RESPONSE TO COMMENTS
Permit Modification of the APS Four Corners Power Plant Permit
NPDES Permit No. NN0000019
December 2023

EPA solicited comments on the draft permit modification and factsheet on September 27, 2023 and this comment period ended on October 30, 2023. EPA received comments from Law Office of John Barth on behalf of Dine CARE, San Juan Citizens' Alliance, Center for Biological Diversity, Amigos Bravos, and Sierra Club on October 30, 2023. EPA has summarized the comments and responded to comments below.

COMMENT 1: The currently effective effluent guideline for the discharge of pollutants in bottom ash states, "there shall be no discharge of pollutants in bottom ash transport water." 40 C.F.R. §423.13(k)(1)(i). EPA's draft permit modification would allow APS to avoid this "no discharge" requirement by allowing a discharge of up to 2.5% of a 30-day rolling average of the primary active wetted bottom ash system volume at Outfall 01E. These bottom ash pollutants would flow into the receiving canal and then flow into Morgan Lake. Morgan Lake is a public recreation lake allowing for primary contact with the water and sustenance fishing. APS' permit modification request poses risks to public health and the environment because of the discharge of toxic pollutants into waters of the Navajo Nation.

RESPONSE 1: Commenter is citing the general no discharge rule. However, the full text of 40 C.F.R. Section 423.13(k)(1)(i) is as follows:

> **" (i)** ***Bottom ash transport water.*** Except for those discharges to which paragraph (k)(2) of this section applies, or when the bottom ash transport water is used in the FGD scrubber, there shall be no discharge of pollutants in bottom ash transport water. Dischargers must meet the discharge limitation in this paragraph by a date determined by the permitting authority that is as soon as possible beginning October 13, 2021, but no later than December 31, 2025. This limitation applies to the discharge of bottom ash transport water generated on and after the date determined by the permitting authority for meeting the discharge limitation, as specified in this paragraph. Except for those discharges to which paragraph (k)(2) of this section applies, whenever bottom ash transport water is used in any other plant process or is sent to a treatment system at the plant (except when it is used in the FGD scrubber), the resulting effluent must comply with the discharge limitation in this paragraph. When the bottom ash transport water is used in the FGD scrubber, it ceases to be bottom ash transport water, and instead is FGD wastewater, which must meet the requirements in paragraph (g) of this section."

This complete excerpt from the applicable regulation indicates that although full prohibition of the discharge of bottom ash transport water is the general rule, there is also a well-developed provision for identifying exceptions to that full prohibition.

In the case of this permit modification, and as discussed in more detail in the Notice of Proposed Modification and below, EPA has found that the discharger has met the requirements of Section

423.3(k)(2), including the allowance for and limits on discharge of bottom ash transport water at Section 423(k)(2)(i), such that the proposed modification is appropriate. Section 423(k)(2)(i)(A) states that:

> *"**The discharge of pollutants in bottom ash transport water from a properly installed, operated, and maintained bottom ash system is authorized under the following conditions**:* (1) To maintain system water balance when precipitation-related inflows are generated from storm events exceeding a 10-year storm event of 24-hour or longer duration (*e.g.*, 30-day storm event) and cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment; or (2) To maintain system water balance when regular inflows from waste streams other than bottom ash transport water exceed the ability of the bottom ash system to accept recycled water and segregating these other waste streams is not feasible; or (3) To maintain system water chemistry where installed equipment at the facility is unable to manage pH, corrosive substances, substances or conditions causing scaling, or fine particulates to below levels which impact system operation or maintenance; or (4) To conduct maintenance not otherwise included in paragraphs (k)(2)(i)(A) (1),(2), or (3) of this section and not exempted from the definition of transport water in § 423.11(p), and when water volumes cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment."

The permit modification allows for discharge of bottom ash transport water only in the above authorized situations.

As an artificial cooling pond designed and constructed to be used as treatment for the FCPP's waste heat, Morgan Lake is a waste treatment system and is excluded from the definition of "waters of the United States." 40 C.F.R. § 122.2. EPA regulates discharges from the FCPP into Morgan Lake as an "internal outfall" pursuant to 40 CFR 122.45(h), and the proposed permit modification affects only the discharge into Morgan Lake labeled Internal Outfall No. 01E.

COMMENT 1a: The permit modification request should be denied because APS has not proven that the water balance in its system "cannot be managed by installed spares, redundancies, maintenance tasks, and other secondary bottom ash system equipment" or other measures. 40 C.F.R. §423.13(k)(2)(i)(1)-(4). APS should be required to install and operate additional and/or redundant equipment, such as additional bottom ash sluice water recycle tanks, in order to comply with the "no discharge" effluent requirement. Alternatively, APS should be required to abandon its wet sluicing of bottom ash and fly ash at the plant and switch to a dry system.

RESPONSE 1a: Commenter is correct that APS must demonstrate that the water balance in the system "cannot be managed" by surplus tankage before the facility is entitled to a purge. This demonstration necessarily differs at a facility with a fully constructed and operating high recycle rate system and one which, though fully designed, has yet to be commissioned. APS can only be responsible for providing what is possible and to the extent the facility falls in the latter category it is not possible for operational data to be applied to such a demonstration. Instead, APS has provided a good faith estimate of the circumstances in which it estimates that water balance

"cannot be managed" and thus, may require a discharge. For example, in the January 8, 2021 permit modification request, APS stated on page 3:

> ***"Every effort will be made to divert stormwater flows from the BATW recirculation system to a future separate low volume waste system, but given the configuration of process areas and the open top tanks and equipment that will be part of the BATW recirculation system, storm events will result in surges in system volume that could require system purges."***

These "efforts" were an intended system design which was followed up on, resulting in a system design that was later estimated to be able to handle flows not just up to the 10-year events required by the rule, but up to 100-year events.[1] Furthermore, as presented, other potential in-flows would also be able to be handled by redirection to the FGD scrubber rather than a regular purge. While there is more uncertainty regarding potential maintenance discharges, here too APS attempts to estimate the need, stating in the initial certification statement that it may be necessary to empty a secondary tank as often as once per year.[2] In justification of this need, the company stated that physical space for a third tank was limited, and furthermore that the cost of a third tank was not warranted for a maintenance event that would happen no more frequently than once per year. Thus, it is clear that for managing water balance issues, APS is taking actions that achieve the requirement that "[t]he total volume that may be discharged for the above activities shall be reduced or eliminated to the extent achievable…" 423.13(k)(2)(i)(B).

With respect to the alternative suggestion that APS should be required to switch to a dry system, the preamble of the 2020 Rule stated that "[w]hile plants are free to use dry handling technologies to achieve the limitations in the rule, the final rule limitations are based on high recycle rate systems…" (85 Fed. Reg. 64660) EPA does not have the authority to require which system APS uses to meet the limitations. While a dry handling system might achieve equal or greater pollutant removals, APS may select any system so long as it can meet the 2020 Rule limitations, including the allowable purge.

COMMENT 2: EPA should deny the permit modification request based on environmental justice considerations. Almost the entire population living near the plant is Native American. Additionally, the vast majority of the local population is at or below the poverty line. Further, the Navajo Nation and Four Corners area has been treated as a national "sacrifice zone" for decades, allowing heavily polluting industries to adversely impact public health. A review of the administrative record for the proposed permit modification fails to undertake any environmental justice analysis, contrary to EPA policy and Presidential Executive Orders. See, Attachment 1 and 2 [of the October 30, 2023 comment letter] hereto. EPA must undertake a comprehensive and cumulative environmental justice analysis before proceeding with this permit modification and closely consider the findings of that analysis before rendering a decision.

[1] See Table 2-2 of *Initial Certification Statement Supporting the Discharge of Bottom Ash Transport Water*, May, 2022 Draft (**see Attachment 3**).

[2] *Id* at Table 2-3.

RESPONSE 2: As discussed in more detail below, EPA is reconsidering only those permit conditions being proposed for revision in the public notice. The other provisions of the permit remain in place for the remainder of the permit term. EPA's consideration of environmental justice concerns in the permitting decisions have already been subject to public scrutiny when this permit was issued in 2020 and will again be available for public comment when this entire permit is proposed for reissuance following reapplication.

As a factual matter, EPA completed a screening-level environmental justice analysis for Four Corners Power Plant NPDES permit in 2015. In 2015, EPA was considering NPDES permit renewals for both the FCPP and the adjacent Navajo Mine. In a report dated August 7, 2015, EPA used the EJSCREEN program to evaluate for EJ concerns an area within 10 miles of the Navajo Mine, which area includes the entire FCPP facility. The 2015 EJSCREEN report is included to this Response to Comments document as **Attachment 1**.

Again, EPA notes that the environmental justice analysis for the FCPP is not being reopened in this permit modification. EPA notes, however, that the EJSCREEN program is still cited as a valid EJ screening mechanism. *See* EPA, E.O. 13985 Equity Action Plan, April 2022, at p. 7 and footnote 10. EJSCREEN program has been updated since the screening in 2015, so EPA performed a second EJSCREEN evaluation of the area including the FCPP and the Navajo Mine on November 21, 2023. The 2023 EJSCREEN report is also included as **Attachment 2.** The 2023 results largely mirror the initial review from 2015. EPA used EJSCREEN to identify environmental factors in the vicinity of the APS Four Corners Power Plant (FCPP) that could pose risk to local residents USEPA also evaluated whether demographic characteristics of the population living in the vicinity of the facility indicate that the local population might be particularly susceptible to such environmental risks. The 2023 results largely mirror the initial review from 2015. The results show that, at the time of this analysis, conducted on November 21, 2023, the area in which the facility is located was above the 97th percentile in New Mexico and 28th percentile nationally for toxics releases to air. No other environmental parameter exceeded the 80th percentile either for New Mexico, or nationally. The EJSCREEN analysis of demographic characteristics of the community living near the facility indicates a higher proportion of minority and low-income population, and population with less than high school education, compared to the national population.

EPA considers the characteristics of the facility operation and discharges, and whether those discharges, in combination with discharges from local toxics to air, pose exposure risks that the NPDES permit needs to further address. The effluent discharge authorized by this permit is unlikely to contribute to toxics in the air. EPA acknowledges that operations of the facility outside the scope of this permit may contribute toxics to the air, and air pollution from the facility is regulated by a separate Air Quality permit. (CAA Operating Permit NN00000035045NAV02). EPA finds the results of these EJSCREEN analyses do not indicate the need to adjust the permit modification.

Review of past NPDES Discharge Monitoring Reports in EPA's Enforcement and Compliance History Online (ECHO) database[3] for the period of this permit indicate no violations of numeric

[3] See ECHO database at echo.epa.gov, FRS ID number 110042068473

limits from any of the discharges to receiving surface waters. Thus, EPA finds no evidence to indicate the effluent discharged from the facility poses a significant risk to residents.

The proposed modification does not alter any of the permit limits and monitoring requirements from Outfall 001, the only authorized outfall to the receiving waterbody. Additionally, the proposed modification reduces the permitted discharge of bottom ash transport water at internal Outfall 01E by over 90% compared to the existing permit.

EPA believes that by implementing and requiring compliance with the provisions of the Clean Water Act, which are designed to ensure full protection of human health, the permit including the proposed modification, is sufficient to ensure that the permitted effluent discharges will not cause or contribute to human health risk in the vicinity of the facility, nor would it result in adverse impacts that would disproportionally affect low-income or minority populations or contribute to any environmental justice issues.

COMMENT 3: Section 423.19(c) of the current effective regulation requires facilities proposing to discharge BA transport water to provide in the Initial Certification Statement, "the primary active wetted bottom ash system volume in §423.11(aa)" and "[a] list of all potential discharges…the expected volume of each discharge, and the expected frequency of each discharge." 40 C.F.R. §423.19(C)(2)(D) and (F). The deadline for submission of this information was October 13, 2023. To date, APS has failed to provide specific volumes of ***each*** discharge and the frequency of ***each*** discharge. Instead, APS proposes to use 2024 to generate data that "would be used to identify the bottom as purge volume…." APS letter to Gary Sheth, EPA dated November 1, 2022 and referred to in EPA's draft Fact Sheet. APS' permit modification application should be denied because, to date, it has failed to provide specific, concrete data on the volume and frequency of each discharge.

RESPONSE 3: Commenter misinterprets the Initial Certification Statement. The title of the document contains the word "initial" and yet commenter treats it as the "final" word on purge needs. While the 2020 Rule did create a nationally applicable requirement for an initial certification statement that would assist permitting authorities in evaluating purge requests, this requirement was not intended either to prohibit the permit writer from requesting additional information when first implementing the 2020 Rule or to prohibit future requests for updated information that might allow a permit writer to tighten the purge allowance as operational experience and facts on the ground allow.[4]

Here, where APS has yet to commission and operate the high recycle rate system at issue, it would be wholly inconsistent with the permitting authority's determination of an "as soon as possible" date under 423.11(t) to read this initial paperwork submission to demand knowledge for a system that is not yet operating. APS provided an initial certification statement in May, 2022 and has since provided supplemental information to satisfy EPA's concerns that it justify

[4] NPDES regulations prohibit the permitting authority from issuing an individual permit until and unless a prospective discharger provides a "complete application which includes an application form and any supplemental information completed to their satisfaction." 40 CFR 122.21(e).

the volumes and frequencies of each discharge.[5] Volumes and frequencies of even fully operating systems can never be known with certainty (e.g., stormwater events). Instead, best estimates are all that is possible at this time, estimates which APS has provided.

To the extent that APS, and subsequently EPA, learn more after the system is commissioned and begins closed-loop operations, it may become appropriate for EPA to adjust the purge limitations that get ***initially*** established based on the engineering calculations and assumptions provided in the ***initial*** certification statement. In that sense, the limit may naturally tighten over time with the experience of the system operators. The fact that APS has committed to minimize its purge and provide data and information to EPA once it becomes available further supports that this is a reasonable path for compliance.[6]

COMMENT 4: EPA's proposed modification to NPDES Permit NN0000019 is limited to issues related to a proposed "BA purge water" exemption request to allow for the discharge of bottom ash transport water from Internal Outfall 01E. However, both the proposed Fact Sheet and Draft Permit fail to acknowledge the significant physical and operational changes that have been made to the Four Corners Power Plant water pollution control systems since EPA last re-issued this permit on September 30, 2019. These physical and operational changes are documented in Arizona Public Service's 2022 Annual CCR Impoundment and Landfill Inspection Report, which is posted to the company's mandated Coal Combustion Residual ("CCR") public website. Attachment 3 hereto. Some of the notable operational and physical changes to the Four Corners Power Plant water pollution controls systems since September 30, 2019 include the following:

• "APS stopped discharging to the LAI [Lined Ash Impoundment] on April 2, 2021. At the time of the October 2022 inspection, the reservoir pool had been removed, leaving only interstitial water within the impounded ash to drain into the LDWP [Lined Decant Water Pond] via the Drop Inlet Structure and the Deadpool Sump." Exhibit 1, p. 3.
• "APS constructed the Bottom Ash Sluice Water Recycle (BASWR) Tank to replace the CWTP [Combined Waste Treatment Pond] in 2020…APS ceased discharging to the CWTP by November 23, 2020." Exhibit 1, pp. 3-4.
• "The RWP [Return Water Pond] is an approximately 5.13-acre lined impoundment facility for the temporary storage of LAI/LDWP and Pond 3 pump house discharges. The RWP was constructed in 2019 and was placed into service as a CCR unit on October 20, 2020. Exhibit 1, p. 4. As shown above and in Exhibit 1, the water pollution control system has been almost entirely modified since EPA's last issuance of NPDES Permit NN0000019 on September 30, 2019. A review of EPA's September 20, 2019 permit and fact sheet contain no references to the BASWR Tank, Drop Inlet Structure, Deadpool Sump, or RWP. Further, the current proposed Draft Permit and Fact Sheet fail to acknowledge all of these significant physical and operational changes since September 30, 2019. As written, the Draft Permit is factually

[5] APS correspondence dated: May 5, 2021, June 21, 2022, November 1, 2022, January 26, 2023, and July 21, 2023. **(See Attachments 3 - 7**).

[6] In the June 21, 2022 update to EPA (**see Attachment 4),** APS states that it will:
"Monitor and, to the maximum extent feasible, minimize BATW discharges from startup to compliance deadline" and "Regularly report to EPA (e.g., monthly) blowdown volumes, internal water chemistry, etc."

inaccurate. More specifically, the Location Map at Attachment C is no longer reflective of existing coal ash facilities. Moreover, the Wastewater Flow Schematic is also no longer accurate as it still refers to the "CWTP," fails to identify the BASWR Tank, Drop Inlet Structure, Deadpool Sump, or RWP, and otherwise displays an inaccurate wastewater flow schematic. Further, as noted above, APS' permit application fails to prove that it cannot meet the "no discharge of pollutants in bottom ash" effluent limitation by utilizing the new BASWR Tank, Drop Inlet Structure, Deadpool Sump, or RWP facilities or adding additional redundant facilities. In the event EPA proceeds with any permit modification, we ask that EPA re-open the permit in its entirety to address the numerous factual deficiencies in both the Permit and Fact Sheet. We ask that EPA amend the Fact Sheet to contain a comprehensive description of the current wastewater flow at the Four Corners Power Plant. This should include a cradle to grave description of all water pollution flow paths and where is each path discharges. Because the Outfall 01E physical location was recently moved, we ask that EPA include an accurate map identifying all structures and features along the wastewater flow path discussed herein, all outfall locations, and all monitoring locations. We also ask the EPA replace Attachment C of the current permit with a legible and currently accurate Location Map and Attachment D with a legible and currently accurate one-page Wastewater Flow Schematic.

RESPONSE 4: A permit modification is not a review of the entire permit and fact sheet. EPA's regulations are quite clear on this: "In a permit modification under this section, only those conditions to be modified shall be reopened when a new draft permit is prepared. All other aspects of the existing permit shall remain in effect for the duration of the unmodified permit." 40 CFR Section 124.5(c)(2). For that reason, EPA's Public Notice solicited public comment "only on the modifications as described in the proposed modified permit and factsheet."

This permit modification does not contemplate changes to the location of the authorized discharge point at Outfall 001 which discharges treated effluent from Morgan Lake into No Name Wash. EPA wishes to clarify that Outfall 01E is an internal discharge point, upstream of Outfall 001 and need not be updated.

EPA further notes that significant changes in plant operations were envisioned at the time of permit issuance in 2020. A fully revised Fact Sheet describing the changed configuration will be released at the time of any future permit renewal.

COMMENT 5: APS is required by law to maintain a publicly available website where it posts filings, reports, and data related to certain CCR activities at the Four Corners Power Plant. In the event EPA proceeds with a permit modification, it should require that APS post all filings, data, and reports related to the BA purge water exemption to APS' publicly available website. This information would include, but not be limited to, date(s) of each discharge, volume of each discharge, the volume of the primary active wetted bottom ash system at the time of each discharge, the Initial Certification Statement and any amendments thereto, the Best Management Plan for the recycling of bottom ash transport water, all data, filings, and reports required under Section 423.19 of the regulations, and all data, filings, and reports required under the proposed regulation at Section 423.19 that can be found at 88 Fed. Reg. 18900 (March 29, 2023).

RESPONSE 5: Commenter appears to be suggesting that this permit modification should incorporate language that mandates compliance with the operative CCR monitoring, reporting and disclosure provisions of 40 CFR Section 423.19. EPA declines to do so. As noted, only the provisions being modified are being reopened in this action. EPA has included in the proposed modification language appropriate monitoring, documentation and reporting provisions it believes are necessary to implement the proposed modifications.

EPA notes that the provisions of proposed regulations are inapplicable to this action, unless and until those proposals are finalized.

Attachment 1: EPA EJScreen Report, 2015

Attachment 2: EPA EJScreen Community Report, 2023

Attachment 3: APS Draft Initial Certification, May 19, 2022

Attachment 4: APS ELG Project Status Update, June 6, 2021

Attachment 5: APS letter to EPA, Proposed Permit Modification Approach, November 1, 2022

Attachment 6: APS letter to EPA, Permit Modification Approach Request, January 26, 2023

Attachment 7: APS letter to EPA, Supplementary Information Supporting Permit Modification, July 21, 2023

Attachment 1: EJSCREEN Report

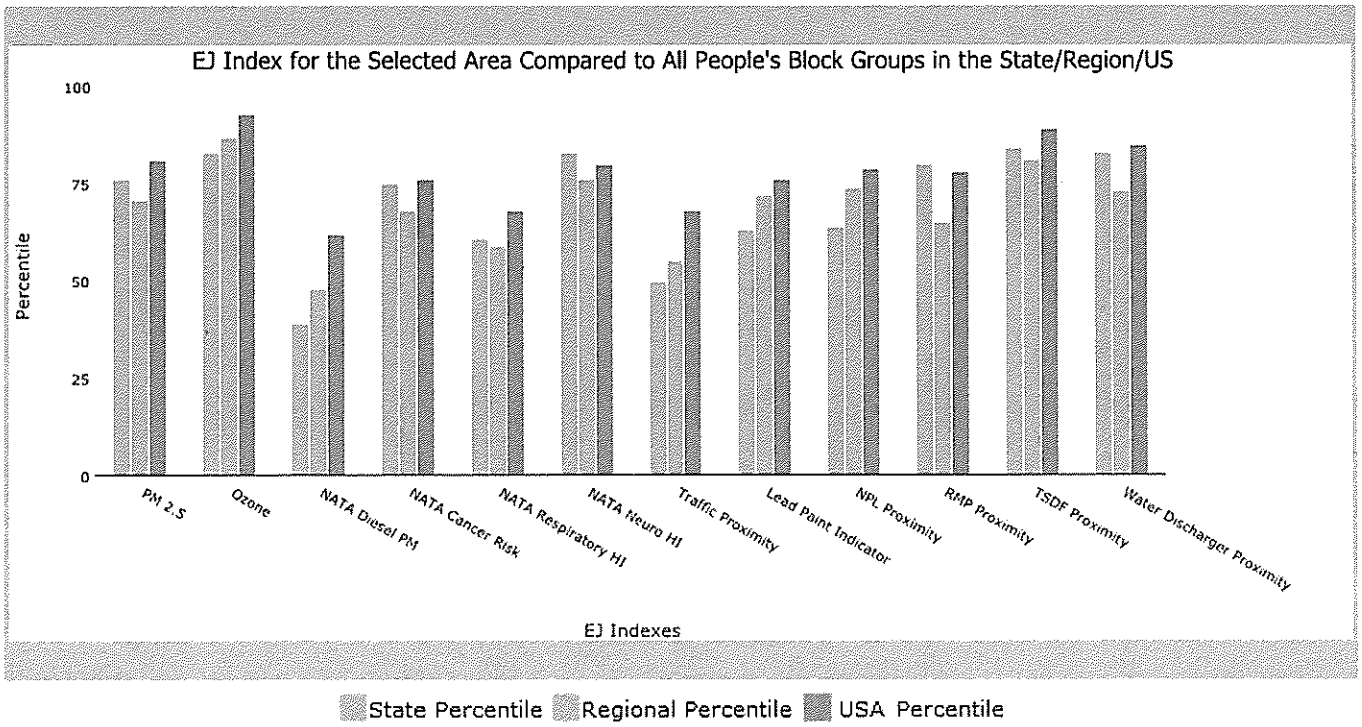
EJSCREEN Report

for 10 mile Ring Centered at 36.599724,-108.500172, NEW MEXICO, EPA Region 6

Approximate Population: 1782

Navajo Mine

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	76	71	81
EJ Index for Ozone	83	87	93
EJ Index for NATA Diesel PM	39	48	62
EJ Index for NATA Air Toxics Cancer Risk	75	68	76
EJ Index for NATA Respiratory Hazard Index	61	59	68
EJ Index for NATA Neurological Hazard Index	83	76	80
EJ Index for Traffic Proximity and Volume	50	55	68
EJ Index for Lead Paint Indicator	63	72	76
EJ Index for Proximity to NPL sites	64	74	79
EJ Index for Proximity to RMP sites	80	65	78
EJ Index for Proximity to TSDFs	84	81	89
EJ Index for Proximity to Major Direct Dischargers	83	73	85



This report shows environmental, demographic, and EJ indicator values. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report

for 10 mile Ring Centered at 36.599724,-108.500172, NEW MEXICO, EPA Region 6

Approximate Population: 1782

Navajo Mine

August 7, 2015

Digitized Point

Buffer Area

1:288,895

0 2.5 5 10 mi

0 4 8 16 km

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

EJSCREEN Report

for 10 mile Ring Centered at 36.599724,-108.500172, NEW MEXICO, EPA Region 6

Approximate Population: 1782

Navajo Mine

Selected Variables	Raw Data	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	5.61	7.18	8	9.77	0	9.78	0
Ozone (ppb)	53.3	54.1	44	48.6	74	46.1	86
NATA Diesel PM (µg/m³)*	0.0107	0.387	6	0.733	<50th	0.824	<50th
NATA Cancer Risk (lifetime risk per million)*	20	28	16	42	<50th	49	<50th
NATA Respiratory Hazard Index*	0.33	0.88	7	1.4	<50th	2.3	<50th
NATA Neurological Hazard Index*	0.031	0.031	58	0.043	<50th	0.063	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	4.5	73	16	81	10	110	11
Lead Paint Indicator (% Pre-1960 Housing)	0.058	0.2	39	0.19	42	0.3	27
NPL Proximity (site count/km distance)	0.025	0.1	36	0.063	42	0.096	29
RMP Proximity (facility count/km distance)	0.088	0.13	47	0.42	20	0.31	30
TSDF Proximity (facility count/km distance)	0.05	0.062	63	0.062	62	0.054	73
Water Discharger Proximity (facility count/km distance)	0.11	0.12	62	0.35	38	0.25	42
Demographic Indicators							
Demographic Index	81%	51%	91	44%	91	35%	95
Minority Population	100%	60%	97	49%	97	36%	98
Low Income Population	61%	42%	80	39%	81	34%	87
Linguistically Isolated Population	9%	6%	76	6%	75	5%	81
Population With Less Than High School Education	23%	17%	70	18%	67	14%	78
Population Under 5 years of age	8%	7%	65	7%	62	7%	71
Population over 64 years of age	10%	13%	38	11%	49	13%	40

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: http://www.epa.gov/ttn/atw/natamain/index.html.

For additional information, see: www.epa.gov/environmentaljustice

Attachment 2: EJSCREEN Community Report

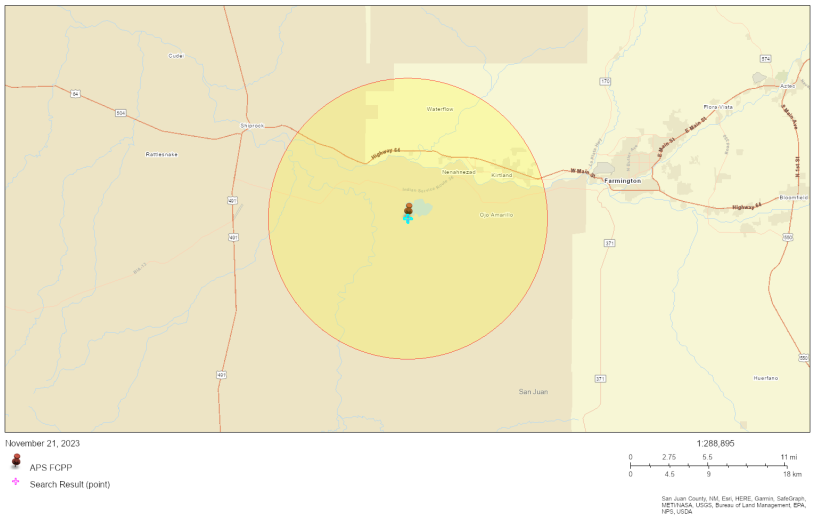
EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

San Juan County, NM

10 miles Ring Centered at 36.689896,-108.482437
Population: 10,237
Area in square miles: 314.03

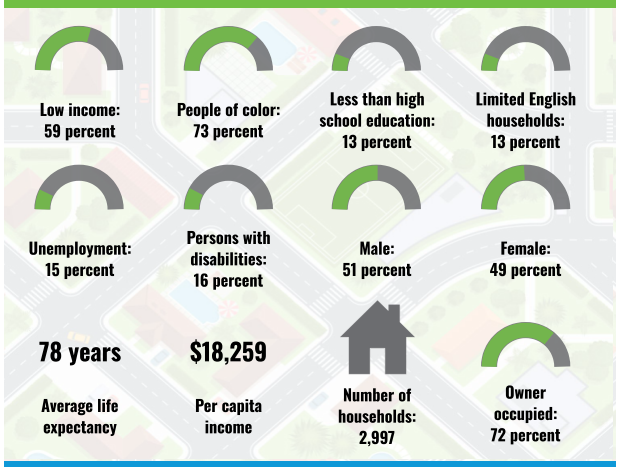
A3 Landscape



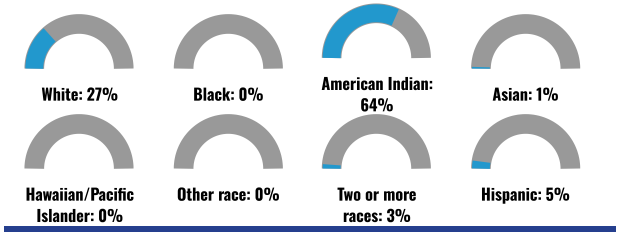
LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
English	60%
Spanish	3%
Other and Unspeci ed	37%
Total Non-English	40%

COMMUNITY INFORMATION



BREAKDOWN BY RACE



BREAKDOWN BY AGE

From Ages 1 to 4	7%
From Ages 1 to 18	29%
From Ages 18 and up	71%
From Ages 65 and up	15%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	13%
Speak Other Indo-European Languages	0%
Speak Asian-Paci c Island Languages	7%
Speak Other Languages	80%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2017 -2021. Life expectancy data comes from the Centers for Disease Control.

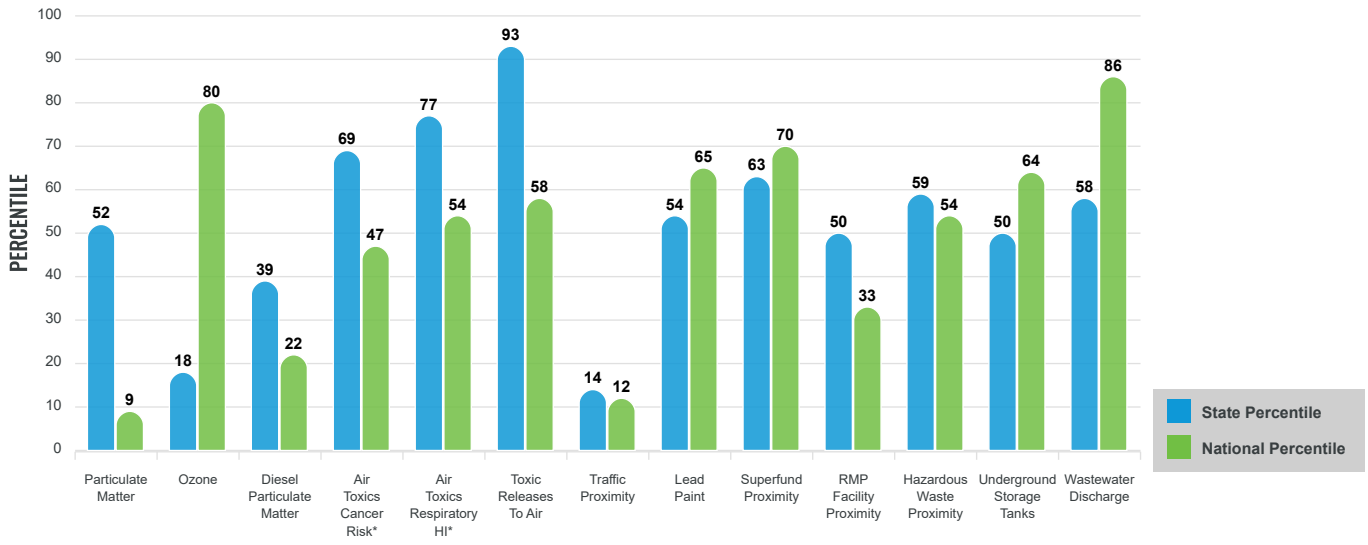
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen re ecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

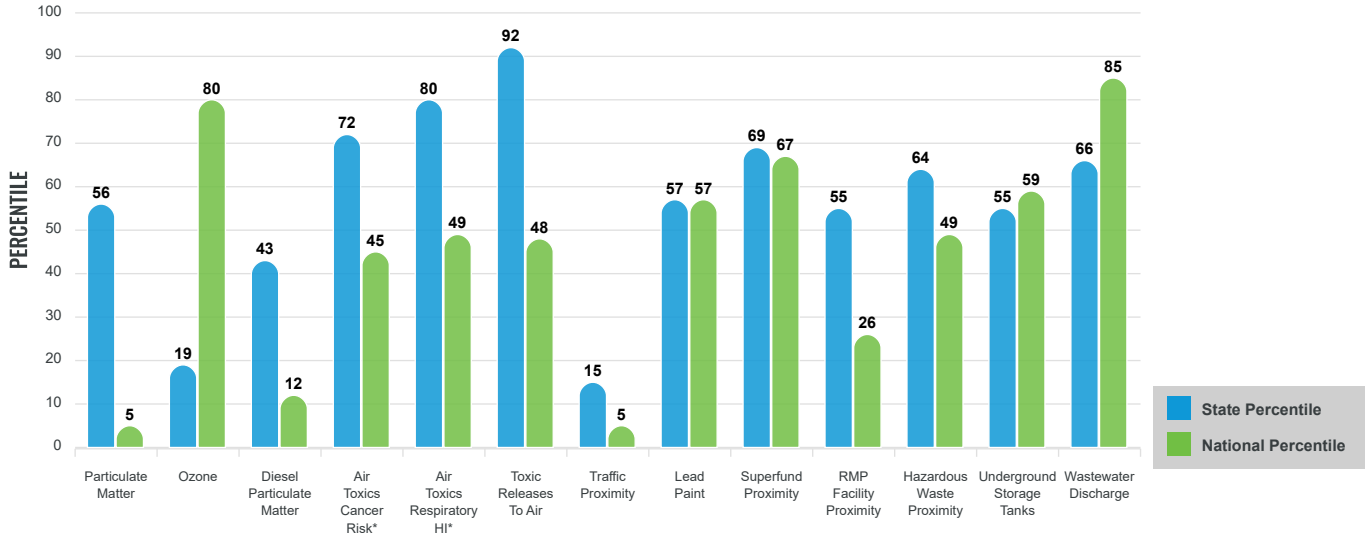
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low-income, percent linguistically isolated, percent less than high school education, percent unemployed, and low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



These percentiles provide perspective on how the selected block group or buffer area compares to the entire state or nation.

Report for 10 miles Ring Centered at 36.689896,-108.482437

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
POLLUTION AND SOURCES					
Particulate Matter (µg/m^3)	4.71	5.16	32	8.08	2
Ozone (ppb)	61	64.7	9	61.6	49
Diesel Particulate Matter (µg/m^3)	0.0573	0.194	26	0.261	5
Air Toxics Cancer Risk* (lifetime risk per million)	19	18	1	25	1
Air Toxics Respiratory HI*	0.25	0.21	29	0.31	4
Toxic Releases to Air	150	29	97	4,600	28
Tra c Proximity (daily tra c count/distance to road)	1.1	84	12	210	4
Lead Paint (% Pre-1960 Housing)	0.094	0.19	47	0.3	34
Superfund Proximity (site count/km distance)	0.038	0.14	43	0.13	34
RMP Facility Proximity (facility count/km distance)	0.049	0.15	33	0.43	10
Hazardous Waste Proximity (facility count/km distance)	0.13	0.73	45	1.9	26
Underground Storage Tanks (count/km^2)	0.58	3.3	44	3.9	41
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.0069	0.47	41	22	64
SOCIOECONOMIC INDICATORS					
Demographic Index	66%	51%	74	35%	87
Supplemental Demographic Index	23%	17%	78	14%	86
People of Color	74%	62%	65	39%	80
Low Income	58%	40%	77	31%	87
Unemployment Rate	14%	7%	86	6%	90
Limited English Speaking Households	13%	6%	85	5%	88
Less Than High School Education	13%	14%	57	12%	67
Under Age 5	7%	5%	73	6%	71
Over Age 64	15%	19%	43	17%	48
Low Life Expectancy	20%	19%	54	20%	54

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund	0
Hazardous Waste, Treatment, Storage, and Disposal Facilities	0
Water Dischargers	79
Air Pollution	16
Brown elds	0
Toxic Release Inventory	4

Other community features within defined area:

Schools	7
Hospitals	0
Places of Worship	4

Other environmental data:

Air Non-attainment	No
Impaired Waters	Yes

Selected location contains American Indian Reservation Lands*	Yes
Selected location contains a "Justice40 (CEJST)" disadvantaged community	Yes
Selected location contains an EPA IRA disadvantaged community	Yes

Report for 10 miles Ring Centered at 36.689896,-108.482437

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	HEALTH VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	20%	19%	54	20%	55
Heart Disease	6.4	6.2	56	6.1	58
Asthma	12.7	10.3	93	10	95
Cancer	5.2	5.7	33	6.1	27
Persons with Disabilities	15.3%	16.6%	45	13.4%	67

CLIMATE INDICATORS

INDICATOR	HEALTH VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	14%	9%	82	12%	78
Wild re Risk	55%	58%	39	14%	86

CRITICAL SERVICE GAPS

INDICATOR	HEALTH VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	42%	22%	87	14%	96
Lack of Health Insurance	15%	9%	81	9%	83
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access	Yes	N/A	N/A	N/A	N/A
Food Desert	Yes	N/A	N/A	N/A	N/A

Footnotes

Report for 10 miles Ring Centered at 36.689896,-108.482437

Attachment 3: APS Transmittal of Draft Initial Certification

Jeffrey Jenkins
Plant Manager
Cholla Power Plant

Tel. 505-330-3943
e-mail: Jeffrey.Jenkins@aps.com

PO Box 355
Station 4900
Fruitland, NM 87416

May 19, 2022

Electronically submitted

Mr. Gary Sheth
NPDES Permits Section, Water Division (WTR-2-3)
US Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Subject: TRANSMITTAL OF DRAFT INITIAL CERTIFICATION STATEMENT SUPPORTING A PERMIT MODIFICATION PURSUANT TO AMENDED STANDARDS IN THE STEAM ELECTRIC RECONSIDERATION RULE Arizona Public Service Company Four Corners Power Plant Fruitland, New Mexico – NPDES Permit NN0000019

Dear Mr. Sheth,

In accordance with 40 CFR 423.19(c)(1), Arizona Public Service Company (APS) hereby submits the enclosed Draft Initial Certification Statement for review and comment by the United States Environmental Protection Agency (USEPA). This certification statement supports a permit modification request for Four Corners Power Plant National Pollutant Discharge Elimination System (NPDES) permit NN0000019. As a steam electric power generating point source, APS is in the process of making changes to Four Corners Power Plant that will convert the once-through bottom ash transport water system into a future high recycle rate bottom ash transport system. APS is committed to operating this future system in a manner that limits the discharge of bottom ash transport water pursuant to regulation. However, there will be instances, as anticipated by §423.13(k)(2)(i), where the discharge of bottom ash transport water through a NPDES outfall will promote reliability of power plant operations.

