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CHOLLA POWER PLANT FLY ASH POND – CCR Closure Plan

Amendment 3

AECOM Project No. 60710305

July 31, 2025

Delivering a better world

Prepared for:

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CHOLLA POWER PLANT
CLOSURE PLAN §257.102(b)
FLY ASH POND
Amendment 3 (July 31, 2025)

Closure Plan Contents §257.102(b)(1)

The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section.

Prepared for Arizona Public Service by AECOM Technical Services, Inc. (AECOM)	
CLOSURE PLAN AMENDMENT HISTORY	
Initial	August 30, 2016
Amendment 1	October 2, 2020 – Updated regulatory framework information and dates
Amendment 2	November 23, 2020 – Deleted reference to closure of Sedimentation Pond being performed concurrently with closure of Fly Ash Pond. Added reference to “closure by removal” of CCR-impacted materials within the reservoir area to a consolidated CCR solids delta for “closure in place”. Added new Figure 1, renumbered remaining figure numbers.
Amendment 3	July 31, 2025 – Updated details of plan for “closure in place,” replaced upstream stormwater diversion channel with upstream stormwater evaporation basins, updated volume of stored CCR, and replaced all Figures. Adjusted most content to reflect improved understanding of goals and to comply with changes to the CCR Rule introduced by the United States Environmental Protection Agency’s (USEPA’s) “Legacy Coal Combustion Residuals Surface Impoundments and CCR Management Units” rulemaking. Revised

	Closure Schedule to comply with the “Completion of closure activities” provisions of §257.102 (f)(1)(ii) and removed references to the “Site-specific alternative deadlines to initiate closure of CCR surface impoundments” provisions of §257.103(f)(2).
SITE INFORMATION	
Site Name / Address	Cholla Power Plant / 4801 I-40 Frontage Road, Joseph City, AZ 86032
Owner Name / Address	Arizona Public Service / 400 North 5th Street, Phoenix, AZ 85004
CCR Unit	Fly Ash Pond
Location	36° 55′ 60″ N, 110° 15′ 51″ W
Reason for Initiating Closure	Final receipt of CCR
Final Cover System Type	Evapotranspirative Cover
Closure Method	Closure will primarily be achieved by leaving CCR in place although some CCR and CCR-impacted soils will be closed by removal and consolidation.
CLOSURE PLAN DESCRIPTION	
§257.102(b) **Written closure plan** —	
(1) **Content of the plan.** The owner or operator of a CCR unit must prepare a written closure plan that describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section.	
§257.102(b)(1)(i) – A narrative description of how the CCR unit will be closed in accordance with this section.	The Fly Ash Pond (FAP) is an existing Coal Combustion Residual (CCR) impoundment constructed for the storage of fly ash and flue gas desulfurization (FGD) solids generated by the Cholla Power Plant. The FAP was placed into service in 1978 and received sluiced CCR from the plant until 2025. The FAP consists of an engineered earthen embankment, an impounded pond of free (standing) water (principally sluice water), and an impounded delta of variably

	saturated CCR solids, both above and below the free water pond level. Figures 1 and 2 depict the Grading Concept Plan and Idealized Longitudinal Cross-Section views, respectively, of the FAP and present the key areas and components, and their relative positions, of the planned closure of the FAP. The FAP is regulated by the United States Environmental Protection Agency per 40 Code of Federal Regulation (CFR) §§257 and 261.4. The FAP embankment dam is regulated by the Arizona Department of Water Resources (ADWR) Dam Safety Program (ADWR Dam #09.28). The FAP has a maximum permitted (by ADWR) capacity of approximately 18,000 acre-feet (af) but contained approximately 9,400 af, or 15,200,000 cubic yards (cy), of CCR when discharges to the unit ceased in June 2025. Elevations presented in this Closure Plan are referenced relative to the National Geodetic Vertical Datum of 1929 (NGVD 29), which was used for the original construction documentation for the FAP and most of the historic dam performance monitoring data sets. The final closure construction surveys and documentation are referenced relative to the more recent North American Vertical Datum of 1988 (NAVD 88). At this site, the reported elevation of a given point relative to NAVD 88 is 2.57 feet (ft) higher than the reported elevation relative to NGVD29. The design elevation of the crest of the dam is elevation (El.) 5120 ft above mean sea level (amsl). The maximum permitted (by

	ADWR) operating impoundment level is El. 5114 ft amsl. As of the last aerial topographic survey in 2023, the highest elevation of ash on the delta was approximately 5103 ft amsl. As of June 2025, the free water elevation was 5080 ft amsl. The high water mark within the pond, which occurred in 2015, was approximately El. 5100 ft amsl and corresponded to a maximum areal extent of CCR impoundment of 310 acres, as illustrated on Figure 1. The total area contacted by CCR is 355 acres, which includes the impounded area of 310 acres and 36 acres of an eastern hillside area, located between the El. 5100 and 5114.0 ft amsl ground surface contours, on which 800,000 cy of dry CCR (fly ash and CCR-impacted soil) removed from an area of the Plant known as Ash Pond 1 and 1,900,000 cy of dry CCR (bottom ash) removed from the Bottom Ash Monofill have been stockpiled. The stockpiled CCR will provide a source of relatively dry, lightweight fill for stabilizing wetter or softer CCR deposits within the pond. The sub areas are delineated in Figure 1. The impounded CCR solids delta within the FAP will be closed by: 1. Removing and disposing of free water from the free water pond. 2. Removing and disposing of drainable pore water from the impounded CCR solids. 3. Removing, consolidating, and regrading material within the CCR solids delta to design subgrades including incorporation of: a. the thinner CCR deposits and CCR-impacted native soils

	from the northern edges of the free water pond; and b. Stockpiled dry CCR on the eastern hillside. 4. Constructing four (4) large, lined stormwater evaporation basins on the upgradient side of the closed pond to capture: a. unimpacted (i.e., non-contact) run-on from tributary natural drainages; and b. unimpacted run-off from the closure cap. 5. Constructing a perimeter collection ditch to collect and transport unimpacted run-off from the final cover system and adjacent natural hillsides to the closest stormwater evaporation basin. 6. Constructing a multi-layered soil evapotranspirative (ET) soil final cover system over the CCR solids delta to close-in-place the CCR.
§257.102(b)(1)(ii) – If closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with paragraph (c) of this section.	Applicable for a minor portion (102 acres) of the FAP, comprising 66 acres of the upstream limits of the impounded CCR area and 36 acres of imported dry fly ash and bottom ash stockpiled on the eastern hillside of the impoundment. These two areas will be closed by removal and consolidation of CCR within the grading fill required for the closure in place portion of the pond, in accordance with a removal design that incorporates the requirements of §257.102(c) as described in response to that section in this document. After the free water pond is dewatered, the remaining exposed northern edge of the impounded CCR area, expected to consist of a thin layer of CCR sediment and a

	thickness of several feet of CCR precipitates and evaporites, will be removed and consolidated within the grading fill for the closure in place portion of the pond. The stockpiled CCR on the eastern hillside area will similarly be removed and incorporated into the closure in place portion of the pond as part of the closure process. Both these regions will be decontaminated by physical removal of CCR and CCR-impacted soil to a visual standard, followed by sampling and analysis verification of the absence of remaining surficial impacts as described in the response to §257.102(c) below.
§257.102(b)(1)(iii) – If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section.	Applicable for the major portion (253 acres) of the FAP, as illustrated on Figure 1 (identified as the area underlying the final cover system). The CCR solids delta area of the FAP, including CCR materials consolidated from the closure by removal areas, will be closed by covering the CCR in place. The closure has been designed and will be constructed to achieve the requirements of §257.102(d). The site is in a semi-arid to arid climate with precipitation on the order of 7 inches per year and evaporation losses (pan evaporation rate) on the order of 58 inches per year. Therefore, this environment is appropriate for using an evapotranspirative (“water-balance”) soil final cover system that relies on the net water losing climate to reduce infiltration into the CCR subgrade from the final cover system. The final cover system will be installed in direct contact with a sloped subgrade of CCR or other fill to achieve final subgrade elevations designed for positive drainage of storm water. An alternative

	"evapotranspirative" (ET) soil final cover system, designed in accordance with requirements of §257.102(d)(3)(ii), will consist of the following (from bottom to top): 1) 12 inches of stockpiled bottom ash, serving as a capillary break. 2) 12 inches of compacted clay, serving as an infiltration barrier. 3) 24 inches of compacted earthen material, serving as an infiltration layer. 4) 7 inches of blended gravel and soil capable of resisting erosion and seeded with and capable of sustaining native plant growth, serving as an erosion layer. Stockpiled bottom ash (from the eastern hillside of the impoundment) and select earth materials will be placed, graded, and compacted in layers to meet the specified properties, thicknesses, and densities. The erosion layer will be seeded with native vegetation types. The outside slopes of the existing FAP embankment dam will not be regraded as the existing outside slopes already have erosion protection and previous geotechnical analyses have shown the slopes to be stable in their current condition. All portions of the final cover system will be graded to drain non-contact run-off to one of four upgradient stormwater geosynthetic-lined stormwater evaporation basins. The basins are sized to contain on-site and off-site run-off, including from the adjacent natural hillsides and upstream drainages, from the Probable Maximum Flood (PMF).

	They are closed systems without means for uncontrolled discharge.
§257.102(c) ***Closure by removal of CCR.***	
§257.102(c) *Closure by removal of CCR.* An owner or operator that elects to close a CCR unit by-removal of CCR must follow the procedures specified in either paragraph (c)(1) or (2) of this section. Closure by removal is complete when CCR has been removed; any areas affected by releases from the CCR unit have been removed or decontaminated; and groundwater monitoring concentrations of the constituents listed in appendix IV to this part do not exceed groundwater protection standards established pursuant to §257.95(h). Removal and decontamination activities include removing all CCR from the unit, CCR mixed with soils, and CCR included in berms, liners, or other unit structures, and removing or decontaminating all areas affected by releases from the CCR unit.	Applicable for a minor portion (102 acres) of the FAP, comprising 66 acres of the upstream limits of the impounded CCR area and 36 acres of imported dry fly ash and bottom ash stockpiled on the eastern hillside of the impoundment. Within the closed by removal portions of the CCR unit, removal and decontamination activities will remove all CCR, all CCR mixed with soils, and all CCR included in berms, liners, or other unit structures. §257.102(c) identifies two conditions of completion. The first and second conditions of completion are that “closure by removal is complete when CCR has been removed” and that closure by removal is complete when “any areas affected by releases from the CCR unit have been removed or decontaminated”. The first two conditions of completion will be satisfied by removing visible CCR and visibly impacted underlying soil. Fly ash, bottom ash and FGD are readily distinguished from native soil. To demonstrate closure standard effectiveness and appropriate risk mitigation, APS will perform statistically based verification sampling and analysis of the exposed native soil subgrade for CCR constituents following CCR removal. Laboratory analytical results for samples collected from the native soil subgrade will be compared to corresponding State of Arizona non-residential Soil Remediation Levels (nrSRLs) and Groundwater Protection Levels (GPLs) derived pursuant to Arizona guidance from

	FAP Groundwater Protection Standards (GWPSs). The third condition of completion required by §257.102(c) is that closure by removal is complete when "groundwater monitoring concentrations of the constituents listed in appendix IV to this part do not exceed groundwater protection standards established pursuant to §257.95(h)." APS will incorporate the requirements of §257.102(c)(2) as discussed in response to that section below.
§257.102(c)(1) *Complete all removal and decontamination activities during the active life of the CCR unit.*	Not applicable.
§257.102(c)(2) *Complete removal and decontamination activities during the active life and post-closure care period of the CCR unit.* The owner or operator may close a CCR unit by completing all removal and decontamination activities, except for groundwater corrective action, during the active life of the CCR unit and by completing groundwater corrective action during the post-closure care period pursuant to the following procedures:	Applicable. APS plans to complete removal and decontamination activities within the removal-applicable portions of the CCR unit during the active life of the facility and anticipates that completion of groundwater corrective action will extend into the post-closure care period. APS has identified groundwater impacts downgradient of the FAP and completed an Assessment of Corrective Measures (Wood, 2019) for the unit. APS continues to conduct assessment monitoring of groundwater and is currently in the process of selecting a remedy for identified groundwater impacts. Collected groundwater data and progress regarding remedy selection are presented each year in the site Groundwater Monitoring and Corrective Action Report which is posted to the APS CCR Rule Compliance Data and Information website. Additional detail regarding scheduling of unit closure activities is included in responses to §257.102(c)(2)(i) through (vi) in responses to those sections below.

