DECATUR, AR WWTP
PRELIMINARY CAPACITY ANALYSIS FINDINGS

Prepared for:

City of Decatur, AR

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Digitally Signed 09/06/2024

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1. ADEQ REQUEST

1.1 Initiation

In a letter dated May 22, 2024, the Division of Environmental Quality's Office of Water Quality DEQ requested a capacity analysis be performed for the City of Decatur's wastewater treatment plant for current and future capacity. The following items were requested to be included in the analysis:

1. The actual treatment capacity of the plant compared to the design flow as stated in the plans and specifications submitted in the application for State Construction Permit No. AR0022292C, issued November 22, 2017.
2. The flow rates and total daily flows of wastewater received from the City of Centerton, the Simmons poultry processing facility, and the City of Decatur,
3. The pollutant concentrations of the influent flows referenced in No.2 above;
4. The quantity of sludge produced from treatment and how it is managed;
5. The anticipated increase, or changes to, the flows, pollutant concentrations, and sludge production noted in Nos. 1, 2, and 3 above.
6. The operational aspects of the industrial production and discharge schedule, as well as the operation of the wastewater treatment plant in terms of ability to manage flow and load fluctuations, upsets from industrial contributors, and storage capacity.

1.2 Urgent Release of Preliminary Findings

On September 4, 2024, Richard Healey requested that available preliminary findings regarding the Decatur, AR WWTP be made available, even if additional analysis outlined in the Capacity Analysis Request, dated May 22, 2024, was not yet complete.

1.3 Preliminary Findings

This preliminary report summarizes findings pertaining to the demand for capacity at the Decatur WWTP with respect to the permitted capacity in its NPDES Permit.

2. TREATMENT CAPACITY AND OPERATION

2.1 Actual Treatment Capacity

The design flow of the existing facility is 3.8 MGD, with one treatment train out of service. This is based on an instantaneous membrane capacity of 1,330 gpm (1.9 MGD) per train, with constant filtration. The total instantaneous membrane capacity is 3,990 gpm (5.7 MGD), for the existing configuration (3 tanks x 5 modules per tank x 266 gpm per module [60 elements]).

However, the membrane system is typically operated with one minute of rest following seven minutes of operation; under this operation scheme the total treatment capacity is approximately 5.0 MGD. One additional membrane module could be added to each tank, which would bring the total capacity to approximately 6.0 MGD with the recommended resting period (4.0 MGD firm).

The absolute limit to the plant's treatment capacity is the existing U.V. disinfection system; the primary unit has a design capacity of 5.0 MGD, with a 3.0 MGD backup unit.

The influent flow splitter box, headworks, and treatment feed pump station were part of the original plant, designed to only 2.2 MGD. The headworks expansion project (currently under design) will increase this capacity well beyond the capacity of the existing membranes, accounting for future expansion of the treatment facilities.

2.2 Operational Aspects

The Simmon poultry processing facility's operation schedule is typically 24-hours per day, 5-days per week. With this schedule, the weekday flows are higher than the weekend flows. Typical operation at the WWTP involves processing as much wastewater as reasonably possible during the week, allowing excess to divert to the equalization basin upstream of the headworks (typically, inadvertently, because of the undersized flow splitter box), and processing the excess wastewater during the weekend when influent flows are reduced.

This operation strategy works well during dry weather periods but can cause issues during wet weather. The community has issues with inflow and infiltration, which results in higher influent flows after heavy rainfall events. The increase in industrial contributions during the week is putting a greater strain on the existing storage.

Besides the hydraulic limitations of the industrial contribution, occasional upsets of fats/oils/greases (FOG) occur. These can blind the fine screens, resulting in overflows at the screens. Managing these upsets involves pressure washing the fine screens to remove the build-up. The new headworks will have more reliability to avoid overflows resulting from FOG accumulation.

3. DATA AND ANALYSIS

3.1 Data Sources

The City of Decatur provided data from March 1, 2019 through June 30, 2024. These data sets included influent flows and loadings, miscellaneous (non-reported) effluent data, and the DMR (reported) effluent data. Monthly totals for billed usage were provided for the City of Centerton and the Simmons poultry processing facility for the same period. A small subset of daily flows from Centerton was provided for October 2023 through April 2024. The influent data set was used primarily for the analysis in this report, with minimal analysis of the DMR reported effluent flows.

Influent flows to the WWTP are recorded at the influent Parshall flume at the headworks. There is a flow meter on the force main from the City of Centerton at the WWTP. The flow is metered for Simmons at the processing facility. The effluent flow is recorded at the effluent Parshall flume, downstream of the membranes.

3.1.1 Limitations

It should be noted that there are significant limitations to the analysis based on the available data. The data from Centerton and Simmons is limited to monthly averages, with assumptions being made for the operation schedule of Simmons.

