ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 257

[EPA–HQ–OLEM–2022–0903; FRL 11262–01–OLEM]

Alabama: Denial of State Coal Combustion Residuals Permit Program

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of availability; request for comment.

SUMMARY: Pursuant to section 4005(d) of the Resource Conservation and Recovery Act (RCRA), the Environmental Protection Agency (EPA or the Agency) is proposing to deny the Alabama Department of Environmental Management's (ADEM or Department) Application for approval of the Alabama coal combustion residuals (CCR) permit program (Application). After reviewing the State CCR permit program Application submitted by ADEM on December 29, 2021, and additional relevant materials, and based on extensive discussions with ADEM regarding its Application, EPA has preliminarily determined that Alabama's CCR permit program does not meet the standard for approval under RCRA. This document announces that EPA is seeking comment on this proposal during a 60-day public comment period and will be holding an in-person public hearing on EPA's proposed denial of Alabama's CCR permit program.

DATES:

Comments due. Comments must be received on or before October 13, 2023.

Public Hearing: EPA will hold an in-person public hearing on September 20, 2023, and a virtual public hearing on September 27, 2023. Please refer to the **SUPPLEMENTARY INFORMATION** section for additional information on the public hearing.

ADDRESSES: You may send comments, identified by Docket ID No. EPA–HQ–OLEM–OLEM–2022–0903, by any of the following methods:

- *Federal eRulemaking Portal*: *https://www.regulations.gov/* (our preferred method). Follow the online instructions for submitting comments.
- *Mail:* U.S. Environmental Protection Agency, EPA Docket Center, Office of Land and Emergency Management (OLEM) Docket, Mail Code 28221T, 1200 Pennsylvania Ave. NW, Washington, DC 20460.
- *Hand Delivery or Courier* (by scheduled appointment only): EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004. The Docket Center's hours of operations are 8:30 a.m.–4:30 p.m., Monday–Friday (except Federal holidays).

Instructions: All submissions received must include the Docket ID No. for this rulemaking. Comments received may be posted without change to *https://www.regulations.gov/,* including any personal information provided. For detailed instructions on sending comments and additional information on the rulemaking process, see the ''Public Participation'' heading of the **SUPPLEMENTARY INFORMATION** section of this document.

FOR FURTHER INFORMATION CONTACT: Michelle Lloyd, Office of Resource Conservation and Recovery, Materials Recovery and Waste Management Division, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue NW, MC: 5304T, Washington, DC 20460; telephone number: (202) 566–0560; email address: *lloyd.michelle@epa.gov.* For more information on this notice please visit *https://www.epa.gov/coalash.*

SUPPLEMENTARY INFORMATION:

Table of Contents

List of Acronyms

ACM Assessment of Corrective Measures
ADEM Alabama Department of Environmental Management
ASD alternative source demonstration
BGS below ground surface
CBI Confidential Business Information
CCP coal combustion product
CCR coal combustion residuals
CD Consent Decree
CFR Code of Federal Regulations
CY cubic yards
eFile electronic filing system
EPA Environmental Protection Agency
EPRI Electric Power Research Institute
FR Federal Register
GWMCA groundwater monitoring and corrective action
GWMP Groundwater Monitoring Plan
GWPS groundwater protection standard
HSWA Hazardous and Solid Waste Amendments
ICR Information Collection Request
MCL maximum contaminant level
MNA Monitored Natural Attenuation
MSL mean sea level
NOPV Notice of Potential Violation
NPDES National Pollutant Discharge Elimination System
RCRA Resource Conservation and Recovery Act
RTC Response to Comments
SSI statistically significant increase
SSL statistically significant level
TSD Technical Support Document
TVA Tennessee Valley Authority
USGS U.S. Geological Survey
USWAG Utility Solid Waste Activities Group
WBWT waste below the water table
WIIN Water Infrastructure Improvements for the Nation

I. Public Participation

A. Written Comments

Submit your comments, identified by Docket ID No. EPA–HQ–OLEM–OLEM–2022–0903, at *https://www.regulations.gov* (our preferred method), or the other methods identified in the **ADDRESSES** section. Once submitted, comments cannot be edited or removed from the docket. EPA may publish any comment received to its public docket. Do not submit to EPA's docket at *https://www.regulations.gov* any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. EPA will generally not consider comments or comment contents located

outside of the primary submission (*i.e.,* on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit *https://www.epa.gov/dockets/commenting-epa-dockets.*

B. Participation in In-Person Public Hearing

EPA will begin pre-registering speakers for the hearing upon publication of this document in the **Federal Register**. To register to speak at the hearing, please use the online registration form available on EPA's CCR website (*https://www.epa.gov/coalash*) or contact the person listed in the **FOR FURTHER INFORMATION CONTACT** section to register to speak at the hearing. The last day to pre-register to speak at the hearing will be September 18, 2023.

EPA will make every effort to follow the schedule as closely as possible on the day of the hearing; however, please plan for the hearings to run either ahead of schedule or behind schedule. Additionally, requests to speak will be taken the day of the hearing at the hearing registration desk. EPA will make every effort to accommodate all speakers who arrive and register, although preferences on speaking times may not be able to be fulfilled.

Each commenter will have five (5) minutes to provide oral testimony. EPA encourages commenters to provide EPA with a copy of their oral testimony electronically by emailing it to the person listed in the **FOR FURTHER INFORMATION CONTACT** section. EPA also recommends submitting the text of your oral comments as written comments to the rulemaking docket. If EPA is anticipating a high attendance, the time allotment per testimony may be shortened to no shorter than three (3) minutes per person to accommodate all those wishing to provide testimony and who have pre-registered. While EPA will make every effort to accommodate all speakers who do not pre-register, opportunities to speak may be limited based upon the number of pre-registered speakers. Therefore, EPA strongly encourages anyone wishing to speak to pre-register. Participation in the public hearing does not preclude any entity or individual from submitting a written comment.

EPA may ask clarifying questions during the oral presentations but will not respond to the presentations at that time. Written statements and supporting information submitted during the comment period will be considered with the same weight as oral comments and supporting information presented at the public hearing.

Please note that any updates made to any aspect of the hearing are posted online at EPA's CCR website at *https://www.epa.gov/coalash.* While EPA expects the hearing to go forward as set forth above, please monitor our website or contact the person listed in the **FOR FURTHER INFORMATION CONTACT** section to determine if there are any updates. EPA does not intend to publish a document in the **Federal Register** announcing updates.

If you require the services of an interpreter or special accommodations such as audio description, please pre-register for the hearing with the person listed in the **FOR FURTHER INFORMATION CONTACT** section and describe your needs by September 6, 2023. EPA may not be able to arrange accommodations without advance notice.

C. Participation in Virtual Public Hearing

EPA will begin pre-registering speakers for the hearing upon publication of this document in the **Federal Register**. To register to speak at the virtual hearing, please use the online registration form available on EPA's CCR website (*https://www.epa.gov/coalash*) or contact the person listed in the **FOR FURTHER INFORMATION CONTACT** section to register to speak at the hearing. The last day to pre-register to speak at the hearing will be September 25, 2023.

EPA will make every effort to follow the schedule as closely as possible on the day of the hearing; however, please plan for the hearing to run either ahead of schedule or behind schedule. Additionally, requests to speak will be taken the day of the hearing according to the procedures specified on EPA's CCR website (*https://www.epa.gov/coalash*) for this hearing. The Agency will make every effort to accommodate all speakers who arrive and register, although preferences on speaking times may not be able to be fulfilled.

Each commenter will have five (5) minutes to provide oral testimony. EPA encourages commenters to provide EPA with a copy of their oral testimony electronically (via email) to the person listed in the **FOR FURTHER INFORMATION CONTACT** section. If EPA is anticipating a high attendance, the time allotment per testimony may be shortened to no shorter than three (3) minutes per person to accommodate all those wishing to provide testimony and who have pre-registered. While EPA will make every effort to accommodate all speakers who do not pre-register, opportunities to speak may be limited based upon the number of pre-registered speakers. Therefore, EPA strongly encourages anyone wishing to speak to pre-register. Participation in the virtual public hearing does not preclude any entity or individual from submitting a written comment.

EPA may ask clarifying questions during the oral presentations but will not respond to the presentations at that time. Written statements and supporting information submitted during the comment period will be considered with the same weight as oral comments and supporting information presented at the public hearing. Verbatim transcripts of the hearings and written statements will be included in the docket for this action.

Please note that any updates made to any aspect of the hearing will be posted online on EPA's CCR website at *https://www.epa.gov/coalash.* While EPA expects the hearing to go forward as set forth above, please monitor our website or contact the person listed in the **FOR FURTHER INFORMATION CONTACT** section to determine if there are any updates. EPA does not intend to publish a document in the **Federal Register** announcing updates.

If you require the service of a translator, please pre-register for the hearing and describe your needs on the registration form by September 13, 2023. If you require special accommodations such as audio description or closed captioning, please pre-register for the hearing and describe your needs on the registration form by September 13, 2023. Alternatively, registrants may notify the person listed in the **FOR FURTHER INFORMATION CONTACT** section of any special needs. We may not be able to arrange accommodations without advanced notice.

II. General Information

A. Overview of Proposed Action

On April 17, 2015, EPA published a final rule, creating 40 CFR part 257, subpart D,[1] that established a comprehensive set of minimum Federal requirements for the disposal of CCR in landfills and surface impoundments (80 FR 21302) (''Federal CCR regulations''). Section 2301 of the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act amended section 4005 of RCRA, creating a new subsection (d) that establishes a Federal CCR permit program that is similar to the permit programs under RCRA

[1] Unless otherwise specified, all references to part 257 and part 239 in this notice are to title 40 of the Code of Federal Regulations (CFR).

subtitle C and other environmental statutes. *See* 42 U.S.C. 6945(d).

RCRA section 4005(d) also allows states to seek approval for a State CCR permit program that will operate in lieu of a Federal CCR permit program in the State. The statute provides that within 180 days after a State submits an application to the Administrator for approval, EPA shall approve the State permit program if the Administrator determines that the State program requires each CCR unit located in the State to achieve compliance with either the Federal requirements or other State requirements that EPA determines, after consultation with the State, are at least as protective as those included in the Federal CCR regulations. See, 42 U.S.C. 6945(d)(1)(B).

On December 29, 2021, ADEM submitted its State CCR permit program Application to EPA Region 4 requesting approval of the State's partial CCR permit program.[2] [3] ADEM established State CCR regulations that mirrored the provisions in the Federal CCR regulations with additional State-specific provisions and clarifications. Though ADEM primarily adopted the language in the Federal CCR regulations, EPA reviewed both proposed and final permits Alabama issued under its CCR program and concluded that ADEM was interpreting its State regulations in a manner inconsistent with the plain language of the Federal requirements, and that, as a result, the permits for CCR units in the State contain permit terms that are neither the same as, nor as protective as, the Federal CCR regulations. Specifically, EPA identified deficiencies in ADEM's permits with respect to the closure requirements for unlined surface impoundments and the associated groundwater monitoring network and corrective action requirements. EPA discussed these issues with ADEM, and, despite EPA's concerns, the State declined to modify the existing permits and proceeded to issue another CCR permit with the same deficient provisions. Further, ADEM failed to adequately explain how the permits ensured that each CCR unit would achieve compliance with either the Federal requirements or other State requirements that are at least as protective as the requirements in the Federal CCR regulations.

EPA is proposing to deny Alabama's request for approval of its CCR permit program Application pursuant to RCRA section 4005(d)(1)(B), because the State's program does not meet either standard for approval. 42 U.S.C. 6945(d)(1)(B).

B. Background

CCR are generated from the combustion of coal, including solid fuels classified as anthracite, bituminous coal, subbituminous coal, and lignite, for the purpose of generating steam to power a generator to produce electricity or electricity and other thermal energy by electric utilities and independent power producers. CCR, commonly known as coal ash, include fly ash, bottom ash, boiler slag, and flue gas desulfurization materials.

As noted above, on April 17, 2015, EPA published a final rule that established a comprehensive set of minimum Federal requirements in 40 CFR part 257, subpart D for the disposal of CCR in landfills and surface impoundments. The rule created a self-implementing program that regulates the location, design, operating criteria, and groundwater monitoring and corrective action for CCR units, as well as the closure and post-closure care of CCR units. The rule also includes requirements for recordkeeping and notifications for CCR units. EPA has since amended 40 CFR part 257, subpart D (81 FR 51802, August 5, 2016), (83 FR 36435, July 30, 2018), (85 FR 53516, August 28, 2020), (85 FR 72506, November 12, 2020). More information on these rules is provided in the Technical Support Document (TSD) Volume III.

C. Statutory Authority

EPA is issuing this proposed action pursuant to sections 4005(d) and 7004(b)(1) of RCRA. *See* 42 U.S.C. 6945(d) and 6974(b)(1). As stated above, section 2301 of the WIIN Act amended section 4005 of RCRA, creating a new subsection (d) that establishes a Federal CCR permitting program similar to permit programs under RCRA subtitle C and other environmental statutes. *See* 42 U.S.C. 6945(d).

Under RCRA section 4005(d)(1)(A), 42 U.S.C. 6945(d)(1)(A), states seeking approval of a permit program must submit to the Administrator, ''in such form as the Administrator may establish, evidence of a permit program or other system of prior approval and conditions under [S]tate law for regulation by the State of coal combustion residuals units that are located in the State.'' EPA shall approve a State permit program if the Administrator determines that the State program requires *each* CCR unit located in the State to achieve compliance with either: (1) The Federal CCR requirements at 40 CFR part 257, subpart D; or (2) Other State criteria that the Administrator, after consultation with the State, determines to be ''at least as protective as'' the Federal requirements. *See* 42 U.S.C. 6945(d)(1)(B). The Administrator must make a final determination, after providing for public notice and an opportunity for public comment, within 180 days of determining that the State has submitted a complete application consistent with RCRA section 4005(d)(1)(A).[4] *See* 42 U.S.C. 6945(d)(1)(B). EPA may approve a State CCR permit program in whole or in part. *Id.* Once approved, the State permit program operates in lieu of the Federal requirements. *See* 42 U.S.C. 6945(d)(1)(A). In a State with a partial permit program, only the State requirements that have been approved operate in lieu of the Federal requirements, and facilities remain responsible for compliance with all remaining non-State approved requirements in 40 CFR part 257, subpart D.

As noted above, the Federal CCR regulations are self-implementing and that means that CCR landfills and surface impoundments must comply with the terms of the rule even prior to obtaining a Federal permit or permit issued by an approved State, and noncompliance with any requirement of the Federal CCR regulations can be directly enforced against the facility. Once a final CCR permit is issued by an approved State or pursuant to a Federal CCR permit program, however, the terms of the permit apply in lieu of the terms of the Federal CCR regulations and/or requirements in an approved State program, and RCRA section 4005(d)(3) provides a permit shield against direct enforcement of the applicable Federal or State CCR regulations (meaning the permits terms

[2] Alabama Department of Environmental Management. Application For CCR Permit Program Approval. December 2021.

[3] In the December 29, 2021 Application, Alabama sought a partial program approval (rather than full program approval) of the State's CCR permit program because it is not seeking approval for some of its CCR regulations. Specifically, ADEM is not seeking approval for six items that are listed in Unit IV.B.1.b of this preamble and in the Technical Support Document Volume III. See Volume III: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, EPA Analysis of Alabama CCR Permitting and Technical Regulations. U.S. Environmental Protection Agency, Office of Land and Emergency Management (5304T), 1200 Pennsylvania Avenue NW, Washington, DC 20460. August 2023.

[4] *See* U.S. Environmental Protection Agency. Coal Combustion Residuals State Permit Program Guidance Document; Interim Final, August 2017, Office of Land and Emergency Management, Washington, DC 20460 (providing that the 180-day deadline does not start until EPA determines the application is complete).

become the enforceable requirements for the permittee).

In addition, RCRA section 7004(b) applies to all RCRA programs, directing that ''public participation in the development, revision, implementation, and enforcement of any. . .program under this chapter shall be provided for, encouraged, and assisted by the Administrator and the States.'' 42 U.S.C. 6974(b)(1).

III. The Alabama CCR Permit Program Application

On December 29, 2021, ADEM submitted its revised CCR permit program Application to EPA Region 4.[5] The Application requested approval of the State's partial CCR permit program.[6] Alabama's first CCR regulations were promulgated in 2018 and continued to be revised over the next several years in response to public comment, discussions between ADEM and EPA, and changes to the Federal CCR regulations in 40 CFR part 257, subpart D.

EPA conducted an analysis of the Alabama CCR permit program Application, including a thorough analysis of ADEM's statutory authorities for the CCR program, as well as regulations at Alabama Administrative Code Chapter. 335–13–15, Standards for the Disposal of Coal Combustion Residuals in Landfills and Impoundments. This analysis is discussed in Unit IV.B.2.b of this preamble and in the TSD Volume III. EPA also reviewed Alabama's permitting regulations, as well as recent and ongoing permit decisions ADEM was making under its CCR regulations.

A. Alabama CCR Units and Resources

In the Program Narrative in the Application, ADEM identified 16 units that are currently, or have been, used for disposal of CCR (3 landfills and 13 surface impoundments) in Alabama. ADEM stated that it has the personnel and funding to administer a CCR permit program. The State also indicated that its program is funded from three sources: tipping fees collected for the disposal of solid waste, permitting fees, and civil penalties from enforcement orders.

B. Alabama CCR Regulations

ADEM Administrative Code Chapter 335–13–15 largely replicates the requirements of 40 CFR part 257, subpart D, for the portions of those regulations for which the State is seeking approval. In addition to the technical criteria at ADEM Chapter 335–13–15, ADEM has adopted State-specific permitting requirements, including public participation requirements, at ADEM Administrative Code Chapter. 335–13–05. ADEM also has additional reporting and approval requirements for CCR units, as described in the TSD Volume III.

C. Alabama Authority To Regulate CCR

ADEM derives its authority to operate the Solid Waste Program, which includes CCR, in Alabama pursuant to the following statutory provisions of the Code of Alabama, 1975: (1) Section 22–22A–5 provides the Department with the authority to administer and enforce the State's Solid Wastes and Recyclable Materials Management Act, to adopt and promulgate rules, regulations, and standards through the Environmental Management Commission, and to develop environmental policy for the State; and to serve as the State Agency responsible for administering federally-approved or federally-delegated environmental programs; (2) Section 22–27–9 provides ADEM with authority over the management of solid waste in the State (except for the collection and transportation of nonhazardous and nonmedical solid waste) and the permitting and operation of solid waste management facilities; and (3) Section 22–27–12 provides ADEM with the authority to promulgate and adopt rules establishing requirements for the management of solid waste and to issue permits with conditions regarding the management of such solid waste.

D. Alabama Permits

Unlike Georgia, Texas, and Oklahoma (currently the only three States with EPA approval for State CCR permit programs), Alabama had already begun implementing its State CCR permit program and issuing permits prior to its submittal of an Application for EPA approval of the State's CCR permit program. At the time of submission of ADEM's December 29, 2021 Application, ADEM had issued permits for the following CCR facilities: (1) the James H. Miller Electric Generating Plant (Permit #37–51; issued December 18, 2020); (2) Greene County Electric Generating Plant (Permit #32–03: issued December 18, 2020); (3) Gadsden Steam Plant (Permit #28–09, issued December 18, 2020); (4) James M. Barry Electric Generating Plant (Permit #49–35, issued July 1, 2021); (5) E.C. Gaston Electric Generating Plant (Permit #59–16, issued May 25, 2021); and (6) Charles R. Lowman Power Plant (Permit #65–06, issued August 30, 2021). At the time of submission of the December 29, 2021 Application, permits were under development by ADEM at two other facilities: the William C. Gorgas Electric Generating Plant and Tennessee Valley Authority (TVA) Plant Colbert. Since the submission of ADEM's Application, ADEM has proceeded to issue both the Plant Gorgas Permit (Permit #64–12 issued February 28, 2022) and the TVA Colbert Permit (Permit #17–11, issued October 25, 2022).

E. Summary of EPA Communications With Alabama

As part of EPA's review of State CCR permit programs, the Agency engages the State both before and after submittal of a State CCR permit program application. These discussions serve a number of purposes; for example, EPA engages in these discussions to help the State determine the scope of the CCR permit program it wants to adopt (*e.g.,* full or partial program) and to ensure the State establishes the necessary State CCR regulations prior to submitting the request for program approval. EPA also assists the State in determining what to include in the Narrative Statement component of its permit program application, which serves as a roadmap to the State's CCR permit program. EPA also uses these discussions to clarify questions raised during the public comment period about the State program. To the extent the State implements its CCR regulations prior to EPA's determination of State program adequacy, EPA will also discuss the State's interpretation and implementation of its program to ensure that EPA fully understands the program and to determine which of the two statutory standards EPA will use to evaluate the State program. EPA took the same approach with Alabama as with other states seeking approval, and, as detailed below, EPA and ADEM have had extensive discussions about the State's CCR permit program.[7]

[5] Application to USEPA Region IV for CCCR Permit Program Approval in Accordance with Section 4005 of the Resource Conservation and Recovery Act (RCRA) Alabama Department of Environmental Management Land Division-Solid Waste Branch. December 2021.

[6] ADEM previously submitted CCR permit program applications on July 12, 2018, and February 26, 2021. For purposes of this proposed action, EPA reviewed the most recent Application submitted on December 29, 2021.

[7] EPA has attempted to identify all the interactions between EPA and ADEM with respect to the State's CCR permit program. A summary of the interactions between EPA and ADEM is included in the docket to this notice in Volume II: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, Communication Between EPA and ADEM. U.S. Environmental Protection Agency Office of Land and Emergency Management (5304T). August 2023. In addition,

Continued

EPA began telephone calls and meetings with ADEM about its development of an Application for a CCR permit program in January 2018 and continued them through July 2022. In the early calls, EPA and ADEM discussed the process for EPA to review and approve State CCR permit programs, ADEM's plans for formally adopting CCR regulations, its anticipated timeline for submitting a CCR permit program Application to EPA, and ADEM's permit requirements. During these calls, EPA reviewed ADEM's submission and sent comments to ADEM on those documents. The frequency of calls between EPA and ADEM varied depending on the stage of ADEM's efforts to develop and submit (or re-submit) its CCR permit program Application. For example, during ADEM's public comment periods associated with State rulemaking, or during periods of re-working regulations or documents, calls were held less frequently. When ADEM had questions or requested EPA input, calls were held more often.

After ADEM's initial CCR regulations became effective in 2018, the State began to issue permits. Calls were then held on specific facilities and technical issues that ADEM sought EPA's input on, such as specific corrective action proposed remedies or closure methods. In addition, consistent with RCRA section 4005(d), EPA began discussions with ADEM on specific facilities and permits to evaluate whether ADEM was requiring, as part of its permit process, each CCR unit in the State ''to achieve compliance with'' the Federal part 257 standards or ''other State criteria that the Administrator, after consultation with the State, determines to be at least as protective as'' the Federal criteria.

Of particular concern to the Agency were facilities that were closing (or had already closed) unlined CCR surface impoundments while leaving waste (*i.e.,* CCR) below the water table (WBWT). On March 15, 2022, EPA shared a list of such facilities in Alabama with ADEM and scheduled discussions regarding the closures and groundwater monitoring activities at the Greene County Electric Generating Plant and the Gadsden Steam Plant. Discussions also focused on the William C. Gorgas Electric Generating Plant. ADEM had issued permits at all three of these facilities. During these discussions and written communication, EPA expressed concern that Alabama's permit program appeared to differ from the Federal program, and that these differences appeared to make the State's program less protective than the Federal program. The Agency specifically identified problems with the State's permit requirements covering closure of unlined surface impoundments, groundwater monitoring networks, and corrective action. *See also* Unit IV.C of this preamble below and the TSD Volume I for a detailed discussion of the deficiencies in ADEM's CCR permits. In addition to the concerns raised with respect to Plants Greene, Gorgas, and Gadsden, EPA has also raised concerns with respect to the TVA Plant Colbert permit. On June 29, 2022, ADEM posted public notice of the draft permit for Plant Colbert. Because the proposed permit for Plant Colbert raised many of the same issues already being discussed with respect to Plants Greene, Gorgas, and Gadsden, EPA submitted a letter to ADEM outlining specific concerns with respect to the proposed permit.[8]

As a result of these discussions, on July 7, 2022, EPA informed ADEM via telephone that the Agency was putting on hold its completeness review of ADEM's CCR permit program Application until Alabama demonstrated to EPA that the State was implementing its program consistent with the Federal CCR regulations. Further, EPA explained to ADEM that it was exploring options for actions to take at the Federal level with respect to both the CCR permit program Application, and at specific facilities where there are outstanding concerns.

On October 25, 2022, ADEM proceeded to issue a CCR permit to Plant Colbert without revising the proposed permit to address EPA's concerns. In a letter dated October 27, 2022, ADEM responded to EPA's letter regarding Plant Colbert, presenting an interpretation of the requirements applicable to closing CCR impoundments that EPA had previously rejected in the discussions about the interpretation of the Federal CCR regulations with ADEM described above and in EPA's Part A proposed and final decisions. See discussion of Part A proposals in Unit IV.C. of this preamble. To date, the State has not taken action to revise the permits issued to Plants Colbert, Green, Gorgas, or Gadsden to address the deficiencies EPA noted to ADEM.

On December 9, 2022, ADEM gave EPA notice of its intent to sue EPA under section 7002(a)(1)(A) and (1)(B) of RCRA, alleging EPA failed to perform a nondiscretionary duty to approve the State's CCR permit program.[9] Among other things, ADEM asserted that EPA failed to comply with the statutory requirement to approve the State's CCR permit program within 180 days of the State's submittal of the permit program Application on December 29, 2021. On February 1, 2023, EPA responded to ADEM's Notice of Intent to Sue letter and informed the State that the 180-day timeframe does not start until EPA determines that a State's Application is administratively complete and that, in this case, EPA did not start the clock because EPA's concerns with ADEM's interpretation of the minimum requirements of the Federal CCR regulations had yet to be resolved and EPA was providing an opportunity for ADEM to submit further Application information.[10] EPA further stated that the Agency could evaluate the State's program on the current record if ADEM decided not to supplement its Application with an explanation of how the State's interpretation of its regulations is at least as protective as the Federal CCR regulations, but EPA expressed concern that the current record would not support a proposal to approve the State's partial CCR permit program. Id. On February 17, 2023, ADEM responded to EPA that it did not intend to supplement the record and that EPA should evaluate its program accordingly.[11] EPA thereafter continued to review the Application based on the information submitted to date, and this notice reflects EPA's proposed conclusions from that review.

IV. EPA Analysis of the Alabama Application and Basis for Denial

As stated above, a State seeking approval of a CCR permit program can either adopt the Federal CCR requirements or establish State-specific criteria that are at least as protective as the Federal CCR requirements. *See* 42 U.S.C. 6945(d)(1)(B). After a State submits a complete application, EPA evaluates the State program to determine whether it ''requires each

copies of emails and letters between EPA and ADEM can be found in the docket.

[8] Letter from Carolyn Hoskinson, Director, Office of Resource Conservation and Recovery, to Mr. Russell A. Kelly, Chief, Permits and Services Division, and Mr. Steve Cobb, Chief, Land Division. EPA Comments on Proposed Permit, Tennessee Valley Authority Colbert Fossil Plant, Alabama Department of Environmental Management, Permit No. 17–11. September 15, 2022.

[9] Letter from Alabama Attorney General Steve Marshall to EPA Administrator Michael Regan, Notice of Endangerment and Intent to Sue under Section 7002(a)(1)(A) and (1)(B) of the Resource Conservation and Recovery Act. December 9, 2022.

[10] Letter from Barry Breen, Acting Assistant Administrator, OLEM, to Lance LeFleur, Director, ADEM, February 1, 2023. Email sent February 2, 2023.

[11] Letter from Lance LeFleur, Director, ADEM, to Barry Breen, Acting Assistant Administrator, OLEM, February 17, 2023.

coal combustion residuals unit located in the state to achieve compliance with the applicable [Federal or other equally protective State] criteria.'' Id. Specifically, EPA evaluates the terms of the permit program or other system of prior approval and conditions and the Narrative Statement, to determine whether by its terms the State program meets either of these standards for each CCR unit regulated by the State. As discussed in more detail below and in the TSD Volume III, to make this determination EPA evaluates not only the CCR specific requirements but also the State's general authority to issue permits and impose conditions in those permits, as well as the State's authority for compliance monitoring and enforcement.[12] Thus, collectively, the CCR specific and general permit requirements must provide the State with sufficient authority to require compliance from all CCR units located within the State. In addition, if the State begins issuing CCR permits and overseeing compliance with the permits prior to EPA's State program approval decision, the Agency must also consider whether the State in fact ''requires each CCR unit located in the state *to achieve compliance with*'' either the Federal criteria in part 257 or other State criteria that ''are at least as protective as'' the Federal regulations. 42 U.S.C. 6945(d)(1)(B) (*emphasis added).* See Unit IV.A of this preamble (discussing the Agency interpretation of RCRA section 4005(d)).

ADEM adopted regulations that largely mirror the Federal CCR regulations, but in some places ADEM also added additional or different criteria to be consistent with its existing solid waste regulations. When a State adopts the language in the Federal CCR regulations, EPA's review of the terms of the permit program is generally straightforward, and, in this case, EPA's review of the express terms of ADEM's CCR permit program demonstrates that the State program includes all regulatory provisions required for approval of a partial program.[13] Thus, the terms of the permit program provide ADEM with the authority necessary to issue permits that will ensure each CCR unit in the State achieves the minimum required level of control (*i.e.,* the State has the authority to issue permits that require compliance with standards that are at least as protective as those in the Federal CCR regulations).

While the statutes and regulations of the Alabama CCR permit program provide the State with sufficient authority to require compliance with the Federal requirements or equivalent State requirements, EPA is proposing to determine that permits issued by ADEM allow CCR units in the State to comply with alternative requirements that are less protective than the requirements in the Federal CCR regulations with respect to groundwater monitoring, corrective action, and closure. For example, as discussed in more detail in subsequent sections, ADEM has issued multiple permits allowing CCR in closed units to remain saturated by groundwater, without requiring any engineering measures to control the groundwater flowing into and out of the closed unit. ADEM has also approved groundwater monitoring systems that contain an inadequate number of wells, and in incorrect locations, to detect groundwater contamination from the CCR units. Finally, ADEM has issued multiple permits that effectively allow the permittee to delay implementation of effective measures to remediate groundwater contamination both on- and off-site of the facility. Overall, EPA's review of the permit records demonstrates a consistent pattern of deficiencies in the permits and a lack of oversight and independent evaluation of facilities' proposed permit terms on the part of ADEM. In each case, EPA was unable to locate any evaluation or record of decision documenting that ADEM had critically evaluated the materials submitted as part of the permit applications, or otherwise documented its rationale for adopting those proposed permit terms prior to approving the application. As a consequence, EPA cannot conclude that the permits are as protective as the Federal CCR regulations.

As noted above, EPA discussed many of these issues with ADEM and the State declined to revise the permits to be consistent with the Federal CCR regulations. ADEM also declined to demonstrate that its alternative requirements satisfy the requirement in RCRA section 4005(d)(1)(B). Instead, the Alabama Attorney General, on behalf of ADEM, asserted in the Notice of Intent to Sue that EPA does not have the authority to consider implementation of the State program when determining whether a State program is sufficient, and that the Agency may only look to the ''four corners'' of the State program submission when evaluating the program for approval. In the Notice of Intent to Sue, the ''four corners'' of the application are described as being public participation, guidelines for compliance, guidelines for enforcement authority, and intervention in civil enforcement proceedings. Regarding deficiencies in implementation of a State CCR permit program, the State of Alabama's position must, therefore, be that EPA first approve a State CCR permit program even if the Agency knows the State's implementation is deficient prior to approval, and the Agency must then follow the process for withdrawal of the program through the program review and withdrawal provisions in RCRA sections 4005(d)(1)(D) and (E), respectively. Id.

EPA does not agree with ADEM's interpretation of the Agency's authority under RCRA, and the Agency is proposing to deny the program under RCRA section 4005(d)(1)(B). Though the statute authorizes EPA to approve a State CCR permit program in whole or in part, implementation of the groundwater monitoring, corrective action, and closure regulations are fundamental to an adequate CCR State permit program. EPA does not see any meaningful way for a State to implement a partial CCR permit program without the authority to oversee these three major elements of the CCR program. Thus, EPA is proposing to deny the entire Alabama CCR State permit program that ADEM submitted for approval.

In Unit IV.A of this preamble, EPA responds to ADEM's position that RCRA section 4005(d) prohibits EPA from considering the permits issued under the State CCR permit program when determining whether to approve the program and that EPA may only address such issues after the State program is approved. In Unit IV.B of this preamble, the Agency provides a short summary of EPA's conclusions after review of the express terms of the ADEM statutes and regulations. In Unit IV.C of this preamble, EPA identifies specific permits that the Agency believes are deficient and explains the bases for EPA's proposed determination that they are inconsistent with the standard for approval in RCRA section 4005(d)(1)(B).

[12] State permit program regulations usually include general requirements that apply across multiple permit programs (*e.g.,* procedures for issuing permits). When new performance standards are issued for a type of facility or unit (for example, CCR regulations), states include both general and facility/unit specific requirements in the State permit program as necessary to develop a program that satisfies the Federal requirements to support approval of a State program.

[13] EPA conducted a thorough review of the terms of Alabama's CCR permit program submittal, consistent with review of submittals by states that were granted approval, and that review can be found in the Volume III: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, EPA Analysis of Alabama CCR Permitting and Technical Regulations. U.S. Environmental Protection Agency, Office of Land and Emergency Management (5304T), 1200 Pennsylvania Avenue NW, Washington, DC 20460. August 2023.

A. Legal Authority To Evaluate State CCR Program Submittals

For the reasons set forth below, EPA does not agree with ADEM's assertion that EPA may not consider the State's CCR permit history when determining whether to approve its permit program. In short, the Agency interprets the statute to require EPA to consider the CCR permits a State has issued under its CCR program when determining whether the State program can be approved, where such information is available prior to approval.

1. The Statute Requires EPA To Consider a State's CCR Permits When Determining Whether To Approve the Program if the Information Is Available

Section 4005(d)(1)(B) of RCRA provides in part that the Administrator ''shall approve, in whole or in part, a permit program or other system of prior approval and conditions submitted under subparagraph (A) if the Administrator determines that the program or other system *requires each coal combustion residuals unit located in the State to achieve compliance with*'' either: (1) The Federal CCR requirements at 40 CFR part 257 (*i.e.,* the Federal CCR regulations); or (2) Other State criteria that the Administrator, after consultation with the State, determines to be at least as protective as the Federal requirements. 42 U.S.C. 6945(d)(1)(B) (*emphasis added*). The statute directs the Administrator to determine whether the State program ''requires each'' CCR unit in the State ''to achieve compliance'' with either the Federal standard or an alternative State standard at least as protective as the Federal CCR regulations. This necessarily includes Agency consideration of both a State's statute and regulations and what the State actually requires individual CCR units to do, such as in permits or orders, when such information is available prior to approval of the State program. By specifying that EPA is to determine that the State program requires each unit ''to achieve compliance,'' rather than merely that the State requires compliance or has the *authority* to require compliance, Congress indicated that EPA is not restricted to evaluating the letter of the State's regulations. Moreover, the statute makes clear that once a permit goes into effect, those are the relevant requirements applicable to the CCR unit rather than the regulations. See 42 U.S.C. 6945(d)(3) (specifying that the applicable criteria for CCR units in an approved State are those contained in the State *permit,* rather than the Federal or State regulations). Whether issued permits comply with Federal requirements or a State program that is at least as protective is directly relevant to whether the State program ''requires each CCR unit in the State to achieve compliance.'' If issued permits do not comply, the State program does not require compliance. EPA cannot reasonably ignore such information, when available, as it falls squarely within the ordinary meaning of what the statute expressly directs EPA to consider. This is particularly true, where, as here, the Agency knows ADEM is issuing permits to CCR units that do not require compliance with the Federal CCR regulations, and the State has not demonstrated that its alternative approach is as protective as the Federal CCR regulations.

In this case, ADEM adopted into its State regulations the provisions of the Federal CCR regulations. For this reason, ADEM believes that EPA must approve the State's CCR program because it in large part mirrors to the Federal CCR regulations, thus, according to ADEM, the State program satisfies the requirements for an approvable program pursuant to RCRA section 4005(d)(1)(B)(i). ADEM is correct that EPA may approve a State program under this provision based on the fact that the State's regulations are identical to those in the Federal CCR regulations, but not where the State interprets the State regulations to impose significantly different requirements than the Federal CCR regulations, and the State has issued permits authorizing actions that the Federal regulations prohibit. Here, despite adopting the language in the Federal CCR regulations, ADEM has affirmatively stated that it interprets the State regulations differently than the identically worded Federal provisions and has issued permits on that basis, even though the Agency has informed the State on multiple occasions that its interpretation and implementation of the regulations are not consistent with the Federal CCR regulations. See Units III.E and IV.C of this preamble (discussing Alabama's interpretation of ''infiltration'' under § 257.102(d)(1)(i), among other examples). Based on all of the information in the record, EPA cannot conclude that Alabama's program ''requires each'' CCR unit in the State ''to achieve compliance with'' the Federal CCR regulations as required by RCRA section 4005(d)(1)(B)(i).

Further, because Alabama is interpreting the language in the Federal CCR regulations differently than the Agency, Alabama is essentially submitting ''other State criteria,'' and in order for EPA to approve such a program, Alabama must provide information to support a determination that the State criteria are ''at least as protective as the [Federal CCR regulations]'' consistent with RCRA section 4005(d)(1)(B)(ii). EPA has explained its position to Alabama, most recently by letter dated February 1, 2023, and Alabama has declined to provide any explanation, much less an adequate one, of how its program will require each CCR unit to achieve compliance with standards at least as protective as the Federal CCR regulations. Accordingly, the Agency is proposing to deny Alabama's request for approval of its CCR permit program. This proposed denial is based on all the available information in the record, and as discussed in Unit IV.C of this preamble, it demonstrates that the Alabama CCR permits do not require each CCR unit in the State to achieve compliance with requirements at least as protective as those contained in the Federal CCR regulations.

2. EPA Is Not Required To Approve a Deficient State Program and Then Redress the Deficiencies Through RCRA's Program Review Provisions

In addition to the express terms of RCRA section 4005(d)(1)(B), as explained below, the overall context of RCRA section 4005(d) supports consideration of State CCR permits when they have been issued prior to approval of the State program. Even were that not the case, it would be unreasonable to interpret the statute to require that EPA must approve a State program based on the four corners of the submission and then use the program review provisions of RCRA section 4005(d)(1)(D) to address pre-existing deficiencies in the program. As an initial matter, EPA questions how it would be reasonable to ignore directly relevant and readily available information in review of a State program that will stand in for a Federal program, because once EPA approves a State program, the requirements of the State program apply instead of the Federal rules. Further, once a State permit is issued, facilities are shielded from enforcement of anything other than the provisions of the State permit. Compounding the problem is the time it would take to go through the statutorily mandated process to withdraw a deficient program and the fact that prior noncompliance would be arguably sanctioned by approval of a State program that is being implemented improperly.

In this case, all the potential problems that can arise by approving a State CCR program based solely on the ''four

corners'' of the State application are in play. Specifically, the State is interpreting the terms of the State program (*i.e.,* the terms of the Federal CCR regulations) in a manner that is less protective than the Federal CCR regulations, the State is issuing permits based on its flawed interpretation, EPA approval of the State program would be the equivalent of approving the deficient permits, it would take considerable time to withdraw the State program after approval, and, in the interim, facilities would be able to operate under permits that are less protective than required. Furthermore, the Agency is proposing to determine, based on the available information, that Alabama's CCR permit program is deficient under two of the bases provided in RCRA section 4005(d)(1)(D)(ii), EPA has notified Alabama of the deficiencies, and the State has declined to address them. See Unit IV.C of this preamble (discussing the deficiencies in Alabama's CCR program).

