# Compliance with the Closure Performance Standard Required by Coal Combustion Residuals (CCR) Rule
# Plant Yates Ash Pond (AP) B' and 3

The objective of this Report is to supplement the closure permit application submitted to the Georgia Environmental Protection Division (GA EPD) by Georgia Power Company (Georgia Power). This Report further demonstrates that the closure method selected for Plant Yates Ash Pond B' and 3 Ash Management Area (AMA) complies with the closure performance standards of the Federal and State CCR regulations (i.e., CCR Rule).

## I. Introduction to the regulated unit, closure method, and conceptual site model

### A. Regulated Unit and Site Location

As detailed in the Plant Yates Ash Management Area (AMA), Solid Waste Permit Application, Part A, Permit Documents, Section 1, Introduction, Plant Yates is located at 708 Dyer Road, on approximately 2,400 acres on the east bank of the Chattahoochee River in Coweta County, Georgia, approximately eight miles northwest of the city of Newnan. Plant Yates originally operated seven coal-fired steam generating units. Five of the units were retired in 2015 and the two largest units were converted from coal to natural gas and currently operate as a natural gas electric generation plant. During coal-fired operations, the plant utilized a series of permitted surface impoundments (NPDES Permit No. GA0001473) that functioned as a multi-CCR unit wastewater treatment system. Five of the generating units were retired in 2015 and the two largest were converted from coal-fired to natural gas and currently operate as a natural gas electric generating units.

Per the Closure Plan section of the CCR Permit Application (Part A, Section 7, 1 General), the AMA permit boundary encompasses AP-A, AP-B, AP-B', and AP-3, and the closure of the AMA consists of closure by removal for AP-A and AP-B, with consolidation of CCR from those impoundments to AP-B' and AP-3, which make up the footprint of the AMA consolidation area. Upon completion of CCR removal activity, the consolidated footprint within the AMA will be closed in place. Additionally, some CCR from AP-1 and AP-A has been removed and consolidated within the AMA consolidated footprint and R6. Removal certifications for the closure of AP-1 and AP-A were submitted to GA EPD in November 2019 and January 2021, respectively, and the GA EPD acknowledged complete CCR removal for AP-1 in November of 2020 and March 2021 for AP-A. CCR from the ongoing closure by removal project for AP-2 is also being consolidated to the AMA. The inactive R6 CCR Landfill is currently being closed in place under a separate permit application and is located immediately west of the AMA.

### B. Summary of Closure Method

Per the Closure Plan section of the CCR Permit Application (Part A, Section 7, 6 Final Cover System), CCR consolidated within the AMA is moisture conditioned (as necessary), spread, and compacted prior to capping with the final cover system. The final cover system will consist of a prepared subgrade overlain with ClosureTurf®. The ClosureTurf® final cover system will consist of a 50 mil Linear Low-density Polyethylene (LLDPE) or High-density Polyethylene (HDPE) MicroDrain® geomembrane covered by an engineered synthetic turf and a specified infill material. The specified infill material will be a sand infill placed on the top of the ClosureTurf ® and then treated with Armorfill® on the side slopes and ditches. A detail of the final cover system is provided in the Closure Drawings.

An advanced engineering method (AEM), in the form of a deep subsurface drain system to serve as a hydraulic conveyance, has been installed downgradient of the AMA within the R6 surface channel alignment north and northeast of the R6 landfill. The subsurface drain AEM, approximately 4 feet wide and consisting of 2,800 linear feet of horizontal perforated/slotted 8-inch- HDPE (ADS-brand) pipe, was installed between July 8 and December 6, 2019. The deep subsurface drain is designed to lower and sustain a lowered groundwater elevation relative to the elevation of the CCR closed in place. In general, the bottom of the subsurface drain AEM rests on the surface of the bedrock, allowing trenched sidewalls to intercept the transition zone between the bedrock and the upper saprolitic soils. The AEM includes a groundwater extraction system consisting of 12 to 15 pneumatic pumps that will remove groundwater from the subsurface drain. The extracted water will be managed in accordance with the Site's permitting requirements.

