REGION 3
PHILADELPHIA, PA 19103

Report Title:	Clean Air Act Inspection of Queen Lane Water Treatment Plant
Inspection Date(s):	11/15/2023
Regulatory Program(s):	SIP, NSPS
Company Name:	Philadelphia Water Department
Facility Name:	Queen Lane Water Treatment Plant- City of Philadelphia
Facility Location:	3110 Queen Lane Philadelphia, PA 19129
Latitude:	40.01851 **Longitude:** -75.183267
County/Parish:	Philadelphia County
AFS/ICIS-Air Number:	PAPAM0004210106854
Permit Number:	OP19-000038
NAICS Code:	221310 **SIC:** 1623
DSB ID #:	ECAD-71

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I. Introduction

The United States Environmental Protection Agency (EPA) conducted a Clean Air Act (CAA) inspection at Queen Lane Water Treatment Plant (Queen Lane WTP or Facility) to verify compliance with applicable State, local and Federal regulations. Philadelphia AMS was notified of the inspection on October 30, 2023, via email. On November 14, 2023, EPA notified the Facility of the planned inspection via phone and email. EPA emailed a list of records for review to the Queen Lane WTP Plant Manager, Shiju Kuriakose, prior to the inspection (see Attachment 1). These records are listed in the Records Review section of the report.

The inspection included an evaluation of the Facility's processes and its compliance with the CAA. All information included in this report is the result of statements by the Facility representatives, materials shown to the inspectors by the Facility representatives, and/or documents provided by the Facility representatives to the inspectors at the time of, or subsequent to, the inspection. In addition, information gathered prior to the inspection from a review of EPA and State records may be included in Section A. Summary of the Facility.

A. Summary of the Facility

The Facility is located at 3110 Queen Lane, Philadelphia, PA 10129. The Queen Lane Water Treatment Plant is a surface water treatment plant that treats water from the Schuylkill River to produce drinking for the city of Philadelphia. This is done through several processes that takes particulates out of the water and sanitizes it to be fit for human consumption.

The Facility received a Natural Minor Operating Permit (OP19-000038) from Philadelphia AMS issued on April 22, 2020.

Queen Lane WTP is classified as minor source for PM, CO, SOx, VOCs, HAPs, and NOx. The Facility is subject to, or potentially subject to the following federal regulations:

- 40 C.F.R. Part 60 Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (NSPS 4I)
- 40 C.F.R. Part 63 Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

B. Inspection Opening Conference

At 10:03 AM on November 15, 2023, EPA inspectors arrived at the Facility for a CAA Inspection and conducted a brief opening conference. The Philadelphia Water Department (PWD) was represented by Shiju Kuriakose and Hiral Amin. Also, John Ewurum from Philadelphia AMS was present. EPA inspectors, Scott Yanos and Erin Malone, presented their credentials and explained the purpose of the visit was to conduct a CAA inspection to determine compliance with their permit and any applicable regulations. Additionally, EPA informed the facility representatives of their right to claim any

confidential business information (CBI). At that time, Shiju Kuriakose did claim that interior photos of the facility and the diagrams of the facility layout for the for security reasons and declared these to be CBI.

II. Site Activity/Process Description

Queen Lane Water Treatment Plant was built in 1902 with one raw water basin to a slow sand filter basin in order to produce drinking water. In the 1960s, the facility was modernized to the current process, described below, at the facility expanding the capacity to produce up to 140 million gallons per day (mgd) of water. The facility produces, on average 60-65 mgd of drinking water for the City of Philadelphia.