The statute requires EPA to periodically review approved State programs and provides a process by which EPA can address identified deficiencies. RCRA sections 4005(d)(1)(D)(i) and 4005(d)(1)(D)(ii), respectively. The review provisions in RCRA section 4005(d)(1)(D)(i) require review:

- from time to time, as the Administrator determines necessary, but not less frequently than once every 12 years;
- not later than 3 years after the date on which the Administrator revises the applicable criteria for coal combustion residuals units under part 257 of title 40, Code of Federal Regulations (or successor regulations promulgated pursuant to sections 6907(a)(3) and 6944(a) of this title);
- not later than 1 year after the date of a significant release (as defined by the Administrator), that was not authorized at the time the release occurred, from a coal combustion residuals unit located in the State; and
- on request of any other State that asserts that the soil, groundwater, or surface water of the State is or is likely to be adversely affected by a release or potential release from a coal combustion residuals unit located in the State for which the program or other system was approved.

The statute clearly provides for review of State programs whenever ''the Administrator determines necessary,'' in addition to the situations that mandate EPA review of a State program (*e.g.,* RCRA section 4005(d)(1)(D)(i)(I) requiring review periodically and at least every 12 years). Under Alabama's reading of the statute, EPA must approve a knowingly deficient State program and then undertake a program review, either mandatory or discretionary, to address the deficiencies in that same program. Under such circumstances, CCR units in the State would potentially be allowed to operate in a manner that is not consistent with the Federal CCR regulations for many years unless EPA were to undertake a voluntary program review immediately after approving the program.

An additional factor that argues against Alabama's interpretation is the fact that RCRA section 4005(d)(1)(D)(ii) provides a process that EPA *must* follow to address identified deficiencies in a State CCR permit program before EPA may withdraw the program, and, during that time, ADEM could continue to issue permits that are not as protective as the statute requires. See also 42 U.S.C. 6945(d)(1)(E)(i) (allowing withdrawal of a State program only after notice to the State and an opportunity for a hearing). Specifically, under RCRA section 4005(d)(1)(D)(ii), EPA must provide the State with notice of deficiencies in the State program and an opportunity for a hearing if the Administrator determines that:

- a revision or correction to the permit program or other system of prior approval and conditions of the State is necessary to ensure that the permit program or other system of prior approval and conditions continues to ensure that each coal combustion residuals unit located in the State achieves compliance with the criteria described in clauses (i) and (ii) of subparagraph (B);
- the State has not implemented an adequate permit program or other system of prior approval and conditions that requires each coal combustion residuals unit located in the State to achieve compliance with the criteria described in subparagraph (B); or
- the State has, at any time, approved or failed to revoke a permit for a coal combustion residuals unit, a release from which adversely affects or is likely to adversely affect the soil, groundwater, or surface water of another State.

The information currently available to EPA already indicates that Alabama's program is deficient under the first two provisions of RCRA section 4005(d)(1)(D)(ii). First, a revision to Alabama's CCR permit program is necessary to ensure that each CCR unit located in the State achieves compliance with State standards that are ''at least as protective as'' the Federal CCR regulations because Alabama has never adequately explained how its alternative requirements achieve that standard. 42 U.S.C. 6945(d)(1)(D)(ii)(I). Second, as explained further in Unit IV.C. of this preamble, ADEM has not implemented its permit program in a manner that ''ensures each CCR unit located in the State achieves compliance with the criteria described in subparagraph (B).'' 42 U.S.C. 6945(d)(1)(D)(ii)(II). In addition, EPA has notified Alabama of these deficiencies on multiple occasions, and the State has not provided an adequate justification for the position that its interpretation of the Federal CCR regulations should govern over EPA's interpretation.

Given Alabama's continued failure to adequately address EPA's concerns with its CCR program, EPA has no reason to believe that Alabama will change its interpretation and implementation of its program if EPA were to approve Alabama's CCR program and then subsequently proceed with the RCRA section 4005(d)(1)(D)(ii) process to attempt to resolve the program deficiencies. EPA would then have to go through the RCRA section 4005(d)(1)(E) process to withdraw the Alabama program. In that case, EPA would then be back at the point where Alabama would have to either adopt EPA's interpretation of the Federal CCR regulations or explain how its alternative interpretation ensures that the State's program is as least as protective as the Federal CCR regulations.

The statutory language is clear, and it does not support Alabama's interpretation. In addition, the Agency believes Alabama's interpretation could, as in this case, lead to the illogical result that EPA must approve a State CCR permit program that it believes it likely will eventually have to withdraw. EPA also declines to adopt Alabama's suggested approach because the process to withdraw takes significant time and in the interim Alabama would likely continue to issue permits that allow CCR units in the State to operate under conditions that are less protective than those required in the Federal CCR regulations. Finally, EPA is aware of several CCR permits that allow units to operate less protectively than required by Federal CCR regulations and approving Alabama's program would mean that these units would no longer be subject to the Federal CCR regulations. Thus, if EPA were to approve Alabama's program now (*i.e.,* after the deficient CCR permits were issued), the Alabama CCR program, including the facility-specific permits, would apply in lieu of the Federal CCR

regulations pursuant to RCRA section 4005(d)(1)(A) and (3).

For all these reasons, EPA does not believe the statute must be interpreted as Alabama suggests and EPA declines to adopt the State's interpretation.

B. EPA's Analysis of the Alabama CCR Regulations

Section 4005(d)(1)(A) of RCRA, 42 U.S.C. 6945(d)(1)(A), requires a State seeking CCR permit program approval to submit to EPA, ''in such form as the Administrator may establish, evidence of a permit program or other system of prior approval and conditions under State law for regulation by the State of coal combustion residuals units that are located in the State.'' Although the statute directs EPA to establish the form of such evidence, the statute does not require EPA to promulgate regulations governing the process or standard for determining the adequacy of such State programs. EPA, therefore, developed the *Coal Combustion Residuals State Permit Program Guidance Document; Interim Final* (82 FR 38685, August 15, 2017) (the ''Guidance Document''). The Guidance Document provides recommendations on a process and standards that states may choose to use to apply for EPA approval of a State CCR permit program, based on the standards in RCRA section 4005(d), existing regulations at 40 CFR part 239, and the Agency's experience in reviewing and approving State programs.

As stated above, State permit programs under RCRA generally include both sector specific technical regulations (*e.g.,* performance standards for CCR units) and general State permitting and enforcement provisions that apply to all the different State RCRA permitting programs. In this case, Alabama is seeking approval of a partial State CCR permit program and it established State regulations that are almost the same as the Federal CCR regulations for the portions of the Federal program for which the State is seeking approval. To the extent the Federal and State provisions are different, the differences do not on their face substantively make the State regulations less protective than the Federal CCR regulations. EPA reviewed ADEM's CCR regulations and, based on that review, EPA proposes to find that the express terms of the regulations provide ADEM with sufficient authority to issue permits that are at least as protective as those required under the Federal CCR regulations. See the TSD Volume III (providing a detailed analysis of the regulatory terms of Alabama's CCR regulations). EPA is proposing to determine that the terms of the regulations provide the State with sufficient authority to implement an adequate CCR permit program despite the fact that the Agency is also proposing to deny the Application for Alabama CCR permit program based on the State's issuance of permits under those same regulations. Therefore, the Agency believes the record would support approval of Alabama's program if the State either modified its permits to be consistent with the Federal requirements or demonstrated that its alternative requirements are at least as protective as the Federal CCR regulations.

EPA briefly discusses its evaluation of the State's regulations below. A comprehensive evaluation is included in the TSD Volume III in the docket for this proposed action.

1. Adequacy of Technical Criteria

a. Alabama CCR Regulations

EPA first evaluates the technical criteria that will be included in each permit the State issues to determine whether they are the same as the Federal criteria, or to the extent they differ, whether the modified criteria are ''at least as protective as'' the Federal requirements. *See* 42 U.S.C. 6945(d)(1)(B).

On April 20, 2018, ADEM, by and through the Alabama Environmental Management Commission (EMC), amended ADEM Admin. Code div. 335–13 to: (1) Modify Chapters 1, 4, and 5 and (2) Add a new Chapter 15: *Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.* These rules became effective on June 8, 2018. In response to EPA comments and changes to the Federal CCR regulations, ADEM proposed and finalized several amendments to its CCR rules with the first revisions becoming effective February 15, 2021. The most recent revisions became effective December 13, 2021.

ADEM's regulations adopt the Federal CCR regulations amended through August 28, 2020, and include the corrections EPA made at §§ 257.102(d)(3)(ii) and 257.103(f)(1)(vi) (85 FR 72506, November 12, 2020) (except for certain provisions outlined below).

EPA has preliminarily determined that the Alabama CCR permit program contains all the technical criteria in 40 CFR part 257, subpart D, except for the provisions specifically discussed below. EPA's full analysis of the terms of the Alabama CCR permit program and how the Alabama regulations differ from the Federal requirements can be found in the TSD Volume III.

b. Federal Rule Provisions Excluded From Alabama's Request for Approval of a Partial Program

Alabama is requesting approval for a partial State CCR program, rather than a full CCR program that includes all the requirements of the Federal CCR regulations. ADEM is not seeking approval for the following six provisions:

1. ADEM Administrative Code r. 335–13–15–.01(1)(d); this State provision is the analog to the Federal exclusion of inactive surface impoundments at inactive facilities, found at § 257.50(e), that was vacated in *Utility Solid Waste Activities Group* v. *EPA, 901 F.3d 414 (per curiam)* (*USWAG);*

2. ADEM Admin. Code r. 335–13–15–.07(4)(f); this State provision is the analog to the Federal requirement for alternative closure deadlines, found at 40 CFR 257.103(f);

3. EPA has revised the Federal regulations to granting Participating State Directors authority to issue certifications in lieu of requiring a professional engineer (PE) certification. ADEM did not adopt these provisions; therefore, an owner or operator of a CCR unit must submit certifications from a PE, as appropriate, as required by ADEM Admin. Code chapter 335–13–15;

4. The Federal regulations include a provision that authorizes the suspension of groundwater monitoring requirements under certain circumstances, found at § 257.90(g), which the State has not adopted;

5. The Federal regulations include a provision for an alternate liner demonstration found at § 257.71(d), and the State has not adopted this Federal provision; and,

6. ADEM Admin. Code r. 335–13–15–.06(6)(h)2.: The State has adopted the groundwater protection standards for cobalt, lead, lithium, and molybdenum found at § 257.95(h)(2) but is not seeking approval because the Federal provision has been challenged and is under reconsideration.

More detail on the elements of the partial program and EPA's analysis of the program can be found in the TSD Volume III. With the exception of specific provisions spelled out in the TSD Volume III, EPA has preliminarily determined that the Alabama CCR regulations contain all the technical elements of the portions of the Federal CCR regulations for which the State is seeking approval.

2. Review of Generally Applicable Alabama CCR Permit Program Statutes and Regulations

As explained above, *supra* note 12, Alabama's CCR permit program regulations include general requirements that apply across multiple permit programs, and its Application for approval of a CCR permit program thus includes both general and facility/unit-specific requirements in the State CCR permit program. EPA therefore also evaluated the Alabama CCR permit program as modified to address CCR units using the process discussed in Units II.C and IV.A of this preamble. EPA's findings are summarized below and provided in more detail in in the TSD Volume III for this notice.

In evaluating Alabama's CCR permitting requirements, EPA reviewed the State's permit requirements for CCR units including applicability, duration, application process, denial process, and the process for draft and final permit determinations. EPA also reviewed Alabama's requirements that apply to modification, suspension, and revocation of permits. For permit modifications, EPA specifically looked at major and minor modifications to determine which modifications would require public participation. After conducting this review, EPA has preliminarily determined that the Alabama regulations concerning CCR permit applications and approvals is adequate, and that this aspect of the Alabama CCR permit program meets the standard for program approval.

Based on RCRA section 7004, 42 U.S.C. 6974, it is EPA's judgment that an adequate State CCR permit program will ensure that: (1) Documents for permit determinations are made available for public review and comment; (2) Final determinations on permit applications are made known to the public; and (3) Public comments on permit determinations are considered. Alabama has adopted public participation opportunities for the CCR program that can provide an inclusive dialogue, allowing interested parties to talk openly and frankly about issues within the CCR program and search for mutually agreeable solutions to differences. EPA reviewed Alabama's public participation requirements, processes, and procedures including public notices, public comment periods (including consideration of public comments), public hearings, and public availability of final determinations. An overview of the Alabama public participation provisions is provided in the TSD Volume III. After conducting this review, EPA has preliminarily determined that the Alabama approach to public participation requirements provides adequate opportunities for public participation in the permitting process sufficient to meet the standard for program approval.

EPA also reviewed Alabama's compliance monitoring authority, enforcement authority, and the procedures for intervention in civil enforcement proceedings. It is EPA's judgment that an adequate permit program should provide the State with the authority to gather information about compliance, perform inspections, and ensure that information it gathers provides an adequate basis for enforcement. ADEM's statutory authority for compliance monitoring for its Solid Waste Program is set forth in sections 22–27–7, 22–27–9, 22–27–12, 22–22A–5 and 22–22A–8 of the Code of Alabama, 1975. These portions of the statute, as well as ADEM Admin. Code rules 335–13–1–.11(2) and 335–13–6-.01(2) give the Department authority during an inspection to obtain all information necessary to determine whether the owner/operator is in compliance with State CCR requirements. This includes authority to conduct monitoring and testing when necessary.

Based on the information Alabama has submitted on the State's permitting requirements, EPA has preliminarily determined these aspects of the Alabama CCR permit program provide the State with the necessary authority to implement an adequate State program. More detail on the review and analysis of Alabama's CCR permit program can be found in the TSD Volume III.

C. EPA's Analysis of Alabama's Permits Issued Under the State CCR Regulations

EPA conducted a review of Alabama's permitting decisions as part of the Agency's evaluation of whether ADEM's CCR permit program requires *each* coal combustion residual unit located in the State to achieve compliance with standards at least as protective as the Federal CCR regulations. 42 U.S.C. 6945(d)(1)(B). Alabama's permitting decisions issued under its CCR regulations are directly relevant to determining whether the State's program satisfies this statutory requirement, and EPA considers such information to be appropriately part of the record for a decision on the permit program when permit issuance begins prior to approval of the State program and the Agency has information that the State's implementation is not sufficiently protective.

ADEM submitted its revised State CCR permit program Application on December 29, 2021. Less than a month later, on January 11, 2022, EPA published several proposed decisions responding to requests from owners and operators of CCR units nationwide for extensions of the April 11, 2021, deadline to cease sending waste to unlined CCR surface impoundments (Part A proposals). EPA proposed to deny several of the extension requests because facilities were planning to close unlined CCR surface impoundments with, among other things, waste remaining in groundwater without adopting engineering measures to limit the flow of groundwater into and out of the unit. Soon after issuing the Part A proposals, several states, utility facilities that own unlined surface impoundments, and trade groups contacted EPA to object to the Agency's application of the closure requirements to the unlined surface impoundments in those proposed decisions. Based on these objections, EPA was concerned that Alabama's and other states' CCR permit programs were being interpreted and implemented to allow facilities to close unlined surface impoundments without complying with all the necessary requirements in the Federal regulations.

Because of these concerns, on March 15, 2022, EPA sent a list to ADEM of CCR surface impoundments in Alabama that, based on the information available to EPA, appear to be inundated by groundwater.[14] Over the next several months, EPA and ADEM met several times to discuss the application of the Federal closure performance standards to such impoundments, and to better understand how the State interpreted its own requirements.[15]

EPA also started reviewing permits for unlined surface impoundments in Alabama as part of EPA's review of the State CCR permit program. As a consequence, in meetings and in correspondence with ADEM, EPA

[14] The CCR surface impoundments with insufficient permits that are discussed in this Unit of the preamble are all surface impoundments with WBWT. For a list of all the CCR surface impoundments EPA identified in Alabama with WBWT, see Email from Meredith Anderson to Scott Story. CCR units in AL. March 15, 2022.

[15] Interactions between EPA and Alabama about implementation of the State program include: April 13, 2022, meeting to discuss the Federal closure performance standards; three separate meetings to discuss the proposed closure requirements for Plant Gorgas, Plant Greene County, and Plant Gadsden; May 10, 2022, meeting to further discuss the closure performance standard and specifically how ADEM was interpreting and applying the closure and groundwater monitoring performance standards at the Ash Pond at Plant Gadsden; and May 28, 2022, meeting to discuss the status of closure activities at Plant Greene County and Plant Gadsden. A list of EPA/Alabama interactions is in the Technical Support Document Volume II.

expressed concern that Alabama's permit program appeared to differ from the Federal program, and that these differences appeared to make the State's program less protective than the Federal program. As a result of these discussions, on July 7, 2022, EPA informed ADEM via telephone that EPA would be unable to approve ADEM's CCR permit program Application until Alabama demonstrated to EPA that the State is implementing its program to be as protective as the Federal CCR regulations.[16] Further, EPA explained to ADEM that it was exploring options for actions to take at the Federal level with respect to both the CCR permit program Application and at specific facilities where there are outstanding concerns.

Throughout the course of these discussions, and in EPA's nationwide Part A determinations, EPA explained the existing requirements under the Federal regulations; in response, ADEM offered notably different interpretations of some of the obligations under the State's current closure requirements. Despite the Agency's concerns, the State continues to implement its CCR program in a manner that is less protective than the Federal CCR regulations, and Alabama has not adequately explained how its alternative State program satisfies the statutory requirement to require each CCR unit in the State to achieve compliance with either the Federal requirements or with State standards that are at least as protective as the Federal requirements.

As part of the evaluation of Alabama's CCR program submittal, EPA reviewed four final State CCR permits issued by ADEM for the following facilities: Plants Colbert, Gadsden, Greene County, and Gorgas. EPA's review focused specifically on permits issued to unlined surface impoundments that have closed or are closing with waste that will remain in place below the water table, because these units have the greatest potential to cause significant environmental and human health effects if mismanaged. EPA limited its review to information in the permit record (*e.g.,* the Permit Application or information on ADEM's e-File site) and to information publicly available on each facility's CCR website, even though the permit record alone should contain all the information necessary to determine whether the permit is as protective as the Federal CCR regulations. EPA also did not attempt to catalog every potential inconsistency between the permits and the Federal CCR regulations. Instead, EPA concentrated on the permits' consistency with fundamental aspects of the closure, groundwater monitoring, and corrective action requirements. EPA took this approach because the purpose of this review is to determine whether Alabama's program meets the statutory standard for approval, not to reach final conclusions about an individual facility's compliance with the CCR regulations.

During its review, EPA identified a consistent pattern of ADEM issuing permits to CCR units that fail to demonstrate compliance with fundamental requirements in part 257, without requiring the permittees to take specific actions to bring the units into compliance. EPA also identified a consistent pattern of ADEM approving documents submitted by the facilities, such as closure plans, groundwater monitoring plans, and assessments of corrective measures, even though the submissions lacked critical information or are otherwise deficient. ADEM also did not require the permittees to take any action to cure deficiencies in the permits even where ADEM previously identified the deficiencies and requested further information prior to issuing the final permits. Specifically, EPA is proposing to determine that ADEM issued multiple permits allowing CCR in closed units to remain saturated by groundwater, without requiring engineering measures that will control the groundwater flowing into and out of the closed unit. See, 40 CFR 257.102(d). EPA is also proposing to determine that ADEM approved groundwater monitoring systems that contain an inadequate number of wells, and in incorrect locations, to monitor all potential contaminant pathways and to detect groundwater contamination from the CCR units in the uppermost aquifer. See, 40 CFR 257.91. Finally, EPA is proposing to determine that ADEM issued multiple permits that effectively allow the permittee to delay implementation of effective measures to remediate groundwater contamination both on- and off-site of the facility. See, 40 CFR 257.96–257.97. Overall, EPA's review of the permit records and other readily available information documents a consistent pattern of deficient permits and a lack of oversight and independent evaluation of facilities' proposed permit terms. In each case, EPA was unable to locate any evaluation or record of decision documenting that ADEM critically evaluated the materials submitted as part of the permit application, or otherwise documented its rationale for adopting them. For all these reasons, EPA is proposing to conclude that the ADEM permits discussed below are not as protective as the Federal CCR regulations.

In the next several sections, EPA discusses specific issues identified during the review of ADEM's final permits for Plants Colbert, Gadsden, Greene County, and Gorgas.[17] Based on EPA's review, the Agency is proposing to deny Alabama's Application because the State's CCR permit program does not require each CCR unit in the State to achieve compliance with either the minimum requirements in the Federal CCR regulations or with alternative requirements that EPA has determined to be at least as protective as the Federal provisions.

1. Colbert Fossil Plant

TVA owns and operates the Colbert Fossil Plant (Colbert or Colbert Plant) located in Colbert County, Alabama, and it submitted a permit application for the facility dated December 10, 2021.[18] The plant property is on the south bank of the Tennessee River, approximately 8 miles west of Tuscumbia, Alabama. The Colbert Fossil Plant was fully idled and stopped generating electricity in March 2016. The plant had five generating units with a combined generating capacity of 1,204 megawatts. In accordance with the ADEM Land Division, Solid Waste Program, Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, Chapter 335–13–15–.02, Ash Disposal Area 4 (also called Ash Pond 4) is classified as an existing CCR surface impoundment. Ash Disposal Area 4 is located on the southern portion of the plant property, approximately 3,000 feet south of the powerhouse. The CCR surface impoundment is bounded to the west by Colbert Steam Plant Road, to the east by Cane Creek, and to the south by Lee Highway. EPA reviewed TVA's permit application and draft and final permits

[16] July 7, 2022– Telephone call between Carolyn Hoskinson, Director of EPA's Office of Resource Conservation and Recovery, and Stephen Cobb, Chief of the Land Division at the Alabama Department of Environmental Management.

[17] On January 31, 2023, EPA Region 4 sent a Notice of Potential Violations (NOPV) and Opportunity to Confer to Alabama Power Company. The NOPV addressed concerns with compliance of Alabama Power Company's Plant Barry Ash Pond. The NOPV addressed the following potential violations: failure to meet the criteria for conducting the closure of the Plant Barry Ash Pond, failure to establish an adequate groundwater monitoring system, and failure to address certain site-specific criteria in the Emergency Action Plan. Although the permit and record for Plant Barry share many of the flaws in the CCR permits for other unlined surface impoundments in Alabama, EPA will not address the Plant Barry permit as part of this action because the enforcement process with the facility is ongoing.

[18] Tennessee Valley Authority Colbert Fossil Plant (COF) Ash Pond 4 Permit Application. Submitted to ADEM. December 10, 2021.

for the Colbert Plant along with associated documents. Issues with closure, groundwater monitoring networks, and corrective action at the Colbert Plant are discussed below.

a. TVA Colbert Closure Issues

The Federal CCR regulations provide two options for closing a CCR unit: closure by removal and closure with waste in place. 40 CFR 257.102(a). Both options establish specific performance standards. 40 CFR 257.102(c) and (d). TVA closed Ash Pond 4 at Colbert by leaving the CCR in the unit in place; but, as explained below, the TVA application for Ash Pond 4 did not comply with the Federal closure standards for closure with waste in place for unlined surface impoundments and ADEM issued the permit without addressing the deficiencies.

TVA's Permit Application for the Colbert Plant explains that Ash Pond 4 was built in 1972 and TVA completed its closure in early 2018, prior to its application for a permit under the ADEM CCR rules in Chapter 335–13–15.[19] TVA elected to close Ash Pond 4 by leaving CCR in place and constructing a final cover system over the waste, which is estimated to be 2.6 million cubic yards (CY) of waste.[20] Closure of Ash Pond 4 was completed in accordance with a closure and post-closure care plan dated February 2017, which was approved by ADEM on August 22, 2017.[21] Closure activities were deemed complete in March 2018 and a certification report dated September 18, 2018, documenting closure of Ash Disposal Area 4, was submitted to ADEM.

ADEM's Final Permit, issued in October 2022, provides the following terms and conditions:

Closure Timeframe and Notifications. The Permittee shall close their CCR units as specified in 335–13–15–.07(2), this permit and the Application.

B. Criteria for Closure.

1. Cover. Closure of a CCR landfill, surface impoundment, or any lateral expansion of a CCR unit must be completed by either leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit, as described in 335–13–15–.07(3)(b) through (j). The minimum and maximum final grade of the final cover system may be less than 5 percent and greater than 25 percent, as specified in the Permit Application, for the Colbert Fossil Plant Ash Disposal Area 4. Ash Disposal Area 4 may utilize erosion control measures, as specified in the Permit Application, other than horizontal terraces. (See Section IX.A. and B.)

2. Written Closure Plan. The written closure plan, as part of the Application, must include, at a minimum, the information specified in 335–13–15–.07(3)(b)1.(i) through (vi).

According to ADEM, ''[t]he Department adopted the terms of the closure plan as part of the permit as the Department has previously approved the plan and determined it meets both State and Federal regulations for closure of a CCR unit.'' [22] Once ADEM approved and adopted TVA's Closure Plan into the permit, the Closure Plan, rather than the referenced State regulations, became the State requirements with which TVA is required to comply. See, 42 U.S.C. 6945(d)(3)(A). As discussed in detail in the next section and summarized in Table II, between 2019 and 2021, approximately 6 to 13 feet of ash (on average)– or 13 to 35 percent of the CCR in the closed Ash Pond remains saturated by groundwater.

i. The CCR in the Closed Ash Pond 4 Remains Saturated by Groundwater

Neither TVA's Closure Plan, the Permit Application, ADEM's Final Permit, or any other document in the permitting record specifically discuss how the closure of Ash Pond 4 would meet the closure performance standards given the measured groundwater elevations and hydrogeology of the site. Accordingly, EPA reviewed information in the Permit Application as well as other publicly available information available on TVA's CCR website to determine whether groundwater remains in contact with the CCR in Ash Pond 4 since closure was completed in March 2018. As described below, available groundwater measurements recorded between 2018 and 2021 show that, even after closure, groundwater levels at Ash Pond 4 continue to be present above the base of the unlined impoundment, saturating a portion of the CCR in the closed unit. EPA's basis for these findings is described in the succeeding paragraphs, which summarize EPA's understanding of the base elevation of Ash Pond 4 (*e.g.,* the lowest extent of CCR in the unit), the groundwater levels since closure was completed in 2018, and EPA's estimate of the volume of CCR that remains saturated with liquid (groundwater). More details on EPA's analyses can be found in TSD Volume I.[23]

(1) Base of the Impoundment

Ash Pond 4 is a 52-acre CCR surface impoundment that was created by constructing a single dike around the perimeter of the impoundment and two internal divider dikes. EPA was unable to locate information in the Permit Application or other publicly available documents that fully describes the as-constructed configuration of the bottom of Ash Pond 4 across its entire footprint prior to the initial receipt of waste. However, based on information in the Permit Application and documents referenced in the Permit Application, the lowermost documented elevations at which CCR occurs within the impoundment varies depending on the location, ranging from approximately 413.5 to 427.1 ft above mean sea level (MSL). See TSD Volume I, Section II.a.

EPA also relied on an average elevation to estimate the volume of CCR in the impoundment remaining in contact with groundwater, rather than trying to account for what may be as much as a 14-foot difference across the 52-acre impoundment. Specifically, EPA relied on an average bottom elevation of 422 ft above MSL, which is the average of elevation measurements taken at 18 locations within the footprint of the impoundment based on borings for piezometers and wells. Information on these borings is found on construction drawings 10W395–7 through 9 and a report from 2010. See TSD Volume I, Section II.a. This average is also consistent with several documents in the Permit Application and other documents that depict the

[19] The terms ''Ash Pond 4'' and ''Ash Pond Area 4'' are both used in the Colbert Plant Permit Application to refer to the impoundment in question. For purposes of this proposal, EPA is referring to the impoundment as Ash Pond 4.

[20] The Permit Application states that the ''total capacity of Ash Disposal Area 4 is approximately 2.6 million CY, covering approximately 52 acres.'' EPA is aware that other reports State that the ''approximate volume of CCR material at the time of the inspection'' is 3.29 million CY. See, *e.g.,* FY2021 Intermediate Inspection of CCR Facilities dated May 6, 2021. For purposes of estimating volumes of saturated CCR in this proposal, EPA is taking an approach that provides a minimum estimate, relying on the value presented in the Permit Application to represent the volume of CCR in the impoundment, instead of relying on the larger estimates established based on the inspection of the unit.

[21] Tennessee Valley Authority. Permit Application for CCR Surface Impoundment, TVA Colbert Fossil Plant Ash Disposal Area 4. December 10, 2021. Attachment I.

[22] Letter from Stephen Cobb to Carolyn Hoskinson, Responding to EPA Comments on Proposed Permit for the

Tennessee Valley Authority Colbert Fossil Plant, October 27, 2022, Enclosure 1, page 6.

[23] Volume I: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, Supplemental Analyses of Technical Issues with ADEM Permits. U.S. Environmental Protection Agency, Office of Land and Emergency Management (5304T), 1200 Pennsylvania Avenue NW, Washington, DC 20460. August 2023.

base of the impoundment at 422 ft above MSL. For example, Section A–A of construction drawing 10N292R3 shows a bottom elevation of approximately 422 ft above MSL in the vicinity of the northern perimeter dike where the spillways were constructed. Id. at Volume I, Section II.a.i.3. Another example is a slope stability section supporting a steady-state seepage analysis that shows a portion of the base of the impoundment to be at an elevation of 422 ft above MSL. Id. at Section II.a.i.2. Similarly, design drawings from 2010 for a temporary rock buttress and sheet pile wall constructed in a portion of an internal divider dike show the bottom of the impoundment to be 422 ft above MSL at this location. Id. at Section II.a.i.3. A final example is the liner design demonstration prepared by TVA to comply with § 257.71 that states ''[f]rom information contained in drawing 10N290, it was assumed the base of the pond is at elevation 422 ft.'' Id. at Section II.a.iv. However, it is important to note that the use of the 422 ft elevation mark to represent the base of the unit was an effort to represent average conditions. As noted earlier, the preponderance of the evidence suggests that base of the impoundment varies depending on the location, ranging from approximately 413.5 to 427.1 ft above MSL, but an average value of 422 ft above MSL is technically defensible and conservatively high. See TSD Volume I, Section II.a. Volumes during worst case conditions (*i.e.,* when river stages and water tables are higher than reported values) would be greater, and actual saturated CCR volumes could be higher than estimated if portions of the unit with lower documented waste bottom elevations (less than 422 ft above MSL) were considered. The estimates provided by EPA below and in the TSD Volume I are reasonable based on the available information provided in the Permit Application regarding the waste bottom elevations.

ii. Characterization of Groundwater Elevations

Information from TVA's Permit Application clearly supports a conclusion that at least some portion of the CCR in Ash Pond 4 remains saturated by continued infiltration of groundwater. The groundwater elevation maps for 2020 and 2021 provided in the Permit Application reveal that the lowest measured groundwater elevations range between just over 414 to just over 416 ft above MSL.[24] These levels are found in groundwater monitoring wells COF–105 and CA31A, which are screened in the residuum/alluvium layer, and consistently measure the lowest groundwater elevations of any of the wells immediately surrounding Ash Pond 4. In every measurement reported in the Permit Application, the groundwater elevations measured in these wells are 0.86 to 2.7 feet above the lowest documented elevation of CCR within the unit (413.5 ft above MSL). Furthermore, COF–105 is located approximately 150 feet east of the unit boundary in the downgradient direction and CA31A is located approximately 400 feet northeast of the unit boundary in the downgradient direction. As corroborated by monitoring well and piezometer data from within the unit, the actual groundwater elevations directly beneath the unit are generally higher than these minimum recorded values, which are well beyond the unit boundary in downgradient directions. This basic information clearly supports a conclusion that at least some portion of the waste in Ash Pond 4 is wet under typical conditions.

A closer examination of available data from the Permit Application further supports this conclusion. Assuming that the base of the CCR is uniformly at 422 ft above MSL, based on the contour intervals depicted on the groundwater elevation map for February 27, 2020 (Figure A–1), groundwater elevations range from 414.36 to 437.46 ft above MSL, and exceed 422 ft above MSL at over fifty percent of the entire Ash Pond 4 footprint. Similarly, the groundwater elevation contours depicting the February 22, 2021 (Figure A–3), groundwater elevation data documents water levels ranging from 415.14 to 436.54 ft above MSL, indicating that water levels greater than 422 ft above MSL are present at one-third or more of the area within the impoundment.

Even though data from summer monitoring events show that summer groundwater levels are considerably lower than the data reported for February 2020 and 2021, there still appears to be a considerable footprint of wet waste under all reported conditions, and conditions indicative of groundwater saturation or infiltration into the closed unit appear to be sustained without interruption in some regions of the unit. On August 10, 2020 (Figure A–2), groundwater levels ranged from 414.38 to 422.58 ft above MSL and are mapped between 415 and 420 ft over most of the unit's footprint, with a small portion in the extreme southwest corner of the mapped area showing higher groundwater levels of greater than 420 ft. On August 23, 2021 (Figure A–4), groundwater elevations ranged from 414.79 to 429.00 ft above MSL and are mapped as being greater than 422 ft above MSL beneath a somewhat larger portion of the impoundment's surface area in the southwestern corner, with the remainder of groundwater elevations in the unit mapped between 415 and 420 ft above MSL.

The Permit Application also presents groundwater elevation contour maps for the Tuscumbia limestone bedrock aquifer for 2020 and 2021. This is appropriate as there is an abundance of information contained in the materials presented for the Permit Application, the annual groundwater monitoring reports, and the 2019 Comprehensive Groundwater Investigation Report that indicates that the Tuscumbia limestone aquifer is in direct contact and is in direct hydraulic communication with the overlying residuum/alluvium aquifer.[25] In this respect, EPA interprets the Tuscumbia limestone aquifer to be part of the uppermost aquifer system for the unit. EPA's analysis in this regard is included in Section II.b of the TSD Volume I.

For the Tuscumbia limestone, the Permit Application included four contour maps from groundwater elevation measurement events on February 27, 2020, August 10, 2020, February 22, 2021, and August 23, 2021.[26] These data sets, which are summarized in Table I below, generally indicate that water levels in the bedrock aquifer are higher than the 422-foot base elevation beneath significant regions of the Ash Pond 4 footprint during most of these four monitoring events, particularly during winter conditions. For February 27, 2020 (Figure A–5), groundwater elevations in the Tuscumbia limestone ranged from 414.61 to 437.77 ft above MSL.[27] TVA's interpretive contours depicting the Tuscumbia limestone bedrock groundwater elevations for February 27, 2020, indicate that the entire

[24] Tennessee Valley Authority. Permit Application for CCR Surface Impoundment, TVA Colbert Fossil Plant Ash Disposal Area 4. December 10, 2021. Attachment H, Appendix A, Figures A–1 through A–4.

[25] Stantec, Comprehensive Groundwater Investigation Report, First Amended Consent Decree # 20–01–2013–900123 Ash Pond 4 and Ash Stack 5. TVA Colbert Fossil Plant, Prepared for Tennessee Valley Authority Chattanooga, Tennessee. May 17, 2019.

[26] Permit Application at Figures A–5 through A–8, respectively.

[27] The elevation corresponding to wells CA29BR and CA22B on Figures A–5 through A–8 were excluded from this range based on TVA's footnote indicating these wells are ''poorly connected to site wide groundwater flow system.''

impoundment is characterized by water levels greater than or equal to 422 ft above MSL, except for a very small area near monitoring well COF–111 near the eastern boundary. For February 22, 2021 (Figure A–7), measured groundwater elevation data for the Tuscumbia limestone aquifer ranged from 411.11 to 436.70 ft above MSL. TVA's interpretive contour map for the same period indicates that groundwater levels at or above 422 ft above MSL were mapped at approximately half of the unit's footprint. Similarly, on August 23, 2021 (Figure A–8), groundwater elevation data ranged from 413.47 to 429.07 ft above MSL and interpretive contours for same period for the Tuscumbia limestone bedrock aquifer again indicate that approximately 50 percent of the unit's footprint exhibits groundwater levels at or above 422 ft above MSL. Conditions during the August 10, 2020 (Figure A–6), monitoring event show lower groundwater levels, with groundwater elevation values for the Tuscumbia limestone aquifer ranging from 412.85 to 422.54 ft above MSL. TVA's interpretive groundwater elevation contours for the same period show groundwater elevations below 422 ft above MSL in all areas except for a small portion near the southwestern corner of the unit. It should also be noted that surface water levels associated with the four monitoring events listed above indicate that surface water levels in the Pickwick Reservoir are greater than 413.5 ft above MSL (the lowest documented waste bottom elevation) for two of the four monitoring events as shown in Table I. It is also worth noting that river stage, which fluctuates, was measured as above the lowest groundwater elevations measured in the Tuscumbia limestone for three of the four time periods presented in the Permit Application.

Together with the documented occurrence of solution features in the limestone and associated preferential pathways in groundwater, it is reasonable to expect some degree of hydraulic communication between the reservoir/river and the underlying limestone aquifer. Depending on the magnitude and duration of the occurrence of higher river/reservoir levels, some degree of recharge from the river to the underlying aquifers may be expected. It is perhaps partly for this reason that the CCR in the unit remains wet, at least intermittently, so many years after the unit was closed. Despite the disclaimer,[28] which appears on all the Tuscumbia groundwater elevation maps in the Permit Application, EPA believes that the interpretive contours provided on these maps corroborate the anisotropic groundwater flow conditions to which TVA refers. EPA's interpretation of this information confirms the presence of northeast striking preferential pathways within the Tuscumbia limestone aquifer. In any event, the measured head values in the Tuscumbia limestone aquifer within and surrounding the unit are hard data points that enable the simplistic analysis regarding position of the waste relative to measured water levels. EPA's analysis and reasoning on this subject are further detailed in Section II.b of the TSD Volume I.

TABLE I—MAXIMUM AND MINIMUM REPORTED GROUNDWATER ELEVATIONS [a] FOR THE TUSCUMBIA LIMESTONE AND ASSOCIATED CONTEMPRANEOUS RIVER STAGE ELEVATIONS FOR PICKWICK RESERVOIR ON FOUR MONITORING EVENTS DURING 2020–2021

	Feb 27, 2020	Aug 10, 2020	Feb 22, 2021	Aug 23, 2021
High Groundwater Elevation	437.77	422.54	436.7	429.07
Low Groundwater Elevation	414.61	412.85	411.11	413.47
River Stage [b]	410.95	414.24	412.41	413.79

[a] All data presented in feet above MSL, NGVD 29 datum.
[b] River stage values obtained from Figures A–5 through A–8 in the Groundwater Plant in the Permit Application.

The groundwater elevations provided in the Permit Application are based primarily on data collected from outside of the unit, without consideration of actual groundwater levels directly within and beneath the unit. Although data from inside the unit were not provided in the Permit Application, data from piezometers and monitoring points within Ash Pond 4 are available in the Annual Inspection Reports posted on TVA's CCR website. EPA reviewed the water level information reported in the Annual Inspection Reports from 2016 through 2022.[29] These reports document the change of water levels within the unit over time since closure and provide for a direct, more highly resolved and representative analysis of actual groundwater levels and conditions directly within and beneath the unit. These data demonstrate that significant areas and volumes of CCR below the water table have been and remain sustained within the unit as discussed in further detail below. These data also enabled EPA to estimate the minimum volumes of saturated CCR that remain in the closed unit under various observed conditions.

The most recent Annual Inspection Report from May 2022 states that ''[t]here are 54 automated vibrating wire piezometers, eight (8) automated slope inclinometers, and six (6) manual magnetic extensometers installed at Ash Disposal Area 4.'' The Annual Inspection Reports categorize the piezometers as ''A'' or ''B'' in the alphanumeric identifiers assigned to each individual piezometer. Because many of these ''A'' piezometers have recorded ''dry'' conditions in later monitoring events, it appears that the ''A'' series piezometers generally represent the shallower portions of the subsurface beneath the unit, *e.g.,* screened primarily in CCR materials. While there seems to be some degree of overlap in the vertical dimension, the ''B'' series piezometers appear to be screened into generally deeper stratigraphic intervals than the ''A'' series, and generally reflect water levels in the deeper portions of the CCR waste as well as the underlying native aquifer materials in contact with the waste.