§257.102(c)(2)(i) Within the timeframes specified in paragraph (f) of this section, document that CCR has been removed from the unit and any areas affected by releases from the CCR unit have been removed or decontaminated;	Applicable. Within the closure by removal portions of the FAP, APS plans to complete and document removal of CCR, and any areas affected by releases from the CCR unit, prior to the applicable closure timeframe (see Closure Schedule below).
§257.102(c)(2)(ii) Within the timeframes specified in paragraph (f) of this section, begin implementation of the remedy selected in accordance with §257.97 such that all components of the remedy are constructed, or otherwise in place, and operating as intended unless the owner or operator documents both that:	Applicable. APS plans to begin implementation of a remedy selected in accordance with §257.97 such that all components of the remedy are constructed, or otherwise in place, and operating as intended no later than the applicable closure timeframe (see Closure Schedule below).
§257.102(c)(2)(ii)(A) All applicable requirements in §§ 257.96 through 257.98 have been met; and	Not anticipated to be applicable.
§257.102(c)(2)(ii)(B) The active life of the unit could not be extended until implementation of the remedy consistent with §257.102(f);	Not anticipated to be applicable.
§257.102(c)(2)(iii) Complete groundwater corrective action as a post-closure care requirement as specified in §257.104(g);	Applicable. Within the post-closure care period, APS plans to complete groundwater corrective action and to demonstrate that any areas affected by releases from the FAP do not exceed the groundwater protection standards established pursuant to §257.95(h) for appendix IV constituents.
§257.102(c)(2)(iv) Amend the written closure plan required by paragraph (b) of this section and the written post-closure care plan required by §257.104(d);	Applicable. APS hereby amends the written closure plan required by paragraph (b) of this section and will continue to amend the written closure plan as warranted. Separately, APS will amend the written post-closure care plan required by §257.104(d).
§257.102(c)(2)(v) Within the timeframes specified in paragraph (f) of this section, obtain the completion of closure certification or approval required by paragraph (f)(3) of this section; and	Applicable. APS plans to obtain the completion of closure certification from a qualified professional engineer documenting that CCR has been removed from the unit and any areas affected by releases from the FAP have been removed or

	decontaminated prior to the applicable closure timeframe (see Closure Schedule below).
§257.102(c)(2)(vi) Within the timeframes specified in paragraph (f) of this section, record the notation on the deed to the property required by paragraph (i) of this section.	Applicable. APS plans to record a notation on the deed to the property required by §257.102(i) no later than to the applicable closure timeframe (see Closure Schedule below). The deed notation will note that the land has been used as a CCR unit, and its use is restricted under the post-closure care requirements identified in §257.104(d). Within 30 days of recording the notification, APS will prepare a notification for the facility's operating record that the deed notation has been recorded.
§257.102(d) ***Closure performance standard when leaving CCR in place*** —	
(1) **General performance standard.** The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that will:	
§257.102(d)(1)(i) – 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.	Applicable. Responses are presented to each set of conditions in the following paragraphs. "Control, minimize or eliminate, to the maximum extent feasible, *post-closure infiltration of liquids into the waste…"* – Based on the hydrogeological setting of the FAP in a valley with adjacent bedrock abutments underlain by naturally-occurring alluvial groundwater more than 15 feet below the base of CCR and a closure design that intercepts and contains run-on from upstream surface drainages, there is no source of post-closure infiltration of liquids into the waste other than direct precipitation onto the unit. Thus, this response addresses how the planned cover system controls, minimizes or eliminates, to the maximum extent feasible, infiltration from precipitation into the waste. A separate document attached as Appendix A to this demonstration, *Cholla Fly Ash Pond*

	Closure - Alternative Final Cover Design Documentation (AECOM, 2025a), presents the design basis and details for the final cover system that will be placed on the regraded top surface of the consolidated CCR solids delta. The report presents the results of laboratory testing and computer modelling to demonstrate the final cover system design will control and minimize post-closure infiltration of incipient precipitation into the waste such that the unit area flux through the final cover system does not exceed the unit area flux from the unlined native soil comprising the bottom of the FAP. A final cover system that relies on the properties of natural materials and the natural evapotranspiration process to prevent infiltration has many practical and performance advantages in the long term. As such, the four-layer final cover system described in the design is assessed to minimize to the maximum extent feasible the post-closure infiltration of liquids in the waste. "Control, minimize or eliminate, to the maximum extent feasible, … *releases of CCR … to the ground or surface waters or to the atmosphere*" – All construction activities will be subject to strict dust control requirements to minimize, to the maximum extent feasible, dispersal of CCR dust during this phase of work. Following completion of closure, the CCR within the FAP will be consolidated under the final cover system that will physically isolate the CCR from the ground, surface waters and the atmosphere. Additional control measures will be implemented if physical releases are

	identified through monitoring performed under the Post-Closure Plan. <u>“Control, minimize or eliminate, to the maximum extent feasible, … *releases of … leachate … to the ground or surface waters or to the atmosphere*”</u> – The demonstration for this section considers the portion of entrained pore water that can readily separate from the impounded CCR under ambient temperature and pressure as a “free liquid” per §257.53 and leave the FAP as leachate. A separate demonstration that addresses the need to eliminate free liquids before installing the final cover system from the perspective of minimizing future settlement and distress to the final cover system is presented in a subsequent response to the separate requirement of §257.102(d)(2)(i). The FAP dam incorporates significant measures to control seepage from the unit, including: 1. a slurry wall from the dam core to the base of the alluvium beneath the dam in the middle of the valley, and 2. clay-filled cutoff trenches that extend that dam core to the bedrock foundation on the abutments and saddle dam. Although the slurry wall provides a significant impediment to seepage discharge, the flanks of the impoundment started to leak approximately 18 months after filling began. Assessment of multiple lines of evidence suggests that weathered portions of the Moqui Member bedrock, that the dam is keyed into, conducts a relatively small amount of seepage beneath/around

	the abutment cutoff trenches. The seepage causes surface seeps and impacts shallow groundwater downgradient of the dam, specifically the Geronimo Seep at the downstream toe of the dam, the Hunt Seep significantly beyond the toe of the dam, and the I-40 Seep on a road cut downgradient of the west abutment of the dam. Seepage collection systems at these locations were installed in the 1990s. In more recent years, groundwater quality samples from downgradient wells screened in the alluvium and weathered portions of the underlying Moqui Member indicate a dilute plume of CCR-impacted groundwater. APS intends to decrease the magnitude of the downgradient seepage by removing the primary sources of the seepage: 1) the free water pond; and 2) the piezometric head provided by pore water entrained in saturated CCR impounded against the higher flanks of the FAP where weathered Moqui bedrock is exposed. APS anticipates that, by removing sufficient drainable pore water in appropriate locations from within the impounded CCR, there will be a beneficial reduction in piezometric head and contaminant loading to the downgradient seeps and plume. Furthermore, APS anticipates that capping the CCR and capturing run-off from adjacent drainages and hillsides in lined evaporation ponds will cause a beneficial reduction in natural recharge to the alluvial sediments underlying the CCR impoundment. This reduction in recharge, coupled with dewatering of the overlying CCR and ongoing drainage from the alluvial sediments, will, over time, allow a lowering

	of the piezometric head within the alluvium and promote separation between the base of the CCR unit and shallow groundwater. APS recognizes the impracticability of eliminating, or removing, all pore water from the saturated portion of impounded CCR using only dewatering wells. Therefore, the objective of the drainable pore water removal program is to provide stable, long-term “source control” to mitigate releases of CCR pore water from the impoundment. Improved source control will contribute to and reinforce the opportunity for success of the selected groundwater corrective action remedy. APS’s specific goals for drainable pore water removal as a part of the Closure Plan are to demonstrate that: 1. groundwater quality in downgradient areas affected by releases from the FAP does not exceed groundwater protection standards established pursuant to §257.94 for appendix III and §257.95(h) for appendix IV constituents; and 2. separation of at least five feet is established between the base of the FAP and the water table in the uppermost aquifer beneath the FAP, pursuant to the general requirement of §257.60(a). AECOM has developed a conceptual site seepage model (*Conceptual Site Seepage Model Report*, AECOM, 2025b). The Conceptual Site Seepage Model Report describes: 1. the physiography and hydrogeology of the site;

	2. the physical nature of the CCR placement and containment at the site; 3. the pathways and mechanisms by which AECOM assesses seepage has accessed the foundation and bypassed seepage control measures incorporated in the dam; and 4. how proposed dewatering measures can significantly reduce the volume and improve control of the drainable pore water source within the FAP. Drainable pore water that has been removed from the impoundment will be disposed in accordance with applicable state and federal air and water quality regulations. The specific disposal technology will be selected by the closure contractor, subject to approval by APS. “Control, minimize or eliminate, to the maximum extent feasible, … *releases of … contaminated run-off to the ground or surface waters or to the atmosphere*” – All CCR within the FAP will be consolidated under the final closure cap. All portions of the final cover system will be graded to drain non-contact run-off to one of four upgradient stormwater evaporation basins. As described in response to §257.102(d)(1)(v), portions of the cover may be designated as “interim final cover”. One purpose of the interim final cover and final cover systems is to prevent contact between incipient precipitation and stormwater run-off with the CCR so that all run-off can be treated as non-contact stormwater. The geosynthetic-lined upgradient stormwater evaporation basins are sized to contain on-site and off-site run-off from the

	Probable Maximum Flood (PMF). They are closed systems without means for uncontrolled discharge. They are sufficiently large so that they can store and evaporate collected run-off from many consecutive wetter-than-average years. If needed, they can be emptied by pumping in accordance with applicable state and federal water quality discharge permit requirements at that time. The composite geosynthetic liner system of the stormwater basins, consisting of soil overlying a 60-mil high density polyethylene (HDPE) liner, overlying a geosynthetic clay liner (GCL), was selected to provide enhanced protection against release of impounded stormwater to the subgrade; the composite liner system should have higher resistance to UV exposure, resistance to puncture, and overall durability in comparison to a single liner.
§257.102(d)(1)(ii) – Preclude the probability of future impoundment of water, sediment, or slurry.	Applicable. The regraded CCR subgrade for the final cover system will have a minimum as-constructed top slope of 0.5 to 1.0 percent to shed run-off and minimize the opportunity for surface water ponding. The final cover system will generally slope from thickest to thinnest deposited CCR, thereby decreasing the opportunity for localized grade reversals. The closure design provides for operation of CCR dewatering wells before and during construction of the final cover system. Dewatering of the CCR will cause settlement of the CCR subgrade. Any low areas or local grade reversals will be corrected by final grading before completion and certification of the final cover system. The post-closure plan includes maintenance measures to

	correct local grading deficiencies after closure. Stormwater run-off from the final cover system and the upgradient watershed will be collected and stored in the four geosynthetic-lined upgradient stormwater evaporation basins that are sized to contain on-site and off-site run-off from the Probable Maximum Flood (PMF). These basins are each located on native ground that was previously impounded with CCR and has been decontaminated after removal of all CCR.
§257.102(d)(1)(iii) – Include 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.	Applicable. The downstream slopes of the embankment dam will remain at 3H:1V and not be regraded for the final closure configuration of the FAP. These slopes are inspected annually and are considered stable in their current configuration. For slopes within the impoundment, investigations and analyses developed for the closure design indicate that interior slopes are not currently liable to move. The following design measures will further stabilize interior slopes and prevent sloughing or movement of the final cover system within the impoundment: 1. Phased drawdown of the free water pond to allow time for relief of excess pore pressure and avoid rapid drawdown-type slope failures. 2. Strengthening of impounded CCR by consolidation after removal of pore water. 3. Buttressing of the north edge of the CCR solids delta by placement of grading fills in low areas and against more-steeply sloping areas.

§257.102(d)(1)(iv) – Minimize the need for further maintenance of the CCR unit; and	Applicable. The final cover system and all components of the stormwater collection system incorporate erosion protection design measures to minimize the need for erosion maintenance. The topmost layer of the final cover system, the erosion layer, will be a 7-inch-thick layer of 3-inch minus gravel blended in-place with infiltration zone soil. The erosion layer will be seeded with native vegetation. The perimeter channel and all concentrated flow areas will be armored with rip rap. The stormwater impoundments will be lined with a composite liner system consisting of 60-mil HDPE liner overlying a geosynthetic clay liner (GCL). The liner system on the side slopes of the ponds will be overlain by a geotextile and soil-filled geocell layer. Geocells at channel entrances will be filled with concrete instead of soil. The liner system on the bottom of the ponds will be overlain by a geotextile and soil layer to provide resistance against UV degradation and to allow sediment removal.
§257.102(d)(1)(v) – Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.	Applicable. Closure construction will begin after contractor selection which is anticipated to occur in Fall of 2025. Dewatering is ongoing and APS anticipates several years of operations to accomplish the requirement of §257.102(d)(2)(i) to eliminate free liquids, interpreted to include drainable pore water, prior to completing the final cover system. While dewatering advances, the soft ash beneath the former free water pond will be stabilized and dry ash will be incorporated within CCR solids delta to achieve the final subgrade for the final cover system. During this period, the

<table>
<tr><td></td><td>lower layers of the final closure system may be installed as an “interim final cover”. In areas in which the full depth of the infiltration layer has been placed, the interim final cover should provide equivalent infiltration resistance and isolation of run-off from the CCR. Maintenance may be required to correct any minor erosion gullies on the exposed upper surface of the infiltration layer. Final grading and placement of the uppermost erosion layer will be performed after completion of pore water removal.

APS anticipates it may take many years to complete dewatering and final closure consistent with recognized and generally accepted good engineering practices. The primary factors affecting the time required are the quantity of pore water to be removed and the difficulty of doing so.</td></tr>
<tr><td colspan="2">§257.102(d)(2) - Drainage and stabilization of CCR units. The owner or operator of any CCR unit must meet the requirements of paragraphs (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section.</td></tr>
<tr><td>§257.102(d)(2)(i) – Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.</td><td>Applicable to 1) water within the free water pond, 2) soft sediments underlying the free water pond, and 3) drainable pore water within the CCR.

This demonstration of satisfaction of §257.102(d)(2)(i) addresses the need to eliminate free liquids before installing the final cover system from the perspective of minimizing future settlement and distress to the final cover system. A separate demonstration that addresses the need to remove drainable pore water to minimize the release of leachate from the unit to groundwater is presented in a preceding response to the separate requirement of §257.102(d)(1)(i).</td></tr>
</table>

	Free Water Pond – After cessation of discharge, the FAP free water pond will be emptied by pumping water into a geosynthetic-lined pond, known as the East Temporary Basin (ETB) located within the footprint of the FAP, for disposal by evaporation. Soft sediments – Very soft CCR sediments within the former free water pond area will be made stable by placement of a bridge lift of stockpiled bottom ash to establish a stable working platform. The planning expectation is that the bridge lift will be able to support an overlying grading fill that will provide the subgrade for the final cover system. The weight of the grading fill will promote dewatering, consolidation, and strengthening of the soft sediments. If warranted, pore pressure relief wells or wick drains may be installed to accelerate dewatering and consolidation of the soft sediments. If warranted, track hoes or large diameter auger mixers may be used to introduce and mix stockpiled dry fly ash and/or cement into the very soft CCR sediments to solidify them in-place. Drainable pore water – For this demonstration, the term “free liquid” is interpreted to include entrained pore water that will drain under ambient temperature and pressure within the FAP. APS installed and currently operates 89 vertical and 1 horizontal CCR pore water dewatering wells within the FAP. On average, the wells each produce about one gallon per minute (gpm) of pore water, although some produce significantly more and some significantly less than the average. The extracted pore water is

	currently pumped to the ETB for disposal by evaporation but will be managed by the contractor during closure construction in accordance with applicable regulation. As part of final closure construction, APS plans to install a significant number of additional dewatering wells, with the goal of removing and disposing of as much pore water as quickly as practicable. In the interest of minimizing as much infiltration as early as possible, APS will install portions of the cover system, designated as “the interim cover system”, while pore water removal pumping continues. APS recognizes the impracticability of eliminating all pore water from the saturated portion of impounded CCR using dewatering wells. Practicability constraints include: 1. Low bulk permeability of hydraulically deposited fly ash and FGD. 2. Decreasing transmissivity and well production as an unconfined aquifer is drawn down. 3. Loss of productivity if wells or lines of wells are spaced too closely. 4. Inaccessible remaining volume between wells that have been drawn down to a maximum extent. Although it is not practicable to eliminate all pore water within the CCR pore space by pumping, it is practicable to monitor extracted volumes, the rate of lowering of phreatic surfaces, and settlement of the ground surface to understand how much of the available pore water has been removed and what portion of the likely settlement has been realized.

