



John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

REPORT ON PROPOSED CYANOTOXIN GENERAL PLAN FOR THE CITY OF WILMINGTON

The Cyanotoxin General Plan for the water treatment plant that services the City of Wilmington (PWSID: 1401211) was received January 9, 2018 from Strand Associates, Inc. with the plan application number 1212583. The Cyanotoxin General Plan was stamped by Jenn Delebreaux, P.E., with additional information received through February 22, 2018.

Existing Facility

The City of Wilmington WTP is the main source of potable water for the City of Wilmington, providing treated drinking water from Caesar Creek Lake, from which the City has a contract with Ohio Department of Natural Resources to withdraw 7 million gallons per day (MGD) from the lake. The City of Wilmington draws raw water from two reservoirs in Burtonville that can be refilled from Cowan Creek, with a combined capacity of 450 million gallons (MG). The City of Wilmington utilizes conventional surface water treatment processes, including coagulation, flocculation, sedimentation, lime softening, recarbonation, filtration, and disinfection. The plant has an approved capacity of 4.0 MGD and serves a population of 12,428 people.

Proposed Plan

The general plan proposes source water protection, avoidance strategies, reservoir management, optimization of existing treatment process for removal of intracellular microcystin (rapid mix/flocculation, sedimentation, and filtration), extracellular microcystins (PAC and Chlorine Contact Time (CT)), and overall harmful algal bloom (HAB) management for the City of Wilmington.

Source Water Protection

The Ohio EPA prepared a report for the Wilmington PWS titled "Drinking Water Source Assessment for the City of Wilmington." The drinking water source protection area as defined in the report is almost entirely outside of the City, includes six other cities, and Caesar Creek, which is managed by the United States Army Corps of Engineers (USACE). Recommendations from the report related to HAB prevention included controlling septic discharge and runoff from urban and agricultural sources and restoring riparian areas. The City has budgeted for a new source water protection coordinator position for 2018. This position is intended to address both the Caesar Creek Lake and Cowan Creek watersheds. Efforts to fill this new position are already underway.

Avoidance Strategies

The most effective avoidance strategy that the Wilmington PWS has is the capability to alternate between Caesar Creek Lake and the Burtonville Reservoirs as a raw water source. Wilmington PWS can switch between sources based on the quality of the water at each location.

Reservoir Management

The City's intake structure at Caesar Creek Lake is equipped to selectively withdraw raw water at three depths: 6 feet, 20 feet and 35 feet below the lake's normal level. The City will periodically test the lake at various depths and operate the intake to withdraw water of suitable water quality.

An algaecide program has been used to combat algal blooms in the Burtonville Reservoirs. A copper-based product is applied in the spring or early summer when algae and cyanobacteria growth begins. Treatments are normally repeated every 30 to 45 days depending on any evidence of algal growth. The dosage can be varied based upon the water quality and the algae species present. The treatment process is labor intensive and the large size of Caesar Creek Lake makes an algaecide program impractical at that location.

Intracellular Removal Optimization

Raw Water Source Depth Selection:

The raw water intake at Caesar Creek Lake recently received some maintenance work on the valves isolating raw water from varying depths. Work to maintain both the Caesar Creek Lake and Burtonville Reservoir Intakes, both pump stations, and the Burtonville Reservoirs, will continue as needed.

Ultrasonic Algae Control:

Burtonville Reservoir No. 1 will have a trial ultrasonic algae control system implemented subject to Ohio EPA approval. If the trial is successful, the ultrasonic algae control system will be expanded to Burtonville Reservoir No. 2. The system is composed of ultrasonic transducer units on floats installed strategically to cover all parts of the reservoir. The units can also be accompanied by a solar panel and battery power system, and water quality monitoring sondes. Unit floats will be placed at the spacing and location suggested by the manufacturer, a preliminary review suggests three units will be needed for the Burtonville Reservoir No. 1 and four units for Burtonville Reservoir No. 2.

Lime Feed Adjustments and Maintenance:

High lime dosages have caused lime deposits downstream in the treatment process. Lime feed will be controlled based on measured temperature, alkalinity, and pH of the raw water, while maintaining settling goals for cyanobacteria. The elevations of the Settling Basin effluent top of trough and the Filter Distribution Box weir will first be checked against the design elevations. The 18-inch DI and/or 24-inch DI pipe between the two will be cleaned or replaced as necessary following further investigations of the systems backflow problem.