APS appreciates USEPA feedback on a previous draft of the certification statement received on December 10, 2021. We believe that the current version of the document transmitted herewith is more complete and details the available backup documentation supporting the analyses requested by the USEPA. Since the planned system has not been constructed or operated, purge water quantities required to maintain recirculation operations (principally due to water quality) as well as the rate and volume of water that can be managed within other systems at the plant (i.e., the flue gas desulfurization process) should be viewed as estimates.

At this time, Four Corners is confronting a number of significant challenges completing major capital projects as a result of supply chain delays and limited contractor availability. To mitigate these issues, our design engineering firm assessed long-lead time components and divided the high-recycle rate bottom ash transport system project scope into multiple design, procurement, and construction phases (i.e., pumps, controls, valves, chemical feed equipment, piping, controls, electrical equipment, tanks, piping, the pipe rack, a new low volume wastewater treatment system, and mechanical equipment). Construction packages have been awarded for the new Hydrobin overflow tanks, the extensive pipe rack that routes the recirculation piping, and the low volume wastewater treatment tank. Fieldwork supporting

the pipe rack has begun and construction of foundations for the new tanks will begin later this month. Procurement of other equipment is in process, and we anticipate completing construction procurement by Fall of this year.

We plan to provide a more thorough update on project status when construction procurement is complete. In the meantime, we propose to set up a meeting to address any questions you might have about the enclosed certification and discuss next steps with respect to the pending permit modification. Please let us know when you have availability for that meeting at your earliest convenience.

If you have any questions regarding the enclosed certification prior to the proposed meeting, please contact Natalie Chrisman Lazarr at 602.316.1324 or via email at natalie.chrisman@aps.com.

Sincerely,

Jeffrey Jenkins
Plant Manager
Four Corners Power Plant

Enclosure

Cc: Natalie Chrisman Lazarr, Principal Engineer, APS
Jeffrey Allmon, Senior Attorney, APS

Initial Certification Statement Supporting the Discharge of Bottom Ash Transport Water

Arizona Public Service Company

Four Corners Generating Station
NPDES Permit No. NN0000019

Project No. 129532 / FCC016494

Revision 0
May 2022

DRAFT

Initial Certification Statement Supporting the Discharge of Bottom Ash Transport Water

Prepared for

Arizona Public Service Company
Four Corners Generating Station
NPDES Permit No. NN0000019

Project No. 129532 / FCC016494
Fruitland, NM

Revision 0
May 2022

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Arizona Public Service Company
Initial Certification Statement
Supporting the Discharge of
Bottom Ash Transport Water

Report Index

Certification

I hereby certify, as a Professional Engineer in the State of New Mexico, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by Arizona Public Service Company or others without specific verification or adaptation by the Engineer. I hereby certify that this initial certification was prepared for the Arizona Public Service Company's Four Corners Generating Station in accordance with standard engineering practices and based on my knowledge, information, and belief, the content of this Certification when developed in May 2022 is true and meets the requirements of 40 CFR § 423.19(c). I hereby certify that I am familiar with the ELG regulation requirements and Arizona Public Service Company's Four Corners Generating Station.

May 16 2022 9:22 AM

Hansen, Bryan

Digitally signed by Hansen, Bryan
Date: 2022.05.16 11:32:10-05'00'

Bryan D. Hansen, P.E.
(New Mexico License No. 23480)

Date: May 16, 2022

Owner's Certification of Compliance - 40 CFR 122.22

Pursuant to 40 CFR 122.22, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

On behalf of Arizona Public Service Company:

_____

_____
(Printed Name

_____
(Title

_____
(Date

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LIST OF TABLES

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
APS	Arizona Public Service Company
BA	Bottom Ash
BASWR	Bottom Ash Sluice Water Recycling
BAT	Best Available Technology Economically Achievable
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	U.S. Environmental Protection Agency
FGD	Flue Gas Desulfurization
Four Corners	Four Corners Generating Station
gpm	gallons per minute
L-SI	Larson-Skold Index
LSI	Langelier Scaling Index
MW	Megawatt
NPDES	National Pollutant Discharge Elimination System
PSI	Puckorius Scaling Index
RSI	Ryznar Scaling Index
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

1.0 INTRODUCTION

On November 3, 2015, the U.S. Environmental Protection Agency EPA issued the federal Steam Electric Power Generating Effluent Limit Guidelines and Standards (ELGs); see 80 FR 67838. The 2015 rule addressed discharges from flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash (BA transport water, flue gas mercury control wastewater, gasification wastewater, combustion residual leachate, and non-chemical metal cleaning wastes.

The 2015 rule was reconsidered by EPA, with updates finalized on October 13, 2020 (see 85 FR 64650), and effective as of December 14, 2020. The final rule revises limitations and standards for two of the waste streams addressed in the 2015 rule: BA transport water and FGD wastewater. For BA transport water, the final rule establishes Best Available Technology Economically Achievable (BAT) as a high recycle rate system with a site-specific volumetric purge (defined in the final rule as BA purge water) which cannot exceed a 30-day rolling average of 10 percent of the BA transport water system's primary active wetted volume. The purge volume and associated effluent limitations are to be established by the permitting authority. EPA selected a 95th percentile of total system volume as representative of a 30-day rolling average, which results in a limitation of 10 percent of total system volume and requires the National Pollutant Discharge Elimination System NPDES permitting authority to develop a site-specific purge percentage that is capped at 10 percent. EPA recognizes that some plants may need to improve their equipment, process controls, and/or operations to consistently meet the limitations included in this final rule; however, this is consistent with the Clean Water Act, which requires that BAT discharge limitations and standards reflect the best available technology economically achievable.

This document serves as the Initial Certification Statement required by 40 CFR § 423.19(c)(1). On behalf of Arizona Public Service Company (APS), this initial certification seeks to discharge BA transport water pursuant to 40 Code of Federal Regulations CFR § 423.13(k 2 i at the Four Corners Generating Station (Four Corners), located in San Juan County, New Mexico in accordance with NPDES Permit NN0000019. As required by the ELG Rule, this plan includes the following:

A. A statement that the professional engineer is a licensed professional engineer.
B. A statement that the professional engineer is familiar with the regulation requirements.
C. A statement that the professional engineer is familiar with the facility.
D. A calculation of the primary active wetted bottom ash system volume as required per 40 CFR § 423.11(aa).

E. Material assumptions, information, and calculations used by the certifying professional engineer to determine the primary active wetted bottom ash system volume.
F. A list of all potential discharges under 40 CFR § 423.13 k) 2) i A 1) through (4 , the expected volume of each discharge, and the expected frequency of each discharge.
G. Material assumptions, information, and calculations used by the certifying professional engineer to determine the expected volume and frequency of each discharge, including a narrative discussion of why such water cannot be managed within the system and must be discharged.
H. A list of all wastewater treatment systems at the facility currently, or otherwise required by a date certain under this section.
I. A narrative discussion of each treatment system including the system type, design capacity, and current or expected operation.

The Four Corners Generating Station is a coal-fired mine-mouth generating plant located on the Navajo Indian Reservation near Fruitland, NM. The plant includes two 770-Megawatt (MW) coal-fired units (Units 4 and 5 . Four Corner's existing once-thru sluicing system is being replaced with a new BAT high recycle system which will utilize wet sluicing to transport bottom ash through a hydrobin and Bottom Ash Sluice Water Recycling (BASWR) settling tank system to dewater the bottom ash. The system cannot be operated as a closed loop without significant water balance, scaling, corrosion, and maintenance challenges and should be operated as a high recycle rate system with the allowed purge to alleviate these concerns. **APS is requesting to purge up to 10 percent of the total system volume up to 459,435 gallons per day on a 30-day rolling average basis to maintain water balance, address system water chemistry, and conduct maintenance as allowed under 40 CFR § 423.13(k 2 i A).**

2.0 HIGH RECYCLE SYSTEM DESCRIPTION

As required by 40 CFR § 423.19(c) 3) D) through I , the following is a description of the bottom ash system at Four Corners, including the assumptions, information, and calculations used by the certifying professional engineer to determine the primary active wetted bottom ash system volume and the expected volume and frequency of each discharge. This section also includes a description of the wastewater treatment systems at Four Corners.

2.1 Bottom Ash System Description

After combustion, ash that accumulates in the bottom of the boiler is captured in the ash hoppers located directly beneath the boiler. Bottom ash is then crushed into small pieces by the clinker grinders and sluiced by jet pumps to a series of unit processes designed to separate the bottom ash from the transport water. At present, the existing once-thru sluicing system discharges after treatment to an internal outfall identified in the facility's NPDES permit but in the future bottom ash transport water will be treated and recycled for reuse in BA sluicing operations.

When plant modifications supporting the high recycle bottom ash system at Four Corners are complete, major process equipment will consist of the following:

- Two (2) existing ash hoppers with multiple compartments, one per unit
- Eight 8 existing pyrites tanks per unit, sixteen (16) total
- Four (4) existing hydrobins
- Two (2) new hydrobin overflow tanks
- Four (4) new hydrobin overflow tank agitators, two per tank
- Three (3) new hydrobin overflow return pumps
- Three (3) sumps, two new and one existing
- Three (3) new boiler area sump pumps
- Three (3) new hydrobin area sump pumps
- The existing BASWR settling tank system consisting of:
    - One (1) primary settling basin
    - Two (2) secondary settling basins
    - One (1) clearwell chamber
- Two (2) new sluice water pumps
- Two (2) new flush water pumps
- One (1) new low volume wastewater settling tank

- Two 2 new bottom ash system makeup pumps
- One (1) existing makeup water storage tank

Appendix A contains a schematic overview of the future bottom ash sluicing system's major components and interfaces with other plant systems. The hydrobin overflow tanks and two (2 of the sumps are new and will be installed no later than mid-2023. In addition to these new process units, planned plant modifications will isolate many of the currently permitted low volume wastewater flows at the facility from the existing BA sluicing system and will direct these segregated flows to a new low volume wastewater treatment system prior to discharge through the facility's NPDES permit (see Section 2.4).

The sluiced bottom ash will be initially treated with hydrobins, allowing dewatered bottom ash to be discharged into trucks prior to being hauled to the site Coal Combustion Residuals CCR) landfill or hauled offsite for beneficial reuse. The four 4) existing hydrobins will be operated sequentially with a single hydrobin receiving sluiced ash from both units until it is full. Once a hydrobin is full, the next hydrobin will be placed into service, and the full hydrobin will be allowed to decant for 10-12 hours prior to discharging ash to the trucks. Hydrobins will be continuously cycled to allow for filling to capacity, decanting, and unloading to maintain the system in operation. The two 2) new 111,000-gallon hydrobin overflow tanks (plumbed in parallel) will receive intermittent overflow from the hydrobins during sluicing operations. The new hydrobin overflow tanks represent the only surge capacity within the system other than the freeboard available in the BASWR. The surge capacity in the system provided by the new hydrobin overflow tanks is needed to allow for operational flexibility in responding to system upset conditions, equipment failures, and stormwater inflow without having to discharge sluice water from the system or cause a plant outage.

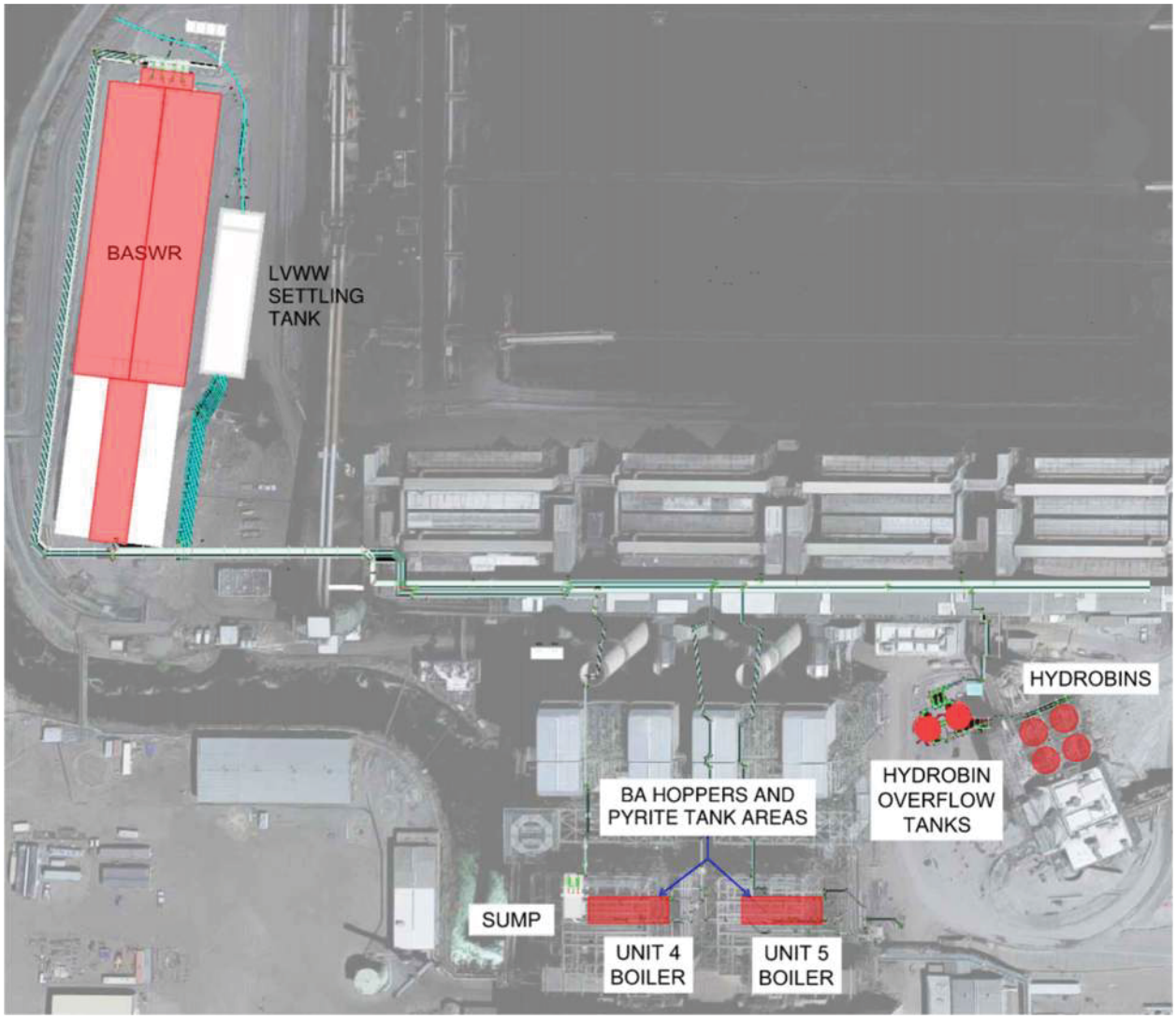
Bottom ash will also be mechanically removed from the BASWR settling tank system, loaded into trucks, and hauled to the site CCR landfill. The BASWR settling tank system is a reinforced concrete free-standing) structure comprised of a single primary settling basin that discharges into two adjacent secondary settling basins operated in parallel that overflow into a clearwell chamber. The treated transport water that overflows into the clearwell will then be pumped back to the boiler hoppers for re-use.

Due to proximity and level of effort to segregate flows, seal trough water for the bottom ash hoppers will be routed with bottom ash hopper overflow to the bottom ash system even though it is technically not bottom ash transport water. In the future, the seal trough water will be sourced from the bottom ash loop water and will not add additional fresh water to the system.

As part of the design of the future bottom ash high recycle system, APS identified all non-bottom ash transport flows that are currently combined with bottom ash transport water in the existing once-thru sluicing system. The intent of this analysis was to segregate low volume wastewater from the future bottom ash high recycle system to simplify process operations and promote reliability. In addition to the seal trough water previously discussed, wastewater flows generated during cleaning events in the baghouse enclosure were identified as a waste stream that should not be directed to a low volume wastewater system due the high total suspended solids content and variable nature of flows which could lead to performance issues in the low volume wastewater treatment system. On this basis, the baghouse enclosure sump waste stream will be routed to the bottom ash system. Routing of this wastewater into the bottom ash system with treatment in the BASWR tank system allows for efficient removal of these suspended solids. Washdown of the baghouse area is an infrequent operation, so it does not substantially contribute to the solids loading in the BASWR tank system.

The site plan below and in Appendix E includes a general overview of the major equipment included in the proposed high-recycle system design.

Figure 2-1: Site Plan Showing Major System Components



To determine the Four Corners primary active wetted system volume, calculations were performed based on the major equipment and piping systems. A summary of the system volume calculations is provided in Table 2-1. The volumes of the existing ash hoppers and pyrites tanks were derived from plant drawings. The volumes of the existing hydrobins, system sumps, and individual BASWR tank cells were calculated from dimensions summarized below in Table 2-1) derived either from field measurements and/or plant drawings. For the BASWR tank system, both secondary cells were included in the calculations because one secondary cell per electric generating unit is required to be in operation per the original design basis of the BASWR tank system to achieve the target effluent solids concentration. Finally, the volume of future interconnecting piping was calculated for the major piping in the system as shown in Table 2-1. Piping

sizes and overall estimated lengths of each run are also shown in Table 2-1. Since the final piping design for the system has yet to be completed, overall piping lengths were estimated based on the equipment layout shown above. The overall system volume was calculated as the summation of the volumes from the major components in the system including interconnecting piping.

A water balance analysis used to size new equipment and evaluate future operations is discussed in Section 2.2 and presented in Appendix A.

Table 2-1: Four Corner's Primary Active Wetted Volume Summary

Ash Hoppers		
	Volume (cubic ft)	Volume (gals)
Unit 4 Hopper	10,000	74,800
Unit 5 Hopper	10,000	74,800
Total	20,000	149,600

Pyrites Tanks		
	Volume (cubic ft)	Volume (gals)
Unit 4 (8 total)	144	1,077
Unit 5 (8 total)	144	1,077
Total	288	2,154

Hydrobins					
	Diameter (ft)	Height of Cylinder (ft)	Height of Cone (ft)	Volume (cubic ft)	Volume (gals)
Tank 1	35	13.25	27.75	21,648	161,924
Tank 2	35	13.25	27.75	21,648	161,924
Tank 3	35	13.25	27.75	21,648	161,924
Tank 4	35	13.25	27.75	21,648	161,924
			Total	86,590	647,694

Sumps					
	Width/Diameter (ft)	Length (ft)	Depth (ft)	Volume (cubic ft)	Volume (gals)
Unit 4 Ash Pit	6		10	283	2,115
Unit 4 Bottom Ash Area Sump	18	35	13	8,190	61,261
Hydrobin Area Sump	15	10	10	1,500	11,220
			Total	9,973	74,596

Hydrobin Overflow Tanks				
	Diameter (ft)	Height (ft)	Volume (cubic ft)	Volume (gals)
Tank 1	32.5	18	14,932	111,694
Tank 2	32.5	18	14,932	111,694
		Total	29,865	223,388

BASWR (Settling) Tank System					
	Width (ft)	Length (ft)	Depth (ft)	Volume (cubic ft)	Volume (gals)
Primary	40	200	8.5	68000	508,640
Secondary 1	66	356	8.2	190,915	1,428,043
Secondary 2	66	356	8.2	190,915	1,428,043
Clearwell	60	20	7.8	9,400	70,312
			Total	459,230	3,435,039

Piping				
	Diameter (in)	Length (ft)	Volume (cubic ft)	Volume (gals)
Sluice Piping 1	12	1,800	1,414	10,575
Sluice Piping 2	12	1,800	1,414	10,575
Flush Piping 1	12	1,800	1,414	10,575
Flush Piping 2	12	1,800	1,414	10,575
U4 Sump Return 1	10	1,100	600	4,488
U4 Sump Return 2	10	1,100	600	4,488
Hydrobin Overflow Return 1	10	1,300	709	5,304
Hydrobin Overflow Return 2	10	1,300	709	5,304
		Total	8,273	61,881

Total System Wetted Volume (gal) =	149,600 + 2,154 + 647,694 + 74,596 + 223,388 + 3,435,039 + 61,881 = 4,594,352
10% gal/day	459,435
10% gal/hr	19,143
10% gpm	319

2.2 Water Balance Description

Three water balance cases were created to evaluate planned operations and are included in Appendix A. The flows used in the water balance analyses represent best estimates for future operations based on engineering judgement and flow measurements (where feasible) conducted during existing operations. All water balances included daily average/max process flows while water balance cases WMB-01 and WMB-

03 include 10-year and 100-year design storm events averaged over a 24-hour period, respectively. Water balance calculations are based on average flows, but maximum flows are also shown in the water balance figures to demonstrate the magnitude of variability that must be accounted for in routine flow balancing operations.

2.2.1 Process Flows

As shown on the water balances, the main process flow in the bottom ash sluice system is intermittent and comes from the sluicing of bottom ash to the hydrobins. Each units' hoppers are sluiced via jet pumps on a scheduled basis to the hydrobins, at an average rate of 2,629 gpm, where bottom ash, 966 tons/day including 35 gpm of entrained water, is removed via trucks. The overflow from the hydrobins, at an average rate of 2,610 gpm, will be captured and sent to the BASWR settling tank system for further treatment prior to reuse or purge.

The other main flow in the bottom ash system is from seal trough and hopper overflows. The seal trough consistently overflows to maintain level within the hopper seal trough while the hopper overflows discharge during/after sluice events. As indicated previously, seal trough overflow is typically not considered a bottom ash transport stream, but in this case, it will be fed off the high recycle return water system based on the magnitude and proximity of these flows. Seal trough and hopper overflows will continue to gravity discharge to an existing drainage trench which will be rerouted to a new sump prior to being forwarded to the BASWR settling tank for solids settling. The seal trough overflow and hopper overflow average rates are 1,400 gpm and 1,197 gpm, respectively. The remainder of the flows within the system are due to miscellaneous water users.

A new low volume wastewater settling tank is also shown on the water balance figures. Various sumps were evaluated at Four Corners for flow and quality prior to determining adequate treatment for the low volume waste streams to meet NPDES permitted outfall limits. Typical discharges to the low volume wastewater tank include reverse osmosis reject and backwash discharges, at an average rate of 200 gpm, and miscellaneous service water users, at an average rate of 230 gpm. A majority of the plant stormwater runoff will also be directed to the low volume wastewater settling tank for solids settling prior to discharge. WMB-01 includes a 10-year, 24-hour storm event which is the required system stormwater design basis per regulation and was used as the design basis for the stormwater calculations. WMB-03 includes a 100-year, 24-hour event for reference purposes.

2.2.2 Operational Scenarios

Existing flow rates for the bottom ash sluice and low volume wastewater systems were measured to evaluate potential discharges from the future high recycle rate system. Daily average flows were established for the major system components based on future expected flow rates once the system operates as a high recycle rate system. WMB-01 and WMB-03 include design storm events for a 10-year, 24-hour and 100-year, 24-hour storm respectively. Estimated purge flows required from the water balance scenarios evaluated are listed in Table 2-2 below.

Table 2-2: Purge Rates for Water Balance Considerations

Water Balance Number/Condition	Purge Rate Directed to a NPDES Outfall (gpm)	Purge Rate Directed to Other Systems for Plant Reuse (gpm)
WMB-01 Process and 10-year, 24-hour storm	0	156
WMB-02 Process Only	0	79
WMB-03 Process and 100-year, 24-hour storm	32	156

Based on the water balance analyses, routine operations will require a constant purge to the FGD system once high-recycle operations are initiated. Given the complexity of this system, all purges to the FGD system will have to be carefully managed. Short duration increases in the purge rate to accommodate storm surges will be incorporated into the design; however routine discharges exceeding 79 gpm could pose water management issues in the FGD system and impact plant reliability.

2.3 List of All Potential Discharges under 40 CFR § 423.13(k)(2 i A 1) – 4

APS is designing the high-recycle bottom ash transport system to routinely operate without purging via the new low volume wastewater treatment to the NPDES outfall water balance case WMB-02 in Appendix A). However, as 40 CFR §423(k 2 i)(A) anticipates, there will be circumstances that could affect the reliability of plant operations if the high-recycle bottom ash transport system is overwhelmed. In those instances, discharges directed to the NPDES outfall would be required and permitted under existing regulation under four categories of conditions. To inform a case-by-case analysis of the allowable purge rate for the future high-recycle bottom ash system at Four Corners, Table 2-3 presents the best available estimate of discharges that could be directed to a NPDES outfall under the four categories of conditions allowed in regulation:

Table 2-3: Four Corner's Purge Discharges

Discharge Stream	Estimated Flow/Volume	Description	Estimated Frequency
A 1) Water Balance – Stormwater	Stormwater flows in excess of 111,000 gallons	Precipitation-related inflows generated from storm events exceeding a 10-year storm event of 24-hour or longer duration e.g., 30-day storm event and cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment	Following storm events that exceed the design storm i.e., a storm event with a return period greater than 10 years and intensity of 24 hours which is equivalent to 1.54 inches of rainfall, or 111,000 gallons). This design storm would be stored within the freeboard of the BASWR settling tank system prior to being reused within the FGD system. Anything surpassing this storm event would be purged via the low volume wastewater treatment system to the NPDES outfall. A 100-year/24-hour storm event would contain an estimated additional 70,000 gallons of water that would need to be purged from the system to maintain water balance and avoid overtopping of the BASWR settling tank system.
A 2) Water Balance – Other Waste Streams	400 gpm peak 20 gpm average	Regular inflows from waste streams other than bottom ash transport water that exceed the ability of the bottom ash system to accept recycled water	Intermittent flows from sumps that discharge into the bottom ash system because they have a high solids content and/or contribute area washdown volumes on an irregular basis have the potential to create water balance issues if spare/surge capacity is unavailable. For the purpose of estimating a potential 'other waste stream' flow, the intermittent flow from baghouse enclosure sumps, which discharge high solids content wastewater, serves as the basis for the estimated other inflow rates.

Discharge Stream	Estimated Flow/Volume	Description	Estimated Frequency
A)(3 Water Chemistry	319 gpm	To maintain system water chemistry where installed equipment at the facility is unable to manage pH, corrosive substances, substances or conditions causing scaling, or fine particulates to below levels which impact system operation or maintenance	Water within the bottom ash system has corrosive tendencies based on low alkalinity and elevated sulfate concentrations in the makeup water which will become exacerbated when closed-loop operations begin. The extent of impacts due to water chemistry cycling is difficult to predict with the existing open loop system configuration. A continuous purge of up to 10% of the total system wetted volume (319 gpm could be required to prevent corrosion in the future bottom ash system.
A)(4 Maintenance	1,428,043 gallons	To conduct maintenance not otherwise included in (A) (1), (2 , or (3 of this table and not exempted from the definition of transport water in § 423.11 p), and when water volumes cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment	Although it is difficult to predict the volumes/discharge frequencies required for maintenance of a future system, there will be times when one secondary BASWR cell will need to be dewatered for cleaning purposes. This could occur as frequently as once a year and is the basis for the estimate of volume required for maintenance of the BA system. Maintenance of smaller vessels at a similar frequency is anticipated.

2.3.1 Water Balance – Stormwater

Although APS has taken measures in the design of the future bottom ash transport system to limit the inflow of as much stormwater as possible, there will be purges required for storm events that exceed the design storm noted in regulation. Calculation of the threshold stormwater volume of 111,000 gallons as well as the 100-year, 24-hour reference storm is detailed in Appendix B and summarized below:

- Stormwater calculations are based on the methodology outlined in the New Mexico Department of Transportation Drainage Design Manual and the 'Civil Engineering Reference Manual for the PE Exam,' Lindeburg, M, 2008). Rainfall data for the 1-year, 10-year, and 100-year 24-hour storm

were obtained from the National Oceanic and Atmospheric Administration Atlas 14, Volume 8, Version 2. The assumed design storm is the 10-year, 24-hour storm as identified by regulation.

- The stormwater contribution method begins with estimating the drainage areas and determining the type of cover for each area which was done from site arrangement drawings. From there we calculate the total weighted curve number, soil water storage capacity, and initial abstraction values as inputs to the curve number method runoff equation. This provides the estimated runoff for each area which in turn is used to calculate the total volume input per area for each storm event.

- The total volume of stormwater that enters the bottom ash handling system is comprised of three areas: the U4 Bottom Ash Area Sump, the Hydrobin Overflow Sump, and the open top BASWR settling tank system. For the 10-year, 24-hour storm, these volumes are 35,900 gallons, 14,400 gallons, and 61,000 gallons respectively. This equates to the 111,000 gallons noted above in Table 2-2.

- For the 100-year, 24-hour storm, the corresponding stormwater volumes are 57,900 gallons, 23,200 gallons, and 98,400 gallons respectively. This equates to a total of 179,500 gallons or the difference of about 70,000 gallons 179,500 – 111,300 = 68,200 gallons) as noted above in Table 2-2.

2.3.2 Water Balance – Other Waste Streams

As noted in Table 2-3 above, there could be other waste streams from intermittent sources that have the potential to impact the water balance of the bottom ash transport system, especially in the aftermath of a significant storm when the spare/surge capacity in the system would be full. One example waste stream is the intermittent discharge of wastewater from the baghouse enclosure sump into the bottom ash system. The baghouse enclosure sump pumps are rated for 400 gpm which could over short periods cause water balance issues if the spare/surge capacity of the system is limited. Although this flowrate is not significant relative to the full process flow of the bottom ash transport recirculation flow, balancing short duration, high intensity flows could overwhelm an already overwhelmed system.

2.3.3 High Recycle Rate Bottom Ash Chemistry Considerations

In the existing once thru i.e., open loop bottom ash sluicing system, ash is sluiced to the hydrobins which act as the primary ash separation devices. Overflow and decant sluice water is pumped to the BASWR settling tank system, where most of the remaining ash settles out to be dewatered and removed. Overflow from the BASWR settling tank system is discharged thru the permitted NPDES outfall and fresh makeup water is used for subsequent sluice cycles.

After the conversion to a high recycle rate system, it is expected that the future closed-loop water quality will cycle up to an equilibrium concentration, where the additional mass of constituents introduced per sluice cycle is equal to the mass exiting the closed-loop system through purge flows and the reuse of treated sluice water in the FGD system. Since the existing system is not currently operating in a closed-loop configuration, the corrosiveness or scaling potential in the future high recycle rate configuration cannot be reliably predicted. However, once operating in a high recycle rate configuration, there will likely be an increase in total dissolved solids (TDS), total suspended solids TSS), conductivity, aluminum, calcium, chloride, iron, silica, sodium, sulfates, and other constituents from contact with the bottom ash and due to evaporation of water in the system.

Several scaling indices can be used to model the scaling and corrosive properties of the water. These are the Puckorius Scaling Index PSI), The Ryznar Scaling Index (RSI , the Langelier Scaling Index LSI), and the Larson-Skold Index (L-SI . The PSI, RSI, and LSI all use alkalinity, hardness, temperature, and pH to estimate calcium scale and corrosivity, comparing the pH of the system to the equilibrium pH and the pH of saturation. The L-SI looks at the concentrations of carbonate, bicarbonate, sulfate, and chloride to estimate the tendency for sulfate and chloride to interfere with scale formation and to support corrosion due to sulfate and chloride chemistry. The target ranges for these indices are shown in Table 2-4.

Table 2-4: Key to Scaling Indexes (pH of the system

	PSI	RSI	LSI	L-SI
Extreme Corrosion	>9.0	>9.0	<-2	>4.0
Moderate Corrosion	>7.5 - 9.0	>7.5 - 9.0	-2.0 - -0.5	1.2 - 4.0
Slight Corrosion	>7.0 - 7.5	>7.0 - 7.5	>-0.5 - 0.0	0.8 - <1.2
In range	>6.0 - 7.0	>6.0 - 7.0	>0.0 - 0.5	<0.8
Slight Scaling	5.0 - 6.0	5.0 - 6.0	>0.5 - 2.0	
Heavy Scaling	<5.0	<5.0	>2.0	

To estimate the effect of future closed loop operations, a series of samples were taken at various locations in the bottom ash handling system and analyzed for a variety of constituents see analytes and results in Appendix C as well as sampling locations in the water balance figures presented in Appendix A . Although, the current system is operating as a once-through system, the intent was to try and capture the impact of operations on the water quality as it is sluiced through the system and use this information to extrapolate to the water chemistry in the future closed loop, high-recycle rate bottom ash system design.

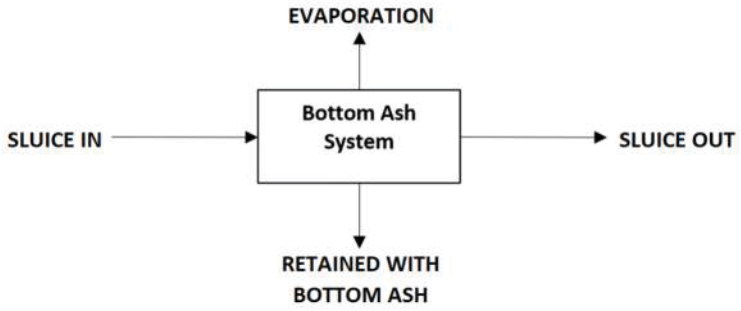
We compared the expected concentration of various parameters to determine if there was a measurable increase or decrease in these constituents given the once-through bottom ash system design. The primary change in water quality evaluated was the effect of adding pulverized bottom ash to makeup water, sluicing the mixture, and bulk solids removal in the hydrobin system; thus, average concentrations of evaluated constituents in water samples collected from the hydrobin overflow were compared to samples representative of makeup water sourced from Morgan Lake. The difference in water quality parameters from these two samples is mainly from contact of the bottom ash with the sluice water and from evaporation of water in the bottom ash hoppers and in the BASWR. Parameters that exhibited a measurable change included conductivity, total dissolved solids, chlorides, sulfates, manganese, calcium, bicarbonate alkalinity, and temperature.

Appendix D presents a chemistry mass balance model of the bottom ash system which was developed to try and simulate the existing open loop system on bottom ash chemistry (Baseline Conditions – Open Loop Configuration). Key input parameters and assumptions into the chemistry mass balance model include:

- Total system volume: 4,594,352 gallons see Table 2-1 above
- System evaporation: 4.0 gpm 5,760 gallons/day) based on the BASWR tank system surface area and annual average evaporation rates plus 5.79 gpm 8,338 gallons/day) based on evaporation in the bottom ash hoppers from contact with the bottom of the boiler. Total system evaporation was estimated at 9.79 gpm (14,098 gallons/day).
- Bottom ash drag out rate amount removed from system) was calculated as follows: 21.2 tons/hour average bottom production rate per unit * 2 units * 20% assumed moisture content, 21.2 * 2000 2 * 0.2 / 500.4 = 33.9 gpm (48,805.8 gallons/day) water in bottom ash drag out waste stream. This provided a good correlation to the measured average value of 35 gpm from the hydrobins as shown on the water balances. Water entrained with the bottom ash removed from the system was assumed to be the average 35-gpm number based on existing flow measurement data.
- Total makeup rate: evaporation + drag out rates = 9.79 + 35.0 = 44.79 gpm (64,498 gallons/day
- The hydraulic residence time of the system is calculated as the total system volume divided by the makeup rate, or 4,594,353 gallons / 64,498 gallons / day = 71.2 days.
- Selected water quality data was collected over a period of six months from various locations in the system as shown with blue boxes on the water balance diagrams. The water quality data was averaged for use in the chemistry model. A summary of the sampling results is contained in Appendix C.

For development of the baseline chemistry model (existing open-loop configuration), we looked at specific constituents in the bottom ash sluice water inlet and compared them to the same constituents in the sluice water outlet. Constituents that were compared included conductivity, total dissolved solids, chlorides, sulfates, magnesium, calcium, pH, and temperature. With an open-loop configuration, we lose some water to evaporation in the bottom ash hoppers and BASWR while some water is retained in the bottom ash drag out, see Figure 2-2 below. Evaporation in the bottom ash hoppers and BASWR has a net result of increasing the constituent concentrations in the water. The water retained in the bottom ash that is removed does not change the remaining concentrations in the system but does remove some mass from the system. Contact of the bottom ash material with the water results in some dissolution of constituents from the bottom ash into the water. The combination of evaporation and contact of bottom ash with the sluice water results in a change in some of the constituent concentrations.

Figure 2-2: Mass Balance Around Bottom Ash System



When we compared the measured change in concentration for the compared constituents, we see that the expected change in concentration from evaporation is greater than the measured concentration changes for most of the compared constituents. For example, with chlorides we would expect a concentration increase of 0.76 mg/L due to evaporation alone; however, the measured concentration change was reported as 0.03 mg/L. It is unreasonable to assume that chlorides were removed from the bottom ash water by some mechanism as chloride salts are super soluble and the system concentrations are nowhere near solubility limits. Similar results for calcium and magnesium were observed; expected concentration changes due to evaporation were greater than the measured concentration changes. Alkalinity had a similar result, however, exposure to the bottom ash could introduce some acidity in the system resulting in the observed decrease in alkalinity concentration. TDS and sulfates were the only compared constituents that had a measured concentration change greater than the expected concentration change due to evaporation.

With most of compared constituents exhibiting poor chemistry modeling results we concluded that it is impossible to predict the impact of the future system configuration on the system corrosion or scaling tendencies. With the current system showing slight to extreme corrosion potential, we assume that the cycling up of constituents in the future high recycle rate system configuration would only worsen the system corrosion potential. The ability to purge sluice water from the system will allow operations to maintain a water chemistry like the current conditions.

An acid feed to lower alkalinity and pH would make the water more corrosive than current conditions. A caustic feed to increase alkalinity and pH would make the water less corrosive than current conditions. A soda ash feed to increase alkalinity would also make the water less corrosive than current conditions. There is no way to quantify if chemical feed systems can improve on system water quality without the need to purge some wastewater from the system.

The Baseline Conditions – Open Loop conditions show that in the current open-loop configuration the bottom ash sluice water is moderately corrosive for the PSI value, within range for the RSI value, and slightly scaling for the LSI value. The L-SI value is showing an extreme corrosion potential due to the elevated sulfate levels and relatively low alkalinity. Because the makeup water has elevated sulfates and low alkalinity concentrations, the best we could hope to achieve would be a water quality like the existing conditions. The addition of some alkalinity from a soda ash feed would improve on the corrosion potential but we would never be able to eliminate the concern with a chemical feed by itself.

The best possible outcome is with a provision for a future 10% purge rate plus the maximum possible purge to the WFGD system peak purge rate of 79 gpm and installation of some form of chemical feed adjustment. Selection of the chemical feed adjustment will not be made until the system can begin operation in the future high rate recycle configuration when we can monitor changes in system chemistry during steady state conditions. The provisions for a system purge and chemical feed addition will produce a sluice water quality that has less scaling potential and comparable corrosion potential to the existing open-loop bottom ash system configuration. On this basis, provisions for a future chemical feed system have been incorporated into the design of the planned high recycle rate, closed-loop bottom ash system prior to the BASWR settling tank system. The chemical feed system will be finalized once the bottom ash system is put into service in the high-recycle rate, closed-loop configuration and we can measure actual chemistry changes in the system.