### C. Conceptual Site Model

The Conceptual Site Model (CSM) is presented in the Hydrogeological Assessment Report (CCR Permit Application, Part B, Section 1), and describes the geologic model elements and the hydrogeologic elements (groundwater and surface water) for the units.

The CSM identifies the bedrock as Ordovician-age, Dadeville Complex of the Inner Piedmont Physiographic Province. The rocks are characterized by igneous and metamorphic units such as granitic/migmatitic gneiss, interlayered biotite gneiss/amphibolite and muscovite schist. The overlying residuum, characterized by silts and clays, is from the weathering of the parent bedrock and constitute the unconsolidated uppermost aquifer at the site. The regional thrust faulting in the area of the facility is defined as; Ordovician-age that is the boundary between the Dadeville Complex and the Brevard Zone. The folding and joint sets are both parallel and perpendicular to foliation.

The facility lies within the Middle Chattahoochee River basin of the Piedmont Physiographic Province, which characteristically has moderate rolling hills that are steeply cut with surface water drainages. Generally, in this region, and specifically at this site, the depth to groundwater is variable depending on the topography. The shallowest water-bearing unit at the site occurs at the soil/rock interface and is generally unconfined. Deeper groundwater flow is within the fractured bedrock and along discontinuities. Groundwater flow direction in the upper aquifer is influenced by topography and by naturally occurring and man-made drainage features. Groundwater flow across the site is generally from east to west.

## II. CCR Rule performance standards

### A. Post-closure infiltration of liquids performance standard of 40 C.F.R. § 257.102(d)(1)(i).

This provision requires the final cover system to control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.

**Post- Closure Infiltration**

The United States Geologic Survey[1] defines infiltration as the movement of water from the land surface into the subsurface. Infiltration is further defined in the text titled Groundwater[2] (Freeze and Cherry) as "the entry into the soil of water made available at the ground surface, together with the associated flow away from the ground surface within the unsaturated zone." EPA also says that infiltration is how

[1] https://www.usgs.gov/special-topic/water-science-school/science/dictionary-water-terms?qt-science_center_objects=0#qt-science_center_objects

[2] Freeze and Cherry, Groundwater 1979

"water applied to the soil surface through rainfall and irrigation events subsequently enters the soil" and that "this term can be used in the estimation of water available for downward percolation..."[3]

Considering the above technical definitions of infiltration, to meet the performance standard, the engineered final cover system must control, minimize, or eliminate the infiltration of liquids into the CCR to the maximum extent feasible. The final cover system will consist of a 50 mil LLDPE or HDPE MicroDrain® geomembrane having a permeability far less than the maximum permissible permeability allowed under 102(d)(3)(i)(A) of $1 \times 10^{-5}$ cm/sec. The geomembrane will be overlain by ClosureTurf® and a minimum 0.5-inch thickness sand infill such that the final cover system will outperform the reduction in infiltration that would be achieved by the infiltration layer specified in 102(d)(3)(i)(B). See CCR Permit Application, Part B, Engineering Report, Section 3. The hydraulic performance of the proposed ClosureTurf™ final cover system was evaluated using the Hydrologic Evaluation for Landfill Performance (HELP) Model resulting in an annual average infiltration rate 1,400 times less than that of the prescriptive minimum final cover system rate demonstrating that the ClosureTurf™ final cover system effectively reduces and limits infiltration into the CCR compared to the prescriptive minimum final cover. The final cover system will also extend beyond CCR placement and be secured with a perimeter anchor trench. See CCR Permit Application, Part A, Closure Drawings. The geomembrane will isolate the CCR from potential sources of infiltration and essentially eliminate infiltration into the CCR relative to existing conditions as required by 40 C.F.R. § 257.102(d)(1)(i). See CCR Permit Application, Part A, Closure Plan, Section 6. Additional benefits of the ClosureTurf® final cover system are listed in CCR Permit Application, Part A, Closure Plan, Section 6.

The engineered final cover system described in the permit application will: (i) eliminate ponding of water on top of the consolidated and covered CCR through grading and stormwater conveyance features; and (ii) virtually eliminate infiltration of precipitation into the underlying CCR by installation of an essentially impermeable geomembrane as part of the final cover system. The ClosureTurf® final cover system presented in the closure permit application shows how it will meet the baseline (i.e., prescriptive) requirements of 40 C.F.R. § 257.102(d)(3). The cover system will be installed over the entire Consolidation Area, eliminating direct exposure of CCR to precipitation and other potential sources of infiltration.