	APS will assess periodically whether the environmental goals of pore water removal have been accomplished sufficiently to define dewatering as complete and cease operation of the extraction and observation wells within the FAP. After dewatering is complete, the soil cover will be completed, inspected and certified as the final cover system.
§257.102(d)(2)(ii) – Remaining wastes must be stabilized sufficient to support the final cover system.	Applicable. Field explorations and an extensive network of test and dewatering well access roads provide a basis for predicting that the majority of the CCR solids delta is already sufficiently stable to support heavy construction equipment and the final cover system. All areas of the FAP will be covered with a minimum of 12 inches of stockpiled bottom ash to serve as a working surface for construction traffic and as the capillary break component of the ET soil final closure system. The free water pond area will remain very soft after the free water has been removed. Initially, sumps will be created to lower the phreatic surface below the ash surface. Where feasible, large quantities of lightweight bottom ash, currently stockpiled on the eastern hillside of the impoundment, will be deployed to construct a sufficiently rigid bridge lift over the soft ash to support subsequent grade building fill and the final cap. If needed, the advancing bridge lift could be used to support track hoes to mix cement and/or dry fly ash into the wet ash to increase the strength of the subgrade and its

	ability to support extension of the bridge lift and overlying fills.
§257.102(d)(3) – ***Final cover system.*** If a CCR unit is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.	
§257.102(d)(3)(i) - The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.	Not applicable. An alternative final cover system meeting the requirements of §257.102(d)(3)(ii) is described in the next section.
§257.102(d)(3)(ii) - The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (d)(3)(ii)(A) through (C) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.	Applicable. The selected final cover system is considered to be an "alternative final cover system". The selected final cover system for the FAP is designed to meet the alternative final cover system design requirements of §257.102(d)(3)(ii). The engineering design basis, details, and demonstration of compliance with the requirements of §257.102(d)(3)(ii) of the proposed final cover system are described in a separate report titled *Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation* (AECOM, 2025) that is incorporated as Appendix A to this Closure Plan. The final cover system will consist of the following (from bottom to top): 1) 12 inches of stockpiled bottom ash, serving as a capillary break. 2) 12 inches of compacted clay, serving as an infiltration barrier. 3) 24 inches of compacted earthen material, serving as an infiltration layer.

	4) 7 inches of blended gravel and soil capable of resisting erosion and seeded with and capable of sustaining native plant growth, serving as an erosion layer.
§257.102(d)(3)(ii)(A) – The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.	These demonstrations are presented in a separate report titled *Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation* (AECOM, 2025) that is incorporated as Appendix A to this Closure Plan.
§257.102(d)(3)(ii)(B) - The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (d)(3)(i)(C) of this section.	This demonstration is presented in a separate report titled *Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation* (AECOM, 2025) that is incorporated as Appendix A to this Closure Plan.
§257.102(d)(3)(ii)(C) - The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.	This demonstration is presented in a separate report titled *Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation* (AECOM, 2025) that is incorporated as Appendix A to this Closure Plan.
INVENTORY AND AREA ESTIMATES	
§257.102(b)(1)(iv) – An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.	15,200,000 cubic yards (cy), consisting of 12,500,000 cy deposited hydraulically in the FAP, plus 800,000 cy of fly ash imported from the Plant's former Ash Pond 1 and 1,900,000 cy of bottom ash imported from the Plant's Bottom Ash Monofill.
§257.102(b)(1)(v) – An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life.	The size of the area planned to receive the final cover is 253 acres. The maximum area impacted by CCR, specifically below El. 5100 ft, the historical high-water mark within the reservoir, plus the footprint of stockpiled CCR and soil, is 355 acres, as illustrated on Figure 1.
CLOSURE SCHEDULE	
§257.102 (b)(1)(vi) – A schedule for completing all activities necessary to satisfy	The following milestones are estimates and may be changed based on the actual

the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. When preparing the written closure plan, if the owner or operator of a CCR unit estimates that the time required to complete closure will exceed the timeframes specified in paragraph (f)(1) of this section, the written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under paragraph (f)(2) of this section.	approaches to closure work proposed by the selected closure contractor. Activities associated with some milestones may overlap. Completion of groundwater corrective action is anticipated to extend into the post-closure care period. Amendments to milestones and timeframes may be provided as more or different information becomes available.
Initial Written Closure Plan Completed	August 2016
Closure Plan Amendment 1	October 2020
Closure Plan Amendment 2	November 2020
Closure Plan Amendment 3	July 2025
Permits and Approvals from Agencies	December 2025 (estimated)
Date of Final Receipt of CCR and Initiation of Closure	June 30, 2025
Complete Free Water Removal	November 2025 (4 months, estimated)
Complete Pore Water Removal	June 30, 2030 (5 years, estimated)
Complete and document removal of CCR, and any areas affected by releases from the CCR unit, from removal portion of CCR unit.	By June 30, 2030 (five years)
Complete CCR Stabilization and Final Cover System Installation. Publish the completion of closure certification from a qualified professional engineer.	By June 30, 2030 (five years)

Begin implementation of a groundwater remedy selected in accordance with §257.97.	By June 30, 2030
Record a notation on the deed that will, in perpetuity, notify any potential purchaser of the property that: 1) the land has been used as a CCR unit; and 2) its use is restricted under the post-closure care requirements as provided by § 257.104(d)(1)(iii).	By June 30, 2030 (five years)

REFERENCES
AECOM, 2025a. Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation, June 27, 2025.
AECOM, 2025b. Cholla Fly Ash Pond Closure – Conceptual Site Seepage Model Report, August 2025.
Wood, 2019. Assessment of Corrective Measures for the Fly Ash Pond and the Bottom Ash Pond. Arizona Public Service Cholla Power Plant – Navajo County, Arizona. June 4, 2019.

Attachments:

Certification Statement 40 CFR § 257.102(b)(4) – Amended Written Closure Plan for a CCR Surface Impoundment, dated July 31, 2025.

Figures:

Figure 1: APS Cholla Fly Ash Pond Closure-in-Place – Grading Concept – Plan

Figure 2: APS Cholla Fly Ash Pond Closure-in-Place – Grading Concept – Idealized Longitudinal Section

Appendices:

A: AECOM, 2025a. *Cholla Fly Ash Pond Closure - Alternative Final Cover Design Documentation*

Attachments

Certification Statement 40 CFR § 257.102(b)(4) – Amended Written Closure Plan for a CCR Surface Impoundment

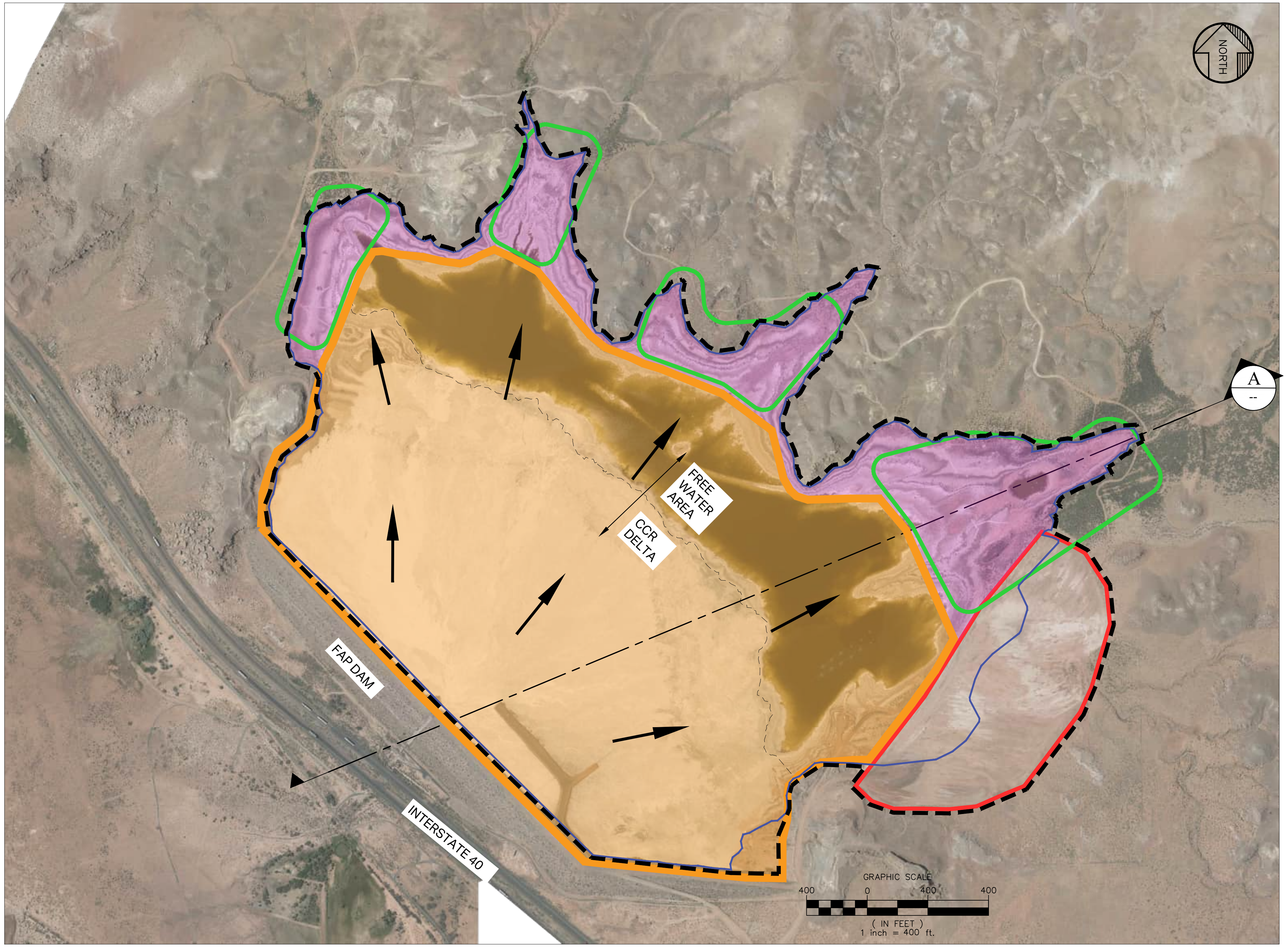
CCR Unit: Arizona Public Service; Cholla Power Plant; Fly Ash Pond

I, Alexander W. Gourlay, being a Registered Professional Engineer in good standing in the State of Arizona, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the information contained in the amended written closure plan dated July 31, 2025, meets the requirements of 40 CFR § 257.102.

Alexander W. Gourlay, P.E.
Printed Name

July 31, 2025
Date

Figures



SURFACE FLOW DIRECTION

FINAL COVER SYSTEM (253 ACRES)

OUTLINE OF CLOSURE BY REMOVAL AREAS EXCLUDING THE ASH POND 1 AND BOTTOM ASH STOCKPILE AREA (66 ACRES)

ASH POND 1 AND BOTTOM ASH STOCKPILE (CLOSURE BY REMOVAL) (36 ACRES)

EL 5,100' CONTOUR - MAXIMUM EXTENT OF POOLED CCR AND SLUICE WATER (310 ACRES)

OUTLINE OF CCR AND CCR-IMPACTED AREAS (355 ACRES)

FUTURE STORMWATER EVAPORATION BASINS (66 ACRES)

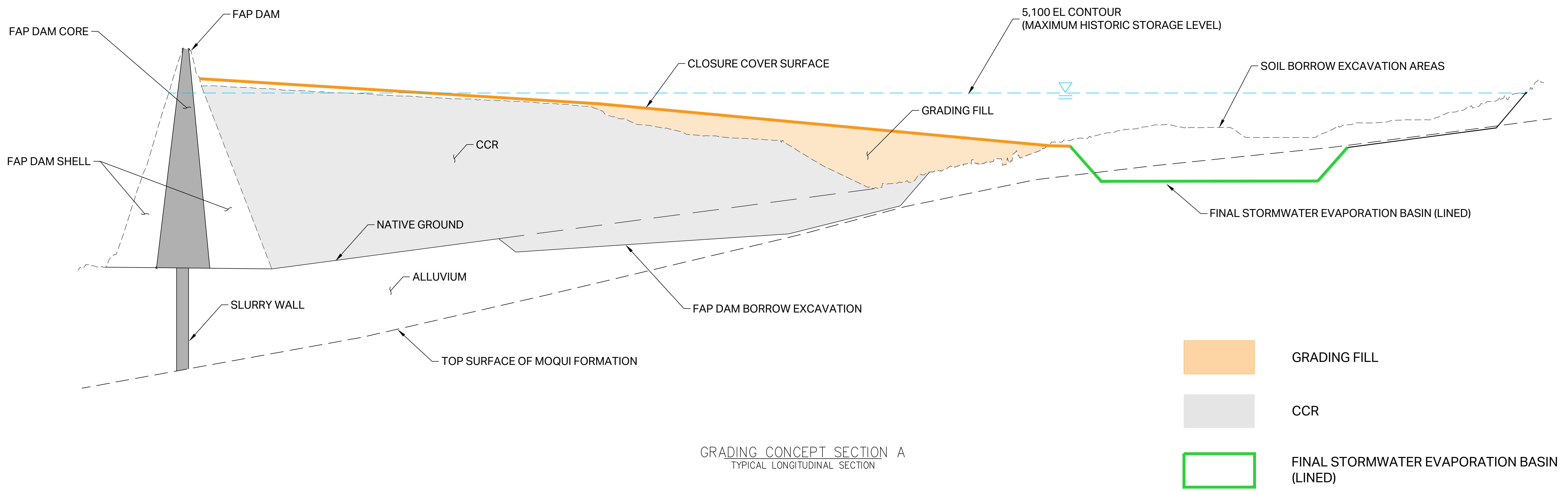
NOTES:

1. LINES, CONTOURS, AREAS, AND ELEVATIONS ARE DEPICTED AS CONCEPT ILLUSTRATION AND SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.