Flows for the City of Decatur should, theoretically, be estimated from the total influent flows minus Centerton and Simmons. However, since daily meter readings from each source were not readily available for this analysis, it is difficult to rely on this information. Additionally, hydraulic overloading of the influent flow splitting box allows part of the incoming flow to divert to the equalization pond prior to the flow being recorded. As a result, the raw data shows flow from the City of Decatur to be “negative” during much of the study period.

3.2 Analysis

Trends in daily influent wastewater flows were analyzed to determine the extent to which flows have increased over the last five years. The average daily flows from the City of Centerton were calculated from the monthly billed totals based on the number of days between billing periods. The average daily flows for the Simmons poultry processing facility were calculated from the monthly billed totals by assuming the facility only operates Monday through Friday, with closures on major holidays (typically 21-22 days per billing cycle). Trends in the DMR reported effluent flows were compared to the permitted design flow, as summarized below.

3.2.1 Daily Influent Flows

Centerton: Since 2019, the average daily flow from Centerton has increased by about 35%. In 2024, the daily flow has ranged from 1.07 MGD to 1.51 MGD, with an average of 1.28 MGD. The peak monthly usage for the data provided was 1.52 MGD in 2023. The peak daily usage recorded from October 2023 through April 2024 was 1.78 MGD (October 2023).

Simmons: The Simmons poultry processing facility has steadily increased flows over the last five years. The minimum monthly usage increased by approximately 13% from 2019 to 2024 (minimum of 1.34 MGD in January 2023), while the maximum monthly usage increased by approximately 30% (maximum of 4.1 MGD in June 2024). From 2019 to 2024, the average monthly usage per year increased by 19%, from 2.67 MGD to 3.17 MGD.

Decatur: The average flow from Decatur was estimated as 0.3 MGD in 2022, based on operator feedback. Estimates from April 2024 showed an average of 0.29 MGD, when all weekday totals were greater than the sum of recorded Centerton flow and Simmons average.

Recorded Total Influent: While the data is somewhat incomplete, an important trend in the flow being received at the City of Decatur's WWTP can be observed in Figure 3-1. From 2019 to 2024, the overall total average influent wastewater flow has increased by 44% (from 2.79 MGD to 3.99 MGD), the weekday average has increased by 32% (from 3.16 MGD to 4.18 MGD), and the weekend average has increased by 94% (from 1.85 MGD to 3.55 MGD). The peak daily influent flow recorded was 5.47 MGD (May 2022).

Of most concern is the increase in the weekend average, due to the fact that Simmons does not operate over the weekends. The average daily flow from Simmons has increased by nearly 0.5 MGD in the past 18 months and is likely pushing an equal volume of wastewater to the equalization basin. While the weekday average has not increased as significantly, it is likely that most of the increase in weekend flows is due to extra wastewater being diverted to the equalization basin (therefore not being recorded), which the operators push to treat over the weekend.