In addition, the final cover system will be constructed with final slopes promoting positive drainage to the stormwater conveyance systems. The design grades within the Consolidation Area accounted for estimated volumes of CCR to be consolidated, as presented in Section 7 (Rev. 1 Closure Plan) of Part A of the Closure Permit Application. All designed grading was developed with the use of Autodesk AutoCAD Civil 3D grading software. Final cover will have slopes ranging from 3% minimum to 25% maximum. All stormwater conveyance systems are designed to carry the stormwater away from the final cover system, further controlling, minimizing, and eliminating the ability of conveyed stormwater to infiltrate the closed CCR unit. See CCR Permit Application, Part B, Engineering Report, Section 2. Open channels are constructed to be non-erosive, with no sediment deposition. The velocity of each section of the inside and outside perimeter ditches surrounding AMA was analyzed using the Hydraflow Express Extension for Autodesk AutoCAD Civil 3D.

The permit application Construction Quality Assurance (CQA) Plan summarizes the testing and quality assurance requirements ensuring that the components of the final cover system meet design specifications and are installed properly.

The above section briefly describes measures to ensure the infiltration performance standard is met, as required by 40 C.F.R. § 257.102(d)(1)(i). See the GA EPD permit application for a more detailed account.

[3] https://www.epa.gov/water-research/infiltration-models

**Lateral migration**

While controlling, minimizing, or eliminating lateral migration of groundwater is not a requirement of the performance standard because lateral migration is, by definition, not infiltration, the selected closure method will control and minimize lateral migration from the AMA to the maximum extent feasible as shown by the following lines of evidence:

- The Hydrogeological Assessment Report for Plant Yates (HAR Rev-01, Part B Section 1 of the Permit Application) presents a groundwater flow model, which was constructed to simulate hydrogeologic conditions at the site. Following groundwater model calibration, the proposed closure plan was incorporated to build a predictive groundwater flow model. The predictive model incorporated the layout of the R6 landfill and the planned layout of the AMA. As reported in the HAR Rev-01, results of the modeling predict that the final closure system meaningfully lowers the groundwater table elevation within the AMA relative to the elevation of the CCR closed in place, as compared to pre-closure conditions. As a result, a lower groundwater table will reduce the potential for lateral migration of groundwater relative to the CCR.

- The Addendum for the Groundwater Modeling Report for Plant Yates was produced to incorporate the AEM into the site groundwater flow model. The supplemental modeling indicates that the AEM, in the form of a deep subsurface drain outfitted with a groundwater collection system, is expected to further lower the groundwater table and capture lateral flow of groundwater in the vicinity and downgradient of the AMA.

- Operation of the AEM as a component of the overall closure approach is anticipated to result in an approximate decrease in groundwater elevation of over 20 feet near the subsurface drain feature which tapers to less than 1 foot in more distant areas within the footprint of the AMA. The effect of the decrease in the groundwater elevation translates into a reduction in the volume of CCR present below the existing potentiometric surface.

**Post-closure releases of CCR, leachate, or contaminated run-off**

The final cover system will control, minimize, and essentially eliminate releases of CCR to the ground, to surface waters, and to the atmosphere as required by the performance standard in 40 C.F.R. §257.102(d)(1)(i). This is accomplished by using an essentially impermeable geomembrane cover with a permeability less than the maximum permissible permeability required by 40 C.F.R. § 257.102(d)(3)(i)(A). The final cover system will be installed over the entire consolidated AMA. See CCR Permit Application, Part A, Closure Plan, Section 6.

The defined term "groundwater" is not included among the media listed in this performance standard. Matters related to potential CCR groundwater impacts are instead regulated by other parts of the CCR Rule. Thus, the basis for evaluating compliance with this performance standard is the degree to which the closure design controls, minimizes, or eliminates these releases to the ground, surface waters, and the atmosphere.