The body of water that the Queen Lane WTP draws from to produce drinking water is the nearby Schuylkill River. The plant raw water intake is located within the river and uses electric pumps to draw the water to a 250-million-gallon raw water basin where the water is stored prior to going through the treatment process. While being held in the basin, there are a few pre-treatments that the facility adds to the raw river water prior to processing. Pretreatments at the water basin can include carbon and sodium hypochlorite; to improve the smell and taste of the water; and if the water is above 50 degrees Fahrenheit, the facility will add potassium permanganate for algae control. Water sits in detention within the basin for a day and a half before going to the treatment process. At the intake for the treatment process, a diffuser adds ferric chloride to help with turbidity and enhance coagulation for flocculation later in the treatment process. If the water is too acidic, hydrated lime is added to raise the pH before going into the treatment process. Queen Lane WTP attempts to maintain the water at 6.5 pH at this point in the water treatment process.

After sitting in detention for one and a half days, the water is then gravity fed by dropping it 60 feet into the treatment process. The water crosses under Fox street and is fed through E-shaft. In E-shaft, the water is tested, and several chemicals can be added, depending on water quality, to prepare the water for flocculation and sedimentation as well as keep the water properly sanitized. Sodium hypochlorite is added to maintain 10% concentration of sodium hypochlorite throughout the process. Hydrofluorosilicic acid is added for water fluoridation. Several other optional treatments can be used at this point depending on the quality of the water. Hydrated lime can be added if the pH has dropped below 6.5, activated carbon for smell and taste, ferric chloride, and polymer (also known as flocculant) if the water has high turbidity. After this, the water is routed through F-shaft before heading out to the flocculation tanks and sedimentation basins.

It is in the four flocculation tanks and sedimentation basins that the turbidity of the water is lowered to clean the water of suspended solids. The flocculation tank is where the solids start to coagulate into larger solid particles. The flocculation tanks have slow rotating paddles that agitate the water so that the solid particles collide and begin to form the larger solid particles. Once the water enters the sedimentation basins, the agitation of the water ceases, and the now heavy solid particles are able to

fall out of suspension to the bottom of the basins where it forms a sludge. The sludge is removed and sent to wastewater treatment plants.

With the majority of solids removed from the water, the water is routed back across the street to the dual media filters. On the way to the filters, the water is treated once more with sodium hypochlorite to maintain the 10% levels of sodium hypochlorite and hydrated lime, in order to bring the pH to 7.2. The same flocculation polymer can be added to help get the last of the solids out through the dual media filters. There are 40 filters in total but at the time of the inspection, only 39 were operational since one was down for service. The filters consist of 21 inches of anthracite, 9 inches of sand and 9.5 inches of gravel. The filter run time is 72 hours before the Facility backwashes the filter and fills the tank again for use. Electric pumps are sometimes used to assist in the backwashing of the filters. If a filter is taken out of service for any reason, it is always backwashed before returning to service. The facility backwashes 13-14 filters per day. The filters have reached their life expectancy and the facility is in the process of replacing the filters as part of a capital improvement project.

Once the last of the solids are removed from the water, it is treated with ammonia and zinc orthophosphate for further sanitization. As the flows combine, there are also injection ports for sodium hypochlorite, to maintain the 10%, hydrofluorosilicic acid for additional water fluoridation, and caustic soda to maintain the pH at 7. The treated water flows into two 45 million gallons clear wells for water storage where it can be pumped out into the city's water supply. There is a load control that maintains how much water is pumped at a time according to the demands and usage.

The flocculation tanks and sedimentation basins are taken out of service once a year for cleaning. The basins are cleaned with firehoses. The timing of this cleaning is coordinated with the wastewater treatment plants because the facility is limited to sending 40 tons per day of sludge offsite for treatment. Queen Lane WTP cleans two basins in the spring and cleans the other two basins in the autumn. The facility collects samples of the sludge in the basins and has a laboratory test it to ensure the quality of the water stays consistent.