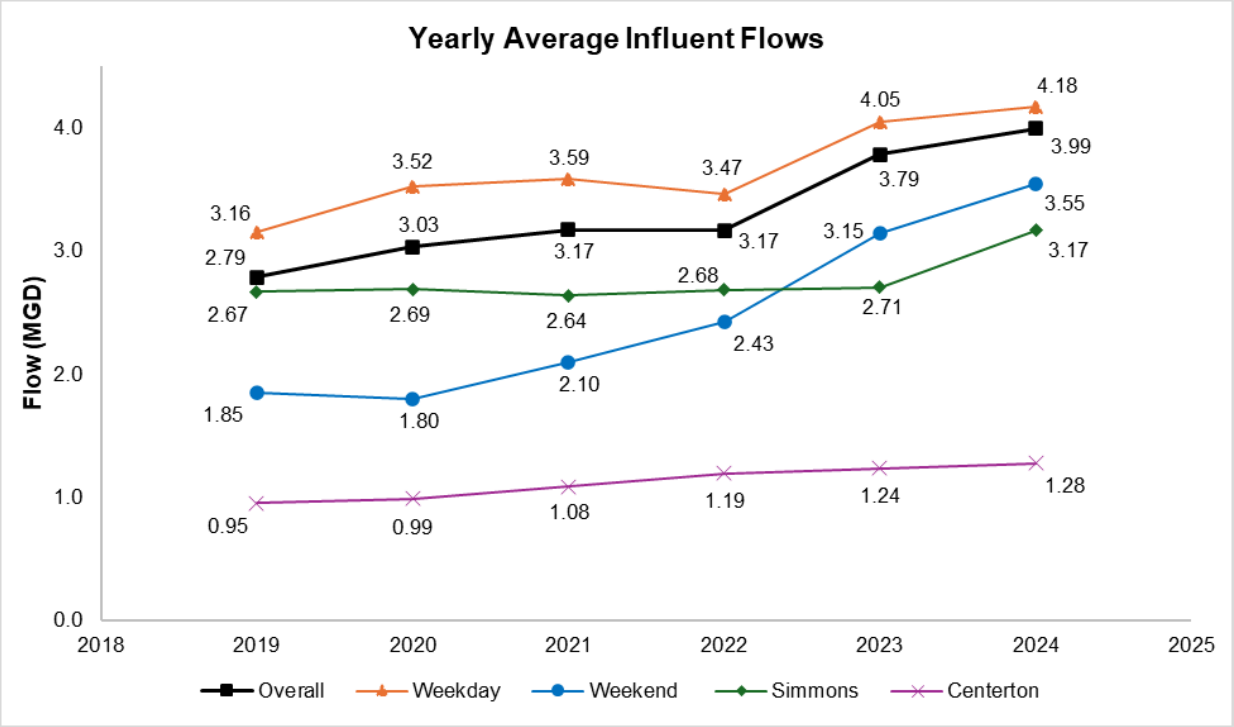

Figure 3-1. Yearly average recorded/estimated influent wastewater flows.

3.2.2 Effluent Flows (DMR)

Figure 3-2 shows the trend of monthly average reported effluent flows from March 2019 through June 2024. The design capacity (one train out-of-service) is 3.8 MGD. The typical threshold for needing additional treatment capacity is 80-percent of the design capacity. During the study period, 64% of the average monthly flows have been above this threshold. The City of Decatur's average monthly flows have remained above the 80-percent threshold since February 2023.

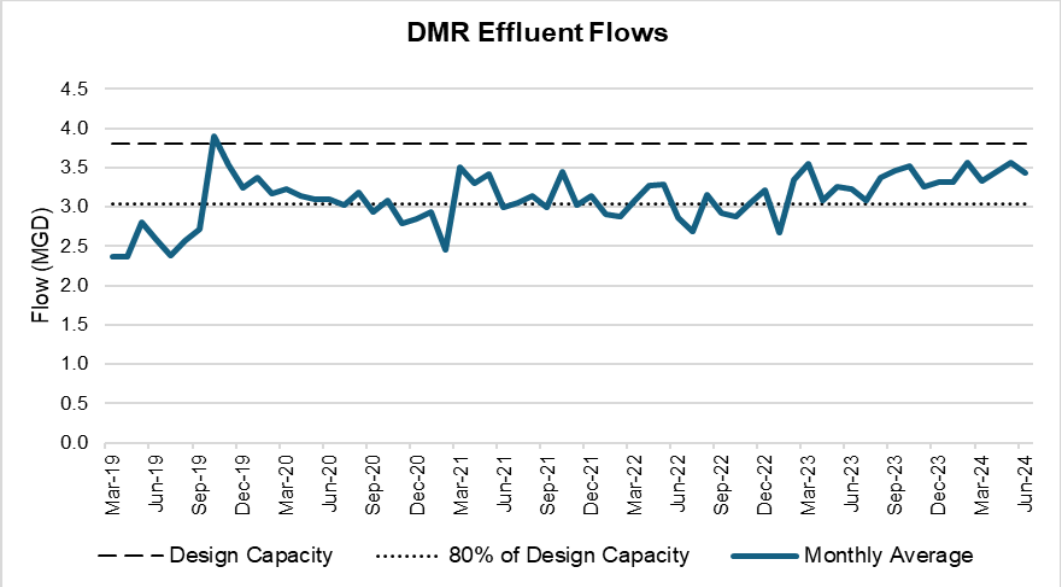

Figure 3-2. Monthly average reported effluent flows.

3.2.3 Influent Pollutants

While influent samples are taken for the combined flows into the plant, samples are only taken occasionally for the wastewater received from Centerton and Simmons. This data was not readily available for the included analysis timeline, but previously provided sampling data suggests that pollutants from both sources are consistent with the overall average loading.

Influent sampling data was provided from March 1, 2019 through June 30, 2024; Table 3-1 includes a summary of the data. Samples are taken by an automatic sampler, prior to the headworks; samples are only analyzed on weekdays. Included in the influent sampling data are COD, TSS, Total N, Total P, pH, alkalinity, and temperature. Influent BOD is estimated from the COD measurements. Yearly trends for the influent concentrations of BOD, TSS, TN, and TP are provided in Appendix B.