The groundwater elevations measured in ''A'' and ''B'' series piezometers for the post-closure period from 2019 through 2021 varied over similar ranges. Groundwater elevations measured in the ''A'' series ranged from 414.58 to 447.4

[28] Permit Application at Note ''1'' on Figures A–5 through A–8.

[29] The TVA reports are titled: 2022 Engineering (Annual) Inspection of CCR Facilities dated May 9, 2022; FY2021 Intermediate Inspection of CCR Facilities dated May 6, 2021; FY2020 Intermediate Inspection of CCR Facilities dated July 29, 2020; FY2019 Intermediate Inspection of CCR Facilities dated August 30, 2019; FY2018 Intermediate Inspection of CCR Facilities dated September 4, 2018; and FY2017 Intermediate Inspection of CCR Facilities dated December 15, 2017. Collectively, EPA is referring to one or more of these reports as the ''Annual Inspection Reports.''

ft above MSL during this post-closure period whereas groundwater elevations in the ''B'' series ranged from 414.5 to 445.1 ft above MSL during the same period. Average piezometric water levels in the shallow ''A'' piezometers during this post-closure period were generally at or above 430 ft above MSL beneath most of the footprint of the unit, except for a lobe of lower groundwater elevations (generally measured from 423 to 428 ft above MSL or below) in the east-central portion of the unit. The only groundwater elevations measured at or below 422 ft above MSL were at locations on the extreme eastern edge of the impoundment or further eastward in the vicinity of Cane Creek. At the deeper ''B'' piezometers, *average* groundwater elevations during the post-closure period from 2019 to 2021 were observed to be universally greater than 425 ft above MSL except for a thin strip along the eastern margin of the impoundment containing a small area (approximately 15% or less of the unit's footprint area) of somewhat lower groundwater elevations (ranging generally from 416 to 424 ft above MSL), which projects into the unit in the vicinity of piezometer COF_P4_VWP03_B. Lastly, the most recently reported groundwater elevation measurements in each piezometer and well (in 2021) continue to show a similar pattern, with nearly all groundwater elevation values between 425 to 440 ft above MSL, except for a thin strip of lower groundwater elevations near the extreme eastern margin of the impoundment, again with a small lobe-shaped area of lower groundwater elevations (421.5 to 424.2 ft above MSL) projecting a short distance into the central part of the unit from the east-central edge. Again, groundwater exceeding the average waste elevation of 422 ft above MSL was measured across virtually the entire unit.[30]

EPA also evaluated these data using common commercially available software for contouring groundwater data,[31] creating a series of maps that present a series of potentiometric surfaces and groundwater elevation measurements based on monitoring well and piezometer data from within Ash Pond 4, for various time frames and representative values, including pre-closure, during or immediately after closure, and post-closure. These groundwater elevation contour maps are available in Section II.b of the TSD Volume I.

While different software packages could be used to contour groundwater data and many different interpolation methods, EPA's contouring approach honors the data and other known constraints and is a conservate estimation of site conditions on those dates. These computer-generated contour maps are useful to illustrate what the measured groundwater elevations reveal: that groundwater levels decreased immediately after closure, but even several years later groundwater levels continue to exceed not only the lowest documented waste bottom elevation (413.5 ft above MSL), but also the average waste bottom elevation (422 ft above MSL) of the CCR in the unit. The computer-generated contours of *average* groundwater elevations representing pre-closure conditions measured at monitoring wells from January 1, 2016, through December 31, 2017, indicate pronounced groundwater mounding centered on the central and southcentral portions of the unit where a broad region of groundwater elevations on the order of 450 ft above MSL are outlined. See Section II.b in TSD Volume I. Contours of *average* groundwater elevations over a timeframe that includes the initiation of unit closure, measured at monitoring wells and piezometers from January 1, 2018, through December 31, 2019, indicate a reduction in the groundwater elevations beneath the central part of the unit to values on the order of 430 ft above MSL. A significant reduction in groundwater elevations as compared to pre-closure conditions is evident from these data. Id. Further decreases in groundwater elevations are indicated from computer-generated contours of *average* groundwater elevations measured at monitoring wells and piezometers post-closure from January 1, 2020, through December 31, 2021. However, the magnitude of groundwater elevation decreases is much smaller compared to the period just after closure, with the northeastern corner of the unit indicating the greatest relative decrease. Id. It is important to note that despite the post-closure decreases in groundwater elevations, groundwater levels currently remain well above the lowest recorded waste bottom elevation (413.5 ft above MSL) of CCR in the unit as well as the average (422-ft above MSL) waste bottom elevation of CCR at the preponderance of the impoundment.

It is important to note, however, that the foregoing analyses are somewhat skewed to the high side of the range of groundwater fluctuation because the Annual Inspection Reports list the highest recorded value for each location over the reported time interval (approximately the previous year). It is possible that some portions of the unit are above the water table during certain times of year or under certain hydrologic conditions. Nevertheless, the available reported data strongly suggests that there is a large and measurable volume of persistent wet CCR present in the closed unit. With these caveats, EPA's overall analysis of groundwater elevation data for Ash Pond 4 is as follows.

Prior to closure, there appears to have been significant groundwater mounding beneath Ash Pond 4 that has slowly decreased since pond closure. Such mounding resulted in substantially higher groundwater levels directly beneath the impoundment that generally decrease radially (as indicated by lower levels consistently measured in the monitoring wells in the peripheral and downgradient portions of the unit). As discussed above, it appears that the ''A'' piezometers (assumed shallow) are screened within the CCR materials and are measuring piezometric head beneath the impoundment area and the (assumed) deeper ''B'' piezometers are sampling groundwater in the native geologic materials and/or CCR near the base of CCR waste beneath the impoundment. The reported groundwater elevations in both the ''A'' (shallow) and the ''B'' (deeper) piezometers indicate that groundwater continues to infiltrate into the CCR in many portions of the closed unit as noted in the paragraphs above. While the assumed deeper piezometers (''B'' series) typically have water levels somewhat closer to those observed in the monitoring wells peripheral to the unit, the generally higher elevations in the shallow (''A'') piezometers versus the deeper (''B'') piezometers indicates that a downward vertical gradient likely

[30] EPA's analysis of post-closure (2019–2021) groundwater elevations within the unit evaluated ''A'' and ''B'' series piezometers. It should be noted that the ''A'' series also included a number of additional piezometers with an ''S'' designation indicating shallow screened interval depths. Evaluation of ''A'' series data also included shallow alluvium monitoring wells COF–104, –105, and –111, and CA–17A. Evaluation of ''B'' series data also included alluvium monitoring wells COF–104, –105, and –111. It should be noted that these monitoring wells are located along the extreme eastern periphery of the unit or downgradient to the east of the unit. It is also noted that these few monitoring wells consistently recorded some of the lowest groundwater elevations in the combined ''A'' and ''B'' data sets. In this this respect, the average values for the ''A'' and ''B'' piezometers are somewhat lower than they would be if the monitoring well data were excluded. This is to say that actual average groundwater elevation conditions within the unit proper are likely slightly higher than these assessments reflect due to the inclusion of the monitoring well data.

[31] EPA used EnviroInsite software to visualize geotechnical data (*e.g.,* contouring groundwater elevation data from discrete point measurements).

existed between the impoundment and the underlying geologic materials prior to closure, that the general potential for downward vertical hydraulic gradients has been sustained during and following closure, and that it persists currently, many years after closure. A detailed analysis of well/piezometer construction information, boring logs and other data are needed to further confirm and assess persistence, magnitude, and variability of downward vertical hydraulic gradients from the unit to the underlying aquifers.

Upgradient (west) groundwater elevations were consistently above waste bottom elevations, whereas downgradient waste bottom elevations were consistently near or above groundwater elevations. In a general sense, Ash Pond 4 can be described as a quasi-wedge-shaped body with higher elevations and generally thicker waste profiles on the west side, sloping eastward where generally thinner waste profiles occur at lower elevations to the east. While the groundwater table also generally slopes from west to east, the groundwater elevation surface (*i.e.,* water table) does not fall to the level of the base of the waste except in small portions of the eastern half of the unit, at best, and at worst only near the extreme eastern margins of the unit. This equates to a quasi-wedge-shaped body of saturated waste with generally higher elevations and greatest thicknesses to the west, pinching out in the eastward direction at the eastern margin of the unit.

These data and analyses underscore the general concerns that absent active engineering measures, which the permit approved by Alabama does not require, groundwater will continue to infiltrate into and flow out of Ash Pond 4 and the waste will remain wet for the foreseeable future.

iii. Volumes of Saturated CCR Estimates

Based on the available information concerning the configuration of the CCR waste mass, elevation and configuration of the surface defining the interface between the CCR waste and underlying native geologic materials, and the position of the water table under a variety of conditions, EPA made a series of calculations to estimate the volume of CCR in Ash Pond 4 that continues to be saturated with groundwater. In all the estimates, the volume of saturated waste is generally estimated to be the area within the impoundment where groundwater elevations exceed the average bottom elevation of 422 ft above MSL, using computer contouring software to create modeled contours of the groundwater elevation surface within the unit. Under all scenarios considered, substantial volumes of CCR remain saturated by continually infiltrating groundwater. EPA's analyses and the resulting estimates can be found in Section II.c of the TSD Volume I.

EPA estimates that significant volumes of saturated CCR currently remain in the closed unit, ranging from 346,183 to 914,774 CY of CCR. EPA further estimates that approximately 13% to 35% of the total volume of CCR in the unit remains in the groundwater, and that 75% to 97% of the total unit surface area is underlain by saturated CCR. Finally, EPA estimates that, on average, approximately 6 to 13 feet of the CCR remains saturated with groundwater. See Table II below.

Under this approach, EPA used a 2-ft contour interval to create more granular digital models of the groundwater surface elevation. Computer contouring software was further used to calculate the areas contained between successive 2-ft contour lines and to calculate the average groundwater elevation for that subregion. Saturated waste thickness values were then calculated for each sub-area containing groundwater elevations greater than 422-ft above MSL. Thickness values were then multiplied by the respective areas computed for each sub-area to obtain partial volumes of CCR in the aquifer. Total volumes of saturated CCR were then computed by adding the partial volumes for each sub-area.

Using this approach, three separate estimates of volumes of saturated CCR were calculated from average groundwater elevations reported from overburden monitoring wells for the following time periods:

- Spring 2019 (January 1, 2019, through May 31, 2019),
- Spring 2020 (January 1, 2020, through May 31, 2020), and
- Spring 2021 (January 1, 2021, through May 31, 2021).

Table II summarizes the volumes and areas of saturated CCR calculated for each of these time intervals.

TABLE II—DEPTH, SURFACE AREA, AND VOLUME ESTIMATES OF SATURATED CCR AT ASH POND 4 FOR 2019–2021

Estimates of saturated CCR	Spring 2019	Spring 2020	Spring 2021
Total Surface Area of Unit (SY)[a]	275,880	275,880	275,880
Total CCR Volume (CY)[b]	2,600,000	2,600,000	2,600,000
Average Thickness of Saturated CCR (ft)	13	13	6
Surface Area of Unit with CCR in Groundwater (SY)	263,907	267,657	204,302
Percentage of Unit Area with CCR in Groundwater (%)	96	97	75
Volume Percentage of Saturated CCR (%)	35	33	13
Volume of Saturated CCR (CY)	914,774	858,445	346,183

[a] Source: AECOM. Closure and Post-Closure Plan. October 12, 2016.
[b] Source: CTI and Associates. FY2021 Intermediate Inspection of CCR Facilities. May 6, 2021.

The 2019 and 2020 total estimates of saturated CCR for the unit were similar, 914,774 and 858,445 CY, respectively. Total volume estimates for 2021 were lower (346,183 CY) owing to lower average groundwater elevations over that period as compared to 2019 and 2020. It should be noted that daily precipitation amounts from publicly available data indicate a greater level of rainfall in the proximity of the unit in Spring 2020 as compared to 2021. Additionally, ambient groundwater levels in monitoring wells outside of the impoundment were generally higher in 2020 as compared to 2021. Lastly, there is a greater number of monitoring points with reported water level data for 2020. It is therefore likely that variations in local precipitation exert a strong and variable influence on groundwater elevations beneath and in the vicinity of the unit, and therefore the lower levels in 2021 are not enough to support a conclusion that the unit will eventually dry itself out. In any case, the supplemental analysis using the more refined contour intervals is consistent with and within the upper and lower bounds of previous estimates, further corroborating the overall conclusion of sustained and ongoing presence of significant volumes of CCR that continues to be infiltrated by groundwater from within the unit. The magnitude of the estimates clearly

varies in response to fluctuations in groundwater levels beneath the unit due to variation in annual precipitation and other factors, including closure. However, despite some evidence that water levels have declined somewhat since closure, the record supports a conclusion that substantial volumes of CCR will continue to be perpetually inundated by groundwater.

Based on all these data EPA is proposing to determine that both the Closure Plan approved by ADEM and incorporated into the permit, and the closure itself (which ADEM also approved) are not consistent with the requirements in § 257.102(d). Neither the approved Closure Plan nor any other document in the record for the permit accounts for the levels of groundwater present in the unit prior to closure or describes any engineering measures taken to meet each of the Federal CCR closure-in-place performance standards in § 257.102(d)(1) and (2) in light of the groundwater present in the unit. Nor, based on the post-closure groundwater elevation data from piezometer wells from 2019 to the present, did the approved closure address the groundwater continuously flowing into and out of the CCR, as required by the Federal regulations.

The Federal regulations require that ''prior to installing the final cover system . . . [f]ree liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.'' 40 CFR 257.102(d)(2). Free liquids are defined as all ''liquids that readily separate from the solid portion of a waste under ambient temperature and pressure,'' regardless of whether the source of the liquids is from sluiced water or groundwater. 40 CFR 257.53. As EPA has previously explained, based on the regulatory terms, the structure, and context in which the terms are employed, as well as the dictionary definitions of ''liquid,'' and the fact that nothing in the regulatory definition limits the source of the liquid, EPA considers groundwater to be a liquid under the existing regulation.[32] Consequently, the directive applies to both the freestanding liquid in the impoundment and to all separable porewater in the impoundment, whether the porewater was derived from sluiced water, stormwater runoff, or groundwater that migrates into the impoundment.

TVA's Annual Inspection Reports from 2016 through 2018 show that groundwater was infiltrating into Ash Pond 4. The *average* groundwater elevations measured at monitoring wells inside Ash Pond 4 from January 1, 2016 through December 31, 2017 were on the order of 450 feet above MSL (*i.e.,* approximately 28 feet above the average elevation of the CCR) centered on the central and southcentral portions of the unit).[33] Yet neither the approved Closure Plan nor any other document in the record for the permit accounts for the approximately 28 feet of groundwater present in the unit prior to closure, or describes any engineering measures taken to eliminate the groundwater. The approved Closure Plan states only:

> Final Closure of the Ash Pond 4 requires following general tasks: . . . Begin decanting the Ash Pond 4 using pumps and existing siphons. Discharged water will be monitored throughout decanting operations to maintain compliance with NPDES [National Pollutant Discharge Elimination System] permitted limits.

TVA Closure Plan, pp 6–7. As EPA has previously explained, § 257.102(d)(2)(i) establishes a clear standard to be met: ''free liquids must be eliminated.'' [34] The regulation further specifies how this standard is to be met: by ''removing liquid wastes or solidifying the remaining wastes and waste residues.'' Id. In situations such as this, where the waste in the unit is inundated with groundwater, the requirement to eliminate free liquids thus obligates the facility to take engineering measures necessary to ensure that the groundwater, along with the other free liquids, has been permanently removed from the unit prior to installing the final cover system. See, 40 CFR 257.102(d)(2)(i). Yet neither the Closure Plan that ADEM approved nor the permit ADEM issued contained any such requirements.

Moreover, it is clear from the post-closure 2019–2021 Annual Inspection Reports that whatever measures were taken as part of closure did not actually eliminate free liquids from Ash Pond 4. These reports document average groundwater elevations within the Ash Pond that significantly exceed 422 above MSL. And the most recently reported groundwater elevation measurements in 2021 reported nearly all groundwater elevation at values of 425 to 440 ft above MSL, except for a thin strip of lower ground water elevations near the extreme eastern margin of the impoundment, again with a small lobe-shaped area of lower levels (421.5 to 424.2 ft above MSL) projecting a short distance into the central part of the unit. All of this information was available before ADEM issued the permit in October 2022, yet the permit was issued, essentially approving closure with CCR that will remain saturated by groundwater, with no engineering measures to limit groundwater from continually flowing into and out of the unit.

A further concern is that, given the groundwater levels that continue to be measured in the unit, it is not clear that the remaining wastes have been stabilized sufficiently to support the final cover system, as required by § 257.102(d)(2)(ii). What is clear, however, is that neither the approved Closure Plan nor ADEM's permit provides any details on how this performance standard was met, given that groundwater continues to flow into and out of the unit from the sides and bottom. The approved Closure Plan merely summarizes the § 257.102(d)(2) performance standards, and contains, for example, no description of how, if at all, the groundwater levels would be affected by any of the dewatering activities associated with unit closure. Consequently, EPA is proposing to determine that the approval of the Closure Plan, and subsequently the unit closure itself, in the absence of such information, and the failure to include measures in the permit requiring TVA to remedy the omission is not consistent with § 257.102(d)(2)(ii).

EPA was also unable to find any description in the ADEM approved Closure Plan or any other permit document of engineering measures that TVA took to ''control, minimize, or eliminate, to maximum extent feasible'' either the post-closure infiltration of the groundwater into the waste or the post-closure releases of CCR or leachate to the groundwater, as a consequence of the groundwater that continues to infiltrate into and be released from the impoundment from the sides and bottom of the unit. 40 CFR 257.102(d)(1)(i). Based on the data and analyses described above, groundwater continues to infiltrate into the unit and yet the only measures described in the Closure Plan and the permit are those taken to facilitate consolidation and cap construction. In essence, this means the Ash Pond will continue releasing CCR contaminants indefinitely past the waste boundary unless TVA takes additional actions that are not required by or explained in the permit. Given that

[32] U.S. EPA. Denial of Alternative Closure Deadline for General James M. Gavin Plant, Cheshire, Ohio. November 18, 2022. pp 14–42; 88 FR 31,982, 31,992–31,993 (May 18, 2023).

[33] Tennessee Valley Authority. FY2018 Intermediate Inspection of CCR Facilities. September 4, 2018; and Tennessee Valley Authority. FY2017 Intermediate Inspection of CCR Facilities. December 15, 2017.

[34] See, U.S. EPA. Denial of Alternative Closure Deadline for General James M. Gavin Plant, Cheshire, Ohio. November 18, 2022. pp 14–42.

reasonably available engineering measures exist that can prevent, or at least control, the flow of groundwater into the Ash Pond (and consequently the releases out of the Ash Pond), such as physical barriers or hydraulic containment systems, EPA cannot conclude that TVA's Closure Plan adequately describes how the closure work will meet the requirement to ''control, minimize or eliminate, to the maximum extent feasible'' post-closure infiltration into the unit and post-closure releases of CCR or leachate to the groundwater. EPA is proposing to determine that the permit's exclusive reliance on engineering measures related to the consolidation and cap construction is inconsistent with § 257.102(d)(1)(i).

In addition, EPA was unable to identify any description in the Closure Plan narrative of how TVA will ''preclude the probability of future impoundment of water, sediment, or slurry.'' 40 CFR 257.102(d)(1)(ii). The continued presence of groundwater in the unit constitutes the impoundment of water, and in the absence of any engineering measures, such as a slurry wall, there are no intrinsically obvious facts to demonstrate that this performance standard has been met. Finally, the Closure Plan contains no discussion of how the closure activities will minimize the need for additional maintenance of the Ash Pond beyond a brief discussion of the final cover system. 40 CFR 257.102(d)(1)(iv).

EPA raised these issues to ADEM in comments on the draft Colbert permit. In response, ADEM did not dispute EPA's conclusion that CCR in Ash Pond 4 remains saturated by groundwater. Instead ADEM stated that EPA's comments were based on a misinterpretation of the Federal regulations, raising three specific interpretations of the regulations that EPA has previously rejected. First, ADEM stated that ''the Federal CCR regulations do not require that the closure account for groundwater levels either before or after closure.'' Rather they claim the only requirements relevant to groundwater are the location restrictions applicable to new or operating units in § 257.60 for an operating unit.[35] To support this point ADEM argues that § 257.102(d)(1)(i) does not refer to groundwater. Second, ADEM argues that the Federal standards have been met because Colbert has installed a cover system that meets the standard in § 257.102(d)(3), and the facility has complied with all of the requirements in the general performance standard relating to ''infiltration.'' The State supports this claim by pointing to the absence of specific requirements for an infiltration layer or barrier along the sides or bottom of a CCR unit, and by defining ''infiltration'' to refer exclusively to vertical infiltration from the surface, *e.g.,* as rainwater entering through the cover system. Finally, ADEM states that ''In the event that it is determined that the closure activities conducted at Ash Disposal Area 4, as described above, are insufficient to prevent further groundwater contamination, additional controls or methods will be considered and addressed through the ongoing Assessment of Corrective Measures (ACM) and selection of a final remedy,'' that is, as part of corrective action.

EPA has explained, at length, that a closed, unlined impoundment, where the CCR remains in groundwater several feet deep because the facility failed to take any reasonably available engineering measures to prevent, or at least control, the flow of groundwater into the unit (and consequently the releases out of the unit), does not meet the requirements of § 257.102(d).[36] Specifically, in the final decision denying an extension under Part A for Gavin Generating Station, EPA expressly rejected the various interpretations of the regulatory text that ADEM offers in its October 27 letter. Specifically, EPA rejected the claim that the Federal closure regulations do not require a facility to address groundwater in the impoundment as part of closure. As noted above, based on the regulatory terms, the structure, and context in which the terms are employed, as well as the dictionary definitions of ''liquid,'' and the fact that nothing in the regulatory definition limits the source of the liquid, EPA considers groundwater to be a ''liquid'' under the existing regulation. See, Gavin Final Denial, p, 34; Response to Comments (RTC) on Gavin Proposed Denial, pp. 42–43, 53–58, 76.[37] Moreover, the source of the liquid is not important with respect to its basic and fundamental designation as a liquid. It therefore does not matter whether the liquid in the surface impoundment comes from the rain, waters the facility deliberately places in the unit, floodwaters from an adjacent river, or from groundwater—all are liquids, and once present in the unit, they have the same potential to create leachate (another type of liquid), as well as to contribute to hydraulic head and drive flows driven by hydraulic gradients, and potentially destabilize the cover system.

EPA also explained its decision to rely on the plain language meaning of ''infiltration,'' explicitly rejecting the interpretation that the term refers only to the vertical migration of liquid through the cover system. See, Gavin Final Denial, pp 34–38; RTC pp. 38–47. Finally, EPA rejected the interpretation that under part 257 risks from a CCR unit submerged in groundwater are properly addressed exclusively as part of corrective action. Gavin Final Denial, pp. 41, RTC, pp 65–68, 102. Accordingly, EPA is proposing to determine that ADEM's permit approved a closure of Ash Pond 4 that is not consistent with § 257.102(d).

Because Alabama interprets its regulations to impose different requirements than the Federal regulations in part 257, EPA must determine that the State's requirements are ''at least as protective as'' the Federal requirements in order to approve the program. 42 U.S.C. 6945(d)(1)(B)(ii). All the information available to EPA supports a conclusion that the closure approved in the Colbert permit is significantly less protective than a closure that meets the requirements under the Federal CCR regulations. Simply put, this is because allowing groundwater to continue flowing through the waste indefinitely will not protect human health and the environment. As discussed at length in 88 FR 32008–32012 (May 18, 2023), there are several ways in which the failure to remove CCR from the water table as part of closure can result in significantly higher risks than a comparable closure where waste no longer remains in contact with the water table.

The Electric Power Research Institute (EPRI), a coal industry analytical group, reached similar conclusions in a report issued in 2006, finding that ''[c]aps are not effective when CCP is filled below the water table, because groundwater flowing through the CCP will generate leachate even in the absence of vertical infiltration through the CCP.'' [38] [39]

[35] Letter from Stephen Cobb to Carolyn Hoskinson, Responding to EPA Comments on Proposed Permit for the Tennessee Valley Authority Colbert Fossil Plant. October 27, 2022. Enclosure 1, page 6.

[36] U.S. EPA. Denial of Alternative Closure Deadline for General James M. Gavin Plant, Cheshire, Ohio. November 18, 2022. pp 14–42.

[37] U.S. EPA. Denial of Alternative Closure Deadline for General James M. Gavin Plant (Cheshire, Ohio) Response to Comments on Proposed Denial (Docket ID No. EPA–HQ–OLEM–2021–0590). November 2022.

[38] CCP means ''coal combustion product,'' another term for CCR.

[39] Electric Power Research Institute. Groundwater Remediation of Inorganic Constituents at Coal Combustion Product Management Sites, Overview

Continued

Similarly, an earlier EPRI study examined the dewatering of three sites, two with ash situated above the water table and one with ash in contact with groundwater. The study concluded: ''[T]he existence of saturated ash will greatly reduce the effectiveness of any cap design when the facility is underlain by geologic materials with high hydraulic conductivity, because groundwater will continue to leach ash constituents.'' [40] The fact that coal ash is in contact with groundwater can reduce the effectiveness of dewatering as well: ''[W]hen ash remains below the water table, dewatering may be less effective because groundwater continues to leach constituents from the saturated ash, particularly if the impoundment is underlain by geologic media with relatively high rates of groundwater flow. In the case of [the studied site], concentrations increased because groundwater contact time with the saturated ash increased when the hydraulic gradient of the pond was removed.''

Finally, EPA is proposing to determine that the record fails to support a finding that ADEM's alternative approach of relying on corrective action to impose additional controls through the ongoing ACM and selection of a final remedy will be as protective as the Federal requirements. As discussed previously, data that was available at the time of permit issuance documents that groundwater elevations remain within the Ash Pond over three years after closure was completed, yet the permit that ADEM issued is silent on the need to address this as part of the corrective action process. Moreover, as discussed in the next section, EPA has serious concerns about the protectiveness of the corrective action at Colbert that ADEM is overseeing; for example, it has been three years since TVA posted its initial ACM, and the facility has still not selected a remedy. EPA is aware of no information to support a conclusion that continuing to allow saturated CCR to remain in Ash Pond 4 while TVA delays corrective action will protect human health or the environment, and ADEM has offered no explanation to support a conclusion that it is.

Accordingly, EPA is proposing to determine that the permit for the Colbert Plant does not require TVA to achieve compliance with either § 257.102(d) or with alternative State standards that EPA has determined to be at least as protective.

b. Groundwater Monitoring and Corrective Action Issues

i. Summary of Federal Requirements

The objective of a groundwater monitoring system is to characterize groundwater to determine whether it has been contaminated by the CCR unit being monitored. This begins in detection monitoring, by conducting statistical comparisons between (1) The background level of a constituent measured in one or more upgradient wells, and (2) The level of that same constituent in a downgradient well. If the concentration of the constituent in the downgradient well is higher than the background concentration by a statistically significant amount, (*i.e.,* a statistically significant increase (SSI) over background has been detected), this provides evidence of a potential release from the unit. After an SSI, assessment monitoring is required for additional constituents, and the concentrations of each of those constituents at downgradient wells are compared to a groundwater protection standard established for each constituent (either background level or a regulatory limit). Prompt contaminant detection is important in order for corrective measures to be developed to stop migration of contaminants as soon as possible.

To ensure detection of a release, the regulations establish a general performance standard that all groundwater monitoring systems must meet: all groundwater monitoring systems must consist of a sufficient number of appropriately located wells that will yield groundwater samples in the uppermost aquifer that represent the quality of the background groundwater and the quality of groundwater passing the downgradient waste boundary, monitoring all potential contaminant pathways. 40 CFR 257.91(a)(1) and (2). Because hydrogeologic conditions vary so widely from one site to another, the regulations do not prescribe the exact number, location, and depth of monitoring wells needed to achieve the general performance standard. Rather the regulation requires installation of a minimum of one upgradient and three downgradient wells, as well as any additional monitoring wells necessary to achieve the general performance standard of accurately representing the quality of the background groundwater and the groundwater passing the downgradient waste boundary, monitoring all potential contaminant pathways. 40 CFR 257.91(c)(1) and (2). The number, spacing, and depths of the monitoring wells must be determined based on a thorough characterization of the site, including a number of specifically identified factors relating to the hydrogeology of the site (*e.g.,* aquifer thickness, groundwater flow rates and direction). 40 CFR 257.91(b). Groundwater elevation measurements must be obtained around the unit(s) at sampling events over time to characterize groundwater flow direction and identify seasonal and temporal fluctuations. 40 CFR 257.91(b). Further, any facility that determines that the regulatory minimum number of wells is adequate to meet the performance standard must document the factual basis supporting that determination. 40 CFR 257.91(f). In essence, the regulation establishes a presumption that the minimum of one upgradient and three downgradient wells is not sufficient, and it requires the facility to rebut the presumption in order to install only this minimum. *See,* 80 FR 21399. The number and placement of the monitoring wells is critical to proper characterization of the groundwater.

The Federal CCR regulations establish a phased approach to monitoring. The first phase is detection monitoring where ''indicator'' constituents are monitored to determine whether groundwater is potentially being contaminated. In selecting the parameters for detection monitoring, EPA chose constituents that are present in CCR and would rapidly move through the subsurface, and thus provide an early indication of other contaminants that may be migrating from the CCR units. *See,* 80 FR 21397. The constituents that are monitored in detection monitoring are listed in Appendix III to 40 CFR part 257.

After groundwater samples are collected during each monitoring event, the samples are sent to a laboratory for analysis to determine constituent concentrations. Once the facility has the analytical results, it must conduct statistical analyses to determine the background level of each constituent in upgradient groundwater for comparison with data from downgradient compliance wells. This stage is also critical, as even a sufficient number of properly placed wells will not provide adequate characterization if the sampling and analysis of data are not properly conducted. In order for upgradient groundwater quality to be accurately characterized, the statistical approach must be appropriate for site conditions and the data sets obtained. To this end, the regulations require an owner or operator to select a statistical approach and meet the performance

of Technologies, Focusing on Permeable Reactive Barriers. Technical Report. 2006. 3–6.

[40] Electric Power Research Institute. Evaluation and Modeling of Cap Alternatives at Three Unlined Coal Ash Impoundments. Technical Report. 2001.1005165.

standards applicable to that approach when analyzing the data. 40 CFR 257.93(f)–(g).

If a facility determines that there is an SSI over background levels for one or more of the constituents in Appendix III at a monitoring well at the downgradient waste boundary, there is an opportunity to complete an alternate source demonstration (ASD) showing that a source other than the unit (*i.e.,* an alternate source) was the cause of the SSI. 40 CFR 257.94(e)(2). A successful ASD must be sufficient to rebut the presumption that the CCR unit is the source of the SSI in a downgradient well of a properly designed groundwater monitoring network by demonstrating that a source other than the CCR unit is responsible for the SSI. An ASD requires conclusions that are supported by site-specific facts and analytical data in order to rebut the site-specific monitoring data and analysis that resulted in an SSI. Speculative or theoretical bases for the conclusions are insufficient. If a successful ASD for an SSI is not completed within 90 days, an assessment monitoring program must be initiated. Id.

In assessment monitoring, facilities are required to monitor for additional constituents of concern, which are listed in appendix IV to part 257. Whenever assessment monitoring results indicate a statistically significant level (SSL) exceeding the groundwater protection standard has been detected at a downgradient well for any of the Appendix IV constituents, the facility must start the process for cleaning up the contamination by characterizing the nature and extent of the release and of site conditions that may affect the cleanup, and by initiating an assessment of corrective measures.

As discussed in Unit III.B of this preamble and TSD Volume III, Alabama adopted regulations that mirror the Federal CCR regulations.

ii. TVA Colbert Groundwater Monitoring Issues

ADEM approved the Groundwater Monitoring Plan (GWMP) dated December 10, 2021, and incorporated the approved plan into the Final Permit.[41] Once ADEM approved and adopted TVA's GWMP into the permit, the GWMP, rather than the referenced State regulations, became the State requirements with which TVA is required to comply. After reviewing the GWMP and all the materials in the permit record, EPA is proposing to determine that the groundwater monitoring network that ADEM approved is less protective than the Federal regulations in several regards. As discussed below and in the technical support document, EPA identified a number of deficiencies in the approved monitoring network.

First, EPA is proposing to determine that the approved monitoring system inappropriately includes numerous monitoring wells located beyond the waste boundary, as well as an insufficient number of monitoring wells at necessary locations and vertical depths to ensure that all potential contaminant pathways have been monitored. In addition, EPA has identified critical deficiencies in the construction of a significant number of the bedrock monitoring wells that call into question the accuracy of the monitoring data. As a consequence, EPA is proposing to determine that ADEM's Final Permit fails to require TVA to ''install a groundwater monitoring system that. . .accurately represent[s] the quality of the groundwater passing the waste boundary of the CCR unit, [and to monitor] all potential contaminant pathways.'' 40 CFR 257.91(a)(2).

(1) ADEM Issued a Final Permit That Approved the Bedrock Wells To Not Be Installed at the Waste Boundary in Accordance With § 257.91(a)

The Federal CCR regulations require that a downgradient monitoring system ''be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer,'' and define the uppermost aquifer as ''the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.'' 40 CFR 257.53, 257.91(a)(2). The cross sections and boring logs that were included as attachments to the Permit Application confirm that the unconsolidated and underlying limestone aquifers are hydraulically interconnected and communication via vertical migration can occur. The hydraulic connection between the Tuscumbia limestone aquifer, and the Tennessee River/Pickwick Reservoir and Cane Creek, as well as the hydrogeologic continuum between the Tuscumbia limestone and the overlying epikarst, residuum, and alluvial units of the upper aquifer system, all indicate that the Tuscumbia is an integral part of the composite uppermost aquifer system. Accordingly, the entire horizontal length along the CCR unit must be monitored in all hydrogeologic units present, alluvium, residiuum, epikarst, and bedrock in accordance with § 257.91.

The approved GWMP includes bedrock monitoring wells COF–111BR, COF–112BR, COF–113BR, COF–114BR, CA17B, CA30B, MC1, MC5C, and COF–108BR (future installation), CA6 (background), and COF–116BR (background) as part of the groundwater monitoring system. However, none of these bedrock wells are located at the downgradient waste boundary as expressly required by § 257.91(a)(2). Instead, they are located hundreds of feet away from this boundary. Among the wells that monitor bedrock, only COF–111BR is located adjacent to the downgradient (east) side of the unit and the other downgradient open-borehole bedrock wells are located hundreds of feet to the east, and in many cases on the other side of Cane Creek.

Another systemic issue is that the bedrock wells were installed as open-borehole completions with long permanently grouted surface casings, and as a consequence have significant potential to systemically exclude zones that have been ''cased off'' from the monitoring well network. Permanent steel casing installations range from 14.6 to 76.0 feet in length for in-program wells. These cased off intervals represent potential data gaps, depending on the circumstances and geology local to that specific region of the unit. As a highly relevant example, well COF–111 is screened from 9–19 feet below ground surface (bgs). The open interval for the adjacent well pair, COF–111 BR, is 76–126 ft bgs. This results in a 57-foot vertical gap at a critical location adjacent to the unit's downgradient boundary, where the groundwater quality is entirely unmonitored. This is significant because the failure to monitor in the variable and significant zone of transition from uppermost alluvium to residuum, epi-karst, and finally to ''unweathered'' limestone would be a significant and systemic data gap in potential contaminant pathways. Accordingly, EPA is proposing to determine that ADEM has approved a monitoring plan with an insufficient number of monitoring wells at necessary locations and vertical depths to ensure that all potential contaminant pathways have been monitored.

[41] Alabama Department of Environmental Management. Colbert Fossil Plant Coal Combustion Residual Permit. Permit No. 17–11, October 25, 2022. Section V.A., specifying that ''The Permittee shall install and/or maintain a groundwater monitoring system, identified in Table 1, as specified in 335–13–15–. 06(2) and the approved groundwater monitoring plan.''

(2) ADEM Approved Wells That Were Not Constructed in Accordance With § 257.91(e), and as a Consequence the Monitoring System Does Not Accurately Represent the Quality of Groundwater Flowing From Ash Pond 4

The Federal regulations provide that ''monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole.'' 40 CFR 257.91(e). Integrity of the monitoring well borehole includes all elements of the well within and including the borehole itself. Such elements include the surface casing, generally intended to isolate deeper geologic materials (commonly consolidated materials, *i.e.,* bedrock) from overlying unconsolidated materials and associated groundwater, but also the filter pack, bentonite and grout seals, screened intervals, riser pipe, and other constructed monitoring well elements internal to the borehole used to isolate and ensure the integrity of the sampling interval (*e.g.,* screened interval). The integrity of these elements individually and as an integrated system is essential to meeting the performance standards in § 257.91(a), (b), and (e).

As noted in ADEM's October 27, 2022 letter, these installations included installation of a permanently grouted surface casing. ADEM further indicated Rotosonic drilling methods were used to identify the first three-to five-foot zone of unweathered material, and that a casing was installed from this depth to the ground surface. It should be noted that Rotosonic drilling can be a disruptive process that may not result in full recovery of undisturbed samples of soil or bedrock. For this reason, absent any additional information, the use of the Rotosonic method as a tool for discriminating between weathered, partially weathered, and unweathered bedrock, must be used with care, particularly if sample materials are altered, pulverized, or otherwise destroyed or obfuscated by the process of drilling as indicated by a ''no recovery'' zone or interval.[42] In a variable zone of transition from weathered material (residuum) to unweathered bedrock (in this case limestone), recovered samples from each type of material would likely be affected by the drilling process to some degree, and most competent intervals are often preserved to a greater degree than decomposed or partially decomposed intervals. In such a context, absent documentation demonstrating a continuous core sample from the interval in question, with full recovery, which penetrates and unequivocally identifies the interface between weathered and unweathered material, it would not be possible to confirm that any missing sample intervals did not simply represent voids or other potentially permeable zones. The potential to mischaracterize three-to five-foot zones as ''competent and unweathered'' on the basis of an incomplete sequence of samples therefore appears to be substantial. It should therefore be noted that in this context a three-to-five-foot penetration into ''unweathered'' bedrock would generally not be considered a ''conservative'' approach, absent additional information validating the integrity of the casing seal and its effectiveness in isolating the ''unweathered'' bedrock interval from the overlying materials. In such a scenario, at best, the penetration of just a 3- to 5-foot interval of ''unweathered'' bedrock with variably weathered materials just above introduces uncertainty with respect to the integrity and effectiveness of the casing in isolating the open interval from groundwater in the overlying residuum and epikarst. Based on information provided, it is not clear how the approach (as described) can be demonstrated to have achieved the performance criteria outlined in § 257.91(e).

In addition, the boring and well construction logs that were included in the Permit Application indicate that nearly one-half of the groundwater wells surrounding Ash Pond 4 were constructed as open boreholes in bedrock, with open hole intervals ranging from 45 feet up to as much as 100 feet in length. If EPA's analysis is accurate, nearly one half of the groundwater monitoring wells surrounding Ash Pond 4 appear to not meet the casing requirements of § 257.91(e).

One limitation of open-borehole bedrock wells of this kind is that the entire bedrock interval serves as the monitoring zone. In effect, the long open interval serves as a reservoir within which inputs from various fractures intersected by the borehole are blended, resulting in an average composition of some kind. In this situation, it is very difficult or even impossible to monitor a specific zone because the contaminants being monitored could be diluted to the extent of being non-detectable. On this subject, ADEM's October 27, 2022, letter states:

> An Interstate Technology and Regulatory Council guidance document entitled Characterization and Remediation of Fractured Rock discusses construction and design considerations for monitoring wells installed in karst aquifers. Section 7.3.3 states ''Where the bedrock has adequate strength and competency, monitoring wells may be constructed as an open borehole.'' Because of the proven competent nature of the Tuscumbia Limestone, there is substantial confidence that the integrity of the monitoring well borehole will be maintained.

