City of Le Roy Illinois
Water Treatment and Distribution System Water Quality Study

Meeting Date:	March 8, 2024
Meeting Time:	9:00 am to 2:00 pm
Location:	Le Roy Municipal Building, 207 S East St.
Attendees:	Dave Jenkins/Le Roy Perry Mayer/Le Roy Tony Myers/Jacobs Vern Snoeyink/Jacobs Todd Elliott/Jacobs Ron Legner/Chastain & Associates

Purpose

The purpose of this Water Treatment and Distribution System Water Quality Study is to make recommendations for the water treatment plant and distribution system that improve water quality.

The purpose of this meeting is to:

- Review project background, purpose and goals
- Discuss information provided and additional information needs
- Tour the water treatment plant to learn about the facilities and operational practices
- Discuss the distribution system and flushing practices
- Discuss next steps

Discussion Items

Project Goals

- Improve water quality and customer confidence in the drinking water
- Comply with regulations
- Improve the perception of the water department

Water Quality Challenges

The main water quality challenges are:

1. High lead and copper levels at customers tap
2. Unstable chlorine residuals in the distribution system

3. Red water in the distribution system (iron and manganese)
4. Occasional high levels of disinfection byproducts (TTHM and HAA)

This study does not include a lead/copper corrosion control treatment study, but some of the recommendations are related to reducing corrosion in the distribution system. A lead/copper corrosion control study is being conducted by Chastain & Associates and is planned to be completed in April 2024.

The existing water treatment plant has the capability to remove iron, manganese and hardness through aeration, oxidation, anthracite/greensand filters and ion exchange. The water plant is not equipped to remove ammonia or total organic carbon (TOC).

Based on a preliminary evaluation of water quality, it appears that the ammonia is causing nitrification in the distribution system. This nitrification makes it difficult to maintain a chlorine residual and can create corrosive conditions. The high TOC exerts a chlorine demand and produces disinfection byproducts in the presence of chlorine.

This study will focus on alternatives to remove ammonia and TOC at the water plant, and ways to optimize the existing anthracite/greensand filters and ion exchange. Recommendations for distribution system flushing techniques and maintaining water quality in the distribution system will also be made.

This study does not include a nitrification control plan, but some of the recommendations will help reduce nitrification in the distribution system. A first step in controlling nitrification is removing the excess ammonia in the water supply. The City of Le Roy inquired about developing a scope of work for a nitrification control plan.

The Illinois Environmental Protection Agency (IEPA) and United States EPA (USEPA) have engaged with the City to discuss the issues. There may be opportunities to collaborate with USEPA if bench or pilot testing is required to assess treatment alternatives.

City budgeting for the next fiscal year is due by April 30 with City Council approval a few weeks prior. Any recommended projects for the next fiscal year should be identified before this date.

Water System Information

Groundwater Supply

There are two water supply wells with capacities of 250 gallons per minute (gpm) and 450 gpm. A third well at the water plant site is not is use and planned for abandonment. The average day water demand is around 180 gpm and the maximum day demand is about 360 gpm. The water supply system does not have firm capacity for maximum day, so a third well is being planned in the same aquifer west of town. The application for this well has been submitted to the IEPA by Chastain & Associates.

An evaluation of alternative water supply sources is not included in this study. However, the Mahomet aquifer was discussed as a potential water source. This aquifer is farther away (8-10 miles) but has better water quality in terms of ammonia, iron and TOC. Treatment of this water source would still be required, but it would be easier to treat than the existing water supply.

Buying wholesale water from Bloomington was also preliminarily discussed, but is not part of this study. The distance is around 15 miles and there are many regulatory, permitting and political

issues to consider. Once the cost of improving the existing water supply and treatment system is determined in this study, it will provide a benchmark for comparison to other water supplies in the future.

Water Treatment

Aeration

The water treatment plant averages about 16 hours of operation per day. Well water aerated then further oxidized with chlorine (11 mg/L) and sodium permanganate (2 mg/L as Mn) before passing through a detention tank. The detention tank is planned to be cleaned once per year. A new aerator was installed in 2004. There is capability to bypass the aerator.

Anthracite/Greensand Filters

The oxidized water is then pumped through 5 pressure greensand filters (12" anthracite over 18" greensand). The greensand filters were installed in 2020 and replaced microfiltration membranes which were installed in 2004. The greensand filters are backwashed after 55,000 gallons of water are treated. The greensand filters are backwashed with water only (no air scour). The greensand filters are each rated at 150 gpm at 4 gpm/sf. Three greensand filters tend to get more water than the other two. Each greensand filter has inlet and outlet pressure gauges. Pressure drop through all 5 filters is measured, as well as flow through all 5 filters. Backwash waste goes to the wastewater treatment plant through the existing sewer collection system.

Ion Exchange Softening

After greensand filters the water passes through four ion exchange softeners. About 30% of the water is bypassed, providing some hardness (about 120 mg/L as CaCO3) in the finished water. Each softener is regenerated after 100,000 gallons is treated. The softeners were installed in 2004 and the softener vessel internals and ion exchange resin were replaced in 2020. The ion exchange resin is Purolite C100E. The City stated they were in the process of conducting an ammonia breakthrough test to assess regeneration frequency required to remove ammonia using existing ion exchange media.

Regeneration waste goes to the wastewater treatment plant through the existing sewer collection system.

Clearwell

After softening a blended polyphosphate is added (WSU 110, 90% ortho/10% poly) at a dose of about 2 mg/L as PO4. Chlorine can also be added after softening but is not often used. After softening the water passes through a 250,000 gallon clearwell with a divider wall. The theoretical detention time is about 23 hours at average day flows (180 gpm) assuming the clearwell is full.

Sodium fluoride is added to the high service pump line at 0.7 mg/L as F.

Other Facilities

The old water plant building from 1976 houses the chlorine and sodium permanganate storage and feed chemicals. The building is about 30 feet wide by 40 feet long. The flat precast concrete roof is relatively short, estimated at around 12 feet. The aeration and detention tank are adjacent to the old water plant building.

A maintenance building on the water plant site houses trucks and is used for storage. It was built in the 1970s and expanded in the 1990s. The maintenance building is larger than the newer water treatment plant building.

There is a City owned park to the west of the water plant.

Distribution System

The distribution system flushing procedure starts with flushing hydrants near the water plant in concentric circles, then working out to elevated storage tanks. Valves are not closed to isolate water mains and increase velocity, such as in a Unidirectional Flushing program.

It was noted that the distribution system has many dead ends.

There are two elevated storage tanks, 250,000 gallons each. At an average day water demand of 180 gpm, those storage tanks together would have a water age of almost 2 days if they were full.

The City does not have a hydraulic model of the distribution system.

Next Steps

1. **Jacobs** to contact David Cook at IEPA and make him aware of this study and its objectives. IEPA will be invited to the next meeting.
2. **Ron Legner** will send Jacobs design information on the existing water plant, including the Farnsworth drawings for ion exchange and aeration.
3. **Jacobs** will evaluate the water plant operational data sent by Perry Mayer on March 8th.
4. **Jacobs** will begin developing and evaluating alternatives to improve water quality and treatment. These will include potential short term modifications and long term solutions.
5. **Jacobs** will schedule another meeting in mid to late April to discuss preliminary alternatives and potential short term recommendations.