Extracellular Removal

Taking its source water from an inland reservoir, Wilmington must provide at least two effective extracellular treatment barriers to potentially treat up to 50 ug/L of raw water extracellular cyanotoxins, as stated in the Ohio EPA Guidance for Developing a HAB General Plan. The plant currently has two recognized extracellular barriers: PAC addition for adsorption of cyanotoxins and chlorine Contact Time (CT) for oxidation destruction of microcystins toxin.

PAC Contact Basin:

The PAC contact basin is proposed to be located outside on the south side of the Settling Basin Building with a new pipe to divert flow from the 24-inch raw water main before it enters the Settling Basin Building. Raw water will continue to the PAC Contact Basin, with the PAC injected in line with a static mixer. The basin will have two m trains to provide flexibility for maintenance. Mixers will keep the PAC in suspension. Raw water will then be returned to the existing WTP processes.

A 21.5-foot wide, 29-foot long, and 12-foot side water depth PAC Contact Basin is sized for 20 minutes of detention time at a flow of 4.0 MGD. At the current averaged daily flow of 1.81 MGD, the basin will provide approximately 45 minutes of detention time before addition of any oxidants. In addition to the PAC Contact Basin, the existing Rapid Mix Tank, Flocculation Tanks, and Settling Basins provide another 5.5 hours of contact time for the PAC. Jar testing was completed during a recently performed CPE, but results were not conclusive. Additional jar testing should be completed to appropriately size the PAC Contact Basin during design. The PAC feed equipment rehabilitated as part of the Emergency Carbon Feed Plan will be able to dose 40 mg/L PAC. The PAC dosing locations before the plant influent flow meter and at the Rapid Mix Tank will remain as backup dosing options.

Chlorine Contact Time (CT):

Cyanotoxin oxidation is dependent on temperature, pH, contact time, and chlorine dose. During 2015 and 2016 the raw water temperature varied from 40.8 °F in the winter to 72.7 °F in the summer on average. Filter effluent pH varied from 8.84 in the winter to 8.79 in the summer on average. The clearwells have a theoretical contact time of 541 minutes at the current peak flow of 2.21 MGD, but with a baffling factor of 0.6, the actual contact time is approximately 325 minutes at 2.21MGD. Table 6.02-1 of the GP uses the AWWA calculator CyanoTOX® Version 2.0 showing the range of oxidation in the clearwells depending on the effective CT, which could vary based on operational parameters. The results are based on providing a residual chlorine concentration of 2 mg/L as recommended by Recommended Standards for Water Works 2012, but could be increased during a HAB event to increase the effective CT.

General Plan Implementation Schedule

Milestone	Date
Submit Draft HAB General Plan to OEPA	Due December 31, 2017
Draft HAB General Plan Public Hearing	February 2018
Submit Final HAB General Plan to OEPA	February 2018
Submit WSRLA HAB Nomination Form	March 2018
Implement Ultrasonic Algae Control System	April 2018
Project 30% Design Phase Completion	July 2018
Project 60% Design Phase Completion	November 2018
Project 90% Design Phase Completion	March 2019
Project Final Design Completion	April 2019
Project Advertise for Bids	May 2019
Project Bid Opening	June 2019
Submit Bid and Loan Documents to WSRLA	July 2019
Request Loan Award from WSRLA	August 2019
Project Start Construction	August 2019
Project Substantial Completion	September 2020
Project Final Completion & Startup	December 2020

The Plans are to be approved at this time under normal conditions and the following special conditions of the director:

- (a) The enclosed report contains a description of the facilities approved which may include information regarding approved operating rates, capacities, and requirements, and is incorporated herein.
- (b) In accordance with Ohio Administrative Code (OAC) 3745-90-05(B), the owner shall implement the approved cyanotoxin general plan in accordance with the approved schedule and continue to monitor for microcystins in accordance with OAC 3745-90-03 to demonstrate treatment effectiveness.
- (c) In accordance with OAC 3745-90-05(C), if the owner fails to comply with item (b) of this plan approval, it is a violation of the treatment technique requirement of the HAB rules and the owner shall issue a tier 2 notification in accordance with OAC 3745-81-32.
- (d) If there are any substantial changes to either source water or treatment, as defined in OAC 3745-91-01, the owner shall contact the Division of Drinking and Ground Waters, northeast District Office to determine if a revision to the Cyanotoxin General Plan is needed.
- (e) The Cyanotoxin General Plan shall be reviewed annually and updated as needed. Any revisions to the general plan shall be submitted to the Division of Drinking and Ground Waters, northeast District Office for review.

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