To justify their approval of long open borehole intervals, ADEM states:

> As described above, the karst aquifer present at this site consists of a rock matrix with distinct fractures that create preferential pathways for groundwater flow. Studies comparing hydraulic properties measured within different karst aquifers indicate that conduits typically account for more than 95 percent of the permeability of an aquifer (Rosenberry et al., 2008). Thus, because the majority of water within the monitoring well column will be provided by discrete fractures of the bedrock unit, the potential for dilution in the open hole borings would be limited.

While EPA agrees that fractured intervals in the karst limestone aquifer are highly relevant as contaminant migration pathways as compared to the (unfractured) rock matrix, treating all discrete fractures that may contribute groundwater and/or contaminants to a borehole equally would fail to ''accurately represent the quality of the groundwater passing the downgradient waste boundary.'' 40 CFR 257.91(a)(2). The implied logical extension—that is, 'the majority of water in a large open borehole may be sampled to provide accurate and representative groundwater samples—is simplynot correct. The technical literature provides a many detailed examples that illustrate the opposite conclusion. See Section II.d of TSD Volume I. A more likely scenario is that specific fractures serve as contaminant migration conduits and a long borehole may cross connect these fractures with fractures containing clean and/or less contaminated groundwater. In such a case, the water in the borehole represents in effect a blended average of the individual contributions from the specific fractures which it cross connects. As no information has been provided which indicate the means or methods by which specific fractures may have been isolated and more precisely monitored, EPA is proposing to determine that the long-screened interval open-borehole monitoring wells yield blended or otherwise unrepresentative samples, and thus do not comply with the performance standards in § 257.91(a)(1) and (2) and (e). Many options are available to redevelop and reconfigure these existing open boreholes to fully comply with the regulations, including installing standard monitoring wells (*e.g.,* with discrete screened intervals) within the open boreholes with discrete

[42] See Section II.d of TSD Volume I.

screened intervals targeted to the most important discrete fracture zones, or a variety of specialized technologies and methods developed to address fracture-specific sampling in fractured bedrock environments. ADEM chose to approve the GWMP without requiring any of them.

(3) ADEM's Permit Authorizes Intrawell Data Comparisons That Are Not Consistent With Federal CCR Requirements

The approach to intrawell data comparisons described in the approved GWMP does not require TVA to achieve compliance with the requirement in § 257.91(a)(1) to establish background groundwater quality in an upgradient well unless the criteria in § 257.91(a)(1)(i) or (ii) are met. The approved GWMP contains procedures that would allow TVA to update the background data set used in intrawell comparisons, which would mean including data in the background characterization that is potentially impacted by a release from the CCR unit.[43] See, 40 CFR 257.91(a)(1).

Intrawell comparisons are not simply a statistical method; in the CCR regulations, they are an approach to background characterization. Intrawell data comparisons use samples taken at different times from the same well to characterize both background groundwater quality and downgradient compliance groundwater quality. This means downgradient compliance wells also serve as background wells. Alternatively, interwell data comparisons use samples taken from different wells—upgradient or sidegradient wells characterize background groundwater quality and downgradient wells to characterize downgradient groundwater quality.

The Federal CCR regulations do not mention interwell or intrawell comparisons specifically; instead, they establish requirements for characterizing background. Background groundwater quality is required to be established in an upgradient well, unless a groundwater flow gradient does not exist or it can be shown that groundwater samples from a well that is not upgradient of the CCR unit would characterize background groundwater quality as accurately or more accurately than samples from an upgradient well. 40 CFR 257.91(a)(1)(i),(ii). It also must be demonstrated that the data were gathered when the well was known to be uncontaminated by the CCR unit. This generally means that background data used in intrawell comparisons must be obtained prior to placement of CCR in the unit. This also indicates a strong preference for interwell comparison, which would necessarily be used when background is established in any well other than a downgradient compliance well (*i.e.,* an upgradient or side gradient well).

The approach to intrawell data comparisons described in the approved GWMP includes procedures to periodically update intrawell background data sets. Updating background data sets may be appropriate in interwell monitoring, where background groundwater quality may change over time due to migration of contaminants toward a CCR unit from upgradient sources. However, in intrawell monitoring, background data were obtained at compliance wells at the downgradient boundary of a monitored CCR unit, prior to placement of CCR in the unit. After a CCR unit begins operation, sampling data obtained from these downgradient wells cannot be known to be unimpacted by leakage from the unit.

Samples from downgradient monitoring wells are intended to determine whether a release could have occurred. If concentrations of constituents monitored at the downgradient wells change, this would not represent a change in background groundwater quality, it would represent a release from the CCR unit. Mischaracterizing any increase in constituent concentration at these wells over time as a change in ''background'' would result in elevating background levels and could mask releases by preventing detection of SSLs of constituents, which trigger corrective action requirements.

Because the procedures for updating background levels used in intrawell data comparisons are approved in the Final Permit, this permit does not require Colbert to achieve compliance with either the Federal requirements at § 257.91(a)(1) or an alternative State requirement that is equally protective.

c. TVA Colbert Permit Corrective Action Issues

In 2018 TVA detected SSLs for cobalt and arsenic.[44] TVA first completed an ACM to comply with the requirements of the Federal CCR regulations in July 2019 (''2019 ACM''). An ACM was completed in 2021 to comply with a 2018 Consent Decree issued by ADEM (''2021 CD ACM'').[45] The 2021 CD ACM included State requirements applicable to units not regulated by the Federal program, as well as requirements applicable to CCR units regulated by the Federal program.

On October 25, 2022, ADEM issued the Final Permit to TVA for Ash Disposal Area 4 (also identified as Ash Pond 4 in the 2021 CD ACM). The Final Permit contained only the following terms and conditions for corrective action:

> C. Assessment of Corrective Measures. The Permittee must initiate an assessment of corrective measures as specified in 335–13–15–.06(7) if any constituent listed in Appendix IV of 335–13–15 has been detected at a statistically significant level exceeding the groundwater protection standard, or immediately upon detection of a release from the CCR unit.
>
> 1. The permittee must continue to monitor groundwater in accordance with the assessment monitoring program while assessing corrective measures.
>
> 2. Selection of Remedy. Based on the results of the corrective measures assessment, the Permittee must select a remedy as specified in 335–13–15–.06(8).
>
> 3. Implementation of the Corrective Action Program. Within 90 days of selecting a remedy, the Permittee must initiate remedial activities as specified in 335–13–15–.06(9), and shall be required to modify the permit in accordance with Section II.E.9.

In its Colbert Permit RTC, ADEM explains that:

> TVA submitted to the Department an initial Assessment of Corrective Measures (ACM) in July of 2019. A revised ACM was submitted by TVA in April 2021 and is still undergoing a detailed review to ensure that the proposed final remedy selected by TVA conforms to the requirements of ADEM Admin. Code r. 335–13–15–.06(7) and (8). The proposed corrective measures will use monitored natural attenuation (MNA) and institutional controls, interim responses, and adaptive management. Should additional revisions be required, the Department will review them to ensure compliance with the requirements of ADEM Admin. Code r. 335–13–15–.06(7) and (8).
>
> Because an ACM has not been finalized and a final remedy has not been selected, the permit does not include provisions for the remediation of the groundwater at this time. However, once a final remedy is determined complete by the Department, the permit will be revised to include such provisions. The permit revision to include the final remedy will include public participation.

The Final Permit issued by ADEM merely reiterates the Alabama

[43] Tennessee Valley Authority. Colbert Fossil Plant Ash Pond 4 Permit Application, December 10, 2021. Appendix C Section 2.3, p. 4 of 9 (PDF p. 469 of 603).

[44] Tennessee Valley Authority. 2019 Annual Groundwater Monitoring and Corrective Action Report, TVA Colbert. January 2020. p. 3.

[45] Notice Of Electronic Filing in the Circuit Court of Colbert County, Alabama. Alabama Department of Environmental Management v. Tennessee Valley Aut 20–Cv–2013–900123.00. C001 Alabama Department of Environmental Management Joint Motion for Entry of First Amended Consent. Decree. August 15, 2018.

regulations, which are the same as the Federal corrective action requirements. However, incorporating the regulations verbatim in the permit does not require TVA to achieve compliance with those requirements. This is because ADEM did not take into account relevant facts about the status of corrective action at Colbert, such as whether the 2019 ACM complied with the regulatory requirements, or whether the 2021 CD ACM complied with either the Consent Decree or the regulations or both.[46] Most importantly, ADEM did not adjudicate what actions are still necessary in light of those facts to achieve compliance with the regulations and include those actions as requirements in the Final Permit. As a consequence, EPA is proposing to determine that the permit in essence authorizes TVA to continue to delay selection of a remedy well beyond the required deadline, in order to pursue assessment of a remedy that does not appear to meet the criteria in § 257.97(b).

In the Colbert Permit RTC, ADEM states that it is still reviewing the 2021 CD ACM and has not determined whether the ACM and TVA's preferred remedy (MNA with institutional controls but no source control measures beyond the existing closure with waste remaining in place) complies with the regulations. It is not clear whether ADEM provided comments on the 2019 ACM or whether it believes that the ACM satisfies the requirements in §§ 257.95 and 257.96, which remain applicable to Ash Pond 4. ADEM also states in the Colbert Permit RTC that an ACM has not been finalized and a final remedy has not been selected, so the permit does not include provisions for the remediation of the groundwater. Whether or not the 2021 CD ACM meets the requirements of the regulations is precisely the type of adjudication required in a permitting action. What the permittee is required to do in order to achieve compliance with the regulations must be determined prior to final permit issuance, because the permit must contain these requirements. This is the role of a permitting authority (*i.e.,* ADEM).

Under the Federal regulations, an assessment of corrective measures that will ''prevent further releases, remediate any releases, and restore affected areas to original conditions'' is required once corrective action is triggered. 40 CFR 257.96. Section 257.96(c) requires an analysis of the effectiveness of potential corrective measures in meeting all requirements and objectives of the remedy required by § 257.97, and mandates that the analysis address at least the criteria listed in § 257.96(c)(1) through (3). Based on the results of an ACM conducted in accordance with § 257.96, a remedy that meets the requirements of § 257.97(b) must be selected ''as soon as feasible.'' 40 CFR 257.97(a).

The full extent of corrective action requirements applicable to Colbert are not yet known due to numerous concerns about the adequacy of the detection and assessment groundwater monitoring system and its ability to identify all SSLs. However, based on review of the Final Permit, the Colbert Permit RTC, the 2019 ACM, the 2021 CD ACM, and the January 13, 2023, Progress Report, EPA has identified a number of areas in which it appears that neither the ACMs nor the proposed remedies are consistent with or as protective as the Federal requirements.[47] At a minimum, EPA would have expected the permit to have clearly established a deadline for submission of a final ACM and to have identified specific corrections that must be made to address the specific deficiencies discussed in the paragraphs below.

i. The Colbert Permit Does Not Require TVA To Complete an ACM That Includes an Assessment of Source Control Measures in Accordance With 40 CFR 257.96

40 CFR 257.97(b)(3) requires that all remedies control the source of releases in order to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment. Neither the 2019 ACM nor the 2021 CD ACM contains any assessment of measures to achieve this requirement (*i.e.,* source control). Section 4.2. of the 2019 ACM states, ''Since closure of the Ash Disposal Area 4 CCR Unit serves as a source control measure, the remedial technologies considered in the following sections are focused on addressing the area of groundwater exhibiting arsenic and cobalt at concentrations above the GWPS.'' The 2021 CD ACM also does not evaluate any source control measures, focusing exclusively on three groundwater remediation alternatives involving MNA.[48] However, the assessment required by § 257.96 must include more than one source control measure, and must actually assess how the various measures would perform according to the criteria in § 257.96(c). Here there is no assessment of the one source control measure identified in the ACMs—the closure of Ash Pond 4, which left a significant amount of CCR in contact with groundwater—and how it would perform according to the criteria in § 257.96(c) compared to other source control alternatives, such as clean closure or the imposition of engineering measures to control or eliminate the groundwater that continues to flow in and out of the impoundment.

ADEM's failure to require submission of an ACM that actually evaluates whether the closure of the Ash Pond meets the source control requirements in § 257.97(b)(3) also undercuts their claim that they will use the corrective action process to address any remaining concerns with respect to the closure of the Ash Pond. In its October 27, 2022, letter to EPA regarding compliance at TVA Colbert, ADEM states on page 7,

> In the event that it is determined that the closure activities conducted at Ash Disposal Area 4 . . . are insufficient to prevent further groundwater contamination, additional controls or methods will be considered and addressed through the on-going Assessment of Corrective Measures (ACM) and selection of a final remedy . . .

Ash Disposal Area 4 completed closure in 2018, and groundwater monitoring in 2022 revealed SSLs of additional constituents at wells without prior SSLs, which indicates that the closure activities were insufficient to prevent further groundwater contamination. Yet the permit issued by ADEM does not require TVA to take any action to remedy this deficiency.

ii. The Colbert Permit Does Not Require Collection of Data Needed To Characterize Site Conditions That May Affect a Remedy To Support the Assessments in the ACMs

40 CFR 257.95(g)(1) requires a facility to characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The

[46] The Federal CCR regulations State that an ACM is complete when it is placed in the facility operating record. 40 CFR 257.96(d). The regulations require posting of this information to the publicly accessible website within 30 days 40 CFR 257.107(d), (h)(8). The 2021 Revised ACM was not posted to the TVA Colbert CCR website at the time of EPA's review.

[47] Tennessee Valley Authority. TVA Seventh Semi-Annual Report on the Progress of Remedy Selection at Ash Disposal Area 4. January 13, 2023.

[48] MNA refers to reliance on natural attenuation processes to achieve corrective action objectives within a time frame that is reasonable compared to that offered by other, more active methods. The ''natural attenuation processes'' at work in such a remediation approach generally include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.

characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96. The 2019 ACM and 2021 CD ACM do contain information about the delineation of the identified releases. Although, given the concerns discussed previously about the adequacy of the downgradient wells in the groundwater monitoring well network, EPA is concerned that additional plume delineations may be needed, because potential contaminant pathways are unmonitored and additional releases may have occurred.

But critically, the reports do not include any information collected about site conditions that would affect the efficacy of any remedies analyzed in the 2019 and 2021 CD ACMs. Site data needed to assess remedies vary depending on the remedy being assessed, but could include: speciated results of constituent concentrations in groundwater and soil, in dissolved and suspended phases; concentrations of constituents, if present, which are necessary to complete reactions that result in immobilization of contaminants (*e.g.* iron or sulfur); and data to confirm the presence of attenuated and immobilized contaminants in the subsurface, to demonstrate attenuation is occurring naturally. As discussed in subsequent sections, the absence of such data is particularly critical with respect to MNA, which is the only remedy identified in the 2021 CD ACM. But neither ACM contains any of these data, which would be needed to accurately assess any of the remedies identified in the 2019 and 2021 ACMs. Yet the Final Permit does not include terms to address these deficiencies, such as a requirement to collect data to characterize site conditions that would affect the corrective measures considered in either ACM, or a deadline to submit a revised ACM that contains such data.

iii. Colbert's Permit Does Not Require an ACM That Accurately Assesses Alternatives According to the Criteria in 40 CFR 257.96(c)

40 CFR 257.96(c)(1) requires an assessment of how well alternative remedies will control exposure to residual contamination. Instead, the 2019 ACM assesses potential risks from any exposure to residual contamination that may occur. This is inconsistent with the Federal regulations and is, in any event, a less useful metric to evaluate control measure technologies relative to one another, particularly when more than one alternative leaves contaminants in the environment. This is because this alternative criterion serves as an assessment of harm from the contaminants themselves if they are not removed from the environment, rather than an assessment of each technology's effectiveness at removing them. For example, in Table 6–1 in the 2019 ACM—MNA is assessed as low risk with respect to this alternative criterion, but it would have assessed poorly according to the criterion of how well alternative remedies will control exposure to residual contamination. This is less an assessment of MNA's effectiveness at meeting the requirements of § 257.97(b) and more an assessment of whether those requirements must be met, which is not the purpose of the ACM. Moreover, this conclusion of low risk is unsupported by data or analysis.

The 2019 ACM also fails to consider safety impacts and cross-media impacts. See, 40 CFR 257.96(c)(1). The 2021 CD ACM does not correct this deficiency as it entirely fails to assess alternative remedies with respect to this criterion at all. The Final Permit issued by ADEM does not require any actions, by a deadline, to remedy these deficiencies in the ACMs.

iv. The Final Permit Allows TVA To Continue To Pursue a Remedy (MNA) That Has Not Been Demonstrated To Meet All of the Requirements in § 257.97(b)

The 2019 ACM for Colbert identified MNA as one of several potential corrective measures to address groundwater contamination (*i.e.,* hydraulic control and treatment; in-situ treatment). However, the 2021 CD ACM considers only MNA as a primary remedy, which suggests that TVA is now largely pursuing a remedy that relies exclusively on MNA.

MNA refers to reliance on natural attenuation processes to achieve corrective action objectives within a time frame that is reasonable compared to that offered by other, more active methods. The ''natural attenuation processes'' at work in such a remediation approach could generally include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. However, mass reduction through degradation generally is not a viable process for most inorganic contaminants (*i.e.,* the constituents in Appendix IV to 40 CFR part 257) in groundwater, except for radioactive decay. These constituents are atoms, and atoms do not break down or degrade through any naturally occurring process unless they are radioactive.

Thus, while MNA can reduce the concentration or mobility of inorganic contaminants in groundwater if immobilization occurs through adsorption or absorption to subsurface soils, it does not remove the contaminants from the environment. MNA, therefore, would not perform well with respect to the requirement in § 257.97(b)(4), which requires that remedies ''remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible.'' This is particularly true in this circumstance, where, as discussed in the next sections, TVA has failed to collect the site data needed to identify whether any naturally occurring attenuation may be occurring on-site, as well as the mechanism by which it occurs, and to assess whether site characteristics that control and sustain this naturally occurring attenuation are sufficient to immobilize the entire release. Assessments in an ACM are relative in that the expected performance of the different technologies are compared with one another according to how well each alternative meets each regulatory criterion. Given both the absence of any evidence of any attenuation mechanisms occurring at the Ash Disposal Area 4, and the conclusion in the 2020 ACM that the other alternatives such as pump and treat are feasible, there would appear to be no basis for assessing MNA more favorably than an alternative that unquestionably removes contaminants from the environment. The Final Permit nevertheless allows TVA to continue to attempt to validate MNA as a technology instead of accurately assessing alternatives based on-site conditions and selecting a remedy that meets the requirements in § 257.97(b).

v. ADEM Issued a Final Permit That Impermissibly Allows a Remedy (MNA) That Is Based on Unsupported Assessments

The 2019 and 2021 ACMs assessed the performance of MNA favorably without any supporting data that characterize site conditions that may ultimately affect a remedy, as required by § 257.95(g)(1). In order to legitimately consider MNA as required by § 257.96(c), site data are needed to identify any naturally occurring attenuation that may be occurring, and to assess whether site characteristics that control and sustain this naturally occurring attenuation are sufficient to

immobilize the entire release. ''It is necessary to know what specific mechanism (*e.g.,* what type of sorption or reduction and oxidation reaction) is responsible for the attenuation of inorganics so that the stability of the mechanism can be evaluated. [. . .] Changes in a contaminant's concentration, pH, oxidation and reduction potential (ORP), and chemical speciation may reduce a contaminant's stability at a site and release it into the environment.'' [49] Determining the existence, and demonstrating the irreversibility, of MNA mechanisms is necessary to assess the performance, reliability, ease of implementation, and the time required to begin and complete the remedy. 40 CFR 257.96(c)(1) and (2). This information would ultimately be necessary to assess how well MNA meets the requirements of § 257.97(b).

MNA of inorganic contaminants would be assessed most favorably at sites where immobilization is demonstrated to be in effect and the process/mechanism is irreversible. Immobilization that is not permanent would require ongoing monitoring in accordance with § 257.98(a)(1) as long as immobilized constituents remain in the aquifer matrix.

(1) The ACMs Do Not Include Data That Characterize Site Conditions or Identify Any Attenuation Mechanisms Occurring at the Ash Disposal Area 4

The site data that were collected focus only on contaminant concentrations and trend analyses regarding the presence of contaminants. The 2019 ACM and 2021 CD ACM do not discuss how attenuation may be naturally occurring through any particular MNA mechanisms (*e.g.,* adsorption, precipitation, dispersion). EPA was not able to find any indication in the Final Permit or supporting documentation to confirm that the Permittee has identified the mechanism by which MNA would occur at the site. Nor is there any condition in the Final Permit requiring the development and submission of such information. The Final Permit should have required collection of groundwater data (*e.g.,* pH or oxidation potential, speciated concentrations of constituents of concern) as well as samples to identify the presence of immobilized constituent in subsurface soils. The Final Permit also should have required an amended ACM which considered this information in the assessment of all alternatives, including assessment of the performance of identified naturally-occurring attenuation mechanisms (*i.e.,* MNA).

Determining the existence and demonstrating the irreversibility of MNA mechanisms is necessary to evaluate the performance, reliability, ease of implementation, and the time required to begin and complete the remedy. See, 40 CFR 257.96(c)(1) and (2). This information would ultimately be necessary to show that MNA meets the requirements of § 257.97(b) and would need to be supported with site-specific characterization data and analysis. Yet the Final Permit contained no terms or conditions requiring TVA to remedy these deficiencies.

(2) MNA Is Not a Viable Remedy Without Source Control

From a scientific point of view, source control is necessary in order for any MNA remedy to be effective at a particular site.[50] In order to properly assess MNA, first the attenuation mechanisms (for inorganic metals, these include both chemical and physical reactions) by which the specific constituents released may be immobilized at a specific site must be identified. As discussed above, no mechanism was identified in either the 2019 or 2021 ACM. After attenuation mechanisms are identified, it is necessary to determine whether the aquifer has the capacity (*i.e.,* the presence of these reactants available in sufficient amounts) to provide those reactions to attenuate the release that has occurred. If site data are obtained verifying the localized presence and availability of reactants, appropriate types of soil, and other factors needed to immobilize the constituents, it must be determined whether they are available in sufficient quantities to react with the quantity of constituents released. This can be done using the estimated mass of the release that was calculated in accordance with § 257.95(g)(1)(ii), as well as site data collected to determine the presence and concentrations of the chemical and physical materials required to complete the immobilization reactions. If there are enough available reactants to immobilize the entire release, and the site conditions are right for those reactions to occur, then MNA may be effective at immobilizing a release. However, if the source of a release has not been controlled (*i.e.,* the CCR remains in contact with groundwater and releases are ongoing), then it is impossible to know if an aquifer has the capacity to attenuate the release, *even if attenuation mechanisms have been identified and site conditions are favorable for those reactions to occur.* That is because the amounts of contaminants being released will continue over time, and releases of new constituents could occur. Therefore, it is impossible to determine whether the aquifer has sufficient chemical and physical materials required to complete the immobilization reactions because the total amount of the release is not yet known.

At TVA Colbert, source control has not been achieved. As discussed above, the closure of Ash Pond 4 has resulted in continuing releases from the closed unit, *i.e.,* a continual source of groundwater contamination from the unit. Therefore, based on the current record, MNA is not a viable remedy for Ash Pond 4. This should have been addressed prior to permit issuance during the permit application review stage or by some other means, such as a schedule of compliance in the final permit, *e.g.,* by requiring TVA to submit a revised ACM that accurately assesses MNA and includes a corrective measure which achieves source control in each alternative assessed.

(3) The Assessment of Cross-Media Impacts in the ACMs Is Inaccurate and Not Supported by Data

The table in the 2019 ACM, which summarizes TVA's assessment of groundwater corrective measures, states that MNA poses a low risk of cross-media impacts. The reason given is that ''all work activities occur in-situ.'' This conclusion is only accurate if natural attenuation through immobilization is occurring on-site, but no such showing has been made. In fact, in the absence of any information to the contrary, it is more likely that MNA through dilution and dispersion would occur, that is, by mixing with clean groundwater as it migrates from the unit, ultimately transferring the contamination from groundwater to surface water. But the transfer of contamination from groundwater to surface water is a cross-media impact and it only occurs in-situ until the groundwater reaches the surface water. The assessment of low risk of cross-media impacts is therefore not supported by facts and site data. See, 40 CFR 257.95(g)(1).

A similar table (6–1) in the 2021 CD ACM assesses ''potential adverse impacts'' as low. Its assessment of the first alternative, MNA with no institutional controls or adaptive management, is favorable even though it is noted that there would be no protection of surface water in the short term. In fact, because all three

[49] Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, EPA OSWER Directive 9200.4–17P. April 21, 1999. p. 8.

[50] Id.

alternatives rely on MNA and do not include active remediation or containment, none of them would protect surface water in the short term. It is unclear why this concern is not noted in all the alternatives. There is also no discussion of long-term impacts to surface water. Accordingly, EPA is proposing to determine that the assessment of these potential remedies as low risk is not supported by any evidence, and that the assessment of the third alternative does not meet the requirements of § 257.96(c)(1) because it does not consider impacts to surface water (*i.e.,* cross-media impacts).

The lack of data to support the assessments in both ACMs means they may not accurately reflect MNA's ''effectiveness of potential corrective measures in meeting all of the requirements and objectives'' in § 257.97(b). 40 CFR 257.96(c) Conclusions without a supporting assessment or data do not constitute ''an *analysis* of the effectiveness of potential corrective measures.'' 40 CFR 257.96(c) (emphasis added). In addition, inaccurate assessments in an ACM can ultimately result in selection of a remedy that will not meet the requirements of § 257.97(b). The Final Permit issued by ADEM in October 2022 does not require TVA to take any actions to remedy the deficiencies in either the earlier 2019 ACM or subsequent 2021 CD ACM.

(4) The 2021 CD ACM Is More Deficient Than the 2019 ACM

Even though the 2021 CD ACM was developed in response to comments from ADEM, it not only fails to remedy the deficiencies in the 2019 ACM, but also contains provisions that raise additional concerns. First, the remedial objectives in section 1.3 of the 2021 CD ACM do not address the requirements in § 257.97(b)(3) or (4) relating to source control or the removal of the release from the environment—rather, they only consider off-site impacts of groundwater contamination.

It is unclear whether the 2021 ACM was intended to replace or to supplement the 2019 ACM. But assessed on its own merits, the 2021 CD ACM failed to assess two remedies included in the 2019 ACM: hydraulic control and treatment and enhanced in-situ treatment as primary corrective measures. Only three alternatives are considered in the 2021 CD ACM, which all rely on MNA as the primary corrective measure. The only consideration of active corrective measures is in alternative three, as part of an adaptive management strategy if MNA does not meet the remedial objectives on its own. Therefore, EPA is proposing to determine that the 2021 CD ACM does not meet the requirement in § 257.96(a) to assess corrective measures ''to prevent further releases, to remediate any releases and to restore affected area to original conditions,'' because the alternatives, limited to MNA without additional source control, would not meet any of these requirements at the Colbert Plant.

(5) The Ongoing Data Collection and Model Development Are Not Necessary To Select a Remedy

According to the January 13, 2023 Progress Report, the facility has delayed selection of a remedy by, among other tasks, continuing to monitor the migration of the release and developing a computer model to predict groundwater behavior. It is not necessary to delay completion of an ACM or selection of a remedy until a model can be developed and refined; the Federal regulations do not require development of a groundwater model to complete an ACM or to select a remedy. Since actual site monitoring data—rather than an estimate from a model—is required to characterize the release sufficiently to assess corrective measures— the primary use of a model in this stage of CCR corrective action would be to estimate the amount of time needed to complete a remedy. But this estimate may be accomplished through other methods (*e.g.,* calculation of the mass of the release, groundwater flow velocity, hydraulic conductivity, and the attenuation capacity of the downgradient subsurface where MNA mechanisms have been identified and can be quantified). Nor is such delay consistent with the requirements of § 257.95(g), which only requires characterization ''sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96.'' In order to support the assessment in the ACM, this characterization must be complete *prior* to the deadline to complete the ACM.

Based on all of the above, EPA is proposing to determine that the permit fails to require the Permittee to select its remedy ''as soon as feasible,'' as required by § 257.97(a). Section 5.C.2 of the permit, entitled ''Selection of Remedy,'' only reiterates the regulatory requirement that the Permittee must select a remedy as soon as feasible. It has been three years since the 2019 ACM for the Ash Pond was placed in the facility's operating record, and it is not clear why the facility has not selected a remedy.[51] The 2021 CD ACM does not reflect progress toward selection of a remedy, as it does not address any of the deficiencies in the 2019 ACM. For example, even though the 2021 CD ACM focuses exclusively on MNA, it still fails to identify any attenuation mechanism, or to include any of the supporting data that characterize site conditions that may ultimately affect a remedy, as required by § 257.95(g)(1). For all the reasons discussed above, EPA is proposing to determine that neither the 2019 ACM, the 2021 CD ACM, or the two ACMs taken together meet the requirements of § 257.96 or § 257.97 or support selection of a compliant remedy. By failing to require TVA to obtain the necessary data and submit a revised ACM by a date certain, the Final Permit appears to authorize the permittee to continue to indefinitely delay selecting a remedy, while the permittee continues to conduct the same sampling it has conducted since 2019, that is likely to be insufficient to support the selection of that alternative as a remedy. Accordingly, EPA is proposing to determine that the permit does not require compliance with the Federal requirements and, because it allows the facility to continue to delay corrective action, the alternative State requirement is less protective.

2. Plant Gadsden

EPA reviewed the Final Determination Initial Permit And Variance for the Alabama Power Company, Gadsden Steam Plant (Plant Gadsden Permit), issued by ADEM under Permit No. 28–09 on December 18, 2020.[52] The permit summary on Page 1 says:

> [t]he Plant Gadsden Ash Pond is a CCR surface impoundment located in Section 2, Township 12 South, Range 6 East in Etowah County, Alabama consisting of approximately 130.22 acres with a disposal area that consists of approximately 58.73 acres. The permit requires the Permittee to manage CCR in accordance with the conditions of the permit, ADEM Admin. Code r. 335–13–15, . . . and the approved permit application. . . .
>
> The Permittee must comply with all conditions of the permit except to the extent and for the duration such noncompliance is authorized by a variance granted by ADEM. The first variance requests to exclude boron as an Appendix IV assessment monitoring

[51] Tenessee Valley Authority. 2019 Assessment of Corrective Measures Report for the Ash Pond TVA Colbert Fossil Plant, Tuscumbia, Alabama. July 15, 2019.

[52] Alabama Department of Environmental Management. Final Determination Initial Permit And Variance for the Alabama Power Company, Gadsden Steam Plant, issued under Permit No. 28–09. December 18, 2020.

constituent. The second variance requests groundwater protection standards of 6 micrograms per liter (µg/L) for cobalt; 15 µg/L for lead; 40 µg/L for lithium; and 100 µg/L for molybdenum. The third variance requests the final grade of the cover system be less than 5 percent and greater than 25 percent. The fourth variance being requested is from 335–13–15–.03(6) requiring a 100 foot buffer from the perimeter of the facility boundary.

a. Plant Gadsden Closure Issues

Section VII.B.1 of Plant Gadsden Permit contains the following terms and conditions:

A. Closure Timeframe and Notifications. The Permittee shall close their CCR units as specified in 335–13–15–07(2), this permit and the Application.

B. Criteria for Closure.

1. Cover. Closure of a CCR landfill, surface impoundment, or any lateral expansion of a CCR unit must be completed by either leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit, as described in 335–13–15–.07(3)(b) through (j). The minimum and maximum final grade of the final cover system may be less than 5 percent and greater than 25 percent, as specified in the Permit Application. (See Section IX.C.)

2. Written Closure Plan. The written closure plan, as part of the Application, must include, at a minimum, the information specified in 335–13–15–.07(3)(b) 1.(i) through (vi).

The Ash Pond was closed by removing CCR from the southern portion of the Lower Pond (the area of the western expansions in the 1970s) and consolidating the ash in the Lower Pond to about 30 acres in the northern portion of the Lower Pond. The CCR in the Upper Pond (original ash pond prior to expansions) was regraded to achieve a minimum 3% slope, and a cover system was constructed over the re-graded Upper Pond and consolidated ash in the Lower Pond.[53]

Closure construction activities for the Ash Pond were certified as completed in October 2018, and a certification of completion of closure activities was later submitted in April 2020, and approved by ADEM on June 9, 2022.[54] [55]

i. Base of the Impoundment

Plant Gadsden is located in Gadsden, Alabama, south of the Coosa River. The Ash Pond is located on the north side of and adjacent to the Coosa River. The Permit Application states that the Ash Pond was initially constructed in 1949 and subsequently expanded to the west in 1976 and 1978.[56] The Permit Application states that the fully constructed Ash Pond was 75 acres. Id. at Appendix 8. Alabama Power closed the Ash Pond by consolidating CCR to a smaller area within the impoundment footprint. Id. at Appendix 6. As a result, the consolidated closed footprint of Ash Pond 4 decreased to approximately 59 acres. Id. at Appendix 2.

EPA was unable to locate information in the Permit Application or other publicly available documents that characterizes the bottom elevation of the Ash Pond across its entire footprint. Nonetheless, similar to the review for the permit for Plant Colbert, EPA estimates the average bottom elevation of the impoundment for purposes of calculating the volume of CCR that remains saturated by groundwater. EPA is estimating that the average bottom elevation of the closed Ash Pond is 510 ft above MSL.[57] This estimate is based on consideration of the information available in the Permit Application. Specifically, EPA considered the following information: (1) the original ground surface contours shown on construction drawings for areas that were closed by leaving CCR in place; (2) information showing that the bottom of the impoundment was lower than the original ground surface contours at some locations while the unit was in operation; and (3) closure-related drawings portraying an estimated waste bottom.

EPA's estimate recognizes that the original ground surface contours for most of the impoundment footprint (both the initial footprint and western expansions) range between 505 to 515 ft above MSL, or an average elevation of 510 ft above MSL. In addition, certain closure drawings show that current surface elevations in the upper northern part of the unit are actually *lower* in 2016 than the original ground surface elevations depicted on the 1978 expansion drawing. This means that the original ground surface elevations shown on the 1949, 1976, and 1978 drawings do not necessarily reflect the bottom of the impoundment at closure at all locations within the unit footprint. The 2016 drawing shows the bottom elevation at this upper northern part of the unit to be no higher than 505 to 510 ft above MSL, which is lower than the original ground contours at this location that ranged from 510 to 515 ft above MSL. Finally, the four cross-sections provided in the Gadsden Permit Application depict the impoundment bottom appearing to range between 495 to 510 ft above MSL, but these cross-sections are annotated with a note that the bottom elevations have not been verified. Based on the available information, EPA's estimated average bottom elevation of 510 ft above MSL is a reasonable reconciliation of the available information.

ii. Characterization of Groundwater Elevations

The CCR program groundwater monitoring network installed at the unit consists of fifteen downgradient monitoring wells (GSD–AP–MW–1 through MW–12 and GSD–AP–PZ–1, PZ–5, and PZ–6). The following evaluation of groundwater elevation data for the unit focuses on the twelve monitoring wells that are immediately adjacent to the waste boundary (*i.e.,* MW–1 through MW–12). Monitoring wells PZ–1, PZ–5 and PZ–6 are located hundreds of feet from the waste boundary and thus were not considered. Also, three ''upgradient'' monitoring wells (MW–14, –16, and –17) are located to the southeast on the other side of the Coosa River and are not considered with respect to groundwater elevations within the unit. Based on the single groundwater flow map included in the Permit Application,[58] based on August 19, 2019, data, groundwater elevations in monitoring wells surrounding the unit ranged from a high of 512.03 ft above MSL along the northeastern boundary of the unit (GSD–AP–MW–3) to 506.95 ft above MSL along the western boundary (GSD–AP–MW–7). The potentiometric surface contour map presented for August 19, 2019, reveals a somewhat radial flow pattern, with highest groundwater elevation values recorded along the northeastern boundary of the facility. Between monitoring wells GSD–AP–MW–1 and GSD–AP–MW–4 along the northeastern boundary of the unit, groundwater elevation values are similar, approximately 512 ft above MSL, resulting in a northwest to southeast trending ridge-like region of relatively high groundwater elevations.

Groundwater elevations drop to the north, northeast, northwest, west and to

[53] Alabama Power. Revised Closure Permit Application for the Plant Gadsden Ash Pond. April 30, 2020. Appendix 6.

[54] Alabama Power. Plant Gadsden 2020 Notice of Closure Completion Plant Gadsden Ash Pond Alabama Power Company.

[55] Alabama Power. Plant Gadsden 2022 Closure Inspection Gadsden Steam Plant Permit No. 28–09.

[56] Alabama Power. Revised Closure Permit Application for the Plant Gadsden Ash Pond. April 30, 2020. Appendix 3.

[57] USEPA. Volume I: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, Supplemental Analyses of Technical Issues with ADEM Permits. August 2023. Section III.a.

[58] Alabama Power. Revised Closure Permit Application for the Plant Gadsden Ash Pond. April 30, 2020, Appendix 7, Plant Gadsden Ash Pond Groundwater Monitoring Plan, Figure 6.

the south and southwest from this central axis which is mapped as a groundwater divide just east of the unit boundary on the August 19, 2019, map. There are no data in the Permit Application that can enable a determination of groundwater flow directions to the east and southeast of the unit, thus the possibility of unmonitored flow in these directions has not been ruled out. These uncertainties notwithstanding (see Unit IV.C.2.b of this preamble for additional assessment of uncertainties associated with the groundwater monitoring network), the available information indicates that groundwater from the Ash Pond generally flows toward the surface water features represented by the main stem of the Coosa River as well as toward the tributary stream segments to the north and northwest of the unit. Groundwater elevations within the unit appear to be primarily controlled by the consistently higher elevations along the northeastern boundary of the unit as well as the lower elevations associated with the Coosa River to the northwest, west, and southwest. On August 19, 2019, the elevation of the Coosa River was reported to be approximately 508 ft above MSL.[59]

It is important to note that the groundwater elevations reported on August 19, 2019, represent a relatively low condition, on balance, and groundwater elevation values measured at the unit are observed to oscillate over several feet on average in response to seasonal rainfall or other variations, with individual wells immediately adjacent to the Ash Pond (*i.e.,* GSD–AP–MW–1 through MW–12) varying over a range of approximately 3.9 to 8.5 feet between 2018 and 2022,[60] which covers the period after closure construction activities for the Ash Pond were certified as completed in October 2018. Similarly, the Coosa River levels show considerable variation, ranging from 503.3 to 512.6 ft above MSL between 2018 and 2022 as monitored by a gauge located approximately 900 feet upstream of GSD–AP–MW–11. Given these fluctuations, EPA considered additional groundwater elevation data from documents included on Alabama Power's CCR website. Groundwater elevation data from measurement events since August 19, 2019, were initially evaluated to illustrate the range of groundwater elevation fluctuations at the site, as summarized in Table III. The recorded elevations of the Coosa River on the corresponding dates are also included on the table.

TABLE III—GROUNDWATER ELEVATION FLUCTUATIONS AT THE ASH POND AND CORRESPONDING COOSA RIVER ELEVATIONS [a]

Date	Groundwater elevation (ft above MSL)		Coosa River elevation (ft above MSL) [b]
	Maximum	Minimum	Range Over 24-Hour Period
8/19/2019	512.03	506.95	507.6–507.8
4/13/2020	517.91	508.71	507.9–510.3
8/24/2020	512.57	507.64	507.8–508
3/15/2021	516.98	507.18	507–507.4
10/4/2021	513.76	508.03	507.9–508.1
1/11/2022	515.65	508.01	507.8–508.2
5/5/2022	516.18	507.97	507.6–508.1
10/24/2022	510.86	506.64	[c] 507.5–507.7

[a] Measured at groundwater monitoring wells GSD–AP–MW–1 through GSD–AP–MW–12.
[b] Source: U.S. Geological Survey (USGS). See Section III.b.i of TSD Volume I for further details.
[c] These data are provisional and may be revised by the USGS.