2.3.4 Maintenance

Estimates of potential purge volumes required for future maintenance are difficult to predict, especially for a system that has not been constructed (much less operated). It is anticipated, however, that there will be scenarios where large volumes of water will need to be drained from the bottom ash transport system for maintenance. To provide an example maintenance purge volume that would be difficult to retain onsite given the magnitude of the system, a scenario involving clean out of one of the secondary settling cells of the BASWR tank was selected.

The existing BASWR system consists of a primary settling cell, two secondary settling cells, and one clearwell. As noted in Table 2-2 above, there will be times when one 1,428,043-gallon secondary BASWR cell will need to be dewatered for cleaning purposes which may happen as frequently as once per year. Under normal operating circumstances, every effort will be made to process drainage of the secondary settling cell within routine system purges to the FGD system. However, due to the magnitude of volume in each of the secondary cells, as well as plant operational requirements, a purge through the NPDES outfall will likely be required.

The BASWR system design requires one secondary settling cell to be in service per unit in operation to achieve the target TSS removal rates. As noted in Table 2-2 above, there will be times when one secondary BASWR cell will need to be dewatered for cleaning purposes which may happen as frequently as once per year. This means that the BASWR tank system is undersized for proper treatment of full flow from both units and secondary settling cell cleanouts will have to occur during either a scheduled single or dual unit outage. In the lead up to the scheduled outage, a single secondary settling cell will require over 12 days of continuous draining to dewater the cell at the FGD bottom ash transport system purge rate identified for routine operations 79 gpm; see water balance case WMB-02 in Appendix A . This operation could take longer if there are issues in FGD operations. Further, there may be times when it will be necessary to dewater a cell very quickly as when an equipment failure could lead to a forced unit outage. In either instance, maintenance would require a significant purge volume equal to the volume of the cell to be actively managed with the needs of plant operational requirements. The addition of a third (spare secondary settling cell was considered for this scenario; however, the cost to incorporate a third settling cell for a once/year maintenance event does not have a good cost to benefit ratio and physical space for such an addition was limited.

2.4 Wastewater Treatment Systems at Four Corners

Table 2-5 summarizes the water treatment systems that process water that will have the potential to be discharged in accordance with the NPDES permit at Four Corners (i.e., non-bottom ash transport systems). Design assumptions and design basis information are discussed in the following sections.

Table 2-5: Four Corners Wastewater Treatment Systems

System Name	Design Capacity	Current Operation	Expected Operation
Low Volume Wastewater Treatment System	440 gpm daily average. 1,213 gpm daily max including stormwater flows based on a 10-year, 24-hour storm.	Settling via BASWR prior to discharge through the permitted NPDES outfall.	Low volume wastewater will be segregated from bottom ash sluice system flows and re-routed to a new settling tank prior to discharge through the permitted NPDES outfall.
High Recycle Bottom Ash System	Hydrobins – 2,610 gpm daily average BASWR – 5,642 gpm daily average	Ash removed via Hydrobins prior to final settling via BASWR with polymer addition prior to discharge through the permitted NPDES outfall.	Ash removed via Hydrobins with newly installed polymer injection. Chemical feeds prior to BASWR for alkalinity and pH adjustment. Final settling via BASWR with polymer prior to reuse within existing FGD system or purge to LVWTS and ultimately through the permitted NPDES outfall.

2.4.1 Low Volume Wastewater Treatment System

Low volume wastewater flows were evaluated based on existing plant data and flowmeter analysis. Stormwater areas were established to determine runoff volumes that contribute to each low volume wastewater area. Average/max daily flows were established at each low volume source along with expected flows from a 10-year, 24-hour storm to establish sizing required for a low volume wastewater treatment system capable of meeting the NPDES permitted outfall.

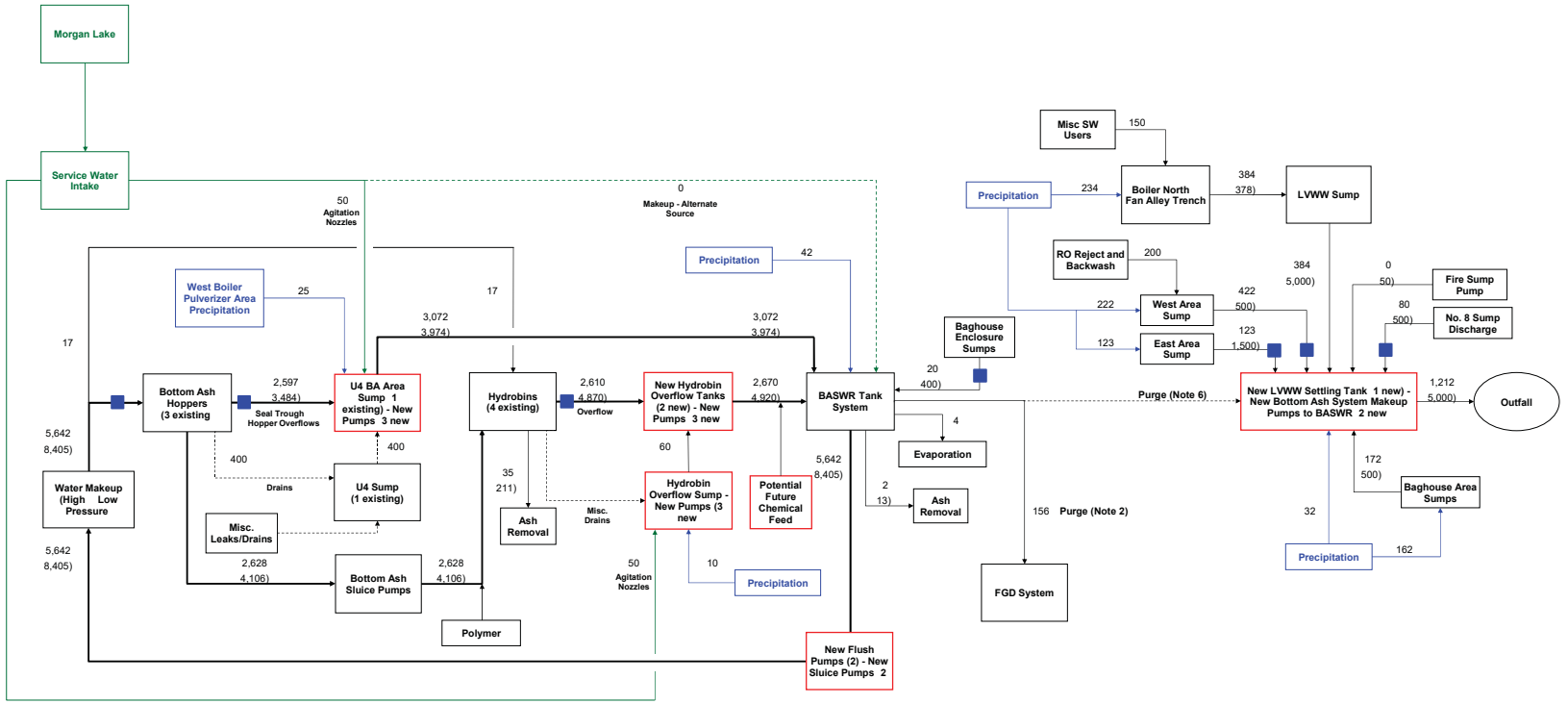
2.4.2 High Recycle Bottom Ash System

High-recycle bottom ash system flow rates, based on existing system flow rates averaged over a 24-hour period, were utilized to establish daily averages. Hydrobins are the primary ash separation step while the

BASWR settling tank system settles fines carryover from the Hydrobins along with seal trough and hopper overflow. Two sumps are included in the high recycle bottom ash system to capture various closed-loop waters along with any stormwater in the bottom ash areas. Polymer injection is expected to be utilized upstream of the Hydrobins and BASWR settling tank system to enhance fines settling while acid / caustic injection and/or soda ash may be included in the future for pH adjustment or alkalinity adjustment respectively. Purge flow to the FGD system or LVWW treatment system (to the NPDES outfall) would be discharged after the treatment of the closed-loop water by the Hydrobins and BASWR settling tank system along with any required chemical feed. Purge flow for reuse or outfall discharge is dependent on considerations listed in Section 2.3.

Wastewater streams generated at the plant that do not discharge through NPDES permitted outfalls include blowdown from the wet FGD scrubber, sanitary wastewater, and various boiler cleaning solutions. Blowdown and associated slurries from the wet FGD scrubber are blended with ash and landfilled in an on-site CCR landfill. Sanitary wastewater and boiler cleaning solutions are discharged to an on-site CCR surface impoundment where they evaporate or are reused in non-bottom ash sluice water plant operations.

APPENDIX A – WATER BALANCE DRAWINGS



no.	date	by	ckd	description
A	7/30/21	DKE		PRELIMINARY
B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

E	Precipitation Included

NOTES:

1. Precipitation values based on 10 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system.
3. All flows shown in gallons per minute (GPM.
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 20% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

	Sampling Location

PRELIMINARY

BURNS McDONNELL

date 7/30/2021	detailed D. Elliott
designed D. Elliott	checked B. Hansen

aps

APS Four Corners
Future Conditions
Process & 10yr Stormwater Flows

project 129532	contract
drawing **WMB-01**	rev. **---** **E**
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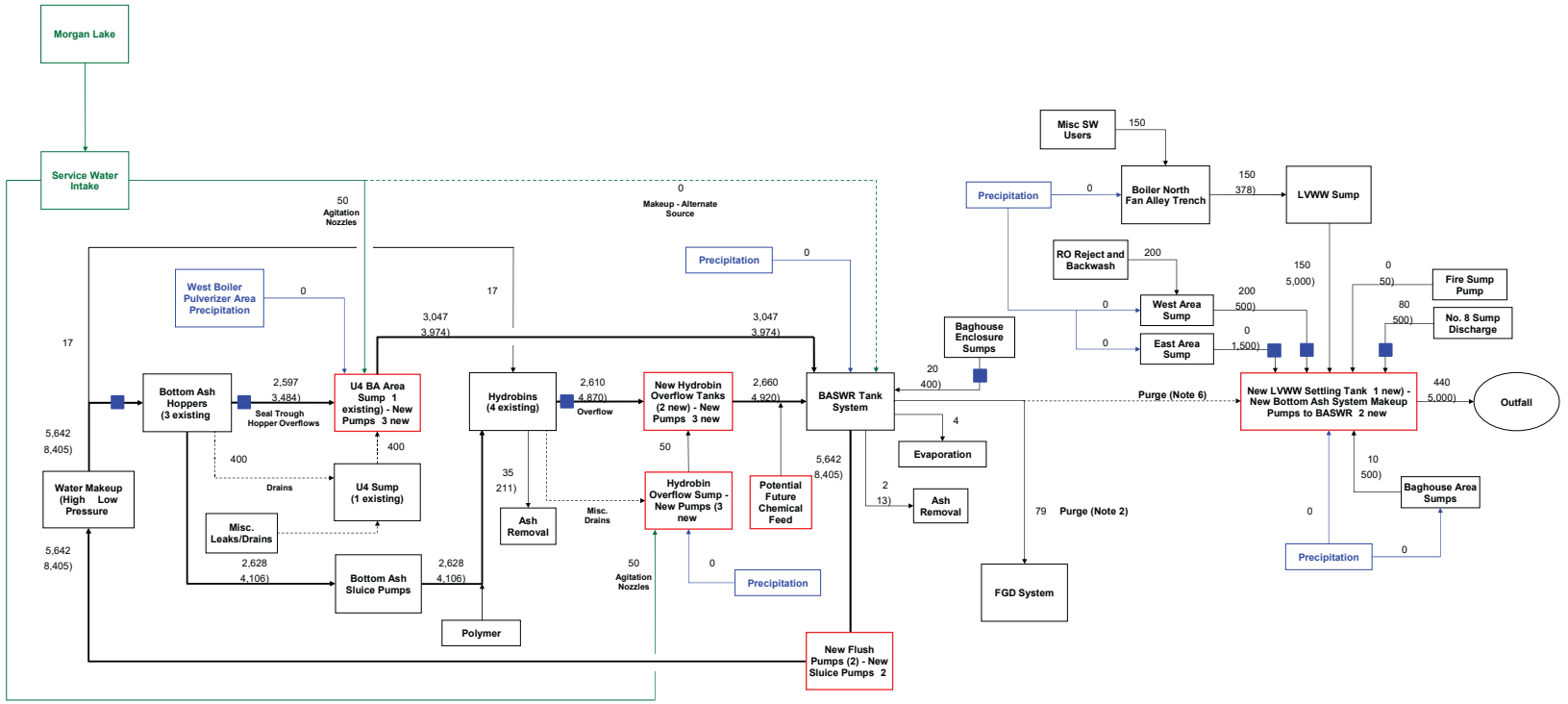

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B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

⊏ Precipitation Included

NOTES:

1. Precipitation values based on 10 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system.
3. All flows shown in gallons per minute (GPM.
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 20% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

■ Sampling Location

PRELIMINARY

BURNS McDONNELL

date	detailed
7/30/2021	D. Elliott
designed	checked
D. Elliott	B. Hansen

aps

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Future Conditions
Process Only Flows

project	contract
129532	

drawing **WMB-02** rev. **---** **E**

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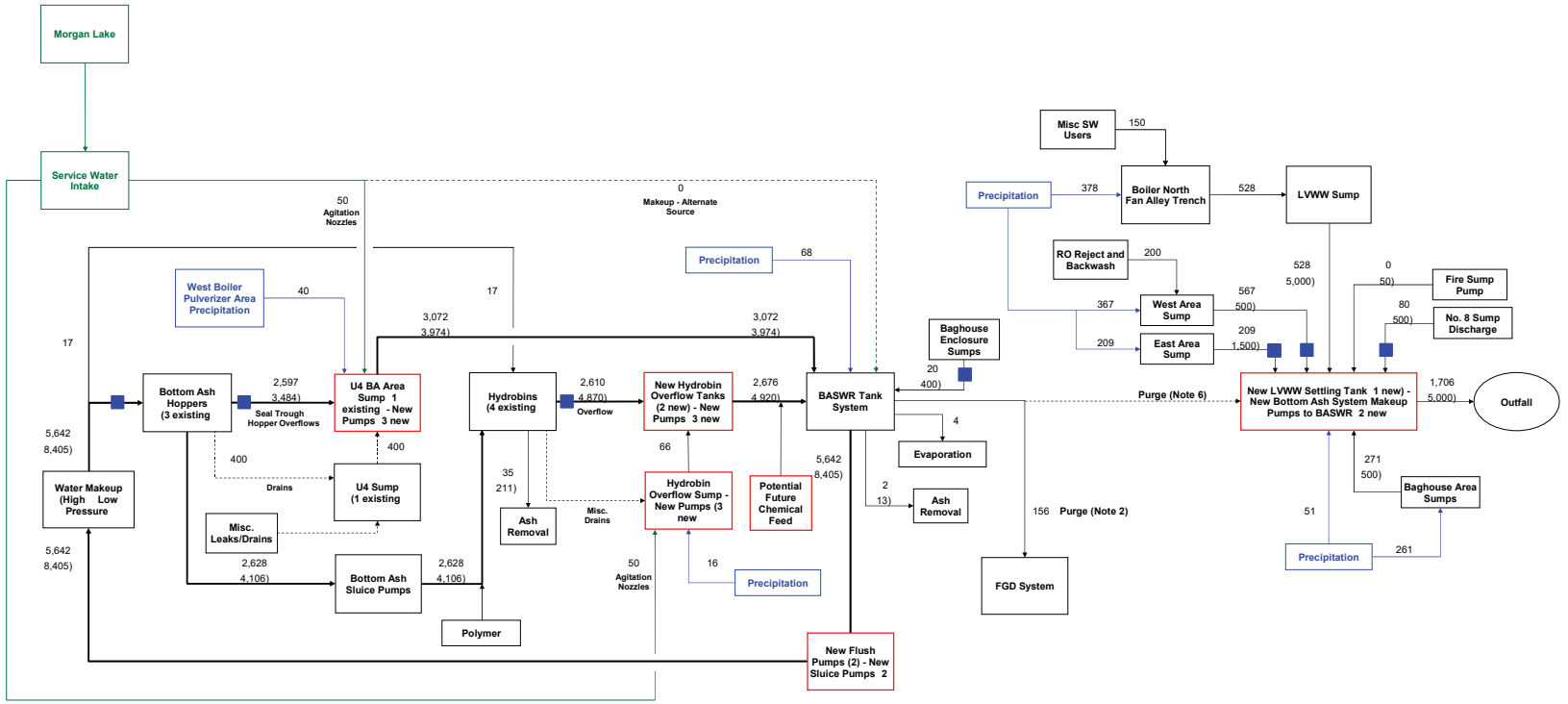

no.	date	by	ckd	description
A	7/30/21	DKE		PRELIMINARY
B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

E	Precipitation Included

NOTES:

1. Precipitation values based on 100 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system. Purge to LVWW based on flow exceeding 10 year storm.
3. All flows shown in gallons per minute (GPM
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 22% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

	Sampling Location

PRELIMINARY

BURNS McDONNELL

date 7/30/2021	detailed D. Elliott
designed D. Elliott	checked B. Hansen

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Future Conditions
Process & 100yr Stormwater Flows

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drawing **WMB-03**	rev. **---** **E**
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APPENDIX B – STORMWATER RUNOFF CALCULATIONS

BURNS McDONNELL

WORKSHEET TITLE: APS 4C Runoff Calcs
CREATED: 4/26/2021
PERFORMED BY: D. ELLIOTT
OBJECTIVE: Determine Runoff Volumes

CALCULATION NO.:
REVISION: A
REVIEWED BY:

REFERENCES:

1 Lindeburg, M. (2008). Civil engineering reference manual for the PE exam. Belmont, CA: Professional Publications, Inc.
2 Drainange Design Manual - NMDOT
https://dot.state.nm.us/content/dam/nmdot/Infrastructure/Drain_Design_Manual.pdf
3 National Oceanic and Atmospheric Administration. (2015). NOAA Atlas 14, Volume 8, Version 2. [Point precipitation frequency estimates for Farmington, NM, US]. Retrieved from http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=mo
4 United States. Department of Agriculture. Natural Resources Conservation Service. National Engineering Handbook: Part 630 Hydrology, Chapter 15 Time of Concentration. N.p., n.d. Web. 9 Feb. 2016.

DESIGN INPUTS:

1 Design storm duration is 24 hours.
2 Max intensity duration is 5 minutes
3 Based on Custom Soils Resource Report, soils in the vicinity of the watershed areas are generally sandy loam Hydrologic Soil Group C. Reference 3

EQUATIONS:

1 SCS Curve Number Method Runoff Equation
$Q = (P-I_a)^2/(P-I_a+S)$ Reference 1, p. 20-19, eq. 20.44
2 Soil Water Storage Capacity
$S = (1000/CN) -10$ Reference 1, p. 20-19, eq. 20.43
3 Initial Abstraction
$I_a = 0.2*S$ Reference 1, p. 20-15, eq. 20.38
4 Weighted Curve Number
$CN_W = (CN_i*A_i)/A_T$
5 Volume of Runoff
$V = Q*A_i$

VARIABLES:

1	Q	runoff, in
2	A_d	total drainage area, ac or mi^2
3	S	soil water storage capacity, in
4	CN	curve number, unitless
5	I_a	initial abstraction, in
6	CN_W	weighted curve number, unitless
7	A_T	total area, ac
8	CN_{WT}	total weighted curve number, unitless

CALCULATIONS:

1 Establish drainage area

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7
	West Sump	**East Sump**	**LVWW Sump**	**Baghouse Area**	**U4 BA Area**	**BASWR**	**Hydrobin Area**
A_d (ac)	9.61	5.75	9.40	6.50	1.00	1.70	0.40
A_d (mi^2)	0.015	0.009	0.015	0.010	0.002	0.003	0.001

As shown on the area map figure, see below
Conversion from ac to mi^2

2 Establish rainfall data

SCS Storm	Depth (in)	
1yr, 24hr	0.83	Reference 3
10yr, 24hr	1.54	Reference 3
100yr, 24hr	2.36	Reference 3

3 Establish CN, Percent Impervious Cover, and Initial Abstraction

	West Sump			East Sump			LVWW Sump			Baghouse Area			U4 BA Area			BASWR			Hydrobin Area			
Land Description	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	
Open space, fair condition	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	Equation 4
Gravel	96	7.21	72.0	96	5.18	86.4	96		0.0	96		0.0	96		0.0	96		0.0	96		0.0	Equation 4
Pond	100		0.0	100		0.0	100		0.0	100		0.0	100		0.0	100	1.62	95.0	100		0.0	Equation 4
Pavement	98	2.40	24.5	98	0.58	9.8	98	9.40	98.0	98	6.50	98.0	98	9.40	98.0	98	0.09	4.9	98	0.40	98.0	Equation 4
Coal Pile	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	Equation 4
A_T (ac)		9.61			5.75			9.40			6.50			9.40			1.70			0.40		Sum
CN_{WT}			97			96			98			98			98			100			98	Sum
S			0.31			0.42			0.20			0.20			0.20			0.00			0.20	Equation 2
I_a			0.06			0.08			0.04			0.04			0.04			0.00			0.04	Equation 3

*Reference 1, Table 20.4, p. 20-17 and Design Input 3

**Measured in Microstation

4 Establish Runoff Volume based on SCS Curve Number Method

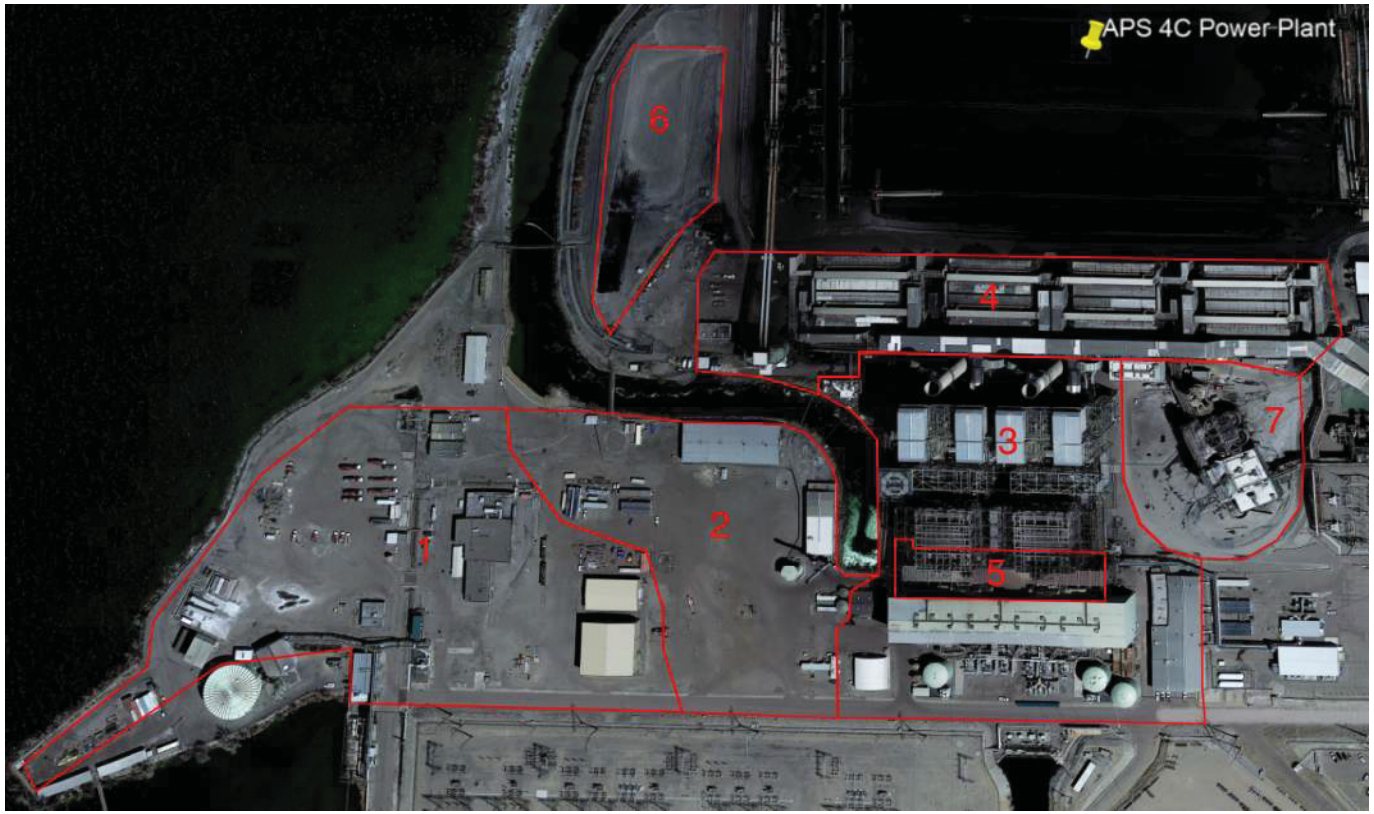
		West Sump	East Sump	LVWW Sump	Baghouse Area	U4 BA Area	BASWR	Hydrobin Area	
1-yr Storm	P (in)	0.83	0.83	0.83	0.834	0.834	0.834	0.834	Reference 3
	Q (in)	0.55	0.48	0.63	0.63	0.63	0.63	0.63	Equation 1
	V (gal)	143,900	75,400	161,100	111,400	17,200	29,200	6,900	Equation 5
	Flow (gpm)	100	52	112	77	12	20	5	
10-yr Storm	P (in)	1.54	1.54	1.54	1.54	1.54	1.54	1.54	Reference 3
	Q (in)	1.22	1.13	1.32	1.32	1.32	1.32	1.32	Equation 1
	V (gal)	319,000	176,900	336,800	232,900	35,900	61,000	14,400	Equation 5
	Flow (gpm)	222	123	234	162	25	42	10	
100-yr Storm	P (in)	2.36	2.36	2.36	2.36	2.36	2.36	2.36	Reference 3
	Q (in)	2.03	1.92	2.13	2.13	2.13	2.13	2.13	Equation 1
	V (gal)	528,600	300,500	544,100	376,300	57,900	98,400	23,200	Equation 5
	Flow (gpm)	367	209	378	261	40	68	16	

5 Evaporation Calcs

68,200

	Area (acres)	Pan Evap Rate (in/yr)	Total Evap (gal/yr)	Average Evap (gpm)
BASWR	1.40	55.00	2,090,877	3.98
LVWW Settling Basin	1.00	55.00	1,493,484	2.84

Drawing showing relative areas (APS 4C - Google Earth.pdf):



APPENDIX C – SAMPLING ANALYTICAL RESULTS

BURNS McDONNELL

Client: APS Four Corners

Date 10/18/2021

Project No. 129532

Notes:
1) Non Detects (ND are not factored into average/max.
2) Blank cells were not analyzed for specific constituent.

Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Seal Trough Makeup (Service Water)	3/4/21 12:31		8.97	5	721		114	ND	41.1	0.73	ND	ND	8.97	7.92	367		0.215	ND	74.3	72.2	ND	ND	28.7	27.1	ND	ND			ND	ND	ND	ND
	3/8/21 12:03		8.92	11	719		142	ND	41.6	0.757	ND	ND	8.54	8.56	361		0.138	ND	74.4	79.6	0.75	ND	28	29.7	ND	ND			ND	ND	ND	ND
	3/11/21 9:40		9.06	13	717		101	ND	40.9	0.759	ND	ND	9.03	8.73	367	0.64	0.175	0.101	76.7	74.4	ND	ND	27.5	27.4	ND	ND			ND	ND	ND	ND
	3/15/21 10:51		8.81		691		110	ND	40.7	0.742	ND	ND	9.06	8.03	364	0.64	0.222	ND	72.2	74.6	2.48	ND	25.2	26.3	ND	ND			ND	ND	ND	ND
	3/18/21 9:59		8.93	7	774		113	ND	41.3	0.75	ND	ND	ND	ND	359	0.64	ND	ND	71.4	78.1	ND	ND	25.3	27.1	ND	ND			ND	ND	ND	ND
	9/13/21 13:31		8.77	14	744		105	ND	43.4	0.821	ND		ND	ND	383		ND	ND	77	76.2	ND	ND	31.2	30.2	ND	ND	90.7	114				
	9/16/21 12:02		8.74	6	762		102	ND	43.6	0.815	ND		ND	ND	396		ND	ND	83	72.1	ND	ND	31.8	27.8			98.2	108				
	9/17/21 11:13		8.71	7	772		102	ND	43.2	0.815	ND		ND	ND	393		ND	ND	78.4	68.2	ND	ND	30.2	27.6			91.2	101				
	Average			9.00	737.50		111.13		41.98	0.77			8.90	8.31	373.75	0.64	0.19	0.10	75.93	74.43	1.62		28.49	27.90			93.37	107.67				
	Max			14.00	774.00		142.00		43.60	0.82			9.06	8.73	396.00	0.64	0.22	0.10	83.00	79.60	2.48		31.80	30.20			98.20	114.00				
Flush Water	3/1/21 14:37		8.85	47	525		128	ND	41	0.738	ND	ND	6.79	5.35	366		ND	ND	70.6	79.4	ND	ND	27.3	27.3	ND	ND			ND	ND	ND	ND
	3/4/21 11:42		9.09	11	698		128	ND	41	0.727	ND	ND	8.16	8.2	366		0.221	ND	70.5	77.3	2	ND	28.1	27.8	ND	ND			ND	ND	ND	ND
	3/8/21 12:54		9	15	728		128	ND	41.6	0.759	ND	ND	8.5	7.86	361		0.1	ND	69.3	73.2	0.832	ND	26	27.9	ND	ND			ND	ND	ND	ND
	3/11/21 9:33		9.05	6	716		123	ND	40.8	0.758	ND	ND	9.06	8.35	366	0.64	0.173	ND	75.5	73.9	ND	ND	27.5	26.7	ND	ND			ND	ND	ND	ND
	3/15/21 11:39		8.92	10	699		114	ND	40.7	0.738	ND	ND	7.91	8.11	364	0.64	ND	ND	69.5	71.7	ND	ND	25.4	26.1	ND	ND			ND	ND	ND	ND
	3/18/21 9:43		8.88	8	759		113	ND	41.2	0.749	ND	ND	ND	ND	359	2.56	ND	ND	68.8	67.1	ND	ND	25.5	24.4	ND	ND			ND	ND	ND	ND
	Average			16.17	687.50		122.33		41.05	0.74			8.08	7.57	363.67	1.28	0.16		70.70	73.77	1.42		26.63	26.70								
	Max			47.00	759.00		128.00		41.60	0.76			9.06	8.35	366.00	2.56	0.22		75.50	79.40	2.00		28.10	27.90								
	All SW Average			12.31	716.07		115.93		41.58	0.76			8.45	7.90	369.43	0.96	0.18	0.10	73.69	74.14	1.52		27.69	27.39			93.37	107.67				
	All SW Max			47.00	774.00		142.00		43.60	0.82			9.06	8.73	396.00	2.56	0.22	0.10	83.00	79.60	2.48		31.80	30.20			98.20	114.00				
Seal Trough Overflow	3/1/21 12:33		8.47	30	664		97	ND	35.9	0.59	1.14	ND	6.19	5.69	350		0.118	ND	56.4	56.9	ND	ND	33.5	32.1	ND	ND			ND	ND	ND	ND
	3/4/21 12:16		8.68	15	717		126	ND	40.9	0.727	ND	ND	8.65	7.85	366		0.243	ND	73.3	73.5	ND	ND	27.8	28	ND	ND			ND	ND	ND	ND
	3/8/21 11:49		8.74	11	719		119	ND	41.5	0.763	ND	ND	5.2	8.46	361		0.146	ND	68	75.6	ND	ND	26	28.1	ND	ND			ND	ND	ND	ND
	3/11/21 10:13		8.64	17	723		120	ND	40.9	0.756	ND	ND	7.44	8.67	367	0.64	0.121	ND	73.2	76.5	ND	ND	26.6	27.8	ND	ND			ND	ND	ND	ND
	3/15/21 11:23		8.71	91	704		118	ND	40.7	0.759	ND	ND	8.75	7.68	365	0.64	0.417	ND	69.8	72.1	ND	ND	25.4	26.3	ND	ND			ND	ND	ND	ND
	3/18/21 10:19		8.74	32	766		114	ND	41.3	0.764	ND	ND	6.33	ND	361	0.64	0.144	ND	73.2	75.7	ND	ND	25.6	26.5	ND	ND			ND	ND	ND	ND
	Average			32.67	715.50		115.67		40.20	0.73	1.14		7.09	7.67	361.67	0.64	0.20		68.98	71.72			27.48	28.13								
	Max			91.00	766.00		126.00		41.50	0.76	1.14		8.75	8.67	367.00	0.64	0.42		73.30	76.50			33.50	32.10								
BASWR Inlet from LVWW Sump	3/1/21 11:55		7.76	140	706		124	ND	40.4	0.768	0.302	ND	6.94	7.67	373		0.463	ND	72.6	72.9	ND	ND	27.1	27.1	ND	ND			ND	ND	ND	ND
	3/4/21 11:15		9.01	127	710		138	ND	40	0.737	0.449	ND	9.47	7.38	373		0.736	ND	78.7	72.3	ND	ND	28.9	26.5	ND	ND			ND	ND	ND	ND
	3/8/21 11:29		8.86	11	1080		191	ND	27.3	ND	ND	ND	12.2	12.3	229		0.17	ND	111	114	ND	ND	42.6	42.8	0.004	ND			ND	ND	ND	ND
	3/11/21 9:15		7.94	300	712		110	ND	39.6	0.796	0.303	ND	18.7	8.13	368	0.64	4.09	0.105	75.7	75.4	2.46	ND	26.5	27	ND	ND			ND	ND	ND	ND
	3/15/21 10:30		8.59	1420	699		107	ND	40.3	0.793	0.281	ND	7.62	7.62	374	3.2	1.06	ND	73.4	77.1	0.604	ND	26.3	26.1	ND	ND			ND	ND	ND	ND
	3/18/21 9:20		8.35	217	776		102	ND	41.1	0.821	0.447	ND	ND	ND	371	4.48	0.852	ND	72.9	22.2	0.436	ND	25.5	24.8	ND	ND			ND	ND	ND	ND
	Average			369.17	780.50		128.67		38.12	0.78	0.36		10.99	8.62	348.00	2.77	1.23	0.11	80.72	72.32	1.17		29.48	29.05	0.004							
	Max			1420.00	1080.00		191.00		41.10	0.82	0.45		18.70	12.30	374.00	4.48	4.09	0.11	111.00	114.00	2.46		42.60	42.80	0.004							

BURNS McDONNELL

Client: APS Four Corners

Date 10/18/2021

Project No. 129532

Notes:
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2) Blank cells were not analyzed for specific constituent.

Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Unit 4 & 5 Hydrobin Overflow	3/1/21 13:44		7.79	450	736		122	ND	41.2	0.819	ND	ND	6.87	4.74	375		0.858	ND	75	72.7	0.509	ND	27.6	27	ND	ND			ND	ND	ND	ND
	3/4/21 12:05		8.64	58	750		128	ND	41.5	0.822	ND	ND	9,76	6.3	380		0.579	0.11	75.3	78.2	ND	ND	27.3	28	ND	ND			ND	ND	ND	ND
	3/8/21 12:24		7.84	924	756		130	ND	41.6	0.806	ND	ND	12.7	8.65	368		1.79	ND	75.1	74.9	0.763	ND	26	27.3	0.00416	ND			ND	ND	ND	ND
	3/11/21 10:04		8.86	9	712		108	ND	40.9	0.759	0.321	ND	8.1	5.45	367	0.64	ND	ND	68.6	69.8	ND	ND	25.5	25.5	ND	ND			ND	ND	ND	ND
	3/15/21 11:04		8.88	29	706		112	ND	40.9	0.83	ND	ND	9.45	9.76	379	1.28	0.214	ND	75.8	83.1	ND	ND	26.7	28.5	ND	ND			ND	ND	ND	ND
	3/18/21 10:49		8.76	1470	776		104	ND	41.4	0.882	ND	ND	ND	5	367	1.28	0.919	ND	78.2	78.2	ND	ND	25.8	25.8	ND	ND			ND	ND	ND	ND
	7/7/21 15:54	41.84	7.69	2940	762		107	ND	42.3	0.858	ND	ND	ND	ND	378		1.53	ND	73.8	74.6	0.929	ND	25.2	29.3	0.005	ND			ND	ND	ND	ND
	7/8/21 14:43	43.52	8.13	512	764		99	ND	42.4	0.918	ND	ND	ND	ND	380		0.256	0.172	79.2	82	ND	ND	27.7	27.4	ND	ND			ND	ND	ND	ND
	8/5/21 7:00	32.90	8.74	1080																												
	8/5/21 7:30	31.70	8.29	667																												
	8/5/21 8:00	32.70	8.17	637																												
	8/5/21 8:30	32.90	8.2	611																												
	8/5/21 9:00	34.40	8.07	723																												
	8/5/21 9:30	34.70	7.96	726																												
	8/5/21 10:00	34.30	7.98	840																												
	8/5/21 10:30	35.70	7.95	575																												
	8/5/21 11:00	36.40	7.93	830																												
	8/5/21 11:30	35.90	7.89	1320																												
	8/5/21 12:00	37.90	7.86	1010																												
	8/5/21 12:30	36.70	8.19	807																												
	8/5/21 13:00	37.80	8.05	483																												
	8/5/21 13:30	38.00	7.32	292																												
	8/5/21 14:00	38.20	7.04	396																												
	8/5/21 14:30	38.70	7.85	846																												
	8/5/21 15:00	40.30	7.95	496																												
	8/5/21 15:30	40.20	8.35	306																												
	8/5/21 16:00	35.90	7.92	782																												
	8/5/21 16:30	38.10	7.88	643																												
	8/5/21 17:00	40.50	7.96	856																												
	8/5/21 17:30	38.90	9.61	20																												
	8/5/21 18:00	38.50	9.67	8																												
	8/5/21 18:30	37.40	9.84	6																												
	9/13/21 13:41	34.40	8.04	483	771		104	ND	43.5	0.921	ND		ND	ND	393		2.17	ND	83.5	75.3	ND	ND	30.9	28.2			92.5	108				
	9/16/21 13:42	34.30	7.93	2000	790		98.5	ND	43.1	0.877	ND		ND	ND	403		ND	ND	84.7	74.9	ND	ND	31.2	28.3			93.6	110				
	9/17/21 13:01	30.70	7.93	1530	783		95.2	ND	43.3	0.929	ND		ND	2.47	407		ND	ND	71.3	72	ND	1.29	28.8	28.1			86.6	108				
	Average	36.67		724.71	755.09		109.79		42.01	0.86	0.32		9.28	6.05	381.55	1.07	1.04	0.14	76.41	75.97	0.73	1.29	27.52	27.58	0.00		90.90	108.67				
	Max	43.52		2940.00	790.00		130.00		43.50	0.93	0.32		12.70	9.76	407.00	1.28	2.17	0.17	84.70	83.10	0.93	1.29	31.20	29.30	0.01		93.60	110.00				
U4 Hopper Overflow	7/7/21 15:00	38.83	7.63	15	747		110	ND	42.1	0.779	ND	ND	ND	ND	367		0.113	ND	66.2	76.9	ND	ND	26.6	29.4	ND	ND			ND	ND	ND	ND
	7/8/21 14:05	55.80	7.76	373	773		92	ND	42.7	1.01	ND	ND	ND	ND	392		0.345	ND	79.9	82.6	ND	ND	27.2	27.6	0.00494	0.00462			ND	ND	ND	ND
	9/13/21 13:10	27.60	8.66	2.5	781		107	ND	44.1	0.952	ND		ND	ND	394		0.859	0.813	81.4	86.2	ND	ND	29.2	28.4			90.8	123				
	9/16/21 12:22	31.40	8.36	98	766		103	ND	43.2	0.82	ND		ND	ND	393		ND	ND	79.9	73.3	ND	ND	30.8	29			92.1	114				
	9/17/21 11:45	29.50	8.54	44	777		102	ND	43.1	0.835	ND		ND	ND	392		ND	ND	83.1	71	ND	ND	30.7	28.5			93.3	111				
U5 Hopper Overflow	7/7/21 15:17	55.20	6.85	276	773		82	ND	42.6	1.13	ND	ND	ND	ND	403		1.63	ND	66.9	76.6	0.758	ND	25.8	27.3	0.00618	ND			ND	ND	ND	ND
	7/8/21 14:13	54.22	7.81	307	755		90	ND	42.6	1.03	ND	ND	ND	ND	392		0.238	ND	81.1	81.6	ND	ND	28.4	28.4	0.00502	0.00424			ND	ND	ND	ND
	9/13/21 13:19	40.30	7.85	98	773		90	ND	43.8	1.06	ND		ND	ND	405		0.514	ND	81.8	80.1	ND	ND	30.9	29			90.1	115				
	9/16/21 12:03	36.10	7.54	493	776		98.4	ND	43.3	0.953	ND		ND	ND	404		ND	ND	81.6	70.2	ND	ND	31.9	27.3			90.5	103				
	9/17/21 11:51	38.10	7.64	131	793		89.5	ND	43.6	1.06	ND		ND	2.8	415		ND	ND	73	71.1	ND	ND	28	27.6			86.7	122				
	Average			183.75	771.40		96.39		43.11	0.96					395.70		0.62		77.49	76.96	0.76		28.95	28.25	0.005	0.004						
	Max			493.00	793.00		110.00		44.10	1.13					415.00		1.63		83.10	86.20	0.76		31.90	29.40	0.006	0.005						

BURNS McDONNELL

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Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Sump #8	8/10/21 11:30		8.58		752	7.7	114	ND	43.8						393																	
	8/12/21 14:40		8.58	8	759	ND	114	ND	43.3						377																	
	8/17/21 11:00		8.56	11	736	9.18	106	ND	43.7						388																	
	8/19/21 16:15		8.47	22	753	8.31	111	ND	43.6						389																	
	9/13/21 14:53		8.45	13	709	ND	104	ND	42.6						385																	
	9/16/21 12:51		8.74	6	749	ND	103	ND	41.5						385																	
	9/17/21 10:31		8.79	8	775	ND	103	ND	42.4						392																	
	Average			11.3333	747.571	8.39667	107.857		42.9857						387																	
	Max			22	775	9.18	114		43.8						393																	
East Sump	8/10/21 11:53		8.46	10	587	ND	70.2	ND	28.6						322																	
	8/12/21 14:52		8.58	13	626	ND	72.3	ND	29						324																	
	8/17/21 11:15		8.48	7	629	5.4	76.4	ND	29.8						339																	
	8/19/21 16:20		8.26	80	659	ND	75	ND	28.4						345																	
	Average			27.5	625.25	5.4	73.475		28.95						332.5																	
	Max			80	659	5.4	76.4		29.8						345																	
West Sump	8/10/21 12:12		8.6	10	1140	5.4	179	ND	72.7						590																	
	8/12/21 15:00		8.52	9	1330	ND	181	ND	83						685																	
	8/17/21 11:25		8.53	13	1190	6.5	163	ND	74						600																	
	8/19/21 16:30		8.43	13	1200	ND	158	ND	73.6						605																	
	9/13/21 15:22		8.63	19	1400	ND	192	ND	88.7						716																	
	9/16/21 11:41		8.68	6	1190	ND	148	ND	70						590																	
	9/17/21 10:10		8.71	13	1370	ND	162	ND	82.6						692																	
	Average			11.8571	1260	5.95	169		77.8						639.714																	
	Max			19	1400	6.5	192		88.7						716																	
U4 Baghouse Enclosure Sump	8/10/21 11:07		7.86	8600	3960	83.2	23.2	5.43	176						2370																	
	8/12/21 14:30		8.02	3680	2390	28.8	98.6	ND	99.5						1460																	
	8/17/21 10:50		8.22	8230	1610	32	113	ND	64.9						974																	
	8/19/21 16:04		8.05	5420	1720	48.4	120	ND	55.3						1040																	
	9/13/21 14:40		6.27	5720	2020	79.4	ND	187	70.9						1330																	
	9/16/21 13:24		6.36	4330	2160	62.3	24.5	ND	80.1						1580																	
	9/17/21 12:13		6.41	2190	2410	86.6	ND	104	82.1						1600																	
	Average			5452.86	2324.29	60.1	88.7	98.81	89.8286						1479.14																	
	Max			8600	3960	86.6	120	187	176						2370																	
U5 Baghouse Enclosure Sump	8/10/21 10:42		8.76	8830	1870	19.7	117	ND	56.4						1080																	
	8/12/21 14:18		8.1	21500	2120	14.5	171	ND	63.9						1180																	
	8/17/21 10:38		8.6	10600	1660	16.5	118	ND	56.8						1050																	
	8/19/21 15:54		8.12	4460	1610	9.3	125	ND	56.6						1020																	
	9/13/21 14:30		7.48	3810	1200	9.7	ND	ND	30.5						727																	
	9/16/21 13:59		7.2	1350	1090	ND	32.3	ND	ND						836																	
	9/17/21 11:04		8.2	1010	1270	6.07	ND	ND	29.8						733																	
	Average			7365.71	1545.71	13.94	132.75		52.84						946.571																	
	Max			21500	2120	19.7	171		63.9						1180																	

APPENDIX D – CHEMISTRY CALCULATIONS

Baseline Conditions - Open Loop Configuration

Entire system volume	4,594,353	gallons	3,190.52	gpm		USER INPUT VALUES
Bottom ash hopper volume, total	149,600	gallons				
Bottom ash hydrobins, total	647,694	gallons				
Makeup (gpm) (dragout + evap)	44.79					
Total Makeup (GPD)	64,504	gpd				
Dragout	50,400	gpd	35.00	gpm, from Ash design basis		
System Evaporation	14,104	gpd	9.79	gpm	9.79	gpm, BASWR evaporation plus bottom ash hopper evaporation
Cycles of Concentration			1.00	current system is open loop - no cycling		
Hydraulic Residence Time (HRT), day	71.23					
Seal trough overflow / agitation nozzles	3,047	gpm	4,387,680	gal/day - assumes seal trough flow is continuous		
Sluice rate	2,628	gpm	1,261,440	gal/day - assumes sluicing 2x per day for 2 hours each sluice per unit		

This sheet calculates the concentration of solutes added to the system by the ash, for use in projecting water quality under different purge rates. When the estimated concentrations in red font (Estimated Concentrations row) agree with the measured values (Hydrobin Overflow row), the estimated contribution of the ash to the solutes in the system from the model is showing good correlation and is considered acceptable.

Water quality data	Cond, uS/cm	TDS, ppm	Cl, ppm	SO4, ppm	Mg, ppm	Ca, ppm	alk/HCO3, ppm	alk/CO3, ppm	pH, SU	Temp, F	PSI = 2(pHs)-pHeq	RSI =2(pHs) - pHmeasured	LSI = pHmeasured - pHs	LS-I
Makeup Water	1,100.75	737.50	41.98	373.75	28.49	75.93	111.13		8.86	70.00	8.12	6.79	1.03	4.92
Hydrobin Overflow	1,127.00	755.09	42.01	381.55	27.52	76.41	109.79		8.20	98.01	7.55	6.87	0.66	5.07
Current Cycles Observed	1.0239	1.0239	1.0007	1.0209	0.9660	1.0063	0.9879							
Change in system concentration	26.25	17.59	0.03	7.80	(0.97)	0.48	(1.34)			28.01				
Excess concentration at reported HRT, ppm/day		0.2470	0.0004	0.1095	(0.0136)	0.0067	(0.0188)							
Concentration change from evaporation (increase)		13.28	0.76	6.73	0.51	1.37	2.00	<- increase in system concentration from evaporation losses						
Concentration input from contact with bottom ash		4.31	(0.73)	1.07	(1.48)	(0.89)	(3.34)	<- negative values do not make sense; should have an increase in concentration						

	MGD	gpm	
		100.0%	percentage of design basis
Evaporation	0.014	9.79	gpm
Dragout	0.050	35.00	gpm, calculated dragout/system losses to approximate concentration factors
Sluice rate	3.784	2,628.00	gpm, current sluicing rate, open-loop system
Makeup	0.065	44.79	gpm

APPENDIX E – GENERAL ARRANGEMENT

BURNS McDONNELL

date 08/12/21

designed K. MATTHEWS

FOUR CORNERS

OVERALL SITE

ELG PLANT MODIFICATIONS

GENERAL ARRANGEMENT

project 129532

W. A. FCC016494

SK M003

Z:\CLIENTS\ENR\ARIZONAPS\129532_FCC016494ELG\DESIGN\MECH\CADD\SKETCHES\129532_SKM003.DWG 2/24/2022 4:31 PM KJMATTHEWS

BURNS McDONNELL

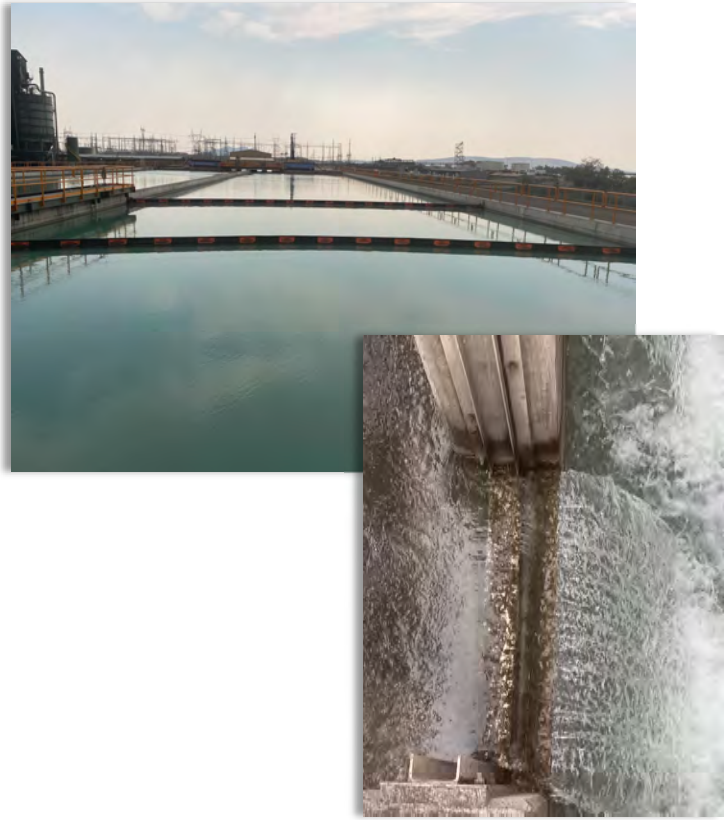
CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

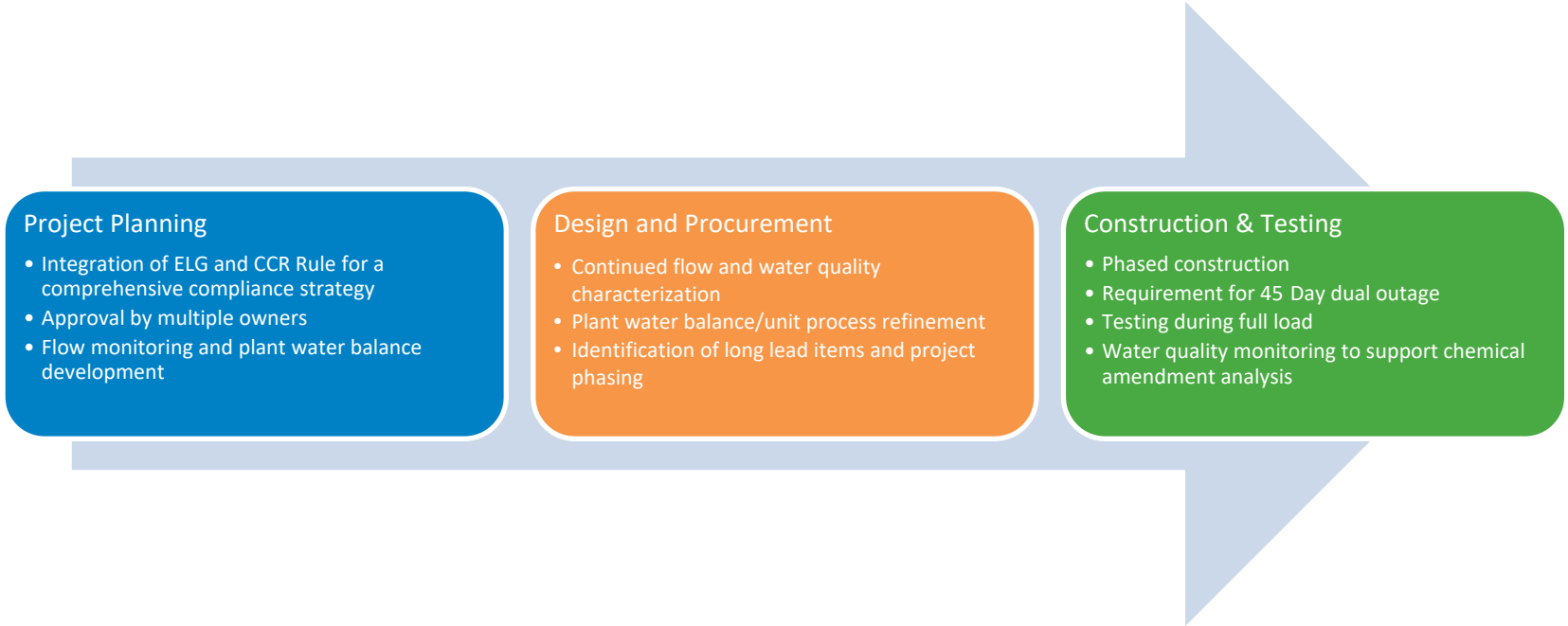
Attachment 4: APS Project Status Update Presentation

Agenda

- ELG Compliance Project update
- Timing issues
- Proposed permit modification approach



ELG Compliance Project Update



Timing Issues

COVID-19 / Ukraine Conflict

- Supply chain disruption
  - 10 material bid packages
    - Pumps
    - Power Distribution Center
    - Overflow tanks
    - Piping material
    - **Electrical cable (40-52 weeks)**
    - Knifegate valves
    - **Control valves (48-60 weeks)**
    - ABB Control Cabinet
    - Chemical Feed Tanks
  - 8 construction bid packages

Testing Requirement

- Startup dependent on outage schedule
- Operational water quality cycling evaluation
- Chemical amendment assessment

Proposed Permit Modification Approach

- Impose a Schedule of Compliance extending the compliance deadline consistent with the 2020 ELG Reconsideration Rule “blowdown” limits and “as soon as possible” deadline
- Base EPA’s determination of the BATW blowdown limits on actual plant closed-loop BATW recirculation operations and follow this schedule:
  - Construct and begin operating the closed-loop BATW recirculation system by 12/31/23
  - Monitor and, to the maximum extent feasible, minimize BATW discharges from startup to compliance deadline
  - Regularly report to EPA (e.g., monthly) blowdown volumes, internal water chemistry, etc.

Attachment 5: APS NPDES Permit Modification Letter

Tel. 602-250-2414
Cell 602-284-3899
e-mail: neal.brown@aps.com

PO Box 53999
Mail Station 9303
Phoenix, Arizona 85072

November 1, 2022

Electronically Submitted

U.S. Environmental Protection Agency, Region 9
NPDES Permits Section, Water Division (WTR-2-3)
Attn: Gary Sheth (Sheth.Gary@epa.gov)
75 Hawthorne Street
San Francisco, CA 94105

Subject: PROPOSED PERMIT MODIFICATION APPROACH
Information Supporting a Permit Modification Pursuant to Amended Standards in the Steam Electric Reconsideration Rule
APS Four Corners Power Plant – Fruitland, New Mexico
NPDES Permit No. NN0000019

Dear Mr. Sheth,

As discussed in recent meetings with the U.S. Environmental Protection Agency (EPA), Arizona Public Service Company (APS) is making progress modifying our once-through bottom ash transport sluice water system at Four Corners Power Plant (FCPP) into a high-recycle system. Upon completion of this project, the system will comply with the bottom ash transport water (BATW) discharge requirements of 40 CFR 423 – Steam Electric Power Generating Point Source Category (i.e., the 2020 ELG Steam Electric Reconsideration Rule, 85 Fed Reg 64,650 (October 13, 2020)).

Although we are confident that our system will be constructed no later than the compliance deadline for ceasing BATW discharges in the current FCPP National Pollutant Discharge Elimination System (NPDES) permit (i.e., December 31, 2023), supply chain disruptions associated with COVID-19 and the Ukraine conflict will not allow sufficient testing and evaluation of system operations to support finalization of our Initial Certification detailing the necessary BATW purge allowance prior to the existing permit compliance deadline. Attachment A to this letter presents a Schedule Progress Report transmitting documentation that identifies the specific equipment impacted by the supply chain delays, including backup correspondence from vendors.

Since the information provided in the Initial Certification forms the basis for EPA's determination regarding BATW discharges under the amended standards in the 2020 ELG Steam Electric Reconsideration Rule, see 40 CFR § 423.19(c), APS requests that EPA modify the FCPP permit in two steps, as warranted:

1. First, establish December 31, 2025 as the permit's "as soon as possible" date for compliance with amended BATW discharge requirements, consistent with 40 CFR §§ 423.11(t) and 423.13(k)(1)(i), and impose both interim compliance milestones and discharge limits for the BATW discharge under the 2020 Rule. FCPP would operate the high-recycle BATW system starting no later than December 31, 2023, and comply with interim discharge requirements consistent with 40 CFR § 423.13(k)(2)(i)(A).
2. Second, use actual FCPP operating data based on testing and evaluation of the high-recycle BATW system documented in a finalized Initial Certification to modify the permit as appropriate to account for adjustments needed to the BATW discharge limits.

This second step in the process would be finalized no later than December 31, 2025—the current compliance deadline for BATW allowed for under 40 CFR § 423.13(k)(1)(i).

Basis for December 31, 2025 "As Soon as Possible" Date

Under the 2020 ELG Steam Electric Reconsideration Rule, the "as soon as possible" date for meeting BATW limitations must be no later than December 31, 2025. 40 CFR § 423.13(k)(1)(i). In accordance with 40 CFR § 423.11(t), the "as soon as possible" date must reflect consideration of: (1) time to plan, design, procure, and install compliance equipment; (2) changes being made or planned at the facility in response to other environmental regulations; and (3) other factors, as appropriate.

During the permit process, on April 4, 2019, APS provided EPA with an ELG Compliance Project Summary, which provided an overview of the proposed projects and timeline to address compliance with both the 2015 ELG Rule's standards for BATW and requirements under EPA's coal combustion residuals (CCR) regulations. Based on developments that have occurred since our last update, APS now provides information that supports a determination under the § 423.11(t) factors that the "as soon as possible" date for compliance with amended BATW discharge requirements should be modified to December 31, 2025.

High-Recycle BATW Project Construction, Testing, & Tuning Timeline

To address BATW requirements and EPA's CCR regulations, APS previously identified the implementation of three separate, yet interrelated projects at the FCPP: (1) closure of the Combined Waste Treatment Pond (CWTP), (2) construction of the BATW treatment tank, and (3) construction of a high-recycle BATW system.

The CWTP historically treated BATW comingled with low volume wastewater prior to discharge through internal outfall 01E to Morgan Lake. Due to CCR Rule requirements, closure of the CWTP was necessary and thus the BATW treatment tank was constructed to replace the function of the CWTP in plant operations. The BATW treatment tank was completed and put into service in November 2020 concurrent with reissuance of the FCPP NPDES permit. To date, all flows of NPDES-regulated wastewater, which had been routed through the CWTP, have been diverted from that unit as it undergoes closure. Closure of the CWTP was previously integral to construction of the high-recycle BATW system because it was identified as a future treatment unit for segregated low volume wastewater following unit closure. Given delays in closing the CWTP, APS has proceeded with the design and construction of a new Low Volume Waste Tank, uncoupling closure of the CWTP as a required milestone in commissioning the high-recycle BATW system.

Construction of the high-recycle BATW system is ongoing. As previously identified, the schedule for development of the high recycle BATW system has been impacted by supply chain issues related to COVID-19 and the conflict in Ukraine, which has necessitated advancing design engineering, procurement, and construction along parallel paths. Engineering of all major systems is near complete and procurement packages have been issued. Construction of the Hydrobin overflow tanks, the Low Volume Waste Tank, and pipe rack has begun. Despite our best efforts to progress procurement of long-lead equipment, supply chain issues have resulted in delays to the completion of the high recycle BATW system. APS currently meets twice per month with each supplier to discuss production and delivery status and vendors have indicated that critical elements of the system will not be on-site until Spring 2023. *See* Attachment A. The information provided in Attachment A demonstrates clearly that delays have significantly impacted the "time to plan, design, procure, and install compliance equipment" at FCPP and, in accordance with 40 CFR § 423.11(t), it is appropriate to establish December 31, 2025 as the compliance date for FCPP as to the 2020 ELG Steam Electric Reconsideration Rule.

APS has scheduled two planned outages for system installation, commissioning, and tuning. During the initial outage, scheduled for Spring 2023, APS intends to install and check the function of equipment in the new high recycle BATW system. Over the Summer of 2023, APS

will perform initial testing and balancing of the system, allowing BATW discharges to continue through the existing 01E outfall as needed to ensure safe and reliable plant operations. Then, during the Fall 2023 outage, APS will address any issues or concerns that were discovered over the summer months. Under this schedule, FCPP would fully-rely upon and operate the high-recycle BATW system starting no later than December 31, 2023—at which point, BATW discharges would only be allowed in accordance with the interim discharge limits as described herein.

High-Recycle BATW Project Monitoring, Evaluation, and Initial Certification

To ensure adequate time for testing under consistent and high load after startup, APS proposes to perform monitoring and evaluation of the system throughout 2024. A year of testing is required to allow assessment over periods of sustained and variable plant operation given the impacts recirculation of BATW can have on water chemistry. During this time, APS would report blowdown volumes and the results of internal water chemistry monitoring to EPA on a monthly basis, while maintaining strict compliance with interim discharge limits. This data would be used to identify the bottom ash purge volume needed to maintain system water chemistry on the newly-installed system consistent with 40 CFR § 423.13(k)(2)(i)(A)(3). Based on such testing and evaluation, APS would thereafter finalize its Initial Certification using actual FCPP operating data.

In light of the time to procure, install, and test the BATW compliance equipment, consistent with all three of the identified § 423.11(t) factors, APS requests that EPA establish the "as soon as possible" date in the current NPDES permit for compliance with amended BATW discharge requirements to December 31, 2025. This is the soonest date by which APS can achieve compliance in light of the supply chain and procurement delays that have impacted system construction and accommodate the time that will be needed for testing of the system once it is in operation.

<u>Interim Compliance Milestones & Discharge Limits</u>

Between December 31, 2023 and December 31, 2025, APS understands that EPA needs to include discharge limits in our NPDES permit for the high-recycle BATW system in accordance with the 2020 ELG Steam Electric Reconsideration Rule. With respect to system water chemistry in particular, APS conducted supplemental research to assess the experience of other steam-electric power generating facilities that have implemented high-recycle BATW systems, including a review of Electric Power Research Institute studies, consultation with our design engineering firm, and discussion with other utilities. Although there is limited information that is directly applicable to our facility because systems and operating conditions are unique, we identified that Duke Energy's Cayuga Station in Indiana has experience operating their high recycle BATW system and has assessed the impacts that high sulfide concentrations have in their operations. Based on current operating experience with our once-through BATW system, FCPP will similarly confront high sulfide concentrations in maintaining our high recycle BATW system.

For the Cayuga Station Initial Certification documents, a requirement is included to purge up to 75,400 gallons per day to maintain system water chemistry. In the absence of other operationally derived data, APS proposes to use the discharge volume proposed for Cayuga Station, normalized for plant rated capacity, and rounded to the nearest 0.5% as the basis for our interim discharge limit to maintain system water chemistry:

(75,400 gallons at Cayuga) * (1,540 MW at FC)/(1,104 MW at Cayuga) = 105,178 gallons

105,178 gallons divided by FC total system volume (4,594,352 gallons) = 2.29% - rounded to 2.5%

Thus, our proposed permit modification approach includes:

- Revise the FCPP NPDES permit before December 31, 2023 to establish an "as soon as possible deadline" of December 31, 2025, and impose a defined schedule of permit milestones consistent with the 2020 ELG Steam Electric Reconsideration Rule BATW

"blowdown" limits and "as soon as possible" deadline (i.e., no later than December 31, 2025):

  - Construct and begin operating a high-recycle BATW system by December 31, 2023;
  - Report blowdown volumes and the results of internal water chemistry monitoring to EPA on a monthly basis during interim operations (i.e., between December 31, 2023 and the "as soon as possible" date of December 31, 2025); and
  - Submit an updated draft Initial Certification incorporating interim operational data for the high-recycle BATW recirculation system no later than March 31, 2025 to allow for an update of permit conditions by December 31, 2025.

- During interim operations between December 31, 2023 and December 31, 2025, impose limits for high-recycle BATW system blowdown discharges based on volumes identified in our draft Initial Certification (filed on May 19, 2022, and attached here for reference) for all conditions except those required to maintain water chemistry (where the limit will be adapted from Cayuga Station permit, as provided above). In sum, the interim BATW high recycle system blowdown discharge limits applicable as of December 31, 2023 to FCPP would be:

  - Limit stormwater flows to those greater than the 10-Year, 24-Hour Storm (i.e., stormwater flows in excess of 111,000 gallons in a 24-hour period);
  - Limit discharges required to maintain water balance due to intermittent flows from other waste streams to 400 gpm peak (20 gpm average) for a period of no greater than 3 days when spare or surge capacity is limited;
  - Limit discharges required to maintain water chemistry to 2.5% of the total system wetted volume per day (i.e., 114,859 gallons per 24-hour period); and
  - Limit discharges required for maintenance to 1,428,043 gallons.

  In addition to the individual limits based on discharge condition, the total of all BATW discharges from the high-recycle system shall be limited to no more than 10% of the total system wetted volume per day (i.e., 459,435 gallons per day calculated on a 30-day rolling average basis), consistent with 40 CFR 423.13(k)(2)(i)(B).

* * * *

APS appreciates EPA's input on our requested permit modification for FCPP. We welcome the opportunity to discuss any additional feedback you may have on this proposal. If you have any questions or would like to discuss this approach in more detail, please contact Natalie Chrisman Lazarr at (602) 316-1324 or via email at natalie.chrismanlazarr@aps.com.

Sincerely,

Neal Brown
Environmental Operations Manager
Arizona Public Service Company

Cc: Mr. Jeffrey Jenkins, Plant Manager – APS, Four Corners Power Plant
Ms. Pamela Norris, Environmental Manager – APS, Four Corners Power Plant
Mr. Jeffrey Allmon, Senior Attorney – Pinnacle West Capital Corporation

Attachments

ATTACHMENT A
SCHEDULE PROGRESS REPORT

GENERATION ENGINEERING SERVICES

Schedule Progress Report Transmittal

September 26, 2022

WA FCC016494 – ELG PLANT MODIFICATIONS

This report presents the status of Material Schedule Delivery Dates to meet the December 31, 2023 National Pollutant Discharge Elimination System (NPDES) Permit compliance deadline for bottom ash transport water at the Four Corners Power Plant. Internally the capital project being implemented to comply with this deadline is referred to as the ELG Plant Modification Project which refers to the EPA regulation that requires suspension of once-through sluicing systems for bottom ash transport water and conversion to a high-recycle bottom ash transport water recirculation system.

The schedule of the ELG Plant Modification Project has been impacted by supply chain issues related to COVID and the Ukraine conflict which has necessitated advancing design engineering, procurement, and construction along parallel paths. To ensure some time for testing under consistent and high load after startup, APS has scheduled two planned outages for system installation and maintenance; these outage dates are fixed and can be considered the dates that all system components must be received by to ensure compliance with the permit.

Four Corners Planned Outages:

Installation Dual Unit Outage: April 1st, 2023 thru May 15th, 2023

- Completion of all work using the newly installed system to be used and tested throughout the Summer Run of 2023 for training purposes of balancing the closed loop water system.

Maintenance Dual Unit Outage: October 15th, 2023 thru November 12th, 2023

- Final checks of the installed system to address issues and items discovered during the 2023 Summer Run to be prepared for the 2024 operations.

Summary of Major Risks to Installation Outage:

Due to the Supply Chain Management issues throughout 2021 and 2022, our team progressed the engineering and procurement packages to minimize the delay of materials to meet the date of the Installation Dual Unit Outage. Critical packages based on feedback supplied by vendors are summarized below:

PO	Vendor		Plan	Outlook	Actual	Notes
100618708	ABB	DCS Hardware	3/13/2023	3/13/2023		1
100618300	Okonite	4160 V Cable	12/3/2022	12/03/2022		2
100619766	Graybar	MCC	1/15/2023	3/23/2023		2
100619374	IMI-CCI	Control Valves	2/15/2023	2/24/2023		1
100616045	Powell	PDC Building	7/31/2022	1/25/2023		2
100616044	PPI	Vertical Turbine Pumps	10/31/2022	1/15/2023		2

1) U45 outage no-go without material
2) Delay in cable would push construction into U45 outage

Summary of Material Delays:

Above are the items that have been ordered and the dates have shifted, or the items are critical to meeting the needs of the Installation Outage. All parts need to be on-site prior to the April 1st, 2023, date as all parts need to be in working order prior to the end of the Installation outage.

The Major parts that have turned out to be very critical to the outage are the MCC (Motor Control Center), Control Valves and the DCS hardware.

The other parts are being tracked and are at risk but are trending towards the beginning of the year.

***APS has meetings twice a month with each supplier to discuss these materials and trending delivery dates**.*

More detailed discussion of critical packages with vendor documentation is presented in the following pages.

Power Distribution Center – Powell PDC – Bid Event

Issued Date of the Purchase Order – 10/17/21 – Delivery Date on Order – 7/30/22

Current tracking date 01/25/23 – Delay of 6 Months

RE_ FCC016494 -
ELG PDC Design Rev

Email Dated – 2/18/22 – Shipment Date 10/17/22

RE_ FCC016494 F45
ELG Modifications -

Email – Dated – 7/1/22 – Shipment Date 1/16/23

The Okonite Company – Electrical Cable 4160V

Issued Date – 4/8/22 – Delivery Date 12/03/22 –

Currently tracking in 12/03/22

Notes: Okonite has any delays in this cable will extend the construction of this work scope into the dual unit outage however it is trending positively.

RE_ Post Award Meeting .msg

E-mail Dated – 08/31/22 – Shipment Date 12/3/22

IMI CCI – Control Valves:

Issued Date – 4/25/22 – Delivery Date per specifications – 2/24/23 –

Final Complete Control Valves to be delivered 7/25/23

Notes:
Installation Outage will have the Control Valve Installed, and then in the Maintenance Outage will readdress the Control Valve Parts for permanent installation after summer run.

RE_
(IMI_TRANSMIT_A79

Email Dated 8/24/22 – Issues with components on the Control Valve

RE_ APS PO
100618499 - IMI CCI

Control Valve Supplier Discussing the Covid Issues as well as the Ukraine Conflict.

Phoenix Pumps – Vertical Turbine Pumps –

Issued Date – 3/25/22 – Delivery Date per specification – 10/25/22

Updated delivery date of the Vertical Turbine Pumps is 1/15/23

APS Four Corners -
VTP Motors.msg

Ship Date 9/27 as of Email of 7/20

Still tracking and trending behind the 9/27 date but waiting on the final testing from the shops.

Graybar – Motor Control Center –

Design completion – Issued date – 9/12/22 – Delivery per specification – 01/15/23

Updated delivery date to 3/23/23

Notes: The design has to be completed based on the completion of the other engineering designs and with the delays of MCC turning to 50 weeks and Burns & McDonnell Engineering to get these timelines moved in – still working with the vendor to improve these dates.

RE_ ELG - Graybar MCC Delivery .msg

Email 9/26 – Shipment is 3/23

RE_ MCC - ATS - Graybar.msg

Email 8/17 – Shipment is still 16 weeks

RE_ MCC - ATS - Graybar.msg

Email 8/24 – Shipment is 27 Weeks

ABB Hardware –

Issued Date – 5/10/22 – Deliver per specification – 03/30/23

Notes: The Design team is not expecting this to delay the dual unit outage; however, this is a high risk for completion of the project.

U324_ APS 4C F45
ELG Modifications P

Email of Meeting Notes from 8/11/22 – Shipment Date of hardware to be worked on by the end of January for Delivery of 3/30/23

ATTACHMENTS

From: Von Ruff, Brandon
To: McGary, Nicolas; Lemieux, Brendan; Lemieux, Brendan; Schroeder, Timothy; Lawrence.Hunt@mwconsultllc.com; Yazzie, Rachael G; Mix, Larry; Stewart, Terry; Nicholson, Steven; Austin, Robert; Cole, Dennis
Cc: "brendan.lemieux@mwconsultllc.com"; Terry Stewart; 129532
Subject: RE: FCC016494 - ELG PDC Design Review Meeting
Date: Friday, February 18, 2022 9:38:04 AM
Attachments: image001.png
image003.png
image005.png

Please see the following high level schedule:

Approval Drawings – 4/14/2022
Customer Return of drawing to Powell – 4/29/2022
Release to Manufacturing Drawings – 5/20/2022
Record Drawings with wiring diagrams – 6/15/2022
Powell Inspection Start – 9/12/2022
Customer Inspection (FAT) – 9/19/2022 – 9/23/2022
Shipment From Powell – 10/17/2022

For items on this project that we are seeing longer than usual lead times are the following:
LV MCC – Will order buckets/vertical sections as soon as proposed arrangement is approved
MV MCC – ISO Switches – ordering these earlier than typical to offset
Relays – SEL did have a bunch of relays on production hold, but these are starting to come off hold and have longer than typical lead times. Once we have approval of the relay part numbers we will order.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Wednesday, February 16, 2022 10:20 AM
To: Brendan.Lemieux@aps.com; Lemieux, Brendan <Brendan.Lemieux@aps.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Lawrence.Hunt@mwconsultllc.com; Yazzie, Rachael G <Rachael.Yazzie@aps.com>; Mix, Larry <Larry.Mix@aps.com>; Stewart, Terry <Terry.Stewart@aps.com>; Nicholson, Steven <Steven.Nicholson@aps.com>; Austin, Robert <Robert.Austin@aps.com>; Cole, Dennis <Dennis.Cole@powellind.com>; Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Allen, Chris <Chris.Allen@powellind.com>; 'brendan.lemieux@mwconsultllc.com' <brendan.lemieux@mwconsultllc.com>; Terry Stewart <terry.stewart@mwconsultllc.com>; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 - ELG PDC Design Review Meeting

All,

Please see attached for this week's meeting minutes. Let me know if you have any questions or comments. Thanks again.

Have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

-----Original Appointment-----
From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Tuesday, January 4, 2022 3:02 PM
To: Lemieux, Brendan; tschroeder@burnsmcd.com; McGary, Nicolas; Lawrence.Hunt@mwconsultllc.com; Yazzie, Rachael G; Mix, Larry; Stewart, Terry; Nicholson, Steven; Austin, Robert; Cole, Dennis; Von Ruff, Brandon
Cc: Allen, Chris; 'brendan.lemieux@mwconsultllc.com'; Terry Stewart
Subject: FCC016494 - ELG PDC Design Review Meeting
When: Wednesday, February 16, 2022 8:30 AM-9:00 AM (UTC-07:00) Mountain Time (US & Canada).
Where: Microsoft Teams Meeting

Powell PDC Building Update –

This meeting will be to review the design and the drawings that are ongoing as well as the schedule from Powell Regarding the PDC Building.

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device
teams@vc.aps.com
Video Conference ID: 113 585 817 2
Alternate VTC instructions

Or call in (audio only)
+1 602-607-1180,,154330172# United States, Phoenix
Phone Conference ID: 154 330 172#
Find a local number | Reset PIN

For best experience, use the Teams mobile app or computer audio instead of dial-in. Limit use of call-me feature to save company money.

Learn More | Meeting options

From: Von Ruff, Brandon
To: McGary, Nicolas; Lemieux, Brendan
Cc: Schroeder, Timothy; brendan.lemieux@mwconsultllc.com; 129532
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote
Date: Friday, July 1, 2022 4:48:48 AM
Attachments: image001.png
image006.png
image007.png
image008.png
image009.png
image010.png
image011.png

Nick,

Yes I spoke to the Production and Quality teams and based on the SEL Relay dates we propose the following:
Customer Inspection - 12/12 – 12/16,
Shipment - 1/16/23

Do you believe you can make these dates work with your schedules?

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Thursday, June 30, 2022 4:09 PM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; Brendan.Lemieux@aps.com
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Brandon,

On another topic, have you received an updated ship date for the PDC itself? We had noted that the relays were going to push things out. I just wanted to follow up and see if that date had become more clear yet.

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Thursday, June 30, 2022 10:13 AM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Brendan.Lemieux@aps.com
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Please see the response from Joe:

Per my email yesterday, I am not sure we are going to have a good solution on the large panelboard. We can get the ELG-2 broken up into 3 smaller panels in 6-8 weeks but I am not getting any responses back that are favorable leads on the "ELG-3 Distribution Panel". Lead times are in the 36-40 range on this panel. I am still waiting on a couple of responses back and will advise. What time is call tomorrow?

I'm not sure if a call will really help with the situation, but we are open to one. There is also still no reply on the ATS/MTS.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Thursday, June 30, 2022 9:25 AM
To: Brendan.Lemieux@aps.com; Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

All,

I have availability tomorrow for a meeting. Busy 9-10AM Mountain Time, but available the rest of the day. I would also like to discuss or get an update on where we are at with ATS/MTS equipment from the various vendors.

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Wednesday, June 29, 2022 10:55 AM
To: Brandon.VonRuff@powellind.com; McGary, Nicolas <nmcgary@burnsmcd.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Nick and Brandon –

Are we available to have a meeting about this to shore up the pathway forward this week –

I would like to try and get this moving forward this week if this is possible.

