or rejected in their entirety without modification or further condition(s) that may be unacceptable to any Settling Party. If the Commission does not approve this Settlement Agreement in its entirety, this Settlement Agreement shall be null and void and deemed withdrawn, upon notice in writing by any Settling Party within fifteen (15) business days after the date of the Final Order that any modifications made by the Commission are unacceptable to it. In the event this Settlement Agreement is withdrawn, the Settling Parties will request that an Attorneys' Conference be convened to establish a procedural schedule for the continued litigation of this proceeding.

11. Proposed Order. The Settling Parties will work together to prepare an agreed upon proposed order to be submitted in this Cause. The Settling Parties will request Commission acceptance and approval of this Settlement Agreement and the December 19 Settlement Agreement in their entirety, without any change or condition that is unacceptable to any party to this Settlement Agreement.

12. Publicity. The Settling Parties also will work cooperatively on news releases or other announcements to the public about this Settlement Agreement.

13. Waiver of Opposition. The Settling Parties shall not appeal or seek rehearing, reconsideration or a stay of any Final Order entered by the Commission approving this Settlement Agreement in its entirety without changes or condition(s) unacceptable to any Settling Party (or related orders to the extent such orders are specifically and exclusively implementing the provisions hereof) and shall not oppose this Settlement Agreement in the event of any appeal or a request for rehearing, reconsideration or a stay by any person not a party hereto.

Accepted and Agreed on this 9th day of January, 2020.

(signature page follows)

Southern Indiana Gas and Electric Company
d/b/a Vectren Energy Delivery of Indiana, Inc.

By: _____

Citizens Action Coalition of Indiana, Inc.

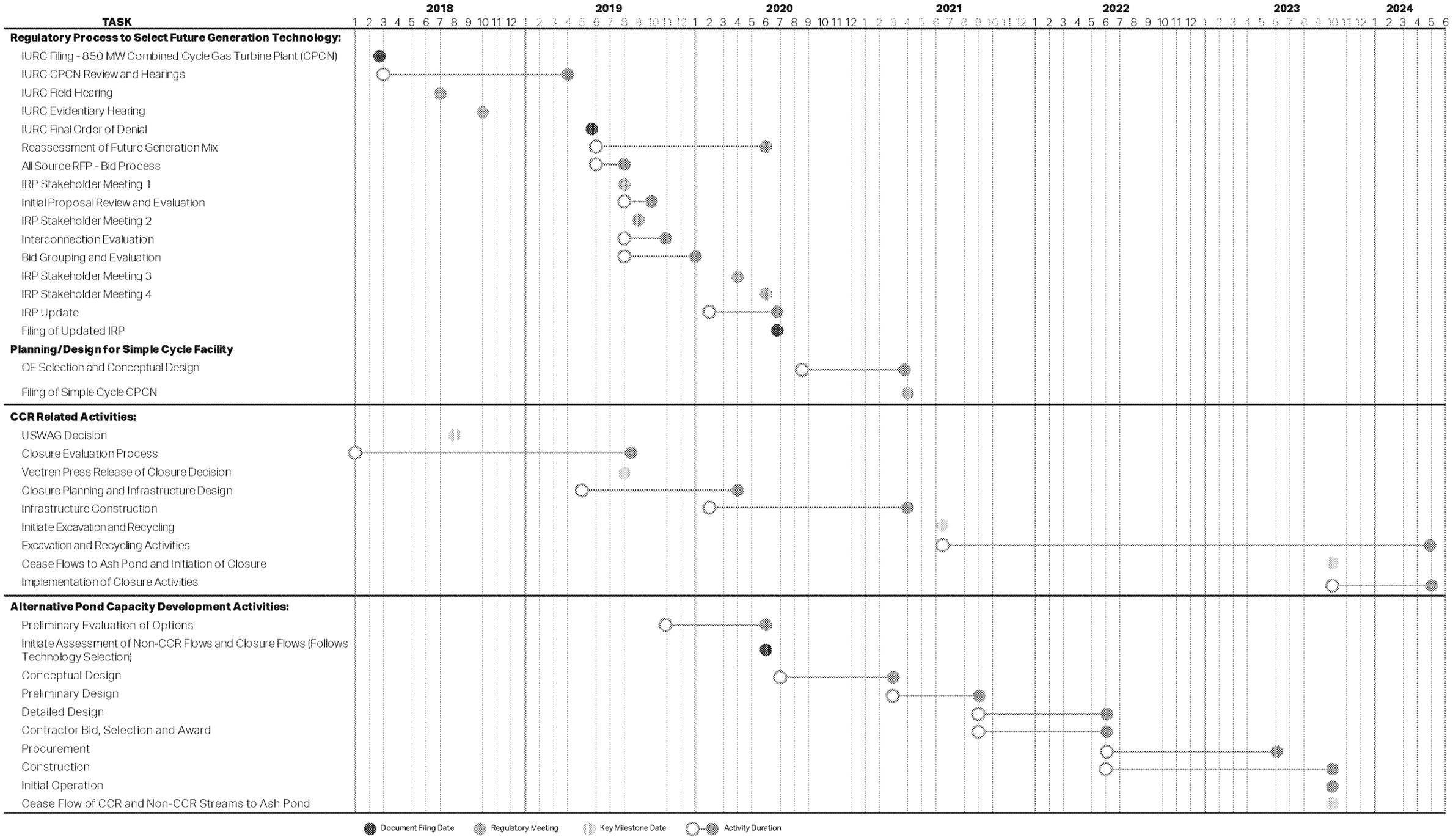
By: _____
Kerwin L. Olson, Executive Director

Indiana Office of Utility Consumer Counselor

By: Lorraine Hitz-Bradley

Appendix C
Schedule Activities and Milestone

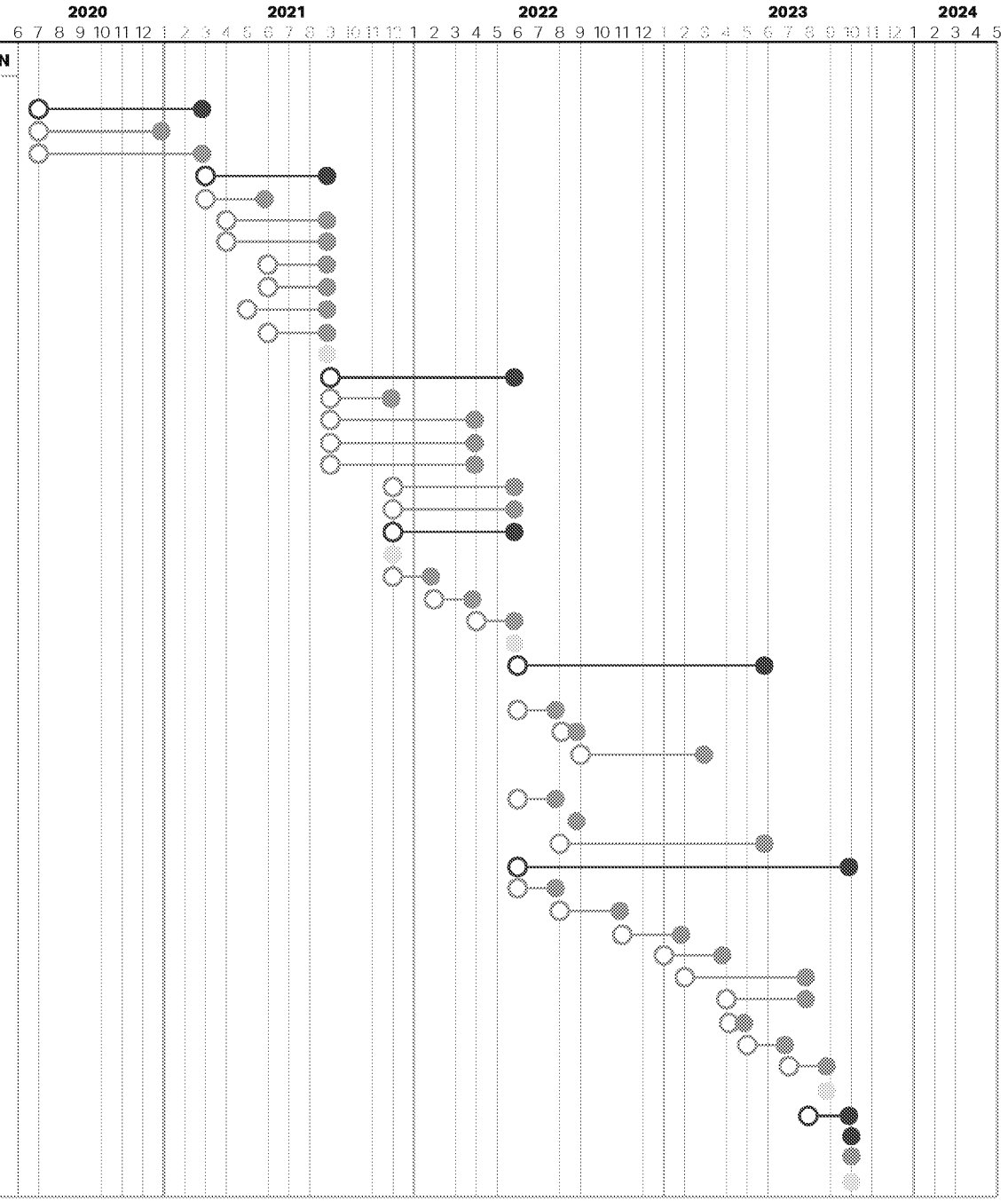
DRAFT


TASK
2018
2019
2020
2021
2022
2023
2024
Regulatory Process to Select Future Generation Technology:
IURC Filing - 850 MW Combined Cycle Gas Turbine Plant (CPCN)
IURC CPCN Review and Hearings
IURC Field Hearing
IURC Evidentiary Hearing
IURC Final Order of Denial
Reassessment of Future Generation Mix
All Source RFP - Bid Process
IRP Stakeholder Meeting 1
Initial Proposal Review and Evaluation
IRP Stakeholder Meeting 2
Interconnection Evaluation
Bid Grouping and Evaluation
IRP Stakeholder Meeting 3
IRP Stakeholder Meeting 4
IRP Update
Filing of Updated IRP
Planning/Design for Simple Cycle Facility
OE Selection and Conceptual Design
Filing of Simple Cycle CPCN
CCR Related Activities:
USWAG Decision
Closure Evaluation Process
Vectren Press Release of Closure Decision
Closure Planning and Infrastructure Design
Infrastructure Construction
Initiate Excavation and Recycling
Excavation and Recycling Activities
Cease Flows to Ash Pond and Initiation of Closure
Implementation of Closure Activities
Alternative Pond Capacity Development Activities:
Preliminary Evaluation of Options
Initiate Assessment of Non-CCR Flows and Closure Flows (Follows Technology Selection)
Conceptual Design
Preliminary Design
Detailed Design
Contractor Bid, Selection and Award
Procurement
Construction
Initial Operation
Cease Flow of CCR and Non-CCR Streams to Ash Pond
Document Filing Date
Regulatory Meeting
Key Milestone Date
Activity Duration

Appendix D
Detailed Schedule for Development of Alternative Capacity

DRAFT

TASK	DURATION
Initiate Assessment of Non-CCR Flows and Closure Flows	6/15/20
Conceptual Design	8
Identification and Evaluation of Post-Shutdown and Closure Flows	6
Conceptual Design New Pond and Redirection of Flows	8
Preliminary Design	6
Process - Flow Diagrams, Water Balance, P&ID's, Treatment Requirements	3
Mechanical - Site Plan, GA, P&ID's, Equip. Sizing, Piping, Specs.	5
Civil / Earthworks - Pond Site Plan, Storm Water Mgt, Specs.	5
Civil / Structural - Preliminary Foundations, Sumps and Steel. Specs	3
Electrical and I&C - One-Lines, Load Evaluations, Control System Architecture, Specs	3
Surveys and Investigations - Geotechnical, Topographic, Underground, Electrical Power	4
Request for Proposal Specification Package	3
Technical Specification, Preliminary Design and Cost Estimate	MS
Detailed Design	9
Process - P&ID's, Control Narrative	3
Civil - Pond Site Plan, Sections and Details, Storm Water Mgt	7
Mechanical - GA's, Detail Piping, Specs, Lists	7
Civil Structural - Foundations, Support and Access Steel	7
Electrical - GA's, Load Studies, Cable Routing & Connection Dwgs	6
Instrument and Controls - GA's, Controller, Cable Routing & Connection Dwgs	6
Contractor Bid, Selection and Award	6
Request for Proposal Issue	MS
Contractor Bidding Period	2
Evaluation of Bids	2
Contract Negotiations	2
Award Contract	MS
Procurement	12
Mechanical Equipment (Agitators, Pumps...)	9
Vendor Bidding Period	2
Evaluate Vendor Bids and Award Vendor Package	1
Procure, Manufacture and Deliver Engineered Equipment	6
Electrical & I&C (Power Distribution Center, Transformers, PLC)	12
Vendor Bidding Period	2
Evaluate Vendor Bids and Award Vendor Package	1
Procure, Manufacture and Deliver Engineered Equipment	10
Construction	16
Mobilization	2
Foundations and Cast Concrete Sumps	3
Structural and Access Steel	3
Equipment and Tanks	3
Piping - Above Ground and Buried	6
Electrical and Controls - Power Distribution, Controller, Cabling	4
Pond Site Prep and Clearing	1
Pond Cut and Fill	2
Pond Liner Installation	2
Mechanical Completion	MS
Start-Up and Commissioning	2
Initial Operation	1
Operation of New lined Pond and Flow Management System	1
Cease Flow of CCR and Non-CCR Streams to Ash Pond	10/15/23



Key Milestone Date Activity Duration Major Activity Duration

Appendix E
Certification of Compliance

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Certification of Compliance

In accordance with 40 CFR §257.103(f)(1)(iv)(B)(1), I, _____, being a qualified representative of Southern Industrial Gas & Electric Company, do hereby certify, to the best of my knowledge, information, and belief, that the A.B. Brown Generating Station Ash Pond is in compliance with all of the requirements of 40 CFR 257 Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. A.B. Brown's CCR Compliance website is up-to-date and contains all the necessary documentation and notification postings.

_____

Signed

_____

Printed Name

_____

Date

Appendix F
Groundwater Monitoring Well Location

DRAFT

LEGEND

- CCR MONITORING WELL
- NATURE AND EXTENT MONITORING WELL
- CCR PIEZOMETER WELL
- ASH POND UNIT BOUNDARY

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.

N

0 1,100 2,200
SCALE IN FEET

HALEY ALDRICH

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

GROUNDWATER MONITORING WELL LOCATIONS - ASH POND

JANAURY 2020

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\bos_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2020_01\129420_001_0001_MONITORING_WELL_LOCATIONS_BROWN_ASH_POND.mxd — USER: dfeirgl — LAST SAVED: 1/29/2020 1:44:21 PM

Appendix G
Well Construction Diagrams

DRAFT

TEST BORING REPORT

Boring No. CCR-AP-1

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 1
Start	18 December 2015
Finish	18 December 2015
Driller	B. Marshall
H&A Rep.	T. Vanage
Elevation	465.7 (est.)
Datum	
Location	See Plan N 968260.82 E 2773560.71

	Casing	Sampler	Barrel
Type	Sonic	-	Steel
Inside Diameter (in.)	6	-	6.0
Hammer Weight (lb)	-	-	-
Hammer Fall (in.)		-	-

Drilling Equipment and Procedures

Rig Make & Model: Track Geoprobe 8140LS
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 38	0.0 5.0	CL		Soft brown lean CLAY (CL), mps 20 mm, no odor, moist, roots throughout -OVERBURDEN-	-	5	-	-	5	90				
5		U2 58	5.0 10.0	ML	460.0 5.8	Soft brown SILT (ML), no odor, wet -OVERBURDEN-	-	-	-	-	5	95				
10		U3 108	10.0 20.0													
15					447.7 18.0	Moderately weathered red-brown medium-grained SANDSTONE -BEDROCK-										
20					445.7 20.0	BOTTOM OF EXPLORATION 20.0 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	4.87

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	18.0
Rock Cored (ft)	2.0
Samples	3U

Boring No. CCR-AP-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-1R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	26 July 2016
Finish	26 July 2016
Driller	J. Gryska
H&A Rep.	C. Toscano
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: Spun
Hammer Fall (in.)		30	-	Hoist/Hammer: - PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-1, see test boring report for soils logged from 0-20 ft. -OVERBURDEN-										
5																	
10																	
15																	
						18.0	Top of weathered bedrock -BEDROCK										
20																	

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	7:15	-	-	-	5.60

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	18.0
Rock Cored (ft)	19.0
Samples	1S

Boring No. CCR-AP-1R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-1R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
	4 5 5 16	S1 24	28.0 30.0				Loose reddish-brown sandy SILT (ML) with occasional layers of highly weathered rock with distinct rock fabric (sandstone/siltstone)	-	5	10	15	10	60				
30																	
							Drill action, occasional rig chatter and soil cuttings indicated highly weathered Siltstone/Sandstone										
35																	
						37.0	BOTTOM OF EXPLORATION 37.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-1R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-2

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel
Type	Sonic	-	Steel
Inside Diameter (in.)	4.5	-	6.0
Hammer Weight (lb)	-	-	-
Hammer Fall (in.)		-	-

Drilling Equipment and Procedures
Rig Make & Model: Track Geoprobe 8140LS
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 2
Start 17 December 2015
Finish 17 December 2015
Driller B. Marshall
H&A Rep. T. Vanage
Elevation 465.2 (est.)
Datum
Location See Plan
N 969079.16
E 2771922.52

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 47	0.0 5.0	CL		Medium stiff brown lean CLAY (CL), no odor, moist, red mottling at 3 feet, organics present -FILL-	-	-	-	-	-	100				
5		U2 58	5.0 10.0	CL		Medium stiff yellow-brown lean CLAY (CL), no door, moist	-	-	-	-	-	100				
10		U3 57	10.0 15.0													
				MH	452.7 12.5	Soft to medium stiff yellow-brown elastic SILT (MH), no odor, dry -OVERBURDEN-	-	-	-	-	-	100				
15		U4 60	15.0 20.0	MH		Driller indicated collapse at 15.5 feet Soft yellow-brown elastic SILT (MH), no odor, wet	-	-	-	-	5	95				
20		U5 60	20.0 25.0													

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	18.46

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 25.5
Rock Cored (ft) -
Samples 5U

Boring No. CCR-AP-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-2
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
				MH			Similar as above, except wet										
25						439.7 25.5	BOTTOM OF EXPLORATION 25.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2

TEST BORING REPORT

Boring No. CCR-AP-2R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	28 July 2016
Finish	28 July 2016
Driller	J. Gryska
H&A Rep.	C. Toscano
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel
Type	HSA	S	Steel
Inside Diameter (in.)	4.25	1 3/8	9.0
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures

Rig Make & Model: Track CME 850 XR
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-2, see test boring report for soils logged from 0-25 ft.										
							-OVERBURDEN-										
5																	
10																	
15																	
20																	
25																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/29/15	7:30	-	-	-	28.80

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	30.0
Rock Cored (ft)	23.3
Samples	3S

Boring No. CCR-AP-2R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-2R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	1 1 1 1	S1 8	25.0 27.0	ML			Very soft yellowish-brown sandy SILT (ML), mps 1 mm, no odor, wet	-	-	-	-	25	75				
							Top of decomposed bedrock at 30.0 ft										
30	7 9 13 12	S2 24	30.0 32.0			30.0	Stiff yellowish-brown to tan sandy SILT (ML) with frequent alternating layers and seems of silt and fine sand. Trace coal and decomposed rock fragments, wet	-	-	-	-	25	75				
						32.0	-BEDROCK-										
35	50/6	S3 6	35.0 37.0				Hard yellowish-brown to gray-brown SILT with sand (ML) with frequent alternating layers and seams of sandy silt and silty fine sand, well stratified, entire sample exhibits distinct rock fabric, wet	-	-	-	-	15	85				
40																	
45																	
50						53.3	Drill action and rig chatter indicated harder rock at 53.0 ft, soil cuttings on auger flights indicated limestone bedrock										
							BOTTOM OF EXPLORATION 53.3 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-3

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	19 December 2015
Finish	20 December 2015
Driller	B. Marshall
H&A Rep.	T. Vanage
Elevation	450.0 (est.)
Datum	
Location	See Plan N 966865.12 E 2771404.27

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	-	-	Casing: Spun Hoist/Hammer: -
Hammer Fall (in.)		-	-	PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 42	0.0 3.5	CL		Medium stiff brown lean CLAY (CL), interbedded gravel, very fine sand partings, no odor, dry -FILL-	-	5	-	-	10	85				
5					444.5 5.5											
		U2 48	5.5 9.0	ML		Very soft brown SILT (ML), no odor, dry -OVERBURDEN-	-	-	-	-	-	100				
		U3 120	9.0 19.0													
10																
						Grades to very moist at 14 feet										
15						Grades to wet at 15 feet										
		U4 120	19.0 29.0													
20																

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	21.97

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	32.5
Rock Cored (ft)	2.5
Samples	5U

Boring No. CCR-AP-3

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-3
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
				CL		429.0 21.0	Medium stiff red-brown lean CLAY (CL), no odor, moist -OVERBURDEN-	-	-	-	-	-	100				
25																	
30						417.5 32.5	Highly weathered brown SANDSTONE, fine-grained, trace silt and clay present -BEDROCK-										
35						415.0 35.0	BOTTOM OF EXPLORATION 35.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-3R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	27 July 2016
Finish	28 July 2016
Driller	J. Gryska
H&A Rep.	S.Lewis
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: Spun
Hammer Fall (in.)		30	-	Hoist/Hammer: - PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-3, see test boring report for soils logged from 0-25 ft -OVERBURDEN-										
5																	
10																	
15																	
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	8:00	-	-	-	37.90

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	32.5
Rock Cored (ft)	14.5
Samples	1S

Boring No. CCR-AP-3R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-3R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30																	
						32.5	Top of decomposed bedrock at 32.5 ft -BEDROCK-										
35	12 21 18 25	S1 24	35.0 37.0				Dense tan to yellow-brown silty SAND (SM) with frequent interbedded seams layers of sandy silt and silt, well stratified, entire sample exhibits distinct rock fabric, dry	-	-	5	15	45	35				
40																	
45						47.0	BOTTOM OF EXPLORATION 47.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-4

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel
Type	HSA	S	Steel
Inside Diameter (in.)	4.25	1 3/8	6.0
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures
Rig Make & Model: Track CME 850 XR
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 2
Start 14 March 2016
Finish 14 March 2016
Driller J. Gryska
H&A Rep. J. Yonts
Elevation 472.9 (est.)
Datum
Location See Plan
N 966741.47
E 2772827.01

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML		Hand clear to 5.0 ft bgs, mostly brown SILT (ML), no odor, moist -OVERBURDEN-										
5	WOH 1 WOH 1	S1 22	5.0 7.0	ML		Very soft brown SILT (ML), no structure, moist, trace clay, trace woody debris Wet at 6.0 ft	-	-	-	-	5	95				
	1 1 2 3	S2 16	8.5 10.5	ML	464.4 8.5	Soft brown SILT (ML), no odor, dry, faint laminae from light brown to brown (1-2 mm thick)	-	-	-	-	10	90				
10																
	2 5 4 5	S3 17	13.5 15.5	ML		Similar as above										
15						Water between 15.6 ft to 18.5 ft										
	2 2 2 3	S4 20	18.5 20.5	ML		Similar as above except no structure and wet										
20																

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	17:05	-	-	-	31.69

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 28.5
Rock Cored (ft) 7.0
Samples 7S

Boring No. CCR-AP-4

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-4
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
	2 3 4 5	S5 24	23.5 25.5	CL	449.4 23.5	Medium stiff dark red brown red-brown CLAY (CL), no structure										
25																
	2 2 3 5	S6 24	28.5 30.5	SC	444.4 28.5	Brown red-brown black clayey SAND (SC), no odor, moist, mostly medium to fine poorly graded sands, weathered sandstone -BEDROCK-										
30																
	3 6 11 14	S7 24	33.5 35.5	SC		Red-brown orange black yellow mottled clayey SAND (SC), weathered sandstone										
35					437.4 35.5	BOTTOM OF EXPLORATION 35.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-4

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-4R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	27 July 2016
Finish	27 July 2016
Driller	J. Gryska
H&A Rep.	C. Toscano
Elevation	
Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: Spun
Hammer Fall (in.)		30	-	Hoist/Hammer: - PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-4, see test boring report for soils logged from 0-35.5 ft. -OVERBURDEN-										
5																	
10																	
15																	
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	12:30	-	-	-	31.60

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	28.5
Rock Cored (ft)	19.5
Samples	1S

Boring No. CCR-AP-4R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-4R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
						28.0	-BEDROCK-										
30																	
35						35.5	Medium dense tan to yellow-brown silty SAND (SM) with occasional layers of completely weathered bedrock exhibiting distinct rock fabric	-	-	10	15	40	35				
	2 12 18 22	S1 24	35.5 37.5	SM													
						38.0	Drill action, occasional rig chatter and soil cuttings indicated completely weathered bedrock at 38.0 ft.										
40																	
45																	
						48.0	BOTTOM OF EXPLORATION 48.0 ft										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-4R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-5

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 2
Start	13 March 2016
Finish	14 March 2016
Driller	J. Gryska
H&A Rep.	S. Lewis
Elevation	451.0 (est.)
Datum	
Location	See Plan N 968166.03 E 3771019.7

	Casing	Sampler	Barrel
Type	HSA	S	Steel
Inside Diameter (in.)	4.25	1 3/8	6.0
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures

Rig Make & Model: Track CME 850 XR
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand auger to 0.0 ft to 5.0 ft, brown SILT (ML), dry -FILL-										
5	4 2 5 7	S1 18	5.0 7.0	ML			Medium stiff grayish brown SILT (ML), no odor, moist	-	5	-	-	5	90				
	WOH 2 3 2	S2 9	8.0 10.0	ML			Medium stiff grayish brown SILT (ML), no odor, moist	-	-	-	-	5	95				
10																	
	4 7 6 12	S3 15	13.0 15.0	ML			Stiff grayish brown SILT (ML), no odor, dry, mottled with red color	-	-	-	-	10	90				
15																	
	2 5 10 18	S4 12	18.0 20.0	ML			Stiff grayish brown sandy SILT (ML), no odor, dry, trace clay, mottled with red color	-	10	-	-	30	60				
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	09:12	-	-	-	37.46

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	45.0
Rock Cored (ft)	-
Samples	9S

Boring No. CCR-AP-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-5
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	4 11 15 18	S5 18	23.0 25.0	ML		Very stiff brown SILT with sand (ML), no odor, dry, trace clay, mottled with red color	-	5	-	-	15	80				
					423.0											
30	1 2 1 3	S6 24	28.0 30.0	ML	28.0	Soft brown and gray SILT (ML), no odor, wet -OVERBURDEN-	-	-	-	-	5	95				
35	1 3 3 4	S7 24	33.0 35.0	ML		Medium stiff gray SILT (ML), no odor, wet	-	-	-	-	-	100				
					413.0											
40	WOH WOH 3 4	S8 24	38.0 40.0	CL	38.0	Soft brown lean CLAY (CL), no odor, wet	-	-	-	-	-	100				
					408.0											
	WOH WOH 2 3	S9 24	43.0 45.0	ML	43.0	Very soft brown SILT (ML), no odor, wet, trace clay	-	-	-	-	-	100				
45					406.0 45.0	BOTTOM OF EXPLORATION 45.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-5

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-6

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: Spun
Hammer Fall (in.)		30	-	Hoist/Hammer: - PID Make & Model: -

File No.	42796-001
Sheet No.	1 of 2
Start	10 March 2016
Finish	11 March 2016
Driller	J. Gryska
H&A Rep.	S. Lewis
Elevation	458.9 (est.)
Datum	
Location	See Plan N 969932.76 E 2771626.75

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							-FILL-										
						454.9											
	1 2 2 4	S1 24	4.0 6.0	CL		4.0	Soft brown lean CLAY (CL), no odor, moist -OVERBURDEN-	-	-	-	-	10	90				
5																	
						449.9											
	8 15 30 50/2	S2 24	9.0 11.0	SM		9.0	Dense grayish brown silty SAND (SM), no odor, moist	-	-	-	10	60	30				
10																	
						444.9											
	20 50/6	S3 6	14.0 16.0			14.0	Tan mottled with red brown and dark gray weathered SANDSTONE, moist, thinly laminated -BEDROCK-										
15																	
	50/6	S4 2	19.0 21.0				Brownish tan weathered SANDSTONE, moist, thinly laminated										
20																	

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	15:33	-	-	-	12.15

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	14.0
Rock Cored (ft)	25.0
Samples	8S

Boring No. CCR-AP-6

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-6
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	6 9 15 16	S5 24	24.0 26.0				Brownish tan weathered SANDSTONE, moist, thinly laminated										
						429.9 29.0	Dark gray weathered SHALE, wet, fissile										
30	50/5	S6 4	29.0 31.0														
35	50/6	S7 7	34.0 36.0				Dark gray weathered SHALE, organic matter at 34.5 ft (1.0 in. thick)										
						419.9 39.0	Dark gray weathered SHALE										
	50/1	S8 1	39.0 39.0				BOTTOM OF EXPLORATION 39.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-6