The facility has two 1.69 MMBTU/hr boilers which are used for comfort heat in the facility's offices. The boilers are not directly maintained by facility staff but the Facility Management Group. Queen Lane WTP also has a diesel-powered emergency generator on the premises which is maintained by facility staff. It is tested monthly but is never tested with a load. The emergency generator is a last resort for power as the facility has two PECO lines as a way to maintain power should problems arise with the power grid. The emergency generator has not been used for emergency power; the only time it is operated is for the monthly testing. The emergency generator fuel tank is 850-gallon belly tank and can power the generator for 40 hours when full. The facility has only filled it once during the time that it has been installed in 2014. All pumps used within the facility are electric.

The carbon and lime are delivered under pressure to underground storage tanks (USTs). The hoses from the truck hook up to the filters which helps to cut down on particulate emissions from the delivery. Filters are checked after each delivery and are changed when visibly fully soiled. The facility

stores ammonia on premise via two 6,500-gallon underground storage tanks. Potassium permanganate is stored in two 44,000-gallon underground storage tanks and the zinc orthophosphate is stored in the basement of the maintenance shed in two 3,000-gallon storage tanks that lead to two 2,400-gallon feed tanks.

In 2019, the City of Philadelphia developed a Water Revitalization Plan. The 25-year plan includes multiple large-scale water improvement projects, including a total rebuild of the Queen Lane WTP.

The facility has 59 employees in total. The office and maintenance staff work Monday through Friday, 6:00 AM to 3:30 PM. The four certified operators and four operations chiefs work on a rotating 24-hour schedule working 7 days a week with a standby sheet to ensure that a certified operator is at the water treatment plant when in operation. One certified operator and one operations chief is on a shift for 8 hours at a time.

The opening conference concluded at 11:19 AM.

III. Observations

EPA inspectors were led on a walkthrough of the Facility at 11:20 AM by Shiju Kuriakose and Hiral Amin of the Philadelphia Water Department and John Ewurum was also present for the walkthrough. EPA inspectors noted photos would be taken during the Facility walkthrough (Attachment 2 - CBI).

The walkthrough of the facility commenced at the raw water basin where the EPA inspectors observed the open air 250-million-gallon basin. On the other side of the basin from where the EPA inspectors stood, the backwash tank, used to backwash the filters was observed. Potassium permanganate is added below the surface of the water along with sodium hypochlorite. The sodium hypochlorite is added using the liquid form of the chemical as a 20% solution but is diluted to 10%. The sodium hypochlorite, activated carbon and lime all are added from underwater injectors. Ferric chloride is added via a custom-made diffuser at an exit point of the raw water basin which is the only injector port to be exposed to open air. There is also an option to add either anionic or cationic polymers to assist in flocculation, but this is done only rarely if the water has high turbidity. Mr Kuriakose also explained that they pump more water during the night for energy cost savings.

From here the EPA inspectors followed the water process as Mr. Kuriakose pointed out where the raw water system drops 60-feet to allow it to cross Fox street and enter the Pre-Treatment Building; which is now used mostly laboratory and office space. Upon entry to the Pre-Treatment Building, an unpermitted generator was observed. The generator is a G30F3S 2005 Caterpillar Olympian 30 kW natural gas generator. Mr. Kuriakose explained that it was an emergency generator that was purchased after Hurricane Sandy but never used. Mr. Kuriakose went on further to explain that the electricians had disconnected it and it was no longer used. The fuel line was observed to have the fuel line closed by a valve with no visible disconnection from the natural gas line and the electrical line to the electrical grid was still in place. From here, the EPA inspectors observed where the four shafts of water enter to

the flocculation tanks and sedimentation basins with one shaft going to each of the four tanks and basins.

Mr. Kuriakose then showed the EPA inspectors the water analyzation room and the process laboratory where the facility monitors water quality. While in the laboratory, the EPA inspectors observed a fume hood for chemicals that contained small amounts of potassium iodide and acetic acid for various chemical preparation purposes. After observing the labs, the group proceeded outside to observe the flocculation tanks and sedimentation basins. The #2 Flocculation tank and basin was empty because it was being cleaned and repaired after mechanical failure occurred on one of the cross connectors. This allowed the EPA inspectors to observe where the sludge is collected at the bottom of the tank and then piped to wastewater treatment. Mr. Kuriakose continued demonstrating how the solids in the water combine in the flocculation tank to form "flocc" that settle out in the sedimentation banks. He stated to EPA inspectors that after all the "flocc" has settled, all the water from all four basins combine and sodium hypochlorite and lime are added to the water before the water is routed across the street to the filtering process.