As shown here, groundwater levels are variable, and are generally higher during spring monitoring events (March, April) as compared to late summer/fall events (August, October). In consideration of the 15 groundwater elevation monitoring events from October 4, 2018, through October 24, 2022, EPA calculated average minimum, average maximum, and overall average groundwater elevations within the unit over the four-year period, as follows:

Groundwater Elevation (overall average): 511 ft above MSL
Groundwater Elevation (average maximum): 514.6 ft above MSL
Groundwater Elevation (average minimum): 508.6 ft above MSL

The average range of fluctuation between maximum and minimum values at a particular monitoring well location over this same period of interest was 5.9 feet.

These values were used in conjunction with the estimates for the bottom-of-waste elevation to calculate estimated volumes of saturated waste, as presented in the following section.

iii. Volumes of Saturated Ash Estimates

Based on available information and the averages discussed above, EPA estimated the volume of CCR in the Ash Pond that, on average, would continue to be saturated with approximately 1 to 4.6 feet of groundwater.[61] Because both the base elevation of the waste and the groundwater elevations vary, those estimates both overstate and underestimate the degree of saturation. For example, at its lowest point, the base of the impoundment measures 505 ft above MSL, and the highest elevation of groundwater was measured at 519.26 ft above MSL (GSD–AP–MW–1 on February 25, 2019). However, the data show that even during the periodically dry conditions in summer when the groundwater elevations can decline to values approaching Coosa River surface levels, significant volumes of saturated waste may still be present because of uncertainties with the waste bottom elevation. If areas of waste are present below the elevation of the Coosa River, as some information suggests, these areas of waste are expected to remain saturated because, absent any information to the contrary, it is presumed that a hydraulic connection between the uppermost aquifer and the river exists due to the close proximity of the Ash Pond to the river. In any case,

[59] Volume I: Technical Support Document for the Proposed Notice to Deny Alabama's Coal Combustion Residuals Permit Program, EPA Analysis of Alabama CCR Permits. U.S. Environmental Protection Agency, Office of Land and Emergency Management (5304T), 1200 Pennsylvania Avenue NW, Washington, DC 20460. August 2023. Section III.b.i.

[60] Id at Section III.c.iii.

[61] Id at Section III.c.iv.

the regular and significant oscillation in waters levels in the CCR indicate that significant volumes of saturated CCR persist routinely despite closure efforts to date. Moreover, evaluation of water level elevations over time show that water levels are higher than the bottom of the impoundment under most conditions, and there is no indication from available information that this situation will change absent additional engineering controls.

EPA's analysis shows that substantial volumes of saturated CCR currently remain in the closed impoundment under conditions where groundwater elevations were at the overall average or maximum average levels, ranging from approximately 95,000 to 436,000 CY, respectively. Furthermore, these saturated volume estimates equate to approximately 8% to 36% of the total volume of CCR in the Ash Pond with an average thickness of CCR over the entire footprint between approximately 1 to 4.6 feet of statured CCR within the unit. These estimates are further explained in Section III.c of the TSD Volume I. Table IV summarizes the volumes and areas of saturated CCR calculated under both conditions.

TABLE IV—ESTIMATES OF SATURATED CCR AT PLANT GADSDEN ASH POND

Groundwater elevation condition	Overall average	Maximum average
Groundwater elevation (ft above MSL)	511	514.6
Average waste bottom (ft above MSL)	510	510
Saturated CCR thickness (feet)	1	4.6
Total CCR in Ash Pond (cubic yards)	1,200,000	1,200,000
Area of Ash Pond (acres)	58.73	58.73
Area of Ash Pond (square yards)	284,253	284,253
Volume of saturated CCR (cubic yards)	94,751	435,855
Fraction of total CCR saturated (%)	7.9	36.3

Based on EPA's estimates, the closure of the Plant Gadsden Ash Pond, authorized and approved by ADEM, does not meet the requirements of § 257.102(d). Overall, the closure of the Gadsden Ash Pond presents the same issues as the closure of the Colbert Ash Pond 4 discussed in the previous section. The post-closure groundwater monitoring data from 2019 through 2021 show that groundwater is still infiltrating into the Ash Pond. The *average* groundwater elevations measured at monitoring wells surrounding the Ash Pond from 2018 through 2022 were on the order of 514 ft MSL (*i.e.,* approximately 4 feet above the average bottom elevation of the CCR). Yet neither the approved Closure Plan nor any other document in the record for the permit accounts for the levels of groundwater present in the unit prior to closure or describe any engineering measures taken to meet each of the Federal CCR closure-in-place performance standards in § 257.102(d)(1) and (2) in light of the groundwater present in the unit. Nor based on the post-closure groundwater elevation data from piezometer wells from 2019–2021, did the approved closure address the groundwater that continues to saturate the CCR in the closed unit. EPA is therefore proposing to determine that the permit for Plant Gadsden does not require Alabama Power to achieve compliance with either § 257.102(d) or with alternative State standards that EPA has determined to be at least as protective. EPA is therefore, proposing to determine that Alabama's CCR permit program does not satisfy the statutory requirement in RCRA section 4005(d)(1)(A) or (B).

As previously explained, in situations such as this, where the waste in the unit is continually saturated with groundwater, the requirement to eliminate free liquids obligates the facility to take engineering measures to ensure that the groundwater, along with the other free liquids, has been permanently removed from the unit prior to installing the final cover system. See, 40 CFR 257.102(d)(2)(i). Yet neither the Closure Plan that ADEM-approved nor the permit ADEM issued contained any such requirements.

While the approved Closure Plans for the Ash Pond at Plant Gadsden discuss dewatering techniques employed before and during closure, it appears the facility at most eliminated only the ''free water'' ponded above the CCR, and only dewatered the CCR and sediment ''to the extent necessary to provide a stable working surface for earthwork equipment'' as provided in the closure and post-closure for the Ash Pond:

2.2 DEWATERING FOR CLOSURE

Free water in the clear pool will be removed through pumping, maintaining compliance with the NPDES discharge limits. The saturated ash will be dewatered to the extent necessary to allow a stable working surface for earthwork equipment. Interstitial water '' removal. All water will be sent to an onsite water treatment system prior to discharge to ensure compliance with the NPDES discharge limits.[62]

The ''free water'' referenced above is only a subset of the ''free liquids'' that must be eliminated; and that standard (''eliminated'') applies equally to the pore water intermingled with the CCR. See, 40 CFR 257.102(d)(2)(i). The Closure Plans do not acknowledge the groundwater within the consolidated footprint that continues to routinely flow into the base of the impoundment and saturate the CCR or describe any engineering measures to eliminate those free liquids, despite the continued saturation. Moreover, it is clear from the post-closure 2019–2022 monitoring data that the measures that were taken during closure did not actually eliminate the free liquids from Ash Pond.

A further concern is that, given the failure to eliminate the free liquids from the saturated CCR underlying the consolidated unit, it is not at all clear that the remaining wastes have been stabilized sufficiently to support the final cover system, as required by § 257.102(d)(2)(ii). Creating a stable working surface for earthwork equipment while the cover system is being installed is not the same as ensuring that the unit has been sufficiently dewatered prior to installation of the cover system and that over the long term there will be no differential settlement of the CCR in the closed unit that would disrupt the integrity of the cover system and allow

[62] Alabama Power. Revised Closure Permit Application for the Plant Gadsden Ash Pond. April 30, 2020. Appendix 8, p 2.

liquids to infiltrate into the closed unit. Neither the approved Closure Plan nor ADEM's permit provides any details of engineering measures that were taken to address the groundwater that continues to flow into and out of the unit from the sides and bottom. In the absence of such measures, EPA has no basis for concluding that the standard in § 257.102(d)(2) has been met.

EPA was also unable to find any description in the ADEM approved Closure Plan or any other permit document of engineering measures that Alabama Power took to ''control, minimize, or eliminate, to maximum extent feasible'' either the post-closure infiltration of the groundwater into the waste or the post-closure releases of CCR or leachate to the groundwater, resulting from the groundwater that continues to infiltrate into the impoundment from the sides and bottom of the unit. 40 CFR 257.102(d)(1)(i). Based on the data and analyses described above, groundwater continues to infiltrate into the unit and yet the only measures described in the Closure Plan and the permit are those taken to facilitate consolidation and cap construction.[63] In essence, this means the Ash Pond will continue releasing CCR contaminants indefinitely unless Alabama Power is taking additional actions that are not required by or explained in the permit.

The absence of such measures from the closure approved by ADEM is consistent with the State's interpretation of its closure requirements, but as discussed above, it is neither consistent with, nor as protective as, the Federal regulations. As with the TVA Colbert Plant Permit, EPA is proposing to determine that the record does not support a finding that ADEM's alternative approach of relying on the existing corrective action process will be as protective as the Federal requirements. As discussed in a subsequent section, EPA has serious concerns about the protectiveness of the corrective action at Gadsden that ADEM is overseeing.

All of this information was available before ADEM issued the permit in December 2020, and again when ADEM approved the completion of closure on June 9, 2022. Yet the permit continues to authorize the closure of the unit with no engineering measures to limit the groundwater from continually flowing into and out of the CCR in the unit, and with no permit terms on the need to address this as part of the corrective action process.

[63] Id at Appendix B (Infiltration Equivalency Demonstration) in Appendix 8.

Accordingly, EPA is proposing to determine that the permit for Plant Gadsden does not require Alabama Power to achieve compliance with either § 257.102(d) or with alternative State standards that EPA has determined to be at least as protective.

b. Plant Gadsden Groundwater Monitoring Issues

The Plant Gadsden Permit says on page 1,

Groundwater monitoring and corrective action requirements in the permit establish a groundwater monitoring system of wells that provides an accurate representation of the groundwater quality underlying the unit and a groundwater monitoring plan to establish appropriate sampling and analysis of the system to detect the presence of CCR constituents.

In addition, Section V of the Plant Gadsden Permit incorporates the GWMP submitted with the Permit Application, and directed Alabama Power to comply with the State regulations and the approved plan:

Section V. Groundwater Monitoring and Corrective Action Requirements.

A. Groundwater Monitoring System. The Permittee shall install and/or maintain a groundwater monitoring system, identified in Table 1, as specified in 335- 13- 15-. 06(2) and the approved groundwater monitoring plan.

Once ADEM approved and adopted the GWMP into the permit, the GWMP, rather than the referenced State regulations, became the State requirements with which the facility is required to comply.

Based on EPA's review of the approved groundwater monitoring plan, EPA is proposing to determine that the groundwater monitoring well network ADEM approved does not meet the performance standards in § 257.91(a) or (b). As discussed in more detail below, EPA is proposing to determine that the approved groundwater monitoring system is not based on a thorough characterization of the elements listed in § 257.91(b). EPA is also proposing to determine that the groundwater monitoring system does not ''yield groundwater samples from the uppermost aquifer,'' but has been screened instead in only a portion of the aquifer. 40 CFR 257.91(a). Further, it appears that the background wells were not installed in locations hydraulically upgradient of the Ash Pond, and EPA was unable to locate sufficient information in the permitting record demonstrating that the standard for such wells in § 257.91(a)(1)(i) or (ii) was met. In addition, based on the documentation provided in the Permit Application, it appears that the downgradient compliance wells are spaced too far apart and/or are screened too deeply and/or shallow to accurately represent the quality of groundwater passing the waste boundary and to monitor all potential contaminant pathways in the uppermost aquifer. See, 40 CFR 257.91(a)(2). Therefore, EPA is proposing to determine that ADEM's Final Permit fails to require Alabama Power to achieve compliance with either the Federal regulations or with an equally protective State requirement.

i. Failure To Delineate the ''Uppermost Aquifer'' and To Base the System on Thorough Characterization of Site Data

The Federal CCR regulations require that a groundwater monitoring system sample ''the uppermost aquifer,'' which is defined as ''the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.'' 40 CFR 257.53, 257.91(a). The design of the monitoring systems must be based on a thorough characterization of, among other things, the ''aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer.'' 40 CFR 257.91(b)(1) and (2). EPA is proposing to determine that ADEM approved a groundwater monitoring plan that does not meet these requirements.

Based on the limited information in the permit record, it appears the facility failed to fully define the limits of the uppermost aquifer, particularly its lower boundary. The GWMP provided in the Permit Application provides only limited characterization of the geologic units beneath the Ash Pond. In addition, the technical information provided in the Permit Application is insufficient to support a determination of the lateral and vertical limits of the entire uppermost aquifer; for example, EPA found only limited data on the ''saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer and materials comprising the uppermost aquifer.'' 40 CFR 257.91(b)(2). And EPA was unable to find adequate information about the ''materials comprising the confining unit defining the lower boundary of the uppermost aquifer.'' Because the information in the Permit Application

was inadequate, EPA also consulted information available on Alabama Power's CCR website to understand the hydrogeology of the site. EPA is proposing to determine that neither the information in the Permit Application nor the additional information available on Alabama Power's CCR website constitutes ''a thorough characterization of . . . aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer.'' 40 CFR 257.91(b)(1) and (2).

A generalized visual representation of the various lithologies composing the uppermost aquifer beneath the Ash Pond can be found in the cross sections in Figures 5A and 5B (included on pages 142 and 143) in the Permit Application and in other places, such as Figures 4A, 4B, 9, and 10 from the 2021 Semi-Annual Groundwater Monitoring and Corrective Action (GWMCA) Report for Plant Gadsden.[64] Based on EPA's assessment of the available information, the uppermost aquifer, which has not yet been fully identified and characterized, is a composite layered system consisting of unconsolidated deposits of alluvial origin on top of a predominantly mudstone bedrock. The unconsolidated alluvial deposits consist of interlayered deposits of silt, sand, gravel, and clay material. These unconsolidated alluvial deposits unconformably overlay a variably fractured and weathered bedrock material, predominantly mudstones of the Conasauga formation. The three-dimensional surface represented by the contact between the uppermost portion of the (consolidated) bedrock and the overlying alluvium (unconsolidated), which can also be described as the top-of-rock surface, is a distinct hydraulically relevant zone of interest. These points are illustrated (in part) in the geologic cross-sections on Figures 5A and 5B (included on pages 142 and 143) in the Permit Application, which show the uppermost aquifer consisting of layers of sand, silt, gravel, as well as the underlying Conasauga bedrock formation. The elevation of this contact zone changes laterally across the unit, depending on location, and these differences in elevation are important with respect to the siting of appropriate monitoring well location and depths.

Immediately located beneath the unconsolidated alluvial materials is a zone of degraded bedrock (typically referred to as ''weathered bedrock'') in the uppermost portion of the Conasauga bedrock. This weathered bedrock material consists primarily of variably weathered mudstones which have been degraded by naturally occuring processes. The weathered rock zones vary in thickness laterally and vertically. This interface between the unconsolidated alluvial materials and the underlying bedrock constitutes an irregular geologic contact, which varies spatially in terms of the thickness and degree of the weathered bedrock material, that is sandwiched between alluvial deposits above, and lightly weathered or unweathered bedrock below. The contact can be thick and gradational in some areas, and abrupt and thin in other areas. This variability demands additional characterization as it creates the potential for preferential pathways which may exploit the weathered interval. While limited information has been collected from this interval, a few monitoring wells are partially screened across the bedrock/overburden contact, and thus monitor the weathered bedrock interval to some degree at those locations. However, the variable nature of the bedrock/overburden contact was not sufficiently characterized to meet the performance standards in § 257.91(a) or (b), as discussed in more detail below.

Beneath the uppermost veneer of weathered bedrock are rocks of the Conasauga group, which consists of varying amounts of limestone, dolomite, and shale, with chert and siltstone horizons present locally. The 2021 Semi-Annual GWMCA Report states, ''The Limited core logs from the Site indicate the Conasauga [beneath the Ash Pond] to be a medium to dark gray mudstone or shale with noticeable calcite veining.'' [65] While the Report goes on to State, ''The Conasauga Formation is not considered to be a water-bearing aquifer at the Site,'' this statement conflicts with boring logs and other information which indicate that the mudstones of the Conasauga Formation are locally fractured, weathered and hydraulically connected to the alluvium and weathered bedrock deposits lying above. The lower limits of the hydraulically connected portions of the bedrock, however, have not yet been established, and reporting is not consistent on this. Both the Permit Application and the 2021 Semi-Annual GWMCA Report generally describe the aquifer similarly. For example, the 2021 Semi-Annual GWMCA Report [66] states,

The uppermost aquifer beneath the Site corresponds to a coarse and more permeable fraction of alluvial overburden soils and weathered or fractured rock near the soil-rock interface. The uppermost aquifer is typically located at depths between 15 and 50 feet below ground surface (BGS). Soils are generally poorly graded sands with layers of clay and well-graded gravels that overlay a mudstone or shale bedrock,''

See also Permit Application at section 3 of the GWMP. As shown on Figures 5A and 5B in the Permit Application, bedrock intervals are not included in the represented monitoring wells and little characterization appears to have penetrated the bedrock beyond the uppermost intervals.

But elsewhere the 2021 Semi-Annual GWMCA Report states that,

Vertical delineation wells targeted more permeable/fractured water-bearing zones within the Conasauga formation in the upper 50 feet of bedrock.

A further inconsistency appears on the geologic cross sections included in the 2021 Semi-Annual GWMCA Report (see Figures 4A, 4B, 9, and 10), which indicate the connection of the alluvial and bedrock zones to depths of over 100 feet into the mudstone bedrock. These cross sections and the associated boring logs, some of which were included in the Permit Application and some of which were included in the 2021 Semi-Annual GWMCA Report, confirm that this group of geologic layers and formations are hydraulically interconnected to depths of over 100 feet into the bedrock. The totality of this information forces the conclusions that the lower limits of the uppermost aquifer have not been determined and the uppermost aquifer and hydraulically connected underlying intervals extends at least 100 feet into the bedrock.

In other words, based on the available information, the uppermost aquifer consists of the alluvial aquifer nearest the ground surface and at least the uppermost 100 feet of the hydraulically connected bedrock beneath it. See, 40 CFR 257.53 (definition of uppermost aquifer). As such the materials presented in the Permit Application do not present a complete or accurate representation of the uppermost aquifer and hydraulically connected aquifer zones beneath it.

In addition, the top-of-bedrock surface has not been adequately resolved in all

[64] Southern Company Services. 2022 Semi-Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gadsden Ash Pond. Prepared for Alabama Power Company. January 31, 2022.

[65] Id.

[66] Id.

areas of the site because some boring logs lack reliable confirmatory data. According to the boring logs that were included in the Permit Application, there are multiple missing intervals of ''no recovery'' from numerous borings advanced into bedrock, which indicate a large potential for hydraulically significant zones that are currently insufficiently characterized. As a consequence, EPA is proposing to determine that the thickness, variability, nature, and hydrogeologic significance of the transitional zone of weathering in the uppermost part of bedrock has not been established, as required by § 257.91(b).

Furthermore, a hydraulic divide, generally located along the northeastern boundary of the unit, indicates the groundwater hydraulics are more complex than the current coarse monitoring network can adequately evaluate. Additional monitoring points are needed laterally (and vertically) in this area to provide the ''thorough characterization of groundwater flow rate [and] groundwater flow directions, including seasonal and temporal fluctuations in groundwater flow'' required to support the design of the groundwater monitoring system pursuant to § 257.91(b)(1). There are also insufficient data to allow for the determination of groundwater flow directions at the eastern limits of the Ash Pond. While GSD–AP–MW–12 is downgradient of GSD–AP–MW–1, there are no wells or piezometers that would serve as hydraulic control points to the east of the Ash Pond to fully characterize the groundwater flow directions at the eastern waste boundary. Furthermore, GSD–AP–MW–1 consistently has one of the highest groundwater elevations, and the possibility of eastward flow beyond the eastern boundary cannot be ruled out without additional data. Additional groundwater monitoring wells are needed to the northeast, east, and southeast of the easternmost boundary of the Ash Pond. In summary, EPA is proposing to determine that significant numbers of additional characterization borings and monitoring wells are needed to effectively characterize the alluvial aquifer nearest the ground surface and hydraulically connected zones within the weathered bedrock and upper portion of the bedrock intervals. See, 40 CFR 257.91(b).

ii. ADEM Issued a Final Permit With Background Wells That Do Not Meet the § 257.91(a)(1) Performance Standard

The Federal CCR regulations require that a groundwater monitoring system consist of a sufficient number of wells at appropriate locations and depths to yield samples from the uppermost aquifer that accurately represent the quality of the background groundwater that has not been affected by leakage from a CCR unit. 40 CFR 257.91(a)(1). The regulations also specify that background wells must normally be hydraulically upgradient of the CCR unit, unless specific showings have been made. See, Id. EPA is proposing to determine that the approved GWMP fails to document either that the background wells are upgradient of the CCR unit or that the wells meet the performance standards in § 257.91(a)(1)(i) or (ii). EPA is also proposing to determine that the background wells in the approved groundwater monitoring system do not ''accurately represent the quality of the background groundwater'' because of differences in the lithology between the background wells and the majority of the wells in the downgradient groundwater monitoring network, which is discussed in detail below.

At the time of permit issuance, the approved groundwater monitoring network installed at the unit consisted of three ''background'' monitoring wells (GSD–AP–MW–14, –16, and –17). According to the single groundwater flow map included in the Permit Application,[67] groundwater predominantly flows toward the main stem of the Coosa River from both the southern and northern sides of the river. The Coosa River acts as a hydraulic divide between the Ash Pond and the region to the south of the river where the background wells are located. Consequently, the Plant Gadsden background wells, which are all located on the southern side of the river, are hydraulically disconnected from the Ash Pond, rather than ''upgradient'' of the Ash Pond. In addition, they are in a different flow system and therefore cannot accurately represent the quality of the background groundwater at the Ash Pond.

The Federal regulations specify that wells that are not hydraulically upgradient of the CCR unit can only serve as background wells if one of two showings have been made: (1) that hydrogeologic conditions do not allow the owner or operator to determine whether wells are hydraulically upgradient; or (2) sampling at other wells will be as representative or more representative of background groundwater quality than that provided by the upgradient wells. 40 CFR 257.91(a)(1)(i), (ii).

EPA found nothing in the Permit Application or on the facility's CCR website to indicate that site conditions made it infeasible to determine whether background wells could be installed at locations that are hydraulically upgradient on the same side of the river. For example, while on-site access may be limited due to conditions near the Ash Pond, there is no discussion about other access points offsite to the north, northeast, or east of the unit that may provide adequate background samples. In addition, there are site-specific geologic conditions identified in the Permit Application that indicate that sampling at the current background wells will not ''accurately represent the quality background groundwater'' quality at the Ash Pond. 40 CFR 257.91(a)(1). For example, based on the boring logs presented in the Permit Application, background monitoring well GSD–AP–MW–17 is screened in limestone but nearly all of the bedrock groundwater monitoring wells surrounding the Ash Pond are screened in a different rock type (*i.e.,* mudstone). In addition, background monitoring well GSD–AP–MW–16 is screened in sand and gravel alluvial materials and based on a note included within the boring log, it is partially screened into approximately four feet of limestone bedrock, whereas numerous wells in the shallow downgradient compliance monitoring network surrounding the Ash Pond are screened just above or across the interface between mudstone and overlying overburden materials. Limestone and mudstone are different rock types and, based on the boring logs presented in the Permit Application, limestone substrates do not appear to have been penetrated by monitoring wells installed for the unit's downgradient compliance monitoring network on the northern side of the river.

Due to fundamental differences between limestone and mudstone mineralogy and chemical composition, it is not clear that ambient geochemical conditions in the limestone-hosted aquifer would be representative of an environment where mudstone predominates, and site-specific comparative analysis of both the geology and geochemistry for the two distinct geochemical environments and flow systems is necessary to determine whether the wells across the river are in fact sufficiently representative of conditions within the uppermost aquifer to serve as representative background wells. Although the Groundwater Monitoring Plan included a limited

[67] Alabama Power. Revised Closure Permit Application for the Plant Gadsden Ash Pond. April 30, 2020. Appendix 7, Plant Gadsden Ash Pond Groundwater Monitoring Plan, Figure 6.

narrative at Section 4.2.2, entitled ''Groundwater Geochemistry,'' the narrative did not address any known differences in geology, lithology, or mineralogy between the two aquifers that are located on opposite sides of the river. ADEM nevertheless approved the plan without requiring the facility to resolve these issues.

iii. The Gadsden Final Permit Allows Insufficient Locations and Depths of Downgradient Compliance Wells To Monitor the Uppermost Aquifer

As previously discussed, the Federal regulations specify that a groundwater monitoring system must ''consist[ ] of a sufficient number of wells, installed at appropriate locations and depths, that . . . accurately represent the quality of the groundwater passing the waste boundary of the CCR unit.'' 40 CFR 257.91(a)(2). The regulations further specify that ''[a]ll potential contaminant pathways must be monitored.'' Id. But as discussed in more detail below, EPA is proposing to determine that ADEM approved a GWMP with an insufficient number of wells laterally along the downgradient perimeter of the unit to monitor all potential contaminant pathways. EPA is also proposing to determine that monitoring wells in the approved plan were not installed at appropriate depths to ensure that all potential contaminant pathways were monitored. Finally, EPA is proposing to determine that the approved groundwater monitoring system fails to account for preferential pathways beneath the Ash Pond.

(1) Insufficient Lateral Spacing of Compliance Wells To Monitor All Potential Contaminant Pathways

At the time of permit issuance, the approved groundwater monitoring network installed at the unit consisted of only fifteen compliance monitoring wells (GSD–AP–MW–1 through GSD–AP–MW–12 and GSD–AP–PZ–1, GSD–AP–PZ–5 and GSD–AP–PZ–6), at an impoundment with a perimeter of approximately 7,500 feet.

Most of the groundwater monitoring wells that parallel the river for the Plant Gadsden Ash Pond unit are spaced approximately 400 to 900 feet apart, and lateral distribution of wells is somewhat uniform with downgradient monitoring wells surrounding the waste boundary at an average lateral spacing of 630 feet.[68] These large lateral well spacings are particularly problematic to the north, northwest, west, and to the southwest where groundwater discharges to the Coosa River. Given the propensity for groundwater to flow within the preferential pathways that exist at the site and the close proximity of the Coosa River to the unit, one would expect to see a detailed rationale explaining why these well locations at large lateral distances were sufficient to monitor all potential contaminant pathways. However, EPA's review of the approved GWMP did not identify any such explanation. Therefore, given the proximity to the Coosa River, the large well spacings make it likely that all potential contaminant pathways—such as the gravel and other coarse material in the alluvium and fractures, or the dissolution features at or below the weathered bedrock surface that may be causing groundwater to surface water discharges immediately adjacent to the Ash Pond—are not currently monitored.

(2) Insufficient Number of Downgradient Compliance Wells Installed at Appropriate Depths To Monitor the Entire Aquifer (Inadequate Vertical Spacing)

EPA is also proposing to determine that ADEM approved a GWMP that lacked ''a sufficient number of wells, installed at appropriate locations and depths'' to ensure that all potential contaminant pathways in the entire uppermost aquifer are monitored. As stated previously, the uppermost aquifer is a composite layered system consisting of unconsolidated deposits of alluvial origin on top of mudstone bedrock. The unconsolidated alluvial deposits consist of interlayered deposits of silt, sand, gravel, and clay material. These unconsolidated alluvial deposits overlay a variably fractured and weathered bedrock material, predominantly mudstones of the Conasauga formation. The contact between the uppermost portion of the (consolidated) bedrock and the overlying (unconsolidated) alluvium, which can also be described as the top-of-rock surface, is a distinct hydraulically relevant zone of interest, and many ''downgradient'' compliance monitoring wells in the approved network are screened across this interface, as is appropriate. However, although the lower limits of the hydraulically connected portions of the bedrock have not yet been established, as previously discussed, the available information supports the conclusion that this group of geologic layers and formations are hydraulically interconnected to depths of 100 feet or more into the bedrock. Consequently, EPA is proposing to determine that the entire group of geologic layers and formations should have been more comprehensively monitored. See, 40 CFR 257.53 (definition of uppermost aquifer).

The downgradient well network ADEM approved is focused on a narrow subset of the uppermost geologic layers associated with river deposition. These unconsolidated materials occur in terrace deposits at low elevations near the current Coosa River channel as well as at higher topographic levels. These alluvial deposits are reported to range from approximately 20 to 30 feet in thickness. Most of the downgradient compliance monitoring wells in the approved network are screened in these shallow materials, and most of the wells are screened only in the gravel.[69] Additional compliance wells are needed both at the upper and lower bounds of the uppermost aquifer system, including within alluvial deposits and hydraulically connected weathered bedrock and bedrock zones, to ensure all potential contaminant pathways will be monitored in all relevant flow zones.

A few wells are screened near the top of the Conasauga bedrock formation, and a few wells are cross screened across the interface between the alluvium (the gravel) and the underlying bedrock. As depicted on the cross-section in Figure 5A in the Permit Application, no wells appear to have been screened in either the sand or silt layers that are situated above the gravel; and a single well on the cross-section in Figure 5B in the Permit Application appears to be partially screened in the silt. But additional compliance wells should have been installed in those upper zones given that the sand and silt layers are saturated with groundwater. Even when the gravel layers were not present, the well screens were set at the bottom of the alluvium or at the top of bedrock, and not in the silts. Wells in each of the saturated units are needed in order to monitor all potential contaminant pathways.

In addition, as previously discussed, key interfaces, such as the interface between alluvium and weathered bedrock have apparently not been fully characterized; as this portion of the bedrock system is hydraulically connected to the overlying alluvium, additional compliance wells are needed in the upper part of the bedrock in most areas of the Ash Pond unit to ensure that all potential contaminant pathways are monitored. Additional wells also

[68] Southern Company Services 2022 Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. February 1, 2023.

[69] The Plant Gadsden Permit Application at page 111 includes a statement that ''[m]onitoring wells target the uppermost aquifer with wells screened in coarse fractions of the alluvial materials or more weathered, fractured upper bedrock beneath the Site.''

need to be installed in deeper intervals of the underlying Conasauga mudstones which are hydraulically connected the uppermost zone of weathered bedrock. The relevant zone of interest in the upper part of the Conasauga group is at least 100 feet in thickness, as discussed previously, but the true thickness of the uppermost aquifer has not been determined. As such additional monitoring wells may need to be screened more deeply to ensure all potential contaminant pathways are monitored.

(3) Preferential Pathways Are Not Monitored

Preferential pathways have been documented in the uppermost aquifer under the Ash Pond. Yet under the approved GWMP, these significant potential contaminant pathways do not appear to be adequately monitored, despite the express requirement in § 257.91(a)(2).

Based on the boring logs and cross-sections in the Permit Application and the 2021 Semi-Annual GWMCA Report, several types of preferential pathways are present at the site. These include, among others, continuous lenses or channel-like bodies of coarse sand and gravel in overburden, low-lying areas along the overburden/bedrock interface, laterally continuous zones of weathered bedrock in the uppermost part of the bedrock section, and zones of fracturing and/or weathering and/or dissolution within deeper levels of the bedrock. The current monitoring network only incompletely monitors some of these.

While some monitoring wells are installed in sand and gravel bodies in the alluvium, it appears that the monitoring network does not target all such zones that may be serving as preferential pathways. As just one example, consider the southwestern unit boundary that borders the Coosa River; as indicated on Figures 5B and 6 of the approved GWMP, while the wells installed along this boundary (GSD–AP–MW–8 thru GSD–AP–MW–12) are screened along a zone where groundwater flow is likely occurring along preferential pathways, they are spaced over 500 feet apart. Considering the unique geologic conditions at the site that could result in the presence of more localized preferential pathways, it is not known whether the gravel materials screened by GSD–AP–MW–11 are present elsewhere along this boundary. In short, there could be sand and gravel alluvial zones or highly fractured zones in bedrock near the bedrock/alluvium interface that have not been identified and are unmonitored. EPA is proposing to determine that additional borings (and possibly monitoring wells) should have been installed along this boundary, and it appears that this level of detailed investigation to identify preferential pathways was not performed elsewhere along the unit.

It is clear that preferential pathways in the bedrock exist based on the characterization and monitoring Alabama Power conducted as part of the continuing corrective action at the site. However, there is little to no discussion in the Permit Application regarding how these pathways were identified and how the lateral/vertical dimensions of the pathways were delineated to ensure that compliance wells were installed correctly to monitor these pathways. As illustrated on Figures 9 and 10 of the 2021 Semi-Annual GWMCA Report, assessment monitoring has identified plumes emanating from the unit to the northeast in overburden and bedrock. After installing additional monitoring wells to delineate the contaminant plume, Alabama Power identified that contamination was present deeper in the Conasauga bedrock formation than any of the compliance wells previously installed as part of the groundwater monitoring system. For example, Figures 5 and 10 of the 2021 Semi-Annual GWMCA Report indicate that pathway in bedrock has influenced migration of a lithium plume beyond the unit boundary at least hundreds of feet to the northeast to depths of at least 130 feet into the bedrock. It is reasonable to expect that similar pathways may exist also along the same regional northeast to southwest geologic strike to the southwest of the unit, exploiting these same inherent zones of fracturing in the bedrock, yet the southwestern waste boundary, along the Coosa River, generally lacks any monitoring points in deeper bedrock.

In summary, after reviewing the GWMP and all the materials in the permit record, EPA is proposing to determine that the monitoring network that ADEM approved is not likely to detect all groundwater contamination in the uppermost aquifer and is therefore less protective than the Federal regulations.

c. Plant Gadsden Corrective Action Issues

In January 2020, the first SSLs above groundwater protection standards were reported for arsenic and lithium. An ACM was prepared in July 2020. On December 18, 2020, ADEM issued the Final Permit to Alabama Power for Gadsden Ash Pond. EPA is proposing to determine that the Final Permit issued to the Gadsden Ash Pond, as with the other permits discussed in this notice, fails to require Alabama Power to achieve compliance with the Federal corrective action requirements.

The Gadsden Final Permit states that the Permittee is required ''. . . to manage CCR in accordance with the conditions of the permit, ADEM Admin. Code r. 335- 13- 15, 'Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments,' and the approved permit application.'' [70] The permit also contains the same recitation of the corrective action regulations as the Colbert Final Permit did.

Corrective Action

1. Assessment of Corrective Measures. The Permittee must initiate an assessment of corrective measures as specified in 335–13–15–. 06(7) if any constituent listed in Appendix IV of 335- 13- 15 has been detected at a statistically significant level exceeding the groundwater protection standard, or immediately upon detection of a release from the CCR unit.

a. The permittee must continue to monitor groundwater in accordance with the assessment monitoring program while assessing corrective measures.

2. Selection of Remedy. Based on the results of the corrective measures assessment, the Permittee must select a remedy as specified in 335–13–15–. 06(8).

3. Implementation of the Corrective Action Program. Within 90 days of selecting a remedy, the Permittee must initiate remedial activities as specified in 335–13–15–. 06(9), and shall be required to modify the permit in accordance with Section II. E. 9.

In the RTC for the Gadsden Final Permit, ADEM states that, ''The ACM is currently under review. Once the final review is complete, the Department will provide comments to Alabama Power related to the submitted ACM and proposed final remedy.'' The preferred remedy in the ACM was MNA with adaptive site management and ''remediation system enhancement.'' [71] Any comments provided by ADEM to

[70] Alabama Department of Environmental Management. Initial Permit and Variance, Gadsden Steam Plant, Permit No. 28–09. December 18, 2020. PDF p. 2.

[71] It is not clear what is meant by ''remediation system enhancement'' with respect to MNA, because MNA relies upon naturally occurring processes for remediation. The only systems installed are for performance monitoring. Any ''enhancement'' would require action on the part of Alabama Power to remediate the releases and would be, by definition, a different remedy.

Alabama Power on the 2020 ACM were not available for review.

As with Colbert, incorporating the regulations verbatim in the permit does not require Gadsden to achieve compliance with those requirements. This is because ADEM did not take into account relevant facts about the status of corrective action at Gadsden, such as whether the 2020 ACM, which was completed more than 2 years prior to issuance of the permit, complied with the regulatory requirements. Most importantly, ADEM did not adjudicate what actions are still necessary in light of those facts to achieve compliance with the regulations and include those actions as requirements in the Final Permit.

Whether the 2020 ACM meets the requirements of the regulations and what actions Alabama Power must take to remediate groundwater in compliance with § 257.97 are precisely the types of adjudication required in a permit. What the permittee is required to do in order to achieve compliance with the regulations must be determined prior to final permit issuance, because the permit must contain these requirements. This is the role of a permitting authority (*i.e.,* ADEM). Delaying this decision effectively allows Alabama Power to continue operating out of compliance with the regulations, while operating in compliance with the permit. In this case, that means Alabama Power can continue to pursue a remedy that does not appear to meet the requirements of § 257.97, and consequently, delay or avoid the cleanup. This results in a permit program that is less protective than the Federal regulations.

In sum, EPA is proposing to determine that, by failing to determine the adequacy of the revised ACM or the permittee's proposed remedy, the permit in essence authorizes Alabama Power to continue to pursue a remedy that does not appear to meet the requirements in § 257.97(b) and is based on the results of a deficient ACM. Accordingly, EPA is proposing to determine that this permit does not require compliance with the Federal requirements and, because it allows the facility to continue to delay initiating corrective action that would address the continuing groundwater contamination, the State requirement is less protective than the Federal regulations.

i. Gadsden Final Permit Does Not Require an ACM That Includes an Assessment of Source Control Measures in Accordance With 40 CFR 257.96

40 CFR 257.97(b)(3) requires that all remedies control the source of releases in order to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment. The ACM for Gadsden contains no assessment of control measures to achieve this requirement (*i.e.,* source control). Instead, section 2.5 describes the closure of the unit, which has already occurred, and states, ''Site closure appears to have already been effective in controlling the source and reducing infiltration into the underlying aquifer.'' However, the ACM must include more than one source control measure and must actually analyze how effectively each of the potential measures would meet the criteria in § 257.96(c). See, 40 CFR 257.96(a), (c). Here, as was the case with Plant Colbert, there is no assessment of the one source control measure identified in the ACM—the closure of the Ash Pond, which left a significant amount of CCR in contact with groundwater—and how effectively it would achieve the criteria in § 257.96(c) compared to other source control alternatives, such as clean closure or the imposition of engineering measures to control or eliminate the groundwater that continues to flow in and out of the impoundment. Yet the permit issued by ADEM does not require any actions to remedy these readily apparent deficiencies.

ADEM's failure to require Alabama Power to submit an ACM that actually evaluates whether the closure of the Ash Pond meets the source control requirements in § 257.97(b)(3) also undercuts their claim that they will use the corrective action process to address any remaining concerns with respect to the closure of the Ash Pond. As discussed above, closure construction activities for the Ash Pond were certified as completed in October 2018, and a certification of the completion of closure activities was submitted in April 2020. As discussed above, in the two years between the time closure was completed and the permit was issued in December 2020, groundwater elevations were measured between 2 and 7 feet above the average base elevation of the closed unit. Yet ADEM issued the permit without evaluating the ACM. Nor did the State take any further action when they approved the closure of the Ash Pond in 2022.

ii. The Gadsden Permit Does Not Require Alabama Power To Collect Site Data Needed To Characterize Site Conditions That May Affect a Remedy To Support Assessments in the ACM

As discussed above, § 257.95(g)(1) requires a facility to characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96. The 2020 ACM delineates releases but does not characterize any site conditions that would affect its preferred remedy of in-situ immobilization through treatment or MNA (*e.g.,* testing for the presence of released constituents in soils to demonstrate they are being removed from the groundwater and immobilized on-site). As discussed in subsequent sections, these data are necessary to accurately assess any of the remedies identified in the ACM, particularly MNA. The Final Permit issued by ADEM does not require collection of these data or any revisions to the ACM to remedy this deficiency.

iii. The Assessment of In-situ Geochemical Treatment and MNA in the ACMs Is More Favorable Than Can Be Supported by the Available Data

The 2020 ACM for Gadsden identified in-situ geochemical treatment and MNA as corrective measures to address groundwater contamination, in addition to hydraulic control and treatment. As discussed previously, MNA relies on natural processes to treat releases; in-situ geochemical treatment adds chemicals to the subsurface to create conditions for this immobilization to occur. For arsenic and lithium, in-situ geochemical treatment and MNA can reduce mobility through sorption to soils, but they do not remove the contaminants from the environment. Therefore, MNA and geochemical in-situ treatment generally would not perform well with respect to the requirement in § 257.97(b)(4) that remedies ''remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible,'' since the constituents remain in the subsurface soils, albeit immobilized.