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-7

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel
Type	Sonic	-	Steel
Inside Diameter (in.)	4.5	-	6.0
Hammer Weight (lb)	-	-	-
Hammer Fall (in.)		-	-

Drilling Equipment and Procedures
Rig Make & Model: Track Geoprobe 8140LS
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: -
PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 2
Start 13 March 2016
Finish 14 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation 486.0 (est.)
Datum
Location See Plan
N 970758.7
E 2773501.63

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 60	0.0 5.0	ML		Brown SILT with trace clay (ML), no structure, no odor, moist, root material	-	-	-	-	5	95				
						-OVERBURDEN-										
				ML		Brown SILT (ML), no odor, moist, no wood material	-	-	-	-	10	90				
5		U2 60	5.0 10.0	ML		Similar as above										
				ML		Brown SILT with trace clay (ML), no structure, no odor, moist	-	-	-	-	10	90				
10		U3 96	10.0 18.0	ML		Similar as above										
15					471.0 15.0	Orange red red-brown weathered SANDSTONE, moist, mostly medium to fine sands										
						-BEDROCK-										
		U4 24	18.0 20.0			Similar as above except more competent, bedrock										
20		U5 120	20.0 30.0			Similar as above										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	14:18	-	-	-	31.95

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 15.0
Rock Cored (ft) 20.0
Samples 6U

Boring No. CCR-AP-7

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-7
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						464.0											
						22.0	Brown orange gray SHALE, moist, fissile, trace fine sand										
25																	
						460.0											
						26.0	Gray SILTSTONE, soft, wet										
						458.0											
						28.0	Red brown orange brown SANDSTONE, moist, moistly fine sands										
30		U6 60	30.0 35.0				Brown tan black gray orange SANDSTONE, moist to wet, fine to medium sands										
						451.0											
35						35.0	BOTTOM OF EXPLORATION 35.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-7R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: Spun
Hammer Fall (in.)		30	-	Hoist/Hammer: - PID Make & Model:

File No.	42796-001
Sheet No.	1 of 3
Start	30 July 2016
Finish	30 July 2016
Driller	J. Gryska
H&A Rep.	C. Toscano
Elevation	
Datum	
Location	See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-7, see test boring report for soils logged from 0-35.0 ft. -OVERBURDEN-										
5																	
10																	
15						15.0	Drill action, rig chatter and soil cuttings indicated highly to slightly weathered Sandstone/Shale -BEDROCK-										
20																	

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/30/16	-	-	-	-	28.30

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	15.0
Rock Cored (ft)	38.5
Samples	-

Boring No. CCR-AP-7R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-7R
File No. 42796-001
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30																	
35						35.0											
40																	
45																	
50																	

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-7R
File No. 42796-001
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						53.5	BOTTOM OF EXPLORATION 53.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7R

H&A-TEST BORING-08 REV HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

TEST BORING REPORT

Boring No. CCR-AP-10

Project	Nature and Extent, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	ATC

	Casing	Sampler	Barrel
Type	HSA	S	
Inside Diameter (in.)	4.25	1 3/8	
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)	-	30	-

Drilling Equipment and Procedures

Rig Make & Model: Diedrich D-50 Turbo
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: -

File No. 129420-018
Sheet No. 1 of 2
Start January 25, 2019
Finish January 25, 2019
Driller J. Mitchner
H&A Rep. J. Yonts
Elevation
Datum
Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																
5	4 5 6 6	S1 8	4.0 6.0	ML		Stiff, brown and yellow-brown SILT (ML), mps < 0.075 mm, no structure, no odor, dry						100				
					9.0											
10	3 3 5 5	S2 11	9.0 11.0	ML		Medium stiff, yellow-brown SILT (ML), mps < 0.075 mm, stratified, no odor, dry						100				
15	4 5 6 7	S3 16	14.0 16.0	ML		Similar to above, except moist						100				
20	3 7 9 10	S4 19	19.0 21.0	ML		Similar to above										
25	3 3	S5 20	24.0	ML	24.7	Similar to above										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft) 46.3
Rock Cored (ft) -
Samples 11S

Boring No. CCR-AP-10

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-10
File No. 129420-018
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	6 6		26.0	CL		Stiff, red-brown CLAY (CL), mps < 0.075 mm, no structure, no odor, moist						100				
30	2 3 4 5	S6 24	29.0 31.0	CL-ML		Stiff, red-brown silty CLAY (CL), mps < 0.075 mm, no structure, no odor, moist					5	95				
					34.0	Very soft, completely weathered, brown red-brown, fine- to medium-grained SANDSTONE. Bedding thin and horizontal, close, rough, decomposed, open, wet.										
35	2 3 5 10	S7 24	34.0 36.0													
						Note: Rig chatter from 38.5-39 ft.										
40	16 28 38 50	S8 24	39.0 41.0		39.4	Hard, completely weathered, tan and yellow-brown fine- to medium-grained SANDSTONE. Bedding thin and horizontal, close, rough, decomposed, open, wet.										
	11 22 38 50/5"	S9 24	41.0 43.0			Mica-rich parting at 42.2 ft.										
	7 6 8 9	S10 24	43.0 45.0		44.1	Soft, completely weathered, black fine-grained COAL. Decomposed, open, wet.										
45	5 26 50/3"	S11 15	45.0 47.0		44.3	Soft, completely weathered, maroon and gray, aphanitic, SHALE. Bedding thin and horizontal, close, smooth, discolored, open, wet. Hard, completely weathered, tan and yellow-brown fine- to fine-grained SANDSTONE. Bedding thin and horizontal, closer, rough, discolored, open, wet. Hard, highly weathered, tan and yellow-brown fine- to fine-grained SANDSTONE. Bedding thin and horizontal, closer, rough, discolored, open, wet. Hard, moderately weathered, blue, fine-grained SANDSTONE. Bedding thin and horizontal, closer, rough, decomposed, open, wet. BOTTOM OF EXPLORATION 46.3 FT										
						Note: Backfill borehole with hydrated bentonite to 43.5 ft										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-2I

Project	Nature and Extent, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	ATC

File No. 129420-018
Sheet No. 1 of 3
Start January 13, 2019
Finish January 14, 2019
Driller J. Mitchner
H&A Rep. J. Yonts
Elevation
Datum
Location See Plan

	Casing	Sampler	Barrel
Type	HSA	S	Steel
Inside Diameter (in.)	4.25	1 3/8	1 7/8
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)	-	30	-

Drilling Equipment and Procedures
Rig Make & Model: Diedrich D-50 Turbo
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Refer to Soil Boring CCR-AP-2 for lithology from 0-35 ft.										
5																	
10																	
15																	
20																	
25																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 74.5
Rock Cored (ft) 19.9
Samples 8S, 5C

Boring No. CCR-AP-2I

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-2I
File No. 129420-018
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																
30																
35	3 11 50/4"	S1 20	34.0 36.0	ML SM	34.7	Hard, red-yellow to gray SILT with sand (ML) interbedded with red-yellow silty SAND (SM), mps 1.0 mm, stratified, no odor, moist Hard, gray and red-yellow silty fine SAND (SM) interbedded with sandy SILT (ML), mps 2.0 mm, moist					25	75				
40	38 42 50/1"	S2 24	39.0 41.0		39.0	Soft, tan and brown, highly weathered fine-grained interbedded SHALE and SILTSTONE, extremely thin, smooth, dry/moist, trace seams of fine sandstone										
45	28 50/3"	S3 9	44.0 46.0		44.0	Soft, moderately weathered, gray, aphanitic SHALE. Bedding extremely thin and horizontal, extremely close, smooth, fresh, tight, moist										
50	38 26 10 6	S4 24	49.0 51.0		49.0 49.8	Soft, moderately weathered, dark gray, aphanitic SHALE. Bedding extremely thin and horizontal, extremely close, smooth, discolored, tight, abundant organic-rich partings, wet Very soft, highly weathered, gray black and brown fine-grained SILTSTONE. Bedding extremely thin and horizontal, extremely close, smooth, discolored, tight, abundant organic-rich partings, wet										
55	WOH WOH 1 2	S5 9	54.0 56.0	CL	54.0 55.0	Very soft, residual, red-brown CLAY (CL), no structure, no odor, wet, completely weathered SHALE and SILTSTONE Very soft, highly weathered, brown and gray aphanitic SHALE and fine-grained SILTSTONE, wet, residual rock fabric Sample rods fell from 56-ft to 59-ft after pulling S5 sample. Possible void or very soft material					10	90				
60	3 50/2"	S6 0	59.0 61.0			Sample rods pulled, full of wet red-brown CLAY, similar to S5 Note: Drill action and rig chatter indicate hard rock at 59.5 ft.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2I

TEST BORING REPORT

Boring No. CCR-AP-2I
File No. 129420-018
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
							Note: Rig chatter 59.5-63.0 ft.										
65	50/2"	S7 2	64.0 66.0			64.0	Soft. slightly weathered, dark gray, aphanitic SHALE and gray, fine-grained SILTSTONE. Bedding extremely thin and horizontal, extremely close, rough, fresh, open, moist										
70	50/3"	S8 3	69.0 71.0			69.0	Soft, slightly weathered, gray, fine-grained SANDSTONE and gray, fine-grained SILTSTONE. Bedding extremely thin to very thin and horizontal, extremely close, rough, fresh, tight, moist										
75		C1 10	74.5 75.4			74.5	Moderately hard to hard, fresh, cross-bedded, olive-gray, fine-grained SANDSTONE. Bedding extremely thin to very thin, extremely close, rough, stepped, fresh, tight to open										
		C2 60	75.4 80.4														
80		C3 60	80.4 85.4														
85		C4 46	85.4 90.4			85.4	Moderately hard to hard, fresh, cross-bedded, olive-gray, fine-grained SILTSTONE. Bedding extremely thin to very thin, extremely close, rough, stepped, fresh, tight to open										
90		C5 37	90.4 94.4			90.4	Moderately hard to hard, fresh, olive-gray, fine-grained SANDSTONE. Bedding extremely thin to very thin, extremely close, rough, stepped, discolored and CLAY filled, open. Cross-bedding ends at 91.0 ft										
						94.4	BOTTOM OF EXPLORATION 94.4 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2I

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-3I

Project	Nature and Extent, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	ATC

File No. 129420-018
Sheet No. 1 of 3
Start January 22, 2019
Finish January 24, 2019
Driller J. Mitchner
H&A Rep. J. Yonts
Elevation
Datum
Location See Plan

	Casing	Sampler	Barrel
Type	HSA	S	Steel
Inside Diameter (in.)	4.25	1 3/8	1 7/8
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)	-	30	-

Drilling Equipment and Procedures
Rig Make & Model: Diedrich D-50 Turbo
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Refer to Soil Boring CCR-AP-3 for lithology from 0-44 ft										
5																	
10																	
15																	
20																	
25																	

Water Level Data					
Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 44.6
Rock Cored (ft) 33.7
Samples 1S, 8C

Boring No. CCR-AP-3I

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-3I
File No. 129420-018
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30																	
35																	
40																	
45	2 50/5"	S1 11	44.0 44.6			44.0 44.3 44.6	Very soft, completely weathered, tan and brown, fine-grained SANDSTONE interbedded brown, fine-grained SILTSTONE. Bedding extremely thin and horizontal, extremely close, rough, fresh, open, moist Soft, highly weathered, red-brown and dark brown, fine-grained SILTSTONE and gray fine-grained SHALE. Bedding extremely thin to very thin and horizontal, extremely close, smooth, fresh, tight, wet Note: Rig chatter at 44.5 ft bgs.										
		C1 20	44.6 48.5														
		C2 6.5	48.5 50.1				Hard, slightly weathered, gray and dark gray, fine-grained LIMESTONE with numerous fossils (crinoid stems, brachiopods) with interbedded frequent dark gray shaley LIMESTONE. Bedding extremely thin to very thin and horizontal, extremely close, smooth to rough, fresh to discolored, tight to open, wet. Low angle black stylolite at 48.4 ft										
50		C3 12	50.1 55.1			50.4	Similar to above, except slightly darker gray Interbedded hard, slightly weathered, gray and dark gray, fine-grained to medium-grained, fossiliferous LIMESTONE and soft, gray, aphanitic SHALE. Bedding extremely thin to very thin and horizontal, extremely close, smooth to rough, fresh to discolored, tight to open, wet										
55		C4 58	55.1 60.1			54.4	Soft, slightly weathered, olive, fine-grained SILTSTONE. Bedding extremely thin and horizontal, extremely close, rough, fresh, open Residual soil composed of very soft, olive fine-grained SAND and CLAY Interbedded, soft, olive-green to gray, fine-grained SHALE and SILTSTONE with gray, fine-grained LIMESTONE with frequent stylolites (dark gray) and occasional fossils with occasional gray, fine-grained SANDSTONE. Bedding extremely thin to very thin and horizontal, extremely close, smooth to rough, fresh to discolored, open to tight, wet										
60		C5 60	60.1 65.1				Similar to above. Transition to moistly SHALE, occasional limestone.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3I

TEST BORING REPORT

Boring No. CCR-AP-3I
File No. 129420-018
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						62.5	Moderately hard to hard, fresh, cross-bedded, olive-gray, fine-grained SILTSTONE and SANDSTONE. Bedding extremely thin to very thin, extremely close, rough, stepped, fresh, tight to open										
65		C6 56	65.1 70.0				Vertical/nearly vertical fracture from 69.3 ft to 69.7 ft bgs, 0.2 mm thick with voids filled with quartz crystals										
70		C7 12	70.0 75.0			70.0	Moderately hard to hard, fresh, cross-bedded, olive-gray, fine-grained SILTSTONE and SANDSTONE. Bedding extremely thin to very thin, high angle, extremely close, rough, stepped, fresh, open. Fracture frequency increases with depth and no crystallization along fractures.										
75		C8 39	75.0 77.7			75.0	Similar to above, except no fractures and horizontal bedding.										
						78.3	BOTTOM OF EXPLORATION 78.3 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3I

TEST BORING REPORT

Boring No. CCR-AP-8

Project	Nature and Extent, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	ATC

	Casing	Sampler	Barrel
Type	HSA	S	
Inside Diameter (in.)	4.25	1 3/8	
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)	-	30	-

Drilling Equipment and Procedures

Rig Make & Model: Diedrich D-50 Turbo
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: -

File No. 129420-018
Sheet No. 1 of 1
Start January 26, 2019
Finish January 26, 2019
Driller J. Mitchner
H&A Rep. J. Yonts
Elevation
Datum
Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						Grass and topsoil										
5	3 3 7 5	S1	3.5 5.5	CL	3.5	Interbedded stiff red-brown CLAY (CL), and red-gray clayey SAND (SC), mps 1.5 mm, no odor, wet Note: 3 in. piece of black wood in the shoe of S1, spoon indicated hitting at 4.9 ft				5	5 60	90 40				
	4 4 4 5	S2 16	8.5 10.5	CL	8.5	Medium stiff, gray and red-gray CLAY (CL), stratified, no odor, wet Note: Wood from 8.8 to 8.9 ft.					10	90				
10				CL	9.8	Medium stiff, red-gray CLAY (CL), stratified, no odor, wet					5	95				
15	16 28 50/5"	S3	13.5 15.5		13.5 14.5 16.5	Soft, highly weathered, gray and brown, aphanitic SHALE. Bedding extremely thin and horizontal, extremely close, smooth, fresh, tight, wet Soft, slightly weathered, gray, aphanitic SHALE. Bedding extremely thin and horizontal, extremely close, smooth, fresh, tight, wet Spoon refusal at 16.5 ft BOTTOM OF EXPLORATION 16.5 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 16.5
Rock Cored (ft) -
Samples 3S

Boring No. CCR-AP-8

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

Boring No. CCR-AP-9

Project	Nature and Extent, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	ATC

File No. 129420-018
Sheet No. 1 of 2
Start January 26, 2019
Finish January 26, 2019
Driller J. Mitchner
H&A Rep. J. Yonts
Elevation
Datum
Location See Plan

	Casing	Sampler	Barrel
Type	HSA	S	
Inside Diameter (in.)	4.25	1 3/8	
Hammer Weight (lb)	-	140	-
Hammer Fall (in.)	-	30	-

Drilling Equipment and Procedures

Rig Make & Model: Diedrich D-50 Turbo
Bit Type: Cutting Head
Drill Mud: None
Casing: Spun
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						Gravel roadway										
	6 8 9 9	S1 20	3.5 5.5	ML CL	3.5	Medium stiff, brown clayey SILT (ML), mps 1 mm, stratified, no odor, moist				5	5	90				
				ML	4.1	Stiff, dark brown and gray CLAY (CL), mps < 0.075 mm, stratified, no odor, moist						100				
5				CL	4.8	Medium stiff, brown clayey SILT (ML), mps 1 mm, stratified, no odor, moist										
					5.1	Stiff, dark brown and gray CLAY (CL), mps < 0.075 mm, stratified, no odor, moist										
	1 1 1 1	S2 24	8.5 10.5	CL	8.5	Very soft, black CLAY (CL), no structure, strong sulfur-like odor, wet, possibly coal run-off						100				
10																
	1 2 1 3	S3 24	13.5 15.5	CL CL	13.9	Similar to above Soft, yellow-brown to brown, fat CLAY (CL), mps < 0.075 mm, no structure, no odor, wet						100				
15																
	2 4 2 2	S4 18	18.5 20.5	ML SM	18.5	Soft, yellow-brown SILT (ML), mps 1 mm, stratified, no odor, wet					10	90				
					19.2	Medium stiff, red-brown silty SAND (SM), mps 15 mm, no structure, no odor, wet		5	10	30	25	30				
20				ML	20.0	Soft, gray sandy SILT (ML), mps < 2.0 mm, stratified, no odor, wet					25	75				
	WOH WOH 1	S5 24	23.5 25.5	ML		Similar to above except brown wood noted at 24.1 ft, occasional sandy SILT (ML) layers <1 in. thick					10	90				
25																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 35.5
Rock Cored (ft) -
Samples 7S

Boring No. CCR-AP-9

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-09 REV 132892_HA-LIB09.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\129420 VECTREN\PROJECT DATA\FIELD DATA\04_GINT\AB BROWN\2019_0328_HAI_N&E ABBROWN_D1.GPJ Jul 16, 19

TEST BORING REPORT

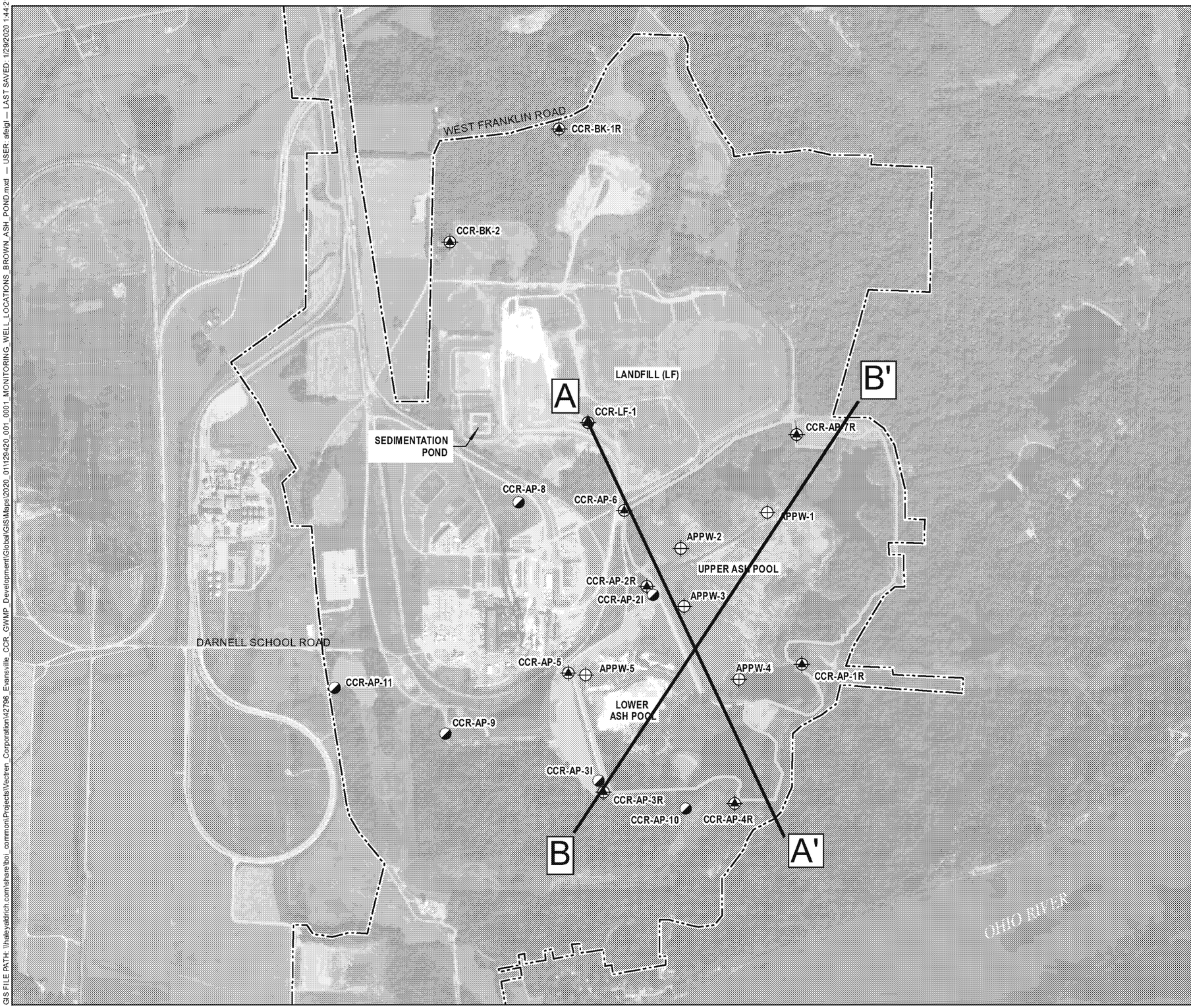
Boring No. CCR-AP-9
File No. 129420-018
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	1																
	WOH 2 3 2	S6 24	28.5 30.5	ML			Similar to S5					5	95				
30																	
	WOH WOH WOH WOH	S7 24	33.5 35.5	ML/ CL		33.5	Soft, gray sandy silty CLAY (ML/CL), mps < 2.0 mm, stratified, no odor, wet					10	20				
35						35.5	BOTTOM OF EXPLORATION 35.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-9

GIS FILE PATH: \\haleyaldrich.com\share\bos_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2020_011\29420_001_0001_MONITORING_WELL_LOCATIONS_BROWN_ASH_POND.mxd — USER: dfeirgl — LAST SAVED: 1/29/2020 1:44:21 PM



LEGEND

- CCR MONITORING WELL
- NATURE AND EXTENT MONITORING WELL
- CCR PIEZOMETER WELL
- ASH POND UNIT BOUNDARY

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.

N

0 1,100 2,200
SCALE IN FEET

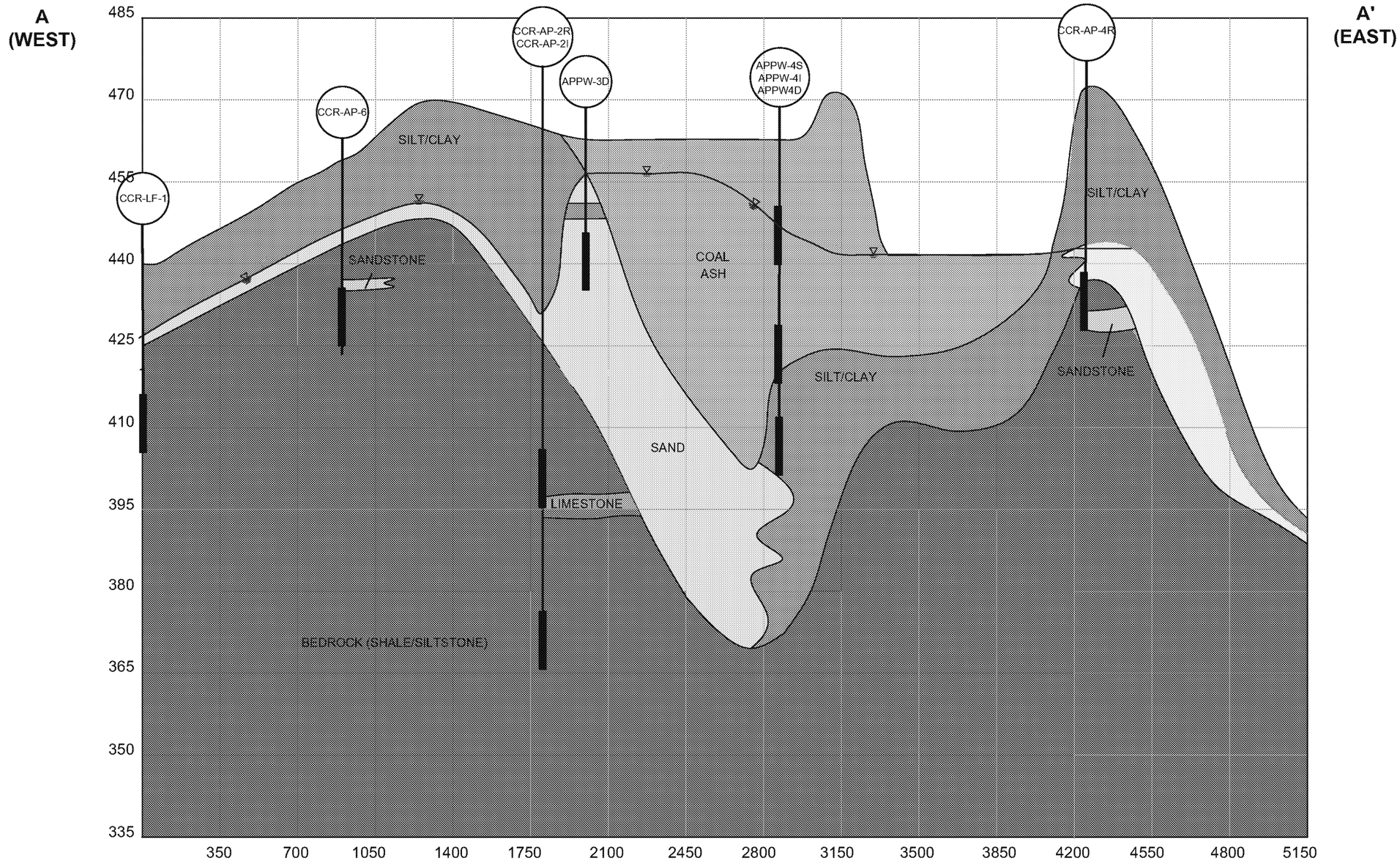
HALEY ALDRICH

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

CROSS-SECTION TRANSECT
BASE MAP

OCTOBER 2020

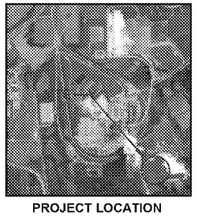
FIGURE 1



LEGEND

- COAL ASH
- LIMESTONE
- POORLY GRADED AND WELL GRADED SANDS
- SILT/CLAY
- SHALE
- SANDSTONE
- SHALE/SANDSTONE
- GROUNDWATER LEVEL
- INTERPRETED SOIL/BEDROCK LEVELS
- BORING ID/LOCATION WITH GROUND SURFACE ELEVATION
- SCREEN LOCATION

HORIZ. 0 500 1,000
VERT. 0 20 40
SCALE IN FEET



PROJECT LOCATION
TOPO SOURCE: IMAGE DATED 2019 TAKEN ELECTRONICALLY FROM BING MAPS

PREPARED FOR:

SIGECO
A.B. BROWN GENERATION STATION
ASH POND

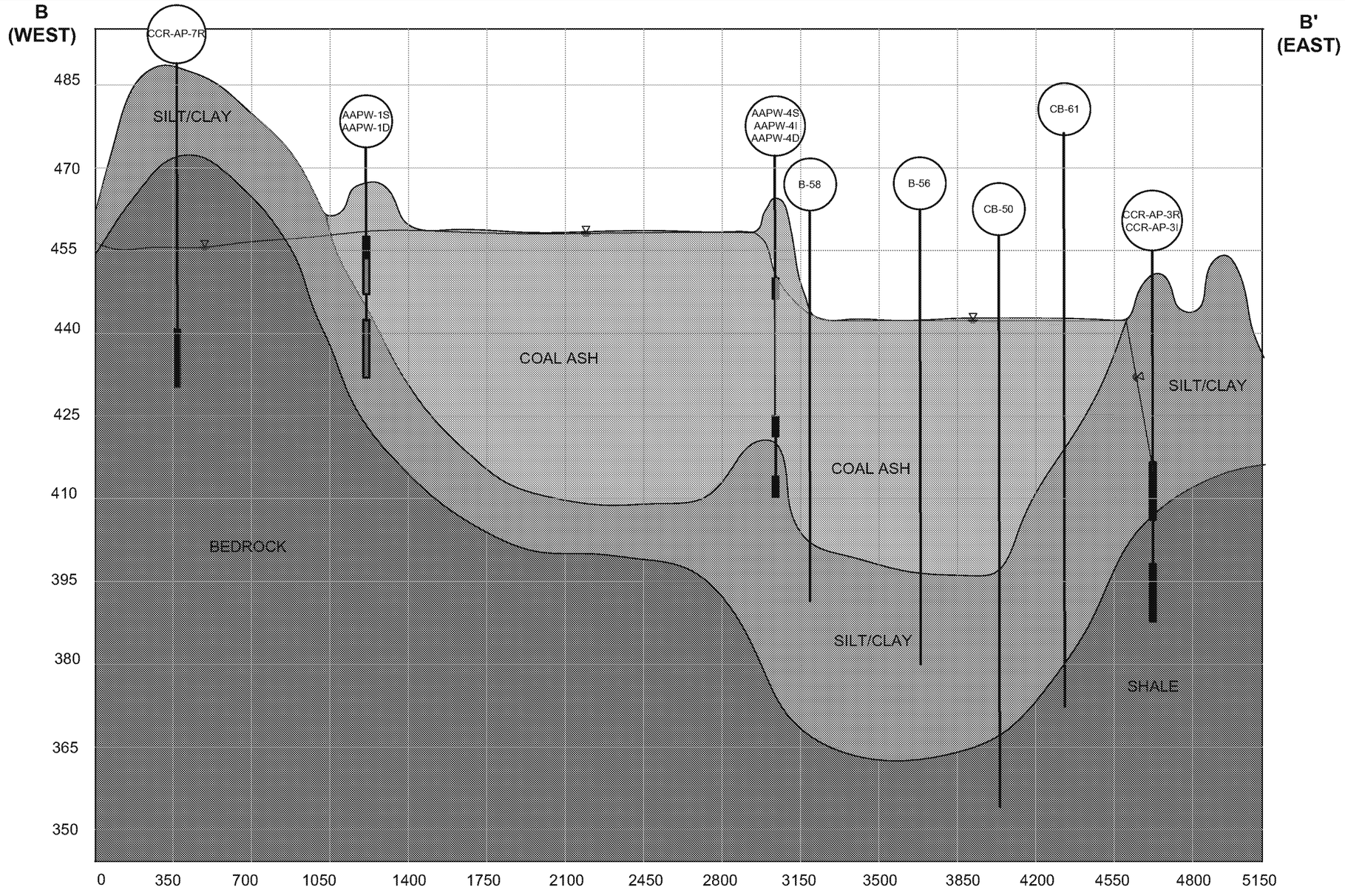
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

FIGURE 1A

EXISTING CONDITIONS
CROSS SECTION A-A'
ASH POND

PROJECT: 129420	BY: OS/KC	REVISIONS:
DATE: OCT 2020	CHECKED: SL	

HALEY & ALDRICH



LEGEND

- COAL ASH
- LIMESTONE
- WELL GRADED AND POORLY GRADED SANDS
- SILT/CLAY
- SHALE
- SANDSTONE
- SHALE/SANDSTONE

- GROUNDWATER LEVEL
- INTERPRETED SOIL/BEDROCK LEVELS
- BORING ID/LOCATION WITH GROUND SURFACE ELEVATION
- SCREEN LOCATION

HORIZ. 0 500 1,000
VERT. 0 20 40
SCALE IN FEET

PROJECT LOCATION
TOPO SOURCE: IMAGE DATED 2019 TAKEN ELECTRONICALLY FROM BING MAPS

PREPARED FOR:

SIGECO
A.B. BROWN GENERATION STATION
ASH POND

A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

FIGURE 1B

EXISTING CONDITIONS
CROSS SECTION B-B'
ASH POND

PROJECT: 129420	BY: OS/KC	REVISIONS:
DATE: OCT 2020	CHECKED: SL	

HALEY & ALDRICH

Appendix H
Groundwater Flow Direction

DRAFT

LEGEND

MONITORING WELL

GROUNDWATER ELEVATION CONTOUR, IN FEET

TOPOGRAPHIC DIVIDE

NOTES

1. LOCATIONS DERIVED FROM THREE I DESIGN DATA.
2. WATER LEVELS MEASURED 14-16 NOVEMBER 2016
3. AERIAL IMAGERY SOURCE: ESRI

N

0 500 1,000 1,500 2,000

SCALE IN FEET

HALEY ALDRICH

VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MOUNT VERNON, IN 47620

GROUNDWATER ELEVATION CONTOURS - NOVEMBER 2016

JANUARY 2018

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\bo_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2017_12\42796_000_002_AB_BROWN_GW_MONITORING_LOCS_SURV.mxd — USER: ajcope — LAST SAVED: 1/15/2018 12:46:01 PM

LEGEND

MONITORING WELL

GROUNDWATER ELEVATION CONTOUR, IN FEET

TOPOGRAPHIC DIVIDE

NOTES

1. LOCATIONS DERIVED FROM THREE I DESIGN DATA.
2. WATER LEVELS MEASURED JUNE 2017
3. AERIAL IMAGERY SOURCE: ESRI

N

0 500 1,000 1,500 2,000

SCALE IN FEET

HALEY ALDRICH

VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MOUNT VERNON, IN 47620

GROUNDWATER ELEVATION CONTOURS - JUNE 2017

JANUARY 2018

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\bo_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2017_12\42796_000_002_AB_BROWN_GW_MONITORING_LOCS_SURV.mxd — USER: ajcope — LAST SAVED: 1/15/2018 2:54:14 PM

Appendix I
Groundwater Monitoring Analytical Results

DRAFT

TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Upgradient								
Location Name	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R	CCR-BK-1R
Sample Name	CCR-BK-1-20160811	CCR-BK-1-20161027	CCR-BK-1R-20161107	CCR-BK-1R-20161206	CCR-BK-1R-20170207	CCR-BK-1R-20170407	CCR-BK-1R-20170606	CCR-BK-1R-20170928	CCR-BK-1R-20171116
Sample Date	08/11/2016	10/27/2016	11/07/2016	12/06/2016	02/07/2017	04/07/2017	06/06/2017	09/28/2017	11/16/2017
Lab Sample ID	180-57528-14	180-60271-6	180-60609-5	180-61491-18	180-63324-18	180-65040-1	180-67229-16	180-70809-15	180-72643-21
Water Level (ft amsl)	463.50	422.65	423.39	422.39	421.39	425.39	425.39	425.39	
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**20.68**	**15.88**	**20.42**	**11.36**	**14.52**	**14.94**	**17.06**	**24.01**	**10.95**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**0.76**	-
Dissolved Oxygen, Field (mg/L)	**5.15**	**5.85**	**5.89**	**7.03**	**5.98**	**5.43**	**6.28**	**6**	**8.82**
Conductivity, Field (mS/cm)	**0.3475**	**0.38255**	**0.36566**	**0.32748**	**0.3703**	**0.31348**	**0.35539**	**0.35718**	**0.40797**
ORP, Field (mv)	**222**	**223.99**	**116.48**	**52.8**	**131.91**	**98.13**	**266.28**	**147.09**	**47.02**
Turbidity, Field (NTU)	**17.39**	**19.19**	**10.68**	**97.13**	**6.47**	**17.2**	**24.08**	-	**131.33**
pH, Field (su)	**6.8**	**6.95**	**7.02**	**7.14**	**6.87**	**7.22**	**6.95**	**6.88**	**7.13**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	0.014 U	0.02 U	0.023 U	0.02 U	0.08 U	**0.019 J**	**0.026 J**	**0.015 J+**	**0.041 J**
Calcium, Total	**36**	**41**	**38**	**36**	**34**	**35**	**34**	**35**	**39**
Chloride (mg/L)	R	**2.4**	**1.5**	**2.3**	**2.3**	**2.7**	**2.1**	**2.2**	**2.6**
Fluoride (mg/L)	R	**0.35**	**0.32**	**0.35**	**0.3**	**0.38**	**0.3**	**0.35 J+**	**0.3**
Sulfate (mg/L)	R	**26**	**21**	**26**	**27**	**28**	**25**	**25**	**26 J-**
pH (lab) (su)	**7.4 J**	**7.5 J**	**7 J**	**6.9 J**	**7.2 J**	**7.2 J**	**7.1 J**	**7.1 J**	**7.8 J**
Total Dissolved Solids (TDS) (mg/L)	**220**	**210**	**220**	**200**	**230**	**250**	**270**	**210**	**210**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	**0.000056 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.00045 J**
Arsenic, Total	**0.0011**	**0.00021 J**	0.001 U	**0.00031 J**	**0.00094 J**	**0.00095 J**	**0.00047 J**	**0.0025 J+**	**0.0015 J+**
Barium, Total	**0.048**	**0.035**	**0.037 J-**	**0.031 J-**	**0.038**	**0.04**	**0.038**	**0.032 J-**	**0.082 J-**
Beryllium, Total	**0.00012 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	**0.0025**	**0.00046 J**	**0.00087 J**	**0.00071 J**	**0.003**	**0.0026**	**0.0019 J**	R	**0.0027 J+**
Cobalt, Total	**0.0028**	**0.00076**	**0.00051**	0.0005 U	**0.0011**	**0.001**	**0.00062**	R	**0.0022**
Lead, Total	**0.00082 J**	**0.00024 J**	**0.000079 J**	**0.000096 J**	**0.00099 J**	**0.00092 J**	**0.00052 J**	0.001 U	**0.0008 J**
Lithium, Total	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**0.0086 J**
Molybdenum, Total	**0.0025 J**	0.005 U	0.005 U	**0.0015 J**	**0.0017 J**	**0.0025 J**	**0.0015 J**	R	**0.0034 J**
Selenium, Total	**0.00067 J**	0.005 U	**0.00037 J**	**0.00051 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.000038 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	R	**0.35**	**0.32**	**0.35**	**0.3**	**0.38**	**0.3**	**0.35 J+**	**0.3**
Radiological (pCi/L)									
Radium-226	0.0484 U ± 0.104	0.0760 U ± 0.210	R	0.303 U ± 0.296	**0.142 ± 0.0913**	**0.280 ± 0.0981**	**0.177 J ± 0.0924**	R	**0.165 ± 0.0740**
Radium-228	0.0724 UJ ± 0.514	0.191 U ± 0.217	-0.0566 U ± 0.222	0.179 U ± 0.238	-0.0934 U ± 0.194	0.177 U ± 0.257	**0.337 ± 0.257**	0.171 U ± 0.226	0.388 U ± 0.268
Radium-226 & 228	0.121 UJ ± 0.525	0.267 U ± 0.302	R	**0.482 ± 0.380**	0.142 UJ ± 0.214	**0.457 J ± 0.275**	**0.515 J ± 0.273**	**0.426 J+ ± 0.243**	**0.553 J+ ± 0.278**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals
CFR: Code of Federal Regulations
ft amsl: feet above mean sea level
MCL: Maximum Contaminant Level
mg/L: milligram per liter
mS/cm: milliSiemen per centimeter
mv: millivolt
NA: Not Applicable
NTU: Nephelometric Turbidity Units
pCi/L: picoCurie per liter
su: standard units
USEPA: United States Environmental Protection Agency

QUALIFIERS:

J: value is estimated
J+: value is estimated with a potentially high bias
J-: value is estimated with a potentially low bias
R: value is rejected
U: Not detected value is the laboratory reporting limit

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Upgradient								
Location Name	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2	CCR-BK-2
Sample Name	CCR-BK-2-20160608	CCR-BK-2-20160810	CCR-BK-2-20161027	CCR-BK-2-20161206	CCR-BK-2-20170210	CCR-BK-2-20170405	CCR-BK-2-20170606	CCR-BK-2-20170927	CCR-BK-2-20171116
Sample Date	06/08/2016	08/10/2016	10/27/2016	12/06/2016	02/10/2017	04/05/2017	06/06/2017	09/27/2017	11/16/2017
Lab Sample ID	180-55607-6	180-57528-15	180-60271-7	180-61491-19	180-63446-1	180-64974-1	180-67229-17	180-70809-16	180-72643-22
Water Level (ft amsl)	416.46	412.21	408.69	407.90	412.89	413.71	413.94	412.64	406.12
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**17.51**	**17.4**	**15.98**	**14.25**	**13.49**	**15.79**	**15.68**	**16.85**	**14.23**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**167.49**	-
Dissolved Oxygen, Field (mg/L)	**0.42**	**0.22**	**0.38**	**0.33**	**0.35**	**1.08**	**0.14**	**0.43**	**0.47**
Conductivity, Field (mS/cm)	**0.6551**	**0.4173**	**0.40128**	**0.30961**	**0.38131**	**0.29739**	**0.41407**	**0.38594**	**0.38795**
ORP, Field (mv)	**28.72**	**144**	**234.6**	**87.3**	**120.09**	**200.74**	**212.67**	**212.04**	**108.47**
Turbidity, Field (NTU)	**17.85**	**1.751**	**858.51**	**336.44**	**11.66**	**-22.18**	**-1.12**	-	**181.78**
pH, Field (su)	**6.98**	**6.64**	**6.7**	**6.19**	**6.72**	**6.66**	**6.67**	**6.64**	**6.74**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**0.018 J+**	0.014 U	0.02 U	0.02 U	0.08 U	0.016 U	**0.021 J**	**0.018 J+**	**0.02 J**
Calcium, Total	**53**	**39**	**46**	**36**	**34**	**45**	**37**	**37**	**35**
Chloride (mg/L)	**12**	**17**	**17**	**19**	**12 J+**	**19**	**14**	**19**	**19**
Fluoride (mg/L)	R	**0.14 J+**	**0.16**	**0.2 J+**	**0.14**	**0.16**	**0.13**	R	**0.13**
Sulfate (mg/L)	**61**	**30 J-**	**28**	**26**	**25 J+**	**29**	**27**	**24**	**23 J-**
pH (lab) (su)	**7.09 J**	**7.1 J**	**6.8 J**	**6.7 J**	**8.5 J**	**7.2 J**	**7 J**	**6.8 J**	**7.3 J**
Total Dissolved Solids (TDS) (mg/L)	**360**	**260**	**350**	**260**	**230**	**240**	**270**	**320**	**250**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.00048 J**
Arsenic, Total	**0.00032 J**	0.001 U	**0.0013**	**0.00051 J**	**0.00031 J**	0.001 U	0.001 U	**0.0035 J+**	**0.0028**
Barium, Total	**0.041 J-**	**0.033**	**0.15**	**0.036 J-**	**0.033 J-**	**0.034 J-**	**0.035**	**0.048 J-**	**0.046 J-**
Beryllium, Total	0.001 U	0.001 U	**0.0004 J**	0.001 U	0.001 U	0.001 U	0.001 U	**0.00018 J**	0.001 U
Cadmium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.002 U	0.002 U	**0.0047**	**0.00076 J**	0.002 UJ	0.002 U	0.002 U	R	**0.0043 J+**
Cobalt, Total	**0.000096 J**	**0.0001 J**	**0.0062**	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0015 J+**	**0.0012**
Lead, Total	**0.000028 J**	0.001 U	**0.011**	**0.00057 J**	0.001 U	0.001 U	0.001 U	**0.0028 J+**	**0.0024**
Lithium, Total	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Molybdenum, Total	**0.0017 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.00062 J**	0.005 U	**0.00068 J**
Selenium, Total	0.005 U	0.005 U	**0.00098 J**	**0.00047 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.000059 J**
Mercury, Total	0.0002 UJ	0.0002 U	**0.0001 J**	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	R	**0.14 J+**	**0.16**	**0.2 J+**	**0.14**	**0.16**	**0.13**	R	**0.13**
Radiological (pCi/L)									
Radium-226	**0.102 J ± 0.0557**	0.0387 U ± 0.0693	**1.14 J ± 0.720**	0.346 U ± 0.284	0.0539 UJ ± 0.0753	0.0198 U ± 0.0619	0.00911 UJ ± 0.0490	R	**0.149 ± 0.0943**
Radium-228	0.0185 U ± 0.200	0.0797 UJ ± 0.324	0.764 U ± 0.727	R	0.163 U ± 0.253	0.102 U ± 0.198	**0.144 ± 0.284**	0.279 U ± 0.416	**2.98 ± 0.579**
Radium-226 & 228	0.120 U ± 0.207	0.118 UJ ± 0.331	**1.91 J ± 1.02**	**0.796 J ± 0.380**	0.217 UJ ± 0.264	0.122 U ± 0.208	0.153 U ± 0.288	0.525 UJ ± 0.436	**3.13 ± 0.587**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals
CFR: Code of Federal Regulations
ft amsl: feet above mean sea level
MCL: Maximum Contaminant Level
mg/L: milligram per liter
mS/cm: milliSiemen per centimeter
mv: millivolt
NA: Not Applicable
NTU: Nephelometric Turbidity Units
pCi/L: picoCurie per liter
su: standard units
USEPA: United States Environmental Protection Agency

QUALIFIERS:

J: value is estimated
J+: value is estimated with a potentially high bias
J-: value is estimated with a potentially low bias
R: value is rejected
U: Not detected value is the laboratory reporting limit

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R
Sample Name	CCR-AP-1-20160607	CCR-AP-1-20160810	CCR-AP-1-20161026	CCR-AP-1R-20161205	CCR-AP-1R-20170206	CCR-AP-1R-20170404	CCR-AP-1R-20170605	CCR-AP-1R-20170926	CCR-AP-1R-20171114
Sample Date	06/07/2016	08/10/2016	10/26/2016	12/05/2016	02/06/2017	04/04/2017	06/05/2017	09/26/2017	11/14/2017
Lab Sample ID	180-55566-3	180-57528-16	180-60193-1	180-61491-1	180-63324-4	180-64974-2	180-67229-1	180-70809-1	180-72643-14
Water Level (ft amsl)	457.99	457.78	451.26	450.94	451.51	450.75	449.88	448.78	451.72
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**19.22**	**20.4**	**17.85**	**14.6**	**13.31**	**17.97**	**16.45**	**16.88**	**15.21**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**72.64**	-
Dissolved Oxygen, Field (mg/L)	**7.03**	**0.14**	**0.17**	**0.17**	**5.67**	**0.32**	**0.03**	**0.01**	**0.02**
Conductivity, Field (mS/cm)	**2.00099**	**7.41**	**7.48293**	**4.554**	**0.98911**	**4.76554**	**5.6183**	**5.10195**	**5.2188**
ORP, Field (mv)	**-13.54**	**88**	**200.43**	**99.2**	**126.78**	**190.47**	**224.98**	**420.3**	**115.65**
Turbidity, Field (NTU)	**41.73**	**28.41**	**-1.47**	**573.87**	**24.67**	**604.32**	**-1.78**	-	**117.39**
pH, Field (su)	**6.47**	**6.67**	**6.73**	**6.57**	**6.98**	**6.63**	**6.75**	**6.81**	**6.73**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**2.2**	**9.5**	**9.5**	**9.8**	**12**	**9.5**	**11**	**7.5 J+**	**7.6**
Calcium, Total	**41**	**480**	**530**	**420**	**370**	**420**	**320**	**230**	**270**
Chloride (mg/L)	**110**	**670**	**840**	**740**	**700**	**640**	**520**	**390**	**430**
Fluoride (mg/L)	**0.22**	0.5 U	5 U	**0.73**	0.5 U	**0.25 J**	**0.41 J**	**0.46 J+**	**0.2 J**
Sulfate (mg/L)	**460**	**2700 J-**	**3500 J-**	**3200**	**3700**	**2800**	**2300**	**2100**	**2100 J-**
pH (lab) (su)	**6.51 J**	**7 J**	**6.8 J**	**6.8 J**	**7.2 J**	**7 J**	**7.2 J**	**7 J**	**7.8 J**
Total Dissolved Solids (TDS) (mg/L)	**1100**	**6500**	**6800**	**6400**	**6600**	**5600**	**5100**	**4000**	**4200**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.0052**	**0.0012 J+**	**0.0008 J**	**0.00039 J**	0.001 U	**0.00033 J**	**0.00031 J**	R	0.001 U
Barium, Total	**0.041**	**0.022**	**0.018 J-**	**0.018 J-**	**0.049**	**0.017 J-**	**0.016**	**0.012 J-**	**0.017 J-**
Beryllium, Total	**0.000065 J**	0.001 U	**0.00019 J**	**0.00019 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.001 U	**0.00028 J**	**0.00017 J**	**0.00016 J**	**0.0008 J**	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	**0.0011 J**	0.002 U	0.002 U	0.002 U	**0.00087 J**	0.002 U	0.002 U	0.002 UJ	0.002 U
Cobalt, Total	**0.011**	**0.0077**	**0.0025**	**0.0019**	**0.003**	**0.00071**	**0.0006**	**0.00042 J**	**0.00084**
Lead, Total	**0.0013**	**0.00031 J**	**0.00015 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	**0.012 J**	**0.0099 J**	**0.016 J**	**0.015 J**	**0.066**	0.05 U	0.05 U	0.05 U	0.05 U
Molybdenum, Total	**0.005**	**0.0049 J**	**0.0031 J**	**0.0039 J**	**1.6**	**0.0024 J**	**0.0032 J**	**0.0024 J**	**0.0036 J**
Selenium, Total	0.005 U	**0.00049 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.000038 J**	**0.000075 J**	**0.00013 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	**0.22**	0.5 U	5 U	**0.73**	0.5 U	**0.25 J**	**0.41 J**	**0.46 J+**	**0.2 J**
Radiological (pCi/L)									
Radium-226	0.0602 U ± 0.0870	**0.411 ± 0.108**	**0.717 J ± 0.337**	R	**0.292 ± 0.120**	**0.193 ± 0.0909**	**0.211 J ± 0.0870**	R	**0.256 ± 0.0859**
Radium-228	0.229 U ± 0.397	0.300 UJ ± 0.262	0.320 U ± 0.247	**0.493 ± 0.246**	**0.513 ± 0.252**	**0.391 ± 0.255**	0.247 U ± 0.265	**0.673 ± 0.280**	**0.594 ± 0.243**
Radium-226 & 228	0.289 U ± 0.406	**0.711 J ± 0.284**	**1.04 J ± 0.418**	R	**0.805 ± 0.279**	**0.583 ± 0.270**	**0.458 J ± 0.278**	**1.05 J+ ± 0.303**	**0.849 ± 0.258**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals
CFR: Code of Federal Regulations
ft amsl: feet above mean sea level
MCL: Maximum Contaminant Level
mg/L: milligram per liter
mS/cm: milliSiemen per centimeter
mv: millivolt
NA: Not Applicable
NTU: Nephelometric Turbidity Units
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QUALIFIERS:

J: value is estimated
J+: value is estimated with a potentially high bias
J-: value is estimated with a potentially low bias
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U: Not detected value is the laboratory reporting limit

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R	CCR-AP-2R
Sample Name	CCR-AP-2-20160811	CCR-AP-2-20161025	CCR-AP-2R-20161107	CCR-AP-2R-20161206	CCR-AP-2R-20170207	CCR-AP-2R-20170404	CCR-AP-2R-20170606	CCR-AP-2R-20170927	CCR-AP-2R-20171115
Sample Date	08/11/2016	10/25/2016	11/07/2016	12/06/2016	02/07/2017	04/04/2017	06/06/2017	09/27/2017	11/15/2017
Lab Sample ID	180-57528-17	180-60160-5	180-60609-1	180-61491-2	180-63324-2	180-64974-3	180-67229-2	180-70809-2	180-72643-15
Water Level (ft amsl)	441.66	435.66	435.24	436.03	435.12	431.29	431.57	425.15	425.07
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**19.8**	**19.46**	**20.24**	**14.47**	**16.1**	**19.54**	**18.76**	**19.71**	**16.19**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**-11.22**	-
Dissolved Oxygen, Field (mg/L)	**1.25**	**0.68**	**0.69**	**0.72**	**0.53**	**0.69**	**0.23**	**0.25**	**0.27**
Conductivity, Field (mS/cm)	**8.151**	**8.54406**	**5.18532**	**6.975**	**7.58134**	**5.4526**	**8.67183**	**8.90809**	**8.01588**
ORP, Field (mv)	**189**	**145.29**	**107.1**	**115**	**115.79**	**187.26**	**167.33**	**358.49**	**123.91**
Turbidity, Field (NTU)	**756.5**	**15.14**	**17.82**	**20.32**	**12.2**	**-15.03**	**5.16**	-	**0.74**
pH, Field (su)	**7.11**	**7.03**	**6.99**	**6.82**	**6.87**	**6.91**	**6.94**	**6.96**	**6.83**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**12**	**14**	**15**	**15**	**9.9**	**12**	**12**	**12 J+**	**12**
Calcium, Total	**290**	**370**	**380**	**360**	**430**	**390**	**410**	**350**	**350**
Chloride (mg/L)	R	**870**	**810**	**710**	**670**	**920**	**850**	**790**	**760**
Fluoride (mg/L)	0.5 U	**0.58 J**	**0.5 J**	**0.7**	0.5 U	**0.9**	**0.51 J**	**0.5 J+**	**0.27 J**
Sulfate (mg/L)	R	**3800**	**3700**	**3800**	**3100**	**4400**	**4200**	**4100**	**3900 J-**
pH (lab) (su)	**7.4 J**	**7.2 J**	**7 J**	**7 J**	**6.9 J**	**7.1 J**	**7.2 J**	**7.1 J**	**7.5 J**
Total Dissolved Solids (TDS) (mg/L)	**6800**	**8500**	**7200**	**6300**	**5700**	**7100**	**8000**	**7200**	**6000**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.02 U	**0.00011 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.0024**	0.01 U	**0.0011 J+**	**0.00071 J**	0.001 U	**0.00043 J**	**0.00034 J**	R	0.001 U
Barium, Total	**0.041**	**0.035 J**	**0.037 J-**	**0.051 J-**	**0.019**	**0.045 J-**	**0.046**	**0.035 J-**	**0.043 J-**
Beryllium, Total	**0.00027 J**	0.01 U	0.001 U	**0.0002 J**	0.001 U	**0.00015 J**	0.001 U	**0.00013 J**	0.001 U
Cadmium, Total	**0.0003 J**	0.01 U	**0.00056 J**	**0.00031 J**	**0.00019 J**	**0.0003 J**	**0.00032 J**	**0.00063 J**	**0.00038 J**
Chromium, Total	**0.0036**	0.02 U	**0.00071 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UJ	0.002 U
Cobalt, Total	**0.0079**	**0.0022 J**	**0.0025**	**0.0032**	**0.0012**	**0.0021**	**0.0023**	**0.0019 J+**	**0.0026**
Lead, Total	**0.0052 J**	0.01 U	**0.00019 J**	**0.000083 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	**0.054**	**0.06**	**0.062**	**0.067**	**0.011 J**	**0.056**	**0.061**	**0.062**	**0.058**
Molybdenum, Total	**1.2**	**1.6**	**1.8**	**1.5**	0.005 U	**1.4**	**1.5**	**1.6**	**1.7**
Selenium, Total	**0.00079 J**	0.05 U	**0.00042 J**	**0.0004 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.000041 J**	0.01 U	**0.00015 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	0.5 U	**0.58 J**	**0.5 J**	**0.7**	0.5 U	**0.9**	**0.51 J**	**0.5 J+**	**0.27 J**
Radiological (pCi/L)									
Radium-226	**0.703 ± 0.205**	**0.434 J ± 0.280**	0.261 U ± 0.223	0.0875 U ± 0.213	**0.188 ± 0.108**	**0.141 ± 0.0848**	**0.233 J ± 0.0901**	**0.409 J ± 0.118**	**0.217 ± 0.0813**
Radium-228	0.675 UJ ± 0.622	0.352 U ± 0.249	**0.394 ± 0.241**	**0.647 ± 0.271**	**0.373 ± 0.236**	0.291 U ± 0.229	**0.403 ± 0.224**	R	**0.620 ± 0.256**
Radium-226 & 228	**1.38 J ± 0.655**	**0.786 J ± 0.374**	R	R	**0.562 ± 0.259**	**0.432 J ± 0.244**	**0.636 ± 0.241**	**1.09 J+ ± 0.311**	**0.837 ± 0.269**