The location of the two 6,500-gallon underground ammonia tanks was observed by the EPA inspectors. Since the tanks are completely sealed underground with only a concrete top, only the filling ports were able to be seen at the surface. The same observations were made when Mr. Kuriakose identified to the EPA inspectors the two 44,000-gallon potassium permanganate tanks. Next, the filling ports and filters used to control particulate matter emissions during the delivery of carbon and lime were observed for the three carbon and three lime underground tanks. Mr. Kuriakose explained that the lime is continuously stirred in order to avoid clumping. If the lime is not stirred, it will not be able to be pumped into the process.

The EPA inspection team then proceeded to the main operations center, which is where the operations chief monitors the water treatment process using various computer and mechanical monitoring systems. Mr. Kuriakose then led the EPA inspectors to the chemical pump rooms, where all the various chemicals are pumped to the process using electric pumps. The EPA inspection team the proceeded to the basement of the maintenance building and were able to observe the sides of the USTs for carbon and lime. EPA inspectors also observed two 3,000-gallon storage tanks and two 2,500-gallon feeder tanks for the zinc orthophosphate system as well as the electric pumps that are used to pump the lime and carbon to the various injectors in the water system. The basement also contains four air compressors that are all electrically powered.

After completing the walkthrough in this area, the Mr. Kuriakose led the EPA inspectors back across the street for the inspection of the emergency generator. The emergency generator is a QST30-G5 NR2 Quantum Series Cummins 1111 kW (1490 HP) diesel generator. The engine's emission control information (ECI) label stated that the engine was manufactured in September 2015 and an EPA Engine Family of FCEXL030AAD. The engine had 62.2 runtime hours at the time of the inspection. The generator was installed at the facility for emergency use during heavy storms like Hurricane Sandy. The generator was bought to handle both the pumping station and the water treatment plant, but the

pumping station has since been moved to another location. From the emergency generator, the EPA inspectors observed the backwash and surface flush pumps which are all electric pumps before moving on to inspect the boilers. The facility has two Weil-McLain LGB Commercial Natural Gas Boilers used for comfort heat in the offices of the facility. The exhaust of the two boilers are combined into a single stack prior to exiting the building.

The walkthrough portion of the inspection finished with Mr. Kuriakose identifying to EPA inspectors the north and south filter beds before proceeding to the clear wells. The filter beds are where the last of the solid material suspended in the water is filtered out after the sedimentation basins. It is from here that the two sides of filters combine into one water stream, ammonia, flouride and sodium hypochlorite is added before the finished water is sent to the clear wells where it sits until being sent offsite for use as drinking water in Philadelphia.

The walkthrough concluded at 1:16 PM.

IV. Records Review

The records review was completed during the Opening Conference before the walkthrough was conducted. EPA inspectors reviewed documents requested in the November 14, 2023, email to Shiju Kuriakose (see Attachment 1). Records were provided at the time of the inspection by Shiju Kuriakose. Below are the records requested and what was provided:

1. Provide a plot plan of the Facility. Also, provide a paper copy during the opening conference. – *Plot plan was provided during opening conference of the inspection – Confidential Business Information (CBI)*
2. Provide a detailed description of the Queen Lane Water Treatment's process(es). – *Detailed description was provided during the opening conference of the inspection.*
3. A list of all combustion sources at the Facility such as furnaces, boilers, and/or engines.
    a. For each boiler or engine identified, provide:
        i. Date of installation;
        ii. Type of fuel(s) combusted;
        iii. Maximum heat input rating (MMbtu or kW/hr);
        iv. Hours of operation monthly from January 2020 to the present.
    b. Fuel usage on a monthly basis for any combustion equipment at the Facility (boilers, emergency generators, fire pumps, etc.) since January 2020.
    c. Records of each tune-up conducted at each unit since January 2020.