In order for immobilization through MNA or in-situ treatment to be assessed favorably with respect to reliability, the chemical reactions and processes involved in this immobilization must be demonstrated to be irreversible. Immobilization that is not permanent could be reversed, causing contaminants to be released back into groundwater, where they can migrate off-site. Immobilization that is not permanent would also require ongoing monitoring in accordance with § 257.98(a)(1) as long as immobilized constituents remain in the subsurface. Determining the viability and demonstrating the irreversibility of immobilization

mechanisms is necessary to assess the performance, reliability, ease of implementation, and the time required to begin and complete the remedy. 40 CFR 257.96(c)(1) and (2). These assessments would need to be supported with site-specific characterization data and analysis. This information would ultimately be necessary to show that MNA and geochemical in-situ treatment meet all the requirements of § 257.97(b), but the permit record does not include such information.

(1) The 2020 ACM Does Not Include Data That Characterize Site Conditions or Identify Any Attenuation Mechanisms Occurring at the Ash Pond

The 2020 ACM assessed the performance of MNA favorably without any supporting data to characterize site conditions that may ultimately affect a remedy, as required by § 257.95(g)(1). For example, site-specific groundwater data (*e.g.,* pH or oxidation potential, speciated concentrations of constituents of concern) were not considered in the assessment narrative, and analytical results of soil samples to identify the presence of immobilized constituents in the subsurface were not provided. The site data that were collected focus only on contaminant concentrations and trend analyses regarding the presence of contaminants. The ACM also does not discuss how attenuation may be naturally occurring through any particular MNA mechanisms (*e.g.,* adsorption, precipitation, dispersion). EPA was not able to find any indication in the permit or supporting documentation to confirm that the Permittee has identified the mechanisms by which MNA would occur at the site for both arsenic and lithium. Nor is there any condition in the permit requiring the development and submission of such information.

(2) MNA Is Not a Viable Remedy Without Source Control

As discussed previously for Plant Colbert, MNA is not viable without source control, because the total amount of contaminants in the groundwater will continue to increase as the releases from the unit continue and potential releases of new constituents will occur. Therefore, it is impossible to determine whether the aquifer has sufficient chemical and physical materials required to complete any identified immobilization reactions because the total amount of the release is not yet known.

Source control has not been achieved here, as releases from the Ash Pond are ongoing. The closure of the Ash Pond with waste remaining in place in the aquifer has resulted in a continual source of groundwater contamination from the unit. Therefore, MNA is not a viable remedy for the Ash Pond and should not be included in the 2020 ACM unless the ACM is revised to include an alternative that achieves source control.

(3) Plant Gadsden's Permit Does Not Require an ACM That Accurately Assesses Groundwater Remediation Alternatives According to the Criteria in 40 CFR 257.96(c)

The 2020 ACM also fails to meet the requirements at § 257.96(c)(3) to consider safety impacts, cross-media impacts, and control of exposure to any residual contamination in its assessment of MNA. Neither the narrative nor Table 5 in the 2020 ACM consider these impacts for MNA. Table 5 in the 2020 ACM, in the column labeled ''potential impacts of remedy'' assesses the potential impacts from MNA as ''none.'' This conclusion is not only unsupported by data or analysis but is also inconsistent with other information in the ACM. The Ash Pond is next to a river and groundwater flow is depicted toward the river in Figure 3 in the 2020 ACM. Because no site data were collected that would demonstrate immobilization of constituents is occurring, the only MNA that is known to occur is dilution and dispersion (*i.e.,* the normal transport associated with groundwater releases). This means that contaminants are migrating out of the Ash Pond in groundwater toward the river. Migration of contamination from groundwater to surface water is a cross-media impact. Thus, the assessment of potential impacts from the remedy for MNA in Table 5, which includes these cross-media impacts, should be ''high.''

The lack of data to support the assessments in the ACMs means they may not accurately reflect MNA's ''effectiveness in meeting all of the requirements and objectives'' in § 257.97(b). Conclusions without a supporting assessment or data do not constitute ''an *analysis* of the effectiveness of potential control measures.'' 40 CFR 257.96(c) (emphasis added). Inaccurate assessments in an ACM can ultimately result in selection of a remedy that will not meet the requirements of § 257.97(b). Yet the Final Permit issued by ADEM does not require any actions to remedy this deficiency.

3. Plant Gorgas

EPA reviewed the Initial Permit and Variance (Final Permit) for the Alabama Power Company, William C. Gorgas Electric Generating Plant (Plant Gorgas), issued by ADEM under Permit No. 64–12 on February 28, 2022.[72] Plant Gorgas is located near Parrish, Alabama. The units covered by the Final Permit include the Plant Gorgas Ash Pond, Plant Gorgas Gypsum Pond, Plant Gorgas Bottom Ash Landfill, and Plant Gorgas CCR and Gypsum Landfill. The Plant Gorgas CCR and Gypsum Landfill is still in operation while the other three CCR units are in the process of closing or closed. For this proposal, of the CCR units at Plant Gorgas, EPA only evaluated the Final Permit for the Plant Gorgas Ash Pond (Ash Pond) because it is directly comparable to the other State CCR permits evaluated in this proposal, and because, based on the characteristics of the unit and the surrounding hydrogeology, it has the greatest potential for significant environmental and human health effects if mismanaged.

The Plant Gorgas Ash Pond is a ''CCR surface impoundment located in Sections 20, 21, 28 and 29, Township 16 South, Range 6 West in Walker County, Alabama . . . with a disposal area that consists of approximately 423.32 acres.'' Final Permit at pg. 2. The Ash Pond is located southeast of Plant Gorgas on the opposite side of the Mulberry Fork of the Black Warrior River. The Permit Application describes that the Ash Pond was originally formed by a cross-valley dam in 1953, with the original dam located on the northern boundary of the impoundment adjacent to Mulberry Fork.[73] The original dam was raised to increase the capacity of the impoundment in the mid-1970's, and then raised once again in 2007. Id. at Appendix 4. When the Ash Pond was in operation, the impoundment covered an approximate area of 420 acres containing 25 million CY of waste.

EPA has identified issues with closure, groundwater monitoring networks, and corrective action at Plant Gorgas, and we discuss those issues below.

a. Plant Gorgas Closure Issues

As noted, the closure at Plant Gorgas is not yet complete. To evaluate the closures at Plants Colbert and Gadsden, EPA reviewed the measured post-closure groundwater elevations to determine whether the § 257.102(d) performance standards were met. But since the closure of the Gorgas Ash

[72] Alabama Department of Environmental Management. Initial Permit and Variance William C. Gorgas Electric Generating Plant Permit Number 64–12. February 28, 2022.

[73] Alabama Power Company. Revised Closure Permit Application for the Plant Gorgas Ash Pond. April 30, 2020.

Pond is not yet complete, that same information (''measured post-closure groundwater elevations'') is not available. As discussed below, however, it is clear that CCR in the Ash Pond is currently saturated by groundwater. Despite the saturated CCR currently in the unit, it may be possible for the Ash Pond to close with waste in place if engineering measures are implemented to meet the performance standards in § 257.102(d). Although some engineering measures are described in the Closure Plan, EPA was unable to locate the information in the permit record to support a definitive conclusion that the proposed closure will meet the performance standards in § 257.102(d). For example, EPA was unable to locate any evaluation of the expected impact of the proposed engineering measures on groundwater elevations conducted by either the permittee or ADEM. EPA's inability to reliably estimate post-closure conditions is a consequence of the complexity of the site, the absence of critical information in the Closure Plan, and the inadequacy of the groundwater monitoring system at the site (which is discussed in the next section). Nevertheless, as described below, based on the available information there are several reasons to determine that it is unlikely that the proposed closure of the Ash Pond will meet the performance standards in § 257.102(d). EPA is therefore proposing to determine that the approved Closure Plan fails to demonstrate that the closure will meet the performance standards in § 257.102(d), as required by § 257.102(b)(1)(i). Based on ADEM's failure to require the permittee to provide this information, or to otherwise resolve the issues presented below before approving the Closure Plan, EPA is proposing to determine that the Final Permit fails to require the Gorgas Ash Pond to achieve compliance with either § 257.102(d), or with an equally protective State alternative. See 42 U.S.C. 6945(d)(1)(B).

i. CCR in the Ash Pond Is Currently Saturated by Groundwater and Is Likely To Remain so Once Closure Is Complete

Given the complexity of the site and the absence of detailed information in the Permit Application, EPA lacks the data to reliably estimate the amount of CCR that will remain saturated after closure activities are complete. These deficiencies are significant enough that ADEM's approval of a Closure Plan with these deficiencies, and in the absence of any evaluation, leads to the conclusion that the State CCR permit program does not meet the standard in 42 U.S.C. 6945(d)(1). However, based on the available information in the Permit Application, there are many reasons to determine that the proposed closure of the Ash Pond will not meet the performance standards in § 257.102(d). Based on the limited data available, EPA estimates that groundwater will continue to saturate a substantial amount of CCR, even after the activities described in the approved Closure Plan have been completed. As described below, available groundwater measurements recorded between 2021 and 2022 show that groundwater levels at the Ash Pond continue to be present above the base of the unlined impoundment, saturating substantial amounts of CCR in the closing unit. Moreover, comparison of groundwater elevation data from 2021 and 2022 to elevation data in the same wells for prior years does not yet indicate any statistically significant or sustained declines, further supporting EPA's conclusions about future persistence of saturated CCR waste.

As shown on the center line cross section B–B' on construction drawing G–204 in the Permit Application, the base of the Ash Pond varies substantially. In view of this information, EPA conducted an analysis using existing monitoring wells near the waste boundary and south of the planned closure buttress. Few monitoring wells are located directly adjacent to the CCR; most are located hundreds of feet away from the waste boundary, with many at distances of over 1,000 feet away. Faced with these significant limitations, EPA based estimates of saturated waste presence and thickness on the limited available pairs of wells which are in close proximity to the waste material and are located on opposite sides of the main waste body or larger fingers of CCR waste. Using this approach allowed for limited direct comparison of recent water levels data collected in 2021 and 2022 to the top and bottom elevations of the CCR in that area of the unit. EPA considered transects between the following well pair or pairs of clustered wells:

- [GS–AP–MW–16S/GS–AP–MW–16D/GS–AP–PZ–16] to [GP–AP–MW–19]
- [GS–AP–MW–21/GS–AP–MW–21V] to [GS–AP–MW–1/GS–AP–MW–1R/GS–AP–MW–46]
- [GS–AP–MW–12/GS–AP–MW–12V] to [GS–AP–MW–1/GS–AP–MW–1R/GS–AP–MW–46]

Lastly, it is also important to note that EPA's assessment of water levels in this action focused primarily on those monitoring wells which were screened nearest the CCR in the unit at those specific locations. These included wells screened in a variety of different levels within the uppermost aquifer system. It must be recognized that this exercise suffered from the limitations of the well network as screened interval elevations varied somewhat from transect to transect. Regardless of these complexities, water levels in most screened intervals were consistently above the base of the impoundment.

This assessment suggests the sustained presence of significant thickness of saturated waste in all of the areas EPA investigated. For the [GS–AP–MW–16S/GS–AP–MW–16D/GS–AP–PZ–16] to [GP–AP–MW–19] transect near the southern end of the Ash Pond, reported groundwater elevation measurements from monitoring wells GS–AP–MW–16S and GS–AP–MW–19 range from roughly 381 to 407 ft above MSL. In this area near the center of the unit, the bottom of the CCR unit is located at approximately 335 feet above MSL and the top of the waste at closure is planned to be roughly 450 feet above MSL. Based on these data EPA estimates that at the deepest point of this transect a layer of CCR between 46 and 72 ft in thickness is saturated. As stated above, EPA's estimates were complicated by Alabama Power's failure to install many of the monitoring wells at the waste boundary which is inconsistent with the requirement in § 257.91(a)(2)). In this case, EPA used data from GS–AP–MW–16S and GS–AP–MW–19 because, based on the materials in the Permit Application, they are a well pair that are located along opposite sides of the unit from each other, or in other words, the two wells span across a large portion of the unit. Nevertheless, the lateral distance between GS–AP–MW–16S and GS–AP–MW–19 is still roughly 2,000 feet, and the bottom unit elevation is highly variable over that distance given the incised valley setting in which the unit sits.

EPA also evaluated the most recent groundwater elevation data from the Plant Gorgas 2022 Annual Groundwater Monitoring and Corrective Action Report to determine if any recent closure activity at the site has influenced groundwater elevations.[74] Regarding the impact of closure activity on groundwater elevations, the report itself is contradictory. On page 20, the report indicates that no significant changes in groundwater elevations or flow have been noted at the site as ash

[74] Southern Company Services 2022 Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. January 31, 2023.

pond dewatering activities have not been initiated. However, on pages 21 and 22, the report states that dewatering operations began in 2022 and may be contributing to the groundwater elevations observed. Further, on page 56 of the report, there is an acknowledgment that ''[t]he lack of obvious or significant trends [or changes in groundwater quality] is likely in part due to (1) dewatering operations not starting until the first week of July 2022, (2) the low permeability nature of the subsurface flow systems, and (3) the number of wells that have been recently installed or replaced (too few data points for trend analyses).'' In any event, EPA's evaluation indicated that groundwater elevation data collected in July 2022 is mostly comparable to historical data, suggesting little influence thus far from dewatering efforts. For example, most decreases in groundwater elevations were observed to be less than a few feet. Some larger decreases (greater than 10 feet) were observed at the southern portion of the Ash Pond, but the report indicated that these decreases may be the result of resumed mining activity south or southwest of the Ash Pond, rather than closure activity related to the Ash Pond. Therefore, while some uncertainty remains as to just how much CCR is currently saturated, the available site data indicates that considerable areas, thicknesses, and volumes of saturated CCR remain in the impoundment.

Similarly, along the [GS–AP–MW–21/GS–AP–MW–21V] to [GS–AP–MW–1/GS–AP–MW–1R/GS–AP–MW–46] transect through Finger 1 of the Ash Pond, water levels reported in 2021 and 2022 for GS–AP–MW–21 and GS–AP–MW–46 ranged from 335 to 367 feet above MSL. The elevation of the bottom of the CCR is roughly 322 feet above MSL and the top of the CCR unit is planned to be approximately 428 feet above MSL in that part of the unit. Based on these data EPA estimates that at the deepest point of this transect a layer of CCR between 13 and 45 ft in thickness is saturated.

EPA also considered groundwater and waste elevations along the [GS–AP–MW–12/GS–AP–MW–12V] to [GS–AP–MW–1/GS–AP–MW–1R/GS–AP–MW–46] transect near the center main valley of the Ash Pond and extending eastward along the northern side of Finger 1. Water levels from 2021 and 2022 from GS–AP–MW–12 and GS–AP–MW–46 ranged from 360 to 380 feet above MSL. Given that the bottom of and top of the CCR are approximately 270 feet and 390 ft above MSL respectively in the center of the impoundment, EPA estimates that between 90 to 110 feet of saturated waste are present. Similarly, for Finger 1 of the unit, EPA estimates that between 35 and 55 feet of saturated waste are present, based on bottom and top of the CCR being at 325 feet and 430 ft above MSL, respectively. Based on these limited available data, significant thicknesses of saturated CCR are present in these areas.

Lastly, EPA evaluated groundwater elevations along a north to south transect, south of the planned closure buttress, along the west side of the main valley containing CCR. From north to south, this included monitoring wells, GS–AP–MW–12, –13, –14, –47, –15, –16, and –18. This transect is approximately 6,150 feet in length, or over a mile. Over this distance the available monitoring wells were located from approximately 25 to 1,100 feet away from the edge of the CCR waste and from 50 to 1,500 feet from the central part of the valley filled with CCR. EPA used engineering drawings available in the Permit Application to estimate CCR top and bottom elevations adjacent to each groundwater monitoring point (*e.g.,* construction drawings G–204, C–200 to C–205). CCR thickness values varied from 65 to 149 feet along the transect. In some locations more than one estimate was made due to the complexity of the subsurface. EPA then subtracted the CCR waste bottom elevation from the most recent water levels for each location (primarily July 18, 2022), to determine the thickness of saturated CCR, which varied from zero (no saturated waste) to approximately 115 feet of saturated CCR. This analysis supported the overall conclusion that saturated CCR is present in all of these locations and is therefore likely present at all locations south of the planned closure buttress. Even at those locations where pinpoint estimates of waste bottom elevations exceeded the groundwater elevation values, there were also immediately adjacent measurements indicating lower elevations of CCR that were below groundwater elevation values. For example, in the GS–AP–MW–15 area, estimates of waste bottom elevations varied by over 52 feet: at the lower end of the range in Finger 6, EPA estimates there are 13 feet of saturated CCR, compared with over 65 feet of saturated waste in the adjacent main valley of the unit (*i.e.,* station 70+00 on section B–B' on construction drawing G–204). The only area arguably without any saturated CCR is the extreme southern tip of the unit; on July 18, 2022, groundwater elevation values at GS–AP–MW–18 indicate that the waste is above the water table. However, groundwater elevation values measured at the closely adjacent well, GS–AP–MW–18R, which is also screened in the Pratt strata, but more shallowly at elevations comparable to the waste, on the same day, indicate approximately 63 feet of saturated waste.

According to the Closure Plan, it appears that dewatering may have commenced relatively recently in 2022, so the measured groundwater elevations described above from 2022 may not reflect early stage decreases in hydraulic head within the unit from any initial dewatering efforts. But as discussed below, the Closure Plan contains neither meaningful details nor supporting analysis to demonstrate that the saturated CCR in the consolidated southern portion of the unit will ever be dewatered sufficiently to meet the performance standards in § 257.102(d)(2). Moreover, as discussed below, in the absence of any engineering measures that would effectively prevent the continued migration of groundwater into the closed unit, there is no information in the Permit Application that suggests any meaningful decline is likely in the groundwater elevations proximal to and within the CCR unit. Significant thickness of saturated waste is therefore expected to persist in the areas south of the closure buttress where CCR is still present at elevations at or above the basal excavation level for the consolidation effort (*i.e.,* > 270 ft above MSL).

(1) In Order To Close the Ash Pond With Waste in Place Effective Engineering Measures Must Be Implemented

The fact that prior to closure the base of the Ash Pond intersects with groundwater does not mean that the unit may not ultimately be able to meet the performance standards in § 257.102(d) for closure with waste in place. Depending on the site conditions a facility may be able to meet these performance standards by demonstrating that a combination of engineering measures and site-specific circumstances will ensure that, after closure of the unit has been completed, the groundwater is no longer in contact with the waste in the closed unit. In this case EPA is proposing to determine that the approved Closure Plan fails to demonstrate that either performance standard in § 257.102(d) will be met. In addition, neither the approved Closure Plan nor the Permit requires any engineering measures, such as the slurry wall proposed for Plant Greene, described in Unit IV.C.4 of this preamble, or a groundwater extraction system (*e.g.,* pumping wells) to control

or prevent the continued infiltration of liquids (groundwater) into the CCR from the sides and beneath. Nor does the approved Closure Plan or the Permit require any engineering measure that will effectively control releases of leachate to the groundwater. Based on these facts, and as discussed in more detail below, EPA is proposing to determine that the approved Closure Plan fails to demonstrate that the closure at Plant Gorgas will meet the Federal performance standards in § 257.102(d) or an equally protective alternative State standard.

ii. Consistency With 40 CFR 257.102(d)(2)

As discussed previously, the Federal CCR regulations applicable to surface impoundments closing with waste in place require that ''[f]ree liquids must be eliminated by removing liquid wastes or solidifying the remaining waste and waste residues, [and] remaining wastes must be stabilized sufficient to support final cover system.'' 40 CFR 257.102(d)(2). But due to the lack of meaningful details and supporting analysis in the Closure Plan, EPA is proposing to determine that the Closure Plan approved by ADEM does not demonstrate that the proposed closure at Plant Gorgas will meet either standard.

According to the approved Closure Plan, various dewatering techniques will be employed before and during closure; however, the Closure Plan appears to largely limit the use of these techniques to the CCR in the northern portion of the unit that will be excavated and transported to the consolidated area, and to the areas under the new Closure Buttress.[75] For example, in the sections specifically discussing dewatering, the Closure Plan states:

> 4.3 Procedures During Closure
> 4.3.1 Dewatering
> This conceptual dewatering plan was developed to provide a summary of the removal of free water, interstitial water, contact water, and surface water as defined below.
> - Free water—water contained in the CCR unit above the surface of CCR material
> - Interstitial water—water within the pore space of CCR material
> - Contact water—surface or ground water that comes in contact with CCR material
> - Surface water—non-contact surface water at the site that requires management
>
> . . .
>
> The free water *in the northern portion of the pond* will be decanted by pumping to a water treatment facility prior to discharge off-site. The management of the free water levels in the pond are important for site water management controls including coordination with the proposed dredging and other construction processes. *Interstitial water levels will be monitored in critical areas to allow for safe excavation and working on ash as needed to facilitate construction activities.* The main pond free water management pumps will deliver water to the water treatment plant for treatment and discharge up to a treatment rate of 12,000 gpm. The pumping system will be equipped with a floating intake, including a sediment curtain around the intake.
>
> Removal of contact water will be completed within the limits of the Ash Pond using both in-situ (*in place prior to excavation/handling*) and ex-situ (*after initial handling/excavation*) techniques. Dewatering of ash during closure activities includes removing water using a variety of methods, including but not limited to passive, gravity-based methods (*e.g.* trench drains, rim ditching, wick points) and/or active dewatering methods (*e.g.* use of the ash thickening plant, and in-situ pumps or well points) as *needed to allow for CCR removal and transportation.* Ex-situ dewatering techniques consist of but are not limited to the following: gravity dewatering (settling basins and/or lateral trenching), racking and windrowing, mechanical thickening, and absorbent desiccation.

EPA expects that Alabama Power intends to dewater the entire unit to some extent, if only to ensure that the consolidated unit can support the weight of the earthmoving equipment needed to grade the surface and to install the cover system. But EPA was unable to find any discussion of the methods that will be used to dewater the significant volumes of saturated CCR in the southern portion of the impoundment in sufficient detail to evaluate whether the free liquids (and not simply the ''free water'' defined above) will be eliminated as required by § 257.102(d)(2)(i). For example, on page three, the Closure Plan states only that ''During closure, the ash pond will be progressively dewatered as required to facilitate closure.'' And on page 5, the Plan states

> Initial stages of construction and dewatering will include lowering of the pond levels through pumping and treatment at the onsite water treatment facility to optimize dredge performance. Once the desired initial free water depth is achieved in the pond, further dewatering will occur incrementally in response to storm events in order to maintain the free water at a relatively constant depth that will lower as ash removal from the designated areas progresses.

Moreover, the narrative in the Closure Plan does not explain how the liquids within the consolidated southern portion of the unit will be eliminated in light of the groundwater that, as described above, is expected to continue to saturate the remaining CCR. None of the proposed engineering measures mentioned in the Closure Plan are discussed in sufficient detail to support a determination that the proposed measures could effectively remove these liquids. For example, the approved plan mentions that a leachate collection system will be installed at the downgradient limit of the Closure Buttress but fails to explain which liquids the proposed drain system will capture and how well or extensively it will do so.

However, based on the limited information available, the leachate collection system that ADEM has approved appears to likely have only a minimal impact on the level of liquids in the closed unit, as it is designed to capture only a limited amount of leachate. According to the construction drawings submitted with the Permit Application, it appears the drain will only extend approximately 1,200 feet laterally beneath a portion of the 274-acre impoundment and appears to rely exclusively on gravity to direct any residual pore water or other free liquids to the drains. In essence, the leachate collection system appears to be designed to only collect leachate along its 1,200 foot design length, and to only address residual leachate produced from limited pore water within the CCR, which was perhaps expected to drain over a shorter limited time frame, during the so-called ''dewatering phase.'' But since not all groundwater leaving the unit will flow to the drain system, any collection of free liquids from saturated CCR farther south in the unit or along the eastern fingers would be purely coincidental, even without considering the likely ongoing inputs of ''new'' groundwater (''contact water'') into the system south of the Buttress.[76]

In addition, to be effective the leachate treatment system would need to address not only leachate generated from short-term ''dewatering'' activities, but also the significantly greater long-term volumes of leachate emanating from the continuously saturated CCR resulting from ongoing groundwater inputs into the unit from the sides and bottom. More critically, the system was not designed to handle the volumes of ''new'' leachate that will continue to be generated from the continued groundwater flow into the unit. The Closure Plan therefore appears to have grossly underestimated the amount of

[75] Alabama Power Company. Revised Closure Permit Application for the Plant Gorgas Ash Pond. April 30, 2020. Revised Closure Plan for the Plant Gorgas Ash Pond. Appendix 11, pp 7–8 (Emphasis added).

[76] ADEM confirmed these details during conversations with EPA in July 2022.

free liquids that will continue to flow through the saturated waste to the face drain and associated leachate collection system.

To illustrate this concern, EPA performed a rough estimate of potential recharge to the groundwater system within the 1,300-acre watershed area which contains the unit. After subtracting the 274 acres representing the closed, capped and consolidated unit, and assuming all precipitation directly contacting the cap will be effectively managed by the drainage system and other engineering controls, one is left with 1,026 acres available for potential recharge to the groundwater system. Conservatively assuming 1-ft of effective recharge to groundwater in one year over the 1,026-acre catchment area results in approximately 334 million gallons of effective recharge. Assuming this total effective recharge is evenly distributed over time and remains in the catchment area that contains the unit, and all flows into the unit, this would result in a value on the order of 636 gallons per minute of groundwater flow focused to the subsurface CCR waste beneath the capped unit. In other words, additional engineering controls capable of managing (and treating as necessary) this additional ongoing input of groundwater into the unit would be a minimum necessity for a successful Closure Plan.

Based on all of the above, it appears that further engineering measures would be necessary to ensure that all free liquids are eliminated prior to installing the final cover system, as required by § 257.102(d)(2)(i).

Additional data are necessary to demonstrate that saturated CCR will not be present in the base of the closed unit prior to the installation of the final cover system. Absent such data, the permit record does not support a finding that the remaining wastes will be stabilized sufficiently to support the final cover system, as required by § 257.102(d)(2)(ii). If the CCR in the unit is not sufficiently stabilized, *e.g.,* if it has not been completely drained, differential settlement of the CCR after installation of the cover system is possible, especially given the substantial added load from the consolidation of CCR from the northern portion of the Ash Pond. If the settlement is great enough, it could cause a disruption in the continuity, and potentially failure of, the final cover system. Additional information is needed to determine that the permit meets Federal requirements. This could have been accomplished either by requiring submission of the information prior to the issuance of the permit or by including a permit term requiring submission of the information, along with a clause allowing for further permit conditions if necessary.

iii. Consistency With 40 CFR 257.102(d)(1)(i)

The available information indicates groundwater is likely to continue to infiltrate into the unit and yet the only measures described in the Closure Plan and the Permit to address this continued infiltration are those taken to facilitate consolidation and cap construction. As explained in previous sections, the exclusive reliance on a cover system in this circumstance would not ''control, minimize, or eliminate, to maximum extent feasible'' the post-closure infiltration of the groundwater into the waste. 40 CFR 257.102(d)(1)(i).

The approved Closure Plan does not adequately account for the hydrogeology of the site, which includes complex topography, stratigraphy, hydrology, and other complex site characteristics such as preferential pathways (faults, mines, etc.) that make it likely that groundwater elevations will be higher than the bottom elevation of the surface impoundment, even after the cover system is installed. The cover system will only prevent liquids (precipitation) from entering directly into the unit from the surface/top of the unit. But as shown on the construction drawings in the Closure Plan (*e.g.,* drawing C–100), precipitation will continue to fall onto the surrounding higher ground surfaces in the catchment area beyond the lateral extent of cover system and then percolate down below the ground surface, the underlying aquifer will recharge and groundwater levels will continue to infiltrate into the CCR from beneath the unit, as well as from the sides.

There are commonly used engineering measures that can prevent, or at least control, the post-closure flow of groundwater into the unit; for example, physical barriers such as slurry walls or liner systems or by other means such as hydraulic containment systems (*e.g.,* groundwater extraction wells), additional backfilling to create a buffer between the bottom of the unit and groundwater, CCR relocation, etc. EPA is therefore proposing to determine that ADEM's approval of a Closure Plan that relies exclusively on consolidation and cap construction to control infiltration into the Ash Pond is inconsistent with § 257.102(d)(1)(i).

EPA is also proposing to determine that the approved Closure Plan fails to demonstrate that post-closure releases of CCR or leachate to the groundwater will be controlled ''to the maximum extent feasible.'' 40 CFR 257.102(d)(2)(i). While a leachate collection system is proposed in the Closure Plan, EPA was unable to find either analysis or evidence demonstrating the extent to which the proposed leachate collection system will control ''post-closure releases of CCR or leachate to the groundwater to the maximum extent feasible.'' 40 CFR 257.102(d)(2)(i). Moreover, the available information does not support a determination that the proposed system will meet this performance standard. As previously discussed, the leachate collection system is not designed to control the volume of leachate that is likely to be created from the continued infiltration of groundwater, nor does it extend underneath the entire unit.

In addition, there is substantial evidence that the hydrogeologic pathways that will allow unimpeded migration of groundwater into the unit from the bottom and sides of the unit will also allow leachate to migrate laterally and vertically out of the unit at particular locations. The absence of natural or engineered hydraulic barriers along the base and sides of the unit, which allows for both infiltration and exfiltration of liquids, will likely result in additional releases of contaminated groundwater (*i.e.,* ''plumes'') out of the unit via the bottom or sides. For example, preferential pathways, such as geologic faults and mine shafts from former mining operations, are present beneath the unit that would be expected to draw contamination from any uncaptured leachate down into the aquifer. The existence of preferential pathways was clearly acknowledged in the GWMP that was included in the Permit Application as Appendix C.[77]

The approved Closure Plan does not account for these pathways or otherwise evaluate how well the proposed drain system will capture liquids. To meet the performance standard in § 257.102(d)(1)(i), the approved Closure Plan would have to show that the

[77] Alabama Power Company. Revised Closure Permit Application for the Plant Gorgas Ash Pond. April 30, 2020. Response to Comments, Approved Groundwater Monitoring Plan included in the October 20, 2021. For example, the following statements were made within the RTC for the GWMP:

[i]n-conjunction [with statements made earlier in the letter], the geology at Plant Gorgas dictates preferential flow through coal seams and vertical to subvertical joints, fractures, and faults. Targeting such features for monitoring, even if stepped back from the waste boundary, is technically justified. This because preferential flow paths concentrate groundwater migration through enhanced fracture interconnectivity within otherwise impermeable rock strata. Therefore, given the travel-times described [earlier in the letter], and the age of the facility—it was appropriate to target these features for determining potential impacts to groundwater.

leachate will be channeled to the leachate collection system rather than to the preferential pathways, EPA was unable to find anything in the Permit Application or permit record to show that either Alabama Power or ADEM made any such showing. As discussed previously, the available information indicates that the face drain and under-designed leachate collection system would likely be ineffective in preventing such releases, given the under-designed leachate collection system.

b. Plant Gorgas Groundwater Monitoring Issues

The Final Permit incorporated the GWMP submitted with the Permit Application, and directed Alabama Power to comply with the State regulations and the approved plan:

A. Groundwater Monitoring System. The Permittee shall install and/or maintain a groundwater monitoring system, identified in Table 1, as specified in 335–13–15–.06(2) and the approved groundwater monitoring plan.

Once ADEM approved and adopted the GWMP into the permit, the GWMP, rather than the referenced State regulations, became the State requirements with which the facility is required to comply.

Based on EPA's review of the approved GWMP, EPA is proposing to determine that the groundwater monitoring well network approved by ADEM does not meet the performance standards in § 257.91(a) or (b). As discussed in more detail below, EPA is proposing to determine that the groundwater monitoring system does not ''yield groundwater samples from the uppermost aquifer,'' but has been screened instead in only a portion of the aquifer. 40 CFR 257.91(a). EPA is also proposing to determine that approved groundwater monitoring system is not based on a thorough characterization of any of the elements listed in § 257.91(b). Further, EPA is proposing to determine that the approved monitoring system inappropriately includes numerous downgradient monitoring wells that are not located at the waste boundary. See 40 CFR 257.91(a)(2). In addition, based on the documentation provided in the Permit Application, it appears that there are an insufficient number of monitoring wells at necessary locations and depths to meet the Federal performance standards for either the background wells or the compliance wells. See, 40 CFR 257.91(a)(1)–(2). Therefore, EPA is proposing to determine that ADEM's Final Permit fails to require Alabama Power to achieve compliance with either the Federal regulations or with an equally protective State requirement.

i. Failure To Delineate the ''Uppermost Aquifer''

The Federal regulations require that a groundwater monitoring system sample ''the uppermost aquifer,'' which is defined as ''the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.'' 40 CFR 257.53, 257.91(a). The design of the monitoring systems must be based on a thorough characterization of, among other things, the ''aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer.'' 40 CFR 257.91(b)(2). EPA is proposing to determine that ADEM approved a groundwater monitoring plan that does not meet these requirements.

Based on the limited information in the permit record, it appears the facility failed to define both the upper and lower limits of the uppermost aquifer. The GWMP provided in the Permit Application provides only limited characterization of the geologic units beneath the Ash Pond. In addition, the technical information provided in the Permit Application and available on Alabama Power's CCR website is insufficient to support a determination of the lateral and vertical limits of the entire uppermost aquifer; for example, EPA found only limited data on the ''saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer and materials comprising the uppermost aquifer.'' 40 CFR 257.91(b)(2). And EPA was only able to find limited and conflicting information about the ''materials comprising the confining unit defining the lower boundary of the uppermost aquifer.'' *Id.* In the absence of such key information it is impossible to determine that the monitoring system adequately covers the entire uppermost aquifer, which includes all ''lower aquifers that are hydraulically interconnected'' with the aquifer nearest the ground surface. 40 CFR 257.53 (definition of ''uppermost aquifer''). Nevertheless, ADEM approved Alabama Power's GWMP unconditionally.

A representation of the various aquifers beneath the Ash Pond can be obtained by examining the cross sections found in the 2021 Remedy Selection Report.[78] The uppermost aquifer may be described in its most basic expression as a ''layer cake'' with interbedded layers of sub-horizontal sedimentary rocks. As depicted in these cross sections, for example Figure 9B of Appendix B of this report, for instance the aquifer nearest the ground surface is shown as the Cobb Group. A portion of the Cobb Group is present in higher elevations of the site, overlying the Pratt Group. Both the Cobb and Pratt Groups are part of the regionally significant Pottsville Formation. Coal beds known to be present regionally in the Cobb Group were not identified near the unit and Cobb Group rocks near the unit consist of sandstones, mudstones, and shales. Some individual sandstone beds are depicted as having thicknesses of over 50 feet as well as significant lateral extent, on the order of thousands of feet. The Cobb Group also contains thick laterally extensive mudstones, and the mudstones are interbedded with thinner sand layers in the northern part of the unit. The aggregate thickness of the Cobb Group is on the order of 200 to 250 feet or more at the unit. As the stratigraphically highest rock layer, the Cobb Group thickness varies across the unit due to differences of the uppermost surface elevation of the Cobb Group resulting from differential erosion. Alluvial materials and/or fill deposits rest unconformably and discontinuously on top of the Cobb Group's upper erosional surface in many areas of the unit, particularly to the south. These Cobb Group stratigraphic intervals are poorly characterized in comparison to the underlying Pratt Group, with few monitoring wells installed in the Cobb Group rocks.

The upper part of the Pratt Group includes interbedded sandstones, siltstones, mudstones, as well as several distinct coal beds. The uppermost of these named coal beds is the Pratt Coal Seam and associated layers, but additional named coal seams are present at successively deeper levels, as described in Section 3 of the approved GWMP: ''The Pratt Coal Group generally contains three named coal seams each separated by 10 to 30 feet of intraburden. In descending order, they are, the Pratt, Nickel Plate, and American coal seams.''

Beneath the upper part of the Pratt Group and its named coal seams, a significant thickness of interbedded

[78] Southern Company Services. 2021 Groundwater Remedy Selection Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. December 2021.

sandstones and mudstones on the order of 50 feet or more is present. These intervals are described as the Lower Pratt Group, which has received comparatively little characterization and few monitoring wells. The Pratt Group, including both the lower and upper portions, is depicted as having an aggregate thickness of approximately 200 feet beneath the unit. Differential erosion, particularly within the main channel-like finger of the Ash Pond, has locally resulted in alluvial materials and/or fill deposits resting unconformably on top of the Pratt Group's upper erosional surface, particularly in the central part of the unit.

In the southern portion of the unit, the Gillespy Group, also of the Pottsville Formation, is shown on cross sections as underlying the Pratt Group at great depths, but characterization of this interval is extremely limited. The cross sections in the 2022 Semi-Annual Groundwater Monitoring and Corrective Action Report show that the Gillespy Group also has an aggregate thickness on the order of 200 feet, yet the upper and lower contacts between the Gillespy and underlying and overlying layers is poorly characterized, particularly with respect to the lower contact, and the thus the variability and full vertical extent (*i.e.,* thickness) of the Gillespy Group under the Ash Pond has not been precisely determined. On cross section F–F' (Figure 4F), the Gillespy Group is depicted as just over 200 feet in thickness. The cross section also depicts the contact with the underlying Mary Lee Group mudstones at a depth of several hundred feet below the unit at a corresponding elevation just above MSL. However, it is not clear what data informs this interpretation as no borings are known to have penetrated the full thickness of the Gillespy Group near the unit based on the cross sections and monitoring well installation details. As such the true thickness of the uppermost aquifer and hydraulically connected aquifers is not known, nor has it been established whether the Gillespy Group constitutes an effective lower confining unit to the uppermost or aquifer system. See 40 CFR 257.91(b). It is also notable that the elevation of the top of the Gillespy Group is relatively high near the northern part of the unit, and differential erosion has resulted in deposits of overburden, alluvium and/or fill, including fill/dam materials resting unconformably on top of the upper part of the Gillespy Group in the northern part of the unit, as shown of cross section F–F'.

The additional relevant geologic aspects of the aggregate layering which constitutes the uppermost aquifer system includes faulting and folding of the layering. Following the ''layer cake'' analogy, the layers of rocks have been disrupted locally on several steep fault lines that predominantly strike north-northwest in the vicinity of the unit, as such the ''layer cake'' package of rocks has been disrupted and contains many distinct ''slices'' separated by these faults. The faults indicate significant vertical offset on cross sectional representations, and the rock layers are locally bent or ''folded'' near these fault structures, resulting in steeper dips. The entire package has been slightly tilted regionally to the south as if the northern end of the ''layer cake's serving platter'' had been lifted slightly.

The final element, following the ''layer cake'' analogy, is the ''icing on the cake.'' Like drizzled icing, unconsolidated fill and alluvial materials irregularly cover the tilted, faulted, and eroded surface of the ''layer cake'' of rock layers. It is expected that overburden including alluvial materials (*e.g.,* sands and gravels) originally present as stream deposits in the incised erosional stream valleys were covered by the introduced CCR materials. These buried alluvial materials therefore represent the uppermost veneer of the uppermost aquifer system. Since there are few wells screened in these former stream valleys, this element of the uppermost aquifer system is significantly underrepresented in the monitoring network.