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MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R
Sample Name	CCR-AP-3-20160815	CCR-AP-3-20161027	CCR-AP-3R-20161108	CCR-AP-3R-20161206	CCR-AP-3R-20170207	CCR-AP-3R-20170405	CCR-AP-3R-20170606	CCR-AP-3R-20170927	CCR-AP-3R-20171115
Sample Date	08/15/2016	10/27/2016	11/08/2016	12/06/2016	02/07/2017	04/05/2017	06/06/2017	09/27/2017	11/15/2017
Lab Sample ID	180-57626-1	180-60271-4	180-60609-2	180-61491-3	180-63324-3	180-64974-4	180-67229-3	180-70809-3	180-72643-16
Water Level (ft amsl)	427.18	411.89	409.39	413.95	410.28	408.61	408.56	410.77	409.86
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**19.68**	**17.53**	**18.16**	**16.4**	**17.21**	**18.78**	**18.62**	**19.96**	**17.14**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**-11.22**	-
Dissolved Oxygen, Field (mg/L)	**0.65**	**0.38**	**0.97**	**0.26**	**0.17**	**0.7**	**0.12**	**0.07**	**0.08**
Conductivity, Field (mS/cm)	**7.828**	**8.67638**	**8.57001**	**8.645**	**8.63738**	**6.66285**	**9.48072**	**10.426**	**10.517**
ORP, Field (mv)	**48**	**217.95**	**152.88**	**131.8**	**117.35**	**189.49**	**179.62**	**232.4**	**126.38**
Turbidity, Field (NTU)	**10.41**	**-4.28**	**-4.38**	**0**	**-1.71**	**-22.88**	**-3.07**	-	**-0.87**
pH, Field (su)	**7.25**	**7.04**	**7.17**	**6.91**	**6.9**	**6.96**	**7**	**7.01**	**6.97**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**11**	**14**	**13**	**15**	**11**	**16**	**12**	**14 J+**	**13**
Calcium, Total	**260**	**380**	**370**	**380**	**400**	**450**	**480**	**420**	**420**
Chloride (mg/L)	**730**	**900**	**860**	**880**	**820**	**1500 J**	**990**	**930**	**980**
Fluoride (mg/L)	**0.95**	**0.96 J**	**0.96 J**	**1.1**	**0.82 J+**	**1.1**	**0.87 J**	**1 J+**	**0.72 J**
Sulfate (mg/L)	**3000**	**3400**	**3500**	**3900**	**3700**	**6900 J**	**4400**	**4900**	**5300 J-**
pH (lab) (su)	**7.4 J**	**7.2 J**	**7 J**	**7 J**	**7.1 J**	**7 J**	**7.3 J**	**7.1 J**	**7.5 J**
Total Dissolved Solids (TDS) (mg/L)	**6200**	**7000**	**6900**	**7100**	**7100**	**7800**	**8500**	**8500**	**8000**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.00022 U	0.02 U	**0.000092 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.00044 J**	0.01 U	0.001 U	**0.00036 J**	0.001 U	**0.00029 J**	0.001 U	R	0.001 U
Barium, Total	**0.015**	**0.016 J**	**0.02 J-**	**0.024 J-**	**0.017**	**0.017 J-**	**0.017**	**0.016 J-**	**0.017 J-**
Beryllium, Total	0.001 U	0.01 U	0.001 U	**0.00021 J**	0.001 U	**0.00017 J**	0.001 U	0.001 U	0.001 U
Cadmium, Total	**0.00017 J**	0.01 U	**0.00024 J**	**0.0003 J**	**0.0002 J**	**0.00013 J**	**0.00018 J**	**0.00029 J**	**0.0002 J**
Chromium, Total	**0.0008 J**	0.02 U	**0.00085 J**	**0.00051 J**	0.002 U	0.002 U	0.002 U	0.002 UJ	0.002 U
Cobalt, Total	**0.00035 J**	0.005 U	**0.00011 J**	0.0005 U	**0.00017 J**	0.0005 U	**0.00015 J**	R	**0.00021 J**
Lead, Total	**0.00028 J**	0.01 U	0.001 U	**0.00014 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	**0.071**	**0.077**	**0.083**	**0.08**	**0.065**	**0.062**	**0.077**	**0.087**	**0.09**
Molybdenum, Total	**0.94**	**0.91**	**1**	**0.93**	**0.72**	**0.74**	**0.82**	**0.81**	**0.86**
Selenium, Total	**0.021**	**0.017 J**	**0.024**	**0.016**	**0.0041 J**	**0.0017 J**	**0.0028 J**	**0.0043 J+**	**0.0031 J**
Thallium, Total	0.001 U	0.01 U	**0.00014 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	**0.000071 J**	**0.000082 J**	0.0002 U	**0.000094 J-**	**0.00053**	**0.00012 J**	**0.000085 J**	**0.00018 J**	**0.00016 J-**
Fluoride (mg/L)	**0.95**	**0.96 J**	**0.96 J**	**1.1**	**0.82 J+**	**1.1**	**0.87 J**	**1 J+**	**0.72 J**
Radiological (pCi/L)									
Radium-226	**0.199 ± 0.0723**	0.173 U ± 0.202	R	0.0963 U ± 0.229	**0.172 ± 0.104**	0.0894 U ± 0.0714	**0.116 J ± 0.0696**	R	**0.138 ± 0.0700**
Radium-228	**0.523 ± 0.314**	**0.431 ± 0.281**	0.162 U ± 0.254	**1.06 ± 0.285**	0.393 U ± 0.263	**0.429 ± 0.253**	0.367 U ± 0.248	R	**0.509 ± 0.277**
Radium-226 & 228	**0.722 ± 0.322**	**0.603 J ± 0.346**	R	R	**0.565 J ± 0.283**	**0.518 J ± 0.263**	**0.484 J ± 0.257**	**1.24 J+ ± 0.320**	**0.647 ± 0.286**

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Sample Name	CCR-AP-4-20160607	CCR-AP-4-20160811	CCR-AP-4-20161026	CCR-AP-4R-20161209	CCR-AP-4R-20170206	CCR-AP-4R-20170425	CCR-AP-4R-20170605	CCR-AP-4R-20170926	CCR-AP-4R-20171114
Sample Date	06/07/2016	08/11/2016	10/26/2016	12/05/2016	02/06/2017	04/25/2017	06/05/2017	09/26/2017	11/14/2017
Lab Sample ID	180-55566-2	180-57528-18	180-60193-2	180-61491-4	180-63324-1	180-65681-1	180-67229-4	180-70809-4	180-72643-17
Water Level (ft amsl)	444.60	441.50	439.76	440.62	440.39	-	440.65	439.72	439.49
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**14.77**	**21.89**	**14.98**	**12.35**	**15.08**	**14.55**	**16.87**	**16.55**	**13.58**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**74.75**	-
Dissolved Oxygen, Field (mg/L)	**4.6**	**6.51**	**4.79**	**6.91**	**0.1**	**6.18**	**5.93**	**6.64**	**6.23**
Conductivity, Field (mS/cm)	**1.98612**	**1.891**	**1.8735**	**2.92**	**6.67429**	**1.01**	**1.35109**	**1.05291**	**1.06282**
ORP, Field (mv)	**86.77**	**105**	**226.69**	**107.6**	**114.16**	**259**	**210.43**	**154.14**	**135.88**
Turbidity, Field (NTU)	**2.16**	**48.15**	**9.75**	**441.79**	**34.52**	**150.4**	**-1.82**	-	**329.8**
pH, Field (su)	**7.06**	**7.03**	**6.98**	**6.9**	**6.71**	**6.97**	**6.92**	**6.98**	**6.89**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**0.018**	**0.089 J+**	**0.045 J+**	**0.13 J+**	**0.16**	**0.21**	**0.2**	**0.23 J+**	**0.15**
Calcium, Total	**210**	**180**	**210**	**130**	**110**	**110**	**160**	**110**	**110**
Chloride (mg/L)	**48**	R	**79**	**34**	**23**	**21**	**30**	**20**	**22**
Fluoride (mg/L)	**0.44**	**0.41**	**0.4**	**0.48**	**0.33 J+**	**0.41**	**0.39**	**0.39 J+**	**0.41**
Sulfate (mg/L)	**220**	R	**150 J-**	**86**	**97**	**130**	**96**	**120**	**140 J-**
pH (lab) (su)	**6.97 J**	**7.3 J**	**7.1 J**	**7.1 J**	**7.3 J**	**7.5 J**	**7.3 J**	**7.3 J**	**7.7 J**
Total Dissolved Solids (TDS) (mg/L)	**1300**	**1200**	**1300**	**710**	**630**	**640**	**930**	**650**	**650**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.00029 J**	**0.00059 J**	**0.00032 J**	**0.00032 J**	0.001 U	**0.0003 J**	**0.00026 J**	R	0.001 U
Barium, Total	**0.12**	**0.089**	**0.11 J-**	**0.063 J-**	**0.051**	**0.043**	**0.069**	**0.042 J-**	**0.045 J-**
Beryllium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.001 U	**0.00018 J**	0.001 U	0.001 U	**0.000084 J**	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	**0.0022**	**0.0016 J**	**0.0022**	**0.0018 J**	**0.0015 J**	**0.0018 J**	**0.0022**	R	**0.0027 J+**
Cobalt, Total	**0.00026 J**	**0.0033**	**0.00081**	0.0005 U	**0.0002 J**	**0.00011 J**	0.0005 U	0.0005 U	**0.0003 J**
Lead, Total	**0.000085 J**	**0.00023 J**	**0.00017 J**	**0.00009 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Molybdenum, Total	**0.0016 J**	**0.0088**	**0.0033 J**	**0.0046 J**	0.005 U	**0.0019 J**	**0.0028 J**	**0.002 J**	**0.0017 J**
Selenium, Total	0.005 U	**0.001 J**	**0.00057 J+**	**0.00051 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.000021 J**	0.001 U	0.001 U	0.001 U	**0.00022 J**	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	**0.44**	**0.41**	**0.4**	**0.48**	**0.33 J+**	**0.41**	**0.39**	**0.39 J+**	**0.41**
Radiological (pCi/L)									
Radium-226	**0.157 ± 0.0919**	**0.327 ± 0.108**	0.116 U ± 0.206	R	0.0779 U ± 0.0791	0.126 U ± 0.0996	**0.185 J ± 0.0926**	R	**0.159 ± 0.0794**
Radium-228	0.127 U ± 0.259	**7.60 J ± 1.03**	0.369 U ± 0.307	**0.370 ± 0.239**	0.199 U ± 0.251	-0.0800 U ± 0.296	0.144 U ± 0.215	-0.0756 U ± 0.212	**0.488 ± 0.307**
Radium-226 & 228	0.285 U ± 0.275	**7.93 J ± 1.04**	0.485 U ± 0.370	R	0.277 U ± 0.263	0.126 U ± 0.313	0.329 UJ ± 0.234	0.11 UJ ± 0.223	**0.647 ± 0.317**

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mS/cm: milliSiemen per centimeter
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NA: Not Applicable
NTU: Nephelometric Turbidity Units
pCi/L: picoCurie per liter
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QUALIFIERS:

J: value is estimated
J+: value is estimated with a potentially high bias
J-: value is estimated with a potentially low bias
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TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5
Sample Name	CCR-AP-5-20160606	CCR-AP-5-20160811	CCR-AP-5-20161027	CCR-AP-5-20161206	CCR-AP-5-20170207	CCR-AP-5-20170405	CCR-AP-5-20170606	CCR-AP-5-20170927	CCR-AP-5-20171115
Sample Date	06/06/2016	08/11/2016	10/27/2016	12/06/2016	02/07/2017	04/05/2017	06/06/2017	09/27/2017	11/15/2017
Lab Sample ID	180-55566-1	180-57528-19	180-60271-5	180-61491-5	180-63324-5	180-64974-5	180-67229-5	180-70809-5	180-72643-18
Water Level (ft amsl)	415.47	415.79	415.43	415.67	416.24	416.25	416.06	416.61	417.07
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**19.24**	**22.87**	**16.36**	**13.43**	**16.93**	**18.87**	**17.69**	**19.05**	**15.34**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**-11.22**	-
Dissolved Oxygen, Field (mg/L)	**0.28**	**0.66**	**0.51**	**0.26**	**0.24**	**0.2**	**0.06**	**0.06**	**0.07**
Conductivity, Field (mS/cm)	**5.99649**	**6.133**	**4.98392**	**5.8693**	**5.87591**	**4.20036**	**5.60685**	**5.99388**	**5.89855**
ORP, Field (mv)	**8.67**	**209**	**30**	**120.8**	**91.74**	**126.06**	**210.99**	**461.25**	**108.88**
Turbidity, Field (NTU)	**10.35**	**4.789**	**7.46**	**0**	**0.17**	**-20.21**	**-2.99**	-	**332.69**
pH, Field (su)	**7**	**6.89**	**7.12**	**6.95**	**6.97**	**7.01**	**7.02**	**7.02**	**6.99**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**11**	**11**	**10**	**12**	**11**	**11**	**12**	**9.3 J+**	**11**
Calcium, Total	**300**	**310**	**350**	**350**	**330**	**360**	**340**	**300**	**310**
Chloride (mg/L)	**380**	R	**380**	**380**	**370**	**370**	**380**	**350**	**360**
Fluoride (mg/L)	**0.26 J**	0.5 U	**0.31 J**	**0.54**	0.5 U	**0.23 J**	**0.34 J**	**0.2 J+**	**0.32 J**
Sulfate (mg/L)	**2900**	R	**2600**	**3000**	**3000**	**3100**	**2700**	**3000**	**3100 J-**
pH (lab) (su)	**7.05 J**	**7.4 J**	**7.2 J**	**7.1 J**	**7.2 J**	**7.2 J**	**7.2 J**	**7.1 J**	**8 J**
Total Dissolved Solids (TDS) (mg/L)	**5000**	**5100**	**5000**	**5000**	**5300**	**4900**	**5000**	**4900**	**4800**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.02 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.00057 J**	**0.0003 J**	0.01 U	**0.00016 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Total	**0.019**	**0.016**	**0.015 J**	**0.016 J-**	**0.016**	**0.016 J-**	**0.015**	**0.012**	**0.015 J-**
Beryllium, Total	**0.000052 J**	0.001 U	0.01 U	**0.00016 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.001 U	0.001 U	0.01 U	0.001 U	**0.00012 J**	0.001 U	**0.00012 J**	0.001 U	0.001 U
Chromium, Total	**0.00062 J**	0.002 U	0.02 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt, Total	**0.00081**	**0.00011 J**	0.005 U	0.0005 U	**0.000098 J**	0.0005 U	0.0005 U	0.0005 U	**0.00016 J**
Lead, Total	**0.00024 J**	0.001 U	**0.0007 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	**0.014 J**	**0.015 J**	**0.018 J**	**0.023 J**	**0.022 J**	**0.014 J**	**0.017 J**	**0.019 J**	**0.016 J**
Molybdenum, Total	**0.022**	**0.019**	**0.016 J**	**0.038**	**0.049**	**0.044**	**0.059**	**0.055**	**0.067**
Selenium, Total	0.005 U	0.005 U	0.05 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.000076 J**	0.001 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	**0.26 J**	0.5 U	**0.31 J**	**0.54**	0.5 U	**0.23 J**	**0.34 J**	**0.2 J+**	**0.32 J**
Radiological (pCi/L)									
Radium-226	**0.107 ± 0.0697**	**0.179 ± 0.0827**	0.293 U ± 0.242	-0.0341 U ± 0.180	**0.130 ± 0.0873**	**0.145 ± 0.0840**	0.0962 UJ ± 0.0743	R	**0.100 ± 0.0637**
Radium-228	0.214 U ± 0.278	0.161 UJ ± 0.287	0.0785 U ± 0.226	**0.743 ± 0.259**	0.294 U ± 0.220	0.208 U ± 0.204	0.222 U ± 0.289	0.198 U ± 0.226	0.330 U ± 0.233
Radium-226 & 228	0.321 U ± 0.287	0.339 UJ ± 0.298	0.372 U ± 0.332	R	**0.424 J ± 0.236**	**0.354 J ± 0.221**	0.318 U ± 0.298	**0.522 J+ ± 0.249**	**0.430 J ± 0.242**

ABBREVIATIONS AND NOTES:

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CFR: Code of Federal Regulations
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MCL: Maximum Contaminant Level
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TABLE II
SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-6
Sample Name	CCR-AP-6-20160607	CCR-AP-6-20160810	CCR-AP-6-20161026	CCR-AP-6-20161206	CCR-AP-6-20170207	CCR-AP-6-20170404	CCR-AP-6-20170605	CCR-AP-6-20170926	CCR-AP-6-20171116
Sample Date	06/07/2016	08/10/2016	10/26/2016	12/06/2016	02/07/2017	04/04/2017	06/05/2017	09/26/2017	11/16/2017
Lab Sample ID	180-55566-5	180-57528-20	180-60193-3	180-61491-6	180-63324-6	180-64974-6	180-67229-6	180-70809-6	180-72643-19
Water Level (ft amsl)	447.90	447.74	445.41	446.06	447.62	445.63	446.05	443.90	443.36
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**16.68**	**17.63**	**15.71**	**13.31**	**13.86**	**16.14**	**15.3**	**15.47**	**13.29**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**854.31**	-
Dissolved Oxygen, Field (mg/L)	**0.39**	**0.23**	**0.16**	**0.21**	**1.34**	**2.04**	**2.05**	**0.08**	**0.4**
Conductivity, Field (mS/cm)	**2.86715**	**2.622**	**2.34393**	**2.0108**	**2.10516**	**1.76314**	**2.25261**	**2.26168**	**2.1014**
ORP, Field (mv)	**30.1**	**12**	**18.27**	**28.3**	**5.82**	**21.67**	**-19.79**	**-23.68**	**16.07**
Turbidity, Field (NTU)	**58.7**	**47.74**	**50.74**	**20.35**	**20.98**	**171.35**	**-0.8**	-	**357.65**
pH, Field (su)	**6.9**	**6.89**	**7.01**	**6.97**	**7.02**	**6.98**	**7.07**	**6.98**	**6.93**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	**2.2**	**2.2**	**1.4**	**0.88**	**0.83**	**0.98**	**1.5**	**0.95 J+**	**0.59**
Calcium, Total	**240**	**250**	**260**	**270**	**250**	**290**	**280**	**260**	**240**
Chloride (mg/L)	**150**	**150**	**130**	**100**	**100**	**110**	**130**	**110**	**100**
Fluoride (mg/L)	**0.12**	0.1 U	**0.18**	**0.24**	**0.2 J+**	**0.2**	**0.19 J**	**0.21 J+**	**0.21**
Sulfate (mg/L)	**1000**	**900 J-**	**920 J-**	**890**	**880**	**900**	**1100**	**930**	**880 J-**
pH (lab) (su)	**7.14 J**	**7.2 J**	**7.1 J**	**7.1 J**	**7.4 J**	**7.3 J**	**7.2 J**	**7.1 J**	**7.4 J**
Total Dissolved Solids (TDS) (mg/L)	**2100**	**2100**	**2000**	**1800**	**3300**	**1800**	**2100**	**1800**	**1700**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.00068 J**
Arsenic, Total	**0.0053**	**0.0045**	**0.0041**	**0.0039**	**0.0029 J+**	**0.0021**	**0.002**	**0.0032 J+**	**0.0044 J**
Barium, Total	**0.028**	**0.019**	**0.022 J-**	**0.021 J-**	**0.021**	**0.018 J-**	**0.018**	**0.026 J-**	**0.04 J-**
Beryllium, Total	**0.0001 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.00051 J**	**0.00042 J**
Cadmium, Total	**0.00021 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.00013 J**
Chromium, Total	**0.0012 J**	0.002 U	**0.001 J**	**0.00048 J**	0.002 U	0.002 U	0.002 U	R	**0.0072 J+**
Cobalt, Total	**0.0068**	**0.0038**	**0.0032**	**0.0023**	**0.0013**	**0.001**	**0.00099**	**0.0033**	**0.0054**
Lead, Total	**0.0011**	**0.00023 J**	**0.00061 J**	**0.00028 J**	0.001 U	0.001 U	0.001 U	**0.005**	**0.0036 J**
Lithium, Total	**0.043 J**	**0.04 J**	**0.042 J**	**0.041 J**	**0.04 J**	**0.036 J**	**0.039 J**	**0.042 J**	**0.043 J**
Molybdenum, Total	**0.021**	**0.015**	**0.012**	**0.011**	**0.01**	**0.0086**	**0.009**	**0.0066**	**0.0089**
Selenium, Total	**0.00065 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	**0.00006 J**	0.001 U	**0.000039 J**	0.001 U	0.001 U	0.001 U	0.001 U	**0.00018 J**	**0.000097 J**
Mercury, Total	**0.000055 J**	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	**0.12**	0.1 U	**0.18**	**0.24**	**0.2 J+**	**0.2**	**0.19 J**	**0.21 J+**	**0.21**
Radiological (pCi/L)									
Radium-226	**0.162 ± 0.0727**	**0.177 ± 0.0778**	0.195 U ± 0.228	0.278 U ± 0.281	0.0398 U ± 0.0860	**0.120 ± 0.0878**	0.0399 UJ ± 0.0601	**1.10 J ± 0.398**	**0.122 ± 0.0669**
Radium-228	-0.0541 U ± 0.342	-0.0414 UJ ± 0.239	0.394 U ± 0.274	**0.641 ± 0.284**	0.0520 U ± 0.252	-0.0275 U ± 0.213	**0.0246 ± 0.242**	**3.67 ± 1.20**	**0.406 ± 0.244**
Radium-226 & 228	0.108 U ± 0.350	0.136 UJ ± 0.251	**0.589 ± 0.356**	R	0.0918 U ± 0.266	0.12 UJ ± 0.230	0.0646 U ± 0.250	**4.77 ± 1.26**	**0.528 ± 0.253**

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SUMMARY OF ANALYTICAL RESULTS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Location Group	Downgradient								
Location Name	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R	CCR-AP-7R
Sample Name	CCR-AP-7-20160609	CCR-AP-7-20160810	CCR-AP-7-20161026	CCR-AP-7R-20161209	CCR-AP-7R-20170206	CCR-AP-7R-20170425	CCR-AP-7R-20170605	CCR-AP-7R-20170926	CCR-AP-7R-20171114
Sample Date	06/09/2016	08/10/2016	10/26/2016	12/05/2016	02/06/2017	04/25/2017	06/05/2017	09/26/2017	11/14/2017
Lab Sample ID	180-55607-7	180-57528-21	180-60193-4	180-61491-7	180-63324-7	180-65681-2	180-67229-7	180-70809-7	180-72643-20
Water Level (ft amsl)	457.39	457.59	456.07	455.82	456.15	-	454.32	453.14	452.74
Monitoring Program	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Detection
Field Parameters									
Temperature (Deg C)	**17.91**	**16.91**	**15.41**	**12.19**	**13.33**	**14.48**	**15.06**	**15.56**	**13.51**
Turbidity, Field (FNU)	-	-	-	-	-	-	-	**524.01**	-
Dissolved Oxygen, Field (mg/L)	**7.01**	**7.69**	**9.08**	**10.04**	**6.85**	**7.2**	**8.31**	**6.67**	**6.72**
Conductivity, Field (mS/cm)	**0.53443**	**4.234**	**4.08942**	**1.9895**	**4.16272**	**4.453**	**4.15439**	**4.62098**	**4.68238**
ORP, Field (mv)	**121.77**	**198**	**195.26**	**166.1**	**179.67**	**269**	**256.13**	**257.35**	**129.8**
Turbidity, Field (NTU)	**3.02**	**171.8**	**11.72**	**53.54**	**57.61**	**487.6**	**136.87**	-	**121.17**
pH, Field (su)	**6.49**	**6.37**	**6.47**	**6.31**	**6.43**	**6.42**	**6.46**	**6.53**	**6.51**
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	0.011 U	**5.4**	**3.7**	**3.6**	**3.4**	**4.1**	**4.1**	**2.7 J+**	**2.8**
Calcium, Total	**47**	**320**	**340**	**340**	**330**	**340**	**340**	**300**	**320**
Chloride (mg/L)	**26**	**300**	**320**	**320**	**290**	**320**	**330**	**260**	**280**
Fluoride (mg/L)	R	0.25 U	**0.17 J**	**0.25**	0.25 U	**0.2 J**	**0.19 J**	R	**0.094 J**
Sulfate (mg/L)	**15**	**1600 J-**	**1900 J-**	**2100**	**1900**	**2200**	**2100**	**2300**	**2400 J-**
pH (lab) (su)	**6.75 J**	**6.9 J**	**6.6 J**	**6.6 J**	**6.8 J**	**6.9 J**	**6.7 J**	**6.6 J**	**7.2 J**
Total Dissolved Solids (TDS) (mg/L)	**350**	**3700**	**3700**	**3600**	**3800**	**7800**	**4000**	**4100**	**3900**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.00059 J**	0.002 U	0.002 U	0.002 U
Arsenic, Total	**0.00067 J**	R	**0.00061 J**	**0.00051 J**	**0.0016 J+**	**0.0032**	**0.0017**	R	**0.0014 J+**
Barium, Total	**0.024 J-**	**0.039**	**0.032 J-**	**0.033 J-**	**0.039**	**0.063**	**0.05**	**0.048 J-**	**0.039 J-**
Beryllium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.00024 J**	0.001 U	**0.00013 J**	0.001 U
Cadmium, Total	0.001 U	**0.00032 J**	**0.00019 J**	**0.00015 J**	**0.00014 J**	**0.00015 J**	**0.0002 J**	0.001 U	**0.00011 J**
Chromium, Total	**0.0016 J**	**0.00093 J**	**0.00076 J**	**0.00093 J**	**0.0016 J**	**0.0063**	**0.0033**	R	**0.0029 J+**
Cobalt, Total	**0.0002 J**	**0.0039**	**0.0012**	**0.0012**	**0.0015**	**0.004**	**0.0023**	**0.0019**	**0.0013**
Lead, Total	R	**0.00041 J**	**0.00022 J**	**0.00014 J**	**0.00062 J**	**0.0033**	**0.0017**	**0.0018 J+**	**0.0011**
Lithium, Total	**0.011 J**	**0.02 J**	**0.024 J**	**0.025 J**	**0.023 J**	**0.03 J**	**0.021 J**	**0.025 J**	**0.022 J**
Molybdenum, Total	**0.0016 J**	**0.0011 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.00062 J**	**0.00065 J**	0.005 U
Selenium, Total	0.005 U	**0.0007 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.000054 J**	0.001 U
Mercury, Total	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Fluoride (mg/L)	R	0.25 U	**0.17 J**	**0.25**	0.25 U	**0.2 J**	**0.19 J**	R	**0.094 J**
Radiological (pCi/L)									
Radium-226	**0.0958 J ± 0.0549**	**0.324 ± 0.149**	0.284 U ± 0.252	0.0965 U ± 0.221	**0.164 ± 0.0985**	**0.350 ± 0.130**	**0.248 J ± 0.0930**	R	**0.217 ± 0.0812**
Radium-228	-0.0103 U ± 0.186	0.127 UJ ± 0.584	0.157 U ± 0.248	0.347 U ± 0.251	0.193 U ± 0.275	0.0871 U ± 0.274	**0.202 ± 0.223**	0.450 U ± 0.305	**0.559 ± 0.268**
Radium-226 & 228	0.0856 U ± 0.194	0.451 UJ ± 0.603	**0.441 ± 0.353**	R	0.357 UJ ± 0.292	0.437 UJ ± 0.303	**0.451 J ± 0.242**	R	**0.776 ± 0.280**

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R: value is rejected
U: Not detected value is the laboratory reporting limit

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - JUNE THROUGH AUGUST 2018
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA
FILE NO. 129420

Location Group	Action Level	Upgradient			
Location Name	Maximum	CCR-BK-1R	CCR-BK-1R	CCR-BK-2	CCR-BK-2
Sample Name	Contaminant	CCR-BK-1R-20180608	CCR-BK-1R20180827	CCR-BK-2-20180608	CCR-BK-2-20180820
Sample Date	Level/Regonal	06/08/2018	08/27/2018	06/08/2018	08/20/2018
Lab Sample ID	Screening Level	180-78556-5	180-81365-1	180-78556-6	180-81110-10
Detection Monitoring - EPA Appendix III Constituents (mg/L)					
Boron, Total	NA	-	0.08 U	-	0.08 U
Calcium, Total	NA	-	**34**	-	**36**
Chloride	NA	-	**1.9**	-	**15**
Fluoride	4	**0.37**	**0.31**	**0.16**	**0.13 J+**
Sulfate	NA	-	**21 J-**	-	**18 J-**
Total Dissolved Solids (TDS)	NA	-	**220**	-	**230**
pH (lab) (SU)	NA	-	**7.2 J**	-	**6.8 J**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)					
Antimony, Total	0.006	0.002 U	-	0.002 U	-
Arsenic, Total	0.01	R	**0.0011**	0.001 U	0.001 U
Barium, Total	2	**0.049 J-**	**0.041 J**	**0.037 J-**	**0.033 J**
Beryllium, Total	0.004	0.001 UJ	-	0.001 UJ	-
Cadmium, Total	0.005	0.001 UJ	0.001 U	0.001 UJ	0.001 U
Chromium, Total	0.1	**0.003 J+**	**0.0076**	0.002 U	0.002 U
Cobalt, Total	0.006	**0.0008 J**	**0.001**	**0.000098 J**	0.0005 U
Fluoride	4	**0.37**	**0.31**	**0.16**	**0.13 J+**
Lead, Total	0.015	**0.00063 J**	**0.0011**	0.001 UJ	0.001 U
Lithium, Total	0.04	**0.0036 J**	**0.0048 J**	0.005 U	0.05 U
Mercury, Total	0.002	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U
Molybdenum, Total	0.1	**0.0014 J**	**0.0013 J**	**0.00051 J**	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.002	0.001 U	-	0.001 U	-
Radiological (pCi/L)					
Radium-226	NA	**0.223 ± 0.148**	R	0.0863 U ± 0.108	R
Radium-228	NA	0.263 U ± 0.217	0.285 U ± 0.313	0.230 U ± 0.194	0.0380 U ± 0.238
Radium-226 & 228	5	R	R	R	0.209 UJ ± 0.251