GRADING CONCEPT
PLAN

FIGURE 1: APS CHOLLA FLY ASH POND CLOSURE-IN-PLACE
GRADING CONCEPT - PLAN

AECOM



NOTES:

1. LINES, CONTOURS, AREAS, AND ELEVATIONS ARE DEPICTED AS CONCEPT ILLUSTRATION AND SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.

FIGURE 2: APS CHOLLA FLY ASH POND CLOSURE-IN-PLACE
GRADING CONCEPT - IDEALIZED LONGITUDINAL SECTION

Appendices

Cholla Fly Ash Pond Closure

Alternative Final Cover Design Documentation

Arizona Public Service

Project number: 60710305

June 27, 2025

Delivering a better world

Prepared for:

Arizona Public Service

Prepared by:

AECOM
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Figure 2 – Simplified Stratigraphic Column

Attachment A: Results of Permeability Tests, SH&B – Proposed Ash Disposal Areas Soil and Geologic Study Report, 1973

Attachment B: Summary of Ebasco Laboratory Falling Head Permeability Tests Results, Ebasco Engineering Report – Cholla Generating Station Ash Disposal Sites and Seepage and Foundation Studies, 1975

Attachment C: Summary of Saturated Hydraulic Conductivity Tests Results, AECOM Project 60710305, May 2024.

Attachment D: Final ET Closure Cover System, Maximum Flux versus Depth for Design Section, UNSAT-H Model Output, Figure 10 from ET Cover Design Calculation Package, AECOM Project 60710305, September 2024.

1. Background

Arizona Public Service (APS) is the majority owner and operator of the Cholla Power Plant (Cholla, the Plant). The Plant is a coal-fired power plant near Joseph City, Arizona. The coal combustion process at the Plant produces coal combustion residuals (CCR), which consist of bottom ash, fly ash, and flue gas desulfurization (FGD) solids and sludge. The Fly Ash Pond (FAP) at the Plant impounds fly ash and FGD solids, which are classified as a CCR and as such are regulated by Title 40, Code of Federal Regulation (CFR), Part 257 (40 CFR §257), otherwise known as the CCR Rule. APS has elected to close the FAP in place in accordance with 40 CFR §257.102(d).

2. Objective

The objective of this report is to document the demonstration that the final cover system design for the FAP closure satisfies the requirements of Title 40, CFR § 257.102 "Criteria for conducting the closure or retrofit of CCR units and closure of CCR management units", (d) "Closure performance standard when leaving CCR in place –", (3) "Final cover system", (ii) "*the requirements of the alternative final cover system*" as described in Section 3.

APS, in consultation with its closure design engineer, AECOM Technical Services, Inc. (AECOM), has elected to use an alternative final cover system designed to meet the requirements of 40 CFR §257.102(d)(3) for closure of the FAP. An evapotranspiration (ET) soil cover, which is a type of water balance cover, is the selected alternative final cover system type. The following sections of this report demonstrate how the FAP closure design satisfies the requirements of 40 CFR §257.102(d)(3).

3. Regulation for Alternative Final Cover [40 CFR §257.102(d)(3)(ii)]

40 CFR §257.102(d)(3)(ii) states the following:

> *§257.102(d)(3)(ii): The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (d)(3)(ii)(A) through (C) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.*
>
> > *§257.102(d)(3)(ii)(A): The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.*
> >
> > > *§257.102(d)(3)(i)(A): The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.*
> > >
> > > *§257.102(d)(3)(i)(B): The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.*

§257.102(d)(3)(ii)(B): The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (d)(3)(i)(C) of this section.

§257.102(d)(3)(i)(C): The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

§257.102(d)(3)(ii)(C): The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

3.1 Criteria for Final Cover Permeability and Infiltration - 40 CFR §257.102(d)(3)(ii)(A)

The following provides documentation that the final cover is designed to meet the permeability and infiltration reduction requirements of 40 CFR §257.102(d)(3)(ii)(A) stated above. The following subsections provide a summary of the design of the final cover related to infiltration rate reduction.

As indicated in the preamble of the CCR Rule (80 Federal Register [FR] 21413 through 21414), the requirements for cover were generally modeled after the standards and technical requirements of 40 CFR 258.60 for MSWLFs. In addition, 80 FR 21413-214714 states the following:

"The final rule does not require the use of composite final covers, such as geomembrane underlain by a compacted soil infiltration layer. This is also the case in situations for a CCR unit that is designed with a composite bottom liner or if the permeability of the soil underlying the unit is comparable to the permeability of a geomembrane. As EPA has concluded for municipal solid waste landfills, in certain site-specific situations it may be possible to construct an infiltration layer that achieves an equivalent reduction in infiltration without matching the permeability in the bottom liner material (62 FR 40710)."

The last sentence in conclusion to the above excerpt indicates that a cover could be constructed that achieves an infiltration reduction that is lower than infiltration through the bottom liner or base of the unit without matching the permeability of the base soils or liner. An ET cover designed and constructed for arid and semi-arid climates could meet this site-specific situation as described above. ET soil covers have been utilized as final cover systems over several decades.

The following summary of the final cover design for the FAP site, which is in a semi-arid climate, provides documentation that the cover achieves adequate infiltration rate (unit area flux) reduction while not specifically matching the permeability of the natural subsoils present or bottom liner material.

3.1.1 Final Cover Unit Area Flux Equivalency to Permeability

The calculated unit area flux or infiltration rate of the final ET cover is equivalent to the permeability of the final cover. Permeability is a measure of material's inherent ability to allow fluid to pass through, independent of the flow vector and assumed to be fully saturated. Unit area flux or groundwater flux is the discharge of water through a unit area of material, which is simply the velocity of groundwater. Therefore, unit area flux is considered equivalent to permeability in the context of this report. The actual unit area flux, which is the infiltration rate through the cover system, is the calculated output of the numerical model used to evaluate the design of the ET soil cover (UNSAT-H). The following subsections will demonstrate that the unit area flux or infiltration rate of the final cover system is less than the permeability of the natural soil present below the FAP.

3.1.2 Permeability of Natural Subsoils Present

Site Geologic Setting

The FAP is within the Colorado Plateau Physiographic Province and is situated within the northwestern area of the Holbrook Basin. The FAP is built on younger alluvial deposits that are surrounded by and overlie much older Paleozoic and Mesozoic-aged sedimentary rock formations. A geologic map of the area is presented in Figure 1.

The younger alluvial deposits in the area consist of the Quaternary alluvium deposited in the unnamed drainage underlying the FAP. The surrounding sedimentary rock units are from youngest to oldest, the Triassic Chinle Formation (which includes the Shinarump Conglomerate Member), the Triassic Moenkopi Formation, and the Permian Coconino Sandstone. Figure 2 illustrates a simplified stratigraphic column for the site area.

The geology immediately underlying the FAP CCR consists of an Alluvial Unit, which overlies the Moqui Member of the Moenkopi Formation. Following a period of erosion in the underlying Moenkopi Formation, the FAP unconsolidated heterogeneous alluvial deposits composed of clay, silt, sand, and gravel, were deposited within the lower reach of the unnamed drainage. These alluvial soils are the natural subsoils present below the impounded CCR within the FAP. Based on the geotechnical data collected at this site, the alluvial soils consist of various interbedded layers of gravel, sand, silt, and clay. Hydraulic conductivities of unconsolidated alluvial soils (gravel, sand, silt, and clay) range over several orders of magnitude, and the soils information collected for this site indicate a range of between 10^{-3} and 10^{-8} centimeters/second (cm/sec).

SH&B Soil and Geologic Study (1973)

The report by Sergent, Hauskins & Beckwith (SH&B) titled *Proposed Ash Disposal Areas Soil and Geologic Study Report* (SH&B, 1973) described the alluvial soils consisting of unconsolidated clay, silt, sand, and gravel in the vicinity of the FAP. These alluvial soils are also present downstream of the FAP Dam as shown in the subsequent geotechnical investigations presented in other reports associated with the construction of the FAP Dam.

The SH&B report presents borehole permeability testing of alluvial materials used in the later designs for the FAP dam (SH&B, 1973). The borehole permeability tests were performed in companion borings drilled into the alluvium and saturated for several days prior to testing. Of the ten borehole permeability tests performed, five were located below the FAP footprint and showed permeabilities ranging from 1.01×10^{-5} to 1.45×10^{-6} cm/sec. The borehole permeability test results are provided in Attachment A.

Ebasco Seepage and Foundation Studies (1975)

The *Arizona Public Service Company Cholla Generating Station Ash Disposal Sites Seepage and Foundation Studies* engineering report by Ebasco (Ebasco, 1975a/b) provides information on the permeability of the alluvial soils underlying the FAP. The Ebasco engineering report presented geotechnical investigation data consisting of borings, test pits, and associated laboratory testing. The Ebasco engineering report also presented seepage analyses performed for the design of the FAP Dam. Ebasco performed an evaluation of the permeability testing performed during the Ebasco investigation (Ebasco, 1975a/b) and past geotechnical investigations (SH&B, 1973) and assigned an overburden alluvium permeability of 1×10^{-5} cm/sec (shallow soils at or near ground surface). Ebasco also assigned a permeability of 1×10^{-7} cm/sec for the recompacted dam clay core and cut off slurry wall. The Moenkopi Formations underlying the overburden alluvium were assigned a permeability of 5.5×10^{-6} cm/sec to an elevation of 4,985 feet, which is approximately 55 feet below existing grade at the low point of the FAP prior to dam construction.

The geotechnical laboratory testing, documented in the Ebasco engineering report (Ebasco, 1975a/b), included falling head permeability test on alluvial clay soil materials used for the construction of the clay core for the FAP Dam. Three laboratory falling head permeability tests were performed as part of evaluating the clay core design and indicated coefficients of permeability of 3.74×10^{-7}, 1.27×10^{-7}, and 3.40×10^{-8} cm/sec. The falling head permeability tests were performed on specimens of clay soil recompacted at or above 95 percent of maximum dry densities, as determined by both Modified and Standard Proctor testing. The results are presented in Attachment B. The geometric mean of these three falling head permeability test results is 1.17×10^{-7} cm/sec.

AECOM Geotechnical Investigation (2024)

The geotechnical investigation in 2024 for the FAP closure project includes laboratory testing of alluvial borrow soils within and directly upstream of the FAP reservoir area. The soils encountered in the investigation consisted of interbedded gravel, sand, silt, and clay. Soil samples collected and tested at the laboratory ranged from Gravel to Elastic Silt (MH) with hydraulic conductivity ranging from 1.2×10^{-3} to 6.0×10^{-5} cm/sec. These results are provided in Attachment C.

Permeability of the Natural Subsoils below the FAP

As the data presented above suggests, the soils at the base of the FAP CCR impoundment have a wide range of permeabilities. Based on the preponderance of information available, including from drilling investigations of the upper alluvium, AECOM concluded that clayey soils likely exist over a significant portion of the base of the CCR impoundment. On that basis, assignment of a single permeability for the base of the impoundment that is closer to the lower range permeabilities evident in the data is appropriate. This selection would be biased toward the finer-grained silts and clays. The results of the laboratory falling head permeability tests performed by Ebasco on the recompacted clay soil intended for the construction of the FAP Dam clay core, were some of the lowest reported values of permeability for the site soils. Therefore, the geometric mean of the three test results, 1.17×10^{-7} cm/sec, was assigned as the target permeability of the natural subsoils underlying the FAP, for the purposes of the ET cover design unit area flux analysis.

3.1.3 Permeability of the Final Cover System

The final cover system for the FAP is an ET soil cover constructed from earthen soil materials excavated from within the FAP depositional valley area. The ET soil cover design consists of a 12-inch Capillary Break Layer overlain by a 12-inch Compacted Clay Layer, 24-inch Infiltration Layer, and 7-inch Erosion Layer. The surface slope of the final cover system ranges from approximately 0.5 to 1.0 percent to shed stormwater off the cover to lined evaporation basins.

The cover was designed using UNSAT-H, a finite difference numerical modeling software, which simulates isothermal flow of liquid water and water vapor while also incorporating soil-water extraction by plants. An evaluation of approaches to simulate engineered cover performance degradation prepared for the U.S. Nuclear Regulatory Commission (CNWRA, 2007) indicates that UNSAT-H models have been used to simulate ET cover performance at various project sites in the United States and UNSAT-H is appropriate for simulating the hydrologic processes at arid and semiarid sites such as occur in northern Arizona, the location of the FAP site. Site specific properties for soil materials that will be used to construct the final cover system and meteorological data for the site area were input into the UNSAT-H model for the analysis.

The cover design included warmup model simulations to eliminate the inherent bias introduced to the model via the initial input parameters and converge on a vertical profile of initial moisture content (running model repeatedly for 15 years to converge). The model was then run through a 30-year simulation of daily weather to provide output of unit area flux. Daily meteorological data collected from nearby weather stations was aggregated into 30 meteorological simulation years as part of the model. The model also included a conservative assumption that plants failed to flourish and were unable to extract soil water from the cover system (no transpiration). The unit area flux (infiltration rate) target for the cover design was 1×10^{-7} cm/sec based on the review of FAP base subgrade permeability data as presented in Section 3.1.2.

At the end of the model 30-year simulation, the UNSAT-H model for the FAP cover system resulted in a final cover unit area flux (infiltration rate) of 1.27 x 10^{-8} cm/sec (1.10 x 10^{-3} cm/day), as presented in Attachment D for the design cover layer thicknesses described above.