The geomembrane will cap the CCR, preventing its release to the ground and eliminating potential CCR contact with surface waters and the atmosphere. For example, the surface water control system will promote positive drainage for surface water runoff from the cover system to stormwater conveyance systems. Also, surface water conveyance structures will be lined to resist erosion during the design storm event and to minimize surface water infiltration. See CCR Permit Application, Part A, Closure Plan, Section 6.

The stability of the AMA is demonstrated in the *Slope Stability Analysis* calculation package. See CCR Permit Application, Part B, Section 3. Critical sections of the AMA were analyzed to ensure it meets or exceeds the design requirements for a static-short term factor of safety (FoS) greater than 1.30, long-term static FoS greater than 1.50, and seismic FoS greater than 1.00.

In addition, the fugitive dust control plan identifies and describes the CCR fugitive dust control measures that Georgia Power is using to minimize CCR from becoming airborne during closure activities. See CCR Permit Application, Part A, Closure Plan, Section 5.2.

With the design of the final cover system, along with the operating requirements of the *Closure Plan* and testing and quality assurance requirements of the *CQA Plan* to ensure components meet the design specifications, there will not be a pathway for the release of CCR, leachate, or contaminated run-off to the ground, surface water, or atmosphere.

The above section briefly describes measures to ensure the post-closure release performance standard is met, as required by 40 C.F.R. § 257.102(d)(1)(i). See the GA EPD permit application for a more detailed account.

### B. Future impoundment of water, sediment, or slurry, per 40 C.F.R. § 257.102(d)(1)(ii).

The final cover system must be designed to "preclude the probability of future impoundment of water, sediment, or slurry." See 40 C.F.R. § 257.102(b)(iii); (d)(1)(ii). The performance standard is met if the closure method precludes the probability of future surface accumulation of water, sediment, or slurry. A surface impoundment typically means a natural or man-made depression or excavation in earthen materials designed to hold liquid at the surface. This performance standard is based on Mine Safety and Health Administration (MSHA) regulation for closures of impoundments under MSHA jurisdiction [75 Fed. Reg. at 35,128 & 35,208 (June 21, 2010)]. According to MSHA, capping meets the requirement to "preclude the probability of future impoundment of water, sediment, or slurry." The MSHA's Coal Mine Impoundment Inspection and Plan Review Handbook states that this standard is typically met by breaching the dam or capping. EPA also indicates that the impoundment performance standard is met by precluding future surface accumulations through final cover system grades that promote surface water runoff [80 Fed. Reg. at 21,411]. Understanding "future impoundment" as referring to surface accumulation is also consistent with the definition of a "CCR Surface Impoundment" as "a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids".

Considering the above definitions, construction of the final cover system will preclude the probability of future impoundment of water, sediment, or slurry by providing positive drainage while resisting erosion. The final cover system will control and essentially eliminate infiltration of liquids into the CCR so the future formation and impoundment of slurry will be precluded as required by 40 C.F.R. § 257.102(d)(1)(i). The specified infill material will be sand infill on the top of the closure cap and sand infill treated with Armorfill® on the side slopes and ditches. Thus, the future formation and impoundment of sediment will be precluded. A more thorough description of the stormwater management system is presented in the *Final Cover Surface Water Management* section of the *Engineering Report* calculation package.

Furthermore, all CCR consolidated within the AMA will have been moisture conditioned (as necessary), spread, compacted, and will be capped with the ClosureTurf® final cover system. Final cover grades will range from 3 percent to 25 percent to provide positive drainage of surface water. Finally, a surface water control system that promotes positive drainage for surface water runoff from the closure cap to the perimeter stormwater conveyance systems will preclude the probability of future impoundment of water, sediment, or slurry. For grading plans pertaining to the closure of AMA see CCR Permit Application, Part A, Closure Drawings.

The surface water management system is designed to meet the criteria identified from the following documents as well as design considerations based on general engineering practices:

- "Manual for Erosion and Sediment Control in Georgia" (Green Book) [Georgia Soil and Water Conservation Commission (GSWCC), 2016];
- "ClosureTurf® Design Guidelines Manual" (ClosureTurf® Manual) [WatershedGeo, 2017]; and
- The CCR Rule.