ABBREVIATIONS AND NOTES:

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - JUNE THROUGH AUGUST 2018
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA
FILE NO. 129420

Location Group	Action Level	Downgradient							
Location Name	Maximum	CCR-AP-1R	CCR-AP-1R	CCR-AP-2R	CCR-AP-2R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R	CCR-AP-3R
Sample Name	Contaminant	CCR-AP-1R-20180606	CCR-AP-1R-20180822	CCR-AP-2R-20180606	CCR-AP-2R-20180821	CCR-AP-3R-20180606	BLIND DUPLICATE 1-20180606	CCR-AP-3R-20180821	BLIND DUPLICATE 1-20180821
Sample Date	Level/Regonal	06/06/2018	08/22/2018	06/06/2018	08/21/2018	06/06/2018	06/06/2018	08/21/2018	08/21/2018
Lab Sample ID	Screening Level	180-78475-8	180-81267-1	180-78475-9	180-81110-1	180-78475-10	180-78475-14	180-81110-2	180-81110-11
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	NA	-	**0.57**	-	**12**	-	-	**12**	**12**
Calcium, Total	NA	-	**280**	-	**290**	-	-	**260**	**260**
Chloride	NA	-	110	-	510	-	-	**700**	**700**
Fluoride	4	**0.49**	**0.2 J+**	**0.49 J**	**0.39 J**	1.6	1.5	1.3	1.6
Sulfate	NA	-	**900 J-**	-	**2500 J-**	-	-	**3600 J-**	**3500 J-**
Total Dissolved Solids (TDS)	NA	-	**1800**	-	**5200**	-	-	**7100**	**7000**
pH (lab) (SU)	NA	-	**7.3 J**	-	**7 J**	-	-	**7.4 J**	**7.2 J**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.006	0.002 U	-	0.002 U	-	0.002 U	0.002 U	-	-
Arsenic, Total	0.01	0.001 U	**0.00099 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Total	2	**0.015 J-**	**0.02 J**	**0.043 J-**	**0.047 J**	**0.016 J-**	**0.015 J-**	**0.013 J**	**0.013 J**
Beryllium, Total	0.004	0.001 UJ	-	0.001 UJ	-	0.001 UJ	0.001 UJ	-	-
Cadmium, Total	0.005	0.001 UJ	0.001 U	**0.00045 J**	**0.0004 J**	**0.00025 J**	**0.00023 J**	**0.00022 J**	**0.0002 J**
Chromium, Total	0.1	0.002 U	0.0023 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt, Total	0.006	**0.00021 J**	**0.0014**	**0.0022 J**	**0.0021**	**0.00016 J**	**0.00015 J**	0.0005 U	0.0005 U
Fluoride	4	**0.49**	**0.2 J+**	**0.49 J**	**0.39 J**	1.6	1.5	1.3	1.6
Lead, Total	0.015	0.001 UJ	**0.00015 J**	**0.00022 J**	**0.00015 J**	0.001 UJ	0.001 UJ	**0.00015 J**	0.001 U
Lithium, Total	0.04	0.005 U	**0.032**	**0.044 J**	**0.053**	**0.076 J**	**0.073 J**	**0.087**	**0.082**
Mercury, Total	0.002	**0.000085 J-**	0.0002 U	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Molybdenum, Total	0.1	**0.0028 J**	**0.0074**	**1.9 J**	**1.7**	**1 J**	**0.99 J**	1	**0.98**
Selenium, Total	0.05	0.005 U	0.005 U	**0.00083 J+**	0.005 U	**0.011 J+**	**0.01 J+**	**0.019 J**	**0.019 J**
Thallium, Total	0.002	0.001 U	-	0.001 U	-	0.001 U	0.001 U	-	-
Radiological (pCi/L)									
Radium-226	NA	**0.360 ± 0.209**	R	0.139 U ± 0.15	R	0.136 U ± 0.153	**0.336 ± 0.201**	R	R
Radium-228	NA	0.0870 U ± 0.21	0.192 U ± 0.271	**0.393 ± 0.226**	0.309 U ± 0.215	0.223 U ± 0.179	0.125 U ± 0.191	**0.400 ± 0.232**	0.364 U ± 0.238
Radium-226 & 228	5	**0.447 J ± 0.296**	0.372 UJ ± 0.282	**0.532 J ± 0.271**	R	**0.359 ± 0.235**	**0.461 J ± 0.277**	**0.738 J+ ± 0.259**	**0.639 J+ ± 0.257**

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - JUNE THROUGH AUGUST 2018
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA
FILE NO. 129420

Location Group	Action Level	Downgradient							
Location Name	Maximum	CCR-AP-4R	CCR-AP-4R	CCR-AP-5	CCR-AP-5	CCR-AP-6	CCR-AP-6	CCR-AP-7R	CCR-AP-7R
Sample Name	Contaminant	CCR-AP-4R-20180606	CCR-AP-4R-20180821	CCR-AP-5-20180606	CCR-AP-5-20180821	CCR-AP-6-20180607	CCR-AP-6-20180822	CCR-AP-7R-20180606	CCR-AP-7R-20180822
Sample Date	Level/Regonal	06/06/2018	08/21/2018	06/06/2018	08/21/2018	06/07/2018	08/22/2018	06/06/2018	08/22/2018
Lab Sample ID	Screening Level	180-78475-11	180-81110-3	180-78475-12	180-81110-4	180-78556-7	180-81267-2	180-78475-13	180-81267-3
Detection Monitoring - EPA Appendix III Constituents (mg/L)									
Boron, Total	NA	-	**0.077 J**	-	11	-	**6**	-	**3.4**
Calcium, Total	NA	-	**160**	-	**290**	-	**120**	-	**330**
Chloride	NA	-	**33**	-	**280**	-	**160**	-	**320**
Fluoride	4	**0.43**	**0.34**	**0.4**	**0.26 J+**	**0.23**	**0.44**	**0.15 J**	**0.19 J+**
Sulfate	NA	-	**100 J-**	-	**2400 J-**	-	**1100 J-**	-	**2600 J-**
Total Dissolved Solids (TDS)	NA	-	**960**	-	**4500**	-	**2500**	-	**4500**
pH (lab) (SU)	NA	-	**7.2 J**	-	**7.2 J**	-	**7.2 J**	-	**6.7 J**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)									
Antimony, Total	0.006	0.002 U	-	0.002 U	-	0.002 U	-	0.002 U	-
Arsenic, Total	0.01	0.001 U	0.001 U	0.001 U	0.001 U	R	**0.00046 J**	0.001 U	**0.00077 J**
Barium, Total	2	**0.098 J-**	**0.094 J**	**0.016 J-**	**0.015 J**	**0.022 J-**	**0.015 J**	**0.032 J-**	**0.031 J**
Beryllium, Total	0.004	0.001 UJ	-	0.001 UJ	-	0.001 UJ	-	0.001 UJ	-
Cadmium, Total	0.005	0.001 UJ	0.001 U	0.001 UJ	0.001 U	0.001 UJ	0.001 U	0.001 UJ	0.001 U
Chromium, Total	0.1	**0.0036 J+**	**0.0038 J+**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0033 J+**
Cobalt, Total	0.006	**0.00013 J**	0.0005 U	**0.00012 J**	0.0005 U	**0.0011 J**	**0.00017 J**	**0.00037 J**	**0.00049 J**
Fluoride	4	**0.43**	**0.34**	**0.4**	**0.26 J+**	**0.23**	**0.44**	**0.15 J**	**0.19 J+**
Lead, Total	0.015	0.001 UJ	0.001 U	0.001 UJ	0.001 U	**0.00013 J**	0.001 U	**0.00013 J**	**0.00031 J**
Lithium, Total	0.04	0.005 U	0.05 U	**0.013 J**	**0.023 J**	**0.026 J**	0.005 U	**0.02 J**	**0.019 J+**
Mercury, Total	0.002	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U
Molybdenum, Total	0.1	**0.0016 J**	**0.0015 J**	**0.054 J**	**0.052**	**0.0064 J**	**0.0032 J**	0.005 U	0.005 U
Selenium, Total	0.05	**0.0014 J+**	0.005 U	**0.00085 J+**	0.005 U	0.005 U	0.005 U	0.005 U	**0.00099 J**
Thallium, Total	0.002	0.001 U	-	0.001 U	-	0.001 U	-	0.001 U	-
Radiological (pCi/L)									
Radium-226	NA	0.216 U ± 0.173	R	**0.234 ± 0.173**	R	0.0628 U ± 0.107	**0.438 J ± 0.119**	0.186 U ± 0.169	R
Radium-228	NA	**0.354 ± 0.224**	0.414 U ± 0.284	0.225 U ± 0.222	**0.371 ± 0.222**	R	R	0.0364 U ± 0.199	R
Radium-226 & 228	5	**0.569 J ± 0.283**	**0.743 J+ ± 0.3**	**0.459 J ± 0.281**	**0.552 J+ ± 0.235**	R	R	0.222 U ± 0.261	R

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Background			
Location Name	Maximum	CCR-BK-1R	CCR-BK-1R	CCR-BK-2	CCR-BK-2
Sample Name	Contaminant	CCR-BK-1R-20190521	CCR-BK-1R-20191014	CCR-BK-2-20190521	CCR-BK-2-20191014
Sample Date	Level/ Regional	05/21/2019	10/14/2019	05/21/2019	10/14/2019
Lab Sample ID	Screening Levels	180-90467-7	180-97392-1	180-90467-8	180-97392-2
Detection Monitoring - EPA Appendix III Constituents (mg/L)					
Boron, Total	NA	0.08 U	**0.056 J**	**0.58**	**0.051 J**
Calcium, Total	NA	**37**	**34**	**71**	**35**
Chloride	NA	**2.3**	**2.4**	**4.6**	**17**
Fluoride	4	0.23 U	**0.2**	0.12 U	**0.07 J**
Sulfate	NA	**23**	**22**	**60**	**20**
Total Dissolved Solids (TDS)	NA	**230**	**210**	**440**	**230**
pH (lab) (SU)	NA	**7.4 J**	**7.2 HF**	**7.5 J**	**7 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)					
Antimony, Total	0.006	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.01	**0.00034 J**	**0.00036 J**	**0.00041 J**	0.001 U
Barium, Total	2	**0.027 J**	**0.036**	**0.045 J-**	**0.032**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.1	0.002 U	0.002 U	**0.0087**	0.002 U
Cobalt, Total	0.006	**0.00012 J**	**0.00017 J**	**0.0005**	**0.00011 J**
Fluoride	4	0.23 U	**0.2**	0.12 U	**0.07 J**
Lead, Total	0.015	**0.00016 J**	**0.00023 J**	0.001 U	0.001 U
Lithium, Total	0.04	0.0065 U	0.005 U	0.0095 U	0.005 U
Mercury, Total	0.002	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.00063 J**	**0.00075 J**	**0.0025 J**	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.002	0.001 U	0.001 U	0.001 U	0.001 U
Radiological (pCi/L)					
Radium-226	NA	**0.336 J ± 0.108**	0.0729 U ± 0.182	-0.0109 U ± 0.184	-0.0644 U ± 0.0992
Radium-228	NA	-0.0733 UJ ± 0.235	0.147 U ± 0.233	0.0733 U ± 0.246	0.323 U ± 0.292
Radium-226 & 228	5	0.336 UJ ± 0.259	0.220 U ± 0.296	0.0733 U ± 0.307	0.259 U ± 0.308
Field Parameters					
Temperature (Deg C)	NA	**15.78**	**15.72**	**14.47**	**16.04**
Dissolved Oxygen, Field (mg/L)	NA	**5.82**	**5.98**	**0.48**	**0.51**
Conductivity, Field (mS/cm)	NA	**0.34186**	**0.3542**	**0.72035**	**0.38427**
ORP, Field (mv)	NA	**43.3**	**104.9**	**47.9**	**72.1**
Turbidity, Field (NTU)	NA	**0.97**	**9.8**	**12.88**	**11.89**
pH, Field (SU)	NA	**7**	**6.34**	**7.2**	**6.54**

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient									
Location Name	Maximum	CCR-AP-1R	CCR-AP-1R	CCR-AP-2I	CCR-AP-2I	CCR-AP-2R	CCR-AP-2R	CCR-AP-3I	CCR-AP-3I	CCR-AP-3R	CCR-AP-3R
Sample Name	Contaminant	CCR-AP-1R-20190524	CCR-AP-1R-20191016	CCR-AP-2I-20190614	CCR-AP-2I-20191021	CCR-AP-2R-20190524	CCR-AP-2R-20191017	CCR-AP-3I-20190614	CCR-AP-3I-20191018	CCR-AP-3R-20190522	CCR-AP-3R-20191017
Sample Date	Level/ Regional	05/24/2019	10/16/2019	06/14/2019	10/21/2019	05/24/2019	10/17/2019	06/14/2019	10/18/2019	05/22/2019	10/17/2019
	Screening			180-91430-1				180-91430-2			
Lab Sample ID	Levels	180-90606-4	180-97535-1	1906640-1	180-97725-1	180-90606-5	180-97535-2	1906640-3	180-97535-4	180-90467-9	180-97535-3
Detection Monitoring - EPA Appendix III Constituents (mg/L)											
Boron, Total	NA	**4.5**	**4.6**	**2.1**	**2.2**	**11**	**11**	**2.2**	**2.3**	**11**	**14**
Calcium, Total	NA	**68**	**61**	**19**	**13 F1**	**300**	**280**	**16**	**18**	**260**	**280**
Chloride	NA	**69**	**55**	**110**	**97**	**530**	**440**	**150**	**140**	**620**	**670**
Fluoride	4	**0.57 J+**	**0.37**	**0.83**	**1.1**	**0.47 J+**	**0.3 J**	**1.1**	**1.2**	**1.3 J+**	**0.79**
Sulfate	NA	**530**	**410**	**23**	**7.6**	**2600**	**2500**	**16**	**14**	**3100**	**3700**
Total Dissolved Solids (TDS)	NA	**1500**	**1300**	**710**	**710**	**4100**	**4400**	**700**	**720**	**5800**	**5100**
pH (lab) (SU)	NA	**7.5 J**	**7.3 HF**	**7.6 J**	**8 HF**	**7.3 J**	**7.2 HF**	**8.1 J**	**8.1 HF**	**7.5 J**	**7.5 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)											
Antimony, Total	0.006	0.002 U	0.002 U	**0.00053 J**	**0.00052 J**	0.002 U	0.002 U	**0.00045 J**	0.002 U	0.02 U	0.002 U
Arsenic, Total	0.01	**0.00047 J**	**0.00038 J**	**0.0022**	**0.0019**	**0.00053 J**	**0.00058 J**	**0.0018**	**0.0016**	0.01 U	**0.00035 J**
Barium, Total	2	**0.025 J+**	**0.027 B**	**0.11**	**0.1**	**0.042 J+**	**0.023 B**	**0.17**	**0.17 B**	**0.16 J-**	**0.016 B**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	**0.00027 J^**	0.001 U	0.001 U	**0.00026 J**	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.001 U	**0.00023 J**	**0.00059 J**	**0.00039 J**	0.001 U	0.001 U	0.01 U	**0.00025 J**
Chromium, Total	0.1	0.002 U	0.002 U	0.004 U	**0.0027**	0.002 U	0.002 U	0.0046 U	0.002 U	0.02 U	0.002 U
Cobalt, Total	0.006	**0.00021 J**	**0.0002 J**	0.0005 U	**0.0004 J**	**0.0026**	**0.0026**	**0.0013**	**0.00059**	**0.0017 J**	**0.0019**
Fluoride	4	**0.57 J+**	**0.37**	**0.83**	**1.1**	**0.47 J+**	**0.3 J**	**1.1**	**1.2**	**1.3 J+**	**0.79**
Lead, Total	0.015	0.001 U	0.001 U	0.001 U	**0.00047 J**	**0.00016 J**	**0.00015 J**	0.0011 U	**0.00072 J**	0.01 U	**0.00013 J**
Lithium, Total	0.04	**0.0036 J**	0.025 U	**0.024**	**0.023**	**0.033**	**0.05**	**0.025**	**0.026**	**0.062**	**0.1**
Mercury, Total	0.002	0.0002 U	-	0.0002 U	-	0.0002 U	-	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.0042 J**	**0.0047 J**	**0.0092**	**0.0038 J**	**1.9**	**1.7**	**0.0061**	**0.0043 J**	**0.89**	**0.9**
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	**0.0074**
Thallium, Total	0.002	0.001 U	0.001 U	0.001 U	**0.00048 J**	0.001 U	0.001 U	**0.00013 J**	0.001 U	0.01 U	0.001 U
Radiological (pCi/L)											
Radium-226	NA	0.0879 U ± 0.0697	0.0796 U ± 0.0757	0.07 U ± 0.11	**0.349 ± 0.12**	**0.264 ± 0.102**	-0.0236 U ± 0.0528	**0.43 ± 0.25**	**0.397 ± 0.135**	**0.283 J ± 0.0999**	-0.0190 U ± 0.0631
Radium-228	NA	-0.0354 U ± 0.241	0.0814 U ± 0.239	0.53 U ± 0.37	0.237 U ± 0.249	**0.448 ± 0.291**	**0.518 ± 0.269**	0.56 U ± 0.39	0.357 U ± 0.251	0.163 UJ ± 0.283	**0.437 ± 0.253**
Radium-226 & 228	5	0.0879 U ± 0.251	0.161 U ± 0.251	0.60 U ± 0.386	**0.587 ± 0.276**	**0.713 ± 0.308**	**0.494 ± 0.274**	**0.99 J ± 0.463**	**0.753 ± 0.285**	0.447 UJ ± 0.3	**0.418 ± 0.261**
Field Parameters											
Temperature (Deg C)	NA	**16.16**	**15.44**	**19.55**	**17.3**	**18.73**	**16.89**	**18.31**	**18.55**	**18.78**	**18.29**
Dissolved Oxygen, Field (mg/L)	NA	**0.03**	**0.13**	**1.62**	**2.77**	**0.66**	**0.28**	**0.09**	**0.46**	**0.08**	**0.21**
Conductivity, Field (mS/cm)	NA	**2.0135**	**1.9694**	**1.264**	**1.2276**	**5.577**	**5.6187**	**1.2331**	**1.2989**	**7.4198**	**8.2589**
ORP, Field (mv)	NA	**-8.6**	**32.2**	**-16.2**	**99.2**	**90.9**	**111.1**	**-114.6**	**89**	**85.5**	**113.4**
Turbidity, Field (NTU)	NA	**0**	**3.77**	**17.09**	**14.99**	**2.19**	**1.83**	**141.52**	**49.94**	**0**	**0.49**
pH, Field (SU)	NA	**7.21**	**6.94**	**7.71**	**7.71**	**7.05**	**6.83**	**8.23**	**7.82**	**7.26**	**7.23**

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pCi/L: picoCurie per liter.
SU: standard units.
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Results in **bold** are detected.

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient									
Location Name	Maximum	CCR-AP-4R	CCR-AP-4R	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-7R	CCR-AP-7R
Sample Name	Contaminant	CCR-AP-4R-20190522	CCR-AP-4R-20191017	CCR-AP-5-20190522	ND DUPLICATE 2-20190	CCR-AP-5-20191017	CCR-AP-6-20190521	CCR-AP-6-20191016	ID DUPLICATE 1-20191	CCR-AP-7R-20190521	CCR-AP-7R-20191016
Sample Date	Level/ Regional	05/22/2019	10/17/2019	05/22/2019	05/22/2019	10/17/2019	05/21/2019	10/16/2019	10/16/2019	05/21/2019	10/16/2019
Lab Sample ID	Screening Levels	180-90467-10	180-97535-5	180-90467-11	180-90467-17	180-97535-6	180-90467-12	180-97535-7	180-97535-10	180-90467-13	180-97535-8
Detection Monitoring - EPA Appendix III Constituents (mg/L)											
Boron, Total	NA	**0.045 J**	**0.14**	**11**	**11**	**12**	**2.9**	**3.2**	**3**	**5.6**	**3.6**
Calcium, Total	NA	**190**	**180**	**410**	**420**	**390**	**320**	**300**	**310**	**410**	**370**
Chloride	NA	**40**	**41**	**410**	**390**	**380**	**230**	**220**	**210**	**500**	**250**
Fluoride	4	**0.41 J+**	**0.1**	**0.31 J+**	**0.31 J+**	**0.23 J**	0.17 U	**0.14 J**	**0.14 J**	0.17 U	**0.16 J**
Sulfate	NA	**99**	**94**	**3100**	**2900**	**2900**	**1200**	**1200**	**1200**	**2600**	**3100**
Total Dissolved Solids (TDS)	NA	**950**	**940**	**5000**	**4900**	**4800**	**2400**	**2400**	**2300**	**4200**	**4500**
pH (lab) (SU)	NA	**7.4 J**	**7.3 HF**	**7.4 J**	**7.4 J**	**7.3 HF**	**7.5 J**	**7.3 HF**	**7.2 HF**	**6.8 J**	**6.7 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)											
Antimony, Total	0.006	0.002 U	0.002 U	0.02 U	0.02 U	0.002 U	0.02 U	0.002 U	0.002 U	0.02 U	0.002 U
Arsenic, Total	0.01	**0.00038 J**	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	**0.00049 J**	**0.00043 J**	0.01 U	**0.00046 J**
Barium, Total	2	**0.094 J-**	**0.1 B**	**0.018 J**	**0.02 J**	**0.019 B**	0.1 UJ	**0.014 B**	**0.015 B**	**0.029 J**	**0.028 B**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	0.001 U
Chromium, Total	0.1	**0.0035**	**0.0025**	0.02 U	0.02 U	0.002 U	0.02 U	0.002 U	0.002 U	0.02 U	0.002 U
Cobalt, Total	0.006	**0.00017 J**	**0.00024 J**	0.005 U	0.005 U	**0.00034 J**	**0.0013 J**	**0.0011**	**0.001**	0.005 U	**0.00052**
Fluoride	4	**0.41 J+**	**0.1**	**0.31 J+**	**0.31 J+**	**0.23 J**	0.17 U	**0.14 J**	**0.14 J**	0.17 U	**0.16 J**
Lead, Total	0.015	0.001 U	**0.00013 J**	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	**0.00016 J**
Lithium, Total	0.04	0.0067 U	0.005 U	0.05 U	0.05 U	0.05 U	**0.034 J+**	**0.042**	**0.04**	0.05 U	**0.034 J**
Mercury, Total	0.002	0.0002 U	-	0.0002 U	0.0002 U	-	0.0002 U	-	-	0.0002 U	-
Molybdenum, Total	0.1	**0.0014 J**	**0.0013 J**	**0.059**	**0.053**	**0.058**	**0.0067 J**	**0.0064**	**0.0061**	0.05 U	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.05 U	0.05 U	0.005 U	0.05 U	0.005 U	0.005 U	0.05 U	0.005 U
Thallium, Total	0.002	0.001 U	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	0.001 U
Radiological (pCi/L)											
Radium-226	NA	0.0797 UJ ± 0.0791	0.132 U ± 0.0937	0.0606 UJ ± 0.0578	0.153 U ± 0.196	0.0430 U ± 0.0752	0.0195 UJ ± 0.0643	0.116 U ± 0.0914	**0.129 ± 0.0881**	-0.0773 U ± 0.198	0.104 U ± 0.0828
Radium-228	NA	0.412 UJ ± 0.361	0.251 U ± 0.244	-0.0634 UJ ± 0.257	0.254 U ± 0.27	**0.468 ± 0.264**	0.237 UJ ± 0.234	-0.0619 U ± 0.234	0.166 U ± 0.233	0.307 U ± 0.26	0.0730 U ± 0.233
Radium-226 & 228	5	0.492 UJ ± 0.37	0.382 U ± 0.261	0.0606 UJ ± 0.263	0.406 U ± 0.334	**0.511 ± 0.275**	0.257 UJ ± 0.243	0.0546 U ± 0.251	0.294 U ± 0.249	0.307 U ± 0.327	0.177 U ± 0.247
Field Parameters											
Temperature (Deg C)	NA	**15.77**	**14.22**	**16.6**	**16.6**	**16.67**	**15.42**	**14.33**	**14.33**	**15.25**	**13.9**
Dissolved Oxygen, Field (mg/L)	NA	**6.71**	**5.74**	**0.13**	**0.13**	**0.25**	**2.86**	**1.08**	**1.08**	**8.7**	**6.78**
Conductivity, Field (mS/cm)	NA	**1.4896**	**1.6039**	**5.9903**	**5.9903**	**6.2118**	**2.9476**	**3.154**	**3.154**	**5.2145**	**5.6246**
ORP, Field (mv)	NA	**25.7**	**55.9**	**73.3**	**73.3**	**87.8**	**-2.9**	**56.5**	**56.5**	**66.1**	**85.3**
Turbidity, Field (NTU)	NA	**1.67**	**8.3**	**0**	**0**	**0**	**4.05**	**1.52**	**1.52**	**6.41**	**25.87**
pH, Field (SU)	NA	**7.12**	**6.73**	**7.15**	**7.15**	**7**	**7.19**	**6.86**	**6.86**	**6.54**	**6.37**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals.
mg/L: milligram per liter.
pCi/L: picoCurie per liter.
SU: standard units.
USEPA: United States Environmental Protection Agency.
Results in **bold** are detected.

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient						
Location Name	Maximum	CCR-AP-8	CCR-AP-8	CCR-AP-9	CCR-AP-9	CCR-AP-9	CCR-AP-10	CCR-AP-10
Sample Name	Contaminant	CCR-AP-8-20190617	CCR-AP-8-20191021	CCR-AP-9-20190617	ND DUPLICATE-20190	CCR-AP-9-20191021	CCR-AP-10-20190617	CCR-AP-10-20191018
Sample Date	Level/ Regional	06/17/2019	10/21/2019	06/17/2019	06/17/2019	10/21/2019	06/17/2019	10/18/2019
	Screening	180-91430-3		180-91430-4	180-91430-6		180-91430-5	
Lab Sample ID	Levels	1906640-4	180-97725-2	1906640-5	1906640-7	180-97725-3	1906640-6	180-97535-9
Detection Monitoring - EPA Appendix III Constituents (mg/L)								
Boron, Total	NA	0.12 U	**0.2**	**9.5**	**9**	**7.9**	**7.5**	**7.4**
Calcium, Total	NA	**140**	**190**	**470**	**490**	**440**	**230**	**220**
Chloride	NA	**41**	**52**	**870**	**820**	**720**	**250**	**220**
Fluoride	4	**0.29 J+**	**0.3**	**0.33 J+**	**0.33 J+**	**0.52 J**	**0.45 J+**	**0.24 J**
Sulfate	NA	**210**	**500**	**4400**	**4200**	**4800**	**2000**	**2000**
Total Dissolved Solids (TDS)	NA	**810**	**1200**	**6900**	**7300**	**6600**	**3400**	**3300**
pH (lab) (SU)	NA	**7.2 J**	**7.2 HF**	**6.8 J**	**6.8 J**	**6.8 HF**	**7.4 J**	**7.4 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)								
Antimony, Total	0.006	0.002 U	0.002 U	0.02 U	0.02 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.01	**0.0013**	**0.001**	**0.023**	**0.023**	**0.022**	**0.0011**	**0.00054 J**
Barium, Total	2	**0.066**	**0.1**	**0.086 J**	**0.074 J**	**0.088**	**0.019**	**0.016 B**
Beryllium, Total	0.004	0.001 U	**0.00024 J^**	0.01 U	0.01 U	0.001 U^	**0.00021 J**	0.001 U
Cadmium, Total	0.005	0.001 U	**0.00015 J**	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.1	0.0039 U	**0.0022**	0.02 U	0.02 U	**0.0027**	0.0038 U	0.002 U
Cobalt, Total	0.006	**0.0046**	**0.0018**	0.005 U	0.005 U	**0.00081**	**0.0016**	**0.0011**
Fluoride	4	**0.29 J+**	**0.3**	**0.33 J+**	**0.33 J+**	**0.52 J**	**0.45 J+**	**0.24 J**
Lead, Total	0.015	0.001 U	**0.00018 J**	0.01 U	0.01 U	**0.00065 J**	0.001 U	**0.00031 J**
Lithium, Total	0.04	**0.011**	**0.013**	0.05 U	0.05 U	**0.032**	**0.0059**	0.025 U
Mercury, Total	0.002	0.0002 U	-	0.0002 U	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.001 J**	**0.001 J**	**0.021 J**	**0.021 J**	**0.014**	**0.0039 J**	**0.0028 J**
Selenium, Total	0.05	0.005 U	0.005 U	0.05 U	0.05 U	**0.0015 J**	**0.015**	**0.014**
Thallium, Total	0.002	0.001 U	**0.00029 J**	0.01 U	0.01 U	**0.00016 J**	**0.00013 J**	0.001 U
Radiological (pCi/L)								
Radium-226	NA	**0.35 ± 0.23**	0.104 U ± 0.0875	**0.58 ± 0.38**	**0.61 ± 0.38**	**0.260 ± 0.104**	0.32 U ± 0.27	0.0667 U ± 0.0737
Radium-228	NA	0.67 U ± 0.44	0.127 U ± 0.252	**0.76 ± 0.41**	0.63 U ± 0.38	**0.452 ± 0.294**	0.66 U ± 0.38	**0.490 ± 0.241**
Radium-226 & 228	5	**1.02 J ± 0.496**	0.231 U ± 0.267	**1.34 ± 0.559**	**1.24 J ± 0.537**	**0.713 ± 0.312**	**0.98 ± 0.466**	**0.556 ± 0.252**
Field Parameters								
Temperature (Deg C)	NA	**17.86**	**18.78**	**20.57**	**20.57**	**18.87**	**16.26**	**14.62**
Dissolved Oxygen, Field (mg/L)	NA	**0.35**	**0.76**	**0.01**	**0.01**	**0.15**	**0.43**	**1.79**
Conductivity, Field (mS/cm)	NA	**1.0861**	**1.5669**	**9.4045**	**9.4045**	**8.5938**	**4.6168**	**4.6003**
ORP, Field (mv)	NA	**12.4**	**-7.8**	**-165.1**	**-165.1**	**-82.2**	**11.5**	**120.8**
Turbidity, Field (NTU)	NA	**10.63**	**1.29**	**49.53**	**49.53**	**29.83**	**97.33**	**177.4**
pH, Field (SU)	NA	**7.38**	**6.85**	**7.66**	**7.66**	**7.03**	**7.85**	**7.09**

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HALEY ALDRICH

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ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
ASH POND
A.B. BROWN GENERATING STATION
POSEY COUNTY, INDIANA

by
Haley & Aldrich, Inc.
Greenville, South Carolina

for
Southern Indiana Gas and Electric Company
Evansville, Indiana

File No. 129420
January 2020

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1. 40 CFR § 257.90 Applicability

1.1 40 CFR § 257.90(a)

Except as provided for in § 257.100 for inactive CCR surface impoundments, all CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under § 257.90 through § 257.98.