    A list for the combustion sources listed in the permit was provided during the opening conference of the inspection. For the QST30-G5 NR2 Quantum Series Cummins diesel generator the date of installation, the type of fuel, maximum input rating, hours of operation, fuel usage and maintenance records were all provided during the opening conference of the inspection. Because the boilers are maintained by Philadelphia Facility Management, the records were provided for the two boilers on 11/16/202. On 11/28/2023 records were provided for the G30F3S 2005 Caterpillar Olympian 30 kW natural gas generator.

4. Annual production and emissions calculations (preferably emailed in an unlocked Microsoft Excel format) since 2020, including but not limited to:
    a. Monthly emissions of VOCs, HAPs, PM-10, SOx, CO and NOx for each process unit and facility wide along with supporting calculations for 2020-2022 (lbs/hr).

    Provided during the opening conference of the inspection.

5. Provide a list of any and each control device currently in use at the Queen Lane Water Treatment Plant used to control or reduce emissions from any emission point at the site. The list should include:
    a. The make/model of the control;
    b. Date of installation at the Facility;
    c. Which pollutant(s) are being controlled;
    d. Each source or emission point being controlled;
    e. The reduction efficiency (%) for each control;
    f. Copies of any stack tests conducted to determine emissions, control efficiency, for compliance demonstrations, etc. conducted at the Facility since 2000.

    Provided during the opening conference of the inspection

6. Provide a list of each request for permit determination or permit application submitted to City of Philadelphia Air Management Services since January 2020. Also, provide a list of each permit or permitting determination issued to Queen Lane Water Treatment Plant. This should include the date of the request/permit and the permit number, if applicable. – *Provided during the opening of the inspection*
7. Provide copies of any initial notifications, compliance reports, and/or periodic reports submitted to either EPA or AMS for applicable air emission sources. – *Provided during the opening conference of the inspection.*

V. Closing Conference

After the records review, EPA inspectors, Shiju Kuriakose and Hiral Amin of the Philadelphia Water Department and John Ewurum of Philadelphia AMS had a brief closing conference to ask additional questions and discuss observations. The EPA inspectors noted that the investigation is on-going, and any areas of concern identified in the final report do not necessarily reflect a violation or deviation, rather, they are areas that will require further investigation. EPA also noted that they would issue an inspection report within in 60 days, with a copy to the City. During the closing conference, Shiju Kuriakose declared that the interior photos and process diagrams are CBI. Simultaneously, EPA will perform a detailed review of records and may have additional questions. The inspection concluded at 1:33 PM.

The following have been identified as potential issues during the inspection. They are issues that require either further investigation by EPA or additional information or explanation by the facility.

- Review compliance status of the unpermitted emergency generator with the regulatory requirements of 40 CFR Part 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, that was observed during the inspection.

- Review of the emission calculations for the facility to ensure all possible air emission sources are considered.
- Review compliance status of the permitted emergency generator with the regulatory requirements of Part 60, Subpart IIII- Standards of Performance for Stationary Compression Ignition Internal Combustion Engines and of Part 63, Subpart ZZZZ National Emission Standards for Stationary Reciprocating Internal Combustion Engines. This includes a review of the requirements detailed in 40 CFR Parts 60.4205(b),(d) and the Parts 63.6605, 63.6640 and 63.6645(f).

VI. List of Attachments

Attachment 1:	Email correspondence to Shiju Kuriakose of records requested to review during inspection
Attachment 2:	Photo Log (CBI)
Attachment 3:	Sign-in Sheet