The required CCR consolidation properties are specified in the Construction Quality Assurance Plan and require a maximum lift thickness of 12 inches and compaction of 95 percent along with third party observation and testing. The compaction standards of the CCR will minimize settlement of the final cover system and thereby further preclude the probability of future impoundment of water or other materials on the final cover system. See CCR Permit Application, Part A, Construction Quality Assurance Plan, Section 3.

The final cover system was also evaluated for differential settlement which could lead to impoundment of water. The settlement was calculated along a critical cross section including the top of the final cover system in which short-term primary compression and long-term secondary compression of the consolidated CCR and the native soils were evaluated. The post settlement elevation of the final cover system confirmed that the final grades maintain positive drainage. See CCR Permit Application, Part B, Engineering Report, Section 4.

In addition, the ClosureTurf® final cover system was successfully tested in the rainfall simulator at TRI Environmental's Erosion Control Laboratory. ClosureTurf® was also successfully tested in accordance with ASTM D6459-Standard Test Method for determination of Rolled Erosion Controlled Product Performance in Protecting Hillslopes from Rainfall-Induced Erosions. See CCR Permit Application, Part A, Engineering Report, Section 5. Surface water conveyance structures will be lined to resist erosion during the design storm event. Stormwater modeling prepared by Schnabel Engineering included as an appendix to the Engineering Report (Permit Application Part B) that includes the evaluation of the perimeter ditches, culverts, and ponds using HEC-HMS 9TR-55 methodology) and HEC-RAS to demonstrate management of the 100-Year storm event. See CCR Permit Application, Part A, Closure Plan, Section 6.

The above section briefly describes measures to ensure the requirement to preclude the probability of future impoundment of water, sediment, or slurry are met, as required by 40 C.F.R. § 257.102(d)(1)(ii). See the GA EPD permit application for a more detailed account.

### C. Slope stability of final cover system 40 C.F.R. § 257.102(d)(1)(iii).

The AMA closure design includes measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period. Stability analyses conducted as part of the design of the AMA closure are presented in the *Global Slope*

*Stability* calculation package, *Final Cover Settlement* calculation package, and *Veneer Stability* calculation package within the *Engineering Report*.

The closure method provides for major slope stability by ensuring a consistent and conservative final cover footprint during the closure and post-closure care periods, in accordance with this performance standard. As stated above the CCR placement specification in the CQA Plan require a maximum lift thickness of 12 inches and compaction of 95 percent along with third party observation and testing. This ensures a consistent consolidated footprint. The final cover grades will have a maximum slope of 25% with built in benches every 24 vertical feet, and a maximum fill height of less than 110-feet above ground elevation. Each contributing to and providing major slope stability in the final closed configuration.

The stability of the proposed final configuration of the AMA was evaluated using the computer program Slide2, version 9.006 {Rocscience,2020}. The analysis showed that the geometry of the critical cross sections well exceeded the recommended factor of safety for final cover slope stability. See CCR Permit Application, Part B, Engineering Report, Section 3.

The above section briefly describes the manner in which the AMA closure design includes measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care periods, as required by 40 C.F.R. § 257.102(d)(1)(ii). See the GA EPD permit application for a more detailed account.

### D. Minimize the need for further maintenance 40 C.F.R. § 257.102(d)(1)(iv).

The need for further maintenance of the AMA is minimized by the use of final slopes that promote positive drainage to the stormwater conveyance systems, the erosion resistant lining of those conveyance systems, the use of ClosureTurf® as the final cover, the 3-25% grading, and the Construction Quality Assurance Plan requirements for CCR consolidated into the AMA, all of which are described above, along with their benefits. The engineering report denotes that inside perimeter ditches will be lined with ClosureTurf™ with ArmorFill while outside perimeter ditches (evaluated in Engineering report Section 2.5) will be lined with Curlex II matting, to minimize erosion potential, as provided in Part B of Permit Application of the Engineering Report.

The AEM will be configured with a pneumatic AutoPump® system as opposed to electric, submersible pumps. The pneumatic pump system offers several advantages such as reduced maintenance and reduced downtime over conventional electric groundwater extraction systems.

The above section briefly describes that the AMA closure design satisfies the CCR Rule Requirement to minimize the need for future maintenance, as required by 40 C.F.R. § 257.102(d)(1)(iv). See the GA EPD permit application for a more detailed account.