3.1.4 Satisfaction of 40 CFR §257.102(d)(3)(ii)(A)

The above subsections demonstrate the satisfaction of §257.102(d)(3)(ii)(A) based on the following:

- The natural subsoils present below the FAP have a permeability ranging from 1.2 x 10^{-3} to 3.4 x 10^{-8} cm/sec. A single permeability of 1.17 x 10^{-7} cm/sec was selected to represent the base of the CCR impoundment.
- The unit area flux or infiltration rate of the FAP final cover system is estimated to be approximately 1.27 x 10^{-8} cm/sec.
- Calculated unit area flux or infiltration rate is equivalent to a permeability of the final cover.
- The infiltration rate of the FAP final cover system is less than the permeability of the natural subsoil present below the FAP as stated above, thus §257.102(d)(3)(i)(A) is satisfied.
- The FAP final cover system includes a 12-inch-thick, Compacted Clay Layer and 24-inch-thick, Infiltration layer, which combined create the ET cover infiltration layer. The closure design includes a 36-inch-thick Infiltration Layer and satisfies §257.102(d)(3)(i)(B) by having more than 18 inches of earthen material.

3.2 Criteria for Erosion Protection - 40 CFR §257.102(d)(3)(ii)(B)

The following provides documentation that the final cover is designed to meet the erosion protection requirements of 40 CFR §257.102(d)(3)(ii)(B) stated above. The following section provides a summary of the design of the erosion protection layer for the final cover.

As described in Section 3.1, the final cover system for the FAP includes an Erosion Layer that has a minimum thickness of 7 inches and will be seeded for vegetation growth. The Erosion Layer is comprised of a mixture of on-site rock and soil materials that will be vegetated with native plants as part of the FAP closure design.

The Erosion Layer was designed for protection against water erosion using methods from the United States Environmental Protection Agency (EPA) *Closing Small Tribal Landfills and Open Dumps* (EPA, 2007), and total potential soil losses were checked using the *Revised Universal Soil Loss Equation* (RUSLE) (David J.S. et. al., No Date). The *Closing Small Tribal Landfills and Open Dumps* (EPA, 2007) document presents guidance to calculate the thickness of and required gravel diameter for a rock armor layer to resist wind and water erosion. This guidance uses site specific design, precipitation, and wind information to generate a rock armor layer of adequate thickness of gravel to remain so that continued erosion is not progressed into the underlying Infiltration Layer. The RUSLE method provides an estimate of the average annual soil loss by water erosion.

The Erosion Layer was designed using a maximum slope grade of 2.0 percent, slope length of 1,000 feet, and the 1-hour duration, 100-year return period rainfall intensity of 1.99 inches per hour. Using the input parameters and methodologies from the EPA guidance, the Erosion Layer was indicated as requiring a combination of 2.2 inches of a gravel consisting of a minimum of 35 percent passing the 0.75-inch sieve designation, and 4.8 inches of the fine-grained sandy soils (maximum 40 percent passing No 200 sieve). A total depth of the resulting gravelly soil would therefore equal 7 inches (4.8 inches of infiltration soil with 2.2 inches of gravel). The RUSLE indicates that the Erosion Layer soil loss is estimated to be approximately 0.0057 inches per year or 0.17 inches in 30 years. Any soil loss from water and wind erosion will be monitored by APS as part of post-closure operations and will be repaired as required.

3.2.1 Satisfaction of 40 CFR §257.102(d)(3)(ii)(B)

The above section demonstrates that the engineering design of the Erosion Layer and planned post-closure operations meet §257.102(d)(3)(ii)(B) based on the following:

- The FAP closure design includes an Erosion Layer that has a minimum thickness of 7 inches.
- The Erosion Layer is comprised of a mixture of on-site rock and soil materials that will be seeded with native plants as part of the FAP closure design.
- The rock armor design, which follows the guidance in *Closing Small Tribal Landfills and Open Dumps (EPA, 2007)*, provides an Erosion Layer of an adequate thickness to protect against water and wind erosion of the underlying Infiltration Layer.

3.3 Criteria for Final Cover Settlement and Subsidence - 40 CFR §257.102(d)(3)(ii)(C)

The following provides documentation that the final cover is designed to meet the settlement and subsidence requirements of 40 CFR §257.102(d)(3)(ii)(C) stated above. The following subsections provide a summary of the design of the final cover related to settlement and subsidence.

The removal of a majority of the drainable pore water from the CCR within the FAP will occur before the final cover system is completed for the FAP closure. During the closure construction period, and before the drainable pore water removal system (dewatering wells) ceases operation, the majority of the cover system will be installed.

The dewatering process is expected to cause subsidence of the impounded CCR subgrade. The weight of fill for grading and the cover materials may cause settlement. The subsidence and settlement that appears due to dewatering and fill placement will be managed during the construction period, when a majority of the subsidence and settlement is expected to occur.

An assessment of the estimated settlement of the FAP closure was performed. This assessment considered consolidation potential due to the change in effective stress from the addition of the closure cover, fill placement, and subsidence due to drawdown of the phreatic levels in the impounded CCR from dewatering. The settlement calculations and analyses were performed using Excel spreadsheets using the classical theory of one-dimensional consolidation proposed by Terzaghi (Terzaghi, 1943) that included both primary consolidation and secondary compression.

The final cover will incorporate a 24-inch-thick, loosely compacted to between 80 and 90 percent of the maximum dry density as measured by ASTM D698, infiltration layer that will behave in a flexible manner to minimize the risk of disrupting the continuities of the ET cover due to settlement. The Compacted Clay Layer is the component of the final cover system considered most susceptible to loss of performance due to settlement and subsidence. The mechanism by which it would lose performance is through differential settlement causing sufficient tensile strain to open a crack that would allow water to infiltrate. The assessment of the estimated settlement of the FAP closure indicates the estimated magnitude of differential settlement is approximately 6 inches of vertical displacement over a distance of 100 feet (0.002% axial extension strain). The EPA *Draft Technical Guidance for RCRA/CERCLA Final Cover* (EPA, 2004) indicates that, based on previous studies of cracking in compacted clays, compacted clays tested under unconfined and low confinement conditions reached failure (cracking) at axial extensional strains of 0.02 to 4 percent. The projected maximum tensile strains caused to the FAP final cover system by settlement are at least one order of magnitude less than might be expected to cause cracking and loss of performance of a clay liner, so loss of integrity through settlement is not considered to be likely.

The assessment of the estimated settlement indicates that settlement will vary across the closure cover, depending on CCR thickness, fill thickness, and dewatered thickness, and a majority of the settlement

The assessment of the estimated settlement indicates that settlement will vary across the closure cover, depending on CCR thickness, fill thickness, and dewatered thickness, and a majority of the settlement and subsidence will occur during the closure construction and dewatering period, before the final cover system is installed. Minor settlement and subsidence of the final cover system is expected and repairs for settlement are part of the post-closure operations.

3.3.1 Satisfaction of 40 CFR §257.102(d)(3)(ii)(C)

The above section demonstrates that the cover design, phase of the installation of the final cover system, and planned post-closure operations meets §257.102(d)(3)(ii)(C) based on the following:

- The subsidence due to dewatering will be managed during the construction period, when a majority of the subsidence is expected. The subsidence will be managed by measuring the amount of vertical displacement during closure construction and placing additional fill or infiltration layer material to accommodate for the displacement.
- The final cover will incorporate a 24-inch-thick, loosely compacted infiltration layer that will behave in a flexible manner to minimize the risk of disrupting the continuities of the closure cover due to settlement.
- The projected maximum tensile strains caused to the FAP final cover system by settlement are at least one order of magnitude less than might be expected to cause cracking and loss of performance of a clay liner, so loss of integrity of the 12-inch-thick clay liner through settlement is not considered to be likely.
- Minor settlement and subsidence of the final cover system is expected and repairs for settlement are part of the post-closure operations.

Certification Statement 40 CFR § 257.102(d)(3)(ii) – Alternative Final Cover System Design

CCR Unit: Arizona Public Service, Cholla Power Plant, Fly Ash Pond

I, Jeffery Heyman, being a Registered Professional Engineer in good standing in the State of Arizona, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification package has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the documentation of the design of the alternative composite liner of the CCR Unit is accurate and satisfies the requirements of 40 CFR § 257.102(d)(3)(ii).

Jeffery Heyman

Printed Name

June 27, 2025

Date

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Sergent, Hauskins & Beckwith (SH&B). 1973. Proposed Ash Disposal Areas Soil and Geologic Study Report.