The Ash Pond at A.B. Brown Generating Station (ABB) is subject to the groundwater monitoring and corrective action requirements described under Code of Federal Regulations Title 40 (40 CFR) § 257.90 through § 257.98 (Rule). This document addresses the requirement for the Owner/Operator to prepare an Annual Groundwater Monitoring and Corrective Action Report per § 257.90(e).

1.2 40 CFR § 257.90(e) - SUMMARY

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1).

This Annual Groundwater Monitoring and Corrective Action Report documents the activities completed in 2019 for the Ash Pond as required by the Rule. Groundwater sampling and analysis was conducted per the requirements described in § 257.93, and the status of the groundwater monitoring program described in § 257.95 is provided in this report.

1.2.1 Status of the Groundwater Monitoring Program

As provided in the notification on 15 January 2018 statistically significant increases (SSI) of Appendix III constituents were identified downgradient of the Ash Pond. An evaluation of alternate sources was conducted; however, a successful alternate source demonstration (ASD) was not achieved at that time. As a result, an Assessment Monitoring program was initiated as required by § 257.94(e)(2). The notification was placed in the facility's operating record as required by 257.105(h)(5). Annual and semi-annual groundwater samples were collected as outlined in § 257.95(b) and 257.95(d)(1) and groundwater protection standards were established as required by § 257.95(d)(2). Statistical analysis was completed in January 2019 as described in § 257.93(h)(2) and statistically significant levels (SSL) of Appendix IV constituents (lithium and molybdenum) were identified downgradient of the Ash Pond. An alternate source evaluation was conducted and was not successful in identifying a source other than the CCR unit. As a result, nature and extent and assessment of corrective measures was initiated as defined in § 257.96. A 60-day extension to complete the assessment of corrective measures (Appendix A) was

required and certified by a professional engineer as required by 257.96(a) resulting in completion of the Assessment of Corrective Measures in September 2019.

1.2.2 Key Actions Completed

The following key actions were completed in 2019:

- Completed a statistical analysis of assessment monitoring results to evaluate potential SSLs;
- Prepared 2018 Annual Report including:
  - The Annual Report was placed in the facility's operating record pursuant to § 257.105(h)(1);
  - Pursuant to § 257.106(h)(1), the notification was sent to the relevant State Director and/or Tribal authority within 30 days of the Annual Report being placed in the facility's operating record [§ 257.106(d)];
  - Pursuant to § 257.107(h)(1), the Annual Report was posted to the CCR Website within 30 days of the Annual Report being placed in the facility's operating record [§ 257.107(d) and 257.107(h)(1)];
- Evaluated the nature and extent of Appendix IV SSLs as required by § 257.95(g)(1);
- Collected and analyzed two rounds of groundwater samples in accordance with § 257.95
- Initiated and completed an assessment of corrective measures in accordance with § 257.96;
  - The 90-day deadline to complete the assessment of corrective measures was extended an additional 60-days in accordance with § 257.96(a). (Appendix A)
  - The assessment of corrective measures was placed in the facility's operating record in accordance with § 257.96(d).

1.2.3 Problems Encountered

No problems such as damaged wells, issues with sample collection or lack of sampling, and problems with analytical analysis were encountered at the ABB Ash Pond in 2019.

1.2.4 Actions to Resolve Problems

Actions to resolve problems were not required.

1.2.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2020 include the following:

- Further refine the characterization of the nature and extent of lithium and molybdenum in groundwater downgradient of the Ash Pond.
- Continue semiannual groundwater monitoring in accordance with § 257.95.
- Complete statistical analysis of the semiannual groundwater sampling results as required by § 257.93(h)(2).
- Hold a public meeting with interested and affected parties in accordance with § 257.96(e) to discuss the results of the corrective measures assessment at least 30 days prior to the selection of remedy.
- As soon as feasible following the public meeting select a remedy that, meets the standards outlined in § 257.97(b).

- As part of the selected remedy SIGECO will develop a schedule for implementing and completing remedial activities as defined in § 257.97(d).
- Prepare semiannual and annual progress reports, , describing the progress in selecting and designing the remedy as outlined in § 257.97(a).

1.3 40 CFR § 257.90(e) - INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

1.3.1 40 CFR § 257.90(e)(1)

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

As required by § 257.90(e)(1), a map showing the locations of the Ash Pond and associated upgradient, nature and extent and downgradient wells is presented as Figure 1.

1.3.2 40 CFR § 257.90(e)(2)

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

To characterize the horizontal and vertical nature and extent of SSLs at the Ash Pond, five new monitoring wells were installed in the uppermost aquifer downgradient of the Ash Pond. The new monitoring wells, identified as CCR-AP-2I, CCR-AP-3I, CCR-AP-8, CCR-AP-9 and CCR-AP-10 as shown on Figure 1, were completed in the intermediate zone within the uppermost aquifer. Location and construction details are provided in Table I.

1.3.3 40 CFR § 257.90(e)(3)

In addition to all the monitoring data obtained under § 257.90 through § 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

In accordance with § 257.95(b) and § 257.95(d)(1), two independent samples from each background and downgradient monitoring well were collected and analyzed. A summary table including the sample names, dates of sample collection, reason for sample collection (detection or assessment), and monitoring data obtained for the groundwater monitoring program for the Ash Pond is presented in Table II of this report.

1.3.4 40 CFR § 257.90(e)(4)

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

As required by § 257.95(d) through § 257.95(g) a statistical analysis of the Appendix IV constituents was completed by 15 January 2019. This statistical analysis determined that statistically significant levels of lithium and molybdenum were present downgradient of the Ash Pond. An evaluation of alternate

sources was initiated as required by § 257.94(e)(2). The Assessment Monitoring program was established to meet the requirements of 40 CFR § 257.95. Nature and extent and assessment of corrective measures was initiated as required by § 257.95 and § 257.96. Semiannual sampling will continue in 2020.

1.3.5 40 CFR § 257.90(e)(5)

Other information required to be included in the annual report as specified in § 257.90 through § 257.98.

Other information including development of groundwater protection standards, recording groundwater monitoring results in the operating record, and an evaluation of alternate sources is discussed in preceding sections.

TABLES

TABLE I

GROUNDWATER MONITORING WELL LOCATION AND CONSTRUCTION DETAILS

A.B. BROWN GENERATING STATION - ASH POND

MOUNT VERNON, INDIANA

Well	CCR Unit	Date Installed	Easting	Northing	Top of Pad Elevation (ft msl)	Top of Riser Elevation (ft msl)	Surface Grout (ft bgs)	Bentonite (ft bgs)	Sand Pack (ft bgs)	Screen Zone (ft bgs)	Screen Length (ft)	Well Radius (in)	Status
CCR-AP-1R	Ash Pond	July 2016	2773560.71	968260.82	464.70	467.57	0.0 - 23.0	23.0 - 25.0	25.0 - 37.0	27.00 - 37.00	10	2	Active
CCR-AP-2R	Ash Pond	July 2016	2771922.52	969079.16	465.40	468.13	0.0 - 39.0	39.0 - 41.0	41.0 - 53.3	43.30 - 53.30	10	2	Active
CCR-AP-2I	Ash Pond	January 2019	**319167.75	**148852.17	465.82	468.88	0.0 - 77.0	77.0 - 79.0	79.0 - 93.3	83.00 - 93.00	10	2	Available
CCR-AP-3R	Ash Pond	July 2016	2771404.27	966865.12	450.10	449.13	0.0 - 33.0	33.0 - 35.0	35.0 - 47.0	37.00 - 47.00	10	2	Active
CCR-AP-3I	Ash Pond	January 2019	**318653.79	**146643.51	450.35	450.35	0.0 - 63.5	63.5 - 67.5	67.5 - 77.8	67.50 - 77.50	10	2	Available
CCR-AP-4R	Ash Pond	July 2016	2772827.01	966741.47	472.80	475.38	0.0 - 34.0	34.0 - 36.0	36.0 - 48.0	38.00 - 48.00	10	2	Active
CCR-AP-5	Ash Pond	March 2016	2771019.70	968166.03	451.00	453.77	0.0 - 31.0	31.0 - 33.0	33.0 - 45.0	35.00 - 45.00	10	2	Active
CCR-AP-6	Ash Pond	March 2016	2771626.75	969932.76	458.90	461.57	0.0 - 25.0	25.0 - 27.0	27.0 - 39.0	29.00 - 39.00	10	2	Active
CCR-AP-7R	Ash Pond	July 2016	2773501.63	970758.70	486.00	488.57	0.0 - 39.5	39.5 - 41.5	41.5 - 53.5	43.50 - 53.50	10	2	Active
CCR-AP-8	Ash Pond	January 2019	**317746.04	**149793.38	413.97	417.17	0.0 - 2.0	2.0 - 4.2	4.2 - 16.5	6.20 - 16.20	10	2	Available
CCR-AP-9	Ash Pond	January 2019	**316940.58	**147282.61	392.51	392.51	0.0 - 19.5	19.5 - 22.5	22.5 - 35.5	25.20 - 35.20	10	2	Available
CCR-AP-10	Ash Pond	January 2019	**319549.96	**146467.58	471.46	474.34	0.0 - 29.2	29.2 - 31.2	31.2 - 43.5	33.20 - 43.20	10	2	Available
CCR-BK-1R	Background	March 2016	2770919.08	974083.40	480.10	483.39	0.0 - 50.0	50.0 - 52.0	52.0 - 64.0	54.00 - 64.00	10	2	Active
CCR-BK-2	Background	March 2016	2769728.14	972854.33	427.50	430.60	0.0 - 11.5	11.5 - 13.5	13.5 - 25.5	15.50 - 25.50	10	2	Active
APPW-1I	Ash Pond	November 2018	-	-	-	-	+	12.0 - 14.0	14.0 - 20.0	15.00 - 20.00	5	2	Available
APPW-1D	Ash Pond	November 2018	-	-	-	-	+	24.0 - 28.0	28.0 - 29.0	29.00 - 34.00	5	2	Available
APPW-2S	Ash Pond	November 2018	-	-	-	-	+	10.0 - 12.0	13.0 - 19.0	14.00 - 19.00	5	2	Available
APPW-2I	Ash Pond	November 2018	-	-	-	-	+	26.0 - 28.0	28.0 - 34.0	29.00 - 34.00	5	2	Available
APPW-2D	Ash Pond	November 2018	-	-	-	-	+	34.0 - 38.0	38.0 - 44.0	39.00 - 44.00	5	2	Available
APPW-3	Ash Pond	November 2018	-	-	-	-	+	16.0 - 18.0	18.0 - 29.0	19.00 - 29.00	10	2	Available
APPW-4S	Ash Pond	November 2018	-	-	-	-	+	12.0 - 14.0	14.0 - 20.0	15.00 - 20.00	5	2	Available
APPW-4I	Ash Pond	November 2018	-	-	-	-	+	34.0 - 36.0	36.0 - 42.0	37.00 - 42.00	5	2	Available
APPW-4D	Ash Pond	November 2018	-	-	-	-	+	42.0 - 47.0	47.0 - 54.0	49.00 - 54.00	5	2	Available
APPW-5I	Ash Pond	November 2018	-	-	-	-	+	10.0 - 12.0	12.0 - 18.0	13.00 - 18.00	5	2	Available
APPW-5D	Ash Pond	November 2018	-	-	-	-	+	17.0 - 23.0	23.0 - 29.0	24.00 - 29.00	5	2	Available

Notes:

bgs = below ground surface

- = not been surveyed

+ = Natural collaspe

ft = feet

in = inches

msl = mean sea level

Datum of Elevations in NAVD 88

**Elevation of wells is based on IN State Plane (US Foot) West NAD27

TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Background			
Location Name	Maximum	CCR-BK-1R	CCR-BK-1R	CCR-BK-2	CCR-BK-2
Sample Name	Contaminant	CCR-BK-1R-20190521	CCR-BK-1R-20191014	CCR-BK-2-20190521	CCR-BK-2-20191014
Sample Date	Level/ Regional	05/21/2019	10/14/2019	05/21/2019	10/14/2019
Lab Sample ID	Screening Levels	180-90467-7	180-97392-1	180-90467-8	180-97392-2
Detection Monitoring - EPA Appendix III Constituents (mg/L)					
Boron, Total	NA	0.08 U	**0.056 J**	**0.58**	**0.051 J**
Calcium, Total	NA	**37**	**34**	**71**	**35**
Chloride	NA	**2.3**	**2.4**	**4.6**	**17**
Fluoride	4	0.23 U	**0.2**	0.12 U	**0.07 J**
Sulfate	NA	**23**	**22**	**60**	**20**
Total Dissolved Solids (TDS)	NA	**230**	**210**	**440**	**230**
pH (lab) (SU)	NA	**7.4 J**	**7.2 HF**	**7.5 J**	**7 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)					
Antimony, Total	0.006	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.01	**0.00034 J**	**0.00036 J**	**0.00041 J**	0.001 U
Barium, Total	2	**0.027 J**	**0.036**	**0.045 J-**	**0.032**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.1	0.002 U	0.002 U	**0.0087**	0.002 U
Cobalt, Total	0.006	**0.00012 J**	**0.00017 J**	**0.0005**	**0.00011 J**
Fluoride	4	0.23 U	**0.2**	0.12 U	**0.07 J**
Lead, Total	0.015	**0.00016 J**	**0.00023 J**	0.001 U	0.001 U
Lithium, Total	0.04	0.0065 U	0.005 U	0.0095 U	0.005 U
Mercury, Total	0.002	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.00063 J**	**0.00075 J**	**0.0025 J**	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.002	0.001 U	0.001 U	0.001 U	0.001 U
Radiological (pCi/L)					
Radium-226	NA	**0.336 J ± 0.108**	0.0729 U ± 0.182	-0.0109 U ± 0.184	-0.0644 U ± 0.0992
Radium-228	NA	-0.0733 UJ ± 0.235	0.147 U ± 0.233	0.0733 U ± 0.246	0.323 U ± 0.292
Radium-226 & 228	5	0.336 UJ ± 0.259	0.220 U ± 0.296	0.0733 U ± 0.307	0.259 U ± 0.308
Field Parameters					
Temperature (Deg C)	NA	**15.78**	**15.72**	**14.47**	**16.04**
Dissolved Oxygen, Field (mg/L)	NA	**5.82**	**5.98**	**0.48**	**0.51**
Conductivity, Field (mS/cm)	NA	**0.34186**	**0.3542**	**0.72035**	**0.38427**
ORP, Field (mv)	NA	**43.3**	**104.9**	**47.9**	**72.1**
Turbidity, Field (NTU)	NA	**0.97**	**9.8**	**12.88**	**11.89**
pH, Field (SU)	NA	**7**	**6.34**	**7.2**	**6.54**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals.
mg/L: milligram per liter.
pCi/L: picoCurie per liter.
SU: standard units.
USEPA: United States Environmental Protection Agency.
Results in **bold** are detected.

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient									
Location Name	Maximum	CCR-AP-1R	CCR-AP-1R	CCR-AP-2I	CCR-AP-2I	CCR-AP-2R	CCR-AP-2R	CCR-AP-3I	CCR-AP-3I	CCR-AP-3R	CCR-AP-3R
Sample Name	Contaminant	CCR-AP-1R-20190524	CCR-AP-1R-20191016	CCR-AP-2I-20190614	CCR-AP-2I-20191021	CCR-AP-2R-20190524	CCR-AP-2R-20191017	CCR-AP-3I-20190614	CCR-AP-3I-20191018	CCR-AP-3R-20190522	CCR-AP-3R-20191017
Sample Date	Level/ Regional	05/24/2019	10/16/2019	06/14/2019	10/21/2019	05/24/2019	10/17/2019	06/14/2019	10/18/2019	05/22/2019	10/17/2019
	Screening			180-91430-1				180-91430-2			
Lab Sample ID	Levels	180-90606-4	180-97535-1	1906640-1	180-97725-1	180-90606-5	180-97535-2	1906640-3	180-97535-4	180-90467-9	180-97535-3
Detection Monitoring - EPA Appendix III Constituents (mg/L)											
Boron, Total	NA	**4.5**	**4.6**	**2.1**	**2.2**	**11**	**11**	**2.2**	**2.3**	**11**	**14**
Calcium, Total	NA	**68**	**61**	**19**	**13 F1**	**300**	**280**	**16**	**18**	**260**	**280**
Chloride	NA	**69**	**55**	**110**	**97**	**530**	**440**	**150**	**140**	**620**	**670**
Fluoride	4	**0.57 J+**	**0.37**	**0.83**	**1.1**	**0.47 J+**	**0.3 J**	**1.1**	**1.2**	**1.3 J+**	**0.79**
Sulfate	NA	**530**	**410**	**23**	**7.6**	**2600**	**2500**	**16**	**14**	**3100**	**3700**
Total Dissolved Solids (TDS)	NA	**1500**	**1300**	**710**	**710**	**4100**	**4400**	**700**	**720**	**5800**	**5100**
pH (lab) (SU)	NA	**7.5 J**	**7.3 HF**	**7.6 J**	**8 HF**	**7.3 J**	**7.2 HF**	**8.1 J**	**8.1 HF**	**7.5 J**	**7.5 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)											
Antimony, Total	0.006	0.002 U	0.002 U	**0.00053 J**	**0.00052 J**	0.002 U	0.002 U	**0.00045 J**	0.002 U	0.02 U	0.002 U
Arsenic, Total	0.01	**0.00047 J**	**0.00038 J**	**0.0022**	**0.0019**	**0.00053 J**	**0.00058 J**	**0.0018**	**0.0016**	0.01 U	**0.00035 J**
Barium, Total	2	**0.025 J+**	**0.027 B**	**0.11**	**0.1**	**0.042 J+**	**0.023 B**	**0.17**	**0.17 B**	**0.16 J-**	**0.016 B**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	**0.00027 J^**	0.001 U	0.001 U	**0.00026 J**	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.001 U	**0.00023 J**	**0.00059 J**	**0.00039 J**	0.001 U	0.001 U	0.01 U	**0.00025 J**
Chromium, Total	0.1	0.002 U	0.002 U	0.004 U	**0.0027**	0.002 U	0.002 U	0.0046 U	0.002 U	0.02 U	0.002 U
Cobalt, Total	0.006	**0.00021 J**	**0.0002 J**	0.0005 U	**0.0004 J**	**0.0026**	**0.0026**	**0.0013**	**0.00059**	**0.0017 J**	**0.0019**
Fluoride	4	**0.57 J+**	**0.37**	**0.83**	**1.1**	**0.47 J+**	**0.3 J**	**1.1**	**1.2**	**1.3 J+**	**0.79**
Lead, Total	0.015	0.001 U	0.001 U	0.001 U	**0.00047 J**	**0.00016 J**	**0.00015 J**	0.0011 U	**0.00072 J**	0.01 U	**0.00013 J**
Lithium, Total	0.04	**0.0036 J**	0.025 U	**0.024**	**0.023**	**0.033**	**0.05**	**0.025**	**0.026**	**0.062**	**0.1**
Mercury, Total	0.002	0.0002 U	-	0.0002 U	-	0.0002 U	-	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.0042 J**	**0.0047 J**	**0.0092**	**0.0038 J**	**1.9**	**1.7**	**0.0061**	**0.0043 J**	**0.89**	**0.9**
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	**0.0074**
Thallium, Total	0.002	0.001 U	0.001 U	0.001 U	**0.00048 J**	0.001 U	0.001 U	**0.00013 J**	0.001 U	0.01 U	0.001 U
Radiological (pCi/L)											
Radium-226	NA	0.0879 U ± 0.0697	0.0796 U ± 0.0757	0.07 U ± 0.11	**0.349 ± 0.12**	**0.264 ± 0.102**	-0.0236 U ± 0.0528	**0.43 ± 0.25**	**0.397 ± 0.135**	**0.283 J ± 0.0999**	-0.0190 U ± 0.0631
Radium-228	NA	-0.0354 U ± 0.241	0.0814 U ± 0.239	0.53 U ± 0.37	0.237 U ± 0.249	**0.448 ± 0.291**	**0.518 ± 0.269**	0.56 U ± 0.39	0.357 U ± 0.251	0.163 UJ ± 0.283	**0.437 ± 0.253**
Radium-226 & 228	5	0.0879 U ± 0.251	0.161 U ± 0.251	0.60 U ± 0.386	**0.587 ± 0.276**	**0.713 ± 0.308**	**0.494 ± 0.274**	**0.99 J ± 0.463**	**0.753 ± 0.285**	0.447 UJ ± 0.3	**0.418 ± 0.261**
Field Parameters											
Temperature (Deg C)	NA	**16.16**	**15.44**	**19.55**	**17.3**	**18.73**	**16.89**	**18.31**	**18.55**	**18.78**	**18.29**
Dissolved Oxygen, Field (mg/L)	NA	**0.03**	**0.13**	**1.62**	**2.77**	**0.66**	**0.28**	**0.09**	**0.46**	**0.08**	**0.21**
Conductivity, Field (mS/cm)	NA	**2.0135**	**1.9694**	**1.264**	**1.2276**	**5.577**	**5.6187**	**1.2331**	**1.2989**	**7.4198**	**8.2589**
ORP, Field (mv)	NA	**-8.6**	**32.2**	**-16.2**	**99.2**	**90.9**	**111.1**	**-114.6**	**89**	**85.5**	**113.4**
Turbidity, Field (NTU)	NA	**0**	**3.77**	**17.09**	**14.99**	**2.19**	**1.83**	**141.52**	**49.94**	**0**	**0.49**
pH, Field (SU)	NA	**7.21**	**6.94**	**7.71**	**7.71**	**7.05**	**6.83**	**8.23**	**7.82**	**7.26**	**7.23**

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TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient									
Location Name	Maximum	CCR-AP-4R	CCR-AP-4R	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-6	CCR-AP-6	CCR-AP-6	CCR-AP-7R	CCR-AP-7R
Sample Name	Contaminant	CCR-AP-4R-20190522	CCR-AP-4R-20191017	CCR-AP-5-20190522	ND DUPLICATE 2-20190	CCR-AP-5-20191017	CCR-AP-6-20190521	CCR-AP-6-20191016	ID DUPLICATE 1-20191	CCR-AP-7R-20190521	CCR-AP-7R-20191016
Sample Date	Level/ Regional	05/22/2019	10/17/2019	05/22/2019	05/22/2019	10/17/2019	05/21/2019	10/16/2019	10/16/2019	05/21/2019	10/16/2019
	Screening										
Lab Sample ID	Levels	180-90467-10	180-97535-5	180-90467-11	180-90467-17	180-97535-6	180-90467-12	180-97535-7	180-97535-10	180-90467-13	180-97535-8
Detection Monitoring - EPA Appendix III Constituents (mg/L)											
Boron, Total	NA	**0.045 J**	**0.14**	**11**	**11**	**12**	**2.9**	**3.2**	**3**	**5.6**	**3.6**
Calcium, Total	NA	**190**	**180**	**410**	**420**	**390**	**320**	**300**	**310**	**410**	**370**
Chloride	NA	**40**	**41**	**410**	**390**	**380**	**230**	**220**	**210**	**500**	**250**
Fluoride	4	**0.41 J+**	**0.1**	**0.31 J+**	**0.31 J+**	**0.23 J**	0.17 U	**0.14 J**	**0.14 J**	0.17 U	**0.16 J**
Sulfate	NA	**99**	**94**	**3100**	**2900**	**2900**	**1200**	**1200**	**1200**	**2600**	**3100**
Total Dissolved Solids (TDS)	NA	**950**	**940**	**5000**	**4900**	**4800**	**2400**	**2400**	**2300**	**4200**	**4500**
pH (lab) (SU)	NA	**7.4 J**	**7.3 HF**	**7.4 J**	**7.4 J**	**7.3 HF**	**7.5 J**	**7.3 HF**	**7.2 HF**	**6.8 J**	**6.7 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)											
Antimony, Total	0.006	0.002 U	0.002 U	0.02 U	0.02 U	0.002 U	0.02 U	0.002 U	0.002 U	0.02 U	0.002 U
Arsenic, Total	0.01	**0.00038 J**	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	**0.00049 J**	**0.00043 J**	0.01 U	**0.00046 J**
Barium, Total	2	**0.094 J-**	**0.1 B**	**0.018 J**	**0.02 J**	**0.019 B**	0.1 UJ	**0.014 B**	**0.015 B**	**0.029 J**	**0.028 B**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	0.001 U
Chromium, Total	0.1	**0.0035**	**0.0025**	0.02 U	0.02 U	0.002 U	0.02 U	0.002 U	0.002 U	0.02 U	0.002 U
Cobalt, Total	0.006	**0.00017 J**	**0.00024 J**	0.005 U	0.005 U	**0.00034 J**	**0.0013 J**	**0.0011**	**0.001**	0.005 U	**0.00052**
Fluoride	4	**0.41 J+**	**0.1**	**0.31 J+**	**0.31 J+**	**0.23 J**	0.17 U	**0.14 J**	**0.14 J**	0.17 U	**0.16 J**
Lead, Total	0.015	0.001 U	**0.00013 J**	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	**0.00016 J**
Lithium, Total	0.04	0.0067 U	0.005 U	0.05 U	0.05 U	0.05 U	**0.034 J+**	**0.042**	**0.04**	0.05 U	**0.034 J**
Mercury, Total	0.002	0.0002 U	-	0.0002 U	0.0002 U	-	0.0002 U	-	-	0.0002 U	-
Molybdenum, Total	0.1	**0.0014 J**	**0.0013 J**	**0.059**	**0.053**	**0.058**	**0.0067 J**	**0.0064**	**0.0061**	0.05 U	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.05 U	0.05 U	0.005 U	0.05 U	0.005 U	0.005 U	0.05 U	0.005 U
Thallium, Total	0.002	0.001 U	0.001 U	0.01 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U	0.01 U	0.001 U
Radiological (pCi/L)											
Radium-226	NA	0.0797 UJ ± 0.0791	0.132 U ± 0.0937	0.0606 UJ ± 0.0578	0.153 U ± 0.196	0.0430 U ± 0.0752	0.0195 UJ ± 0.0643	0.116 U ± 0.0914	**0.129 ± 0.0881**	-0.0773 U ± 0.198	0.104 U ± 0.0828
Radium-228	NA	0.412 UJ ± 0.361	0.251 U ± 0.244	-0.0634 UJ ± 0.257	0.254 U ± 0.27	**0.468 ± 0.264**	0.237 UJ ± 0.234	-0.0619 U ± 0.234	0.166 U ± 0.233	0.307 U ± 0.26	0.0730 U ± 0.233
Radium-226 & 228	5	0.492 UJ ± 0.37	0.382 U ± 0.261	0.0606 UJ ± 0.263	0.406 U ± 0.334	**0.511 ± 0.275**	0.257 UJ ± 0.243	0.0546 U ± 0.251	0.294 U ± 0.249	0.307 U ± 0.327	0.177 U ± 0.247
Field Parameters											
Temperature (Deg C)	NA	**15.77**	**14.22**	**16.6**	**16.6**	**16.67**	**15.42**	**14.33**	**14.33**	**15.25**	**13.9**
Dissolved Oxygen, Field (mg/L)	NA	**6.71**	**5.74**	**0.13**	**0.13**	**0.25**	**2.86**	**1.08**	**1.08**	**8.7**	**6.78**
Conductivity, Field (mS/cm)	NA	**1.4896**	**1.6039**	**5.9903**	**5.9903**	**6.2118**	**2.9476**	**3.154**	**3.154**	**5.2145**	**5.6246**
ORP, Field (mv)	NA	**25.7**	**55.9**	**73.3**	**73.3**	**87.8**	**-2.9**	**56.5**	**56.5**	**66.1**	**85.3**
Turbidity, Field (NTU)	NA	**1.67**	**8.3**	**0**	**0**	**0**	**4.05**	**1.52**	**1.52**	**6.41**	**25.87**
pH, Field (SU)	NA	**7.12**	**6.73**	**7.15**	**7.15**	**7**	**7.19**	**6.86**	**6.86**	**6.54**	**6.37**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals.
mg/L: milligram per liter.
pCi/L: picoCurie per liter.
SU: standard units.
USEPA: United States Environmental Protection Agency.
Results in **bold** are detected.