### E. Completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices, per 40 C.F.R. § 257.102(d)(1)(v).

The closure of the AMA is ongoing and is to be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices. Table 1 on the following page presents the anticipated closure schedule, as presented in the Closure Plan. The order and duration of individual closure activities will allow for closure construction in the shortest time possible consistent with recognized and generally accepted good engineering practices.

**TABLE 1 – ANTICIPATED CLOSURE SCHEDULE FOR THE ASH MANAGEMENT AREA**

| Closure Activity | Year 1 | | Year 2 | | Year 3 | | Year 4 | | Year 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Notify GA EPD of intent to close | | | | | | | | | | |
| Provide GA EPD with date of final CCR | | | | | | | | | | |
| Prepare accurate legal description of permit boundary | | | | | | | | | | |
| Prepare and develop the laydown areas | | | | | | | | | | |
| Install and maintain erosion and sediment control systems for disturbed areas | | | | | | | | | | |
| Provide dust control for earthwork and CCR handling operations. Maintain for project duration and until the area reaches final stabilization | | | | | | | | | | |
| CCR excavation and dewatering | | | | | | | | | | |
| Compact and place CCR in lifts in the AMA | | | | | | | | | | |
| Installation of clean water ditch around the AMA | | | | | | | | | | |
| Topsoil and permanent seeding will be applied to all areas that are closure by removal | | | | | | | | | | |
| Final grading and installation of the ClosureTurf® cover system on the consolidated CCR footprint | | | | | | | | | | |
| Conduct site re-vegetation and restoration | | | | | | | | | | |
| Prepare accurate legal description of final CCR limit of waste boundary | | | | | | | | | | |
| Provide the closure report to the Director | | | | | | | | | | |
| Submit to the Director confirmation that the notation on the property deed has been recorded | | | | | | | | | | |

## F. Stability for the final cover system, per 40 C.F.R. § 257.102(d)(2).

40 C.F.R. § 257.102(d)(2) provides that the owner or operator of a CCR surface impoundment must meet the drainage and stabilization requirements of subsections (d)(2)(i) and (ii), as applicable, prior to installing the final cover system required under paragraph (d)(3). This work is required for the purpose of ensuring that the final cover system subgrade will provide sufficient support for the cover system. Specifically, the performance standard calls for the elimination of free liquids by removing liquid waste or solidifying the remaining wastes and waste residues and stabilizing the remaining wastes to a sufficient degree to support the final cover system. Consistent with standard good engineering practices, the performance standard requires the removal of standing water and sufficient additional liquids to, in conjunction with other stabilization efforts, ensure the stability of the final cover system. Prior to installing the AMA final cover system, in accordance with 40 C.F.R. § 257.102(d)(2), free liquids will be eliminated by removing liquid wastes. The remaining wastes will be stabilized as necessary to support the final cover system.

**Removal of free liquids**

Free liquids are defined as "liquids that readily separate from the solid portion of waste under ambient temperature and pressure." In the CCR Rule, the requirement to eliminate free liquids by removing liquid wastes is focused on eliminating ponded water. Removal of ponded water facilitates the proper installation of the final cover system. EPA has also identified other benefits of removing ponded water. Specifically, the EPA has stated: "[d]uring operations, free liquids that are ponded in the impoundment create a strong hydraulic head that acts to increase infiltration through the base of the impoundment. The removal of free liquids and capping during closure reduces the hydraulic head...." [see EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals, Appendix K at K-1 (Dec. 2014)]. Unlike ponded water, groundwater, for example, is not considered free liquid as it is defined separately from free liquids as "water below the land surface in a zone of saturation" [40 C.F.R. § 257.53].

Per subsection (d)(2)(i), the closure method eliminates free liquids by removing liquid wastes. A detailed "Dewatering Plan" was approved by GA EPD's Watershed Protection Branch. In conjunction with the other stability steps described below, implementation of the Dewatering Plan eliminates standing water and removes additional CCR contact water via rim ditches and well points to support the stability of the final cover system. See CCR Permit Application, Part A, Closure Plan, Section 5.4.