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FIGURES

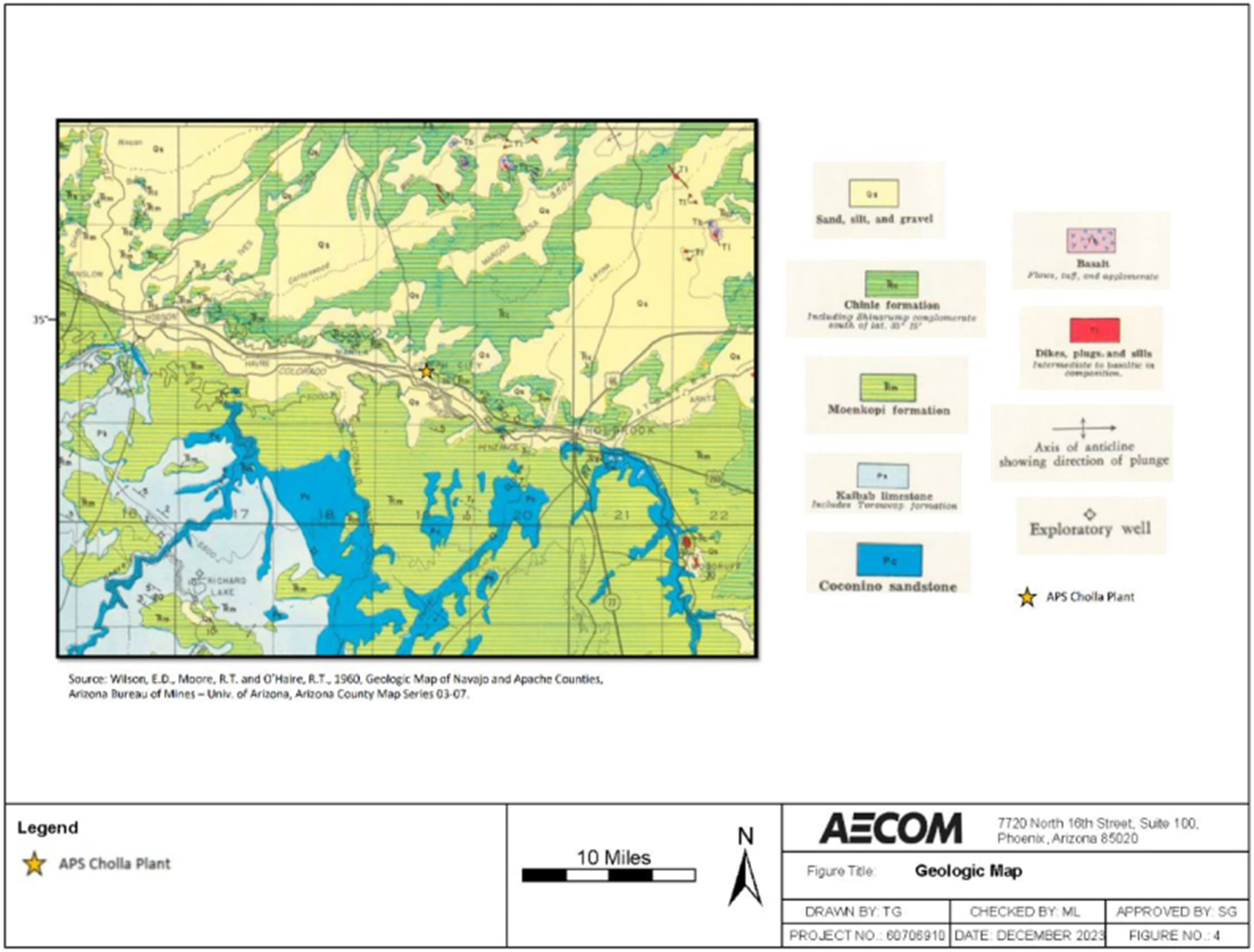


Figure 1 – Regional Geologic Map

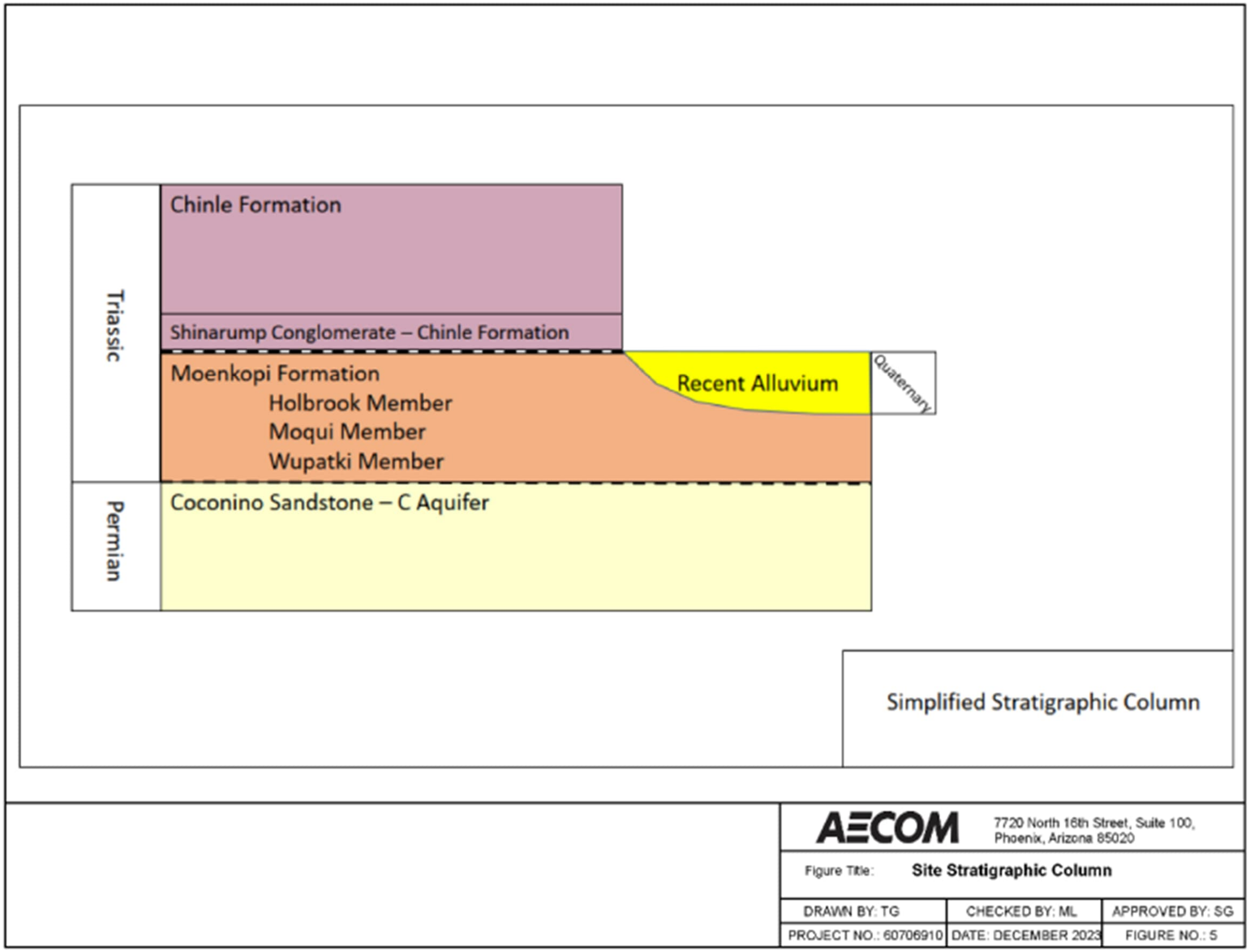


Figure 2 – Simplified Stratigraphic Column

ATTACHMENT A

Results of Permeability Tests

SH&B – Proposed Ash Disposal Areas Soil and Geologic Study Report, 1973

Ash Disposal Areas
APS Cholla Plant
Near Joseph City, Arizona
Job No. E73-255

Results of Permeability Tests (E-19)*

Boring No.	Depth (Ft.)	Permeability (Ft./Yr.)
4D	$2\frac{1}{2}$	16
8A	$8\frac{1}{2}$	1.8
9A	34	1.5
9B	25	5.8
11A	10	68
13A	34	33
14A	21	30
14B	37	13
14C	13	10.5
17A	$9\frac{1}{2}$	100

* The tests were performed in borings drilled into the alluvium at locations adjacent to the core boring. The borings were allowed to saturate several days prior to testing. Some of the borings caved during this soaking period, thus, the tests were discontinued at these locations.

ATTACHMENT B

Summary of Ebasco Laboratory Falling Head Permeability Tests

Ebasco Engineering Report – Cholla Generating Station Ash Disposal Sites Seepage and Foundation Studies, 1975

ENGINEERS TESTING LABORATORIES, INC.
2525 E. Indian School Road, Phoenix, Arizona 85016, (602) 264-4781
423 S. Olsen Avenue, Tucson, Arizona 85719, (602) 624-8894
20 Mikes Pike, Flagstaff, Arizona 86001, (602) 774-4881
2020 Holly Drive, Lake Havasu City, Ariz. 86403, (602) 855-3730

REPORT ON LABORATORY TESTS

Lab. No. 512-157

Client:

Date 8/28/75

Date Rec'd

Project CHOLLA STEAM ELECTRIC STATION FLY ASH DISPOSAL POND

Location JOSEPH CITY, ARIZONA

Source of Sample NOTED BELOW

Material BORROW SOILS

Sampled By ETL & EBASCO

Submitted By ETL/BOYD

Requested By EBASCO/EHASZ

Tested PERMEABILITY - FALLING HEAD TESTS

TEST RESULTS

SAMPLE IDENTIFICATION	GROUP I	GROUP II	GROUP III
DRY DENSITY (PCF)*	121.1PCF	115.4PCF	103.6PCF
MOISTURE CONTENT %*	6.2%	9.0%	13.0%
COEFFICIENT OF PERMEABILITY (CM/SEC)	3.74×10^{-7}	1.27×10^{-7}	3.40×10^{-8}

*AS COMPACTED CONDITIONS

Copies To:

Respectfully submitted,
ENGINEERS TESTING LABORATORIES, INC.

ATTACHMENT C

Summary of Saturated Hydraulic Conductivity Test Results

Prepared for: Arizona Public Service

AECOM Project No. 60710305, May 2024

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-72 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties		Post Permeation Sample Properties		Test and Sample Conditions	
Initial Mass (g):	1532.20	*Saturated Mass (g):*	1677.34	*Permeant liquid used:*	Tap Water
Diameter (cm):	10.193	*Dry Mass (g):*	1380.51	*Sample Preparation:*	☐ In situ sample, extruded
Length (cm):	10.156	*Diameter (cm):*	10.249		☑ Remolded Sample
Area (cm^2):	81.60	*Length (cm):*	10.094	*Number of Lifts:*	3
Volume (cm^3):	828.74	*Deformation (%)**:*	0.61	*Split:*	3/4"
Dry Density (g/cm^3):	1.67	*Area (cm^2):*	82.50	*Percent Coarse Material (%):*	15.6
Dry Density (pcf):	104.0	*Volume (cm^3):*	832.75	*Particle Density(g/cm^3):*	2.72 ☐ Assumed ☑ Measured
Water Content (%, g/g):	11.0	*Dry Density (g/cm^3):*	1.66	*Cell pressure (PSI):*	81.0
Water Content (%, vol):	18.3	*Dry Density (pcf):*	103.5	*Influent pressure (PSI):*	80.0
Void Ratio (e):	0.63	*Water Content (%, g/g):*	21.5	*Effluent pressure (PSI):*	80.0
Porosity (%, vol):	38.7	*Water Content (%, vol):*	35.6	*Panel Used:*	☑ A ☐ B ☐ C
Saturation (%):	47.3	*Void Ratio(e):*	0.64	*Reading:*	☐ Annulus ☑ Pipette
		Porosity (%, vol):	39.0		
		Saturation (%):*	91.4		

	Value	Date/Time
B-Value (% saturation) prior to test*:	0.97	4/18/24 1000
B-Value (% saturation) post to test:	0.95	4/18/24 1400

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

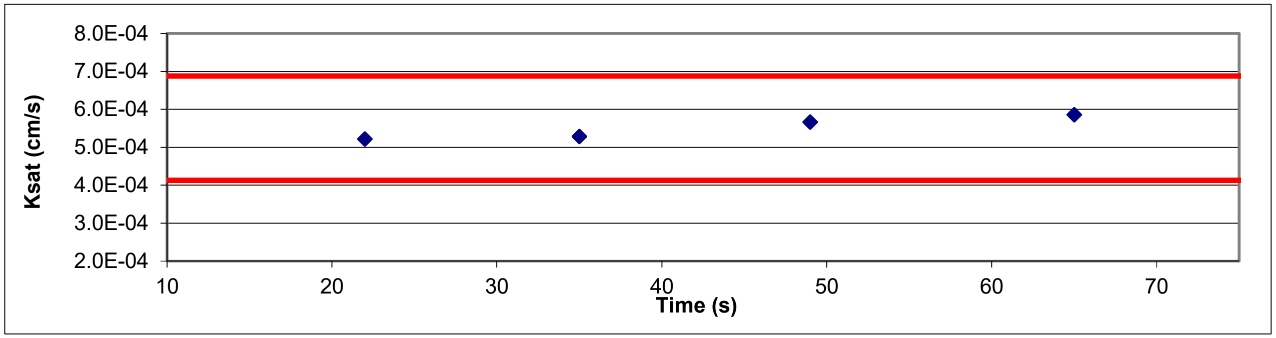
Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-72 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
18-Apr-24	10:41:00	21.4	10.00	20.00	1.14	0.87	22	1.00	20%	5.39E-04	5.21E-04
18-Apr-24	10:41:22	21.4	11.00	19.00	0.92						
Test # 2:											
18-Apr-24	10:41:22	21.4	11.00	19.00	0.92	0.43	13	1.00	12%	5.46E-04	5.28E-04
18-Apr-24	10:41:35	21.4	11.50	18.50	0.80						
Test # 3:											
18-Apr-24	10:41:35	21.4	11.50	18.50	0.80	0.43	14	1.00	14%	5.85E-04	5.66E-04
18-Apr-24	10:41:49	21.4	12.00	18.00	0.69						
Test # 4:											
18-Apr-24	10:41:49	21.4	12.00	18.00	0.69	0.43	16	1.00	17%	6.06E-04	5.86E-04
18-Apr-24	10:42:05	21.4	12.50	17.50	0.57						

Average Ksat **(cm/sec):** **5.50E-04**
Calculated Gravel Corrected Average Ksat (cm/sec): 4.64E-04



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 4.13E-04

Ksat (+25%) (cm/s): 6.88E-04

Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-73 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties

Initial Mass (g):	410.61
Diameter (cm):	6.126
Length (cm):	7.607
Area (cm^2):	29.47
Volume (cm^3):	224.21
Dry Density (g/cm^3):	1.64
Dry Density (pcf):	102.1
Water Content (%, g/g):	12.0
Water Content (%, vol):	19.6
Void Ratio (e):	0.63
Porosity (%, vol):	38.8
Saturation (%):	50.4

Post Permeation Sample Properties

Saturated Mass (g):	447.41
Dry Mass (g):	366.73
Diameter (cm):	6.006
Length (cm):	7.590
*Deformation (%)**:*	0.22
Area (cm^2):	28.33
Volume (cm^3):	215.03
Dry Density (g/cm^3):	1.71
Dry Density (pcf):	106.5
Water Content (%, g/g):	22.0
Water Content (%, vol):	37.5
Void Ratio(e):	0.57
Porosity (%, vol):	36.2
Saturation (%):*	103.6

Test and Sample Conditions

Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	3/8"
Percent Coarse Material (%):	2.2
Particle Density(g/cm^3):	2.67 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☑ G ☐ H ☐ I
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.99	4/12/24 0830
B-Value (% saturation) post to test:	0.95	4/12/24 1115

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

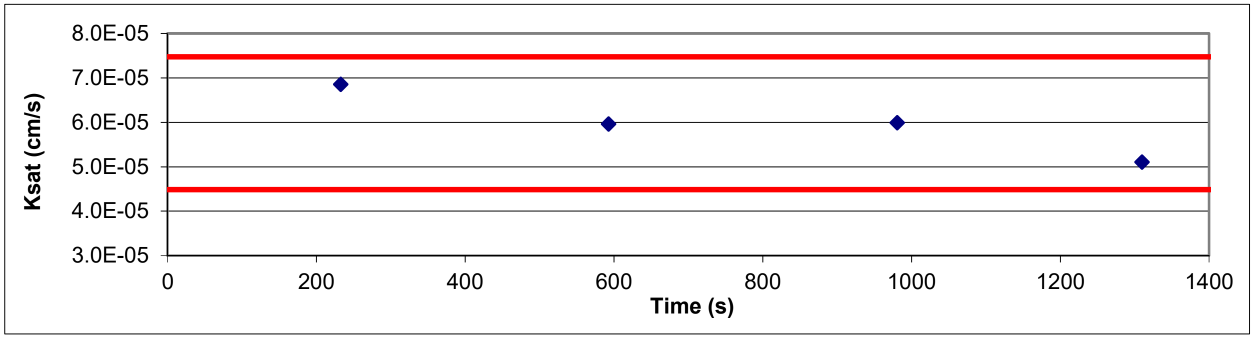
Laboratory analysis by: F.Cerno
Data entered by: F.Cerno
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-73 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
12-Apr-24	08:34:00	22.8	2.00	24.00	3.35	1.30	233	1.00	14%	7.32E-05	6.85E-05
12-Apr-24	08:37:53	22.8	3.50	22.50	2.89						
Test # 2:											
12-Apr-24	08:37:53	22.8	3.50	22.50	2.89	1.48	360	1.00	18%	6.38E-05	5.96E-05
12-Apr-24	08:43:53	22.8	5.20	20.80	2.37						
Test # 3:											
12-Apr-24	08:43:53	22.8	5.20	20.80	2.37	1.30	388	1.00	19%	6.41E-05	5.99E-05
12-Apr-24	08:50:21	22.8	6.70	19.30	1.92						
Test # 4:											
12-Apr-24	08:50:21	22.8	6.70	19.30	1.92	0.78	329	1.00	14%	5.45E-05	5.10E-05
12-Apr-24	08:55:50	22.8	7.60	18.40	1.64						

***Average Ksat* (cm/sec):** **5.98E-05**
Calculated Gravel Corrected Average Ksat (cm/sec): ---



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 4.48E-05

Ksat (+25%) (cm/s): 7.47E-05

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-76 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties

Initial Mass (g):	1556.33
Diameter (cm):	10.194
Length (cm):	10.157
Area (cm^2):	81.62
Volume (cm^3):	828.98
Dry Density (g/cm^3):	1.76
Dry Density (pcf):	109.6
Water Content (%, g/g):	6.9
Water Content (%, vol):	12.1
Void Ratio (e):	0.51
Porosity (%, vol):	34.0
Saturation (%):	35.6

Post Permeation Sample Properties

Saturated Mass (g):	1700.76
Dry Mass (g):	1455.93
Diameter (cm):	10.332
Length (cm):	10.104
*Deformation (%)**:*	0.52
Area (cm^2):	83.84
Volume (cm^3):	847.13
Dry Density (g/cm^3):	1.72
Dry Density (pcf):	107.3
Water Content (%, g/g):	16.8
Water Content (%, vol):	28.9
Void Ratio(e):	0.55
Porosity (%, vol):	35.4
Saturation (%):*	81.7

Test and Sample Conditions

Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	3/4"
Percent Coarse Material (%):	36.2
Particle Density(g/cm^3):	2.66 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☐ A ☑ B ☐ C
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.97	4/18/24 1000
B-Value (% saturation) post to test:	0.97	4/18/24 1400