Table 3-1. Summary of Influent Pollutant Concentrations

	Minimum	Maximum	2019-2024 Average	2023-2024 Average
COD	277.0	2,210.0	612.3	648.6
BOD	166.2	1,326.0	367.4	389.2
TSS	5.2	6,685.0	158.7	178.1
Total N	23.4	207.0	88.8	100.3
Total P	3.8	20.5	10.0	11.2

3.2.4 Sludge Production

Analysis of the sludge production was not able to be completed for these preliminary findings. However, it is apparent that sludge production has increased in the past year because the City has rented a second sludge screw press to keep up with dewatering.

4. DEMAND FOR CAPACITY

4.1 Current Demand for Capacity

The average demands for 2024 are summarized in Table 4-1. The total influent average shown is approximately 110% of the permitted capacity (3.8 MGD) and 84% of the total capacity (5.0 MGD, assuming recommended membrane rest periods). The peak day total shown is approximately 130% of the permitted capacity and 99% of the total capacity. Previous years' peak days of 5.47 MGD required the membranes to be operated with longer operating intervals.

Table 4-1. Current Approximate Demands

	Decatur [1]	Centerton	Simmons	Total Influent [2]
2024 Weekday Average (MGD)	0.29	1.28	3.17	4.18
2024 Peak Day / Max. Month (MGD) [3]	0.43	1.73	4.12*	4.93

1. Estimated from Weekday Daily Total – Daily Centerton – Average Simmons (2.638 MGD) for the April 2024 billing cycle.
2. Average for January 2024 through June 2024; not the sum of the flows listed in this table.
3. Centerton, Decatur, and Total Influent are peak day; Simmons is a calculated maximum month.

4.2 Projected Demand for Capacity (Immediate Future)

To estimate the potential increase in flow from the City of Decatur, the amount of land available for development within the City's jurisdiction was obtained. An estimated 417 acres of land are currently available/slated for development. Assuming 0.25-lots, 3 persons per household, and 100 gpd per person, an estimated 0.5 MGD increase in daily flows could be expected. These values are conservative for the number of houses and gpd per person but may be low for the occupancy per household. Any development beyond the currently approved housing additions is not included and should be considered in future analysis.

Simmons has averaged 3.17 MGD in 2024, or 2,200 gpm (assuming 24-hour operation). The last figure provided by Simmons was an estimated maximum of 2,500 gpm (3.6 MGD) of desired capacity. However, the estimated average use in June 2024 was 4.1 MGD (2,860 gpm), which is greater than the permitted discharge capacity of the WWTP. The desired capacity of 3.6 MGD is for the existing facility and does not include any expansion which may be completed in the future.

The City of Centerton is rapidly growing in population, although this increase has not translated into significantly greater wastewater flows. If it is assumed that flow from Centerton

increases by approximately 10% per year, the flow would be increased by 0.5 MGD within four years. It is likely that the rate of increase could be much higher in subsequent years.

Table 4-2 shows the projected demands for capacity within two years if each of the above assumptions were true and housing developments begin soon. The total estimated flow is based on sum of all, which is compared to the design (permitted) effluent capacity and the actual treatment capacity. Compared to the average total in Table 4-1, the sum is much greater; this is due to the limitations of the data available and flow diversions.

Table 4-2. Projected Demands for Capacity Within Two Years.

	Decatur	Centerton	Simmons	Sum	Percent of Permitted Capacity (3.8 MGD)	Percent of Actual Capacity (5.0 MGD)
2024 Weekday Average (MGD)	0.29	1.28	3.17	4.74	125%	95%
2026 Estimated Average (MGD)[1]	0.79	1.55	3.60	5.94	156%	119%
1. Assumptions for increases stated in previous paragraphs.						

As shown in Table 4-2, the average flows seen in 2024 would push the WWTP to nearly maximum capacity if the full volume of wastewater could pass through the influent flow splitter. The housing additions that are currently being planned, along with anticipated growth in Centerton and full capacity from Simmons would push the average influent wastewater flow beyond the absolute capacity of the treatment facility.

5. PRELIMINARY CONCLUSIONS

After analyzing the influent wastewater flows over the last five years, it is apparent that the flow to the City of Decatur's WWTP is rapidly increasing. The overall average influent flow has increased by more than 0.5 MGD over the last two years to 4.0 MGD. The weekday average recorded flow has increased to 4.2 MGD but is likely closer to 4.7 MGD, based on the sum of the average constituent flows. With the limitations at the headworks and influent pump station, the difference in flow (more than 0.5 MGD) is being diverted to the equalization basin to be treated over the weekends. The weekend average has increased by more than 1.1 MGD over the last two years (current average: 3.55 MGD)

The average influent flow has increased to beyond the design (permitted) flow of 3.8 MGD since July 2023; the average effluent flow has been above the 80% threshold since February 2023. Anticipated demand from the addition of approved housing in Decatur will continue to push the WWTP to operate near or above the recommended maximum treatment capacity (5.0 MGD).