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

TABLE II
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY THROUGH OCTOBER 2019
A.B. BROWN GENERATION STATION
MOUNT VERNON, INDIANA

Location Group	Action Level	Downgradient						
Location Name	Maximum	CCR-AP-8	CCR-AP-8	CCR-AP-9	CCR-AP-9	CCR-AP-9	CCR-AP-10	CCR-AP-10
Sample Name	Contaminant	CCR-AP-8-20190617	CCR-AP-8-20191021	CCR-AP-9-20190617	ND DUPLICATE-201906	CCR-AP-9-20191021	CCR-AP-10-20190617	CCR-AP-10-20191018
Sample Date	Level/ Regional	06/17/2019	10/21/2019	06/17/2019	06/17/2019	10/21/2019	06/17/2019	10/18/2019
	Screening	180-91430-3		180-91430-4	180-91430-6		180-91430-5	
Lab Sample ID	Levels	1906640-4	180-97725-2	1906640-5	1906640-7	180-97725-3	1906640-6	180-97535-9
Detection Monitoring - EPA Appendix III Constituents (mg/L)								
Boron, Total	NA	0.12 U	**0.2**	**9.5**	**9**	**7.9**	**7.5**	**7.4**
Calcium, Total	NA	**140**	**190**	**470**	**490**	**440**	**230**	**220**
Chloride	NA	**41**	**52**	**870**	**820**	**720**	**250**	**220**
Fluoride	4	**0.29 J+**	**0.3**	**0.33 J+**	**0.33 J+**	**0.52 J**	**0.45 J+**	**0.24 J**
Sulfate	NA	**210**	**500**	**4400**	**4200**	**4800**	**2000**	**2000**
Total Dissolved Solids (TDS)	NA	**810**	**1200**	**6900**	**7300**	**6600**	**3400**	**3300**
pH (lab) (SU)	NA	**7.2 J**	**7.2 HF**	**6.8 J**	**6.8 J**	**6.8 HF**	**7.4 J**	**7.4 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)								
Antimony, Total	0.006	0.002 U	0.002 U	0.02 U	0.02 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.01	**0.0013**	**0.001**	**0.023**	**0.023**	**0.022**	**0.0011**	**0.00054 J**
Barium, Total	2	**0.066**	**0.1**	**0.086 J**	**0.074 J**	**0.088**	**0.019**	**0.016 B**
Beryllium, Total	0.004	0.001 U	**0.00024 J^**	0.01 U	0.01 U	0.001 U^	**0.00021 J**	0.001 U
Cadmium, Total	0.005	0.001 U	**0.00015 J**	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.1	0.0039 U	**0.0022**	0.02 U	0.02 U	**0.0027**	0.0038 U	0.002 U
Cobalt, Total	0.006	**0.0046**	**0.0018**	0.005 U	0.005 U	**0.00081**	**0.0016**	**0.0011**
Fluoride	4	**0.29 J+**	**0.3**	**0.33 J+**	**0.33 J+**	**0.52 J**	**0.45 J+**	**0.24 J**
Lead, Total	0.015	0.001 U	**0.00018 J**	0.01 U	0.01 U	**0.00065 J**	0.001 U	**0.00031 J**
Lithium, Total	0.04	**0.011**	**0.013**	0.05 U	0.05 U	**0.032**	**0.0059**	0.025 U
Mercury, Total	0.002	0.0002 U	-	0.0002 U	0.0002 U	-	0.0002 U	-
Molybdenum, Total	0.1	**0.001 J**	**0.001 J**	**0.021 J**	**0.021 J**	**0.014**	**0.0039 J**	**0.0028 J**
Selenium, Total	0.05	0.005 U	0.005 U	0.05 U	0.05 U	**0.0015 J**	**0.015**	**0.014**
Thallium, Total	0.002	0.001 U	**0.00029 J**	0.01 U	0.01 U	**0.00016 J**	**0.00013 J**	0.001 U
Radiological (pCi/L)								
Radium-226	NA	**0.35 ± 0.23**	0.104 U ± 0.0875	**0.58 ± 0.38**	**0.61 ± 0.38**	**0.260 ± 0.104**	0.32 U ± 0.27	0.0667 U ± 0.0737
Radium-228	NA	0.67 U ± 0.44	0.127 U ± 0.252	**0.76 ± 0.41**	0.63 U ± 0.38	**0.452 ± 0.294**	0.66 U ± 0.38	**0.490 ± 0.241**
Radium-226 & 228	5	**1.02 J ± 0.496**	0.231 U ± 0.267	**1.34 ± 0.559**	**1.24 J ± 0.537**	**0.713 ± 0.312**	**0.98 ± 0.466**	**0.556 ± 0.252**
Field Parameters								
Temperature (Deg C)	NA	**17.86**	**18.78**	**20.57**	**20.57**	**18.87**	**16.26**	**14.62**
Dissolved Oxygen, Field (mg/L)	NA	**0.35**	**0.76**	**0.01**	**0.01**	**0.15**	**0.43**	**1.79**
Conductivity, Field (mS/cm)	NA	**1.0861**	**1.5669**	**9.4045**	**9.4045**	**8.5938**	**4.6168**	**4.6003**
ORP, Field (mv)	NA	**12.4**	**-7.8**	**-165.1**	**-165.1**	**-82.2**	**11.5**	**120.8**
Turbidity, Field (NTU)	NA	**10.63**	**1.29**	**49.53**	**49.53**	**29.83**	**97.33**	**177.4**
pH, Field (SU)	NA	**7.38**	**6.85**	**7.66**	**7.66**	**7.03**	**7.85**	**7.09**

ABBREVIATIONS AND NOTES:

CCR: Coal Combustion Residuals.
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pCi/L: picoCurie per liter.
SU: standard units.
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Results in **bold** are detected.

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FIGURES

LEGEND

- CCR MONITORING WELL
- NATURE AND EXTENT MONITORING WELL
- CCR PIEZOMETER WELL
- ASH POND UNIT BOUNDARY

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.

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SCALE IN FEET

HALEY ALDRICH

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

GROUNDWATER MONITORING WELL LOCATIONS - ASH POND

JANAURY 2020

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\bos_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2020_011129420_001_0001_MONITORING_WELL_LOCATIONS_BROWN_ASH_POND.mxd — USER: dfeirgl — LAST SAVED: 1/29/2020 1:44:21 PM

APPENDIX A

60 Day CMA Extension Demonstration

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

MEMORANDUM

July 2019
Project No. 129420-011

SUBJECT: **Demonstration for 60-Day Extension – Corrective Measures Assessment (CMA)**
Southern Indiana Gas and Electric Company (SIGECO)
Ash Pond
A. B. Brown Generating Station (ABB); Posey County, Indiana

Pursuant to 40 CFR §257.96(a) (CCR Rule Assessment of Corrective Measures), I certify that SIGECO has demonstrated the need for additional time beyond the period of 90 days to complete the assessment of corrective measures due to site-specific conditions and the evaluation of remedial treatment alternatives in support of an informed CMA process.

In the case of the assessment of corrective measures for the ABB Ash Pond, the site has complex hydrogeology. In addition, SIGECO is in the process of reviewing possible groundwater remedies and is having ongoing discussions with third-party experts regarding potential closure strategies, including beneficial reuse as well as implementation of critical steps in the groundwater treatment and remedy assessment process. Based on these site-specific conditions and related groundwater treatment alternatives evaluations in support of the CMA by SIGECO, the CCR Rule allows for a 60-day extension to complete the CMA process.

This certification as submitted, is to the best of my knowledge, accurate and complete.

Signed:_____

Certifying Engineer

Print Name:	Steven F. Putrich, P.E.
Indiana License No.:	PE11200566
Title:	CCR Practice Lead, Senior Consulting Engineer
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal

HALEY & ALDRICH, INC.
400 Augusta Street
Suite 130
Greenville, SC 29601
864.214.8750

24 September 2020
File No. 129420

TO: Southern Indiana Gas and Electric Company

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

SUBJECT: May 2020 Sampling Results and Assessment Monitoring Statistical Analysis Summary Pursuant to 40 CFR § 257.96(b)
A.B. Brown Generating Station – Ash Pond – West Franklin, Indiana

Southern Indiana Gas and Electric Company (SIGECO) is implementing the 17 April 2015 United States Environmental Protection Agency Federal Coal Combustion Residuals (CCR) Rule (40 CFR § 257 and 261) for the A.B. Brown Generating Station, in Posey County near West Franklin, Indiana. Detection monitoring events occurred in 2016 and 2017. The results of the sampling events were compared to background using appropriate statistical methods to determine if Appendix III constituents were present at concentrations above background. The result of the statistical analysis identified statistically significant increases of Appendix III constituents downgradient of the Ash Pond thereby triggering Assessment Monitoring and respective notification of the same.

During the Assessment Monitoring phase, groundwater samples were collected from the CCR monitoring well network. Samples were collected in June, and August 2018 and subsequently analyzed for the Appendix III and Appendix IV constituents as required by 40 CFR § 257.95(b) and 40 CFR § 257.95(d)(1). Concurrent with the second assessment sampling round, and as required by 40 CFR § 257.95(h), groundwater protection standards (GWPS) were established for the detected Appendix IV constituents. The assessment monitoring sampling results were compared to the GWPS to determine if statistically significant levels (SSL) of Appendix IV constituents were present downgradient of the Ash Pond. The results of this evaluation indicated that lithium and molybdenum were present in groundwater at SSLs above the GWPS thereby requiring notification as established by 40 CFR § 105(h)(8) and triggering an assessment of corrective measures.

As a result of this determination, and in accordance with 40 CFR § 257.95(g)(3), a field investigation was initiated to demonstrate that a source other than the Ash Pond caused the lithium and molybdenum contamination. The field investigation included sampling and analysis of naturally occurring coal identified near monitoring well CCR-AP-2R as an alternative source of molybdenum and lithium and surface water sampling from the Coal Pile Runoff Pond and lower pool of the Ash Pond to evaluate the effluent from the coal pile runoff as an alternate source of the Appendix IV SSLs detected at CCR-AP-3R. While this investigation showed that the naturally occurring coal and the coal pile runoff were contributing sources, they did not contribute lithium and molybdenum at levels that resulted in a

determination of an alternative source. Consequently, both lithium and molybdenum were carried forward into the assessment of corrective measures.

As required by 40 CFR § 257.95(b) and 40 CFR § 257.95(d)(1), semiannual groundwater sampling and analysis continued for the Ash Pond in 2020. The first round of semiannual groundwater sampling was conducted in May 2020. Analytical results for the May 2020 semiannual sampling event are summarized in Table I. For the Ash Pond, statistical analysis of the May 2020 analytical results was finalized within 90-days of completion of sampling and analysis as required by 40 CFR § 257.93(g). Downgradient wells were compared to each constituents' respective GWPS. The assessment monitoring statistical analysis summary is provided in Table II.

If the detected constituent was greater than the associated GWPS for that Unit, pursuant to 40 CFR § 257.93 (f)(5), the confidence interval method was used to evaluate if that Appendix IV constituent was present at a SSL. Based on the comparisons outlined above, the results of the statistical analyses conducted for those detected Appendix IV constituents confirm that lithium and molybdenum remain as the only constituents present at SSLs above GWPSs downgradient of the Ash Pond. This information is being provided for SIGECO's records. Since no new constituents were identified at SSLs above the GWPS, further notifications associated with the statistical analysis of the May 2020 sampling results are not required at this time.

Attachments:
Table I - Summary of Analytical Results – May 2020
Table II - Assessment Monitoring Statistical Analysis Summary – May 2020

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TABLE I
SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY 2020
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA
FILE NO. 129420

Location Group	Action Level	Upgradient		Downgradient								
Location	Maximum	CCR-BK-1R	CCR-BK-2	CCR-AP-1R	CCR-AP-2I	CCR-AP-2R	CCR-AP-3I	CCR-AP-3R	CCR-AP-4R	CCR-AP-5	CCR-AP-6	CCR-AP-7R
Sample Date	Contaminant Level/	05/26/2020	05/26/2020	05/26/2020	05/26/2020	05/26/2020	05/26/2020	05/26/2020	05/21/2020	05/26/2020	05/22/2020	05/22/2020
Sample Type	Regional Screening	N	N	N	N	N	N	N	N	N	N	N
Sample Name	Levels	CCR-BK-1R-20200526	CCR-BK-2-20200526	CCR-AP-1R-20200526	CCR-AP-2I-20200526	CCR-AP-2R-20200526	CCR-AP-3I-20200526	CCR-AP-3R-20200526	CCR-AP-4R-20200521	CCR-AP-5-20200526	CCR-AP-6-20200522	CCR-AP-7R-20200522
Detection Monitoring - EPA Appendix III Constituents (mg/L)												
Boron, Total	-	**0.11 B**	**0.091 B**	**3.5 B**	**1.9 B**	**13 B**	**2.2 B**	**13 B**	**0.041 J**	**12 B**	**4.5**	**5**
Calcium, Total	-	**41**	**56**	**47**	**14**	**340**	**19**	**300**	**180**	**430**	**310**	**420**
Chloride	-	**3.7**	**10**	**39**	**97**	**580**	**150**	**730**	**28**	**420**	**260**	**2400**
Fluoride	4	**0.37**	**0.21**	**0.62**	**1.1**	**0.76**	**1.4**	**1.7**	**0.26**	**0.56**	**0.12 J**	**0.55**
Sulfate	-	**24**	**42**	**280**	**1.9**	**2800**	**12**	**4200**	**99**	**2900**	**1500**	**14000**
Total Dissolved Solids (TDS)	-	**220**	**450**	**1100**	**740**	**5600**	**740**	**6600**	**920**	**4900**	**2600**	**4400**
pH (lab) (SU)	-	**7 HF**	**7.1 HF**	**7.2 HF**	**7.5 HF**	**7.1 HF**	**8 HF**	**7.4 HF**	**7.2 HF**	**7.1 HF**	**7.2 HF**	**6.6 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)												
Antimony, Total	0.006	0.002 U	0.002 U	0.002 U	0.002 U	0.02 U	0.002 U	0.02 U	0.002 U	0.02 U	0.002 U	**0.0004 J**
Arsenic, Total	0.01	0.001 U	0.001 U	**0.00031 J**	**0.0013**	0.01 U	**0.0021**	0.01 U	0.001 U	0.01 U	**0.0011**	**0.00057 J**
Barium, Total	2	**0.031**	**0.038**	**0.026**	**0.096**	**0.021 J**	**0.16**	**0.019 J**	**0.091**	**0.02 J**	**0.013**	**0.026**
Beryllium, Total	0.004	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U
Chromium, Total	0.1	0.002 U	0.002 U	0.002 U	0.002 U	0.02 U	0.002 U	0.02 U	**0.0027**	0.02 U	0.002 U	0.002 U
Cobalt, Total	0.006	**0.00015 J**	0.0005 U	0.0005 U	**0.00019 J**	**0.0027 J**	**0.00014 J**	0.005 U	0.0005 U	0.005 U	**0.00098**	**0.00023 J**
Fluoride	4	**0.37**	**0.21**	**0.62**	**1.1**	**0.76**	**1.4**	**1.7**	**0.26**	**0.56**	**0.12 J**	**0.55**
Lead, Total	0.015	**0.00023 J**	0.001 U	0.001 U	0.001 U	0.01 U	**0.00021 J**	0.01 U	0.001 U	0.01 U	**0.00019 J**	**0.00016 J**
Lithium, Total	0.04	0.005 U	**0.0036 J**	0.005 U	**0.022**	**0.035 J**	**0.023**	**0.074**	0.005 U	0.05 U	**0.029**	**0.021**
Mercury, Total	0.002	0.0002 U	**0.0002**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum, Total	0.1	**0.00079 J**	**0.0015 J**	**0.0042 J**	**0.0014 J**	**2**	**0.0023 J**	**0.86**	**0.0012 J**	**0.071**	**0.0057**	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	0.005 U	0.05 U	0.005 U	0.05 U	0.005 U	0.005 U
Thallium, Total	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	**0.00023 J**	0.01 U	0.001 U	0.01 U	0.001 U	0.001 U
Radiological (pCi/L)												
Radium-226	-	0.0680 U ± 0.124	-0.0171 U ± 0.066	0.0878 U ± 0.123	**0.329 ± 0.196**	**0.213 ± 0.148**	**0.385 ± 0.17**	-0.0218 U ± 0.0691	**0.114 ± 0.0759**	0.0594 U ± 0.0909	0.00136 U ± 0.0653	0.0914 U ± 0.0671
Radium-228	-	0.141 U ± 0.307	-0.0790 U ± 0.213	0.113 U ± 0.259	**0.362 ± 0.226**	**0.339 ± 0.224**	**0.391 ± 0.228**	**0.636 ± 0.247**	0.319 U ± 0.335	**0.492 ± 0.235**	0.300 U ± 0.211	0.327 U ± 0.237
Radium-226 & 228	5	0.209 U ± 0.331	-0.0961 U ± 0.223	0.200 U ± 0.287	**0.690 ± 0.299**	**0.552 ± 0.268**	**0.776 ± 0.284**	**0.615 ± 0.256**	0.433 U ± 0.343	**0.552 ± 0.252**	0.301 U ± 0.221	**0.418 ± 0.246**

ABBREVIATIONS AND NOTES:

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mg/L: milligram per liter.
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SUMMARY OF GROUNDWATER QUALITY DATA
ASH POND - MAY 2020
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA
FILE NO. 129420

Location Group	Action Level	Downgradient				
Location	Maximum	CCR-AP-7R	CCR-AP-8	CCR-AP-9	CCR-AP-10	CCR-AP-11
Sample Date	Contaminant Level/	05/22/2020	05/22/2020	05/26/2020	05/21/2020	05/29/2020
Sample Type	Regional Screening	FD	N	N	N	N
Sample Name	Levels	BLIND DUPLICATE 1-20200522	CCR-AP-8-20200522	CCR-AP-9-20200526	CCR-AP-10-20200521	CCR-AP-11-20200529
Detection Monitoring - EPA Appendix III Constituents (mg/L)						
Boron, Total	-	**5.2**	**0.34**	**7.5 B**	**7.1**	**0.91 B**
Calcium, Total	-	**400**	**240**	**490**	**220**	**120**
Chloride	-	**430**	**79**	**630**	**210**	**54**
Fluoride	4	0.5 U	**0.22**	**0.56**	**0.34**	**0.19**
Sulfate	-	**3000**	**700**	**3700**	**2300**	**200**
Total Dissolved Solids (TDS)	-	**4700**	**1500**	**6000**	**3100**	**850**
pH (lab) (SU)	-	**6.6 HF**	**7.1 HF**	**6.7 HF**	**7.4 HF**	**7 HF**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)						
Antimony, Total	0.006	0.002 U	0.002 U	0.02 U	0.002 U	0.002 U
Arsenic, Total	0.01	**0.00043 J**	**0.00036 J**	**0.017**	**0.00045 J**	**0.0011**
Barium, Total	2	**0.025**	**0.089**	**0.083 J**	**0.012**	**0.06**
Beryllium, Total	0.004	0.001 U	0.001 U	**0.0022 J**	0.001 U	0.001 U
Cadmium, Total	0.005	0.001 U	0.001 U	0.01 U	0.001 U	0.001 U
Chromium, Total	0.1	0.002 U	0.002 U	0.02 U	0.002 U	0.002 U
Cobalt, Total	0.006	**0.00021 J**	**0.00054**	0.005 U	**0.00073**	**0.00099**
Fluoride	4	0.5 U	**0.22**	**0.56**	**0.34**	**0.19**
Lead, Total	0.015	**0.00034 J**	0.001 U	**0.0028 J**	**0.00016 J**	**0.00091 J**
Lithium, Total	0.04	**0.02**	**0.012**	0.05 U	0.005 U	**0.014**
Mercury, Total	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	-
Molybdenum, Total	0.1	0.005 U	**0.00082 J**	**0.0089 J**	**0.0026 J**	**0.00082 J**
Selenium, Total	0.05	0.005 U	0.005 U	0.05 U	**0.018**	**0.0075**
Thallium, Total	0.002	0.001 U	0.001 U	0.01 U	0.001 U	0.001 U
Radiological (pCi/L)						
Radium-226	-	**0.227 ± 0.096**	**0.208 ± 0.0939**	**0.319 ± 0.185**	0.113 U ± 0.107	0.0569 U ± 0.0942
Radium-228	-	**0.352 ± 0.221**	0.177 U ± 0.309	**0.807 ± 0.381**	0.294 U ± 0.295	**0.440 ± 0.267**
Radium-226 & 228	5	**0.578 ± 0.241**	0.385 U ± 0.323	**1.13 ± 0.424**	0.408 U ± 0.314	**0.497 ± 0.283**

ABBREVIATIONS AND NOTES:
CCR: Coal Combustion Residuals.
mg/L: milligram per liter.
pCi/L: picoCurie per liter.
SU: standard units.
USEPA: United States Environmental Protection Agency.
Results in **bold** are detected.

- USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

Table II
A.B. Brown Generating Station
Ash Pond
Assessment Monitoring Statistical Analysis Summary
Prepared: September 01, 2020

																				Inter-well Analysis					
Location Id	Frequency of Detection	Percent Non-Detects	Range of Non-Detect	Mean	50th Percentile (Median)	95th Percentile	Maximum Detect	Variance	Standard Deviation	Coefficient of Variance	CCR MCL/RSL	Report Result Unit	Detection Exceedances (Y/N)	Number of Detection Exceedances	Outlier Detected	Outlier Removed	Trend	Distribution Group*	Distribution Well*	May 2020 Concentrations	Detect?	Upper Tolerance Limit	Background Limit (Higher of MCL/RSL or Upper Tolerance Limit)	[2]Exceedance above Background at Individual Well	SSL
CCR Appendix-IV: Antimony, Total (mg/L)																									
CCR-BK-1	2/13	85%	0.002-0.002	0.00346	0.004	0.004	0.0009	8.388E-07	0.0012952	0.7482	0.006	mg/L	N	0	N	N	Stable	Non-parametric	Non-parametric			0.002	0.006		
CCR-BK-2	1/13	92%	0.002-0.002	0.00376	0.004	0.004	0.00096	3.412E-07	0.0008262	0.4388	0.006	mg/L	N	0	N	N	Stable		Non-parametric						
CCR-AP-1	0/13	100%	0.002-0.002	0.004	0.004	0.004		0	0	0	0.006	mg/L	N	0	N	N	NA		Non-parametric	0.002	N			N	FALSE
CCR-AP-2	1/13	92%	0.002-0.02	0.00924	0.004	0.04	0.00022	0.00008994	0.013412	2.9	0.006	mg/L	N	0	Y	N	Stable		Non-parametric	0.020	N			Y	FALSE
CCR-AP-3	1/13	92%	0.00022-0.02	0.01174	0.004	0.04	0.000184	0.00012546	0.01584	2.698	0.006	mg/L	N	0	Y	N	Stable		Non-parametric	0.020	N			Y	FALSE
CCR-AP-4	0/13	100%	0.002-0.002	0.004	0.004	0.004		0	0	0	0.006	mg/L	N	0	N	N	NA		Non-parametric	0.002	N			N	FALSE
CCR-AP-5	0/13	100%	0.002-0.02	0.0123	0.004	0.04		0.00011964	0.015468	2.514	0.006	mg/L	N	0	N	N	NA		Non-parametric	0.020	N			Y	FALSE
CCR-AP-6	1/13	92%	0.002-0.02	0.00656	0.004	0.031	0.00136	0.0000487	0.009868	3.006	0.006	mg/L	N	0	N	N	Stable		Non-parametric	0.002	N			N	FALSE
CCR-AP-7	2/13	85%	0.002-0.02	0.0063	0.004	0.031	0.00118	0.0000498	0.00998	3.166	0.006	mg/L	N	0	N	N	Stable		Non-parametric	0.0004	Y			N	FALSE
CCR Appendix-IV: Arsenic, Total (mg/L)																									
CCR-BK-1	12/14	14%	0.001-0.001	0.00184	0.00195	0.0043	0.005	6.922E-07	0.0011766	1.279	0.01	mg/L	N	0	N	N	Stable	Non-parametric	Normal			0.004	0.010		
CCR-BK-2	7/14	50%	0.001-0.001	0.0023	0.002	0.00651	0.007	1.5966E-06	0.001787	1.549	0.01	mg/L	N	0	N	N	Stable		Log transformed						
CCR-AP-1	11/14	21%	0.001-0.001	0.001962	0.00127	0.0076	0.0104	0.000003048	0.00247	2.518	0.01	mg/L	N	0	N	N	Stable		Log transformed	0.00031	Y			N	FALSE
CCR-AP-2	8/14	43%	0.001-0.01	0.00438	0.002	0.02	0.0048	0.00002156	0.006566	2.996	0.01	mg/L	N	0	N	N	Stable		Log transformed	0.01000	N			N	FALSE
CCR-AP-3	5/14	64%	0.001-0.01	0.0054	0.002	0.02	0.00088	0.00003026	0.00778	2.878	0.01	mg/L	N	0	Y	N	Stable		Non-parametric	0.01000	N			N	FALSE
CCR-AP-4	8/14	43%	0.001-0.001	0.001242	0.00097	0.002	0.00118	2.356E-07	0.0006864	1.1046	0.01	mg/L	N	0	N	N	Stable		Non-parametric	0.00100	N			N	FALSE
CCR-AP-5	3/14	79%	0.001-0.01	0.00558	0.002	0.02	0.00114	0.00002958	0.00769	2.758	0.01	mg/L	N	0	Y	N	Stable		Non-parametric	0.01000	N			N	FALSE
CCR-AP-6	13/14	7%	0.01-0.01	0.0065	0.0061	0.01671	0.0106	0.000012066	0.004912	1.51	0.01	mg/L	N	0	N	N	Decrease		Normal	0.00110	Y			N	FALSE
CCR-AP-7	12/14	14%	0.001-0.01	0.00362	0.002	0.01524	0.0064	0.000011766	0.00485	2.686	0.01	mg/L	N	0	N	N	Stable		Normal	0.00057	Y			N	FALSE
CCR Appendix-IV: Barium, Total (mg/L)																									
CCR-BK-1	14/14	0%	-	0.0808	0.075	0.1409	0.164	0.0003498	0.02646	0.6554	2	mg/L	N	0	Y	N	Stable	Non-parametric	Non-parametric			0.150	2.000		
CCR-BK-2	14/14	0%	-	0.0916	0.073	0.2286	0.3	0.0017864	0.05978	1.3056	2	mg/L	N	0	Y	N	Stable		Non-parametric						
CCR-AP-1	14/14	0%	-	0.0418	0.037	0.0722	0.082	0.00009998	0.014142	0.6756	2	mg/L	N	0	N	N	Stable		Log transformed	0.026	Y			N	FALSE
CCR-AP-2	14/14	0%	-	0.0798	0.085	0.1006	0.102	0.00015462	0.017586	0.4412	2	mg/L	N	0	N	N	Stable		Normal	0.021	Y			N	FALSE
CCR-AP-3	14/14	0%	-	0.0548	0.034	0.2248	0.32	0.00282	0.0751	2.746	2	mg/L	N	0	Y	N	Stable		Log transformed	0.019	Y			N	FALSE
CCR-AP-4	14/14	0%	-	0.1584	0.18	0.233	0.24	0.001348	0.05192	0.6554	2	mg/L	N	0	N	N	Stable		Normal	0.091	Y			N	FALSE
CCR-AP-5	14/14	0%	-	0.0326	0.032	0.0393	0.04	0.000008424	0.004104	0.252	2	mg/L	N	0	Y	N	Stable		Normal	0.020	Y			N	FALSE
CCR-AP-6	13/14	7%	0.1-0.1	0.0538	0.042	0.158	0.08	0.0009418	0.0434	1.6116	2	mg/L	N	0	N	N	Stable		Normal	0.013	Y			N	FALSE
CCR-AP-7	14/14	0%	-	0.0732	0.065	0.1169	0.126	0.0002242	0.02118	0.5778	2	mg/L	N	0	N	N	Stable		Normal	0.026	Y			N	FALSE
CCR Appendix-IV: Beryllium, Total (mg/L)																									
CCR-BK-1	1/13	92%	0.001-0.001	0.001864	0.002	0.002	0.00024	1.1438E-07	0.0004782	0.513	0.004	mg/L	N	0	N	N	Stable	Non-parametric	Non-parametric			0.001	0.004		
CCR-BK-2	2/13	85%	0.001-0.001	0.001782	0.002	0.002	0.0008	1.4036E-07	0.0005298	0.5948	0.004	mg/L	N	0	N	N	Stable		Non-parametric						
CCR-AP-1	3/13	77%	0.001-0.001	0.001606	0.002	0.002	0.00038	2.694E-07	0.0007342	0.9138	0.004	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR-AP-2	4/13	69%	0.001-0.01	0.00426	0.002	0.02	0.00054	0.00002366	0.00688	3.224	0.004	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-3	2/13	85%	0.001-0.01	0.00452	0.002	0.02	0.00042	0.00002282	0.006756	2.99	0.004	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-4	0/13	100%	0.001-0.001	0.002	0.002	0.002		0	0	0	0.004	mg/L	N	0	N	N	NA		Non-parametric	0.001	N			N	FALSE
CCR-AP-5	2/13	85%	0.001-0.01	0.0045	0.002	0.02	0.00032	0.00002294	0.006774	3.014	0.004	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-6	3/13	77%	0.001-0.001	0.001696	0.002	0.002	0.00102	1.7408E-07	0.00059	0.6954	0.004	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR-AP-7	2/13	85%	0.001-0.001	0.00175	0.002	0.002	0.00048	1.8082E-07	0.0006014	0.6876	0.004	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR Appendix-IV: Cadmium, Total (mg/L)																									
CCR-BK-1	0/14	100%	0.001-0.001	0.002	0.002	0.002		0	0	0	0.005	mg/L	N	0	N	N	NA	Non-parametric	Non-parametric			0.001	0.005		
CCR-BK-2	0/14	100%	0.001-0.001	0.002	0.002	0.002		0	0	0	0.005	mg/L	N	0	N	N	NA		Non-parametric						
CCR-AP-1	4/14	71%	0.001-0.001	0.001542	0.002	0.002	0.00056	2.722E-07	0.0007378	0.9566	0.005	mg/L	N	0	N	N	Stable		Non-parametric	0.0010	N			N	FALSE
CCR-AP-2	12/14	14%	0.01-0.01	0.00364	0.00085	0.02	0.0016	0.0000232	0.00681	3.75	0.005	mg/L	N	0	Y	N	Stable		Non-parametric	0.0100	N			Y	FALSE
CCR-AP-3	11/14	21%	0.01-0.01	0.00464	0.00049	0.02	0.0006	0.0000334	0.008172	3.528	0.005	mg/L	N	0	Y	N	Stable		Non-parametric	0.0100	N			Y	FALSE
CCR-AP-4	2/14	86%	0.001-0.001	0.001752	0.002	0.002	0.00036	1.9202E-07	0.0006198	0.7074	0.005	mg/L	N	0	Y	N	Stable		Non-parametric	0.0010	N			N	FALSE
CCR-AP-5	2/14	86%	0.001-0.01	0.0056	0.002	0.02	0.00024	0.00002948	0.00768	2.74	0.005	mg/L	N	0	Y	N	Stable		Non-parametric	0.0100	N			Y	FALSE
CCR-AP-6	2/14	86%	0.001-0.01	0.00304	0.002	0.0137	0.00042	0.000011634	0.004824	3.164	0.005	mg/L	N	0	Y	N	Stable		Non-parametric	0.0010	N			N	FALSE
CCR-AP-7	7/14	50%	0.001-0.01	0.00246	0.00132	0.0137	0.00064	0.00001259	0.005018	4.07	0.005	mg/L	N	0	N	N	Stable		Non-parametric	0.0010	N			N	FALSE
CCR Appendix-IV: Chromium, Total (mg/L)																									
CCR-BK-1	11/14	21%	0.002-0.002	0.00484	0.0045	0.01198	0.0152	0.000005574	0.003338	1.3772	0.1	mg/L	N	0	Y	N	Increase	Non-parametric	Normal			0.009	0.1		
CCR-BK-2	5/14	64%	0.002-0.002	0.0058	0.004	0.0146	0.0174	0.000007726	0.00393	1.3568	0.1	mg/L	N	0	N	N	Stable		Non-parametric						
CCR-AP-1	1/14	93%	0.002-0.0023	0.00392	0.004	0.00439	0.0022	1.2952E-07	0.000509	0.26	0.1	mg/L	N	0	Y	N	Stable		Non-parametric	0.0020	N			N	FALSE
CCR-AP-2	3/14	79%	0.002-0.02	0.00902	0.004	0.04	0.0072	0.00008372	0.01294	2.868	0.1	mg/L	N	0	Y	N	Stable		Non-parametric	0.0200	N			N	FALSE
CCR-AP-3	3/14	79%	0.002-0.02	0.01116	0.004	0.04	0.0017	0.00011812	0.01537	2.754	0.1	mg/L	N	0	Y	N	Stable		Non-parametric	0.0200	N			N	FALSE
CCR-AP-4	14/14	0%	-	0.00482	0.0044	0.00746	0.0076	0.000001145	0.0015134	0.6286	0.1	mg/L	N	0	N	N	Increase		Normal	0.0027	Y			N	FALSE
CCR-AP-5	1/14	93%	0.002-0.02	0.01152	0.004	0.04	0.00124	0.00011498	0.015164	2.634	0.1	mg/L	N	0	Y	N	Stable		Non-parametric	0.0200	N			N	FALSE
CCR-AP-6	5/14	64%	0.002-0.02	0.00692	0.004	0.03104	0.0144	0.0000482	0.009818	2.836	0.1	mg/L	N	0	Y	N	Stable		Non-parametric	0.0020	N			N	FALSE
CCR-AP-7	10/14	29%	0.002-0.02	0.00728	0.004	0.0304	0.0126	0.00004666	0.00966	2.65	0.1	mg/L	N	0	N	N	Stable		Normal	0.0020	N			N	FALSE