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

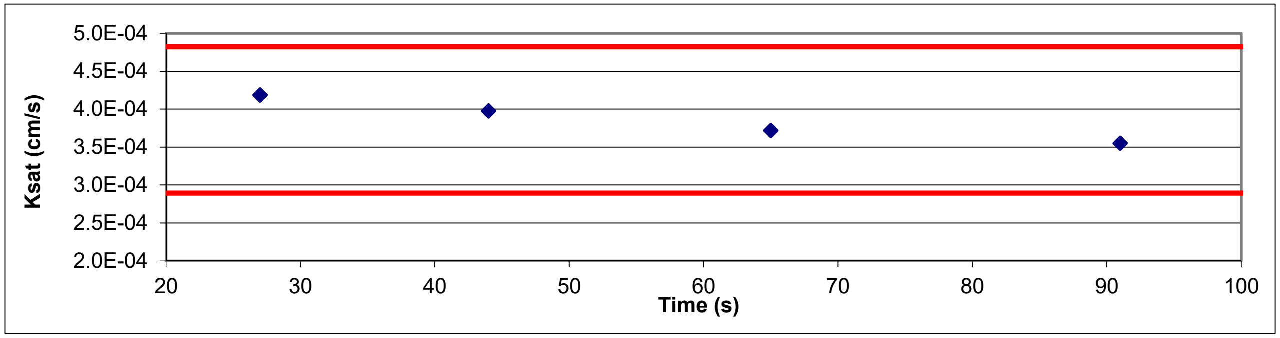
Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-76 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
18-Apr-24	10:50:08	21.4	10.00	20.00	1.14	0.87	27	1.00	20%	4.33E-04	4.18E-04
18-Apr-24	10:50:35	21.4	11.00	19.00	0.91						
Test # 2:											
18-Apr-24	10:50:35	21.4	11.00	19.00	0.91	0.43	17	1.00	12%	4.11E-04	3.98E-04
18-Apr-24	10:50:52	21.4	11.50	18.50	0.80						
Test # 3:											
18-Apr-24	10:50:52	21.4	11.50	18.50	0.80	0.43	21	1.00	14%	3.84E-04	3.72E-04
18-Apr-24	10:51:13	21.4	12.00	18.00	0.69						
Test # 4:											
18-Apr-24	10:51:13	21.4	12.00	18.00	0.69	0.43	26	1.00	17%	3.67E-04	3.55E-04
18-Apr-24	10:51:39	21.4	12.50	17.50	0.57						

***Average Ksat* (cm/sec):** **3.86E-04**
Calculated Gravel Corrected Average Ksat (cm/sec): 2.46E-04



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 2.89E-04

Ksat (+25%) (cm/s): 4.82E-04

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-77 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties	
Initial Mass (g):	401.76
Diameter (cm):	6.121
Length (cm):	7.606
Area (cm^2):	29.43
Volume (cm^3):	223.82
Dry Density (g/cm^3):	1.60
Dry Density (pcf):	100.0
Water Content (%, g/g):	12.0
Water Content (%, vol):	19.3
Void Ratio (e):	0.66
Porosity (%, vol):	39.7
Saturation (%):	48.5

Post Permeation Sample Properties	
Saturated Mass (g):	436.52
Dry Mass (g):	358.66
Diameter (cm):	6.049
Length (cm):	7.482
*Deformation (%)**:*	1.66
Area (cm^2):	28.74
Volume (cm^3):	215.02
Dry Density (g/cm^3):	1.67
Dry Density (pcf):	104.1
Water Content (%, g/g):	21.7
Water Content (%, vol):	36.2
Void Ratio(e):	0.59
Porosity (%, vol):	37.3
Saturation (%):*	97.2

Test and Sample Conditions	
Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	3/8"
Percent Coarse Material (%):	24.1
Particle Density(g/cm^3):	2.66 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☐ A ☐ B ☑ C
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.98	4/16/24 0800
B-Value (% saturation) post to test:	0.97	4/16/24 1015

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

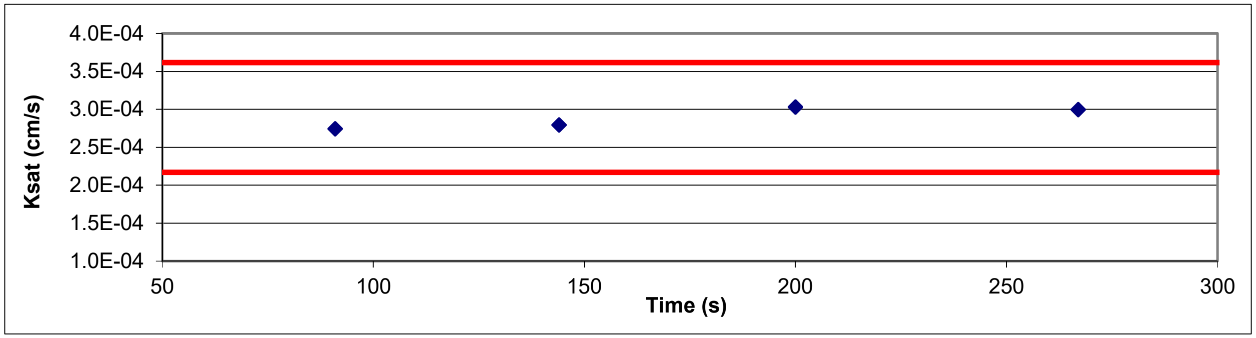
Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-77 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
16-Apr-24	08:16:00	20.4	10.00	20.00	1.54	0.87	91	1.00	20%	2.77E-04	2.74E-04
16-Apr-24	08:17:31	20.5	11.00	19.00	1.23						
Test # 2:											
16-Apr-24	08:17:31	20.5	11.00	19.00	1.23	0.43	53	1.00	12%	2.85E-04	2.79E-04
16-Apr-24	08:18:24	21.2	11.50	18.50	1.08						
Test # 3:											
16-Apr-24	08:18:24	21.2	11.50	18.50	1.08	0.43	56	1.00	14%	3.11E-04	3.03E-04
16-Apr-24	08:19:20	21.1	12.00	18.00	0.93						
Test # 4:											
16-Apr-24	08:19:20	21.1	12.00	18.00	0.93	0.43	67	1.00	17%	3.08E-04	3.00E-04
16-Apr-24	08:20:27	21.1	12.50	17.50	0.77						

***Average Ksat* (cm/sec):** **2.89E-04**
Calculated Gravel Corrected Average Ksat (cm/sec): 2.19E-04



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 2.17E-04

Ksat (+25%) (cm/s): 3.61E-04

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-80 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties

Initial Mass (g):	395.04
Diameter (cm):	6.12
Length (cm):	7.607
Area (cm^2):	29.42
Volume (cm^3):	223.77
Dry Density (g/cm^3):	1.58
Dry Density (pcf):	98.6
Water Content (%, g/g):	11.8
Water Content (%, vol):	18.6
Void Ratio (e):	0.71
Porosity (%, vol):	41.4
Saturation (%):	44.8

Post Permeation Sample Properties

Saturated Mass (g):	430.50
Dry Mass (g):	353.49
Diameter (cm):	5.947
Length (cm):	7.669
*Deformation (%)**:*	0.81
Area (cm^2):	27.78
Volume (cm^3):	213.02
Dry Density (g/cm^3):	1.66
Dry Density (pcf):	103.6
Water Content (%, g/g):	21.8
Water Content (%, vol):	36.2
Void Ratio(e):	0.63
Porosity (%, vol):	38.5
Saturation (%):*	93.9

Test and Sample Conditions

Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded; ☑ Remolded Sample
Number of Lifts:	3
Split:	3/8"
Percent Coarse Material (%):	20.3
Particle Density(g/cm^3):	2.70 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☐ A ☐ B ☑ C
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.98	4/12/24 830
B-Value (% saturation) post to test:	0.99	4/12/24 1115

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

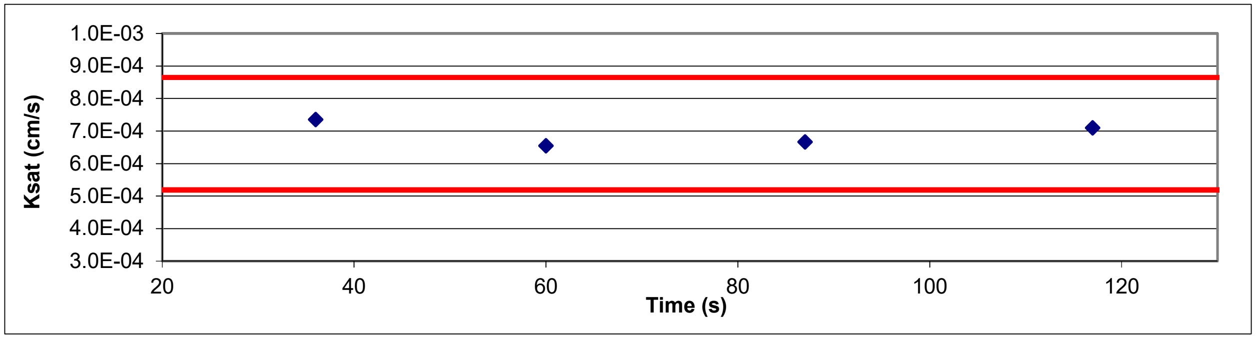
Laboratory analysis by: D. O'Dowd
Data entered by: D. O'Dowd
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-80 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
12-Apr-24	10:07:00	20.4	10.00	20.00	1.51	0.87	36	1.00	20%	7.44E-04	7.36E-04
12-Apr-24	10:07:36	20.5	11.00	19.00	1.20						
Test # 2:											
12-Apr-24	10:07:36	20.5	11.00	19.00	1.20	0.43	24	1.00	12%	6.67E-04	6.54E-04
12-Apr-24	10:08:00	21.2	11.50	18.50	1.05						
Test # 3:											
12-Apr-24	10:08:00	21.2	11.50	18.50	1.05	0.43	27	1.00	14%	6.85E-04	6.67E-04
12-Apr-24	10:08:27	21.1	12.00	18.00	0.90						
Test # 4:											
12-Apr-24	10:08:27	21.1	12.00	18.00	0.90	0.43	30	1.00	17%	7.29E-04	7.10E-04
12-Apr-24	10:08:57	21.1	12.50	17.50	0.75						

***Average Ksat* (cm/sec):** **6.92E-04**
Calculated Gravel Corrected Average Ksat (cm/sec): 5.51E-04



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 5.19E-04

Ksat (+25%) (cm/s): 8.65E-04

Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-81 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties

Initial Mass (g):	396.47
Diameter (cm):	6.111
Length (cm):	7.607
Area (cm^2):	29.33
Volume (cm^3):	223.11
Dry Density (g/cm^3):	1.57
Dry Density (pcf):	97.8
Water Content (%, g/g):	13.4
Water Content (%, vol):	21.0
Void Ratio (e):	0.70
Porosity (%, vol):	41.1
Saturation (%):	51.2

Post Permeation Sample Properties

Saturated Mass (g):	433.74
Dry Mass (g):	349.52
Diameter (cm):	6.064
Length (cm):	7.543
*Deformation (%)**:*	0.85
Area (cm^2):	28.88
Volume (cm^3):	217.85
Dry Density (g/cm^3):	1.60
Dry Density (pcf):	100.2
Water Content (%, g/g):	24.1
Water Content (%, vol):	38.7
Void Ratio(e):	0.66
Porosity (%, vol):	39.7
Saturation (%):*	97.4

Test and Sample Conditions

Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	3/8"
Percent Coarse Material (%):	11.41
Particle Density(g/cm^3):	2.66 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☑ A ☐ B ☐ C
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.98	4/12/24 830
B-Value (% saturation) post to test:	0.98	4/12/24 1115

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

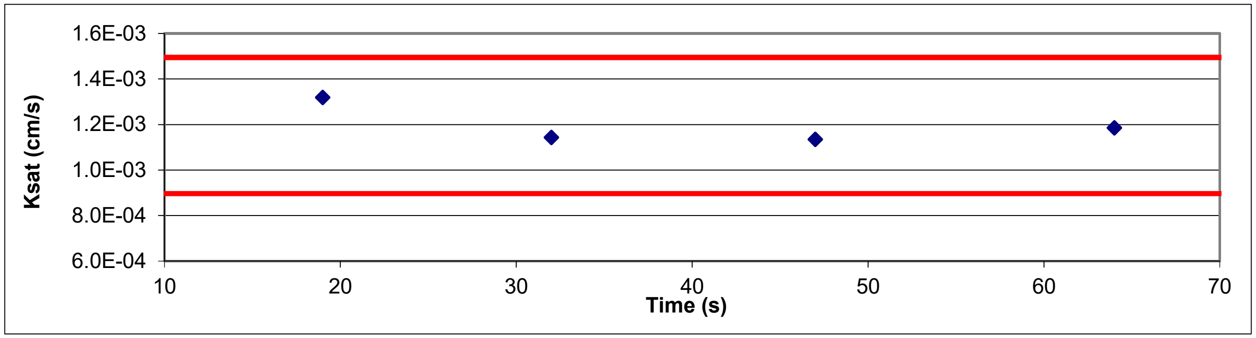
Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-81 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient ($\Delta H/\Delta L$)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
12-Apr-24	10:58:00	20.4	10.00	20.00	1.53	0.87	19	1.00	20%	1.33E-03	1.32E-03
12-Apr-24	10:58:19	20.5	11.00	19.00	1.22						
Test # 2:											
12-Apr-24	10:58:19	20.5	11.00	19.00	1.22	0.43	13	1.00	12%	1.17E-03	1.14E-03
12-Apr-24	10:58:32	21.2	11.50	18.50	1.07						
Test # 3:											
12-Apr-24	10:58:32	21.2	11.50	18.50	1.07	0.43	15	1.00	14%	1.17E-03	1.14E-03
12-Apr-24	10:58:47	21.1	12.00	18.00	0.92						
Test # 4:											
12-Apr-24	10:58:47	21.1	12.00	18.00	0.92	0.43	17	1.00	17%	1.22E-03	1.19E-03
12-Apr-24	10:59:04	21.1	12.50	17.50	0.77						

***Average Ksat* (cm/sec):** **1.20E-03**
Calculated Gravel Corrected Average Ksat (cm/sec): 1.06E-03



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 8.97E-04

Ksat (+25%) (cm/s): 1.49E-03

Daniel B. Stephens & Associates, Inc.