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Wednesday, June 29, 2022 7:44 AM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Lemieux, Brendan <Brendan.Lemieux@aps.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

See the following:

Got a response back from an OEM. 25-36 Week lead times on Cutler Hammer 480V panels. Still waiting on a Siemens OEM to respond.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Wednesday, June 29, 2022 8:40 AM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; Brendan.Lemieux@aps.com
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Hey Brandon,

Any updates from Joe on the lead times for those panels?

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: McGary, Nicolas
Sent: Monday, June 27, 2022 8:58 AM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; Brendan.Lemieux@aps.com
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Brandon,

Could you have your vendors take a look at what we could do with using Manual Transfer Switches (MTS) with equivalent ratings to the ATS equipment? What would that look like in terms of lead times? We are trying to look at all options to get equipment in sooner. We would still need the ATS equipment, but we could consider using MTSs while waiting for the ATSs to arrive and be installed during a later outage.

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Thursday, June 23, 2022 1:12 PM
To: Brendan.Lemieux@aps.com; McGary, Nicolas <nmcgary@burnsmcd.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Per our call today, please see the attached and following from Joe. Please review and advise:

See attached drawing and cut sheets. This is an example of building the switchboards in Panelboard config with Siemens. I chose 400A mains on the 3 smaller panels. Customer can tell me what main size they want. Siemens was at 40 weeks on the P5 on the drawing so this would have to come from an OEM with stock which I am checking on. I have also included a ABB Reliagear datasheet for reference of another mfr.

I will let you know what I find in the market on swbds and these types of panels.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: Von Ruff, Brandon
Sent: Tuesday, June 21, 2022 1:07 PM
To: Brendan.Lemieux@aps.com; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Brendan,

That is what their lead time is right now. They wouldn't commit to improving it either. Simple panelboards from them are extremely long lead time as well.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: Brendan.Lemieux@aps.com [mailto:Brendan.Lemieux@aps.com]
Sent: Monday, June 20, 2022 3:43 PM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

Brandon -

Are these hard dates that you have or are any of these or is this 41 weeks as it is – which puts us at the end of March which isn't where we want to be.

thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Monday, June 20, 2022 1:56 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Brendan,

Still waiting on the quote for the ATS. Please see the following and attached for the Switchboards. Please confirm the drawings and summary below match what you are needing. The lead time they are quoting right now is 205 working days or about 41 weeks.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: Brendan.Lemieux@aps.com [mailto:Brendan.Lemieux@aps.com]
Sent: Monday, June 20, 2022 9:45 AM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

10-4 thank you – looking forward to receiving the pricing.

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Monday, June 20, 2022 8:43 AM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

I saw a quote on Friday, but it was incomplete it didn't have the ATS or a lead time for anything. I have asked them to update it to give me the lead time and the ATS pricing/lead time.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: Brendan.Lemieux@aps.com [mailto:Brendan.Lemieux@aps.com]
Sent: Monday, June 20, 2022 9:35 AM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>; nmcgary@burnsmcd.com
Cc: tschroeder@burnsmcd.com; brendan.lemieux@mwconsultllc.com; 129532@burnsmcd.com
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

Brandon –

Where are you at with this quote?

thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Tuesday, June 14, 2022 12:11 PM
To: McGary, Nicolas <nmcgary@burnsmcd.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Lemieux, Brendan <Brendan.Lemieux@aps.com>; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

I talked to him this morning and he still did not have anything back from Siemens or Eaton. He pinged them again.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Tuesday, June 14, 2022 1:08 PM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Good afternoon Brandon,

Have you had any luck with the ATS and switchboard vendors?

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Tuesday, June 7, 2022 1:04 PM
To: McGary, Nicolas <nmcgary@burnsmcd.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Still waiting on the vendors to come back with a quote. I asked for an update yesterday and haven't heard back. Will keep bugging them.

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Monday, June 6, 2022 1:07 PM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

Good morning Brandon,

Could you give us a status update on the switchboard and ATS quotes please?

Thanks, and have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: McGary, Nicolas
Sent: Tuesday, May 17, 2022 7:36 AM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Brandon,

Preference would be Eaton, but we are willing to look at other options depending on the lead times we get from Eaton.

Thanks,

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Sent: Monday, May 16, 2022 3:02 PM
To: McGary, Nicolas <nmcgary@burnsmcd.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: RE: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

Nick,

Is there a certain switchboard manufacture we should be using or just the best lead-time?

Thank you and best regards,

Brandon Von Ruff, PMP
Senior Project Manager
Direct: (713) 948.4902 **Cell:** (713) 584.5530

75 Years Of Innovation

From: McGary, Nicolas [mailto:nmcgary@burnsmcd.com]
Sent: Monday, May 16, 2022 3:08 PM
To: Von Ruff, Brandon <Brandon.VonRuff@powellind.com>
Cc: Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@aps.com; brendan.lemieux@mwconsultllc.com; 129532 <129532@burnsmcd.com>
Subject: FCC016494 F45 ELG Modifications - Powell PO # 100616045 WO # 246247 - Additional Equipment for Quote

EXTERNAL SENDER - BEWARE OF LINKS/ATTACHMENTS

Good morning Brandon,

Per our meeting last week, please reach out to your vendors and provide quotes and lead times for the following equipment:

- One (1) 480V, 800A, 3-phase, 3 wire, 42kAIC rated switchboard
  - See attached drawings 230689-2A, -2B for associated single lines
- One (1) 480V, 800A, 3-phase, 3 wire, 65kAIC rated switchboard
  - See attached drawing 230689-3 for associated single line
- One (1) 480V, 600A, 3-phase, 3 wire, 42kAIC rated fused automatic transfer switch
  - See attached drawing 230689-1 for associated single line
  - Note that the MCC shown on this drawing is the MCC in the PDC (already provided by y'all)
- One (1) 480V, 600A, 3-phase, 3 wire, 65kAIC rated fused automatic transfer switch
  - See attached drawing 230689-3 for associated single line
- One (1) 480V, 800A 3-phase, 3 wire, 42kAIC rated fused automatic transfer switch
  - See attached drawings 230689-2A, -2B for associated single lines

Note the following items common for all equipment:

- Rated for outdoor installation – NEMA 3R minimum
  - Please check on availability for NEMA 4/4X as well

Please let me know if you need any further information for these preliminary quotes.

Thank you!

Nick McGary, PE* \ Burns & McDonnell
Senior Electrical Engineer, Energy Division
O 720-826-9852 \ M 406-698-0214 \ F 303-721-0563
nmcgary@burnsmcd.com \ burnsmcd.com
9785 Maroon Circle \ Centennial, CO 80112

*Registered in CO

From: Tony Larkin
To: Lemieux, Brendan; Slupinski, Melinda
Subject: RE: Post Award Meeting
Date: Wednesday, August 31, 2022 10:25:22 AM
Attachments: image001.png
image002.png
ORDER-006-2833-007.xlsx
ORDER-005-1340-008.xlsx

Brendan,

As of today, the order shows on schedule to ship per the confirmation dates attached. As we get closer to the finish date of the cable, I should be able to get you a more accurate ETA.

Please let me know if there are any questions.

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Monday, August 29, 2022 2:27 PM
To: Tony Larkin <T.Larkin@okonite.com>; Melinda.Slupinski@aps.com
Subject: RE: Post Award Meeting
Importance: High

Tony

Do you have an updated Date for the shipment of the Electrical Cable to the site?

Thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Friday, April 22, 2022 10:59 AM
To: Slupinski, Melinda <Melinda.Slupinski@aps.com>; Lemieux, Brendan <Brendan.Lemieux@aps.com>
Subject: RE: Post Award Meeting

PO has been approved and released to plant, see signed copy attached. I will forward you our plant order acknowledgement when it's available.

Please let me know if there are any questions in the meantime.

Tony Larkin
District Manager
(925) 719-0015 cell

From: Melinda.Slupinski@aps.com <Melinda.Slupinski@aps.com>
Sent: Friday, April 22, 2022 8:21 AM
To: Brendan.Lemieux@aps.com; Tony Larkin <T.Larkin@okonite.com>
Subject: RE: Post Award Meeting

Hi,

See attached for revised Appendix A as well as the POCN indicated this updated document to this order.

Thank you,

MELINDA SLUPINSKI
Procurement Specialist II
Ext 81-3396 **Tel** 602 250 3396 **Cell** 480 734 1903
Melinda.Slupinski@aps.com **aps.com**

From: Lemieux, Brendan <Brendan.Lemieux@aps.com>
Sent: Friday, April 22, 2022 7:43 AM
To: Tony Larkin <T.Larkin@okonite.com>; Slupinski, Melinda <Melinda.Slupinski@aps.com>
Subject: RE: Post Award Meeting

Tony –

Melinda is working on this for your company – once you get it please review for signature.

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Friday, April 22, 2022 8:22 AM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; Slupinski, Melinda <Melinda.Slupinski@aps.com>
Subject: RE: Post Award Meeting

Brendan,

Just a follow up; have not received the revised Purchase Order yet. Once I get that, my HQ will be able to release the order for production.

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Wednesday, April 20, 2022 4:36 PM
To: Tony Larkin <T.Larkin@okonite.com>; Melinda.Slupinski@aps.com
Subject: RE: Post Award Meeting

10-4

We are working on this -

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Wednesday, April 20, 2022 2:19 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; Slupinski, Melinda <Melinda.Slupinski@aps.com>
Subject: RE: Post Award Meeting

Price is locked, just need the PO revised.

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Wednesday, April 20, 2022 1:18 PM
To: Tony Larkin <T.Larkin@okonite.com>; Melinda.Slupinski@aps.com
Subject: RE: Post Award Meeting

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Tony –

We will see what we can do on our end however I need your team to lock in the price and order the cable –

Melinda will work with you on this and Melinda let me know if this is something you need my assistance with.

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Wednesday, April 20, 2022 2:00 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; Slupinski, Melinda <Melinda.Slupinski@aps.com>
Subject: RE: Post Award Meeting
Importance: High

Brendan,

Attached is the revised firm quote along with our red-line exceptions to Master: Appendix A – Compensation portion of the PO. Okonite also requests a slight modification to the purchase agreement;

"We cannot accept "lot" pricing. Please have APS break out each item individually with the footage, unit cost, and total cost."

What my HQ would like to see would be something like this;

Item 1 – 63,000'	1/c 500 8kV	$16,103/m	$1,014,489
Item 2 – 21,000'	1/c 4/0 600v/1000V	$5,008/m	$105,168

Once we get the revised PO, we can get this entered and have plant confirm ship dates.

Please let me know if there are any questions.

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Tuesday, April 19, 2022 2:03 PM
To: Melinda.Slupinski@aps.com; Tony Larkin <T.Larkin@okonite.com>
Subject: RE: Post Award Meeting

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Tony –

Please purchase the metals to firm up the pricing and send over any possible change this would have caused –

Let me know if this works or if you have anything further from.

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Slupinski, Melinda <Melinda.Slupinski@aps.com>
Sent: Tuesday, April 19, 2022 2:35 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>; Tony Larkin <T.Larkin@okonite.com>
Subject: RE: Post Award Meeting

Yes, this was sent to Tony on the 8th and is pending his signature:

Tony, I hit the “reminder” in our system so hopefully that generates another email for you to reference. Signatures are executed through DocuSign. Let me know if you still do not receive it.

Thank you,

MELINDA SLUPINSKI
Procurement Specialist II
Ext 81-3396 **Tel** 602 250 3396 **Cell** 480 734 1903
Melinda.Slupinski@aps.com **aps.com**

From: Lemieux, Brendan <Brendan.Lemieux@aps.com>
Sent: Tuesday, April 19, 2022 1:22 PM
To: Tony Larkin <T.Larkin@okonite.com>; Slupinski, Melinda <Melinda.Slupinski@aps.com>
Subject: RE: Post Award Meeting
Importance: High

Melinda –

Can you send the PO 100618300 to Tony as he has not seen this purchase order as of yet and I thought he was the one to be copied on it –

Thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Tuesday, April 19, 2022 1:41 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>
Subject: RE: Post Award Meeting

We still have not received a PO for this one; who was sending it over and what e-mail address did it go to?

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Tuesday, April 19, 2022 12:27 PM
To: Tony Larkin <T.Larkin@okonite.com>
Subject: RE: Post Award Meeting

Just want to verify the purchase order you received and we are full go forward –

Thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Tony Larkin <T.Larkin@okonite.com>
Sent: Tuesday, April 19, 2022 1:10 PM
To: Lemieux, Brendan <Brendan.Lemieux@aps.com>
Subject: RE: Post Award Meeting

This e-mail is from an **EXTERNAL** address (T.Larkin@okonite.com). **DO NOT** click on links or open attachments unless you trust the sender and know the content is safe. If you suspect this message to be phishing, please report it to the APS Cyber Defense Center at *ACDC@aps.com*.

HI Brendan,

I am available tomorrow 8-11am or 2-3pm, and Thursday morning 8-11:30am. Please let me know what would work best for you.

Anything I need to prepare for the discussion?

Tony Larkin
District Manager
(925) 719-0015 cell

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Tuesday, April 19, 2022 8:59 AM
To: Tony Larkin <T.Larkin@okonite.com>
Subject: Post Award Meeting

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Tony –

Can you send me over some times that will work for the post contract award –

Thanks for your help

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Sorsher, Monica
To: Schroeder, Timothy; Huff, Samuel; Notarnicola, Shelley; Lemieux, Brendan; Ramirez, Samantha; Slupinski, Melinda
Cc: 129532; Ramirez, Gil; McGary, Nicolas; Diaz, Emmanuel G; Davis, Jonathan
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal
Date: Wednesday, August 24, 2022 11:18:32 AM
Attachments: image001.png
image002.png
image003.png
image004.png

Tim and Samuel,

We just received the below feedback from AUMA:

The proposed terminal connection is our standard cage clamp. They will need to open the terminal with a screw driver and insert the wire. The terminal will tighten down onto the wire utilizing a spring. We can certainly supply ring tongue terminals. However, we are having supply chain issues with these components now; therefore, delivery would be 52 weeks.

We can supply our screw type compression terminals. This would allow the customer to tighten a screw on each wire rather than rely on the spring from the cage clamp. This will not include the requested ring tongue terminals however. Please let me know how you would like to proceed.

We have not placed the PO with AUMA yet as our understanding was that we could proceed with AUMA if the comment from Electrical/I&C is acceptable, which was awaiting feedback from AUMA.

Please confirm we can proceed with the AUMA actuators based on the above response, with the details finalized during submittal review.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Schroeder, Timothy <tschroeder@burnsmcd.com>
Sent: Wednesday, August 24, 2022 4:07 AM
To: Sorsher, Monica <monica.sorsher@imi-critical.com>; Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

[External email]

Monica,

Can you confirm the order for the AUMA actuators has been placed? I think we can work out this detail during submittal review.

Timothy (Tim) Schroeder, PE \ Burns & McDonnell
Associate Mechanical Engineer
O 618-380-4915 \ M 314-602-6782 \ F 314-682-1600
tschroeder@burnsmcd.com\ burnsmcd.com
425 S. Woods Mill Road, Suite 300 \ Chesterfield, MO 63017

From: Sorsher, Monica <monica.sorsher@imi-critical.com>
Sent: Tuesday, August 23, 2022 7:16 PM

To: Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Samuel,

Just an update that we are still waiting on a response from AUMA on this question. I have also asked about the possibility of a conference call as we discussed if needed, but have not received any feedback yet.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Huff, Samuel <shuff@burnsmcd.com>
Sent: Friday, August 19, 2022 11:54 AM
To: Sorsher, Monica <monica.sorsher@imi-critical.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

[External email]

Monica,

Comment from Electrical/I&C is that they would want the ring/screw connectors for the wiring. The area where the valves will be located will have some vibration and the bare wire/screw terminals would be subject to this and have a risk of coming loose.

If this is acceptable to AUMA, please proceed forward with the actuators. We will review submittals once they come in.

Thanks,

Samuel A Huff, PE* \ Burns & McDonnell
Associate Mechanical Engineer
M 314-599-1480 \ F 314-682-1600
shuff@burnsmcd.com \ burnsmcd.com
425 South Woods Mill Rd, Suite 300 \ Chesterfield, MO 63017
*Registered in: MO, OH

From: Sorsher, Monica <monica.sorsher@imi-critical.com>
Sent: Wednesday, August 17, 2022 10:23 AM
To: Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary,

Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Samuel,

Please see AUMA's responses below.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Huff, Samuel <shuff@burnsmcd.com>
Sent: Monday, August 8, 2022 7:14 AM
To: Sorsher, Monica <monica.sorsher@imi-critical.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

[External email]

Monica,

Responses below.

- Is min temp acceptable? is this temp with internal heater on or off?
  - The actuator heater is on continuously. The specified temperature is the external ambient temperature.
    APS FOUR CORNERS design temp is -25degF to +105degF for outdoors. Actuator temps range is -22degF to +158degF, Accepted.
- VERIFY THAT MOTOR HEATER IS POWERED FROM CONTROL POWER TRANSFORMER
  - The standard actuator heater is internally powered. The current motor heater is 120V, per spec requirement, and the power will need to be supplied externally. We can modify the motor heater to 460V and have it internally powered. Please advise if we are to make this revision.
    Modify for 460V connection to heater.
    Noted and modified to 460V.
- WHAT DOES THIS MEAN? WHAT IS AM/SEM/AC?
  - This is the standard electrical connection/ plug & socket used to connect the actuator, SA, to local controls AC.
    Acceptable.
- Verify that actuator is shipped with Bluetooth OFF, disabled.
  - The current product is configured to ship with Bluetooth on. This is a programmable selection. We can modify the product to ship with Bluetooth disabled if desired. Please advise desired option.
    Please ship with Bluetooth off/Disabled.
    Noted and modified to disabled Bluetooth.
- HOW ARE ELECTRICAL CONNECTIONS MADE? SOCKET, OR SCREW TERMINAL CONNECTION?
  - The proposed product includes our standard plug and socket connections not screw terminals.
    Confirm that field connections to DCS, as well as power connections for the 480V motor leads will not require a special plug or socket connection. If so, this is acceptable.
    No special tools are required to wire to the plug and socket, simply put the cable in and tighten the screw. Please see attached picture for details.
- Officially submit all these drawings
  - To receive an official submittal package we will need to formally proceed with order from AUMA.
    Acceptable.

Thanks,

Samuel A Huff, PE* \ Burns & McDonnell
Associate Mechanical Engineer
M 314-599-1480 \ **F** 314-682-1600
shuff@burnsmcd.com \ burnsmcd.com
425 South Woods Mill Rd, Suite 300 \ Chesterfield, MO 63017
*Registered in: MO, OH

From: Sorsher, Monica <monica.sorsher@imi-critical.com>
Sent: Monday, August 1, 2022 1:08 PM
To: Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Samuel,

AUMA provided the following responses to the comments in the attached datasheet:

- Is min temp acceptable? is this temp with internal heater on or off?
  - The actuator heater is on continuously. The specified temperature is the external ambient temperature.
- VERIFY THAT MOTOR HEATER IS POWERED FROM CONTROL POWER TRANSFORMER
  - The standard actuator heater is internally powered. The current motor heater is 120V, per spec requirement, and the power will need to be supplied externally. We can modify the motor heater to 460V and have it internally powered. Please advise if we are to make this revision.
- WHAT DOES THIS MEAN? WHAT IS AM/SEM/AC?
  - This is the standard electrical connection/ plug & socket used to connect the actuator, SA, to local controls AC.
- Verify that actuator is shipped with Bluetooth OFF, disabled.
  - The current product is configured to ship with Bluetooth on. This is a programmable selection. We can modify the product to ship with Bluetooth disabled if desired. Please advise desired option.
- HOW ARE ELECTRICAL CONNECTIONS MADE? SOCKET, OR SCREW TERMINAL CONNECTION?
  - The proposed product includes our standard plug and socket connections not screw terminals.
- Officially submit all these drawings
  - To receive an official submittal package we will need to formally proceed with order from AUMA.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Sorsher, Monica
Sent: Tuesday, July 26, 2022 3:46 PM
To: Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Samuel,

Received thank you. These questions are with AUMA and we will provide an update as soon as we receive a response.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Huff, Samuel <shuff@burnsmcd.com>
Sent: Monday, July 25, 2022 4:18 PM
To: Sorsher, Monica <monica.sorsher@imi-critical.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; McGary, Nicolas <nmcgary@burnsmcd.com>; Diaz, Emmanuel G <egdiaz@burnsmcd.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

[External email]

Monica,

Attached are the comments to the AUMA actuators. Please let us know if there are any questions.

Thanks,

Samuel A Huff, PE* \ Burns & McDonnell
Associate Mechanical Engineer
M 314-599-1480 \ **F** 314-682-1600
shuff@burnsmcd.com \ burnsmcd.com
425 South Woods Mill Rd, Suite 300 \ Chesterfield, MO 63017
*Registered in: MO, OH

From: Sorsher, Monica <monica.sorsher@imi-critical.com>
Sent: Monday, July 18, 2022 10:43 AM
To: Huff, Samuel <shuff@burnsmcd.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Samuel,

See attached marked up revision to tag which actuator is intended for each valve.

Best Regards,

Monica Sorsher (Reinwald)
Sr. Project Manager
IMI CCI

Tel: +1 949 835 8361
Mobile: +1 949 434 3723
Email: monica.sorsher@imi-critical.com
www.imi-critical.com

From: Huff, Samuel <shuff@burnsmcd.com>
Sent: Friday, July 15, 2022 3:15 PM
To: Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; Sorsher, Monica <monica.sorsher@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

[External email]

Shelley/Monica,

Please get these tagged for us, even if just a bluebeam title on the cover pages, on Monday. Our I&C and Electrical engineers are very overbooked at the moment and I have a few hours of their time on Monday to look at these.

Thanks,

Samuel A Huff, PE* \ Burns & McDonnell
Associate Mechanical Engineer
M 314-599-1480 \ **F** 314-682-1600
shuff@burnsmcd.com \ burnsmcd.com
425 South Woods Mill Rd, Suite 300 \ Chesterfield, MO 63017
*Registered in: MO, OH

From: Huff, Samuel
Sent: Thursday, July 14, 2022 8:32 AM
To: Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; Sorsher, Monica <monica.sorsher@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Shelley,

Can you tag which actuator is intended for which valve? I don't see a nomenclature on there to say which goes with which.

Thanks,

Samuel A Huff, PE* \ Burns & McDonnell
Associate Mechanical Engineer
M 314-599-1480 \ **F** 314-682-1600
shuff@burnsmcd.com \ burnsmcd.com
425 South Woods Mill Rd, Suite 300 \ Chesterfield, MO 63017
*Registered in: MO, OH

From: Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>
Sent: Wednesday, July 13, 2022 4:56 PM
To: Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Huff, Samuel <shuff@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; Sorsher, Monica <monica.sorsher@imi-critical.com>
Subject: RE: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Brendan, Samuel,

Attached are the Auma Datasheets per our discussion.

Can you please review and confirm that they are in line with what you need?

Regards,

Shelley Notarnicola
Senior Upgrades Inside Sales Engineer
IMI CCI

Tel: +1 949 835 8176
Email: shelley.notarnicola@imi-critical.com
www.imi-critical.com

From: Vijayakumar, Dinesh <dinesh.vijayakumar@imi-critical.com>
Sent: Wednesday, July 13, 2022 1:16 AM
To: Brendan.lemieux@aps.com; Samantha.ramirez@aps.com; Melinda.slupinski@aps.com
Cc: 129532 <129532@burnsmcd.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Huff, Samuel <shuff@burnsmcd.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>; Sorsher, Monica <monica.sorsher@imi-critical.com>; Ortega, Alexandria <alexandria.ortega@imi-critical.com>; Madheswaran, Manoj <manoj.madheswaran@imi-critical.com>; Punnyiakotti, Dhanasekar <dhanasekar.punniyakotti@imi-critical.com>; CCIAmericasDocPortal <cciamericasdocportal@imi-critical.com>
Subject: (IMI_TRANSMIT_A79533US_04), ARIZONA PUBLIC SERVICE COMPANY - Four Corners, PO# 100618499, Level Control Valve - Document Submittal

Doc-Control,

Please find the attached transmittal of the following documents for the subject project.

No.	*IMI CCI Document Name*	*Customer Document No*	*Rev*
1	A79533US-ITP	G-6	1
2	A79533US-STORAGE AND HANDLING PROCEDURES	G-11	1

Project Details	
CUSTOMER	ARIZONA PUBLIC SERVICE COMPANY
PROJECT	Four Corners
PO NO	100618499
CCI REF #	A79533US

Transmittal Status – For Your Review and Approval

Request Your Approvals Before – 27-Jul-2022

Notes:

1. This transmittal is issued so that our customer gets an opportunity to verify that the valves sizes, connection types, materials of fabrication, pressure classes, and actuators are all in accordance with their PO requirements.
2. Our approval/comments returns procedure is changed and henceforth request you to send the returns (both approvals and comments) to "CCIAmericasDocPortal@ccivalve.com" **instead** of sending it to my email address.

Kindly add CCIAmericasDocPortal@ccivalve.com [Document Control] to your mailing list for return transmittals pertaining to comments and approvals. This ID will dispatch a copy to all Documentation people in CCI who are engaged in this project.

Thank you.

Dinesh Kumar V
Lead - Document Controller
IMI CCI

Tel: +91 044 40155020
Mobile: +91 9840546496
Email: dinesh.vijayakumar@imi-critical.com
www.imi-critical.com

IMI Critical Engineering, Control Component India Pvt Ltd, KRM Plaza, First Floor, South Tower, No.2, Harrington Road,Chetpet, Chennai – 600 031, India.

Registered number: U51909KA2006FTC040140
Registered office: Control Component India Pvt. Ltd., Ground, 1st & 2nd Floor, Tower 4, SJR i park, Plot # 13 14&15, EPIP Zone Phase 1, Whitefield Road, Bangalore 560066

From: Notarnicola, Shelley
To: Slupinski, Melinda
Cc: Lemieux, Brendan; Ramirez, Gil; Davis, Jonathan; Jared Harris; Sorsher, Monica; Blew, Mona; Lunine, Jessica
Subject: RE: APS PO 100618499 - IMI CCI Proposal 220127-014211-1 Bottom Ash Valves
Date: Tuesday, May 10, 2022 2:26:18 PM
Attachments: image001.png
image003.png
image004.png
image005.png
image006.jpg
100618499_042522 APS Four Corners.pdf
IMI CCI Proposal 220127-014211-1_Boiler Bottom Ash Valves_Rev 3.pdf

Hi Melinda,

A few slight edits on the wording below.

In view of the Ukraine-crisis (the "Crisis") and the SARS- CoV-2 pandemic (the "Pandemic"), Customer acknowledges that the Supplier may adjust and change the delivery date or performance date of the service even after acceptance of the Contract due to circumstances in connection with the Crisis or the Pandemic, including but not limited to governmental acts or decrees, quarantine restrictions, disruption of procurement or transportation channels. In such case, Supplier shall not be liable for delay or any liquidated damages, provided however that the Supplier shall use its best efforts to minimize any impact thereof in close mutual coordination with the Customer.

Amid unprecedented challenges with the cost and availability of raw materials, IMI CCI reserves the right to apply a material surcharge to any items in this proposal in the event raw material costs increase 3% or higher based on the London Metal Exchange (LME) index from the date of the last proposal to the purchase of raw materials. In the event a significant delay or price increase of raw material occurs during the performance of the contract through no fault of IMI CCI, then (a) either Party ~~APS~~ may terminate the Order, or (b) the Contract price, time of completion or contract requirements may be equitably adjusted by a Change Order in accordance with the procedures of the Contract documents.

Also, on the conference call today, Brendan Lemieux confirmed that APS will be handling shipping so the shipping costs need to be subtracted from the PO. IMI CCI Ready-In-Box date will be 1 March 2023, with every effort to improve.

The PO amount of $219,796 includes shipping costs estimated by IMI CCI. **The amount without shipping costs is $178,814.**

Regards,

Shelley Notarnicola
Senior Upgrades Inside Sales Engineer
IMI CCI

Tel: +1 949 835 8176
Email: shelley.notarnicola@imi-critical.com
www.imi-critical.com

From: Melinda.Slupinski@aps.com <Melinda.Slupinski@aps.com>
Sent: Friday, May 6, 2022 1:49 PM
To: Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>
Cc: Brendan.Lemieux@aps.com; Ramirez, Gil <gil.ramirez@imi-critical.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>; Jared Harris <jared@instandcontrols.com>
Subject: RE: APS PO 100618499 - IMI CCI Proposal 220127-014211-1 Bottom Ash Valves

[External email]

Hi Shelley,

Our Legal reviewed your proposed language and we can accept with the following revisions. Please confirm if you are in agreement and then I can

add it as a clause to the Purchase Order:

In view of the Ukraine-crisis (the "Crisis") and the SARS- CoV-2 pandemic (the "Pandemic"), Customer acknowledges that the Supplier may adjust and change the delivery date or performance date of the service even after acceptance of the Contract due to circumstances in connection with the Crisis or the Pandemic, including but not limited to governmental acts or decrees, quarantine restrictions, disruption of procurement or transportation channels. In such case, Supplier shall not be liable for delay or any liquidated damages, provided however that the Supplier shall use its best efforts to minimize any impact thereof in close mutual coordination with the Customer.

Amid unprecedented challenges with the cost and availability of raw materials, IMI CCI reserves the right to apply a material surcharge to any items in this proposal in the event raw material costs increase 3% or higher based on the London Metal Exchange (LME) index. In the event a significant delay or price increase of raw material occurs during the performance of the contract through no fault of IMI CCI, APS may terminate the Order or the Contract price, time of completion or contract requirements ~~shall~~ may be equitably adjusted by a Change Order in accordance with the procedures of the Contract documents.

Thank you,

MELINDA SLUPINSKI
Procurement Specialist II
Ext 81-3396 **Tel** 602 250 3396 **Cell** 480 734 1903
Melinda.Slupinski@aps.com **aps.com**

From: Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>
Sent: Friday, April 29, 2022 9:29 AM
To: Slupinski, Melinda <Melinda.Slupinski@aps.com>
Cc: Lemieux, Brendan <Brendan.Lemieux@aps.com>; Ramirez, Gil <gil.ramirez@imi-critical.com>; Davis, Jonathan <jonathan.davis@imi-critical.com>; Jared Harris <jared@instandcontrols.com>
Subject: RE: APS PO 100618499 - IMI CCI Proposal 220127-014211-1 Bottom Ash Valves

Melinda,

Thank you for the attached Purchase Order! Please confirm that per the PO we will be processing the order per FCA IMI CCI Factory South Korea incoterms with a ready-in-box date of March 1, 2023 (44 weeks from PO date). A member of our Project Management team will be formally acknowledging the PO shortly.

Due to market instability at this time, we request to add the following clauses to the purchase order that were part of our proposal:

In view of the Ukraine-crisis (the "Crisis") and the SARS- CoV-2 pandemic (the "Pandemic"), Customer acknowledges that the Supplier may adjust and change the delivery date or performance date of the service even after acceptance of the Contract due to circumstances in connection with the Crisis or the Pandemic, including but not limited to governmental acts or decrees, quarantine restrictions, disruption of procurement or transportation channels. In such case, Supplier shall not be liable for delay or any liquidated damages, provided however that the Supplier shall use its best efforts to minimize any impact thereof in close mutual coordination with the Customer.

Amid unprecedented challenges with the cost and availability of raw materials, IMI CCI reserves the right to apply a material surcharge to any items in this proposal in the event raw material costs increase 3% or higher based on the London Metal Exchange (LME) index. In the event a significant delay or price increase of raw material occurs during the performance of the contract through no fault of IMI CCI, the Contract price, time of completion or contract requirements shall be equitably adjusted by a Change Order in accordance with the procedures of the Contract documents.

Please note that Appendix C has a date that is in the past. We assume that this is an on-site date. IMI CCI will follow the purchase order.

Also, the email addresses for IMI CCI sales personnel are incorrect.

Please use Gil.Ramirez@imi-critical.com ph 949-285-6762 and shelley.notarnicola@imi-critical.com ph 949-835-8176

Please confirm that APS will be handling transit from our factory in South Korea to the Four Corners site. The PO includes shipping instructions, but the PO amount of $219,796 includes shipping costs. The amount without shipping costs is $178,814.

Regards,

Shelley Notarnicola
Senior Upgrades Inside Sales Engineer
IMI CCI

Tel: +1 949 835 8176
Email: shelley.notarnicola@imi-critical.com
www.imi-critical.com

From: Nayak, Sandeep <sandeep.nayak@imi-critical.com>
Sent: Wednesday, April 27, 2022 10:19 AM
To: Ramirez, Gil <gil.ramirez@imi-critical.com>; Notarnicola, Shelley <shelley.notarnicola@imi-critical.com>
Cc: Davis, Jonathan <jonathan.davis@imi-critical.com>; Kathavi, Priyavrath <priyavrath.kathavi@imi-critical.com>
Subject: Fwd: APS PO 100618499

Gil, Shelley,

Looks like this is the PO for Four Corners Ashdown valve for around $200K. You may see this from Jared as well.

Congratulations and good work!

Sandeep Nayak
Sales Manager- Aftermarket Sales & Service|Western USA
IMI CCI

Mobile: +1 949 212 8325
Email: sandeep.nayak@imi-critical.com
www.imi-critical.com

From: Jared Harris <jared@instandcontrols.com>
Sent: Wednesday, April 27, 2022 10:14:57 AM
To: Nayak, Sandeep <sandeep.nayak@imi-critical.com>
Subject: FW: APS PO 100618499

[External email]

FYI

Kind Regards,

Jared Harris

New Mexico Territory Manager
6411 Castle Rock Ct
Farmington, NM 87402

Main Cell: 505-220-3830
Alternate: 505-258-2025
Office : 888-715-6203
Email: jared@instandcontrols.com

LinkedIn Profile: https://www.linkedin.com/jaredmharris/

- Instrumentation Measurement & Control
- Filtration
- Valves, Actuators, Piping, Fittings, Fans & Material Handling
- Communications
- Services

From: Melinda.Slupinski@aps.com <Melinda.Slupinski@aps.com>
Sent: Wednesday, April 27, 2022 11:04 AM
To: Jared Harris <jared@instandcontrols.com>
Cc: Brendan.Lemieux@aps.com
Subject: FW: APS PO 100618499

Hi Jared,

Please see attached for PO 100618499. My apologies for not including you on the original email.

Thank you,

MELINDA SLUPINSKI
Procurement Specialist II
Ext 81-3396 **Tel** 602 250 3396 **Cell** 480 734 1903
Melinda.Slupinski@aps.com **aps.com**

From: Slupinski, Melinda
Sent: Monday, April 25, 2022 4:06 PM
To: shelly.notarnicola@imi-critical.com; gil.ramirez@imi.critical.com
Cc: Lemieux, Brendan <Brendan.Lemieux@aps.com>
Subject: APS PO 100618499

Hello,

Please confirm receipt of attached PO # **100618499**. Please sign under the supplier block section located on the last page & return to me.

Please email the invoice(s) to: Payables@aps.com to expedite processing and avoid delays by the USPS. When submitting invoices, please be sure to include PO # **100618499** and supporting documents as necessary.

Thank you!!

MELINDA SLUPINSKI
Procurement Specialist II
480 734 1903
Melinda.Slupinski@aps.com **aps.com**

From: Preston Pierce
To: Brown, Mason A
Cc: 129532; TSchroeder@burnsmcd.com; Lemieux, Brendan; Projects
Subject: APS Four Corners - VTP Motors
Date: Wednesday, July 20, 2022 1:27:11 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.png
Pump-Installation_4ef206db-7e78-4638-a8fc-69d8b944bb86.png

Good afternoon Mason, current ship date for these motors is 9/27. Thank you,

Preston Pierce
Projects

Phoenix Pumps, Inc.
www.phoenixpumps.com
E: ppierce@phoenixpumps.com | D: 602-491-0959 | O: 602-232-2994

» Customer Satisfaction Survey

From: Brown, Mason A <mabrown@burnsmcd.com>
Sent: Friday, July 15, 2022 6:14 AM
To: Preston Pierce <ppierce@phoenixpumps.com>
Cc: 129532 <129532@burnsmcd.com>
Subject: VTP Motors

Preston,

Can we get an update from Nidec on the motors for the VTPs? When will they be ready/shipped?

Thanks,

Mason Brown, PE \ Burns & McDonnell
Staff Mechanical Engineer \ Energy Group
O 314-501-1452 \ **M** 901-827-8873 \ **F** 314-682-1600
mabrown@burnsmcd.com \ burnsmcd.com
425 S. Wood Mills Rd, Ste 300 \ Chesterfield, MO 63017

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From: Fred Panczer
To: Lemieux, Brendan
Cc: Tommy.borobia@mwconsultllc.com
Subject: RE: ELG - Graybar MCC Delivery
Date: Monday, September 26, 2022 10:01:30 AM
Attachments: 09262022_ELG PLANT MODS_STATUS.xlsx

Brendan,
Here is the latest shop schedule. It has both orders listed on status. Square D is telling me that they are not expediting any orders currently. I am going to get someone from Square D on our next call.
Thank you

From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Thursday, September 22, 2022 2:40 PM
To: Fred Panczer <Fredrick.Panczer@graybar.com>
Cc: Tommy.borobia@mwconsultllc.com
Subject: RE: ELG - Graybar MCC Delivery

Fred –

I wanted to make sure that I copied Tommy for our records –

Thanks for your help

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Lemieux, Brendan
Sent: Thursday, September 22, 2022 8:06 AM
To: 'Fred Panczer' <Fredrick.Panczer@graybar.com>
Subject: RE: ELG - Graybar MCC Delivery

Fed –

Is there anything that we can do on our side of the table to get the MCC moved up in the line – also do you have a date of what the second set of MCC's look like now that we have two of them –

thanks

Brendan Lemieux
Brendan.lemieux@aps.com
480-688-0252

From: Fred Panczer <Fredrick.Panczer@graybar.com>
Sent: Thursday, September 22, 2022 5:37 AM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Lemieux, Brendan <Brendan.Lemieux@aps.com>; Bushman, Daniel <Daniel.Bushman@aps.com>; Yazzie, Rachael G <Rachael.Yazzie@aps.com>; Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux <Brendan.Lemieux@mwconsultllc.com>; Tommy.borobia@mwconsultllc.com; Heidi Crowell <heidi.crowell@graybar.com>
Cc: Angela Salinas <Angela.Salinas@graybar.com>
Subject: RE: ELG - Graybar MCC Delivery

Team,
The attached is the response I received from Square D on trying to expedite the MCC's. I will try to get Square D to join our next conference call.
Thank you

From: McGary, Nicolas <nmcgary@burnsmcd.com>
Sent: Thursday, September 15, 2022 11:13 AM
To: Brendan.Lemieux@aps.com; Daniel.Bushman@aps.com; Rachael.Yazzie@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Brendan.Lemieux@mwconsultllc.com; Tommy.borobia@mwconsultllc.com; Heidi Crowell <heidi.crowell@graybar.com>; Fred Panczer <Fredrick.Panczer@graybar.com>
Subject: RE: ELG - Graybar MCC Delivery

All,

Please see the attached minutes from our meeting. Let me know if you have any questions or comments. Thanks.