Appendix A – Flow Data

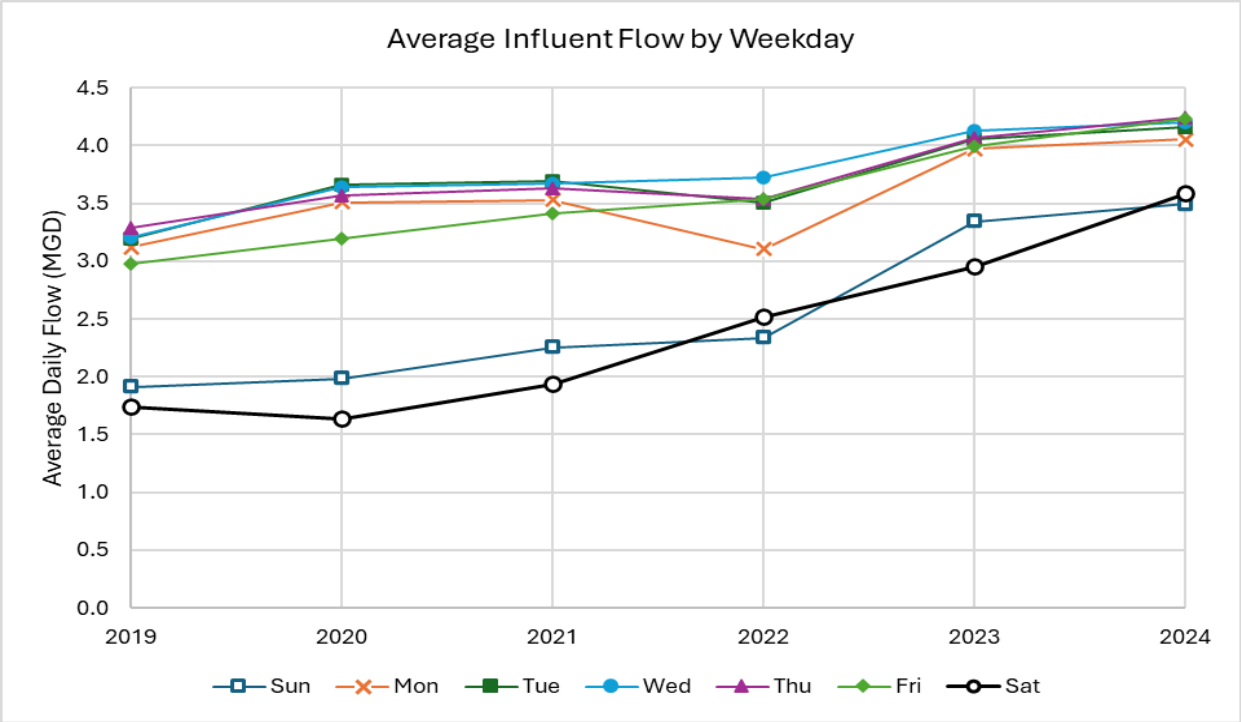

Figure A1. Average influent flow by weekday.