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-84 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties		Post Permeation Sample Properties		Test and Sample Conditions	
Initial Mass (g):	412.90	*Saturated Mass (g):*	450.59	*Permeant liquid used:*	Tap Water
Diameter (cm):	6.124	*Dry Mass (g):*	373.67	*Sample Preparation:*	☐ In situ sample, extruded
Length (cm):	7.606	*Diameter (cm):*	6.098		☑ Remolded Sample
Area (cm^2):	29.46	*Length (cm):*	7.496	*Number of Lifts:*	3
Volume (cm^3):	224.04	*Deformation (%)**:*	1.47	*Split:*	3/8"
Dry Density (g/cm^3):	1.67	*Area (cm^2):*	29.21	*Percent Coarse Material (%):*	5.97
Dry Density (pcf):	104.1	*Volume (cm^3):*	218.92	*Particle Density(g/cm^3):*	2.68 ☐ Assumed ☑ Measured
Water Content (%, g/g):	10.5	*Dry Density (g/cm^3):*	1.71	*Cell pressure (PSI):*	81.0
Water Content (%, vol):	17.5	*Dry Density (pcf):*	106.6	*Influent pressure (PSI):*	80.0
Void Ratio (e):	0.61	*Water Content (%, g/g):*	20.6	*Effluent pressure (PSI):*	80.0
Porosity (%, vol):	37.8	*Water Content (%, vol):*	35.1	*Panel Used:*	☐ A ☐ B ☑ C
Saturation (%):	46.4	*Void Ratio(e):*	0.57	*Reading:*	☐ Annulus ☑ Pipette
		Porosity (%, vol):	36.3		
		Saturation (%):*	96.8		

	Value	Date/Time
B-Value (% saturation) prior to test*:	0.99	4/16/24 0830
B-Value (% saturation) post to test:	0.98	4/16/24 1015

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

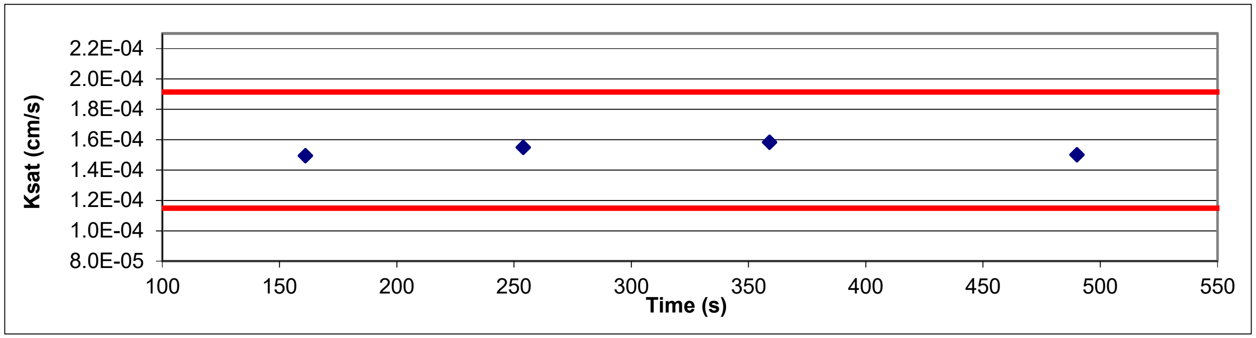
Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-84 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
16-Apr-24	08:26:00	21.4	10.00	20.00	1.54	0.87	161	1.00	20%	1.55E-04	1.49E-04
16-Apr-24	08:28:41	21.4	11.00	19.00	1.23						
Test # 2:											
16-Apr-24	08:28:41	21.4	11.00	19.00	1.23	0.43	93	1.00	12%	1.60E-04	1.55E-04
16-Apr-24	08:30:14	21.4	11.50	18.50	1.08						
Test # 3:											
16-Apr-24	08:30:14	21.4	11.50	18.50	1.08	0.43	105	1.00	14%	1.64E-04	1.58E-04
16-Apr-24	08:31:59	21.4	12.00	18.00	0.92						
Test # 4:											
16-Apr-24	08:31:59	21.4	12.00	18.00	0.92	0.43	131	1.00	17%	1.55E-04	1.50E-04
16-Apr-24	08:34:10	21.4	12.50	17.50	0.77						

***Average Ksat* (cm/sec):** **1.53E-04**
Calculated Gravel Corrected Average Ksat (cm/sec): 1.44E-04



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 1.15E-04

Ksat (+25%) (cm/s): 1.91E-04

Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-85 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Remolded or Initial Sample Properties

Initial Mass (g):	396.79
Diameter (cm):	6.126
Length (cm):	7.607
Area (cm^2):	29.47
Volume (cm^3):	224.21
Dry Density (g/cm^3):	1.59
Dry Density (pcf):	99.2
Water Content (%, g/g):	11.3
Water Content (%, vol):	18.0
Void Ratio (e):	0.68
Porosity (%, vol):	40.5
Saturation (%):	44.5

Post Permeation Sample Properties

Saturated Mass (g):	434.71
Dry Mass (g):	356.41
Diameter (cm):	6.107
Length (cm):	7.529
*Deformation (%)**:*	1.04
Area (cm^2):	29.29
Volume (cm^3):	220.54
Dry Density (g/cm^3):	1.62
Dry Density (pcf):	100.9
Water Content (%, g/g):	22.0
Water Content (%, vol):	35.5
Void Ratio(e):	0.65
Porosity (%, vol):	39.5
Saturation (%):*	90.0

Test and Sample Conditions

Permeant liquid used:	Tap Water
Sample Preparation:	☐ In situ sample, extruded ☑ Remolded Sample
Number of Lifts:	3
Split:	3/8"
Percent Coarse Material (%):	2.9
Particle Density(g/cm^3):	2.67 ☐ Assumed ☑ Measured
Cell pressure (PSI):	81.0
Influent pressure (PSI):	80.0
Effluent pressure (PSI):	80.0
Panel Used:	☐ A ☑ B ☐ C
Reading:	☐ Annulus ☑ Pipette

		Date/Time
B-Value (% saturation) prior to test*:	0.97	4/12/24 830
B-Value (% saturation) post to test:	0.99	4/12/24 1130

* Per ASTM D5084 percent saturation is ensured (B-Value ≥ 95%) prior to testing, as post test saturation values may be exaggerated or skewed during depressurizing and sample removal.
**Percent Deformation: based on initial sample length and post permeation sample length.

Laboratory analysis by: F. Cerno
Data entered by: F. Cerno
Checked by: J. Hines

Daniel B. Stephens & Associates, Inc.

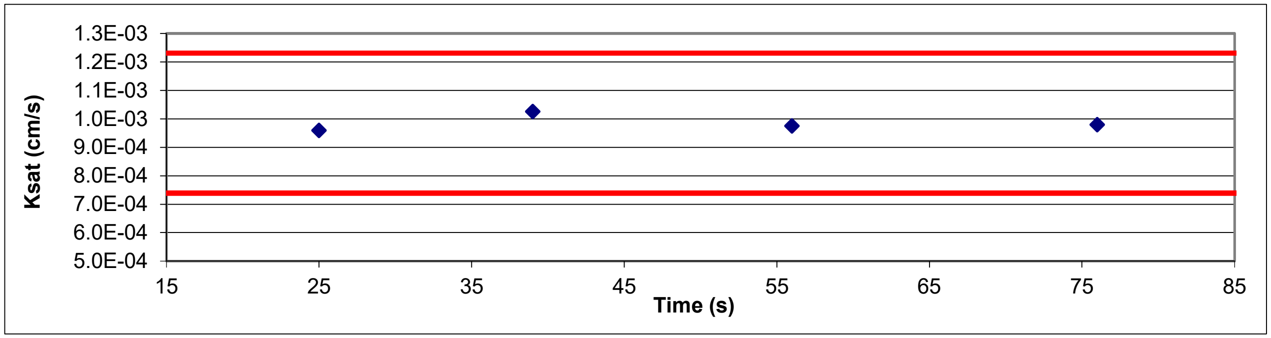
Saturated Hydraulic Conductivity
Flexible Wall Falling Head-Rising Tail Method

Job Name: AECOM
Job Number: DB24.1170.00
Sample Number: TP-85 (0-10) (85%)
Project Name: APS Cholla Fly Ash Pond
Project Number: 60710305

Date	Time	Temp (°C)	Influent Pipette Reading	Effluent Pipette Reading	Gradient (ΔH/ΔL)	Average Flow (cm^3)	Elapsed Time (s)	Ratio (outflow to inflow)	Change in Head (Not to exceed 25%)	k_{sat} T°C (cm/s)	k_{sat} Corrected (cm/s)
Test # 1:											
12-Apr-24	11:24:00	21.6	10.00	20.00	1.53	0.87	25	1.00	20%	9.97E-04	9.59E-04
12-Apr-24	11:24:25	21.6	11.00	19.00	1.23						
Test # 2:											
12-Apr-24	11:24:25	21.6	11.00	19.00	1.23	0.43	14	1.00	12%	1.07E-03	1.03E-03
12-Apr-24	11:24:39	21.6	11.50	18.50	1.07						
Test # 3:											
12-Apr-24	11:24:39	21.6	11.50	18.50	1.07	0.43	17	1.00	14%	1.01E-03	9.75E-04
12-Apr-24	11:24:56	21.6	12.00	18.00	0.92						
Test # 4:											
12-Apr-24	11:24:56	21.6	12.00	18.00	0.92	0.43	20	1.00	17%	1.02E-03	9.80E-04
12-Apr-24	11:25:16	21.6	12.50	17.50	0.77						

***Average Ksat* (cm/sec): 9.85E-04**

Calculated Gravel Corrected Average Ksat (cm/sec): ---



ASTM Required Range (+/- 25%)

Ksat (-25%) (cm/s): 7.39E-04

Ksat (+25%) (cm/s): 1.23E-03

ATTACHMENT D

Final ET Closure Cover System

Maximum Flux versus Depth for Design Section

UNSAT-H Model Output

Figure 10 from ET Cover Design Calculation Package

Prepared for: Arizona Public Service

AECOM Project No. 60710305, September 2024

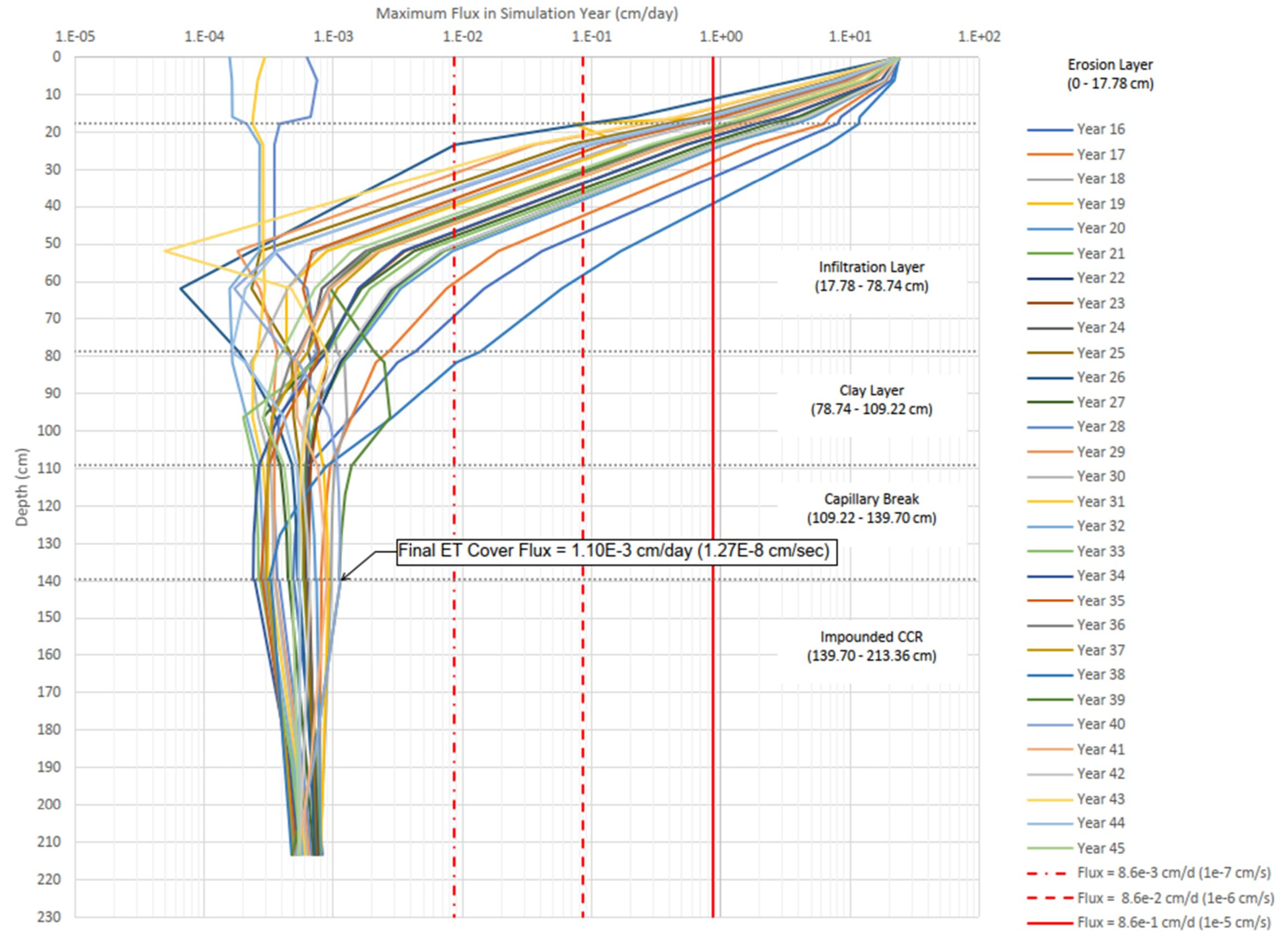


Figure 10. Maximum Flux (cm/day) versus Depth (Planned Section)

Cholla Fly Ash Pond ET Cover
Project No.:60710305

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