Have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

-----Original Appointment-----
From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Tuesday, September 13, 2022 10:55 AM
To: Brendan.Lemieux@aps.com; Daniel.Bushman@aps.com; Rachael.Yazzie@aps.com; Schroeder, Timothy; McGary, Nicolas; Brendan.Lemieux@mwconsultllc.com; Tommy.borobia@mwconsultllc.com; heidi.crowell@graybar.com; Fredrick.Panczer@graybar.com
Subject: ELG - Graybar MCC Delivery
When: Thursday, September 15, 2022 11:00 AM-11:30 AM (UTC-07:00) Mountain Time (US & Canada).
Where: Microsoft Teams Meeting

Meeting with Graybar for reviewing the MCC schedule for delivery –

As well as the spare MCC –

thanks

Microsoft Teams meeting

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Video Conference ID: 115 008 720 4
Alternate VTC instructions

Or call in (audio only)
+1 602-607-1180,,591775946# United States, Phoenix
Phone Conference ID: 591 775 946#
Find a local number | Reset PIN

For best experience, use the Teams mobile app or computer audio instead of dial-in. Limit use of call-me feature to save company money.

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we accept no liability for any loss or damage arising from the use of this e-mail or attachments, or for any delay or errors or omissions in the contents which result from e-mail transmission.

From: Fred Panczer
To: McGary, Nicolas; Lemieux, Brendan; Schroeder, Timothy; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux
Cc: 129532
Subject: RE: MCC - ATS - Graybar
Date: Wednesday, August 17, 2022 12:12:55 PM
Attachments: APS ELG PLANT MODS O-3529247-PD-001_Full Submittal Package_.pdf

All,
Please review the attached submittals for the MCC's without the power meters. The lead time for these units without the meters is 16 weeks. The power meters were pushing the lead times out to the 34 weeks. We can quote them separately and have Square D field services install them on site later. I am waiting on the ASCO submittals. I will forward them as soon as I receive them.
Thank you

From: McGary, Nicolas <nmcgary@burnsmcd.com>
Sent: Wednesday, August 17, 2022 12:51 PM
To: Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com; Fred Panczer <Fredrick.Panczer@graybar.com>
Cc: 129532 <129532@burnsmcd.com>
Subject: RE: MCC - ATS - Graybar

All,

Please see the attached minutes document from this morning's Kickoff Meeting. Let me know if you have any questions or comments. Thanks.

Have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

-----Original Appointment-----
From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Monday, August 15, 2022 10:46 AM
To: Brendan.Lemieux@aps.com; McGary, Nicolas; Schroeder, Timothy; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com; Fredrick.Panczer@graybar.com
Subject: MCC - ATS - Graybar
When: Wednesday, August 17, 2022 10:30 AM-11:00 AM (UTC-07:00) Mountain Time (US & Canada).
Where: Microsoft Teams Meeting

Fred –

Wanted to schedule a all with you over the two purchase orders you received from APS –

MCC and ATS -

Microsoft Teams meeting

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Meeting ID: 264 100 524 758
Passcode: hLZLwy
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Phone Conference ID: 627 222 933#

Find a local number | Reset PIN

For best experience, use the Teams mobile app or computer audio instead of dial-in. Limit use of call-me feature to save company money.

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From: Fred Panczer
To: McGary, Nicolas; Lemieux, Brendan; Schroeder, Timothy; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux
Cc: 129532; Angela Salinas
Subject: RE: MCC - ATS - Graybar
Date: Wednesday, August 24, 2022 5:04:58 AM
Attachments: APS BACK-UP MCC"S.pdf

Nick,
Here is the quote of for the second set of MCC's. The lead time is now 27 weeks.
Thank you

From: McGary, Nicolas <nmcgary@burnsmcd.com>
Sent: Tuesday, August 23, 2022 3:18 PM
To: Fred Panczer <Fredrick.Panczer@graybar.com>; Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com
Cc: 129532 <129532@burnsmcd.com>; Angela Salinas <Angela.Salinas@graybar.com>
Subject: RE: MCC - ATS - Graybar

Fred,

Can you provide a quote and timeline for a second set of MCCs, please? We are considering purchasing a redundant set. MCCs would be identical to the ones we just approved.

Please let us know if you have any questions.

Thanks, and have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Fred Panczer <Fredrick.Panczer@graybar.com>
Sent: Monday, August 22, 2022 10:34 AM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com
Cc: 129532 <129532@burnsmcd.com>; Angela Salinas <Angela.Salinas@graybar.com>
Subject: RE: MCC - ATS - Graybar

All,
Please see the revised submittals for the MCC's.
Thank you

From: McGary, Nicolas <nmcgary@burnsmcd.com>
Sent: Monday, August 22, 2022 8:18 AM
To: Fred Panczer <Fredrick.Panczer@graybar.com>; Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com
Cc: 129532 <129532@burnsmcd.com>; Angela Salinas <Angela.Salinas@graybar.com>
Subject: RE: MCC - ATS - Graybar

Fred,

Please see the attached. The ATS submittal is approved. Per the meeting last week, please confirm the expected delivery date for the ATS equipment.

Please resubmit the MCC package with the changes noted (and discussed this morning).

Let me know if you have any further questions. Thanks again. Have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

From: Fred Panczer <Fredrick.Panczer@graybar.com>
Sent: Thursday, August 18, 2022 7:35 AM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com
Cc: 129532 <129532@burnsmcd.com>; Angela Salinas <Angela.Salinas@graybar.com>
Subject: RE: MCC - ATS - Graybar

Team,
Please see the attached ASCO submittals.
Thank you

From: Fred Panczer
Sent: Wednesday, August 17, 2022 1:06 PM
To: McGary, Nicolas <nmcgary@burnsmcd.com>; Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com
Cc: 129532 <129532@burnsmcd.com>
Subject: RE: MCC - ATS - Graybar

All,
Please review the attached submittals for the MCC's without the power meters. The lead time for these units without the meters is 16 weeks. The power meters were pushing the lead times out to the 34 weeks. We can quote them separately and have Square D field services install them on site later. I am waiting on the ASCO submittals. I will forward them as soon as I receive them.
Thank you

From: McGary, Nicolas <nmcgary@burnsmcd.com>
Sent: Wednesday, August 17, 2022 12:51 PM
To: Brendan.Lemieux@aps.com; Schroeder, Timothy <tschroeder@burnsmcd.com>; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com; Fred Panczer <Fredrick.Panczer@graybar.com>
Cc: 129532 <129532@burnsmcd.com>
Subject: RE: MCC - ATS - Graybar

All,

Please see the attached minutes document from this morning's Kickoff Meeting. Let me know if you have any questions or comments. Thanks.

Have a great day!

Nick McGary, PE*
Burns & McDonnell, Denver, Energy Division
Denver Office 720-826-9852
Cell 406-698-0214

*Registered in CO

-----Original Appointment-----
From: Brendan.Lemieux@aps.com <Brendan.Lemieux@aps.com>
Sent: Monday, August 15, 2022 10:46 AM
To: Brendan.Lemieux@aps.com; McGary, Nicolas; Schroeder, Timothy; Tommy.borobia@mwconsultllc.com; Brendan.Lemieux@mwconsultllc.com; Fredrick.Panczer@graybar.com
Subject: MCC - ATS - Graybar
When: Wednesday, August 17, 2022 10:30 AM-11:00 AM (UTC-07:00) Mountain Time (US & Canada).
Where: Microsoft Teams Meeting

Fred –

Wanted to schedule a all with you over the two purchase orders you received from APS –

MCC and ATS -

Microsoft Teams meeting

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Meeting ID: 264 100 524 758
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From:	John B. Rodin
To:	Lemieux, Brendan; James Clauss; Carl Litzler; Diaz, Emmanuel G
Cc:	lawrence.hunt@mwconsultllc.com; Kevin S. Mcmanigle; tschroeder@burnsmcd.com; Stewart, Terry; Patrick Morgan; Wiltbank, Devlin; John Papini; Tommy Borobia
Subject:	U324: APS 4C F45 ELG Modifications Project Review Meeting Minutes 081122 (DOC1009129)
Date:	Thursday, August 11, 2022 12:23:32 PM
Attachments:	image001.png U324 Project Review Meeting Minutes 081122.docx

All,

Please see attached meeting minutes from today, actions in red and updates highlighted in yellow.

Best Regards,
John

John B. Rodin
Senior Project Manager, Energy Industries

ABB Inc.
23000 Harvard Road
Cleveland, Ohio 44122 USA
Phone: +1 440 585 5394
Mobile: +1 440 336 5746
abb.com

-----Original Appointment-----
From: John B. Rodin
Sent: Wednesday, June 22, 2022 4:30 PM
To: John B. Rodin; Brendan.Lemieux@aps.com; James Clauss; Carl Litzler; Diaz, Emmanuel G
Cc: lawrence.hunt@mwconsultllc.com; Kevin S. Mcmanigle; tschroeder@burnsmcd.com; terry.stewart@aps.com; Patrick Morgan; Devlin.Wiltbank@aps.com; John Papini; Tommy Borobia
Subject: U324: APS 4C F45 ELG Modifications Project Review Meeting (DOC1009129)
When: Thursday, August 11, 2022 2:00 PM-2:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

All,

Please advise if you are available for this reoccurring meeting for subject project, please forward as needed, if we need to adjust the schedule just let me know.

Topics to include:

1. Project Status Review
2. Action items review
3. Schedule Review
4. Any issues or concerns

Feel free to contact me outside of this meeting as needed.

Best Regards,
John

John B. Rodin
Senior Project Manager, Energy Industries

ABB Inc.
23000 Harvard Road
Cleveland, Ohio 44122 USA
Phone: +1 440 585 5394
Mobile: +1 440 336 5746
abb.com

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ATTACHMENT B
DRAFT INITIAL CERTIFICATION

Initial Certification Statement Supporting the Discharge of Bottom Ash Transport Water

Arizona Public Service Company

Four Corners Generating Station
NPDES Permit No. NN0000019

Project No. 129532 / FCC016494

Revision 0
May 2022

Initial Certification Statement Supporting the Discharge of Bottom Ash Transport Water

Prepared for

Arizona Public Service Company
Four Corners Generating Station
NPDES Permit No. NN0000019

Project No. 129532 / FCC016494
Fruitland, NM

Revision 0
May 2022

Prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Arizona Public Service Company
Initial Certification Statement
Supporting the Discharge of
Bottom Ash Transport Water

Report Index

Certification

I hereby certify, as a Professional Engineer in the State of New Mexico, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by Arizona Public Service Company or others without specific verification or adaptation by the Engineer. I hereby certify that this initial certification was prepared for the Arizona Public Service Company's Four Corners Generating Station in accordance with standard engineering practices and based on my knowledge, information, and belief, the content of this Certification when developed in May 2022 is true and meets the requirements of 40 CFR § 423.19(c). I hereby certify that I am familiar with the ELG regulation requirements and Arizona Public Service Company's Four Corners Generating Station.

May 16 2022 9:22 AM

Hansen, Bryan

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Date: May 16, 2022

Owner's Certification of Compliance - 40 CFR 122.22

Pursuant to 40 CFR 122.22, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

On behalf of Arizona Public Service Company:

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(Printed Name

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
APS	Arizona Public Service Company
BA	Bottom Ash
BASWR	Bottom Ash Sluice Water Recycling
BAT	Best Available Technology Economically Achievable
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	U.S. Environmental Protection Agency
FGD	Flue Gas Desulfurization
Four Corners	Four Corners Generating Station
gpm	gallons per minute
L-SI	Larson-Skold Index
LSI	Langelier Scaling Index
MW	Megawatt
NPDES	National Pollutant Discharge Elimination System
PSI	Puckorius Scaling Index
RSI	Ryznar Scaling Index
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

1.0 INTRODUCTION

On November 3, 2015, the U.S. Environmental Protection Agency EPA issued the federal Steam Electric Power Generating Effluent Limit Guidelines and Standards (ELGs); see 80 FR 67838. The 2015 rule addressed discharges from flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash (BA transport water, flue gas mercury control wastewater, gasification wastewater, combustion residual leachate, and non-chemical metal cleaning wastes.

The 2015 rule was reconsidered by EPA, with updates finalized on October 13, 2020 (see 85 FR 64650), and effective as of December 14, 2020. The final rule revises limitations and standards for two of the waste streams addressed in the 2015 rule: BA transport water and FGD wastewater. For BA transport water, the final rule establishes Best Available Technology Economically Achievable (BAT) as a high recycle rate system with a site-specific volumetric purge (defined in the final rule as BA purge water) which cannot exceed a 30-day rolling average of 10 percent of the BA transport water system's primary active wetted volume. The purge volume and associated effluent limitations are to be established by the permitting authority. EPA selected a 95th percentile of total system volume as representative of a 30-day rolling average, which results in a limitation of 10 percent of total system volume and requires the National Pollutant Discharge Elimination System NPDES permitting authority to develop a site-specific purge percentage that is capped at 10 percent. EPA recognizes that some plants may need to improve their equipment, process controls, and/or operations to consistently meet the limitations included in this final rule; however, this is consistent with the Clean Water Act, which requires that BAT discharge limitations and standards reflect the best available technology economically achievable.

This document serves as the Initial Certification Statement required by 40 CFR § 423.19(c)(1). On behalf of Arizona Public Service Company (APS), this initial certification seeks to discharge BA transport water pursuant to 40 Code of Federal Regulations CFR § 423.13(k 2 i at the Four Corners Generating Station (Four Corners), located in San Juan County, New Mexico in accordance with NPDES Permit NN0000019. As required by the ELG Rule, this plan includes the following:

A. A statement that the professional engineer is a licensed professional engineer.
B. A statement that the professional engineer is familiar with the regulation requirements.
C. A statement that the professional engineer is familiar with the facility.
D. A calculation of the primary active wetted bottom ash system volume as required per 40 CFR § 423.11(aa).

E. Material assumptions, information, and calculations used by the certifying professional engineer to determine the primary active wetted bottom ash system volume.
F. A list of all potential discharges under 40 CFR § 423.13 k) 2) i A 1) through (4 , the expected volume of each discharge, and the expected frequency of each discharge.
G. Material assumptions, information, and calculations used by the certifying professional engineer to determine the expected volume and frequency of each discharge, including a narrative discussion of why such water cannot be managed within the system and must be discharged.
H. A list of all wastewater treatment systems at the facility currently, or otherwise required by a date certain under this section.
I. A narrative discussion of each treatment system including the system type, design capacity, and current or expected operation.

The Four Corners Generating Station is a coal-fired mine-mouth generating plant located on the Navajo Indian Reservation near Fruitland, NM. The plant includes two 770-Megawatt (MW) coal-fired units (Units 4 and 5 . Four Corner's existing once-thru sluicing system is being replaced with a new BAT high recycle system which will utilize wet sluicing to transport bottom ash through a hydrobin and Bottom Ash Sluice Water Recycling (BASWR) settling tank system to dewater the bottom ash. The system cannot be operated as a closed loop without significant water balance, scaling, corrosion, and maintenance challenges and should be operated as a high recycle rate system with the allowed purge to alleviate these concerns. **APS is requesting to purge up to 10 percent of the total system volume up to 459,435 gallons per day on a 30-day rolling average basis to maintain water balance, address system water chemistry, and conduct maintenance as allowed under 40 CFR § 423.13(k 2 i A).**

2.0 HIGH RECYCLE SYSTEM DESCRIPTION

As required by 40 CFR § 423.19(c) 3) D) through I , the following is a description of the bottom ash system at Four Corners, including the assumptions, information, and calculations used by the certifying professional engineer to determine the primary active wetted bottom ash system volume and the expected volume and frequency of each discharge. This section also includes a description of the wastewater treatment systems at Four Corners.

2.1 Bottom Ash System Description

After combustion, ash that accumulates in the bottom of the boiler is captured in the ash hoppers located directly beneath the boiler. Bottom ash is then crushed into small pieces by the clinker grinders and sluiced by jet pumps to a series of unit processes designed to separate the bottom ash from the transport water. At present, the existing once-thru sluicing system discharges after treatment to an internal outfall identified in the facility's NPDES permit but in the future bottom ash transport water will be treated and recycled for reuse in BA sluicing operations.

When plant modifications supporting the high recycle bottom ash system at Four Corners are complete, major process equipment will consist of the following:

- Two (2) existing ash hoppers with multiple compartments, one per unit
- Eight 8 existing pyrites tanks per unit, sixteen (16) total
- Four (4) existing hydrobins
- Two (2) new hydrobin overflow tanks
- Four (4) new hydrobin overflow tank agitators, two per tank
- Three (3) new hydrobin overflow return pumps
- Three (3) sumps, two new and one existing
- Three (3) new boiler area sump pumps
- Three (3) new hydrobin area sump pumps
- The existing BASWR settling tank system consisting of:
    - One (1) primary settling basin
    - Two (2) secondary settling basins
    - One (1) clearwell chamber
- Two (2) new sluice water pumps
- Two (2) new flush water pumps
- One (1) new low volume wastewater settling tank

- Two 2 new bottom ash system makeup pumps
- One (1) existing makeup water storage tank

Appendix A contains a schematic overview of the future bottom ash sluicing system's major components and interfaces with other plant systems. The hydrobin overflow tanks and two (2 of the sumps are new and will be installed no later than mid-2023. In addition to these new process units, planned plant modifications will isolate many of the currently permitted low volume wastewater flows at the facility from the existing BA sluicing system and will direct these segregated flows to a new low volume wastewater treatment system prior to discharge through the facility's NPDES permit (see Section 2.4).

The sluiced bottom ash will be initially treated with hydrobins, allowing dewatered bottom ash to be discharged into trucks prior to being hauled to the site Coal Combustion Residuals CCR) landfill or hauled offsite for beneficial reuse. The four 4) existing hydrobins will be operated sequentially with a single hydrobin receiving sluiced ash from both units until it is full. Once a hydrobin is full, the next hydrobin will be placed into service, and the full hydrobin will be allowed to decant for 10-12 hours prior to discharging ash to the trucks. Hydrobins will be continuously cycled to allow for filling to capacity, decanting, and unloading to maintain the system in operation. The two 2) new 111,000-gallon hydrobin overflow tanks (plumbed in parallel) will receive intermittent overflow from the hydrobins during sluicing operations. The new hydrobin overflow tanks represent the only surge capacity within the system other than the freeboard available in the BASWR. The surge capacity in the system provided by the new hydrobin overflow tanks is needed to allow for operational flexibility in responding to system upset conditions, equipment failures, and stormwater inflow without having to discharge sluice water from the system or cause a plant outage.

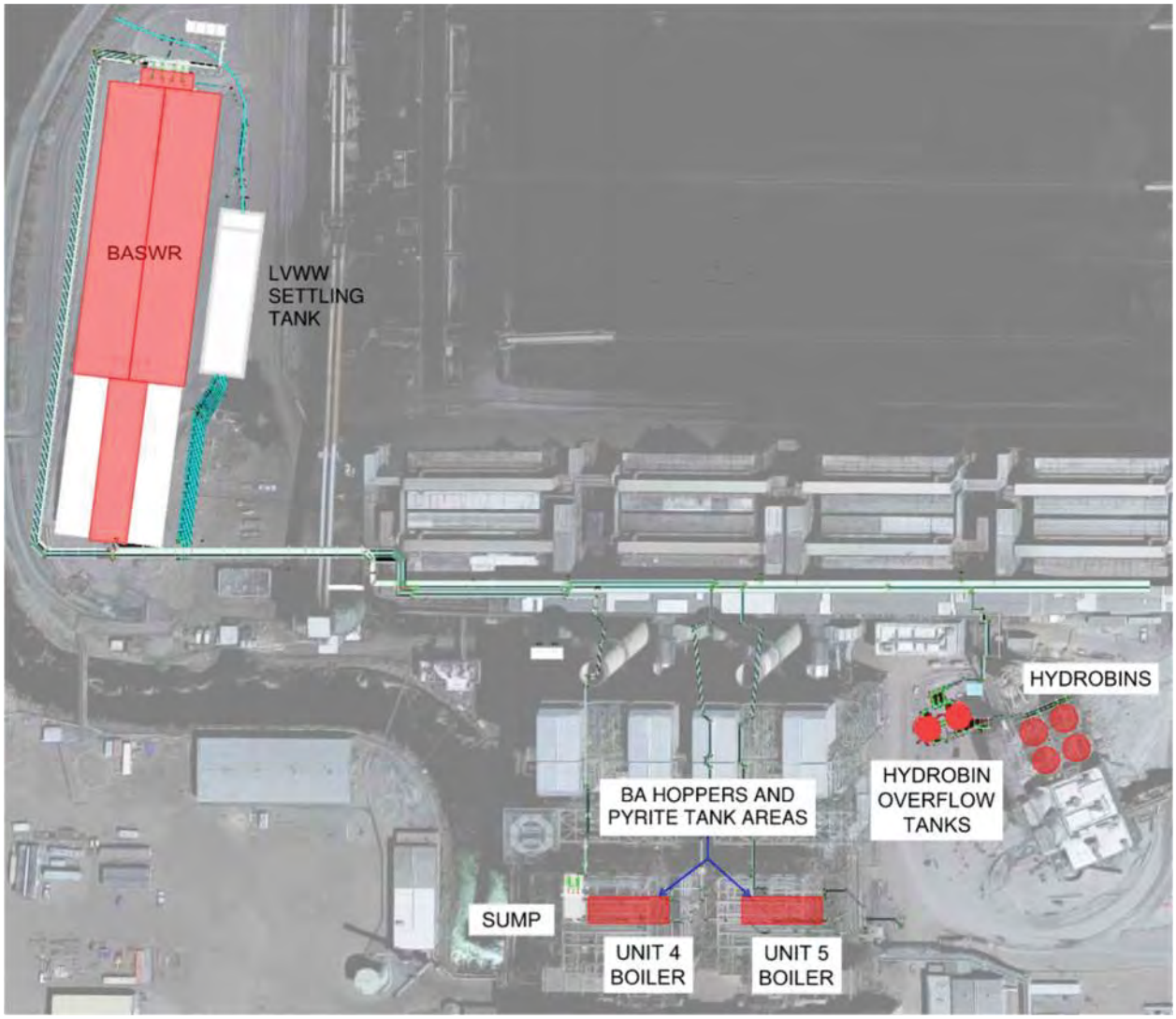
Bottom ash will also be mechanically removed from the BASWR settling tank system, loaded into trucks, and hauled to the site CCR landfill. The BASWR settling tank system is a reinforced concrete free-standing) structure comprised of a single primary settling basin that discharges into two adjacent secondary settling basins operated in parallel that overflow into a clearwell chamber. The treated transport water that overflows into the clearwell will then be pumped back to the boiler hoppers for re-use.

Due to proximity and level of effort to segregate flows, seal trough water for the bottom ash hoppers will be routed with bottom ash hopper overflow to the bottom ash system even though it is technically not bottom ash transport water. In the future, the seal trough water will be sourced from the bottom ash loop water and will not add additional fresh water to the system.

As part of the design of the future bottom ash high recycle system, APS identified all non-bottom ash transport flows that are currently combined with bottom ash transport water in the existing once-thru sluicing system. The intent of this analysis was to segregate low volume wastewater from the future bottom ash high recycle system to simplify process operations and promote reliability. In addition to the seal trough water previously discussed, wastewater flows generated during cleaning events in the baghouse enclosure were identified as a waste stream that should not be directed to a low volume wastewater system due the high total suspended solids content and variable nature of flows which could lead to performance issues in the low volume wastewater treatment system. On this basis, the baghouse enclosure sump waste stream will be routed to the bottom ash system. Routing of this wastewater into the bottom ash system with treatment in the BASWR tank system allows for efficient removal of these suspended solids. Washdown of the baghouse area is an infrequent operation, so it does not substantially contribute to the solids loading in the BASWR tank system.

The site plan below and in Appendix E includes a general overview of the major equipment included in the proposed high-recycle system design.

Figure 2-1: Site Plan Showing Major System Components



To determine the Four Corners primary active wetted system volume, calculations were performed based on the major equipment and piping systems. A summary of the system volume calculations is provided in Table 2-1. The volumes of the existing ash hoppers and pyrites tanks were derived from plant drawings. The volumes of the existing hydrobins, system sumps, and individual BASWR tank cells were calculated from dimensions summarized below in Table 2-1) derived either from field measurements and/or plant drawings. For the BASWR tank system, both secondary cells were included in the calculations because one secondary cell per electric generating unit is required to be in operation per the original design basis of the BASWR tank system to achieve the target effluent solids concentration. Finally, the volume of future interconnecting piping was calculated for the major piping in the system as shown in Table 2-1. Piping

sizes and overall estimated lengths of each run are also shown in Table 2-1. Since the final piping design for the system has yet to be completed, overall piping lengths were estimated based on the equipment layout shown above. The overall system volume was calculated as the summation of the volumes from the major components in the system including interconnecting piping.

A water balance analysis used to size new equipment and evaluate future operations is discussed in Section 2.2 and presented in Appendix A.

Table 2-1: Four Corner's Primary Active Wetted Volume Summary

Ash Hoppers		
	Volume (cubic ft)	Volume (gals)
Unit 4 Hopper	10,000	74,800
Unit 5 Hopper	10,000	74,800
Total	20,000	149,600

Pyrites Tanks		
	Volume (cubic ft)	Volume (gals)
Unit 4 (8 total)	144	1,077
Unit 5 (8 total)	144	1,077
Total	288	2,154

Hydrobins					
	Diameter (ft)	Height of Cylinder (ft)	Height of Cone (ft)	Volume (cubic ft)	Volume (gals)
Tank 1	35	13.25	27.75	21,648	161,924
Tank 2	35	13.25	27.75	21,648	161,924
Tank 3	35	13.25	27.75	21,648	161,924
Tank 4	35	13.25	27.75	21,648	161,924
			Total	86,590	647,694

Sumps					
	Width/Diameter (ft)	Length (ft)	Depth (ft)	Volume (cubic ft)	Volume (gals)
Unit 4 Ash Pit	6		10	283	2,115
Unit 4 Bottom Ash Area Sump	18	35	13	8,190	61,261
Hydrobin Area Sump	15	10	10	1,500	11,220
			Total	9,973	74,596

Hydrobin Overflow Tanks				
	Diameter (ft)	Height (ft)	Volume (cubic ft)	Volume (gals)
Tank 1	32.5	18	14,932	111,694
Tank 2	32.5	18	14,932	111,694
		Total	29,865	223,388

BASWR (Settling) Tank System					
	Width (ft)	Length (ft)	Depth (ft)	Volume (cubic ft)	Volume (gals)
Primary	40	200	8.5	68000	508,640
Secondary 1	66	356	8.2	190,915	1,428,043
Secondary 2	66	356	8.2	190,915	1,428,043
Clearwell	60	20	7.8	9,400	70,312
			Total	459,230	3,435,039

Piping				
	Diameter (in)	Length (ft)	Volume (cubic ft)	Volume (gals)
Sluice Piping 1	12	1,800	1,414	10,575
Sluice Piping 2	12	1,800	1,414	10,575
Flush Piping 1	12	1,800	1,414	10,575
Flush Piping 2	12	1,800	1,414	10,575
U4 Sump Return 1	10	1,100	600	4,488
U4 Sump Return 2	10	1,100	600	4,488
Hydrobin Overflow Return 1	10	1,300	709	5,304
Hydrobin Overflow Return 2	10	1,300	709	5,304
		Total	8,273	61,881

Total System Wetted Volume (gal) =	149,600 + 2,154 + 647,694 + 74,596 + 223,388 + 3,435,039 + 61,881 = 4,594,352
10% gal/day	459,435
10% gal/hr	19,143
10% gpm	319

2.2 Water Balance Description

Three water balance cases were created to evaluate planned operations and are included in Appendix A. The flows used in the water balance analyses represent best estimates for future operations based on engineering judgement and flow measurements (where feasible) conducted during existing operations. All water balances included daily average/max process flows while water balance cases WMB-01 and WMB-

03 include 10-year and 100-year design storm events averaged over a 24-hour period, respectively. Water balance calculations are based on average flows, but maximum flows are also shown in the water balance figures to demonstrate the magnitude of variability that must be accounted for in routine flow balancing operations.

2.2.1 Process Flows

As shown on the water balances, the main process flow in the bottom ash sluice system is intermittent and comes from the sluicing of bottom ash to the hydrobins. Each units' hoppers are sluiced via jet pumps on a scheduled basis to the hydrobins, at an average rate of 2,629 gpm, where bottom ash, 966 tons/day including 35 gpm of entrained water, is removed via trucks. The overflow from the hydrobins, at an average rate of 2,610 gpm, will be captured and sent to the BASWR settling tank system for further treatment prior to reuse or purge.

The other main flow in the bottom ash system is from seal trough and hopper overflows. The seal trough consistently overflows to maintain level within the hopper seal trough while the hopper overflows discharge during/after sluice events. As indicated previously, seal trough overflow is typically not considered a bottom ash transport stream, but in this case, it will be fed off the high recycle return water system based on the magnitude and proximity of these flows. Seal trough and hopper overflows will continue to gravity discharge to an existing drainage trench which will be rerouted to a new sump prior to being forwarded to the BASWR settling tank for solids settling. The seal trough overflow and hopper overflow average rates are 1,400 gpm and 1,197 gpm, respectively. The remainder of the flows within the system are due to miscellaneous water users.

A new low volume wastewater settling tank is also shown on the water balance figures. Various sumps were evaluated at Four Corners for flow and quality prior to determining adequate treatment for the low volume waste streams to meet NPDES permitted outfall limits. Typical discharges to the low volume wastewater tank include reverse osmosis reject and backwash discharges, at an average rate of 200 gpm, and miscellaneous service water users, at an average rate of 230 gpm. A majority of the plant stormwater runoff will also be directed to the low volume wastewater settling tank for solids settling prior to discharge. WMB-01 includes a 10-year, 24-hour storm event which is the required system stormwater design basis per regulation and was used as the design basis for the stormwater calculations. WMB-03 includes a 100-year, 24-hour event for reference purposes.

2.2.2 Operational Scenarios

Existing flow rates for the bottom ash sluice and low volume wastewater systems were measured to evaluate potential discharges from the future high recycle rate system. Daily average flows were established for the major system components based on future expected flow rates once the system operates as a high recycle rate system. WMB-01 and WMB-03 include design storm events for a 10-year, 24-hour and 100-year, 24-hour storm respectively. Estimated purge flows required from the water balance scenarios evaluated are listed in Table 2-2 below.

Table 2-2: Purge Rates for Water Balance Considerations

Water Balance Number/Condition	Purge Rate Directed to a NPDES Outfall (gpm)	Purge Rate Directed to Other Systems for Plant Reuse (gpm)
WMB-01 Process and 10-year, 24-hour storm	0	156
WMB-02 Process Only	0	79
WMB-03 Process and 100-year, 24-hour storm	32	156

Based on the water balance analyses, routine operations will require a constant purge to the FGD system once high-recycle operations are initiated. Given the complexity of this system, all purges to the FGD system will have to be carefully managed. Short duration increases in the purge rate to accommodate storm surges will be incorporated into the design; however routine discharges exceeding 79 gpm could pose water management issues in the FGD system and impact plant reliability.

2.3 List of All Potential Discharges under 40 CFR § 423.13(k)(2 i A 1) – 4

APS is designing the high-recycle bottom ash transport system to routinely operate without purging via the new low volume wastewater treatment to the NPDES outfall water balance case WMB-02 in Appendix A). However, as 40 CFR §423(k 2 i)(A) anticipates, there will be circumstances that could affect the reliability of plant operations if the high-recycle bottom ash transport system is overwhelmed. In those instances, discharges directed to the NPDES outfall would be required and permitted under existing regulation under four categories of conditions. To inform a case-by-case analysis of the allowable purge rate for the future high-recycle bottom ash system at Four Corners, Table 2-3 presents the best available estimate of discharges that could be directed to a NPDES outfall under the four categories of conditions allowed in regulation:

Table 2-3: Four Corner's Purge Discharges

Discharge Stream	Estimated Flow/Volume	Description	Estimated Frequency
A 1) Water Balance – Stormwater	Stormwater flows in excess of 111,000 gallons	Precipitation-related inflows generated from storm events exceeding a 10-year storm event of 24-hour or longer duration e.g., 30-day storm event and cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment	Following storm events that exceed the design storm i.e., a storm event with a return period greater than 10 years and intensity of 24 hours which is equivalent to 1.54 inches of rainfall, or 111,000 gallons). This design storm would be stored within the freeboard of the BASWR settling tank system prior to being reused within the FGD system. Anything surpassing this storm event would be purged via the low volume wastewater treatment system to the NPDES outfall. A 100-year/24-hour storm event would contain an estimated additional 70,000 gallons of water that would need to be purged from the system to maintain water balance and avoid overtopping of the BASWR settling tank system.
A 2) Water Balance – Other Waste Streams	400 gpm peak 20 gpm average	Regular inflows from waste streams other than bottom ash transport water that exceed the ability of the bottom ash system to accept recycled water	Intermittent flows from sumps that discharge into the bottom ash system because they have a high solids content and/or contribute area washdown volumes on an irregular basis have the potential to create water balance issues if spare/surge capacity is unavailable. For the purpose of estimating a potential 'other waste stream' flow, the intermittent flow from baghouse enclosure sumps, which discharge high solids content wastewater, serves as the basis for the estimated other inflow rates.

Discharge Stream	Estimated Flow/Volume	Description	Estimated Frequency
A)(3 Water Chemistry	319 gpm	To maintain system water chemistry where installed equipment at the facility is unable to manage pH, corrosive substances, substances or conditions causing scaling, or fine particulates to below levels which impact system operation or maintenance	Water within the bottom ash system has corrosive tendencies based on low alkalinity and elevated sulfate concentrations in the makeup water which will become exacerbated when closed-loop operations begin. The extent of impacts due to water chemistry cycling is difficult to predict with the existing open loop system configuration. A continuous purge of up to 10% of the total system wetted volume (319 gpm could be required to prevent corrosion in the future bottom ash system.
A)(4 Maintenance	1,428,043 gallons	To conduct maintenance not otherwise included in (A) (1), (2 , or (3 of this table and not exempted from the definition of transport water in § 423.11 p), and when water volumes cannot be managed by installed spares, redundancies, maintenance tanks, and other secondary bottom ash system equipment	Although it is difficult to predict the volumes/discharge frequencies required for maintenance of a future system, there will be times when one secondary BASWR cell will need to be dewatered for cleaning purposes. This could occur as frequently as once a year and is the basis for the estimate of volume required for maintenance of the BA system. Maintenance of smaller vessels at a similar frequency is anticipated.

2.3.1 Water Balance – Stormwater

Although APS has taken measures in the design of the future bottom ash transport system to limit the inflow of as much stormwater as possible, there will be purges required for storm events that exceed the design storm noted in regulation. Calculation of the threshold stormwater volume of 111,000 gallons as well as the 100-year, 24-hour reference storm is detailed in Appendix B and summarized below:

- Stormwater calculations are based on the methodology outlined in the New Mexico Department of Transportation Drainage Design Manual and the 'Civil Engineering Reference Manual for the PE Exam,' Lindeburg, M, 2008). Rainfall data for the 1-year, 10-year, and 100-year 24-hour storm

were obtained from the National Oceanic and Atmospheric Administration Atlas 14, Volume 8, Version 2. The assumed design storm is the 10-year, 24-hour storm as identified by regulation.

- The stormwater contribution method begins with estimating the drainage areas and determining the type of cover for each area which was done from site arrangement drawings. From there we calculate the total weighted curve number, soil water storage capacity, and initial abstraction values as inputs to the curve number method runoff equation. This provides the estimated runoff for each area which in turn is used to calculate the total volume input per area for each storm event.

- The total volume of stormwater that enters the bottom ash handling system is comprised of three areas: the U4 Bottom Ash Area Sump, the Hydrobin Overflow Sump, and the open top BASWR settling tank system. For the 10-year, 24-hour storm, these volumes are 35,900 gallons, 14,400 gallons, and 61,000 gallons respectively. This equates to the 111,000 gallons noted above in Table 2-2.

- For the 100-year, 24-hour storm, the corresponding stormwater volumes are 57,900 gallons, 23,200 gallons, and 98,400 gallons respectively. This equates to a total of 179,500 gallons or the difference of about 70,000 gallons 179,500 – 111,300 = 68,200 gallons) as noted above in Table 2-2.

2.3.2 Water Balance – Other Waste Streams

As noted in Table 2-3 above, there could be other waste streams from intermittent sources that have the potential to impact the water balance of the bottom ash transport system, especially in the aftermath of a significant storm when the spare/surge capacity in the system would be full. One example waste stream is the intermittent discharge of wastewater from the baghouse enclosure sump into the bottom ash system. The baghouse enclosure sump pumps are rated for 400 gpm which could over short periods cause water balance issues if the spare/surge capacity of the system is limited. Although this flowrate is not significant relative to the full process flow of the bottom ash transport recirculation flow, balancing short duration, high intensity flows could overwhelm an already overwhelmed system.

2.3.3 High Recycle Rate Bottom Ash Chemistry Considerations

In the existing once thru i.e., open loop bottom ash sluicing system, ash is sluiced to the hydrobins which act as the primary ash separation devices. Overflow and decant sluice water is pumped to the BASWR settling tank system, where most of the remaining ash settles out to be dewatered and removed. Overflow from the BASWR settling tank system is discharged thru the permitted NPDES outfall and fresh makeup water is used for subsequent sluice cycles.

After the conversion to a high recycle rate system, it is expected that the future closed-loop water quality will cycle up to an equilibrium concentration, where the additional mass of constituents introduced per sluice cycle is equal to the mass exiting the closed-loop system through purge flows and the reuse of treated sluice water in the FGD system. Since the existing system is not currently operating in a closed-loop configuration, the corrosiveness or scaling potential in the future high recycle rate configuration cannot be reliably predicted. However, once operating in a high recycle rate configuration, there will likely be an increase in total dissolved solids (TDS), total suspended solids TSS), conductivity, aluminum, calcium, chloride, iron, silica, sodium, sulfates, and other constituents from contact with the bottom ash and due to evaporation of water in the system.

Several scaling indices can be used to model the scaling and corrosive properties of the water. These are the Puckorius Scaling Index PSI), The Ryznar Scaling Index (RSI , the Langelier Scaling Index LSI), and the Larson-Skold Index (L-SI . The PSI, RSI, and LSI all use alkalinity, hardness, temperature, and pH to estimate calcium scale and corrosivity, comparing the pH of the system to the equilibrium pH and the pH of saturation. The L-SI looks at the concentrations of carbonate, bicarbonate, sulfate, and chloride to estimate the tendency for sulfate and chloride to interfere with scale formation and to support corrosion due to sulfate and chloride chemistry. The target ranges for these indices are shown in Table 2-4.

Table 2-4: Key to Scaling Indexes (pH of the system

	PSI	RSI	LSI	L-SI
Extreme Corrosion	>9.0	>9.0	<-2	>4.0
Moderate Corrosion	>7.5 - 9.0	>7.5 - 9.0	-2.0 - -0.5	1.2 - 4.0
Slight Corrosion	>7.0 - 7.5	>7.0 - 7.5	>-0.5 - 0.0	0.8 - <1.2
In range	>6.0 - 7.0	>6.0 - 7.0	>0.0 - 0.5	<0.8
Slight Scaling	5.0 - 6.0	5.0 - 6.0	>0.5 - 2.0	
Heavy Scaling	<5.0	<5.0	>2.0	

To estimate the effect of future closed loop operations, a series of samples were taken at various locations in the bottom ash handling system and analyzed for a variety of constituents see analytes and results in Appendix C as well as sampling locations in the water balance figures presented in Appendix A . Although, the current system is operating as a once-through system, the intent was to try and capture the impact of operations on the water quality as it is sluiced through the system and use this information to extrapolate to the water chemistry in the future closed loop, high-recycle rate bottom ash system design.