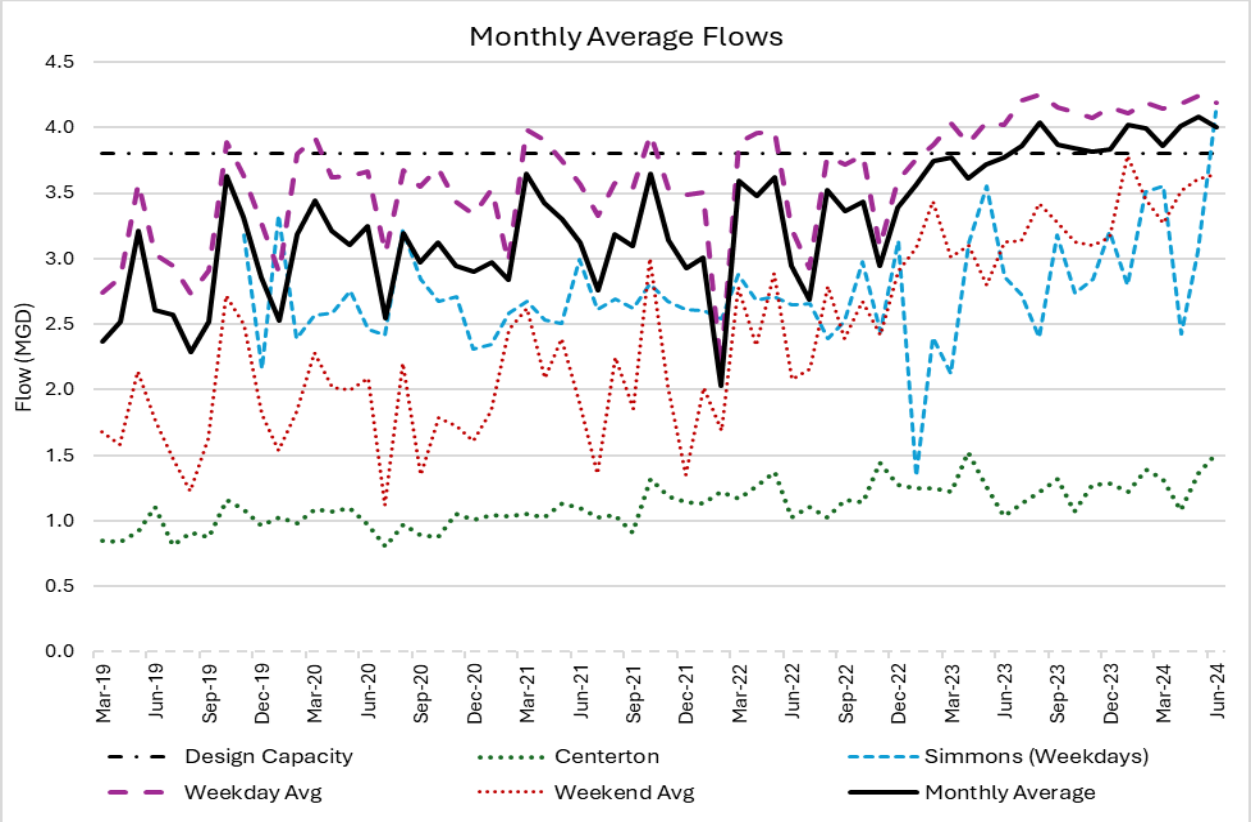

Figure A2. Monthly average influent flows, weekday/weekend averages, for Centerton and Simmons.

Appendix B – Influent Pollutant Loading Data

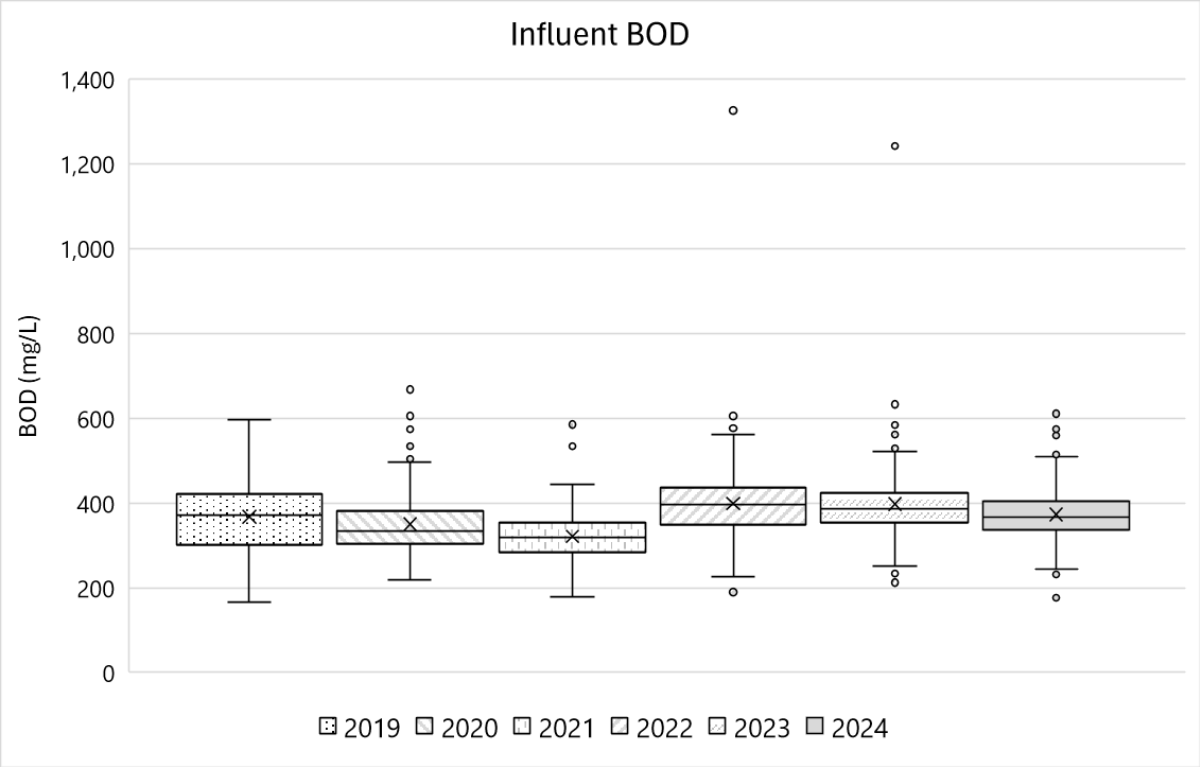

Figure B1. Influent BOD concentrations by year.

