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*"Award Winning Water"*

September 26, 2023

Ms. Christina Brown, Enforcement Analyst  
Office of Water Quality/Enforcement Branch  
Division of Environmental Quality  
5301 Northshore Dr.  
North Little Rock, Arkansas 72118

RE: CAO LIS No. 22-088; NPDES Permit No. AR0021768, AFIN 58-00105

Dear Ms. Brown,

Please find included with this correspondence a Nitrification Study Report for the Russellville wastewater plant as required per the referenced consent administrative order. The deadline for this report is November 1, 2023 and we are submitting this report to comply with the requirement.

I am submitting this report both as CEO of City Corporation and as a licensed professional engineer in the state of Arkansas. We are confident that this report will address the concerns at the plant with regards to the nitrification issues that were identified prior to completion of our most recent plant upgrade/expansion.

If there is anything additional information we need to provide regarding this item, please let me know. Should you have any questions or need other info please contact me at (479) 928-2105 or by email at [smallett@citycorporation.com](mailto:smallett@citycorporation.com).

Sincerely,

A handwritten signature in blue ink, appearing to read "Steve Mallett, Jr.", is written over a light blue horizontal line.

Steve Mallett, Jr.  
Chief Executive Officer  
City Corporation

205 W. 3rd Place  
PO Box 3186  
Russellville, AR 72811  
[citycorporation.com](http://citycorporation.com)



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**Pollution Control Works (PCW)  
Permit No: AR0021768**

**Nitrification Study Report**

**September 26, 2023**



# City Corporation PCW Nitrification Study Report

## Introduction

On August 23, 2022, the Arkansas Energy & Environment, Division of Environmental Quality Enforcement Branch issued Consent Administrative Order (CAO) LIS No. 22-088 to City Corp – Russellville Water & Sewer (City Corp). The CAO required City Corp to submit a Corrective Action Plan (CAP) that included measures to address NPDES permit effluent violations recorded between January 2019 and February 2022. This Nitrification Study Report was prepared as part of the requirements found in the Corrective Action Plan (CAP) submitted by RCC to DEQ on October 31, 2022. The CAP stated that RCC would perform a detailed study into the actions necessary to achieve consistent nitrification at the PCW under the supervision of a professional engineer, with completion of the study on November 1, 2023. This report is intended to outline the actions and improvements undertaken by City Corp to address the nitrification issues at the Pollution Control Works (PCW).

In July 2021, construction work began on a \$15,000,000 treatment upgrade project at the PCW. The project consisted of removal of the primary clarifiers, conversion of an existing primary basin to an anaerobic selector, addition of a fourth aeration basin, new larger variable frequency drive driven turbines with advanced PLC driven dissolved oxygen control for the aeration basins, new mixed liquor recirculation pumps, hydraulic improvements for equal mixed liquor distribution to secondary clarification, a peracetic acid feed system and a new disinfection contact basin. This project was formally completed on March 3, 2023, with State Construction Permit AR0021768C being terminated effective April 19, 2023.

Several factors have been identified over recent years as possible causes of past nitrification inhibition. Listed below, are these factors and the actions taken to prevent or minimize inhibition:

### Batch loading events

- The PCW experienced a series of batch loading events in January 2021 from a single Significant Industrial User (SIU) that created an inability for the plant to properly nitrify over a period of four months.
- Notice of violation issued to contributing SIU for causing loss of efficiency at the PCW, May 2021.
- A transfer of operation of the pretreatment plant from City Corp, put full responsibility of batch loading events on the SIU, June 2022.
- Completed construction of a fourth aeration basin at the PCW created additional treatment volume to better handle potential batch loads, fall of 2022.
- Additional blower capacity combined with variable frequency drive (VFD) programming gives the ability to keep dissolved oxygen levels consistent in the aeration basins.
- No batch loading events are believed to have attributed to inhibition at the plant since July 2021.

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### Inhibitory substances

- Testing for the presence of quaternary ammonium compounds (QAC's) in the MLSS of the aeration basins conducted from April 2021 through August 2021.
- Random sampling of potential industrial sources of QAC's conducted during same timeframe.
- One instance of acute inhibitory levels of quaternary ammonium compounds found in the aeration basins, April 2021.
- All other MLSS samples that were analyzed were below acute inhibitory levels throughout the sampling period.
- Five industries identified as having various levels of QAC's in their effluent, with only one above the acute inhibition threshold.
- The Pretreatment Coordinator engaged industries to develop Best Management Practices to minimize the discharge of QAC's in their process water.
- Research shows that systems will acclimate somewhat to QAC's, but a slug load can present problems.

### Peak wet weather flow

- Between January 2022 and May 2022, the PCW experienced twelve peak flow events over 10 MGD, likely contributing to the washing out of biomass as was evident with high effluent TSS values during this period.
- All but three occurred during the cooler months (January-April) when slower growing nitrifiers take longer to re-establish.
- During this time, one aeration basin and one secondary clarifier were off-line due to ongoing construction improvements, further limiting the capacity of the treatment system.
- Higher design flow after the improvement project was completed equated to a better ability to process wet weather flow.
- Between January 2023 and May 2023, seven peak flow events of 10 MGD or more were experienced. No discharge violations were incurred because of these events.

### Insufficient alkalinity

- The City of Russellville's largest contributing Significant Industrial User can be responsible for up to approximately 25% of all influent flow during the lower flow of the summer months.
- Significant change in the influent flow stream (i.e., weekend or extended shutdown of SIU) has at times correlated with a loss of alkalinity at the PCW.
- Industrial user has been notifying City Corporation of extended shutdowns so that PCW personnel are prepared to make operational changes to account for this difference in the waste stream.
- The PCW is in the process of acquiring magnesium hydroxide to have available on site, as this chemical has shown to be more effective than lime for providing additional alkalinity when needed.

## Conclusion

City Corp feels that it has shown that the actions taken as described above, have had a positive effect on the plant's ability to process ammonia through nitrification. City Corp believes that the construction upgrades, along with continued cooperation from industrial partners, has greatly reduced potential nitrification inhibition issues. As can be shown in the attached graph, effluent ammonia values have been trending downward since June 2022. This study concludes that the PCW is capable of achieving consistent compliance with ammonia limits with no additional capital improvements required.