(1) Uppermost Aquifer

Within this complex ''layer cake'' geology of variable sedimentary layering, Alabama Power screened most of its monitoring wells in the Upper Pottsville Aquifer system, which is described in Section 3.2.2 of the 2022 Semi-Annual Groundwater Monitoring and Corrective Action Report as follows:

> Groundwater occurs in the Pratt Coal Group of the Upper Pottsville Formation at the site. The primary occurrences of groundwater in the uppermost aquifer are: (1) coal seams, (2) rock fractures or zones of fracture enhanced permeability, and to a lesser extent (3) bedding planes. Fractured intervals are sparse across the site as defined by caliper logging and tend to occur with greater density in the upper 100 feet of rock. Groundwater yield at the site is considered low and typical of the Pottsville aquifer system in areas without major geologic structures. Wells were generally screened in the Pratt coal seam or across groundwater yielding fractures. Depth to groundwater producing zones were highly variable at the site and typically ranged from 30 to 240 feet BGS.

It is further noted in Section 3.2.3 of the 2022 Semi-Annual GWMCA Report that,

> Groundwater flow is accomplished primarily by means of fracture flow, where groundwater flows along more conductive secondary discontinuities in the rock mass such as joints or cleat fabric in coal seams. Fracture flow in complex geologic media such as the heterogenous Pottsville Formation can be complex. Groundwater in the Pottsville aquifer is most commonly regarded as confined due to large permeability contrasts within the aquifer (Stricklin, 1989). The Pottsville at the Site is probably better described as a series of discrete, confined to semi-confined, groundwater yielding zones where groundwater elevations can vary significantly laterally and vertically and are governed by the heterogeneity of the lithology and degree of fracture network interconnectivity . . . .
>
> At higher stratigraphic intervals (water-table flow system), groundwater flows towards the Ash Pond or other surface water bodies. This flow system is driven by gravity and mimics the topography of the site. Within deeper rock strata such as coals of the Pratt Group (Pratt Coal Group or deep bedrock flow system), groundwater flows radially away from the site.

Most of the characterization and monitoring is concentrated in the named coal seams of the Pratt Coal Group, and three primary flow systems (*i.e.,* aquifers) have been identified, as follows:

> At the Site, the groundwater flow regime is now grouped into three general flow systems: (1) shallow water-table flow system, (2) Pratt Coal flow system, and (3) American Coal flow system.

In this system of nomenclature, the Nickel Plate Coal Seam is generally included within the Pratt Coal System. EPA also noted that the Pratt Coal System and the American Coal Systems are mapped together and separately in different groundwater monitoring reports. For example, the approved GWMP (Figure 6B) has them mapped together and the 2020 Annual GWMCA Report [79] has them mapped separately (Figures 6B and 6C). Accordingly, subsequent references to aquifers in the coal seams, below, if not specifically described as the ''Pratt'' or ''American'' aquifers, describe the three coal seam flow systems of the Pratt Coal Group jointly as an aggregate combined system.

In addition to the three systems designated above (shallow water table, Pratt, and American), lower intervals of the stratigraphic section have been designated [80] as another (fourth) system, which is primarily localized to the northern part of the unit in the vicinity

[79] Southern Company Services. 2020 Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. January 31, 2021.

[80] Id.

of the Ash Pond dam and northward.[81] In this area, the geologic units located at depths corresponding to the transition zone from the lower Pratt Group to rocks of the underlying Gillespy Group are mapped together as the ''Base of Pratt to Gillespy Transition'' aquifer zone. This interval is at much higher elevations in the northern part of the site than in the southern portion. In any case, based on these aquifer designations various interpretive representations of groundwater flow have been constructed and were provided in the Permit Application and annual monitoring reports. Based on these interpretations, in the Cobb Group, above the Pratt Coal Group, groundwater is within an unconfined aquifer and flows toward the unit. Within the Pratt Coal Group, groundwater flow is interpreted to be mainly within the American and Pratt Aquifers and flows radially away from the unit. However, these interpretations are informed by insufficient data considering the large geographic area represented by the Ash Pond as well as the topographic and hydrogeologic complexity. The Ash Pond is approximately 500 acres and sits within a watershed of roughly 1,300 acres with hundreds of feet of topographic relief. The small number of wells installed in each of the respective aquifer layers simply does not allow for a sufficient level of resolution regarding the true configuration of the potentiometric surface and related groundwater flow directions. As such, the interpretations represented by the various potentiometric surface contour maps included in the 2022 Semi-Annual GWMCA Report contain a large degree of uncertainty.[82] For example, there are just a few wells screened in the unconfined materials above the coal seams. Figure 6A of the 2022 Semi-Annual GWMCA Report, entitled *Potentiometric Surface Contour Map (Upper) Water Table Aquifer, February 7, 2022, Plant Gorgas Ash Pond,* is based on just 10 water level monitoring points over an area hundreds of acres in size. Figure 6B of the same report *Potentiometric Surface Contour Map, Pratt Aquifer, February 7, 2022,* is based on just 31 water level monitoring points over the same area. Figure 6C of the same report is entitled *Potentiometric Surface Contour Map, American Aquifer, February 7, 2022.* This interpretation is based on just 21 water level monitoring points over the same immense area. Lastly, there are a limited number of water level monitoring points (13) that intersect the Gillespy; nearly all of the these are screened across the interface between the Gillespy and the lower part of the Pottsville Formation (see inset map on Figure 6B) entitled, *Generalized Potentiometric Surface Contour Map—Base of Pratt to Gillespy Transition (North of Dam).* In summary, given the large size of the Ash Pond and the surrounding area, interpretations of the flow systems are highly generalized because of the limited number of monitoring points in each hydrostratigraphic units.

Additionally, the nature of the lower boundary of the aggregate ''uppermost aquifer'' system has not been sufficiently characterized or monitored due to the limited number of wells installed into this zone, and the documented importance of fracturing, where present, such as in the subsurface beneath the unit, and its association with increased permeability values. This issue is discussed below. A key consideration with respect to the base of the Pratt to Gillespy transition is whether this transitional formation contact represents the boundary between the materials comprising the ''uppermost aquifer,'' and materials comprising the ''confining unit defining the lower boundary of the uppermost aquifer.'' 40 CFR 257.91(b)(2). It is asserted in the 2022 Semi-Annual GWMCA Report that,

> Except for the far northern portion of the Ash Pond, conceptually, there is likely to be little hydraulic communication with strata deeper than the sandstone unit immediately underlying the American Coal Seam (American Coal Flow System). Below this interval, a low permeability mudstone to interbedded mudstone-sandstone unit likely forms a barrier to vertical migration of groundwater as hydraulic conductivity values in the 10^{-7} centimeter per second (cm/s) range are reported for shales at the site as derived from packer testing. This interval reflects the transition to Gillespy Coal Group.

Additional information presented in the same report presents contradictory information regarding the confining potential of the basal portion of the Gillespy Coal Group:

> However, to the north and underlying the Ash Pond dam, strong hydraulic gradients likely force groundwater along vertical fractures and bedding planes through the upper part of the Gillespy Coal Group. Geophysical and hydrophysical logs obtained in well locations north of the dam suggest that three to four discrete bedding planes occurring between 30 and 90 ft BGS transmit groundwater. The most prominent typically occurring at a depth of 49 to 56 ft BGS (likely Gillespy equivalent; approximately 100 feet below American Coal Seam).

The potential for vertical flow, within the Gillespy is further described as follows:

> Strong upward vertical gradients are observed in paired well locations (see groundwater elevations in MW–6S/6D and MW–41HS/HD pairs) installed north of the ash pond dam. Potentiometric data suggests upward vertical flows along with northerly lateral flow.

Lastly, the same report discusses permeability test results, which again present an inconsistent picture of the Gillespy formation's potential to act as a ''confining unit defining the lower boundary of the uppermost aquifer,'' as follows:

> Forty-three packer tests were conducted resulting in a range of hydraulic conductivity (k) values from an estimated low of 7×10^{-7} cm/sec to a high of 4×10^{-3} cm/sec, with most tests (31) in the moderate range (10^{-5} cm/sec to 10^{-4} cm/sec), two test results in the more permeable range (10^{-3} to 10^{-2} cm/sec), and ten test results in the less permeable range (10^{-6} cm/sec). There is a general trend of decreasing estimated hydraulic conductivity with depth. Packer test results vary over 4 orders of magnitude. Test intervals at the high end of the data range are associated with weathered discontinuities (fractures/joints). Moderate values are associated with minor fractures or bedding planes. The lowest values are associated with more shale intervals without substantial fractures. Test intervals with coal seams are in the moderate to high end of the data range.

EPA disagrees that this information supports a determination that the lower part of the Gillespy formation constitutes a ''confining unit defining the lower boundary of the uppermost aquifer.'' The totality of the information instead supports the opposite conclusion. Since vertical flow is clearly a recognized phenomenon within the Gillespy within the northern part of the unit, and this flow is described as being associated with fractures,[83] it is logical to expect similar vertical flow and enhanced permeability in other areas where fractures are present. Given the prevalence of steeply dipping north-northwest striking fracturing in the area, as well as the likelihood that the linear valley that underlies the unit, which also strikes north northwest, is also controlled by underlying fractures of this orientation, it is reasonable to expect enhanced flow potential along

[81] Southern Company Services. 2022 Semi-Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. July 31, 2022. See inset map entitled, ''Generalized Potentiometric Surface Contour Map—Base of Pratt to Gillespy Transition zone (North of Dam)'' included on Figure 6B.

[82] Id.

[83] Southern Company Services. 2022 Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. January 31, 2023. Section 3.2.3.

and in the vicinity of these fractures where they may exist. Since the subsurface directly beneath the unit is likely the locus of such fracturing (see Unit IV.C.3.b.i.(4)(c) of this preamble for more information on the existence of preferential pathways), it is logical to determine that vertical permeability is high beneath the unit where it matters most. In other words, this situation suggests that rather than a ''confining unit defining the lower boundary of the uppermost aquifer,'' the near vertical fracturing which penetrates all units (see cross sections), including the Gillespy, creates the opposite condition in the uppermost aquifer system, directly beneath the unit. It is therefore unlikely that the uppermost aquifer beneath the Ash Pond has been adequately characterized, and its full thickness in the vertical dimension remains unknown based on the information in the permit record. As was noted above, the lowest measured permeability values are associated with shale intervals *without substantial fractures.* Although conditions are not sufficiently documented directly beneath the unit, the likely presence of fractures here would be expected to invalidate the presence of ''shale intervals without substantial fractures,'' and hence the ''lowest measured permeability values,'' while present in other areas around the unit, would likely not be present directly beneath the unit.

In sum, the uppermost aquifer system– that is, the aquifer nearest the ground surface and the underlying aquifers that are hydraulically connected to it—has not been fully assessed. EPA's assessment of the available information is that there are at least four flow systems that are appropriately considered the ''uppermost aquifer'' at the Ash Pond: (1) the upper unconfined water table (locally includes unconfined Cobb Group); (2) the Pratt Coal seam; (3) the American Coal seam; and (4) the Lower Pratt/Gillespy Transition zone.

The geologic units above and beneath the coal seams are sandstones and interbedded sandstones with mudstone or shale, and both are capable of storing and transmitting groundwater, and therefore should have been more fully characterized and included in the monitoring network. In particular, the depth of the lower confining unit has not been established, and as such, the full extent of the uppermost aquifer system has not yet been established in the vertical (depth) dimension. At several locations, the geologic units immediately below detected groundwater contamination are entirely uncharacterized and unmonitored. This situation hobbles the monitoring network's ability to identify and evaluate potential migration of contaminated groundwater out of the unit at the lower levels, which is discussed further in Unit IV.C.3.b.i.(4)(b) of this preamble.

(2) Background Wells Do Not Meet the 40 CFR 257.91(a)(1) Performance Standard

The Federal CCR regulations require that a groundwater monitoring system consist of a sufficient number of wells at appropriate locations and depths to yield samples from the uppermost aquifer that accurately represent the quality of the background groundwater that has not been affected by leakage from a CCR unit. 40 CFR 257.91(a)(1). The regulations also specify that background wells must normally be hydraulically upgradient of the CCR unit unless specific showings have been made. See, Id. EPA is proposing to determine that the approved GWMP fails to document either that the background wells are upgradient of the CCR unit or that the wells meet the performance standards in § 257.91(a)(1)(i) or (ii). EPA is also proposing to determine that the background wells in the approved groundwater monitoring system do not ''accurately represent the quality of the background groundwater'' because no background wells were installed in the lower flow systems of the uppermost aquifer: *i.e.,* the Pratt Coal seam; the American coal seam, and the Lower Pratt/Gillespy Transition Zone.

Four groundwater monitoring wells have been used at various times to characterize background water quality (GS–AP–MW–8, GS–AP–MW–13, GS–AP–MW–16S, and GS–AP–MW–17V). One of the wells, GS–AP–MW–13 was installed in 2016 and later abandoned in 2019. The three remaining monitoring wells (GS–AP–MW–8, GS–AP–MW–16S, and GS–AP–MW–17V) were installed exclusively in the upper flow system (*i.e.,* in the upper water table aquifer/unconfined Cobb Group formation), where Alabama Power has concluded that groundwater flows toward the Ash Pond. No background wells were ever installed in the three lower flow systems of the uppermost aquifer, which is where contamination is currently present.

According to the 2021 Plant Gorgas Annual GWMCA Report, to the north and underlying the Ash Pond dam, strong hydraulic gradients force groundwater along vertical fractures and bedding planes through the upper part of the Gillespy Coal Group toward the Ash Pond.[84] The approved GWMP also provides details regarding vertical gradients and the potential for using monitoring wells in the shallow flow system as background wells. For example, page 10 states:

> It is because vertical flow is the dominant mechanism for movement through these flow systems and that is a function of the Pottsville operating as a series of discrete, confined to semi-confined groundwater yielding zones. Upgradient well locations monitor younger, recharging waters that will eventually migrate vertically downward into groundwater yielding zones of the Pratt Coal Group.

Based on the limited data available it appears that groundwater in the upper water table (or un-confined Cobb) aquifer may migrate downward into the lower flow systems due to vertical hydraulic gradients. However, as discussed at length above, these interpretations contain a large degree of uncertainty because they are informed by very little data, given the size of the Ash Pond as well as the topographic and hydrogeologic complexity of the site. The complexity of the site is of particular concern here; in addition to the compositional variability of the layers, differential fracturing also creates variable hydraulic conditions which needed to be carefully considered in selecting upgradient background well locations. Lastly, the wells currently selected for background monitoring ignore horizontal flow in the lower flow systems where groundwater contamination is present and migrating laterally. EPA is proposing to determine there is insufficient data to conclude that the approved background wells meet the performance standards in § 257.91(a)(1).[85]

EPA is also proposing to determine that there are insufficient number of background wells in the approved groundwater monitoring system. As discussed in the preceding section, there are at least four flow systems that would each require background wells focused on the specific hydrogeologic conditions in each of these zones: (1) The upper water table aquifer; (2) The Pratt Coal seam; (3) The American Coal seam; and (4) The Lower Pratt/Gillespy Transition zone. In addition to these

[84] Southern Company Services. 2021 Annual Groundwater Monitoring and Corrective Action Report Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. January 31, 2022.

[85] Because Alabama Power believes the background wells to be hydraulically upgradient, the Permit Application did not include a demonstration that the background wells will be ''as representative or more representative'' as hydraulically up gradient wells. 40 CFR 257.91(a)(1)(ii).

four, it remains unclear whether other flow systems should have been included in the monitoring program, which would require the installation of appropriate zone-specific background wells. For example, the Cobb Group appears to contain multiple permeable sandstone units, as do portions of the Pratt Group both above and below the named coal seam aquifers. It would appear that background wells should have been installed in one or both of these geological formations to capture this geologic variability. As noted above, in addition to the compositional variability of the layers, differential fracturing also creates variable hydraulic conditions that needed to be more carefully considered in selecting background well locations.

The Federal regulations require a monitoring well system that accurately represents the quality of background groundwater. 40 CFR 257.91(a)(1). Background concentrations need to be determined for the entire uppermost aquifer system and must be supported by an explanation of the hydraulic and geologic factors that validate the selection of particular locations as representative background conditions. If the uppermost aquifer varies laterally and vertically in terms of geology and chemical composition, it is necessary for the background monitoring wells installed to adequately reflect this same range of variability (*i.e.,* representative conditions in these same layers absent CCR-related impacts). This requires enough monitoring wells to capture the variability represented by the natural system in appropriate dimensions, such as lateral and/or vertical variability. Consequently, in cases of multiple flow systems comprised of variable geology, as a first order requirement, background wells in each hydrostratigraphic unit of interest would be technically necessary.

The specific conditions at Plant Gorgas further illustrate this; the geochemistry of the groundwater within the shallow water table aquifer (consisting of younger groundwater within sandstone and shales) would not represent the geochemistry of deeper flow systems (consisting of older groundwater within interbedded sandstones with coal seams). It is also uncertain how unique conditions in the lower flow systems, such as the presence of coal seams and current and historical mining operations could affect background water quality in the lower flow systems.

In summary, the uncontaminated ''flavors'' (*i.e.,* representative conditions) of each relevant aquifer zone need to be established to provide a representative direct comparison relative to CCR impacts in these same zones on an ''apples to apples'' basis. However, the approved background monitoring system is insufficient in terms of general numbers of background monitoring wells as well as a general failure to include background monitoring in key sub-elements of the layered hydrogeologic system representing the uppermost aquifer. It therefore does not appear to accurately represent the full range of ''background'' conditions in the uppermost aquifer.

(3) Compliance Wells Are Not Installed at the Downgradient Waste Boundary

40 CFR 257.92(a)(2) requires that downgradient compliance wells ''be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer.'' The waste boundary is ''a vertical surface located at the hydraulically downgradient limit of the CCR unit. The vertical surface extends down into the uppermost aquifer.'' 40 CFR 257.53. Notwithstanding this clear direction, most wells in the monitoring network installed at Plant Gorgas were located far from the waste boundary. Yet ADEM approved the system without condition or revision.

For example, EPA evaluated well placement along a north to south transect, south of the buttress, along the west side of the main valley containing CCR. From north to south, this included, GS–AP–MW–9, –10, –11, 12, –13, –14, –47, –15, –16, and –18. This transect is approximately 8,400 feet in length, or over a mile and a half. Over this distance the monitoring wells were located from 55 feet to 510 feet away from the waste boundary, with and average distance from the waste boundary near 295 feet. On average, over the entire unit, monitoring wells here were located approximately 740 feet from the waste boundary.

ii. Insufficient Locations and Depths of Downgradient Compliance Wells To Monitor the Uppermost Aquifer

As previously discussed, the Federal regulations specify that a groundwater monitoring system must ''consist[ ] of a sufficient number of wells, installed at appropriate locations and depths, that . . . accurately represent the quality of the groundwater passing the waste boundary of the CCR unit.'' 40 CFR 257.91(a)(2). The regulations further specify that ''[a]ll potential contaminant pathways must be monitored.'' Id. But the groundwater monitoring system that ADEM approved meets none of these requirements. As discussed in more detail below, EPA is proposing to determine that ADEM approved a GWMP with an insufficient number of wells laterally along the downgradient perimeter of the unit to monitor all potential contaminant pathways. EPA is also proposing to determine that monitoring wells in the approved plan were not installed at appropriate depths to ensure that all potential contaminant pathways were monitored. Finally, EPA is proposing to determine that the approved groundwater monitoring system fails to account for preferential pathways beneath the Ash Pond.

(1) Insufficient Lateral Spacing of Compliance Wells To Monitor All Potential Contaminant Pathways

The majority of the compliance wells along the perimeter of the Plant Gorgas Ash Pond are spaced hundreds and sometimes thousands of feet apart. For example, only a single detection monitoring well (GS–AP–MW–2) was installed near the waste boundary to monitor groundwater over a large area flowing from the Plant Gorgas Ash Pond along the northeastern boundary. The lateral distances from GS–AP–MW–2 to the adjacent compliance wells to the north and south, GS–AP–MW–3, and GS–AP–MW–1R, respectively, both approach 2,000 feet (as the crow flies). Furthermore, the waste boundary between the two compliance wells GS–AP–MW–2 and GS–AP–MW–1R is approximately two miles. This unmonitored two-mile portion of the waste boundary runs along three sides of an adjacent offsite 16-acre parcel that appears to include residential structures. In effect, this leaves a two-mile stretch without any compliance wells to detect contamination before it migrates off-site.[86] See Figure 5A in the 2021 Plant Gorgas Annual GWMCA Report.[87]

This is not an anomaly, and extremely large lateral well spacings and large lateral gaps in monitoring well coverage are not an isolated occurrence. Prior to closure, the perimeter of the unit was roughly 14.7 miles in length, and following closure, the perimeter of the consolidated CCR will be approximately 7.8 miles in lateral extent.[88] Because

[86] Two wells (GS–AP–MW–43H and GS–AP–MW–44HO) are also situated in the vicinity of the adjacent offsite 16-acre parcel, but these wells are designed to horizontally delineate the plume of contamination that has already migrated beyond the unit boundary.

[87] According to a representative from the Copeland Ferry—Pumpkin Center Water Authority Publicly Owned Treatment Works, they serve public drinking water to residents in the vicinity of the Ash Pond. EPA is also working to confirm whether nearby households are on public or private water supply.

[88] This approach is further supported in view of the fact that the original footprint, although

ADEM approved the groundwater monitoring system in its current form, and it appears that the monitoring network will change little during the ongoing closure activities, it is reasonable to evaluate the lateral well spacing in terms of the current (pre-closure) perimeter, *i.e.,* 14.7 miles. Over this 14.7-mile unit boundary there are presently only 30 downgradient compliance wells, indicating an average spacing of approximately 2,600 feet, or roughly half a mile between monitoring wells. Prior to 2021, there were only 20 downgradient compliance wells, indicating an average lateral spacing of downgradient compliance wells in the lateral dimension was on the order of 3,900 feet apart, or almost three quarters of a mile.

Because wells installed to characterize the release in accordance with § 257.95(g)(1)(i) are not located on the downgradient waste boundary and are monitored for different constituents at different frequencies, these wells are not properly included in an evaluation of adequacy of the detection and assessment wells installed to comply with requirements in § 257.91(a). And even if EPA were to consider the delineation wells as part of the detection and assessment monitoring systems, that would only bring the total number of monitoring wells to 68, which would equate to one well per every 1,150 feet of boundary.

However, by any reasonable standard, lateral well spacings on the order of thousands of feet would be excessive. While appropriate lateral well spacing is site-specific, and varies from site to site, lateral well spacing appropriate for a site such as the Ash Pond at Plant Gorgas may be determined by several factors. These include, but are not limited to, the character, the degree of homogeneity, and dimensions of the emplaced waste body itself; the nature, variability, and complexity of the subsurface geology; as well as the dynamics, complexities, and boundary conditions of the hydraulic flow system into which the CCR has been emplaced. A greater degree of complexity and variability concerning these elements would translate to a greater number of compliance wells in the lateral dimension, *i.e.,* a smaller inter-well spacing, for the well network to adequately monitor such a system. Conversely, a well characterized system, based on geological, hydrogeological, and geotechnical investigations at the site, which has been demonstrated to be simple, stable, and uniform would allow for a fewer number of compliance wells to capture the limited inherent variability. In addition, factors related to resolution and uncertainty also affect the lateral well spacing appropriate to a given site. In this regard it should be noted that the Federal regulations indicate clear expectations regarding expected levels of resolution, which are generally described as that necessary to ensure that *all potential contaminant pathways* in the entire uppermost aquifer are monitored, including *preferential pathways.* Uncertainties and data gaps also equate to the need for greater levels of monitoring than would otherwise be required to compensate for these deficiencies. In other words, if characterization data are not available to support a larger minimum lateral well spacing, a default to a more rigid general standard is needed, requiring more wells. At the Ash Pond at Plant Gorgas, a much smaller lateral well spacing is needed to meet the requirements. This is due to (1) The complexity of the buried CCR; (2) The low resolution and extreme uncertainties in the characterization of the groundwater flow system which encompasses the unit; (3) The demonstrated complexity of the geologic layering in the vertical dimension; and (4) The presence of significant localized fracturing and numerous mapped faults which cut through the unit and surrounding areas. In a general sense, therefore, instead of thousands of feet apart, monitoring well spacings should have been on the order of hundreds of feet, except where known features such as narrow buried erosional stream valleys or fracture zones dictate even tighter lateral spacing. For example, the lateral spacings between wells MW–9, –10, –11, and –12 ranges from roughly 700–1,200 feet apart, yet none of these monitoring wells were located sufficiently close together to intersect the mapped fracture which cuts through this area of the site. A tighter well spacing is needed to adequately characterize the site. As another example, many wells are screened in zones which intersect underground coal mines. These mine tunnels represent potential preferential pathways which should have been more intensively monitored. The lateral and vertical dimensions of these types of underground workings are knowable and should be factored into decisions concerning appropriate monitoring well spacings to effectively ensure these preferential pathways are monitored. Much smaller lateral and vertical wells spacings are necessary to meet the requirements in this scenario, instead of wells that are thousands of feet apart.

(2) Insufficient Number of Downgradient Compliance Wells Installed at Appropriate Depths To Monitor the Entire Aquifer (Inadequate Vertical Spacing)

EPA is also proposing to determine that ADEM approved a GWMP that lacked ''a sufficient number of wells, installed at appropriate locations and depths'' to ensure that all potential contaminant pathways in the entire uppermost aquifer are monitored. As discussed above, the uppermost aquifer contains at least four flow systems: (1) the upper water table; (2) the Pratt Coal seam; (3) the American Coal seam; and (4) the Lower Pratt/Gillespy Transition zone. A system of compliance wells that meet the performance standards of § 257.91(a)(2) must be installed in each of them. But none of the four flow systems contain sufficient numbers of wells to meet these standards.

Nearly all the compliance wells installed in the three lower flow systems were screened across the shallow coal seams located between approximately 250 and 350 ft-MSL, *i.e.,* in the Pratt Coal seam and the American Coal seam. Of the eight cross sections reviewed,[89] it appears that only two downgradient compliance wells were screened below the coal seams in the Lower Pratt/Gillespy Transition zone (GS–AP–MW–6S and –6D). These wells are downgradient due to the unit's radial flow at this depth, and two wells are insufficient to comprehensively monitor this portion of the uppermost aquifer. First, all the monitoring wells installed below the coal seams are focused along the western and northern section of the unit, leaving the northeastern, southwestern, southern, and eastern sections with little to no data in the aquifer below the coal seams. Conservatively, this means the lower flow systems within the Lower Pratt/Gillespy Transition for over half of the pre-closure extent of the unit (at least 237 acres) are not being monitored.

This is further corroborated by the cross-sections in Figures 11A, 14A, 15, and 16 of the Groundwater Remedy Selection Report, which document the large portions of the uppermost aquifer below the coal seams where no data

reconfigured, is still integral to the overall closure strategy. Further, SSLs have been detected in the reconfigured northern region, which will require monitoring and/or corrective action into the future.

[89] Anchor QEA. Prepared for Alabama Power Company. Plant Gorgas Groundwater Remedy Selection Report. December 2021. Figures 5A and 5B in the revised GWMP and Figures 9A thru 16 in the

have been obtained.[90] According to Figure 14A, there appears to be only one well cluster (GS–AP–MW–6S/6V/6D) installed below the coal seams, approximately 900 feet from the edge of the ash pond immediately downgradient of the current dam. Given the unit's pre-closure size of 474 acres and a vast downgradient waste boundary exceeding fourteen miles in length, this single well cluster would certainly not monitor all potential contaminant pathways in this lower flow system.

There are also only 10 wells screened in the upper water table (*i.e.,* in the unconfined materials above the coal seams in the Cobb Group). As shown in Figure 6A of the 2022 Semi-Annual GWMCA Report, entitled *Potentiometric Surface Contour Map (Upper) Water Table Aquifer, February 7, 2022, Plant Gorgas Ash Pond,* these 10 water level monitoring points are installed over hundreds of acres, only 7 of these are designated as compliance wells, and there is conflicting information between the Permit Application and the most recent Annual GWMCA Report from 2022 regarding the stratigraphic layers in which these compliance wells are screened. For example, the 2022 Annual GWMCA Report only indicates that two of these 7 wells are screened across the ''shallow water table.'' EPA therefore is proposing to determine that the compliance monitoring with respect to the shallow unconfined water table aquifer zone is not adequate to comply with the regulations.

Similarly, based on the 2022 Semi-Annual GWMCA Report, 52 wells were installed in the Pratt Group as a whole across the entire 274-acre Ash Pond.[91] Of these, based on the interpretation of the flow system provided in the 2022 Semi-Annual GWMCA Report, water levels were measured at 31 wells installed in Pratt Coal seam,[92] and water levels were measured at 21 wells screened in the American Coal seam.[93] However, the compliance well network listed in Table 1A in the Permit Application indicates only 15 compliance wells screened in the Pratt coal seam zone, and only 11 compliance wells screened in the American Coal seam.

Lastly, based on the interpretation of the flow system provided in the 2022 Semi-Annual GWMCA Report, water levels were measured and plotted for 15 wells to inform a representation of potentiometric contours for the Base of the Pratt—Gillespy transition zone.[94] However, these 15 wells do not appear to be screened in equivalent levels of the transition zone and only 13 of these are listed on Tables 1A (3 Wells), 1B (8 Wells), and 1C (2 wells) in the 2022 Semi-Annual GWMCA Report. Moreover, not all of 13 wells were included/depicted on Figure 6B [95] and only 3 ''Pottsville Fm—Gillespy zone transition'' wells are listed as compliance wells on Table 1A in the Permit Application. This lack of clarity concerning the characterization and monitoring of the transition zone between the lower Pratt Group and Gillespy Group, supports EPA's basic conclusion above, that the base of the uppermost aquifer has not been determined or sufficiently characterized vertically (or laterally).

In summary, installing so few compliance monitoring wells over such great lateral distances and over such significant vertical intervals cannot possibly monitor all the potential contaminant pathways at Plant Gorgas, given the size of the Ash Pond as well as the topographic and hydrogeologic complexity of the site.

(3) Preferential Pathways Are Not Monitored

Numerous preferential pathways have been documented in the uppermost aquifer under the Ash Pond. Yet under the approved GWMP, none of these significant potential contaminant pathways appear to be adequately monitored, despite the express requirement in § 257.91(a)(2).

The approved GWMP states that, ''Locally, Pratt Coal Group strata gently dip (0.5° to 1.0°) to the south and south-southwest. Figure 5A Geologic Cross-Section A–A' and Figure 5B Geologic Cross-Section B–B' illustrate the geologic layering beneath the site.'' It is immediately apparent from these cross sections that a simple, nearly flat series of geologic layers is an overly simplistic representation of the site. As has been noted in many reports from Alabama Power in the permit record, the geologic layering is disrupted in many locations by mappable faults which indicate significant displacement and have steepened dips resulting in folding in some areas of the subsurface.

Nevertheless, the monitoring network does not include monitoring wells with screens deliberately targeted to these mapped faults and associated fractures. Given the presence of these significant fault zones, some of which have been mapped and delineated within the aquifer, additional monitoring wells should have been installed to detect whether CCR contaminants are migrating beyond the unit boundaries in pathways that follow these fracture lines. As an illustrative example, as shown on Figures 7A, 7B, 8A and 8B of the 2022 Semi-Annual GWMCA Report, a series of north-northwest striking fractures with steep dips to the west cut through the unit. One such fracture is mapped from the region of MW–10R north-northwestward 3600 feet (over half a mile) to the Mulberry Fork and beyond, further to the north-northwest. Monitoring wells MW–12 and 12V are located hundreds of feet to the east of the fault and therefore did not intersect it. Similarly, MW–11 is too far away from the feature and too shallow, so it also failed to intersect the feature. Ultimately it does not appear that any monitoring wells effectively monitor this significant potential contaminant pathway, which is particularly problematic as the fault appears to intersect the river in the general downgradient direction and thus has the (unassessed) potential to directly discharge CCR-related contaminants to the river system. This natural fracture-controlled ''pipeline'' represents a likely conduit for preferential groundwater flow which follows the strike of the fracture and thus represents a significant, unmonitored, potential contaminant pathway. It is notable that none of these identified fractures are included on Figure 5, Monitoring Well Location Map Plant Gorgas Ash Pond, of the same report.

Additional preferential pathways are associated with underground mine workings which impinge on parts of the unit. Coal mining operations, including underground workings, are also well documented in the vicinity of the site, and coal beds have been generally targeted for most of the monitoring well installations. But while some monitoring points appear to be screened at the same horizon as these underground mine workings, their lateral extent in the subsurface remains unknown, and as such the potential for preferential pathways which exploit these zones represents a clear data gap. For example, the geologic cross sections included in the 2021 Plant Gorgas

[90] Id at pp 81, 83 of the revised Groundwater Monitoring Plan and Figures 9A thru 16.

[91] Monitoring wells screened in the Nickel Plate coal seam are included in the Pratt Coal seam category for this discussion.

[92] Southern Company Services. 2022 Semi-Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company, Plant Gorgas Ash Pond. Prepared for Alabama Power Company. July 31, 2022. Figure 6B, Potentiometric Surface Contour Map, Pratt Aquifer, February 7, 2022.

[93] Id at Figure 6C of the same report is entitled Potentiometric Surface Contour Map, American Aquifer,

[94] Id at inset map on Figure 6B entitled, Generalized Potentiometric Surface Contour Map—Base of Pratt to Gillespy Transition (North of Dam).

[95] Id.

Annual GWMCA Report indicate the presence of former mine shafts that could significantly impact groundwater flow, and therefore warranted additional characterization and focused monitoring. These pathways were also documented in the December 2021 Remedy Selection Report, which ADEM received 3 months prior to its issuance of the Plant Gorgas permit in February 2022. In addition, according to the cross section in Figure 5A in the revised GWMP and Figure 12A in the Groundwater Remedy Selection Report, at least one fault that could serve as a potential preferential pathway for groundwater has been mapped immediately adjacent to the Ash Pond and penetrates below the coal seams. It is therefore another significant failure of the approved groundwater monitoring system that it does not include wells to monitor the targeted and delineated contaminant pathways that follow coal seams, underground workings, or other natural and/or man-made features that can act as preferential pathways for groundwater and contaminant migration. See 40 CFR 257.91(a)(2). The significance of ADEM's failure to address this deficiency is illustrated by the numerous and documented SSIs and SSLs detected in the monitoring wells which are screened within the coal layers.

In summary EPA is proposing to determine that the groundwater monitoring network ADEM approved for the Ash Pond at Plant Gorgas falls far short of the performance standards in § 257.91(a) and (b). The uppermost aquifer has not been sufficiently characterized or monitored. In particular, the lower limits of the uppermost aquifer and hydraulically connected aquifers beneath it have not been defined. Compliance monitoring wells have not been located at the waste boundary in most locations. There are an insufficient number of monitoring wells along the perimeter of the downgradient waste boundary, and at insufficient depths, to monitor all potential contaminant pathways in the entire uppermost aquifer, given the potential for radial flow in deeper aquifer zones. Finally, numerous preferential pathways have not been monitored.

ADEM's permit does include a permit condition that states:

> The Permittee shall install and maintain additional groundwater monitoring wells as necessary to assess changes in the rate and extent of any plume of contamination or as otherwise deemed necessary to maintain compliance with [ADEM Admin. Code] 335–13–15–. 06. A plan in the form of a permit modification request should be submitted to the Department as required by Section V.D.

However, this condition does not actually require any action that will bring the groundwater monitoring system into compliance; for example, by requiring the facility to fully characterize the uppermost aquifer system or install additional monitoring wells at the waste boundary. Or, more broadly, it does nothing to compel the facility to meet the requirements in 40 CFR 257.91(a) and (b).

c. Plant Gorgas Corrective Action Issues

In November 2018, the first SSLs above a groundwater protection standard were detected at the Gorgas Plant. SSLs were reported for lithium, arsenic, and molybdenum. The Ash Pond reported SSLs of all three constituents; the Gypsum Pond, CCR Landfill, and Gypsum Landfills reported SSLs of lithium only; and the Bottom Ash Landfill reported SSLs of arsenic. One ACM was developed for all the units at the facility in June 2019 and revised in February 2020 (''revised ACM'').[96] On February 28, 2022, ADEM issued a Final Permit to Alabama Power for Plant Gorgas Ash Pond, Gypsum Pond, and Bottom Ash Landfill.

In the RTC for the Gorgas Final Permit,[97] ADEM states:

> In November of 2019, the Department provided extensive comments to Alabama Power related to the submitted ACM and proposed final remedy. The Department's comments addressed many of the concerns raised by commenters, including the selection of monitored natural attenuation (MNA) as the final remedy despite providing limited data to its efficiency as a remedy. To date, Alabama Power has not submitted a revised ACM, as the facility has been collecting additional data to support a final remedy proposal.

It appears the permit record (Final Permit and RTC) may not reflect all the relevant information about the status of corrective actions at Plant Gorgas that was available to ADEM when the permit was issued. According to Alabama Power ''[a] Groundwater Remedy Selection Report was prepared and submitted on December 17, 2021, to meet the requirements of 40 CFR 257.97, ADEM Admin. Code r. 335–13–15–.06(8), and Part C of ADEM Administrative Order AO 18–096–GW . . .''.[98] The remedy the facility selected for the Ash Pond, Gypsum Pond, and Bottom Ash Landfill consists of closure with waste in place and capping, permeation grouting at the Ash Pond, and MNA. Additionally, any comments that may have been provided by ADEM to Alabama Power on the 2020 ACM were not available for review.

The Plant Gorgas Final Permit contained the same recitation of the corrective action regulations as the other permits issued by ADEM. As with the others, incorporating the regulations verbatim in the permit does not require Alabama Power to achieve compliance with those requirements at Plant Gorgas. Here as well, it appears that ADEM did not take into account relevant facts about the status of corrective action at Plant Gorgas, such as whether the 2020 revised ACM or the selected remedy submitted to ADEM in December 2021 complied with the regulatory requirements. Most importantly, ADEM did not determine what actions are still necessary in light of those facts to achieve compliance with the regulations and include those actions as requirements in the Final Permit. Instead, two months later, ADEM issued a Final Permit that was silent on the adequacy of the revised ACM and the applicant's selected remedy. Over a year later, it does not appear that ADEM has evaluated the adequacy of the revised ACM and the applicant's selected remedy. As a consequence, EPA is proposing to determine that, by remaining silent, the permit in essence authorized Alabama Power to continue to pursue a remedy based on the results of an ACM that does not meet the requirements of § 257.96, even though the selected remedy does not appear to meet the requirements in § 257.97(b), and the ACM identified other measures that would meet those requirements.

Delaying a decision on the adequacy of the facility's selected remedy until some unspecified point after permit issuance [99] effectively allows Alabama Power to continue operating out of compliance with the regulations, while operating in compliance with the permit. Releases continue to migrate off-site during this delay, and in this case, it appears the contamination may have already migrated off-site to residential

[96] Anchor QEA. Assessment of Corrective Measures, Plant Gorgas. Prepared for Alabama Power Company. June 2019 (Revised: February 2020).

[97] Alabama Department of Environmental Management. Initial Permit and Variance, William C. Gorgas Electric Generating Plant, Permit No. 64–12, Public Commenters. February 28, 2022.

[98] Southern Company Services 2022 Annual Groundwater Monitoring and Corrective Action Report, Alabama Power Company Plant Gorgas Ash Pond. Prepared for Alabama Power Company. February 1, 2023. p 2.

[99] It appears that ADEM has still not evaluated either the revised 2020 ACM or Alabama Power's selected remedy.

property.[100] [101] The sanctioned delay in implementing an effective remedy with no schedule for compliance results in a permit program that is less protective than the Federal regulations.

EPA is proposing to determine that the Final Permit contains many of the same issues discussed with respect to the other permits. The Final Permit does not contain a deadline for correction and resubmittal of the ACM to address any of the deficiencies ADEM identified in its 2019 comments, or any response to Alabama Power's selected remedy. EPA has also identified deficiencies in the revised ACM beyond those ADEM discussed in the RTC.

i. The Plant Gorgas Final Permit Does Not Require Collection of Site Data Needed To Support Assessments in the ACM

As discussed previously, § 257.95(g)(1) requires a facility to characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96.