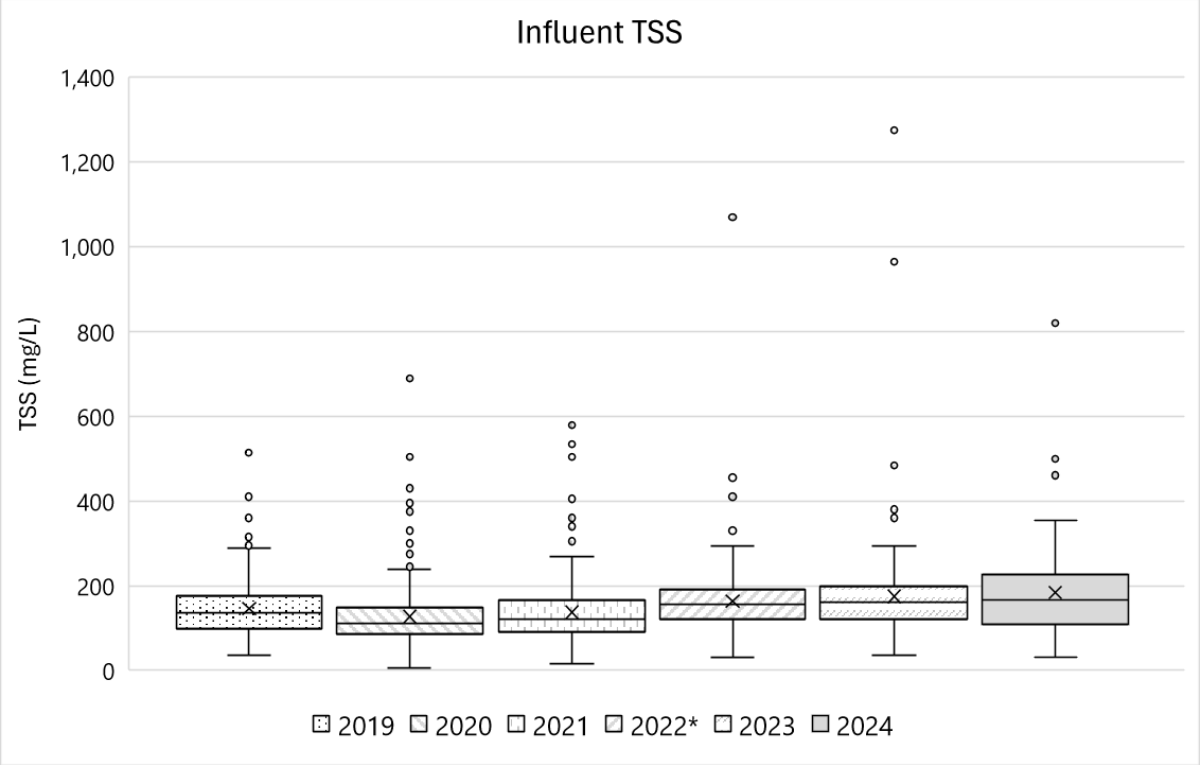

Figure B2. Influent TSS concentrations by year; outlier of 6,685 mg/L recorded in September 2022 was removed from analysis.