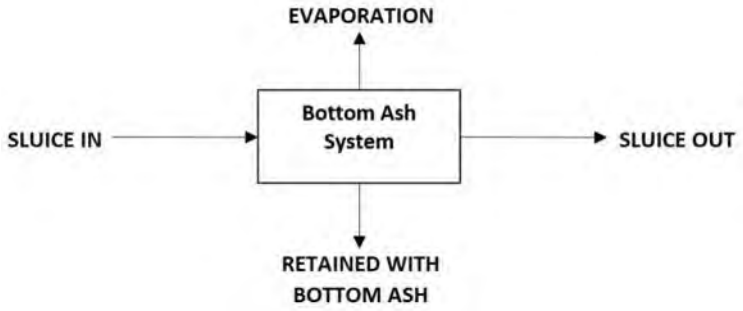
We compared the expected concentration of various parameters to determine if there was a measurable increase or decrease in these constituents given the once-through bottom ash system design. The primary change in water quality evaluated was the effect of adding pulverized bottom ash to makeup water, sluicing the mixture, and bulk solids removal in the hydrobin system; thus, average concentrations of evaluated constituents in water samples collected from the hydrobin overflow were compared to samples representative of makeup water sourced from Morgan Lake. The difference in water quality parameters from these two samples is mainly from contact of the bottom ash with the sluice water and from evaporation of water in the bottom ash hoppers and in the BASWR. Parameters that exhibited a measurable change included conductivity, total dissolved solids, chlorides, sulfates, manganese, calcium, bicarbonate alkalinity, and temperature.

Appendix D presents a chemistry mass balance model of the bottom ash system which was developed to try and simulate the existing open loop system on bottom ash chemistry (Baseline Conditions – Open Loop Configuration). Key input parameters and assumptions into the chemistry mass balance model include:

- Total system volume: 4,594,352 gallons see Table 2-1 above
- System evaporation: 4.0 gpm 5,760 gallons/day) based on the BASWR tank system surface area and annual average evaporation rates plus 5.79 gpm 8,338 gallons/day) based on evaporation in the bottom ash hoppers from contact with the bottom of the boiler. Total system evaporation was estimated at 9.79 gpm (14,098 gallons/day).
- Bottom ash drag out rate amount removed from system) was calculated as follows: 21.2 tons/hour average bottom production rate per unit * 2 units * 20% assumed moisture content, 21.2 * 2000 2 * 0.2 / 500.4 = 33.9 gpm (48,805.8 gallons/day) water in bottom ash drag out waste stream. This provided a good correlation to the measured average value of 35 gpm from the hydrobins as shown on the water balances. Water entrained with the bottom ash removed from the system was assumed to be the average 35-gpm number based on existing flow measurement data.
- Total makeup rate: evaporation + drag out rates = 9.79 + 35.0 = 44.79 gpm (64,498 gallons/day
- The hydraulic residence time of the system is calculated as the total system volume divided by the makeup rate, or 4,594,353 gallons / 64,498 gallons / day = 71.2 days.
- Selected water quality data was collected over a period of six months from various locations in the system as shown with blue boxes on the water balance diagrams. The water quality data was averaged for use in the chemistry model. A summary of the sampling results is contained in Appendix C.

For development of the baseline chemistry model (existing open-loop configuration), we looked at specific constituents in the bottom ash sluice water inlet and compared them to the same constituents in the sluice water outlet. Constituents that were compared included conductivity, total dissolved solids, chlorides, sulfates, magnesium, calcium, pH, and temperature. With an open-loop configuration, we lose some water to evaporation in the bottom ash hoppers and BASWR while some water is retained in the bottom ash drag out, see Figure 2-2 below. Evaporation in the bottom ash hoppers and BASWR has a net result of increasing the constituent concentrations in the water. The water retained in the bottom ash that is removed does not change the remaining concentrations in the system but does remove some mass from the system. Contact of the bottom ash material with the water results in some dissolution of constituents from the bottom ash into the water. The combination of evaporation and contact of bottom ash with the sluice water results in a change in some of the constituent concentrations.

Figure 2-2: Mass Balance Around Bottom Ash System



When we compared the measured change in concentration for the compared constituents, we see that the expected change in concentration from evaporation is greater than the measured concentration changes for most of the compared constituents. For example, with chlorides we would expect a concentration increase of 0.76 mg/L due to evaporation alone; however, the measured concentration change was reported as 0.03 mg/L. It is unreasonable to assume that chlorides were removed from the bottom ash water by some mechanism as chloride salts are super soluble and the system concentrations are nowhere near solubility limits. Similar results for calcium and magnesium were observed; expected concentration changes due to evaporation were greater than the measured concentration changes. Alkalinity had a similar result, however, exposure to the bottom ash could introduce some acidity in the system resulting in the observed decrease in alkalinity concentration. TDS and sulfates were the only compared constituents that had a measured concentration change greater than the expected concentration change due to evaporation.

With most of compared constituents exhibiting poor chemistry modeling results we concluded that it is impossible to predict the impact of the future system configuration on the system corrosion or scaling tendencies. With the current system showing slight to extreme corrosion potential, we assume that the cycling up of constituents in the future high recycle rate system configuration would only worsen the system corrosion potential. The ability to purge sluice water from the system will allow operations to maintain a water chemistry like the current conditions.

An acid feed to lower alkalinity and pH would make the water more corrosive than current conditions. A caustic feed to increase alkalinity and pH would make the water less corrosive than current conditions. A soda ash feed to increase alkalinity would also make the water less corrosive than current conditions. There is no way to quantify if chemical feed systems can improve on system water quality without the need to purge some wastewater from the system.

The Baseline Conditions – Open Loop conditions show that in the current open-loop configuration the bottom ash sluice water is moderately corrosive for the PSI value, within range for the RSI value, and slightly scaling for the LSI value. The L-SI value is showing an extreme corrosion potential due to the elevated sulfate levels and relatively low alkalinity. Because the makeup water has elevated sulfates and low alkalinity concentrations, the best we could hope to achieve would be a water quality like the existing conditions. The addition of some alkalinity from a soda ash feed would improve on the corrosion potential but we would never be able to eliminate the concern with a chemical feed by itself.

The best possible outcome is with a provision for a future 10% purge rate plus the maximum possible purge to the WFGD system peak purge rate of 79 gpm and installation of some form of chemical feed adjustment. Selection of the chemical feed adjustment will not be made until the system can begin operation in the future high rate recycle configuration when we can monitor changes in system chemistry during steady state conditions. The provisions for a system purge and chemical feed addition will produce a sluice water quality that has less scaling potential and comparable corrosion potential to the existing open-loop bottom ash system configuration. On this basis, provisions for a future chemical feed system have been incorporated into the design of the planned high recycle rate, closed-loop bottom ash system prior to the BASWR settling tank system. The chemical feed system will be finalized once the bottom ash system is put into service in the high-recycle rate, closed-loop configuration and we can measure actual chemistry changes in the system.

2.3.4 Maintenance

Estimates of potential purge volumes required for future maintenance are difficult to predict, especially for a system that has not been constructed (much less operated). It is anticipated, however, that there will be scenarios where large volumes of water will need to be drained from the bottom ash transport system for maintenance. To provide an example maintenance purge volume that would be difficult to retain onsite given the magnitude of the system, a scenario involving clean out of one of the secondary settling cells of the BASWR tank was selected.

The existing BASWR system consists of a primary settling cell, two secondary settling cells, and one clearwell. As noted in Table 2-2 above, there will be times when one 1,428,043-gallon secondary BASWR cell will need to be dewatered for cleaning purposes which may happen as frequently as once per year. Under normal operating circumstances, every effort will be made to process drainage of the secondary settling cell within routine system purges to the FGD system. However, due to the magnitude of volume in each of the secondary cells, as well as plant operational requirements, a purge through the NPDES outfall will likely be required.

The BASWR system design requires one secondary settling cell to be in service per unit in operation to achieve the target TSS removal rates. As noted in Table 2-2 above, there will be times when one secondary BASWR cell will need to be dewatered for cleaning purposes which may happen as frequently as once per year. This means that the BASWR tank system is undersized for proper treatment of full flow from both units and secondary settling cell cleanouts will have to occur during either a scheduled single or dual unit outage. In the lead up to the scheduled outage, a single secondary settling cell will require over 12 days of continuous draining to dewater the cell at the FGD bottom ash transport system purge rate identified for routine operations 79 gpm; see water balance case WMB-02 in Appendix A . This operation could take longer if there are issues in FGD operations. Further, there may be times when it will be necessary to dewater a cell very quickly as when an equipment failure could lead to a forced unit outage. In either instance, maintenance would require a significant purge volume equal to the volume of the cell to be actively managed with the needs of plant operational requirements. The addition of a third (spare secondary settling cell was considered for this scenario; however, the cost to incorporate a third settling cell for a once/year maintenance event does not have a good cost to benefit ratio and physical space for such an addition was limited.

2.4 Wastewater Treatment Systems at Four Corners

Table 2-5 summarizes the water treatment systems that process water that will have the potential to be discharged in accordance with the NPDES permit at Four Corners (i.e., non-bottom ash transport systems). Design assumptions and design basis information are discussed in the following sections.

Table 2-5: Four Corners Wastewater Treatment Systems

System Name	Design Capacity	Current Operation	Expected Operation
Low Volume Wastewater Treatment System	440 gpm daily average. 1,213 gpm daily max including stormwater flows based on a 10-year, 24-hour storm.	Settling via BASWR prior to discharge through the permitted NPDES outfall.	Low volume wastewater will be segregated from bottom ash sluice system flows and re-routed to a new settling tank prior to discharge through the permitted NPDES outfall.
High Recycle Bottom Ash System	Hydrobins – 2,610 gpm daily average BASWR – 5,642 gpm daily average	Ash removed via Hydrobins prior to final settling via BASWR with polymer addition prior to discharge through the permitted NPDES outfall.	Ash removed via Hydrobins with newly installed polymer injection. Chemical feeds prior to BASWR for alkalinity and pH adjustment. Final settling via BASWR with polymer prior to reuse within existing FGD system or purge to LVWTS and ultimately through the permitted NPDES outfall.

2.4.1 Low Volume Wastewater Treatment System

Low volume wastewater flows were evaluated based on existing plant data and flowmeter analysis. Stormwater areas were established to determine runoff volumes that contribute to each low volume wastewater area. Average/max daily flows were established at each low volume source along with expected flows from a 10-year, 24-hour storm to establish sizing required for a low volume wastewater treatment system capable of meeting the NPDES permitted outfall.

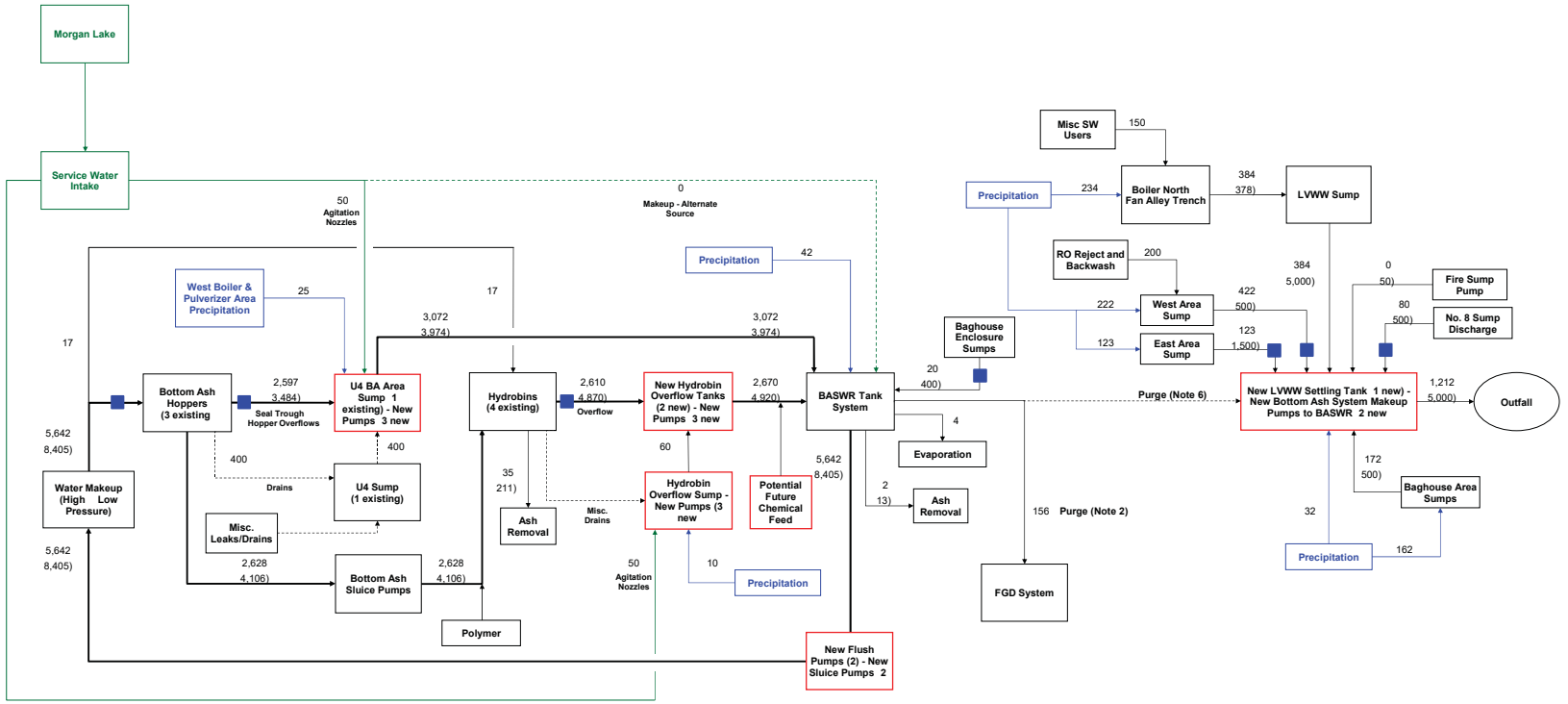
2.4.2 High Recycle Bottom Ash System

High-recycle bottom ash system flow rates, based on existing system flow rates averaged over a 24-hour period, were utilized to establish daily averages. Hydrobins are the primary ash separation step while the

BASWR settling tank system settles fines carryover from the Hydrobins along with seal trough and hopper overflow. Two sumps are included in the high recycle bottom ash system to capture various closed-loop waters along with any stormwater in the bottom ash areas. Polymer injection is expected to be utilized upstream of the Hydrobins and BASWR settling tank system to enhance fines settling while acid / caustic injection and/or soda ash may be included in the future for pH adjustment or alkalinity adjustment respectively. Purge flow to the FGD system or LVWW treatment system (to the NPDES outfall) would be discharged after the treatment of the closed-loop water by the Hydrobins and BASWR settling tank system along with any required chemical feed. Purge flow for reuse or outfall discharge is dependent on considerations listed in Section 2.3.

Wastewater streams generated at the plant that do not discharge through NPDES permitted outfalls include blowdown from the wet FGD scrubber, sanitary wastewater, and various boiler cleaning solutions. Blowdown and associated slurries from the wet FGD scrubber are blended with ash and landfilled in an on-site CCR landfill. Sanitary wastewater and boiler cleaning solutions are discharged to an on-site CCR surface impoundment where they evaporate or are reused in non-bottom ash sluice water plant operations.

APPENDIX A – WATER BALANCE DRAWINGS



no.	date	by	ckd	description
A	7/30/21	DKE		PRELIMINARY
B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

E	Precipitation Included

NOTES:

1. Precipitation values based on 10 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system.
3. All flows shown in gallons per minute (GPM.
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 20% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

	Sampling Location

PRELIMINARY

BURNS McDONNELL

date 7/30/2021	detailed D. Elliott
designed D. Elliott	checked B. Hansen

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APS Four Corners
Future Conditions
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project 129532	contract
drawing **WMB-01**	rev. **---** **E**
sheet 1 of 1 sheets	
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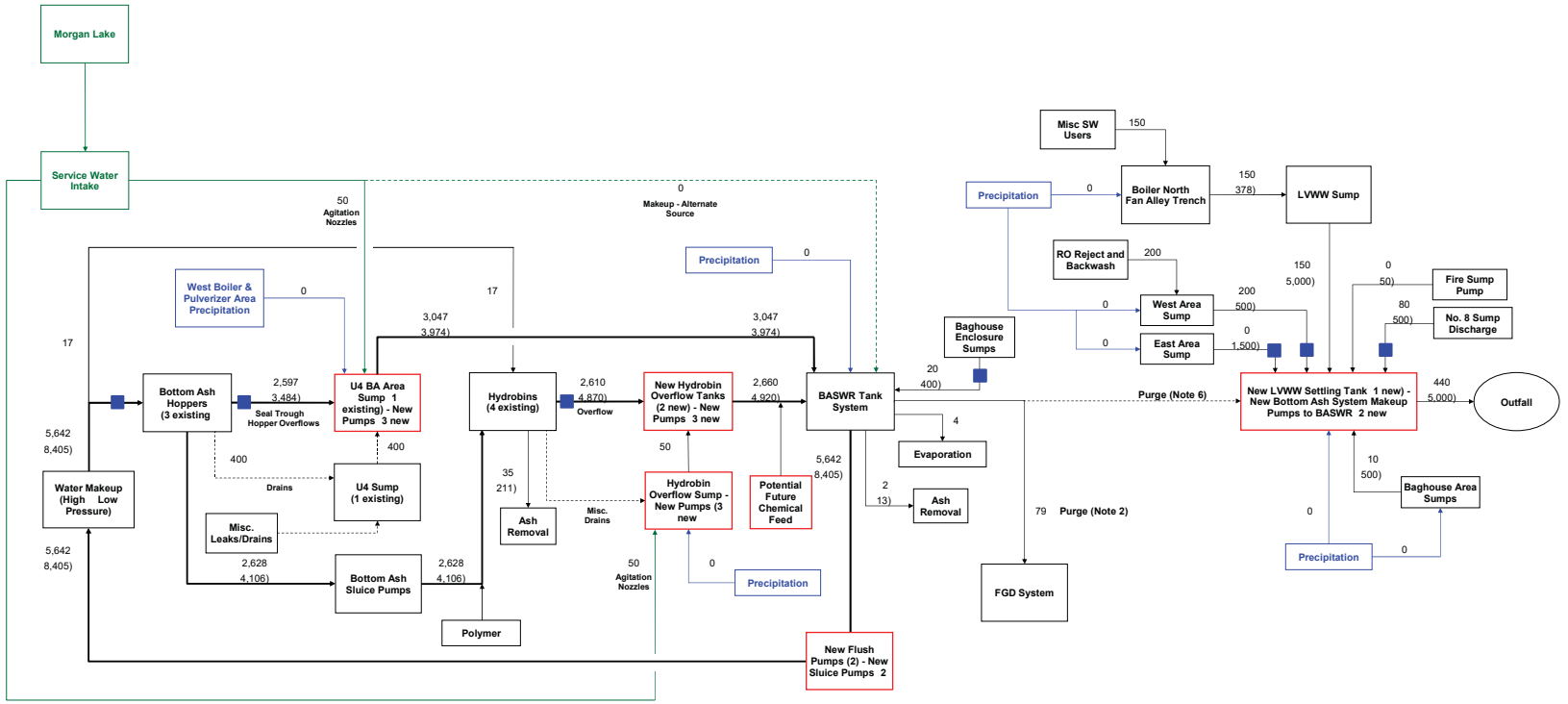

no.	date	by	ckd	description
A	7/30/21	DKE		PRELIMINARY
B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

⊏ Precipitation Included

NOTES:

1. Precipitation values based on 10 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system.
3. All flows shown in gallons per minute (GPM.
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 20% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

■ Sampling Location

PRELIMINARY

BURNS McDONNELL

date	detailed
7/30/2021	D. Elliott
designed	checked
D. Elliott	B. Hansen

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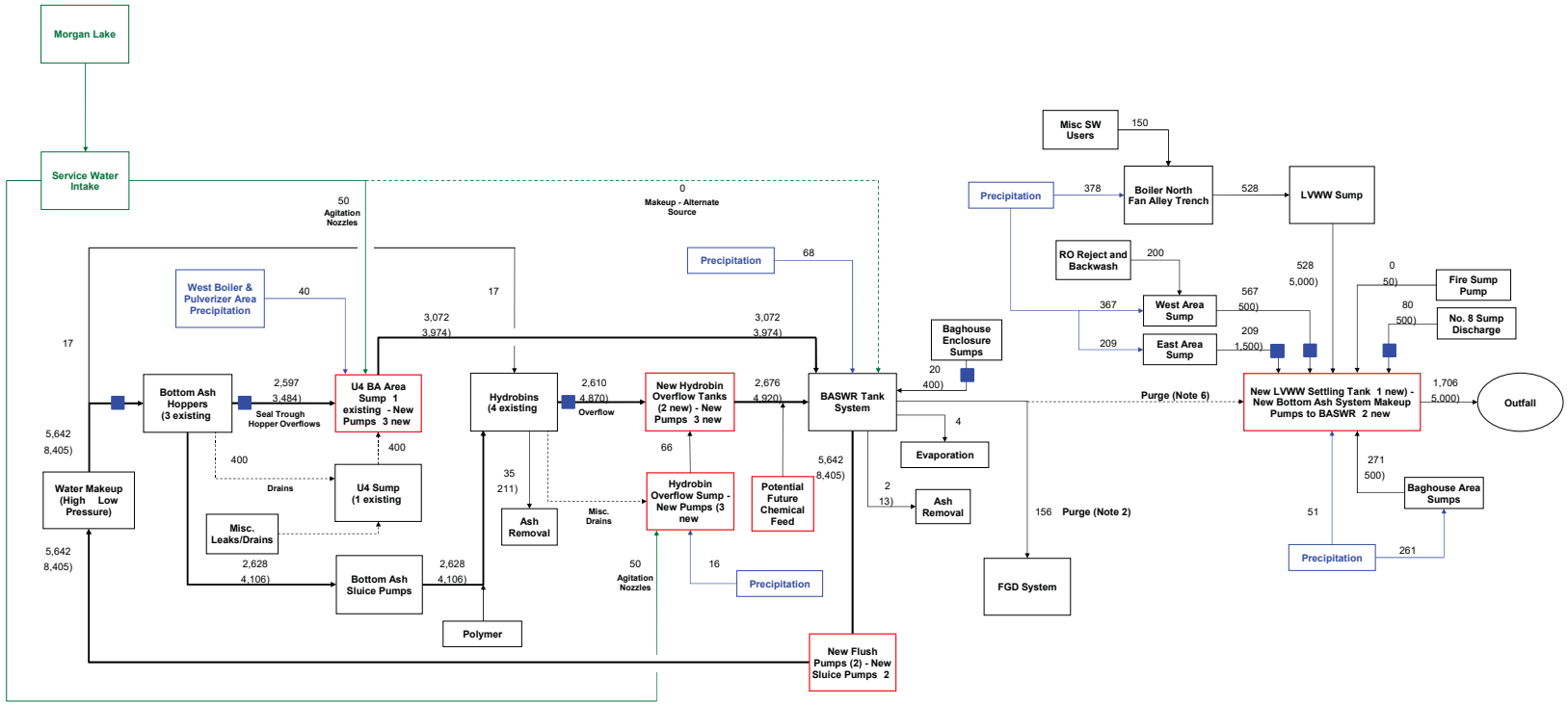
APS Four Corners
Future Conditions
Process Only Flows

project	contract
129532	

drawing **WMB-02** rev. **---** **E**

sheet 1 of 1 sheets

file



no.	date	by	ckd	description
A	7/30/21	DKE		PRELIMINARY
B	1/13/22	BDH		UPDATES
C	1/24/22	BDH		EPA LETTER UPDATES
D	2/16/22	BDH	DKE	EPA LETTER UPDATES
E	3/3/22	BDH	DKE	EPA LETTER UPDATES

E	Precipitation Included

NOTES:

1. Precipitation values based on 100 year, 24 hour storm averaged over 24 hour period.
2. Purge based on water balance requirements for the closed-loop system. Purge to LVWW based on flow exceeding 10 year storm.
3. All flows shown in gallons per minute (GPM
4. Max flows for normal operation are in parentheses and may not balance.
5. Water leaving with ash assumed to be 22% moisture. Hydrobin ash expected to be removed for 4 hour duration per day. BASWR ash removal expected 3 times per week and estimated to be removed within 8 hour duration.
6. Purge to maintain system water chemistry up to 319 gpm or 10% of the bottom ash system flow.
7. Maintenance purge to drain one secondary cell of the BASWR to the LVWW settling tank is not shown.
8. Dashed lines represent intermittent flows.

Sampling Location

PRELIMINARY

BURNS McDONNELL

date 7/30/2021	detailed D. Elliott
designed D. Elliott	checked B. Hansen

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Future Conditions
Process & 100yr Stormwater Flows

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sheet 1 of 1 sheets	
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APPENDIX B – STORMWATER RUNOFF CALCULATIONS

BURNS McDONNELL

WORKSHEET TITLE: APS 4C Runoff Calcs
CREATED: 4/26/2021
PERFORMED BY: D. ELLIOTT
OBJECTIVE: Determine Runoff Volumes

CALCULATION NO.:
REVISION: A
REVIEWED BY:

REFERENCES:

1 Lindeburg, M. (2008). Civil engineering reference manual for the PE exam. Belmont, CA: Professional Publications, Inc.
2 Drainange Design Manual - NMDOT
https://dot.state.nm.us/content/dam/nmdot/Infrastructure/Drain_Design_Manual.pdf
3 National Oceanic and Atmospheric Administration. (2015). NOAA Atlas 14, Volume 8, Version 2. [Point precipitation frequency estimates for Farmington, NM, US]. Retrieved from http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=mo
4 United States. Department of Agriculture. Natural Resources Conservation Service. National Engineering Handbook: Part 630 Hydrology, Chapter 15 Time of Concentration. N.p., n.d. Web. 9 Feb. 2016.

DESIGN INPUTS:

1 Design storm duration is 24 hours.
2 Max intensity duration is 5 minutes
3 Based on Custom Soils Resource Report, soils in the vicinity of the watershed areas are generally sandy loam Hydrologic Soil Group C. Reference 3

EQUATIONS:

1 SCS Curve Number Method Runoff Equation
$Q = (P-I_a)^2/(P-I_a+S)$ Reference 1, p. 20-19, eq. 20.44
2 Soil Water Storage Capacity
$S = (1000/CN) -10$ Reference 1, p. 20-19, eq. 20.43
3 Initial Abstraction
$I_a = 0.2*S$ Reference 1, p. 20-15, eq. 20.38
4 Weighted Curve Number
$CN_W = (CN_i*A_i)/A_T$
5 Volume of Runoff
$V = Q*A_i$

VARIABLES:

1	Q	runoff, in
2	A_d	total drainage area, ac or mi^2
3	S	soil water storage capacity, in
4	CN	curve number, unitless
5	I_a	initial abstraction, in
6	CN_W	weighted curve number, unitless
7	A_T	total area, ac
8	CN_{WT}	total weighted curve number, unitless

CALCULATIONS:

1 Establish drainage area

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7
	West Sump	**East Sump**	**LVWW Sump**	**Baghouse Area**	**U4 BA Area**	**BASWR**	**Hydrobin Area**
A_d (ac)	9.61	5.75	9.40	6.50	1.00	1.70	0.40
A_d (mi^2)	0.015	0.009	0.015	0.010	0.002	0.003	0.001

As shown on the area map figure, see below
Conversion from ac to mi^2

2 Establish rainfall data

SCS Storm	Depth (in)	
1yr, 24hr	0.83	Reference 3
10yr, 24hr	1.54	Reference 3
100yr, 24hr	2.36	Reference 3

3 Establish CN, Percent Impervious Cover, and Initial Abstraction

	West Sump			East Sump			LVWW Sump			Baghouse Area			U4 BA Area			BASWR			Hydrobin Area			
Land Description	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	**CN_i***	**A_i** (ac)**	**CN_W**	
Open space, fair condition	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	79		0.0	Equation 4
Gravel	96	7.21	72.0	96	5.18	86.4	96		0.0	96		0.0	96		0.0	96		0.0	96		0.0	Equation 4
Pond	100		0.0	100		0.0	100		0.0	100		0.0	100		0.0	100	1.62	95.0	100		0.0	Equation 4
Pavement	98	2.40	24.5	98	0.58	9.8	98	9.40	98.0	98	6.50	98.0	98	9.40	98.0	98	0.09	4.9	98	0.40	98.0	Equation 4
Coal Pile	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	60		0.0	Equation 4
A_T (ac)		9.61			5.75			9.40			6.50			9.40			1.70			0.40		Sum
CN_{WT}			97			96			98			98			98			100			98	Sum
S			0.31			0.42			0.20			0.20			0.20			0.00			0.20	Equation 2
I_a			0.06			0.08			0.04			0.04			0.04			0.00			0.04	Equation 3

*Reference 1, Table 20.4, p. 20-17 and Design Input 3

**Measured in Microstation

4 Establish Runoff Volume based on SCS Curve Number Method

		West Sump	East Sump	LVWW Sump	Baghouse Area	U4 BA Area	BASWR	Hydrobin Area	
1-yr Storm	P (in)	0.83	0.83	0.83	0.834	0.834	0.834	0.834	Reference 3
	Q (in)	0.55	0.48	0.63	0.63	0.63	0.63	0.63	Equation 1
	V (gal)	143,900	75,400	161,100	111,400	17,200	29,200	6,900	Equation 5
	Flow (gpm)	100	52	112	77	12	20	5	
10-yr Storm	P (in)	1.54	1.54	1.54	1.54	1.54	1.54	1.54	Reference 3
	Q (in)	1.22	1.13	1.32	1.32	1.32	1.32	1.32	Equation 1
	V (gal)	319,000	176,900	336,800	232,900	35,900	61,000	14,400	Equation 5
	Flow (gpm)	222	123	234	162	25	42	10	
100-yr Storm	P (in)	2.36	2.36	2.36	2.36	2.36	2.36	2.36	Reference 3
	Q (in)	2.03	1.92	2.13	2.13	2.13	2.13	2.13	Equation 1
	V (gal)	528,600	300,500	544,100	376,300	57,900	98,400	23,200	Equation 5
	Flow (gpm)	367	209	378	261	40	68	16	

5 Evaporation Calcs

68,200

	Area (acres)	Pan Evap Rate (in/yr)	Total Evap (gal/yr)	Average Evap (gpm)
BASWR	1.40	55.00	2,090,877	3.98
LVWW Settling Basin	1.00	55.00	1,493,484	2.84

Drawing showing relative areas (APS 4C - Google Earth.pdf):

APPENDIX C – SAMPLING ANALYTICAL RESULTS

BURNS McDONNELL

Client: APS Four Corners

Date 10/18/2021

Project No. 129532

Notes:
1) Non Detects (ND are not factored into average/max.
2) Blank cells were not analyzed for specific constituent.

Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Seal Trough Makeup (Service Water)	3/4/21 12:31		8.97	5	721		114	ND	41.1	0.73	ND	ND	8.97	7.92	367		0.215	ND	74.3	72.2	ND	ND	28.7	27.1	ND	ND			ND	ND	ND	ND
	3/8/21 12:03		8.92	11	719		142	ND	41.6	0.757	ND	ND	8.54	8.56	361		0.138	ND	74.4	79.6	0.75	ND	28	29.7	ND	ND			ND	ND	ND	ND
	3/11/21 9:40		9.06	13	717		101	ND	40.9	0.759	ND	ND	9.03	8.73	367	0.64	0.175	0.101	76.7	74.4	ND	ND	27.5	27.4	ND	ND			ND	ND	ND	ND
	3/15/21 10:51		8.81		691		110	ND	40.7	0.742	ND	ND	9.06	8.03	364	0.64	0.222	ND	72.2	74.6	2.48	ND	25.2	26.3	ND	ND			ND	ND	ND	ND
	3/18/21 9:59		8.93	7	774		113	ND	41.3	0.75	ND	ND	ND	ND	359	0.64	ND	ND	71.4	78.1	ND	ND	25.3	27.1	ND	ND			ND	ND	ND	ND
	9/13/21 13:31		8.77	14	744		105	ND	43.4	0.821	ND		ND	ND	383		ND	ND	77	76.2	ND	ND	31.2	30.2	ND	ND	90.7	114				
	9/16/21 12:02		8.74	6	762		102	ND	43.6	0.815	ND		ND	ND	396		ND	ND	83	72.1	ND	ND	31.8	27.8			98.2	108				
	9/17/21 11:13		8.71	7	772		102	ND	43.2	0.815	ND		ND	ND	393		ND	ND	78.4	68.2	ND	ND	30.2	27.6			91.2	101				
	Average			9.00	737.50		111.13		41.98	0.77			8.90	8.31	373.75	0.64	0.19	0.10	75.93	74.43	1.62		28.49	27.90			93.37	107.67				
	Max			14.00	774.00		142.00		43.60	0.82			9.06	8.73	396.00	0.64	0.22	0.10	83.00	79.60	2.48		31.80	30.20			98.20	114.00				
Flush Water	3/1/21 14:37		8.85	47	525		128	ND	41	0.738	ND	ND	6.79	5.35	366		ND	ND	70.6	79.4	ND	ND	27.3	27.3	ND	ND			ND	ND	ND	ND
	3/4/21 11:42		9.09	11	698		128	ND	41	0.727	ND	ND	8.16	8.2	366		0.221	ND	70.5	77.3	2	ND	28.1	27.8	ND	ND			ND	ND	ND	ND
	3/8/21 12:54		9	15	728		128	ND	41.6	0.759	ND	ND	8.5	7.86	361		0.1	ND	69.3	73.2	0.832	ND	26	27.9	ND	ND			ND	ND	ND	ND
	3/11/21 9:33		9.05	6	716		123	ND	40.8	0.758	ND	ND	9.06	8.35	366	0.64	0.173	ND	75.5	73.9	ND	ND	27.5	26.7	ND	ND			ND	ND	ND	ND
	3/15/21 11:39		8.92	10	699		114	ND	40.7	0.738	ND	ND	7.91	8.11	364	0.64	ND	ND	69.5	71.7	ND	ND	25.4	26.1	ND	ND			ND	ND	ND	ND
	3/18/21 9:43		8.88	8	759		113	ND	41.2	0.749	ND	ND	ND	ND	359	2.56	ND	ND	68.8	67.1	ND	ND	25.5	24.4	ND	ND			ND	ND	ND	ND
	Average			16.17	687.50		122.33		41.05	0.74			8.08	7.57	363.67	1.28	0.16		70.70	73.77	1.42		26.63	26.70								
	Max			47.00	759.00		128.00		41.60	0.76			9.06	8.35	366.00	2.56	0.22		75.50	79.40	2.00		28.10	27.90								
	All SW Average			12.31	716.07		115.93		41.58	0.76			8.45	7.90	369.43	0.96	0.18	0.10	73.69	74.14	1.52		27.69	27.39			93.37	107.67				
	All SW Max			47.00	774.00		142.00		43.60	0.82			9.06	8.73	396.00	2.56	0.22	0.10	83.00	79.60	2.48		31.80	30.20			98.20	114.00				
Seal Trough Overflow	3/1/21 12:33		8.47	30	664		97	ND	35.9	0.59	1.14	ND	6.19	5.69	350		0.118	ND	56.4	56.9	ND	ND	33.5	32.1	ND	ND			ND	ND	ND	ND
	3/4/21 12:16		8.68	15	717		126	ND	40.9	0.727	ND	ND	8.65	7.85	366		0.243	ND	73.3	73.5	ND	ND	27.8	28	ND	ND			ND	ND	ND	ND
	3/8/21 11:49		8.74	11	719		119	ND	41.5	0.763	ND	ND	5.2	8.46	361		0.146	ND	68	75.6	ND	ND	26	28.1	ND	ND			ND	ND	ND	ND
	3/11/21 10:13		8.64	17	723		120	ND	40.9	0.756	ND	ND	7.44	8.67	367	0.64	0.121	ND	73.2	76.5	ND	ND	26.6	27.8	ND	ND			ND	ND	ND	ND
	3/15/21 11:23		8.71	91	704		118	ND	40.7	0.759	ND	ND	8.75	7.68	365	0.64	0.417	ND	69.8	72.1	ND	ND	25.4	26.3	ND	ND			ND	ND	ND	ND
	3/18/21 10:19		8.74	32	766		114	ND	41.3	0.764	ND	ND	6.33	ND	361	0.64	0.144	ND	73.2	75.7	ND	ND	25.6	26.5	ND	ND			ND	ND	ND	ND
	Average			32.67	715.50		115.67		40.20	0.73	1.14		7.09	7.67	361.67	0.64	0.20		68.98	71.72			27.48	28.13								
	Max			91.00	766.00		126.00		41.50	0.76	1.14		8.75	8.67	367.00	0.64	0.42		73.30	76.50			33.50	32.10								
BASWR Inlet from LVWW Sump	3/1/21 11:55		7.76	140	706		124	ND	40.4	0.768	0.302	ND	6.94	7.67	373		0.463	ND	72.6	72.9	ND	ND	27.1	27.1	ND	ND			ND	ND	ND	ND
	3/4/21 11:15		9.01	127	710		138	ND	40	0.737	0.449	ND	9.47	7.38	373		0.736	ND	78.7	72.3	ND	ND	28.9	26.5	ND	ND			ND	ND	ND	ND
	3/8/21 11:29		8.86	11	1080		191	ND	27.3	ND	ND	ND	12.2	12.3	229		0.17	ND	111	114	ND	ND	42.6	42.8	0.004	ND			ND	ND	ND	ND
	3/11/21 9:15		7.94	300	712		110	ND	39.6	0.796	0.303	ND	18.7	8.13	368	0.64	4.09	0.105	75.7	75.4	2.46	ND	26.5	27	ND	ND			ND	ND	ND	ND
	3/15/21 10:30		8.59	1420	699		107	ND	40.3	0.793	0.281	ND	7.62	7.62	374	3.2	1.06	ND	73.4	77.1	0.604	ND	26.3	26.1	ND	ND			ND	ND	ND	ND
	3/18/21 9:20		8.35	217	776		102	ND	41.1	0.821	0.447	ND	ND	ND	371	4.48	0.852	ND	72.9	22.2	0.436	ND	25.5	24.8	ND	ND			ND	ND	ND	ND
	Average			369.17	780.50		128.67		38.12	0.78	0.36		10.99	8.62	348.00	2.77	1.23	0.11	80.72	72.32	1.17		29.48	29.05	0.004							
	Max			1420.00	1080.00		191.00		41.10	0.82	0.45		18.70	12.30	374.00	4.48	4.09	0.11	111.00	114.00	2.46		42.60	42.80	0.004							

BURNS McDONNELL

Client: APS Four Corners

Date 10/18/2021

Project No. 129532

Notes:
1) Non Detects (ND are not factored into average/max.
2) Blank cells were not analyzed for specific constituent.

Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Unit 4 & 5 Hydrobin Overflow	3/1/21 13:44		7.79	450	736		122	ND	41.2	0.819	ND	ND	6.87	4.74	375		0.858	ND	75	72.7	0.509	ND	27.6	27	ND	ND			ND	ND	ND	ND
	3/4/21 12:05		8.64	58	750		128	ND	41.5	0.822	ND	ND	9,76	6.3	380		0.579	0.11	75.3	78.2	ND	ND	27.3	28	ND	ND			ND	ND	ND	ND
	3/8/21 12:24		7.84	924	756		130	ND	41.6	0.806	ND	ND	12.7	8.65	368		1.79	ND	75.1	74.9	0.763	ND	26	27.3	0.00416	ND			ND	ND	ND	ND
	3/11/21 10:04		8.86	9	712		108	ND	40.9	0.759	0.321	ND	8.1	5.45	367	0.64	ND	ND	68.6	69.8	ND	ND	25.5	25.5	ND	ND			ND	ND	ND	ND
	3/15/21 11:04		8.88	29	706		112	ND	40.9	0.83	ND	ND	9.45	9.76	379	1.28	0.214	ND	75.8	83.1	ND	ND	26.7	28.5	ND	ND			ND	ND	ND	ND
	3/18/21 10:49		8.76	1470	776		104	ND	41.4	0.882	ND	ND	ND	5	367	1.28	0.919	ND	78.2	78.2	ND	ND	25.8	25.8	ND	ND			ND	ND	ND	ND
	7/7/21 15:54	41.84	7.69	2940	762		107	ND	42.3	0.858	ND	ND	ND	ND	378		1.53	ND	73.8	74.6	0.929	ND	25.2	29.3	0.005	ND			ND	ND	ND	ND
	7/8/21 14:43	43.52	8.13	512	764		99	ND	42.4	0.918	ND	ND	ND	ND	380		0.256	0.172	79.2	82	ND	ND	27.7	27.4	ND	ND			ND	ND	ND	ND
	8/5/21 7:00	32.90	8.74	1080																												
	8/5/21 7:30	31.70	8.29	667																												
	8/5/21 8:00	32.70	8.17	637																												
	8/5/21 8:30	32.90	8.2	611																												
	8/5/21 9:00	34.40	8.07	723																												
	8/5/21 9:30	34.70	7.96	726																												
	8/5/21 10:00	34.30	7.98	840																												
	8/5/21 10:30	35.70	7.95	575																												
	8/5/21 11:00	36.40	7.93	830																												
	8/5/21 11:30	35.90	7.89	1320																												
	8/5/21 12:00	37.90	7.86	1010																												
	8/5/21 12:30	36.70	8.19	807																												
	8/5/21 13:00	37.80	8.05	483																												
	8/5/21 13:30	38.00	7.32	292																												
	8/5/21 14:00	38.20	7.04	396																												
	8/5/21 14:30	38.70	7.85	846																												
	8/5/21 15:00	40.30	7.95	496																												
	8/5/21 15:30	40.20	8.35	306																												
	8/5/21 16:00	35.90	7.92	782																												
	8/5/21 16:30	38.10	7.88	643																												
	8/5/21 17:00	40.50	7.96	856																												
	8/5/21 17:30	38.90	9.61	20																												
	8/5/21 18:00	38.50	9.67	8																												
	8/5/21 18:30	37.40	9.84	6																												
	9/13/21 13:41	34.40	8.04	483	771		104	ND	43.5	0.921	ND		ND	ND	393		2.17	ND	83.5	75.3	ND	ND	30.9	28.2			92.5	108				
	9/16/21 13:42	34.30	7.93	2000	790		98.5	ND	43.1	0.877	ND		ND	ND	403		ND	ND	84.7	74.9	ND	ND	31.2	28.3			93.6	110				
	9/17/21 13:01	30.70	7.93	1530	783		95.2	ND	43.3	0.929	ND		ND	2.47	407		ND	ND	71.3	72	ND	1.29	28.8	28.1			86.6	108				
	Average	36.67		724.71	755.09		109.79		42.01	0.86	0.32		9.28	6.05	381.55	1.07	1.04	0.14	76.41	75.97	0.73	1.29	27.52	27.58	0.00		90.90	108.67				
	Max	43.52		2940.00	790.00		130.00		43.50	0.93	0.32		12.70	9.76	407.00	1.28	2.17	0.17	84.70	83.10	0.93	1.29	31.20	29.30	0.01		93.60	110.00				
U4 Hopper Overflow	7/7/21 15:00	38.83	7.63	15	747		110	ND	42.1	0.779	ND	ND	ND	ND	367		0.113	ND	66.2	76.9	ND	ND	26.6	29.4	ND	ND			ND	ND	ND	ND
	7/8/21 14:05	55.80	7.76	373	773		92	ND	42.7	1.01	ND	ND	ND	ND	392		0.345	ND	79.9	82.6	ND	ND	27.2	27.6	0.00494	0.00462			ND	ND	ND	ND
	9/13/21 13:10	27.60	8.66	2.5	781		107	ND	44.1	0.952	ND		ND	ND	394		0.859	0.813	81.4	86.2	ND	ND	29.2	28.4			90.8	123				
	9/16/21 12:22	31.40	8.36	98	766		103	ND	43.2	0.82	ND		ND	ND	393		ND	ND	79.9	73.3	ND	ND	30.8	29			92.1	114				
	9/17/21 11:45	29.50	8.54	44	777		102	ND	43.1	0.835	ND		ND	ND	392		ND	ND	83.1	71	ND	ND	30.7	28.5			93.3	111				
U5 Hopper Overflow	7/7/21 15:17	55.20	6.85	276	773		82	ND	42.6	1.13	ND	ND	ND	ND	403		1.63	ND	66.9	76.6	0.758	ND	25.8	27.3	0.00618	ND			ND	ND	ND	ND
	7/8/21 14:13	54.22	7.81	307	755		90	ND	42.6	1.03	ND	ND	ND	ND	392		0.238	ND	81.1	81.6	ND	ND	28.4	28.4	0.00502	0.00424			ND	ND	ND	ND
	9/13/21 13:19	40.30	7.85	98	773		90	ND	43.8	1.06	ND		ND	ND	405		0.514	ND	81.8	80.1	ND	ND	30.9	29			90.1	115				
	9/16/21 12:03	36.10	7.54	493	776		98.4	ND	43.3	0.953	ND		ND	ND	404		ND	ND	81.6	70.2	ND	ND	31.9	27.3			90.5	103				
	9/17/21 11:51	38.10	7.64	131	793		89.5	ND	43.6	1.06	ND		ND	2.8	415		ND	ND	73	71.1	ND	ND	28	27.6			86.7	122				
	Average			183.75	771.40		96.39		43.11	0.96					395.70		0.62		77.49	76.96	0.76		28.95	28.25	0.005	0.004						
	Max			493.00	793.00		110.00		44.10	1.13					415.00		1.63		83.10	86.20	0.76		31.90	29.40	0.006	0.005						

BURNS McDONNELL

Client: APS Four Corners

Date 10/18/2021

Project No. 129532

Notes:
1) Non Detects (ND are not factored into average/max.
2) Blank cells were not analyzed for specific constituent.

Stream Description	Sample Date/Time	Temp (C)	pH	Total Suspended Solids, ppm	Total Dissolved Solids, ppm	Oil & Grease, ppm	Alkalinity as CaCO3, ppm	Acidity, ppm	Chloride, ppm	Fluoride, ppm	Nitrate, ppm	Nitrite, ppm	Total Silica, ppm	Dissolved Silica, ppm	Sulfate, ppm	Sulfite, ppm	Total Aluminum,ppm	Dissolved Aluminum,ppm	Total Calcium, ppm	Dissolved Calcium, ppm	Total Iron, ppm	Dissolved Iron, ppm	Total Magnesium, ppm	Dissolved Magnesium, ppm	Total Arsenic, ppm	Dissolved Arsenic, ppm	Total Sodium, ppm	Dissolved Sodium, ppm	Total Mercury, ppb	Dissolved Mercury, ppb	Total Selenium, ppb	Dissolved Selenium, ppb
Sump #8	8/10/21 11:30		8.58		752	7.7	114	ND	43.8						393																	
	8/12/21 14:40		8.58	8	759	ND	114	ND	43.3						377																	
	8/17/21 11:00		8.56	11	736	9.18	106	ND	43.7						388																	
	8/19/21 16:15		8.47	22	753	8.31	111	ND	43.6						389																	
	9/13/21 14:53		8.45	13	709	ND	104	ND	42.6						385																	
	9/16/21 12:51		8.74	6	749	ND	103	ND	41.5						385																	
	9/17/21 10:31		8.79	8	775	ND	103	ND	42.4						392																	
	Average			11.3333	747.571	8.39667	107.857		42.9857						387																	
	Max			22	775	9.18	114		43.8						393																	
East Sump	8/10/21 11:53		8.46	10	587	ND	70.2	ND	28.6						322																	
	8/12/21 14:52		8.58	13	626	ND	72.3	ND	29						324																	
	8/17/21 11:15		8.48	7	629	5.4	76.4	ND	29.8						339																	
	8/19/21 16:20		8.26	80	659	ND	75	ND	28.4						345																	
	Average			27.5	625.25	5.4	73.475		28.95						332.5																	
	Max			80	659	5.4	76.4		29.8						345																	
West Sump	8/10/21 12:12		8.6	10	1140	5.4	179	ND	72.7						590																	
	8/12/21 15:00		8.52	9	1330	ND	181	ND	83						685																	
	8/17/21 11:25		8.53	13	1190	6.5	163	ND	74						600																	
	8/19/21 16:30		8.43	13	1200	ND	158	ND	73.6						605																	
	9/13/21 15:22		8.63	19	1400	ND	192	ND	88.7						716																	
	9/16/21 11:41		8.68	6	1190	ND	148	ND	70						590																	
	9/17/21 10:10		8.71	13	1370	ND	162	ND	82.6						692																	
	Average			11.8571	1260	5.95	169		77.8						639.714																	
	Max			19	1400	6.5	192		88.7						716																	
U4 Baghouse Enclosure Sump	8/10/21 11:07		7.86	8600	3960	83.2	23.2	5.43	176						2370																	
	8/12/21 14:30		8.02	3680	2390	28.8	98.6	ND	99.5						1460																	
	8/17/21 10:50		8.22	8230	1610	32	113	ND	64.9						974																	
	8/19/21 16:04		8.05	5420	1720	48.4	120	ND	55.3						1040																	
	9/13/21 14:40		6.27	5720	2020	79.4	ND	187	70.9						1330																	
	9/16/21 13:24		6.36	4330	2160	62.3	24.5	ND	80.1						1580																	
	9/17/21 12:13		6.41	2190	2410	86.6	ND	104	82.1						1600																	
	Average			5452.86	2324.29	60.1	88.7	98.81	89.8286						1479.14																	
	Max			8600	3960	86.6	120	187	176						2370																	
U5 Baghouse Enclosure Sump	8/10/21 10:42		8.76	8830	1870	19.7	117	ND	56.4						1080																	
	8/12/21 14:18		8.1	21500	2120	14.5	171	ND	63.9						1180																	
	8/17/21 10:38		8.6	10600	1660	16.5	118	ND	56.8						1050																	
	8/19/21 15:54		8.12	4460	1610	9.3	125	ND	56.6						1020																	
	9/13/21 14:30		7.48	3810	1200	9.7	ND	ND	30.5						727																	
	9/16/21 13:59		7.2	1350	1090	ND	32.3	ND	ND						836																	
	9/17/21 11:04		8.2	1010	1270	6.07	ND	ND	29.8						733																	
	Average			7365.71	1545.71	13.94	132.75		52.84						946.571																	
	Max			21500	2120	19.7	171		63.9						1180																	

APPENDIX D – CHEMISTRY CALCULATIONS

Baseline Conditions - Open Loop Configuration

Entire system volume	4,594,353	gallons	3,190.52	gpm	USER INPUT VALUES	
Bottom ash hopper volume, total	149,600	gallons				
Bottom ash hydrobins, total	647,694	gallons				
Makeup (gpm) (dragout + evap)	44.79					
Total Makeup (GPD)	64,504	gpd				
Dragout	50,400	gpd	35.00	gpm, from Ash design basis		
System Evaporation	14,104	gpd	9.79	gpm	9.79	gpm, BASWR evaporation plus bottom ash hopper evaporation
Cycles of Concentration			1.00	current system is open loop - no cycling		
Hydraulic Residence Time (HRT), day	71.23					
Seal trough overflow / agitation nozzles	3,047	gpm	4,387,680	gal/day - assumes seal trough flow is continuous		
Sluice rate	2,628	gpm	1,261,440	gal/day - assumes sluicing 2x per day for 2 hours each sluice per unit		

This sheet calculates the concentration of solutes added to the system by the ash, for use in projecting water quality under different purge rates. When the estimated concentrations in red font (Estimated Concentrations row) agree with the measured values (Hydrobin Overflow row), the estimated contribution of the ash to the solutes in the system from the model is showing good correlation and is considered acceptable.

Water quality data	Cond, uS/cm	TDS, ppm	Cl, ppm	SO4, ppm	Mg, ppm	Ca, ppm	alk/HCO3, ppm	alk/CO3, ppm	pH, SU	Temp, F	PSI = 2(pHs)-pHeq	RSI =2(pHs) - pHmeasured	LSI = pHmeasured - pHs	LS-I
Makeup Water	1,100.75	737.50	41.98	373.75	28.49	75.93	111.13		8.86	70.00	8.12	6.79	1.03	4.92
Hydrobin Overflow	1,127.00	755.09	42.01	381.55	27.52	76.41	109.79		8.20	98.01	7.55	6.87	0.66	5.07
Current Cycles Observed	1.0239	1.0239	1.0007	1.0209	0.9660	1.0063	0.9879							
Change in system concentration	26.25	17.59	0.03	7.80	(0.97)	0.48	(1.34)			28.01				
Excess concentration at reported HRT, ppm/day		0.2470	0.0004	0.1095	(0.0136)	0.0067	(0.0188)							
Concentration change from evaporation (increase)		13.28	0.76	6.73	0.51	1.37	2.00	<- increase in system concentration from evaporation losses						
Concentration input from contact with bottom ash		4.31	(0.73)	1.07	(1.48)	(0.89)	(3.34)	<- negative values do not make sense; should have an increase in concentration						

	MGD	gpm	
		100.0%	percentage of design basis
Evaporation	0.014	9.79	gpm
Dragout	0.050	35.00	gpm, calculated dragout/system losses to approximate concentration factors
Sluice rate	3.784	2,628.00	gpm, current sluicing rate, open-loop system
Makeup	0.065	44.79	gpm

APPENDIX E – GENERAL ARRANGEMENT

BURNS McDONNELL

date 08/12/21

designed K. MATTHEWS

FOUR CORNERS

OVERALL SITE

ELG PLANT MODIFICATIONS

GENERAL ARRANGEMENT

project 129532

W. A. FCC016494

SK M003

Z:\CLIENTS\ENR\ARIZONAPS\129532_FCC016494ELG\DESIGN\MECH\CADD\SKETCHES\129532_SKM003.DWG 2/24/2022 4:31 PM KJMATTHEWS

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

Attachment 6: APS NPDES Permit Modification Update

Tel. 602-250-2414
Cell 602-284-3899
e-mail: neal.brown@aps.com

PO Box 53999
Mail Station 9303
Phoenix, Arizona 85072

January 26, 2023

Electronically Submitted

U.S. Environmental Protection Agency, Region 9
NPDES Permits Section, Water Division (WTR-2-3)
Attn: Gary Sheth (Sheth.Gary@epa.gov)
75 Hawthorne Street
San Francisco, CA 94105

Subject: PERMIT MODIFICATION APPROACH REQUEST
Information Supporting a Permit Modification Pursuant to Amended Standards in the Steam Electric Reconsideration Rule
APS Four Corners Power Plant – Fruitland, New Mexico
NPDES Permit No. NN0000019

Dear Mr. Sheth,

Further to your discussion with our staff, this letter provides an update on the construction of a high recycle bottom ash transport water (BATW) recirculation system at the Arizona Public Service Company (APS) Four Corners Power Plant (FCPP) and requests a minor change to the schedule identified in our Proposed Permit Modification Approach transmitted to the U.S. Environmental Protection Agency (EPA) on November 1, 2022. This request would not affect APS's request that EPA establish December 31, 2025 as the "as soon as possible" date for compliance with current BATW ELG requirements, nor does it affect the date by which APS will complete construction of the FCPP BATW high-recycle rate water recirculation system (i.e., December 31, 2023); this request only concerns certain interim milestones APS addressed in its November 1, 2022 letter.

In that letter, we indicated that two planned outages had been scheduled for BATW recirculation system installation, commissioning, and tuning. The first outage was to begin in April 2023 (the 2023 Spring Outage) and be complete before 2023 "Summer Run," which refers to a period that begins on June 1 each year when FCPP operates day-in, day-out at full capacity and provides a critical supply of electricity to the western United States. During recent "Summer Runs," FCPP has proven essential to keeping the lights on within APS's service territory and elsewhere in the region. The second outage was scheduled to begin in October 2023 (the 2023 Fall Outage) to address any issues or concerns that were discovered over the summer months of system startup operations.

Unfortunately, several global supply chain and material availability constraints outside of APS's control have compounded to make it impossible to complete the installation and commissioning of our high-recycle BATW recirculation system prior to the 2023 Summer Run. APS previously identified several critical equipment items that must be on-site and verified to be in working order at the beginning of the 2023 Spring Outage to ensure the system is installed and connections are made before the end of the outage. In particular, the delivery of previously identified long-lead critical equipment has been delayed such that it is no longer possible to complete this work during the Spring Outage. Affected equipment includes, but is not limited to control valves, DCS hardware, automatic transfer switches, and project-specific electrical cable.

Even with APS's best efforts to secure the needed equipment as soon as possible, receipt of this equipment is still in question until it arrives onsite and the outlook as to vendors *actually*

meeting projected delivery dates remains highly uncertain. On this basis, we have had to revisit our plans over the past month for the 2023 Spring Outage. Power plant outages are carefully scheduled—involving the orchestrated activities of multiple stakeholders both onsite and offsite—to prevent adverse impacts to the grid and ensure the availability of replacement capacity while FCPP is offline. We still intend to conduct the 2023 Spring Outage, for items supporting construction of the BATW recirculation system as well as other plant maintenance; however, our objective has shifted from completing project installation to minimizing the work that must be conducted during the 2023 Fall Outage to reduce future risk to the project schedule.

We believe that our supply chain issues should be resolved no later than June 2023, but our operating obligations for the 2023 "Summer Run" will postpone making final equipment connections and startup of the new recirculation system. That work must now be completed during the scheduled 2023 Fall Outage in order to ensure continued operations of FCPP and regional electric grid reliability.

Since this change in schedule results in no opportunity to perform initial testing and balancing of the new BATW recirculation system before the planned transition to full-time operation of this system on January 1, 2024, APS requests a change to the Company's currently pending permit modification request. Instead of interim discharge limits taking effect on January 1, 2024 (as described in our November 1, 2022 letter), our permit modification should reflect a start date of June 30, 2024 for when the interim discharge limits apply. We propose that prior to June 30, 2024, operation of the high-recycle BATW recirculation system be required (as of January 1, 2024) but that BATW discharges would be allowed to continue through the existing 01E outfall on an as-needed basis to ensure safe and reliable plant operations for a six-month system startup period while APS identifies and addresses potential issues prior to the 2024 "Summer Run". No changes are required or requested to the following aspects of the proposed permit modification: the compliance date for construction of the high-recycle BATW recirculation system (i.e., December 31, 2023), the submittal date for an updated draft Initial Certification incorporating interim operational data for the system (i.e., March 31, 2025), or the "as soon as possible" date in the NPDES permit for compliance with amended BATW discharge requirements (i.e., December 31, 2025).

APS is committed to successfully operating the new high-recycle BATW system. As previously discussed with EPA, FCPP is a key resource for ensuring regional grid reliability over the near term while APS transitions away from coal-fired plant ownership and operations by 2031.

* * * *

APS appreciates EPA's input on our requested permit modification for FCPP. We welcome the opportunity to discuss any additional feedback you may have on this proposal. If you have any questions or would like to discuss this request in more detail, please contact Natalie Chrisman Lazarr at (602) 316-1324 or via email at natalie.chrismanlazarr@aps.com.

Sincerely,

Neal Brown
Environmental Operations Manager
Arizona Public Service Company

Cc: Mr. Jeffrey Jenkins, Plant Manager – APS, Four Corners Power Plant
Ms. Pamela Norris, Environmental Manager – APS, Four Corners Power Plant
Mr. Jeffrey Allmon, Senior Attorney – Pinnacle West Capital Corporation
Mr. Phil Smithers, APS, Director of Safety, Environmental, & Human Performance

Attachment 7: APS NPDES Permit Modification Supplementary Information

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July 21, 2023

Electronically Submitted

U.S. Environmental Protection Agency, Region 9
NPDES Permits Section, Water Division (WTR-2-3)
Attn: Gary Sheth (Sheth.Gary@epa.gov)
75 Hawthorne Street
San Francisco, CA 94105

Subject: SUPPLEMENTARY INFORMATION
Supporting a Permit Modification Pursuant to
Amended Standards in the Steam Electric Reconsideration Rule
APS Four Corners Power Plant – Fruitland, New Mexico
NPDES Permit No. NN0000019

Dear Mr. Sheth,

Pursuant to your request, this letter transmits supplementary information supporting modification of the Four Corners Power Plant (FCPP) National Pollutant Discharge Elimination System (NPDES) permit (No. NN0000019) pursuant to amended standards for bottom ash transport water (BATW) in 40 CFR 423 – Steam Electric Power Generating Point Source Category (i.e., the 2020 ELG Steam Electric Reconsideration Rule, 85 Fed Reg 64,650 (October 13, 2020)). Specifically, enclosed as Attachment 1 is a photograph log documenting the substantial progress FCPP has made towards transforming our once-through BATW system into a high-recycle BATW system. FCPP is on track to complete construction activities before the end of 2023, and plans to conduct startup and testing between January 1, 2024 and June 29, 2024, as proposed in our January 26, 2023 letter. This letter also presents estimated BATW flows to be discharged via our new low volume wastewater (LVWW) system through outfall 01E during that 6-month high-recycle BATW system start-up period, which will represent a 93% reduction from once-through BATW operations.

Discussion of Photograph Log. As depicted in Attachment 1, Arizona Public Service Company (APS) has advanced installation of the high-recycle BATW system since our last update; we are on track to complete construction activities during our planned 2023 Fall Outage and conduct initial system commissioning with equipment checks before the end of the year. When complete, we will have installed:

- 20,000 linear feet (ft) of pipe
- 15 new pumps (four vertical turbine, three centrifugal, and eight submersible pumps)
- 70,000 linear ft of medium voltage cable
- Greater than 100,000 linear ft of low voltage cable; and
- 177 tons of structural steel associated with the pipe rack and pipe supports

The attached photograph log, which provides photos taken on June 27, 2023 (unless otherwise noted), shows the substantial progress FCPP has made to convert operations to the high-recycle BATW system. The photograph log notes multiple process improvements that will increase the treatment efficiency of our future system including (1) the addition of a new polymer system upgradient of the Hydrobin system, (2) the installation of a new chemical amendment system for pH/alkalinity control, (3) upgrades to the existing polymer system upgradient of the Bottom Ash Sluice Water Return (BASWR) tank system for better

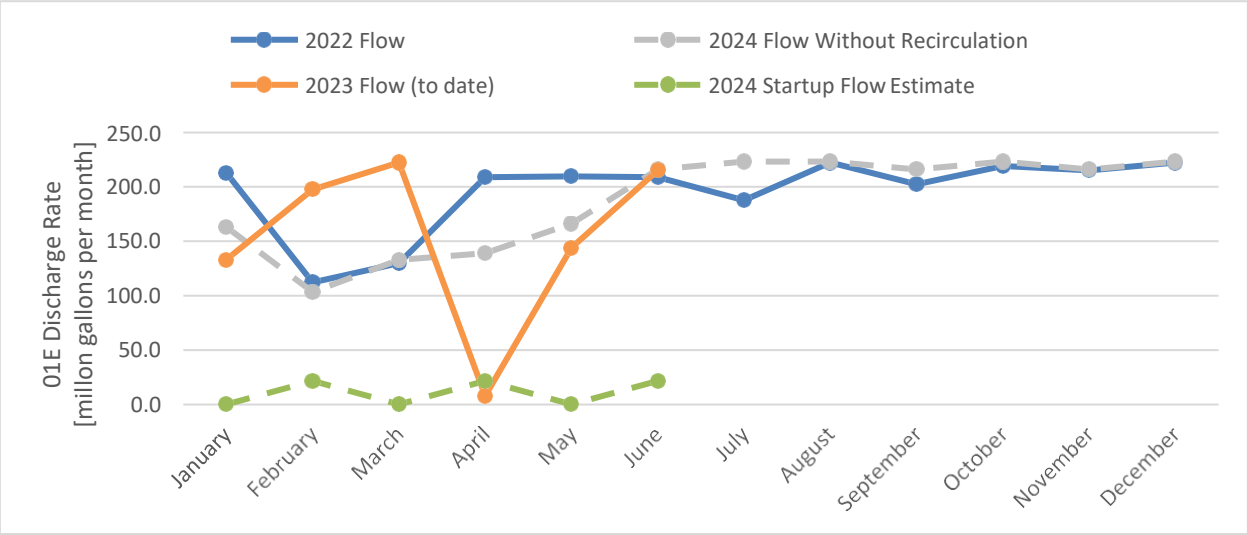
distribution, and (4) transition to hydraulic dredging of solids from the primary chamber of the BASWR tank system in lieu of mechanical dredging.

Other improvements that are being made to the future BATW high recycle system include the addition of two new 112,000-gallon Hydrobin Overflow Return Tanks that will provide substantial surge capacity and flow equalization to recirculation system operations. Based on the normal operating water level (7 ft) of these a 22-ft tall tanks, the surge capacity of this tank system is 136,000 gallons. Additional surge capacity (149,000 gallons) is available in the existing BASWR tank system which has 1 ft 9 inches of freeboard to its design capacity.

In summary, our efforts to improve treatment efficiency and add surge capacity will promote system reliability and limit the need for future discharges of BATW from recirculation operations due to water balance, water chemistry, and maintenance concerns. Even in the face of supply chain and material availability constraints, FCPP has worked diligently to convert the system and has made substantial progress to ensure that construction will be complete before the end of 2023.

Estimate of BATW Discharges During Startup. As noted in our January 26, 2023 letter to EPA, several global supply chain and material availability constraints outside of APS's control have compounded to make startup and testing of our new BATW high recycle system impossible before the end of 2023. Based on APS's request for a six-month startup period during which recirculation operations will be required but interim discharge limits will not apply, EPA has asked APS for an estimate of how much BATW could potentially be discharged during this startup period with a comparison to how much would be discharged if once-through BATW operations continued.

The latter is readily estimated based on past discharges as well as projected levels of electrical generating unit operation from January 2024 through June 2024. As indicated in the graph below, APS's generation of BATW in our once-through system is relatively consistent during the months of June through December but can be more variable in the first half of the year based on demand. Given lower demand for electricity in our service area from January through May each year, APS generally schedules generating unit outages at FCPP for maintenance during this time of year. For 2024, single unit outages for each of our electrical generating units are planned. On this basis, theoretical BATW flows through internal outfall 01E (if the recirculation system was not in place) would range from approximately 100 to 220 million gallons per month, or 920 million gallons, during the first six months of 2024.



Although APS is still finalizing our testing program for BATW recirculation startup, we are confident that BATW discharges through our LVWW system outfall during this period would be nominal relative to once-through BATW system operations. This is because a primary objective of startup testing would be to cycle up the chemistry in recirculation operations to assess potential impacts. If testing required resetting the chemistry to initial conditions,

purging the system would take some time given the maximum rate at which BATW can be purged from BATW recirculation operations to the LVWW system (i.e., 500 gallons per minute) and the number of turnover volumes that would be required for a reset. Based on these constraints, a conservative estimate of BATW discharges during startup would be 22 million gallons per month for up to three months (65 million gallons) assuming three months of zero-liquid discharge and three months of purging at the maximum recirculation system purge rate to the LVWW system (which discharges to internal outfall 01E). This volume represents a 93% reduction over the six-month startup period from once-through BATW operations.

* * * *

APS appreciates EPA's input on and prompt consideration of our requested permit modification for FCPP. We welcome the opportunity to discuss this supplementary information. If you have any questions or would like to discuss this letter in more detail, please contact Natalie Chrisman Lazarr at (602) 316-1324 or via email at natalie.chrismanlazarr@aps.com.

Sincerely,

Neal Brown
Environmental Operations Manager
Arizona Public Service Company

Attachment 1 – BATW Recirculation Project Photograph Log (Four Corners Power Plant)

Cc: Mr. Jeffrey Jenkins, Plant Manager – APS, Four Corners Power Plant
Ms. Pamela Norris, Environmental Manager – APS, Four Corners Power Plant
Mr. Jeffrey Allmon, Senior Attorney – Pinnacle West Capital Corporation
Mr. Phil Smithers, APS, Director of Safety, Environmental, & Human Performance

ATTACHMENT 1

BATW Recirculation Project Photograph Log (Four Corners Power Plant)

BATW Recirculation Project

FOUR CORNERS POWER PLANT

Photographs taken on June 27, 2023 (unless otherwise noted)

Photograph 1. *Bottom ash hopper under Unit 4's boiler*. Process flow in the bottom ash transport water (BATW) sluice system begins with the collection of bottom ash from under each unit's boiler. There are currently two electrical generating units operating at Four Corners (Units 4 and 5) and each unit has three bottom ash hoppers to collect bottom ash and slag generated during coal combustion.	
Photograph 2. *Bottom ash sluice piping located under the clinker grinder at the base of one of the bottom ash hoppers of Unit 5.* Ash and slag that falls into each of the bottom ash hoppers is ground and then sluiced with water from under each unit. The BATW is routed to a common sluice pipeline system that conveys the water and solids to multiple BATW treatment unit processes. As depicted in this photograph, the lack of clearance below the hoppers renders infeasible the installation of alternative bottom ash handling technologies.	

Photograph 3. *BATW sluice piping.* After collecting the sluice water carrying bottom ash from the individual hoppers, the BATW sluice piping (one pipe for Unit 4 and the other for Unit 5) is routed from the power block area (where the units are located) to a nearby ash processing area.	
Photograph 4. *New polymer amendment system upstream of the Hydrobin system*. The APS engineering team identified the need to enhance the performance of the Hydrobin system in planned recirculation operations. The system is installed and has been operational since June 2023 (connections were completed during the Spring 2023 outage).	

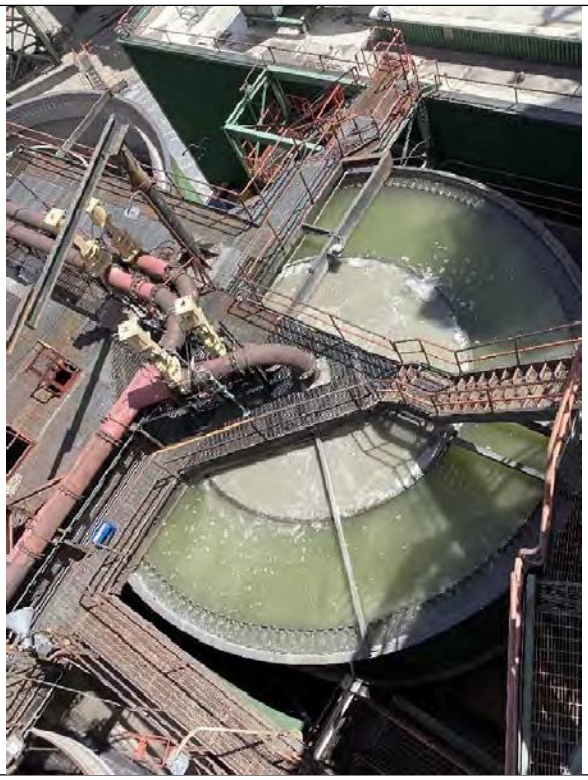
Photograph 5.

Hydrobins associated with Units 4 and 5 (viewed from below in the ash processing area). Four Corners Power Plant has used Hydrobin systems to separate bottom ash from sluice water for much of its operational history. BATW laden with bottom ash is directed to one of four 162,000-gallon Hydrobins sequentially, promoting reliable, gravity-driven solids separation.

Photograph 6.

View of a filled Hydrobin from the top of the bin prior to the polymer amendment upgrade in March 2023. BATW laden with bottom ash discharges into one of the bins until full; discharges are then directed to the next empty bin. Hydrobin overflow water from the bin is recovered either by overflowing the serrated weir located around the bin perimeter or flowing through a system of fine mesh screen decanters located along the sides of the bins.

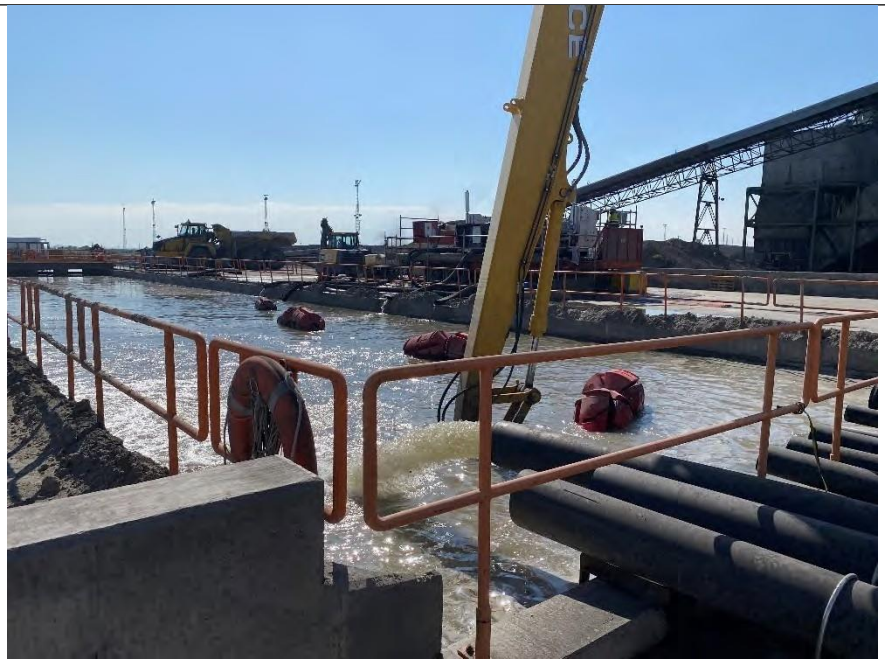
Photograph taken on March 23, 2023

Photograph 7. *View of a filled Hydrobin from the top of the bin after the polymer amendment upgrade in June 2023*. Visible increases in the treatment performance of the Hydrobin system were observed following the addition of polymer upgradient of this system.	
Photograph 8. *View inside a Hydrobin after sluice water has drained from the bin*. Bottom ash drains readily; the cycle time to drain a bin is less than six hours.	

Photograph 9. *View inside a Hydrobin after the bin has been emptied of bottom ash.* Fine mesh decant screens are visible along the sides of the bin interior.	
Photograph 10. *Ash haul truck being filled from overhead Hydrobin system.* After filling, this truck will transport the bottom ash which has a moisture content of approximately 20% by weight to an on-site Coal Combustion Residuals landfill.	

Photograph 11. *One of two new 112,000-gallon Hydrobin Overflow Return Tanks.* Sluice water separated from bottom ash by the Hydrobin system will be directed to these tanks when recirculation operations begin. These tanks can be operated individually or as a coupled tank system to provide surge capacity and flexibility. Tanks and pumps are in place; electrical and instrumentation connections were in progress in June 2023.	
Photograph 12. *Hydrobin Overflow Return Pumps.* These pumps will be used to convey water processed in the Hydrobin system to the Bottom Ash Sluice Water Recycle (BASWR) tank system for additional treatment during recirculation operations. Three pumps are installed; two pumps are required for combined U4 and U5 operations and the third is an installed spare for redundancy.	

Photograph 13. *New chemical amendment system.* Multiple pumps and metering equipment have been installed immediately downstream of the Hydrobin overflow return pumps to inject either acid, caustic or soda ash (to supply alkalinity) from future chemical feed totes. Since it is currently unknown which chemical adjustments could be necessary, pumps and associated equipment have been provided for an array of likely metering rates and chemical compatibilities.	
Photograph 14. *Piping routed through baghouse area between the ash processing area and the BASWR tank system*. Multiple pipes are shown because some pipes convey flows from the Hydrobin overflow tanks and the bottom ash area return sump to the BASWR tank system for treatment and some pipes convey treated flows from the BASWR tank system back to Unit 4 and 5 for sluicing and flush water. All pipelines routed through the congested areas of the plant were in place as of June 2023.	

Photograph 15. *Pipe rack upstream of the BASWR tank system influent.* An exposed pipeline conveyance system was constructed to ensure any issues associated with this critical system can be identified and addressed immediately. The area that the pipe rack is routed through is a high traffic area which required that the rack be elevated.	
Photograph 16. *Discharge into the primary cell of the BASWR tank*. In addition to upgrading the existing polymer amendment system upstream of the BASWR tank to enhance polymer distribution, a new method of removing solids from the BASWR system was in place as of June 2023. In lieu of mechanically removing solids, hydraulic dredging is now performed to limit disturbance of settling in other portions of the pond resulting in better treatment performance of the tank system.	

Photograph 17.

View looking west with the pipe rack on the right and the BASWR tank system on the left. This portion of the pipe rack supports piping conveying treated water from the BASWR tank system back to the Unit 4 and 5 sluice and flush water systems. The piping is in place; electrical and instrumentation connections were in progress in June 2023.

Photograph 18.

Sluice and flush pumps above the BASWR tank system clear well. Two high pressure sluice pumps and two low pressure flush pumps are installed above the BASWR tank system clear well to recirculate treated BATW back to Units 4 and 5. Work to complete pump intake piping, electrical connections, and control system installation was in progress in June 2023.

Photograph taken on July 17, 2023

Photograph 19. *Secondary cells of the BASWR tank system (to the left) and the new Low Volume Wastewater (LVWW) treatment tank (to the right)*. The LVWW system was undergoing concrete curing in June 2023. The concrete contains a Xypex admixture for waterproofing. After curing, the tank will be leak tested in accordance with ACI Standard 350.1 and independent oversight by the design engineer.	 *Photograph taken on June 28, 2023*
Photograph 20. *Valving on the flush water system.* During the Spring 2023 outage, recirculation piping connections to the sluice and flush water systems at both units were completed. Valving or spectacle blinds were installed during this outage to isolate the new recirculation piping from existing systems so that the plant could be placed back into operation for Summer Run. Valving and spectacle blinds can readily be repositioned for the startup of recirculation operations in the Fall of 2023.