**Stabilization sufficient to support final cover**

Subsection (d)(2)(ii) is satisfied because, along with the elimination of free liquids as described above, the closure method will stabilize the remaining CCR sufficiently to support the final cover system. As described above, all CCR consolidated within the AMA is moisture conditioned (as necessary), spread, compacted, and will be capped with the ClosureTurf® final cover system. The required CCR fill properties are specified in the Construction Quality Assurance Plan and require a maximum lift thickness of 12 inches and compaction of 95 percent along with third party observation and testing. The required compaction standards of the CCR will provide stabilization to support the final cover system and prevent settlement or impoundment of water on the final cover system. See CCR Permit Application, Part A, Construction Quality Assurance Plan, Section 3.

The stability of the proposed final configuration of the AMA was evaluated using the computer program Slide2, version 9.006 {Rocscience,2020}. The analysis showed that the geometry of the critical cross sections well exceeded the recommended factor of safety for final cover slope stability. See CCR Permit Application, Part B, Engineering Report, Section 3.

The above section briefly describes that the AMA closure design satisfies the CCR Rule Requirement for drainage and stabilization prior to installation of the final cover system, 40 C.F.R. § 257.102(d)(2). See the GA EPD permit application for a more detailed account.

### G. Final cover system Per 40 C.F.R. § 257.102(d)(3)

The final cover system is of an alternate design that meets the requirements of paragraph 102(d)(3)(ii)(A). The final cover system will consist of a 50 mil LLDPE or HDPE MicroDrain® geomembrane having a permeability less than the maximum permissible permeability required under 40 C.F.R. § 102(d)(3)(i)(A) of $1 \times 10^{-5}$ cm/sec. The geomembrane will be overlain by ClosureTurf® such that the final cover system will outperform the reduction in infiltration that would be achieved by the infiltration layer specified in 102(d)(3)(i)(B). See CCR Permit Application, Part B, Engineering Report, Section 3.

The final cover system meets the requirements of paragraph 102(d)(3)(ii)(B) because the ClosureTurf® final cover system is proven to provide better protection from wind and water erosion than the erosion layer described at 102(d)(3)(i)(C). See CCR Permit Application, Part B, Engineering Report, Section 5.

The final cover system meets the requirements of paragraph 102(d)(3)(ii)(C) due to a design which results in reduced settling and subsidence while providing flexibility to handle minimal settling and subsidence while maintaining positive drainage. As described above, all CCR consolidated within the AMA is moisture conditioned (as necessary), spread, compacted, and will be capped with the flexible ClosureTurf® final cover system. Final cover grades will range from 3 percent to 25 percent to provide positive drainage of surface water. The required CCR fill properties are specified in the Construction Quality Assurance Plan and require a maximum lift thickness of 12 inches and compaction of 95 percent along with third party observation, testing and certification. The construction standards required by the Construction Quality Assurance Plan will minimize settlement and subsidence and the final cover slopes will accommodate anticipated settlements. See CCR Permit Application, Part A, Construction Quality Assurance Plan, Section 3 and CCR Permit Application, Part A, Closure Drawings.

## III. Professional Engineer Certification

As required by 40 C.F.R. § 257.102(b)(4), a Georgia-registered professional engineer, has certified that the design in the Permit Application meets the requirements of the CCR Rule. Additionally, the certification is reaffirmed as provided by the engineer stamp on this report.

*"I certify that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person who manages the system and those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I do hereby certify that the requirements of the United States Environmental Protection Agency Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (40 C.F.R. Subpart D) and Georgia Environmental Protection Division Solid Waste Rule for Management of Coal Combustion Residuals (391-3-4-.10) have been met."*

**ATTEST:**

GEORGIA REGISTERED No. 27467 PROFESSIONAL ENGINEER RICHARD T. DEASON

10/21/21

*Richard Deason, PE*
*President*
*Atlantic Coast Consulting, Inc.*
*For Closure and Cover Design*

GEORGIA REGISTERED No. PE038887 PROFESSIONAL ENGINEER JAMES M. KIRLIN

10/21/21

James M. Kirlin, PE
Project Engineer
*TRC Engineers, Inc.*
*For Advanced Engineering Measure (AEM)*

COA LICENSE NO. PEF004919
EXP DATE 6/30/22