CCR Appendix-IV: Cobalt, Total (mg/L)																										
CCR-BK-1	13/14	7%	0.0005-0.0005	0.000855	0.00069	0.00241	0.0028	0.000000607	0.0007791	0.9112	0.006	mg/L	N	0	Y	N	Stable	Non-parametric	Log transformed			0.006	0.006			
CCR-BK-2	8/14	43%	0.0005-0.0005	0.000915	0.0005	0.003145	0.0062	0.000002478	0.001574	1.721	0.006	mg/L	Y	1	Y	N	Stable		Log transformed							
CCR-AP-1	13/14	7%	0.0005-0.0005	0.0021	0.000775	0.008855	0.011	0.00001031	0.00321	1.529	0.006	mg/L	Y	2	N	N	Decreasing		Log transformed	0.00050	N			N	FALSE	
CCR-AP-2	14/14	0%	-	0.00285	0.00255	0.004845	0.0079	0.000002243	0.001498	0.5255	0.006	mg/L	Y	1	Y	N	Stable		Log transformed	0.00270	Y			N	FALSE	
CCR-AP-3	9/14	36%	0.0005-0.005	0.00117	0.000425	0.005	0.0019	0.000002956	0.001719	1.472	0.006	mg/L	N	0	Y	N	Stable		Log transformed	0.00500	N			N	FALSE	
CCR-AP-4	9/14	36%	0.0005-0.0005	0.000573	0.0004	0.001681	0.0033	0.000000655	0.0008093	1.413	0.006	mg/L	N	0	N	N	Stable		Log transformed	0.00050	N			N	FALSE	
CCR-AP-5	6/14	57%	0.0005-0.005	0.00137	0.0005	0.005	0.00081	0.000003917	0.001979	1.448	0.006	mg/L	N	0	N	N	Stable		Log transformed	0.00500	N			N	FALSE	
CCR-AP-6	14/14	0%	-	0.00234	0.0013	0.00589	0.0068	0.000003728	0.001931	0.8256	0.006	mg/L	Y	1	N	N	Decreasing		Normal	0.00098	Y			N	FALSE	
CCR-AP-7	13/14	7%	0.005-0.005	0.00172	0.00125	0.00435	0.004	0.000002396	0.001548	0.8988	0.006	mg/L	N	0	N	N	Stable		Normal	0.00023	Y			N	FALSE	
CCR Appendix-III: Fluoride (mg/L)																										
CCR-BK-1	13/14	7%	0.23-0.23	2.56	2.68	3.04	3.04	0.020944	0.40936	1.2792	4	mg/L	N	0	N	N	Stable	Non-parametric	Normal			0.380	4.000			
CCR-BK-2	13/14	7%	0.12-0.12	1.192	1.12	1.68	1.68	0.010456	0.2892	1.9464	4	mg/L	N	0	N	N	Decreasing		Normal							
CCR-AP-1	11/14	21%	0.5-5	6.008	3.8	40	5.84	11.512	9.6	12.768	4	mg/L	N	0	Y	N	Stable		Non-parametric	0.62	Y			N	FALSE	
CCR-AP-2	12/14	14%	0.5-0.5	4.208	4	7.2	7.2	0.21544	1.3128	2.4936	4	mg/L	N	0	N	N	Stable		Normal	0.76	Y			N	FALSE	
CCR-AP-3	14/14	0%	-	8.64	7.84	13.6	13.6	0.65728	2.2928	2.116	4	mg/L	N	0	N	N	Stable		Normal	1.70	Y			N	FALSE	
CCR-AP-4	14/14	0%	-	2.968	3.24	3.84	3.84	0.067592	0.73536	1.98	4	mg/L	N	0	N	N	Stable		Normal	0.26	Y			N	FALSE	
CCR-AP-5	12/14	14%	0.5-0.5	2.832	2.52	4.48	4.48	0.11584	0.9624	2.7176	4	mg/L	N	0	N	N	Stable		Normal	0.56	Y			N	FALSE	
CCR-AP-6	11/14	21%	0.1-0.17	1.568	1.56	3.52	3.52	0.051152	0.63968	3.2568	4	mg/L	N	0	N	N	Increasing		Log transformed	0.12	N			N	FALSE	
CCR-AP-7	11/14	21%	0.17-0.25	1.728	1.52	4.4	4.4	0.08472	0.8232	3.8104	4	mg/L	N	0	N	N	Stable		Normal	0.55	Y			N	FALSE	
CCR Appendix-IV: Lead, Total (mg/L)																										
CCR-BK-1	13/14	7%	0.001-0.001	0.001116	0.00115	0.00213	0.0022	2.752E-07	0.000742	1.3292	0.015	mg/L	N	0	N	N	Stable	Non-parametric	Normal			0.011	0.015			
CCR-BK-2	5/14	64%	0.001-0.001	0.00368	0.002	0.01626	0.022	0.00001428	0.005344	2.9	0.015	mg/L	N	0	Y	N	Stable		Non-parametric							
CCR-AP-1	4/14	71%	0.001-0.001	0.001702	0.002	0.00239	0.0026	2.518E-07	0.0007096	0.834	0.015	mg/L	N	0	N	N	Stable		Non-parametric	0.00100	N			N	FALSE	
CCR-AP-2	7/14	50%	0.001-0.01	0.00446	0.002	0.02	0.0104	0.00002414	0.006946	3.122	0.015	mg/L	N	0	Y	N	Stable		Non-parametric	0.01000	N			N	FALSE	
CCR-AP-3	4/14	71%	0.001-0.01	0.00538	0.002	0.02	0.00056	0.00003046	0.007806	2.898	0.015	mg/L	N	0	Y	N	Stable		Non-parametric	0.01000	N			N	FALSE	
CCR-AP-4	5/14	64%	0.001-0.001	0.001386	0.002	0.002	0.00046	3.536E-07	0.0008408	1.213	0.015	mg/L	N	0	N	N	Stable		Non-parametric	0.00100	N			N	FALSE	
CCR-AP-5	2/14	86%	0.001-0.01	0.00442	0.002	0.02	0.0014	0.00002106	0.00649	2.936	0.015	mg/L	N	0	Y	N	Stable		Non-parametric	0.01000	N			N	FALSE	
CCR-AP-6	8/14	43%	0.001-0.01	0.00374	0.002	0.0165	0.01	0.00001421	0.005332	2.856	0.015	mg/L	N	0	N	N	Stable		Log transformed	0.00019	Y			N	FALSE	
CCR-AP-7	13/14	7%	0.01-0.01	0.00288	0.00072	0.01531	0.0066	0.000013332	0.005164	3.586	0.015	mg/L	N	0	N	N	Stable		Normal	0.00016	Y			N	FALSE	
CCR Appendix-IV: Lithium, Total (mg/L)																										
CCR-BK-1	3/14	79%	0.005-0.05	0.031	0.05	0.05	0.0086	0.0005215	0.02284	0.7375	0.04	mg/L	N	0	N	N	Stable	Non-parametric	Non-parametric			0.050	0.050			
CCR-BK-2	1/14	93%	0.005-0.05	0.0374	0.05	0.05	0.0036	0.0004314	0.02077	0.5559	0.04	mg/L	N	0	N	N	Stable		Non-parametric							
CCR-AP-1	7/14	50%	0.005-0.05	0.0278	0.0205	0.0556	0.066	0.000458	0.0214	0.7693	0.04	mg/L	Y	1	N	N	Stable		Normal	0.005	N			N	FALSE	
CCR-AP-2	14/14	0%	-	0.0504	0.055	0.06375	0.067	0.0002301	0.01517	0.3008	0.04	mg/L	Y	11	Y	N	Stable		Non-parametric	0.035	Y			N	FALSE	
CCR-AP-3	14/14	0%	-	0.0779	0.077	0.0935	0.1	0.0001208	0.01099	0.1411	0.04	mg/L	Y	14	N	N	Stable		Normal	0.074	Y			Y	TRUE	
CCR-AP-4	0/14	100%	0.005-0.05	0.0373	0.05	0.05		0.0004369	0.0209	0.5609	0.04	mg/L	N	0	N	N	NA		NA	0.005	N			N	FALSE	
CCR-AP-5	11/14	21%	0.05-0.05	0.0246	0.0185	0.05	0.023	0.0002004	0.01416	0.5762	0.04	mg/L	N	0	N	N	Stable		Normal	0.050	N			N	FALSE	
CCR-AP-6	13/14	7%	0.005-0.005	0.0359	0.04	0.043	0.043	0.0001066	0.01032	0.2879	0.04	mg/L	Y	6	N	N	Stable		Non-parametric	0.029	Y			N	FALSE	
CCR-AP-7	13/14	7%	0.05-0.05	0.0246	0.0225	0.0396	0.034	0.00008132	0.009018	0.3659	0.04	mg/L	N	0	N	N	Stable		Normal	0.021	Y			N	FALSE	
CCR Appendix-IV: Mercury, Total (mg/L)																										
CCR-BK-1	0/13	100%	0.0002-0.0002	0.0004	0.0004	0.0004		6.776E-23	1.1642E-11	5.82E-08	0.002	mg/L	N	0	N	N	Stable	Non-parametric	Normal			0.0002	0.002			
CCR-BK-2	2/13	85%	0.0002-0.0002	0.000384	0.0004	0.0004	0.0004	1.477E-09	0.00005434	0.2826	0.002	mg/L	N	0	N	N	Stable		Non-parametric							
CCR-AP-1	1/13	92%	0.0002-0.0002	0.000382	0.0004	0.0004	0.00017	1.9532E-09	0.0000625	0.327	0.002	mg/L	N	0	Y	N	Stable		Normal	0.0002	N			N	FALSE	
CCR-AP-2	1/13	92%	0.0002-0.0002	0.000382	0.0004	0.0004	0.00016	2.126E-09	0.00006522	0.3418	0.002	mg/L	N	0	Y	N	Stable		Normal	0.0002	N			N	FALSE	
CCR-AP-3	8/13	38%	0.0002-0.0002	0.000358	0.00036	0.000895	0.00106	2.662E-08	0.0002308	1.2918	0.002	mg/L	N	0	N	N	Increasing		Normal	0.0002	N			N	FALSE	
CCR-AP-4	0/13	100%	0.0002-0.0002	0.0004	0.0004	0.0004		6.776E-23	1.1642E-11	5.82E-08	0.002	mg/L	N	0	N	N	Stable		Log transformed	0.0002	N			N	FALSE	
CCR-AP-5	0/13	100%	0.0002-0.0002	0.0004	0.0004	0.0004		6.776E-23	1.1642E-11	5.82E-08	0.002	mg/L	N	0	N	N	Increasing		Normal	0.0002	N			N	FALSE	
CCR-AP-6	1/13	92%	0.0002-0.0002	0.000378	0.0004	0.0004	0.00011	3.106E-09	0.0000788	0.4174	0.002	mg/L	N	0	N	N	Decreasing		Normal	0.0002	N			N	FALSE	
CCR-AP-7	0/13	100%	0.0002-0.0002	0.0004	0.0004	0.0004		6.776E-23	1.1642E-11	5.82E-08	0.002	mg/L	N	0	N	N	Stable		Non-parametric	0.0002	N			N	FALSE	
CCR Appendix-IV: Molybdenum, Total (mg/L)																										
CCR-BK-1	12/14	14%	0.005-0.005	0.00208	0.0015	0.005	0.0034	0.000002118	0.001455	0.7009	0.1	mg/L	N	0	N	N	Decreasing	Non-parametric	Normal			0.005	0.1			
CCR-BK-2	6/14	57%	0.005-0.005	0.00339	0.005	0.005	0.0025	0.000003944	0.001986	0.5852	0.1	mg/L	N	0	N	N	Stable		Non-parametric							
CCR-AP-1	13/14	7%	0.005-0.005	0.00406	0.00405	0.00584	0.0074	0.000001775	0.001332	0.3284	0.1	mg/L	N	0	Y	N	Stable		Normal	0.0042	Y			N	FALSE	
CCR-AP-2	14/14	0%	-	1.65	1.65	1.935	2	0.04577	0.2139	0.1297	0.1	mg/L	Y	14	Y	Y	Decreasing		Normal	2.0000	Y			Y	TRUE	
CCR-AP-3	14/14	0%	-	0.884	0.895	1	1	0.008073	0.08985	0.1016	0.1	mg/L	Y	14	N	N	Stable		Normal	0.8600	Y			Y	TRUE	
CCR-AP-4	13/14	7%	0.005-0.005	0.00276	0.0018	0.00633	0.0088	0.000004486	0.002118	0.7662	0.1	mg/L	N	0	N	N	Decreasing		Log transformed	0.0012	Y			N	FALSE	
CCR-AP-5	14/14	0%	-	0.0474	0.053	0.0684	0.071	0.0003066	0.01751	0.3697	0.1	mg/L	N	0	N	N	Increasing		Normal	0.0710	Y			N	FALSE	
CCR-AP-6	14/14	0%	-	0.00932	0.00875	0.0171	0.021	0.00002014	0.004488	0.4814	0.1	mg/L	N	0	N	N	Decreasing		Normal	0.0057	Y			N	FALSE	
CCR-AP-7	4/14	71%	0.005-0.05	0.00707	0.005	0.02075	0.0016	0.0001561	0.0125	1.768	0.1	mg/L	N	0	N	N	Stable		Non-parametric	0.0050	N			N	FALSE	
CCR Appendix-IV: Radium-226 & 228 (pCi/L)																										
CCR-BK-1	8/14	43%	0.366-5	2.96	1.001	10	1.59	7.032	3.75	2.526	5	pCi/L	N	0	Y	N	Increasing	Non-parametric	Normal			0.005	5.000			
CCR-BK-2	4/14	71%	0.356-5	6.72	10	10	6.26	8.344	4.086	1.2148	5	pCi/L	N	0	N	N	Stable		Non-parametric							
CCR-AP-1	9/14	36%	0.672-5	3.94	1.879	10	2.1	7.664	3.916	1.9826	5	pCi/L	N	0	Y	N	Stable		Non-parametric	5.00	N			N	FALSE	
CCR-AP-2	14/14	0%	-	1.452	1.368	2.556	2.76	0.12064	0.4912	0.6762	5	pCi/L	N	0	N	N	Stable		Normal	0.55	Y			N	FALSE	
CCR-AP-3	13/14	7%	5-5	2.02	1.262	7.368	2.48	2.678	2.314	2.298	5	pCi/L	N	0	Y	N	Stable		Normal	0.62	Y			N	FALSE	
CCR-AP-4	5/14	64%	0.414-5	6.02	5.856	13.81	15.86	13.182	5.134	1.7078	5	pCi/L	Y	2	N	N	Stable		Non-parametric	5.00	N			N	FALSE	
CCR-AP-5	9/14	36%	0.393-5	2.26	0.998	10	1.486	5.18	3.218	2.836	5	pCi/L	N	0	Y	N	Stable		Non-parametric	0.55	Y			N	FALSE	
CCR-AP-6	6/14	57%	0.441-5	4.94	1.778	10	9.54	9.704	4.406	1.7836	5	pCi/L	N	0	N	N	Stable		Non-parametric	5.00	N			N	FALSE	
CCR-AP-7	7/14	50%	0.339-5	3.68	1.382	10	1.552	8.354	4.088	2.224	5	pCi/L	N	0	N	N	Stable		Non-parametric	0.42	Y			N	FALSE	

CCR Appendix-IV: Selenium, Total (mg/L)																									
CCR-BK-1	3/14	79%	0.005-0.005	0.00808	0.01	0.01	0.00134	0.000007026	0.003748	0.928	0.05	mg/L	N	0	N	N	Stable	Non-parametric	Non-parametric			0.005	0.050		
CCR-BK-2	2/14	86%	0.005-0.005	0.00878	0.01	0.01	0.00196	0.00000466	0.003054	0.6956	0.05	mg/L	N	0	Y	N	Stable		Non-parametric						
CCR-AP-1	1/14	93%	0.005-0.005	0.00936	0.01	0.01	0.00098	0.000002798	0.002366	0.5058	0.05	mg/L	N	0	N	N	Stable		Non-parametric	0.0050	N			N	FALSE
CCR-AP-2	4/14	71%	0.005-0.05	0.0204	0.01	0.1	0.00166	0.000556	0.03334	3.278	0.05	mg/L	N	0	Y	N	Stable		Non-parametric	0.0500	N			N	FALSE
CCR-AP-3	12/14	14%	0.05-0.05	0.033	0.027	0.1	0.048	0.0004932	0.0314	1.9004	0.05	mg/L	N	0	N	N	Stable		Normal	0.0500	N			N	FALSE
CCR-AP-4	4/14	71%	0.005-0.005	0.00764	0.01	0.01	0.0028	0.000007296	0.00382	1	0.05	mg/L	N	0	N	N	Stable		Non-parametric	0.0050	N			N	FALSE
CCR-AP-5	1/14	93%	0.005-0.05	0.0286	0.01	0.1	0.0017	0.0007214	0.03798	2.648	0.05	mg/L	N	0	Y	N	Stable		Non-parametric	0.0500	N			N	FALSE
CCR-AP-6	1/14	93%	0.005-0.05	0.0158	0.01	0.0685	0.0013	0.0002854	0.02388	3.022	0.05	mg/L	N	0	N	N	Stable		Non-parametric	0.0050	N			N	FALSE
CCR-AP-7	2/14	86%	0.005-0.05	0.01524	0.01	0.0685	0.00198	0.0002908	0.02412	3.164	0.05	mg/L	N	0	Y	N	Stable		Non-parametric	0.0050	N			N	FALSE
CCR Appendix-IV: Thallium, Total (mg/L)																									
CCR-BK-1	1/13	92%	0.001-0.001	0.001852	0.002	0.002	0.000076	1.3668E-07	0.0005228	0.5646	0.002	mg/L	N	0	N	N	Stable	Non-parametric	Non-parametric			0.001	0.002		
CCR-BK-2	1/13	92%	0.001-0.001	0.001856	0.002	0.002	0.000118	1.3078E-07	0.0005114	0.5514	0.002	mg/L	N	0	N	N	Stable		Non-parametric						
CCR-AP-1	3/13	77%	0.001-0.001	0.001576	0.002	0.002	0.00026	3.126E-07	0.0007906	1.0034	0.002	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR-AP-2	2/13	85%	0.001-0.01	0.0045	0.002	0.02	0.0003	0.00002296	0.006776	3.018	0.002	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-3	1/13	92%	0.001-0.01	0.00602	0.002	0.02	0.00028	0.00003058	0.007822	2.598	0.002	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-4	2/13	85%	0.001-0.001	0.00173	0.002	0.002	0.00044	2.126E-07	0.000652	0.7542	0.002	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR-AP-5	1/13	92%	0.001-0.01	0.00602	0.002	0.02	0.000152	0.00003064	0.00783	2.604	0.002	mg/L	N	0	Y	N	Stable		Non-parametric	0.010	N			Y	FALSE
CCR-AP-6	4/13	69%	0.001-0.01	0.00282	0.002	0.0155	0.00036	0.000013132	0.005124	3.626	0.002	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE
CCR-AP-7	1/13	92%	0.001-0.01	0.00324	0.002	0.0155	0.000108	0.000012304	0.00496	3.064	0.002	mg/L	N	0	N	N	Stable		Non-parametric	0.001	N			N	FALSE

UG - Up Gradient DG - Down Gradient N/A - Not available NT- Not tested

* - Determined using the Shapiro-Wilks statistical test at a 1% significance level and a residual probability plot.

Appendix J
Description of Site Hydrogeology

DRAFT

2. Site Geology and Hydrogeology

The regional geology and hydrogeology is described in the *Surficial Geologic Map of the Evansville Indiana, and Henderson, Kentucky, Area* prepared by the USGS 2009 and in the *May 2017 Groundwater Quality Data and Statistics* prepared by Cardno ATC in May 2017.

2.1 SITE GEOLOGY

The Ohio River valley contains fill and loess (windblown) deposits derived indirectly from continental ice sheets. These were deposited from meltwater heavily loaded with entrained sediments accumulated in the area on the Pennsylvanian age shale, limestone and sandstone bedrock. Westerly winds simultaneously deposited silty sediments. As a result, base levels of the valley floor increased in elevation and created natural levees and outwashes. These natural levees produced slackwater lakes which deposited thick sequences of silt and clay. When the ice sheets retreated, the sediment load in the Ohio River diminished and lowered base levels. Consequently, the river incised the slackwater lake sediments, sculpted lacustrine terraces, and deposited silty and clayey stream alluvium.

Soil borings drilled at the Site indicates that the uppermost geologic unit is comprised of unconsolidated alluvial deposits consisting of primarily silts and clays with discontinuous layers of sand. This unit overlies Pennsylvanian age sandstone which is commonly identified as the Inglefield Sandstone. Underlying the Inglefield Sandstone is low-permeability weathered shale and siltstone. The sandstone and shale unit has been eroded on the north side of the landfill where the underlying limestone unit was encountered.

2.2 SITE HYDROGEOLOGY

Hydrogeologic units are defined based on their ability to transmit groundwater or serve as confining units between zones of groundwater saturation. The uppermost aquifer at the Site occurs within unconsolidated alluvial deposits which consist primarily of silty clay containing discontinuous layers of sand. Beneath upland areas, or ridgelines the uppermost aquifer occurs in weathered sandstone, shale, or siltstone. Recharge to the surficial aquifer occurs through direct surface infiltration.

Piezometric data recorded from the monitoring wells installed on-Site shows that the configuration of the uppermost aquifer is primarily controlled by surface topography with some influence from the underlying weathered bedrock. Groundwater flow across the eastern portion of the Landfill is to the north and northeast. Beneath the western portion of the Landfill groundwater flow shifts to the north and northwest into a trough that flows to the southwest beneath the Sedimentation Ponds (Figure 3). Groundwater flow in the vicinity of the permitted Ash Pond is predominantly to the west with a component of flow to the northwest from the northern portion of the Ash Pond beneath the Landfill. Groundwater elevations vary seasonally but the groundwater flow patterns remain consistent.

Groundwater flow velocity in the uppermost aquifer beneath the CCR units was estimated using site-specific hydraulic conductivity obtained from slug testing and hydraulic gradients, and an assumed effective porosity of 25 percent. Hydraulic conductivity varied from 1E-3 cm/sec in the vicinity of the Landfill to 3E-4 cm/sec in the vicinity of the Sedimentation Ponds and the Ash Pond. The hydraulic gradient beneath and downgradient of the Landfill and the Ash Pond is 0.03 feet/foot and 0.04 feet/foot respectively. The hydraulic gradient lessens beneath and downgradient of the Sedimentation Pond

dropping to 0.004 feet/foot. Using the site-specific hydraulic conductivity and hydraulic gradients, and assuming an effective porosity of 25 percent the groundwater flow velocity in the vicinity of the CCR units is estimated as follows; 120 feet/year at the Landfill, 50 feet/year at the Ash Pond, and approximately 5 feet/year beneath and downgradient of the Sedimentation Pond.

525 Vine Street, Suite 1500
Cincinnati, Ohio 45202
1.513.651.3440

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