The revised ACM identified MNA as a corrective measure to address groundwater contamination, in addition to other corrective measures (*e.g.,* hydraulic control and treatment; in-situ treatment). The revised ACM delineates releases of lithium, arsenic, and molybdenum but does not characterize the site conditions that would affect Alabama Power's selected remedy of MNA. Although the ACM identifies a number of potential attenuation mechanisms that might be effective for arsenic, lithium, and molybdenum, the ACM does not demonstrate that any of these mechanisms occur on site. EPA was unable to locate any data confirming that any of those potential attenuation mechanisms are occurring at Plant Gorgas. For example, this could include testing for the presence and quantity of lithium detected in the aquifer matrix solids to demonstrate that the constituent is being removed from the groundwater and immobilized on-site. But no site data were discussed in the ACM.

The subsequent Remedy Selection Report also fails to contain the necessary site data. Although the Report, like the ACM, identifies a number of potential attenuation mechanisms that might be occurring on-site for arsenic, lithium, and molybdenum, the Report does not conclude that any of these mechanisms occur on-site. Some site data that were not available in the ACM are discussed in Section 5.3 of the Remedy Selection Report, but they do not demonstrate that any significant amount of lithium, molybdenum, or arsenic is being immobilized in the ''solids'' samples,[102] (*e.g.,* aquifer matrix) or otherwise confirm the presence of attenuated constituents in the aquatic matrix. The Report identifies only dispersion and dilution as an MNA mechanism that currently occurs at Plant Gorgas. Ultimately none of the data presented support selection of MNA as a primary remedy.

Site data would also be needed to support any assessment of the performance, reliability, ease of implementation, and the time required to begin and complete the remedy must also be assessed and supported with site characterization data and analysis. 40 CFR 257.96(c)(1) and (2). But the Final Permit issued by ADEM requires neither the collection of data, or any revisions to the ACM, or any change in the facility's selected remedy to address these deficiencies.

ii. The Final Permit Does Not Require Submission of a Revised ACM That Accurately Assesses MNA

In the revised ACM, Alabama Power acknowledges that, ''USEPA (2015) discourages using dilution and dispersion as primary MNA mechanisms, as these mechanisms disperse contaminant mass rather than immobilize it.'' [103] ADEM also raised this as a concern in its 2019 comments on the original ACM.[104] However, as noted neither the revised ACM or the Remedy Selection Report identifies any natural attenuation mechanisms other than dilution and dispersion that have been demonstrated to be occurring on-site: ''The performance of MNA requires further investigation, especially related to the identification of an attenuating mechanisms, capacity of the Pottsville Formation for attenuation, and time to achieve GWPS.'' [105] This investigation was not completed prior to completion of the ACM. Regardless, Alabama Power assessed the performance of MNA as ''medium'' based on the dilution and dispersion (*i.e.,* releases of contaminants) occurring on-site and the identification of potential attenuation mechanisms.

Such a favorable assessment of MNA is contrary to the requirement in § 257.97(b)(4) that ''[r]emedies must . . . [r]emove from the environment as much of the contaminated material that was released from the CCR unit as is feasible.'' As previously discussed, while MNA can reduce the concentration or mobility of inorganic contaminants in groundwater if immobilization occurs through adsorption or absorption to subsurface soils, it does not remove the contaminants from the environment. MNA, therefore, would not perform well with respect to the requirement in 40 CFR 257.97(b)(4). This is particularly true in this circumstance, where Alabama Power has failed to collect the site data needed to identify whether any naturally occurring attenuation may be occurring on-site, as well as the mechanism by which it occurs, and to assess whether site characteristics that control and sustain this naturally occurring attenuation are sufficient to immobilize the entire release. Because the revised ACM presents no information that MNA would meet these requirements, the ACM should have assessed MNA's performance and reliability as ''low.''

Similarly, in order for MNA through immobilization to be assessed favorably with respect to its reliability at meeting the other requirements in § 257.97(b), such as the requirement in § 257.97(b)(2) to attain groundwater protection standards, the chemical reactions and processes involved that achieve immobilization must be demonstrated to be present on site and be permanent. Immobilization that is not permanent could be reversed, causing contaminants to be released back into groundwater and to migrate off-site. Yet despite the absence of any data demonstrating immobilization mechanisms to be present, let alone permanent, the revised ACM assessed the reliability of MNA through immobilization as ''high.'' This conclusion is unsupported; since no immobilization mechanisms were

[100] Alabama Power. Letter to Mr. Taylor. Alabama Power Plant Gorgas Ash Pond Closure and Groundwater Investigations. July 6, 2020.

[101] Alabama Power. Letter to Mrs. Salter. Alabama Power Plant Gorgas Ash Pond Closure and Groundwater Investigations. October 30, 2020.

[102] Anchor QEA. Prepared for Alabama Power Company. Plant Gorgas Groundwater Remedy Selection Report. December 2021. Tables 6 and 12 in Appendix D.

[103] Anchor QEA. Assessment of Corrective Measures, Plant Gorgas. Prepared for Alabama Power Company. June 2019 (Revised: February 2020). p. 14.

[104] Alabama Department of Environmental Management. Response to CCR Documents Submitted to the Department. Alabama Power Company. November 14, 2019.

[105] Anchor QEA. Assessment of Corrective Measures, Plant Gorgas. Prepared for Alabama Power Company. June 2019 (Revised: February 2020). p. 17.

demonstrated to be present, they could not be known to be reliable.

The revised ACM also fails to consider safety impacts, cross-media impacts, and control of exposure to any residual contamination in its assessment of MNA. See 40 CFR 257.96(c)(3). Neither the narrative nor Table 5 in the 2020 ACM discuss these impacts for MNA. Yet Table 5 in the 2020 ACM, in the column labeled ''potential impacts of remedy'' nevertheless concludes that the potential impacts from MNA are ''none.'' This conclusion is unsupported by data or analysis. This conclusion is also inconsistent with other information in the revised ACM. The Ash Pond and Bottom Ash Landfill are both adjacent to a river. In the revised ACM in Figure 3, groundwater flow is depicted from the Ash Pond toward the river. The Bottom Ash Landfill is also near and upgradient from an adjacent river. As noted, the only MNA that is known to occur at the site is dilution and dispersion (*i.e.,* the normal transport associated with groundwater releases.) This means that contaminants are migrating in groundwater from the Ash Pond to the river. Migration of contamination from groundwater to surface water is a cross-media impact. Therefore, the assessment of potential impacts from the remedy for MNA in Table 5, which includes these cross-media impacts, should be ''high.''

Conclusions without a supporting assessment or data do not constitute ''an *analysis* of the effectiveness of potential control measures.'' 40 CFR 257.96(c) (emphasis added). In addition, the lack of data to support the assessments in the revised ACM means it may not accurately reflect MNA's ''effectiveness in meeting all of the requirements and objectives'' in § 257.97(b). Inaccurate assessments in an ACM can ultimately result in selection of a remedy that will not meet the requirements of § 257.97(b), which is what appears to be occurring here.

In an ACM, technologies' expected performances are compared with one another according to how well each alternative meets each regulatory criterion. The Revised ACM identified MNA as one of several potential corrective measures to address groundwater contamination (*i.e.,* hydraulic control and treatment; in-situ treatment). Given both the absence of any evidence of any attenuation mechanisms occurring at the Ash Pond, and the conclusion in the revised ACM that the other alternatives, such as pump and treat, are feasible, there would appear to be no basis for assessing MNA more favorably than an alternative that unquestionably removes contaminants from the environment. For the same reasons, there is no apparent basis for ultimately selecting MNA as the remedy.

ADEM's Final Permit contains no measures to remedy this, even though in their 2019 comments on the original ACM, ADEM raised many of the same issues discussed above. For example, ADEM requested that Alabama Power update the ACMs to include detailed information for each requirement. In particular, the comments noted that:

> Furthermore, ADEM Admin. Code r. 335–13–15-.06(8)(b)3. and (b)4. require that the remedy must (1)'' control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV into the environment'' and (2) '' remove from the environment as much of the contaminated material that was released from the CCR unit as feasible . . .''.The ACMs evaluate a number of options, with source control (by consolidating and capping the CCR units) and monitored natural attenuation (MNA) proposed as the most effective remedy. The Department requests a more detailed justification for the proposed remedies given that source control will not be achieved for an average of 10 years and that no other mechanism is proposed to reduce the potential for further releases to the'' maximum extent feasible'.

EPA was unable to find any evidence that a revised ACM or a more detailed justification was submitted in response to ADEM's concerns. By failing to require Alabama Power to take any concrete action to address these deficiencies, the Final Permit effectively authorizes the permittee to continue to indefinitely pursue a remedy that ADEM previously determined had not been demonstrated to meet the requirements in § 257.97(b). Accordingly, EPA is proposing to determine that the permit does not require Alabama Power to achieve compliance with the Federal requirements; and because it allows the facility to continue to delay implementing a remedy that would meet the requirements of § 257.97, the alternate State requirement is less protective.

4. Plant Greene County

EPA reviewed the Final Determination Initial Permit and Variance for the Alabama Power Company, Greene County Electric Generating Plant (Plant Greene County Permit), issued by ADEM under Permit No. 32–03 on December 18, 2020.[106] The permit summary on Page 1 says,

> [t]he Plant Greene County Ash Pond is a CCR surface impoundment located in Sections 21 and 28, Township 19 North, Range 3 East in Greene County, Alabama consisting of approximately 559.41 acres with a disposal area that consists of approximately 477.24 acres. The permit requires the Permittee to manage CCR in accordance with the conditions of the permit, ADEM Admin. Code r. 335–13–15, '' Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments,'' and the approved permit application.
> . . .
> The Permittee must comply with all conditions of the permit except to the extent and for the duration such noncompliance is authorized by a variance granted by ADEM. The first variance requests to exclude boron as an Appendix IV assessment monitoring constituent. The second variance requests groundwater protection standards of 6 micrograms per liter (µg/L) for cobalt; 15 µg/L for lead; 40 µg/L for lithium; and 100 µg/L for molybdenum. The third variance requests the final grade of the cover system be less than 5 percent and greater than 25 percent. The fourth variance being requested is from 335–13–15-.03(6) requiring a 100 foot buffer from the perimeter of the facility boundary.

As with the other permits evaluated in this proposal, EPA has identified issues with ADEM's approval of the closure, groundwater monitoring network, and corrective action at Plant Greene County, which are discussed below. As previously discussed, EPA focused on only a subset of the potential issues associated with the permit and limited its review to information in the permit record (*e.g.,* the Permit Application) and information publicly available on Alabama Power's CCR website. This is because the purpose of this review is to determine whether Alabama's program meets the statutory standard for approval, not to reach final conclusions about an individual facility's compliance with the CCR regulations.

a. Plant Greene County Closure Issues

Plant Greene County had not completed closure of the Ash Pond when ADEM issued the Final Permit in December 2020. But the final permit ADEM issued looks largely the same as the permits issued to the other facilities. ADEM incorporated the Alabama CCR regulations by reference into the Final Permit for Plant Greene County, and it approved and incorporated the Closure Plan submitted as part of the application into the Final Permit without modification.[107] The Final Permit provides:

[106] Alabama Department of Environmental Management. Final Determination Initial Permit and Variance for the Alabama Power Company, Greene County Electric Generating Plant, issued under Permit No. 32–03. December 18, 2020.

[107] Although the Permit terms are ambiguous, it appears from the Response to Public Comment that ADEM approved the Closure Plan submitted as part of the Permit Application.

SECTION VII. CLOSURE AND POST-CLOSURE REQUIREMENTS.
A. Closure Timeframe and Notifications. The Permittee shall close their CCR units as specified in 335–13–15–07(2), this permit and the Application.
B. Criteria for Closure.
1. Cover. Closure of a CCR landfill, surface impoundment, or any lateral expansion of a CCR unit must be completed by either leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR unit, as described in 335–13–15-.07(3)(b) through (j). The minimum and maximum final grade of the final cover system may be less than 5 percent and greater than 25 percent, as specified in the Permit Application. (See Section IX.C.)
2. Written Closure Plan. The written closure plan, as part of the Application, must include, at a minimum, the information specified in 335–13–15-.07(3)(b)1.(i) through (vi).
3. Initiation of Closure Activities. Except as provided for in 335–13–15-.07(3)(e)4 and 335–13–15-.07(4), the owner or operator of a CCR unit must commence closure of the CCR unit no later than the applicable timeframes specified in either 335–13–15-.07(3)(e)l or 2.
4. Completion of closure activities. Except as provided for in 335–13–15-.07(3)(f)2, the owner or operator must complete closure of the CCR unit subject to the requirements in 335–13–15–.07(3)(f)l.(i) through (ii).

According to the Closure Plan submitted with the Permit Application, Alabama Power intends to remove CCR from the southern portion of the Ash Pond and consolidate it within the northern portion of the existing ash pond.[108] After the excavation and consolidation have been completed, the footprint of the remaining waste will occupy approximately 221 acres. The Plan calls for the 221 acres of consolidated waste to be closed in place, with a final cover system consisting of an engineered synthetic turf and geomembrane to be installed on the consolidated unit. In addition, according to the Plan, a barrier wall keyed into the low permeability Demopolis Chalk will be installed around the perimeter of the consolidated CCR material to create a hydraulic barrier that ''limits the movement of interstitial water through the constructed interior dike and existing northern dike.'' [109] This hydraulic barrier will be connected to the geomembrane of the final cover system.[110] According to the Closure Plan:

These actions will effectively control the source of CCR constituents to groundwater by removing free water and some interstitial water from the ash, reducing the footprint area of the ash and preventing further infiltration of surface water resulting from rainfall through the ash. Removal of the free liquid will reduce the volume of water available to flow from the Ash Pond during and after closure, while also minimizing the hydraulic head driving water through the subsurface.[111]

In many respects, the outlines of the closure presented in the Plan could be implemented to be consistent with the Federal requirements; however, ADEM approved the Plan without requiring Alabama Power to provide the information necessary to confirm that several critical closure requirements—which were not addressed or were insufficiently described—would be met. Specifically, neither the Closure Plan nor other materials in the Permit Application addressed how the performance standards in § 257.102(d)(2) will be met with respect to the saturated CCR that it appears will remain in the base of the consolidated unit. The Permit could either have specified what the facility needs to do to meet the requirements, or ADEM could have required the facility to submit a revised Closure Plan. ADEM did neither, and as a consequence, there is no binding and enforceable provision for the facility to comply with these performance standards. In essence, ADEM has issued a permit that allows the facility to decide whether to comply with § 257.102(b) and (d)(2), rather than ''requiring each CCR unit to achieve compliance with'' those provisions. 42 U.S.C. 6945(d)(1).

While it was in operation, the base of the Ash Pond was in continuous contact with the groundwater beneath the unit. Even now groundwater continues to saturate the CCR in the unit.[112] EPA estimated the amount of saturated CCR remaining in the Ash Pond using the same methodologies described above for Plants Colbert and Gadsden. The average groundwater elevation from groundwater monitoring wells in the vicinity of the Ash Pond between September 2019 and August 2021 is 84.8 ft above MSL. While the base elevation for the unit varies, by relying on an average base elevation of 83 feet, EPA estimates that, on average, just under 2 feet in depth of CCR across the entire footprint of the impoundment is currently in contact with groundwater. This equates to roughly 640,000 CY of saturated waste. Dewatering and pool drawdown continue at the site, and when combined with the installation of the slurry wall, groundwater elevations would be expected to decrease over time. However, the extent to which the CCR will remain saturated once closure activities are completed cannot be estimated due to the lack of information in the relevant documents.

As discussed previously, the Federal regulations applicable to surface impoundments closing with waste in place require that ''[f]ree liquids must be eliminated by removing liquid wastes or solidifying the remaining waste and waste residues, [and that] remaining wastes must be stabilized sufficient to support final cover system.'' 40 CFR 257.102(d)(2). But due to the deficiencies in the Closure Plan, it is not clear that the closure approved by ADEM will meet either standard.

According to the approved Closure Plan, various dewatering techniques will be employed before and during closure; however, the Closure Plan appears to limit the use of these techniques to the CCR in the southern portion of the unit that will be excavated and transported to the consolidated area, and to the areas under the new dike.[113] For example, in the sections specifically discussing dewatering, the Closure Plan states:

i. Dewatering
Dewatering of the CCR Ponds consists of two phases: decanting of free water and dewatering of interstitial water within the CCR material. Dewatering will be required prior to ash excavation and throughout construction. . . .
Interstitial dewatering refers to the removal of subsurface water within the saturated CCR material. This dewatering requires lowering phreatic water levels *to improve material handling for excavation and transport.* Removal of interstitial water will likely require both passive and active methods of drainage.
* * * * *
The CCR material within the subgrade of the proposed interior dike will be over excavated and a stable, temporary slope formed to the interior to allow the dike and barrier wall to be constructed. During this time, *the subgrade beneath the new dike* will be dewatered (discussed in a following section).
* * * * *

[108] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. Appendix 9, p 3, 18–19.

[109] Id. p.16.

[110] Additional details regarding the barrier wall system are provided in the Permit Application in Appendix 6 and Appendix 7, entitled ''Draft—Construction Quality Assurance Plan.'' Although the drawings are marked with statements such as ''60 Percent Design Package'' or ''Issued for 60% Client Review,'' and the Construction Quality Assurance Plan is marked ''Draft,'' it appears that ADEM approved these materials with the permit condition directing the Permittee to close their CCR units ''as specified in the Application.''

[111] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. Appendix 9, p 19.

[112] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. GWMP pp 220–221.

[113] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. Appendix 9, pp 5,7, and 9.

As dewatering continues, CCR material will be excavated from the closure by removal areas and placed and compacted in horizontal lifts on top of the existing CCR material within the consolidation area. As discussed previously, the CCR material will be dewatered in a systematic fashion prior to and during excavation activities, to maintain the phreatic surface below the working elevation of removal operations. For construction of the closed ash pond, it is expected that the CCR material will be handled multiple times prior to final placement and closure of the pond. CCR material will be stacked and dewatered to the proper moisture content prior to placement in the consolidation area.

(emphasis added).[114] The Closure Plan lacks the required description of how—or even whether—Alabama Power intends to dewater the entire unit. For example, there are inconsistent statements in the Closure Plan about the scope of the dewatering activities Alabama Power intends to conduct. In one section, there is a reference to ''dewatering of wetter ash across the site, especially in the southern end of the pond.'' But the remainder of the discussion focuses on a technique that is unlikely to be used on CCR that is not intended to be excavated and transferred, which suggests that Alabama Power does not intend to fully dewater all of the CCR in the unit. Specifically, the Closure Plan states that:

Utilization of stacking & casting methods is anticipated. With this approach, ash with higher moister[*sic*] content will be excavated and stacked in piles to allow for gravity drainage. A similar technique of windrowing may be used throughout the site. This technique involves spreading the wet ash in thin lifts and rowing/tilling the ash to allow the moisture to evaporate from the surface. To expedite interstitial water dewatering and construction stormwater management, a capillary break drainage system may also be considered for the ash excavation/placement around the interior dike. The drainage system will help relieve pore water pressure in the underlying ash as the weight of earthwork filling is applied.

This is compounded by the Closure Plan's repeated references to the removal of ''free water,'' rather than the ''free liquids'' the Federal regulations specify must be eliminated.[115] For example, on pages 18–19, under the heading ''f. Achievement of Closure Performance Standards,'' the Closure Plan states:

Free water will be removed, and interstitial water will be lowered to accomplish the CCR removal from the closure by removal areas and to close in a consolidated footprint.

* * * * *

These actions will effectively control the source of CCR constituents to groundwater by removing free water and *some* interstitial water from the ash, reducing the footprint area of the ash and preventing further infiltration of surface water resulting from rainfall through the ash.

(emphasis added). Alabama Power has defined the term ''free water'' in other Closure Plans as ''water contained in the CCR unit above the surface of CCR material.'' [116] Compare, 40 CFR 257.53 (definition of ''free liquids'').

Moreover, the Closure Plan never refers to the groundwater within the northern portion of the unit or describes any engineering measures that will be implemented to remove these liquids. Based on the information provided, further engineering measures would be necessary to effectively eliminate these free liquids from the unit prior to installing the final cover system, required by § 257.102(d)(2)(i). Absent further data demonstrating that saturated CCR will not be present in the base of the closed unit prior to the installation of the final cover system, the permit record does not support a finding that the remaining wastes will be stabilized sufficiently to support the final cover system, as required by § 257.102(d)(2)(ii). If the CCR in the unit is not sufficiently stabilized, *e.g.,* if it has not been completely drained prior to the installation of the final cover system, differential settlement of the CCR after installation of the cover system is possible, especially given the substantial added load from the consolidation of CCR from the southern portion of the Ash Pond. If the settlement is great enough it could cause a disruption in the continuity, and potentially failure, of the final cover system. Additional information is needed to determine that the permit meets Federal requirements. This could have been accomplished either by requiring submission of the information prior to the issuance of the permit or by including a permit term requiring submission of the information, along with a clause allowing for further permit conditions if necessary.

Based on all of the above, EPA is proposing to determine that, by failing to resolve these issues, ADEM's permit does not require the Plant Greene County Ash Pond to achieve compliance with the Federal requirements for closure, or with alternative closure requirements that are at least as protective as the Federal requirements.

b. Plant Greene County Groundwater Monitoring Issues

Based on EPA's review of the approved groundwater monitoring well network, EPA is proposing to determine that ADEM approved a groundwater monitoring system that fails to meet the Federal requirements. As previously discussed, the Federal regulations specify that a groundwater monitoring system must be installed that ''consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represents the quality of the groundwater passing the waste boundary of the CCR unit.'' 40 CFR 257.91(a)(2). The regulations further specify that ''[a]ll potential contaminant pathways must be monitored.'' Id. But as discussed in more detail below, EPA is proposing to determine that ADEM approved a groundwater monitoring plan with an insufficient number of wells laterally along the perimeter of the unit to monitor all contaminant pathways. EPA is also proposing to determine that monitoring wells in the approved plan were not installed at appropriate depths to ensure that all contaminant pathways in the entire uppermost aquifer were monitored. These are essentially the same issues previously discussed with respect to Plants Gadsden and Gorgas.

i. Insufficient Number of Downgradient Compliance Wells Installed at Appropriate Depths To Monitor the Entire Aquifer (Inadequate Vertical Spacing)

The downgradient well network approved by ADEM was focused primarily on a narrow subset of the uppermost geologic layers within what is referred to in the Permit Application as Unit 2: Poorly Graded Sands With Gravel Lenses. Other interconnected portions of the uppermost aquifer are not being monitored as discussed below. When evaluating whether monitoring wells are installed at appropriate depths (*i.e.,* the adequacy of vertical monitoring well coverage), it is important to look at cross-sectional views of the entire uppermost aquifer in the vertical dimension to understand interrelationships of groundwater monitoring wells, screen depths, and lithological variations. These points are illustrated (in part) in the geologic cross-sections on Figures 5A and 5B included on pages 208 and 209 of the Permit Application, which show that the uppermost aquifer consists of layers of

[114] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. Appendix 9, pp 7–8.

[115] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. Appendix 9, pp 5, 7–8, 19.

[116] See, *e.g.,* Alabama Power Company. Revised Closure Plan for the Plant Gorgas Ash Pond. Appendix 11, p 7.

poorly graded sands with gravel lenses (identified as Unit 2), as well layers of lean clay to sandy clay (identified as Unit 1). These cross sections and the boring logs that were included in the Permit Application confirm that the two geologic formations are hydraulically interconnected and both are therefore the ''uppermost aquifer.'' See, 40 CFR 257.53 (defining uppermost aquifer to include lower hydraulically connected aquifers). Accordingly, monitoring wells must be installed in the two formations.

Nearly all of the compliance wells at the waste boundary of the unit are screened in Unit 2, well below (in some cases over 20 feet below) the top of the uppermost aquifer; as a consequence there are an insufficient number of wells across nearly all of Unit 1. More precisely, EPA found that the groundwater monitoring well network for the Ash Pond unit has an insufficient number of wells screened in Unit 1 (*i.e.,* a vertical data gap) along at least three sides, as follows: (1) a 1500-foot section of Unit 1 parallel to the Barge Canal, as shown on Figure 4A, entitled ''Geologic Cross Section A–A′ Plant Greene County Ash Pond''; (2) a 6000-foot section of Unit 1 along the western side of the unit, as shown on Figure 4B, entitled ''Geologic Cross Section B–B′ Plant Greene County Ash Pond''; and (3) an approximately 2000-foot section of Unit 1, along the northern side of the unit between groundwater monitoring wells GC–AP–MW–59–HO and GC–AP–MW–1 as shown on Figure 4C, entitled ''Geologic Cross Section C–C′ Plant Greene County Ash Pond.'' These figures are found in the 2021 Plant Greene County Annual GWMCA Report.[117] EPA was unable to determine if a similar gap currently exists along the southern side of the Plant Greene County Ash Pond, because no cross-section extending along the southern waste boundary of the unit was included in either the 2021 Plant Greene County Annual GWMCA Report or the Permit Application. The omission of a cross-section in the Permit Application that extends along the southern side of the Ash Pond is significant because, given the proximity to the Black Warrior River, which is located immediately adjacent to the south and southeast of the Ash Pond, additional potential contaminant pathways that would need to be monitored would normally be expected to be present.

ii. Insufficient Lateral Spacing of Compliance Wells To Monitor All Potential Contaminant Pathways

EPA is also proposing to determine that ADEM approved lateral spacing between wells along the perimeter of the Ash Pond that is insufficient to meet the performance standards in § 257.91(b). Monitoring wells used for the detection and assessment monitoring program are spaced approximately one thousand feet apart with few exceptions. Large lateral well spacings are particularly problematic to the east, south and west of the waste boundary of the unit where groundwater is expected to discharge to surface water. Given the proximity to the various surface water features, such as the Black Warrior River and the Barge Canal, the large well spacings make it likely that potential contaminant pathways from groundwater discharging to surface water located immediately adjacent to the Ash Pond are not being monitored. This groundwater to surface water pathway was acknowledged in the Permit Application with a statement that reads, as follows: ''Groundwater that migrates downward into the surficial aquifer will migrate vertically through the Unit 1 clay and then, primarily laterally (horizontal) and to a lesser extent vertically along more coarse fractions of the Unit 2 aquifer toward the Black Warrior River and barge canal.'' [118]

Based on the concerns discussed above, EPA is proposing to determine that by approving the deficient downgradient groundwater monitoring well network in the Permit Application, ADEM's final permit does not require Alabama Power to achieve compliance with the performance standards in § 257.91(a)(2), or with an equally protective alternative.

c. Plant Greene County Corrective Action Issues

In November 2018, SSLs above the groundwater protection standards at Plant Greene County were reported for arsenic and lithium. An ACM was prepared in June 2019 (''2019 ACM''). On December 18, 2020, ADEM issued a final permit to Alabama Power for the Plant Greene County Ash Pond. In the RTC for the Final Permit, ADEM states:

In November of 2019, the Department provided extensive comments to Alabama Power related to the submitted ACM and proposed final remedy. The Department's comments addressed many of the concerns raised by commenters, including the selection of monitored natural attenuation (MNA) as the final remedy despite providing limited data to its efficiency as a remedy. To date, Alabama Power has not submitted a revised ACM, as the facility has been collecting additional data to support a final remedy proposal.

The Plant Greene County Final Permit only contained a recitation of the corrective action regulations, but did not require Alabama Power to achieve compliance with those requirements. This is because the Final Permit does not require Alabama Power to take specific actions to correct the deficiencies in the 2019 ACM, even though, as discussed in its RTC on the permit, ADEM identified them a year before issuing the Final Permit. Significantly, ADEM did not determine what actions are still necessary in light of those facts for Alabama Power to achieve compliance with the regulations and include those actions as requirements in the Final Permit. For example, the Final Permit does not require the permittee to take any particular actions to address ADEM's comments on the 2019 ACM or with respect to Alabama Power's proposed remedy, such as specifying the additional data needed to support the permittee's preferred remedy under a set timetable. As a consequence, EPA is proposing to determine that the permit authorized Alabama Power to continue to indefinitely pursue a remedy that appears not to meet the requirements of § 257.97(b), and that is based on the results of an ACM that does not meet the requirements of § 257.96.

Whether the 2019 ACM meets the requirements of the regulations, and what actions Alabama Power must take to remediate groundwater in compliance with § 257.97 are precisely the types of issues that must be determined before the permit is issued. This is because, once the permit is issued, the requirements in the permit become the State requirements with which the Permittee must comply. 42 U.S.C. 6945(d)(3)(A). And if the permittee is not in compliance with the regulations, the permit must specify what the permittee is required to do in order to achieve compliance with those regulations. This is the role of a permitting authority (*i.e.,* ADEM). Delaying this decision until after permit issuance effectively allows Alabama Power to continue operating out of compliance with the regulations, while operating in compliance with the permit. This results in a permit program

[117] Alabama Power. Plant Greene 2021 Annual Groundwater Monitoring and Corrective Action Report. January 31, 2022. Two similar geologic cross sections are found in the Groundwater Monitoring Plan included in the Permit Application. The two geologic cross sections were included as Figures 4A, for A–A1, and 4B, for B–B1; however, no geologic cross section for C—C1 was included in the Permit Application.

[118] Alabama Power Company. Revised Closure Permit Application for the Plant Greene County Ash Pond. April 30, 2020. PDF pp. 192.

that is less protective than the Federal regulations.

As discussed below, EPA is proposing to determine that the Final Permit fails to require Alabama Power to achieve compliance with several of the Federal corrective action requirements.

These are many of the same deficiencies that ADEM identified in its comments on the 2019 ACM, but declined to remedy in the permit issued a year and a half later.[119]

i. The Final Permit Does Not Require Collection of the Data Needed To Support Assessments in the ACM

As discussed previously, § 257.95(g)(1) requires a facility to characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96. The 2019 ACM delineates releases of arsenic, cobalt, and lithium but does not characterize site conditions that would affect any of the potential remedies identified in the ACM (*e.g.,* testing for the presence and quantity of arsenic and lithium detected in soils to demonstrate they are being removed from the groundwater and immobilized on-site.)

The 2019 ACM identified MNA as a potential corrective measure to address groundwater contamination, in addition to other corrective measures (*e.g.,* hydraulic control and treatment; in-situ treatment). However, Alabama Power failed to collect the site data needed to identify whether natural attenuation may be occurring on-site, as well as the mechanism by which it occurs, and to assess whether site characteristics that control and sustain this naturally occurring attenuation are sufficient to immobilize the entire release. For example, in order to accurately assess MNA, site data are needed to determine whether immobilization occurs on-site through adsorption or absorption to subsurface soils. In addition, data would be needed to determine whether the chemical reactions and processes involved that achieve immobilization are permanent. Immobilization that is not permanent could be reversed, causing contaminants to be released back into groundwater and to migrate off-site.

Although the Remedy Selection Report contained some data regarding the presence of released constituents in soils,[120] the relative performance, reliability, ease of implementation, and the time required to begin and complete the remedy must also be assessed for each alternative, including MNA. 40 CFR 257.96(c)(1) and (2). These assessments must be supported with site characterization data and analysis, but no data were provided in the ACM to support an assessment of MNA against these criteria, relative to other alternatives, to support its selection. The Remedy Selection Report discusses site data in the context of these criteria for MNA only, with no side-by-side assessments of alternatives based on site data provided. Additionally, the data discussed in Section 4.3.2 of the Remedy Selection Report do not demonstrate that any significant amount of lithium or cobalt is being immobilized in the solids samples.[121]

ii. The Final Permit Does Not Require Submission of a Revised ACM That Accurately Assesses MNA According to the Criteria in 40 CFR 257.96(c)

No naturally occurring attenuation mechanisms other than dilution and dispersion were identified at Plant Greene County in the ACM. Alabama Power acknowledges in the ACM that, ''USEPA (2015) discourages using dilution and dispersion as primary MNA mechanisms, as these mechanisms disperse contaminant mass rather than immobilize it.'' [122] Regardless, Alabama Power assessed the performance of MNA as ''medium'' based on the fact that the aquifer is sandy and dilution and dispersion (*i.e.,* releases of contaminants) are occurring.

This favorable assessment of MNA is inconsistent with § 257.97(b)(4), which specifies that ''[r]emedies must . . . remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible.'' Neither dilution nor dispersion removes the contaminants from the environment. Therefore, at this site MNA would not meet this requirement, since the constituents would remain in the environment, albeit in a different environment (*i.e.,* the river rather than the aquifer). Absent information to support a conclusion that MNA can meet these requirements at this site, MNA performance and reliability should have been assessed as ''does not meet.''

Further, in order for MNA through immobilization to be assessed favorably with respect to its reliability at meeting the other requirements in § 257.97(b), such as the requirement in § 257.97(b)(2) to attain groundwater protection standards, the chemical reactions and processes involved that achieve immobilization must be demonstrated to be permanent. Immobilization that is not permanent could be reversed, causing contaminants to be released back into groundwater and to migrate off-site. Assessing the reliability of MNA through immobilization as ''high'' in the ACM was not supported by data, since no immobilization mechanisms were identified, they could not be known to be reliable. Although Section 4.3.2 of the Remedy Selection Report contained some data regarding the presence of released constituents in soils, the data do not demonstrate that any significant amount of lithium or cobalt are being immobilized in the solid samples,[123] and therefore these data do not actually support selection of MNA as a primary remedy for these contaminants.[124]

In another section of the ACM, MNA was assessed as easy to implement because no design or construction would be required. If MNA occurs through immobilization of constituents in the subsurface that is not permanent, this would generally require ongoing monitoring as long as contaminants remain in the soil—indefinitely—in accordance with § 257.98(a)(1). Since the goal of the remedy would be for immobilized constituents to remain in the subsurface indefinitely, monitoring would be needed to demonstrate whether this goal is achieved. This is a much longer compliance monitoring timeframe than any other alternative, except possibly in-situ geochemical manipulation, which means that implementation is not significantly easier than alternatives that can be completed sooner, such as hydraulic control and treatment.

EPA is also proposing to determine that the ACM fails to meet the requirements to consider safety impacts, cross-media impacts, and control of exposure to any residual contamination in its assessment of MNA in either the narrative or Table 6. See 40 CFR 257.96(c)(3). Table 6, in the column labeled ''potential impacts of remedy'' assesses the potential impacts from MNA as ''none.'' This conclusion is

[119] Alabama Department of Environmental Management. Response to CCR Comments Submitted to the Department, Alabama Power Company. November 14, 2019. pp 6–7.

[120] Alabama Power Company. Plant Greene County Groundwater Remedy Selection Report, September 2021. Appendix D, Tables 6, 9 and 19.

[121] Id at Appendix D, Tables 6 and 12.

[122] Alabama Power Company. Assessment of Corrective Measures Greene County Ash Pond. June 2019, p. 12

[123] Alabama Power Company. Plant Greene County Groundwater Remedy Selection Report, September 2021. Appendix D, Tables 6 and 12.

[124] Some data were provided in the Remedy Selection Report to indicate arsenic may be immobilized on-site.

unsupported by data or analysis. This conclusion is also inconsistent with information in the ACM. The Ash Pond is bounded on three sides by adjacent surface water features. In the ACM in Figure 3, groundwater flow is depicted from the Ash Pond toward surface water features. Further, as noted Section 4.2.1 of the Groundwater Monitoring Plan, entitled ''Groundwater Elevations and Flow,'' ''[g]roundwater elevations in monitoring wells located adjacent or close to the barge canal and the river appear to demonstrate a temporary reversal of flow to the groundwater system associated with recent storm events.'' This temporary reversal of flow indicates a connection between surface water and groundwater in the vicinity of the Ash Pond.

Because no site data were presented to demonstrate that immobilization of lithium or cobalt is occurring at Plant Greene, the only MNA that is known to occur for these two constituents is dilution and dispersion (*i.e.,* the normal transport associated with groundwater releases). This means that these contaminants are migrating in groundwater from the Ash Pond to the river. Migration of contamination from groundwater to surface water is a cross-media impact. Therefore, the assessment of potential impacts from the remedy for MNA in Table 6, which includes these cross-media impacts, should be ''high.''

Conclusions without a supporting assessment or data do not constitute ''an *analysis* of the effectiveness of potential control measures.'' 40 CFR 257.96(c) (emphasis added). In addition, the lack of data means the ACM does not sufficiently establish MNA's ''effectiveness in meeting all of the requirements and objectives'' in § 257.97(b). Inaccurate assessments in an ACM can ultimately result in selection of a remedy that will not meet the requirements of § 257.97(b).

ADEM identified many of these same issues in their comments on the 2019 ACM. For example, on page 6, ADEM states:

> ADEM Admin. Code r. 335–13–15–.06(8) contains substantial requirements that must be evaluated when selecting a remedy, such as the long- and short-term effectiveness and protectiveness of the potential remedy, the effectiveness of the remedy in controlling the source to reduce further releases, among many others. The ACMs submitted by APCO do not match the level of detail required in the regulations. Please update the ACMs to include detailed information for each requirement of this section. Furthermore, ADEM Admin. Code r. 335–13–15–.06(8)(b)3. and (b)4. require that the remedy must (1) ''control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV into the environment'' and (2) ''remove from the environment as much of the contaminated material that was released from the CCR unit as feasible. . .''.
>
> * * * * *
>
> The Department requests a more detailed evaluation of the effectiveness of MNA, or any other proposed remedy, based on site specific conditions.

Yet ADEM's Final Permit does not require Alabama Power to take any actions to remedy any of the deficiencies they identified.

iii. The Permit Does Not Require an Assessment of Source Control Measures

The permit record contains no assessment of source control measures. Section 2.5 of the 2019 ACM describes the approved closure with waste remaining in the Ash Pond but contains no assessment of how well the closure would control releases. Nor can that information be found in the Remedy Selection Report, or the Closure Plan.

Moreover, the ACM neither identifies nor assesses any alternative measures. 40 CFR 257.96 requires that various alternatives for source control be compared in accordance with the criteria in § 257.96(c).

ADEM raised similar concerns in their comments, which state:

> The ACMs evaluate a number of options, with source control (by consolidating and capping the CCR units) and monitored natural attenuation (MNA) proposed as the most effective remedy. The Department requests a more detailed justification for the proposed remedies given that source control will not be achieved for an average of 10 years and that no other mechanism is proposed to reduce the potential for further releases to the ''maximum extent feasible''.

Yet the permit ADEM subsequently issued does not require any actions to remedy this deficiency.

5. EPA Conclusion About Alabama's Implementation of the CCR Regulations

Given the systemic problems noted above in ADEM's CCR permits related to the groundwater monitoring, corrective action and closure requirements, EPA is proposing to determine that ADEM's implementation of its permit program is resulting in a State program that is notably less protective than the Federal CCR regulations. First, ADEM's permits allow closure with waste in place in unlined surface impoundments, without requiring any, or sufficient, controls to prevent groundwater from flowing in and out of CCR in the units indefinitely. In such circumstances, the permit will allow ongoing contamination of groundwater from CCR impoundments. Second, ADEM's permits do not require Permittees to achieve compliance with the groundwater monitoring regulations. The State-issued permits discussed in this notice approve groundwater monitoring networks that are insufficient to accurately determine if a unit is leaking. Finally, ADEM's permits are inadequate related to the implementation of the corrective action requirements because they allow facilities to delay effective responses to contaminant releases that may pose a risk to human health and the environment. Compounding this problem is the fact that the groundwater monitoring networks are insufficient and that means there may be additional unmonitored releases are occurring.

Ultimately, Alabama's CCR permit program Application would not ''require each coal combustion residuals unit located in the State to achieve compliance with the applicable [Federal or other equally protective State] criteria.'' 42 U.S.C. 6945(d)(1)(B). Therefore, EPA is proposing this denial of Alabama's CCR permit program Application.

V. Proposed Action

EPA has preliminarily determined that the Alabama CCR permit program does not meet the statutory standard for approval. Therefore, in accordance with 42 U.S.C. 6945(d), EPA is proposing to deny the Alabama CCR permit program.

Michael S. Regan,

Administrator.

[FR Doc. 2023–17023 Filed 8–11–23; 8:45 am]

BILLING CODE 6560–50–P