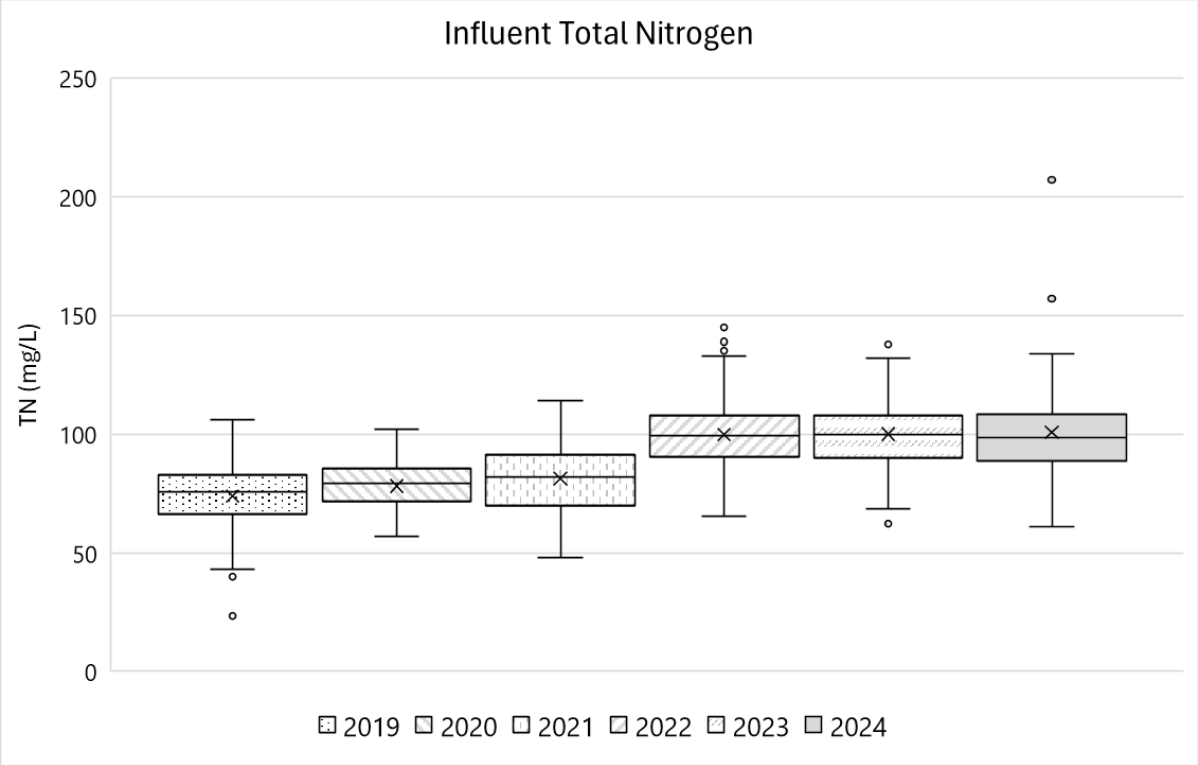

Figure B3. Influent total nitrogen concentrations by year.

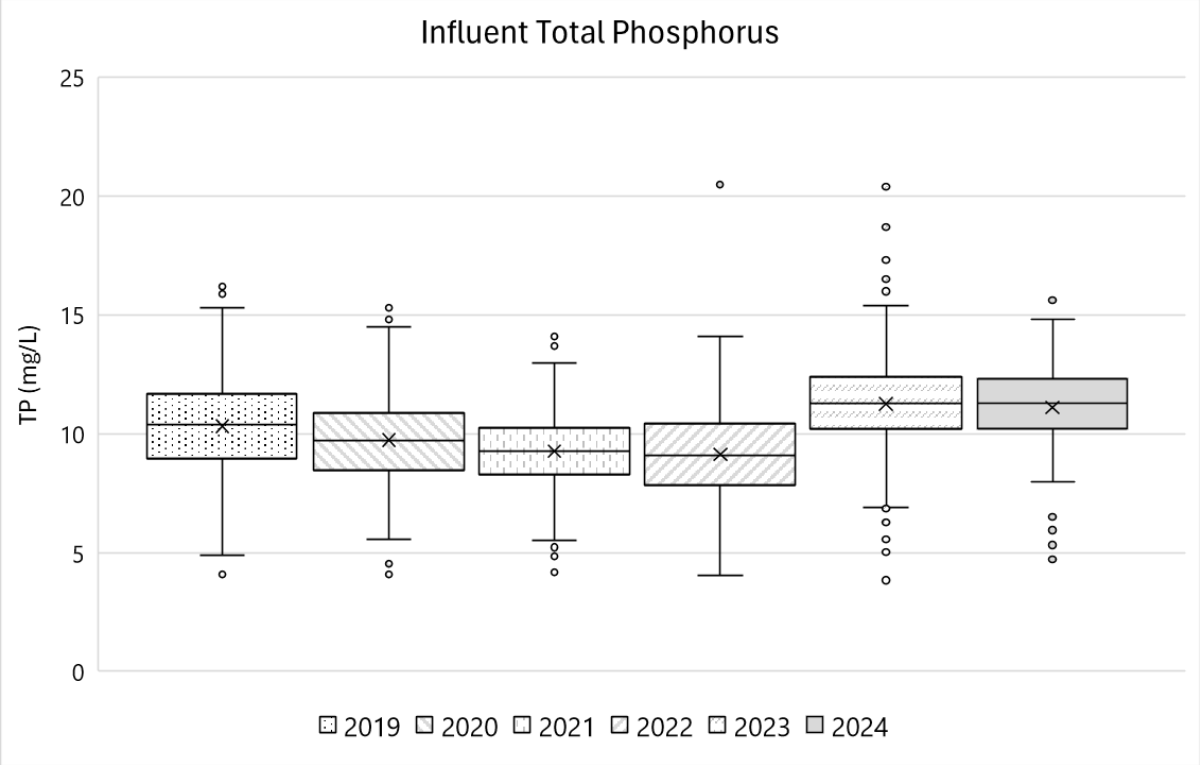

Figure B4. Influent total phosphorus concentrations by year.